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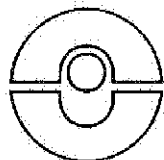
**O R**

1st edition: 1-1-92

### Brakes

Regulations governing the construction  
of different types of braking gear

Simple pressure receptacles, of steel,  
not fired, for air braking equipment  
and auxiliary pneumatic equipment for  
railway rolling stock



**NUMERISATION DANS  
L'ETAT DU DOCUMENT**

International Union of Railways

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**To be classified in volumes:**

- V - Transport stock
- VI - Traction
- VIII - Technical specifications

### Amendment

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### Foreword:

This leaflet is:

- **mandatory** for all the documents produced by UIC and ERRI;
- **mandatory** for simple pressure receptacles to equip rolling stock still to be designed.
- **recommendatory** for simple pressure receptacles equipping existing rolling stock.

Mandatory provisions are preceded by an asterisk: \*

The double line in the margin (||) indicates the amendments made on the date given at the foot of the page.

The date of enforcement of this leaflet is governed by the provisions given under "Application" at the end of the text.

### Note

This leaflet is part of a series including:

- Leaflet 542 - Brake parts (interchangeability).
- Leaflet 834 - Technical specifications for the supply of simple pressure receptacles of steel, not fired, for air braking equipment and auxiliary pneumatic equipment for railway rolling stock. (to be published)
- Leaflet 842-4 - Technical specifications for protection against corrosion and for paint on wagons and containers.

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**\* 1 - Purpose**

This leaflet lays down the conditions to be observed in the design, assembly on rolling stock and in-service maintenance of simple pressure steel receptacles, non fired, for air braking equipment and auxiliary pneumatic equipment in tractive and trailing stock.

Simple receptacles are made up of either a straight cylindrical section, the "shell", closed at either end by two torispheric bases with their convex side facing outwards, or of two convex bases with the same rotational axis (see figure 1).

**2 - Scope**

This leaflet applies to the reservoir itself, between its intake and outlet points and at any other individual connection point.

This leaflet contains an alternative constructional design derived from European standard EN 286-3.

The reservoirs are designed for use:

- at a maximum in-service pressure (PS) of 10 bar; a temporary maximum pressure of 11 bar is, however, permitted;
- at temperatures of between -40°C and +100°C;

- within the limits of the product of the maximum in-service pressure (in bars) and the volume (in litres), such as: 50 bar.  $L < PV \leq 10\ 000$  bar . L;
- secured to vehicles with straps.

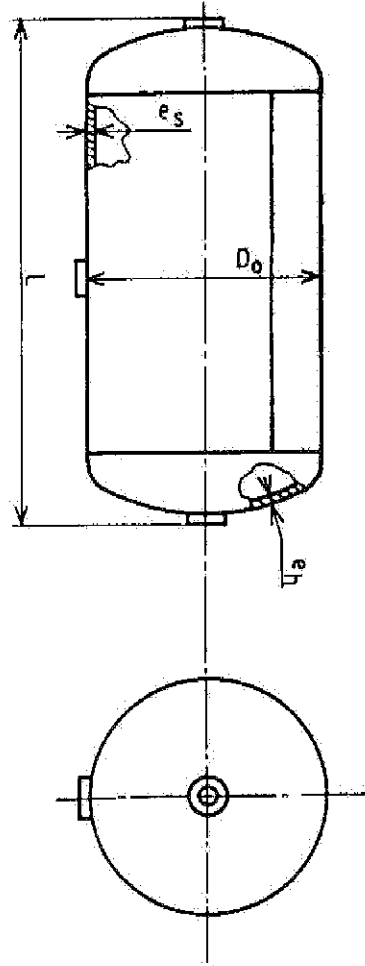
**3 - Abbreviations**

$D_o$	External diameter of the reservoir shell	mm
$d_1, d_2$	Internal diameters of the connection points	mm
$e_h$	Nominal thickness of the base	mm
$e_s$	Nominal thickness of the shell	mm
L	Total length of the reservoir	mm
$L_1$	Distance of the axis of a drainage point from the end of the reservoir	mm
PS	Maximum in-service pressure	bar
V	Volume of the reservoir	litres

OR

4 - Dimensions (in millimetres) and volumes (in litres) of reservoirs

Figure 1



Reservoirs with dimensions and volumes specified in the following table are only recommended.

