Design manual of welded and cold-formed hollow sections

1st Edition, 2014

FERPINTA

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1. INTRODUTION

1.1 The structural tube

The use of steel tubes in structures is a major advantage to the steel and composite construction field. It is produced in several resistance classes. With the use of hollow sections, it is possible to obtain:

i) resistant structures, with excellent resistance to compression and torsion;
(ii) light and dynamic structures; and
(iii) with a high ratio "Resistance/Weight".

Due to their versatility, low weight and ease of maintenance, the tubes are widely used in great projects allowing large spans, such as in football stadiums, airports, sports facilities and oil rigs.

Aesthetical appearance

The use of circular, square and rectangular tubes contributes significantly to the improvement of the architectural component of the structure. Structures with hollow sections have attractive, modern and innovative aesthetical appearance. It is very common to use these sections in space frames and trusses.

Uniformity

The intrinsic properties of hollow sections result in uniform mechanical and geometrical characteristics, which, on its turn, lead to predictable and easy application. In addition, since hollow sections present smooth surfaces, do not have sharp edges and angles, maintenance and painting become simple and consequently more economical.

Easy technological transformation

Not only technological operations are easier (with adequate preparation in the design phase), but also structural tube provides significant reductions in costs. Due to the lower surface area (A_L) when compared to open sections, painting; fire protection; and maintenance become cheaper.

Resistance / Consistency

Tubular structures also offer greater fire resistance than open sections due to decreased surface exposed. The possibility that these are also easily filled with concrete, mainly in columns, gives a considerable increase in what concerns mechanical strength and fire resistance. These profiles have smooth surfaces and do not have corners, which promotes resistance to corrosion.

Finally, due to the high warping resistance, tubular sections do not require major precautions during erection/assembly phase. Due to this, tubular sections are usually used in cranes and scaffolding structures, without the need to major restraining solutions.

Environmentally friendly

Steel is one of the most recyclable materials in the world, and unlike other construction products does not contribute to the greenhouse effect. In combination with hollow sections when applied to structural applications – temporary or not – these are much more easily dismantled allowing reuse.

1.2 Scope and organization of the manual

This document aims at providing the rules for verification of structural hollow sections according to European Standard Eurocode 3 – Part 1-1 General rules and rules for buildings (EC3-1-1) [1], pragmatically and through key examples.

It is organized into 3 main parts:

- **Part A.** Safety verification of structures with steel hollow sections;
- **Part B.** Numerical examples;
- **Parte C.** Product standards and FERPINTA hollow sections.

PART A

PART A

Global analysis of internal forces and displacements in a structure, in particular in a steel structure, depends mainly on its deformability and stiffness properties, as well as on the global and member stability, cross section resistance and behavior, imperfections and support deformability.

As a result, in Part A, the following is presented:

- **Chapter 2** – Structural analysis: types of analyses; member imperfections; classification of cross sections; and safety factors;
- **Chapter 3** – Resistance of cross sections;
- **Chapter 4** – Stability of members;
- **Chapter 5** – Local buckling of cross sections (class 4).

2. STRUCTURAL ANALYSIS

2.1 Types of analyses and imperfections

Steel structures are usually slender structures when compared to alternatives using other materials. Instability phenomena are potentially present, so that it is normally necessary to verify the global stability of the structure or of part of it. This verification leads to the need to carry out a 2nd order analysis, with the consideration of imperfections (EC3-1-1 clause 5.2.2(2)). There is a multiplicity of ways to assess 2nd order effects including imperfections. In general terms and according to clause 5.2.2(3), the different procedures can be categorized according to the following three methods (EC3-1-1 clause 5.2.2(3)):

- global analysis directly accounts for all imperfections (geometrical and material) and all 2nd order effects (method 1);
- global analysis partially accounts for imperfections (global structural imperfections) and 2nd order effects (global effects), while individual stability checks on members (clause 6.3) intrinsically account for member imperfections and local 2nd order effects (method 2);
- in basic cases, individual stability checks of equivalent members (clause 6.3), using appropriate buckling lengths corresponding to the global buckling mode of the structure (method 3)

Figure 2.1 illustrates the described methodologies.

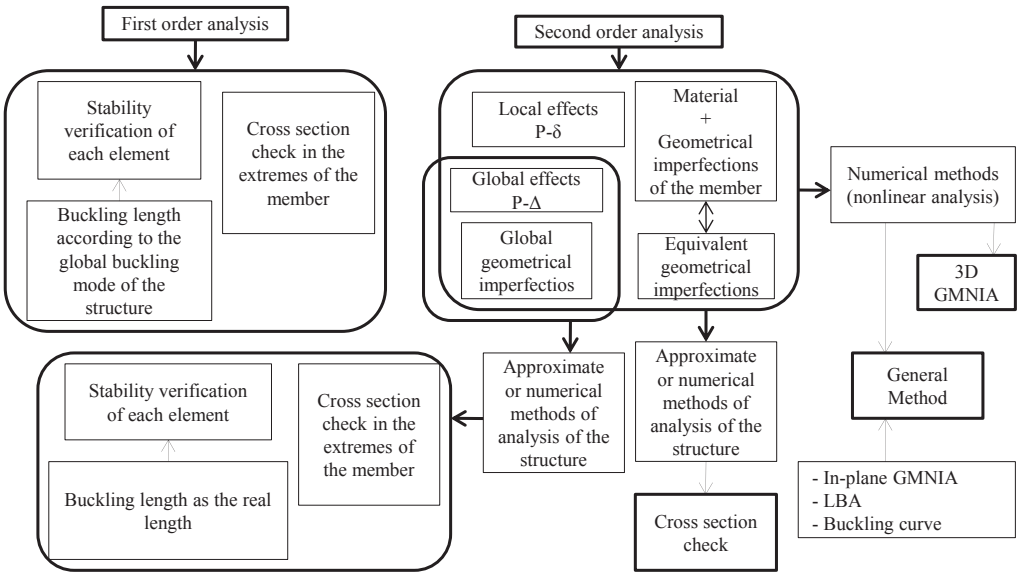


Fig. 2.1 - Methods of Structural analysis and safety verification of steel structures

2.2 Cross section classification

The local buckling of cross sections affects their resistance and rotation capacity and must be considered in design. The evaluation of the influence of local buckling of a cross section on the resistance or ductility of a steel member is complex. Consequently, a deemed-to-satisfy

approach was developed in the form of cross section classes that greatly simplify the problem.
According to clause 5.5.2(1), four classes of cross sections are defined, depending on their rotation capacity and ability to form rotational plastic hinges:

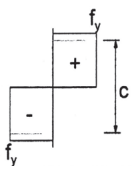
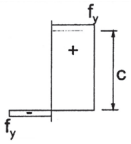
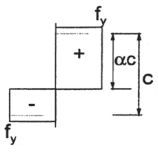
- **Class 1** – cross sections are those which can form a plastic hinge with the rotation capacity required from plastic analysis without reduction of the resistance;
- **Class 2** – cross sections are those which can develop their plastic resistance moment, but have limited rotation capacity because of local buckling;
- **Class 3** – cross sections are those in which the stress in the extreme compression fibre of the steel member, assuming an elastic distribution of stresses, can reach the yield strength. However, local buckling is liable to prevent development of the plastic resistance moment;
- **Classe 4** – cross sections are those in which local buckling will occur before the attainment of yield stress in one or more parts of the cross section.

The classification of a cross section depends on the width to thickness ratio *c/t* of the parts subjected to compression (EC3-1-1 clause 5.5.2(3)), the applied internal forces and the steel grade. Parts subject to compression include every part of a cross section which is either totally or partially in compression under the load combination considered (EC3-1-1 clause 5.5.2(4)). The limiting values of the ratios *c/t* of the compressed parts are indicated in Tables 2.1 to 2.2 that reproduce Table 5.2 of EC3-1-1, in what concerns tubular sections.

For rectangular and square hollow sections, $c = h - 3t$ or $c = b - 3t$.

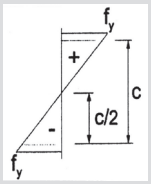
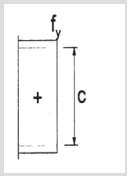
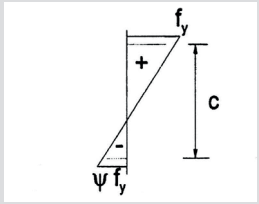
Table 2.1 - Maximum width-to-thickness ratios for internal compression parts

Internal compression parts or RHS or SHS cross sections

Class	Part subjected to bending	Part subjected to compression	Part subjected to bending and compression
Stress distribution (compression positive)			
1	$c/t \le 72\varepsilon$	$c/t \le 33\varepsilon$	if $\alpha > 0{,}5$, $c/t \le \frac{396\varepsilon}{13\alpha - 1}$ if $\alpha \le 0{,}5$, $c/t \le \frac{36\varepsilon}{\alpha}$

2.2 CROSS SECTION CLASSIFICATION

Table 2.1 - Maximum width-to-thickness ratios for internal compression parts

2	$c/t \le 83\varepsilon$	$c/t \le 38\varepsilon$	if $\alpha > 0{,}5$, $c/t \le \frac{456\varepsilon}{13\alpha - 1}$ if $\alpha \le 0{,}5$, $c/t \le \frac{41{,}5\varepsilon}{\alpha}$
Stress distribution (compression positive)			
3	$c/t \le 124\varepsilon$	$c/t \le 42\varepsilon$	if $\Psi > -1$, $c/t \le \frac{42\varepsilon}{0{,}67 + 0{,}33\Psi}$ if $\Psi > -1$*, $c/t \le 62\varepsilon(1-\Psi)\sqrt{(-\Psi)}$

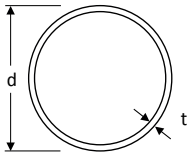
$\varepsilon = \sqrt{235/f_y}$

f_y (N/mm²)	235	275	355	420	460
ε	1,00	0,92	0,81	0,75	0,71

*Ψ = -1 applies where either the compression stress σ < f_y or the tensile strain $\varepsilon_y > f_y/E$.

Table 2.2 - Maximum width-to-thickness ratios for compression parts

Tubular sections



Class	Section in bending and/or compression
1	$d/t \le 50\varepsilon^2$
2	$d/t \le 70\varepsilon^2$
3	$d/t \le 90\varepsilon^2$ Note: For $d/t > 90\varepsilon^2$, see EN 1993-1-6 [2]

Table 2.2 - Maximum width-to-thickness ratios for compression parts

$e = \sqrt{235 / f_y}$	$f_y (N/mm^2)$	235	275	355	420	460
	ε	1,00	0,92	0,81	0,75	0,71

As alternative to Table 2.2, a new limit *d/t* is proposed in [3] for classification of circular hollow sections subject to bending and axial compression, given by

$$d/t \leq \frac{2520\varepsilon^2}{5\psi + 23}$$

Eq. 2.1

2.3 Reliability of the design methods

For steel members, the following three failure modes are considered (clause 6.1(1)): i) resistance of cross sections, whatever the class; ii) resistance of members to instability assessed by member checks and iii) resistance of cross sections in tension to fracture. The first two are addressed in the application. Specific partial safety factors γ_{M0}, γ_{M1} and γ_{M2}, deemed to guarantee the reliability targets of EN 1990 [5], correspond to each failure mode, respectively. The following values of the partial safety factors γ_{Mi} are recommended for buildings: γ_{M0} = 1.00; γ_{M1} = 1.00 and γ_{M2} = 1.25 are considered here.

3. RESISTANCE OF CROSS SECTIONS

3.1 Compression or tension in laterally restrained members

According to clause 6.2.3, the cross section resistance of axially tensioned members is verified by the following condition:

$$\frac{N_{Ed}}{N_{t,Rd}} \leq 1,0 \qquad \text{Eq. 3.1}$$

where N_{Ed} is the design value of the axial force and $N_{c,Rd}$ is the design resistance of the cross section for uniform tension. According to clause 6.2.4, the design value of the tension resistant axial force $N_{t,Rd}$, in general, is given by the smallest value between the plastic design resistance of the whole section $N_{pl,Rd}$ design ultimate resistance of the net cross section at holes for fasteners $N_{u,Rd}$.

The cross section resistance of axially compressed members is verified by the following condition (EC3-1-1 clause 6.2.4(1)):

$$\frac{N_{Ed}}{N_{c,Rd}} \leq 1,0 \qquad \text{Eq. 3.2}$$

where N_{Ed} is the design value of the axial force and $N_{c,Rd}$ is the design resistance of the cross section for uniform compression, given by (EC3-1-1 clause 6.2.4(2)):

- Class 1, 2 or 3 cross sections

$$N_{c,Rd} = A f_y / \gamma_{Mo} \qquad \text{Eq. 3.3}$$

- Class 4 cross section

$$N_{c,Rd} = A_{eff} f_y / \gamma_{Mo} \qquad \text{Eq. 3.4}$$

where A is the gross area of the cross section, A_{eff} is the effective area of a class 4 cross section, f_y is the yield strength of steel and γ_{Mo} is a partial safety factor. In evaluating $N_{c,Rd}$, holes for fasteners can be neglected, provided they are filled by fasteners and are not oversize or slotted (EC3-1-1 clause 6.2.4(3)).

3.2 Uniaxial Major Axis bending

In the absence of shear forces, the design value of the bending moment M_{Ed} at each cross section should satisfy (EC3-1-1 clause 6.2.5(1)):

$$\frac{M_{Ed}}{M_{c,Rd}} \leq 1,0 \qquad \text{Eq. 3.5}$$

where M_{Ed} is the design value of the bending moment and $M_{c,Rd}$ is the design resistance for bending. The design resistance for bending about one principal axis of a cross section is determined as follows (EC3-1-1 clause 6.2.5(2)):

- Class 1 or 2 cross sections

$$M_{c,Rd} = W_{pl} f_y / \gamma_{Mo} \qquad \text{Eq. 3.6}$$

- Class 3 cross sections

$$M_{c,Rd} = W_{el,min} f_y / \gamma_{Mo} \qquad \text{Eq. 3.7}$$

- Class 4 cross sections

$$M_{c,Rd} = W_{eff,min} f_y / \gamma_{Mo} \qquad \text{Eq. 3.8}$$

where W_{pl} is the plastic section bending modulus; $W_{el,min}$ is the minimum elastic section bending modulus; $W_{eff,min}$ is the minimum elastic bending modulus of the reduced effective section; f_y is the yield strength of the material; and γ_{Mo} is the partial safety factor.

3. RESISTANCE OF CROSS SECTIONS

3.3 Shear force

According to clause 6.2.6, the design value of the shear force, V_{Ed}, must satisfy the following condition:

$$\frac{V_{Ed}}{V_{c,Rd}} \leq 1,0$$

Eq. 3.9

where $V_{c,Rd}$ is the design shear resistance.

Considering plastic design, in the absence of torsion the design shear resistance, $V_{c,Rd}$, is given by the design plastic shear resistance, $V_{pl,Rd}$, given by the following expression:

$$V_{pl,Rd} = A_v \left(f_y / \sqrt{3}\right) / \gamma_{Mo}$$

Eq. 3.10

where A_v is the shear area, defined in a qualitative manner for a section subjected to shear. The shear area corresponds approximately to the area of the parts of the cross section that are parallel to the direction of the shear force. Clause 6.2.6(3) provides expressions for the calculation of the shear area for tubular steel sections:

- rectangular hollow sections of uniform thickness, load parallel to depth:

$$A_v = Ah/(b+h)$$

Eq. 3.11

- rectangular hollow sections of uniform thickness, load parallel to width:

$$A_v = Ab/(b+h)$$

Eq. 3.12

- circular hollow sections and tubes of uniform thickness:

$$A_v = 2A/\pi$$

Eq. 3.13

where A is the cross sectional area; b is the overall breadth; and h is the overall depth.

Considering elastic design, the verification of resistance to shear force is given by the following criterion:

$$\frac{\tau_{Ed}}{f_y / \left(\sqrt{3}\,\gamma_{Mo}\right)} \leq 1,0$$

Eq. 3.14

where τ_{Ed} is the design value of the local shear stress at a given point. For tubular sections it is obtained from:

$$\tau_{Ed} = \frac{V_{Ed}\,S}{2It}$$

Eq. 3.15

Where V_{Ed} is the design value of the shear force; S is the first moment of area about the centroidal axis of that portion of the cross section between the point at which the shear is required and the boundary of the cross section; I is the second moment of area about the neutral axis; t is the thickness of the section at the given point.

The shear buckling resistance of webs should be verified, for unstiffened webs when $h_w/t_w > 72\,\varepsilon/\eta$, where h_w and t_w represent the depth and the thickness of the web (RHS and SHS sections), respectively, η is a factor defined in EC3-1-5, which may be conservatively taken as 1.0, and ε is given by the relation $\sqrt{(235/f_y)}$. When load is parallel to width, h_w shall be replaced by b_f, where b_f is the width of the hollow section.

3.4 Torsion

The design of members subjected to a torsional moment should comply with the following condition (clause 6.2.7):

3.5 COMBINED SHEAR AND BENDING OR TORSION

$$\frac{T_{Ed}}{T_{Rd}} \leq 1,0$$

Eq. 3.16

where T_{Ed} is the design value of the torsional moment and T_{Rd} is the design torsional resistance of the cross section, evaluated according to the formulations presented previously.

For verification of (3.44) in cross sections under non-uniform torsion, the design value of the torsional moment, T_{Ed}, should be decomposed into two components:

$$T_{Ed} = T_{t,Ed} + T_{wEd}$$

Eq. 3.17

where $T_{t,Ed}$ is the internal component of uniform torsion (or St. Venant's torsion) and $T_{w,Ed}$ is the internal component of warping torsion. According to clause 6.2.7 (7), for closed hollow sections, the latter may be neglected, $T_{W,Ed} \approx 0$.

For the calculation of the resistance T_{Rd} of closed hollow sections the design shear strength of the individual parts of the cross section according to EN 1993-1-5 should be taken into account.

Finally, when shear force and torsion is presente, where $V_{pl,Rd}$ shall be replaced by $V_{pl,T,Rd}$, which is the reduced design plastic shear resistance, to account for the torsional moment. According to clause 6.2.7(9) the following shall be satistied:

$$\frac{V_{Ed}}{V_{pl,T,Rd}} \leq 1,0$$

Eq. 3.18

Where, for hollow sections,

$$V_{pl,T,Rd} = \left[1 - \frac{\tau_{t,Ed}}{f_y / \left(\sqrt{3}\,\gamma_{Mo}\right)}\right] \leq 1,0$$

Eq. 3.19

And the shear stresses $\tau_{t,Ed}$ come from the uniform component $T_{t,Ed}$.

3.5 Combined shear and bending or torsion

In an elastic stress analysis, the interaction between bending and shear force may be verified by applying a yield criterion. This procedure, valid for any type of cross section, requires calculation of elastic normal stresses (σ) and elastic shear stresses (τ), based on formulas from the theory of the elasticity, at the critical points of the cross section. The following condition (from von Mises criterion for a state of plane stress) has then to be verified (clause 6.2.1 (5)):

$$\sigma_{von-Mises} = \sqrt{\sigma^2 + 3\tau^2} \leq \frac{f_y}{\gamma_{Mo}}$$

Eq. 3.20

which, for the case of combined shear and bending is given by

$$\left(\frac{\sigma_{x,Ed}}{f_y/\gamma_{Mo}}\right)^2 + \left(\frac{\tau_{Ed}}{f_y/3\gamma_{Mo}}\right)^2 \leq 1 \Rightarrow \left(\frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 + \left(\frac{V_{Ed}}{V_{el,Rd}/\gamma_{Mo}}\right)^2 \leq 1$$

Eq. 3.21

For plastic analysis, there are several models for combining shear and bending. The model used by EC3-1-1 evaluates a reduced bending moment obtained from a reduced yield strength (f_{yr}) along the shear area. Clause 6.2.8 establishes the following interaction criterion between bending moment and shear force:

- When V_{Ed} < 50% of the plastic shear resistance $V_{pl,Rd}$, it is not necessary to reduce the design moment resistance $M_{c,Rd}$, except where shear buckling reduces the cross section resistance.
- When V_{Ed} ≥50% of the plastic shear resistance $V_{pl,Rd}$, the value of the design moment resistance should be evaluated using a reduced yield strength $(1-\rho)f_y$ for the shear area, where $\rho = (2\,V_{Ed}/V_{pl,Rd}-1)^2$.

When torsion is present, $\rho = (2\,V_{Ed} / V_{pl,T,Rd} - 1)^2$; and $\rho = 0$ if $V_{Ed} \le 0{,}5\,V_{pl,T,Rd}$

3.6 Combined bending and axial force

In an elastic stress analysis, the interaction between bending, axial force and shear force may be verified by applying a yield criterion. Eq. (3.13) (from von Mises criterion for a state of plane stress) has then to be verified, which, for the case of combined bending, axial force and shear is given by

$$\left(\frac{\sigma_{x,Ed}}{f_y/\gamma_{Mo}}\right)^2 + \left(\frac{\tau_{Ed}}{f_y/3\gamma_{Mo}}\right)^2 \le 1 \quad \Rightarrow \left(\frac{N_{Ed}}{N_{el,Rd}/\gamma_{Mo}} + \frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 + \left(\frac{V_{Ed}}{V_{el,Rd}/\gamma_{Mo}}\right)^2 \le 1$$

Eq. 3.22

For plastic analysis, cross section verification to combined bending and axial force is verified according in Section 6.2.9.1. For rectangular hollow sections of uniform thickness and for welded box sections with equal flanges and equal webs and where fastener holes are not to be accounted for, the reduced plastic moment resistance, can also be obtained from clause 6.2.9.1(5):

$$M_{N,y,Rd} = M_{pl,y,Rd}\frac{1-n}{1-0{,}5\,a_w} \quad \text{but} \quad M_{N,y,Rd} \le M_{pl,y,Rd}$$

Eq. 3.23

$$M_{N,z,Rd} = M_{pl,z,Rd}\frac{1-n}{1-0{,}5\,a_f} \quad \text{but} \quad M_{N,y,Rd} \le M_{pl,y,Rd}$$

Eq. 3.24

where

$$n = \frac{N_{Ed}}{N_{pl,Rd}} \le 0{,}5, \quad a_w = \frac{A-2bt}{A} \le 0{,}5 \quad \text{and} \quad a_f = \frac{A-2ht}{A} \le 0{,}5$$

For a circular hollow section, the following exact expression may be established (not given in EC3-1-1):

$$M_{N,Rd} = M_{pl,Rd}\left(1-n^{1{,}7}\right)$$

Eq. 3.25

Finally, for bi-axial bending the following criterion may be used:

$$\left[\frac{M_{y,Ed}}{M_{N,y,Rd}}\right]^{\alpha} + \left[\frac{M_{z,Ed}}{M_{N,z,Rd}}\right]^{\beta} \le 1$$

Eq. 3.26

3.6 COMBINED BENDING AND AXIAL FORCE

Where, for rectangular hollow sections,

$$\alpha = \beta = \frac{1.66}{1 - 1,13n^2} \leq 6$$

Eq. 3.27

And for circular hollow sections,

$$\alpha = \beta = 2$$

Eq. 3.28

4. BUCKLING RESISTANCE OF MEMBERS

4.1 Compression

4.1.1 Elastic critical load

The critical axial load of a straight prismatic member is given by

$$N_{cr} = \frac{\pi^2 E I}{L_e^{\,2}} \qquad \text{Eq. 4.1}$$

where $L_e = k.L$ is the buckling length and depends on the support conditions of the column. For a simply supported column, $k=1$

4.1.2 Flexural buckling resistance

The cross section resistance of axially compressed members is verified by the condition in Eq. (3.2). In compression members it must also be verified that:

$$N_{Ed} \le N_{b,Rd} \qquad \text{Eq. 4.2}$$

where $N_{b,Rd}$ is the design buckling resistance of the compression member (EC3-1-1 clause 6.3.1.1(1)) and this generally controls design. The design flexural buckling resistance of prismatic members is given by:

- Class 1, 2 or 3 cross sections

$$N_{b,Rd} = \chi A f_y / \gamma M_1 \qquad \text{Eq. 4.3}$$

- Class 4 cross sections

$$N_{b,Rd} = \chi A_{eff} f_y / \gamma M_1 \qquad \text{Eq. 4.4}$$

where χ is the reduction factor for the relevant buckling mode and γ_{M1} is a partial safety factor (EC3-1-1 clause 6.3.1.1(3)). The reduction factor χ is obtained from the following expression:

$$\chi = \frac{1}{\phi + \sqrt{\phi^2 - \overline{\lambda}^2}}, \text{ mas } \chi \le 1 \qquad \text{Eq. 4.5}$$

In this expression, $\phi = 0{,}5\left[1 + \alpha\left(\overline{\lambda} - 0{,}2\right) + \overline{\lambda}^2\right]$ and $\overline{\lambda}$ is the non-dimensional slenderness coefficient, given by:

- Class 1, 2 or 3 cross sections

$$\overline{\lambda} = \sqrt{A f_y / N_{cr}} = \frac{\lambda}{\lambda_1} \qquad \text{Eq. 4.6}$$

- Class 4 cross sections

$$\overline{\lambda} = \sqrt{A_{eff} f_y / N_{cr}} = \frac{\lambda}{\lambda_1}\sqrt{\frac{A_{eff}}{A}} \qquad \text{Eq. 4.7}$$

where N_{cr} is the elastic critical load (Euler's critical load) for the relevant buckling mode and $\lambda = L_e / i$ e $\lambda_1 = \pi\sqrt{E/f_y}$. The effect of imperfections is included by the imperfection factor α, which assumes values of 0.13, 0.21, 0.34, 0.49 and 0.76 for curves a_o, a, b, c and d (European design buckling curves), respectively. These curves, mathematically represented by equation (3.29), are illustrated in Figure 3.1. The imperfection factor α and the associated buckling curve to be adopted in design of a given member depends on the geometry of the cross sections, on the steel grade, on the fabrication process and on the relevant buckling plane, as described in Table 3.4, for the case of tubular sections.

4. BUCKLING RESISTANCE OF MEMBERS

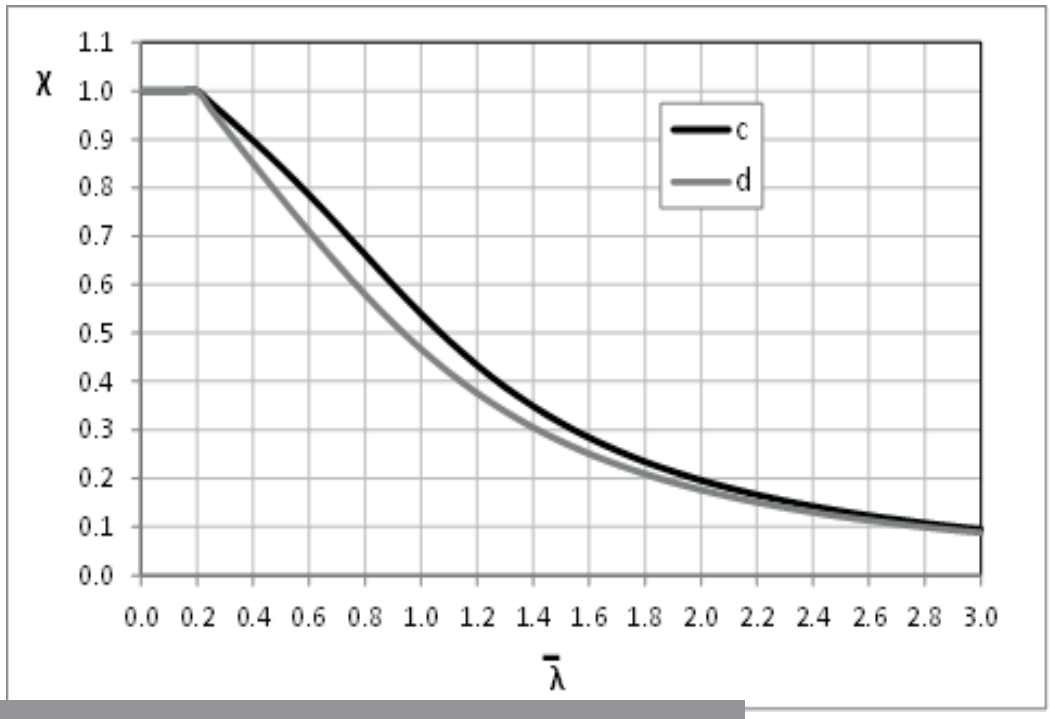


Fig. 4.1 - Buckling curves according to EC3-1-1

Table 4.1 - Selection of the buckling curve

Cross section	Geometry limits	Buckling about axis	Buckling curve S 235 S 275 S355 S420	Buckling curve S460
Hollow sections 	Cold formed	any	*c*	*c*

According to clause 6.3.1.2(4), for values of the non-dimensional slenderness $\bar{\lambda} \leq 0{,}2$ or if $N_{Ed}/N_{cr} \leq 0{,}04$, the effect of buckling can be neglected, and members are designed based only on the cross section resistance.

Annex BB.1 provides guidelines that allow quantification of the buckling length for members in triangulated and lattice structures. In general, for the evaluation of the buckling resistance of chord members, a buckling length equal to the real length *L* may be adopted, for both in-plane and out-of-plane buckling; in some particular cases lower values can be adopted, provided that they are properly justified.

Example 6.1 illustrates this procedure.

