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# Dimensions, mass and permissible variations of hot rolled steel sections

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Descriptors : dimensions, size, quantity, tolerances (measurement), mechanical tolerances, material-deforming processes, rolling, metal sections, steels, wrought steels, shape

Reference number : JIS G 3192 : 2000 (E)

## Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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the original JIS is to be the final authority.



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# Dimensions, mass and permissible variations of hot rolled steel sections

**Introduction** Annexes to this Standard have been prepared based on the parts of the first edition of **ISO 657**, *Hot-rolled steel sections* published in 1987 as noted in Remarks of clause **1 Scope** without change of technical contents, and items described in the former Standard have been specified in the text of this Standard.

## 1 Scope

**1.1** This Japanese Industrial Standard specifies the dimensions, mass and their tolerances of hot rolled steel sections as well as the appearance, shapes and permissible variations thereof.

**1.2** The scope of this Standard and the choice of specified items in this Standard shall be specified in respective product standards or in accordance with the agreement between the purchaser and the supplier.

Unless otherwise specified, the text of this Standard shall be applied, however, the Annexes may be applied in place of the text according to the agreement between the purchaser and the supplier.

Remarks: The corresponding International Standards to this Standard are as follows:

ISO 657-1 : 1989 *Hot-rolled steel sections —Part 1 : Equal-leg angles —Dimensions*

ISO 657-2 : 1989 *Hot-rolled steel sections — Part 2 : Unequal-leg angles — Dimensions*

ISO 657-5 : 1976 *Hot-rolled steel sections —Part 5 : Equal-leg angles and unequal-leg angles —Tolerances for metric and inch series*

ISO 657-11 : 1980 *Hot-rolled steel sections — Part 11 : Sloping flange channel sections (metric series) —Dimensions and sectional properties*

ISO 657-13 : 1981 *Hot-rolled steel sections —Part 13 : Tolerances on sloping flange beam, column and channel sections*

ISO 657-15 : 1980 *Hot-rolled steel sections —Part 15 : Sloping flange beam sections (metric series) —Dimensions and sectional properties*

ISO 657-16 : 1980 *Hot-rolled steel sections —Part 16 : Sloping flange column sections (metric series) —Dimensions and sectional properties*

ISO 657-18 : 1980 *Hot-rolled steel sections —Part 18 : L sections for shipbuilding (metric series) —Dimensions, sectional properties and tolerances*

ISO 657-19 : 1980 *Hot-rolled steel sections —Part 19 : Bulb flats (metric series) — Dimensions, sectional properties and tolerances*

ISO 657-21 : 1983 *Hot-rolled steel sections —Part 21 : T-sections with equal depth and flange width —Dimensions*

**2 Normative references** The following standard contains provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent edition of the standard indicated below shall be applied.

JIS Z 8401 *Guide to the rounding of numbers*

**3 Sectional shape and classification** The sectional shapes of the steel sections and their classification shall be as given in **Table 1**.

**Table 1 Sectional shape of steel sections and classification**

| Classification | | Sectional shape diagram |
|---|---|---|
| Angles | Equal legs |  |
| | Unequal legs |  |
| | Unequal legs and unequal thickness |  |
| I-sections | |  |
| Channels | |  |
| Bulb flats | |  |
| T-sections | |  |
| H-sections | |  |

**4 Expression of size** The size of the steel sections shall be expressed by each sectional dimension in millimetre and the length in metre.

**5 Standard dimensions** The standard dimensions shall be as follows:

a) The standard sectional dimensions of the steel sections shall be as given in **Attached Tables 1** to **8**.

b) The standard lengths of the steel sections shall be as given in **Table 2**.

**Table 2 Standard length**

Unit: m

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 | 6.5 | 7.0 | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 |

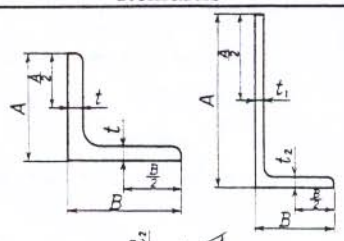
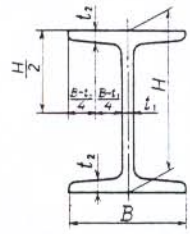
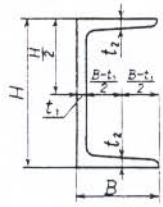
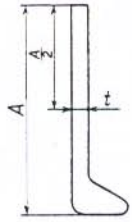
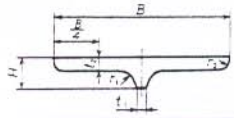
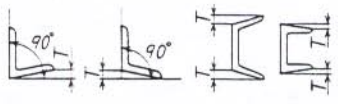
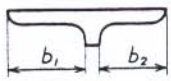
**6 Shape and dimensional tolerances** The shape and dimensional tolerances of the steel sections shall be as follows. The tolerances of the steel sections other than those specified in **a**) and **b**) shall be agreed upon between the purchaser and the supplier.

a) The shapes and dimensional tolerances of the angles, I-sections, channels, bulb flats and T-sections shall be as given in **Table 3**.

b) The shape and dimensional tolerances of the H-sections shall be as given in **Table 4**. The tolerances on squareness, however, shall be applied on the request of the purchaser.

Table 3 Shapes and dimensional tolerances of angles, I sections, channels, bulb flats and T sections

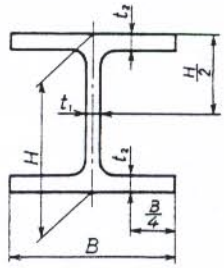
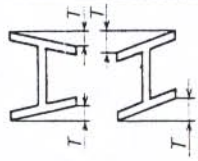
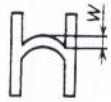
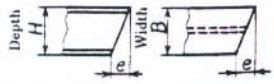
Unit: mm

| Division and dimension | | | Tolerance | Remarks |
|---|---|---|---|---|
| Leg length ($A$ or $B$) | Under 50 | | ± 1.5 |  |
| | 50 or over to and excl. 100 | | ± 2.0 | |
| | 100 or over to and excl. 200 | | ± 3.0 | |
| | 200 or over | | ± 4.0 | |
| Depth ($H$) | Under 100 | | ± 1.5 | |
| | 100 or over to and excl. 200 | | ± 2.0 | |
| | 200 or over to and excl. 400 | | ± 3.0 | |
| | 400 or over | | ± 4.0 | |
| Thickness ($t$, $t_1$, $t_2$) | For leg length $A$ ($B$ for T section) or under 130 in depth | Under 6.3 | ± 0.6 |  |
| | | 6.3 or over to and excl. 10 | ± 0.7 | |
| | | 10 or over to and excl. 16 | ± 0.8 | |
| | | 16 or over | ± 1.0 | |
| | For leg length $A$ ($B$ for T section) or 130 or over in depth | Under 6.3 | ± 0.7 |  |
| | | 6.3 or over to and excl. 10 | ± 0.8 | |
| | | 10 or over to and excl. 16 | ± 1.0 | |
| | | 16 or over to and excl. 25 | ± 1.2 | |
| | | 25 or over | ± 1.5 | |
| Length | 7 m or under | | + 40<br>0 |  |
| | Over 7 m | | Add 5 mm to the plus side tolerance given in the above column for every 1 m increase in lengths or its fraction. |  |
| Out-of-square ($T$) | I section | | 2.0 % or under of width $B$ |  |
| | Sections excluding I and T sections | | 2.5 % or under of width $B$ | |
| Bend | I and T sections | | 0.20 % or under of length | To be applied to bend such as sweep and camber. |
| | Sections excluding I and T sections | | 0.30 % or under of length | |
| Eccentricity ($S$) | 300 or under in width $B$ | T section | ± 3.0 | $S=\frac{b_1-b_2}{2}$  |

Remarks: The purchaser may designate that the out-of-square shall be 2 % or under of the leg length for equal leg angles 200 mm or more in leg length.

Table 4 Shapes and dimensional tolerances of H-sections

Unit: mm

| Division and dimension | | | Tolerance | Remarks |
|---|---|---|---|---|
| Width ($B$) | | Under 100 in nominal width | ± 2.0 |  |
| | | 100 or over to and excl. 200 in nominal width | ± 2.5 | |
| | | 200 or over in nominal width | ± 3.0 | |
| Depth ($H$) | | Under 400 in nominal depth | ± 2.0 | |
| | | 400 or over to and excl. 600 in noinal depth | ± 3.0 | |
| | | 600 or over in nominal depth | ± 4.0 | |
| Thickness | Flange ($t_2$) | Under 16 | ± 1.0 | |
| | | 16 or over to and excl. 25 | ± 1.5 | |
| | | 25 or over to and excl. 40 | ± 1.7 | |
| | | 40 or over | ± 2.0 | |
| | Web ($t_1$) | Under 16 | ± 0.7 | |
| | | 16 or over to and excl. 25 | ± 1.0 | |
| | | 25 or over to and excl. 40 | ± 1.5 | |
| | | 40 or over | ± 2.0 | |
| Length | | 7 m or under | + 40<br>0 | |
| | | Over 7 m | Add 5 mm to the plus side tolerance given in the above column for every 1 m increase in length or its fraction. | |
| Out-of-Square ($T$) | | 300 or under in nominal depth | 1.0 % or under of width $B$, provided that 1.5 mm is the minimum. |  |
| | | Over 300 in nominal depth | 1.2% or under of width $B$, provided that 1.5 mm is the minimum. | |
| Bend | | 300 or under in nominal depth | 0.15 % or under of length | To be applied to bend such as sweep and camber. |
| | | Over 300 in nominal depth | 0.10 % or under of length | |
| Eccentricity ($S$) | | 300 or under in nominal depth and 200 or under in nominal width | ± 2.5 | $S=\frac{b_1-b_2}{2}$  |
| | | Over 300 in nominal depth or over 200 in nominal width | ± 3.5 | |
| Concavity of web ($W$) | | Under 400 in nominal depth | 2.0 |  |
| | | 400 or over to and excl. 600 in nominal depth | 2.5 | |
| | | 600 or over in nominal depth | 3.0 | |
| Sectional squareness ($e$) | | | 1.6 % or under of width $B$ or of depth $H$, provided that 3.0 mm is the minimum. |  |

**7 Mass** The mass of the steel sections shall be as follows:

a) The mass of the steel sections shall, as a rule, be expressed by theoretical mass in kilogram.

b) The method for calculation of mass of the steel sections shall be in accordance with **Table 5** based on the nominal dimensions.

c) The sectional area and unit mass of the steel sections obtained in terms of the standard sectional dimension in accordance with **b)** are as shown in **Attached Tables 1** to **8**. Besides the sectional area and unit mass, **Attached Tables 1** to **8** show the position of gravity center, the geometrical moment of inertia, the radius of gyration of area and the modulus of sections for informative reference.

**Table 5 Method for calculation of mass**

| Calculating step | Calculation method | Number of figures in calculated result |
|---|---|---|
| Basic mass<br>kg/cm$^2$ · m | 0.785 (mass per cm$^2$ sectional area, per metre length) | — |
| Sectional area<br>cm$^2$ | The values calculated by the following formulas shall be multiplied by 1/100.<br>For equal leg angles<br>$t\,(2A-t) + 0.215\,(r_1^2-2r_2^2)$<br>For unequal leg angles<br>$t\,(A+B-t) + 0.215\,(r_1^2-2r_2^2)$<br>For unequal leg and unequal thickness angles<br>$At_1 + t_2\,(B-t_1) + 0.215\,(r_1^2-r_2^2)$<br>For I-sections<br>$Ht_1 + 2t_2\,(B-t_1) + 0.615\,(r_1^2-r_2^2)$<br>For channels<br>$Ht_1 + 2t_2\,(B-t_1) + 0.349\,(r_1^2-r_2^2)$<br>For bulb flats<br>$At + dr_1 - 0.289d\,(2r_1 + d) - 0.215\,(r_1^2 + r_2^2)$<br>For T-sections<br>$Bt_2 + 0.307r_1^2 + 482.6$<br>For H-sections<br>$t_1\,(H-2t_2) + 2Bt_2 + 0.858r^2$ | Round off to 4 significant figures. |
| Unit mass<br>kg/m | Basic mass (kg/cm$^2$ · m) × sectional area (cm$^2$) | Round off to 3 significant figures. For those exceeding 1 000 kg, round off to integer in kg. |
| Mass of single piece<br>kg | Unit mass (kg/m) × length (m) | Round off to 3 significant figures. For those exceeding 1 000 kg, round off to integer in kg. |
| Total mass<br>kg | Mass of single piece (kg) × total number of pieces of the same size | Round off to integer in kg. |

Remarks 1 The calculation method for the sectional area of the steel sections other than those given in **Table 5** shall be agreed upon between the purchaser and supplier.

2 The symbols which are used for the calculation of the sectional area stand for the sectional dimensions of the steel section, and the relation of the symbols to the respective parts of the section is shown in **Attached Tables 1** to 8.

3 The rounding off of the numerical values shall be in accordance with **JIS Z 8401**.

**8 Tolerance on mass** When the mass tolerances for steel sections are designated by the purchaser, they shall conform to **Table 6**. In this case, the tolerances on mass shall be expressed by the quotient in percentage that the difference between the theoretical mass and actual mass is divided by the theoretical mass.

**Table 6 Tolerances on mass**

| Thickness | Tolerance | Remarks |
|---|---|---|
| Under 10 mm | ± 5 % | (1) Thicker nominal values shall be applied<br>(2) To be applied to one lot of the same size (1 t or over). When the number of pieces corresponding to 1 t does not amount to 10, it shall be applied to each lot of 10 or more pieces. |
| 10 mm or over | ± 4 % | |

**9 Appearance** The appearance of the steel sections shall be as follows:

a) The steel sections shall be free form defects that are detrimental to practical use.

b) In the case where there are some harmful defects on the surface of the steel sections, the manufacturer may remove or repair the defects by grinding or welding. In this case, the operation shall be as follows:

1) **Conditioning with grinder**

1.1) The sectional dimensions of the steel sections after conditioning shall fall within the range of the tolerances. When approved by the purchaser, however, this restriction may be applied flexibly according to its application.

1.2) The conditioned parts of the steel sections shall be finished neatly, and the boundary between the repaired portions and as rolled surface shall be smoothly finished.

2) **Repair by welding**

2.1) The harmful defects of the steel sections shall be repaired by welded overlay after complete removal by means of appropriate method such as chipping or grinding.

2.2) The depth of the defect-removed portion previous to repair by welding shall be not more 30 % of the nominal thickness. For the toe of the flange of the steel sections, however, the depth shall fall within the nominal thickness of the flange from the edge (12 mm max.).

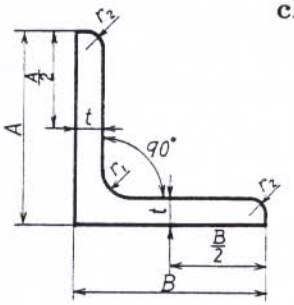
2.3) The repaired area by welding shall fall within 2 % of the whole surface area of the steel sections.

2.4) The weld repairing shall be carried out by suitable means according to the kind of steel products.

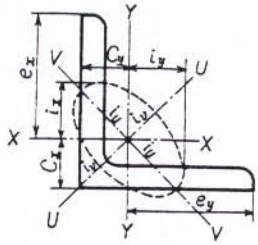
2.5) The welded part of the steel sections shall be free from undercut or overlaps around the fringe of welds. The reinforcement of weld shall be at least 1.5 mm in height from the rolled surface, and this shall be removed by chipping, grinding, etc. and neatly finished as high as the rolled surface.

2.6) The heat-treated steel sections themselves shall be heat-treated once again after the repair by welding.

## Attached Table 1 Standard sectional dimensions of equal leg angles and their sectional area, unit mass and sectional characteristics




Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)



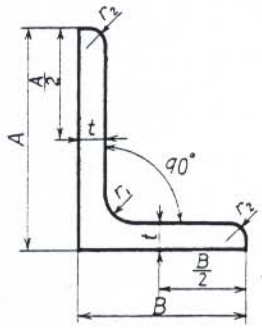

| Standard sectional dimension mm | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | | | Radius of gyration of area cm | | | | Modulus of section cm³ | |
| $A\times B$ | $t$ | $r_1$ | $r_2$ | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | Maximum $I_u$ | Minimum $I_v$ | $i_x$ | $i_y$ | Maximum $i_u$ | Minimum $i_v$ | $Z_x$ | $Z_y$ |
| 25× 25 | 3 | 4 | 2 | 1.427 | 1.12 | 0.719 | 0.719 | 0.797 | 0.797 | 1.26 | 0.332 | 0.747 | 0.747 | 0.940 | 0.483 | 0.448 | 0.448 |
| 30× 30 | 3 | 4 | 2 | 1.727 | 1.36 | 0.844 | 0.844 | 1.42 | 1.42 | 2.26 | 0.590 | 0.908 | 0.908 | 1.14 | 0.585 | 0.661 | 0.661 |
| 40× 40 | 3 | 4.5 | 2 | 2.336 | 1.83 | 1.09 | 1.09 | 3.53 | 3.53 | 5.60 | 1.46 | 1.23 | 1.23 | 1.55 | 0.790 | 1.21 | 1.21 |
| 40× 40 | 5 | 4.5 | 3 | 3.755 | 2.95 | 1.17 | 1.17 | 5.42 | 5.42 | 8.59 | 2.25 | 1.20 | 1.20 | 1.51 | 0.774 | 1.91 | 1.91 |
| 45× 45 | 4 | 6.5 | 3 | 3.492 | 2.74 | 1.24 | 1.24 | 6.50 | 6.50 | 10.3 | 2.70 | 1.36 | 1.36 | 1.72 | 0.880 | 2.00 | 2.00 |
| 45× 45 | 5 | 6.5 | 3 | 4.302 | 3.38 | 1.28 | 1.28 | 7.91 | 7.91 | 12.5 | 3.29 | 1.36 | 1.36 | 1.71 | 0.874 | 2.46 | 2.46 |
| 50× 50 | 4 | 6.5 | 3 | 3.892 | 3.06 | 1.37 | 1.37 | 9.06 | 9.06 | 14.4 | 3.76 | 1.53 | 1.53 | 1.92 | 0.983 | 2.49 | 2.49 |
| 50× 50 | 5 | 6.5 | 3 | 4.802 | 3.77 | 1.41 | 1.41 | 11.1 | 11.1 | 17.5 | 4.58 | 1.52 | 1.52 | 1.91 | 0.976 | 3.08 | 3.08 |
| 50× 50 | 6 | 6.5 | 4.5 | 5.644 | 4.43 | 1.44 | 1.44 | 12.6 | 12.6 | 20.0 | 5.23 | 1.50 | 1.50 | 1.88 | 0.963 | 3.55 | 3.55 |
| 60× 60 | 4 | 6.5 | 3 | 4.692 | 3.68 | 1.61 | 1.61 | 16.0 | 16.0 | 25.4 | 6.62 | 1.85 | 1.85 | 2.33 | 1.19 | 3.66 | 3.66 |
| 60× 60 | 5 | 6.5 | 3 | 5.802 | 4.55 | 1.66 | 1.66 | 19.6 | 19.6 | 31.2 | 8.09 | 1.84 | 1.84 | 2.32 | 1.18 | 4.52 | 4.52 |
| 65× 65 | 5 | 8.5 | 3 | 6.367 | 5.00 | 1.77 | 1.77 | 25.3 | 25.3 | 40.1 | 10.5 | 1.99 | 1.99 | 2.51 | 1.28 | 5.35 | 5.35 |
| 65× 65 | 6 | 8.5 | 4 | 7.527 | 5.91 | 1.81 | 1.81 | 29.4 | 29.4 | 46.6 | 12.2 | 1.98 | 1.98 | 2.49 | 1.27 | 6.26 | 6.26 |
| 65× 65 | 8 | 8.5 | 6 | 9.761 | 7.66 | 1.88 | 1.88 | 36.8 | 36.8 | 58.3 | 15.3 | 1.94 | 1.94 | 2.44 | 1.25 | 7.96 | 7.96 |
| 70× 70 | 6 | 8.5 | 4 | 8.127 | 6.38 | 1.93 | 1.93 | 37.1 | 37.1 | 58.9 | 15.3 | 2.14 | 2.14 | 2.69 | 1.37 | 7.33 | 7.33 |
| 75× 75 | 6 | 8.5 | 4 | 8.727 | 6.85 | 2.06 | 2.06 | 46.1 | 46.1 | 73.2 | 19.0 | 2.30 | 2.30 | 2.90 | 1.48 | 8.47 | 8.47 |
| 75× 75 | 9 | 8.5 | 6 | 12.69 | 9.96 | 2.17 | 2.17 | 64.4 | 64.4 | 102 | 26.7 | 2.25 | 2.25 | 2.84 | 1.45 | 12.1 | 12.1 |
| 75× 75 | 12 | 8.5 | 6 | 16.56 | 13.0 | 2.29 | 2.29 | 81.9 | 81.9 | 129 | 34.5 | 2.22 | 2.22 | 2.79 | 1.44 | 15.7 | 15.7 |
| 80× 80 | 6 | 8.5 | 4 | 9.327 | 7.32 | 2.18 | 2.18 | 56.4 | 56.4 | 89.6 | 23.2 | 2.46 | 2.46 | 3.10 | 1.58 | 9.70 | 9.70 |
| 90× 90 | 6 | 10 | 5 | 10.55 | 8.28 | 2.42 | 2.42 | 80.7 | 80.7 | 128 | 33.4 | 2.77 | 2.77 | 3.48 | 1.78 | 12.3 | 12.3 |
| 90× 90 | 7 | 10 | 5 | 12.22 | 9.59 | 2.46 | 2.46 | 93.0 | 93.0 | 148 | 38.3 | 2.76 | 2.76 | 3.48 | 1.77 | 14.2 | 14.2 |
| 90× 90 | 10 | 10 | 7 | 17.00 | 13.3 | 2.57 | 2.57 | 125 | 125 | 199 | 51.7 | 2.71 | 2.71 | 3.42 | 1.74 | 19.5 | 19.5 |
| 90× 90 | 13 | 10 | 7 | 21.71 | 17.0 | 2.69 | 2.69 | 156 | 156 | 248 | 65.3 | 2.68 | 2.68 | 3.38 | 1.73 | 24.8 | 24.8 |
| 100×100 | 7 | 10 | 5 | 13.62 | 10.7 | 2.71 | 2.71 | 129 | 129 | 205 | 53.2 | 3.08 | 3.08 | 3.88 | 1.98 | 17.7 | 17.7 |
| 100×100 | 10 | 10 | 7 | 19.00 | 14.9 | 2.82 | 2.82 | 175 | 175 | 278 | 72.0 | 3.04 | 3.04 | 3.83 | 1.95 | 24.4 | 24.4 |
| 100×100 | 13 | 10 | 7 | 24.31 | 19.1 | 2.94 | 2.94 | 220 | 220 | 348 | 91.1 | 3.00 | 3.00 | 3.78 | 1.94 | 31.1 | 31.1 |
| 120×120 | 8 | 12 | 5 | 18.76 | 14.7 | 3.24 | 3.24 | 258 | 258 | 410 | 106 | 3.71 | 3.71 | 4.67 | 2.38 | 29.5 | 29.5 |

