British Standard

BRITISH STANDARD

BS 1449 : Section 1.7 : 1991

Steel plate, sheet and strip

Part 1. Carbon and carbon-manganese plate, sheet and strip

Section 1.7 Specification for tolerances on dimensions and shape for cold rolled wide material

Tôles, bandes et feuillards en acier
Partie 1. Tôles, bandes et feuillards en acier au carbone et au carbone-manganèse
Section 1.7 Tolérances de dimensions et de forme des produits larges laminés à froid — Spécifications

Bleche und Bänder
Teil 1. Bleche und Bänder aus unlegiertem Stahl und Manganstahl
Abschnitt 1.7 Maß- und Formtoleranzen für kaltgewalztes Breitband

BSI STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) to Technical Committee ISM/10, upon which the following bodies were represented:

British Railways Board
British Steel Industry
Cold Rolled Sections Association
Society of Motor Manufacturers and Traders Limited

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Welded Steel Tube Association
Institution of Mechanical Engineers
National Association of Steel Stockholders

This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 31 October 1991

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Contents

Foreword

This Section of BS 1449 has been prepared under the direction of the Iron and Steel Standards Policy Committee. It is a new edition of the element of BS 1449 : Part 1 : 1983 covering tolerances on dimensions and shape for cold rolled wide material. This Section of BS 1449, together with BS 1449 : Sections 1.1 to 1.6 and 1.8 to 1.15 and BS EN 10130, supersedes BS 1449 : Part 1 : 1983 which is withdrawn.

The requirements specified are technically identical to those applicable to cold rolled wide strip in section five of BS 1449 : Part 1 : 1983. This Section of BS 1449 will be withdrawn when prEN 10131 'Cold rolled and high yield strength steel flat products for cold forming. Tolerances on dimensions and shape' becomes a European Standard and is published as a British Standard.

For further explanation of this change in presentation see the foreword to BS 1449 : Section 1.1 : 1991.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This Section of BS 1449 specifies tolerances on dimensions and shape for cold rolled wide material.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Section of BS 1449, the definitions given in BS 1449 : Section 1.1 apply.

3 Tolerance on thickness

3.1 The thickness of material shall be measured at a position that complies with the appropriate requirements of table 1.

Table 1. Details of position for measurement of thickness

Nominal width of ordered material	Details of position for measurement
mm	
Up to and including 75	Not less than 10 % of the ordered width from the edge
Over 75 up to and including 600	Not less than 10 mm from the edge
Over 600 (sheared or slit edge (E2))	Not less than 15 mm from the edge
Over 600 (mill edge (E1))	Not less than 25 mm from the edge

3.2 The variation in thickness of cold rolled materials produced on wide strip mills shall be in accordance with the tolerances given in table 2.

4 Tolerance on width

The variation in the width of cold rolled materials shall be in accordance with the tolerances given in table 3.

5 Tolerance on length

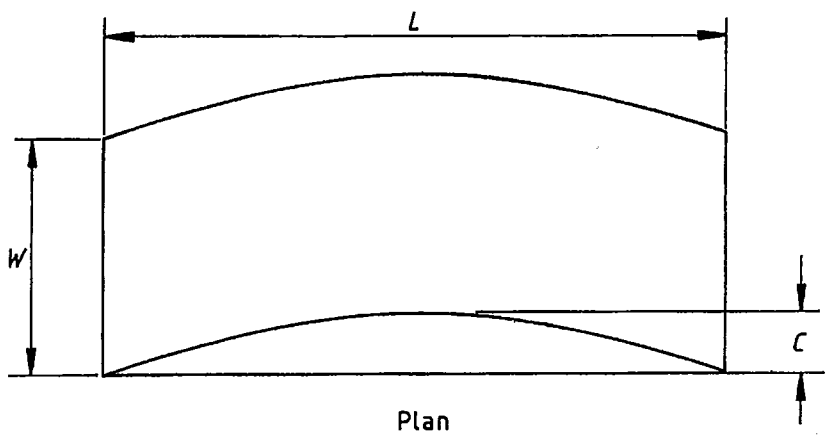
The variation in length of flat cut lengths shall not exceed the tolerances given in table 4. Tolerances on length for resheared material shall be in accordance with those given in table 4.

6 Maximum edge camber

The edge camber (i.e. lateral departure of the edge of the material from a straight line forming a chord) (see figure 1) shall not exceed the values given in table 5.

7 Maximum out-of-squareness

The out-of-squareness (i.e. the greatest deviation of an end edge from a straight line at right angles to a side and touching one corner) of material shall not exceed the tolerances given in table 6. Tolerances for out-of-squareness for resquared material shall be in accordance with those given in table 6.



