

UIC Code

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1st edition, 1.1.93

**Technical specification for the supply
of simple pressure receptacles of steel,
not fired, for air braking equipment
and auxiliary pneumatic equipment
for railway rolling stock**



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International Union of Railways

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O R**Leaflet to be classified in volumes:**

V - Transport stock
VIII - Technical specifications

Amendments

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Preliminary remarks:

Provisions of an obligatory nature are preceded by an asterisk: *

The double vertical line (||) in the margin denotes amendments introduced on the date shown at the foot of the page.

Enforcement of this leaflet is governed by the provisions listed under "Application" at the end of this document.

This leaflet is:

- mandatory for all technical documents drafted within UIC or ERRI,
- mandatory for simple pressure receptacles to be fitted to rolling stock yet to be designed,
- recommendatory for simple pressure receptacles fitted to existing rolling stock.

Note

This leaflet forms part of a series which also include:

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.
Leaflet 800-30	Selection of ISO threads.
Leaflet 897-11	Technical specification for the acceptance of welders for fusion welding of steel.
Leaflet 897-12	Technical specification for the acceptance of welding procedures for arc welding in steels.
ISO standard 228-1	Pipe threads where pressure-tight joints are not made on the thread - Part 1 - Designation, dimensions and tolerances.
ISO standard 261	ISO general purpose metric screw threads - General plan.
ISO standard 1101	Technical drawings - Geometrical tolerancing - Tolerances of form, orientation, location and run-out - Generalities, definitions, symbols, indications on drawings.

ISO standard 1106 Part 1	Recommended practice for radiographic examination of fusion welded joints. Fusion welded butt joints in steel plates up to 50 mm thick.
ISO standard 1106 Part 3	Recommended practice for radiographic examination of fusion welded joints. Fusion welded circumferential joints in steel pipes of up to 50 mm wall thickness.
ISO standard 9001	Quality systems. Model for quality assurance in design/development, production, installation and servicing.

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1 - Purpose

This leaflet shall govern the manufacture and supply of simple pressure receptacles in steel, not fired, for air braking equipment and auxiliary pneumatic equipment in tractive and trailing stock.

2 - Scope of application

This leaflet contains a manufacturing alternative as shown in European Norm EN 286-3.

2.1 - The reservoirs covered by this leaflet shall:

- consist of a single chamber;
- be made from a non-alloy grade of steel;
- be of welded manufacture;
- be used at a maximum in-service pressure of 10 bars;
- be such that the product of the maximum in-service pressure (in bars) and the volume (in litres) falls within the following limits:
 $50 \text{ bars} \times L < PV \leq 10,000 \text{ bars} \times L$;

consist either of a cylindrical part with the straight tubular section, called 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;

be designed with a calculation pressure $P = PS \times a$ (see paragraph 5.1.3.1) ;

- be designed for use at temperatures between -40°C and $+100^{\circ}\text{C}$;
- be secured to vehicles by means of straps.

2.2 - In normal service, a momentary internal pressure of 11 bars shall be authorised.

2.3 - This leaflet shall apply to the reservoir itself, between its intake and outlet pipes, and to any other isolated or auxiliary pipe belonging to the reservoir.

3 - Abbreviations

a	Coefficient of increase of PS to obtain the value of P for calculating thicknesses	—
A	Elongation at rupture	in %
A_{fb}	Area of connection piece cross-section	in mm^2
A_{fm}	Area of main body cross-section	in mm^2
A_{fp}	Area of supporting plate	in mm^2
A_p	Area of pressurized zone	in mm^2
c	Absolute value of the negative tolerance for rolling of sheets plus the value of the reduced thickness of the base wall, due to the forming process	in mm

D_o	External diameter of reservoir shell	in mm
d	External diameter of inspection and pipe connection pieces	in mm
e	Nominal thickness	in mm
e_b	Height of connecting piece	in mm
e_{bi}	Height of connecting piece within the reservoir	in mm
e_c	Calculated thickness	in mm
e_{ch}	Calculated thickness of base	in mm
e_{cs}	Calculated thickness of shell	in mm
e_h	Nominal thickness of base	in mm
e_p	Thickness of supporting plate	in mm
e_s	Nominal thickness of shell	in mm
f	Nominal stress for calculation at the calculation temperature	in N/mm ²
f_b	Permissible stress of connecting piece	in N/mm ²
h	External height of convex part of one base	in mm
h_1	Height of cylindrical part of base	in mm
h_2	Internal height of convex part of base	in mm
K_c	Coefficient of calculation which is dependent on the welding and inspection procedure adopted	_____