4.2 LATERALLY UNRESTRAINED BEAMS

4.2 Laterally unrestrained beams

4.2.1 Elastic critical moment

The elastic critical moment can be estimated using expression (4.8) proposed by Clark and Hill [12] and Galéa [13], simplified for the case of tubular profiles. This is applicable to members subject to bending about the strong axis, for several support conditions and types of loading.

$$M_{cr} = C_1 \frac{\pi^2 E I_z}{(k_z L)^2} \left\{ \left[\frac{(k_z L)^2 G I_T}{\pi^2 E I_z} + (C_2 z_g)^2 \right]^{0.5} - (C_2 z_g) \right\}$$

Eq. 4.8

where,

- C_1 and C_2 are coefficients depending on the shape of the bending moment diagram and on support conditions;
- k_z and k_w are effective length factors that depend on the support conditions at the end sections. Factor k_z is related to rotations at the end sections about the weak axis z, and k_w refers to warping restriction in the same cross sections. These factors vary between 0.5 (restrained deformations) and 1.0 (free deformations), and are equal to 0.7 in the case of free deformations at one end and restrained at the other. Since in most practical situations restraint is only partial, conservatively a value of $k_z = k_w = 1.0$ may be adopted;
- $z_g = (z_a - z_s)$ where z_a and z_s are the coordinates of the point of application of the load and of the shear centre, relative to the centroid of the cross section; these quantities are positive if located in the compressed part and negative if located in the tension part;

For determination of C_1, the procedure from Figure 4.2 for a general bending moment distribution is considered [6]:

$$\alpha_1 = 1 - k_2 \quad \alpha_2 = 5\frac{k_1^3}{k_2^2} \quad \alpha_3 = 5\left(\frac{1}{k_1} + \frac{1}{k_2}\right) \quad \alpha_4 = 5\frac{k_2^3}{k_1^2} \quad \alpha_5 = 1 - k_1$$

$$A_1 = \frac{M_{max}^2 + \alpha_1 M_1^2 + \alpha_2 M_2^2 + \alpha_3 M_3^2 + \alpha_4 M_4^2 + \alpha_5 M_5^2}{(1 + \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \alpha_5) M_{max}^2}$$

$$A_2 = \left| \frac{M_1^2 + 2M_2 + 3M_3 + 2M_4 + M_5}{9M_{max}} \right|$$

$$k = \sqrt{k_1 k_2}$$

$$C_1 = \frac{\sqrt{\sqrt{k} A_1 + \left[\frac{1 - \sqrt{k}}{2} A_2 \right]^2} + \frac{1 - \sqrt{k}}{2} A_2}{A_1}$$

Fig. 4.2 - Determination of C1 according to [6]

4. BUCKLING RESISTANCE OF MEMBERS

The values of M_i and M_{max} to be considered in for determination of C_1 are given in Figure 4.3, with the corresponding signs.

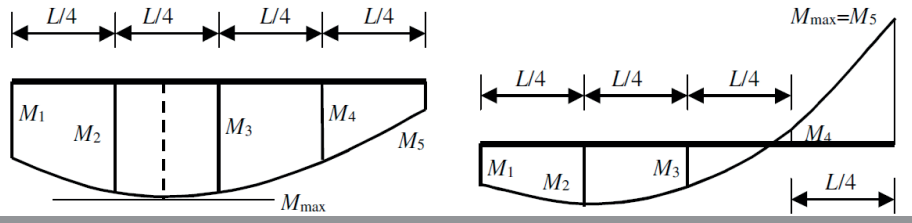


Fig. 4.3 - Values of M_i and M_{max} a to be considered in the determination of C1 according to [6]

The values of k_1 and k_2 correspond respectively to the left and right end warping and minor axis bending conditions. If warping and bending are prevented at the left (or right) end, k_1 (or k_2) is 0.5; if warping and bending are free at the left (or right) end, k_1 (or k_2) is 1. k_1 or k_2 may be safely assumed as 1 for other end conditions.

Regarding C_2, for a uniformly distributed loading it may be taken as C_2=0.45 and C_2=0.36 respectively for k_z=1 and k_z=0.5; and for a concentrated load at mid-span it may be taken as C_2=0.59 and C_2=0.48 respectively for k_z=1 and k_z=0.5. In beams subject to end moments, by definition, $C_2 z_g$ =0.

4.2.2 Lateral-torsional buckling resistance

The verification of resistance to lateral-torsional buckling of a prismatic member consists of the verification of the following condition (EC3-1-1 clause 6.3.2.1(1)):

$$\frac{M_{Ed}}{M_{b,Rd}} \leq 1,0$$

Eq. 4.9

where M_{Ed} is the design value of the bending moment and $M_{b,Rd}$ is the design buckling resistance, given by (EC3-1-1 clause 6.3.2.1(3)):

$$M_{b,Rd} = \chi_{LT} W_y f_y / \gamma_{M1}$$

Eq. 4.10

where $W_y = W_{pl,y}$ for class 1 and 2 cross sections; $W_y = W_{el,y}$ for class 3 cross sections; $W_y = W_{eff,y}$ for class 4 cross sections; and χ_{LT} is the reduction factor for lateral-torsional buckling.

In EC3-1-1 two methods for the calculation of the reduction coefficient χ_{LT} in prismatic members are proposed: a general method that can be applied to any type of cross section (more conservative) and an alternative method that can be applied to rolled cross sections or equivalent welded sections. The General Method is considered here.

According to the general method (clause 6.3.2.2), the reduction factor χ_{LT} is determined by the following expression:

4.3 COMBINED BENDING AND COMPRESSION

$$\chi_{LT} = \frac{1}{\phi_{LT} + \left(\phi_{LT}^{\ 2} - \overline{\lambda}_{LT}^{2}\right)^{0,5}}, \text{ but } \chi_{LT} \leq 1,0$$

Eq. 4.11

where:
$\phi_{LT} = 0,5\left[1 + \alpha_{LT}\left(\overline{\lambda}_{LT} - 0,2\right) + \overline{\lambda}_{LT}^{2}\right]$; α_{LT} is the imperfection factor, which depends on the buckling curve; $\overline{\lambda}_{LT} = \left[W_y f_y / M_{cr}\right]^{0,5}$; M_{cr} the elastic critical moment.
The buckling curves to be adopted depend on the geometry of the cross section of the member and are indicated in Table 6.4 of EC3-1-1. For tubular cross sections, curve *d* must me considered. Example 6.2 illustrates this procedure.

4.3 Combined bending and compression

The instability of a member of doubly symmetric cross section, not susceptible to distortional deformations, and subject to bending and axial compression, can be due to flexural buckling or to lateral torsional buckling. Therefore, clause 6.3.3(1) considers two distinct situations:

- Members not susceptible to torsional deformation, such as members of circular hollow section or other sections restrained from torsion. Here, flexural buckling is the relevant instability mode.
- Members that are susceptible to torsional deformations, such as members of open section (I or H sections) that are not restrained from torsion. Here, lateral torsional buckling tends to be the relevant instability mode.

Consider a single span member of doubly symmetric section, with the "standard case" end conditions. The member is subject to biiaxial bending moment and axial compression. The following conditions should be satisfied, respectively Eq. (6.61) and (6.62) of Eurocode:

$$\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}} + k_{yy}\frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT} M_{y,Rk}/\gamma_{M1}} + k_{yz}\frac{M_{z,Ed} + \Delta M_{z,Ed}}{M_{z,Rk}/\gamma_{M1}} \leq 1,0$$

Eq. 4.12b

$$\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}} + k_{zy}\frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT} M_{y,Rk}/\gamma_{M1}} + k_{zz}\frac{M_{z,Ed} + \Delta M_{z,Ed}}{M_{z,Rk}/\gamma_{M1}} \leq 1,0$$

Eq. 4.12a

where:

- N_{Ed}, $M_{y,Ed}$ and $M_{z,Ed}$ are the design values of the axial compression force and the maximum bending moments along the member about *y* and *z* , respectively;
- $\Delta M_{y,Ed}$ and $\Delta M_{z,Ed}$ are the moments due to the shift of the centroidal axis on a reduced effective class 4 cross section;
- χ_y and χ_z are the reduction factors due to flexural buckling about *y* and *z*, respectively, evaluated according to clause 6.3.1 or in sub-chapter 3.6;
- χ_{LT} is the reduction factor due to lateral-torsional buckling, evaluated according to clause 6.3.2 or in sub-chapter 3.6 (χ_{LT} = 1.0 for members that are not susceptible to torsional deformation);

4. BUCKLING RESISTANCE OF MEMBERS

- k_{yy}, k_{yz}, k_{zy} and k_z are ,interaction factors that depend on the relevant instability and plasticity phenomena, obtained through Annex A (Method 1) or Annex B (Method 2);
- $N_{RK} = f_y A_i$, $M_{i,RK} = f_y W_i$ and $\Delta M_{i,Ed}$ are evaluated according to Table 4.2, depending on the cross sectional class of the member.

Table 4.2 – Values for the calculation of N_{Rk}, $M_{i,Rk}$ and $\Delta M_{i,Ed}$

Class	1	2	3	4
A_i	A	A	A	A_{eff}
W_y	$W_{pl,y}$	$W_{pl,y}$	$W_{el,y}$	$W_{eff,y}$
W_z	$W_{pl,z}$	$W_{pl,z}$	$W_{el,z}$	$W_{eff,z}$
$\Delta M_{y,Ed}$	0	0	0	$e_{N,y} N_{Ed}$
$\Delta M_{z,Ed}$	0	0	0	$e_{N,z} N_{Ed}$

In members that are not susceptible to torsional deformation, it is assumed that there is no risk of lateral torsional buckling. The stability of the member is then verified by checking against flexural buckling about *y* and about *z*. This procedure requires application of expressions (4.12a) (flexural buckling around *y*) and (4.12b) (flexural buckling around *z*), considering χ_{LT} = 1.0 and calculating the interaction factors k_{yy} and k_{zy} for a member not susceptible to torsional deformation.

In members that are susceptible to torsional deformation, it is assumed that lateral torsional buckling is more critical. In this case, expressions (4.12a) and (4.12b) should be applied, with χ_{LT} evaluated according to clause 6.3.2 or sub-chapter 4.2, and calculating the interaction factors for a member susceptible to torsional deformation.

Concerning hollow sections, according to Method 2, the following members may be considered as not susceptible to torsional deformation: members with circular hollow sections; members with square hollow sections; members with rectangular hollow sections: according to some authors [7,8] if $h/b \leq 10/\overline{\lambda}_z$, where *h* and *b* is the height and width of the section, respectively and $\overline{\lambda}_z$ is the normalized slenderness with respect to minor axis *z*; and laterally restrained members at the compression level.

For the calculation of the interaction factors according to Method 2, tables from Annex B are presented. Tables 4.3 and 4.4 indicate the interaction factors k_{ij}. Table 3.9 indicates the equivalent uniform moment factors, C_{mi}, evaluated from the diagram of bending moments between braced sections.

4.3 COMBINED BENDING AND COMPRESSION

Table 4.3 – Interaction factors k_{ij} in members not susceptible to torsional deformations according to Method 2

Interaction factors	Type of section	Elastic sectional properties (Class 3 or 4 sections)	Plastic sectional properties (Class 1 or 2 sections)
k_{yy}	I or H sections and rectangular hollow sections	$C_{my}\left(1+0{,}6\,\bar{\lambda}_y\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right)$ $\le C_{my}\left(1+0{,}6\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right)$	$C_{my}\left(1+\left(\bar{\lambda}_y-0{,}2\right)\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right)$ $\le C_{my}\left(1+0{,}8\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right)$
k_{yz}	I or H sections and rectangular hollow sections	K_{zz}	$0{,}6\,K_{zz}$
k_{zy}	I or H sections and rectangular hollow sections	$0{,}8K_{yy}$	$0{,}6K_{yy}$
k_{zz}	Rectangular hollow sections	$C_{mz}\left(1+0{,}6\,\bar{\lambda}_z\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right)$ $\le C_{mz}\left(1+0{,}6\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right)$	$C_{mz}\left(1+\left(\bar{\lambda}_z-0{,}2\right)\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right)$ $\le C_{mz}\left(1+0{,}8\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right)$

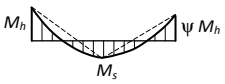
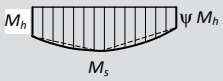
In I or H sections and rectangular hollow sections under axial compression and uniaxial bending ($M_{y,Ed}$), k_{zy} may be taken as zero.

Table 4.4 – Interaction factors k_{ij} in members not susceptible to torsional deformations according to Method 2

Interaction factors	Type of section	Elastic sectional properties (Class 3 or 4 sections)
k_{yy}	k_{yy} of Table 4.3	k_{yy} of Table 4.3
k_{yz}	k_{yz} of Table 4.3	k_{yz} of Table 4.3
k_{zy}	$\left[1-\frac{0{,}05\bar{\lambda}_z}{(C_{mLT}-0{,}25)}\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right]$ $\ge\left[1-\frac{0{,}05}{(C_{mLT}-0{,}25)}\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right]$	$\left[1-\frac{0{,}1\bar{\lambda}_z}{(C_{mLT}-0{,}25)}\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right]$ $\ge\left[1-\frac{0{,}1}{(C_{mLT}-0{,}25)}\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}\right]$ for $\bar{\lambda}_z<0{,}4:\ k_{zy}=0{,}6+\bar{\lambda}_z$ $\le 1-\frac{0{,}1\bar{\lambda}_z}{(C_{mLT}-0{,}25)}\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}}$
k_{zz}	k_{zz} of Table4.3	k_{zz} of Table 4.3

4. BUCKLING RESISTANCE OF MEMBERS

Table 4.5 – Equivalent factors of uniform moment C_{mi}

Diagram of moments	Range		C_{my}, C_{mz} e C_{mLT}	
			Uniform loading	Concentrated load
	$-1 \le \Psi \le 1$		$0{,}6 + 0{,}4\,\Psi \ge 0{,}4$	
 $\alpha_s = M_s/M_h$	$0 \le \alpha_s \le 1$	$-1 \le \Psi \le 1$	$0{,}2+0{,}8\,\alpha_s \ge 0{,}4$	$0{,}2+0{,}8\,\alpha_s \ge 0{,}4$
		$0 \le \Psi \le 1$	$0{,}1-0{,}8\,\alpha_s \ge 0{,}4$	$-0{,}8\,\alpha_s \ge 0{,}4$
	$-1 \le \alpha_s < 0$	$-1 \le \Psi < 0$	$0{,}1(1-\Psi)-0{,}8\,\alpha_s \ge 0{,}4$	$0{,}2(-\Psi)-0{,}8\,\alpha_s \ge 0{,}4$
 $\alpha_h = M_h/M_s$	$0 \le \alpha_h \le 1$	$-1 \le \Psi \le 1$	$0{,}95 + 0{,}05\,\alpha_h$	$0{,}90+0{,}1\,\alpha_h$
		$0 \le \Psi \le 1$	$0{,}95 + 0{,}05\,\alpha_h$	$0{,}90+0{,}1\,\alpha_h$
	$-1 \le \alpha_h < 0$	$-1 \le \Psi < 0$	$0{,}95+0{,}05\,\alpha_h(1+2\,\Psi)$	$0{,}90+0{,}10\,\alpha_h(1+2\,\Psi)$

In the calculation of α_s or α_h parameters, a hogging moment should be taken as negative and a sagging moment should be taken as positive.

For members with sway buckling mode, the equivalent uniform moment factor should be taken as C_{my} = 0,9 or C_{mz} = 0.9, respectively.

Factors C_{my}, C_{mz} and C_{mLT} should be obtained from the diagram of bending moments between the relevant braced sections, according to the following:

Moment factor	Bending axis	Points braced in direction
C_{my}	y-y	z-z
C_{mz}	z-z	y-y
C_{mLT}	y-y	y-y

To illustrate the calculation of the equivalent uniform moment factors C_{mi} (Table 4.5), consider a member under bi-axial bending and axial compression, with the support sections restrained from rotating around its axis (fork conditions) and laterally braced at some intermediate sections. It is assumed that the intermediate bracings prevent not only torsional deformation, but also transverse displacements of the cross sections where they are applied. In this case, the factor C_{my} should be assessed based on the bending moment diagram M_y along the total length of the member; and factors C_{mz} and C_{mLT} should be assessed based on the bending moment diagrams M_z and M_y respectively, between laterally braced sections.

Finally, when expressions 4.12 are applied, the question arises on which cross section class shall be used. Although EC3-1-1 imposes that the highest stresses $M_{y,Ed}$ and N_{Ed} are to be considered in expressions 4.12, there are no indications on how to proceed with respect to the properties of the cross section to consider, since, along a member subject to varying combined bending and compression the cross section class may vary along the member length due to the variation of the applied bending moment relatively to the axial force. Due to this, an "equivalent member class" is established (see [9] for more details). The following procedure is considered:

4.3 COMBINED BENDING AND COMPRESSION

1. The cross section class and cross section utilization is determined along 11 cross sections along the member;
2. The class and utilization of each of the 11 sections shall be determined considering proportional increase between applied forces for determination of the utilization;
3. The class of the cross section with higher utilization is defined as the "member class";
4. The properties of the cross section and interaction factors to be considered in the interaction expressions 4.12 should then be considered according to the resultant "member class".

Examples 6.3, 6.5 and 6.6 the safety of beam-columns with hollow sections is verified.

5. LOCAL BUCKLING SECTIONS

5.1 Introduction

Class 4 cross sections are prone to local instability phenomena, such that total cross section capacity is not achieved. In EC3-1-1 this is taken into account by eliminating cross section parts that are susceptible to local buckling [10]. In practical terms, it is necessary to determine effective cross section properties.

Regarding rectangular hollow sections, the determination of effective cross section properties is done according to part 1-5 of EC3, whereas for circular hollow sections, the verification of thin cylinders is done according to part 1-6 of EC3.

5.2 Rectangular hollow sections

The effective areas of rectangular hollow sections in compression should be obtained according to clause 4.4 of EC3-1-5.

The effective area $A_{c,eff}$ of the compression zone of a plate with the gross cross-sectional area A_c should be obtained from (clause 4.4 of EC3-1-5):

$$A_{c,eff} = \rho_c A_c$$

Eq. 5.1

where ρ_c is the reduction factor for plate buckling. For internal compression elements, it is given by:

$$\rho_c = 1 \qquad \bar{\lambda}_p \le 0{,}673$$

Eq. 5.2a

$$\rho_c = \frac{\bar{\lambda}_p - 0{,}055(3+\psi)}{\bar{\lambda}_p^{\,2}} \le 1{,}0 \quad \bar{\lambda}_p > 0{,}673 \quad (3+\psi) \ge 0$$

Eq. 5.2b

where $\bar{\lambda}_p$ is given by:

$$\bar{\lambda}_p = \sqrt{\frac{f_y}{\sigma_{cr}}} = \frac{\bar{b}/t}{28{,}4\,\varepsilon\sqrt{k_\sigma}}$$

Eq. 5.3

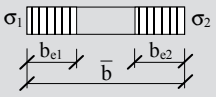
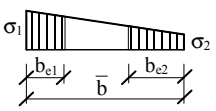
where:

ψ is the stress ratio, to be determined according to Tables 5.1 and 5.2; $\bar{b}$ is the appropriate width (b_w for webs; $b - 3t$ for flanges of RHS); t is the plate thickness; k_σ is the buckling factor corresponding to the stress ratio ψ and boundary conditions – for long plates, k_σ is given in Tables 5.1 and 5.2; and σ_{cr} os the critical stress of the plate:

$$\sigma_{cr} = k_\sigma 189800 \left(\frac{t}{\bar{b}}\right)^2$$

Eq. 5.4

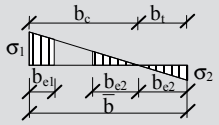
Table 5.1 – Effective width of internal compression elements

Stress distribution (compression positive)	Effective width b_{eff}
	$\psi = 1$ $b_{eff} = \rho\bar{b}$ $b_{e1} = 0{,}5 b_{eff} \quad b_{e2} = 0{,}5 b_{eff}$
	$1 > \psi \ge 0$ $b_{eff} = \rho\bar{b}$ $b_{e1} = \frac{2}{5-\psi} b_{eff} \quad b_{e2} = b_{eff} - b_{e1}$

5. LOCAL BUCKLING SECTIONS

Table 5.1 – Effective width of internal compression elements

Stress distribution (compression positive) | Effective width b_{eff}



$\psi < 0$

$b_{eff} = \rho \quad b_c = \rho \bar{b}/(1-\psi)$

$b_{e1} = 0,4\, b_{eff} \quad b_{e2} = 0,6\, b_{eff}$

$\Psi = \sigma_2/\sigma_1$	1	1>Ψ>0	0	0 > Ψ > -1	-1	-1 > Ψ > -3
Buckling factor k_σ	4,0	8,2/(1,05+ Ψ)	7,81	7,81-6,29 Ψ+9,78 Ψ^2	23,9	5,98(1-Ψ)^2

According to clause 4.4(3) of EC3-1-5, for flange elements of I-sections and box girders the stress ratio ψ used in Table 5.1 should be based on the properties of the gross cross-sectional area, due allowance being made for shear lag in the flanges if relevant. For web elements the stress ratio ψ used in Table 5.1 should be obtained using a stress distribution based on the effective area of the compression flange and the gross area of the web.

The plate normalized slenderness (expression (5.3)) is determined without taking into account the real stress of the plate. Considering that the plate reduction factor, ρ_c, decreases for increasing values of the normalized slenderness $\overline{\lambda}_p$, consideration of the maximum compressive stress in the plate rather than the yield stress, can lead to economy of material. As a result, clause 4.4(4) of EC3-1-5 allows that the plate slenderness $\overline{\lambda}_p$ of an element may be replaced by

$$\overline{\lambda}_{p,red} = \overline{\lambda}_p \sqrt{\frac{\sigma_{com,Ed}}{f_y/\gamma_{M0}}}$$

Eq. 5.5

where $\sigma_{com,Ed}$ is the maximum design compressive stress in the element determined using the effective area of the section caused by all simultaneous actions. This procedure leads to conservative results and demands an iterative procedure in which the ratio ψ is determined for each iteration considering the effective cross section of the previous iteration [10].

5.3 Circular hollow section

The verification of class 4 A verificação de secções circulares tubulares de classe 4 deverá ser efectuada de acordo com a Secção 8 do EC3-1-6.

The verification of class 4 circular hollow sections shall be made according to Section 8 of EC3-1-6. Alternatively, recently, formulae for determination of effective section properties of circular hollow sections were proposed in [3]:

$$A_{eff} = A\left[\frac{90}{d/t}\frac{235}{f_y}\right]^{0,5}$$

Eq. 5.6

$$W_{el,eff} = W_{el}\left[\frac{140}{d/t}\frac{235}{f_y}\right]^{0,25}$$

Eq. 5.7

Example 6.4 illustrates this procedure.

PART B

EXAMPLE 1

6. EXAMPLES

Example 1: Lattice girder in square hollow section (unrestrained members in tension or compression)

Figure 1 illustrates a simply supported lattice girder. Verify the safety of the most stressed member, considering that it is subject to two point loads at nodes B and C with a value of P = 130 kN. The truss is composed of square hollow *FERPINTA* SHS 80×5 in cold formed steel S355J0.

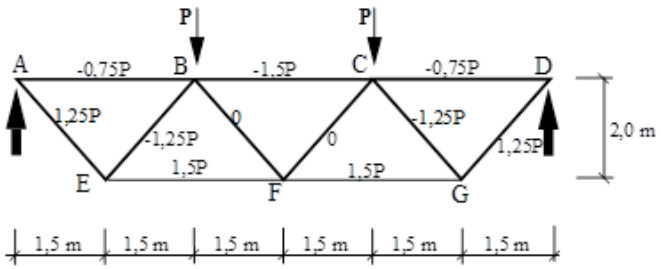


Fig. 6.1 - Steel lattice girder

Solving:

Cross section properties of a cold-formed *FERPINTA* SHS 80×5,0mm em aço S355J0H: A = 14,36 cm², $h = b$ = 80 mm, t = 5 mm, $W_{el,y} = W_{el,z}$ = 33,86 cm³, $W_{pl,y} = W_{pl,z}$ = 39,74 cm³, $I_y = I_z$ =131,44 cm⁴, $i_y = i_z$ = 3,03 cm, I_T = 217,8 cm⁴ e I_W = 0 cm⁶

i) Internal forces

The most stressed bar is BC, with compressive axial force N_{Ed} = 1,5 P = 195 kN.

ii) cross section classification (Tables 2.2 and 2.3 of this document)

Class of web in compression

$$c/t = 65/5 = 13 \leq 33\varepsilon = 33 \times 0,81 = 26,8 \qquad \text{(Class 1)}$$

Class of flange in compression

$$c/t = 65/5 = 13 \leq 33\varepsilon = 33 \times 0,81 = 26,8 \qquad \text{(Class 1)}$$

The cross section class is 1.

iii) Verification of the cross section resistance (Section 3 of this document)

$$N_{c,Rd} = \frac{A \times f_y}{\gamma_{M0}} = \frac{14,36 \times 10^{-4} \times 355 \times 10^3}{1,0} = 509,8\ kN\ >\ N_{Ed} = 195\ kN$$

iv) Verification of the flexural buckling resistance of the member (y-y axis = z-z axis) (Section 4.1 of this document)

Buckling lengths: According to the defined boundary conditions, the buckling lengths are:

$$L_{Ey} = L_{Ez} = 1 \times 3,0 = 3,0\,\text{m}$$

Normalized slenderness:

$$\lambda_1 = \pi \sqrt{\frac{210 \times 10^6}{355 \times 10^3}} = 76,4$$

$$\lambda_y = \lambda_z = \frac{L_{Ey}}{i_y} = \frac{3,0}{3,03 \times 10^{-2}} = 99,32;\ \ \overline{\lambda}_y = \overline{\lambda}_z = \frac{\lambda_y}{\lambda_1} = 1,3$$

Minimum reduction factor χ_{min}

Cold formed square hollow section $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 0,5 \times \left[1 + 0,49 \times (1,3 - 0,2) + 1,3^2\right] = 1,61$$

$$\chi_{\min} = \chi_y = \chi_z = \frac{1}{1,61 + \sqrt{1,61^2 - 1,3^2}} = 0,39$$

Safety verification:

$$N_{b,Rd} = \chi_{\min} A f_y / \gamma_{M1} = 0,39 \times 14,36 \times 10^{-4} \times 355 \times 10^3 / 1,0 = 198,7\,\text{kN}$$

Since $N_{Ed} = 195\,\text{kN} < N_{b,Rd} = 198,7\,\text{kN}$, it is concluded that the lattice girder satisfies safety.

Example 2: Unrestrained beam with rectangular hollow section

The beam illustrated in Figure 2 is fixed in the left edge and simply supported in the right edge. Consider a design uniformly distributed loading of 0,8 kN/m applied along the shear center of a *FERPINTA* RHS 100x40x6 in S 355J0 (E = 210 GPa and G = 81 GPa) and verify the safety of the beam according to EC3-1-1. Consider that in the left edge weak axis rotation and warping are prevented and that in the right edge they are free. Consider torsion prevented in both edges.

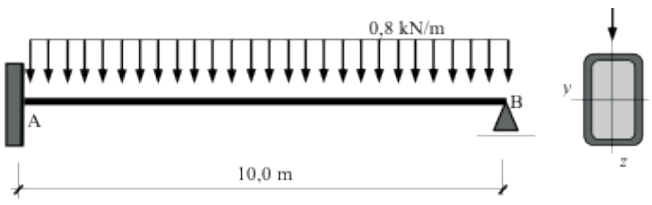


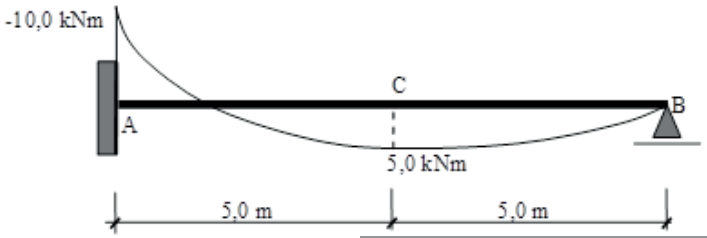
Fig. 6.2 - Steel beam

EXAMPLE 2

Solving:

Cross section properties of a cold formed Ferpinta RHS 100×40×6,0 mm: A = 14,43 cm², h = 100 mm, b = 40 mm, t = 6 mm, $W_{el,y}$ = 30,44 cm³, $W_{pl,y}$ = 41,26 cm³, I_y = 152,21 cm⁴, i_y = 3,25 cm, $W_{el,z}$ = 16,98 cm³, $W_{pl,z}$ = 21,0 cm³, I_z = 33,96 cm⁴, i_z = 1,53 cm, I_T = 99,3 cm⁴ e I_W = 0 cm⁶.

i) Internal forces



$$M_h = M_A = -10,0\ kNm$$

$$\psi = \frac{M_B}{M_A} = 0$$

$$\alpha_s = \frac{M_C}{M_A} = -0,5$$

Fig. 6.3 - Bending diagram moment

ii) Cross section classification (Tables 2.2 and 2.3 of this document)

Class of webs in bending

$$c/t = 82/6 = 13,67 \leq 72\varepsilon = 72 \times 0,81 = 58,6 \qquad \text{(Class 1)}$$

Class of flange in compression

$$c/t = 22/6 = 3,67 \leq 33\varepsilon = 33 \times 0,81 = 26,9 \qquad \text{(Class 1)}$$

The cross section class is 1.

iii) Verification of the cross section resistance (Section 3 of this document)

Bending plastic resistance:

$$M_{y,pl,Rd} = \frac{W_{pl,y} \times f_y}{\gamma_{Mo}} = \frac{41,26 \times 10^{-6} \times 355 \times 10^3}{1,0} = 14,65\ \text{kNm} \geq M_{y,Ed} = 10,0\ \text{kNm}$$

Shear resistance:

$$V_{pl,Rd} = \frac{A_v f_y}{\gamma_{Mo}\sqrt{3}} = \frac{10,31 \times 10^{-4} \times 355 \times 10^3}{1,0 \times \sqrt{3}} = 211,3\ \text{kN} > V_{Ed} = 5\,\text{kN}$$

Verification of the possibility to neglect web buckling of unstiffened webs due to shear (6.2.6 (6) of EC3-1-1):

$$\frac{h_w}{t_w} = \frac{88}{6} = 14,67 < 72\frac{\varepsilon}{\eta} = 72 \times \frac{0,81}{1,0} = 58,3\text{ , can be neglected!}$$

Interaction between shear and bending moment should be verified in section A, where: $V_{Ed} = 5,0 kN < 0,50 \times V_{pl,Rd} = 0,50 \times 211,3 = 105,65 kN$ (6.2.8 do EC3-1-1); hence, it is not necessary to reduce the resistance bending moment of Section A.

iv) Verification of the lateral-torsional buckling resistance of the member (Section 4.2 of this document)

Lateral-torsional buckling is verified by the general case proposed in EC3-1-1. Lateral displacement and rotation about member axis are prevented at supports. Critical moment is determined according to the expression proposed by Clark and Hill [12] and Gálea [13] and factor C_1 is determined according to [5] (see section 4.2).