Key
W is the width
L is the length
C is the edge camber

Figure 1. Edge camber

8 Maximum deviation from flatness

8.1 General

The deviation from flatness of the product shall not exceed the values given in tables 7 and 8.

8.2 Determination of flatness

Flatness shall be determined by resting the material, with the convex side uppermost, on a flat surface. The material shall not rise above the flat table by more than the maximum deviations given in **8.3** plus the thickness of material (see figure 2). If strip is required to be specially flat across the width, the maximum deviation from flatness and the method of measurement shall be agreed between manufacturer and purchaser at the time of ordering.

NOTE 1. Material that has been rotary sheared as a final operation tends to have a slight bow across the width.

NOTE 2. If strip is required specially flat across the width, this condition may be produced by further cold rolling after shearing.

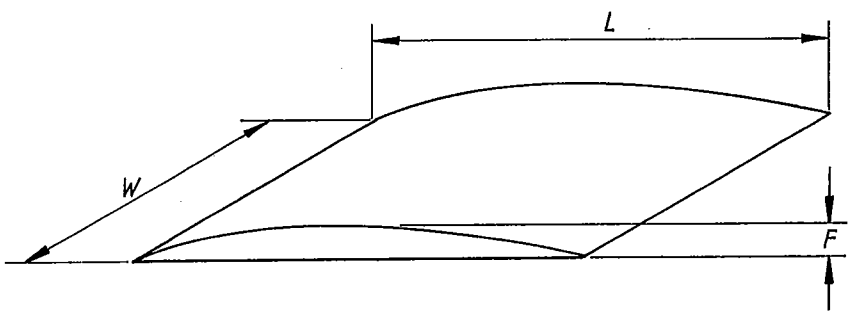
8.3 Products rolled on wide continuous mills

The deviation from flatness shall not exceed the values given in table 7 for material not specially flattened, and table 8 for material specially flattened.

Table 2. Tolerance on nominal thickness for material including products slit from wide strip

Nominal thickness		Tolerance on nominal thickness		
		Nominal width		
>	≤	≤ 1200 mm	> 1200 ≤ 1500 mm	> 1500 ≤ 1830 mm
		mm	mm	mm
—	0.40	±0.045	±0.055	—
0.40	0.60	±0.050	±0.060	—
0.60	0.80	±0.050	±0.065	±0.075
0.80	1.00	±0.065	±0.075	±0.090
1.00	1.20	±0.075	±0.090	±0.100
1.20	1.60	±0.100	±0.120	±0.125
1.60	2.00	±0.125	±0.140	±0.150
2.00	2.50	±0.150	±0.160	±0.180
2.50	3.00	±0.150	±0.180	±0.180
3.00	3.25	±0.160	±0.190	—

NOTE. If thickness is specified as a minimum with tolerances all +, the permitted variation is equal to the total tolerance. For example, a specified minimum thickness of 2.60 mm permits −0, +0.30 mm (for material ≤ 1200 mm wide) and the nominal thickness would be 2.75 mm. However where, as a result, the nominal thickness then falls within the next higher range for nominal thicknesses, the tolerances for the higher range apply; i.e. if a minimum thickness of 1.90 mm is ordered, the tolerance range would be −0, +0.30 mm (products ≤ 1200 mm wide) and the nominal thickness would be 2.05 mm.



Key
W is the width
L is the length
F is the deviation from flatness

Figure 2. Flatness of sheet and plate

Table 3. Tolerance on nominal width

Type of edge	Nominal width		Nominal thickness		Nominal length		Tolerance on nominal width
	Over	Up to and including	Over	Up to and including	Over	Up to and including	
	mm	mm	mm	mm	mm	mm	mm
Mill edge	—	1200	—	3.20	All lengths including strip		−0 +3
	1200	1500	—	3.20			−0 +5
	1500	1830	—	3.20			−0 +6
Sheared edge	All widths		—	3.20	—	3000	−0 +1.6
			—	3.20	3000	—	−0 +3.0
			—	3.20		Strip	−0 +1.6

NOTE. For slit wide strip, material with closer tolerances may be supplied by agreement between manufacturer and purchaser at the time of ordering.

