A handbook
for workplaces

Working safely with air receivers

October 2008
Edition No. 1

On 18 June 2017, the Occupational Health and Safety Regulations 2017 (OHS Regulations 2017) replaced the Occupational Health and Safety Regulations 2007 (OHS Regulations 2007), which expired on this date. **This publication has not yet been updated to reflect the changes introduced by the OHS Regulations 2017 and should not be relied upon as a substitute for legal advice.**

Information on the key changes introduced by the OHS 2017 Regulations can be found in the guidance titled *Occupational Health and Safety Regulations 2017: Summary of changes* - available at https://www.worksafe.vic.gov.au/__data/assets/pdf_file/0011/207659/ISBN-OHS-regulations-summary-of-changes-2017-04.pdf. However, this guidance document contains material of a general nature only and is not to be used as a substitute for obtaining legal advice.

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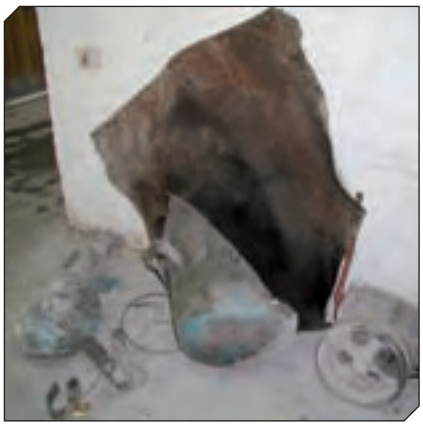


Pressure vessels are potentially very dangerous and can fail catastrophically causing multiple fatalities, serious injuries and property damage. The Longford gas explosion in Victoria in 1998 was the result of pressure vessel failure.

Two people were killed in an air receiver explosion at a roadhouse in Karachi, Pakistan. The body of one of the people killed was found at a distance of 1 kilometre from the place where the explosion occurred.

These two separate incidents (pictured left) occurred in Victoria. It was fortunate that no-one was in the vicinity when the explosions took place.

This handbook covers a type of pressure vessel called an *'air receiver'*. An air receiver that has a hazard level of A, B or C must be 'plant registered'. Refer to Australian Standard AS 4343-2005, *Pressure equipment – Hazard levels.*

To calculate the hazard level of your air receiver(s), refer to Comcare's – *Unfired pressure vessel calculator* at **worksafe.vic.gov.au**. Where the calculator refers to 'licence', this should be interpreted as meaning 'registration' under Victorian requirements. This calculator only calculates hazard levels A, B and C.

While the focus of this handbook is air receivers, there is also some information on other elements of compressed air systems. **This handbook does not cover the specifics of compressed air for the supply of respiratory air.**

Air receivers are used in many workplaces across Victoria, and can be found in manufacturing, mechanical shops, panel shops, tyre shops, dry cleaners, hospitals, TAFEs, universities, construction sites and in the mining industry.

It is expected that employers, health and safety representatives (HSRs), health and safety committees, employees and WorkSafe inspectors will use this handbook to assess health and safety risk controls under the test of reasonably practicable (see Appendix D for a definition of 'reasonably practicable').

This handbook is not a substitute for training or expert advice. It does not cover the specifics that operators need to know to perform their job competently and safely.

A general overview of guidance material can be found in Appendix D.

Occupational health and safety legislation in all states requires employers to:

- ensure risks associated with plant and their operations are eliminated or reduced so far as is reasonably practicable
- ensure supervisors and employees, including independent contractors, are trained and provided with information on:
  - the nature of hazards associated with the plant
  - the safe operation of plant.

Introduction

How to use this handbook

This handbook provides a range of information that can be used to decide the most effective risk control solutions for air receiver safety.

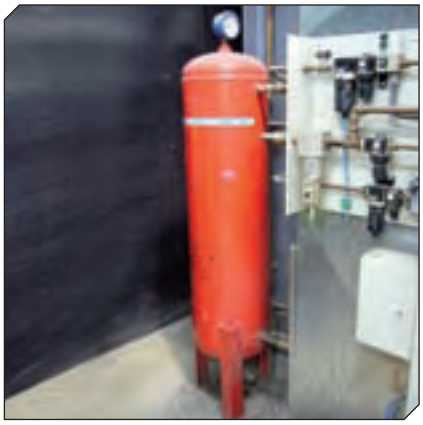
Many of the tasks outlined in the following pages are presented in two columns.

Work practices undertaken with air receivers that are deemed to be unacceptable under occupational health and safety (OHS) legislation are highlighted in the **red** column. To avoid exposing employees and contractors to risk of injury or illness, the practices described in these columns must not be allowed to happen.

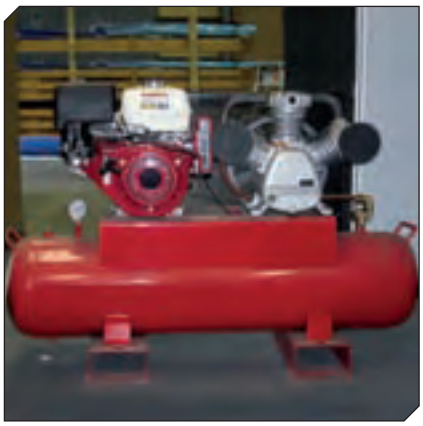
Common risk control solutions to prevent exposing employees or contractors to unacceptable work practices are highlighted in the **green** column. These solutions are regarded as 'reasonably practicable' for most workplaces where air receivers are located and therefore would be expected to be implemented when required. That said, the risk controls listed in the green column are not the only way to control risks. If an alternative way to control risks is used, it should — at a minimum — achieve the same standard as set out here.

