

Overview of Statutory Requirements on Pressure Vessels in Singapore and the Way Forward

28 Jan 2011

Christopher Toh Hao Chieh
Senior Specialist
Occupational Safety & Health Division
Ministry of Manpower



MINISTRY OF
MANPOWER

A Great Workforce A Great Workplace

A Great Workforce A Great Workplace

Scope of Presentation

A. Pressure Vessel

- Definition
- Legal Requirements
- Requirements for Fabrication, Registration, Examination
- Repair
- Steam Piping

B. Pressure Vessel Extension Scheme

- Current Scheme
- Way forward



What's the Difference?



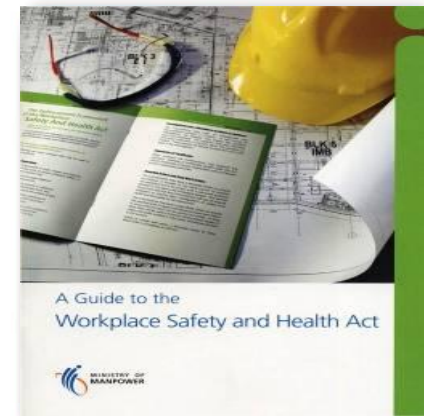
Definition of Pressure Vessel

Legal Definition:

- ❑ “any container or vessel used for containing any substance under pressure,
- ❑ and includes any *steam boiler, steam receiver, steam container, air receiver, refrigerating plant pressure receiver* and gas cylinder.”

A pressure vessel is potentially hazardous and could explode due to

- design fault
- fabrication fault
- misuse



Statutory Pressure Vessels

- ❑ Air receiver:

a container of air under pressure

- ❑ Steam receiver:

any vessel or apparatus which contains steam under pressure

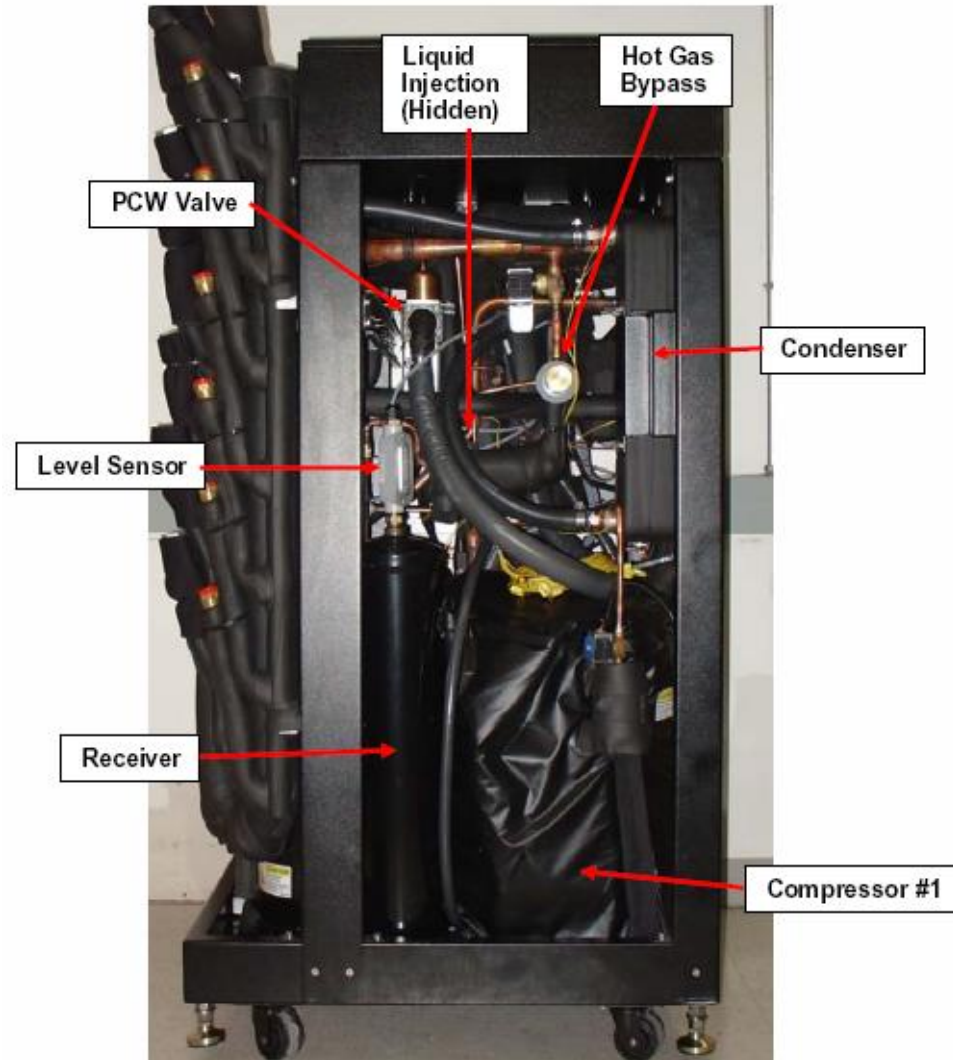
- ❑ Steam boiler:

a closed vessel in which steam is generated at a pressure greater than atmospheric pressure

- ❑ Refrigerating plant pressure receiver:

a container of refrigerant under pressure

Statutory Pressure Vessels



Other Pressure Vessels

Includes the following:

- ❑ PV which contains corrosive, toxic, explosive or flammable products
- ❑ Pipeline, pump, compressor and any other equipment used to convey steam, air, refrigerant or any corrosive, toxic, explosive or flammable substance
- ❑ Gas plant - any equipment used for the manufacture or storage of gas

Legal Requirements:

- Designed to conform to approved codes
- Surveyed by approved inspection agency during construction

