

### Botswana Factories Act Chap 44:01 & Mines and Quarries Act Chap 44:02

Both acts call for periodic inspection and testing of Boilers, steam receivers, air receivers, pressure vessels by an inspector authorized by the Botswana Government Dept of Occupational Health & Safety or Department of Mines

#### What is an air receiver?

Some times called the air tank this is the reservoir used to store air under pressure from the compressor to provide a buffer supply for the end use.

#### Why are these inspections necessary?

A small workshop air receiver under pressure contains stored energy equivalent to several grams of TNT. Catastrophic failure can release this energy like a small bomb impacting on people and property nearby.

#### What should the inspection cover?

Air receivers have several levels of 'protection' from failure which must be checked during the inspection:

- designed and made to a recognised **standard** eg ASME VIII, RSA CIF, etc
- fitted with a **specification plate** showing the information listed below – absence of this plate requires the vessel to be assessed by a qualified engineer who can then specify the design parameters for a new plate.

Manufacturer	Design Temperature
Date of Manufacture	Design Standard
Manufacturer's Number	Design Pressure
Country of Origin	Test Pressure

- The tank must be fitted with a **pressure gauge** which is redlined at or below the maximum acceptable working pressure (MAWP). This red line should be on the dial (not on the glass and not an adjustable needle both of which can be altered). The red line shows, at a glance, if the receiver is operating within acceptable limits. The gauge must be sufficiently accurate. The gauge should be fitted with an isolation valve so that it can be changed with the tank under pressure; this is to provide a means of checking that the tank is not under pressure even though a faulty gauge might indicate that it is empty. This latter requirement is seldom applied on new workshop compressors.
- The tank must be fitted with a drain valve to allow condensed water to be drained. The tank design specifies an allowable thickness based upon design, configuration and pressure rating. Condensation inside corrodes the wall to a point when the tank can no longer contain the pressure. Regular drainage will minimize this problem.
- The tank must be fitted with a **pressure relief valve** (PRV) set to lift and release pressure before the MAWP is exceeded by more than 5-10%. The PRV **and** its connection must be sized to release pressure faster than the pressure source can supply the tank. This valve must be tested adjusted and resealed (if possible & necessary) by the inspector. **THIS VALVE MUST NOT BE TAMPERED WITH BY ANY UNAUTHORISED PERSON.**
- The compressor should be controlled to switch off or deload at a pressure not exceeding the MAWP and should not be capable of delivering a pressure greater than the MAWP of the tank
- The pressure test: A periodic pressure test deliberately over pressurizes the tank to provide an assurance that failure is unlikely in the subsequent service period. It must be assumed that failure could occur and except under very exceptional circumstances must be done hydraulically to limit the stored energy and the consequences of failure.
- The inspector must check the tank condition externally AND internally and look for
  - excessive corrosion – including a thickness survey and measurement of localized corrosion where possible
  - abrasion and mechanical damage of the tank wall eg. Rubbing by loose guards, trailing cables & hoses
  - cracking of the vessel, welds or connections to the tank –using a suitable crack detection method (DPI or MPI)
  - illicit repair or modification welding on the pressure boundary; welding repairs on pressure vessels **MUST** be carried out by correctly coded and tested welders following an approved procedure. Non conforming welds WILL result in immediate condemnation of the tank
  - Presence of oil & water in the tank – both indicate inadequate drainage and possible wear of the compressor. Oil which has overheated and partially burnt in the compressor will deposit as carbonized oil in the tank and adds significantly to the potential for an explosion. This finding would result in immediate condemnation of the tank.

#### Conditions which may result in immediate failure of the vessel or a very restricted service life include:

- excessive corrosion or wastage of the tank wall
- cracking of the tank wall
- illicit welding on the pressure boundary
- illicit setting or tampering with the PRV
- carbonized oil in the tank