Unacceptable Work Practice	Risk Control Solutions
Work practices and systems in the **red** column must not be used in workplaces where air receivers are located. An employer who allows these work practices to be used is likely to be in breach of OHS legislation.	The solutions in the **green** column are the most effective at reducing risk and should be the aim of all workplaces.

1. Equipment



Vertical receiver.



Horizontal receiver.

A pressure vessel is a container that holds either gasses or liquids and is subject to internal or external pressure. It includes interconnecting parts and components, valves, gauges and other fittings up to the first point of connection to the connecting piping. See Appendix C – Types of pressure equipment and definitions.

Pressure vessels, including air receivers, have hazard levels assigned to them. Those with a hazard level of A, B or C have specific requirements, including the requirement to be plant registered.

Air receivers

An air receiver is a type of pressure vessel. It is a tank that stores compressed air for large demands in excess of compressor capacity.

Vertical air receiver

A vertical air receiver tends to be larger and almost always has a hazard level of A, B or C.

Horizontal air receiver

A horizontal air receiver tends to be smaller. As a general rule, if it is over a metre in length then it will have a hazard level of C as a minimum.

Registration

An air receiver must be registered in Victoria according to the hazard level, as follows:

- Air receiver **plant registration** is required where an air receiver has a hazard level of A, B or C
- Air receiver **design registration** is required where an air receiver has a hazard level of A, B, C or D.

To register your air receiver, download the 'Application for registration of item of plant' form from WorkSafe's website, **www.worksafe.vic.gov.au**

1. Equipment

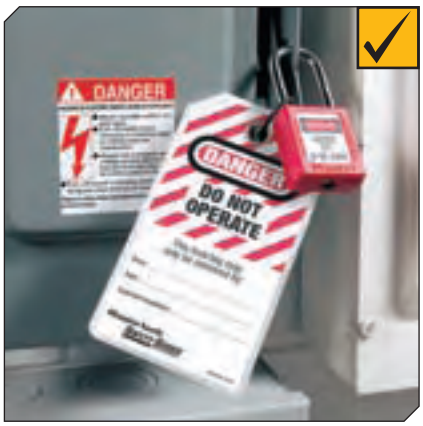
Hazard levels

Pressure vessels can be rated from A through to E, with A being the most hazardous and E being the least hazardous. There are a number of factors that contribute to a pressure vessels hazard level, which include:

- size
- pressure
- temperature
- source of power
- location
- usage
- hazardous contents
- contents type.

Air receivers are classed as having non-hazardous gas content. With many of the risk factors consistent for air receivers, what determines their hazard level is the size of the vessel and the maximum design pressure.

To calculate the hazard level of your air receiver(s), refer to Comcare's – *Unfired pressure vessel calculator* at worksafe.vic.gov.au. Please note that where the calculator refers to 'licence', this should be interpreted as meaning 'registration' under Victorian requirements. This calculator only calculates hazard levels A, B and C.



This on/off switch for the air compressor is capable of being locked out.

Lockouts

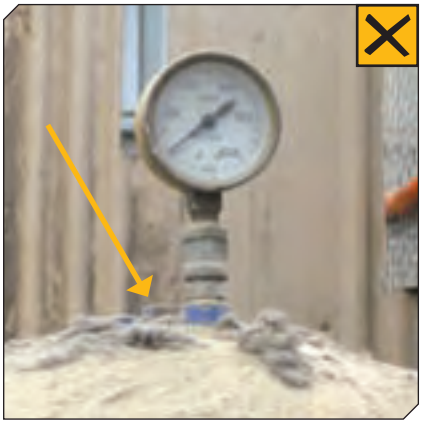
To operate an air receiver safely, it is crucial that it can be locked out and tagged out. The following are examples of when an air receiver may need to be locked out and tagged out:

- when not in use (to prevent unauthorised use)
- when being worked on (to ensure safety of maintenance staff or operators)
- when deemed unfit for use (either following an incident, during an inspection or before commissioning).

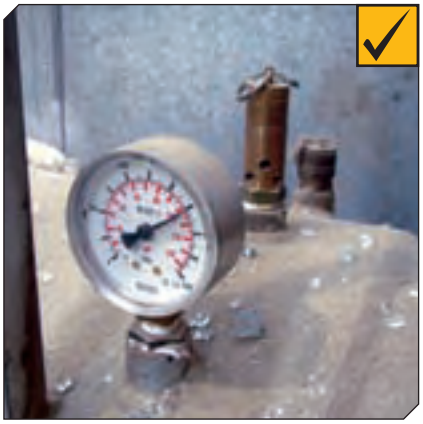
Safety devices

An air receiver must have a number of devices to ensure its safe use. Like all other plant, these devices require constant inspection, surveillance, monitoring, maintenance and repair. They include:

- **pressure relief valves** – designed to prevent pressure building up beyond the design pressure of the air receiver.

