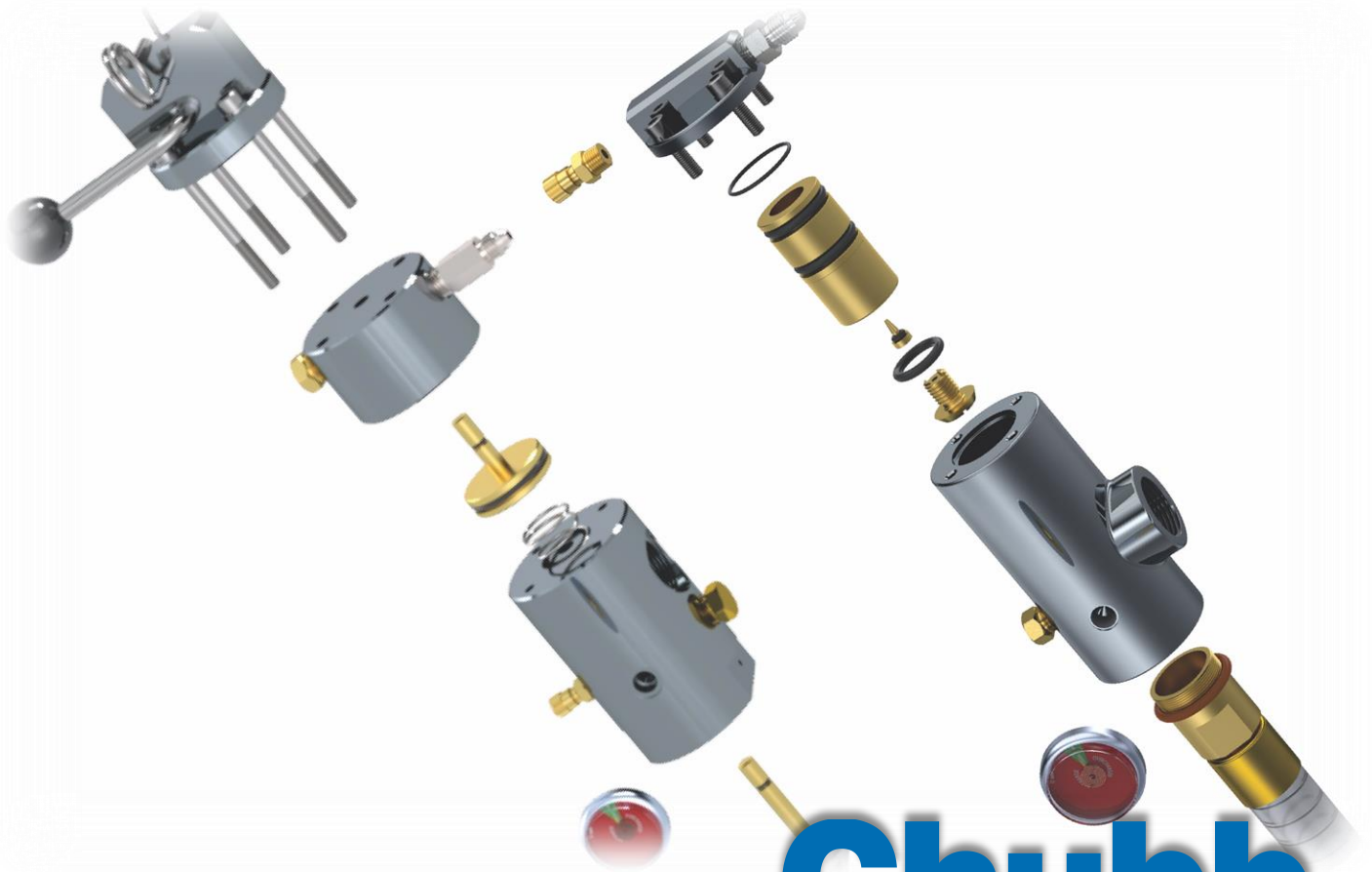


VEHICLE FIRE SUPPRESSION SYSTEM

AFFF C6

Maintenance Manual



PRE-FACE

Document History

Version	Summary of Change
1.0	Original

This manual is an uncontrolled document. Chubb Fire & Security Pty Ltd ("Chubb") reserves the right to alter this manual at any time in accordance with our policy of continuous development. Chubb welcomes feedback regarding this manual and associated equipment.

For further information or feedback, **contact Chubb on 13 15 98.**

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About This Manual

This manual is written for those who maintain PEFS C6 Vehicle Fire Suppression Systems ("PEFS C6"). It contains maintenance information for the system. While reasonable care has been used in the preparation of this manual, Chubb Fire & Security Pty Limited ("Chubb") does not represent or warrant that the information and data contained in this manual is complete, accurate or up-to-date. Chubb reserves the right to make changes to the manual at any time without notice.

PEFS C6 systems are to be designed, installed, commissioned, inspected, maintained, and tested only by qualified, trained personnel.

IMPORTANT

No part of this publication may be distributed, reproduced, modified, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior written approval of Chubb.

Warranty

Chubb warrants to the original system purchaser ("Customer") that each new PEFS C6 system is free from defects in material and workmanship under normal use for a period of twelve (12) months from the date of commissioning. This warranty does not cover any fault, damage or malfunction resulting from:

- a party's negligence, fault, misuse, abuse, neglect (including lack of or improper maintenance) or incorrect use of the PEFS C6 System;
- fair wear and tear;
- replacement of consumables;
- modification of the PEFS C6 System after it has been installed and commissioned;
- modification of the use, condition and environment of the PEFS C6 System after it has been installed and commissioned;
- use, alteration, repair or maintenance by any party that is not suitably authorised, trained and qualified; or
- vandalism, fire, water, accidental damage, power surge or any other circumstance or event outside of Chubb's control.

This warranty is conditional upon documented evidence of proper maintenance, performed in accordance with the PEFS C6 Owner's Manual and Maintenance Manual by authorised, qualified and trained personnel, using replacement parts that conform to original design specifications.

Where Chubb breaches its obligations under this warranty, Chubb may in its sole direction elect to re-supply the PEFS C6 System, or to replace or repair the PEFS C6 System.

To the extent permitted by law, Chubb will have no liability for any statements, representations, guarantees, conditions or warranties not expressly stated in writing by Chubb.

Consumer Guarantees

Nothing in this warranty excludes, restricts or modifies the application of the provisions of any statute (including the Competition and Consumer Act 2010 (Cth) and the Australian Consumer Law contained therein) where to do so would contravene that statute or cause any part of this warranty to be void. If the Customer is a "consumer" as defined in the Australian Consumer Law, the following provisions will apply.

Chubb's products and services come with guarantees that cannot be excluded under the Australian Consumer Law. If the PEFS C6 System is believed to be defective, the Customer must notify Chubb as soon as possible and provide a detailed explanation of the problem.

The Customer is entitled to a replacement or refund for a major failure and to compensation for any other reasonably foreseeable loss or damage. The Customer is also entitled to have the PEFS C6 System repaired or replaced if the PEFS C6 System fails to be of acceptable quality and the failure does not amount to a major failure. Chubb reserves the right to replace any PEFS C6 System under warranty with a new, refurbished or remanufactured PEFS C6 System.

If Chubb elects to repair the PEFS C6 System:

- goods presented for repair may be replaced by refurbished goods of the same type rather than being repaired. Refurbished parts may be used to repair the goods; and
- if the goods are capable of retaining user-generated data, the repair of the goods may result in the loss of the data.

The benefits given to the Customer under this warranty are in addition to other rights and remedies the Customer has under the Australian Consumer Law and other laws applicable to the products and services. This warranty is provided by Chubb Fire & Security Pty Ltd.

Intended use

The PEFS C6 Foam System is a fire suppression system, installed as part of an overall fire risk reduction strategy, as defined in the fire system specifications and or risk assessment outcomes. As such, it is designed to suppress a fire occurring in the specified risk area only within the documented coverage area of each installed nozzle.

Introduction

Mining, Off-Road, Forestry and Construction equipment operating in harsh outdoor environments can be subjected at any time to the threat of fire, which may spread rapidly through the equipment endangering life and resulting in damage to major capital equipment and loss of production. The installation of a fire detection and suppression system is essential to minimise the risk to both operator and equipment.

PEFS C6 is a pre-engineered foam spray suppression system designed specifically to cope with the harsh operating conditions experienced by mobile and transportable equipment. PEFS C6 systems consist of pressurised cylinders containing foam solution (C6 fluorosurfactant based Aqueous film forming foam concentrate mixed with clean potable water), actuation devices to initiate discharge and a discharge network containing spray nozzles to direct the foam spray on the hazard. PEFS C6 systems may be configured for both manual and automatic operation.

PEFS C6 systems offer impressive fire suppression capabilities using a FOAM discharged in the form of a finely atomized SPRAY. Strategically positioned nozzles direct the foam spray and provide “three-dimensional” firefighting properties, allowing the system to suppress pressure fires such as might occur from a ruptured fuel or hydraulic line. The small droplets of foam are extremely efficient at absorbing large amounts of heat and turn to steam which further enhances the three-dimensional firefighting properties of the PEFS C6 system.

PEFS C6 systems can be configured for manual and automatic actuation and is available in two operating modes;

- Loss of Pressure (LOP)
- Rise of Pressure (ROP)

MAINTENANCE

General

The following maintenance schedule is a guide and sets out minimum requirements only. All maintenance carried out on the PEFS C6 system should be carried out in accordance with this manual and Australia Standard AS5062. In all cases, local conditions where the system is installed should be taken into consideration when setting maintenance frequencies. For example, in harsh environments the yearly service may need to be carried out every 6 months.

Precautions

Prior to commencing any service activity, the following precautions shall be carried out as applicable:

- (a) Inform the owner or agent that service is to be carried out.
- (b) Where the system may be temporarily impaired, advise the responsible entity of the nature and expected duration of the impairment.
- (c) On equipment that is remotely monitored, advise the monitoring service provider where service activities may cause a signal to be transmitted.
- (d) Disable the system to prevent testing or other service activities from causing discharge of any extinguishing agent.
- (e) Set the detection and alarm system in the appropriate test mode and isolate ancillary facilities to avoid inadvertent operation.
- (f) "Lock-Out" the equipment to prevent its operation and movement whilst performing any maintenance activities in and around the equipment.

On completion of any service, the system shall be restored to its normal operating condition.

Pre-Maintenance Review (Design Survey)

The design survey together with the inspection, test and preventive maintenance regime demonstrates that the fire protection systems or equipment are functional and capable of performing to a standard not less than that to which they were originally designed.

Prior to commencing any maintenance activities, a pre-maintenance review shall be undertaken to determine whether:

- (a) the system will perform as it is intended to the design at the time of commissioning or recommissioning;
- (b) the date and level of the last scheduled maintenance that has been carried out. Where this cannot be determined, the level of service is to be based from the cylinder date of manufacture.
- (c) neither the fire protection system nor the equipment being protected has changed from the documented system design (baseline data) as of the last commissioning. For example, obstructions to nozzles or fire protection system component changes.

The pre-maintenance review shall include a check against the baseline data, including the approved design for alterations, changes in use or operating environment, or other factors that could adversely affect the performance of the fire protection system.

Any changes to the design of the system including changing the number and or location of nozzles, the number and location of cylinders and or increasing or decreasing the length of discharge pipework shall require a system recommissioning in accordance with the PEFS C6 Design, Installation and Commissioning Manual.

Water Quality

In many areas around Australia, whilst the water may be of drinking quality (potable), it may still contain high levels of chloride salts that make the water unsatisfactory for prolonged contact under pressure in stainless steel cylinders. The presence of salts in water that is used to fill PEFS C6 cylinders may have an impact to the firefighting performance of the foam, can clog the pressure indicator, bind the valve actuation mechanism, inhibit the removal of the cylinder valve and or lead to pitting corrosion of the cylinder.

The maximum limit of chloride ions in water used to fill PEFS cylinders is 150ppm. Only dry nitrogen (not compressed air) shall be used to pressurise PEFS C6 systems.

Where the water quality is in doubt at a particular location where filling activities are carried out, the use of water from another location source should be used. Failure to do so may result in rapid deterioration of the cylinder assembly, leading to leakage or failure to operate. Routine service shall be undertaken more regularly where:

- (a) water quality has proved to be a problem, or is likely to be a problem;
- (b) salts are deposited in the cylinder; or
- (c) hard water is used.

System Defects

Defects, including faulty or defective components advised by public notices or manufacturers' service bulletins, shall be replaced, exchanged or repaired.

Critical defects shall be rectified with the minimum of delay. Unless alternative risk reduction measures are implemented for the safety of personnel, equipment shall not be operated until the critical defects are rectified. Critical defects shall be reported to the responsible entity and confirmed in writing within 24 h.

An 'out-of-service' tag system should be used to indicate that the system is temporarily impaired. Tags should be attached to the affected equipment for the duration of the impairment. Evidence of the service level shall not be applied to the service tag or label. The inspection and the outcome shall be entered in the service records.

