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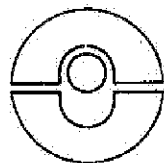
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1st edition, 1.1.93

**Technical specification  
for the execution and control  
of test joints in steel**

Test pieces

**NUMERISATION DANS  
L'ETAT DU DOCUMENT**



International Union of Railways

897-14

- 2 -

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**Leaflet to be classified in volumes:**

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

**Amendments**

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**Preliminary remarks:**

A double vertical line (||) in the margin denotes modifications 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.

**Note**

This leaflet forms part of a series which also includes:

- Leaflet 897-12      Technical specification for the approval of a procedure for arc-welding on steels
  
- Leaflet 897-13      Technical specification for the quality control of welded joints on rolling stock in steel

**1 - Purpose**

This leaflet defines the approval conditions for the procedure description used for manufacturing test assemblies and sub-assemblies.

The procedure for manufacturing test assemblies and sub-assemblies must be approved according to the provisions of this leaflet.

Once a welding procedure has been approved, it may be used in manufacture.

Any manufacturing irregularity noted in production may be confirmed under the provisions of this leaflet.

**2 - Test joints**

**2.1 - Definition**

A test joint shall be an assembly including welded areas subject to large forces and/or to be executed under extremely difficult conditions (e.g. in terms of accessibility).

Such a test joint is referred to as a "mock-up".

It is the responsibility of the customer railway to request the production of test joints.

**2.2 - Preparation of test joints**

Test joints must be prepared in accordance with the provisions of UIC Leaflet 897-13.

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### 2.3 - Execution of test joints

Test joints shall be executed in the presence of a representative of the customer railway.

Weld test joints must be produced using approved welding processes as per UIC Leaflet 897-12 for class B and C welds.

The materials used and their thicknesses shall be the same as those to be used in the actual assemblies.

The preparation and protection of surfaces before or during welding and bevelling processes shall be carried out as prescribed for each part.

Welding must be carried out in accordance with the welding provisions contained in point 3.4 of UIC Leaflet 897-13. However, the use of final production mock-ups is recommendatory rather than mandatory.

Weld test joints must be produced using identical welding equipment and in accordance with the same operating conditions as for actual manufacture (welding process, filler product, position, parameters, etc.).

For each type of weld, welding must be halted and resumed once at an identified point.

If the difference between the maximum and minimum dimensions for lengths and root edges of weld preparations prescribed by the builder exceeds 1/10 of the thickness of the thinnest component in the assembly, it will be carried out on the test joint in order to obtain in one area the minimum length and the maximum root edge and in another area the maximum length and minimum root edge. These areas may be situated on separate welds but they must include the tacking prescribed for the actual manufacture of the parts.

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Heat treatment, where prescribed, shall be carried out on the test joint under the same conditions as for manufacture before any control samples are removed.

### 2.4 - Examinations and inspections on test joints

The number and types of examinations and inspections to be carried out on the test joint are given in the following table.

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Weld Examinations and tests	Class B welds		Class C welds (6)		Class D welds	
	Butt weld	Fillet weld	Butt weld	Fillet weld	Butt weld	Fillet weld
Non-destructive checks on all welds	YES	YES(1)	YES(1)	NO	NO	NO
Visual examination and calibration of all welds	YES	YES	YES	YES	YES	YES
Bend tests with weld beads flush - upper side stressed - underside stressed	1(2)		1(2)			
Included angle (3)		4(2)		3(2)		2
Macrographic test (4)	2(2)	2(2)	2(2)	2(2)	1	1
Hardness test under weld bead of test specimens under microscope (4) (5)	1	1	1	1	1	1

(1) This test may be replaced by 3 fracture samples.

(2) In the area where test joints include an area of minimum length and maximum root edge and an area of maximum length and minimum root edge, a sample shall be taken from each of these areas.

(3) Samples of the included angle shall have the same dimensions as those defined in the Appendix to this leaflet.

(4) The shapes and dimensions of samples for a macroscopic or hardness test are given in UIC Leaflet 897-12. The macroscopic examination may be supplemented by a microscopic examination.

(5) Only for non-austenitic steels, excluding those in group 1.

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### 3. - Results of the examinations and inspections.