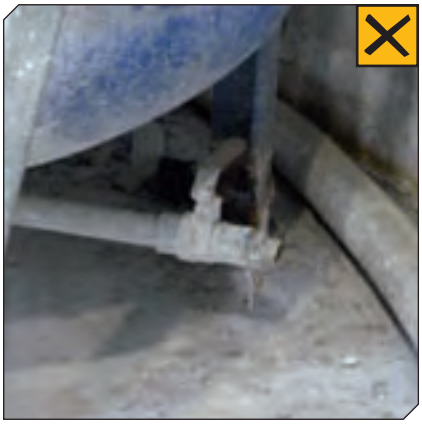


Incorrect: *The nozzle for the pressure relief valve has been plugged.*

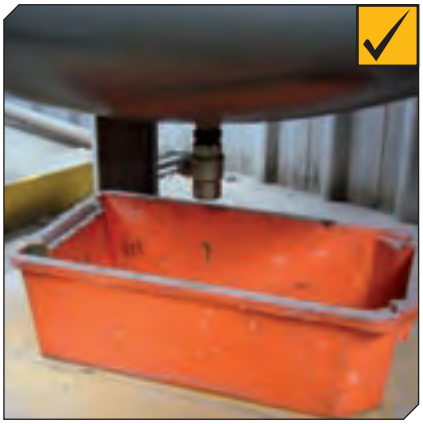


Correct: *The pressure relief valve is located behind the gauge.*

- **blowdown valves** – used to drain contaminants from the air receiver. There are automated systems available. These need to be tested to ensure that they are working on a regular basis.



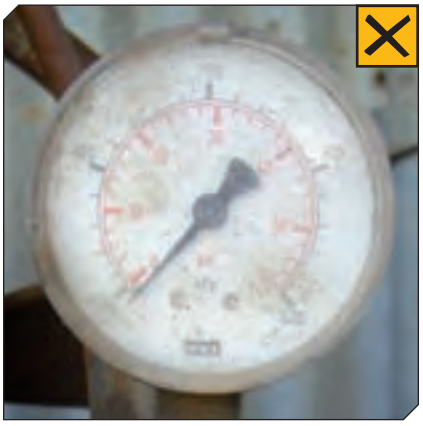
Incorrect: *This blowdown valve discharges oil and water onto the wall and floor creating hazards.*



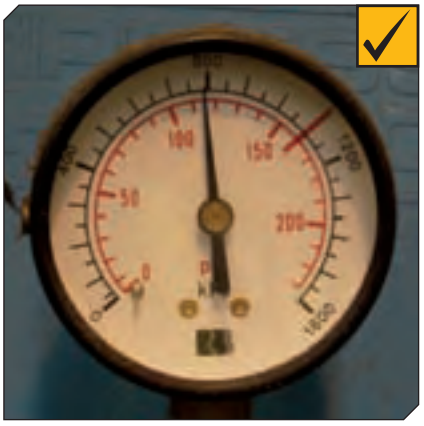
Correct: *This blowdown valve discharges into a container so that the oil and water is captured.*

1. Equipment

- **pressure gauges** – used to monitor the pressure within the air receiver.

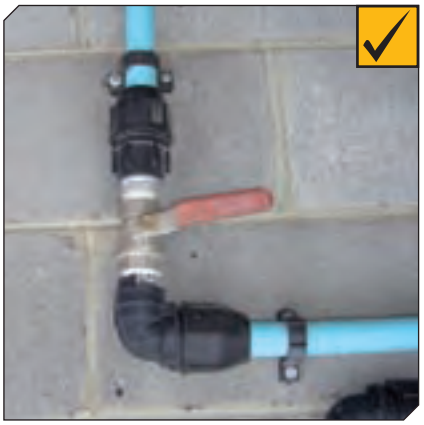


Incorrect: *This pressure gauge is broken and the needle is stuck against the rest. This gauge has no red line and is not within the calibration range for the air receiver.*



Correct: *This pressure gauge has the red line and is within the calibration range for the air receiver.*

- **shut off valves** – used to shut the air off from the air line or hose. They need to be accessible easily from locations along the line in case of rupture or other issues when immediate access is required.



Correct: *The shut off valve allows this air line to have the air supply stopped in case of rupture.*

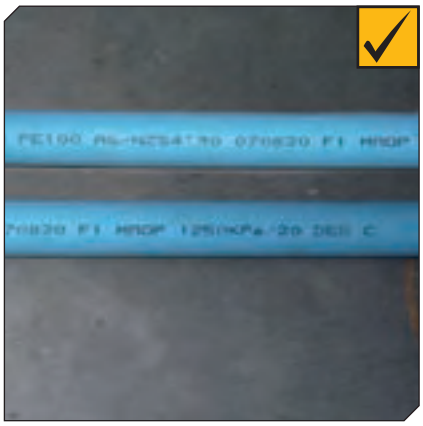
- **isolation point** – should be located so that the air compressor can be shut down safely in an emergency. The isolation point will not discharge the energy or compressed air from the system.

1. Equipment

Selecting an air receiver

Before purchasing an air receiver, the employer should consult with key staff, including health and safety representatives (HSRs). This consultation should be documented and include operational requirements and any hazards that need to be considered, for example:

- the intended use
- operational parameters
- frequency of use (eg 24 hours a day continuously or sporadically)
- physical constraints of the workplace
- required distances from other plant
- required distances from flammable liquids
- required distances from people
- impact caused by the weather.



This piping is rated for the required pressure as per the appropriate standard.

Consultation should also consider safety within the workplace after the air receiver is purchased, for example:

- what new risks will be introduced to the workplace
- what engineering controls will need to be introduced (eg piping that is pressure rated)
- what new safe systems of work will need to be developed
- what specific information, instruction, training and supervision will be required for the new plant?

A formalised safe work method statement and a risk assessment should also be completed.

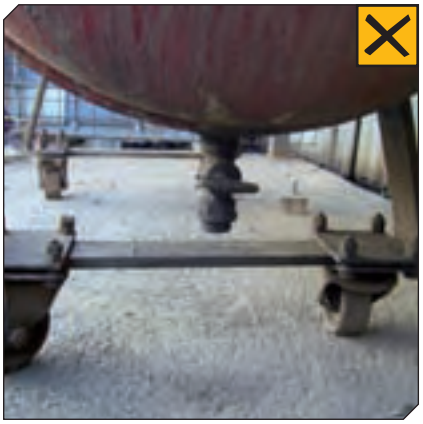
All of these should form the basis of discussions with the supplier of the air receiver.