Non-critical defects shall be rectified as soon as practicable and reported to the responsible entity.

Non-conformances should be rectified prior to the next yearly condition report.

Service Records

A service record at the completion of any scheduled maintenance should be provided to the equipment owner or responsible entity. The service record should contain the following information:

1. Service activities.
2. Defects.
3. Rectifications and by whom.
4. Date conducted.
5. Where modification to the system has occurred:
 - a. Updated system baseline data or fire system specification
 - b. System re-commissioning report.

A service tag or label should be provided for each fire protection system to record the last level of inspection, test and survey performed.

The level of service carried out shall be etched, embossed stamped, or indelibly marked on the tag or label in the box corresponding to the year and month in which the routine was performed, with a figure representing the routine as follows:

Punched hole	= commissioned/placed in-service
1	= Six-monthly
2	= Yearly
3	= Five yearly
4	= Recharged after use

The figures shall be not less than 3mm high, and the markings shall be such that the figures are legible.

When a new service label is provided, the label shall be applied adjacent to the completed label so that the previous service history is not obscured.

Recommended Tool List

The following tool list is provided as a guide only.

PEFS C6 Tools

Description	Part Number
Pressurising Rig	87033
Charging Adaptor	130632
Over-Fill Tube C23	36205
Over-Fill Tube C30	36206
Over-Fill Tube C45	36207
Over-Fill Tube C65	36208
Over-Fill Tube C106	36209
Over-Fill Tube O-ring	90127

Recommended Common Tools

Description
Tape measure (5m minimum)
Portable tube bender (to suit 12.7mm OD tube)
Flaring tool - 37° (to suit 12.7mm OD tube)
Hand / Drill type deburring tool 2-14mm
Angle grinder 100 mm
Drill (Heavy duty) - 12.7 mm chuck
Drill Set 1mm - 13mm x 0.5mm (high speed)
Socket set - metric 4mm - 19mm, A/F 3/16" - 15/16"
Spanner Set - metric 7mm - 22mm, A/F 1/4" - 1"
Adjustable Spanners 250mm & 450mm
Files - Round and Flat (medium bastard) 250mm
Hex Wrench set (Allen keys) Metric & Imperial
Portable drop saw
Hacksaw
Safety knife
Screwdriver set 13 Piece
Hammer - Ball Pein
Side cutters 250mm
Funnel and measuring jug
Digital scales
Pliers (combination) 225mm
Multigrips 250mm
Cable cutters
Lock-Out devices
Loctite 577 pipe thread sealant or Loctite 569 hydraulic thread sealant
Molykote 111 lubricant or equivalent silicon based o-ring lubricant.
Loctite C5-A Anti-Seize Lubricant

Table 1 – Recommended Tool List

Service Schedule

The following maintenance schedule is based on the schedule detailed in AS5062 and those requirements applicable to all the hardware and design features detailed in the PEFS C6 Design, Installation and Commissioning manual. The maintenance schedule is ordered in the recommended sequence of maintenance activities for the PEFS C6 System and does not follow the order given in AS5062.

Commencement of the routine service schedule should begin at the completion date of the initial system commissioning. When carrying out the service on an existing installed system where the service history is unknown the Yearly Service Schedule should be performed.

For more detailed maintenance instructions on electrical control systems, panels, detectors and auxiliary electrical devices please refer to their respective product manuals.

Daily Routine Service Schedule

The following daily inspection items should be completed by the operator prior to equipment start-up, shift change or operator change.

Item	Action
System pressure check.	Check all cylinder valves and LOP manual actuator pressure indicators are visible and read within normal range.
Manual actuators	(a) Check that all anti tamper seals and pull pins are in place and secure. (b) Physically check that all manual actuators are secure, clean, undamaged and accessible.
System control and indicating equipment where fitted	(a) Check that all indicators show normal condition. (b) Check that all panels are secure, clean, undamaged and accessible.

Table 2 – Daily Service Schedule

Six-monthly and Yearly Routine Service Schedule

Item No.	Item	Action	6 Mthly	Yrly
1	System pressure check.	Check all cylinder valves and LOP manual actuator pressure indicators are visible and read within normal range.	✓	✓
2	System control and indicating equipment where fitted	(a) Check that all indicators show normal condition. (b) Check that all panels are secure, clean, undamaged and accessible. (c) Test all indicators and audible alarms. (d) Test battery capacity (if fitted)	✓	✓
3	Distribution system	(a) Clean Nozzles. Check nozzle caps are in place and foils are intact. (b) Check nozzles are pointing at pre-determined aiming points. (c) Check distribution system, (hoses, tube, fittings and supports) are intact and not damaged.	✓	✓
4	Actuation system	(a) Pneumatic actuation system - Check hoses, manifold blocks, fittings and supports are intact and not damaged. (b) Electric actuation system (if fitted) - Check wiring, connections and supports are intact and not damaged.	✓	✓

Item No.	Item	Action	6 Mthly	Yrly
5	Manual actuators	(a) Check that all anti tamper seals and pull pins are in place and secure. (b) Physically check that all manual actuators are secure, clean, undamaged and accessible. (c) Test operation. (d) Check contents of actuator cartridges (if fitted)	✓	✓
6	Detection system	(a) Pneumatic detection system (LOP Tubing) - Check detection hoses, LOP tubing, fittings and supports are intact and not damaged and are in position. (b) Electric detection system (if fitted) - Check detectors, wiring, connection and supports are in intact, not damaged and detectors are in position.	✓	✓
7	Storage containers	(a) Check cylinders and valves are not damaged. (b) Check cylinders and mounting brackets are secure.	✓	✓
8	System Labels	Check Cylinder, Manual Actuator and system warning and instruction labels are securely in place, visible and legible.	✓	✓
9	Discharge test (optional)	(a) Conduct discharge test and record result (b) Check fire suppression system nozzle area coverage.		✓
10	Storage containers	(a) Remove cylinder and inspect mounting bracket and cylinder for damage and condition. (b) Check date of test or manufacture on storage container. If over 5 years old – subject the cylinder to an inspection and hydrostatic pressure test in accordance with AS 2030.5 and AS2337.1		✓
11	Container valves	Service and lubricate the cylinder valve		✓
12	Extinguishing agent solution	Replace foam solution in cylinders		✓
13	Distribution system	Conduct clear passage test using dry nitrogen and physically check distribution system, (i.e. that hoses, tube, fittings and supports are secure).		✓
14	Mechanical actuator	Service and lubricate the Manual actuators		✓
15	Detection system - Pneumatic	Pneumatic detection system (LOP Tubing): (i) replace the LOP Detection Tubing (ii) test pneumatic circuits for leaks (iii) check hoses, LOP tubing, fittings and supports are secure		✓
16	Actuation system – Pneumatic	(a) test pneumatic circuits for leaks (b) check hoses, manifold blocks, fittings and supports are secure (c) check correct orientation of check valves (ROP system)		✓
17	Actuation system – Electrical (where fitted)	(a) Function test all actuation circuits. Ensure electric Actuator opens and closes correctly. (b) check all wiring for earths (c) check wiring, connections and supports are secure		✓

Item No.	Item	Action	6 Mthly	Yrly
18	Detection system - Electrical (where fitted)	Electric detection system (if fitted) (i) function test all detectors (ii) check all wiring for earths (iii) check wiring, connections and supports are secure		✓
19	System interface and shutdown (where fitted)	Test all fire suppression system activated equipment shutdowns and record delay time.		✓
20	Nozzle obstructions	Check for adequate clear space at nozzles and for obstructions likely to impede discharge.		✓
21	Nozzle location and coverage	Check for the introduction of fixtures and bulkheads shielding nozzle discharge and the presence of unprotected hazard areas, particularly where a source of fuel and heat exists.		✓
22	Detector coverage	Check for the presence of unprotected hazard areas, particularly where a source of fuel and heat exists.		✓
23	Operational conditions	Check that the detector response and extinguishing agent discharge or retention will not be adversely affected by such things as enclosure openings, ventilation airflows or high temperature protected areas.		✓
24	Environmental conditions	Check that the fire system and its components are suitable for the environmental conditions in which the machine is operating, e.g. that components are suitable for underground mining, and road gradient and slopes are within container orientation limits.		✓
25	Survey	Complete review of system to confirm it is in accordance with the approved design and no changes have been made which would impair performance.		✓

Table 3 – Six-monthly and Yearly Service Schedule

Six Monthly Service Instructions

System pressure check (Item 1)

1. Check the reading on the pressure indicator located on the cylinder valve of each cylinder assembly installed. The pressure should read within the green segment of the indicator.
2. With LOP systems, check the reading on the pressure indicator located in each LOP manual actuator installed. The pressure should read within the green segment of the indicator.
3. If system is low on pressure, the source of the leak should be identified and rectified prior to re-pressurising the system.
4. If the system pressure shows 0kPa, it is likely the system has been discharged and will need to be refilled.
5. If a pressure indicator reads differently to all of the other pressure indicators, this pressure indicator is most likely faulty or out of calibration. Replace the faulty pressure indicator. Refer to section on valve service and actuator service located later in this manual.

System control and indicating equipment [where fitted] (Item 2)

Note: Refer to Control System / Panel product manuals for detailed operational and maintenance requirements.

1. Check that all indicators show normal condition:
 - a. Power on indicator light illuminated
 - b. Fault indicators are not illuminated
 - c. System Discharge indicators are not illuminated
 - d. Fire Alarm indicators are not illuminated
 - e. System Isolation indicators are not illuminated
 - f. Audible alarms not sounding
2. Set control panel (where applicable) to its "Isolation / Test" mode.

⚠ WARNING: System Control Panels must remain in there "Isolation / Test" mode during the remainder of the scheduled maintenance activities to prevent accidental discharge of the system.

3. Check that all status indicators and audible alarms function correctly.
4. Check that all panels are secure, clean, undamaged and accessible.
5. Test battery capacity (if fitted).

Distribution system (Item 3)

1. Clean Nozzles
2. Check nozzle caps are in place and foils are intact. Replace nozzles if required.
3. Check nozzles are pointing at pre-determined aiming points. Refer to system design data (baseline data) as of last commissioning.
4. Check distribution system is intact and not damaged:
 - a. Hoses are not worn, split, cut or kinked.
 - b. Hoses have protective sleeves fitted along locations where rubbing can occur.
 - c. Tubing is not dented, kinked or otherwise damaged
 - d. Fittings do not show signs of excessive corrosion
 - e. Fittings are secure.
 - f. Clamps are adequately secured to the equipment and firmly hold the discharge hoses and or tubing in place.
 - g. Nozzle brackets (where fitted) are adequately secured to the equipment and firmly holds the nozzle kit fittings.

Actuation system (Item 4)

1. Check pneumatic actuation system is intact and not damaged:
 - a. Hoses are not worn, split, cut or kinked.
 - b. Hoses have protective sleeves fitted along locations where rubbing can occur.
 - c. Fittings do not show signs of excessive corrosion
 - d. Fittings are secure
 - e. Manifold block (where fitted) is adequately secured to the equipment.
 - f. Clamps are adequately secured to the equipment and firmly hold the actuation hose in place.

2. Check electric actuation system (if fitted) is intact and not damaged:
 - a. Electrical cabling is not worn, split, cut or kinked.
 - b. Electrical cabling has protective sleeves fitted along locations where rubbing can occur.
 - c. Electrical connectors are intact and not damaged.
 - d. Separate connectors and check to ensure they are free from ingress of dirt, water and corrosion. Replace if required. Re-connect all electrical connectors.
 - e. All cabling clamps and supports are adequately secured to the equipment and firmly holds the cabling in place.

Manual Actuators (Item 5)

⚠ WARNING: The cylinder and actuation pipework may contain high pressure. Do not remove any parts from the cylinder or actuation pipework unless it is depressurised first.

1. Check that all actuators are intact and not damaged.
2. Check that all actuators are accessible and access has not been restricted by equipment modification.
3. Check that all pull pins and security ties (anti tamper seals) are in place and secure. Replace anti-tamper seals if missing or broken.
4. Check that the pull pin retainer wire is correctly securing the pull pin to the actuator.
5. Check that all actuators are adequately secured to the equipment.

LOP Manual Actuators

NOTE: The LOP Manual actuators are designed to “fail to safe”. That is any fault causing leakage will activate the system. As such the LOP manual actuators may be considered operational if the below listed checks are carried out.

1. Check to ensure pressure is reading in the green sector of the pressure indicator
2. Remove the front housing cover and check that all actuators are:
 - a. Clean and undamaged.
 - b. Foil is intact on outlet port nozzle. Replace if required.
 - c. Schrader Valve has cap fitted to protect against ingress of dust and dirt.
3. Leak Test all connection points (refer figure below) with a liquid leak detection solution. If actuator shows any signs of leakage, carry out service on actuator.



Figure 1

4. Re-fit housing cover and ensure it is securely bolted on and label is intact and readable.

ROP Manual Actuators

⚠ WARNING: The actuation pipework may contain high pressure. Do not remove any parts from the cylinder or actuation pipework unless it is depressurised first.