OR

Do	125	150	200	250	300	350	400	450	500	550	600	700	800	
V (litres)	Length L (mm)													
5	497	358	220											
9		608	353	253										
10		670	387	274										
15			554	383										
25				590	440									
27				644	469									
40					663									
50					810									
57					917	693								
67					1066	802	638							
75 77					1216	911	722	588						
100					1520	1160	913	737						
125						1444	1134	910						
150							1342	1075	898	769				
160							1425	1140	951	812				
180							1592	1370	1056	900				
200							1759	1400	1160	983				
250								1723	1424	1200		801		
300									1686	1418		935		
400										2221	1853	1575	1201	965
500											2287	1940	1468	1170
600												2304	1634	1373
700													2001	1577
800													2268	1781

OR

\* 5 - Connection pieces are required for:

- hose connections;
- drainage;
- internal inspection.

Reservoirs where the product PV is equal to or less than 1,000 bar. L (L being less than 1,500 mm) may have a single connection point for hose connections and for inspections. In this case the minimum diameter of the aperture shall be 30 mm.

Connection points must be made well away from welded joints and from the toric part of the bases.

It is recommended that they be located as indicated in figure 2 below. Other points may be selected providing they enable the internal inspection and drainage to be carried out.

Figure 2b

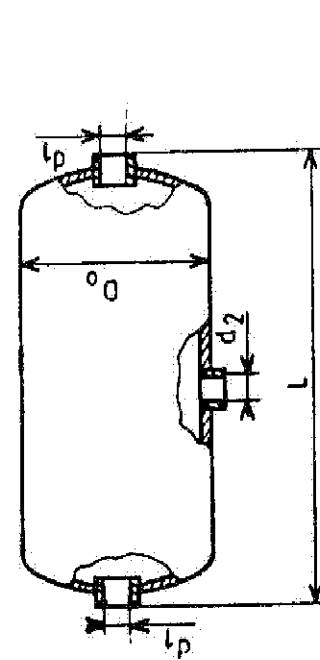
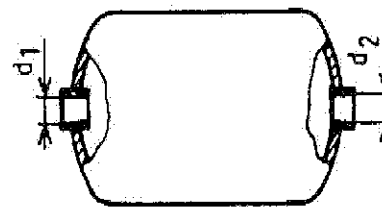


Figure 2a



OR

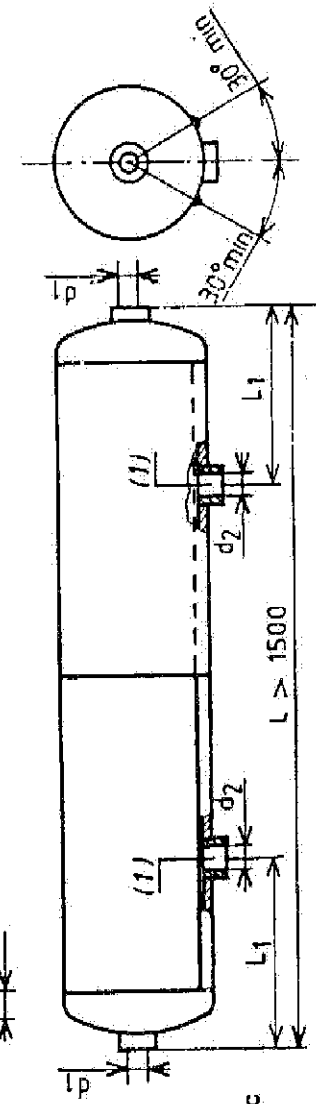


Figure 2c

(1) One of the two connection points must be made at the lowest part of the shell to ensure that the reservoir is completely drained.

D <sub>o</sub>	All diameters
d <sub>1</sub>	Minimum through diameter: 30 mm A through diameter of 30 mm corresponds approximately to internal threads: G 1 and M 32
d <sub>2</sub>	Minimum through diameter: 18 mm A through diameter of 18 mm corresponds to internal threads: G 1/2 and M 20
L <sub>1</sub>	$L/5 \leq L_1 \leq L/3$

**\* 6 - Markings**

Reservoirs must bear the identification and service markings specified in Leaflet 834.