The manufacturer's recommendations are also critical in selecting the appropriate air receiver, for example:

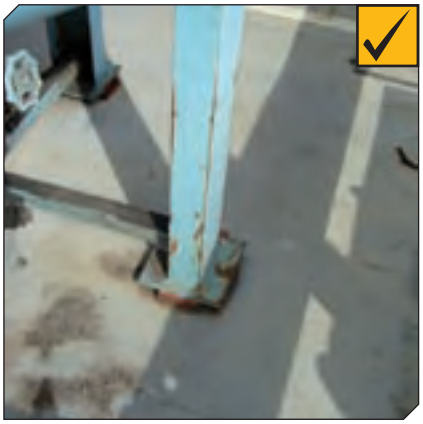
- some compressor and air receiver sets are not designed to supply respiratory air
- which set of components of a compressed air system should be matched to meet requirements and maximise health and safety.

Installing an air receiver

An air receiver shall be installed and anchored on proper foundations to prevent tipping over. The supports shall be protected against corrosion. The air receiver shall be level with the blowdown valve at the lowest point on the vessel. The blowdown valve needs to be accessible for performing the regular blowdown and maintenance activities.



This air receiver is not anchored in place.



This air receiver is anchored in place by a bolt.

Commissioning an air receiver

Before using an air receiver for the first time or before restarting after maintenance or repair, it must be commissioned to specific performance parameters. An air receiver with a hazard level of A, B or C has specific checklists and must meet recording requirements.

A competent person should be appointed to perform the commissioning.

Alterations to an air receiver

Proposed alterations to an air receiver should be assessed by a competent person before the alterations are made. They should be consistent with the designer's and manufacturer's recommendations. For an air receiver with a hazard level of A, B, C or D and where alterations create new hazards, a design registration must be submitted. A Registration of Plant Design form can be obtained from **worksafe.vic.gov.au**.

1. Equipment

Inspection

Inspections should be carried out by competent person(s) at intervals to keep the air receiver in a safe condition.

- **Commissioning or recommissioning inspection** — this must be done before the air receiver is used for the first time and following repairs, changes to use, relocation and when returning to service after period of non-use.
- **Pre-operational and operational surveillance and monitoring** — regular surveillance is an essential part of the operation of all air receivers. This must include checking and monitoring all safety devices, visual observation, as well as monitoring for abnormalities, including odours and temperature extremes.
- **Periodic in-service inspection** — assures the safe operation of an air receiver until the next scheduled inspection. The major elements of periodic inspections are:
  - **external** inspections include fittings, safety devices, protective coatings, anchoring, supports and identification markings. These inspections are used to detect anomalies or defects, such as corrosion, leaks, bulging, signs of excessive temperatures or signs of cracking
  - **internal** inspections are used to detect anomalies or defects to internal surfaces. There is a variety of non-destructive testing techniques for these tests. Care must be taken to ensure that the testing is truly representative of the air receiver's condition
  - **pressure relief valve** is tested at the same time as the internal inspection to ensure that it is in a safe working condition.

See *Maintaining air receivers*, page 18.

Inspection intervals

Pressure equipment	Commissioning inspection required	First yearly inspection required	Typical inspection interval (years)		Typical interval for overhaul and bench test (years)
			External inspection	Internal inspection	
Air receiver					
pV ≤ 100MPa.L	No	No			
pV > 100MPa.L	Yes	No	2 years	4 years	
Pressure relief valve	Yes	Yes			4 years

WorkSafe Victoria recommends the above inspection intervals as a minimum, subject to the condition of the plant.

Repair

The task of repair is a technical area that requires liaising with various people. This may include the manufacturer, the supplier, an in-service inspector or other competent people. The following are points to consider:

- due to cost of repair versus cost of replacement, a damaged air receiver is often scrapped
- the causes of all defects must be addressed before any repairs, alterations or modifications
- the **stored energy needs to be safely discharged** and the system locked out before any repairs, alterations or modifications that require opening the compressed air system
- proposals for repairs, alterations and modifications must be reviewed by a competent person
- repairs, alterations, and modifications must be:
  - competently designed
  - carried out by a competent person
  - tested to ensure that they meet the design standard
  - recorded in the register of pressure equipment (See *Alterations to an air receiver*, page 8)
- repair must be carried out under supervision of a competent person
- an air receiver that has safety-related defects must be immediately withdrawn from service
- when a competent person's report recommends the air receiver be scrapped, it must be locked out and tagged out to prevent further use before decommissioning
- any air receiver that cannot be repaired or is not going to be repaired must be decommissioned.

A dent in an air receiver is serious and must be treated in the same way as a reduction of thickness or a crack in the wall/shell, which may lead to a recommendation to scrap the air receiver.

Records

Both a register of pressure equipment and an information file must be kept for all pressure equipment rated as a A, B or C hazard level. It is recommended that all pressure vessels, including those with hazard levels of D and E, be included in the register.

There is a variety of information required to be kept in the register of pressure equipment and the information file. The competent person who performs the inspection, surveillance, monitoring, maintenance and repair tasks should be able to advise you on what is required to keep your records to the appropriate standard.