⚠ WARNING: The ROP manual actuator contains a CO₂ Cartridge which is a sealed pressure vessel. Care must be taken when handling. Avoid any impacts, this may rupture the CO₂ Cartridge and cause personal injury or damage to other equipment.

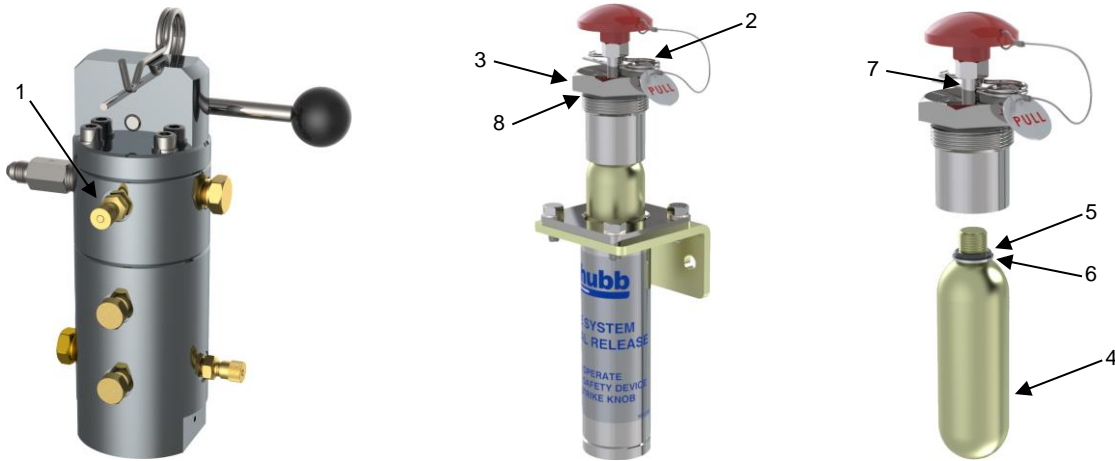


Figure 2

1. Remove Schrader valve cap from valve pneumatic actuator (1)
2. Depress Schrader valve core to release pressure from actuation system.
3. Ensure Pull Pin (2) is in place.
4. Unscrew (large hex nut) and remove the top assembly (3).

NOTE: Unscrew nut slowly. If the actuation lines have not been fully released from pressure, this will allow time to purge any residual pressure through vent slot on side of thread.

5. Remove CO₂ Cartridge (4), O-ring (5) and Washer (6). Handle CO₂ Cartridge with care.
6. Clean CO₂ Cartridge (4) with a clean cloth
7. Check CO₂ Cartridge (4) manufacturing date. Replace if more than 5 years old.
8. Check mass of CO₂ Cartridge (4) is within $\pm 5\%$ of mass stamped on CO₂ Cartridge. Replace CO₂ Cartridge (4) if underweight.
9. Remove Pull Pin (2) from top assembly (3).
10. Check piston assembly (7) moves freely. Clean and re-lubricate piston o-rings with Molykote 111 if required.
11. Refit Pull Pin (2) to top assembly (3).
12. Reinstall CO₂ Cartridge (4), O-ring (5) and Washer (6).
13. Check housing O-ring (8). Replace if damaged.
14. Reinstall top assembly (3). Tighten large hex nut.
15. Cartridges which are damaged or out of test date should be removed from site and depressurised in the workshop using a dedicated actuator piped into the CO₂ discharge vent.

Detection System (Item 6)

⚠ WARNING: The cylinder and actuation pipework contains high pressure. Do not remove any parts from the cylinder or actuation pipework unless it is depressurised first.

1. Check LOP Tubing is intact and not damaged:
 - a. LOP Tubing is not worn, split, cut or kinked.
 - b. LOP Tubing is located in correct position. Refer to system design data (baseline data) as of last commissioning.
 - c. Check to ensure any modifications to equipment has not subjected LOP Tubing to possible heat exposure greater than 90°C.
 - d. Fittings do not show signs of excessive corrosion.
 - e. Fittings are secure.
 - f. Clamps are adequately secured to the equipment and firmly hold the LOP Tubing in place.
2. Check electric detection system (if fitted) is intact and not damaged:
 - a. Electrical cabling is not worn, split, cut or kinked.
 - b. Electrical cabling has protective sleeves fitted along locations where rubbing can occur.
 - c. Electrical connectors are intact and not damaged.
 - d. Separate connectors and check to ensure they are free from ingress of dirt, water and corrosion. Replace if required. Re-connect all electrical connectors.
 - e. All cabling clamps and supports are adequately secured to the equipment and firmly holds the cabling in place.
 - f. Detector locations are in correct position. Refer to system design data (baseline data) as of last commissioning.

Storage containers (Item 7)

1. Check all cylinder valves are not damaged.
2. Check all cylinder burst disk assemblies are not damaged. Use of a vinyl protective cap over the burst disk assembly is recommended to prevent ingress of dirt and wear on the burst disk surface.
3. Visually inspect exterior of all installed cylinders. Where a cylinder is dented, scored, pitted or otherwise damaged by corrosion and it cannot be determined if the damage is within the limits as detailed in AS 2337.1, then the cylinder shall be condemned.
4. Check the manufacture date and or last pressure test date of all installed cylinders. If this exceeds five years old then the cylinder will require an inspection and hydrostatic test in accordance with AS2030.5 and AS2337.1.
5. Check cylinders and mounting brackets are secure.

System Labels (Item 8)

Check Cylinder, Manual Actuator and system warning and instruction labels are securely in place, visible and legible.

After Maintenance Activities

After all 6 monthly maintenance activities have been completed:

1. Ensure all pressure indicators are reading in the green zone.
2. Ensure control panel (where fitted) is reset to its normal operation mode and is no longer in its "Isolation / Test" mode.
3. Complete routine service records in accordance with AS5062
4. Stamp Service Tag with the number "1" in the corresponding Year/Month location.

Yearly Service Instructions

Discharge Test [Optional] (Item 9)

An annual discharge test can be used to confirm the complete PEFS C6 system operates and performs as that intended as when originally commissioned.

Please refer to the Chubb PEFS C6 Vehicle Fire Suppression System SDS prior to carrying out the Discharge Test. Discharge of foam solution must be handled according to national or local waste regulations. Permission must be granted from the site representative before carrying out the discharge test.

1. Check system pressure is reading in the green sector on the pressure indicators located on the cylinder valves and LOP manual actuators.
2. Discharge the PEFS system using the furthest located manual actuator
3. Confirm all nozzles discharge and produce conical spray pattern.
4. Check that the nozzle discharge patterns cover the fire hazard area as specified in the commissioning documentation.
5. Check that all monitoring and control panel alarms, shutdown and ancillary functions operate as intended
6. Record the Effective Discharge Time (EDT) and compare it to the EDT recorded during commissioning.

Storage containers (Item 10)

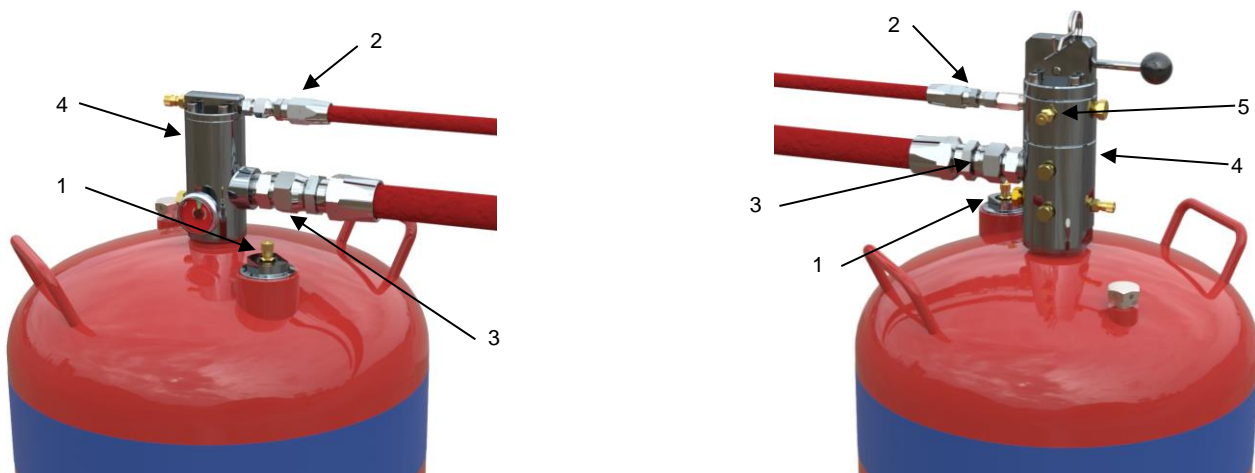


Figure 3

1. Remove discharge hose (3) from cylinder valve (4).
2. Fit end cap to discharge outlet port to prevent accidental discharge.
3. Remove Schrader valve cap from filler port assembly (1).
4. Depress Schrader valve core to release cylinder pressure.
5. Check that the pressure indicator on Cylinder Valve (4) shows 0kPa.

ROP Valve Only

6. Remove Schrader valve cap from valve pneumatic actuator (5)
7. Depress Schrader valve core to release pressure from actuation system
8. Reinstall Schrader valve caps
9. Remove actuation hose (2) from cylinder valve (4).
10. Remove filler port assembly (1)
11. Remove foam solution from the cylinder.
12. Check all cylinder burst disk assemblies are not damaged. Use of a vinyl protective cap over the burst disk assembly is recommended to prevent ingress of dirt and wear on the burst disk surface.
13. Visually inspect exterior of all installed cylinders. Where a cylinder is dented, scored, pitted or otherwise damaged by corrosion and it cannot be determined if the damage is within the limits as detailed in AS 2337.1, then the cylinder shall be condemned.
14. Visually inspect interior of all installed cylinders. Where a cylinder is damaged by corrosion and it cannot be determined if the damage is within the limits as detailed in AS 2337.1, then the cylinder shall be condemned.

15. Check the manufacture date and or last pressure test date of all installed cylinders. If this exceeds five years old then the cylinder will require an inspection and hydrostatic test in accordance with AS2030.5 and AS2337.1.
16. Check brackets are not damaged and secure.
17. Re-fit and secure cylinders into brackets.

Cylinder Valve – Service (Item 11)

⚠ WARNING: The cylinder is a pressure vessel. Do not remove any parts from the cylinder prior to depressurising the cylinder.

LOP Cylinder Valve

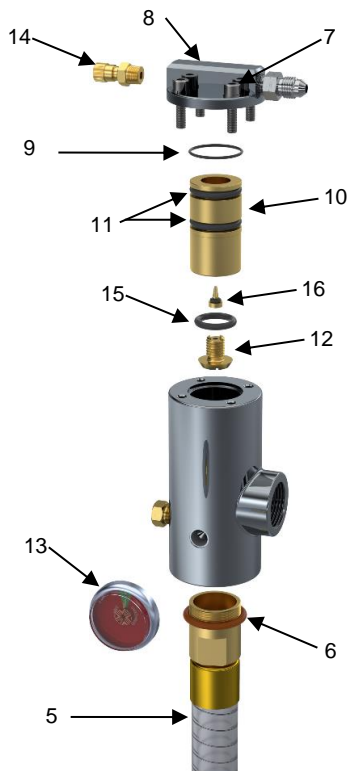


Figure 4

A LOP Valve Service Kit (Part No: 28022) is available for the purpose of servicing the LOP valve.

1. Remove cylinder valve (4) from cylinder.
2. Remove Syphon Tube (5) and Cylinder Neck O-ring (6)
3. Remove the 4 screws and washers (7).
4. Remove the cap (8) and o-ring (9).
5. Remove the piston assembly (10).
6. Inspect and clean piston o-rings (11) and sealing o-ring (15). Replace if they shows signs of wear or damage. Check to ensure check valve (16) moves freely inside piston, clean and or replace if required. Lubricate outside diameter o-rings (11) and outside diameter of piston assembly (10) with Molykote 111. Do not lubricate sealing o-ring (15) and check valve o-ring (16). If retainer (12) was removed, re-fit using Loctite 569 or Loctite 577 on thread.
7. Clean inside of valve. Check for scratches and scoring. Re-install piston assembly (10).
8. Inspect and clean o-ring (9) and replace if it shows signs of wear or damage. Lubricate o-ring (9) with Molykote 111 and fit to cap (8).
9. Re-install cap (8), washers and screws (7) to cylinder valve.
10. Inspect syphon tube (5). Replace if tube has become stiff or is damaged.
11. Inspect and clean Cylinder Neck O-ring (6) and replace if it shows signs of wear or damage. Lubricate with Molykote 111.
12. Inspect and clean Pressure Indicator (13) and Schrader Valve (14). Replace if faulty or damaged. Use Loctite 577 or Loctite 569 on threads
13. Re-install cylinder valve (4) to cylinder.

