



# SLOVENSKI STANDARD

SIST EN 10253-4:2008

01-maj-2008

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**Cevni fittingi za soležne zware - 4. del: Kovna avstenitna in avstenitno-feritna (dupleksna) nerjavna jekla s posebnimi zahtevami glede pregledov**

Butt-welding pipe fittings - Part 4: Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements

Formstücke zum Einschweissen - Teil 4: Austenitischen und austenitisch- ferritischen nichtrostenden Stähle mit besonderen Prüfanforderungen

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Raccords a souder bout a bout (Partie 4: Aciers inoxydables austénitiques et austéno-ferritiques avec contrôle spécifique)

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**ICS:**

23.040.40

77.140.20

**SIST EN 10253-4:2008**

**en**

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ICS 23.040.40; 77.140.20

English Version

Butt-welding pipe fittings - Part 4: Wrought austenitic and  
austenitic-ferritic (duplex) stainless steels with specific  
inspection requirements

Raccords à souder bout à bout - Partie 4: Aciers  
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austenitisch-ferritische (Duplex-)Stähle mit besonderen  
Prüfanforderungen

This European Standard was approved by CEN on 5 January 2008.

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## Contents

Foreword.....	3
Introduction .....	4
1 Scope .....	5
2 Normative references .....	5
3 Terms and definitions .....	7
4 Symbols .....	8
5 Classification of grades and designation .....	9
6 Information to be supplied by the purchaser .....	9
7 Resistance to internal pressure .....	12
8 Manufacturing process .....	12
9 Technical requirements .....	14
10 Appearance and internal soundness.....	22
11 Dimensions and tolerances .....	23
12 Inspection .....	31
13 Sampling.....	33
14 Test methods.....	35
15 Marking .....	38
16 Handling and packaging .....	38
Annex A (normative) Structural dimensions of fittings .....	39
Annex B (normative) Determination of pressure factors and wall thickness.....	46
Annex C (normative) Pressure factor tables for fittings of type A .....	67
Annex D (informative) Wall thickness tables for fittings of type B .....	80
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of the EU Directive 97/23/EC.....	96
Bibliography .....	97

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[SIST EN 10253-4:2008](https://standards.iteh.ai/catalog/standards/sist/e08da56e-027a-4507-be21-5f1640970b75/sist-en-10253-4-2008)

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## Foreword

This document (EN 10253-4:2008) has been prepared by Technical Committee ECISS/TC 29 “Steel tubes and fittings for steel tubes”, the secretariat of which is held by UNI/UNSIDER.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2008, and conflicting national standards shall be withdrawn at the latest by September 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Directive 97/23/EC.

For relationship with the EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

EN 10253 comprises a series of European Standards about *Butt-welding pipe fittings*, namely:

- *Part 1: Wrought carbon steel for general use and without specific inspection requirements*
- *Part 2: Non alloy and ferritic alloy steels with specific inspection requirements*
- *Part 3: Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements*
- *Part 4: Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements*

In writing EN 10253 the competent committee recognized that there are two broad types of products commonly used for stainless steels, and decided to reflect these in the standard by differentiating between two parts, Part 3 and Part 4.

Part 4 defines two types of fittings: Type A fittings have the same wall thickness at the welding ends than a pipe having the same specified wall thickness. Their resistance to internal pressure is, in general, less than that of a straight pipe with the same dimensions. Type B fittings showing increased wall thickness at the body of the fitting are designed to resist the same internal pressure as a straight pipe with same dimensions. These two types of fittings are intended to be used in applications covered by the EU Directive 97/23/EC. According to this Directive and further interpretation guidelines (e.g. guideline 7/19), seamless fittings are considered as materials whereas welded fittings are considered as components. Therefore, in some areas of this European Standard, provisions for seamless and welded fittings are different.

The committee recognized the need to provide a basic type in which the minimum wall thickness of the fitting is guaranteed without formal reference to the pressure resistance. This type is considered in Part 3 and includes products not intended for use in applications covered by the Pressure Equipment Directive category I – IV except applications according to Article 3 Paragraph 3.

Information about structural dimensions of fittings is given in Annex A.

For fittings specified in accordance with this part of EN 10253, the resistance to internal pressure of the fitting may be determined by calculation. Annex B gives information about the calculation.