The records kept in relation to inspection and maintenance should contain the following information as a minimum:

1. What is looked at?
2. What is looked for?
3. What are the rejection/acceptance criteria?
4. How is it looked for?
5. What is found?
6. What recommendations are made, eg future inspections, repairs or changes to current operating procedures and parameters?
7. Actions taken based on those recommendations.

See *Appendix B – Inspection and maintenance records.*

2. Environment

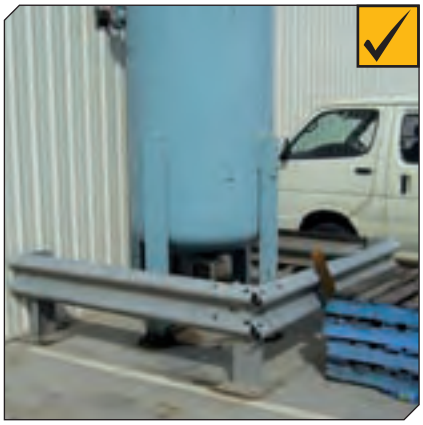
Plant layout

The layout of plant should always be considered from a health and safety perspective, as well as a production perspective. Poor location of an air receiver can affect the ongoing health and safety of operators, maintenance personnel and people in the surrounding area, as well as the integrity of the pressure vessel.

The following matters should always be considered:

- locating the compressor and air receiver outside to minimise the effects of heat and noise, and where:
  - it cannot be struck by mobile plant
  - it can be fully accessed for inspection and maintenance (eg work platforms)
  - safety devices can be monitored
  - other plant does not affect its operation (eg drawing in exhaust fumes from combustion engines)
- the direction that a blowdown/pressure relief valve discharges
- avoiding burns through contact with hot piping
- the location of shut-off valves and isolation points
- the location of dangerous goods (in relation to the air receiver to avoid the possibility of fire).

The air receiver shall be anchored according to the requirements stipulated in Australian Standard AS 1210, *Pressure Vessels*.



This air receiver is protected from traffic by a properly installed traffic barrier.

Workplace traffic

A documented traffic management plan is crucial for resolving many hazards and risks. An air receiver is high risk plant and so the traffic management plan should take into account the potential for impact by mobile plant. Traffic hazards that should be addressed include:

- designated traffic zones
- site layout
- exhaust fumes (which can affect the air quality of the air receiver)
- workstations around the air receiver
- barriers and signage
- trapping spaces
- blind spots.

The traffic management plan should also include incident reporting and investigation procedures.

The traffic management plan should be regularly reviewed and updated when workplace changes or equipment upgrades occur.

Refer to the WorkSafe Victoria guide – *Forklift Safety Reducing the Risk*.

Noise

Compressors and leaking air systems can produce a harmful level of noise. When selecting an air compressor, one of the factors that must be taken into account is the noise emission of the plant. The positioning of the air compressor and air receiver can help minimise risks associated with noise. Maintenance will also minimise risk by having the plant running at its optimum efficiency and eliminating air leaks.

Work practices are another way to minimise risks; for example, avoid the dumping of air without the appropriate hearing protection or when other people are in the vicinity.

If employees in your workplace are exposed to noise that exceeds the exposure standard of 85 dB(A) averaged over an eight-hour period or that has a peak noise level of 140 dB(C), your workplace is too noisy and controls must be implemented to ensure noise exposure does not exceed the standard.

Furthermore, if any of the following occurs, noise controls are likely to be required:

- employees have to raise their voices to communicate at a distance of one metre
- employees have a temporary reduction in hearing or ringing in their ears after leaving work for the day.

The Occupational Health and Safety Regulations 2007 set out a hierarchy of controls to be applied when fixing noise hazards, and include:

1. eliminating noise sources
2. substituting quieter plant or processes, or implementing engineering measures
3. administrative measures
4. hearing protectors.

When hearing protection is required, hearing tests must be provided for employees. This is to ensure the hearing protection is working effectively.

It is worth noting that if there are changes to the workplace, such as new or additional machinery, it may be necessary to redo noise level tests.

Refer to the Occupational Health and Safety Regulations 2007 for more information.

Housekeeping

By implementing a good housekeeping plan, workplaces can be kept clean and free of waste. You can reduce the risk of injuries occurring due to slips, trips and falls, as well as injuries resulting from hitting stationary objects. A tidy, well laid out workplace can also increase work efficiency. Space around the air receiver needs to be kept clean and free of combustibles so as to prevent the likelihood of fire.

An air receiver has a discharge valve to remove contaminants. This discharge valve needs to be located where it will not create slip hazards by discharging directly onto the floor.

Programs that focus on organisation, cleanliness and standardisation can be introduced to the workplace. Cleanliness can be maintained in a ‘clean as you go’ manner. Good housekeeping creates a tidy workplace that helps identify hazards and risks more effectively.

3. Work procedures

Information, instruction, training and supervision

Providing information, instruction and training is an important means of controlling risk. To be effective, training must be task specific and competency based.

Unacceptable Work Practice	Risk Control Solutions
The air receiver • No operator's manual is available on site. • Employees do not have access to an operator's manual. • Employer has not ensured operators are trained on the specific plant in use at the workplace (eg an employee who was employed because they have experience of operating plant at a previous workplace has not been trained on the specific plant due to that experience).	**The air receiver** • Employer provides an operator's manual that includes the manufacturer's recommendations. • Employer ensures the employee understands the instructions given in the operator's manual. • Employer ensures employees are trained on the specific plant in use at the workplace, including: – lockouts and tag outs – safety devices – isolation points – operation – inspection and maintenance requirements.