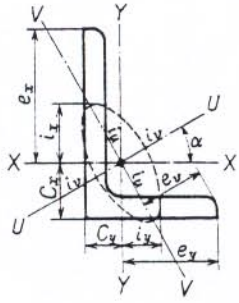
**Attached Table 1 Standard sectional dimensions of equal leg angles and their sectional area, unit mass and sectional characteristics** (concluded)

| Standard sectional dimension mm | | | | Sectional area $cm^2$ | Unit mass kg/m | Informative reference | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Position of center of gravity cm | | Geometrical moment of inertia $cm^4$ | | | | Radius of gyration of area cm | | | | Modulus of section $cm^3$ | |
| $A \times B$ | $t$ | $r_1$ | $r_2$ | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | Maximum $I_u$ | Minimum $I_v$ | $i_x$ | $i_y$ | Maximum $i_u$ | Minimum $i_v$ | $Z_x$ | $Z_y$ |
| 130×130 | 9 | 12 | 6 | 22.74 | 17.9 | 3.53 | 3.53 | 366 | 366 | 583 | 150 | 4.01 | 4.01 | 5.06 | 2.57 | 38.7 | 38.7 |
| 130×130 | 12 | 12 | 8.5 | 29.76 | 23.4 | 3.64 | 3.64 | 467 | 467 | 743 | 192 | 3.96 | 3.96 | 5.00 | 2.54 | 49.9 | 49.9 |
| 130×130 | 15 | 12 | 8.5 | 36.75 | 28.8 | 3.76 | 3.76 | 568 | 568 | 902 | 234 | 3.93 | 3.93 | 4.95 | 2.53 | 61.5 | 61.5 |
| 150×150 | 12 | 14 | 7 | 34.77 | 27.3 | 4.14 | 4.14 | 740 | 740 | 1 180 | 304 | 4.61 | 4.61 | 5.82 | 2.96 | 68.1 | 68.1 |
| 150×150 | 15 | 14 | 10 | 42.74 | 33.6 | 4.24 | 4.24 | 888 | 888 | 1 410 | 365 | 4.56 | 4.56 | 5.75 | 2.92 | 82.6 | 82.6 |
| 150×150 | 19 | 14 | 10 | 53.38 | 41.9 | 4.40 | 4.40 | 1 090 | 1 090 | 1 730 | 451 | 4.52 | 4.52 | 5.69 | 2.91 | 103 | 103 |
| 175×175 | 12 | 15 | 11 | 40.52 | 31.8 | 4.73 | 4.73 | 1 170 | 1 170 | 1 860 | 480 | 5.38 | 5.38 | 6.78 | 3.44 | 91.8 | 91.8 |
| 175×175 | 15 | 15 | 11 | 50.21 | 39.4 | 4.85 | 4.85 | 1 440 | 1 440 | 2 290 | 589 | 5.35 | 5.35 | 6.75 | 3.42 | 114 | 114 |
| 200×200 | 15 | 17 | 12 | 57.75 | 45.3 | 5.46 | 5.46 | 2 180 | 2 180 | 3 470 | 891 | 6.14 | 6.14 | 7.75 | 3.93 | 150 | 150 |
| 200×200 | 20 | 17 | 12 | 76.00 | 59.7 | 5.67 | 5.67 | 2 820 | 2 820 | 4 490 | 1 160 | 6.09 | 6.09 | 7.68 | 3.90 | 197 | 197 |
| 200×200 | 25 | 17 | 12 | 93.75 | 73.6 | 5.86 | 5.86 | 3 420 | 3 420 | 5 420 | 1 410 | 6.04 | 6.04 | 7.61 | 3.88 | 242 | 242 |
| 250×250 | 25 | 24 | 12 | 119.4 | 93.7 | 7.10 | 7.10 | 6 950 | 6 950 | 11 000 | 2 860 | 7.63 | 7.63 | 9.62 | 4.90 | 388 | 388 |
| 250×250 | 35 | 24 | 18 | 162.6 | 128 | 7.45 | 7.45 | 9 110 | 9 110 | 14 400 | 3 790 | 7.49 | 7.49 | 9.42 | 4.83 | 519 | 519 |

## Attached Table 2 Standard sectional dimensions of unequal leg angles and their sectional area, unit mass and sectional characteristics

Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)

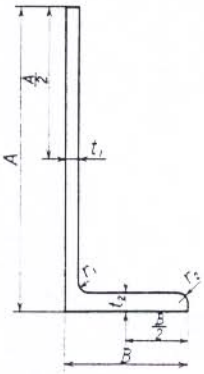


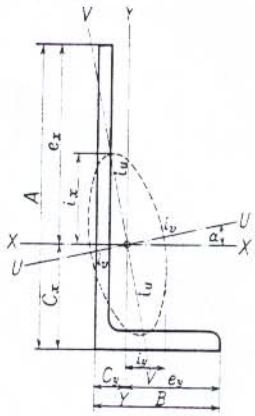




| Standard sectional dimension mm | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A\times B$ | $t$ | $r_1$ | $r_2$ | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | | | Radius of gyration of area cm | | | | tan $\alpha$ | Modulus of section cm³ | |
| | | | | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | Maximum $I_u$ | Minimum $I_v$ | $i_x$ | $i_y$ | Maximum $i_u$ | Minimum $i_v$ | | $Z_x$ | $Z_y$ |
| 90× 75 | 9 | 8.5 | 6 | 14.04 | 11.0 | 2.75 | 2.00 | 109 | 68.1 | 143 | 34.1 | 2.78 | 2.20 | 3.19 | 1.56 | 0.676 | 17.4 | 12.4 |
| 100× 75 | 7 | 10 | 5 | 11.87 | 9.32 | 3.06 | 1.83 | 118 | 56.9 | 144 | 30.8 | 3.15 | 2.19 | 3.49 | 1.61 | 0.548 | 17.0 | 10.0 |
| 100× 75 | 10 | 10 | 7 | 16.50 | 13.0 | 3.17 | 1.94 | 159 | 76.1 | 194 | 41.3 | 3.11 | 2.15 | 3.43 | 1.58 | 0.543 | 23.3 | 13.7 |
| 125× 75 | 7 | 10 | 5 | 13.62 | 10.7 | 4.10 | 1.64 | 219 | 60.4 | 243 | 36.4 | 4.01 | 2.11 | 4.23 | 1.64 | 0.362 | 26.1 | 10.3 |
| 125× 75 | 10 | 10 | 7 | 19.00 | 14.9 | 4.22 | 1.75 | 299 | 80.8 | 330 | 49.0 | 3.96 | 2.06 | 4.17 | 1.61 | 0.357 | 36.1 | 14.1 |
| 125× 75 | 13 | 10 | 7 | 24.31 | 19.1 | 4.35 | 1.87 | 376 | 101 | 415 | 61.9 | 3.93 | 2.04 | 4.13 | 1.60 | 0.352 | 46.1 | 17.9 |
| 125× 90 | 10 | 10 | 7 | 20.50 | 16.1 | 3.95 | 2.22 | 318 | 138 | 380 | 76.2 | 3.94 | 2.59 | 4.30 | 1.93 | 0.505 | 37.2 | 20.3 |
| 125× 90 | 13 | 10 | 7 | 26.26 | 20.6 | 4.07 | 2.34 | 401 | 173 | 477 | 96.3 | 3.91 | 2.57 | 4.26 | 1.91 | 0.501 | 47.5 | 25.9 |
| 150× 90 | 9 | 12 | 6 | 20.94 | 16.4 | 4.95 | 1.99 | 485 | 133 | 537 | 80.4 | 4.81 | 2.52 | 5.06 | 1.96 | 0.361 | 48.2 | 19.0 |
| 150× 90 | 12 | 12 | 8.5 | 27.36 | 21.5 | 5.07 | 2.10 | 619 | 167 | 685 | 102 | 4.76 | 2.47 | 5.00 | 1.93 | 0.357 | 62.3 | 24.3 |
| 150×100 | 9 | 12 | 6 | 21.84 | 17.1 | 4.76 | 2.30 | 502 | 181 | 579 | 104 | 4.79 | 2.88 | 5.15 | 2.18 | 0.439 | 49.1 | 23.5 |
| 150×100 | 12 | 12 | 8.5 | 28.56 | 22.4 | 4.88 | 2.41 | 642 | 228 | 738 | 132 | 4.74 | 2.83 | 5.09 | 2.15 | 0.435 | 63.4 | 30.1 |
| 150×100 | 15 | 12 | 8.5 | 35.25 | 27.7 | 5.00 | 2.53 | 782 | 276 | 897 | 161 | 4.71 | 2.80 | 5.04 | 2.14 | 0.431 | 78.2 | 37.0 |

## Attached Table 3 Standard sectional dimensions of unequal leg and unequal thickness angles and their sectional area, unit mass and sectional characteristics

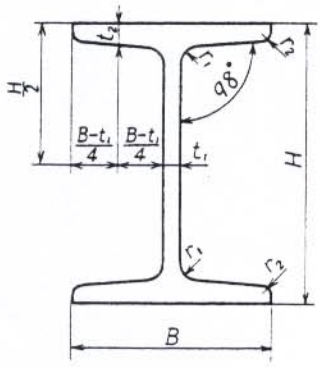
Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)



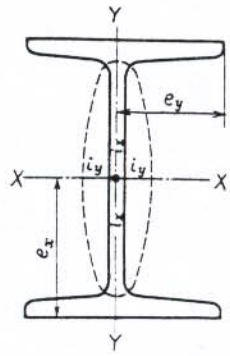


| Standard sectional dimension mm | | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A\times B$ | $t_1$ | $t_2$ | $r_1$ | $r_2$ | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | | | Radius of gyration of area cm | | | | tan $\alpha$ | Modulus of section cm³ | |
| | | | | | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | Maximum $I_u$ | Minimum $I_v$ | $i_x$ | $i_y$ | Maximum $i_u$ | Minimum $i_v$ | | $Z_x$ | $Z_y$ |
| 200× 90 | 9 | 14 | 14 | 7 | 29.66 | 23.3 | 6.36 | 2.15 | 1 210 | 200 | 1 290 | 125 | 6.39 | 2.60 | 6.58 | 2.05 | 0.263 | 88.7 | 29.2 |
| 250× 90 | 10 | 15 | 17 | 8.5 | 37.47 | 29.4 | 8.61 | 1.92 | 2 440 | 223 | 2 520 | 147 | 8.08 | 2.44 | 8.20 | 1.98 | 0.182 | 149 | 31.5 |
| 250× 90 | 12 | 16 | 17 | 8.5 | 42.95 | 33.7 | 8.99 | 1.89 | 2 790 | 238 | 2 870 | 160 | 8.07 | 2.35 | 8.18 | 1.93 | 0.173 | 174 | 33.5 |
| 300× 90 | 11 | 16 | 19 | 9.5 | 46.22 | 36.3 | 11.0 | 1.76 | 4 370 | 245 | 4 440 | 168 | 9.72 | 2.30 | 9.80 | 1.90 | 0.136 | 229 | 33.8 |
| 300× 90 | 13 | 17 | 19 | 9.5 | 52.67 | 41.3 | 11.3 | 1.75 | 4 940 | 259 | 5 020 | 181 | 9.68 | 2.22 | 9.76 | 1.85 | 0.128 | 265 | 35.8 |
| 350×100 | 12 | 17 | 22 | 11 | 57.74 | 45.3 | 13.0 | 1.87 | 7 440 | 362 | 7 550 | 251 | 11.3 | 2.50 | 11.4 | 2.08 | 0.124 | 338 | 44.5 |
| 400×100 | 13 | 18 | 24 | 12 | 68.59 | 53.8 | 15.4 | 1.77 | 11 500 | 388 | 11 600 | 277 | 12.9 | 2.38 | 13.0 | 2.01 | 0.099 6 | 467 | 47.1 |

## Attached Table 4 Standard sectional dimensions of I sections and their sectional area, unit mass and sectional characteristics

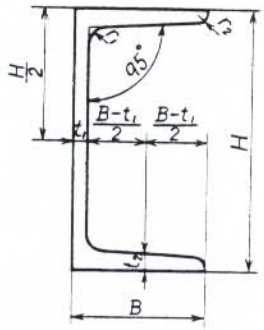



Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)

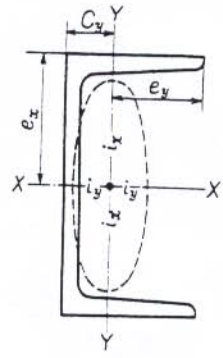



| Standard sectional dimension mm | | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | Radius of gyration of area cm | | Modulus of section cm³ | |
| $H\times B$ | $t_1$ | $t_2$ | $r_1$ | $r_2$ | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | $i_x$ | $i_y$ | $Z_x$ | $Z_y$ |
| 100× 75 | 5 | 8 | 7 | 3.5 | 16.43 | 12.9 | 0 | 0 | 281 | 47.3 | 4.14 | 1.70 | 56.2 | 12.6 |
| 125× 75 | 5.5 | 9.5 | 9 | 4.5 | 20.45 | 16.1 | 0 | 0 | 538 | 57.5 | 5.13 | 1.68 | 86.0 | 15.3 |
| 150× 75 | 5.5 | 9.5 | 9 | 4.5 | 21.83 | 17.1 | 0 | 0 | 819 | 57.5 | 6.12 | 1.62 | 109 | 15.3 |
| 150×125 | 8.5 | 14 | 13 | 6.5 | 46.15 | 36.2 | 0 | 0 | 1 760 | 385 | 6.18 | 2.89 | 235 | 61.6 |
| 180×100 | 6 | 10 | 10 | 5 | 30.06 | 23.6 | 0 | 0 | 1 670 | 138 | 7.45 | 2.14 | 186 | 27.5 |
| 200×100 | 7 | 10 | 10 | 5 | 33.06 | 26.0 | 0 | 0 | 2 170 | 138 | 8.11 | 2.05 | 217 | 27.7 |
| 200×150 | 9 | 16 | 15 | 7.5 | 64.16 | 50.4 | 0 | 0 | 4 460 | 753 | 8.34 | 3.43 | 446 | 100 |
| 250×125 | 7.5 | 12.5 | 12 | 6 | 48.79 | 38.3 | 0 | 0 | 5 180 | 337 | 10.3 | 2.63 | 414 | 53.9 |
| 250×125 | 10 | 19 | 21 | 10.5 | 70.73 | 55.5 | 0 | 0 | 7 310 | 538 | 10.2 | 2.76 | 585 | 86.0 |
| 300×150 | 8 | 13 | 12 | 6 | 61.58 | 48.3 | 0 | 0 | 9 480 | 588 | 12.4 | 3.09 | 632 | 78.4 |
| 300×150 | 10 | 18.5 | 19 | 9.5 | 83.47 | 65.5 | 0 | 0 | 12 700 | 886 | 12.3 | 3.26 | 849 | 118 |
| 300×150 | 11.5 | 22 | 23 | 11.5 | 97.88 | 76.8 | 0 | 0 | 14 700 | 1 080 | 12.2 | 3.32 | 978 | 143 |
| 350×150 | 9 | 15 | 13 | 6.5 | 74.58 | 58.5 | 0 | 0 | 15 200 | 702 | 14.3 | 3.07 | 870 | 93.5 |
| 350×150 | 12 | 24 | 25 | 12.5 | 111.1 | 87.2 | 0 | 0 | 22 400 | 1 180 | 14.2 | 3.26 | 1 280 | 158 |
| 400×150 | 10 | 18 | 17 | 8.5 | 91.73 | 72.0 | 0 | 0 | 24 100 | 864 | 16.2 | 3.07 | 1 200 | 115 |
| 400×150 | 12.5 | 25 | 27 | 13.5 | 122.1 | 95.8 | 0 | 0 | 31 700 | 1 240 | 16.1 | 3.18 | 1 580 | 165 |
| 450×175 | 11 | 20 | 19 | 9.5 | 116.8 | 91.7 | 0 | 0 | 39 200 | 1 510 | 18.3 | 3.60 | 1 740 | 173 |
| 450×175 | 13 | 26 | 27 | 13.5 | 146.1 | 115 | 0 | 0 | 48 800 | 2 020 | 18.3 | 3.72 | 2 170 | 231 |
| 600×190 | 13 | 25 | 25 | 12.5 | 169.4 | 133 | 0 | 0 | 98 400 | 2 460 | 24.1 | 3.81 | 3 280 | 259 |
| 600×190 | 16 | 35 | 38 | 19 | 224.5 | 176 | 0 | 0 | 130 000 | 3 540 | 24.1 | 3.97 | 4 330 | 373 |

## Attached Table 5 Standard sectional dimensions of channels and their sectional area, unit mass and sectional characteristics



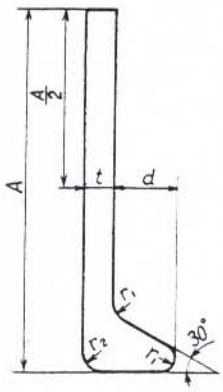

Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)