Since L = 10,0 m, and considering $k_z = k_w = 0,7$ (both weak axis and warping prevented in one edge and free in the other edge) and C1 = 1,74 [5], z_s = 0 (symmetrical cross section) e z_g = 0 (load applied at shear center).

yields: $M_{cr} = 59,04 \text{ kNm} \quad \Rightarrow \bar{\lambda}_{LT} = 0,498$

Since α_{LT} = 0,76 (curve d, tubular section), then:

$$\phi_{LT} = 0,74 \quad \Rightarrow \quad \chi_{LT} = 0,78$$

Resistant buckling bending moment is:

$$M_{b,Rd} = \chi_{LT} W_{pl,y} f_y / \gamma_{M1} = 0,78 \times 4,13 \times 10^{-5} \times \frac{355 \times 10^3}{1,0} = 11,44 kNm > M_{Ed} = 10,0 kNm$$

Safety is verified!

Example 3: Beam-column in rectangular hollow section and varying cross section class along its length: from class 1 to class 4

Consider the beam-column in Figure 4, L= 5 m, composed of *FERPINTA* RHS 200×100×5, in steel S 355J0 (E = 210 GPa and G = 81 GPa), and subject to point bending moment of magnitude 275 kNm at edge A and axial force of 90 kN. Consider that the boundary conditions in both edges are such that vertical and weak axis displacements are prevented as well as torsion. Consider that warping is free. Finally, assume horizontal bracing in section B. Verify safety of the beam-column according to EC3-1-1.

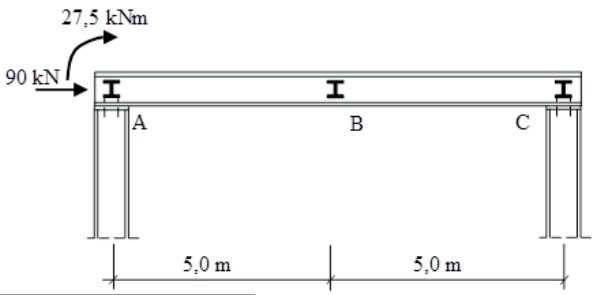


Fig. 6.4 - Steel beam-column

EXAMPLE 3

Solving:

Cross section properties of a cold formed *FERPINTA* RHS 200×100×5,0 mm: A = 28,36 cm², h = 200 mm, b = 100 mm, t = 5 mm, $W_{el,y}$ = 145,93 cm³, $W_{pl,y}$ = 181,37 cm³, I_y = 1459,25 cm⁴, i_y = 7,17 cm, $W_{el,z}$ = 99,39 cm³, $W_{pl,z}$ = 112,09 cm³, I_z = 496,94 cm⁴, i_z = 4,19 cm, I_T = 1206,3 cm⁴ e I_W = 0 cm⁶.

i) Internal forces

The beam-column can be analysed as simply supported. The force diagrames are given in Figure 5:

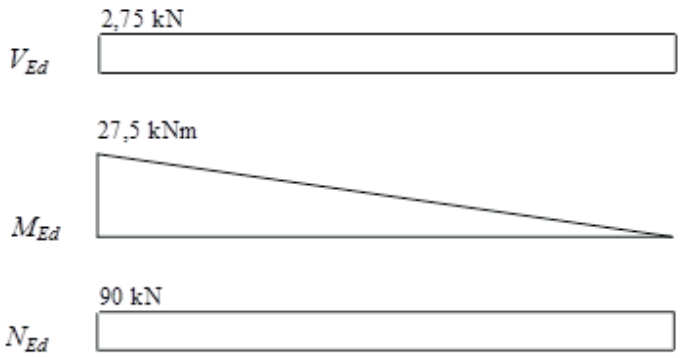


Fig. 6.5 - Internal force diagrams

ii) Cross section classification (Tables 2.2 and 2.3 of this document)

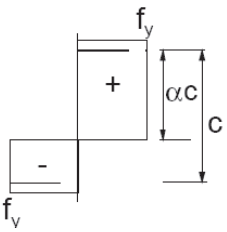
Section under uniaxial bending (M+N): To determine the cross section class, it is necessary to find the neutral axis position. One of the flanges is always in compression; the web will be subject to tension and compression at section A (most stressed cross section) and to pure compression at section C.

Class of webs in bending and/or axial compression

Location (x/L)	α	Ψ	Class of web
0	0,653		1
0,1	0,669	-	1
0,2	0,687	-	1
0,3	0,710	-	1
0,4	0,739	-	1
0,5	0,775	-	2
0,6	0,822	-	2

Class 1:

$$c/t \le \frac{336\,\varepsilon}{13\alpha - 1}$$

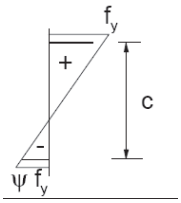


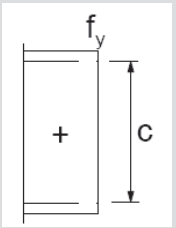
Class 2:

$$c/t \le \frac{456\,\varepsilon}{13\alpha - 1}$$

6. EXAMPLES

Location (x/L)	α	Ψ	Class of web	
0,7	-	- 0,245	3	Class 3: $c/t \le \frac{42\varepsilon}{0,67+0,33\psi}$
0,8	-	- 0,047	3	
0,9	-	0,291	3	
1	-	-	4	





Class of the flange in compression

$$c/t = 85/5 = 17,0 \le 33\varepsilon = 33 \times 0,81 = 26,9 \qquad \text{(Class 1)}$$

Therefore, the cross section class in uniaxial bending and compression varies from class 1 to class 3.

iii) Verification of the cross section resistance (Section 3 of this document)

Bending plastic resistance (for class 1 and 2 cross section):

$$M_{y,pl,Rd} = \frac{W_{pl,y} \times f_y}{\gamma_{Mo}} = 64,39 \text{ kNm} \ge M_{y,Ed} = 27,5 \text{ kNm}$$

$$M_{z,pl,Rd} = \frac{W_{pl,z} \times f_y}{\gamma_{Mo}} = 39,79 \text{ kNm} \ge M_{z,Ed} = 0 \text{ kNm}$$

Bending elastic resistance (class 3):

$$M_{y,el,Rd} = \frac{W_{el,y} \times f_y}{\gamma_{Mo}} = 51,80 \text{ kNm} \ge M_{y,Ed} = 27,5 \text{ kNm}$$

$$M_{z,el,Rd} = \frac{W_{el,z} \times f_y}{\gamma_{Mo}} = 35,28 \text{ kNm} \ge M_{z,Ed} = 0 \text{ kNm}$$

Cross section resistance in compression (class 4):

The resistance in compression of cross sections in class 4 is determined according to clause 4.4 of EC3-1-5 (see section 5.2 of this document). For this, effective area needs to be determined.

Determination of effective area:

$\psi = 1$; $k_\sigma = 4$

EXAMPLE 3

Webs (internal compression parts):

$$\bar{\lambda}_p = \frac{\bar{b}/t}{28,4\varepsilon\sqrt{k_\sigma}} = 0,8006 \text{ and } \rho_c = 0,906 \le 1,0$$

Flanges:

$$\bar{\lambda}_p = \frac{\bar{b}/t}{28,4\varepsilon\sqrt{k_\sigma}} = 0,368 \text{ and } \rho_c = 1 \le 1,0$$

Effective area is then: $A_{eff} = \rho_{c,alma}A_{alma} + \rho_{c,banzos}A_{banzos} + A_{raios} = 26,61 \text{ cm}^2$

$$N_{C,Rd} = \frac{A_{eff} \times f_y}{\gamma_{Mo}} = 944,78 \text{ kN} \ge N_{Ed} = 90 \text{ kNm}$$

Shear plastic resistance:

$$V_{pl,Rd} = \frac{A_v f_y}{\gamma_{Mo}\sqrt{3}} = \frac{18,9\times10^{-4}\times355\times10^3}{1,0\times\sqrt{3}} = 387,5 \text{ kN} \ge V_{Ed} = 2,7 kN$$

Verification of the possibility to neglect web buckling of unstiffened webs due to shear (6.2.6 (6) of EC3-1-1):

$$\frac{h_w}{t_w} = \frac{185}{5} = 37 < 72\frac{\varepsilon}{\eta} = 72\times\frac{0,81}{1,0} = 58,3 \text{ , can be neglected!}$$

Elastic shear resistance:

$$\frac{\tau_{Ed}}{f_y/\left(\sqrt{3}\gamma_{Mo}\right)} = \frac{2,7\times\frac{9,09}{2}\times10^{-5}}{\frac{1458,3\times10^{-8}/5\times10^{-3}}{355\times10^3/\left(\sqrt{3}\times1,0\right)}} = 2,0\times10^{-7} \le 1,0 \text{ , verifies!}$$

Resistance to combined bending and axial force, clause 6.2.9.1 (5) of EC3-1-1:

With respect to the most stressed cross section (section A, class 1), subject to N_{Ed} = 90,0 kN and $M_{y,Ed}$ = 27,5 kNm, yields:

$$n = \frac{N_{Ed}}{N_{pl,Rd}} = \frac{90}{28,36\times10^{-4}\times355\times10^3/1,0} = 0,09$$

$$a_w = \frac{A-2bt}{A} = \frac{28,36\times10^{-4} - 2\times100\times10^{-3}\times5\times10^{-3}}{28,36\times10^{-4}} = 0,65 > 0,5 \Rightarrow a_w = 0,5$$

$$M_{N,y,Rd} = M_{pl,y,Rd}\frac{1-n}{1-0,5a_w} = 78,13kNm, \text{ but : } M_{N,y,Rd} \le M_{pl,y,Rd}$$

$$\text{hence, } M_{N,y,Rd} = M_{pl,y,Rd} = 64,39kNm$$

The interaction between bending moment and shear stress shall be verified at section A: $V_{Ed} = 2,7\text{kN} < 0,50 \times V_{pl,Rd} = 0,50 \times 387,5 = 193,75\text{kN}$ (6.2.8 of EC3-1-1); therefore, it is not necessary to reduce bending moment resistance due to presence of shear.

Regarding the sections that are class 3 or 4, elastic interaction shall be verified:

$$\left(\frac{N_{Ed}}{N_{el,Rd}/\gamma_{Mo}} + \frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 + \left(\frac{V_{Ed}}{V_{el,Rd}/\gamma_{Mo}}\right)^2 \leq 1 \Leftrightarrow 0,249 \leq 1 \text{ (for x/L = 0,7)}$$

Interaction between shear and bending moment is summarized below for all cross sections:

Location (x/L)	$\left(\frac{N_{Ed}}{N_{el,Rd}/\gamma_{Mo}} + \frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 + \left(\frac{V_{Ed}}{V_{el,Rd}/\gamma_{Mo}}\right)^2 \leq 1$	Web class
0	0,427	1
0,1	0,384	1
0,2	0,346	1
0,3	0,314	1
0,4	0,282	1
0,5	0,250	2
0,6	0,218	2
0,7	0,249	3
0,8	0,196	3
0,9	0,143	3
1	0,096	4

iv) Flexural buckling verification (Section 4.1 of this document)

Stability verifications (flexural and/or lateral-torsional buckling) were carried out considering the class of the most stressed cross section, as illustrated in Figure 6.

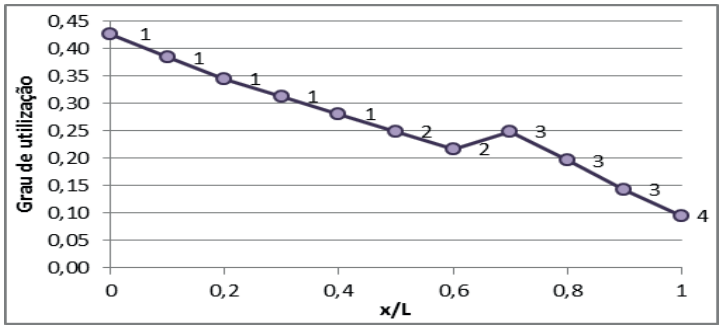


Fig. 6.6 - Use degree across the beam-column A-C

EXAMPLE 3

Major axis flexural buckling, y-y axis; segment AC:

$$\lambda_1 = \pi\sqrt{\frac{210\times10^6}{355\times10^3}} = 76,37$$

$$L_{E,y} = k_y L = 1\times10,0 = 10\,\text{m}$$

$$\lambda_y = \frac{L_{E,y}}{i_y} = \frac{10}{7,17\times10^{-2}} = 139,5; \qquad \bar{\lambda}_y = \frac{\lambda_y}{\lambda_1} = 1,82$$

Cold formed rectangular hollow section $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_y = 2,55; \quad \chi_y = 0,23$$

$$N_{b,Rd} = \chi_y A f_y/\gamma_{M1} = 0,23\times28,36\times10^{-4}\times355\times10^3/1,0 = 230,8\,kN > N_{Ed} = 90kNm$$

Verification of minor axis flexural buckling shall be carried out for the 2 segments: segment AB and BC. However, since geometrical characteristics, loading, and end conditions are the same, only one verification is performed:

$$\lambda_1 = \pi\sqrt{\frac{210\times10^6}{355\times10^3}} = 76,37$$

$$L_{E,z} = k_z L = 1\times5,0 = 5\,\text{m}$$

$$\lambda_z = \frac{L_{E,z}}{i_z} = \frac{5}{4,19\times10^{-2}} = 119,33; \qquad \bar{\lambda}_z = \frac{\lambda_z}{\lambda_1} = 1,56$$

Cold formed rectangular hollow section $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 2,05; \quad \chi_z = 0,29;$$

$$N_{b,Rd} = \chi_z A f_y/\gamma_{M1} = 0,29\times28,36\times10^{-4}\times355\times10^3/1,0 = 296,9\,kN > N_{Ed} = 90kNm$$

iv) Lateral-torsional buckling verification – general case; segment AC (Section 4.2 of this document)

Considering the expression from Clark e Hill [12] and Galéa [13]: $z_g = 0$; $z_s = 0$; $C_1 = 1,3$ yields: $M_{cr} = 824,29$ kNm $\Rightarrow \bar{\lambda}_{LT} = 0,279$

Since $\alpha_{LT} = 0,76$ (curve d, tubular section), then:

$$\phi_{LT} = 0,569 \Rightarrow \chi_{LT} = 0,939$$

Resistant buckling bending moment is given by:

$$M_{b,Rd} = \chi_{LT} W_{pl,y} f_y / \gamma_{M1} = 0,939 \times 181,37 \times 10^{-6} \times \frac{355 \times 10^3}{1,0} = 60,45\,\text{kNm} > M_{Ed} = 30,0\,\text{kNm}$$

v) Combined bending and axial force stability verification (Section 4.3 of this document)

$$C_{m,y} = 0,95;\ C_{m,LT} = 0,8;\ k_{yy} = 1,246;\ k_{zy} = 0$$

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

eq. (6.61): 0,9569 ≤ 1,0

eq. (6.62): 0,3032 ≤ 1,0

Results are summarized below:

Type of verification	Result
Cross section, section A (class 1)	
Axial force	$\frac{N_{Ed}}{N_{pl,Ed}} = \frac{90\,\text{kN}}{1106,8\,\text{kN}} = 0,09 \le 1$
Bending moment	$\frac{M_{y,Ed}}{M_{y,pl,Rd}} = \frac{27,5\,\text{kNm}}{64,39\,\text{kNm}} = 0,43 \le 1$
Shear	$\frac{V_{Ed}}{V_{pl,Rd}} = \frac{2,7\,\text{kN}}{387,5\,\text{kN}} = 0,007 \le 1$
Bending moment and shear	$M_{V,Rd} = M_{y,pl,Rd} \Rightarrow 0,43 \le 1$
Bending moment and axial force	$M_{N,y,Rd} = M_{y,pl,Rd} \Rightarrow 0,43 \le 1$
Stability	
Eq. 6.61	0,9569 < 1
Eq. 6.62	0,3032 < 1

Example 4: Column with circular hollow section

Consider the column of Figure 6 with L= 8 m and a circular hollow *FERPINTA* CHS 273×4, in steel S 355J0 (E = 210 GPa and G = 81 GPa), subject to a design axial force of magnitude 500 kN. The column is simply supported. Verify the safety according to EC3-1-1.

EXAMPLE 4

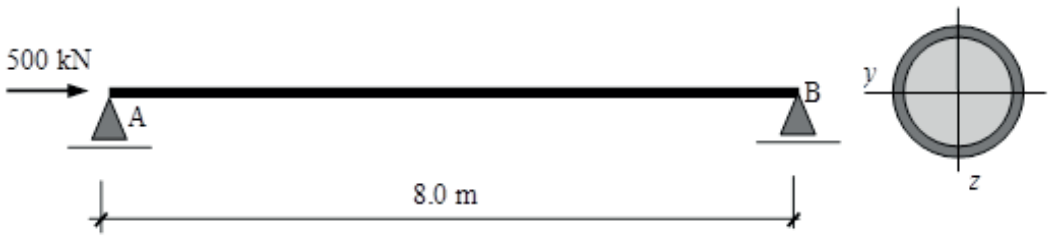


Fig. 6.7 - Steel column

Solving:

Cross section properties of a cold formed *FERPINTA* CHS 273x4,0 mm: A = 33,80 cm², D = 273 mm, t = 4 mm, W_{el} = 224,05 cm³, W_{pl} = 289,47 cm³, I = 3059,25 cm⁴, i = 9,51 cm, I_T = 6116,5 cm⁴ and I_W = 0 cm⁶.

i) Cross section classification (Tables 2.2 and 2.3 of this document)

$$d/t = 273/4 = 68,3 > 90\varepsilon^2 = 90 \times 0,66 = 59,6 \qquad \text{(Class 4)}$$

The cross section class is 4.

ii) Verification of the cross section resistance (Section 3 and 5.3 of this document)

According to Gardner [3], the effective area (A_{eff}) of circular hollow sections is given by:

$$A_{eff} = A\left[\frac{90}{d/t}\frac{235}{f_y}\right]^{0,5} = 38,80 \times 10^{-2} \times 0,9343 = 0,0032\ m^2 = 32\ cm^2$$

As a result: $N_{c,Rd} = \dfrac{A_{eff} \times f_y}{\gamma_{Mo}} = 1121,2\ kN\ >\ 500\ kN = N_{Ed}$

iii) Flexural buckling verification (y-y axis = z-z axis) (Section 4.2 of this document)

$$\lambda_1 = \pi\sqrt{\frac{210 \times 10^6}{355 \times 10^3}} = 76,37;$$

$$L_{E,y} = L_{E,z} = kL = 1 \times 8,0 = 8\,m$$

$$\lambda_y = \lambda_z = \frac{L_{E,y}}{i_y} = \frac{8}{9,51 \times 10^{-2}} = 84,12; \qquad \bar{\lambda}_y = \bar{\lambda}_z = \frac{\lambda_y}{\lambda_1} = 1,10$$

Cold formed square hollow section $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_y = \phi_z = 0,5 \times \left[1 + 0,49 \times (1,10 - 0,2) + 1,10^2\right] = 1,33$$

$$\chi_{min} = \chi_y = \chi_z = \frac{1}{1,33 + \sqrt{1,33^2 - 1,10^2}} = 0,48$$

$$N_{b,Rd} = \chi_{min} A_{eff} f_y / \gamma_{M1} = 0,48 \times 32 \times 10^{-4} \times 355 \times 10^3 / 1,0 = 542,5 kN < N_{Ed} = 500 kN$$

Results of Example 4 are summarized below:

Type of verification	Result
Cross section	$\frac{N_{Ed}}{N_{c,Rd}} = 0,45 < 1$
Flexural buckling	$\frac{N_{Ed}}{N_{b,Rd}} = 0,92 < 1$

Example 5: Optimization of open steel cross sections by replacing with tubular sections

Consider the beam-column of Figure 7 with L = 10m and IPE 300 cross section, in steel S 235 JR (E = 210 GPa and G = 81 GPa), subject to end moments of magnitude 30 kNm in both edges A and C and constant axial force of magnitude 175 kN. Consider that the boundary conditions in both edges are such that vertical and weak axis displacements are prevented as well as torsion. Consider that warping is free. Consider horizontal bracing at mid-span. Following EC3-1-1 provisions, optimize the cross section replacing it by *FERPINTA* tubular sections.

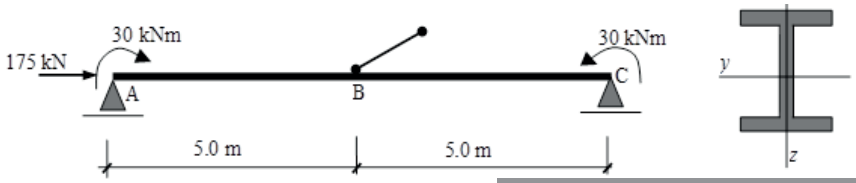


Fig. 6.8 - Steel beam-column

Cases to verify:

Case A (reference case): Hot finished IPE 300 (42,2 kg/m) with mid-span horizontal bracing (section B).

Case B.1: Cold formed *FERPINTA* RHS 300×150×5 (34,03 kg/m) with mid-span horizontal bracing (section B).

Case B.2: Cold formed *FERPINTA* RHS 300×150×5 (34,03 kg/m), without mid-span horizontal bracing.

Case C.1: Cold formed *FERPINTA* RHS 300×100×5 (30,11 kg/m) with mid-span horizontal bracing (section B).

EXAMPLE 5

Case C.2: Cold formed *FERPINTA* RHS 300×100×5 (30,11 kg/m), without mid-span horizontal bracing.

Solving:

Since Examples 1 to 4 have been sufficiently detailed and explained and include all the specific calculations to be considered here, in this example only main calculations will be shown. The four cases are solved in the following:

Case A (reference case): Hot finished IPE 300 (42,2 kg/m) with mid-span horizontal bracing (section B).

Cross section properties of IPE 300: A = 53,80 cm², h = 300 mm, b = 150 mm, t_f = 10,7 mm, t_w = 7,1 mm, r = 15 mm, $W_{el,y}$ = 557,1 cm³, $W_{pl,y}$ = 628,4 cm³, I_y = 8356,1 cm⁴, i_y = 12,5 cm, $W_{el,z}$ = 80,5 cm³, $W_{pl,z}$ = 125,2 cm³, I_z = 603,7 cm⁴, i_z = 3,35 cm, I_T = 20,1 cm⁴ and I_W = 125934,0 cm⁶.

i) Cross section classification (for open sections, see Section 5.5 of EC3-1-1)

Web subject to bending and compression is class 2 and flange in compression is class 1. Therefore, the cross section is class 2.

ii) Verification of the cross section resistance (for open sections, see Section 6.2 of EC3-1-1)

$$N_{c,Rd} = 1264,6 \text{ kN} > N_{Ed} = 175,0 \text{kN}$$

$$M_{y,c,Rd} = 147,7 \text{ kNm} > M_{Ed} = 30,0 \text{kNm}$$

$$M_{N,y,Rd} = 147,7 \text{ kNm} > M_{Ed} = 30,0 \text{kNm}$$

Since there is no shear force in the member, it is not necessary to verify neither shear, nor shear buckling, nor shear and bending moment interaction.

iii) Stability verification of the member subject to bending and axial force (for open sections, see Section 6.3 of EC3-1-1)

$$N_{b,y,Rd} = 965,0 \text{ kNm} > N_{Ed} = 175,0 \text{kNm}$$

$$N_{b,z,Rd} = 393,7 \text{ kNm} > N_{Ed} = 175,0 \text{kNm}$$

$$M_{b,Rd} = 84,98 \text{ kNm} > M_{Ed} = 30,0 \text{kNm}$$

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

eq. (6.61): 0,58 ≤ 1,0

eq. (6.62): 0,78 ≤ 1,0

where $C_{m,y} = 1$; $k_{yy} = 1,119$ *e* $k_{zy} = 0,941$

6. EXAMPLES

Case B.1: Cold formed *FERPINTA* RHS 300×150×5 (34,03 kg/m) with mid-span horizontal bracing (section B).

Cross section properties of *FERPINTA* RHS 300×150×5,0 mm: A = 43,36 cm², h = 300 mm, b = 150 mm, t = 5 mm, $W_{el,y}$ = 343,54 cm³, $W_{pl,y}$ = 421,90 cm³, I_y = 5153,13 cm⁴, i_y = 10,90 cm, $W_{el,z}$ = 236,12 cm³, $W_{pl,z}$ = 261,73 cm³, I_z = 1770,87 cm⁴, i_z = 6,39 cm, I_T = 4214,3 cm⁴ and I_W = 0 cm⁶.

i) Cross section classification (Tables 2.2 and 2.3 of this document)

Under bending and axial compression (M+N):

Class of webs subject to bending and compression

$$\Psi = -0,3454 \ (>-1), \text{ logo } c/t = 285/5 = 57,0 \le \frac{42\varepsilon}{0,67+0,33\psi} = 77,3 \qquad \text{(Class 3)}$$

Class of flange in compression

$$c/t = 135/5 = 27,0 \le 72\varepsilon = 72\times 1 = 72 \qquad \text{(Class 1)}$$

Therefore, the cross section is class 3.

ii) Verification of the cross section resistance (Section 3 of this document)

$$N_{c,Rd} = \frac{A\times f_y}{\gamma_{Mo}} = 1018,87 \ kN \ > \ N_{Ed} = 175 \ kN$$

$$M_{y,c,Rd} = M_{y,el,Rd} = \frac{W_{el,y}\times f_y}{\gamma_{Mo}} = 80,73 \text{ kNm} \ \ge \ M_{y,Ed} = \ 30 \text{ kNm}$$

For class 3 cross sections, elastic interaction must be performed. Hence:

$$\left(\frac{N_{Ed}}{N_{el,Rd}/\gamma_{Mo}} + \frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 \le 1 \Leftrightarrow 0,543 \le 1$$

iii) Flexural buckling verification (Section 4.1 of this document)

Major axis flexural buckling, y-y axis; Segment AC:

$$\lambda_1 = \pi\sqrt{\frac{210\times 10^6}{235\times 10^3}} = 93,87$$

$$L_{E,y} = k_y L = 1\times 10,0 = 10 \text{ m}$$

$$\lambda_y = \frac{L_{E,y}}{i_y} = \frac{10}{10,9\times 10^{-2}} = 91,74; \quad \bar{\lambda}_y = \frac{\lambda_y}{\lambda_1} = 0,977$$

EXAMPLE 5

Cold formed circular hollow section ; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_y = 1,17;\ \chi_y = 0,554$$

$$N_{b,y,Rd} = \chi_y A f_y / \gamma_{M1} = 0,554 \times 43,36 \times 10^{-4} \times 235 \times 10^3 / 1,0 = 564,1\text{kN} > N_{Ed} = 175\ kN$$

Minor axis flexural buckling, z-z axis; Segment AB:

$$\lambda_1 = \pi \sqrt{\frac{210 \times 10^6}{235 \times 10^3}} = 93,87$$

$$L_{E,z} = k_z L = 1 \times 5,0 = 5\,\text{m}$$

$$\lambda_z = \frac{L_{E,z}}{i_z} = \frac{5}{6,39 \times 10^{-2}} = 78,25; \qquad \bar{\lambda}_z = \frac{\lambda_z}{\lambda_1} = 0,834;$$

Cold formed circular hollow section; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 1,00;\ \chi_z = 0,641$$

$$N_{b,z,Rd} = \chi_z A f_y / \gamma_{M1} = 0,641 \times 43,36 \times 10^{-4} \times 235 \times 10^3 / 1,0 = 653,5\text{kN} > N_{Ed} = 175\ kN$$

iv) Lateral torsional buckling verification – general case – segment AB (Section 4.2 of this document)

Considering the expression from Clark and Hill [12] and Galéa [13]: : $z_g = 0$; $z_s = 0$; $C_1 = 1$

Therefore: $M_{cr} = 2235,45$ kNm $\Rightarrow \bar{\lambda}_{LT} = 0,19$

Since $\alpha_{LT} = 0,76$ (curve d, tubular section), yields:

$$\phi_{LT} = 0,514 \Rightarrow \chi_{LT} = 1$$

The resistant buckling bending moment is then:

$$M_{b,Rd} = \chi_{LT} W_{pl,y} f_y / \gamma_{M1} = 1,0 \times 343,54 \times 10^{-6} \times \frac{235 \times 10^3}{1,0} = 80,73\text{kNm} > M_{Ed} = 30,0\text{kNm}$$

v) Combined bending and axial force stability verification (Section 4.3 of this document)

$$C_{m,LT} = 1,0;\ k_{yy} = 1,182;\ k_{zy} = 0$$

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

eq. (6.61): 0,7494 ≤ 1,0

eq. (6.62): 0,2678 ≤ 1,0

6. EXAMPLES

Case B.2: Cold formed *FERPINTA* RHS 300×150×5 (34,03 kg/m), without mid-span horizontal bracing.

i) Cross section classification: see Case B.1

ii) Verification of the cross section resistance: see Case B.1

iii) Flexural buckling verification (Section 4.1 of this document)

Major axis flexural buckling, y-y axis; Segment AC: see Case B.1

Minor axis flexural buckling, z-z axis; Segment AC:

$$\lambda_1 = \pi\sqrt{\frac{210\times10^6}{235\times10^3}} = 93,87;$$

$$L_{E,z} = k_z\, L = 1\times10,0 = 10\,\text{m}$$

$$\lambda_z = \frac{L_{E,z}}{i_z} = \frac{10}{6,39\times10^{-2}} = 156,49; \qquad \overline{\lambda}_z = \frac{\lambda_z}{\lambda_1} = 1,666$$

Cold formed circular hollow section; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 2,25; \quad \chi_z = 0,266$$

$$N_{b,z,Rd} = \chi_z\, A\, f_y/\gamma_{M1} = 0,266\times43,36\times10^{-4}\times235\times10^3/1,0 = 271,3\text{kN} > N_{Ed} = 175\ kN$$

iv) Lateral torsional buckling verification – general case – segment AB (Section 4.2 of this document)

Considering the expression from Clark and Hill [12] and Galéa [13]: : $z_g = 0$; $z_s = 0$; $C_1 = 1$

Therefore: $M_{cr} = 1117,72$ kNm $\Rightarrow \overline{\lambda}_{LT} = 0,269$

Since $\alpha_{LT} = 0,76$ (curve d, tubular section), yields:

$$\phi_{LT} = 0,562 \Rightarrow \chi_{LT} = 0,947$$

The resistant buckling bending moment is then:

$$M_{b,Rd} = \chi_{LT} W_{pl,y}\, f_y/\gamma_{M1} = 0,947\times343,54\times10^{-6}\times\frac{235\times10^3}{1,0} = 76,44\,\text{kNm} > M_{Ed} = 30,0\text{kNm}$$

v) Combined bending and axial force stability verification (Section 4.3 of this document)

$$C_{m,LT} = 1,0;\ k_{yy} = 1,182;\ k_{zy} = 0$$

EXAMPLE 5

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

$$0{,}774 \leq 1{,}0$$

$$0{,}645 \leq 1{,}0$$

Case C.1: Cold formed *FERPINTA* RHS 300×100×5 (30,11 kg/m) with mid-span horizontal bracing (section B).