These markings shall be made either in the metal of the reservoir itself or on a plate welded to the reservoir wall.

It is recommended that these markings be placed on the reservoir at the positions specified in figures 3a, 3b and 3c.

These markings must be positioned horizontally and should be readable under best possible conditions once the reservoir has been mounted on the vehicle.

Figure 3c

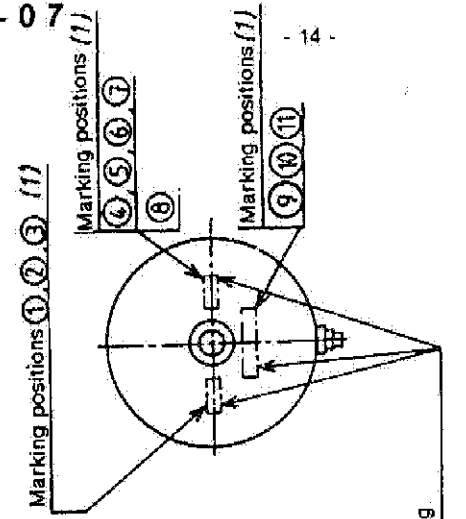


Figure 3b

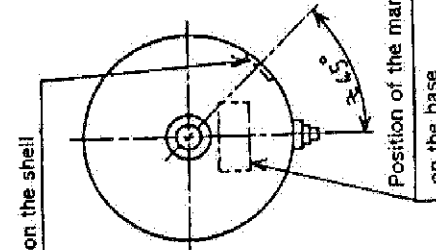
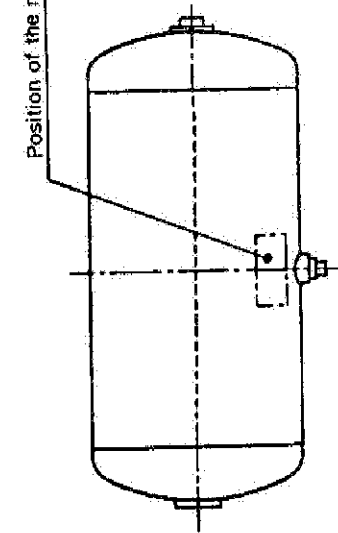


Figure 3a



(1) see Leaflet 834

Note: The positions for markings on the shell or on the base, shown in figures 3a, 3b and 3c are recommended.

**\* 7 - Mounting on the vehicles**

**7.1 - Securing**

Reservoirs must be secured, using straps with the characteristics listed in point 7.1.1 with the addition of anti-corrosion protective bands as described in point 7.1.4.

Reservoirs are generally secured with two straps (figures 4 and 5). However, reservoirs of smaller dimensions may be secured with one strap only, providing that this does not obscure the identification and service markings or the circular welding beads.

Securing straps with their anti-corrosion protective bands shall always be positioned on the shell (see figures 4 and 5).

The position of the straps, in relation to the circular welded joints, must be defined on the basis of the maximum length of the cylindrical part of the base as specified in Leaflet 834, in order to guarantee interchangeability of the reservoir without risk of the straps obscuring the welded joints.

Cradles should always be placed at any reservoir-vehicle contact points with an anti-corrosion protective band placed between the reservoir and the cradles.

The cradle must:

- lie in a transversal position in relation to the reservoir;
- be adapted to the shape of the reservoir;
- be of a width equal to or greater than that of the securing straps;
- have a value  $D_o$  of not less than 0.4.

Every precaution should be taken to avoid any movement of the insulating band in relation to the straps and the reservoir.

The plan for mounting the reservoir on the vehicle must allow the identification and service markings to be read under the best possible conditions.

