

Hydrostatic testing and repairs

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Hydrostatic testing a pressure vessel, or non-pressure vessel such as a fuel tank is done using water as a fluid and pumping it in under pressure to a predetermined level. This is a safe method of finding leaks and is a requirement of the ASME code.

A hydrostatic test is required when a new boiler is built before and after stress relieving (heat treating) of all the welded joints. The ASME code requires a hydrostatic test 150 percent of the designed working pressure.

The method of doing this test is to fill the boiler or pressure vessel with water until all the air is removed. Having installed a gage and valve to release the pressure and a fitting to pump more water into the vessel. The release valve should be at the highest place on the tank or boiler. The pressure should not be just pumped in all at once but brought up to its pressure in stages.

On a boiler that a test of 800 PSI is to be performed, the pressure should be brought up at 200 Lb increments and let set for twenty minutes. Then, release the entrenched air and continue to the next level. A satisfactory test should hold its test pressure for a good hour with out dropping more then 10 PSI.

Fuel tanks have a requirement of 5 PSI. The ASME code can be checked for the testing requirement of most types of vessels. Usually systems such as economizers, superheaters, exhaust feed water heaters, and piping systems are tested separately so as to remove entrenched air and isolate any leaks or failures.

After a boiler has been built and stamped, routine testing is performed at a lower level as required by the inspecting authority. This test is normally performed at 125 % of working pressure. All fittings and plumbing are removed. The outer jacket and insulation is also removed, all welded joints exposed, plugs and fittings are added for the test.

The big question; What if I have a leak? If the inspecting authority determines the boiler shell and all plates are in good condition and the leak is in a weld, then the weld can be ground out and re-welded. Now the problem, this weld needs to be heat-treated and stress relived. Post weld heat-treating.

As a result of the welding processes used to join metals together, the base materials near the weldment, the deposited weld metal, and in particular, the heat-affected zones transform through various metallurgical phases. Depending upon the chemistry of the metals in these areas hardening occurs in various degrees dependent mainly upon carbon content adjacent to the weld metal deposit where the highest stresses due to melting and solidification result. Stress relieving is designed to relieve these imposed stresses by reducing the hardness and increasing ductility thus reducing the danger of further cracking. Controlled cooling down to 800F or lower is also very important as higher carbon steels are subject to surface cracking if cooled too quickly.

The temperature of the heat treatment is normally held for at least one hour. Depending on the carbon and type of metal. Normal low carbon steels of most boilers are 0.35 or lower. The temperature range can be anywhere between 900F to 1200F. Some one specializing in this area should be consulted. Superheaters and components of high carbon and nickel and chrome require temperatures as high as 1350F.

Small area can be heat treated with high frequency induction coils, lower temperature electric elements made from MI cable. Ceramic insulation and thermostatic controls are used to control the level of heat. Don't ignore testing and repairs, your family and friends care about you and share in your hobby.