Cross section properties of *FERPINTA* RHS 300×100×5,0 mm: A = 38,36 cm², h = 300 mm, b = 100 mm, t = 5 mm, $W_{el,y}$ = 271,01 cm³, $W_{pl,y}$ = 348,15 cm³, I_y = 4065,20 cm⁴, i_y = 10,29 cm, $W_{el,z}$ = 144,55 cm³, $W_{pl,z}$ = 159,59 cm³, I_z = 722,77 cm⁴, i_z = 4,34 cm, I_T = 2043,8 cm⁴ and I_W = 0 cm⁶.

i) Cross section classification (Tables 2.2 and 2.3 of this document)

Under bending and axial compression (M+N):

Class of webs subject to bending and compression

$$\Psi = -0{,}3948 \ (>-1), \text{ hence } c/t = 285/5 = 57{,}0 \leq \frac{42\,\varepsilon}{0{,}67+0{,}33\psi} = 77{,}8 \qquad \text{(Class 3)}$$

Class of flange in compression

$$c/t = 85/5 = 17{,}0 \leq 72\,\varepsilon = 72\times 1 = 72 \qquad \text{(Class 1)}$$

Therefore, the cross section is class 3.

ii) Verification of the cross section resistance (Section 3 of this document)

$$N_{c,Rd} = \frac{A\times f_y}{\gamma_{Mo}} = 752{,}7\ kN\ >\ N_{Ed} = 175\ kN$$

$$M_{y,c,Rd} = M_{y,el,Rd} = \frac{W_{el,y}\times f_y}{\gamma_{Mo}} = 63{,}7\ \text{kNm}\ \geq\ M_{y,Ed} =\ 30\ \text{kNm}$$

For class 3 cross sections, elastic interaction must be performed. Hence:

$$\left(\frac{N_{Ed}}{N_{el,Rd}/\gamma_{Mo}} + \frac{M_{y,Ed}}{M_{el,Rd}/\gamma_{Mo}}\right)^2 \leq 1 \Leftrightarrow 0{,}665 \leq 1$$

iii) Flexural buckling verification (Section 4.1 of this document)

Major axis flexural buckling, y-y axis; Segment AC:

$$\lambda_1 = \pi\sqrt{\frac{210\times 10^6}{235\times 10^3}} = 93{,}87$$

$$L_{E,y} = k_y L = 1 \times 10,0 = 10\,\text{m}$$

$$\lambda_y = \frac{L_{E,y}}{i_y} = \frac{10}{10,3 \times 10^{-2}} = 97,09; \qquad \bar{\lambda}_y = \frac{\lambda_y}{\lambda_1} = 1,034;$$

Cold formed circular hollow section ; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_y = 1,24; \;\; \chi_y = 0,520$$

$$N_{b,y,Rd} = \chi_y A f_y / \gamma_{M1} = 0,520 \times 38,36 \times 10^{-4} \times 235 \times 10^3 / 1,0 = 468,97\,\text{kN} > N_{Ed} = 175\ kN$$

Minor axis flexural buckling, z-z axis; Segment AB:

$$\lambda_1 = \pi \sqrt{\frac{210 \times 10^6}{235 \times 10^3}} = 93,87$$

$$L_{E,z} = k_z L = 1 \times 5,0 = 5\,\text{m};$$

$$\lambda_z = \frac{L_{E,z}}{i_z} = \frac{5}{4,34 \times 10^{-2}} = 115,21; \qquad \bar{\lambda}_z = \frac{\lambda_z}{\lambda_1} = 1,226$$

Cold formed circular hollow section ; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 1,50; \;\; \chi_z = 0,421$$

$$N_{b,z,Rd} = \chi_z A f_y / \gamma_{M1} = 0,421 \times 38,36 \times 10^{-4} \times 235 \times 10^3 / 1,0 = 379,8\text{kN} > N_{Ed} = 175\ kN$$

iv) Lateral torsional buckling verification – general case – segment AB (Section 4.2 of this document)

Considering the expression from Clark and Hill [12] and Galéa [13]: : $z_g = 0$; $z_s = 0$, $C_1 = 1$

Therefore: $M_{cr} = 994,56$ kNm $\Rightarrow \bar{\lambda}_{LT} = 0,25$

Since $\alpha = 0,76$ (curve d, tubular section), yields:

$$\varphi_{LT} = 0,552 \;\Rightarrow\; \chi_{LT} = 0,959$$

The resistant buckling bending moment is then:

$$M_{b,Rd} = \chi_{LT} W_{pl,y} f_y / \gamma_{M1} = 0,959 \times 271,01 \times 10^{-6} \times \frac{235 \times 10^3}{1,0} = 61,07\,\text{kNm} > M_{Ed} = 30,0\text{kNm}$$

v) Combined bending and axial force stability verification (Section 4.3 of this document)

$C_{m,LT} = 1,0$; $k_{yy} = 1,224$; $k_{zy} = 0$

EXAMPLE 5

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

eq. (6.61): 0,9744 ≤1,0

eq. (6.62): 0,4608 ≤1,0

Case C.2: Cold formed *FERPINTA* RHS 300×100×5 (30,11 kg/m), without mid-span horizontal bracing.

i) Cross section classification: see Case C.1

ii) Verification of the cross section resistance: see Case C.1

iii) Flexural buckling verification (Section 4.1 of this document)

Major axis flexural buckling, y-y axis; Segment AC: see Case C.1

Minor axis flexural buckling, z-z axis; Segment AC:

$$\lambda_1 = \pi\sqrt{\frac{210\times10^6}{235\times10^3}} = 93,87$$

$$L_{E,z} = k_z L = 1\times10,0 = 10\,\text{m}$$

$$\lambda_z = \frac{L_{E,z}}{i_z} = \frac{10}{4,34\times10^{-2}} = 230,41 \qquad \bar{\lambda}_z = \frac{\lambda_z}{\lambda_1} = 2,453$$

Cold formed circular hollow section ; $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_z = 4,061;\ \chi_z = 0,137$$

$$N_{b,z,Rd} = \chi_z A f_y/\gamma_{M1} = 0,137\times38,36\times10^{-4}\times235\times10^3/1,0 = 123,5\text{kN} > N_{Ed} = 175\ kN$$

Therefore, flexural buckling about minor axis is not verified. No further Stability verifications are performed.

Results of example 5 are summarized below:

Cross section	Weight	Painting surface	mid-span bracing	Condition verification
IPE 300	42,2 kg/m	1,16 m²/m	yes	Eq. 6.62 → 0,78 ≤ 1
FERPINTA RHS 300×150×5,0	34,03 kg/m **(- 19%)**	0,883 m²/m **(-24%)**	yes no	Eq. 6.61 → 0,75 ≤ 1 Eq. 6.62 → 0,79 ≤ 1
FERPINTA RHS 300×100×5,0	30,11 kg/m **(- 29%)**	0,783 m²/m **(-32%)**	yes no	Eq. 6.61 → 0,99 ≤ 1 not verified

In summary, the beam-column in open I section IPE 300 braced at mid span can be optimized by the following solutions with FERPINTA tubular section:

i) Not braced *FERPINTA* RHS 300×150×5 presents less 19,4 % of steel and less 24% of painting area.
ii) Braced *FERPINTA* RHS RHS 300×100×5 presents less 29 % of steel and less 32% of painting area.

Example 6: Verification of column from frame in rectangular hollow section subject to bending moment about z-z and y-y local axis and axial force

Consider the spacial frame in Figure 8, belonging to a 2 floor building, with a 5 m height each floor, and plant dimensions 10 m x 10 m.
The beams are composed of hot finished IPE 400 section and the columns are composed of cold formed *FERPINTA* SHS 260×10, em aço S 355 (E = 210 GPa and G = 81 GPa), and are subject to the design loading presented in Figura 8. Verify the safety of the frame columns according to EC3-1-1.

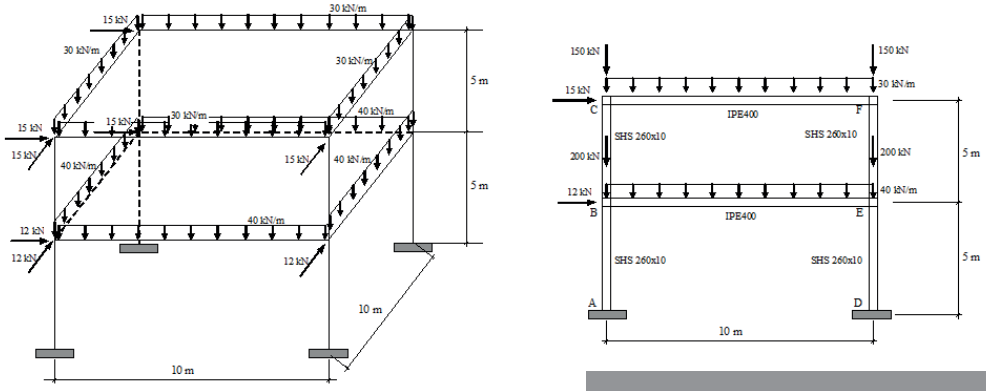


Fig. 6.9 - Steel structure

Solving:

Cross section properties of *FERPINTA* SHS 260×10,0 mm: A = 9,57 cm², h = b = 260 mm, t = 10 mm, $W_{el,y} = W_{el,z}$ = 758,82 cm³, $W_{pl,y} = W_{pl,z}$ = 893,78 cm³, $I_y = I_z$ = 9864,65 cm⁴, $i_y = i_z$ = 10,11 cm, I_T = 16035,5 cm⁴ e I_W = 0 cm⁶.

Cross section properties of IPE 400: A = 84,50 cm², h = 400 mm, b = 180 mm, t_f = 13,5 mm, t_w = 8,6 mm, r = 21 mm, $W_{el,y}$ = 1160 cm³, $W_{pl,y}$ = 1307 cm³, I_y = 23130 cm⁴, i_y = 16,6 cm, $W_{el,z}$ = 146 cm³, $W_{pl,z}$ = 229 cm³, I_z = 1318 cm⁴, i_z = 3,94 cm, I_T = 60,2 cm⁴.

i) Internal forces:

Firstly, it is necessary to check whether second order effects are relevant or not. For that, additional horizontal forces due to global imperfections of the frame need to be determined, as defined in clause 5.3.2 of EC3-1-1.

EXAMPLE 6

The "equivalent geometrical imperfection" that concerns global sway imperfections is given by the angle ϕ, where $\phi = \phi_0 \alpha_h \alpha_m$.

Since: $\phi_0 = 1/200;\ \alpha_h = \frac{2}{\sqrt{h}} = \frac{2}{\sqrt{10}} = 0,63 < \frac{2}{3} = 0,67 \Rightarrow \alpha_h = 0,67$ and

$$\alpha_m = \sqrt{0,5\left(1+\frac{1}{m}\right)} = \sqrt{0,5\times\left(1+\frac{1}{2}\right)} = 0,87\ ,$$

yields $\phi = \phi_0\, \alpha_h\, \alpha_m = 1/200 \times 0,67 \times 0,87 = 0,0029 \text{rad}$.

The vertical load at the 2nd floor level is given by:

$$150 \times 2 + 30 \times 10 = 600,0 \text{kN},\ \text{ vem } F_{i2} = 0,0029 \times 600,0 = 1,7 \text{kN}.$$

The vertical load at the 1st floor level is given by:

$$200 \times 2 + 40 \times 10 = 800,0 \text{kN}, \text{ vem } F_{i1} = 0,0029 \times 800,0 = 2,3 \text{kN}.$$

Adding these forces to the applied horizontal forces, the design forces taking into account sway effects:

$$F_{H2} = 15,0 + 1,7 = 16,7 \text{kN}$$

$$F_{H1} = 12,0 + 2,3 = 14,3 \text{kN}$$

Secondly, a first order elastic analysis is considered with the referred horizontal forces. The horizontal displacements of the structure are obtained:

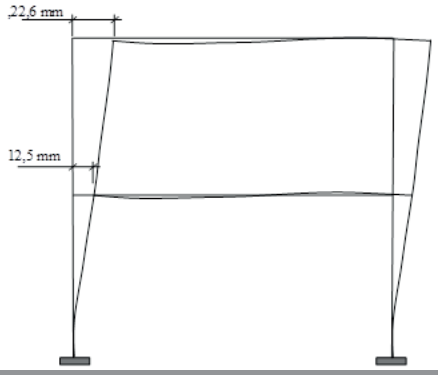


Fig. 6.10 - Deformed shape of the structure (horizontal forces)

α_{cr} may now be evaluated according to clause 5.2.1 of EC3-1-1 considering the determined displacements:

Floor 2: $\alpha_{cr} = \left(\frac{15+1,7}{600,0}\right) \times \left(\frac{5000}{22,6-12,5}\right) = 12,9$

Floor 1: $\alpha_{cr} = \left(\frac{15+1,7+12+2,3}{600,0+800,0}\right)\times\left(\frac{5000}{12,5}\right) = 9,2$

Since α_{cr} is lower than 10, the internal forces for member verification must include second order global effects (P-Δ effects). Considering an elastic analysis, second order global effects, due to horizontal forces, may be directly included in the analysis, via a simplified procedure where horizontal actions are multiplied by the amplification factor:

$$\frac{1}{1-1/\alpha_{cr}} = \frac{1}{1-1/9,2} = 1,12$$

Leading to:

$$F_{H2} = 1,15\times(15+1,7) = 18,7\,kN$$

$$F_{H1} = 1,15\times(12+2,3) = 16,1\,kN$$

Internal force diagrams are then:

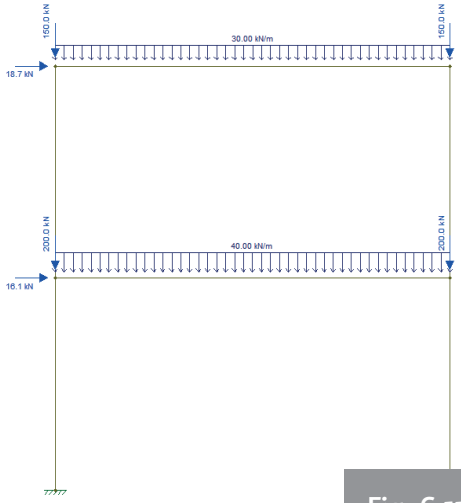


Fig. 6.11 - Final loading

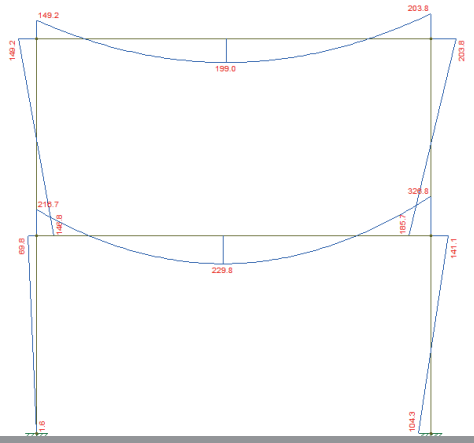


Fig. 6.12 - Bending moment diagram ($M_{y,Ed} = M_{z,Ed}$)

EXAMPLE 6

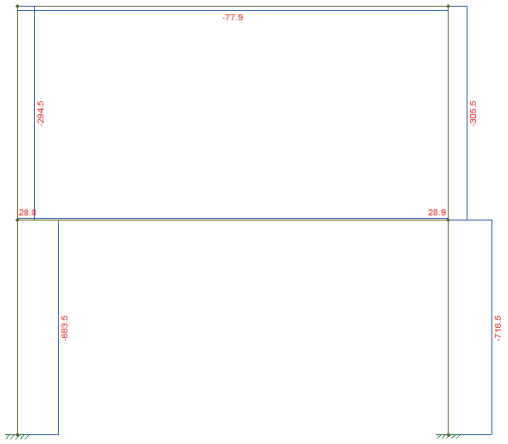


Fig. 6.13 - Axial force diagram

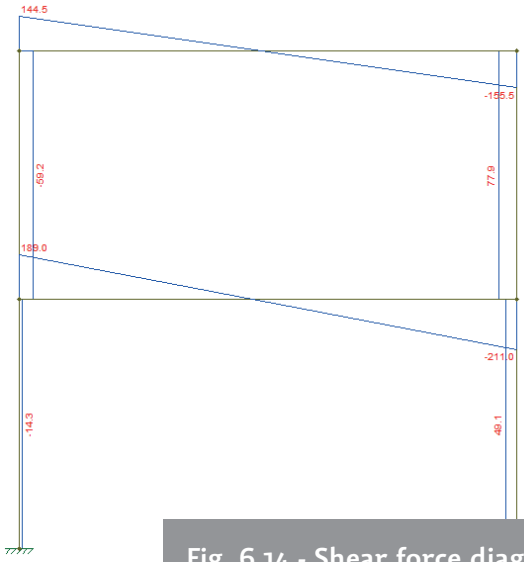


Fig. 6.14 - Shear force diagram

Verification of the most stressed column is carried out: column E-F

ii) Cross section classification (Tables 2.2 and 2.3 of this document)

Considering the most unfavourable section (pure compression):

Class of webs in compression

$$c/t = 230/10 = 23,0 \leq 33\,\varepsilon = 33 \times 0,81 = 26,8 \qquad \text{(Class 1)}$$

Class of flange in compression

$$c/t = 230/10 = 23,0 \leq 33\,\varepsilon = 33 \times 0,81 = 26,8 \qquad \text{(Class 1)}$$

Therefore, the cross section is class 1.

iii) Verification of the cross section resistance (Section 3 of this document):

$$N_{c,Rd} = \frac{A \times f_y}{\gamma_{Mo}} = 3428,1\ kN\ >\ N_{Ed} = 305,5\ kN$$

$$M_{y,c,Rd} = M_{z,c,Rd} = \frac{W_{pl,y} \times f_y}{\gamma_{Mo}} = 317,3\ \text{kNm}\ \geq\ M_{y,Ed} =\ 203,8\ \text{kNm}$$

$$V_{pl,Rd} = \frac{A_v\, f_y}{\gamma_{Mo}\sqrt{3}} = 989,6\ \text{kN} \geq V_{Ed} = 77,9\,\text{kN}$$

Verification of the possibility to neglect web buckling of unstiffened webs due to shear (6.2.6 (6) of EC3-1-1):

$$\frac{h_w}{t_w} = \frac{240}{10} = 24 < 72\frac{\varepsilon}{\eta} = 72 \times \frac{0,81}{1,0} = 58,6$$ can be neglected!

Verification of combined bending and axial force is carried out according to clause 6.2.9.1 (6) do EC3-1-1:

$$\left[\frac{M_{y,Ed}}{M_{N,y,Rd}}\right]^{\alpha} + \left[\frac{M_{y,Ed}}{M_{N,y,Rd}}\right]^{\beta} \leq 1 \quad \Leftrightarrow 0,953 \leq 1$$

Where, for the most stressed cross section:

$$n = \frac{N_{Ed}}{N_{pl,Rd}} = \frac{305,5}{3428,1} = 0,089;\ a = \frac{A - 2bt}{A} = 0,46 > 0,5 \Rightarrow a = 0,5$$

$$\alpha = \beta = \frac{1,66}{1 - 1,13\frac{N_{Ed}}{N_{pl,Rd}}} = 1,675$$

$$M_{N,y,Rd} = M_{N,z,Rd} = M_{pl,y,Rd}\frac{1-n}{1-0,5\,a_w} = 578,12kNm, \text{ but: } M_{N,y,Rd} \leq M_{pl,y,Rd}$$

therefore: $M_{N,y,Rd} = M_{N,z,Rd} = M_{pl,y,Rd} = 317,3kNm$

Plastic interaction between bending moment and shear force must be verified in section F. However, according to clause 6.2.10 of EC3-1-1, since $V_{Ed} = 77,9\,\text{kN} < 0,50 \times V_{pl,Rd} = 0,50 \times 989,6 = 494,8\,\text{kN}$ it is not necessary to reduce the plastic resistant bending moment and therefore, in section F: $M_{y,V,Rd} = M_{z,V,Rd} = M_{N,y,Rd} = 317,3$ kNm.

iv) Flexural buckling verification; y-y axis (= z-z axis):

$$\lambda_1 = \pi\sqrt{\frac{210 \times 10^6}{355 \times 10^3}} = 76,37$$

EXAMPLE 6

$$L_{E,y} = L_{E,z} = kL = 1 \times 5,0 = 5\,\text{m}$$

$$\lambda_y = \lambda_z = \frac{L_{E,y}}{i_y} = \frac{5}{10,11 \times 10^{-2}} = 49,46 \qquad \bar{\lambda}_y = \bar{\lambda}_z = \frac{\lambda_y}{\lambda_1} = 0,65$$

Cold formed rectangular hollow section $\Rightarrow$ *Curve c, hence* $\alpha = 0,49$;

$$\phi_y = \phi_z = 0,822;\ \chi_{\min} = \chi_y = \chi_z = 0,757$$

$$N_{b,Rd} = \chi_{\min} A f_y / \gamma_{M1} = 0,757 \times 96,57 \times 10^{-4} \times 355 \times 10^3 / 1,0 = 2594,8\,\text{kN} > N_{Ed} = 305,5\ kN$$

v) Lateral-torsional buckling verification – general case:

Square hollow sections do not exhibit lateral-torsional buckling phenomena.

vi) Combined bending and axial force stability verification (Section 4.3 of this document)

$$C_{m,LT} = 1,0;\ C_{my} = C_{mz} = 0,4;\ k_{yy} = 0,421;\ \ k_{yz} = 0,253;\ \ k_{zy} = 0,253;\ \ k_{zz} = 0,421$$

Stability verification is carried out according to (6.61) and (6.62) of EC3-1-1:

eq. (6.61): 0,5504 ≤ 1,0

eq. (6.62): 0,5504 ≤ 1,0

Results of Example 6 are summarized below:

Type of verification	Results
Cross section	$\frac{M_{Ed}}{M_{N,y,Rd}} = 0,642 < 1$
Eq. 6.61	0,5504 < 1
Eq. 6.62	0,5504 < 1

PART C

7. GENERAL TECHNICAL DELIVERY CONDITIONS – EN 10219

In the Member States of the European Union, cold formed welded structural hollow sections of non-alloy and fine grain steels should be produced according to EN 10219 [11]. This harmonized product standard is established in Annex I of Directive 98/34/CE, as foreseen in the Construction Products Regulation (EU) No 305/2011, mandatory since July 1st 2013. In compliance with CE marking, cold formed welded structural hollow sections of non-alloy and fine grain steels from *FERPINTA*, are based on the "CERTIFICAT OF FACTORY PRODUCTION CONTROL", no. 1328 – CDP – 0121, which attests that all provisions concerning attestation of factory production control described in Annex ZA of the standard EN 10219-1:2006, and in the respective Declarations of Performance. Since some of the requirements of EN 1090-1/2 are too specific, the product was also certified according to N.oTAC – 013/2009 , by CERTIF, and complements adjusts in the fabrication methods.

certif Certificado

CERTIFICADO DE CONTROLO DE PRODUÇÃO NA FÁBRICA

1328 - CPD - 0121

Do acordo com a Directiva 89/106/CEE, de 21 de Dezembro de 1988, do Conselho das Comunidades Europeias, relativa à aproximação das disposições legislativas, regulamentares e administrativas dos Estados-membros no que respeita aos produtos de construção (Directiva dos Produtos de Construção – DPC), alterada pela Directiva 93/68/CEE do Conselho das Comunidades Europeias, de 22 de Julho de 1993, declara-se que o produto de construção

PERFIS OCOS ACABADOS E ENFORMADOS A FRIO DE AÇOS DE CONSTRUÇÃO NÃO LIGADO E DE GRÃO FINO

Características técnicas:

Tipo de secção	Tipo de aço	Dimensões
Redondo	S235JRH, S275J0H e S355J2H	Diâmetro externo (D) x Espessura (T): (21,3x2,0 a 323,9x12,5)mm
Quadrado	S235JRH, S275J0H e S355J2H	Dimensão lateral (B) x Espessura (T): (20x2,0 a 260x12,5)mm
Rectangular	S235JRH, S275J0H e S355J2H	Dimensões laterais (BxH) x Espessura (T): (40x20x2,0 a 300x200x12,5)mm

produzido pelo fabricante

FERPINTA – Indústrias de Tubos de Aço de Fernando Pinho Teixeira, S.A.
Carregosa - Oliveira de Azeméis,
3730-956 Vale de Cambra - Portugal
na fábrica
Carregosa , Oliveira de Azeméis,
3730-956 Vale de Cambra - Portugal

é submetido pelo fabricante aos ensaios iniciais de tipo, a um controlo de produção na fábrica e a ensaios complementares de amostras colhidas na fábrica, de acordo com um plano de ensaios pré-estabelecido, e que o organismo notificado – CERTIF Associação para a Certificação de Produtos – realizou uma auditoria inicial à fábrica e ao controlo da produção, e efectua o acompanhamento contínuo, a avaliação e a aprovação do controlo de produção na fábrica.

Este certificado atesta que todas as disposições relativas à comprovação da conformidade e ao desempenho do produto descritas no Anexo ZA da norma:

EN 10219-1:2006

foram consideradas.

Este certificado foi emitido pela primeira vez em 2008-11-04 e mantém-se válido desde que não se alterem significativamente as condições definidas na especificação técnica harmonizada ou as condições de fabrico e do controlo de produção na fábrica.

Almada, 10 de Novembro de 2008

Francisco Barroca
Director Geral

Certif – Associação para a Certificação
Rua José Afonso, 9 E – 2810-237 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

7. GENERAL TECHNICAL DELIVERY CONDITIONS – EN 10219

certif Certificado

CERTIFICATE OF FACTORY PRODUCTION CONTROL

1328 - CPD - 0121

In compliance with the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive – CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 22 July 1993, it has been stated that the construction product

COLD FORMED WELDED STRUCTURAL HOLLOW SECTIONS OF NON-ALLOY AND FINE GRAIN STEELS

Technical caracteristics:

Section type	Steel grade	Dimensions
Circular	S235JRH, S275J0H and S355J2H	Outside diameter (D) x Thickness (T): (21,3x2,0 to 323,9x12,5) mm
Square	S235JRH, S275J0H and S355J2H	Side dimension (B) x Thickness (T): (20x2,0 to 260x12,5) mm
Rectangular	S235JRH, S275J0H and S355J2H	Side dimensions (BxH) x Thickness (T): (40x20x2,0 to 300x200x12,5)mm

produced by the manufacturer

FERPINTA – Indústrias de Tubos de Aço de Fernando Pinho Teixeira, S.A.

Carregosa - Oliveira de Azeméis, 3730-956 Vale de Cambra - Portugal

in the factory

Carregosa - Oliveira de Azeméis,

3730-956 Vale de Cambra - Portugal

is submitted by the manufacturer to the initial type-testing of the product, a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the notified body – CERTIF Associação para a Certificação de Produtos – has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

This certificate attests that all provisions concerning the attestation of factory production control described in the Annex ZA of the standard

EN 10219-1:2006

were applied.