KV	Energy at break by impact (testpiece with V notch)	in J
l_b	Thickness of connecting piece	in mm
l_m	Width of stressed cross-section of the main body	in mm
l_p	Width of supporting plate	in mm
L	Total length of reservoir	in mm
L_f	Length of reservoir without connecting pieces	in mm
L_v	Length of shell	in mm
P	Calculation pressure as a function of the maximum in-service pressure, the welding and inspection procedure adopted ($P = PS \times a$)	in bars
PS	Maximum in-service pressure	in bars
R	Internal radius of spherical part of base	in mm
R_l	Local inner radius at a given connecting piece	in mm
r	Internal radius of toric part of base	in mm
R_{eT}	Yield strength at maximum in-service temperature	in N/mm ²
R_m	Minimum tensile strength guaranteed by manufacturer or by defining standard of the steel	in N/mm ²
S	Corrosion allowance	in mm

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$T_{\min}$	Minimum in-service temperature	in °C
$T_{\max}$	Maximum in-service temperature	in °C
T^*	Temperature at which the mean value for energy absorbed at break (V notch), $KV \geq 28$ J, is guaranteed along the length	in °C
V	Volume of reservoir	in litres

4 - Materials

4.1 - Parts under pressure

4.1.1 - Shell and bases

The shell and bases shall:

- be made from steel sheet, non-effervescent and normalised, or in an equivalent state;
- have production content of carbon < 0.25 %, sulphur and phosphorus < 0.05 % for each of its elements;
- comply with the following mechanical production characteristics:
 - the maximum value of the tensile strength R_m must be less than 580 N/mm^2 ,
 - the elongation at rupture must be:
 - $A \% \geq 22$, if the testpiece is taken parallel to the direction of rolling for thicknesses ≥ 3 mm;

