

WOSS 310/8

British Railways Board

Mechanical and Electrical Engineering Department

Air Reservoirs

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REVISION RECORD

This specification will be updated when necessary by the issue of amended pages accompanied by revision letters. The amended or additional part of re-issued pages will be marked with a vertical black line.

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Complete Document	March 1990	
Revision 4	October 1990	

SUBJECT

Air Reservoirs

T&RS JOB CODE	JOB DESCRIPTION	SECT. NO.	PARA. NO.	PRICE or STD. HRS.
	Overhaul			

AIR RESERVOIRS
(VARIOUS)

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INTRODUCTION

This specification outlines the examination, interior and exterior treatment, testing and marking together with notes on the corrosion criteria to be used.

An air reservoir is defined as a vessel (other than a pipe coil or ancillary fitting and part of the compressor) for containing compressed air. The group definition is based on the Reservoirs function, material and vehicle classification.

Group 1 Reservoirs

Group 1 reservoirs are main reservoirs, brake supply reservoirs, and auxiliary reservoirs. As shown in table 1.

Group 2 Reservoirs

Group 2 reservoirs are auxiliary reservoirs, control reservoirs, capacity reservoirs, timing reservoirs and surge reservoirs as shown in Table 1

REFERENCE DOCUMENTS

- WOSS 100/3 - Inspection Procedures
- Painting Schedule No. 7
- BS 3256. Small Fusion Welded Air Reservoirs for Road and Railway Vehicles.
- BS 4232. Surface Finish of Blast Cleaned Steel for Painting.

This method is arranged to give a choice of cleaning methods appropriate to the level of internal contamination seen on the internal visual examination.

At each stage of the process the rejection criteria, clause 3.4, shall be used to determine whether the reservoir is suitable for further service, so as to establish a cost effective repair.

1. Dismantling

1.1 All air reservoirs must be removed from the vehicle at the periodicity stipulated in Table 1 or earlier as defined in the vehicle maintenance schedule. *(see Note below)

1.2 Air reservoirs of stainless steel construction are not to be internally treated, cleaned except steam cleaning or painted in accordance with this instruction unless approved by DM&EE BRB HQ.

1.3 Any dished endplate removed must be free from flame cuts and notches.

2. Cleaning

2.1 Unless the reservoir is found unsuitable for further service after initial examination, the interior surfaces should be cleaned of corrosion products and dirt prior to the secondary visual examination adopting the following procedures where appropriate to the internal condition.

2.2 Choice of Cleaning Process

2.2.1 If the interior of the reservoir is coated with oil or emulsified oil it should be removed by steam cleaning. When a large amount of thick oil or emulsified oil is present it should be removed using steam cleaning and 'M' cleaner process.

2.2.2 If corrosion is negligible and comprises of surface rust/mild corrosion it should be cleaned by Acid washing, taking appropriate safety precautions, BR Safety Sheet 3.2.2. applies. When corrosion is more severe and the reservoir considered suitable for further service it is to be cleaned by Blast cleaning.

* Because the reservoirs on the following Classes:-
411,412,413/3,414/3,421,422,423,431 & 438
are completely boxed in by conduit it is impossible to remove them without extensive modification. Consequently, the Brake Engineer has given approval to the existing pressure testing technique which is carried out with the reservoirs in situ.

- 2.3.1 'M' Cleaner (BR Cat No. 7/19845) is a BR approved material, available to BR Spec No. 623, Item 1.
- 2.3.2 Gloves and goggles (or facemask) should be worn when handling 'M' cleaner or solutions of 'M' cleaner, as it is an irritant, Data Sheet BR 2307/5R applies.
- 2.3.3 Pour a solution of $1/2$ lb of 'M' cleaner per gallon of warm water into the reservoir.
- 2.3.4 Agitate the solution by passing steam through it for $1 1/2$ hours at a pressure which will avoid the formation of foam.
- 2.3.5 Drain the solution from the reservoir. Flush the reservoir out with copious supplies of fresh water and then dry out with warm air. Check for cleanliness. If necessary repeat process.

2.4 Acid Washing Process

- 2.4.1 Blank off openings as required and pour in up to 10 litres (2 gallons) of Rust Remover. The Rust Remover BR Mixture 140 to BR Cat No. 7/21764 or another approved alternative e.g. All Weather Evode; Masons Rust Remover is to be used.
- 2.4.2 Allow the reservoir to stand with the Rust Remover for 4 hours then rotate horizontally through 360° , stopping for 1 hour at 90° , 180° and 270° , then pour out the Rust Remover for re-use.
- 2.4.3 Flush the reservoir out with copious supplies of fresh water and then dry out with warm air, check for cleanliness. If necessary repeat process.