ROP cylinder valve

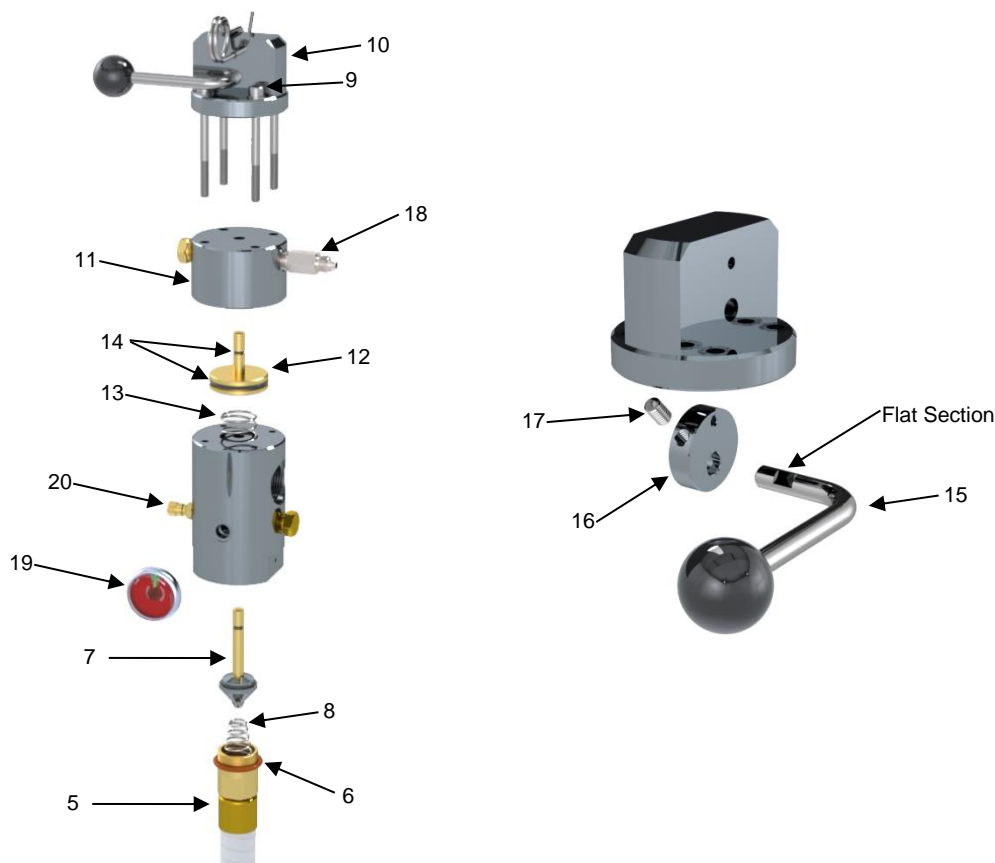


Figure 5

A ROP Valve Service Kit (Part No: 28023) is available for the purpose of servicing the ROP valve.

1. Remove cylinder valve (4) from cylinder
2. Remove Syphon Tube (5) and Cylinder Neck O-ring (6)
3. Remove piston assembly (7) and spring (8).
4. Inspect and clean piston assembly and o-rings. Replace piston assembly (7) if there are signs of wear or damage.
5. Remove the 4 screws and washers (9).
6. Remove the manual actuator (10).
7. Remove the pneumatic actuator (11) and spring (13).
8. Inspect and clean the manual actuator (10). Ensure Lever (15) and Cam (16) moves freely. If required, unscrew grub screw (17) until Lever (15) can be removed. Remove and clean Cam (16). Lubricate sides of Cam (16) with Molykote 111. Re-fit Cam (16) and Lever (15) into manual actuator. Ensure the flat section on the Lever (15) aligns with the grub screw (17). Tighten grub screw (17) and ensure Lever (15) is tightly secured.
9. Remove the pneumatic actuator piston assembly (12)
10. Inspect and clean piston o-rings (14). Replace if they shows signs of wear or damage. Lubricate outside diameter o-rings (14) and outside diameter of piston assembly (12) with Molykote 111.
11. Clean inside the pneumatic actuator (11). Check for scratches and scoring. Re-install pneumatic actuator piston assembly (12).
12. Re-install spring (13), pneumatic actuator (11) and manual actuator (10) with screws and washers (9).
13. Remove and clean check valve (18). Using compressed air gun blow air through both openings of check valve (18). Check that air only blows through check valve in the direction of the arrow stamped on the check valve (18). Replace check valve (18) if faulty. Re-fit using Loctite 569 or Loctite 577 on thread.
14. Check cylinder neck o’ring (6) is clean. Replace o’ring if damaged. Re-lubricate o-ring with Molykote 111.
15. Inspect and clean Pressure Indicator (19) and Schrader Valve (20). Replace if faulty or damaged. Use Loctite 577 or Loctite 569 on threads
16. Inspect syphon tube (5). Replace if tube has become stiff or is damaged.
17. Re-install piston assembly (7), spring (8), syphon tube (5) and Cylinder Neck O-ring (6) to cylinder valve (4)
18. Re-install cylinder valve (4) to cylinder.

Cylinder Refilling (Item 12)

⚠ WARNING: The cylinder is a pressure vessel. Do not remove any parts from the cylinder prior to depressurising the cylinder.

Cylinders must only be filled with clean potable water (chloride ion content <150ppm). The fill quantities for each size cylinder are detailed in the table below.

Please refer to the Chubb PEFS C6 Foam Concentrate SDS prior to handling the foam concentrate.

Cylinder Size	Total Fill	Water quantity	Foam quantity
C23 cylinder assembly	18 ltr.	16 ltr.	2 ltr.
C30 cylinder assembly	24 ltr.	21.5 ltr.	2.5 ltr.
C45 cylinder assembly	35 ltr.	31 ltr.	4 ltr.
C65 cylinder assembly	50 ltr.	44 ltr.	6 ltr.
C106 cylinder assembly	85 ltr.	75 ltr.	10 ltr.

Table 4 - Cylinder Filling Volumes

1. Remove Filler Plug Assembly.
2. Remove Over-fill tube (if fitted) from filling port.
3. Filling by Scales (recommended):
 - a. Fill cylinder with water to required mass (1ltr = 1kg) as per Table 5 - PEFS C6 cylinder specifications.
4. Filling by Anti-overfill Tubes:
 - a. Check to ensure Over-fill tube is marked with “F3” or “C6”. If not:
 - b. Refit correct Anti-overfill tube and ensure it is correctly seated in filling port
 - c. Ensure valve must be fitted to cylinder in closed position
 - d. Add water to cylinder until it initially over-flows. (Do not insert water supply hose below the bottom of the Over-fill tube.)
 - e. Remove Over-fill tube from filling port.
5. Add the required volume of foam concentrate as per Table 5 - PEFS C6 cylinder specifications
 - a. Measure volume using measuring jug
 - b. Do not fill foam concentrate by mass as it has a different density to water.
6. Refit Filler Plug Assembly.

Distribution System – Clear Passage Test (Item 13)

1. Disconnect discharge hose from cylinder valve.
2. If required, remove Nozzles.
3. Flush discharge network with water and/or compressed air/nitrogen
4. Check distribution network is clear of any blockages
5. Clean and inspect Nozzles. Ensure foils are intact. Replace Nozzles if required.
6. Check nozzles are pointing at pre-determined aiming points. Refer to system design data (baseline data) as of last commissioning.
7. Check distribution system is intact and not damaged:
 - a. Hoses are not worn, split, cut or kinked.
 - b. Hoses have protective sleeves fitted along locations where rubbing can occur.
 - c. Tubing is not dented, kinked or otherwise damaged
 - d. Fittings do not show signs of excessive corrosion
 - e. Fittings are secure.
 - f. Clamps are adequately secured to the equipment and firmly hold the discharge hoses and or tubing in place.
 - g. Nozzle brackets (where fitted) are adequately secured to the equipment and firmly holds the nozzle kit fittings.

Manual Actuators – Service (Item 14)

LOP Manual Actuators

⚠ WARNING: Do not loosen any hose connections or fittings in the LOP actuation system while the system is pressurised. This will cause the system to discharge. Prior to servicing any LOP actuators ensure the system is depressurised by depressurising the PEFS C6 cylinders using the Schrader valve fitted to the cylinder Filler Plug Assembly. Ensure pressure indicators on manual actuators read zero pressure.

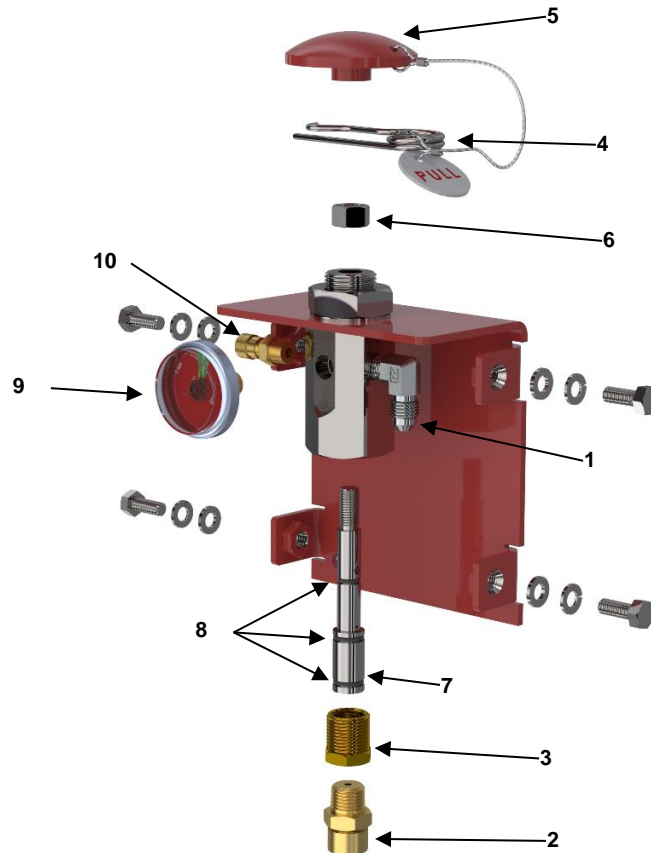


Figure 6

A LOP Actuator Service Kit (Part No: 28036) is available for the purpose of servicing the LOP manual actuator.

1. Remove the actuator cover plate.
2. Remove actuation hose from actuator connection (1).
3. Remove Foil Nozzle (2) and Adaptor (3)
4. Check the Foil Nozzle (2) to ensure its foil seal is intact and not damaged or ruptured. Replace if required.
5. Remove Pull Pin (4)
6. Remove Push Button (5) and Nut (6)
7. Remove valve piston assembly (7) from valve body.
8. Inspect and clean piston o-rings (8) and replace if they show signs of wear or damage. Lubricate using Molykote 111.
9. Refit valve piston assembly (7) to valve body
10. Ensure that the actuation mechanism moves freely.
11. Refit Nut (6) and Push Button (5). Tighten nut up against Push Button.
12. Refit Pull Pin (4)
13. Refit Adaptor (3) and Foil Nozzle (2). Use Loctite 577 or Loctite 569 on threads
14. Inspect and clean Pressure Indicator (9) and or Schrader Valve (10). Replace if faulty or damaged. Use Loctite 577 or Loctite 569 on threads
15. Reconnect actuation hose to actuator connection (1).

ROP Manual Actuators

Refer to Manual Actuators (Item 5)

Detection system – Pneumatic (Item 15)

⚠ WARNING: Do not loosen any hose connections or fittings in the LOP actuation system while the system is pressurised. This will cause the system to discharge. Prior to replacing any LOP detection tubing ensure the system is depressurised by depressurising the PEFS C6 cylinders using the Schrader valve fitted to the cylinder Filler Plug Assembly.

After having depressurised the PEFS C6 system:

1. Replace each length of LOP detection tubing.
3. Ensure LOP tubing does not kink.
4. Check LOP Tubing is located in correct position. Refer to system design data (baseline data) as of last commissioning.
5. Check to ensure any modifications to equipment has not subjected LOP Tubing to possible heat exposure greater than 90°C.
6. Check LOP tubing fittings do not show signs of excessive corrosion.
7. Check LOP tubing fittings are secure.
8. Check LOP tubing clamps are adequately secured to the equipment and firmly hold the LOP tubing in place.

Actuation system – Pneumatic (Item 16)

Check pneumatic actuation system is intact and not damaged:

1. Hoses are not worn, split, cut or kinked.
2. Hoses have protective sleeves fitted along locations where rubbing can occur.
3. Fittings do not show signs of excessive corrosion
4. Fittings are secure
5. Manifold block is adequately secured to the equipment.
6. Clamps are adequately secured to the equipment and firmly hold the actuation hose in place.

Test pneumatic actuation circuits for leaks. Check that all pneumatic actuation hoses, tubes and fittings are undamaged and secure. The leak testing procedure required for ROP systems is detailed below.

ROP Systems



1. Remove actuation hose/fitting from check valve fitted to the ROP cylinder valve (1).
2. Fit a plug to the actuation hose/fitting removed from the check valve.