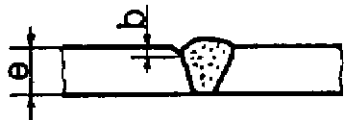

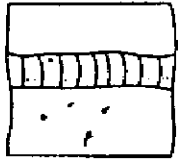
The results to be obtained for the different examinations and inspections carried out on test joints are given in the Appendix to UIC Leaflet 897-13.

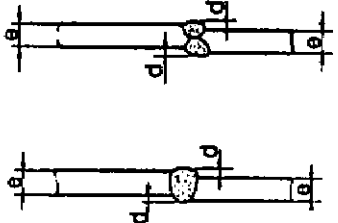



The quality level of test joints must be at least equal to that prescribed for production and must be compatible with the values laid down in Leaflet 897-13.

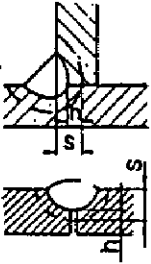
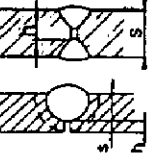

Where these standards are not met, the test joint or corresponding part of the test joint shall be repeated.

## ACCEPTANCE CRITERIA FOR WELDED BUTT AND FILLET JOINTS

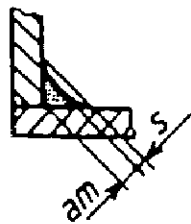
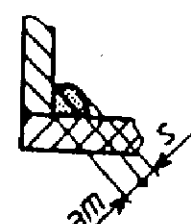
Defect	Type of defect	ISO 6520	Limits for: (Dimensions in mm)		
			Class B High requirement	Class C Medium requirement	Class D Moderate requirement
1	Fissuring	101 to 106	Defect not permitted	Defect not permitted	Defect not permitted
2	Gas pores	2017	dimension $\leq 1$ No more than 2 pores over a length of 200	dimension $\leq 2$ No more than 2 pores over a length of 200	dimension $\leq 3$ No more than 2 pores over a length of 200
3	Shrinkage of craters	2024	Defect not permitted	Defect not permitted	Defect permitted if no sharp notch
4	Solid inclusions at surface	300	Defect not permitted	Defect not permitted	Surface covered by a circle of diameter $\leq 3$ . No more than 5 over a length of 300.


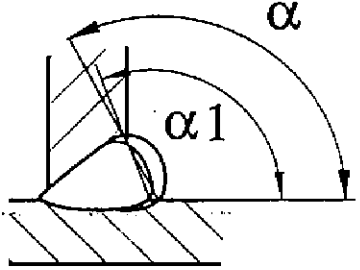
5	Undercut 	5011 5012	Defect not permitted	Defect not permitted	Defect permitted
	Penetration notches 		Defect not permitted	$b \leq 0.5$ Continuous length $\leq 50$ over a length of 300 Cumulative length $\leq 50$	$b \leq 1$ Continuous length $\leq 60$ over a length of 300 Cumulative length $\leq 80$
6	Adhering spatter 	602	Dimension $\leq 2$ No more than four on a surface of 50x50	Dimension $\leq 2$ No more than eight on a surface of 50x50	No more than twelve on a surface of 50x50
7	Arc burn	601	Defect not permitted	Defect not permitted	Defect not permitted
8	Chisel marks	603 to 606	Defect not permitted	Defect not permitted without progressive join	Defect permitted unless deep notch $> 1$ mm


9	Misalignment of edges 	507	The limits shown concern deviation in relation to the correct position. What is meant by 'correct position' depends on the case concerned. In the absence of any indication to the contrary, sheets shall be considered in the correct position when their centre-lines meet at mid-thickness. Alignment defects measured on the surface may be larger or smaller according to variations in sheet thickness, tube diameter and wall thickness.		
			$b \leq 0.1e$ max : 2	$b \leq 0.15e$ max : 3	No tolerance given
10	Weld overfill 	502	A smooth transition is required.		
			$h \leq 1 + 0.1b$ max : 2	$h \leq 1 + 0.15b$ max : 3	$h \leq 1 + 0.25b$ max : 5
11	Insufficient thickness of weld 	511	Defect not permitted	$h \leq 0.1e$ max : 1	$h \leq 0.2e$ max : 2
				Continuous length $\leq 50$ over a length of 300 Cumulative length $\leq 50$	Continuous length $\leq 60$ over a length of 300 Cumulative length $\leq 80$
12	Angular misalignment 	508	$\text{tg.} \leq 0.1$ or $6^\circ$	$\text{tg.} \leq 0.15$ or $9^\circ$	$\text{tg.} \leq 0.2$ or $12^\circ$