2.5 Blast Cleaning Process

- 2.5.1 If considered practical by using the opening provided and using a suitable extension, blast clean the interior using either metallic grit or shot, or a mixture of both. The acceptable standard is SA 2 or BS 4232 Class 2.

Alternatively and only when necessary remove one dished endplate (see Section 1, clause 1.3 and clause 4.1) and then blast clean.

- 2.5.2 On completion of blasting the shot/grit is to be poured out, then vacuumed out, finally removing the residue with a bar magnet.

Due to the quantity and variety of reservoirs in service there is difficulty in presenting definite rejection limits in tabular form for all sizes and types of reservoir. Because of this, extensive experience and judgement is required in the interpretation of types of corrosion.

- 3.1 Should visual inspection of the exterior and in particular the interior reveal a defect it should be possible with judgement and experience to evaluate this against the rejection criteria.
- 3.2 Visual examination of the interior will be dictated by the size and quantity of the available openings. More detailed inspection may be obtained by using specialist equipment or if the internal condition gives rise to uncertainty by removal of a dished endplate from the reservoir.
- 3.3 The pattern of corrosion generally experienced may be classified as follows.
 - 3.3.1 General corrosion (see fig 1) is that which has caused the reduction in the wall thickness over an area exceeding 20% of the interior surface.
 - 3.3.2 Area corrosion (see fig 1) is that which has caused the general reduction in the wall thickness over an area not exceeding 20% of the interior surface. It excludes other types of corrosion described.
 - 3.3.3 Chain pitting and line corrosion (see fig 2) may occur along all or part of the length of the reservoir interior and also around the wall circumference of vertically mounted reservoirs. They are made up of a series of pits of corroded cavities in the wall thickness and generally are of a limited width.
 - 3.3.4 Channel corrosion (see fig 3) can be more concentrated form of line corrosion or a channel formation in the metal.
 - 3.3.5 Isolated pits (see fig 4) are a pitting of the metal in isolated areas.
- 3.4 Rejection Criteria -- Defects in excess of the following are a cause for rejection and replacement of the dished endplates, shell or reservoir complete.
 - 3.4.1 General corrosion. If the depth of penetration exceeds 20% of the original wall thickness or if the original metal surface is not recognisable.
 - 3.4.2 Area corrosion. If the depth of penetration exceeds 25% of the original wall thickness or if the original surface is not recognisable.

- 3.4.3 Chain pitting, Line corrosion and Channel corrosion. If the total length of corrosion in any direction exceeds the circumference of the reservoir, or if the depth of penetration exceeds 25% of the original wall thickness.
 - 3.4.4 Isolated pits. Pits at a concentration greater than 1 per 500 mm² of the surface area shall be classified as Area corrosion. The depth of discrete pits greater than 5 mm diameter shall not exceed 1 mm in depth. Pits less than 5 mm diameter shall be assessed as far as practicable to ensure that the remaining wall thickness is adequate.
 - 3.5 Some reservoirs have been designed in accordance with BS 3256 and others have not. The former and some latter designs have included in their estimates of wall thickness a corrosion allowance. This allowance varies between 0.75 mm and 1.5 mm for reservoirs designed to BS 3256. In determining the limiting depth of corrosion for all reservoirs and noting the material Ultimate Tensile Strength employed an arbitrary depth of 1 mm is advised for Section 1 Clause 3.4.4 for simplicity of interpretation.
 - 3.6 All threaded openings are to be examined and cleaned up as required.
4. Reassembly
- 4.1 The dished endplate when replaced on the reservoir should be in accordance with the design dimensions of the reservoir and the construction/welding requirements of BS 3256. The reservoir shall now be tested in accordance with Section 2.
 - 4.2 No repair to the shell or endplate is permitted other than attention to fixing brackets and associated scantlings.
5. Painting (To be carried out after Testing, see Section 2)
- 5.1 Interior Painting
 - 5.1.1 The painting of the interior surfaces of the reservoir is to be in accordance with BR Painting Schedule No.7.
 - 5.2 Exterior Painting and Marking
 - 5.2.1 The reservoir shall be painted externally in accordance with the vehicle painting diagram.
 - 5.2.2 The date of the test is to be stamped on the reservoir test label, or in the absence of a test label, on the most appropriate boss which would usually be the drain boss, and must be visible when the reservoir is fitted to the vehicle. Only the last two digits of the year need be shown.
 - 5.2.3 The reservoir should also retain and bear the original legible indication in accordance with Clause 28 BS 3256