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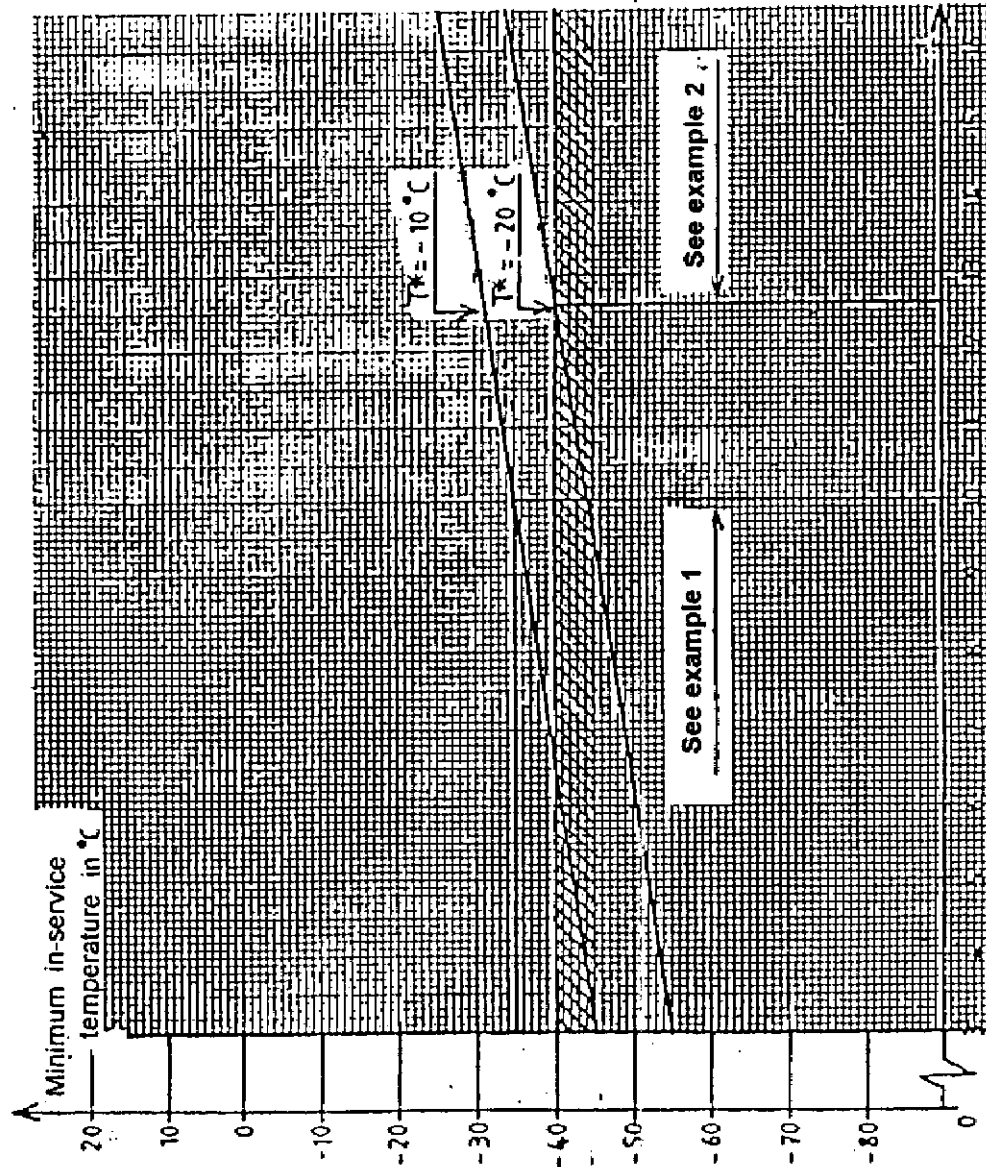
- $A \% \geq 20$, if the testpiece is taken perpendicular to the direction of rolling for thicknesses ≥ 3 mm;
- the mean value of energy absorbed at rupture KV determined from three testpieces lengthways must be at least 28 J. Any one of the three values may be less than 28 J, but none must be less than 20 J under any circumstances.

This essential safety requirement may be met:

- either by carrying out impact bending tests (V notch) at the minimum in-service temperature ($T_{\min}$) under the responsibility of the manufacturer of the material;
- or at a temperature T^* less than or equal to that obtained by extrapolation using the nomograph below.
- if value R_{eT} is not guaranteed at 100 °C, the formula $0.6 R_{eT} \times 0.9$ should be used to determine the stress f .

Examples of use:

- example no. 1: if $e = 10$ mm and $T^* = -10$ °C, $T_{\min} = -35$ °C.
- example no. 2: if $T^* = -20$ °C and $T_{\min} = -40$ °C, $e_{\max} = 12.7$ mm



Sheet thickness
in millimetres

Figure 1

4.1.2 - Connection pieces for inspection, hose connections and purging

The connection pieces shall be produced using round steel or steel pipe with a grade compatible with that of the steel sheets used to make the reservoir and shall be of weldable quality. The steel shall comply with the following conditions on the products themselves:

- $R_m < 580 \text{ N/mm}^2$
- $C \leq 0.25 \%$, $S \leq 0.05 \%$ et $P \leq 0.05 \%$

4.2 - Parts not under pressure

Any fittings that need to be welded to the reservoir but which do not contribute to its strength shall be produced in steel of compatible grade with that of the sheet steel making up the reservoir and be of weldable quality.

This steel, when cast, shall comply with the following conditions:

- $R_m \leq 580 \text{ N/mm}^2$
- $C \leq 0.25 \%$, $S \leq 0.05 \%$ et $P \leq 0.05 \%$.

4.3 - Weld products

The filler product used for welding the parts making up the reservoir shall comply with national standards and be compatible with the standards of the parts to be joined.

The gaseous and powdered flux shall be suitable for the parent metal and filler product used.

Conformity of the welding products used shall be checked during the acceptance of the welding procedure under section 7.

5 - Design

The design of the reservoirs shall enable them to be installed in complete safety under the conditions of installation and maintenance indicated in Leaflet 541-07.

5.1 - Shell and bases

5.1.1 - Design of the shell

Shells shall generally be produced from a single sheet.