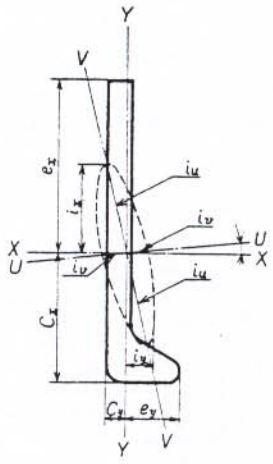



| Standard sectional dimension mm | | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | Radius of gyration of area cm | | Modulus of section cm³ | |
| $H\times B$ | $t_1$ | $t_2$ | $r_1$ | $r_2$ | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | $i_x$ | $i_y$ | $Z_x$ | $Z_y$ |
| 75× 40 | 5 | 7 | 8 | 4 | 8.818 | 6.92 | 0 | 1.28 | 75.3 | 12.2 | 2.92 | 1.17 | 20.1 | 4.47 |
| 100× 50 | 5 | 7.5 | 8 | 4 | 11.92 | 9.36 | 0 | 1.54 | 188 | 26.0 | 3.97 | 1.48 | 37.6 | 7.52 |
| 125× 65 | 6 | 8 | 8 | 4 | 17.11 | 13.4 | 0 | 1.90 | 424 | 61.8 | 4.98 | 1.90 | 67.8 | 13.4 |
| 150× 75 | 6.5 | 10 | 10 | 5 | 23.71 | 18.6 | 0 | 2.28 | 861 | 117 | 6.03 | 2.22 | 115 | 22.4 |
| 150× 75 | 9 | 12.5 | 15 | 7.5 | 30.59 | 24.0 | 0 | 2.31 | 1 050 | 147 | 5.86 | 2.19 | 140 | 28.3 |
| 180× 75 | 7 | 10.5 | 11 | 5.5 | 27.20 | 21.4 | 0 | 2.13 | 1 380 | 131 | 7.12 | 2.19 | 153 | 24.3 |
| 200× 80 | 7.5 | 11 | 12 | 6 | 31.33 | 24.6 | 0 | 2.21 | 1 950 | 168 | 7.88 | 2.32 | 195 | 29.1 |
| 200× 90 | 8 | 13.5 | 14 | 7 | 38.65 | 30.3 | 0 | 2.74 | 2 490 | 277 | 8.02 | 2.68 | 249 | 44.2 |
| 250× 90 | 9 | 13 | 14 | 7 | 44.07 | 34.6 | 0 | 2.40 | 4 180 | 294 | 9.74 | 2.58 | 334 | 44.5 |
| 250× 90 | 11 | 14.5 | 17 | 8.5 | 51.17 | 40.2 | 0 | 2.40 | 4 680 | 329 | 9.56 | 2.54 | 374 | 49.9 |
| 300× 90 | 9 | 13 | 14 | 7 | 48.57 | 38.1 | 0 | 2.22 | 6 440 | 309 | 11.5 | 2.52 | 429 | 45.7 |
| 300× 90 | 10 | 15.5 | 19 | 9.5 | 55.74 | 43.8 | 0 | 2.34 | 7 410 | 360 | 11.5 | 2.54 | 494 | 54.1 |
| 300× 90 | 12 | 16 | 19 | 9.5 | 61.90 | 48.6 | 0 | 2.28 | 7 870 | 379 | 11.3 | 2.48 | 525 | 56.4 |
| 380×100 | 10.5 | 16 | 18 | 9 | 69.39 | 54.5 | 0 | 2.41 | 14 500 | 535 | 14.5 | 2.78 | 763 | 70.5 |
| 380×100 | 13 | 16.5 | 18 | 9 | 78.96 | 62.0 | 0 | 2.33 | 15 600 | 565 | 14.1 | 2.67 | 823 | 73.6 |
| 380×100 | 13 | 20 | 24 | 12 | 85.71 | 67.3 | 0 | 2.54 | 17 600 | 655 | 14.3 | 2.76 | 926 | 87.8 |

## Attached Table 6 Standard sectional dimensions of bulb flats and their sectional area, unit mass and sectional characteristics

Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)

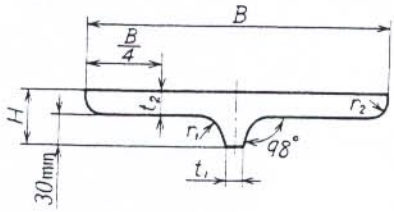


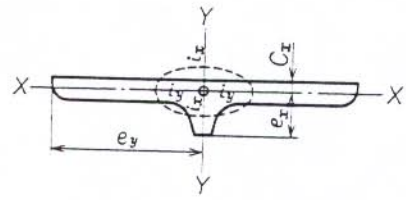




| Standard sectional dimension mm | | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Position of center of gravity cm | | Geometrical moment of inertia cm⁴ | | | | Radius of gyration of area cm | | | | tan α | Modulus of section cm³ | |
| A | t | d | $r_1$ | $r_2$ | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | Maximum $I_u$ | Minimum $I_v$ | $i_x$ | $i_y$ | Maximum $i_u$ | Minimum $i_v$ | | $Z_x$ | $Z_y$ |
| 180 | 9.5 | 23 | 7 | 2 | 21.06 | 16.5 | 7.49 | 0.746 | 671 | 9.48 | 673 | 7.34 | 5.64 | 0.671 | 5.65 | 0.591 | 0.056 8 | 63.8 | 3.79 |
| 200 | 10 | 26.5 | 8 | 2 | 25.23 | 19.8 | 8.16 | 0.834 | 997 | 15.1 | 1 000 | 11.4 | 6.29 | 0.773 | 6.30 | 0.672 | 0.061 1 | 84.2 | 5.35 |
| 230 | 11 | 30 | 9 | 2 | 31.98 | 25.1 | 9.36 | 0.927 | 1 680 | 24.2 | 1 680 | 18.3 | 7.24 | 0.870 | 7.25 | 0.755 | 0.059 9 | 123 | 7.62 |
| 250 | 12 | 33 | 10 | 2 | 38.13 | 29.9 | 10.1 | 1.02 | 2 360 | 35.2 | 2 370 | 26.4 | 7.87 | 0.960 | 7.88 | 0.832 | 0.061 2 | 159 | 10.1 |

## Attached Table 7 Standard sectional dimensions of T sections and their sectional area, unit mass and sectional characteristics

Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)

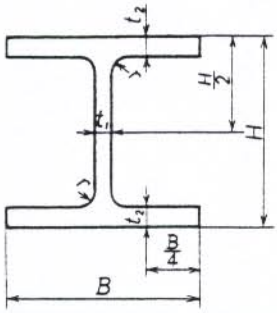


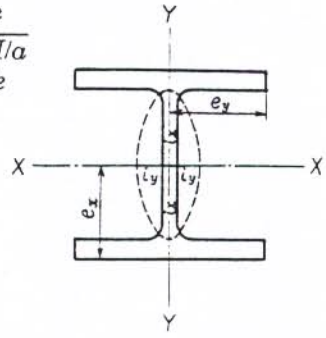




| Standard sectional dimension mm | | | | | | | Sectional area $cm^2$ | Unit mass kg/m | Informative reference | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal dimension $B\times t_2$ | $B$ | $H$ | $t_1$ | $t_2$ | $r_1$ | $r_2$ | | | Position of center of gravity cm | | Geometrical moment of inertia $cm^4$ | | Radius of gyration of area cm | | Modulus of section $cm^3$ | |
| | | | | | | | | | $C_x$ | $C_y$ | $I_x$ | $I_y$ | $i_x$ | $i_y$ | $Z_x$ | $Z_y$ |
| 150× 9 | 150 | 39 | 12 | 9 | 8 | 3 | 18.52 | 14.5 | 0.934 | 0 | 16.5 | 254 | 0.942 | 3.70 | 5.55 | 33.8 |
| 150×12 | 150 | 42 | 12 | 12 | 8 | 3 | 23.02 | 18.1 | 1.02 | 0 | 20.7 | 338 | 0.949 | 3.83 | 6.52 | 45.1 |
| 150×15 | 150 | 45 | 12 | 15 | 8 | 3 | 27.52 | 21.6 | 1.13 | 0 | 25.9 | 423 | 0.971 | 3.92 | 7.70 | 56.4 |
| 200×12 | 200 | 42 | 12 | 12 | 8 | 3 | 29.02 | 22.8 | 0.935 | 0 | 22.3 | 799 | 0.877 | 5.25 | 6.83 | 79.9 |
| 200×16 | 200 | 46 | 12 | 16 | 8 | 3 | 37.02 | 29.1 | 1.09 | 0 | 30.5 | 1 070 | 0.907 | 5.37 | 8.68 | 107 |
| 200×19 | 200 | 49 | 12 | 19 | 8 | 3 | 43.02 | 33.8 | 1.22 | 0 | 38.5 | 1 270 | 0.946 | 5.43 | 10.4 | 127 |
| 200×22 | 200 | 52 | 12 | 22 | 8 | 3 | 49.02 | 38.5 | 1.35 | 0 | 48.3 | 1 470 | 0.993 | 5.47 | 12.6 | 147 |
| 220×16 | 250 | 46 | 12 | 16 | 20 | 3 | 46.05 | 36.2 | 1.06 | 0 | 33.6 | 2 080 | 0.854 | 6.72 | 9.49 | 167 |
| 220×19 | 250 | 49 | 12 | 19 | 20 | 3 | 53.55 | 42.0 | 1.19 | 0 | 43.1 | 2 470 | 0.897 | 6.80 | 11.6 | 198 |
| 250×22 | 250 | 52 | 12 | 22 | 20 | 3 | 61.05 | 47.9 | 1.33 | 0 | 55.0 | 2 870 | 0.949 | 6.85 | 14.2 | 229 |
| 250×25 | 250 | 55 | 12 | 25 | 20 | 3 | 68.55 | 53.8 | 1.46 | 0 | 69.6 | 3 260 | 1.01 | 6.90 | 17.2 | 261 |

## Attached Table 8 Standard sectional dimensions of H sections and their sectional area, unit mass and sectional characteristics

Geometrical moment of inertia $I=ai^2$
Radius of gyration of area $i=\sqrt{I/a}$
Modulus of section $Z=I/e$
($a$=sectional area)




| Standard sectional dimension mm | | | | | Sectional area cm² | Unit mass kg/m | Informative reference | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal dimension (depth× width) | $H\times B$ | $t_1$ | $t_2$ | $r$ | | | Geometrical moment of inertia cm⁴ | | Radius of gyration of area cm | | Modulus of section cm³ | |
| | | | | | | | $I_x$ | $I_y$ | $i_x$ | $i_y$ | $Z_x$ | $Z_y$ |
| 100× 50 | 100× 50 | 5 | 7 | 8 | 11.85 | 9.30 | 187 | 14.8 | 3.98 | 1.12 | 37.5 | 5.91 |
| 100×100 | 100×100 | 6 | 8 | 8 | 21.59 | 16.9 | 378 | 134 | 4.18 | 2.49 | 75.6 | 26.7 |
| 125× 60 | 125× 60 | 6 | 8 | 8 | 16.69 | 13.1 | 409 | 29.1 | 4.95 | 1.32 | 65.5 | 9.71 |
| 125×125 | 125×125 | 6.5 | 9 | 8 | 30.00 | 23.6 | 839 | 293 | 5.29 | 3.13 | 134 | 46.9 |
| 150× 75 | 150× 75 | 5 | 7 | 8 | 17.85 | 14.0 | 666 | 49.5 | 6.11 | 1.66 | 88.8 | 13.2 |
| 150×100 | 148×100 | 6 | 9 | 8 | 26.35 | 20.7 | 1 000 | 150 | 6.17 | 2.39 | 135 | 30.1 |
| 150×150 | 150×150 | 7 | 10 | 8 | 39.65 | 31.1 | 1 620 | 563 | 6.40 | 3.77 | 216 | 75.1 |
| 175× 90 | 175× 90 | 5 | 8 | 8 | 22.90 | 18.0 | 1 210 | 97.5 | 7.26 | 2.06 | 138 | 21.7 |
| 175×175 | 175×175 | 7.5 | 11 | 13 | 51.42 | 40.4 | 2 900 | 98 | 7.50 | 4.37 | 331 | 112 |
| 200×100 | 198× 99 | 4.5 | 7 | 8 | 22.69 | 17.8 | 1 540 | 113 | 8.25 | 2.24 | 156 | 22.9 |
| | 200×100 | 5.5 | 8 | 8 | 26.67 | 20.9 | 1 810 | 134 | 8.23 | 2.24 | 181 | 26.7 |
| 200×150 | 194×150 | 6 | 9 | 8 | 38.11 | 29.9 | 2 630 | 507 | 8.30 | 3.65 | 271 | 67.6 |
| 200×200 | 200×200 | 8 | 12 | 13 | 63.53 | 49.9 | 4 720 | 1 600 | 8.62 | 5.02 | 472 | 160 |
| | *200×204 | 12 | 12 | 13 | 71.53 | 56.2 | 4 980 | 1 700 | 8.35 | 4.88 | 498 | 167 |
| 250×125 | 248×124 | 5 | 8 | 8 | 31.99 | 25.1 | 3 450 | 255 | 10.4 | 2.82 | 278 | 41.1 |
| | 250×125 | 6 | 9 | 8 | 36.97 | 29.0 | 3 960 | 294 | 10.4 | 2.82 | 317 | 47.0 |
| 250×175 | 244×175 | 7 | 11 | 13 | 55.49 | 43.6 | 6 040 | 984 | 10.4 | 4.21 | 495 | 112 |
| 250×250 | 250×250 | 9 | 14 | 13 | 91.43 | 71.8 | 10 700 | 3 650 | 10.8 | 6.32 | 860 | 292 |
| | *250×255 | 14 | 14 | 13 | 103.9 | 81.6 | 11 400 | 3 880 | 10.5 | 6.11 | 912 | 304 |
| 300×150 | 298×149 | 5.5 | 8 | 13 | 40.80 | 32.0 | 6 320 | 442 | 12.4 | 3.29 | 424 | 59.3 |
| | 300×150 | 6.5 | 9 | 13 | 46.78 | 36.7 | 7 210 | 508 | 12.4 | 3.29 | 481 | 67.7 |
| 300×200 | 294×200 | 8 | 12 | 13 | 71.05 | 55.8 | 11 100 | 1 600 | 12.5 | 4.75 | 756 | 160 |
| 300×300 | *294×302 | 12 | 12 | 13 | 106.3 | 83.4 | 16 600 | 5 510 | 12.5 | 7.20 | 1 130 | 365 |
| | 300×300 | 10 | 15 | 13 | 118.4 | 93.0 | 20 200 | 6 750 | 13.1 | 7.55 | 1 350 | 450 |
| | 300×305 | 15 | 15 | 13 | 133.4 | 105 | 21 300 | 7 100 | 12.6 | 7.30 | 1 420 | 466 |
| 350×175 | 346×174 | 6 | 9 | 13 | 52.45 | 41.2 | 11 000 | 791 | 14.5 | 3.88 | 638 | 91.0 |
| | 350×175 | 7 | 11 | 13 | 62.91 | 49.4 | 13 500 | 984 | 14.6 | 3.96 | 771 | 112 |

**Attached Table 8 Standard sectional dimensions of H sections and their sectional area, unit mass and sectional characteristics** (concluded)

| Standard sectional dimension mm | | | | | Sectional area $cm^2$ | Unit mass kg/m | Informative reference | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Geometrical moment of inertia $cm^4$ | | Radius of gyration of area cm | | Modulus of section $cm^3$ | |
| Nominal dimension (depth× width) | $H \times B$ | $t_1$ | $t_2$ | $r$ | | | $I_x$ | $I_y$ | $i_x$ | $i_y$ | $Z_x$ | $Z_y$ |
| 350×250 | 340×250 | 9 | 14 | 13 | 99.53 | 78.1 | 21 200 | 3 650 | 14.6 | 6.05 | 1 250 | 292 |
| 350×350 | *344×348 | 10 | 16 | 13 | 144.0 | 113 | 32 800 | 11 200 | 15.1 | 8.84 | 1 910 | 646 |
| | 350×350 | 12 | 19 | 13 | 171.9 | 135 | 39 800 | 13 600 | 15.2 | 8.89 | 2 280 | 776 |
| 400×200 | 396×199 | 7 | 11 | 13 | 71.41 | 56.1 | 19 800 | 1 450 | 16.6 | 4.50 | 999 | 145 |
| | 400×200 | 8 | 13 | 13 | 83.37 | 65.4 | 23 500 | 1 740 | 16.8 | 4.56 | 1 170 | 174 |
| 400×300 | 390×300 | 10 | 16 | 13 | 133.2 | 105 | 37 900 | 7 200 | 16.9 | 7.35 | 1 940 | 480 |
| 400×400 | *388×402 | 15 | 15 | 22 | 178.5 | 140 | 49 000 | 16 300 | 16.6 | 9.55 | 2 520 | 809 |
| | *394×398 | 11 | 18 | 22 | 186.8 | 147 | 56 100 | 18 900 | 17.3 | 10.1 | 2 850 | 951 |
| | 400×400 | 13 | 21 | 22 | 218.7 | 172 | 66 600 | 22 400 | 17.5 | 10.1 | 3 330 | 1 120 |
| | *400×408 | 21 | 21 | 22 | 250.7 | 197 | 70 900 | 23 800 | 16.8 | 9.75 | 3 540 | 1 170 |
| | *414×405 | 18 | 28 | 22 | 295.4 | 232 | 92 800 | 31 000 | 17.7 | 10.2 | 4 480 | 1 530 |
| | *428×407 | 20 | 35 | 22 | 360.7 | 283 | 119 000 | 39 400 | 18.2 | 10.4 | 5 570 | 1 930 |
| | *458×417 | 30 | 50 | 22 | 528.6 | 415 | 187 000 | 60 500 | 18.8 | 10.7 | 8 170 | 2 900 |
| | *498×432 | 45 | 70 | 22 | 770.1 | 605 | 298 000 | 94 400 | 19.7 | 11.1 | 12 000 | 4 370 |
| 450×200 | 446×199 | 8 | 12 | 13 | 82.97 | 65.1 | 28 100 | 1 580 | 18.4 | 4.36 | 1 260 | 159 |
| | 450×200 | 9 | 14 | 13 | 95.43 | 74.9 | 32 900 | 1 870 | 18.6 | 4.43 | 1 460 | 187 |
| 450×300 | 440×300 | 11 | 18 | 13 | 153.9 | 121 | 54 700 | 8 110 | 18.9 | 7.26 | 2 490 | 540 |
| 500×200 | 496×199 | 9 | 14 | 13 | 99.29 | 77.9 | 40 800 | 1 840 | 20.3 | 4.31 | 1 650 | 185 |
| | 500×200 | 10 | 16 | 13 | 112.2 | 88.2 | 46 800 | 2 140 | 20.4 | 4.36 | 1 870 | 214 |
| | *506×201 | 11 | 19 | 13 | 129.3 | 102 | 55 500 | 2 580 | 20.7 | 4.46 | 2 190 | 256 |
| 500×300 | 482×300 | 11 | 15 | 13 | 141.2 | 111 | 58 300 | 6 760 | 20.3 | 6.92 | 2 420 | 450 |
| | 488×300 | 11 | 18 | 13 | 159.2 | 125 | 68 900 | 8 110 | 20.8 | 7.14 | 2 820 | 540 |
| 600×200 | 596×199 | 10 | 15 | 13 | 117.8 | 92.5 | 66 600 | 1 980 | 23.8 | 4.10 | 2 240 | 199 |
| | 600×200 | 11 | 17 | 13 | 131.7 | 103 | 75 600 | 2 270 | 24.0 | 4.16 | 2 520 | 227 |
| | *606×201 | 12 | 20 | 13 | 149.8 | 118 | 88 300 | 2 720 | 24.3 | 4.26 | 2 910 | 270 |
| 600×300 | 582×300 | 12 | 17 | 13 | 169.2 | 133 | 98 900 | 7 660 | 24.2 | 6.73 | 3 400 | 511 |
| | 588×300 | 12 | 20 | 13 | 187.2 | 147 | 114 000 | 9 010 | 24.7 | 6.94 | 3 890 | 601 |
| | *594×302 | 14 | 23 | 13 | 217.1 | 170 | 134 000 | 10 600 | 24.8 | 6.98 | 4 500 | 700 |
| 700×300 | *692×300 | 13 | 20 | 18 | 207.5 | 163 | 168 000 | 9 020 | 28.5 | 6.59 | 4 870 | 601 |
| | 700×300 | 13 | 24 | 18 | 231.5 | 182 | 197 000 | 10 800 | 29.2 | 6.83 | 5 640 | 721 |
| 800×300 | *792×300 | 14 | 22 | 18 | 239.5 | 188 | 248 000 | 9 920 | 32.2 | 6.44 | 6 270 | 661 |
| | 800×300 | 14 | 26 | 18 | 263.5 | 207 | 286 000 | 11 700 | 33.0 | 6.67 | 7 160 | 781 |
| 900×300 | *890×299 | 15 | 23 | 18 | 266.9 | 210 | 339 000 | 10 300 | 35.6 | 6.20 | 7 610 | 687 |
| | 900×300 | 16 | 28 | 18 | 305.8 | 240 | 404 000 | 12 600 | 36.4 | 6.43 | 8 990 | 842 |
| | *912×302 | 18 | 34 | 18 | 360.1 | 283 | 491 000 | 15 700 | 36.9 | 6.59 | 10 800 | 1 040 |

Remarks 1 The H sections given in the same column with respect to the nominal dimension have same inner depth.