3. One section at a time, connect a source of nitrogen or compressed air to the end of each actuation network section (3).
4. Remove the actuation hose from each check valve (4) in the manifold block (2) (other than the section being tested).
5. Pressurise the section being tested to >1000 kPa and inspect for leaks. Leak test all connections and check valves with liquid leak detection solution (allow to sit for at least 5 minutes).
6. Repeat steps 3 – 5 until all sections of the ROP actuation system has been tested.
7. Release pressure in actuation network and re-instate all actuation hose connections to their original state.

Actuation system – Electrical [where fitted] (Item 17)

Note: The following maintenance activities should be carried out in conjunction with the listed fire control system manuals.

1. Check electric actuation system is intact and not damaged:
 - a. Electrical cabling is not worn, split, cut or kinked.
 - b. Electrical cabling has protective sleeves fitted along locations where rubbing can occur.
 - c. Electrical connectors are intact and not damaged.
 - d. Separate connectors and check to ensure they are free from ingress of dirt, water and corrosion. Replace if required. Re-connect all electrical connectors.
 - e. All cabling clamps and supports are adequately secured to the equipment and firmly holds the cabling in place.
2. Function test all actuation circuits. Ensure each LOP or ROP Electric Actuator opens and closes correctly.
3. Check all wiring for earths

Detection system - Electrical [where fitted] (Item 18)

Note: The following maintenance activities should be carried out in conjunction with the listed fire control system manuals.

1. Check electric detection system is intact and not damaged:
 - a. Electrical cabling is not worn, split, cut or kinked.
 - b. Electrical cabling has protective sleeves fitted along locations where rubbing can occur.
 - c. Electrical connectors are intact and not damaged.
 - d. Separate connectors and check to ensure they are free from ingress of dirt, water and corrosion. Replace if required. Re-connect all electrical connectors.
 - e. All cabling clamps and supports are adequately secured to the equipment and firmly holds the cabling in place.
 - f. Detector locations are in correct position. Refer to system design data (baseline data) as of last commissioning.
2. Function test all detectors
3. Check all wiring for earths

System interface and shutdown [where fitted] (Item 19)

Note: The following maintenance activities should be carried out in conjunction with the listed fire control system manuals.

Test all fire suppression system activated equipment shutdowns and record delay time.

System Pressurising

⚠ WARNING: Do not pressurise a cylinder that is not in test date.

NOTE: Do not pressurise LOP systems using the Schrader valve on the filler port assembly of the PEFS cylinders. This will cause the cylinder to discharge.

1. Cap the discharge port of each cylinder valve to prevent solution loss in the event of an accidental discharge.
2. Check to ensure that all electrical actuation devices have been isolated.
3. Connect a regulated source of nitrogen through an approved charging rig (refer Figure 8) to one of the system charging points:
 - a. LOP System:
 - i) Schrader valve at the top of LOP cylinder valve
 - ii) Schrader valve on the LOP manual actuator
 - b. ROP System:
 - i) Lowest Schrader valve on the side of the ROP cylinder valve
 - ii) Schrader valve on the filler plug assembly.

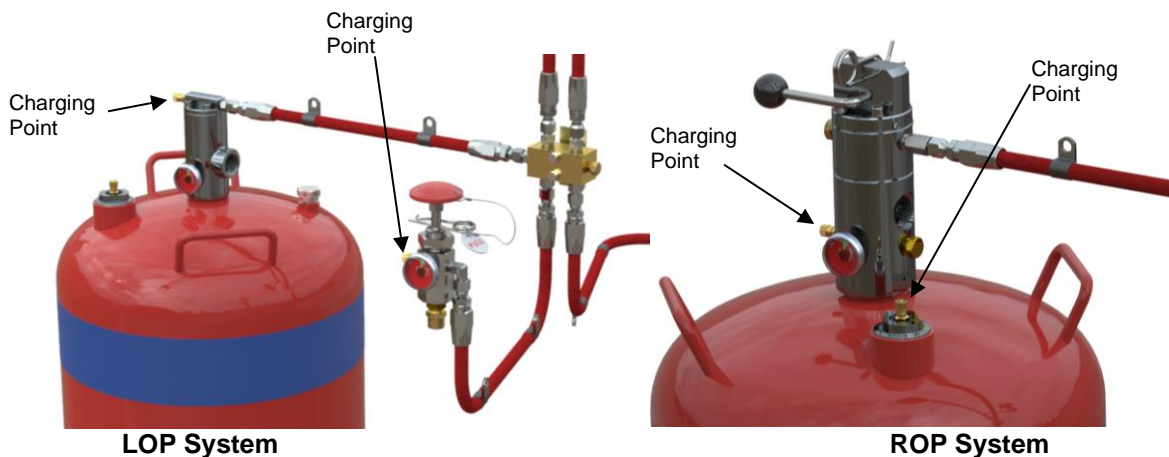


Figure 7 System Charging Points

4. Pressurise the system to the correct listed pressure as per Table 5.
5. Hold pressure for a minimum of 1 minute. Increase this time for each additional cylinder.
6. Check the pressure indicator on the cylinder valve and ensure it reads in the green sector
7. Shut off supply at the control valve and unscrew the charging adaptor (internal)
8. Vent pressure from the charging rig prior to disconnecting adaptor then disconnect the pressure source.
9. Test the LOP actuation system for leaks. Leak testing should be carried out using a liquid leak detection solution.
 - a. Leak test all fitting connections
 - b. Leak test all LOP Manual actuators (refer above under 6 Monthly Service Instructions)
 - c. Leak test all LOP Electrical actuators
10. Test the cylinder for leaks. Leak testing should be carried out using a liquid leak detection solution.
 - a. Leak test filler port
 - b. Leak test burst disk
 - c. Leak test all ports on the Valve assembly
 - d. Leak test cylinder welds.
11. Remove caps from discharge ports and re-fit distribution hoses.

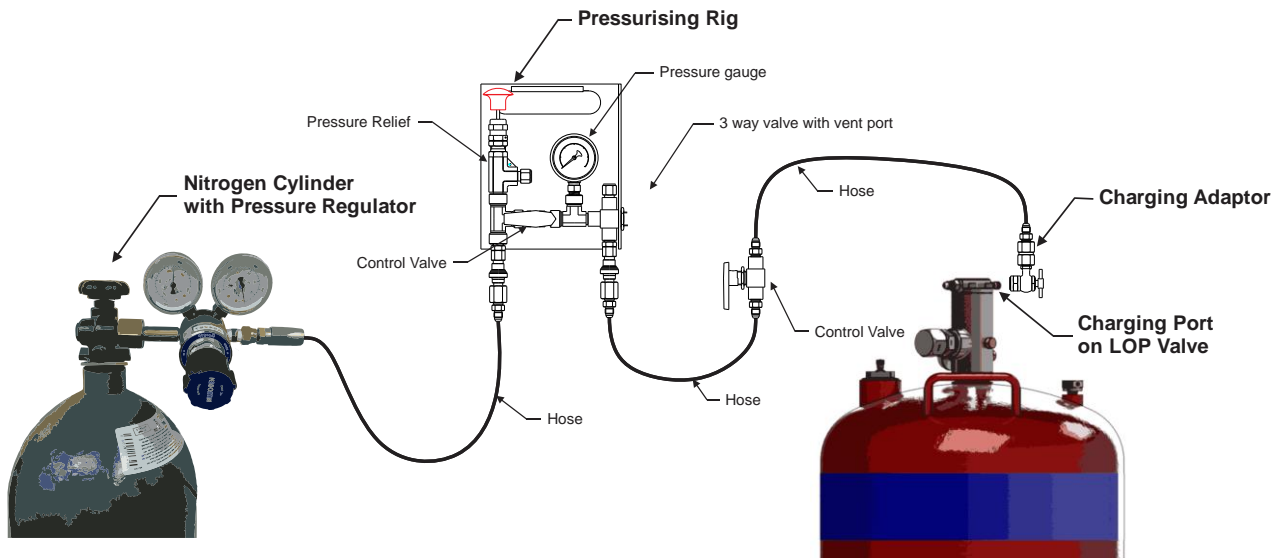


Figure 8 –Typical Pressurising Rig

Ambient Temperature (°C)	Charge Pressure (kPa)
5	1271
10	1296
15	1320
21	1350
25	1370
30	1394
35	1419
40	1444
45	1448
50	1493

Table 5 - PEFS C6 cylinder charging pressure versus ambient temperature

After Maintenance Activities

After all Yearly maintenance activities have been completed:

1. Ensure all pressure indicators are reading in the green zone.
2. Ensure all labels are in good condition (refer 6 monthly service: System Labels (Item 8))
3. Ensure control panel (where fitted) is reset to its normal operation mode and is no longer in its "Isolation / Test" mode.
4. Ensure panel status lights are in normal condition (refer 6 monthly service: System control and indicating equipment [where fitted] (Item 2))
5. Complete routine service records in accordance with AS5062
6. Stamp Service Tag with the number "2" in the corresponding Year/Month location.

MAINTENANCE REPORT

Inspection and Maintenance Report for PEFS C6 Vehicle Fire Suppression System

Work Order Number: _____

Date: _____

Client Information

Customer Name: _____

Contact Name: _____

Customer Address: _____

Telephone: _____ Mobile: _____ Fax: _____

Equipment Information

Equipment Type: _____

Equipment Make: _____

Equipment Model: _____

Equipment Serial No.: _____

Equipment Location: _____

System Information

System Type: LOP ROP

Cylinder Size: _____ Qty: _____ Serial Numbers: _____ Manufacture Date: _____

Qty Nozzles: _____ Qty Manual Actuators: _____ Fire Alarm Panel: Standard Shutdown None

Service

Item	Service	6 Mthly	Yrly	Defect Report
1	System Pressure – Check			
2	System control and indicating equipment - Check			
3	Distribution system – Check			
4	Actuation system – Check			
5	Manual Actuators – Check			
6	Detection system – Check			
7	Storage containers – Check			
8	System Labels - Check			
9	Discharge Test <i>[optional]</i>			Discharge Time: _____
10	Storage containers - Inspect			
11	Container valves - Service			
12	Extinguishing agent solution - Replace			
13	Distribution system - Test			
14	Mechanical actuator - Service			
15	Detection system (Pneumatic) – Check & Test			
16	Actuation system (Pneumatic) – Check & Test			
17	Actuation system (Electrical) <i>[where fitted]</i> – Check & Test			
18	Detection system (Electrical) <i>[where fitted]</i> – Check & Test			
19	System interface and shutdown <i>[where fitted]</i> –Test			
20	Nozzle obstructions – Check			
21	Nozzle location and coverage – Check			
22	Detector coverage – Check			
23	Operational conditions – Check			
24	Environmental conditions – Check			
25	Survey - Review			

Record of all repairs: _____

Record of parts used: _____

Does system meet original Design Specifications: YES NO

If No, Changes: _____

Name of Technician: _____ Signature: _____

Name of Customer: _____ Signature: _____

SPARE PARTS

Cylinder Assemblies & Brackets

Cylinders Assembles



Figure 9

Cylinder Assembly Details:

Part Number	109508	109510	109511	109512	111045
Description	C23 Cylinder	C30 Cylinder	C45 Cylinder	C65 Cylinder	C106 Cylinder
Water Capacity	23 lt.	30 lt.	45 lt.	65 lt.	106 lt.
Height (mm)	726	512	572	772	1188
Height with Valve	960	740	820	1020	1440
Diameter (mm)	216	318	360	360	360
Design Registration	V1061-84 / V1301719	V881-82 / V1301721	V376-84 / V1301718	V376-84 / V1301718	V376-84 / V1301718
Test Pressure	6 MPa / 3.3 MPa	3.3 MPa / 3.3 MPa	3.6 MPa / 3.3 MPa	3.6 MPa / 3.3 MPa	3.6 MPa / 3.3 MPa
Total Fill	18 lt.	24 lt.	35 lt.	50 lt.	85 lt.
Water quantity	16 lt.	21.5 lt.	31 lt.	44 lt.	75 lt.
Foam quantity	2 lt.	2.5 lt.	4 lt.	6 lt.	10 lt.
Pressure @ 21°C	1350 kPa	1350 kPa	1350 kPa	1350 kPa	1350 kPa
Empty Mass (incl Valve Assy)	10.9 kg	12.1 kg	13.5 kg	17.6 kg	24.3 kg
Gross Mass (incl Fill)	28.9 kg	36.1 kg	48.5 kg	67.6 kg	109.3 kg
Total Mass (incl Fill & Bracket)	38.9 kg	45.5 kg	65.5 kg	84.6 kg	134 kg

Table 6 - PEFS C6 cylinder specifications

Item	Part Number	Description
1	112255	Burst Disk
2	23100	Filler Plug Assembly
3	90127	Filler Port O-Ring
4	60328 60329 60330	Label – Blue Identification Band C30 & C45 Cylinders Label – Blue Identification Band C23 & C65 Cylinders Label – Blue Identification Band C106 Cylinder
5	66140	Label – Main PEFS C6 Cylinder Label