For some wall thickness series Annex C lists pressure factors for fittings type A and Annex D lists wall thickness values for the body of the fittings of fittings type B.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

The European Committee for Standardisation (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents applied to steel grade 1.4410, the compositions of which is given in Table 3.

CEN takes no position concerning the evidence, validity and scope of these patent rights.

The holder of these patent rights has assured CEN that they are willing to negotiate licences, under reasonable and non-discriminatory terms and conditions, with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with CEN. Information may be obtained from:

Sandvik AB  
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## 1 Scope

1.1 This European Standard specifies the technical delivery requirements for seamless and welded butt-welding fittings (elbows, concentric and eccentric reducers, equal and reducing tees, caps) made of austenitic and austenitic-ferritic (duplex) stainless steel which are intended for pressure and corrosion resisting purposes at room temperature, at low temperature or at elevated temperatures.

It specifies:

- the type of fittings;
  - type A (see 7.2)
  - type B (see 7.3)
- the steel grades;
- the mechanical properties;
- the dimensions and tolerances;
- the requirements for inspection and testing;
- the inspection documents;
- the marking;
- the handling and packaging.

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NOTE In the case of a harmonised supporting standard for materials, presumption of conformity to the Essential Requirement(s) (ESRs) is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific item of equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of this specific item of equipment to verify that the ESRs of the Pressure Equipment Directive (PED) are satisfied.

1.2 Unless otherwise specified in this European Standard the general technical delivery requirements in EN 10021 apply.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 287-1, *Qualification test of welders - Fusion welding - Part 1: Steels*

EN 473, *Non destructive testing - Qualification and certification of NDT personnel - General principles*

EN 910, *Destructive tests on welds in metallic materials – Bend test*

EN 1418, *Welding personnel - Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature*

**EN 10253-4:2008 (E)**

EN 10002-5, *Metallic materials - Tensile testing - Part 5: Method of testing at elevated temperature*

EN 10021:2006, *General technical delivery conditions for steel products*

EN 10027-1, *Designation systems for steels - Part 1: Steel names*

EN 10027-2, *Designation systems for steels - Part 2: Numerical system*

EN 10028-7, *Flat products made of steels for pressure purposes - Part 7: Stainless steels*

EN 10045-1, *Metallic materials – Charpy impact test - Part 1: Test method*

EN 10088-2, *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 10168, *Steel products - Inspection documents - List of information and description*

EN 10204, *Metallic products - Types of inspection documents*

EN 10216-5, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 5 : Stainless steel tubes*

EN 10217-7, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 7: Stainless steel tubes*

EN 10266:2003, *Steel tubes, fittings and structural hollow sections - Symbols and definitions of terms for use in product standards*

EN 10272, *Stainless steel bars for pressure purposes*

EN 13445-3, *Unfired pressure vessels - Part 3: Design*

EN 13480-3:2002, *Metallic industrial piping - Part 3: Design and calculation*

EN ISO 377:1997, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997)*

EN ISO 1127, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length (ISO 1127:1992)*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions - Part 1: Country codes (ISO 3166-1:2006)*

EN ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels - Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulfuric acid (ISO 3651-2:1998)*

EN ISO 6708, *Pipework components - Definition and selection of DN (nominal size) (ISO 6708:1995)*

EN ISO 14284, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*



### 3 Terms and definitions

For the purposes of this document, the relevant definitions given in EN 10020:2000, EN 10021:2006, EN 10052:1993, EN 10079:2007 and EN ISO 377:1997 apply, except as defined below.

#### 3.1

##### **model**

for elbows and return bend, the model defines the bending radius of the piece

#### 3.2

##### **welded fitting**

##### 3.2.1

fittings made from welded tubes

##### 3.2.2

fittings made from sheet/plate or strip where welding is a part of the manufacturing process

#### 3.3

##### **seamless fitting**

fittings manufactured without welding from starting material which is not welded

#### 3.4

##### **purchaser**

person or organisation that orders products in accordance with this European Standard.

NOTE The purchaser is not necessarily, but may be, a manufacturer of pressure equipment in accordance with the EU Directive listed in Annex ZA. Where a purchaser has responsibilities under this EU Directive, this standard will provide a presumption of conformity with the essential requirements of the Directive so identified in Annex ZA

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#### 3.5

##### **employer**

organisation for which a person works on a regular basis.