This certificate was first issued on 2008-11-04 and remains valid as long as the conditions laid down in the harmonized technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly.

Almada, 10th November 2008

Francisco Barroca

General Manager

Certif – Associação para a Certificação de Produtos
Rua José Afonso, 9 E – 2810-247 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

7. GENERAL TECHNICAL DELIVERY CONDITIONS - EN 10219

certif Certificado

CERTIFICATE OF FACTORY PRODUCTION CONTROL

1328 - CPD - 0121

In compliance with the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive – CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 22 July 1993, it has been stated that the construction product

COLD FORMED WELDED STRUCTURAL HOLLOW SECTIONS OF NON-ALLOY AND FINE GRAIN STEELS

Technical caracteristics:

Section type	Steel grade	Dimensions
Circular	S235JRH, S275J0H and S355J2H	Outside diameter (D) x Thickness (T): (21,3x2,0 to 323,9x12,5) mm
Square	S235JRH, S275J0H and S355J2H	Side dimension (B) x Thickness (T): (20x2,0 to 260x12,5) mm
Rectangular	S235JRH, S275J0H and S355J2H	Side dimensions (BxH) x Thickness (T): (40x20x2,0 to 300x200x12,5)mm

produced by the manufacturer

FERPINTA – Indústrias de Tubos de Aço de Fernando Pinho Teixeira, S.A.

Carregosa - Oliveira de Azeméis, 3730-956 Vale de Cambra - Portugal

in the factory

Carregosa - Oliveira de Azeméis,

3730-956 Vale de Cambra - Portugal

is submitted by the manufacturer to the initial type-testing of the product, a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the notified body – CERTIF Associação para a Certificação de Produtos – has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

This certificate attests that all provisions concerning the attestation of factory production control described in the Annex ZA of the standard

EN 10219-1:2006

were applied.

This certificate was first issued on 2008-11-04 and remains valid as long as the conditions laid down in the harmonized technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly.

Almada, 10th November 2008

Francisco Barroca

General Manager

Certif – Associação para a Certificação de Produtos
Rua José Afonso, 9 E – 2810-237 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

7. GENERAL TECHNICAL DELIVERY CONDITIONS – EN 10219

certif Certificado

CERTIFICATE OF FACTORY PRODUCTION CONTROL

1328 - CPD - 0121

In compliance with the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive – CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 22 July 1993, it has been stated that the construction product

COLD FORMED WELDED STRUCTURAL HOLLOW SECTIONS OF NON-ALLOY AND FINE GRAIN STEELS

Technical caracteristics:

Section type	Steel grade	Dimensions
Circular	S235JRH, S275J0H and S355J2H	Outside diameter (D) x Thickness (T): (21,3x2,0 to 323,9x12,5) mm
Square	S235JRH, S275J0H and S355J2H	Side dimension (B) x Thickness (T): (20x2,0 to 260x12,5) mm
Rectangular	S235JRH, S275J0H and S355J2H	Side dimensions (BxH) x Thickness (T): (40x20x2,0 to 300x200x12,5)mm

produced by the manufacturer

FERPINTA – Indústrias de Tubos de Aço de Fernando Pinho Teixeira, S.A.

Carregosa - Oliveira de Azeméis, 3730-956 Vale de Cambra - Portugal

in the factory

Carregosa - Oliveira de Azeméis,

3730-956 Vale de Cambra - Portugal

is submitted by the manufacturer to the initial type-testing of the product, a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the notified body – CERTIF Associação para a Certificação de Produtos – has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

This certificate attests that all provisions concerning the attestation of factory production control described in the Annex ZA of the standard

EN 10219-1:2006

were applied.

This certificate was first issued on 2008-11-04 and remains valid as long as the conditions laid down in the harmonized technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly.

Almada, 10th November 2008

Francisco Barroca

General Manager

Certif – Associação para a Certificação de Produtos
Rua José Afonso, 9 E – 2810-257 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

7. GENERAL TECHNICAL DELIVERY CONDITIONS - EN 10219

Ferpinta – INDÚSTRIAS DE TUBOS DE AÇO
de Fernando Pinho Teixeira, S.A.

DECLARATION OF PERFORMANCE

DoP - FERPINTA 01/13

Unique identification code of the product-type	TE 13NNNN-LL-NN COLD FORMED WELDED STRUCTURAL HOLLOW SECTIONS OF NON-ALLOY AND FINE GRAIN STEELS		
Product-type reference	Steel Grade	Hollow Section	Dimensions
	S235JRH	Circular	Outside diameter (*D*) x Thickness (T) : (21,3x2,0 to 323,9x12,5) mm
		Square	Side Dimension (*B*) x Thickness (T) : (20x2,0 to 260x12,5) mm
		Rectangular	Side Dimensions (BxH) x Thickness (T) : (40x20x2,0 to 300x200x12,5) mm
Intended use	To be used in metal structures or in composite metal and concrete structures.		
Name, registered trade name and contact address of the manufacturer	FERPINTA - Indústrias de Tubos de Aço de Fernando Pinho Teixeira, SA Carregosa - Oliveira de Azeméis 3730 - 956 VALE DE CAMBRA PORTUGAL		
System of assessment and verification of constancy of performance	System 2 +		
Notified body	CERTIF NB No. 1328, performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control and issued the Certificate of Conformity of the factory production control No 1328-CPD-0121.		
Declared performance:			
Essential characteristics	Performance		Harmonised technical specification
- Tolerances on dimensions and shape	Conform		
- Elongation	Minimum 24 %		
- Tensile strength	T < 3 mm : 360 ≤ *Rm* ≤ 510 MPa T ≥ 3 mm : 360 ≤ *Rm* ≤ 510 MPa		EN 10219-1 : 2005
- Yield strength	T ≤ 16 mm : *ReH* ≥ 235 MPa		
- Impact strength	Minimum 27 J (20 °C)		
- Weldability	CEV maximum : 0,35 %		
- Durability	Uncoated Suitable for hot dip galvanizing		
The Performance of the product identified in this document is in conformity with the Declared performance above described. This DECLARATION OF PERFORMANCE is issued under the exclusive responsibility of the manufacturer identified.			

Declaration of Performance in accordance with the REGULATION (EU) No 305/2011

Carregosa, 17th June of 2013

Nuno Ribeiro Pires
Administrator

PROCESSADO POR COMPUTADOR - NIPC 505 113 089 - C.R.C. OLIVEIRA DE AZEMEIS - SOC. ANÓNIMA - CAPITAL SOCIAL 10.000.000€

GRUPO FERPINTA

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CERTIFICADO N.º 93/CEP. 813

Nº 1 EU PORTUGAL

7. GENERAL TECHNICAL DELIVERY CONDITIONS – EN 10219

Ferpinta – INDÚSTRIAS DE TUBOS DE AÇO
de Fernando Pinho Teixeira, S.A.

LEISTUNGSERKLÄRUNG

DoP - FERPINTA 03/13

Identifikationscode der Produktart	TE 13NNNN-LL-NN KALTGEFERTIGTE GESCHWEIßTE HOHLPROFILE FÜR DEN STAHLBAU AUS UNLEGIERTEN BAUSTÄHLEN UND AUS FEINKORNBAUSTÄHLEN		
Referenzproduktart	Kurzname	Erzeugnisform	Maße
	S355J2H	Kreisförmig	Außendurchmesser (D) x Dicke (T) : (21,3x2,0 bis 323,9x12,5) mm
		Quadratisch	Laterale Abmessung (B) x Dicke (T) : (20x2,0 bis 260x12,5) mm
		Rechteckig	Laterale Abmessungen (BxH) x Dicke (T) : (40x20x2,0 bis 300x200x12,5) mm
Vorgesehener Verwendungszweck	Für die Verwendung in Metallbauwerken oder in Metall-/Betonverbundbauwerken		
Name oder Kennung und registrierte Anschrift des Herstellers	FERPINTA - Indústrias de Tubos de Aço de Fernando Pinho Teixeira, SA Carregosa - Oliveira de Azeméis 3730 - 956 VALE DE CAMBRA PORTUGAL		
System(e) der Konformitäts-bescheinigung	System 2 +		
Zugelassene Stelle	CERTIF NB Nr. 1328, Zertifizierung der werkseigenen Produktionskontrolle unter System 2+ auf der Grundlage . der Erstprüfung des Werks und der werkseigenen Produktionskontrolle, . der kontinuierlichen Überwachung, Beurteilung und Bestätigung der werkseigenen Produktionskontrolle mit abschliessender Ausstellung des Konformitätszertifikates der werkseigenen Produktionskontrolle Nr. 1328-CPD-0121.		
Erklärte Leistungen:			
Wesentliche Eigenschaften	Leistung		Harmonisierte technische Spezifikation
- Grenzabweichungen für Maße und Form	Konform		EN 10219-1 : 2005
- Dehnung	Min.: 20 %		
- Zugfestigkeit	T < 3 mm : 510 ≤ Rm ≤ 680 MPa T ≥ 3 mm : 470 ≤ Rm ≤ 630 MPa		
- Streckgrenze	T ≤ 16 mm : ReH ≥ 355 MPa		
- Kerbschlagarbeit	Min.: 27 J (-20 °C)		
- Schweißeignung	CEV max.: 0,45 %		
- Dauerhaftigkeit	Unbeschichtet Feuerverzinkungsfähig		

Die Leistung des angegebenen Produktes ist übereinstimmend mit der oben spezifizierten Leistungserklärung.
Die Ausstellung dieser Leistungserklärung liegt in der alleinigen Verantwortung des oben genannten Herstellers.

Leistungserklärung nach der Verordnung (EU) Nr. 305/2011.

Carregosa, 17 Juni 2013

Nuno Ribeiro Pires
Geschäftsleitung

GRUPO FERPINTA
TELEF. +351 256 411 400 - FAX +351 256 412 049
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CERTIFICADO Nº. 82/CEP-333

Nº 1 EU PORTUGA

7. GENERAL TECHNICAL DELIVERY CONDITIONS - EN 10219

Ferpinta – INDÚSTRIAS DE TUBOS DE AÇO
de Fernando Pinho Teixeira, S.A.

DECLARAÇÃO DE DESEMPENHO
DoP - FERPINTA 05/13

Código de identificação único do produto-tipo	TC 13NNNN-LL-NN-ZnNN TUBOS DE AÇO NÃO LIGADO COM APTIDÃO PARA SOLDADURA E ROSCAGEM.
Referência do produto-tipo	TUBO W 3/8" (17,2 mm) a 4" (114,3 mm), Tipo LIGEIRO 2, GALVANIZADO
Utilização prevista	Distribuição de líquidos aquosos, gás e fuelóleo.
Fabricante	FERPINTA - Indústrias de Tubos de Aço de Fernando Pinho Teixeira, SA Carregosa - Oliveira de Azeméis 3730 - 956 VALE DE CAMBRA PORTUGAL
Sistema de atestação da conformidade	Sistema 3
Organismo notificado	CATIM – NB 0464, realizou os ensaios de caracterização do produto-tipo no âmbito do sistema 3 e emitiu relatório de ensaio.
Desempenho declarado:	

Características essenciais	Desempenho	Especificação técnica harmonizada
- Reacção ao fogo	Classe A1	
- Tensão de cedência	195 MPa	
- Tolerâncias dimensionais	Conforme	
- Estanquidade: Gás e líquidos	Conforme	EN 10255:2004+A1:2007
- Substâncias perigosas	NPD	
- Durabilidade	Galvanizado 55 µm	

O Desempenho do produto identificado, está conforme com o DESEMPENHO declarado.
A presente Declaração de desempenho é emitida sob a exclusiva responsabilidade do Fabricante identificado.

Declaração de Desempenho segundo Regulamento (EU) nº 305/2011

Carregosa, 24 de Junho de 2013

Avelino Sousa Ribeiro
Administrador

PROCESSADO POR COMPUTADOR - NIPC 500 113 699 - C.R.C. OLIVEIRA DE AZEMÉIS - SOC. ANÓNIMA - CAPITAL SOCIAL 10.000.000€

GRUPO FERPINTA

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apcer ISO 9001 IQNet CERTIFICADO Nº. 92/CEP. 023

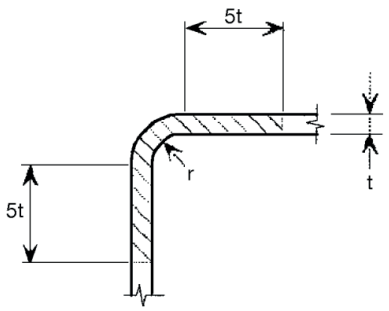
Nº 1 EM PORTUGAL

Steel and mixed construction has been facing a significative evolution throughout the past decades. With the need to comply with CE marking in all Member States, it is crucial that steel suppliers are able to respect the requirements of EN 1090-1/2 and EC3.

7. GENERAL TECHNICAL DELIVERY CONDITIONS – EN 10219

Dissimilar conditions such as equivalent carbon content (CEV) or welding conditions for cold formed zones, are established in the fabrication of hollow sections, considering design standards as a reference.

r/t	Strain due to cold forming (%)	Maximum thickness (mm)		
		Generally		Fully killed Aluminium killed steel (A1 ≥ 0,02%)
		Predominatly static loading	where fatigue predominates	
≥25	≤ 2	any	any	any
≥10	≤ 5	any	16	any
≥3,0	≤ 14	24	12	24
≥2,0	≤ 20	12	10	12
≥1,5	≤ 25	8	8	10
≥1,0	≤ 33	4	4	6



FERPINTA hollow sections chemical content level is limited, thus leading to increased versatility as well as reducing solidification faults and improving galvanization. Recyclability is also taking into account, following LEED reference. Chemical composition and mechanical properties in EN 10219-1 are given by:

Class	%C (max)	%Si (max)	%Mn (max)	%P (max)	% S (max)	% N (max)	CEV (max)	Minimum yiekd strength ReH (Mpa)	Tensile strength Rm (Mpa)		Minimum percentage elongation after failure (%)	Minimum impact energy (J)		
									nominal tickness < 3 mm	nominal tickness ≥ 3 mm		-20 °C	0 °C	20 °C
S235JRH	0,17	-	1,40	0,040	0,040	0,009	0,35	235	360-510	360-510	24	-	-	27
S275JOH	0,20	-	1,50	0,035	0,035	0,009	0,40	275	430-580	410-560	20	-	27	-
S275J2H	0,20	-	1,50	0,030	0,030	-	0,40	275	430-580	410-560	20	27	-	-
S355JOH	0,22	0,55	1,60	0,035	0,035	0,009	0,45	355	510-680	470-630	20	-	27	-
S355J2H	0,22	0,55	1,60	0,030	0,030	-	0,45	355	510-680	470-630	20	27	-	-
S355K2H	0,22	0,55	1,60	0,030	0,030	-	0,45	355	510-680	470-630	20	40	-	-

(Other fine grain steel grades and steel with high elastic limit S500 or S700 are available upon request)

7. GENERAL TECHNICAL DELIVERY CONDITIONS - EN 10219

The main characteristics regarding dimensions and tolerances according to EN 10219 2:2006 for cold formed welded structural hollow sections of non-alloy and fine grain steels, are:

Table 7.1 – Reduction of yield strength, f_y [MPa] as a function of the thickness [11]

t[mm]	≤16	> 16; ≤ 40
S235 JRH	235	225
S275 JoH S275 J2H	275	265
S275 NH S275 NLH	275	265
S275 MH S275 MLH	275	265
S355 JoH S355 J2H S355 K2H	355	345
S355 NH S355 NLH	355	345
S355 MH S355 MLH	355	345
S420 MH S420 MLH	420	400
S460 NH S460 NLH	460	440
S460 MH S460 MLH	460	440

8. *FERPINTA* PROFILE TABLES

8.1 Structural steel hollow sections according to EN10219

Sections 8.1.1, 8.1.2 and 8.1.3 present the list of circular hollow sections, *FERPINTA* CHS; square hollow sections, *FERPINTA* SHS; and rectangular hollow sections, *FERPINTA* RHS; respectively. Listed profiles are produced according to EN 10219 [11]. Presented properties are determined according to Anexo B of EN 10219 [11].

8.1.1 Circular hollow sections, *FERPINTA* CHS

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 10x2,0	0,39	10	2	0,50	0,031	0,04	0,09	0,13	0,29	0,09	0,17	625,00
CHS 12x2,0	0,49	12	2	0,63	0,038	0,08	0,14	0,20	0,36	0,16	0,27	600,00
CHS 13x2,0	0,54	13	2	0,69	0,041	0,11	0,17	0,24	0,40	0,22	0,33	590,91
CHS 14x2,0	0,59	14	2	0,75	0,044	0,14	0,20	0,29	0,43	0,28	0,40	583,33
CHS 16x2,0	0,69	16	2	0,88	0,050	0,22	0,27	0,39	0,50	0,44	0,55	571,43
CHS 17.2x2,0	0,75	17,2	2	0,96	0,054	0,28	0,33	0,46	0,54	0,56	0,65	565,79
CHS 18x2,0	0,79	18	2	1,01	0,057	0,33	0,36	0,51	0,57	0,65	0,73	562,50
CHS 19x2,0	0,84	19	2	1,07	0,060	0,39	0,41	0,58	0,61	0,78	0,82	558,82
CHS 20x2,0	0,89	20	2	1,13	0,063	0,46	0,46	0,65	0,64	0,93	0,93	555,56
CHS 20x2,0	0,89	20	2	1,13	0,063	0,46	0,46	0,65	0,64	0,93	0,93	555,56
CHS 21,3x2,0	0,95	21,3	2	1,21	0,067	0,57	0,54	0,75	0,69	1,14	1,07	551,81
CHS 21,3x2,5	1,16	21,3	2,5	1,48	0,067	0,66	0,62	0,89	0,67	1,33	1,25	453,19
CHS 21,3x3,0	1,35	21,3	3	1,72	0,067	0,74	0,70	1,01	0,66	1,48	1,39	387,98
CHS 21,3x2,0	0,95	21,3	2	1,21	0,067	0,57	0,54	0,75	0,69	1,14	1,07	551,81
CHS 22x2,0	0,99	22	2	1,26	0,069	0,63	0,58	0,80	0,71	1,27	1,15	550,00
CHS 22x2,5	1,20	22	2,5	1,53	0,069	0,74	0,67	0,96	0,70	1,48	1,35	451,28
CHS 25x2,0	1,13	25	2	1,45	0,079	0,96	0,77	1,06	0,82	1,93	1,54	543,48
CHS 25x2,0	1,13	25	2	1,45	0,079	0,96	0,77	1,06	0,82	1,93	1,54	543,48
CHS 26,9x2,0	1,23	26,9	2	1,56	0,085	1,22	0,91	1,24	0,88	2,44	1,81	540,16
CHS 26,9x2,5	1,50	26,9	2,5	1,92	0,085	1,44	1,07	1,49	0,87	2,88	2,14	440,98
CHS 26,9x3,0	1,77	26,9	3	2,25	0,085	1,63	1,21	1,72	0,85	3,27	2,43	375,17
CHS 26,9x2,0	1,23	26,9	2	1,56	0,085	1,22	0,91	1,24	0,88	2,44	1,81	540,16
CHS 28x2,0	1,28	28	2	1,63	0,088	1,39	0,99	1,35	0,92	2,78	1,98	538,46
CHS 30x3,0	2,00	30	3	2,54	0,094	2,35	1,56	2,20	0,96	4,69	3,13	370,37
CHS 30x2,0	1,38	30	2	1,76	0,094	1,73	1,16	1,57	0,99	3,47	2,31	535,71
CHS 32x2,0	1,48	32	2	1,88	0,101	2,13	1,33	1,80	1,06	4,26	2,66	533,33
CHS 33,7x2,0	1,56	33,7	2	1,99	0,106	2,51	1,49	2,01	1,12	5,02	2,98	531,55

8. FERPINTA PROFILE TABLES

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 33,7x2,5	1,92	33,7	2,5	2,45	0,106	3,00	1,78	2,44	1,11	6,00	3,56	432,05
CHS 33,7x3,0	2,27	33,7	3	2,89	0,106	3,44	2,04	2,84	1,09	6,88	4,08	365,91
CHS 33,7x2,0	1,56	33,7	2	1,99	0,106	2,51	1,49	2,01	1,12	5,02	2,98	531,55
CHS 34x2,0	1,58	34	2	2,01	0,107	2,58	1,52	2,05	1,13	5,17	3,04	531,25
CHS 35x2,0	1,63	35	2	2,07	0,110	2,83	1,62	2,18	1,17	5,67	3,24	530,30
CHS 38x2,0	1,78	38	2	2,26	0,119	3,68	1,93	2,59	1,27	7,35	3,87	527,78
CHS 38x2,0	1,78	38	2	2,26	0,119	3,68	1,93	2,59	1,27	7,35	3,87	527,78
CHS 40x3,0	2,74	40	3	3,49	0,126	6,01	3,00	4,12	1,31	12,01	6,01	360,36
CHS 40x2,0	1,87	40	2	2,39	0,126	4,32	2,16	2,89	1,35	8,64	4,32	526,32
CHS 41x2,0	1,92	41	2	2,45	0,129	4,67	2,28	3,04	1,38	9,34	4,56	525,64
CHS 42x2,0	1,97	42	2	2,51	0,132	5,04	2,40	3,20	1,42	10,08	4,80	525,00
CHS 42,4x2,0	1,99	42,4	2	2,54	0,133	5,19	2,45	3,27	1,43	10,38	4,90	524,75
CHS 42,4x2,5	2,46	42,4	2,5	3,13	0,133	6,26	2,95	3,99	1,41	12,52	5,91	425,06
CHS 42,4x3,0	2,91	42,4	3	3,71	0,133	7,25	3,42	4,67	1,40	14,49	6,84	358,71
CHS 42,4x4,0	3,79	42,4	4	4,83	0,133	8,99	4,24	5,92	1,36	17,98	8,48	276,04
CHS 42,4x2,0	1,99	42,4	2	2,54	0,133	5,19	2,45	3,27	1,43	10,38	4,90	524,75
CHS 44,5x2,0	2,10	44,5	2	2,67	0,140	6,04	2,72	3,62	1,50	12,09	5,43	523,53
CHS 45x3,0	3,11	45	3	3,96	0,141	8,77	3,90	5,30	1,49	17,55	7,80	357,14
CHS 45x2,0	2,12	45	2	2,70	0,141	6,26	2,78	3,70	1,52	12,52	5,56	523,26
CHS 48x2,0	2,27	48	2	2,89	0,151	7,66	3,19	4,23	1,63	15,32	6,38	521,74
CHS 48,3x2,0	2,28	48,3	2	2,91	0,152	7,81	3,23	4,29	1,64	15,62	6,47	521,60
CHS 48,3x2,5	2,82	48,3	2,5	3,60	0,152	9,46	3,92	5,25	1,62	18,92	7,83	421,83
CHS 48,3x3,0	3,35	48,3	3	4,27	0,152	11,00	4,55	6,17	1,61	22,00	9,11	355,41
CHS 48,3x4,0	4,37	48,3	4	5,57	0,152	13,77	5,70	7,87	1,57	27,54	11,40	272,57
CHS 48,3x5,0	5,34	48,3	5	6,80	0,152	16,15	6,69	9,42	1,54	32,31	13,38	223,09
CHS 48,3x2,0	2,28	48,3	2	2,91	0,152	7,81	3,23	4,29	1,64	15,62	6,47	521,60
CHS 49x3,0	3,40	49	3	4,34	0,154	11,52	4,70	6,36	1,63	23,03	9,40	355,07
CHS 49x2,0	2,32	49	2	2,95	0,154	8,17	3,33	4,42	1,66	16,34	6,67	521,28
CHS 50x3,0	3,48	50	3	4,43	0,157	12,28	4,91	6,64	1,67	24,56	9,82	354,61
CHS 50x4,0	4,54	50	4	5,78	0,157	15,41	6,16	8,49	1,63	30,81	12,32	271,74
CHS 50x2,0	2,37	50	2	3,02	0,157	8,70	3,48	4,61	1,70	17,40	6,96	520,83
CHS 50x3,0	3,48	50	3	4,43	0,157	12,28	4,91	6,64	1,67	24,56	9,82	354,61
CHS 50x3,5	4,01	50	3,5	5,11	0,157	13,90	5,56	7,58	1,65	27,80	11,12	307,22
CHS 50x4,0	4,54	50	4	5,78	0,157	15,41	6,16	8,49	1,63	30,81	12,32	271,74
CHS 50x4,5	5,05	50	4,5	6,43	0,157	16,81	6,72	9,35	1,62	33,62	13,45	244,20
CHS 50x5,0	5,55	50	5	7,07	0,157	18,11	7,25	10,17	1,60	36,23	14,49	222,22

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Superface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 50x6,0	6,51	50	6	8,29	0,157	20,44	8,18	11,69	1,57	40,89	16,36	189,39
CHS 50x7,0	7,42	50	7	9,46	0,157	22,43	8,97	13,06	1,54	44,87	17,95	166,11
CHS 50x8,0	8,29	50	8	10,56	0,157	24,12	9,65	14,28	1,51	48,24	19,30	148,81
CHS 50x2,0	2,37	50	2	3,02	0,157	8,70	3,48	4,61	1,70	17,40	6,96	520,83
CHS 50,8x2,0	2,41	50,8	2	3,07	0,160	9,14	3,60	4,77	1,73	18,29	7,20	520,49
CHS 50,8x2,5	2,98	50,8	2,5	3,79	0,160	11,09	4,37	5,84	1,71	22,18	8,73	420,70
CHS 50,8x3,0	3,54	50,8	3	4,51	0,160	12,92	5,09	6,86	1,69	25,83	10,17	354,25
CHS 50,8x3,5	4,08	50,8	3,5	5,20	0,160	14,62	5,76	7,84	1,68	29,25	11,52	306,86
CHS 50,8x4,0	4,62	50,8	4	5,88	0,160	16,22	6,39	8,78	1,66	32,44	12,77	271,37
CHS 50,8x4,5	5,14	50,8	4,5	6,55	0,160	17,71	6,97	9,68	1,64	35,41	13,94	243,82
CHS 50,8x5,0	5,65	50,8	5	7,19	0,160	19,09	7,52	10,53	1,63	38,18	15,03	221,83
CHS 50,8x6,0	6,63	50,8	6	8,44	0,160	21,57	8,49	12,11	1,60	43,13	16,98	188,99
CHS 50,8x7,0	7,56	50,8	7	9,63	0,160	23,69	9,33	13,54	1,57	47,38	18,65	165,69
CHS 50,8x8,0	8,44	50,8	8	10,76	0,160	25,49	10,04	14,83	1,54	50,98	20,07	148,36
CHS 55x3,0	3,85	55	3	4,90	0,173	16,62	6,04	8,12	1,84	33,24	12,09	352,56
CHS 55x4,0	5,03	55	4	6,41	0,173	20,96	7,62	10,43	1,81	41,93	15,25	269,61
CHS 55x2,0	2,61	55	2	3,33	0,173	11,71	4,26	5,62	1,88	23,42	8,52	518,87
CHS 57x3,0	4,00	57	3	5,09	0,179	18,61	6,53	8,76	1,91	37,22	13,06	351,85
CHS 57x4,0	5,23	57	4	6,66	0,179	23,52	8,25	11,26	1,88	47,04	16,50	268,87
CHS 57x2,0	2,71	57	2	3,46	0,179	13,08	4,59	6,05	1,95	26,17	9,18	518,18
CHS 60x2,0	2,86	60	2	3,64	0,188	15,34	5,11	6,73	2,05	30,68	10,23	517,24
CHS 60,3x2,0	2,88	60,3	2	3,66	0,189	15,58	5,17	6,80	2,06	31,16	10,34	517,15
CHS 60,3x2,5	3,56	60,3	2,5	4,54	0,189	18,99	6,30	8,36	2,05	37,99	12,60	417,30
CHS 60,3x3,0	4,24	60,3	3	5,40	0,189	22,22	7,37	9,86	2,03	44,45	14,74	350,79
CHS 60,3x4,0	5,55	60,3	4	7,07	0,189	28,17	9,34	12,70	2,00	56,35	18,69	267,76
CHS 60,3x5,0	6,82	60,3	5	8,69	0,189	33,48	11,10	15,33	1,96	66,95	22,21	218,08
CHS 60,3x2,0	2,88	60,3	2	3,66	0,189	15,58	5,17	6,80	2,06	31,16	10,34	517,15
CHS 60,3x4,0	5,55	60,3	4	7,07	0,189	28,17	9,34	12,70	2,00	56,35	18,69	267,76
CHS 60,3x4,5	6,19	60,3	4,5	7,89	0,189	30,90	10,25	14,04	1,98	61,80	20,50	240,14
CHS 63x3,0	4,44	63	3	5,65	0,198	25,51	8,10	10,81	2,12	51,02	16,20	350,00
CHS 63x4,0	5,82	63	4	7,41	0,198	32,41	10,29	13,95	2,09	64,82	20,58	266,95
CHS 65x2,0	3,11	65	2	3,96	0,204	19,66	6,05	7,94	2,23	39,32	12,10	515,87
CHS 65x3,0	4,59	65	3	5,84	0,204	28,14	8,66	11,54	2,19	56,29	17,32	349,46
CHS 65x3,5	5,31	65	3,5	6,76	0,204	32,07	9,87	13,25	2,18	64,15	19,74	301,97
CHS 65x4,0	6,02	65	4	7,67	0,204	35,81	11,02	14,91	2,16	71,61	22,04	266,39
CHS 65x4,5	6,71	65	4,5	8,55	0,204	39,35	12,11	16,50	2,14	78,70	24,21	238,75