Figure 4

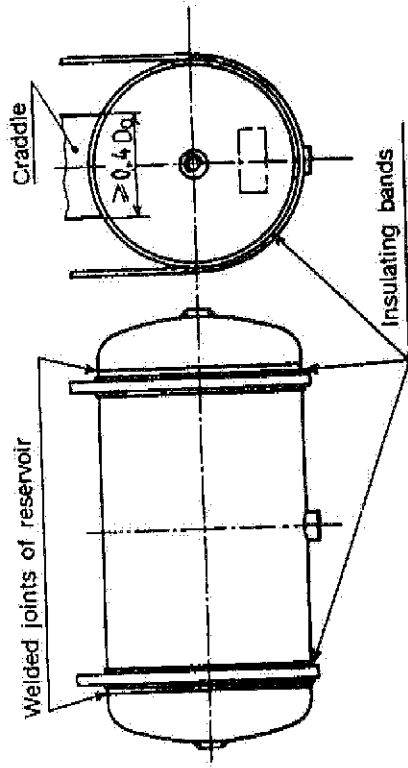
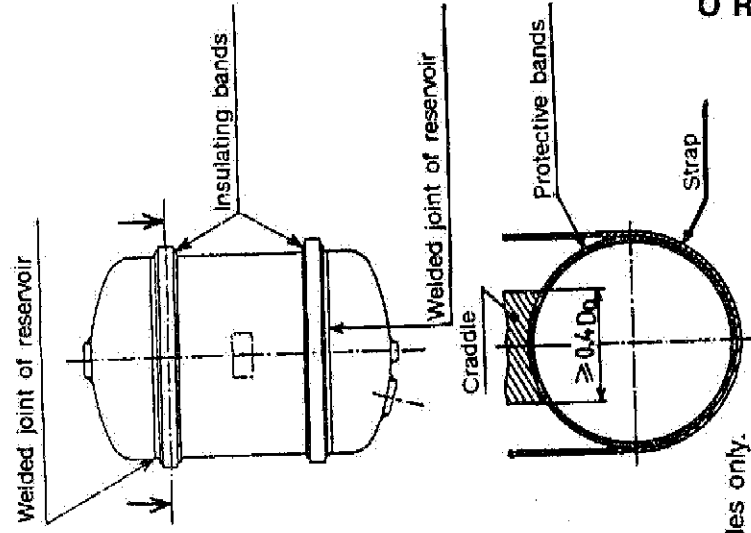


Figure 5



Note: the assemblies in figures 4 and 5 are given as examples only.

OR

Figure 4

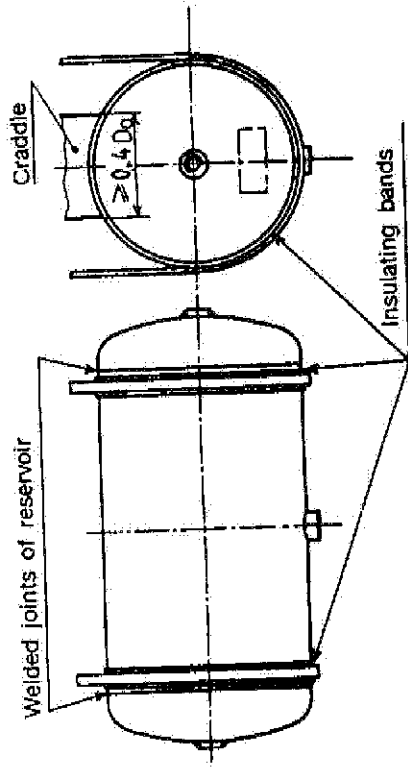
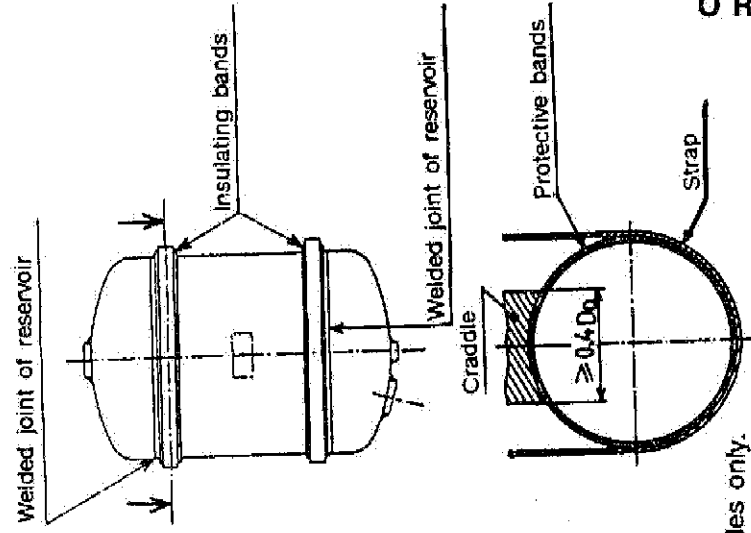


Figure 5



Note: the assemblies in figures 4 and 5 are given as examples only.

