



Defence  
Infrastructure  
Organisation

# Safety Alert

# Parts A, B & C

**Subject: Closed Water System Fluid Release  
from Failed Expansion Bellows Seal (Pipework  
System Component)**

**Number: SA 2021/05**

**DIO Sponsor:** Bryan Dunn

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**This Safety Alert is to be read by the following so appropriate action can be taken:**

- 1. Heads of Establishment**
- 2. DIO Service Manager (or equivalent for non-NGEC contracts)**
- 3. Maintenance Management Organisations**
- 4. Others**

**Others interested in the content of this Safety Alert might include:**

Top Level Budget Holders, TLB Infrastructure Branches, Prime Contractors, Private Finance Initiatives, Public-Private Partnership and other traditionally procured contracts, Project Managers, Infrastructure Managers and Property Managers with responsibility for MOD projects and Property Management Works Services (including the legacy work of EWCs/WSMs), Health & Safety Advisors.

**When it takes effect:** Immediately

**When it is due to expire:** When updated or rescinded.

Health and Safety

## Aim

This Safety Alert does not necessarily cover all aspects of the subject matter and readers should make themselves aware of other potential issues. Readers should also not rely on DIO publications as their only means of becoming aware of safety, operational or technical issues, but they should consult widely across other media to maintain awareness.

To bring to the attention of the appropriate persons the potential risks of closed water systems fluid release from failed expansion bellow seals (pipework system component) and attendant risk of plant room equipment damage, and serious or fatal injury to personnel.

## Introduction

1. Compliance with the contents of this Safety Alert (SA) will enable compliance with the Health & Safety at Work etc. Act 1974 and its subordinate Regulations.
2. The appropriate MOD officer shall arrange for and ensure the Maintenance Management Organisation (MMO) contractor to carry out all actions in accordance with this Alert.
3. Contractors and MMOs are to keep informed the establishment Health, Safety and Environmental Protection Adviser and 4Cs Duty Holder on behalf of the Head of Establishment regarding progress of actions required of this Safety Alert.
4. Any work required because of this Safety Alert must be carried out in accordance with JSP 375.
5. On MOD Establishments occupied by United States Visiting Forces (USVF) responsibility is jointly held by USVF and DIO(USF). At base level this jointly managed organisation is to take appropriate action to implement the contents of this Safety Alert.

## Background

6. Expansion bellows seals, also known as expansion joints, are flexible elements that absorb movements in pipework systems. The movements are generally defined as a combination of axial, lateral, angular movements. They are used in the design of most heating cooling and domestic water pipework systems on the Defence Estate.
7. The suitability of a mechanical expansion bellow seal for such applications depends on many different parameters, e.g. pressure to be sealed, temperature at the seal, velocity, power consumption, water quality (pH-value, conductivity, water additives such as corrosion inhibitors) for their continued safe and reliable performance.
8. This Safety Alert follows the investigation of a recent incident whereby personal injury occurred following servicing and reinstatement of a low temperature hot water (LTHW) boiler to normal operations conditions. The pump expansion bellows seal split releasing hot water that subsequently covered a maintenance operative. The Injured person was wearing 5-point PPE and was able to quickly move away from the affected area, thus avoiding a serious injury from the release. The primary cause of the incident was the failing of a low temperature hot water expansion bellows fitted to the CT pumps sets. (See photograph 1)
9. The investigation identified that improvements are required in the planned preventive maintenance task schedules to include expansion bellow seals components to assure the safety of these components on all connected pipe work systems. Where the condition of some of the bellows seals components could have deteriorated further inspection is required to determine if they suitable for further service.



Photograph 1 failed and rubber split bellows seal

**Guidance Note:**

Expansion bellows seals are designed to accommodate misalignment and both axial and lateral movement. They are also used to reduce noise and vibration from pumps and reciprocating machinery. On rubber bellows manufacturers use a red marking for fittings compatible with primary heating systems. This can be in the form of:

A single red dot or band for LTHW: usually for systems up to 90°C with a maximum working pressure as detailed by manufacturer

A double red dot or band for Medium Temperature Hot water MTHW: usually for systems up to 120°C with a maximum working pressure as detailed by manufacturer.

**In all cases of bellows seals,** the manufacturer's literature should be checked to confirm the unit component is suitable for the temperature and pressures of the system into which it is to be or has been installed.

## Requirement

10. All bellows seals should be subject to PPM which will include as a minimum; examination of physical condition, security of attachment and alignment whilst also ensuring compliance with manufactures requirements.
11. During such maintenance and inspection, the operatives will need to be vigilant ensuring that the bellows seals are in good serviceable condition and any cracking or deterioration is identified and where appropriate the bellows seal replaced.
12. Any work incurring expenditure of MOD funding requires appropriate authority from the MOD officer responsible for the establishment.

## Part A

13. The MMO, on direction from the DIO Service Manager or Equivalent, shall initiate the following tasks:
  - a. Confirm that the existence of bellows seals has been recognised and that they are subject to an appropriate PPM schedule and their inspection is in date.
  - b. Confirm that the risk assessments for plant rooms or other areas where bellows seals are used or located have considered the risk of failure and identify means to reduce and manage risks to operatives in vicinity of such seals should a failure occur.
14. If there is doubt about the serviceability or the safety in use, then it is recommended that consideration is given to their urgent replacement.
15. The MMO is to notify the DIO Service Manager, HoE and establishment 4Cs Duty Holder of any defective bellows seals. Where defective units are identified on an Establishment, the 4Cs risk register should be suitably annotated pending replacement.
16. The MMO is to notify the DIO Service Delivery Performance Management Team, DIO SD-Perf Mgt Team (MULTIUSER) account, through their respective DIO Service Manager confirming the existence of bellows seals has been recognised and they have been subject to routine periodic inspection. The Head of Establishment should be notified where unrecorded and unmaintained units are identified.
17. The contents of this Alert should be considered when undertaking Inspections or Appraisals of plant or equipment containing this type of asset.
18. **A nil return is required from Establishments** with no bellows seals.
19. The data requested in **Part A** is required by 29th October 2021 and will be reviewed on the 30th November 2021.

## Part B.

20. Any bellows isolated under **Part A** of this Safety Alert is not to be returned to service until it has been subject to appropriate maintenance, testing and inspection and **ALL** remedials identified are completed.
21. On completion of any necessary maintenance, inspection and testing and any remedial work the units can be returned to service.
22. The MMO is to notify the DIO Service Manager, HoE and establishment 4Cs Duty Holder when any unit is returned to service.
23. Once the condition, age and serviceability of the assts is known the MMO is requested to provide an establishment specific Asset Management Plan, for approval of DIO Service Manager, detailing their strategy for the planned preventative maintenance (or replacement where appropriate) of these assets by 5<sup>th</sup> January 2022

## Part C.

The MMO is to notify the DIO Service Delivery Performance Management Team, DIO-RDSafetyAlerts@mod.gov.uk (MULTIUSER) account, through their respective DIO Service Manager of the date action detailed in **Part B** was completed.