NOTE The employer may be either the fitting manufacturer or supplier or a third party organisation providing a service, e.g. NDT

## 4 Symbols

For the purposes of this document, the symbols given in EN 10266:2003 and the following apply.

$DN, DN_1$	Conventional dimension used in piping ; non measurable value (See EN ISO 6708) ;
$D$	Specified outside diameter for elbows, return ends, equal tees, caps and the major outside diameter for reducers and reducing tees, expressed in millimetres;
$D_1$	Specified minor outside diameter for reducers and reducing tees, expressed in millimetres;
$T$	Specified wall thickness at the welding ends for elbows, return bends and equal tees or on the $D$ end for reducers and reducing tees, expressed in millimetres;
$T_1$	Specified wall thickness on the $D_1$ welding end of reducers and reducing tees, expressed in millimetres;
$ID$	Internal diameter at the welding ends of elbows, return bends, equal tees and at the major welding end of reducers and reducing tees ( $ID = D - 2T$ );
$ID_1$	Internal diameter at the minor welding end of reducers and reducing tees ( $ID_1 = D_1 - 2T_1$ );
$C$	Centre to centre distance for return bends ( $C=2R$ ), expressed in millimetres;
$B$	Back to face distance for return bends, expressed in millimetres;
$F$	Distance from the axis of the centre line to the face of the branch outlet of reducing and equal tees, expressed in millimetres; distance from the centre of one face to the centre of bending of a 90° or a 45° elbow;
$G$	Distance from the axis of the centre line to the face of the branch outlet of reducing tees, expressed in millimetres;
$H$	Face to centre distance for 45° elbows, expressed in millimetres;
$h$	Distance from the face of the branch outlet to the body of the pulled tee, expressed in millimetres;
$K$	Total height for caps, expressed in millimetres;
$L$	Face to face distance for reducers, expressed in millimetres;
$X$	Tolerance on the form of fittings;
$r$	Inside knuckle radius of cap;
$R$	Bending radius of elbows and return bends, expressed in millimetres;
$R_1$	Inside spherical radius of cap;
$R_m$	Tensile strength at room temperature, expressed in MPa;
$R_{p0,2}$	Minimum 0,2 % proof strength at room temperature, expressed in MPa;
$R_{p1,0}$	Minimum 1,0 % proof strength at room temperature, expressed in MPa;
$A$	Percentage of elongation after rupture, with reference to gauge length of $5,65 \sqrt{S_0}$ ;
$WO$	Welded from hot or cold rolled plate, sheet or strip 1 $D$ , 2 $D$ , 2 $E$ , 2 $B$ (Symbols of flat products

according to EN 10088-2);

- W1* Welded from hot rolled plate, sheet or strip 1 *D*, descaled;
- W2* Welded from cold rolled plate, sheet or strip 2 *D*, 2 *E* and 2 *B*, descaled.

## 5 Classification of grades and designation

### 5.1 Classification of grades

Steels covered in this European Standard are classified according to their structure into:

- austenitic steels;
- austenitic–ferritic (duplex) steels.

For more details see EN 10088-1.

### 5.2 Designation of steel grades

For fittings covered by this European Standard the designation shall consist of:

- the number of this European Standard (EN 10253-4)

plus either:

- the steel name in accordance with EN 10027-1;

or:

- the steel number allocated in accordance with EN 10027-2.

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## 6 Information to be supplied by the purchaser

### 6.1 Mandatory information

#### 6.1.1 Designation of fittings

##### 6.1.1.1 General

Fittings may be designated by their outside diameter *D* (and *D<sub>1</sub>*) or by their inside diameter *ID* (and *ID<sub>1</sub>*).

##### 6.1.1.2 Elbows and return bends

Elbows and return bends are designated by the model, the angle and the inside diameter (*D* or *ID*) (Inside diameter related to metric series).

Models of elbows designated by their outside diameter *D* are:

2*D*, 3 *D* and 5 *D<sub>1</sub>*)

Models of elbows designated by their inside diameter *ID* are:

*ID*+ 100, 3 *ID* and 5 *ID*

### 6.1.1.3 Reducers

Reducers are designated by the model (concentric or eccentric), the major diameter ( $D$  or  $ID$ ) and the minor diameter ( $D_1$  or  $ID_1$ ).

