

Welding & Containers

Welding on a container poses some risks that should be addressed before work begins. Any container that has a lid is a potential pressure vessel when heated. The heat welding can cause the air inside to expand, and if trapped, cause the container to rapidly release pressure at its weakest point. Always verify the contents, or previous contents, of a container before welding. Residual material left behind can evaporate when heated and poses several threats including respiratory issues and possible explosions.

What's a BLEVE?

Boiling Liquid Expanding Vapor Explosion:

A BLEVE is a sudden, explosive release of energy that occurs when a closed container (like a water heater tank) containing heated, pressurized and superheated liquid (water) suddenly ruptures.



Got Me Under Pressure!

We know from LOTO training that high pressure is a potential form of hazardous energy. Pressure vessels can be extremely dangerous as they are designed to operate with internal pressures exceeding the ambient air pressure. In other words, there is more stuff on the inside pressing out against the walls than there is stuff on the outside pushing back in. This makes for a potential bomb.

For example, a common residential 30-gallon hot water heater will reach catastrophic failure at 332°F. This temperature is the flashpoint for water to instantly turn to steam without boiling. The 30 gallons of water instantaneously increases in volume to 48,000 gallons, or approximately 20 ocean shipping containers! The energy released from the explosion is enough to launch an average sedan over 125' in the air at 85 mph!

Pressure vessels are kept in check through a variety of safeguards. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Code contains manufacturing requirements for material strength, thickness, and intended use. The American National Standards Institute (ANSI) AP 510 Code addresses the operation, maintenance, and inspection of pressure vessels. And, let's not forget about OSHA.

OSHA has regulations that pertain to pressure vessels, but they are not specific to pressure vessels. Most will be found in the

Process Safety Management standard (1910.119). It is in this standard that we find the term *Recognized and Generally Accepted Good Engineering Practices* (RGAGEP). These are practices that are not defined by OSHA, but ones that OSHA will default to when expertise is needed on a subject, such as pressure vessels.

RGAGEP are divided into four categories:

- **Widely Adopted Codes** – Codes adopted by governments: ex. *National Electric Code article 422* which covers water heaters
- **Consensus Documents** – manuals, standards, or processes developed by subject matter experts such as ASME that adhere to ANSI's standard for process development
- **Non-Consensus Documents** – processes developed by subject matter experts that do not adhere to ANSI's standards such as manufacturer recommendations
- **Internal Standards** – Standards developed for internal use that are consistent with OSHA's intent of ensuring safe and healthful working conditions

Before you begin any work on a pressure vessel, ALWAYS double check your employer's established processes before starting. You could prevent a bomb from exploding.