Unacceptable Work Practice	Risk Control Solutions
The workplace • There are no safe work method statements in place.	**The workplace** • Safe work method statements are in place. • Operators have been inducted and are familiar with the area they will be working in. • Supervisor ensures that operators are familiar with any operating procedures and other site rules, including: – emergency and evacuation procedures – procedures for reporting faults, hazards and risks.

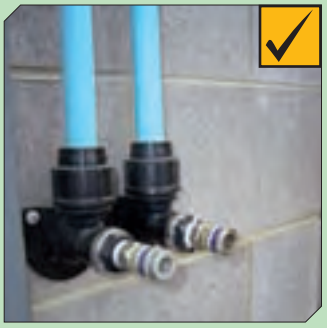
Operating air receivers and auxiliary systems

Regular operational surveillance is an essential part of the safe operation of all pressure equipment.

The air receiver is only one element of a compressed air system. The health and safety of personnel and the operation of the air receiver will be affected by all elements of the system.

The maximum allowable working pressures of air receivers should never be exceeded. Only hydrostatically tested and approved tanks shall be used as air receivers.

Unacceptable Work Practice	Risk Control Solutions
All plant within the compressed air system • Operators are not trained and competent. • Safety supervision is not adequate for the tasks being performed, the potential hazards and the skills of the operators.	**All plant within the compressed air system** • Operators are trained and competent. • Appropriate safety supervision is provided for compressed air work. • All malfunctions and hazards are recorded in the logbook and repaired. • Unsafe plant is appropriately disabled, tagged out, electrically isolated, energy discharged and not operated. • Plant is operated within its limits.
Air receivers • Pre-operational checks are not conducted prior to use. • Safety devices are not monitored. • Air receivers are not drained.	**Air receivers** • Pre-operational checks are conducted prior to use. • Safety devices are constantly monitored while the air receiver is in operation. • Access platforms are provided where required. • Air receivers are drained frequently to prevent build-up of contaminants.

Unacceptable Work Practice	Risk Control Solutions
Air distribution lines and hoses	**Air distribution lines and hoses**
• Air lines and hoses are not inspected frequently. • Defective air lines and/or hoses are used.	• Air lines and hoses are frequently inspected for defects. • Defective air lines and hoses are not used and are repaired or replaced immediately.
• Air lines and hoses are used to discharge compressed air.	• Air lines and hoses are checked to make sure they are properly connected to pipe outlets before use. • Air hoses have safety couplings which shut off the air flow when not coupled to a fitting.  *These couplings shut off air supply when no fitting is attached.*
• Air lines and hoses are used to blow dust off employees clothing.	• Safe work method statements are clearly displayed to prevent employees from using compressed air to clean dust from clothing.
• Air hoses are left on the floor when not in use.	• Air hoses are not bent or kinked. • Air hoses are placed in the appropriate storage systems when not in use.
Safety devices	**Safety devices**
• Safety devices are not monitored. • Safety devices are not inspected and tested. • Malfunctions, faults and unusual events are not reported.	• Safety devices are monitored regularly. • Safety devices are inspected and tested regularly. • Malfunctions, faults and unusual events are reported immediately.
Air compressor operation	**Air compressor operation**
• Air compressors are used without regard to the manufacturer's recommendations.	• Air compressor plant is only operated by authorised and trained personnel. • Air compressors are used only according to the manufacturer's recommendations.

Maintaining air receivers

Most causes of failures of air receivers and associated hazards can be eliminated through proper maintenance regimes. This is a critical area, and planning these tasks goes a long way to reducing the associated risks. Supervision is another area that is critical to achieving safety in relation to maintenance tasks.

Unacceptable Work Practice	Risk Control Solutions
Reporting faults • Faulty plant is not reported, recorded or tagged. • Faulty plant continues to be used.	**Reporting faults** • Defective plant is noted in the logbook and reported to the supervisor or an authorised person. • Defective plant is locked out, tagged out, clearly marked as faulty and rendered unusable pending a decision on how serious the fault is and whether the plant is repairable. • Only competent people repair faults.
General maintenance • There are no procedures for maintenance. • Maintenance procedures are not followed. • Lock out/tag out procedures are not available or are not used. • Workers are not able to lock out plant with their own lock. • Any person can remove another person's lock.	**General maintenance** • There is a maintenance procedure that takes into account the recommendations of the manufacturer. • Only competent people carry out maintenance tasks. • All competent person(s) carrying out maintenance on the compressed air system follow the maintenance procedure. • The compressed air system is switched off, discharged of energy and locked in position before maintenance. • Each person involved in the maintenance work attaches their own **lock** to the appropriate switch. • **No person is able to remove another person's lock.** • Access platforms are provided for servicing air receivers where required: – checking pressure relief valve – testing pressure relief valve – checking for external corrosion.  *Access platform for servicing the air receiver.*

3. Work procedures

Unacceptable Work Practice	Risk Control Solutions
Preventative maintenance • There is no preventative maintenance procedure in place. • Preventative maintenance procedures are not followed.	**Preventative maintenance** • Preventative maintenance is carried out regularly as determined by the usage frequency in line with designer or manufacturer recommendations. • Preventative maintenance is conducted by a competent person according to the maintenance procedure.
Recommissioning • There are no formalised start-up procedures in place. • Start-up procedures are not followed.	**Recommissioning** • There is a recommissioning and testing procedure that has been undertaken prior to re-using an air receiver that has been decommissioned. • Start-up procedures are followed. • Visual inspections are done to ensure that no other maintenance people are on or near the air receiver. • All tags are removed once it is safe to do so.