### 6.1.1.4 Tees

Equal tees are designated by the diameter ( $D$  or  $ID$ ).

Reducing tees are designated by the major diameter ( $D$  or  $ID$ ), the minor diameter ( $D_1$  or  $ID_1$ ).

### 6.1.1.5 Caps

Caps are designated by the diameter ( $D$  or  $ID$ ).

## 6.1.2 Information

The following information shall be supplied by the purchaser at the time of enquiry and order:

- a) the quantity required (number of pieces);
- b) the designation of fittings (see 6.1.1) and the wall thickness  $T(T_1)$ ;
- c) the structural dimensions according to 11.1.2;
- d) the designation of the steel grade according to this European Standard;
- e) the reference to this European Standard; [SIST EN 10253-4:2008](https://standards.iteh.ai/catalog/standards/sist/e08da56e-027a-4507-be21-5f4640970b75/sist-en-10253-4-2008)
- f) the type of fitting,  $A$  or  $B$ ;
- g) seamless ( $s$ ) or welded ( $w$ ).

## 6.2 Options

A number of options are specified in this European Standard and these are listed below. In the event that the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the fittings shall be supplied in accordance with the basic specification (see 6.1).

- 1) method of manufacture of the fitting (see 8.2.1);
- 2) starting product form and /or delivery condition (see 8.2.1);
- 3) heat treatment of the fittings (see 8.2.3.1);
- 4) product analysis (see 9.2.2);
- 5) verification of impact properties at room temperature (see 9.3.1);
- 6) agreed mechanical properties at room temperature for austenitic stainless steel fittings with wall thicknesses greater than 60 mm (see Table 6);
- 7) verification of tensile properties at elevated temperature (see 9.3.2);
- 8) verification of impact properties at low temperature (see 9.3.3);
- 9) intergranular corrosion test (see 9.4);

- 10) pickling (see 10.1.9);
- 11) shot blasting, brushing or bright annealing (see 10.1.9);
- 12) pickling and passivation (see 10.1.9);
- 13) fittings are ordered with tolerance class D 3 or D 4 (see Table 8);
- 14) special ends preparation (see 11.3);
- 15) type of inspection document other than the standard document (see 12.2.1);
- 16) special test size units smaller than those specified in Table 11 (see Table 11);
- 17) verification of tensile properties on the weld at room temperature (see Table 12);
- 18) verification of impact properties transverse to the weld (see 13.2.6);
- 19) liquid penetrant examination of weld and weld ends (see 14.9.2);
- 20) liquid penetrant examination of surfaces (see 14.9.2);
- 21) ultrasonic testing of strip or plates (see 14.9.2);
- 22) additional marking (see 15.1);
- 23) special packaging (see Clause 16).

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### 6.3 Examples of an order

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#### 6.3.1 Example 1

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1000 welded elbows in accordance with this European Standard of model 3D with angle 90° and dimensions 60,3 x 2,9 not having an increased wall thickness at the body of the fitting (type A) and with a bending radius according to Annex A made of steel grade 1.4436.

**1000 elbows – w – EN 10253-4 – type A – model 3D – 90° – 60,3 x 2,9 – 1.4436.**

#### 6.3.2 Example 2

2000 seamless concentric reducers in accordance with this European Standard with dimensions 219,1 x 6,3 – 139,7 x 4,0 with an increased wall thickness at the body of the fitting (type B) and with a length according to Annex A made of steel grade X2CrNi19-11.

**2000 concentric reducers – s – EN 10253-4 – type B – 219,1 x 6,3 – 139,7 x 4,0 – X2CrNi19-11.**

#### 6.3.3 Example 3

3000 welded and pulled equal tees in accordance with this European Standard with dimension *ID* 40,0 x 2,0 not having an increased wall thickness at the body of the fitting (type A) made of steel grade 1.4301 with their surface pickled.

**3000 equal tees – w – EN 10253-4 – type A – ID 40,0 x 2,0 – 1.4301 – option 10**

## 7 Resistance to internal pressure

### 7.1 General

The resistance to internal pressure of a fitting conforming to this European Standard shall be determined according to the relevant design rules laid down in e.g. EN 13480-3 or EN 13445-3.