2 Those sizes without asterisk are given for merchant sizes.

## Annex 1 (normative)
## Hot-rolled steel sections—Part 1 : Equal-leg angles—Dimensions

This **Annex 1** has been prepared based on the first edition of **ISO 657-1**, *Hot-rolled steel sections — Part 1 : Equal-leg angles — Dimensions*, published in 1989, without any modification in technical contents.
The "informative reference" dot-underlined in this Annex is the item not included in the original International Standard.

**1 Scope** This Annex specifies dimensions of hot-rolled equal-leg angles.

**2 Normative reference** The following standard contains provisions which, through reference in this Annex, constitute provisions of this Annex. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this Annex are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

**ISO 657-5** : 1976, *Hot-rolled steel sections—Part 5 : Equal-leg angles and unequal-leg angles—Tolerances for metric and inch series.*

Informative reference...This International Standard comes under **Annex 3.**

**3 Dimensions**

3.1 The dimensions of equal-leg angles shall be as shown in **Annex 1 Table 1.** Preferred dimensions are given in bold type.

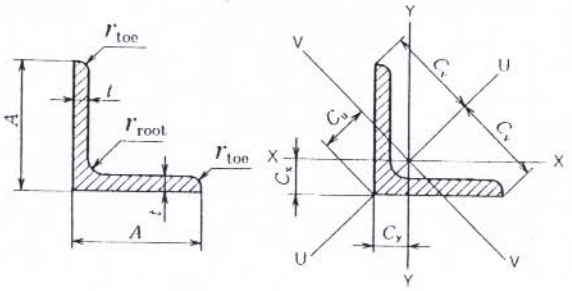
3.2 The root radii given in **Annex 1 Table 1** are for information only.

3.3 The toe radius has not be specified and may, if considered necessary, be determined independently for national standards.

**4 Sectional properties** The mass, sectional area and sectional properties of equal-leg angles are given for information in **Annex 1 Table 1.** They have been calculated assuming a toe radius equal to half the root radius.

**5 Dimensional tolerances** Tolerances on the dimensions specified in **Annex 1 Table 1** are covered in **ISO 657-5.**

## Annex 1 Table 1 Dimensions and sectional properties of hot-rolled equal-leg angles




| Designation | Mass | Sectional area | Dimensions | | | Distances of center of gravity | | | Sectional properties about axes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $X-X=Y-Y$ | | | $U-U$ | | $V-V$ | | | |
| | | | $A$ | $t$ | $r_{root}$ | $C_x=C_y$ | $C_u$ | $C_v$ | $I_x=I_y$ | $r_x=r_y$ | $Z_x=Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | $Z_v$ |
| | kg/m | cm² | mm | mm | mm | cm | cm | cm | cm⁴ | cm | cm³ | cm⁴ | cm | cm⁴ | cm | cm³ |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| **20× 20× 3** | 0.882 | 1.12 | 20 | 3 | 3.5 | 0.598 | 1.41 | 0.846 | 0.392 | 0.590 | 0.279 | 0.618 | 0.742 | 0.165 | 0.383 | 0.195 |
| **25× 25× 3** | 1.12 | 1.42 | 25 | 3 | 3.5 | 0.723 | 1.77 | 1.02 | 0.803 | 0.751 | 0.452 | 1.27 | 0.945 | 0.334 | 0.484 | 0.326 |
| **25× 25× 4** | 1.45 | 1.85 | 25 | 4 | 3.5 | 0762 | 1.77 | 1.08 | 1.02 | 0.741 | 0.586 | 1.61 | 0.931 | 0.430 | 0.482 | 0.399 |
| **30× 30× 3** | 1.36 | 1.74 | 30 | 3 | 5 | 0.835 | 2.12 | 1.18 | 1.40 | 0.899 | 0.649 | 2.22 | 1.13 | 0.585 | 0.581 | 0.496 |
| **30× 30× 4** | 1.78 | 2.27 | 30 | 4 | 5 | 0.878 | 2.12 | 1.24 | 1.80 | 0.892 | 0.850 | 2.85 | 1.12 | 0.754 | 0.577 | 0.607 |
| 35× 35× 4 | 2.09 | 2.67 | 35 | 4 | 5 | 1.00 | 2.47 | 1.42 | 2.95 | 1.05 | 1.18 | 4.68 | 1.32 | 1.23 | 0.678 | 0.865 |
| 35× 35× 5 | 2.57 | 3.28 | 35 | 5 | 5 | 1.04 | 2.47 | 1.48 | 3.56 | 1.04 | 1.45 | 5.64 | 1.31 | 1.49 | 0.675 | 1.01 |
| 40× 40× 3 | 1.84 | 2.35 | 40 | 3 | 6 | 1.07 | 2.83 | 1.52 | 3.45 | 1.21 | 1.18 | 5.45 | 1.52 | 1.44 | 0.783 | 0.949 |
| **40× 40× 4** | 2.42 | 3.08 | 40 | 4 | 6 | 1.12 | 2.83 | 1.58 | 4.47 | 1.21 | 1.55 | 7.09 | 1.52 | 1.86 | 0.777 | 1.17 |
| **40× 40× 5** | 2.97 | 3.79 | 40 | 5 | 6 | 1.16 | 2.83 | 1.64 | 5.43 | 1.20 | 1.91 | 8.60 | 1.51 | 2.26 | 0.773 | 1.38 |
| 45× 45× 4 | 2.74 | 3.49 | 45 | 4 | 7 | 1.23 | 3.18 | 1.75 | 6.43 | 1.36 | 1.97 | 10.2 | 1.71 | 2.68 | 0.876 | 1.53 |
| 45× 45× 5 | 3.38 | 4.30 | 45 | 5 | 7 | 1.28 | 3.18 | 1.81 | 7.84 | 1.35 | 2.43 | 12.4 | 1.70 | 3.26 | 0.871 | 1.80 |
| 50× 50× 4 | 3.06 | 3.89 | 50 | 4 | 7 | 1.36 | 3.54 | 1.92 | 8.97 | 1.52 | 2.46 | 14.2 | 1.91 | 3.73 | 0.979 | 1.94 |
| **50× 50× 5** | 3.77 | 4.80 | 50 | 5 | 7 | 1.40 | 3.54 | 1.99 | 11.0 | 1.51 | 3.05 | 17.4 | 1.90 | 4.55 | 0.973 | 2.29 |

## Annex 1 Table 1 Dimensions and sectional properties of hot-rolled equal-leg angles (continued)

| Designation | Mass | Sectional area | Dimensions | | | Distances of center of gravity | | | Sectional properties about axes | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $X-X=Y-Y$ | | | $U-U$ | | $V-V$ | | |
| | | | $A$ | $t$ | $r_{root}$ | $C_x=C_y$ | $C_u$ | $C_v$ | $I_x=I_y$ | $r_x=r_y$ | $Z_x=Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | $Z_v$ |
| | kg/m | cm² | mm | mm | mm | cm | cm | cm | cm⁴ | cm | cm³ | cm⁴ | cm | cm⁴ | cm | cm³ |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| **50× 50× 6** | 4.47 | 5.69 | 50 | 6 | 7 | 1.45 | 3.54 | 2.04 | 12.8 | 1.50 | 3.61 | 20.3 | 1.89 | 5.34 | 0.968 | 2.61 |
| **60× 60× 5** | 4.57 | 5.82 | 60 | 5 | 8 | 1.64 | 4.24 | 2.32 | 19.4 | 1.82 | 4.45 | 30.7 | 2.30 | 8.03 | 1.17 | 3.46 |
| **60× 60× 6** | 5.42 | 6.91 | 60 | 6 | 8 | 1.69 | 4.24 | 2.39 | 22.8 | 1.82 | 5.29 | 36.1 | 2.29 | 9.44 | 1.17 | 3.96 |
| 60× 60× 8 | 7.09 | 9.03 | 60 | 8 | 8 | 1.77 | 4.24 | 2.50 | 29.2 | 1.80 | 6.89 | 46.1 | 2.26 | 12.2 | 1.16 | 4.86 |
| 65× 65× 6 | 5.91 | 7.53 | 65 | 6 | 9 | 1.80 | 4.60 | 2.55 | 29.2 | 1.97 | 6.21 | 46.3 | 2.48 | 12.1 | 1.27 | 4.74 |
| **65× 65× 8** | 7.73 | 9.85 | 65 | 8 | 9 | 1.89 | 4.60 | 2.67 | 37.5 | 1.95 | 8.13 | 59.4 | 2.46 | 15.6 | 1.26 | 5.84 |
| **70× 70× 6** | 6.38 | 8.13 | 70 | 6 | 9 | 1.93 | 4.95 | 2.73 | 36.9 | 2.13 | 7.27 | 58.5 | 2.68 | 15.3 | 1.37 | 5.60 |
| **70× 70× 7** | 7.38 | 9.40 | 70 | 7 | 9 | 1.97 | 4.95 | 2.79 | 42.3 | 2.12 | 8.41 | 67.1 | 2.67 | 17.5 | 1.36 | 6.28 |
| 75× 75× 6 | 6.85 | 8.73 | 75 | 6 | 9 | 2.05 | 5.30 | 2.90 | 45.8 | 2.29 | 8.41 | 72.7 | 2.89 | 18.9 | 1.47 | 6.53 |
| 75× 75× 8 | 8.99 | 11.4 | 75 | 8 | 9 | 2.14 | 5.30 | 3.02 | 59.1 | 2.27 | 11.0 | 93.8 | 2.86 | 24.5 | 1.46 | 8.09 |
| **80× 80× 6** | 7.34 | 9.35 | 80 | 6 | 10 | 2.17 | 5.66 | 3.07 | 55.8 | 2.44 | 9.57 | 88.5 | 3.08 | 23.1 | 1.57 | 7.55 |
| **80× 80× 8** | 9.63 | 12.3 | 80 | 8 | 10 | 2.26 | 5.66 | 3.19 | 72.2 | 2.43 | 12.6 | 115 | 3.06 | 29.9 | 1.56 | 9.37 |
| 80× 80× 10 | 11.9 | 15.1 | 80 | 10 | 10 | 2.34 | 5.66 | 3.30 | 87.5 | 2.41 | 15.4 | 139 | 3.03 | 36.4 | 1.55 | 11.0 |
| 90× 90× 7 | 9.61 | 12.2 | 90 | 7 | 11 | 2.45 | 6.36 | 3.47 | 92.5 | 2.75 | 14.1 | 147 | 3.46 | 38.3 | 1.77 | 11.0 |
| **90× 90× 8** | 10.9 | 13.9 | 90 | 8 | 11 | 2.50 | 6.36 | 3.53 | 104 | 2.74 | 16.1 | 166 | 3.45 | 43.1 | 1.76 | 12.2 |
| 90× 90× 9 | 12.2 | 15.5 | 90 | 9 | 11 | 2.54 | 6.36 | 3.59 | 116 | 2.73 | 17.9 | 184 | 3.44 | 47.9 | 1.76 | 13.3 |
| **90× 90×10** | 15.0 | 17.1 | 90 | 10 | 11 | 2.58 | 6.36 | 3.65 | 127 | 2.72 | 19.8 | 201 | 3.42 | 52.6 | 1.76 | 14.4 |
| **100×100× 8** | 12.2 | 15.5 | 100 | 8 | 12 | 2.74 | 7.07 | 3.87 | 145 | 3.06 | 19.9 | 230 | 3.85 | 59.9 | 1.75 | 15.5 |
| **100×100×10** | 15.0 | 19.2 | 100 | 10 | 12 | 2.82 | 7.07 | 3.99 | 177 | 3.04 | 24.6 | 280 | 3.83 | 73.0 | 1.96 | 18.3 |
| 100×100×12 | 17.8 | 22.7 | 100 | 12 | 12 | 2.90 | 7.07 | 4.11 | 207 | 3.02 | 29.1 | 328 | 3.80 | 85.7 | 1.94 | 20.9 |
| 120×120× 8 | 14.7 | 18.7 | 120 | 8 | 13 | 3.23 | 8.49 | 4.56 | 255 | 3.69 | 29.1 | 405 | 4.65 | 105 | 2.37 | 23.1 |
| **120×120×10** | 18.2 | 23.2 | 120 | 10 | 13 | 3.31 | 8.49 | 4.69 | 313 | 3.67 | 36.0 | 497 | 4.63 | 129 | 2.36 | 27.5 |

## Annex 1 Table 1 Dimensions and sectional properties of hot-rolled equal-leg angles (concluded)

| Designation | Mass | Sectional area | Dimensions | | | Distances of center of gravity | | | Sectional properties about axes | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $X-X=Y-Y$ | | | $U-U$ | | $V-V$ | | |
| | | | $A$ | $t$ | $r_{root}$ | $C_x=C_y$ | $C_u$ | $C_v$ | $I_x=I_y$ | $r_x=r_y$ | $Z_x=Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | $Z_v$ |
| | kg/m | cm² | mm | mm | mm | cm | cm | cm | cm⁴ | cm | cm³ | cm⁴ | cm | cm⁴ | cm | cm³ |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| **120×120×12** | 21.6 | 27.5 | 120 | 12 | 13 | 3.40 | 8.49 | 4.80 | 368 | 3.65 | 42.7 | 584 | 4.60 | 152 | 2.35 | 31.6 |
| 125×125× 8 | 15.3 | 19.5 | 125 | 8 | 13 | 3.35 | 8.84 | 4.74 | 290 | 3.85 | 31.7 | 461 | 4.85 | 120 | 2.47 | 25.3 |
| 125×125×10 | 19.0 | 24.2 | 125 | 10 | 13 | 3.44 | 8.84 | 4.86 | 356 | 3.84 | 39.3 | 565 | 4.83 | 146 | 2.46 | 30.1 |
| 125×125×12 | 22.6 | 28.7 | 125 | 12 | 13 | 3.52 | 8.84 | 4.98 | 418 | 3.81 | 46.6 | 664 | 4.81 | 172 | 2.45 | 34.6 |
| 150×150×10 | 23.0 | 29.3 | 150 | 10 | 16 | 4.03 | 10.6 | 5.71 | 624 | 4.62 | 56.9 | 990 | 5.82 | 258 | 2.97 | 45.1 |
| **150×150×12** | 27.3 | 34.8 | 150 | 12 | 16 | 4.12 | 10.6 | 5.83 | 737 | 4.60 | 67.7 | 1 170 | 5.80 | 303 | 2.95 | 52.0 |
| **150×150×15** | 33.8 | 43.0 | 150 | 15 | 16 | 4.25 | 10.6 | 6.01 | 898 | 4.57 | 83.5 | 1 430 | 5.76 | 370 | 2.93 | 61.6 |
| 180×180×15 | 40.9 | 52.1 | 180 | 15 | 18 | 4.98 | 12.7 | 7.05 | 1 590 | 5.52 | 122 | 2 520 | 6.96 | 653 | 3.54 | 92.7 |
| 180×180×18 | 48.6 | 61.9 | 180 | 18 | 18 | 5.10 | 12.7 | 7.22 | 1 870 | 5.49 | 145 | 2 960 | 6.92 | 768 | 3.52 | 106 |
| **200×200×16** | 48.5 | 61.8 | 200 | 16 | 18 | 5.52 | 14.1 | 7.81 | 2 340 | 6.16 | 162 | 3 720 | 7.76 | 960 | 3.94 | 123 |
| **200×200×20** | 59.9 | 76.3 | 200 | 20 | 18 | 5.68 | 14.1 | 8.04 | 2 850 | 6.11 | 199 | 4 530 | 7.70 | 1 170 | 3.92 | 146 |
| 200×200×24 | 71.1 | 90.6 | 200 | 24 | 18 | 5.84 | 14.1 | 8.26 | 3 330 | 6.06 | 235 | 5 280 | 7.64 | 1 380 | 3.90 | 167 |
| 250×250×28 | 104 | 133 | 250 | 28 | 18 | 7.24 | 17.7 | 10.2 | 7 700 | 7.62 | 433 | 12 200 | 9.61 | 3 170 | 4.89 | 309 |
| 250×250×35 | 128 | 163 | 250 | 35 | 18 | 7.50 | 17.7 | 10.6 | 9 260 | 7.54 | 529 | 14 700 | 9.48 | 3 860 | 4.87 | 364 |

Remark 1 Member countries may choose, to be included in their national standards, the sizes which are required to meet their demand.
For the angles so chosen, only thicknesses which can be rolled in their mills to meet the demand of the users may be selected from the list of thicknesses corresponding to equal angles in **Annex 1 Table 1**.

2 The sectional area has been calculated using the fomula

$$S=[\ t\ (2A-t)+0.214\ 6\ (r^2_{root}-2r^2_{toe})\ ]\times\ \frac{1}{100}$$

where

$S$ is the sectional area, in square centimetres;
$t$ is the thickness, in millimetres;
$r_{root}$ is the root radius, in millimetres;
$r_{toe}$ is the toe radius, in millimetres;
$A$ is the leg length, in millimetres.

3 Mass is calculated on the basis of density of steel of 7.85 kg/dm$^3$.

## Annex 2 (normative)
## Hot-rolled steel sections—Part 2 : Unequal-leg angles—Dimensions

This **Annex 2** has been prepared based on the first edition of **ISO 657-2**, *Hot-rolled steel sections—Part 2 : Unequal-leg angles—Dimensions*, published in 1989, without any modification in technical contents.
The "informative reference" dot-underlined in this Annex is the item not included in the original International Standard.

1 **Scope** This Annex specifies dimensions of hot-rolled unequal-leg angles.

2 **Normative reference** The following standard contains provisions which, through reference in this Annex, constitute provisions of this Annex. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this Annex are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

**ISO 657-5** : 1976, *Hot-rolled steel sections—Part 5 : Equal-leg angles and unequal-leg angles—Tolerances for metric and inch series.*

Informative reference This International Standard comes under **Annex 3**.

3 **Dimensions**

3.1 The dimensions of unequal-leg angles shall be as shown in **Annex 2 Table 1**. Preferred dimensions are given in bold type.

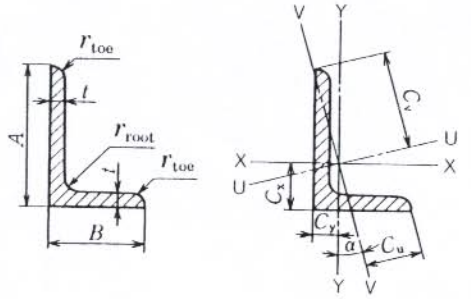
3.2 The root radii given in **Annex 2 Table 1** are for information only.

3.3 The toe radius has not been specified and may, if considered necessary, be determined independently for national standards.