4. Information and guidance

General

- Employees can contact their union
- Employers can contact their industry association
- Visit WorkSafe Victoria at **worksafe.vic.gov.au**
- WorkSafe Victoria publications can be obtained by phoning WorkSafe toll free **1800 136 089** or emailing **info@worksafe.vic.gov.au**

Legislation

- *Occupational Health and Safety Act 2004*
- *Dangerous Goods Act 1985*
- Occupational Health and Safety Regulations 2007

Other publications

- WorkSafe – *Consultation on health and safety: A handbook for Workplaces*
- WorkSafe – *Employee Representation, 2006*
- WorkSafe – *Your health and safety guide to consultation*
- WorkSafe – *Metal Fabrication Industry – a guide to safety*
- WorkSafe – *Wood products manufacturing industry – a guide to safety*
- WorkSafe – *Machinery and Equipment Safety – An Introduction, 2007*
- WorkSafe – *Your health and safety guide to Managing young workers*
- WorkSafe – *Safety Tips for Young Workers*
- AS 1210-1997, *Pressure Vessels*
- AS/NZS 3788-2006, *Pressure equipment – In-service inspection*
- AS 4343-2005, *Pressure equipment – Hazard levels*
- AS 3873-2001, *Pressure equipment – Operation and maintenance*
- AS 3892-2001, *Pressure equipment – Installation*
- AS 1271-2003, *Safety valves, other valves, liquid level gauges, and other fittings for boilers and unfired pressure vessels*
- AS 1657-1992, *Fixed platforms, walkways, stairways and ladders – Design, construction and installation*

Appendices

Appendix A – Common air receiver and auxiliary systems safety issues checklist

WorkSafe Victoria has noticed some common health and safety issues in relation to air receivers. Applying the information contained in this handbook and using this checklist will help minimise risks.

Installation:

- ☐ Air receiver is securely anchored to the floor
- ☐ The supports are designed for anchoring the air receiver (eg the piping is not designed to be used for anchoring)
- ☐ Air receiver's position means there is no build up of contaminant at the opposite end of the air receiver to the blowdown valve
- ☐ There are no flammable liquids in the vicinity of or near the air receiver
- ☐ Air receiver is located away from traffic areas

Compressor:

- ☐ The compressor is using the correct lubricant
- ☐ The compressor has adequate guarding to prevent contact with the pulleys or belts
- ☐ The compressor has adequate insulation/guarding to prevent contact with the hot piping

Operator:

- ☐ The operator is sufficiently competent to perform tasks adequately and safely

Appendices

Air receiver:

- [ ] There is no internal corrosion that could affect the wall/shell thickness
- [ ] There is no internal build-up of contaminants

Pressure relief valve:

- [ ] The pressure relief valve is the correct type and size
- [ ] The pressure relief valve is set at the correct pressure
- [ ] The pressure relief valve is located at a safe level
- [ ] The pressure relief valve is vertical
- [ ] The nozzle for the pressure relief valve has not been plugged
- [ ] There is a pressure relief valve

Blowdown valve:

- [ ] The location of the blowdown valve is an adequate distance from the floor to avoid splash back
- [ ] The location of the blowdown valve relative to the floor is adequate
- [ ] The location of the blowdown valve is located at the lowest point on the air receiver
- [ ] The blowdown valve is working efficiently
- [ ] The automated blowdown valve is regularly tested to ensure that it is functioning

Pressure gauge:

- [ ] The pressure gauge is of good quality
- [ ] The pressure gauge has a red line marking
- [ ] The pressure gauge is within the calibration range required for the air receiver

Appendix B – Inspection and maintenance records

What is a solution to the problem?

Inspection and maintenance records should:

- be kept for the life of each item of plant
- be in a format that allows a third party to readily access them
- provide a clear understanding of the operation, inspection and maintenance activities relating to the particular item of plant.

It is critical that inspection and maintenance records be kept whether the task is undertaken in-house or by contract.

The following seven steps need to be documented:

1. What is looked at?
2. What is looked for?
3. What is the rejection/acceptance criteria?
4. How is it looked for?
5. What is found?
6. What recommendations are made?
7. What actions are taken based on those recommendations?

Example of internal inspection:

Please note this is only a brief example and does not cover the complete inspection criteria of an internal inspection.

Inspection type:

Internal Inspection

Date:	**Inspected by:**
9 October 2008	Henry Green of KB's Repairs Pty Ltd

1.	What is looked at? I checked the wall thickness of the air receiver via an internal inspection.
2.	What is looked for? I looked to see if there was thinning of the wall thickness due to pitting or corrosion.
3.	What is the rejection/acceptance criteria? I measured against AS/NZS 3788 & AS 1210.
4.	How is it looked for? I did this: via non-destructive testing.
5.	What is found? I found that there was no thinning of the wall thickness.
6.	What recommendations are made? I recommend that the air receiver was suitable for continued use until the next inspection.
7.	What actions are taken based on those recommendations? The recommendations were acted on and the next inspection was booked into the register of pressure equipment for action at the appropriate time.

Example of pressure relief valve inspection:

Please note this is only a brief example and does not cover the complete inspection criteria of the pressure relief valve.

Inspection type: Relief valve Inspection	
Date: 9 October 2008	**Inspected by:** Henry Green of KB's Repairs Pty Ltd

1.	What is looked at? I checked the pressure relief valve.
2.	What is looked for? I checked that the correct device was installed and that there was no external mechanical damage.
3.	What is the rejection/acceptance criteria? I measured against AS/NZS 3788 & AS 1210.
4.	How is it looked for? I did this: via an on-line external visual inspection.
5.	What is found? I found that the correct device was installed, there was external mechanical damage.
6.	What recommendations are made? I recommend that the pressure relief valve be replaced with a new one set at the design pressure.
7.	What actions are taken based on those recommendations? The recommendations were acted on and completed 9 October 2008.