OR

Figure 6

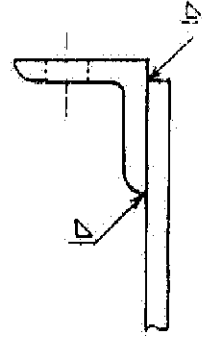


Figure 6

Straps shall be attached to the vehicles by one of the procedures authorised in figures 6, 7, 8 and 9.

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Figure 8

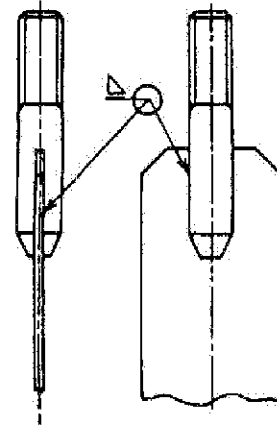


Figure 9

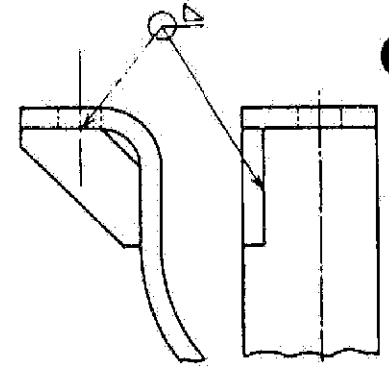
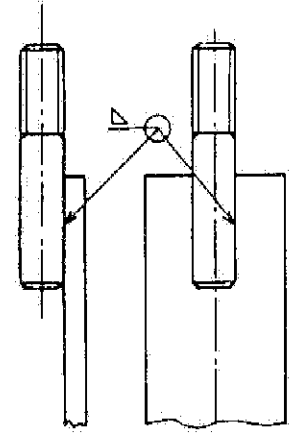


Figure 7





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7.1.1 - Securing straps

Securing straps shall be made from flat steel plate of maximum tensile strength.

$R_m \leq 580 \text{ N/mm}^2$  and of the dimensions specified in paragraph 7.1.2 ou 7.1.3.

**Straps made from round steels are not allowed.**

7.1.2 - Securing with two straps

The dimensions of the flats section to be used are:

$D_o$ (in mm)	$\leq 450$	$> 450$ et $\leq 600$	$> 600$
Section of the flats (in mm)	25 x 4	45 x 6	60 x 6

7.1.3 - Securing with one strap

The section of the flat shall be defined separately for each individual case.

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7.1.4 - Anti-corrosion protective bands

The protective bands as described in paragraph 2.2 of Leaflet 842-4 must be of a type approved by the purchasing railway.

Anti-corrosion protective bands must be impregnated on two surfaces.

The impregnating coating used must have a softening point of at least 50°C and must remain flexible to -15°C.

The impregnated band must have a surface mass of not less than 1.3 kg/m<sup>2</sup>.

The most widely used protective bands are bitumen bands, adhesive vinyl bands and petroleum-based bands with textile backing and a vinyl coating.

7.2 - Protection of the drainage mechanism

Where an automatic drainage device is mounted directly on the reservoir nozzle, it must be protected by a hood against any accidental damage.

**Note :** In the case of vehicles equipped with air driers, the nozzle may be occluded by means of a threaded stopper, with a water-tight seal, containing a drainage aperture.

**\* 8 - In-service monitoring**

Provisions governing in-service monitoring of reservoirs in line with the provisions of this leaflet, constitute a general framework which each railway may adapt to meet its own requirements with a view to obtaining optimum safety conditions.

Reservoir safety conditions will be ensured if the railway complies with the minimum monitoring requirements contained in this leaflet.

Reservoirs are used throughout the service life of the vehicle or of the braking gear on which they are fitted, not to exceed 40 years. After this period they are to be scrapped under the conditions described in paragraph 8.9. However, under particular conditions (range of vehicles in course of being written off or vehicles intended for museums, the service life of reservoirs may be extended providing it is monitored appropriately as described in paragraph 8.8.

In-service monitoring of reservoirs which are in conformity with this leaflet shall be carried out during periodical inspections or overhauls of the vehicle or the braking gear to which they are attached, under the following conditions.

