



**APACHE**  
STAINLESS EQUIPMENT  
CORPORATION



GUIDE TO  
**ASME CUSTOM VESSELS:**  
Factory Tests & Certifications

# Factory Tests and Certifications for ASME Tanks and Vessels

An important part of quality assurance is the process of manufacturing a vessel and the completion of required certifications to meet ASME compliance.

Apache developed this general reference guide on the types of factory testing required to meet ASME code compliance for the manufacturing of stainless tanks and vessels.

All tests are made by qualified and/or certified professionals following written practices or procedures.

## Base Metal Thickness

Base Metal Thickness is a process of measuring the thickness of vessel walls in a new condition using an ultrasonic thickness testing device. Thickness readings are mapped and reported to the vessel owner for future comparisons to determine corrosion and wear.

► Certificate

## CIP (Clean In Place) Coverage

A spray device coverage test verifies spray patterns in process vessels to determine spray coverage. The CIP coverage test is not intended to demonstrate cleanability, but rather the ability to deliver cleaning solution to the target surfaces. The process includes coating the target surface with a riboflavin solution, running CIP equipment, then inspecting for residual riboflavin solution with a UV light. The vessel bottom, impellers, dip tubes and ports are verified in the test.

► Code Ref.: ASME BPE

## Ferrite Levels

Ferrite testing is a non-destructive method which provides data for austenitic stainless and duplex material. The test determines the material corrosion susceptibility, mechanical properties, service suitability and service reliability of the material being tested. Welds, construction, components can all be tested.

► Certificate

## Ferroxyl Test

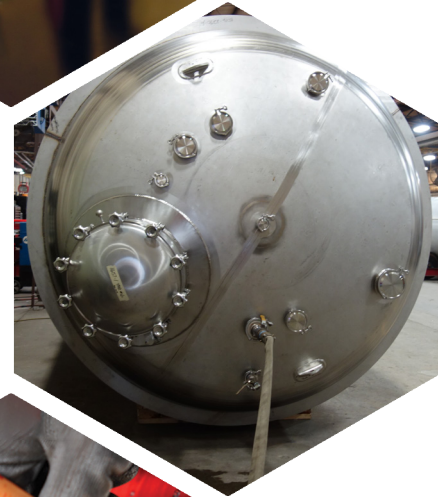
The Ferroxyl Test locates iron residue on stainless steel. The Ferroxyl solution is applied over the testing area(s). After a few moments the solution will show a blue color where iron is present.

► Certificate

## Hydrostatic

The test requires that the vessel is filled completely filled with water. Then the test pressure is applied. Leakage is detected by visual inspection and/or pressure drops.

► Code Ref.: UG99







### Liquid Penetrant

The tank or vessel is clean and dried. The penetrant is applied (dipped, brushed, flooded or sprayed) to the surface to be examined and allowed to penetrate into defects or flaws. Excess penetrant is removed from the surface and developer is applied. The examiners look for bleed back of the penetrant into the developer to look for cracks, porosity, lack of fusion and incomplete penetration and pits.

► Code Ref.: UG100

### Pneumatic Testing - ASME

The test requires the vessel to be filled with air. The tank or vessel is pressurized to the test pressure. Leakage is detected by bubbles in a leak detection solution.

Stringent safety procedures apply to the pneumatic test.

► Code Ref.: UG100

### Radiography

Radiography tests can be conducted on-site as well as at the customer location. Radiographic identification is used to validate weld quality, inclusions porosity, lack of penetration and lack of fusion. Imperfections are shown on x-ray film.

► Code Ref.: ASME BPE

### Positive Material Identification

Positive Material Identification (PMI) is a nondestructive method to determine the chemical composition of metals. The test can be performed by two methods. One, an x-ray fluorescence that identifies the material key element, but cannot detect carbon and lighter elements and therefore has limitation. Two, optical emission spectroscopy, which can detect all elements including carbon and lighter elements but can be more costly to perform.