Table 7 – Cylinder Assembly Parts

Cylinder Valves



Figure 10 –Valve Assemblies

Part Number	Description
118554	PEFS C6 LOP Valve Assembly
28022	PEFS C6 LOP Valve Service Kit
110269	PEFS C6 ROP Valve Assembly
28023	PEFS C6 ROP Valve Service Kit

Table 8 – Valve Assemblies

Siphon Tubes



Figure 11 – Siphon tube

Cylinder Size	Siphon Tube Part Number	Syphon Tube Length (±2mm)
C23	109298	719
C30	110281	485
C45	110282	546
C65	110283	745
C106	112040	1156

Table 9 – Siphon tube details

Over-fill Tubes

Cylinder Size	Part Number	Length (mm)
C23	36205	202
C30	36206	118
C45	36207	158
C65	36208	223
C106	36209	345



Table 10 – Over-fill tube details

Foam Concentrate

Part Number	Description
50424	Chubb C6 AFFF 3%

Table 11 – AFFF concentrate



Cylinder Brackets

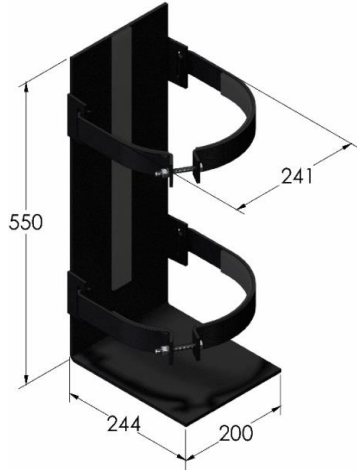


Figure 12 – C23 Cylinder Bracket
(Part number 128735)

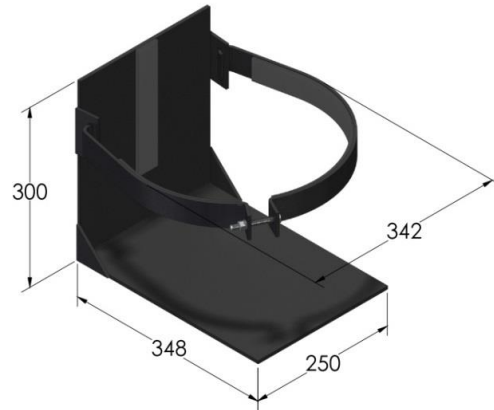


Figure 13 – C30 Cylinder Bracket
(Part number 128736)

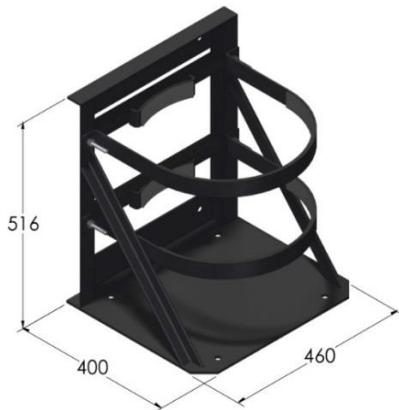


Figure 14 – C45 & C65 Cylinder Bracket
(Part number 128737)

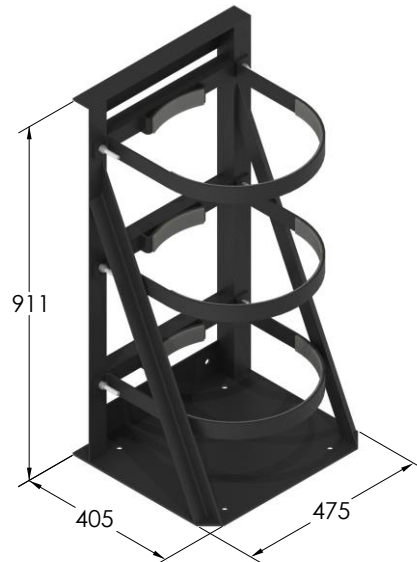


Figure 15 – C106 Cylinder Bracket
(Part number 128738)

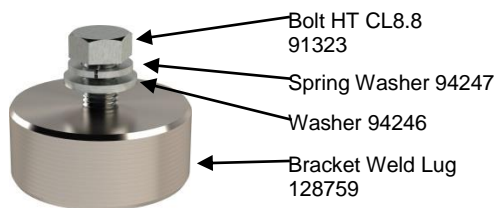


Figure 16 – Bracket Weld Lug Assembly

Discharge Components

Stainless Steel Tube

Part Number 112108 (2m lengths).

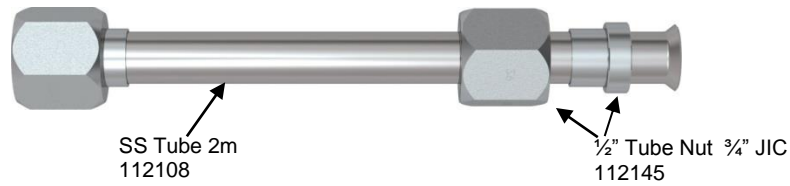


Figure 17 – Stainless steel tube and fittings

Discharge Hose

	Hose Size	Part Number	Minimum Bend Radius	Temperature Rating (Air/Water)
	1/2"	118097	180mm (7")	-40°C – 71°C
3/4"	118098	240mm (9.5")		

Table 12 – Discharge hose

Nozzles



Figure 18 – Nozzle assembly

Part Number	Description
46111	BM17N Foil Nozzle
46112	BM16W Foil Nozzle

Table 13 – Nozzles

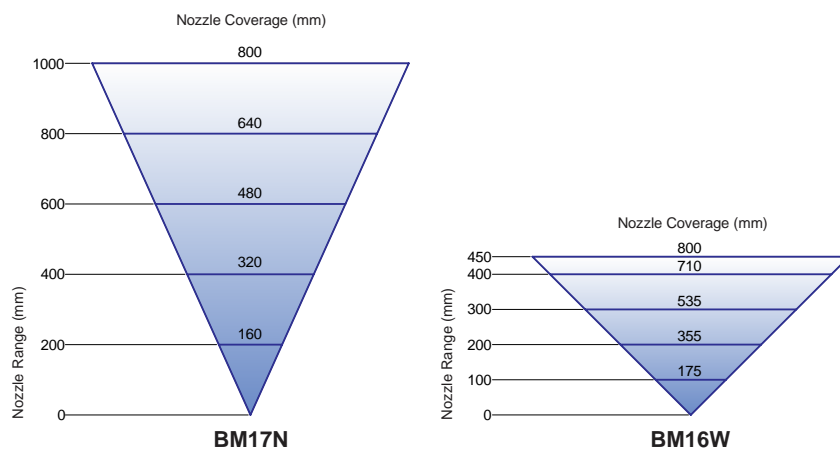


Figure 19 – Nozzle range and coverage

Nozzle Kits

Nozzle kit single straight (part number 115371)



Nozzle kit single end 90° (part number 115151)



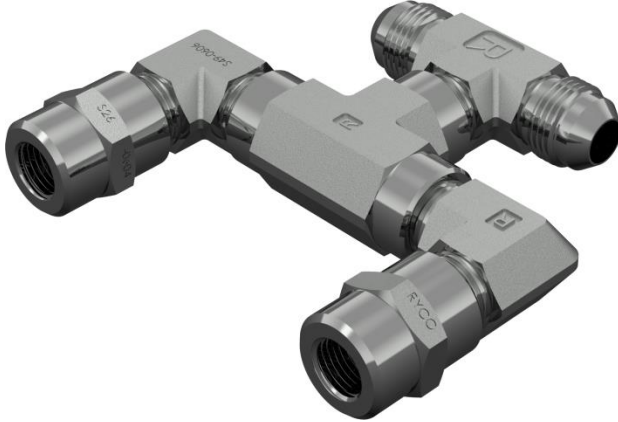
Nozzle kit single straight 90° (part number 115152)



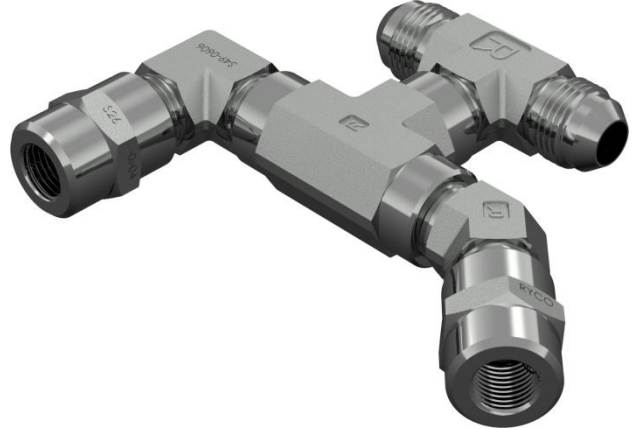
Nozzle kit single end (part number 94431)



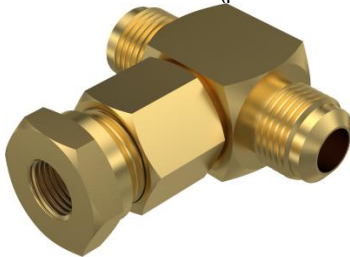
Nozzle kit double straight 90° (part number 115153)



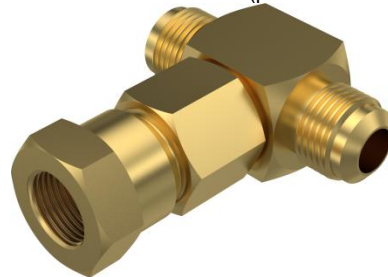
Nozzle kit double straight 90°/45° (part number 125316)



Nozzle kit 1/4" BSP for Bracket (part number 115815)




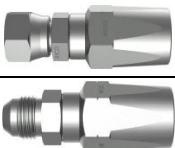
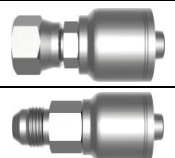






Nozzle kit 3/8" BSP for Bracket (part number 130104)



Nozzle bracket part number: 104592
(Supplied separately)

Figure 20 – Standard nozzle kits

Discharge Hose and Tube fittings

Type		Part No.	Description	
Hose Protector		40155	20mm Red - Suitable for 1/2" hose	
		40154	25mm Red - Suitable for 3/4" hose	
Couplings (Field Attachable)		118099	1/2" Hose x 3/4" JIC (f) swivel	
		118100	3/4" Hose x 1 1/16" JIC (f) swivel	
Couplings (Crimp)		116257	1/2" Hose x 3/4" JIC (f) swivel	
		128995	3/4" Hose x 1 1/16" JIC (f) swivel	
		129671	1/2" Hose x 3/4" JIC (m)	
Cap/Nut		112145	3/4" JIC Nut & Sleeve to suit 1/2" Tube	
Adaptor / Reducing Bushes		112146	3/4" JIC (m) x 1 1/16" JIC (f)	
		112144	3/8" BSP (m) x 1/4" BSP (f)	
Nipples		114545	3/4" JIC	
		128766	3/4" JIC Bulkhead	
		112142	1 1/16" JIC Bulkhead	
		112128	3/4" JIC x 3/4" BSP	
		112129	1 1/16" JIC x 3/4" BSP	
Socket		112143	3/8" BSP (f) x 1/4" BSP (f)	
Plug/Cap		128745	3/4" JIC (m)	
		128741	3/4" JIC (f)	
		137083	1 1/16" JIC cap	
Tees		112130	3/4" JIC (m)	
		112131	1 1/16" JIC (m)	
		114609	1 1/16" JIC (m) x 3/4" JIC (m) x 3/4" JIC (m)	
			112132	3/4" JIC (m) x 3/4" JIC (m) x 3/8" BSP (m)
			112183	3/8" BSP (f)
			130076	3/4" JIC (m) bulkhead
			130077	1 1/16" JIC (m) bulkhead

Type		Part No.	Description	
		115371	3/4" JIC (m) x 1/4" BSP (f) x 3/4" JIC (m)	
		128748	3/4" JIC (m) x 3/4" JIC (f)swv x 3/4" JIC (m)	
		128747	3/4" JIC (f)swv x 3/4" JIC (m) x 3/4" JIC (m)	
128998		3/4" JIC (f)swv x 3/4" JIC (m) x 1 1/16" JIC (m)		
Elbows		112136	3/4" JIC (m & f) swivel	
		112436	1 1/16" JIC (m & f) swivel	
		112138	3/8" BSP (m) x 3/4" JIC (m)	
		112134	3/4" JIC (m)	
		112135	1 1/16" JIC (m)	
		112139	3/8" BSP (f) x 3/8" BSP (f)	
		128743	45° 1 1/16" JIC (m & f) swivel	
		114567	45° 3/4" JIC (m & f) swivel	
		114632	45° 3/8" BSP (m)	
	119336	3/8" BSP (m)		
Nozzle Bracket		104592	Size: 76x51x5 angle, 50mm width, Zinc plated	
Insulated P-Clip			Size	Spacing
		103198	1/2" Hose	0.7
		130080	1/2" Hose with Hose Protector	0.7
		103199	3/4" Hose	0.7
130081	3/4" Hose with Hose Protector	0.7		
Weld Lug		129578	M8 Weld Lug c/w bolt and washer for mounting P-Clips	

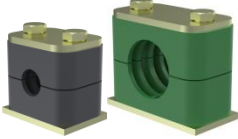

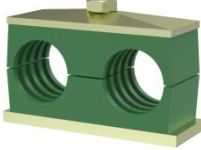
Type		Part No.	Description	Type	
Welded Clamp Blocks			Size	Spacing	
		132823	1/2" Tube	0.5	
		112113	1/2" Hose	0.7	
			128818	3/4" Hose	0.7
		94435	Bolt on Base to suit 132823		
			Size	Spacing	
		130073	Double 1/2" Tube	0.5	
130074		Double 3/4" Hose	0.7		

Table 14 – PEFS C6 discharge hose & tube fittings

Actuation Components

Loss of Pressure Detection Tubing

LOP tubing part number: 118837 (per metre)

LOP detection tubing has an installed life of 1 year and must therefore be replaced annually as part of the regular maintenance routine.