Appendix C – Types of pressure equipment and other definitions

What is pressure equipment?

Pressure equipment includes pressure vessels and boilers.

What is a pressure vessel?

A pressure vessel is a container that holds either gasses or liquids and is subject to either internal or external pressure. It includes interconnecting parts and components, valves, gauges and other fittings up to the first point of connection to connecting piping. Pressure piping has a different meaning to *connecting piping* and is explained below. Some types of pressure vessels are described below.

Air receiver – a tank that serves to store compressed air for large demands in excess of compressor capacity.

Autoclave — a vessel in which high heat and pressure (generated by converting water to steam) is used to sterilise and cure objects.

Calorifier — a device that heats fluids by circulating them over heating coils.

Chiller — a self-contained machine with a refrigeration circuit that cools a fluid circuit.

De-aerator — a device for air removal used to remove dissolved gases from boiler feedwater to make it non-corrosive.

Heat exchanger – a device built for efficient heat transfer from one medium to another.

Pressure piping component – examples include separators and strainers.

Reactor – a device used to force a controlled reaction with a given substance.

Steam type digester – a high-pressure cooker.

What is a boiler?

A boiler is a closed vessel in which water or other fluid is heated or steam or other vapour is generated at a pressure above that of the atmosphere. The heated or vaporised fluid exits the boiler for use in various processes or heating applications.

What is a Competent person?

A person who has acquired the knowledge and skills, through training, qualification, experience or a combination of these, to enable them to correctly perform the required task.

What is an In-service inspector?

A person able to inspect pressure equipment, including air receivers, for the purpose of establishing conformity with the specified requirements in AS/NZS 3788-2006.

What is an Inspector?

Any person involved with an inspection function in accordance with AS 3873-2001

What is an Inspection?

Conformity evaluation by observation and judgement as appropriate by measurement, testing or gauging.

What is a Surveillance?

Activities that observe the general condition of plant.

Appendix D – An introduction to guidance material

The legal framework

There is a legislative framework that sets minimum requirements for controlling risk and for consultation in the workplace. This handbook provides ways to comply in Victoria with the *Occupational Health and Safety Act 2004* and relevant sections of the Occupational Health and Safety Regulations 2007. The rest of this Appendix provides a brief introduction to matters which are regulated by the Act.

Consultation

All employers are required to consult with their employees. This includes consultation with an independent contractor and any employees of the independent contractor. Employers must consult health and safety representatives (HSRs), where they exist. Consultation must cover hazard identification, risk assessment and risk control, as well as any proposed changes in the workplace, plant, substances or work processes that could impact on the health, safety or welfare of workers.

It is recognised that employee input and participation through consultation improves decision-making on health and safety. Apart from being a legal requirement, consultation between employers and employees is an essential part of effectively managing health and safety at work, and a valuable means of improving health and safety and productivity outcomes.

There are many positive outcomes from consultation. Employers become more aware of hazards and occupational health and safety (OHS) issues experienced by employees. Employees can provide input and suggestions about how to solve OHS hazards and risks, and contribute to determining how work can be done more safely and efficiently. Effective consultation can often lead to employees taking more ownership of risk controls. This in turn leads to better adherence of control measures.

See Section 4, Information and guidance for references on consultation.

Representation

Employees are entitled to, and should be encouraged to, be represented in relation to occupational health and safety.

Elected HSRs have been an important feature of occupational health and safety in Victoria since 1985. It is widely acknowledged that HSRs can make a real difference in occupational health and safety. There is often a better safety culture with hazards and risks being raised, and better health and safety outcomes often achieved.

Issue resolution

When a health, safety and/or welfare issue arises in relation to compressed air systems, the employer and employees affected must attempt to resolve it. The employees are entitled to be represented by their health and safety representative in this process.

Section 73 of the *Occupational Health and Safety Act 2004* details how health and safety issues are to be resolved at the workplace. The employer or their representative manager, supervisor and employees affected by an issue must try to resolve the issue by using the agreed workplace procedure. If there is no agreed procedure, then the prescribed one must be used (see Occupational Health and Safety Regulations 2007 Chapter 2, Part 2.2). The employer or representative attempting to resolve the issue must be sufficiently senior and competent to act and make decisions. If the issue can't be resolved, a WorkSafe Victoria inspector can be called in to assist in this process.

For more information on the duty to consult, refer to the WorkSafe publication, *Consultation on health and safety: A handbook for workplaces, 2007.*

Contractors

An employer's legal duty to provide and maintain a safe work environment applies to employees, contractors and labour hire workers

Young workers

Young Victorian workers aged between 15 and 24 years are more likely to be injured at work than any other age group. Young workers must be properly trained, supervised and provided with sufficient information to work safely. Supervision especially needs to be tailored for young people's needs. See worksafe.vic.gov.au/youngworkers.

Reasonably practicable

When determining 'reasonably practicable' controls, Section 20 of the *Occupational Health and Safety Act 2004* outlines what you must take into account. Specifically, the factors to be considered are:

- the likelihood of hazard or risk eventuating
- the degree of harm that would result if the hazard or risk eventuated
- what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing it
- the availability and suitability of ways to eliminate or reduce the hazard or risk
- the cost of eliminating or reducing the hazard or risk.

It is important to understand that all the factors listed above must be taken into account when deciding if something is reasonably practicable.

For more information, refer to the WorkSafe Position *'How WorkSafe applies the law in relation to Reasonably Practicable'.*

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