4 **Sectional properties** The mass, sectional area and sectional properties of unequal-leg angles are given for information in **Annex 2 Table 1**. They have been calculated assuming a toe radius equal to half the root radius.

5 **Dimensional tolerances** Tolerances on the dimensions specified in **Annex 2 Table 1** are covered in **ISO 657-5**.

## Annex 2 Table 1 Dimensions and sectional properties of hot-rolled unequal-leg angles




| Designation | Mass | Sectional area | Dimensions | | | | Distances of center of gravity | | | | Sectional properties about axes | | | | | | | | | | Inclination of V-V axis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | X − X | | | Y − Y | | | U − U | | V − V | | |
| | kg/m | cm² | $A$ mm | $B$ mm | $t$ mm | $r_{root}$ mm | $C_x$ cm | $C_y$ cm | $C_u$ cm | $C_v$ cm | $I_x$ cm⁴ | $r_x$ cm | $Z_x$ cm³ | $I_y$ cm⁴ | $r_y$ cm | $Z_y$ cm³ | $I_u$ cm⁴ | $r_u$ cm | $I_v$ cm⁴ | $r_v$ cm | tanα |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
| **30× 20× 3** | 1.12 | 1.43 | 30 | 20 | 3 | 4 | 0.990 | 0.502 | 2.05 | 1.04 | 1.25 | 0.935 | 0.621 | 0.437 | 0.553 | 0.292 | 1.43 | 1.00 | 0.256 | 0.424 | 0.427 |
| **30× 20× 4** | 1.46 | 1.86 | 30 | 20 | 4 | 4 | 1.03 | 0.541 | 2.02 | 1.04 | 1.59 | 0.925 | 0.807 | 0.553 | 0.546 | 0.379 | 1.81 | 0.988 | 0.330 | 0.421 | 0.421 |
| **40× 20× 4** | 1.77 | 2.26 | 40 | 20 | 4 | 4 | 1.47 | 0.48 | 2.58 | 1.17 | 3.59 | 1.26 | 1.42 | 0.600 | 0.514 | 0.393 | 3.80 | 1.30 | 0.393 | 0.417 | 0.252 |
| **40× 25× 4** | 1.93 | 2.46 | 40 | 25 | 4 | 4 | 1.36 | 0.623 | 2.69 | 1.35 | 3.89 | 1.26 | 1.47 | 1.16 | 0.687 | 0.619 | 4.35 | 1.33 | 0.700 | 0.534 | 0.380 |
| **45× 30× 5** | 2.76 | 3.52 | 45 | 30 | 5 | 4 | 1.52 | 0.779 | 3.04 | 1.58 | 6.98 | 1.41 | 2.35 | 2.47 | 0.837 | 1.11 | 8.00 | 1.51 | 1.45 | 0.641 | 0.429 |
| **50× 30× 4** | 2.41 | 3.07 | 50 | 30 | 4 | 5 | 1.68 | 0.701 | 3.36 | 1.67 | 7.71 | 1.59 | 2.33 | 2.09 | 0.825 | 0.907 | 8.53 | 1.67 | 1.27 | 0.644 | 0.356 |
| **50× 30× 5** | 2.96 | 3.78 | 50 | 30 | 5 | 5 | 1.73 | 0.741 | 3.33 | 1.65 | 9.36 | 1.57 | 2.86 | 2.51 | 0.816 | 1.11 | 10.3 | 1.65 | 1.54 | 0.639 | 0.352 |
| **50× 40× 5** | 3.36 | 4.28 | 50 | 40 | 5 | 5 | 1.55 | 1.06 | 3.49 | 1.85 | 10.3 | 1.55 | 3.00 | 5.85 | 1.17 | 1.99 | 13.2 | 1.75 | 3.03 | 0.842 | 0.621 |
| **60× 30× 5** | 3.36 | 4.28 | 60 | 30 | 5 | 5 | 2.17 | 0.684 | 3.88 | 1.77 | 15.6 | 1.91 | 4.07 | 2.63 | 0.784 | 1.14 | 16.5 | 1.97 | 1.71 | 0.633 | 0.257 |
| **60× 30× 6** | 3.98 | 5.07 | 60 | 30 | 6 | 5 | 2.21 | 0.723 | 3.85 | 1.76 | 18.2 | 1.90 | 4.81 | 3.05 | 0.776 | 1.34 | 19.3 | 1.95 | 2.01 | 0.630 | 0.253 |
| **60× 40× 5** | 3.76 | 4.79 | 60 | 40 | 5 | 6 | 1.96 | 0.972 | 4.10 | 2.11 | 17.2 | 1.89 | 4.25 | 6.11 | 1.13 | 2.02 | 19.7 | 2.03 | 3.54 | 0.86 | 0.434 |
| **60× 40× 6** | 4.46 | 5.68 | 60 | 40 | 6 | 6 | 2.00 | 1.01 | 4.08 | 2.10 | 20.1 | 1.88 | 5.03 | 7.12 | 1.12 | 2.38 | 23.1 | 2.02 | 4.16 | 0.855 | 0.431 |
| **60× 50× 6** | 4.93 | 6.28 | 60 | 50 | 6 | 6 | 1.84 | 1.34 | 4.20 | 2.22 | 21.7 | 1.86 | 5.22 | 13.7 | 1.47 | 3.73 | 28.5 | 2.13 | 6.84 | 1.04 | 0.677 |
| **60× 50× 8** | 6.44 | 8.20 | 60 | 50 | 8 | 6 | 1.91 | 1.42 | 4.18 | 2.24 | 27.7 | 1.84 | 6.77 | 17.3 | 1.45 | 4.84 | 36.2 | 2.10 | 8.81 | 1.04 | 0.672 |
| **65× 50× 5** | 4.35 | 5.54 | 65 | 50 | 5 | 6 | 1.99 | 1.25 | 4.53 | 2.39 | 23.2 | 2.05 | 5.14 | 11.9 | 1.47 | 3.19 | 28.8 | 2.28 | 6.32 | 1.07 | 0.577 |

## Annex 2 Table 1 Dimensions and sectional properties of hot-rolled unequal-leg angles (continued)

| Designation | Mass | Sectional area | Dimensions | | | | Distances of center of gravity | | | | Sectional properties about axes | | | | | | | | | | Inclination of V-V axis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | X－X | | | Y－Y | | | U－U | | V－V | | |
| | | | A | B | t | $r_{mod}$ | $C_x$ | $C_y$ | $C_u$ | $C_v$ | $I_x$ | $r_x$ | $Z_x$ | $I_y$ | $r_y$ | $Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | |
| | kg/m | cm² | mm | mm | mm | mm | cm | cm | cm | cm | cm⁴ | cm | cm³ | cm⁴ | cm | cm³ | cm⁴ | cm | cm⁴ | cm | tanα |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
| 65 × 50 × 6 | 5.16 | 6.58 | 65 | 50 | 6 | 6 | 2.04 | 1.29 | 4.52 | 2.39 | 27.2 | 2.03 | 6.10 | 14.0 | 1.46 | 3.77 | 33.8 | 2.27 | 7.43 | 1.06 | 0.575 |
| 65 × 50 × 8 | 6.75 | 8.60 | 65 | 50 | 8 | 6 | 2.11 | 1.37 | 4.49 | 2.39 | 34.8 | 2.01 | 7.93 | 17.7 | 1.44 | 4.89 | 43.0 | 2.23 | 9.57 | 1.05 | 0.569 |
| 70 × 50 × 6 | 5.41 | 6.89 | 70 | 50 | 6 | 7 | 2.23 | 1.25 | 4.83 | 2.52 | 33.4 | 2.20 | 7.01 | 14.2 | 1.43 | 3.78 | 39.7 | 2.40 | 7.92 | 1.07 | 0.500 |
| 70 × 50 × 7 | 6.25 | 7.96 | 70 | 50 | 7 | 7 | 2.27 | 1.29 | 4.81 | 2.52 | 38.2 | 2.19 | 8.08 | 16.0 | 1.42 | 4.35 | 45.3 | 2.39 | 9.06 | 1.07 | 0.493 |
| **75 × 50 × 6** | 5.65 | 7.19 | 75 | 50 | 6 | 7 | 2.44 | 1.21 | 5.12 | 2.64 | 40.5 | 2.37 | 8.01 | 14.4 | 1.42 | 3.81 | 46.6 | 2.55 | 8.36 | 1.08 | 0.435 |
| 75 × 50 × 8 | 7.39 | 9.41 | 75 | 50 | 8 | 7 | 2.52 | 1.29 | 5.08 | 2.62 | 52.0 | 2.35 | 10.4 | 18.4 | 1.40 | 4.95 | 59.6 | 2.52 | 10.8 | 1.07 | 0.430 |
| 80 × 40 × 6 | 5.41 | 6.89 | 80 | 40 | 6 | 7 | 2.85 | 0.884 | 5.20 | 2.38 | 44.9 | 2.55 | 8.73 | 7.59 | 1.05 | 2.44 | 47.6 | 2.63 | 4.93 | 0.845 | 0.258 |
| 80 × 40 × 8 | 7.07 | 9.01 | 80 | 40 | 8 | 7 | 2.94 | 0.963 | 5.14 | 2.34 | 57.6 | 2.53 | 11.4 | 9.61 | 1.03 | 3.16 | 60.9 | 2.60 | 6.34 | 0.838 | 0.253 |
| 80 × 60 × 6 | 6.37 | 8.11 | 80 | 60 | 6 | 8 | 2.47 | 1.48 | 5.57 | 2.92 | 51.4 | 2.52 | 9.29 | 24.8 | 1.75 | 5.49 | 62.8 | 2.78 | 13.4 | 1.29 | 0.547 |
| **80 × 60 × 7** | 7.36 | 9.38 | 80 | 60 | 7 | 8 | 2.51 | 1.52 | 5.55 | 2.92 | 59.0 | 2.51 | 10.7 | 28.4 | 1.74 | 6.34 | 72.0 | 2.77 | 15.4 | 1.28 | 0.546 |
| 80 × 60 × 8 | 8.34 | 10.6 | 80 | 60 | 8 | 8 | 2.55 | 1.56 | 5.53 | 2.92 | 66.3 | 2.50 | 12.2 | 31.8 | 1.73 | 7.16 | 80.8 | 2.76 | 17.3 | 1.27 | 0.544 |
| **90 × 60 × 8** | 8.97 | 11.4 | 90 | 60 | 8 | 8 | 2.96 | 1.48 | 6.13 | 3.16 | 92.3 | 2.84 | 15.3 | 32.8 | 1.70 | 7.27 | 106 | 3.05 | 19.0 | 1.29 | 0.434 |
| 90 × 65 × 6 | 7.07 | 9.01 | 90 | 65 | 6 | 8 | 2.79 | 1.56 | 6.24 | 3.27 | 73.4 | 2.85 | 11.8 | 32.3 | 1.89 | 6.53 | 87.9 | 3.12 | 17.8 | 1.41 | 0.510 |
| 90 × 65 × 8 | 9.29 | 11.8 | 90 | 65 | 8 | 8 | 2.88 | 1.64 | 6.20 | 3.26 | 94.9 | 2.83 | 15.5 | 41.5 | 1.87 | 8.54 | 113 | 3.10 | 23.0 | 1.39 | 0.507 |
| **90 × 75 × 8** | 9.91 | 12.6 | 90 | 75 | 8 | 8 | 2.72 | 1.98 | 6.31 | 3.35 | 99.5 | 2.81 | 15.8 | 62.7 | 2.23 | 11.4 | 131 | 3.22 | 31.2 | 1.57 | 0.679 |
| **90 × 75 × 10** | 12.2 | 15.6 | 90 | 75 | 10 | 8 | 2.80 | 2.06 | 6.29 | 3.35 | 121 | 2.79 | 19.5 | 75.8 | 2.21 | 13.9 | 159 | 3.19 | 38.1 | 1.56 | 0.676 |
| 90 × 75 × 13 | 15.6 | 19.8 | 90 | 75 | 13 | 8 | 2.91 | 2.17 | 6.26 | 3.38 | 150 | 2.75 | 24.6 | 93.7 | 2.17 | 17.6 | 196 | 3.14 | 47.9 | 1.55 | 0.670 |
| 100 × 50 × 6 | 6.84 | 8.71 | 100 | 50 | 6 | 8 | 3.51 | 1.05 | 6.55 | 3.00 | 89.9 | 3.21 | 13.8 | 15.4 | 1.33 | 3.89 | 95.4 | 3.31 | 9.92 | 1.07 | 0.262 |
| **100 × 50 × 8** | 8.97 | 11.4 | 100 | 50 | 8 | 8 | 3.60 | 1.13 | 6.48 | 2.96 | 116 | 3.19 | 18.2 | 19.7 | 1.31 | 5.08 | 123 | 3.28 | 12.8 | 1.06 | 0.258 |
| 100 × 50 × 10 | 11.0 | 14.1 | 100 | 50 | 10 | 8 | 3.68 | 1.21 | 6.42 | 2.93 | 141 | 3.16 | 22.3 | 23.6 | 1.29 | 6.21 | 149 | 3.25 | 15.5 | 1.05 | 0.253 |
| **100 × 65 × 7** | 8.77 | 11.2 | 100 | 65 | 7 | 10 | 3.23 | 1.51 | 6.83 | 3.49 | 113 | 3.17 | 16.6 | 37.6 | 1.83 | 7.5 3 | 128 | 3.39 | 22.0 | 1.40 | 0.415 |
| **100 × 65 × 8** | 9.94 | 12.7 | 100 | 65 | 8 | 10 | 3.27 | 1.55 | 6.81 | 3.47 | 127 | 3.16 | 18.9 | 42.2 | 1.83 | 8.54 | 144 | 3.37 | 24.8 | 1.40 | 0.413 |
| 100 × 65 × 10 | 12.3 | 15.6 | 100 | 65 | 10 | 10 | 3.36 | 1.63 | 6.76 | 3.45 | 154 | 3.14 | 23.2 | 51.0 | 1.81 | 10.5 | 175 | 3.35 | 30.1 | 1.39 | 0.410 |

## Annex 2 Table 1 Dimensions and sectional properties of hot-rolled unequal-leg angles (continued)

| Designation | Mass | Sectional area | Dimensions | | | | Distances of center of gravity | | | | Sectional properties about axes | | | | | | | | | | Inclination of V-V axis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | X − X | | | Y − Y | | | U − U | | V − V | | |
| | | | A | B | t | $r_{root}$ | $C_x$ | $C_y$ | $C_u$ | $C_v$ | $I_x$ | $r_x$ | $Z_x$ | $I_y$ | $r_y$ | $Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | |
| | kg/m | $cm^2$ | mm | mm | mm | mm | cm | cm | cm | cm | $cm^4$ | cm | $cm^3$ | $cm^4$ | cm | $cm^3$ | $cm^4$ | cm | $cm^4$ | cm | tanα |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
| 100 × 75 × 8 | 10.6 | 13.5 | 100 | 75 | 8 | 10 | 3.10 | 1.87 | 6.95 | 3.65 | 133 | 3.14 | 19.3 | 64.1 | 2.18 | 11.4 | 162 | 3.47 | 34.6 | 1.60 | 0.547 |
| **100 × 75 × 10** | 13.0 | 16.6 | 100 | 75 | 10 | 10 | 3.19 | 1.95 | 6.92 | 3.65 | 162 | 3.12 | 23.8 | 77.6 | 2.16 | 14.0 | 197 | 3.45 | 42.2 | 1.59 | 0.544 |
| 100 × 75 × 12 | 15.4 | 19.7 | 100 | 75 | 12 | 10 | 3.27 | 2.03 | 6.89 | 3.65 | 189 | 3.10 | 28.0 | 90.2 | 2.14 | 16.5 | 230 | 3.42 | 49.5 | 1.59 | 0.540 |
| **100 × 90 × 10** | 14.2 | 18.1 | 100 | 90 | 10 | 10 | 2.96 | 2.47 | 7.04 | 3.68 | 172 | 3.08 | 24.4 | 132 | 2.69 | 20.1 | 242 | 3.66 | 61.2 | 1.84 | 0.797 |
| 100 × 90 × 13 | 18.1 | 23.1 | 100 | 90 | 13 | 10 | 3.08 | 2.59 | 7.03 | 3.71 | 215 | 3.05 | 31.0 | 164 | 2.66 | 25.5 | 301 | 3.61 | 77.1 | 1.83 | 0.794 |
| 120 × 80 × 8 | 12.2 | 15.5 | 120 | 80 | 8 | 11 | 3.83 | 1.87 | 8.23 | 4.23 | 226 | 3.82 | 27.6 | 80.8 | 2.28 | 13.2 | 260 | 4.10 | 46.6 | 1.74 | 0.437 |
| **120 × 80 × 10** | 15.0 | 19.1 | 120 | 80 | 10 | 11 | 3.92 | 1.95 | 8.19 | 4.21 | 276 | 3.80 | 34.1 | 98.1 | 2.26 | 16.2 | 317 | 4.07 | 56.8 | 1.72 | 0.435 |
| 120 × 80 × 12 | 17.8 | 22.7 | 120 | 80 | 12 | 11 | 4.00 | 2.03 | 8.15 | 4.20 | 323 | 3.77 | 40.4 | 114 | 2.24 | 19.1 | 371 | 4.04 | 66.7 | 1.71 | 0.431 |
| 125 × 75 × 8 | 12.2 | 15.5 | 125 | 75 | 8 | 11 | 4.14 | 1.68 | 8.44 | 4.20 | 247 | 4.00 | 29.6 | 67.6 | 2.09 | 11.6 | 274 | 4.21 | 40.9 | 1.63 | 0.360 |
| **125 × 75 × 10** | 15.0 | 19.1 | 125 | 75 | 10 | 11 | 4.23 | 1.76 | 8.39 | 4.17 | 302 | 3.97 | 36.5 | 82.1 | 2.07 | 14.3 | 334 | 4.18 | 49.9 | 1.61 | 0.357 |
| 125 × 75 × 12 | 17.8 | 22.7 | 125 | 75 | 12 | 11 | 4.31 | 1.84 | 8.33 | 4.15 | 354 | 3.95 | 43.2 | 95.5 | 2.05 | 16.9 | 391 | 4.15 | 58.5 | 1.61 | 0.354 |
| **125 × 90 × 10** | 16.2 | 20.6 | 125 | 90 | 10 | 11 | 3.95 | 2.23 | 8.63 | 4.52 | 321 | 3.95 | 37.7 | 140 | 2.60 | 20.6 | 384 | 4.31 | 77.4 | 1.94 | 0.506 |
| 125 × 90 × 13 | 20.7 | 26.4 | 125 | 90 | 13 | 11 | 4.08 | 2.34 | 8.58 | 4.52 | 404 | 3.91 | 48.0 | 175 | 2.57 | 26.2 | 481 | 4.27 | 97.4 | 1.92 | 0.501 |
| **135 × 65 × 8** | 12.2 | 15.5 | 135 | 65 | 8 | 11 | 4.78 | 1.34 | 8.79 | 3.95 | 291 | 4.34 | 33.4 | 45.2 | 1.71 | 8.75 | 307 | 4.45 | 29.4 | 1.38 | 0.245 |
| **135 × 65 × 10** | 15.0 | 19.1 | 135 | 65 | 10 | 11 | 4.88 | 1.42 | 8.72 | 3.91 | 356 | 4.31 | 41.3 | 54.7 | 1.69 | 10.8 | 375 | 4.43 | 35.9 | 1.37 | 0.243 |
| **150 × 75 × 9** | 15.4 | 19.6 | 150 | 75 | 9 | 12 | 5.26 | 1.57 | 9.82 | 4.50 | 455 | 4.82 | 46.7 | 77.9 | 1.99 | 13.1 | 483 | 4.96 | 50.2 | 1.60 | 0.261 |
| **150 × 75 × 10** | 17.0 | 21.7 | 150 | 75 | 10 | 12 | 5.31 | 1.61 | 9.79 | 4.48 | 501 | 4.81 | 51.6 | 85.6 | 1.99 | 14.5 | 531 | 4.95 | 55.1 | 1.60 | 0.261 |
| 150 × 75 × 12 | 20.2 | 25.7 | 150 | 75 | 12 | 12 | 5.40 | 1.69 | 9.72 | 4.44 | 588 | 4.78 | 61.3 | 99.6 | 1.97 | 17.1 | 623 | 4.92 | 64.7 | 1.59 | 0.258 |
| 150 × 75 × 15 | 24.8 | 31.7 | 150 | 75 | 15 | 12 | 5.52 | 1.81 | 9.63 | 4.40 | 713 | 4.75 | 75.2 | 119 | 1.94 | 21.0 | 753 | 4.88 | 78.6 | 1.58 | 0.253 |
| **150 × 90 × 10** | 18.2 | 23.2 | 150 | 90 | 10 | 12 | 5.00 | 2.04 | 10.1 | 5.03 | 533 | 4.80 | 53.3 | 146 | 2.51 | 21.0 | 591 | 5.05 | 88.3 | 1.95 | 0.360 |
| **150 × 90 × 12** | 21.6 | 27.5 | 150 | 90 | 12 | 12 | 5.08 | 2.12 | 10.1 | 5.00 | 627 | 4.77 | 63.3 | 171 | 2.49 | 24.8 | 694 | 5.02 | 104 | 1.94 | 0.358 |
| 150 × 90 × 15 | 26.6 | 33.9 | 150 | 90 | 15 | 12 | 5.21 | 2.23 | 9.98 | 4.98 | 761 | 4.74 | 77.7 | 205 | 2.46 | 30.4 | 841 | 4.98 | 126 | 1.93 | 0.354 |
| **150 × 100 × 10** | 19.0 | 24.2 | 150 | 100 | 10 | 12 | 4.81 | 2.34 | 10.3 | 5.29 | 553 | 4.79 | 54.2 | 199 | 2.87 | 25.9 | 637 | 5.13 | 114 | 2.17 | 0.438 |