SECTION 2 TEST SPECIFICATION

1. Procedure

- 1.1 The reservoir complete with the test label (if fitted) and all welded attachments is to be hydraulically tested for a period of not less than 15 minutes at 1 1/2 times the design pressure after which the pressure is reduced to the design pressure when all welded seams are to be examined.
- 1.2 The design pressure of the reservoir is that stated on the test label or stencilled on the reservoir. If either marking is illegible the design pressure must be confirmed by scrutiny of the reservoir design data. If there remains any doubt the Engineer must be consulted.
- 1.3 If any rectification is necessary the reservoir must be re-tested after satisfactory completion of this work, otherwise the reservoir should be emptied and dried out prior to interior/exterior painting.
- 1.4 Any reservoir which fails the test procedure after rectification as defined by clause 4 must be scrapped.

SECTION 3 TECHNICAL DATA

Table 1. Reservoir group information

RESERVOIR TYPE	MATERIAL	FUNCTION	VEHICLE	MAXIMUM REMOVAL PERIOD (YEARS)
GROUP 1	MILD STEEL	MAIN RES	LOCO	10
		BRAKE SUPPLY RESERVOIR	LOCO	10
		MAIN RES	M.U.	10
		SUPPLEMENTARY RESERVOIR	M.U.	10
		BRAKE SUPPLY RESERVOIR	M.U.	10
GROUP 2	MILD STEEL	3 CHAMBER RES	LOCO	15
		AWS & DSD RES	LOCO/M.U.	15
		CONTROL RES	LOCO/M.U.	15
		SUSPENSION RES	M.U.	15
		CAPACITY RES	M.U/WAGONS	15
		SURGE RES	M.U./C.S.	15
		AUXILIARY RESERVOIR	COACHING STOCK	15
		AUXILIARY RESERVOIR	SERV. VEHLS & WAGONS	15
GROUP 1&2	STAINLESS STEEL	VARIOUS	ALL VEHICLES	15
GROUP 1&2	ALUMINIUM	VARIOUS	ALL VEHICLES	4