Requirements for Fabrication

Pressure Vessel has to be:

- ❑ designed and manufactured to an acceptable code
- ❑ surveyed during the construction stage (statutory PVs)
 - by inspectors appointed by Commissioner if fabricated locally
 - approved inspector from Third Party Inspection Agency
- ❑ approved by Commissioner if fabricated overseas

Acceptable Codes for use in the design of pressure vessels

- American Society of Mechanical Engineers (ASME)
- British Standards Institute (BSi)



Requirements for Registration

Application to OSHD for approval:

- Submits an online application
- Survey Certificate issued by approved third party inspector (if fabricated overseas) or MOM approved inspector
- Approved Construction Drawings showing welding details

For boilers,

- approved design calculations endorsed by surveying inspector
- A layout plan of the boiler house/room conforming to Singapore Standards CP 27
- A steam piping layout plan and design calculations
- A detailed gas train layout for gas-fired boiler
- Approval letter from the Ministry of Environment for installation of chimney and blow-down pit.

Requirements for Inspection

Testing and Examination:

- ❑ Based on the submissions, additional tests may be imposed to determine integrity/ condition of vessel
- ❑ Minimum tests are visual examination and running (functional) test

For boilers,

- the boiler house/room to conform to Singapore Standards CP 27
- steam piping to be surveyed to steam piping guide
- gas train layout and components to comply with basic gas train requirement and to be tested
- The tests imposed to be carried out by Authorised Examiner
- Report of Examination of Pressure Vessel by AE

Periodic Examinations

The examination of a steam boiler during the statutory inspection or after any repair shall consist

- a) of an examination of the boiler when it is cold and the interior and exterior have been prepared in the manner specified by the Commissioner; and
- b) except in the case of an economiser or a superheater, of an examination when it is under normal steam pressure which
 - (i) must be made as soon as possible after the examination of the boiler when cold; and
 - (ii) must include an examination to determine whether the safety valve is so adjusted as to prevent the boiler from being worked at a pressure greater than the safe working pressure, unless prior written permission has been obtained from the Commissioner.

Periodic Examinations

Type of PV	Inspection Frequency
Steam Boiler	12 months
Air Receiver & Steam Receiver	24 months

Every 10 years -to conduct at least one hydrostatic test and thickness gauging



Repair of Pressure Vessel

- ❑ Where the repair of any pressure vessel when improperly done, may lead to a dangerous occurrence, prior approval must be obtained from the Commissioner.
- ❑ The Commissioner may specify conditions or requirements for the repair.



Steam Piping

Design

- ❑ All steam piping shall be designed, fabricated and installed in compliance with a Code approved by the Commissioner.
- ❑ Approval of the Commissioner must be obtained before steam piping installation commences

Category

Category of piping	Design Pressure or Design Temperature
Low Pressure (LP)	Less than 500 kN/m ² (5 Bar)
Medium Pressure (MP)	500 –3500 kN/m ² (5 -35 Bar)
High Pressure (HP)	Above 3500 kN/m ² (35 Bar) or above 400°C

Steam Piping

Inspectors

- ❑ For LP piping, the proposed in-house inspector to inspect the installation of the steam piping.
- ❑ For MP and HP piping, the proposed third party inspector or Authorised Examiner (AE) to survey the piping fabrication and installation.

Put up a full report on piping installation survey, certifying that all welding and NDE are carried out according to required standards and that the piping is of sound material, good construction, free from defects and meets the required standards.

Pressure Vessel Extension Scheme

Current legislative requirements:

- ❑ Authorized examiner may, in his discretion, examine the statutory pressure vessels within one-month after the due date.
- ❑ Extension goes beyond one month from the due date,
Approval by Commissioner – Scheme for Extension of Statutory Inspection Period of Pressure Vessels
- Statutory pressure vessels are subjected to prescribed calendar-based inspection regime
- Extension of inspection period is subjected to approval by Commissioner for WSH

Pressure Vessel Extension Scheme

Plant Owner:

The owner shall submit a proposal to extend the statutory inspection period of a pressure vessel. This proposal shall demonstrate to the department that the pressure vessel is of adequate **design**, of proper **construction**, properly **maintained**, and that no danger will arise with its continued use beyond the statutory period.

Plant designed for extended run length cycle and the pressure vessel cannot be taken out of service without causing the consequential shutdown of the plant or unit.

Pressure Vessel Extension Scheme

Classes of Statutory Pressure Vessels	Extension of Inspection Period
Unfired Steam Boilers, Steam Receivers or Air Receivers which are part of a process plant or unit	Up to 4 years
Fired Steam water-tube boilers which form part of the process plant or unit	Up to 2 years

Pressure Vessel Extension Scheme

Plant Owner:

- Propose and seek approval for appointment of a **Competent Person** to evaluate the eligibility for extension and to jointly develop technical interventions to evaluate the extension application
- Establish a **Scheme to Guarantee the Safe Use (SGSU)** of pressure vessels – subject to **internal audit** and audit by **approved external independent auditors**
- Analysis** of probability, mode of failure, risk assessment & **assessment** of the remaining life of the pressure vessels based on latest inspection findings

Way Forward

2009 – Jun 2010:

MOM -SCIC Taskforce to review
the Regulatory Regime for
Pressure Vessels

SCIC
SINGAPORE CHEMICAL
INDUSTRY COUNCIL



Report on the Review of
Regulatory Regime of
Pressure Vessels under the
Workplace Safety and Health
Act

MOM-SCIC
Pressure Vessel Taskforce

Way Forward

- Internal review & drafting of legislation/ guidelines
- Industry consultation
- 1 Sep 2011: New Workplace Safety & Health (General Provisions) Regulations
- Transitional period
- Current PVES ends