## Annex 2 Table 1 Dimensions and sectional properties of hot-rolled unequal-leg angles (concluded)

| Designation | Mass | Sectional area | Dimensions | | | | Distances of center of gravity | | | | Sectional properties about axes | | | | | | | | | | Inclination of V-V axis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | X − X | | | Y − Y | | | U − U | | V − V | | |
| | | | A | B | t | $r_{root}$ | $C_x$ | $C_y$ | $C_u$ | $C_v$ | $I_x$ | $r_x$ | $Z_x$ | $I_y$ | $r_y$ | $Z_y$ | $I_u$ | $r_u$ | $I_v$ | $r_v$ | |
| | kg/m | cm² | mm | mm | mm | mm | cm | cm | cm | cm | cm⁴ | cm | cm³ | cm⁴ | cm | cm³ | cm⁴ | cm | cm⁴ | cm | tanα |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
| **150×100×12** | 22.5 | 28.7 | 150 | 100 | 12 | 12 | 4.89 | 2.42 | 10.2 | 5.28 | 651 | 4.76 | 64.4 | 233 | 2.85 | 30.7 | 749 | 5.11 | 134 | 2.16 | 0.436 |
| 150 × 100 × 16 | 29.5 | 37.6 | 150 | 100 | 16 | 12 | 5.06 | 2.58 | 10.2 | 5.26 | 834 | 4.71 | 83.9 | 296 | 2.80 | 39.8 | 957 | 5.05 | 173 | 2.14 | 0.431 |
| 180 × 90 × 10 | 20.5 | 26.2 | 180 | 90 | 10 | 12 | 6.31 | 1.86 | 11.8 | 5.42 | 882 | 5.81 | 75.4 | 153 | 2.42 | 21.4 | 937 | 5.99 | 97.9 | 1.94 | 0.264 |
| 200 × 100 × 10 | 23.0 | 29.2 | 200 | 100 | 10 | 15 | 6.93 | 2.01 | 13.2 | 6.05 | 1 220 | 6.46 | 93.2 | 210 | 2.68 | 26.3 | 1 290 | 6.65 | 135 | 2.15 | 0.263 |
| 200 × 100 × 12 | 27.3 | 34.8 | 200 | 100 | 12 | 15 | 7.03 | 2.10 | 13.1 | 6.00 | 1 440 | 6.43 | 111 | 247 | 2.67 | 31.3 | 1 530 | 6.63 | 159 | 2.14 | 0.262 |
| 200 × 100 × 14 | 31.6 | 40.3 | 200 | 100 | 14 | 15 | 7.12 | 2.18 | 13.0 | 5.96 | 1 650 | 6.41 | 128 | 282 | 2.65 | 36.1 | 1 750 | 6.60 | 182 | 2.13 | 0.261 |
| 200 × 100 × 16 | 35.9 | 45.7 | 200 | 100 | 16 | 15 | 7.20 | 2.26 | 13.0 | 5.93 | 1 861 | 6.38 | 145 | 316 | 2.63 | 40.8 | 1 972 | 6.57 | 205 | 2.12 | 0.259 |
| **200×150×12** | 32.0 | 40.8 | 200 | 150 | 12 | 15 | 6.08 | 3.61 | 13.9 | 7.34 | 1 650 | 6.36 | 119 | 803 | 4.44 | 70.5 | 2 030 | 7.04 | 430 | 3.25 | 0.552 |
| **200×150×15** | 39.6 | 50.5 | 200 | 150 | 15 | 15 | 6.21 | 3.73 | 13.9 | 7.33 | 2 022 | 6.33 | 147 | 979 | 4.40 | 86.9 | 2 476 | 7.00 | 526 | 3.23 | 0.551 |
| **200×150×20** | 52.0 | 66.2 | 200 | 150 | 20 | 15 | 6.41 | 3.93 | 13.8 | 7.34 | 2 602 | 6.27 | 191 | 1 252 | 4.35 | 113 | 3 176 | 6.92 | 678 | 3.20 | 0.546 |
| **200×150×25** | 64.0 | 81.5 | 200 | 150 | 25 | 15 | 6.60 | 4.11 | 13.7 | 7.36 | 3 139 | 6.21 | 234 | 1 501 | 4.29 | 138 | 3 816 | 6.84 | 825 | 3.18 | 0.541 |

Remarks 1 Member countries may choose, to be included in their national standards, the sizes which are required to meet their demand.
For the angles so chosen, only thicknesses which can be rolled in their mills to meet the demand of the users may be selected from the list of thicknesses corresponding to unequal angles in **Annex 2 Table 1**.

2 The sectional area has been calculated using the fomula

$$S=[\,t\,(A+B-t)+0.214\,6\,(r^2_{root}-2r^2_{toe})\,]\times\frac{1}{100}$$

where
$S$ is the sectional area, in square centimetres;
$t$ is the thickness, in millimetres;
$r_{root}$ is the root radius, in millimetres;
$r_{toe}$ is the toe radius, in millimetres;
$A$ and $B$ are the legs lengths, in millimetres.

3 Mass is calculated on the basis of density of steel of 7.85 kg/dm³.

## Annex 3 (normative)
## Hot-rolled steel sections—Part 3 : Equal-leg angles and unequal-leg angles —Tolerances

This Annex 3 has been prepared based on the first edition of ISO 657-5, *Hot-rolled steel sections—Part 5 : Equal-leg angles and unequal-leg angles—Tolerance for metric and inch series*, published in 1976, without any modification in technical contents.
The "informative references" dot-underlined in this Annex are the items not included in the original International Standard.

1 Scope This Annex specifies the dimensional tolerances applicable to hot-rolled steel angles having either equal or unequal leg lengths in accordance with ISO 657-1 and ISO 657-2.

Informative reference These International Standards come under Annex 1 and Annex 2.

2 Leg length tolerance Tolerances on leg length shall be as shown in Annex 3 Table 1.

3 Thickness tolerance Tolerance on thickness shall be as shown in Annex 3 Table 2.

4 Cutting tolerances for length Normal and fine tolerances for lengths shall be as shown in Annex 3 Table 3 and Annex 3 Table 4 respectively.

5 Straightness

5.1 The maximum permissible camber shall be as shown in Annex 3 Table 5.

5.2 The camber shall be measured as shown in Annex 3 Fig. 1.

6 Out-of-square

6.1 The legs shall be perpendicular to each other within a maximum deviation at the end as specified in Annex 3 Table 6.

6.2 The deviation shall be measured at the end of leg.

7 Tolerance on mass Where tolerance on mass per unit length is to be specified as an overall controlling, tolerance such provision should be included in the appropriate national standard.

Annex 3 Table 1 Length tolerance

Unit: mm

| Leg length (1) | Tolerance |
|---|---|
| 50 max. | ±1.0 |
| Over 50 up to and incl. 100 | ±1.5 |
| Over 100 up to and incl. 150 | ±2.0 |
| Over 150 up to and incl. 200 | ±3.0 |

Note (1) For unequal-leg angles take the longer leg length.

Annex 3 Table 2 Thickness tolerance

Unit: mm

| Leg length (1) | Tolerance |
|---|---|
| 50 max. | ±0.5 |
| Over 50 up to and incl. 100 | ±0.8 |
| Over 100 up to and incl. 150 | ±1.0 |
| Over 150 up to and incl. 200 | ±1.2 |

Remarks: For angles having a leg length exceeding 75 mm, a tolerance on mass of ±2.5 % of the mass per unit length may be specified in place of thickness tolerance. The masses per unit length of angles are as shown in the corresponding part of ISO 657 according to the classification of angles (refer to 1).

Informative reference ISO 657 comes under Annex 1 to Annex 10 in this Standard.

Annex 3 Table 3 Normal cutting tolerance on length

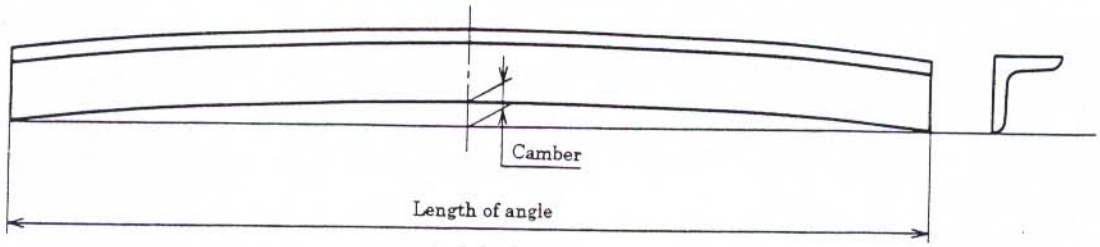
| Length | Tolerance |
|---|---|
| All lengths | ±100 mm |

Annex 3 Table 4 Fine cutting tolerance on length

| Length<br>m | Tolerance<br>mm |
|---|---|
| 12 max. | +75<br>0 |
| Over 12 | +100<br>0 |

Annex 3 Table 5 Camber

| Leg length (1)<br>mm | Straightness tolerance<br>mm |
|---|---|
| Over 50 up to and incl. 150 | 0.4 % of length |
| Over 150 up to and incl. 200 | 0.25 % of length |

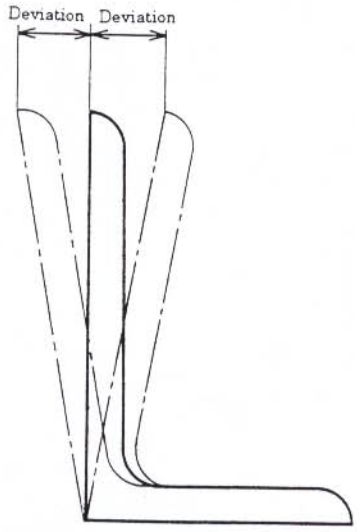



Annex 3 Fig. 1 Measurement of camber

Annex 3 Table 6 Out-of-square

Unit: mm

| Leg length (l) | Maximum deviation |
|---|---|
| 50 max. | 1.0 |
| Over 50 up to and incl. 100 | 2.0 |
| Over 100 up to and incl. 200 | 3.0 |




Annex 3 Fig. 2 Measurement of deviation

## Annex 4 (normative)
## Hot-rolled steel sections—Part 4 : Sloping flange channel sections —Dimensions and sectional properties

This **Annex 4** has been prepared based on the first edition of **ISO 657-11**, *Hot-rolled steel sections —Part 11 : Sloping flange channel sections (metric series) —Dimensions and sectional properties*, published in 1980, without any modification in technical contents.

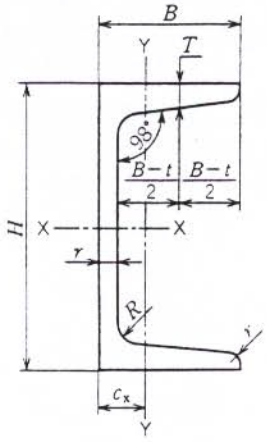
**1 Scope** This Annex specifies dimensions and sectional properties of hot-rolled steel sloping flange channel sections.

**2 Designation** Sloping flange channel sections shall be designated by the letters CH followed by the depth and mass per metre.

Example: CH160×18

**3 Dimensions and sectional properties** The dimensions and sectional properties of sloping flange channel sections shall be as shown in **Annex 4 Table 1**.

## Annex 4 Table 1 Dimensions and sectional properties of hot-rolled steel sloping flange channel sections




| Designation | Mass | Sectional area | Dimensions | | | | | | Centroid | Sectional properties about axes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | X−X | | | Y−Y | | |
| | $M$ | $A$ | $H$ | $B$ | $T$ | $t$ | $R$(1) | $r$(1) | $C_x$ | $I_x$ | $Z_x$ | $r_x$ | $I_y$ | $Z_y$ | $r_y$ |
| | kg/m | cm² | mm | mm | mm | mm | mm | mm | cm | cm⁴ | cm³ | cm | cm⁴ | cm³ | cm |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| CH 80× 8 | 8.23 | 10.5 | 80 | 45 | 7.5 | 5.5 | 8.0 | 4.0 | 1.43 | 102 | 25.6 | 3.12 | 18.0 | 5.85 | 1.30 |
| CH100×10 | 10.3 | 13.1 | 100 | 50 | 8.0 | 5.9 | 8.0 | 4.5 | 1.51 | 200 | 40.0 | 3.91 | 27.2 | 7.77 | 1.44 |
| CH120×12 | 12.5 | 16.0 | 120 | 55 | 8.5 | 6.3 | 8.0 | 4.5 | 1.60 | 350 | 58.4 | 4.68 | 39.5 | 10.1 | 1.57 |
| CH140×15 | 15.0 | 19.2 | 140 | 60 | 9.0 | 6.7 | 9.0 | 4.5 | 1.68 | 570 | 81.4 | 5.45 | 55.3 | 12.8 | 1.67 |
| CH160×18 | 18.2 | 23.2 | 160 | 65 | 10.0 | 7.2 | 9.0 | 5.5 | 1.81 | 900 | 113 | 6.22 | 79.0 | 16.8 | 1.81 |
| CH180×21 | 21.3 | 27.2 | 180 | 70 | 10.5 | 7.7 | 10.0 | 5.5 | 1.90 | 1 320 | 147 | 6.98 | 105 | 20.6 | 1.94 |
| CH200×25 | 25.2 | 32.1 | 200 | 75 | 11.5 | 8.2 | 12.0 | 6.0 | 2.02 | 1 930 | 193 | 7.75 | 142 | 26.0 | 2.10 |
| CH220×29 | 28.7 | 36.6 | 220 | 80 | 12.0 | 8.7 | 12.0 | 6.5 | 2.11 | 2 640 | 240 | 8.50 | 183 | 31.0 | 2.23 |
| CH250×34 | 33.9 | 43.2 | 250 | 85 | 13.0 | 9.2 | 13.5 | 7.0 | 2.20 | 4 000 | 320 | 9.63 | 240 | 38.2 | 2.36 |
| CH300×45 | 45.2 | 57.5 | 300 | 100 | 15.0 | 10.0 | 15.0 | 8.0 | 2.60 | 7 800 | 520 | 11.6 | 452 | 61.1 | 2.80 |
| CH350×52 | 51.8 | 66.0 | 350 | 100 | 16.0 | 10.5 | 16.0 | 8.0 | 2.48 | 11 900 | 678 | 13.4 | 496 | 66.3 | 2.74 |
| CH400×59 | 58.9 | 75.0 | 400 | 100 | 17.0 | 11.0 | 17.0 | 8.5 | 2.38 | 17 200 | 858 | 15.2 | 541 | 71.0 | 2.68 |

Note (1) The fillet and toe radii ($R$ and $r$) are shown only for information and for calculating of the sectional properties.

## Annex 5 (normative)
## Hot-rolled steel sections—Part 5 : Tolerances on sloping flange I-sections, column and channel sections

This Annex 5 has been prepared based on the first edition of ISO 657-13, *Hot-rolled steel sections—Part 13 : Tolerances on sloping flange beam, column and channel sections*, published in 1981, without any modification in technical contents.
The "informative references" dot-underlined in this Annex are the items not included in the original International Standard.

### 1 Scope

1.1 This Annex specifies the dimensional tolerances of hot-rolled sloping flange I-sections, column and channel sections of which the dimensions are specified in the following standards.

a) Sloping flange I-sections ISO 657-15
b) Sloping flange column sections ISO 657-16
c) Sloping flange channel sections ISO 657-11

Informative reference These International Standards come under respectively Annex 4, Annex 6 and Annex 7.

1.2 This Annex 5 specifies the following two cases.

a) Tolerances for the thickness of the web and the flanges are specified along with a higher mass tolerance shown in column (3) of Annex 5 Table 8 (refer to 2.3). This case shall be designated by symbol D (dimensional tolerances).
b) Where no tolerances are specified for the thickness of the web and the flanges, tighter mass tolerances given in Annex 5 Table 8, column (2), are applicable. This case is designated by the symbol M (mass tolerance).

At the time of ordering, the interested parties shall agree as to which of these two above-mentioned alternatives would be applicable, designating the choice by the appropriate symbol D or M.

Example : Column ISO 657-15-SC 100-D
Informative reference Example : Column Annex 6-SC 100-D
If symbol D or M is not indicated in the order, the supply can be made complying to either of the two above cases.

### 2 Tolerances

2.1 Tolerance on depth The tolerance on depth shall be as shown in Annex 5 Table 1 (refer to Annex 5 Fig. 1 and Annex 5 Fig. 2).

Annex 5 Table 1 Tolerance on depth

Unit: mm

| Depth ($H$) | Tolerance on depth |
|---|---|
| 200 max. | ±2.0 |
| Over 200 up to and incl. 400 | ±3.0 |
| Over 400 up to and incl. 600 | ±4.0 |

2.2 Tolerance on width of flange The tolerance on width of flange for I-sections and columns shall be as shown in Annex 5 Table 2 and the tolerance on width of flange for channels shall be as shown in Annex 5 Table 3.

Annex 5 Table 2 Tolerance on width of flange for I-sections and columns

Unit: mm

| Width of flange ($B$) | Tolerance on width of flange |
|---|---|
| 100 max. | ±2.0 |
| Over 100 up to and incl. 125 | ±2.5 |
| Over 125 up to and incl. 250 | ±4.0 |

Annex 5 Table 3 Tolerance on width of flange for channels

Unit: mm

| Width of flange ($B$) | Tolerance on width of flange |
|---|---|
| Under 75 | ±2.0 |
| 75 min. | ±3.0 |

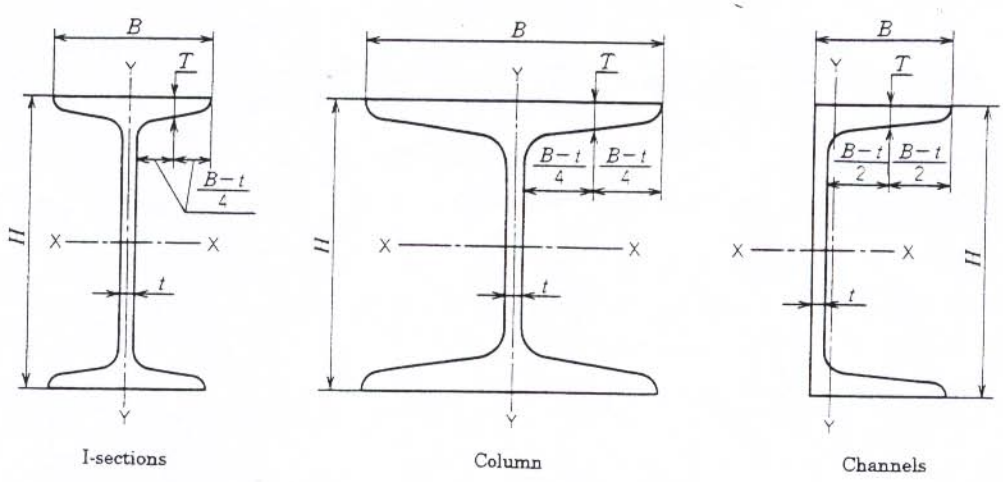
2.3 Tolerance on thickness of flange and web

2.3.1 When the section is ordered to designation D (refer to 1.2), tolerance on thickness of web shall be as shown in Annex 5 Table 4.