<p>13</p>	<p>Lack of penetration</p> 	<p>402</p>	<p>Defect not permitted</p>	<p><math>h \leq 0.1s</math> max: 1.5</p>	<p>No tolerance given</p>
	 <p>s = intended penetration h = penetration lacking</p>		<p>Defect not permitted</p>	<p>Admitted if defect localised</p> <p>Continuous length <math>\leq 50</math> Over a length of 300 Cumulative length <math>\leq 50</math></p>	<p><math>h \leq 0.2s</math></p> <p>Continuous length <math>\leq 60</math> Over a length of 300 Cumulative length <math>\leq 80</math></p>
<p>14</p>	<p>Lack of penetration</p> 		<p>Defect not permitted</p>	<p><math>b \leq 1</math></p>	<p><math>b \leq 0.25a</math></p> <p>Continuous length <math>\leq 60</math> Over a length of 300 Cumulative length <math>\leq 80</math></p>



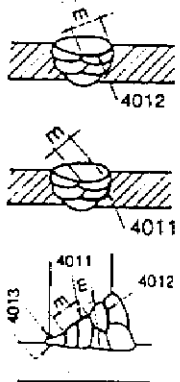
<p>15</p>	<p>Insufficient thickness  <math>a</math>: specified throat  <math>a_m</math>: throat produced</p>  <p>Convexity and Concavity</p> 	<p>503</p>	<p><math>a_m \geq a</math></p> <p><math>s \leq 0.1a + 0.5</math></p>	<p><math>a_m \geq a</math></p> <p><math>s \leq 0.1a + 1</math></p>	<p><math>a_m \geq a</math></p> <p><math>s \leq 0.2a + 1</math></p>
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<p>16</p>	<p>Assymmetrical weld</p> 	<p>512</p>	$\frac{b_1}{b_2} \leq 1.4$	$\frac{b_1}{b_2} \leq 1.7$	$\frac{b_1}{b_2} \leq 2$
<p>17</p>	<p>Inclination defect</p>  <p>a : value measured a<sub>1</sub> : value stipulated in drawing</p>		<p><math>\alpha &gt; 105^\circ</math> or <math>\alpha &gt; \alpha_1</math></p>	<p><math>\alpha &gt; -105^\circ</math> or <math>\alpha &gt; \alpha_1</math></p>	<p>No tolerance given</p>
<p>18</p>	<p>Poor positioning</p>		<p><math>h \leq 0.5 + 0.1a</math> max: 2</p>	<p><math>h \leq 0.5 + 0.2a</math> max: 3</p>	<p><math>h \leq 1 + 0.3a</math> max: 4</p>