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 65x5,0	7,40	65	5	9,42	0,204	42,71	13,14	18,04	2,13	85,41	26,28	216,67
CHS 65x6,0	8,73	65	6	11,12	0,204	48,89	15,04	20,96	2,10	97,78	30,09	183,62
CHS 65x7,0	10,01	65	7	12,75	0,204	54,42	16,74	23,66	2,07	108,83	33,49	160,10
CHS 65x8,0	11,25	65	8	14,33	0,204	59,33	18,25	26,16	2,04	118,65	36,51	142,54
CHS 65x2,0	3,11	65	2	3,96	0,204	19,66	6,05	7,94	2,23	39,32	12,10	515,87
CHS 70x3,0	4,96	70	3	6,31	0,220	35,50	10,14	13,48	2,37	71,01	20,29	348,26
CHS 70x4,0	6,51	70	4	8,29	0,220	45,33	12,95	17,45	2,34	90,65	25,90	265,15
CHS 70x2,0	3,35	70	2	4,27	0,220	24,72	7,06	9,25	2,41	49,43	14,12	514,71
CHS 75x2,0	3,60	75	2	4,59	0,236	30,58	8,15	10,66	2,58	61,15	16,31	513,70
CHS 75x2,5	4,47	75	2,5	5,69	0,236	37,46	9,99	13,15	2,56	74,91	19,98	413,79
CHS 75x3,0	5,33	75	3	6,79	0,236	44,05	11,75	15,56	2,55	88,10	23,49	347,22
CHS 75x3,5	6,17	75	3,5	7,86	0,236	50,36	13,43	17,91	2,53	100,72	26,86	299,70
CHS 75x4,0	7,00	75	4	8,92	0,236	56,40	15,04	20,19	2,51	112,80	30,08	264,08
CHS 75x4,5	7,82	75	4,5	9,97	0,236	62,17	16,58	22,40	2,50	124,35	33,16	236,41
CHS 75x5,0	8,63	75	5	11,00	0,236	67,69	18,05	24,54	2,48	135,38	36,10	214,29
CHS 75x6,0	10,21	75	6	13,01	0,236	77,99	20,80	28,64	2,45	155,98	41,59	181,16
CHS 75x7,0	11,74	75	7	14,95	0,236	87,35	23,29	32,48	2,42	174,70	46,59	157,56
CHS 75x8,0	13,22	75	8	16,84	0,236	95,83	25,56	36,08	2,39	191,67	51,11	139,93
CHS 75x2,0	3,60	75	2	4,59	0,236	30,58	8,15	10,66	2,58	61,15	16,31	513,70
CHS 76,1x2,0	3,65	76,1	2	4,66	0,239	31,98	8,40	10,98	2,62	63,96	16,81	513,50
CHS 76,1x2,5	4,54	76,1	2,5	5,78	0,239	39,19	10,30	13,55	2,60	78,37	20,60	413,59
CHS 76,1x3,0	5,41	76,1	3	6,89	0,239	46,10	12,11	16,04	2,59	92,19	24,23	347,01
CHS 76,1x4,0	7,11	76,1	4	9,06	0,239	59,06	15,52	20,81	2,55	118,11	31,04	263,87
CHS 76,1x5,0	8,77	76,1	5	11,17	0,239	70,92	18,64	25,32	2,52	141,84	37,28	214,06
CHS 76,1x6,0	10,37	76,1	6	13,21	0,239	81,76	21,49	29,56	2,49	163,52	42,97	180,93
CHS 76,1x6,3	10,84	76,1	6,3	13,81	0,239	84,82	22,29	30,78	2,48	169,64	44,58	173,06
CHS 76,1x2,0	3,65	76,1	2	4,66	0,239	31,98	8,40	10,98	2,62	63,96	16,81	513,50
CHS 76,1x4,0	7,11	76,1	4	9,06	0,239	59,06	15,52	20,81	2,55	118,11	31,04	263,87
CHS 76,1x4,5	7,95	76,1	4,5	10,12	0,239	65,12	17,11	23,10	2,54	130,24	34,23	236,19
CHS 80x3,0	5,70	80	3	7,26	0,251	53,87	13,47	17,80	2,72	107,73	26,93	346,32
CHS 80x4,0	7,50	80	4	9,55	0,251	69,15	17,29	23,13	2,69	138,29	34,57	263,16
CHS 80x5,0	9,25	80	5	11,78	0,251	83,20	20,80	28,17	2,66	166,41	41,60	213,33
CHS 80x6,0	10,95	80	6	13,95	0,251	96,11	24,03	32,93	2,62	192,21	48,05	180,18
CHS 80x2,0	3,85	80	2	4,90	0,251	37,30	9,32	12,17	2,76	74,59	18,65	512,82
CHS 83x3,0	5,92	83	3	7,54	0,261	60,40	14,56	19,21	2,83	120,81	29,11	345,83
CHS 83x4,0	7,79	83	4	9,93	0,261	77,64	18,71	24,99	2,80	155,29	37,42	262,66

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 88,9x2,0	4,29	88,9	2	5,46	0,279	51,57	11,60	15,11	3,07	103,14	23,20	511,51
CHS 88,9x2,5	5,33	88,9	2,5	6,79	0,279	63,37	14,26	18,67	3,06	126,75	28,51	411,57
CHS 88,9x3,0	6,36	88,9	3	8,10	0,279	74,76	16,82	22,15	3,04	149,53	33,64	344,97
CHS 88,9x4,0	8,38	88,9	4	10,67	0,279	96,34	21,67	28,85	3,00	192,68	43,35	261,78
CHS 88,9x5,0	10,35	88,9	5	13,18	0,279	116,37	26,18	35,24	2,97	232,75	52,36	211,92
CHS 88,9x6,0	12,27	88,9	6	15,63	0,279	134,94	30,36	41,31	2,94	269,88	60,72	178,73
CHS 88,9x6,3	12,83	88,9	6,3	16,35	0,279	140,24	31,55	43,07	2,93	280,47	63,10	170,84
CHS 88,9x2,6	5,53	88,9	2,6	7,05	0,279	65,68	14,78	19,37	3,05	131,37	29,55	396,20
CHS 88,9x2,9	6,15	88,9	2,9	7,84	0,279	72,52	16,31	21,46	3,04	145,04	32,63	356,46
CHS 88,9x3,2	6,76	88,9	3,2	8,62	0,279	79,21	17,82	23,51	3,03	158,41	35,64	324,17
CHS 88,9x3,6	7,57	88,9	3,6	9,65	0,279	87,90	19,77	26,21	3,02	175,80	39,55	289,50
CHS 88,9x4,0	8,38	88,9	4	10,67	0,279	96,34	21,67	28,85	3,00	192,68	43,35	261,78
CHS 88,9x4,5	9,37	88,9	4,5	11,93	0,279	106,54	23,97	32,09	2,99	213,09	47,94	234,07
CHS 88,9x5,0	10,35	88,9	5	13,18	0,279	116,37	26,18	35,24	2,97	232,75	52,36	211,92
CHS 89x2,0	4,29	89	2	5,47	0,280	51,75	11,63	15,14	3,08	103,49	23,26	511,49
CHS 90x3,0	6,44	90	3	8,20	0,283	77,67	17,26	22,72	3,08	155,34	34,52	344,83
CHS 90x4,0	8,48	90	4	10,81	0,283	100,13	22,25	29,61	3,04	200,26	44,50	261,63
CHS 95x3,0	6,81	95	3	8,67	0,298	91,83	19,33	25,40	3,25	183,67	38,67	344,20
CHS 95x4,0	8,98	95	4	11,44	0,298	118,60	24,97	33,15	3,22	237,20	49,94	260,99
CHS 100x3,0	7,18	100	3	9,14	0,314	107,62	21,52	28,24	3,43	215,25	43,05	343,64
CHS 100x4,0	9,47	100	4	12,06	0,314	139,22	27,84	36,89	3,40	278,43	55,69	260,42
CHS 100x5,0	11,71	100	5	14,92	0,314	168,81	33,76	45,17	3,36	337,62	67,52	210,53
CHS 100x6,0	13,91	100	6	17,72	0,314	196,50	39,30	53,09	3,33	393,00	78,60	177,30
CHS 100x7,0	16,05	100	7	20,45	0,314	222,36	44,47	60,66	3,30	444,72	88,94	153,61
CHS 100x8,0	18,15	100	8	23,12	0,314	246,48	49,30	67,88	3,26	492,96	98,59	135,87
CHS 100x2,0	4,83	100	2	6,16	0,314	73,95	14,79	19,21	3,47	147,90	29,58	510,20
CHS 100x2,5	6,01	100	2,5	7,66	0,314	91,05	18,21	23,77	3,45	182,11	36,42	410,26
CHS 100x3,0	7,18	100	3	9,14	0,314	107,62	21,52	28,24	3,43	215,25	43,05	343,64
CHS 100x3,2	7,64	100	3,2	9,73	0,314	114,11	22,82	30,00	3,42	228,21	45,64	322,83
CHS 100x3,5	8,33	100	3,5	10,61	0,314	123,67	24,73	32,61	3,41	247,35	49,47	296,08
CHS 100x4,0	9,47	100	4	12,06	0,314	139,22	27,84	36,89	3,40	278,43	55,69	260,42
CHS 100x4,5	10,60	100	4,5	13,50	0,314	154,26	30,85	41,07	3,38	308,51	61,70	232,69
CHS 100x5,0	11,71	100	5	14,92	0,314	168,81	33,76	45,17	3,36	337,62	67,52	210,53
CHS 100x6,0	13,91	100	6	17,72	0,314	196,50	39,30	53,09	3,33	393,00	78,60	177,30
CHS 100x7,0	16,05	100	7	20,45	0,314	222,36	44,47	60,66	3,30	444,72	88,94	153,61
CHS 100x8,0	18,15	100	8	23,12	0,314	246,48	49,30	67,88	3,26	492,96	98,59	135,87

8. FERPINTA PROFILE TABLES

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 100x2,0	4,83	100	2	6,16	0,314	73,95	14,79	19,21	3,47	147,90	29,58	510,20
CHS 101,6x2,0	4,91	101,6	2	6,26	0,319	77,63	15,28	19,84	3,52	155,26	30,56	510,04
CHS 101,6x2,5	6,11	101,6	2,5	7,78	0,319	95,61	18,82	24,56	3,50	191,22	37,64	410,09
CHS 101,6x3,0	7,29	101,6	3	9,29	0,319	113,04	22,25	29,17	3,49	226,07	44,50	343,48
CHS 101,6x4,0	9,63	101,6	4	12,26	0,319	146,28	28,80	38,12	3,45	292,57	57,59	260,25
CHS 101,6x5,0	11,91	101,6	5	15,17	0,319	177,47	34,93	46,70	3,42	354,94	69,87	210,35
CHS 101,6x6,0	14,15	101,6	6	18,02	0,319	206,68	40,68	54,91	3,39	413,35	81,37	177,13
CHS 101,6x6,3	14,81	101,6	6,3	18,86	0,319	215,07	42,34	57,30	3,38	430,13	84,67	169,22
CHS 101,6x2,6	6,35	101,6	2,6	8,09	0,319	99,14	19,52	25,49	3,50	198,28	39,03	394,72
CHS 101,6x2,9	7,06	101,6	2,9	8,99	0,319	109,59	21,57	28,26	3,49	219,19	43,15	354,96
CHS 101,6x3,2	7,77	101,6	3,2	9,89	0,319	119,85	23,59	31,00	3,48	239,71	47,19	322,66
CHS 101,6x3,6	8,70	101,6	3,6	11,08	0,319	133,24	26,23	34,59	3,47	266,47	52,46	287,98
CHS 101,6x4,0	9,63	101,6	4	12,26	0,319	146,28	28,80	38,12	3,45	292,57	57,59	260,25
CHS 101,6x4,5	10,78	101,6	4,5	13,73	0,319	162,13	31,92	42,46	3,44	324,26	63,83	232,52
CHS 101,6x5,0	11,91	101,6	5	15,17	0,319	177,47	34,93	46,70	3,42	354,94	69,87	210,35
CHS 108x3,0	7,77	108	3	9,90	0,339	136,49	25,28	33,08	3,71	272,98	50,55	342,86
CHS 108x4,0	10,26	108	4	13,07	0,339	176,95	32,77	43,29	3,68	353,91	65,54	259,62
CHS 108x2,0	5,23	108	2	6,66	0,339	93,58	17,33	22,47	3,75	187,15	34,66	509,43
CHS 108x2,3	6,00	108	2,3	7,64	0,339	106,71	19,76	25,70	3,74	213,43	39,52	444,24
CHS 108x2,5	6,50	108	2,5	8,29	0,339	115,35	21,36	27,83	3,73	230,69	42,72	409,48
CHS 108x3,0	7,77	108	3	9,90	0,339	136,49	25,28	33,08	3,71	272,98	50,55	342,86
CHS 108x3,2	8,27	108	3,2	10,54	0,339	144,78	26,81	35,16	3,71	289,55	53,62	322,04
CHS 108x3,5	9,02	108	3,5	11,49	0,339	157,02	29,08	38,24	3,70	314,05	58,16	295,28
CHS 108x4,0	10,26	108	4	13,07	0,339	176,95	32,77	43,29	3,68	353,91	65,54	259,62
CHS 108x4,5	11,49	108	4,5	14,63	0,339	196,30	36,35	48,24	3,66	392,59	72,70	231,88
CHS 108x5,0	12,70	108	5	16,18	0,339	215,06	39,83	53,09	3,65	430,12	79,65	209,71
CHS 108x6,0	15,09	108	6	19,23	0,339	250,91	46,46	62,50	3,61	501,81	92,93	176,47
CHS 108x7,0	17,44	108	7	22,21	0,339	284,58	52,70	71,52	3,58	569,16	105,40	152,76
CHS 108x8,0	19,73	108	8	25,13	0,339	316,17	58,55	80,17	3,55	632,34	117,10	135,00
CHS 110x3,0	7,92	110	3	10,08	0,346	144,44	26,26	34,36	3,78	288,87	52,52	342,68
CHS 110x4,0	10,46	110	4	13,32	0,346	187,35	34,06	44,97	3,75	374,70	68,13	259,43
CHS 113x3,0	8,14	113	3	10,37	0,355	156,92	27,77	36,31	3,89	313,84	55,55	342,42
CHS 113x4,0	10,75	113	4	13,70	0,355	203,70	36,05	47,55	3,86	407,39	72,11	259,17
CHS 113x5,0	13,32	113	5	16,96	0,355	247,87	43,87	58,36	3,82	495,75	87,74	209,26
CHS 113x6,0	15,83	113	6	20,17	0,355	289,55	51,25	68,77	3,79	579,10	102,50	176,01
CHS 114,3x2,5	6,89	114,3	2,5	8,78	0,359	137,26	24,02	31,25	3,95	274,52	48,03	408,94

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 114,3x3,0	8,23	114,3	3	10,49	0,359	162,55	28,44	37,17	3,94	325,10	56,88	342,32
CHS 114,3x4,0	10,88	114,3	4	13,86	0,359	211,07	36,93	48,69	3,90	422,13	73,86	259,07
CHS 114,3x5,0	13,48	114,3	5	17,17	0,359	256,92	44,96	59,77	3,87	513,84	89,91	209,15
CHS 114,3x6,0	16,03	114,3	6	20,41	0,359	300,21	52,53	70,45	3,83	600,42	105,06	175,90
CHS 114,3x6,3	16,78	114,3	6,3	21,38	0,359	312,71	54,72	73,57	3,82	625,43	109,44	167,99
CHS 114,3x7,0	18,52	114,3	7	23,60	0,359	341,04	59,67	80,71	3,80	682,07	119,35	152,18
CHS 114,3x8,0	20,97	114,3	8	26,72	0,359	379,49	66,40	90,57	3,77	758,98	132,81	134,41
CHS 114,3x2,6	7,16	114,3	2,6	9,12	0,359	142,37	24,91	32,45	3,95	284,75	49,82	393,57
CHS 114,3x2,9	7,97	114,3	2,9	10,15	0,359	157,55	27,57	36,00	3,94	315,09	55,13	353,80
CHS 114,3x3,2	8,77	114,3	3,2	11,17	0,359	172,47	30,18	39,51	3,93	344,94	60,36	321,50
CHS 114,3x3,6	9,83	114,3	3,6	12,52	0,359	191,98	33,59	44,13	3,92	383,97	67,19	286,81
CHS 114,3x4,0	10,88	114,3	4	13,86	0,359	211,07	36,93	48,69	3,90	422,13	73,86	259,07
CHS 114,3x4,5	12,19	114,3	4,5	15,52	0,359	234,32	41,00	54,28	3,89	468,64	82,00	231,33
CHS 114,3x5,0	13,48	114,3	5	17,17	0,359	256,92	44,96	59,77	3,87	513,84	89,91	209,15
CHS 114,3x5,6	15,01	114,3	5,6	19,12	0,359	283,20	49,55	66,23	3,85	566,39	99,11	187,77
CHS 114,3x6,3	16,78	114,3	6,3	21,38	0,359	312,71	54,72	73,57	3,82	625,43	109,44	167,99
CHS 120x3,0	8,66	120	3	11,03	0,377	188,81	31,47	41,08	4,14	377,62	62,94	341,88
CHS 120x4,0	11,44	120	4	14,58	0,377	245,48	40,91	53,85	4,10	490,95	81,83	258,62
CHS 120x2,0	5,82	120	2	7,41	0,377	129,08	21,51	27,85	4,17	258,16	43,03	508,47
CHS 120x2,3	6,68	120	2,3	8,50	0,377	147,33	24,55	31,87	4,16	294,65	49,11	443,28
CHS 120x2,5	7,24	120	2,5	9,23	0,377	159,33	26,56	34,52	4,16	318,67	53,11	408,51
CHS 120x3,0	8,66	120	3	11,03	0,377	188,81	31,47	41,08	4,14	377,62	62,94	341,88
CHS 120x3,2	9,22	120	3,2	11,74	0,377	200,38	33,40	43,67	4,13	400,77	66,79	321,06
CHS 120x3,5	10,06	120	3,5	12,81	0,377	217,52	36,25	47,52	4,12	435,04	72,51	294,30
CHS 120x4,0	11,44	120	4	14,58	0,377	245,48	40,91	53,85	4,10	490,95	81,83	258,62
CHS 120x4,5	12,82	120	4,5	16,33	0,377	272,69	45,45	60,06	4,09	545,39	90,90	230,88
CHS 120x5,0	14,18	120	5	18,06	0,377	299,19	49,86	66,17	4,07	598,38	99,73	208,70
CHS 120x6,0	16,87	120	6	21,49	0,377	350,05	58,34	78,05	4,04	700,10	116,68	175,44
CHS 120x7,0	19,51	120	7	24,85	0,377	398,16	66,36	89,50	4,00	796,32	132,72	151,71
CHS 120x8,0	22,10	120	8	28,15	0,377	443,62	73,94	100,52	3,97	887,25	147,87	133,93
CHS 125x3,0	9,03	125	3	11,50	0,393	214,05	34,25	44,66	4,31	428,11	68,50	341,53
CHS 125x4,0	11,94	125	4	15,21	0,393	278,58	44,57	58,59	4,28	557,16	89,15	258,26
CHS 125x5,0	14,80	125	5	18,85	0,393	339,88	54,38	72,04	4,25	679,76	108,76	208,33
CHS 125x6,0	17,61	125	6	22,43	0,393	398,07	63,69	85,04	4,21	796,13	127,38	175,07
CHS 125x7,0	20,37	125	7	25,95	0,393	453,24	72,52	97,58	4,18	906,48	145,04	151,33
CHS 125x8,0	23,08	125	8	29,41	0,393	505,51	80,88	109,68	4,15	1011,03	161,76	133,55

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	W_t [cm³]
CHS 127x3,0	9,17	127	3	11,69	0,399	224,75	35,39	46,14	4,39	449,50	70,79	341,40
CHS 127x4,0	12,13	127	4	15,46	0,399	292,61	46,08	60,54	4,35	585,23	92,16	258,13
CHS 127x2,0	6,17	127	2	7,85	0,399	153,44	24,16	31,25	4,42	306,87	48,33	508,00
CHS 127x2,3	7,07	127	2,3	9,01	0,399	175,20	27,59	35,77	4,41	350,40	55,18	442,80
CHS 127x2,5	7,68	127	2,5	9,78	0,399	189,53	29,85	38,76	4,40	379,06	59,70	408,03
CHS 127x3,0	9,17	127	3	11,69	0,399	224,75	35,39	46,14	4,39	449,50	70,79	341,40
CHS 127x3,2	9,77	127	3,2	12,45	0,399	238,60	37,57	49,06	4,38	477,19	75,15	320,58
CHS 127x3,5	10,66	127	3,5	13,58	0,399	259,11	40,80	53,40	4,37	518,21	81,61	293,81
CHS 127x4,0	12,13	127	4	15,46	0,399	292,61	46,08	60,54	4,35	585,23	92,16	258,13
CHS 127x4,5	13,59	127	4,5	17,32	0,399	325,29	51,23	67,56	4,33	650,57	102,45	230,39
CHS 127x5,0	15,04	127	5	19,16	0,399	357,14	56,24	74,46	4,32	714,28	112,48	208,20
CHS 127x6,0	17,90	127	6	22,81	0,399	418,44	65,90	87,92	4,28	836,88	131,79	174,93
CHS 127x7,0	20,72	127	7	26,39	0,399	476,63	75,06	100,91	4,25	953,25	150,12	151,19
CHS 127x8,0	23,48	127	8	29,91	0,399	531,80	83,75	113,46	4,22	1063,60	167,50	133,40
CHS 127x2,9	8,88	127	2,9	11,31	0,399	217,78	34,30	44,67	4,39	435,55	68,59	352,89
CHS 127x3,2	9,77	127	3,2	12,45	0,399	238,60	37,57	49,06	4,38	477,19	75,15	320,58
CHS 127x3,6	10,96	127	3,6	13,96	0,399	265,87	41,87	54,83	4,36	531,75	83,74	285,88
CHS 127x4,0	12,13	127	4	15,46	0,399	292,61	46,08	60,54	4,35	585,23	92,16	258,13
CHS 127x4,5	13,59	127	4,5	17,32	0,399	325,29	51,23	67,56	4,33	650,57	102,45	230,39
CHS 133x3,0	9,62	133	3	12,25	0,418	258,97	38,94	50,71	4,60	517,93	77,88	341,03
CHS 133x4,0	12,73	133	4	16,21	0,418	337,53	50,76	66,59	4,56	675,05	101,51	257,75
CHS 133x5,0	15,78	133	5	20,11	0,418	412,40	62,02	81,96	4,53	824,81	124,03	207,81
CHS 133x6,0	18,79	133	6	23,94	0,418	483,72	72,74	96,85	4,50	967,43	145,48	174,54
CHS 133x2,9	9,30	133	2,9	11,85	0,418	250,90	37,73	49,09	4,60	501,81	75,46	352,51
CHS 133x3,2	10,24	133	3,2	13,05	0,418	274,98	41,35	53,92	4,59	549,96	82,70	320,20
CHS 133x3,6	11,49	133	3,6	14,63	0,418	306,55	46,10	60,30	4,58	613,10	92,20	285,51
CHS 133x4,0	12,73	133	4	16,21	0,418	337,53	50,76	66,59	4,56	675,05	101,51	257,75
CHS 133x4,5	14,26	133	4,5	18,17	0,418	375,42	56,45	74,34	4,55	750,83	112,91	230,00
CHS 133x5,0	15,78	133	5	20,11	0,418	412,40	62,02	81,96	4,53	824,81	124,03	207,81
CHS 133x5,6	17,59	133	5,6	22,41	0,418	455,61	68,51	90,95	4,51	911,22	137,03	186,42
CHS 133x6,3	19,69	133	6,3	25,08	0,418	504,43	75,85	101,22	4,49	1008,86	151,71	166,62
CHS 139,7x3,0	10,11	139,7	3	12,88	0,439	301,09	43,11	56,07	4,83	602,18	86,21	340,65
CHS 139,7x4,0	13,39	139,7	4	17,05	0,439	392,86	56,24	73,68	4,80	785,72	112,49	257,37
CHS 139,7x5,0	16,61	139,7	5	21,16	0,439	480,54	68,80	90,76	4,77	961,08	137,59	207,42
CHS 139,7x6,0	19,78	139,7	6	25,20	0,439	564,26	80,78	107,33	4,73	1128,52	161,56	174,15
CHS 139,7x6,3	20,73	139,7	6,3	26,40	0,439	588,62	84,27	112,20	4,72	1177,24	168,54	166,23

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 139,7x7,0	22,91	139,7	7	29,18	0,439	644,14	92,22	123,38	4,70	1288,27	184,43	150,39
CHS 139,7x8,0	25,98	139,7	8	33,10	0,439	720,29	103,12	138,93	4,66	1440,58	206,24	132,59
CHS 139,7x10,0	31,99	139,7	10	40,75	0,439	861,89	123,39	168,55	4,60	1723,79	246,78	107,71
CHS 139,7x2,9	9,78	139,7	2,9	12,46	0,439	291,68	41,76	54,28	4,84	583,37	83,52	352,14
CHS 139,7x3,2	10,77	139,7	3,2	13,72	0,439	319,78	45,78	59,63	4,83	639,55	91,56	319,83
CHS 139,7x3,6	12,08	139,7	3,6	15,39	0,439	356,65	51,06	66,70	4,81	713,30	102,12	285,13
CHS 139,7x4,0	13,39	139,7	4	17,05	0,439	392,86	56,24	73,68	4,80	785,72	112,49	257,37
CHS 139,7x4,5	15,00	139,7	4,5	19,11	0,439	437,20	62,59	82,29	4,78	874,41	125,18	229,62
CHS 139,7x5,0	16,61	139,7	5	21,16	0,439	480,54	68,80	90,76	4,77	961,08	137,59	207,42
CHS 139,7x5,6	18,52	139,7	5,6	23,59	0,439	531,24	76,05	100,76	4,75	1062,48	152,11	186,03
CHS 139,7x6,3	20,73	139,7	6,3	26,40	0,439	588,62	84,27	112,20	4,72	1177,24	168,54	166,23
CHS 141,3x2,9	9,90	141,3	2,9	12,61	0,444	302,03	42,75	55,56	4,89	604,07	85,50	352,05
CHS 141,3x3,2	10,90	141,3	3,2	13,88	0,444	331,15	46,87	61,04	4,88	662,30	93,74	319,74
CHS 141,3x3,6	12,23	141,3	3,6	15,57	0,444	369,37	52,28	68,28	4,87	738,74	104,56	285,04
CHS 141,3x4,0	13,54	141,3	4	17,25	0,444	406,91	57,60	75,43	4,86	813,82	115,19	257,28
CHS 141,3x4,5	15,18	141,3	4,5	19,34	0,444	452,90	64,10	84,24	4,84	905,80	128,21	229,53
CHS 141,3x5,0	16,81	141,3	5	21,41	0,444	497,85	70,47	92,93	4,82	995,71	140,94	207,34
CHS 152x3,0	11,02	152	3	14,04	0,478	389,87	51,30	66,61	5,27	779,73	102,60	340,04
CHS 152x4,0	14,60	152	4	18,60	0,478	509,59	67,05	87,64	5,23	1019,18	134,10	256,76
CHS 152x5,0	18,13	152	5	23,09	0,478	624,43	82,16	108,09	5,20	1248,86	164,32	206,80
CHS 152x6,0	21,60	152	6	27,52	0,478	734,52	96,65	127,97	5,17	1469,04	193,29	173,52
CHS 152,4x3,0	11,05	152,4	3	14,08	0,479	393,01	51,58	66,97	5,28	786,03	103,15	340,03
CHS 152,4x4,0	14,64	152,4	4	18,65	0,479	513,73	67,42	88,11	5,25	1027,46	134,84	256,74
CHS 152,4x5,0	18,18	152,4	5	23,15	0,479	629,54	82,62	108,68	5,21	1259,08	165,23	206,78
CHS 152,4x6,0	21,66	152,4	6	27,60	0,479	740,57	97,19	128,67	5,18	1481,13	194,37	173,50
CHS 152,4x2,9	10,69	152,4	2,9	13,62	0,479	380,67	49,96	64,82	5,29	761,33	99,91	351,52
CHS 152,4x3,2	11,77	152,4	3,2	15,00	0,479	417,56	54,80	71,24	5,28	835,11	109,60	319,20
CHS 152,4x3,6	13,21	152,4	3,6	16,83	0,479	466,04	61,16	79,72	5,26	932,08	122,32	284,50
CHS 152,4x4,0	14,64	152,4	4	18,65	0,479	513,73	67,42	88,11	5,25	1027,46	134,84	256,74
CHS 152,4x4,5	16,41	152,4	4,5	20,91	0,479	572,24	75,10	98,47	5,23	1144,48	150,19	228,98
CHS 152,4x5,0	18,18	152,4	5	23,15	0,479	629,54	82,62	108,68	5,21	1259,08	165,23	206,78
CHS 159x3,0	11,54	159	3	14,70	0,500	447,42	56,28	73,02	5,52	894,84	112,56	339,74
CHS 159x4,0	15,29	159	4	19,48	0,500	585,33	73,63	96,12	5,48	1170,67	147,25	256,45
CHS 159x5,0	18,99	159	5	24,19	0,500	717,88	90,30	118,62	5,45	1435,75	180,60	206,49
CHS 159x6,0	22,64	159	6	28,84	0,500	845,19	106,31	140,53	5,41	1690,37	212,63	173,20
CHS 159x7,0	26,24	159	7	33,43	0,500	967,41	121,69	161,84	5,38	1934,81	243,37	149,44