Annex 5 Table 4 Tolerance on thickness of web

Unit: mm

| Thickness of web ($t$) | Tolerance |
|---|---|
| 10 max. | ±0.5 |
| Over 10 | ±5 % of thickness of web |




**Annex 5 Fig. 1 Dimensions of sloping flange sections**

2.3.2 When the section is ordered to designation D (refer to **1.2**), the tolerance on thickness of flange shall be as shown in **Annex 5 Table 5**.

**Annex 5 Table 5 Tolerance on thickness of flange**

Unit: mm

| Depth ($H$) | Tolerance on thickness of flange ($T$) |
|---|---|
| 140 max. | −0.5 |
| Over 140 up to and incl. 300 | −1.0 |
| Over 300 up to and incl. 600 | −1.5 |

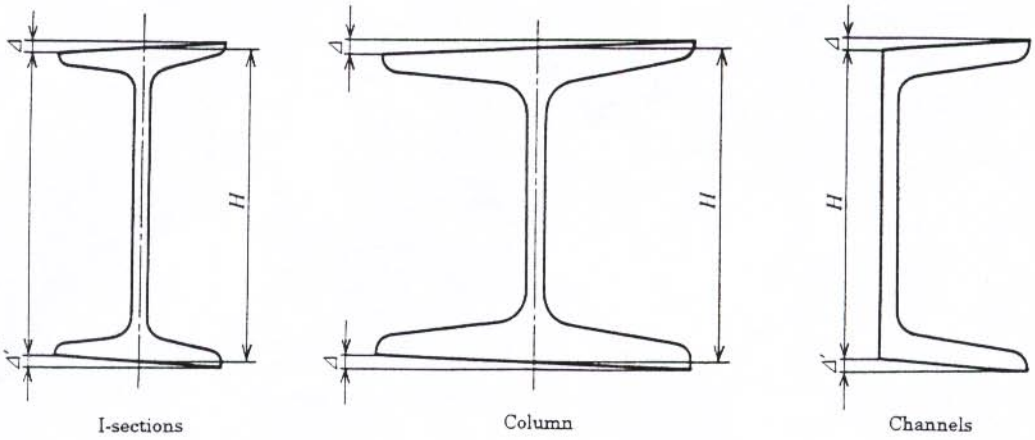
Remarks: The plus tolerance on thickness of flange is limited by the permissible deviation in mass.

2.4 **Flange out-of-square** The flange shall be parallel within the tolerances specified in **Annex 5 Table 6** (refer to **Annex 5 Fig. 2**).

**Annex 5 Table 6 Tolerance on flange out-of-square**

Unit: mm

| Width of flange ($B$) | $\Delta + \Delta'$ (max.) |
|---|---|
| 100 max. | 3.0 mm |
| Over 100 up to and incl. 250 | 3 % of width of flange $B$ |

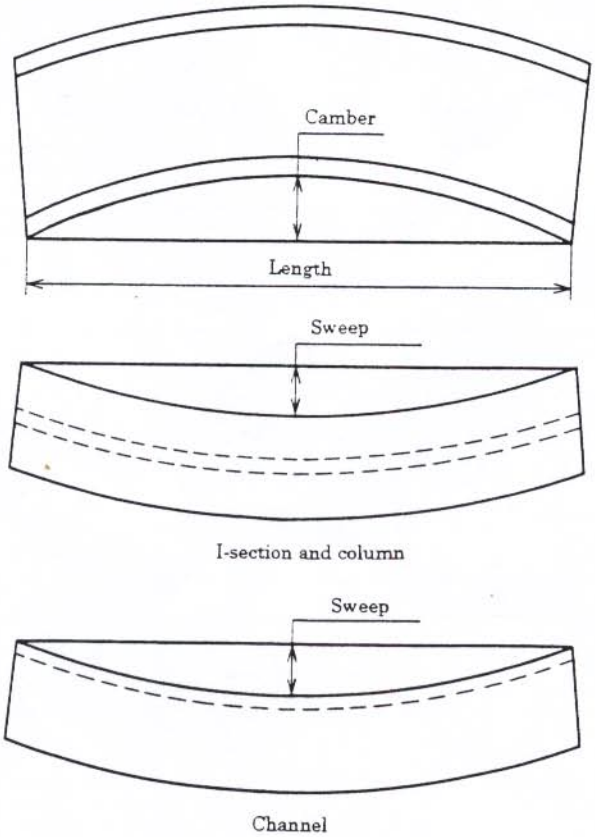



**Annex 5 Fig. 2 Flange out-of-square**

**2.5 Camber** Camber measured as shown in **Annex 5 Fig. 3** shall not exceed 0.20 % of the total length.

**2.6 Sweep** In the case of columns, sweep measured as shown in **Annex 5 Fig. 3** shall not exceed 0.20 % of the total length.

Remarks: Sweep tolerances for I-sections and channels shall be subject to negotiation at the time of enquiry and order, if necessary.

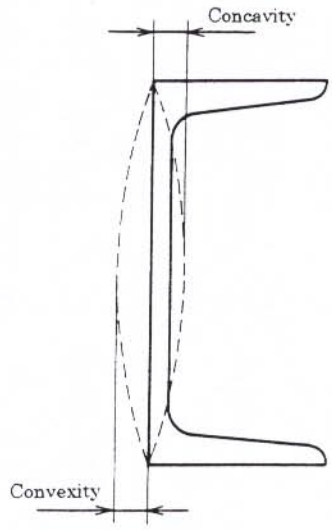



**Annex 5 Fig. 3 Measurement of camber and sweep**

2.7 Flatness of web The tolerance on flatness of outer face of web of channel shall be as follows (refer to Annex 5 Fig. 4).

Convexity: Not permitted

Concavity: 15 % of nominal thickness of web




Annex 5 Fig. 4 Flatness of web of channels

2.8 Tolerance on length Unless otherwise negotiated, the tolerance on length shall be as shown in Annex 5 Table 7.

Annex 5 Table 7 Tolerance on length

| Length<br>m | Tolerance<br>mm |
|---|---|
| 12 max. | +75<br>0 |
| Over 12 | +100<br>0 |

2.9 Tolerance on mass (refer to 1.2) When the tolerance on mass per unit length is specified in place of the tolerance on thickness of flange and web, the tolerance specified in column (2) of Annex 5 Table 8 shall be applied and, for all other cases, the tolerances specified in column (3) of Annex 5 Table 8 shall be applied.

Annex 5 Table 8 Tolerance on mass per unit length

| Depth<br>(1)<br>mm | Tolerance on mass | |
|---|---|---|
| | (2) Mass-controlling tolerance<br>% | (3) Thickness-controlling tolerance<br>% |
| Under 150 | ±3.0 | ±5.0 |
| 150 min. | ±2.5 | ±4.0 |

## Annex 6 (normative)
## Hot-rolled steel sections—Part 6 : Sloping flange I-sections —Dimensions and sectional properties

This **Annex 6** has been prepared based on the first edition of **ISO 657-15**, *Hot-rolled steel sections —Part 15 : Sloping flange beam sections (metric series) —Dimensions and sectional properties*, published in 1980 without any modification in technical contents.

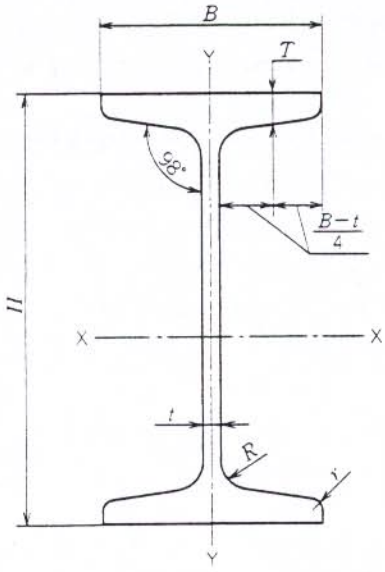
1 **Scope** This Annex specifies the dimensions and sectional properties of hot-rolled steel sloping flange I-sections.

2 **Designations** Sloping flange I-sections shall be designated by the letters SB followed by the depth and mass per metre.

Example: SB160×18

3 **Dimensions and sectional properties** The dimensions and sectional properties of sloping flange I-sections shall be as shown in **Annex 6 Table 1**.

## Annex 6 Table 1 Dimensions and sectional properties of hot-rolled steel sloping flange I-sections




| Designation | Mass | Sectional area | Dimensions | | | | | | Sectional properties about axes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | X−X | | | Y−Y | | |
| | $M$ | $A$ | $H$ | $B$ | $T$ | $t$ | $R$(1) | $r$(1) | $I_x$ | $Z_x$ | $r_x$ | $I_y$ | $Z_y$ | $r_y$ |
| | kg/m | cm² | mm | mm | mm | mm | mm | mm | cm⁴ | cm³ | cm | cm⁴ | cm³ | cm |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
| SB 80× 6 | 6.03 | 7.69 | 80 | 40 | 6.0 | 4.0 | 6.0 | 3.0 | 77.7 | 19.4 | 3.18 | 5.65 | 2.82 | 0.857 |
| SB100× 8 | 8.57 | 10.9 | 100 | 50 | 6.8 | 4.5 | 7.0 | 3.5 | 175 | 35.0 | 4.01 | 12.3 | 4.93 | 1.06 |
| SB120× 12 | 11.5 | 14.7 | 120 | 60 | 7.6 | 5.0 | 8.0 | 4.0 | 342 | 57.0 | 4.83 | 23.5 | 7.84 | 1.27 |
| SB140× 15 | 14.8 | 18.8 | 140 | 70 | 8.4 | 5.5 | 8.0 | 4.0 | 603 | 86.2 | 5.66 | 41.2 | 11.8 | 1.48 |
| SB160× 18 | 18.5 | 23.6 | 160 | 80 | 9.2 | 6.0 | 9.0 | 4.5 | 993 | 124 | 6.49 | 66.7 | 16.7 | 1.68 |
| SB180× 23 | 22.7 | 28.9 | 180 | 90 | 10.0 | 6.5 | 10.0 | 5.0 | 1 540 | 172 | 7.31 | 103 | 22.8 | 1.89 |
| SB200× 27 | 27.2 | 34.6 | 200 | 100 | 10.8 | 7.0 | 11.0 | 5.5 | 2 300 | 230 | 8.14 | 151 | 30.2 | 2.09 |
| SB220× 32 | 32.1 | 40.8 | 220 | 110 | 11.6 | 7.5 | 11.0 | 5.5 | 3 290 | 299 | 8.77 | 216 | 39.2 | 2.30 |
| SB240× 36 | 36.4 | 46.3 | 240 | 120 | 12.0 | 7.8 | 12.0 | 6.0 | 4 450 | 371 | 9.81 | 286 | 47.7 | 2.49 |
| SB250× 38 | 38.4 | 49.0 | 250 | 125 | 12.2 | 7.9 | 12.0 | 6.0 | 5 130 | 410 | 10.2 | 328 | 52.4 | 2.56 |
| SB270× 41 | 41.3 | 52.6 | 270 | 125 | 12.7 | 8.2 | 13.0 | 6.5 | 6 340 | 470 | 11.0 | 343 | 54.9 | 2.55 |
| SB300× 46 | 45.8 | 58.4 | 300 | 130 | 13.2 | 8.5 | 13.0 | 6.5 | 8 620 | 574 | 12.2 | 402 | 61.8 | 2.62 |
| SB350× 56 | 58.8 | 71.1 | 350 | 140 | 14.6 | 9.1 | 15.0 | 7.5 | 14 200 | 812 | 14.1 | 556 | 79.5 | 2.80 |
| SB400× 66 | 65.5 | 83.5 | 400 | 150 | 15.5 | 9.7 | 16.0 | 8.0 | 21 600 | 1 080 | 16.1 | 725 | 96.7 | 2.95 |
| SB450× 76 | 76.1 | 96.9 | 450 | 160 | 16.5 | 10.3 | 16.0 | 8.0 | 31 400 | 1 400 | 18.0 | 940 | 117 | 3.11 |
| SB500× 91 | 91.2 | 116.0 | 500 | 170 | 18.7 | 11.0 | 19.0 | 9.5 | 46 600 | 1 870 | 20.0 | 1 290 | 151 | 3.33 |
| SB550×107 | 107 | 136.0 | 550 | 180 | 20.4 | 12.0 | 20.0 | 10.0 | 65 700 | 2 390 | 21.9 | 1 680 | 186 | 3.51 |
| SB600×131 | 131 | 167.0 | 600 | 210 | 22.1 | 13.0 | 22.0 | 11.0 | 97 500 | 3 250 | 24.1 | 2 850 | 271 | 4.13 |

Note (1) The fillet and toe radii ($R$ and $r$) are shown only for information and for calculating the properties of the sections.

## Annex 7 (normative)
## Hot-rolled steel sections—Part 7 : Sloping flange column sections —Dimensions and sectional properties

This **Annex 7** has been prepared based on the first edition of **ISO 657-16**, *Hot-rolled steel sections —Part 16 : Sloping flange column sections (metric series) —Dimensions and sectional properties*, published in 1980, without any modification in technical contents.

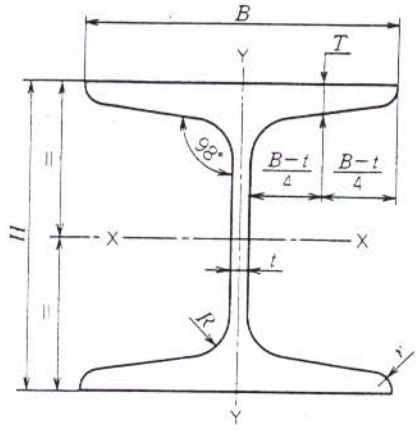
**1 Scope** This Annex specifies the dimensions and sectional properties of hot-rolled sloping flange steel column sections.

**2 Designations** Sloping flange column sections shall be designated by the letters SC followed by the depth of the column.

Example: SC 100

**3 Dimensions and sectional properties** The dimensions and sectional properties of sloping flange column sections shall be as shown in **Annex 7 Table 1**.

## Annex 7 Table 1 Dimensions and sectional properties of hot-rolled sloping flange steel column sections




| Designation | Mass | Sectional area | Dimensions | | | | | | Sectional properties about axes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $X-X$ | | | $Y-Y$ | | |
| | $M$ | $A$ | $H$ | $B$ | $t$ | $T$ | $R$(1) | $r$(1) | $I_x$ | $Z_x$ | $r_x$ | $I_y$ | $Z_y$ | $r_y$ |
| | kg/m | cm² | mm | mm | mm | mm | mm | mm | cm⁴ | cm³ | cm | cm⁴ | cm³ | cm |
| SC100 | 20.0 | 25.5 | 100 | 100 | 6.0 | 10 | 12 | 6.0 | 436 | 87.2 | 4.13 | 136 | 27.2 | 2.31 |
| SC120 | 26.2 | 33.4 | 120 | 120 | 6.5 | 11 | 12 | 6.0 | 842 | 140 | 5.02 | 255 | 42.6 | 2.76 |
| SC140 | 33.3 | 42.4 | 140 | 140 | 7.0 | 12 | 12 | 6.0 | 1 470 | 211 | 5.89 | 438 | 62.5 | 3.21 |
| SC160 | 41.9 | 53.4 | 160 | 160 | 8.0 | 13 | 15 | 7.5 | 2 420 | 303 | 6.74 | 695 | 86.8 | 3.61 |
| SC180 | 50.5 | 64.4 | 180 | 180 | 8.5 | 14 | 15 | 7.5 | 3 740 | 415 | 7.62 | 1 060 | 117 | 4.05 |
| SC200 | 60.3 | 76.8 | 200 | 200 | 9.0 | 15 | 18 | 9.0 | 5 530 | 553 | 8.48 | 1 530 | 153 | 4.46 |
| SC220 | 70.4 | 89.8 | 220 | 220 | 9.5 | 16 | 18 | 9.0 | 7 880 | 716 | 9.35 | 2 160 | 196 | 4.90 |
| SC250 | 85.6 | 109 | 250 | 250 | 10.0 | 17 | 23 | 11.5 | 12 500 | 997 | 10.7 | 3 260 | 260 | 5.46 |

Note (1) The fillet and toe radii ($R$ and $r$) are shown only for information and for calculating the properties of the sections.

## Annex 8 (normative)
## Hot-rolled steel sections—Part 8 : L-sections for shipbuilding —Dimensions, sectional properties and tolerances

This **Annex 8** has been prepared based on the first edition of **ISO 657-18**, *Hot-rolled steel sections —Part 18 :L-sections for shipbuilding (metric series) —Dimensions, sectional properties and tolerances*, published in 1980, without any modification in technical contents.

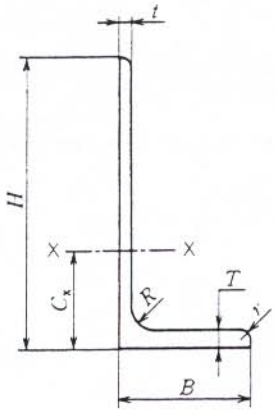
**1 Scope** This Annex specifies the dimensions, sectional properties and dimensional tolerances for hot-rolled steel L-sections for shipbuilding.

**2 Designations** Hot-rolled steel L-sections for shipbuilding shall be designated by the letter L followed by the height of the web ($H$), the width of the flange ($B$), the thickness of the web ($t$) and the thickness of the flange ($T$).