Manual LOP Actuator



Figure 21 – LOP Manual Actuator

Part Number	Description
47124	LOP Manual Actuator
47128	LOP Manual Actuator – Flush Mount
28036	LOP Actuator Service Kit

Table 15 – LOP Manual Actuator Part Numbers

Manual ROP Actuator

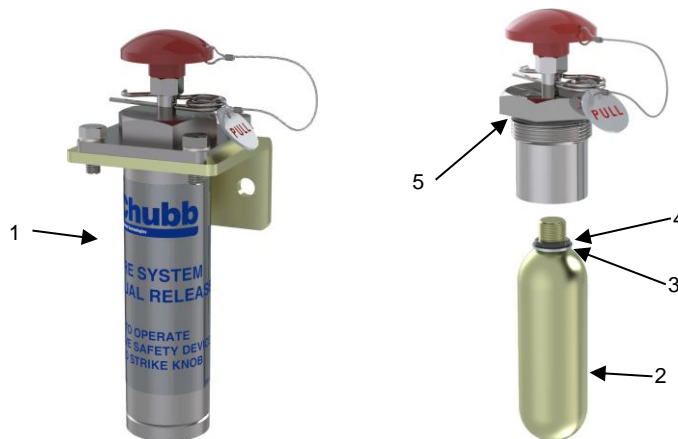


Figure 22 – ROP Manual Actuator

Item	Part Number	Description
1	ES9106-B	ROP Surface or flush mount actuator c/w bracket
2	16004	CO ₂ Cartridge
3	36404	Washer
4	94814	O-ring
5	90222	O-ring
6	90011	Piston O-ring

CO ₂ cartridge (part Number 16004)	
Capacity	98 ml
Service life	5 Years
Charge weight	74g +/- 3 g
Pressure	~5.86Mpa @ 21°C
Material	Carbon Steel Zinc Plated

Table 16 – CO₂ Cartridge specification

Check Valve



Figure 23 – ROP Check Valve (part number 103222)

Electric Solenoid Valve Assembly

Electric actuation of both ROP and LOP PEFS systems is achieved using a 12V DC10W solenoid operated valve.

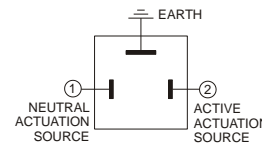


Figure 24 - LOP solenoid valve assembly (part number ES9014-D)

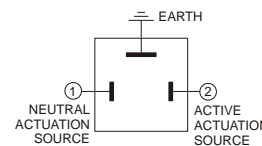







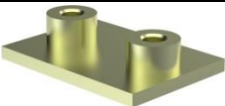











Figure 25 - ROP solenoid valve assembly (part number ES9014-E)

Actuation System Fittings

Type	Image	Part No.	Description
1/4" actuation hose		9344220356	1/4" red coloured, 'FIRE SUPPRESSION' branded, oil resistant synthetic rubber with high tensile steel wire braid reinforcement meeting SAE 100R1AT specifications and U.S.MSHA 2G and AS2660 flame resistance requirements.
Hose Protector		40156	16mm Red - Suitable for 1/4" hose
Hose Fittings (Field Attachable)		9344220357	1/4" Hose x 7/16" JIC (f)swv Field Attachable
Hose Fitting (Crimp)		128999	1/4" Hose x 7/16" JIC (f)swv Crimp
LOP Tubing Coupling		128763	1/4" LOP tube x 7/16" JIC (m) Compression AN Union
LOP Tubing Cap		128764	1/4" LOP Tube EOL Compression Cap
Manifold Blocks		128760	6 x 1/4" NPT(f), 2 x 1/8" NPT(f)
		128761	4 x 1/4" NPT(f), 2 x 1/8" NPT(f)
Weld Clamp Plates		128841	20mm ctr to ctr (to suit 6 port Manifold Block)
		128842	33mm ctr to ctr (to suit 8 port Manifold Block)
Bolts		91319	M6 x 35mm Hex Head (for Manifold Block)
		91320	M6 x 40mm Hex Head (for Manifold Block)
Tee		128752	7/16" JIC (m)
		128753	7/16" JIC (f) x 7/16" JIC (m) x 7/16" JIC (m)
		128749	7/16" JIC (m) x 7/16" JIC (f) x 7/16" JIC (m)
		112149	1/4" NPT (f)
Elbow		114544	7/16" JIC (m & f) swv
		114568	45° 7/16" JIC (m & f) swv
		128751	7/16" JIC (m) x 1/8" NPT (m)
Plug		118551	1/8" NPT
		119568	1/4" NPT

Type	Image	Part No.	Description		
Nipple		112150	7/16" JIC Bulkhead		
		112148	1/4" NPT x 7/16" JIC		
		128817	1/8" NPT x 7/16" JIC		
		118542	1/8" NPT		
Adaptor		93696	1/8" BSPT x 7/16" JIC (f)swv		
		129579	1/4" NPT x 7/16" JIC (f)swv		
Insulated P-Clip			Size	Maximum Spacing (m)	
		128819	1/4" Tube	0.5	
		103197	1/4" Hose	0.5	
		103198	Use with Grommet 103248		0.5
		130078	1/4" Hose with hose protector		0.5
Grommet		103248	Grommet to hold LOP tubing. Use with P-Clip 103198.		
Weld Lug		129578	M8 Weld Lug c/w bolt and washer for mounting P-Clips		

Table 17 – PEFS C6 pneumatic actuation hose and tube fittings

Monitoring Components

Pressure Switches

- “Cylinder low pressure”, 1200kPa NO setting DT04-3P (part number 87042)
- “Fire Alarm/Discharge”, 200kPa NC setting DT04-2P (part number 87041)



Figure 26 – Pressure Switches

Identification & Instruction Labels



part number 66534



part number 66535



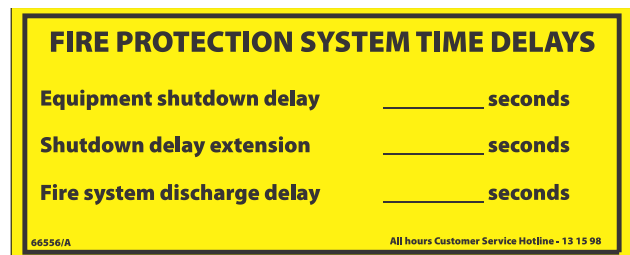
part number 66536



part number 66537



part number 66137



part number 66556



part number 66557

Table 18 - Identification & instruction labels

APPENDIX

SDS – Chubb C6 AFFF 3% Foam Concentrate



SAFETY DATA SHEET

CHUBB AFFF C6 3%Infosafe No.: LQ92P
ISSUED Date : 20/09/2018
ISSUED by: CHUBB FIRE & SECURITY

1. IDENTIFICATION

GHS Product Identifier

CHUBB AFFF C6 3%

Company Name

CHUBB FIRE & SECURITY

Address314 Boundary Road Dingley
Vic 3172 Australia**Telephone/Fax Number**Tel: +61 (3) 9264 9813
Fax: +61 (03) 9264 9751**Emergency phone number**

1300 369 309 (Business hours: 24/7)

Recommended use of the chemical and restrictions on use

Fire fighting foam concentrate

2. HAZARD IDENTIFICATION

GHS classification of the substance/mixture

Classified as Hazardous according to the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) including Work, Health and Safety Regulations, Australia.

Not classified as Dangerous Goods according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. (7th edition)

Eye Damage/Irritation: Category 2A

Signal Word (s)

WARNING

Hazard Statement (s)

H319 Causes serious eye irritation.

Pictogram (s)

Exclamation mark

**Precautionary statement – Prevention**

P264 Wash contaminated skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement – Response

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Name	CAS	Proportion
Diethylene glycol monobutyl ether	112-34-5	1-10 %
Hexylene glycol	107-41-5	1-<10 %
Ethylene glycol	107-21-1	1-<10 %
Ingredients determined not to be hazardous		Balance

4. FIRST-AID MEASURES

Inhalation

If inhaled, remove affected person from contaminated area. Keep at rest until recovered. If symptoms develop and/or persist seek medical attention.

Ingestion

Do not induce vomiting. Wash out mouth thoroughly with water. Seek immediate medical attention.

Skin

Wash affected area thoroughly with soap and water. If symptoms develop seek medical attention.

Eye contact

If in eyes, hold eyelids apart and flush the eyes continuously with running water. Remove contact lenses. Continue flushing for several minutes until all contaminants are washed out completely. Seek medical attention.

First Aid Facilities

Eyewash, safety shower and normal washroom facilities.

Advice to Doctor

Treat symptomatically.

Other Information

For advice in an emergency, contact a Poisons Information Centre (Phone Australia 131 126) or a doctor at once.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Product is a fire extinguishing media. Use appropriate fire extinguisher for surrounding environment.

Hazards from Combustion Products

Under fire conditions this product may emit toxic and/or irritating fumes and gases including hydrogen fluoride, oxides of carbon, sulphur, sodium and nitrogen.

Specific Hazards Arising From The Chemical

No fire hazard.

Decomposition Temperature

Not available

Precautions in connection with Fire

Product is a fire extinguishing media.

6. ACCIDENTAL RELEASE MEASURES

Emergency Procedures

Wear appropriate personal protective equipment and clothing to prevent exposure. Increase ventilation. If possible contain the spill. Place inert absorbent material onto spillage. Collect the material and place into a suitable labelled container. Do not dilute material but contain. Dispose of waste according to the applicable local and national regulations. If contamination of sewers or waterways occurs inform the local water and waste management authorities in accordance with local regulations.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Avoid inhalation of vapours and mists, and skin or eye contact. Use only in a well ventilated area. Keep containers sealed when not in use. Prevent the build up of mists or vapours in the work atmosphere. Maintain high standards of personal hygiene i.e. Washing hands prior to eating, drinking, smoking or using toilet facilities.

Conditions for safe storage, including any incompatibilities

Store in a cool, dry, well-ventilated area, out of direct sunlight. Store in suitable, labelled containers. Keep containers tightly closed. Store away from incompatible materials. Ensure that storage conditions comply with applicable local and national regulations. Protect from freezing.

Storage Temperatures

Store at temperatures not exceeding 60°C.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational exposure limit values

No exposure standards have been established for this material. However, the available exposure limits for ingredients are listed below:

Hexylene glycol:

TWA: 25 Peak limitation ppm

TWA: 121 Peak limitation mg/m³

Ethylene glycol:

TWA: 20 ppm (vapour)

TWA: 52 mg/m³(vapour), 10 mg/m³ (particulate)

STEL: 40 ppm (vapour)

STEL: 104 mg/m³ (vapour)

Notices: Sk

TWA (Time Weighted Average): The average airborne concentration of a particular substance when calculated over a normal eight-hour working day, for a five-day week.

STEL (Short Term Exposure Limit): The average airborne concentration over a 15 minute period which should not be exceeded at any time during a normal eight-hour workday.

Peak Limitation: A ceiling concentration which should not be exceeded over a measurement period which should be as short as possible but not exceeding 15 minutes.

'Sk' Notice: Absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

Source: Safe Work Australia

Biological Limit Values

No biological limits allocated.

Appropriate Engineering Controls

This substance is hazardous and should be used with a local exhaust ventilation system, drawing vapours away from workers' breathing zone. If the engineering controls are not sufficient to maintain concentrations of vapours/mists below the exposure standards, suitable respiratory protection must be worn.

Respiratory Protection

If engineering controls are not effective in controlling airborne exposure then an approved respirator with a replaceable vapor/mist filter should be used. Refer to relevant regulations for further information concerning respiratory protective requirements.

Reference should be made to Australian Standards AS/NZS 1715 (2009), Selection, Use and Maintenance of Respiratory Protective Devices; and AS/NZS 1716 (2012), Respiratory Protective Devices, in order to make any necessary changes for individual circumstances.