Table 4. Tolerance on nominal length for material supplied in cut lengths, including products slit from wide strip

Nominal length		Nominal width		Nominal thickness		Tolerance on nominal length
Over	Up to and including	Over	Up to and including	Over	Up to and including	
Material ordered not resheared						
mm	mm	mm	mm			mm
—	3000	—	600	All thicknesses		−0 +25
				mm	mm	
—	3000	All widths over 600		—	3.0	−0 +6.0
3000	—	All widths over 600		—	3.0	−0 +¼ %
Material ordered resheared						
mm	mm			mm	mm	mm
—	3000			—	3.0	−0 +1.6
—	3000	All widths		3.0	—	−0 +5.0
3000	—			—	3.0	−0 +3.0

Table 5. Maximum edge camber for mill edge and sheared edge material[1)]

Nominal width	Nominal thickness	Maximum edge camber in any 6000 mm length
		mm
All widths rolled on wide mills	All thicknesses	25

[1)]See figure 1.

NOTE. Where it is not practicable to measure over these lengths, equivalent tolerances can be calculated from the following equation and rounded to the next higher millimetre (see example).

$$\text{New tolerance} = \frac{(\text{non-standard length})^2}{(\text{standard length})^2} \times \text{tolerance in table 5}$$

Example. To find tolerance for material

1200 mm wide × 2000 mm long × 3 mm thick:

$$\text{New tolerance on edge camber} = \frac{(2000)^2}{(6000)^2} \times 25 = 2.78$$

which should be rounded to 3.00 mm.

Table 6. Maximum out-of-squareness of width

Nominal length	Nominal width	Nominal thickness	Maximum out-of squareness per 150 mm of nominal width or fraction thereof
Material not resquared			
mm	mm		mm
All lengths	All widths	All thicknesses	1.5 max.
Resquared material			**Maximum out-of-squareness on full width of sheet**
mm	mm		mm
Up to and including 3000	Up to and including 1200	All thicknesses	1.5 max.
	Over 1200		3.0 max.
Over 3000	All widths		3.0 max.

Table 7. Maximum deviation from flatness for material not specially flattened[1)]

Nominal thickness		Nominal width		Nominal length		Maximum deviation from flatness
Over	Up to and including	Over	Up to and including	Over	Up to and including	
mm	mm	mm	mm	mm	mm	mm
—	1.20	—	1200	2000	5000	10
—	1.20	1200	1500	2000	5000	16
—	1.20	1500	1830	2000	5000	19
1.20	—	—	600	2000	5000	10
1.20	—	600	1500	2000	5000	10
1.20	—	1500	1830	2000	5000	16

[1)]See figure 2.

NOTE 1. This table does not apply to material supplied as strip or to either sheet or plate produced to higher tensile ranges (i.e. those in BS 1449 : Section 1.5) or to annealed (A) sheet or plate. For the last category, flatness tolerances are by agreement between the manufacturer and the purchaser.

NOTE 2. Material in lengths less than 2000 mm ordered not specially flattened should have flatness tolerances agreed between the manufacturer and the purchaser.

NOTE 3. Material rotary sheared as a final operation tends to have a slight bow across the width. If strip is required specially flat across the width, this condition can be produced by further cold rolling after shearing. In such cases, the degree of flatness and method of measuring should be agreed between the manufacturer and purchaser.

Table 8. Maximum deviation from flatness for specially flattened material[1)]

Nominal thickness		Nominal width		Nominal length		Maximum deviation from flatness
Over	Up to and including	Over	Up to and including	Over	Up to and including	
mm	mm	mm	mm	mm	mm	mm
		All widths				
—	0.80	≥ 600		—	5000	6
0.80	3.00	600	1200	—	2500	3
0.80	3.00	600	1200	2500	5000	6
0.80	3.00	1200	—	—	5000	6
All thicknesses		All widths		5000	—	By agreement between manufacturer and purchaser

[1)]See figure 2.

NOTE 1. This table does not apply to material supplied in coil or to either sheet or plate produced to higher tensile ranges (i.e. those in BS 1449 : Section 1.5) or to annealed (A) sheet or plate. For these categories, except material supplied in coil flatness tolerances are by agreement between the manufacturer and the purchaser.

NOTE 2. Material, rotary sheared as a final operation, tends to have a slight bow across the width. If strip is required specially flat across the width, this condition can be produced by further cold rolling after shearing. In such cases, the degree of flatness and method of measuring should be agreed between the manufacturer and the purchaser.

NOTE 3. Specially flattened material ordered not resquared or with ends not resheared may show entry or grip marks.

Publication(s) referred to

BS 1449	Steel plate, sheet and strip Section 1.1 General specification Section 1.5 Specification for cold rolled wide material based on specified minimum strength
prEN 10131[1)]	Cold rolled and high yield strength steel flat products for cold forming. Tolerances on dimensions and shape

[1)]Referred to in the foreword only.

BS 1449 : Section 1.7 : 1991

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