Example : L 250×90×9×13

**3 Dimensions** The dimensions of L-sections shall be as shown in **Annex 8 Table 1**.

## Annex 8 Table 1 Dimensions and sectional properties of L-sections




| Designation | Mass | Sectional area | Dimensions | | | | | | Centroid | Moment of inertia |
|---|---|---|---|---|---|---|---|---|---|---|
| | $M$ | $A$ | $H$ | $B$ | $t$ | $T$ | $R$ | $r$ | $C_x$ | $I_x$ |
| | kg/m | cm² | mm | mm | mm | mm | mm | mm | cm | cm⁴ |
| L200× 90× 9 ×12 | 22.0 | 28.1 | 200 | 90 | 9 | 12 | 15 | 7.5 | 6.63 | 1 160 |
| L225× 90× 9 ×12 | 23.8 | 30.3 | 225 | 90 | 9 | 12 | 15 | 7.5 | 7.71 | 1 610 |
| L250× 90× 9 ×13 | 26.2 | 33.4 | 250 | 90 | 9 | 13 | 15 | 7.5 | 8.64 | 2 190 |
| L250× 90×10.5×15 | 30.3 | 38.5 | 250 | 90 | 10.5 | 15 | 15 | 7.5 | 8.76 | 2 510 |
| L250× 90×11.5×16 | 32.7 | 41.7 | 250 | 90 | 11.5 | 16 | 15 | 7.5 | 8.90 | 2 710 |
| L275×100×10.5×14 | 32.8 | 41.8 | 275 | 100 | 10.5 | 14 | 15 | 7.5 | 9.72 | 3 330 |
| L300×100×10.5×15 | 35.6 | 45.3 | 300 | 100 | 10.5 | 15 | 15 | 7.5 | 10.6 | 4 290 |
| L300×100×11.5×16 | 38.5 | 49.0 | 300 | 100 | 11.5 | 16 | 15 | 7.5 | 10.7 | 4 630 |
| L325×120×10.5×14 | 39.3 | 50.1 | 325 | 120 | 10.5 | 14 | 20 | 10 | 11.3 | 5 600 |
| L325×120×11.5×15 | 42.6 | 54.3 | 325 | 120 | 11.5 | 15 | 20 | 10 | 11.4 | 6 060 |
| L350×120×10.5×16 | 43.1 | 54.9 | 350 | 120 | 10.5 | 16 | 20 | 10 | 12.0 | 7 110 |
| L350×120×11.5×18 | 47.4 | 60.4 | 350 | 120 | 11.5 | 18 | 20 | 10 | 12.0 | 7 780 |
| L375×120×10.5×18 | 46.9 | 59.7 | 375 | 120 | 10.5 | 18 | 20 | 10 | 12.7 | 8 850 |
| L375×120×11.5×20 | 51.4 | 65.4 | 375 | 120 | 11.5 | 20 | 20 | 10 | 12.7 | 9 650 |
| L400×120×11.5×23 | 56.2 | 71.6 | 400 | 120 | 11.5 | 23 | 20 | 10 | 13.3 | 11 900 |
| L425×120×11.5×23 | 59.3 | 75.5 | 425 | 120 | 11.5 | 24 | 20 | 10 | 14.2 | 14 200 |
| L450×120×11.5×25 | 62.4 | 79.5 | 450 | 120 | 11.5 | 25 | 20 | 10 | 15.1 | 16 800 |
| L475×120×11.5×28 | 67.2 | 85.6 | 475 | 120 | 11.5 | 28 | 20 | 10 | 15.7 | 20 100 |
| L475×120×12.5×30 | 72.4 | 92.2 | 475 | 120 | 12.5 | 30 | 20 | 10 | 15.9 | 21 600 |
| L500×120×12.5×33 | 77.4 | 98.6 | 500 | 120 | 12.5 | 33 | 20 | 10 | 16.5 | 25 500 |
| L500×120×13.5×35 | 82.8 | 105 | 500 | 120 | 13.5 | 35 | 20 | 10 | 16.6 | 27 100 |

## 4 Tolerances

**4.1 Height of web (*H*) and width of flange (*B*)** The tolerances on height of web (*H*) and width of flange (*B*) shall be as shown in **Annex 8 Table 2.**

**Annex 8 Table 2 Tolerances of height of web (*H*) and width of flange (*B*)**

Unit: mm

| Height of web (*H*) | Tolerances on (*H*) and (*B*) |
|---|---|
| 200 max. | ±3 |
| Over 200 | ±4 |

**4.2 Web thickness (*t*)** The tolerance on web thickness (*t*) shall be $^{+1.6}_{-0.4}$ mm.

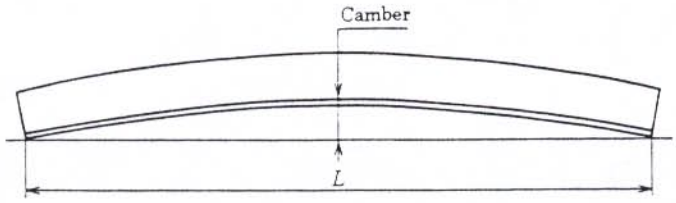
**4.3 Flange thickness (*T*)** The tolerance on flange thickness (*T*) shall be as shown in **Annex 8 Table 3.**

**Annex 8 Table 3 Tolerance on flange thickness (*T*)**

Unit: mm

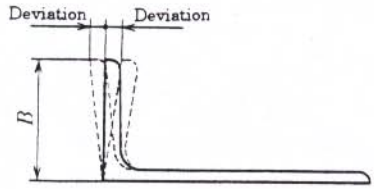
| Flange thickness (*T*) | Tolerance on (*T*) |
|---|---|
| 20 max. | +2.0<br>−0.4 |
| Over 20 up to and incl. 30 | +2.0<br>−0.5 |
| Over 30 up to and incl. 35 | +2.5<br>−0.6 |

**4.4 Camber** The maximum permissible camber, when measured over the entire length, is 0.3 % of full length (refer to **Annex 8 Fig. 1**).




**Annex 8 Fig. 1 Measurement of camber**

**4.5 Out-of-square** The legs shall be perpendicular to each other within a maximum deviation of 2.5 % *B*. The deviation shall be measured at the end of the shorter leg (refer to **Annex 8 Fig. 2**).




**Annex 8 Fig. 2 Measurement of out-of-square**

**4.6 Flatness** The tolerance on flatness of the web shall be the subject of agreement between the purchaser and the supplier. The measurement of deviation from flatness shall be as shown in **Annex 8 Fig. 3**.


**Annex 8 Fig. 3 Measurement of deviation in flatness of web**

**4.7 Length** The tolerance on length shall be between $^{+100}_{0}$ mm. The L-sections may be supplied to tighter length tolerances according to agreement between the purchaser and the supplier.

## Annex 9 (normative)
## Hot-rolled steel sections—Part 9 : Bulb flats—Dimensions, sectional properties and tolerances

This **Annex 9** has been prepared based on the first edition of **ISO 657-19**, *Hot-rolled steel sections—Part 19 : Bulb flats (metric series)—Dimensions, sectional properties and tolerances*, published in 1980, without any modification in technical contents.

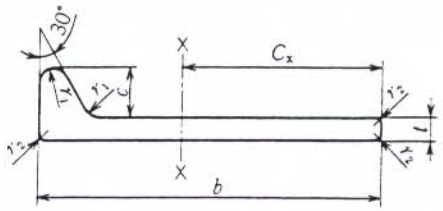
**1 Scope** This Annex specifies dimensions and sectional properties of hot-rolled steel bulb flats and their dimensional tolerances.

**2 Designation** Hot-rolled steel bulb flats shall be designated by the width ($b$) and thickness ($t$).

Example: $200 \times 10$

**3 Dimensions** The dimensions of bulb flats shall be as shown in **Annex 9 Table 1**.

## Annex 9 Table 1 Dimensions and sectional properties of bulb flats




| Designation | Mass | Sectional area | Dimensions | | | | Surface area | Centroid | Sectional properties | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $M$ | $A$ | $b$ | $t$ | $c$ | $r_1$ | | $C_x$ | $I_x$ | $Z_x$ |
| | kg/m | cm² | mm | mm | mm | mm | m²/m | cm | cm⁴ | cm³ |
| 80× 6 | 4.87 | 6.20 | 80 | 6 | 14 | 4 | 0.192 | 4.78 | 39.0 | 8.15 |
| 80× 7 | 5.50 | 7.00 | 80 | 7 | 14 | 4 | 0.194 | 4.69 | 43.3 | 9.24 |
| 100× 7 | 6.86 | 8.74 | 100 | 7 | 15.5 | 4.5 | 0.236 | 5.87 | 85.3 | 14.5 |
| 100× 8 | 7.65 | 9.74 | 100 | 8 | 15.5 | 4.5 | 0.238 | 5.78 | 94.3 | 16.3 |
| 120× 7 | 8.25 | 10.5 | 120 | 7 | 17 | 5 | 0.278 | 7.07 | 148 | 21.0 |
| 120× 8 | 9.19 | 11.7 | 120 | 8 | 17 | 5 | 0.280 | 6.96 | 164 | 23.6 |
| 140× 7 | 9.74 | 12.4 | 140 | 7 | 19 | 5.5 | 0.320 | 8.31 | 241 | 29.0 |
| 140× 8 | 10.8 | 13.8 | 140 | 8 | 19 | 5.5 | 0.322 | 8.18 | 268 | 32.5 |
| 160× 7 | 11.4 | 14.6 | 160 | 7 | 22 | 6 | 0.365 | 9.66 | 373 | 38.6 |
| 160× 8 | 12.7 | 16.2 | 160 | 8 | 22 | 6 | 0.367 | 9.49 | 411 | 43.3 |
| 160× 9 | 14.0 | 17.8 | 160 | 9 | 22 | 6 | 0.369 | 9.36 | 488 | 47.9 |
| 180× 8 | 14.8 | 18.9 | 180 | 8 | 25 | 7 | 0.411 | 10.9 | 609 | 55.9 |
| 180× 9 | 16.2 | 20.7 | 180 | 9 | 25 | 7 | 0.413 | 10.7 | 663 | 61.8 |
| 180×10 | 17.6 | 22.5 | 180 | 10 | 25 | 7 | 0.415 | 10.6 | 717 | 67.8 |
| 200× 9 | 18.5 | 23.6 | 200 | 9 | 28 | 8 | 0.457 | 12.1 | 841 | 77.7 |
| 200×10 | 20.1 | 25.6 | 200 | 10 | 28 | 8 | 0.459 | 11.9 | 1 020 | 85.0 |
| 200×11.5 | 22.5 | 28.6 | 200 | 11.5 | 28 | 8 | 0.462 | 11.7 | 1 130 | 96.2 |
| 220×10 | 22.8 | 29.0 | 220 | 10 | 31 | 9 | 0.503 | 13.4 | 1 400 | 105 |
| 220×11.5 | 25.4 | 32.3 | 220 | 11.5 | 31 | 9 | 0.506 | 13.1 | 1 550 | 118 |
| 240×10 | 25.4 | 32.4 | 240 | 10 | 34 | 10 | 0.547 | 14.7 | 1 860 | 126 |
| 240×11 | 27.4 | 34.9 | 240 | 11 | 34 | 10 | 0.549 | 14.6 | 2 000 | 137 |
| 240×12 | 29.3 | 37.3 | 240 | 12 | 34 | 10 | 0.551 | 14.4 | 2 130 | 148 |
| 260×10 | 28.3 | 36.1 | 260 | 10 | 37 | 11 | 0.593 | 16.2 | 2 470 | 153 |
| 260×11 | 30.3 | 38.7 | 260 | 11 | 37 | 11 | 0.593 | 16.0 | 2 610 | 162 |
| 260×12 | 32.4 | 41.3 | 260 | 12 | 37 | 11 | 0.595 | 15.8 | 2 770 | 175 |
| 280×11 | 33.5 | 42.6 | 280 | 11 | 40 | 12 | 0.637 | 17.4 | 3 330 | 191 |
| 280×12 | 35.7 | 45.5 | 280 | 12 | 40 | 12 | 0.639 | 17.2 | 3 550 | 206 |
| 300×11 | 36.7 | 46.7 | 300 | 11 | 43 | 13 | 0.681 | 18.9 | 4 190 | 222 |
| 300×12 | 39.0 | 49.7 | 300 | 12 | 43 | 13 | 0.683 | 18.7 | 4 460 | 239 |
| 300×13 | 41.5 | 52.8 | 300 | 13 | 43 | 13 | 0.685 | 18.5 | 4 720 | 256 |
| 320×12 | 42.5 | 54.2 | 320 | 12 | 46 | 14 | 0.728 | 20.1 | 5 530 | 274 |
| 320×13 | 45.0 | 57.4 | 320 | 13 | 46 | 14 | 0.730 | 19.9 | 5 850 | 294 |

**Annex 9 Table 1 Dimensions and sectional properties of bulb flats** (concluded)

| Designation | Mass | Sectional area | Dimensions | | | | Surface area | Centroid | Sectional properties | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $M$ | $A$ | $b$ | $t$ | $c$ | $r_1$ | | $C_x$ | $I_x$ | $Z_x$ |
| | kg/m | cm² | mm | mm | mm | mm | m²/m | cm | cm⁴ | cm³ |
| 340 × 12 | 46.1 | 58.8 | 340 | 12 | 49 | 15 | 0.772 | 21.5 | 6 760 | 313 |
| 340 × 14 | 51.5 | 65.5 | 340 | 14 | 49 | 15 | 0.776 | 21.1 | 7 540 | 357 |
| 370 × 13 | 54.6 | 69.6 | 370 | 13 | 53.5 | 16.5 | 0.840 | 23.5 | 9 470 | 402 |
| 370 × 15 | 60.5 | 77.0 | 370 | 15 | 53.5 | 16.5 | 0.844 | 23.0 | 10 400 | 455 |
| 400 × 14 | 63.9 | 81.4 | 400 | 14 | 58 | 18 | 0.908 | 25.5 | 12 900 | 507 |
| 400 × 16 | 70.2 | 89.4 | 400 | 16 | 58 | 18 | 0.912 | 25.0 | 14 200 | 568 |
| 430 × 15 | 73.9 | 94.1 | 430 | 15 | 62.5 | 19.5 | 0.976 | 27.4 | 17 300 | 628 |
| 430 × 17 | 80.6 | 103 | 430 | 17 | 62.5 | 19.5 | 0.980 | 26.9 | 18 900 | 700 |

## 4 Tolerances

**4.1 Width and thickness** The tolerances on width ($b$) and thickness ($t$) shall be as shown in **Annex 9 Table 2.**

**Annex 9 Table 2 Tolerances on width and thickness**

Unit: mm

| Width ($b$) | Thickness ($t$) | Tolerance on width ($b$) | Tolerance on thickness ($t$) |
|---|---|---|---|
| 120 max. | Over 6.0 up to and incl. 8.0 | ±1.5 | +0.7<br>−0.3 |
| Over 120 up to and incl. 180 | Over 7.0 up to and incl. 10.0 | ±2.0 | +1<br>−0.3 |
| Over 180 up to and incl. 300 | Over 9.0 up to and incl. 13.0 | ±3.0 | +1<br>−0.4 |
| Over 300 up to and incl. 430 | Over 12.0 up to and incl. 17.0 | ±4.0 | +1.2<br>−0.4 |

**4.2 Radius at corner** The radius ($r_2$) at corners shall be within the limits as shown in **Annex 9 Table 3.**

**Annex 9 Table 3 Radius at corner**

Unit: mm

| Thickness (t) | Radius ($r_2$) |
|---|---|
| 6 max. | 1.5 max. |
| Over 6 up to and incl. 9 | 2.0 max. |
| Over 9 up to and incl. 13 | 3.0 max. |
| Over 13 up to and incl. 17 | 4.0 max. |

**4.3 Camber** The maximum permissible camber when measured over the entire length is 0.35 % of full length.

**4.4 Length** The cutting tolerance on length shall be $^{+100}_{0}$ mm. The bulb flats may be supplied to tighter length tolerances according to agreement between the purchaser and the supplier.

**4.5 Mass** Where the tolerance on mass per unit length is to be specified as the rolling tolerance in place of thickness tolerance, it shall be specified by appropriate national standard.

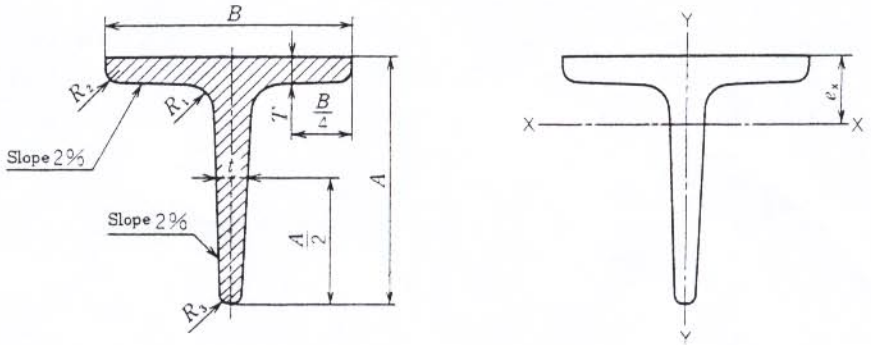
## Annex 10 (normative)
## Hot-rolled steel sections—Part 10 : T-sections with equal depth and flange width—Dimensions

This **Annex 10** has been prepared based on the first edition of **ISO 657-21**, *Hot-rolled steel sections—Part 21 : T-sections with equal depth and flange width—Dimensions*, published in 1983, without any modification in technical contents.

**1 Scope** This Annex specifies the dimensions of hot-rolled T-sections with equal depth and flange width.

**2 Dimensions** The dimensions of T-sections shall be as shown in **Annex 10 Table 1**.

**3 Sectional properties** The mass, sectional area and properties of T-sections are as shown for information in **Annex 10 Table 1**.



## Annex 10 Table 1 Dimensions and sectional properties of hot-rolled steel T-sections with equal depth and flange width

| Designation | Sectional area | Mass | Dimensions | | | | | | | Location of center of gravity | Sectional properties about axes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | $X-X$ | | | $Y-Y$ | | |
| | | | $A$ | $B$ | $T$ | $t$ | $R_1$ | $R_2$ | $R_3$ | $e_x$ | $I_x$ | $Z_x$ | $r_x$ | $I_y$ | $Z_y$ | $r_y$ |
| | $cm^2$ | kg/m | mm | mm | mm | mm | mm | mm | mm | cm | $cm^4$ | $cm^3$ | cm | $cm^4$ | $cm^3$ | cm |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| T 20× 20 | 1.12 | 0.88 | 20 | 20 | 3 | 3 | 3 | 1.5 | 1 | 0.58 | 0.38 | 0.27 | 0.58 | 0.20 | 0.20 | 0.42 |
| T 25× 25 | 1.64 | 1.29 | 25 | 25 | 3.5 | 3.5 | 3.5 | 2 | 1 | 0.73 | 0.87 | 0.49 | 0.73 | 0.43 | 0.34 | 0.51 |
| T 30× 30 | 2.26 | 1.77 | 30 | 30 | 4 | 4 | 4 | 2 | 1 | 0.85 | 1.72 | 0.80 | 0.87 | 0.87 | 0.58 | 0.62 |
| T 35× 35 | 2.97 | 2.33 | 35 | 35 | 4.5 | 4.5 | 4.5 | 2.5 | 1 | 0.99 | 3.10 | 1.23 | 1.04 | 1.57 | 0.90 | 0.73 |
| T 40× 40 | 3.77 | 2.96 | 40 | 40 | 5 | 5 | 5 | 2.5 | 1 | 1.12 | 5.28 | 1.84 | 1.18 | 2.58 | 1.29 | 0.83 |
| T 45× 45 | 4.67 | 3.67 | 45 | 45 | 5.5 | 5.5 | 5.5 | 3 | 1.5 | 1.26 | 8.13 | 2.51 | 1.32 | 4.01 | 1.78 | 0.93 |
| T 50× 50 | 5.66 | 4.44 | 50 | 50 | 6 | 6 | 6 | 3 | 1.5 | 1.39 | 12.1 | 3.36 | 1.46 | 6.06 | 2.42 | 1.03 |
| T 60× 60 | 7.94 | 6.23 | 60 | 60 | 7 | 7 | 7 | 3.5 | 2 | 1.66 | 23.8 | 5.48 | 1.73 | 12.2 | 4.07 | 1.24 |
| T 70× 70 | 10.6 | 8.32 | 70 | 70 | 8 | 8 | 8 | 4 | 2 | 1.94 | 44.5 | 8.79 | 2.05 | 22.1 | 6.32 | 1.44 |
| T 75× 75 | 11.6 | 9.08 | 75 | 75 | 8 | 8 | 8 | 4.5 | 2.0 | 2.14 | 60.5 | 11.3 | 2.29 | 28.1 | 7.49 | 1.56 |
| T 80× 80 | 13.6 | 10.7 | 80 | 80 | 9 | 9 | 9 | 4.5 | 2 | 2.22 | 73.7 | 12.8 | 2.33 | 37.0 | 9.25 | 1.65 |
| T 90× 90 | 17.1 | 13.4 | 90 | 90 | 10 | 10 | 10 | 5 | 2.5 | 2.48 | 119 | 18.2 | 2.64 | 58.5 | 13.0 | 1.85 |
| T100×100 | 20.9 | 16.4 | 100 | 100 | 11 | 11 | 11 | 5.5 | 3 | 2.74 | 179 | 24.6 | 2.92 | 88.3 | 17.7 | 2.05 |
| T120×120 | 29.6 | 16.4 | 120 | 120 | 13 | 13 | 13 | 6.5 | 3 | 3.28 | 366 | 42.0 | 3.51 | 178 | 29.7 | 2.45 |
| T140×140 | 39.9 | 31.3 | 140 | 140 | 15 | 15 | 15 | 7.5 | 4 | 3.80 | 660 | 64.7 | 4.07 | 330 | 47.2 | 2.88 |