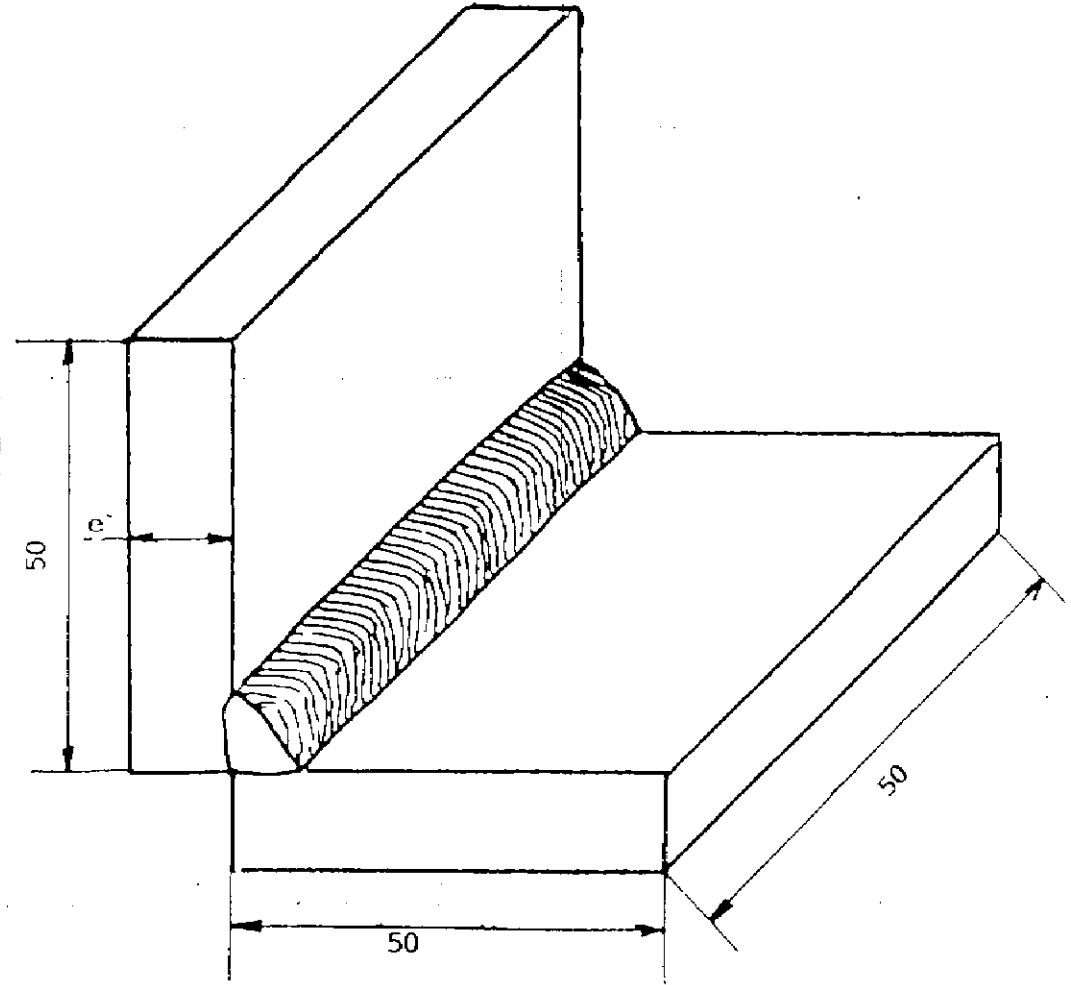
19 <sup>1)</sup>	Fine porosity	2011 2012 2014 2017	The pores must not exceed 1% of the projected surface. The size of one cavity must not be greater than 2 mm.	The pores must not exceed 2% of the projected surface. The size of one cavity must not be greater than 3 mm.	The pores must not exceed 4% of the projected surface. The size of one cavity must not be greater than 5 mm.
20 <sup>2)</sup>	Coarse porosity	2013	Blowholes must not exceed 4% of the projected surface. The size of one cavity must not exceed 2 mm.	Blowholes must not exceed 8% of the projected surface. The size of one cavity must not exceed 3 mm.	Blowholes must not exceed 10% of the projected surface. The size of one cavity must not exceed 5 mm.
21					
22	Excessive penetration 	504	Penetration must be continuous. The height of penetration h must not exceed 3 mm and under no circumstances 1mm+30% of the width of penetration.	In areas without lack of penetration, the height of penetration must not exceed 4 mm, and under no circumstances 1mm+60% of the width of penetration.  Continuous length ≤ 50 Over a length of 300 Cumulative length ≤ 50	No tolerance given

<sup>1)</sup> See remarks in Appendix 4 of UIC Leaflet 897-11 concerning defect 3.

<sup>2)</sup> See remarks in Appendix 4 of UIC Leaflet 897-11 concerning defect 4.

<p>23</p>	<p>Lack of fusion Adhesion</p> 	<p>401</p>	<p>Not permitted</p>	<p>Permitted if the defect is localised.</p>	<p>Authorised though intermittently and without emergence at surface.</p>
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Included angle test specimen



## Application

All UIC Railways

## Record references

*Heading under which the question has been dealt with:*

- Question 5/SA/FIC - Point 8.4 - Approval of Leaflet 897-14  
(Traction and Rolling Stock Committee: Paris, June 1992).

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