**8.1 - Reservoirs used at: PS ≤ 6 bar**

Maximum interval between two operations	Operation	Removal	Method + Action taken
During scheduled inspection: less than 6 years	External inspection	No	8.3
24 years, during overhaul	Internal and external inspection	No	8.3 and 8.4

**8.2 - Reservoirs used at: 6 bar < PS ≤ 10 bar**

Maximum time interval between 2 operations	Operation	Removal	Method + action taken
During a scheduled inspection: less than 2 years and 8 weeks (1)	External inspection	No	8.3
24 years, during overhaul	Internal and external inspection	No	8.3 and 8.4
(1) This time limit shall be extended to 6 years in the case of a reservoir protected against external damage, e.g. where it is mounted in a case or where it is inside another piece of equipment.			

In addition, the good working order of these reservoirs in-service shall be ensured by an annual spot test inspection under the following conditions:

Group of reservoirs concerned	Sample	Remove!	Method + action taken
Reservoirs of the same type used on a entire fleet of vehicles or equipped gear over 20 years of age	1 % rounded up to the nearest unit	Yes	8.5 and 8.6

**8.3 - External inspection**

**8.3.1 - Drainage**

Reservoirs shall be drained by bleeding from the drainage points or by use of a strong air blower until all impurities have been removed.

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**8.3.2 - Cleaning**

Reservoirs which are found to be extremely dirty must be cleaned so that the walls may be examined under acceptable conditions.

**8.3.3 - Examination of markings**

If the markings described in chapter 6 of this leaflet are no longer legible either through corrosion, dents or abnormal wear, the reservoir shall be scrapped.

Where a support plate is deformed as a result of denting or oxydation, but where its markings are still legible, the plate may be replaced.

Once the plate has been welded to the reservoir, a pressure test must be carried out in accordance with point 9.3 of Leaflet 834.

**8.3.4 - Examination of the walls**

**8.3.4.1 - Deformities and irregularities**

If the reservoir walls reveal sharp localised deformities or irregularities as a result of denting, the reservoir shall be scrapped if these deformities or irregularities exceed the permissible tolerances given below.

**8.3.4.1.1 - Base walls**

Any deformities or irregularities must not:

- in the convex part of the base, be situated at more than 0.4 D<sub>0</sub> from the middle of the base;

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- connect up with the immediate surface at an incline of more than 25 % and by means of curves whose radius is less than half the knuckle radius;
- be situated on welds or tangential to them;
- be of a depth greater than 1/100 of the reservoir diameter.

**8.3.4.1.2 - Shell wall**

Any deformities or irregularities must not:

- connect up with the surrounding surface at an incline of more than 25 % or by means of curves whose radius is less than half the knuckle radius;
- be of a depth greater than:
  - . 1/50 of the diameter of the reservoir where the width is less than 4 times the depth;
  - . 1/25 of the diameter of the reservoir in all other cases.

**8.3.4.2 - Corrosion**

Whatever the type of corrosion detected when the reservoir is examined, any fault measuring 1 mm or more in depth shall result in the reservoir being scrapped.

**N.B.:** Where the corrosion does not require the reservoir to be scrapped, further anti-corrosion treatment must be applied in order to protect the reservoir against corrosion until the next examination as described in paragraphs 8.1 and 8.2.

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**8.3.4.3 - Other cases causing the reservoir to be scrapped**

Where there is any doubt as to the seriousness of the faults described above, or if there are any other abnormalities in the reservoir which might reduce its strength, the reservoir shall be scrapped.

**8.3.5 - Examination of the securing straps**

If a strap is found to be cracked or broken, it must be replaced.

Repairs by means of welding shall not be allowed.

**8.4 - Internal examination**

The internal examination of the reservoir walls shall be carried out with the aid of an appropriate tool such as an endoscope.

If traces of corrosion are found, these shall be studied to assess their extent. Any defect of a depth equal to or more than 1 mm shall result in the reservoir being scrapped.

Where there is any doubt as to the depth of the corrosion, measuring equipment, ultrasonic equipment for example, should be used to measure the thickness of the wall.