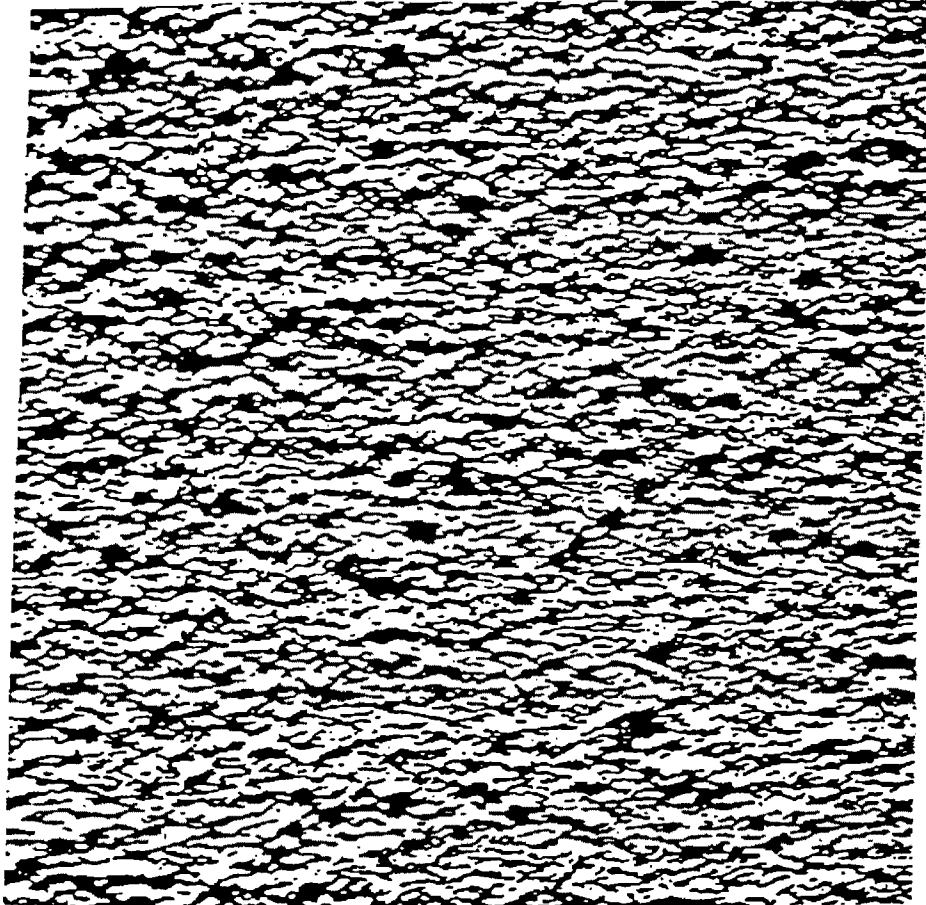


FIG 1. General or Area Corrosion

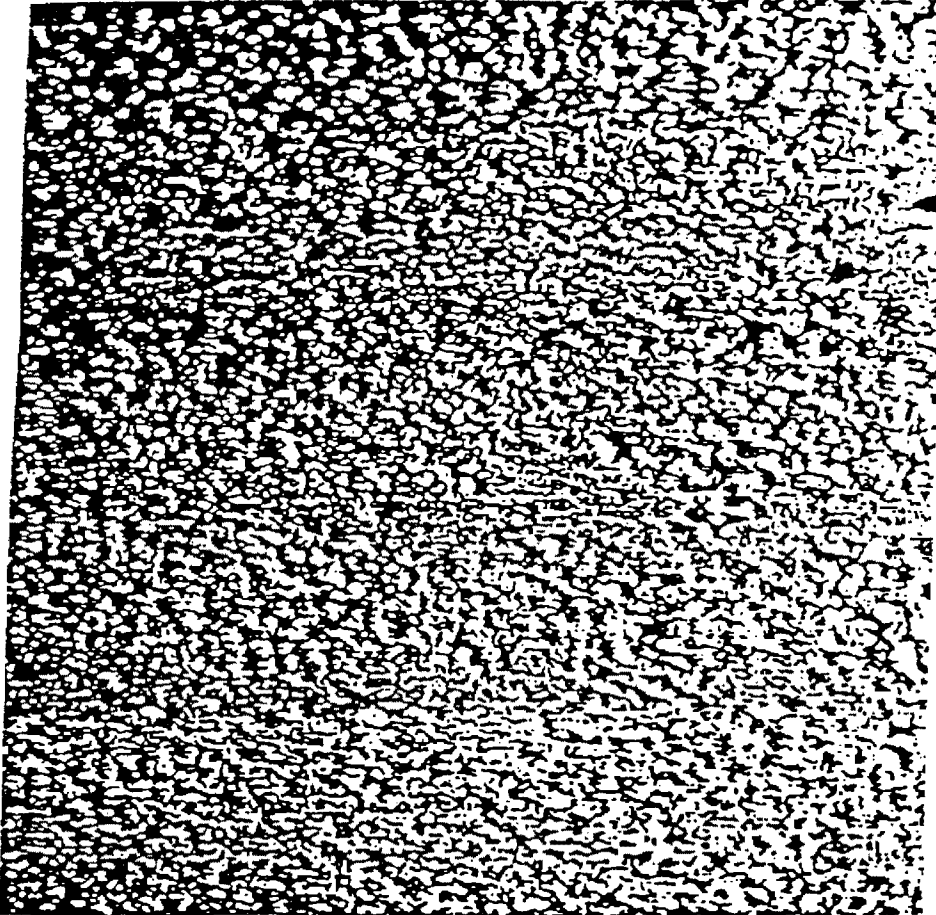


FIG 2. Line Corrosion

