

Proof-Pressure Test and Leak Detection Test in Metal Expansion Joints

It is important to distinguish between a Proof -Pressure Test and a Leak Detection Test.

Expansion Joints need to be proof-pressure tested and tested for leak tightness to ensure observance to regulations and safe and reliable operation.

Proof-Pressure

A Proof-Pressure Test verifies if a component can withstand pressure above its intended operating pressure without permanent damage. It is a form of stress test to demonstrate the fitness of an Expansion Joint under the test pressure conditions.

The proof-pressure test shall be a hydrostatic pressure test, except where the hydrostatic pressure test is harmful or impractical or they cannot safely be filled with water. In these instances, a pneumatic pressure test or other tests shall be performed.

The proof-pressure test (hydrostatic or pneumatic) shall always be carried out under controlled conditions, with appropriate safety precautions and equipment and in such a way that the persons responsible for the test are able to make adequate inspections of all pressurized parts.

Hazards involved in Pneumatic testing: It is well known fact that as water cannot be compressed (Boyles law), the energy stored in a vessel under hydrostatic pressure is lesser as compared to that of a vessel under same pressure with air. This stored potential energy gets converted to kinetic energy at the time of rupture and that is what makes pneumatic test very dangerous.

Pneumatic proof-pressure test, is it permitted by Codes? Pneumatic test is an alternative method of pressure test in lieu of Hydrostatic test, allowed by codes at certain conditions, by using air or any other gas as test media and preferably done only for low pressure applications & vessels having low volumetric capacity.

What are the risks involved with pneumatic test? Air/gas used for pneumatic test is compressible to large extent and has very high potential energy stored when compressed. Any minor leak path can lead to a rupture and blast within no time releasing total energy with an impact of sudden

explosion. Time gap between identifying a leakage and failure is very small making it almost impossible to take remedial action. Damages associated with failure are uncontrollable and huge.

Why Hydrostatic test is safer as compared to Pneumatic Test? Water or liquid used for pressure test are not compressible compared to air or gases. Energy stored is very less. Small leak will reduce gauge pressure immediately which does not happen when air is the test medium.

It has less potential energy hence damages are mostly limited to nearby area.

There is a possibility that you can take remedial action once minor leakages are noticed before total failure occurs.

Leak Detection Test

The primary purpose of a leak detection test is detecting and localizing leaks.

In general, employed method of Leak Detection Test is Pneumatic. The Pneumatic test is extensively used to reduce testing times and for economic reasons.

The techniques involve the establishment of a pressure difference across the object wall and the observation of bubble formation in a liquid medium located on the low pressure side. The minimum detectable leakage rate by these techniques depends on the pressure difference, the gas and the liquid used for testing.

Bubble Test -Immersion technique: This technique is applicable to the examination of expansion joints that can be completely immersed in a container of detection liquid. A stream of bubbles originating from any isolated point shall be interpreted as a leakage.

Bubble Test - Liquid application technique: The bubble test by liquid application technique seems to be the oldest leak detection method at all. This technique involves the application of a liquid film (generally soap) to the surface of the test object. It is applicable to any object in which a pressure differential can be created across the boundary to be examined.

Leakages are identified by soap water application on weld joints and not by observing the pressure gauge.

The bubble test is generally specified for the location of leaks and in this context the leakage rate is not required as any bubble formation means rejection or repairing of the affected area.

Suitable liquid soap is applied on the low pressure side (by brush, spray or other methods).

Afterwards, wait for a sufficiently long inspection time to realize even slow production of foam or bubbles from small leaks.

From large leaks the test fluid may be blown away and no foaming may occur.

A growing foam or bubbles originating from any isolated point shall be interpreted as a leakage.

Pneumatic Test is also functional to detect very fine leak paths which may not be found in Hydrostatic Test.

Normative references:

- ASME Code Section VIII – Division 1
- EN 1593, Non-destructive testing - Leak testing -Bubble emission techniques
- EN 1779:1999, Non-destructive testing -Leak testing - Criteria for method and technique selection
- EN 13184, Non-destructive testing - Leak testing - Pressure change method
- EN 13185, Non-destructive testing - Leak testing - Tracer gas method
- EN 1593 Bubble emission technique
- EN 13185 Tracer gas method
- EN 13184 Pressure change method

Proof-Pressure Test		Leak Detection Test		
Verifies if an Expansion Joint can withstand pressure above its intended operating pressure without permanent damage		The primary purpose of a leak detection test is detecting and localizing leaks		
Hydrostatic	Pneumatic	Hydrostatic	Pneumatic	
Recommended except where the hydrostatic pressure test is harmful or impractical	Permitted by Code Potentially dangerous Low pressure applications & vessels having low volumetric capacity	Not practical Expensive process	Bubble Test Immersion technique	Bubble Test Liquid application technique
			Unusual except for large series	Recommended Extensively used to detecting and localizing leaks Reduces testing times Detects very fine leak paths

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