When the shell is made from several welded parts:

- the number of circular welds shall be kept to a minimum;
- the longitudinal weld beads of the parts of the shell:
 - must not be situated in the lower part of the reservoir as defined by an angle of 30° to either side of the vertical axis (see figure 2);
 - must be sufficiently distant one from the other as to form an angle greater than 40° (see example in figure 3).

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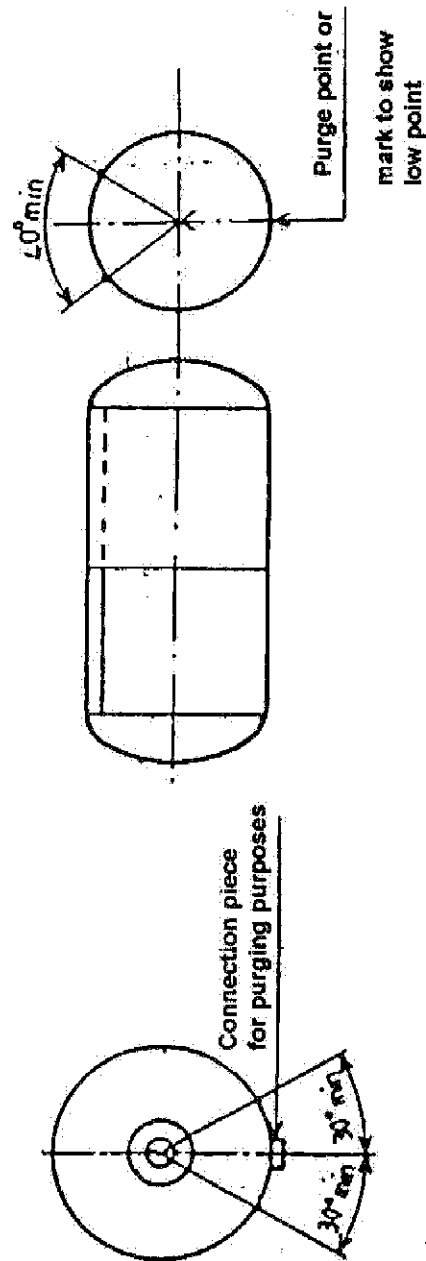


Figure 2

Figure 3

Any tack weld or any weld, even temporary, executed outside the permitted zone shall be prohibited.

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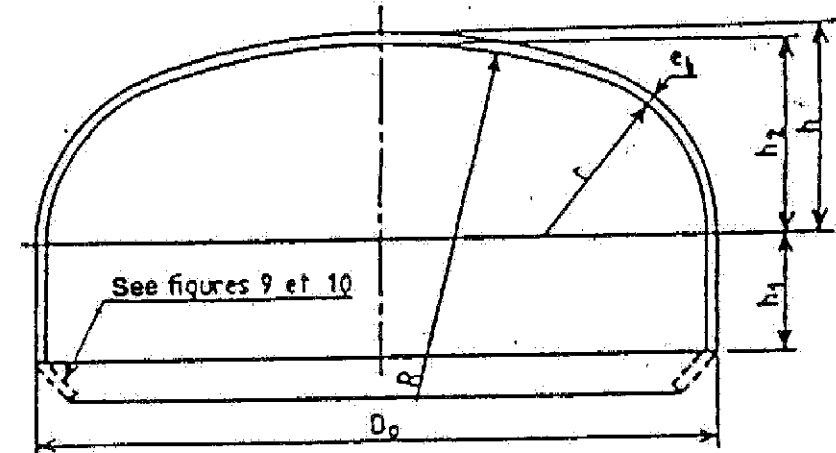
5.1.2 - Design of bases

5.1.2.1 - Form and dimensions of the bases

The torispherical bases shall be formed from one single sheet.

Drawing and flanging the neck shall be performed mechanically, for example using a press or a lathe. Manual forming shall not be permitted.

The torispherical base shall conform to the following dimensions:



$$R \text{ (nominal)} = D_o$$

$$r \text{ (nominal)} = 0.1 D_o$$

e_b	3	4	5	6	8	10	11	12
h_1 min	12	16	20	24	32	40	44	48
h_1 max	25		40		50		55	

Figure 4