### 7.2 Fittings of type A

Fittings of type A have the same wall thickness at the welding ends and on the body of the fitting. Their resistance to internal pressure is less than that of a pipe with the same specified diameter, wall thickness and of the same steel grade. The determination of pressure factors and wall thickness is given in Annex B and tables of pressure factors are given in Annex C.

For reducers the wall thickness at the conical section shall be the specified wall thickness at the major end.

### 7.3 Fittings of type B

Fittings of type B have increased wall thickness at the body of the fitting. They will, in general, withstand the same internal pressure as a pipe with the same specified diameter, wall thickness and of the same steel grade.

Wall thickness requirements of this type of fittings are defined by the calculation procedures given in Annex B. For some commonly used, specified wall thicknesses the resulting wall thicknesses at the body of the fitting are listed in the tables given in Annex D.

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## 8 Manufacturing process

### 8.1 Steelmaking process

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The steelmaking process is left at the discretion of the steel manufacturer.

### 8.2 Product making process for fittings and heat treatment

#### 8.2.1 Product making process

The different allowed processes and the relevant starting product forms are listed in Table 1. The method of manufacturing is left at the discretion of the manufacturer.

The product making process shall be so applied that it will not produce injurious imperfections in the fittings.

Where tubes are used as starting material, following conditions shall apply:

- when manufacturing fittings from tubes, tubes according to EN 10216-5 (seamless) and EN 10217-7 (welded) shall be used.

Where plate/strip are used as starting material, the following conditions shall apply.

- when manufacturing fittings from plate / strip, plate / strip according to EN 10028-7 shall be used.

Where bars are used as starting material, the following conditions shall apply:

- when manufacturing fittings from bars, bars according to EN 10272 shall be used.

Table 1 — Product making process — Starting product forms <sup>a</sup>

Process	Hot deformation			Cold deformation		Machining from round bars ( DN < 50 )
	Bending <sup>b</sup>	Pressed in die <sup>c</sup>	Rolled, forged followed by machining	Bending <sup>b</sup>	Pressed in die <sup>c</sup>	
Elbows	1, 2, 4, 5	1, 2, 3, 4, 5	-	1, 2, 4, 5	1, 2, 3, 4, 5	-
Tees	-	1, 2, 3, 4, 5	4, 5	-	1, 2, 3, 4, 5	-
Reducers	-	1, 2, 3, 4, 5	4, 5	-	1, 2, 3, 4, 5	5
Caps	-	1, 2, 3, 4, 5	4, 5	-	1, 2, 3, 4, 5	5

<sup>a</sup> Starting product forms  
1 Seamless pipe  
2 Welded pipe  
3 Plate and strip  
4 Forging  
5 Bar

<sup>b</sup> When producing elbows from welded pipe, the position of the weld is at the discretion of the manufacturer.

<sup>c</sup> For these processes welding with or without filler metal may be used (see 8.2.2). When filler metal is used it shall be compatible with the parent metal.

**Option 1:** The method of manufacturing and/or details of the manufacturing process, e.g. welding operations or position of the weld before forming shall be as specified on the purchase order.

**Option 2:** The starting product form to be used and/or its delivery condition shall be as specified on the purchase order.

## 8.2.2 Welding as part of the manufacturing process of the fitting

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### 8.2.2.1 General

When producing fittings from plate or strip, welding is considered being a part of the manufacturing of fittings, the following criteria are valid:

- welding process/procedures shall be qualified in accordance with EN ISO 15614-1;
- welders and/or welding operators shall be qualified in accordance with EN 287-1 and/or EN 1418.

All welds carried out during the manufacture of the fitting shall be fusion weld type. All welds shall have complete penetration.

Local repair of weld seam which have been made with filler metal is permitted provided that the repair procedure/welders are qualified in accordance with the relevant part of the above mentioned standards.

If heat treatment is required, the repair welding shall be carried out in advance.

### 8.2.2.2 Finished joint requirement

As welded surfaces are permitted provided the surface imperfections permit proper interpretation of radiographic or other non-destructive examination.

A reduction in thickness due to the welding process is acceptable provided that the material of the joining surfaces shall not be reduced below minimum required thickness at any point.

Concavity due to the welding process on the root side of a single welded joint is permitted when the resulting thickness of the weld is at least equal to the minimum thickness of the thinner part of the parts being joined and the contour of the concavity is smooth.