8. FERPINTA PROFILE TABLES

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 159x8,0	29,79	159	8	37,95	0,500	1084,67	136,44	182,58	5,35	2169,34	272,87	131,62
CHS 159x2,9	11,16	159	2,9	14,22	0,500	433,33	54,51	70,67	5,52	866,66	109,01	351,23
CHS 159x3,2	12,30	159	3,2	15,66	0,500	475,44	59,80	77,69	5,51	950,88	119,61	318,92
CHS 159x3,6	13,80	159	3,6	17,58	0,500	530,82	66,77	86,95	5,50	1061,64	133,54	284,21
CHS 159x4,0	15,29	159	4	19,48	0,500	585,33	73,63	96,12	5,48	1170,67	147,25	256,45
CHS 159x4,5	17,15	159	4,5	21,84	0,500	652,27	82,05	107,45	5,46	1304,54	164,09	228,69
CHS 159x5,0	18,99	159	5	24,19	0,500	717,88	90,30	118,62	5,45	1435,75	180,60	206,49
CHS 159x5,6	21,19	159	5,6	26,99	0,500	794,88	99,99	131,84	5,43	1589,76	199,97	185,09
CHS 159x6,3	23,72	159	6,3	30,22	0,500	882,38	110,99	146,98	5,40	1764,76	221,98	165,28
CHS 164x3,0	11,91	164	3	15,17	0,515	491,82	59,98	77,77	5,69	983,65	119,96	339,54
CHS 164x4,0	15,78	164	4	20,11	0,515	643,80	78,51	102,42	5,66	1287,60	157,02	256,25
CHS 168,3x3,0	12,23	168,3	3	15,58	0,529	532,28	63,25	81,98	5,85	1064,57	126,51	339,38
CHS 168,3x4,0	16,21	168,3	4	20,65	0,529	697,09	82,84	108,00	5,81	1394,18	165,68	256,09
CHS 168,3x5,0	20,14	168,3	5	25,65	0,529	855,85	101,70	133,38	5,78	1711,69	203,41	206,12
CHS 168,3x6,0	24,02	168,3	6	30,59	0,529	1008,69	119,87	158,12	5,74	2017,39	239,74	172,83
CHS 168,3x6,3	25,17	168,3	6,3	32,06	0,529	1053,42	125,18	165,42	5,73	2106,84	250,37	164,90
CHS 168,3x7,0	27,85	168,3	7	35,47	0,529	1155,79	137,35	182,24	5,71	2311,58	274,70	149,06
CHS 168,3x8,0	31,63	168,3	8	40,29	0,529	1297,27	154,16	205,74	5,67	2594,54	308,32	131,24
CHS 168,3x10,0	39,04	168,3	10	49,73	0,529	1563,98	185,86	250,92	5,61	3127,97	371,71	106,32
CHS 168,3x2,9	11,83	168,3	2,9	15,07	0,529	515,46	61,26	79,34	5,85	1030,93	122,51	350,87
CHS 168,3x3,2	13,03	168,3	3,2	16,60	0,529	565,74	67,23	87,24	5,84	1131,47	134,46	318,56
CHS 168,3x3,6	14,62	168,3	3,6	18,63	0,529	631,90	75,09	97,67	5,82	1263,81	150,18	283,85
CHS 168,3x4	16,21	168,3	4	20,65	0,529	697,09	82,84	108,00	5,81	1394,18	165,68	256,09
CHS 168,3x4,5	18,18	168,3	4,5	23,16	0,529	777,22	92,36	120,77	5,79	1554,43	184,72	228,33
CHS 168,3x5,0	20,14	168,3	5	25,65	0,529	855,85	101,70	133,38	5,78	1711,69	203,41	206,12
CHS 168,3x5,6	22,47	168,3	5,6	28,62	0,529	948,25	112,69	148,30	5,76	1896,51	225,37	184,72
CHS 168,3x6,3	25,17	168,3	6,3	32,06	0,529	1053,42	125,18	165,42	5,73	2106,84	250,37	164,90
CHS 177,8x3,0	12,93	177,8	3	16,47	0,559	629,41	70,80	91,67	6,18	1258,82	141,60	339,05
CHS 177,8x4,0	17,14	177,8	4	21,84	0,559	825,09	92,81	120,85	6,15	1650,17	185,62	255,75
CHS 177,8x5,0	21,31	177,8	5	27,14	0,559	1013,97	114,06	149,34	6,11	2027,94	228,11	205,79
CHS 177,8x6,0	25,42	177,8	6	32,38	0,559	1196,22	134,56	177,16	6,08	2392,43	269,12	172,49
CHS 177,8x6,3	26,65	177,8	6,3	33,94	0,559	1249,62	140,56	185,38	6,07	2499,24	281,13	164,56
CHS 177,8x7,0	29,49	177,8	7	37,56	0,559	1371,99	154,33	204,32	6,04	2743,98	308,66	148,71
CHS 177,8x8,0	33,50	177,8	8	42,68	0,559	1541,44	173,39	230,83	6,01	3082,87	346,78	130,89
CHS 177,8x10,0	41,38	177,8	10	52,72	0,559	1861,98	209,45	281,90	5,94	3723,96	418,89	105,96
CHS 177,8x12,0	49,07	177,8	12	62,51	0,559	2159,06	242,86	330,45	5,88	4318,11	485,73	89,36

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 177,8x12,5	50,96	177,8	12,5	64,91	0,559	2229,79	250,82	342,20	5,86	4459,59	501,64	86,05
CHS 177,8x2,9	12,51	177,8	2,9	15,93	0,559	609,46	68,56	88,72	6,18	1218,92	137,11	350,55
CHS 177,8x3,2	13,78	177,8	3,2	17,55	0,559	669,10	75,26	97,56	6,17	1338,19	150,53	318,23
CHS 177,8x3,6	15,47	177,8	3,6	19,70	0,559	747,64	84,10	109,26	6,16	1495,28	168,20	283,52
CHS 177,8x4,0	17,14	177,8	4	21,84	0,559	825,09	92,81	120,85	6,15	1650,17	185,62	255,75
CHS 177,8x4,5	19,23	177,8	4,5	24,50	0,559	920,37	103,53	135,18	6,13	1840,73	207,06	227,99
CHS 177,8x5,0	21,31	177,8	5	27,14	0,559	1013,97	114,06	149,34	6,11	2027,94	228,11	205,79
CHS 177,8x6,0	25,42	177,8	6	32,38	0,559	1196,22	134,56	177,16	6,08	2392,43	269,12	172,49
CHS 193,7x3,0	14,11	193,7	3	17,97	0,609	817,22	84,38	109,11	6,74	1634,45	168,76	338,58
CHS 193,7x4,0	18,71	193,7	4	23,84	0,609	1072,79	110,77	143,97	6,71	2145,58	221,54	255,27
CHS 193,7x5,0	23,27	193,7	5	29,64	0,609	1320,23	136,32	178,08	6,67	2640,46	272,63	205,30
CHS 193,7x6,0	27,77	193,7	6	35,38	0,609	1559,72	161,05	211,46	6,64	3119,45	322,09	171,99
CHS 193,7x6,3	29,12	193,7	6,3	37,09	0,609	1630,05	168,31	221,33	6,63	3260,09	336,61	164,07
CHS 193,7x7,0	32,23	193,7	7	41,06	0,609	1791,43	184,97	244,11	6,61	3582,87	369,94	148,21
CHS 193,7x8,0	36,64	193,7	8	46,67	0,609	2015,54	208,11	276,05	6,57	4031,07	416,22	130,39
CHS 193,7x10,0	45,30	193,7	10	57,71	0,609	2441,59	252,10	337,79	6,50	4883,18	504,20	105,44
CHS 193,7x12,0	53,77	193,7	12	68,50	0,609	2839,20	293,15	396,75	6,44	5678,40	586,31	88,84
CHS 193,7x12,5	55,86	193,7	12,5	71,16	0,609	2934,31	302,97	411,07	6,42	5868,62	605,95	85,52
CHS 193,7x2,9	13,65	193,7	2,9	17,38	0,609	791,21	81,69	105,58	6,75	1582,43	163,39	350,07
CHS 193,7x3,2	15,03	193,7	3,2	19,15	0,609	869,00	89,73	116,14	6,74	1737,99	179,45	317,75
CHS 193,7x3,6	16,88	193,7	3,6	21,50	0,609	971,55	100,31	130,11	6,72	1943,10	200,63	283,04
CHS 193,7x4,0	18,71	193,7	4	23,84	0,609	1072,79	110,77	143,97	6,71	2145,58	221,54	255,27
CHS 193,7x4,5	21,00	193,7	4,5	26,75	0,609	1197,52	123,65	161,12	6,69	2395,03	247,29	227,51
CHS 193,7x5,0	23,27	193,7	5	29,64	0,609	1320,23	136,32	178,08	6,67	2640,46	272,63	205,30
CHS 193,7x6,0	27,77	193,7	6	35,38	0,609	1559,72	161,05	211,46	6,64	3119,45	322,09	171,99
CHS 200x3,0	14,57	200	3	18,57	0,628	900,91	90,09	116,44	6,97	1801,82	180,18	338,41
CHS 200x4,0	19,33	200	4	24,63	0,628	1183,23	118,32	153,69	6,93	2366,46	236,65	255,10
CHS 200x5,0	24,04	200	5	30,63	0,628	1456,86	145,69	190,17	6,90	2913,73	291,37	205,13
CHS 200x6,0	28,71	200	6	36,57	0,628	1721,99	172,20	225,89	6,86	3443,99	344,40	171,82
CHS 200x7,0	33,32	200	7	42,44	0,628	1978,79	197,88	260,86	6,83	3957,59	395,76	148,04
CHS 200x8,0	37,88	200	8	48,25	0,628	2227,44	222,74	295,08	6,79	4454,89	445,49	130,21
CHS 219,1x3,0	15,99	219,1	3	20,37	0,688	1189,13	108,55	140,11	7,64	2378,26	217,09	337,96
CHS 219,1x4,0	21,22	219,1	4	27,03	0,688	1563,84	142,75	185,09	7,61	3127,67	285,50	254,65
CHS 219,1x5,0	26,40	219,1	5	33,63	0,688	1928,04	176,00	229,24	7,57	3856,09	351,99	204,67
CHS 219,1x6,0	31,53	219,1	6	40,17	0,688	2281,95	208,30	272,54	7,54	4563,89	416,60	171,36
CHS 219,1x6,3	33,06	219,1	6,3	42,12	0,688	2386,14	217,81	285,37	7,53	4772,28	435,63	163,43

8. FERPINTA PROFILE TABLES

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 219,1x7,0	36,61	219,1	7	46,64	0,688	2625,75	239,68	315,02	7,50	5251,49	479,37	147,57
CHS 219,1x8,0	41,65	219,1	8	53,06	0,688	2959,63	270,16	356,68	7,47	5919,27	540,33	129,74
CHS 219,1x10,0	51,57	219,1	10	65,69	0,688	3598,44	328,47	437,56	7,40	7196,88	656,95	104,78
CHS 219,1x12,0	61,29	219,1	12	78,07	0,688	4199,88	383,38	515,26	7,33	8399,76	766,75	88,16
CHS 219,1x12,5	63,69	219,1	12,5	81,13	0,688	4344,58	396,58	534,20	7,32	8689,16	793,17	84,84
CHS 219,1x4,5	23,82	219,1	4,5	30,34	0,688	1747,24	159,49	207,27	7,59	3494,48	318,98	226,88
CHS 219,1x5,0	26,40	219,1	5	33,63	0,688	1928,04	176,00	229,24	7,57	3856,09	351,99	204,67
CHS 219,1x6,0	31,53	219,1	6	40,17	0,688	2281,95	208,30	272,54	7,54	4563,89	416,60	171,36
CHS 244,5x4,0	23,72	244,5	4	30,22	0,768	2185,67	178,79	231,38	8,50	4371,35	357,57	254,16
CHS 244,5x5,0	29,53	244,5	5	37,62	0,768	2698,58	220,74	286,84	8,47	5397,16	441,49	204,18
CHS 244,5x6,0	35,29	244,5	6	44,96	0,768	3198,53	261,64	341,37	8,43	6397,07	523,28	170,86
CHS 244,5x6,3	37,01	244,5	6,3	47,14	0,768	3346,03	273,70	357,54	8,42	6692,05	547,41	162,93
CHS 244,5x7,0	41,00	244,5	7	52,23	0,768	3685,75	301,49	394,96	8,40	7371,50	602,99	147,07
CHS 244,5x8,0	46,66	244,5	8	59,44	0,768	4160,45	340,32	447,63	8,37	8320,89	680,65	129,23
CHS 244,5x10,0	57,83	244,5	10	73,67	0,768	5073,15	414,98	550,24	8,30	10146,29	829,96	104,26
CHS 244,5x12,0	68,81	244,5	12	87,65	0,768	5938,34	485,75	649,25	8,23	11876,69	971,51	87,63
CHS 244,5x12,5	71,52	244,5	12,5	91,11	0,768	6147,42	502,86	673,45	8,21	12294,84	1005,71	84,31
CHS 244,5x4,5	26,63	244,5	4,5	33,93	0,768	2443,76	199,90	259,23	8,49	4887,52	399,80	226,39
CHS 244,5x5,0	29,53	244,5	5	37,62	0,768	2698,58	220,74	286,84	8,47	5397,16	441,49	204,18
CHS 244,5x6,0	35,29	244,5	6	44,96	0,768	3198,53	261,64	341,37	8,43	6397,07	523,28	170,86
CHS 273x4,0	26,54	273	4	33,80	0,858	3058,25	224,05	289,47	9,51	6116,50	448,09	253,72
CHS 273x5,0	33,05	273	5	42,10	0,858	3780,81	276,98	359,16	9,48	7561,63	553,97	203,73
CHS 273x6,0	39,51	273	6	50,33	0,858	4487,08	328,72	427,81	9,44	8974,17	657,45	170,41
CHS 273x6,3	41,44	273	6,3	52,79	0,858	4695,82	344,02	448,20	9,43	9391,65	688,03	162,48
CHS 273x7,0	45,92	273	7	58,50	0,858	5177,30	379,29	495,41	9,41	10354,60	758,58	146,62
CHS 273x8,0	52,28	273	8	66,60	0,858	5851,71	428,70	561,97	9,37	11703,43	857,39	128,77
CHS 273x10,0	64,86	273	10	82,62	0,858	7154,09	524,11	692,02	9,31	14308,19	1048,22	103,80
CHS 273x12,0	77,24	273	12	98,39	0,858	8396,14	615,10	818,03	9,24	16792,28	1230,20	87,16
CHS 273x12,5	80,30	273	12,5	102,30	0,858	8697,45	637,18	848,90	9,22	17394,90	1274,35	83,84
CHS 273x4,5	29,80	273	4,5	37,96	0,858	3421,58	250,67	324,45	9,49	6843,17	501,33	225,95
CHS 273x5,0	33,05	273	5	42,10	0,858	3780,81	276,98	359,16	9,48	7561,63	553,97	203,73
CHS 273x6,0	39,51	273	6	50,33	0,858	4487,08	328,72	427,81	9,44	8974,17	657,45	170,41
CHS 323,9x4,0	31,56	323,9	4	40,20	1,018	5143,17	317,58	409,37	11,31	10286,33	635,15	253,13
CHS 323,9x5,0	39,32	323,9	5	50,09	1,018	6369,42	393,30	508,53	11,28	12738,85	786,59	203,14
CHS 323,9x6,0	47,04	323,9	6	59,92	1,018	7572,47	467,58	606,43	11,24	15144,93	935,16	169,81
CHS 323,9x6,3	49,34	323,9	6,3	62,86	1,018	7928,90	489,59	635,56	11,23	15857,79	979,18	161,88

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 323,9x7,0	54,71	323,9	7	69,69	1,018	8752,59	540,45	703,09	11,21	17505,18	1080,90	146,01
CHS 323,9x8,0	62,32	323,9	8	79,39	1,018	9910,08	611,92	798,51	11,17	19820,16	1223,84	128,17
CHS 323,9x10,0	77,41	323,9	10	98,61	1,018	12158,34	750,75	985,67	11,10	24316,68	1501,49	103,19
CHS 323,9x12,0	92,30	323,9	12	117,58	1,018	14319,56	884,20	1167,96	11,04	28639,12	1768,39	86,54
CHS 323,9x12,5	95,99	323,9	12,5	122,29	1,018	14846,53	916,74	1212,78	11,02	29693,06	1833,47	83,21
CHS 323,9x4,5	35,45	323,9	4,5	45,15	1,018	5759,22	355,62	459,10	11,29	11518,43	711,23	225,35
CHS 323,9x5,0	39,32	323,9	5	50,09	1,018	6369,42	393,30	508,53	11,28	12738,85	786,59	203,14
CHS 323,9x6,0	47,04	323,9	6	59,92	1,018	7572,47	467,58	606,43	11,24	15144,93	935,16	169,81

8.1.2 Square hollow sections, *FERPINTA* SHS

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 16x2,0	0,80	16	2	1,02	0,057	0,31	0,39	0,51	0,56	0,6	0,61	561,78
SHS 20x2,0	1,05	20	2	1,34	0,073	0,69	0,69	0,88	0,72	1,2	1,06	546,99
SHS 22x2,0	1,18	22	2	1,50	0,081	0,96	0,87	1,09	0,80	1,7	1,33	541,97
SHS 25x2,0	1,36	25	2	1,74	0,093	1,48	1,19	1,47	0,92	2,5	1,80	536,17
SHS 25x2,5	1,64	25	2,5	2,09	0,091	1,69	1,35	1,71	0,90	3,0	2,07	437,60
SHS 25x3,0	1,89	25	3	2,41	0,090	1,84	1,47	1,91	0,87	3,3	2,27	372,47
SHS 25x2,0	1,36	25	2	1,74	0,093	1,48	1,19	1,47	0,92	2,5	1,80	536,17
SHS 28x2,0	1,55	28	2	1,98	0,105	2,17	1,55	1,89	1,05	3,6	2,35	531,78
SHS 30x2,0	1,68	30	2	2,14	0,113	2,72	1,81	2,21	1,13	4,5	2,75	529,40
SHS 30x2,5	2,03	30	2,5	2,59	0,111	3,16	2,10	2,61	1,10	5,4	3,20	430,34
SHS 30x3,0	2,36	30	3	3,01	0,110	3,50	2,34	2,96	1,08	6,2	3,58	364,66
SHS 30x4,0	2,94	30	4	3,75	0,106	3,97	2,64	3,50	1,03	7,3	4,11	283,53
SHS 30x2,0	1,68	30	2	2,14	0,113	2,72	1,81	2,21	1,13	4,5	2,75	529,40
SHS 32x2,0	1,80	32	2	2,30	0,121	3,36	2,10	2,54	1,21	5,6	3,18	527,35
SHS 35x3,0	2,83	35	3	3,61	0,130	5,95	3,40	4,23	1,28	10,2	5,18	359,45
SHS 35x2,0	1,99	35	2	2,54	0,133	4,51	2,58	3,09	1,33	7,4	3,89	524,77
SHS 38x3,0	3,12	38	3	3,97	0,142	7,85	4,13	5,10	1,41	13,3	6,28	357,08
SHS 38x2,0	2,18	38	2	2,78	0,145	5,88	3,10	3,70	1,46	9,6	4,67	522,63
SHS 40x2,0	2,31	40	2	2,94	0,153	6,94	3,47	4,13	1,54	11,3	5,23	521,39
SHS 40x2,5	2,82	40	2,5	3,59	0,151	8,22	4,11	4,97	1,51	13,6	6,21	421,88
SHS 40x3,0	3,30	40	3	4,21	0,150	9,32	4,66	5,72	1,49	15,8	7,07	355,73
SHS 40x4,0	4,20	40	4	5,35	0,146	11,07	5,54	7,01	1,44	19,4	8,48	273,50
SHS 40x5,0	4,99	40	5	6,36	0,143	12,26	6,13	8,02	1,39	22,3	9,49	224,71

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_t [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 40x2,0	2,31	40	2	2,94	0,153	6,94	3,47	4,13	1,54	11,3	5,23	521,39
SHS 40x2,5	2,82	40	2,5	3,59	0,151	8,22	4,11	4,97	1,51	13,6	6,21	421,88
SHS 40x3,0	3,30	40	3	4,21	0,150	9,32	4,66	5,72	1,49	15,8	7,07	355,73
SHS 40x3,5	3,76	40	3,5	4,79	0,148	10,27	5,14	6,41	1,46	17,7	7,83	308,65
SHS 40x4,0	4,20	40	4	5,35	0,146	11,07	5,54	7,01	1,44	19,4	8,48	273,50
SHS 40x4,5	4,61	40	4,5	5,87	0,145	11,73	5,87	7,55	1,41	21,0	9,03	246,31
SHS 40x5,0	4,99	40	5	6,36	0,143	12,26	6,13	8,02	1,39	22,3	9,49	224,71
SHS 40x6,0	5,68	40	6	7,23	0,139	12,94	6,47	8,76	1,34	24,4	10,14	192,73
SHS 40x7,0	5,93	40	7	7,56	0,130	11,55	5,77	8,38	1,24	23,2	9,65	171,96
SHS 40x8,0	6,31	40	8	8,04	0,126	10,94	5,47	8,36	1,17	22,3	9,29	156,25
SHS 40x2,0	2,31	40	2	2,94	0,153	6,94	3,47	4,13	1,54	11,3	5,23	521,39
SHS 45x3,0	3,77	45	3	4,81	0,170	13,78	6,12	7,44	1,69	23,0	9,27	352,93
SHS 45x4,0	4,83	45	4	6,15	0,166	16,61	7,38	9,22	1,64	28,7	11,26	270,44
SHS 45x2,0	2,62	45	2	3,34	0,173	10,12	4,50	5,32	1,74	16,3	6,77	518,83
SHS 50x2,0	2,93	50	2	3,74	0,193	14,15	5,66	6,66	1,95	22,6	8,51	516,81
SHS 50x2,5	3,60	50	2,5	4,59	0,191	16,94	6,78	8,07	1,92	27,5	10,22	417,11
SHS 50x3,0	4,25	50	3	5,41	0,190	19,47	7,79	9,39	1,90	32,1	11,76	350,76
SHS 50x4,0	5,45	50	4	6,95	0,186	23,74	9,49	11,73	1,85	40,4	14,43	268,09
SHS 50x5,0	6,56	50	5	8,36	0,183	27,04	10,82	13,70	1,80	47,5	16,56	218,80
SHS 50x6,0	7,56	50	6	9,63	0,179	29,45	11,78	15,32	1,75	53,2	18,20	186,23
SHS 50x2,0	2,93	50	2	3,74	0,193	14,15	5,66	6,66	1,95	22,6	8,51	516,81
SHS 50x2,5	3,60	50	2,5	4,59	0,191	16,94	6,78	8,07	1,92	27,5	10,22	417,11
SHS 50x3,0	4,25	50	3	5,41	0,190	19,47	7,79	9,39	1,90	32,1	11,76	350,76
SHS 50x3,5	4,86	50	3,5	6,19	0,188	21,73	8,69	10,61	1,87	36,4	13,17	303,46
SHS 50x4,0	5,45	50	4	6,95	0,186	23,74	9,49	11,73	1,85	40,4	14,43	268,09
SHS 50x4,5	6,02	50	4,5	7,67	0,185	25,50	10,20	12,76	1,82	44,1	15,56	240,66
SHS 50x5,0	6,56	50	5	8,36	0,183	27,04	10,82	13,70	1,80	47,5	16,56	218,80
SHS 50x6,0	7,56	50	6	9,63	0,179	29,45	11,78	15,32	1,75	53,2	18,20	186,23
SHS 50x7,0	8,13	50	7	10,36	0,170	28,47	11,39	15,52	1,66	55,1	18,56	164,09
SHS 50x8,0	8,83	50	8	11,24	0,166	28,59	11,43	16,14	1,59	56,7	18,91	147,36
SHS 50x2,0	2,93	50	2	3,74	0,193	14,15	5,66	6,66	1,95	22,6	8,51	516,81
SHS 60x2,0	3,56	60	2	4,54	0,233	25,14	8,38	9,79	2,35	39,8	12,59	513,85
SHS 60x2,5	4,39	60	2,5	5,59	0,231	30,34	10,11	11,93	2,33	48,7	15,22	414,05
SHS 60x3,0	5,19	60	3	6,61	0,230	35,13	11,71	13,95	2,31	57,1	17,65	347,60
SHS 60x4,0	6,71	60	4	8,55	0,226	43,55	14,52	17,64	2,26	72,6	21,97	264,70
SHS 60x5,0	8,13	60	5	10,36	0,223	50,49	16,83	20,88	2,21	86,4	25,61	215,17

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_t [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 60x6,0	9,45	60	6	12,03	0,219	56,07	18,69	23,68	2,16	98,4	28,62	182,33
SHS 60x6,3	9,55	60	6,3	12,17	0,213	54,41	18,14	23,39	2,11	100,1	28,80	174,99
SHS 60x2,0	3,56	60	2	4,54	0,233	25,14	8,38	9,79	2,35	39,8	12,59	513,85
SHS 60x2,3	4,06	60	2,3	5,17	0,232	28,31	9,44	11,09	2,34	45,2	14,19	448,75
SHS 60x2,5	4,39	60	2,5	5,59	0,231	30,34	10,11	11,93	2,33	48,7	15,22	414,05
SHS 60x3,0	5,19	60	3	6,61	0,230	35,13	11,71	13,95	2,31	57,1	17,65	347,60
SHS 60x3,5	5,96	60	3,5	7,59	0,228	39,53	13,18	15,86	2,28	65,1	19,90	300,19
SHS 60x4,0	6,71	60	4	8,55	0,226	43,55	14,52	17,64	2,26	72,6	21,97	264,70
SHS 60x4,5	7,43	60	4,5	9,47	0,225	47,20	15,73	19,32	2,23	79,8	23,87	237,15
SHS 60x5,0	8,13	60	5	10,36	0,223	50,49	16,83	20,88	2,21	86,4	25,61	215,17
SHS 60x6,0	9,45	60	6	12,03	0,219	56,07	18,69	23,68	2,16	98,4	28,62	182,33
SHS 60x7,0	10,33	60	7	13,16	0,210	56,58	18,86	24,76	2,07	106,0	30,21	159,57
SHS 60x8,0	11,34	60	8	14,44	0,206	58,57	19,52	26,33	2,01	112,5	31,66	142,40
SHS 60x2,0	3,56	60	2	4,54	0,233	25,14	8,38	9,79	2,35	39,8	12,59	513,85
SHS 70x5,0	9,70	70	5	12,36	0,263	84,63	24,18	29,56	2,62	142,2	36,65	212,71
SHS 70x6,0	11,33	70	6	14,43	0,259	95,17	27,19	33,83	2,57	163,5	41,41	179,73
SHS 70x7,0	12,53	70	7	15,96	0,250	98,70	28,20	36,10	2,49	180,0	44,62	156,64
SHS 70x8,0	13,85	70	8	17,64	0,246	104,11	29,74	38,91	2,43	194,4	47,56	139,25
SHS 70x2,5	5,17	70	2,5	6,59	0,271	49,41	14,12	16,54	2,74	78,5	21,22	411,92
SHS 70x3,0	6,13	70	3	7,81	0,270	57,53	16,44	19,42	2,71	92,4	24,74	345,40
SHS 70x4,0	7,97	70	4	10,15	0,266	72,12	20,61	24,76	2,67	118,5	31,11	262,38
SHS 70x5,0	9,70	70	5	12,36	0,263	84,63	24,18	29,56	2,62	142,2	36,65	212,71
SHS 70x6,0	11,33	70	6	14,43	0,259	95,17	27,19	33,83	2,57	163,5	41,41	179,73
SHS 70x6,3	11,53	70	6,3	14,69	0,253	93,77	26,79	33,80	2,53	168,1	42,10	172,20
SHS 70x2,0	4,19	70	2	5,34	0,273	40,73	11,64	13,52	2,76	64,0	17,48	511,77
SHS 70x2.5	5,17	70	2,5	6,59	0,271	49,41	14,12	16,54	2,74	78,5	21,22	411,92
SHS 70x3,0	6,13	70	3	7,81	0,270	57,53	16,44	19,42	2,71	92,4	24,74	345,40
SHS 70x3,5	7,06	70	3,5	8,99	0,268	65,09	18,60	22,15	2,69	105,8	28,03	297,94
SHS 70x4,0	7,97	70	4	10,15	0,266	72,12	20,61	24,76	2,67	118,5	31,11	262,38
SHS 70x4,5	8,85	70	4,5	11,27	0,265	78,63	22,47	27,22	2,64	130,7	33,98	234,77
SHS 70x2,0	4,19	70	2	5,34	0,273	40,73	11,64	13,52	2,76	64,0	17,48	511,77
SHS 70x2,0	4,19	70	2	5,34	0,273	40,73	11,64	13,52	2,76	64,0	17,48	511,77
SHS 80x2,0	4,82	80	2	6,14	0,313	61,70	15,42	17,85	3,17	96,3	23,16	510,24
SHS 80x2,3	5,50	80	2,3	7,01	0,312	69,86	17,46	20,30	3,16	109,7	26,23	445,09
SHS 80x2,5	5,96	80	2,5	7,59	0,311	75,15	18,79	21,90	3,15	118,5	28,22	410,35
SHS 80x3,0	7,07	80	3	9,01	0,310	87,84	21,96	25,78	3,12	139,9	33,02	343,80