Where the extent of corrosion does not automatically require the reservoir to be scrapped, but is situated at a point corresponding to an external area of corrosion where traces of corrosion have already been detected without the reservoir having been scrapped, the reservoir concerned should, nevertheless, be scrapped.

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**8.5 - Detailed inspection and hydraulic test**

These operations must be carried out by approved qualified staff.

**8.5.1 - Detailed inspection**

Reservoirs must be removed for detailed inspection purposes.

Before undergoing the various stages of inspection, the reservoir shall be examined in order to detect any faults which might lead to its being scrapped.

**8.5.1.1 - Preparation**

The internal and external walls of the reservoir shall be stripped and meticulously cleaned, applying chemical or mechanical pickling to the anti-corrosion coating, where necessary.

**8.5.1.2 - Internal and external inspection**

The inspection of the internal and external walls shall be carried out under the conditions described in paragraphs 8.3 and 8.4 and the appropriate points noted.

Furthermore, where cracks, abnormalities in the weld seams or deterioration in the inner threads at the inspection points or in the pipe connections are detected, the reservoir shall immediately be scrapped.

**8.5.2 - Hydraulic test**

Having passed the detailed inspection, the reservoir shall then undergo a hydraulic test under the conditions described in Leaflet 834.

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Having successfully passed the hydraulic test, the reservoir shall be marked with a stamp, in the space indicated by "10" in Leaflet 834, by the representative of the approved body who was present during the test.

He shall affix on it:

- the date of the test;
- the seal of his stamping machine

#### 8.5.3 - Processing before re-commissioning

A reservoir which has passed the hydraulic test shall be dried internally and externally and an anti-corrosion protective coating shall be applied, at the latest 4 hours after chemical or mechanical pickling as described in paragraph 8.5.1.1.

#### 8.5.4 - Re-commissioning

Reservoirs which have satisfactorily passed the detailed inspection, the hydraulic test and have been treated with an anti-corrosion protective coating, may be re-mounted on the vehicle or the suitably-equipped gear.

#### 8.6 - Use of results of the annual sample test on 1 % of existing reservoirs of any one type

Every two years, the results of the detailed technical inspections and hydraulic tests on reservoirs selected for the annual sample test on 1 % of existing reservoirs of any one type and the results of visual inspections, shall be submitted for evaluation with the relevant administrative authority. Measures shall be taken if the results of the 1 % sample test and the internal inspections reveal any significant changes.

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#### 8.7 - Depreciation of vehicles or equipped braking gear

When a vehicle or part of a vehicle has been downgraded on full depreciation, its reservoirs shall be removed.

#### 8.8 - Specific case of reservoirs fitted on a series of vehicles about to be written off, vehicles about to be consigned to a museum or vehicles kept in service for historical reasons

Reservoirs on such vehicles may be kept in service beyond the normal 40 year period on condition that the following provisions are applied:

- reservoirs shall be removed for inspection at the end of the 40 year period;
- following this, the reservoirs shall be removed for inspection once every 10 years;

in order for them to undergo the operations described in paragraph 8.5.

#### 8.9 - Scrapping

Every reservoir discarded during monitoring operations, or in accordance with point 8.7, must be made un-usable by perforating the side wall with a flame-cutter.

The markings either on the metal of the reservoir itself or on a plate welded to the side wall of the reservoir must be made illegible.

OR

**8.10 - Conservation of the results of examinations, inspections and tests**

The results of examinations, inspections and hydraulic tests must be recorded in a maintenance log or any other form of record enabling them to be stored for future reference.

The results of analyses of action taken following detailed technical inspections and hydraulic tests must also be recorded.

At the instigation of the national administration, it must be possible for all results to be produced and submitted to the representative of the official approved body at any time on request.

**8.11 - Responsibilities**

In-service checks of the various reservoirs shall be the responsibility of the railways and shall be carried out under the auspices of and under the conditions stipulated by the relevant administrative authority.

OR

**Application**

To apply from 1 January 1992.

All UIC Railways.

**Record references**

*Title under which the question has been studied:*

- Question 5/T/FIC - Approval of new Leaflet 541-07 - Brakes
- Regulations governing the construction of different types of braking gear - Simple pressure receptacles of steel, not fired, for air braking equipment and auxiliary pneumatic equipment for railway rolling stock.

(Traction and Rolling Stock Committee: Stockholm, June 1991).