► Certificate

### Saline

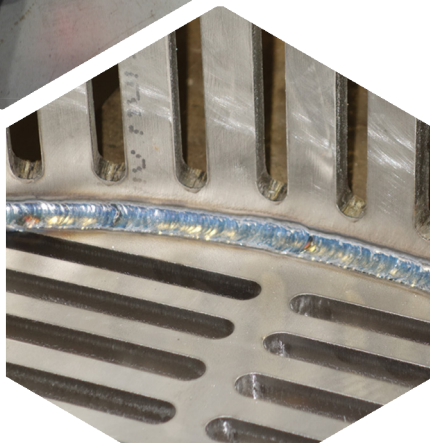
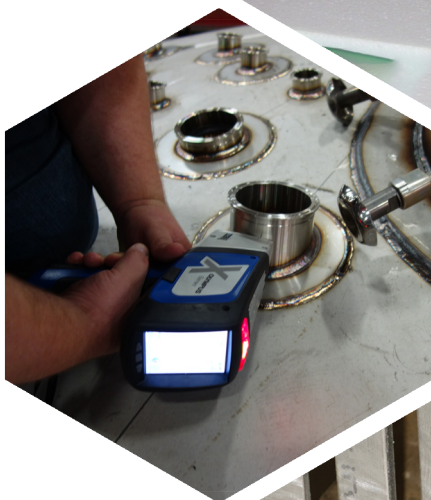
Saline (salt solution) testing is used to test the quality of the passivation. The surface to be examined is exposed to the saline solution for a period of time. Surfaces are then rinsed, dried and visually examined for flaws and cracks.

Certificate

### UT Weld Testing

Ultrasonic (UT) weld testing uses the transmission of high-frequency sound waves into material to detect imperfections.

► Certificate



# CERTIFICATIONS



The UM mark, similar to the U mark, also certifies that the pressured tank or vessel conforms to the latest edition of the ASME code and that the pressure vessel has been designed and manufactured in accordance with ASME. The UM vessels designation is related to the size of the tank/vessel:

- ◀ Vessels 5 Cubic Foot of volume or smaller with pressures not exceeding 250 psi.
- ◀ Vessels 3 Cubic Foot of volume or smaller with pressures not exceeding 350 psi.
- ◀ Vessels 1.5 Cubic Foot of volume or smaller with pressures not exceeding 600 psi.



The U mark certifies that the pressured tank or vessel conforms to the latest edition of the ASME code and that the pressure vessel has been designed and manufactured in accordance with ASME. All aspects are approved by a Third Party ASME Authorized Inspector (AI). U stamps require an ASME inspector to witness the ASME hydro test.

Companies with a U mark undergo a review with the National Board every three years.



The National Board of Boiler and Pressure Vessel Inspectors offers a Certificate of Authorization and R stamp for the repair or alteration of boilers, pressure vessels and other pressure retaining equipment.



The NB mark is used to identify certification by the National Board of Boiler and Pressure Vessel Inspectors.



The Pressure Equipment Directive (PED) is a European set of standards for the design and fabrication of pressure equipment and vessels. It provides the administrative requirement to allow for free placing on the European market without legislative barriers. It has been mandatory in Europe since 2002.



The SELO China Manufacturer License is an approval procedure that qualifies the manufacturer to produce pressure-bearing products, tanks and vessels.



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## PROCESSES

**Material Trace** allows manufacturers to trace items, such as raw materials, back to the supplier and forward through production and installation of the equipment. Tracing helps manufacturers comply with regulatory requirements and allows quality officers to analyze and develop action plan to address quality variances in products and materials.

**Welder Trace** allows manufacturers to trace specific welder(s) and their certifications.

**Passivation** is the removal of excess iron or iron compounds from the surface of stainless steel. No metal is removed from the surface during the process.

▶ ASTM A967

**Pickling** is the immersion of the metal in a pickling bath or coating the material with pickling solution, such as nitric-hydrofluoric acid. The process removes both iron contamination and heat-treating scales. Pickle passivated stainless steel has a matte appearance.

▶ ASTM A380

**Electropolishing (EP)** is an electrochemical process that removes surface material from stainless steel. The stainless component is immersed into a temperature controlled bath of electrolyte that is charged with a DC power supply. Electrolytes used in electropolishing are concentrated sulfuric and phosphoric acid solutions. The finish has a mirror appearance.

▶ ASTM B912



Complete and compliant TOP (Turn-Over-Packets)