Eye Protection

Safety glasses with side shields, chemical goggles or full-face shield as appropriate should be used. Final choice of appropriate eye/face protection will vary according to individual circumstances. Eye protection devices should conform to relevant regulations.

Eye protection should conform with Australian/New Zealand Standard AS/NZS 1337 2 & 6 (2012) - Eye Protectors for Industrial

Applications.

Hand Protection

Wear gloves of impervious material such as butyl rubber. Final choice of appropriate gloves will vary according to individual circumstances. i.e. methods of handling or according to risk assessments undertaken. Occupational protective gloves should conform to relevant regulations.

Reference should be made to AS/NZS 2161.1 (2016): Occupational protective gloves - Selection, use and maintenance.

Body Protection

Suitable protective workwear, e.g. cotton overalls buttoned at neck and wrist is recommended. Chemical resistant apron is recommended where large quantities are handled.

9. PHYSICAL AND CHEMICAL PROPERTIES

Properties	Description	Properties	Description
Form	Liquid	Appearance	Liquid
Colour	Amber	Odour	Characteristic
Decomposition Temperature	Not available	Melting Point	Not available
Freezing Point	-5°C	Boiling Point	Not available
Solubility in Water	Not available	Specific Gravity	Not available
pH	6.6-7.6	Vapour Pressure	Not available
Vapour Density (Air=1)	Not available	Evaporation Rate	Not available
Odour Threshold	Not available	Viscosity	Not available
Partition Coefficient: n-octanol/water	Not available	Density	1 - 1.04
Flash Point	>100°C	Flammability	Not combustible
Auto-Ignition Temperature	Not available	Flammable Limits - Lower	Not available
Flammable Limits - Upper	Not available	Kinematic Viscosity	2 mm ² /s

10. STABILITY AND REACTIVITY

Chemical Stability

Stable under normal conditions of use and storage.

Reactivity and Stability

Reacts with incompatible materials.

Conditions to Avoid

Extremes of temperature and direct sunlight.

Incompatible materials

Alkali metals. Oxidizing agent. Water reactive substances.

Hazardous Decomposition Products

Thermal decomposition of product and/or containers may result in the release of toxic and/or irritating fumes including hydrogen fluoride, oxides of carbon, sulphur, sodium and nitrogen.

Possibility of hazardous reactions

Not available

11. TOXICOLOGICAL INFORMATION

Toxicology Information

No toxicity data available for this material. Data for ingredients is given below.

Acute Toxicity - Oral

Diethylene glycol monobutyl ether

LD50 (rat): 5660mg/kg

Hexylene glycol

LD50 (rat): 3700mg/kg (OECD 420)

Ethylene glycol

LD50 (rat): >5000mg/kg (Literature)

Acute Toxicity - Dermal

Diethylene glycol monobutyl ether

LD50 (rabbit): 2764mg/kg (OECD 402)

Hexylene glycol

LD50 (rat): >2000mg/kg (OECD 402)

LD50 (rabbit): >8000mg/kg

Ingestion

Ingestion of this product may irritate the gastric tract causing nausea and vomiting.

Inhalation

Inhalation of product vapours may cause irritation of the nose, throat and respiratory system.

Skin

May be irritating to skin. The symptoms may include redness, itching and swelling.

Eye

Causes serious eye irritation. On eye contact this product will cause tearing, stinging, blurred vision, and redness.

Respiratory sensitisation

Not expected to be a respiratory sensitiser.

Skin Sensitisation

Not expected to be a skin sensitiser.

Germ cell mutagenicity

Not considered to be a mutagenic hazard.

Carcinogenicity

Not considered to be a carcinogenic hazard.

Reproductive Toxicity

Not considered to be toxic to reproduction.

STOT-single exposure

Not expected to cause toxicity to a specific target organ.

STOT-repeated exposure

Not expected to cause toxicity to a specific target organ.

Aspiration Hazard

Not expected to be an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecological data available for product and ingredients is given below.

Persistence and degradability

The product is readily biodegradable.

Biochemical oxygen demand (BOD): 0.235 g Oxygen/g substance (28 days)

Chemical oxygen demand (COD): 0.353 g Oxygen/g substance (28 days)

Biodegradation: 66% (28 days)

Mobility

Diethylene glycol monobutyl ether

Surface tension: 0.034 N/m (25°C)

Hexylene glycol

Surface tension: 0.033 N/m

Ethylene glycol

Surface tension: 0.048 N/m (20°C)

Bioaccumulative Potential

The product is not expected to bioaccumulate.

Other Adverse Effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Environmental Protection

Prevent this material entering waterways, drains and sewers.

Acute Toxicity - Fish

Diethylene glycol monobutyl ether

LC50 (Lepomis macrochirus): 1300 mg/l/96h

LC50 (Leuciscus idus): 1805 mg/l/48h

Hexylene glycol

LC50 (Lepomis macrochirus): 12,800 mg/l/96h

LC50 (Oncorhynchus mykiss): 9450 mg/l/96h

Ethylene glycol

LC50 (Pimephales promelas): 53,000 mg/l/96h (Static system)

LC50 (Salmo gairdneri (Oncorhynchus mykiss)): 40761 mg/l/96h (Static system)

Acute Toxicity - Daphnia

Diethylene glycol monobutyl ether

EC50 (Daphnia magna): 2850 mg/l/24h (GLP)

EC50 (Daphnia magna): >100 mg/l/48h

Hexylene glycol

EC50 (Daphnia magna): 5410 mg/l/48h

EC50 (Daphnia pulex): 3300 mg/l/48h

Ethylene glycol

EC50 (Daphnia magna): >10,000 mg/l/24h

Acute Toxicity - Algae

Diethylene glycol monobutyl ether

Threshold limit (Microcystis aeruginosa): 53 mg/l/192h

Threshold limit (Scenedesmus subspicatus): >= 100 mg/l/96h

Hexylene glycol

Threshold limit (Pseudokirchneriella subcapitata): > 429 mg/l/72h

Ethylene glycol

Threshold limit (Scenedesmus quadricauda): > 10,000 mg/l/168h

Threshold limit (Microcystis aeruginosa): 2000 mg/l/192h

13. DISPOSAL CONSIDERATIONS

Disposal considerations

Dispose of waste according to applicable local and national regulations.

14. TRANSPORT INFORMATION

Transport Information

Road and Rail Transport (ADG Code):

Not classified as Dangerous Goods according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) (7th edition).

Marine Transport (IMO/IMDG):

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea.

Air Transport (ICAO/IATA):

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air.

U.N. Number

None Allocated

UN proper shipping name
None Allocated

Transport hazard class(es)
None Allocated

IMDG Marine pollutant
No

Transport in Bulk
Not available

Special Precautions for User
Not available

15. REGULATORY INFORMATION

Regulatory information

Classified as Hazardous according to the Globally Harmonised System of Classification and labelling of Chemicals (GHS) including Work, Health and Safety regulations, Australia.

Not classified as a Scheduled Poison according to the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Poisons Schedule
Not Scheduled

16. OTHER INFORMATION

Date of preparation or last revision of SDS
SDS created: September 2018

References

Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice.

Standard for the Uniform Scheduling of Medicines and Poisons.

Australian Code for the Transport of Dangerous Goods by Road & Rail.

Model Work Health and Safety Regulations, Schedule 10: Prohibited carcinogens, restricted carcinogens and restricted hazardous chemicals.

Workplace exposure standards for airborne contaminants, Safe work Australia.

American Conference of Industrial Hygienists (ACGIH).

Globally Harmonised System of classification and labelling of chemicals.

END OF SDS

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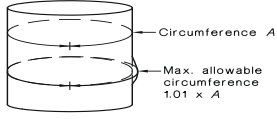
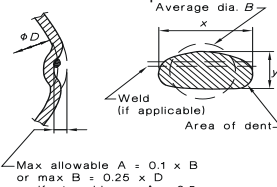
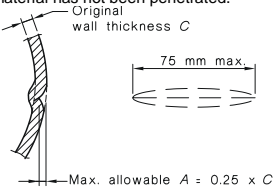
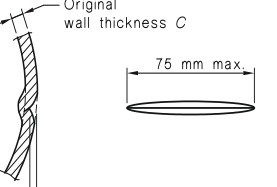
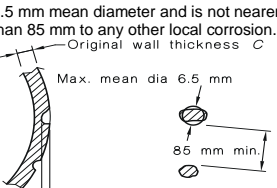
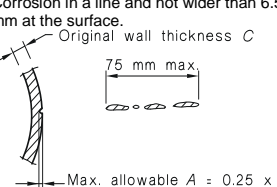
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AS2337 Cylinder Visual Inspection Damage Limits

Name	Definitions and illustrations (with limits)	Limits and treatment					
		General	C23	C30	C45	C65	C106
Bulge	A swelling of the cylinder or vessel wall. 	Condemn where measured circumference varies by more than 1% between any two similar sections of the cylinder.	Variance 6.9mm	Variance 10.1mm	Variance 11.4mm	Variance 11.4mm	Variance 11.4mm
Dent	A blunt impression where the surface material has not been penetrated. 	Condemn where— (a) the depth of dent exceeds 10% of the average dent diameter (b) the average diameter of dent exceeds 25% of the cylinder diameter; or (c) the dent impinges on a weld and it exceeds 6.5 mm in depth Average dent diameter B is taken to be $(y + x)/2$	Dent OD 55mm	Dent OD 80.5mm	Dent OD 91mm	Dent OD 91mm	Dent OD 91mm
Dig	A sharp impression where the surface material has not been penetrated. 	Condemn where length of dig exceeds 75 mm, or the depth of the dig exceeds 25% of the original wall thickness.	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm
Cut (gouge)	A sharp impression where the surface material has been penetrated. 	Condemn where the length of cut exceeds 75 mm, or the depth of the cut exceeds 25% of the original wall thickness.	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm
Pit	Local corrosion which does not exceed 6.5 mm mean diameter and is not nearer than 85 mm to any other local corrosion. 	Condemn where depth of the pit is greater than 50% of original wall thickness. Where the distance between adjacent pits is less than 85 mm, treat as general corrosion.	Depth 1mm	Depth 1mm	Depth 1mm	Depth 1mm	Depth 1mm
Line corrosion or linear wear or abrasion	Corrosion in a line and not wider than 6.5 mm at the surface. 	Condemn where the length exceeds 75 mm, or the depth exceeds 25% of the original wall thickness.	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm
General corrosion	Any corrosion more extensive than pit or line corrosion.	Condemn where mass check in accordance with AS2337.1 Section 8 is failed, or where depth of corrosion exceeds 25% of the original wall thickness.	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm	Depth 0.5mm
Cracks	A crack or rift in the metal.	Condemn (see AS2337.1 Appendix H)					
Gas leakage	Any gas leakage through the cylinder, or at the valve due to damaged or worn cylinder neck threads. NOTE: Areas around the base of the cylinder are particularly susceptible to gas leakage.	Condemn where any leak is detected. Where leakage is suspected, the cylinder shall be pressured to working pressure and either submerged in a water bath or bathed with soapy water, and observed to determine whether or not leakage occurs. Cylinders which have leakage due to damage to threaded openings may be repaired, provided that this is permitted by AS2030.1 and the cylinder specifications. Otherwise, such cylinders shall be condemned.					
Burns	A localized heat-affected region of the cylinder wall. NOTE: Burns may result from contact with an electric arc or an oxygen-acetylene flame.	Where surface damage is evident, either the cylinder shall be condemned or the affected surface ground smooth and any remaining cuts and pits treated in accordance with 'cut (gouge)' and 'pit'. Where the limits are not exceeded, the cylinder shall then be re-heat treated in accordance with AS2337.1 Clause 9.4, and then hydraulically pressure tested in accordance with AS2337.1 Section 7. For cylinders with heat affected regions but no evidence of surface damage, treat as fire damaged as specified in 'Fire damage' below.					

Name	Definitions and illustrations (with limits)	Limits and treatment				
		General	C23	C30	C45	C65
Fire and heat damage	Any damage resulting from a fire or excessive or unusual application of heat.	Condemn where — (a) warping or distortion is evident; (b) bulging exceeds limits specified for a bulge; or (c) there is evidence of damage from excessive heat. Where a steel cylinder has not suffered damage to the extent specified in (a), (b), or (c) above, but has burned areas exceeding 6000 mm ² , it shall either be re-heat treated and tested where appropriate, in accordance with the original manufacturing specification, and hydraulically pressure tested in accordance with AS2337.1 Section 7, or shall be condemned. Where the burned areas of a steel cylinder do not exceed 6000 mm ² , the cylinders may be returned to service.				
Cylinder Neck	Cylinder neck inspection includes both external and internal inspections of the neck area. The cylinder to valve thread of the cylinder shall be examined to ensure that it is— (a) clean and of full form; (b) free of significant damage; (c) free of burrs; (d) free of cracks; and (e) free of other significant imperfections that would affect the integrity of the connection.	Condemn where the neck thread shows evidence of cracks, damage or excessive wear except where gauging with a thread gauge complying with AS2473 shows the thread to be satisfactory.				