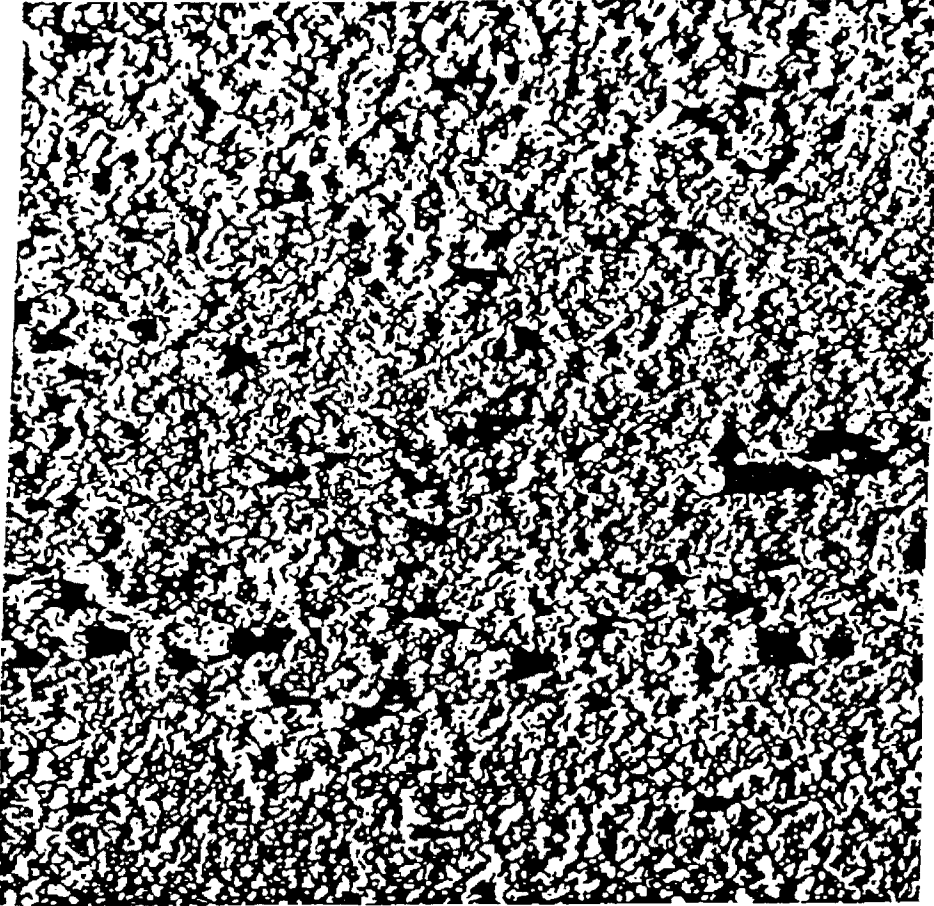


FIG 3. Channel Corrosion (internal)

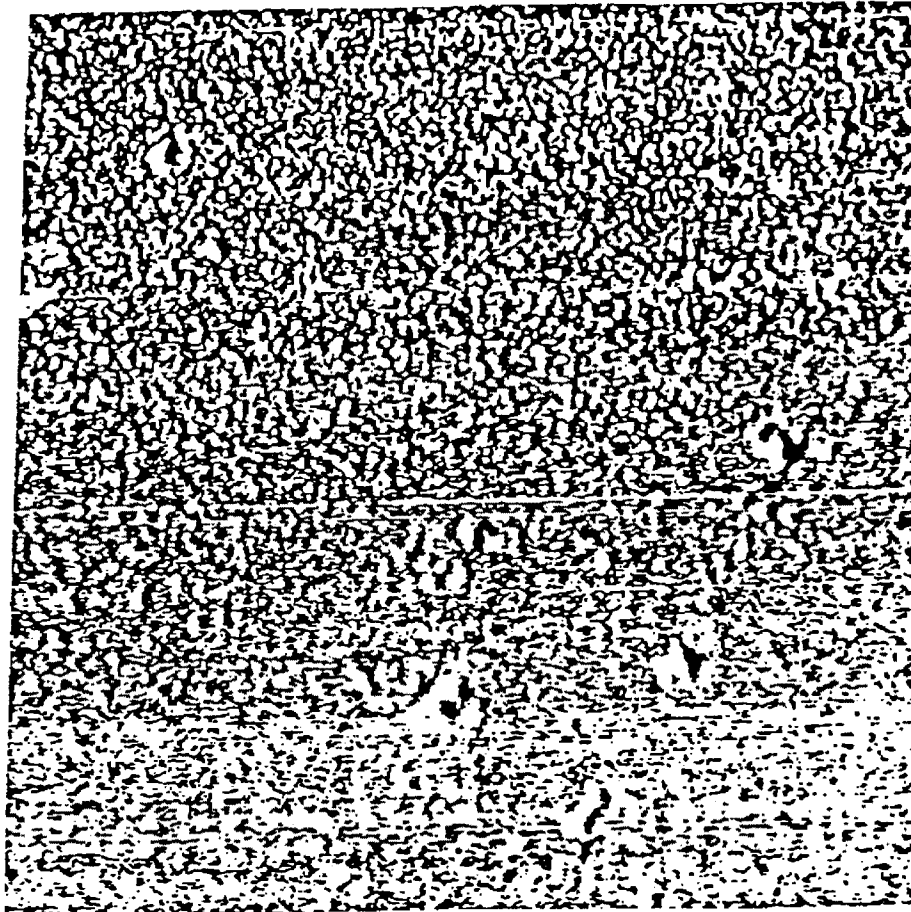


FIG 4. Isolated Pits (internal)