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 80x3,2	7,51	80	3,2	9,57	0,309	92,71	23,18	27,29	3,11	148,3	34,87	323,01
SHS 80x3,5	8,16	80	3,5	10,39	0,308	99,80	24,95	29,50	3,10	160,6	37,56	296,29
SHS 80x4,0	9,22	80	4	11,75	0,306	111,04	27,76	33,07	3,07	180,4	41,84	260,70
SHS 80x4,5	10,26	80	4,5	13,07	0,305	121,58	30,40	36,48	3,05	199,5	45,88	233,04
SHS 80x5,0	11,27	80	5	14,36	0,303	131,44	32,86	39,74	3,03	217,8	49,68	210,94
SHS 80x6,0	13,21	80	6	16,83	0,299	149,18	37,29	45,79	2,98	252,1	56,59	177,86
SHS 80x7,0	14,72	80	7	18,76	0,290	157,61	39,40	49,54	2,90	281,4	61,81	154,58
SHS 80x8,0	16,36	80	8	20,84	0,286	168,38	42,09	53,89	2,84	307,1	66,61	137,06
SHS 80x3,0	7,07	80	3	9,01	0,310	87,84	21,96	25,78	3,12	139,9	33,02	343,80
SHS 80x4,0	9,22	80	4	11,75	0,306	111,04	27,76	33,07	3,07	180,4	41,84	260,70
SHS 80x5,0	11,27	80	5	14,36	0,303	131,44	32,86	39,74	3,03	217,8	49,68	210,94
SHS 80x6,0	13,21	80	6	16,83	0,299	149,18	37,29	45,79	2,98	252,1	56,59	177,86
SHS 80x6,3	13,51	80	6,3	17,21	0,293	148,51	37,13	46,11	2,94	261,0	57,90	170,23
SHS 80x8,0	16,36	80	8	20,84	0,286	168,38	42,09	53,89	2,84	307,1	66,61	137,06
SHS 90x2,0	5,45	90	2	6,94	0,353	88,86	19,75	22,78	3,58	138,1	29,64	509,06
SHS 90x2,3	6,23	90	2,3	7,93	0,352	100,79	22,40	25,93	3,56	157,5	33,63	443,89
SHS 90x2,5	6,74	90	2,5	8,59	0,351	108,55	24,12	28,00	3,56	170,3	36,23	409,14
SHS 90x3,0	8,01	90	3	10,21	0,350	127,28	28,29	33,04	3,53	201,4	42,51	342,57
SHS 90x3,2	8,51	90	3,2	10,85	0,349	134,51	29,89	35,01	3,52	213,6	44,93	321,77
SHS 90x3,5	9,26	90	3,5	11,79	0,348	145,06	32,24	37,90	3,51	231,6	48,49	295,04
SHS 90x4,0	10,48	90	4	13,35	0,346	161,92	35,98	42,58	3,48	260,8	54,17	259,41
SHS 90x4,5	11,67	90	4,5	14,87	0,345	177,87	39,53	47,09	3,46	289,0	59,58	231,73
SHS 90x3,0	8,01	90	3	10,21	0,350	127,28	28,29	33,04	3,53	201,4	42,51	342,57
SHS 90x4,0	10,48	90	4	13,35	0,346	161,92	35,98	42,58	3,48	260,8	54,17	259,41
SHS 90x5,0	12,84	90	5	16,36	0,343	192,93	42,87	51,41	3,43	316,3	64,70	209,60
SHS 90x6,0	15,10	90	6	19,23	0,339	220,48	48,99	59,54	3,39	367,8	74,16	176,47
SHS 90x6,3	15,49	90	6,3	19,73	0,333	221,13	49,14	60,30	3,35	382,3	76,21	168,76
SHS 90x8,0	18,87	90	8	24,04	0,326	254,59	56,58	71,27	3,25	455,6	88,83	135,45
SHS 90x5,0	12,84	90	5	16,36	0,343	192,93	42,87	51,41	3,43	316,3	64,70	209,60
SHS 90x6,0	15,10	90	6	19,23	0,339	220,48	48,99	59,54	3,39	367,8	74,16	176,47
SHS 90x7,0	16,92	90	7	21,56	0,330	236,13	52,47	65,08	3,31	414,2	81,78	153,06
SHS 90x8,0	18,87	90	8	24,04	0,326	254,59	56,58	71,27	3,25	455,6	88,83	135,45
SHS 100x5,0	14,41	100	5	18,36	0,383	271,10	54,22	64,59	3,84	440,5	81,72	208,56
SHS 100x6,0	16,98	100	6	21,63	0,379	311,47	62,29	75,10	3,79	514,2	94,12	175,38
SHS 100x7,0	19,12	100	7	24,36	0,370	337,04	67,41	82,72	3,72	582,7	104,53	151,89
SHS 100x8,0	21,39	100	8	27,24	0,366	365,94	73,19	91,05	3,67	644,5	114,23	134,23

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_t [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 100x3,0	8,96	100	3	11,41	0,390	177,05	35,41	41,21	3,94	278,7	53,19	341,59
SHS 100x4,0	11,73	100	4	14,95	0,386	226,35	45,27	53,30	3,89	362,0	68,10	258,41
SHS 100x5,0	14,41	100	5	18,36	0,383	271,10	54,22	64,59	3,84	440,5	81,72	208,56
SHS 100x6,0	16,98	100	6	21,63	0,379	311,47	62,29	75,10	3,79	514,2	94,12	175,38
SHS 100x6,3	17,47	100	6,3	22,25	0,373	314,17	62,83	76,38	3,76	536,0	97,02	167,63
SHS 100x7,0	19,12	100	7	24,36	0,370	337,04	67,41	82,72	3,72	582,7	104,53	151,89
SHS 100x8,0	21,39	100	8	27,24	0,366	365,94	73,19	91,05	3,67	644,5	114,23	134,23
SHS 100x10,0	25,56	100	10	32,57	0,357	411,08	82,22	105,25	3,55	749,8	130,10	109,65
SHS 100x12,0	28,31	100	12	36,06	0,338	408,06	81,61	109,72	3,36	793,6	135,90	93,79
SHS 100x12,5	29,08	100	12,5	37,04	0,336	410,38	82,08	111,41	3,33	803,6	137,33	90,60
SHS 100x2,0	6,07	100	2	7,74	0,393	123,01	24,60	28,30	3,99	190,5	36,92	508,12
SHS 100x2,5	7,53	100	2,5	9,59	0,391	150,63	30,13	34,86	3,96	235,2	45,23	408,19
SHS 100x3,0	8,96	100	3	11,41	0,390	177,05	35,41	41,21	3,94	278,7	53,19	341,59
SHS 100x3,5	10,36	100	3,5	13,19	0,388	202,28	40,46	47,35	3,92	320,9	60,81	294,05
SHS 100x4,0	11,73	100	4	14,95	0,386	226,35	45,27	53,30	3,89	362,0	68,10	258,41
SHS 100x4,5	13,08	100	4,5	16,67	0,385	249,29	49,86	59,04	3,87	401,9	75,07	230,70
SHS 100x2,0	6,07	100	2	7,74	0,393	123,01	24,60	28,30	3,99	190,5	36,92	508,12
SHS 110x3,0	9,90	110	3	12,61	0,430	238,34	43,33	50,27	4,35	373,5	65,07	340,81
SHS 110x4,0	12,99	110	4	16,55	0,426	305,94	55,62	65,21	4,30	486,5	83,63	257,59
SHS 110x5,0	15,98	110	5	20,36	0,423	367,95	66,90	79,27	4,25	593,6	100,74	207,72
SHS 110x6,0	18,87	110	6	24,03	0,419	424,57	77,19	92,46	4,20	694,9	116,47	174,51
SHS 110x7,0	21,32	110	7	27,16	0,410	463,15	84,21	102,46	4,13	791,2	130,08	150,95
SHS 110x8,0	23,90	110	8	30,44	0,406	505,64	91,93	113,23	4,08	878,7	142,82	133,26
SHS 120x3,0	10,84	120	3	13,81	0,470	312,35	52,06	60,24	4,76	487,7	78,15	340,16
SHS 120x4,0	14,25	120	4	18,15	0,466	402,28	67,05	78,33	4,71	636,6	100,75	256,92
SHS 120x5,0	17,55	120	5	22,36	0,463	485,47	80,91	95,45	4,66	778,5	121,75	207,03
SHS 120x6,0	20,75	120	6	26,43	0,459	562,16	93,69	111,61	4,61	913,5	141,22	173,80
SHS 120x6,3	21,42	120	6,3	27,29	0,453	571,55	95,26	114,22	4,58	955,5	146,19	165,98
SHS 120x7,0	23,52	120	7	29,96	0,450	617,26	102,88	124,29	4,54	1043,7	158,41	150,20
SHS 120x8,0	26,41	120	8	33,64	0,446	676,88	112,81	137,81	4,49	1163,0	174,58	132,47
SHS 120x10,0	31,84	120	10	40,57	0,437	776,81	129,47	161,82	4,38	1376,4	202,52	107,74
SHS 120x12,0	35,84	120	12	45,66	0,418	805,70	134,28	174,09	4,20	1518,4	219,26	91,59
SHS 120x12,5	36,93	120	12,5	47,04	0,416	817,01	136,17	177,83	4,17	1550,7	223,25	88,35
SHS 125x3,0	11,31	125	3	14,41	0,490	354,50	56,72	65,56	4,96	552,7	85,14	339,87
SHS 125x4,0	14,87	125	4	18,95	0,486	457,23	73,16	85,33	4,91	722,0	109,92	256,63
SHS 125x5,0	18,33	125	5	23,36	0,483	552,62	88,42	104,10	4,86	883,8	133,01	206,73

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_t [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 125x6,0	21,69	125	6	27,63	0,479	640,89	102,54	121,87	4,82	1038,1	154,49	173,49
SHS 125x7,0	24,62	125	7	31,36	0,470	705,69	112,91	136,00	4,74	1187,8	173,62	149,87
SHS 125x8,0	27,67	125	8	35,24	0,466	775,32	124,05	151,00	4,69	1325,4	191,66	132,13
SHS 130x3,0	11,78	130	3	15,01	0,510	400,28	61,58	71,10	5,16	623,1	92,43	339,61
SHS 130x4,0	15,50	130	4	19,75	0,506	516,97	79,53	92,64	5,12	814,7	119,48	256,36
SHS 130x5,0	19,12	130	5	24,36	0,503	625,68	96,26	113,13	5,07	998,2	144,77	206,45
SHS 130x6,0	22,63	130	6	28,83	0,499	726,64	111,79	132,57	5,02	1173,6	168,36	173,20
SHS 130x7,0	25,71	130	7	32,76	0,490	802,17	123,41	148,23	4,95	1344,6	189,54	149,57
SHS 130x8,0	28,92	130	8	36,84	0,486	882,85	135,82	164,79	4,90	1502,1	209,54	131,82
SHS 140x3,0	12,72	140	3	16,21	0,550	503,34	71,91	82,86	5,57	781,5	107,92	339,15
SHS 140x4,0	16,76	140	4	21,35	0,546	651,62	93,09	108,15	5,52	1023,3	139,80	255,89
SHS 140x5,0	20,69	140	5	26,36	0,543	790,56	112,94	132,30	5,48	1255,8	169,78	205,96
SHS 140x6,0	24,52	140	6	31,23	0,539	920,43	131,49	155,33	5,43	1478,8	197,90	172,70
SHS 140x6,3	25,38	140	6,3	32,33	0,533	940,82	134,40	159,62	5,39	1549,6	205,42	164,85
SHS 140x7,0	27,91	140	7	35,56	0,530	1020,68	145,81	174,27	5,36	1697,9	223,46	149,04
SHS 140x8,0	31,43	140	8	40,04	0,526	1126,77	160,97	194,18	5,30	1900,8	247,69	131,28
SHS 140x10,0	38,12	140	10	48,57	0,517	1311,67	187,38	230,38	5,20	2273,9	290,85	106,47
SHS 140x12,0	43,38	140	12	55,26	0,498	1398,33	199,76	252,87	5,03	2566,9	321,66	90,16
SHS 140x12,5	44,78	140	12,5	57,04	0,496	1425,23	203,60	259,25	5,00	2634,2	328,99	86,88
SHS 150x3,0	13,67	150	3	17,41	0,590	622,73	83,03	95,53	5,98	964,6	124,60	338,75
SHS 150x4,0	18,01	150	4	22,95	0,586	807,82	107,71	124,87	5,93	1264,8	161,73	255,48
SHS 150x5,0	22,26	150	5	28,36	0,583	982,12	130,95	152,98	5,89	1554,1	196,79	205,54
SHS 150x6,0	26,40	150	6	33,63	0,579	1145,91	152,79	179,88	5,84	1832,7	229,84	172,27
SHS 150x6,3	27,36	150	6,3	34,85	0,573	1173,71	156,49	185,15	5,80	1921,6	238,81	164,41
SHS 150x7,0	30,11	150	7	38,36	0,570	1275,59	170,08	202,41	5,77	2108,0	260,17	148,59
SHS 150x8,0	33,95	150	8	43,24	0,566	1411,83	188,24	225,96	5,71	2364,1	289,03	130,81
SHS 150x10,0	41,26	150	10	52,57	0,557	1652,53	220,34	269,17	5,61	2839,2	340,98	105,98
SHS 150x12,0	47,15	150	12	60,06	0,538	1779,77	237,30	297,66	5,44	3230,6	380,01	89,61
SHS 150x12,5	48,70	150	12,5	62,04	0,536	1817,44	242,33	305,58	5,41	3320,8	389,30	86,33
SHS 160x3,0	14,61	160	3	18,61	0,630	759,64	94,95	109,09	6,39	1174,3	142,48	338,40
SHS 160x4,0	19,27	160	4	24,55	0,626	987,17	123,40	142,78	6,34	1541,4	185,25	255,12
SHS 160x5,0	23,83	160	5	30,36	0,623	1202,36	150,29	175,16	6,29	1896,3	225,79	205,17
SHS 160x6,0	28,29	160	6	36,03	0,619	1405,48	175,69	206,24	6,25	2238,9	264,18	171,90
SHS 160x6,3	29,34	160	6,3	37,37	0,613	1442,13	180,27	212,57	6,21	2348,6	274,71	164,03
SHS 160x7,0	32,31	160	7	41,16	0,610	1569,69	196,21	232,65	6,18	2578,9	299,68	148,20
SHS 160x8,0	36,46	160	8	46,44	0,606	1741,23	217,65	260,14	6,12	2896,6	333,56	130,41

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_t [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 160x10,0	44,40	160	10	56,57	0,597	2047,67	255,96	310,95	6,02	3490,3	395,10	105,55
SHS 160x12,0	50,91	160	12	64,86	0,578	2224,36	278,05	346,05	5,86	3996,7	443,13	89,15
SHS 160x12,5	52,63	160	12,5	67,04	0,576	2275,04	284,38	355,66	5,83	4114,0	454,58	85,86
SHS 175x3,0	16,02	175	3	20,41	0,690	1000,48	114,34	131,13	7,00	1542,7	171,55	337,95
SHS 175x4,0	21,15	175	4	26,95	0,686	1303,12	148,93	171,90	6,95	2027,8	223,54	254,66
SHS 175x5,0	26,18	175	5	33,36	0,683	1590,86	181,81	211,24	6,91	2498,3	273,05	204,71
SHS 175x6,0	31,11	175	6	39,63	0,679	1864,03	213,03	249,15	6,86	2954,2	320,18	171,42
SHS 175x7,0	35,61	175	7	45,36	0,670	2090,47	238,91	281,94	6,79	3408,8	364,20	147,71
SHS 175x8,0	40,23	175	8	51,24	0,666	2325,48	265,77	315,91	6,74	3835,7	406,35	129,90
SHS 180x3,0	16,49	180	3	21,01	0,710	1090,83	121,20	138,92	7,21	1680,7	181,84	337,82
SHS 180x4,0	21,78	180	4	27,75	0,706	1421,74	157,97	182,21	7,16	2210,2	237,10	254,53
SHS 180x5,0	26,97	180	5	34,36	0,703	1736,87	192,99	224,02	7,11	2724,2	289,81	204,57
SHS 180x6,0	32,05	180	6	40,83	0,699	2036,52	226,28	264,35	7,06	3222,6	340,05	171,28
SHS 180x6,3	33,29	180	6,3	42,41	0,693	2095,65	232,85	273,09	7,03	3382,7	354,08	163,40
SHS 180x7,0	36,70	180	7	46,76	0,690	2286,70	254,08	299,43	6,99	3720,4	387,10	147,56
SHS 180x8,0	41,48	180	8	52,84	0,686	2545,86	282,87	335,70	6,94	4188,6	432,21	129,76
SHS 180x10,0	50,68	180	10	64,57	0,677	3016,80	335,20	403,51	6,84	5073,6	515,31	104,87
SHS 180x12,0	58,45	180	12	74,46	0,658	3322,19	369,13	453,63	6,68	5865,3	583,71	88,40
SHS 180x12,5	60,48	180	12,5	77,04	0,656	3406,43	378,49	467,08	6,65	6049,8	600,06	85,10
SHS 200x4,0	24,29	200	4	30,95	0,786	1968,13	196,81	226,44	7,97	3048,7	295,34	254,06
SHS 200x5,0	30,11	200	5	38,36	0,783	2410,09	241,01	278,87	7,93	3763,3	361,82	204,10
SHS 200x6,0	35,82	200	6	45,63	0,779	2832,75	283,27	329,67	7,88	4458,8	425,51	170,80
SHS 200x6,3	37,25	200	6,3	47,45	0,773	2921,53	292,15	341,16	7,85	4682,2	443,52	162,90
SHS 200x7,0	41,10	200	7	52,36	0,770	3194,10	319,41	374,60	7,81	5155,8	485,70	147,06
SHS 200x8,0	46,51	200	8	59,24	0,766	3566,25	356,63	420,86	7,76	5815,2	543,64	129,24
SHS 200x10,0	56,96	200	10	72,57	0,757	4251,06	425,11	508,08	7,65	7071,7	651,48	104,33
SHS 200x12,0	65,99	200	12	84,06	0,738	4730,22	473,02	575,61	7,50	8230,1	743,42	87,82
SHS 200x12,5	68,33	200	12,5	87,04	0,736	4859,42	485,94	593,50	7,47	8501,7	765,47	84,51
SHS 220x4,0	26,81	220	4	34,15	0,866	2639,14	239,92	275,47	8,79	4076,1	359,98	253,68
SHS 220x5,0	33,25	220	5	42,36	0,863	3238,02	294,37	339,73	8,74	5037,7	441,83	203,71
SHS 220x6,0	39,59	220	6	50,43	0,859	3813,36	346,67	402,18	8,70	5976,2	520,57	170,40
SHS 220x6,3	41,20	220	6,3	52,49	0,853	3939,93	358,18	416,80	8,66	6277,3	543,03	162,50
SHS 220x8,0	51,53	220	8	65,64	0,846	4828,01	438,91	515,62	8,58	7814,8	667,86	128,83
SHS 220x10,0	63,24	220	10	80,57	0,837	5782,46	525,68	624,65	8,47	9532,8	803,62	103,90
SHS 220x12,0	73,52	220	12	93,66	0,818	6486,85	589,71	711,99	8,32	11148,8	922,28	87,36
SHS 220x12,5	76,18	220	12,5	97,04	0,816	6673,98	606,73	734,92	8,29	11529,6	950,82	84,05

8. FERPINTA PROFILE TABLES

Designation	Dimensions			Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 250x4,0	30,57	250	4	38,95	0,986	3907,30	312,58	358,01	10,02	6013,7	468,95	253,23
SHS 250x5,0	37,96	250	5	48,36	0,983	4805,01	384,40	442,26	9,97	7443,0	576,84	203,25
SHS 250x6,0	45,24	250	6	57,63	0,979	5672,00	453,76	524,45	9,92	8842,5	681,15	169,94
SHS 250x6,3	47,14	250	6,3	60,05	0,973	5872,62	469,81	544,43	9,89	9290,3	711,19	162,03
SHS 250x7,0	52,09	250	7	66,36	0,970	6442,58	515,41	599,30	9,85	10251,1	781,18	146,17
SHS 250x8,0	59,07	250	8	75,24	0,966	7229,20	578,34	675,77	9,80	11597,8	878,18	128,34
SHS 250x10,0	72,66	250	10	92,57	0,957	8706,67	696,53	822,00	9,70	14197,2	1061,80	103,39
SHS 250x12,0	84,83	250	12	108,06	0,938	9859,42	788,75	943,56	9,55	16691,3	1226,49	86,82
SHS 250x12,5	87,95	250	12,5	112,04	0,936	10161,31	812,91	975,17	9,52	17282,7	1266,25	83,50
SHS 260x6,0	47,13	260	6	60,03	1,019	6404,54	492,66	568,80	10,33	9969,8	739,48	169,81
SHS 260x6,3	49,12	260	6,3	62,57	1,013	6634,95	510,38	590,75	10,30	10475,2	772,29	161,89
SHS 260x8,0	61,58	260	8	78,44	1,006	8178,02	629,08	733,95	10,21	13086,9	954,68	128,20
SHS 260x10,0	75,80	260	10	96,57	0,997	9864,65	758,82	893,78	10,11	16035,5	1155,85	103,25
SHS 260x12,0	88,59	260	12	112,86	0,978	11199,50	861,50	1027,95	9,96	18878,2	1337,48	86,67
SHS 260x12,5	91,88	260	12,5	117,04	0,976	11547,88	888,30	1062,76	9,93	19553,3	1381,37	83,36

8.1.3 Rectangular hollow sections, *FERPINTA* RHS

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 25x15x2,0	1,05	25	15	2	1,34	0,073	0,95	0,76	1,01	0,84	0,42	0,56	0,70	0,56	1,0	0,96	546,99
RHS 30x20x2,0	1,36	30	20	2	1,74	0,093	1,94	1,29	1,65	1,06	1,02	1,02	1,24	0,77	2,3	1,71	536,17
RHS 30x20x3,0	1,89	30	20	3	2,41	0,090	2,41	1,60	2,15	1,00	1,25	1,25	1,61	0,72	3,0	2,13	372,47
RHS 35x20x2,0	1,52	35	20	2	1,94	0,103	2,87	1,64	2,10	1,22	1,18	1,18	1,42	0,78	2,9	2,03	532,44
RHS 40x20x2,0	1,68	40	20	2	2,14	0,113	4,05	2,02	2,61	1,38	1,34	1,34	1,60	0,79	3,5	2,36	529,40
RHS 40x20x2,5	2,03	40	20	2,5	2,59	0,111	4,69	2,35	3,09	1,35	1,54	1,54	1,88	0,77	4,1	2,72	430,34
RHS 40x20x3,0	2,36	40	20	3	3,01	0,110	5,21	2,60	3,50	1,32	1,68	1,68	2,12	0,75	4,6	3,00	364,66
RHS 40x25x3,0	2,60	40	25	3	3,31	0,120	6,24	3,12	4,06	1,37	2,94	2,35	2,90	0,94	7,0	4,01	361,82
RHS 40x27x3,0	2,69	40	27	3	3,43	0,124	6,65	3,32	4,28	1,39	3,55	2,63	3,24	1,02	8,1	4,42	360,83
RHS 40x30x3,0	2,83	40	30	3	3,61	0,130	7,27	3,63	4,61	1,42	4,60	3,07	3,77	1,13	9,7	5,03	359,45
RHS 40x20x2,0	1,68	40	20	2	2,14	0,113	4,05	2,02	2,61	1,38	1,34	1,34	1,60	0,79	3,5	2,36	529,40
RHS 40x25x2,0	1,83	40	25	2	2,34	0,123	4,77	2,39	2,99	1,43	2,28	1,82	2,16	0,99	5,2	3,07	526,89
RHS 40x30x2,0	1,99	40	30	2	2,54	0,133	5,49	2,75	3,37	1,47	3,51	2,34	2,77	1,18	7,1	3,79	524,77
RHS 45x25x3,0	2,83	45	25	3	3,61	0,130	8,48	3,77	4,92	1,53	3,30	2,64	3,23	0,96	8,3	4,60	359,45
RHS 45x30x3,0	3,07	45	30	3	3,91	0,140	9,80	4,36	5,55	1,58	5,15	3,43	4,17	1,15	11,6	5,76	357,45

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 45x35x3,0	3,30	45	35	3	4,21	0,150	11,13	4,95	6,18	1,63	7,49	4,28	5,19	1,33	15,2	6,93	355,73
RHS 45x25x2,0	1,99	45	25	2	2,54	0,133	6,42	2,85	3,60	1,59	2,54	2,04	2,39	1,00	6,1	3,50	524,77
RHS 45x35x4,0	4,20	45	35	4	5,35	0,146	13,24	5,88	7,58	1,57	8,86	5,06	6,35	1,29	18,7	8,29	273,50
RHS 45x35x6,0	5,68	45	35	6	7,23	0,139	15,49	6,88	9,48	1,46	10,28	5,87	7,90	1,19	23,3	9,87	192,73
RHS 45x35x2,0	2,31	45	35	2	2,94	0,153	8,27	3,68	4,46	1,68	5,60	3,20	3,75	1,38	10,9	5,13	521,39
RHS 45x35x2,5	2,82	45	35	2,5	3,59	0,151	9,80	4,35	5,36	1,65	6,61	3,78	4,51	1,36	13,1	6,09	421,88
RHS 45x35x3,0	3,30	45	35	3	4,21	0,150	11,13	4,95	6,18	1,63	7,49	4,28	5,19	1,33	15,2	6,93	355,73
RHS 45x35x3,5	3,76	45	35	3,5	4,79	0,148	12,27	5,45	6,92	1,60	8,24	4,71	5,80	1,31	17,0	7,66	308,65
RHS 45x35x4,0	4,20	45	35	4	5,35	0,146	13,24	5,88	7,58	1,57	8,86	5,06	6,35	1,29	18,7	8,29	273,50
RHS 45x35x4,5	4,61	45	35	4,5	5,87	0,145	14,03	6,24	8,17	1,55	9,37	5,35	6,83	1,26	20,1	8,82	246,31
RHS 45x35x5,0	4,99	45	35	5	6,36	0,143	14,67	6,52	8,67	1,52	9,77	5,58	7,25	1,24	21,4	9,26	224,71
RHS 50x14x2,0	1,80	50	14	2	2,30	0,121	5,85	2,34	3,21	1,60	0,72	1,02	1,23	0,56	2,3	1,92	527,35
RHS 50x20x2,0	1,99	50	20	2	2,54	0,133	7,23	2,89	3,78	1,69	1,67	1,67	1,96	0,81	4,7	3,00	524,77
RHS 50x25x2,0	2,15	50	25	2	2,74	0,143	8,38	3,35	4,26	1,75	2,81	2,25	2,62	1,01	7,1	3,92	522,96
RHS 50x30x2,0	2,31	50	30	2	2,94	0,153	9,54	3,81	4,74	1,80	4,29	2,86	3,33	1,21	9,8	4,84	521,39
RHS 50x20x3,0	2,83	50	20	3	3,61	0,130	9,51	3,81	5,16	1,62	2,12	2,12	2,63	0,77	6,2	3,88	359,45
RHS 50x25x3,0	3,07	50	25	3	3,91	0,140	11,17	4,47	5,86	1,69	3,67	2,93	3,56	0,97	9,6	5,18	357,45
RHS 50x30x2,0	2,31	50	30	2	2,94	0,153	9,54	3,81	4,74	1,80	4,29	2,86	3,33	1,21	9,8	4,84	521,39
RHS 50x30x2,5	2,82	50	30	2,5	3,59	0,151	11,30	4,52	5,70	1,77	5,05	3,37	3,98	1,19	11,7	5,72	421,88
RHS 50x30x3,0	3,30	50	30	3	4,21	0,150	12,83	5,13	6,57	1,75	5,70	3,80	4,58	1,16	13,5	6,49	355,73
RHS 50x40x2,0	2,62	50	40	2	3,34	0,173	11,84	4,74	5,70	1,88	8,39	4,19	4,89	1,59	15,9	6,67	518,83
RHS 50x30x4,0	4,20	50	30	4	5,35	0,146	15,25	6,10	8,05	1,69	6,69	4,46	5,58	1,12	16,5	7,71	273,50
RHS 50x35x3,0	3,54	50	35	3	4,51	0,160	14,49	5,80	7,27	1,79	8,26	4,72	5,67	1,35	17,8	7,80	354,24
RHS 50x40x3,0	3,77	50	40	3	4,81	0,170	16,15	6,46	7,98	1,83	11,38	5,69	6,83	1,54	22,3	9,12	352,93
RHS 50x40x4,0	4,83	50	40	4	6,15	0,166	19,49	7,80	9,89	1,78	13,68	6,84	8,45	1,49	27,8	11,06	270,44
RHS 50x25x2,0	2,15	50	25	2	2,74	0,143	8,38	3,35	4,26	1,75	2,81	2,25	2,62	1,01	7,1	3,92	522,96
RHS 50x30x2,0	2,31	50	30	2	2,94	0,153	9,54	3,81	4,74	1,80	4,29	2,86	3,33	1,21	9,8	4,84	521,39
RHS 50x30x2,5	2,82	50	30	2,5	3,59	0,151	11,30	4,52	5,70	1,77	5,05	3,37	3,98	1,19	11,7	5,72	421,88
RHS 50x30x3,0	3,30	50	30	3	4,21	0,150	12,83	5,13	6,57	1,75	5,70	3,80	4,58	1,16	13,5	6,49	355,73
RHS 50x30x3,5	3,76	50	30	3,5	4,79	0,148	14,15	5,66	7,35	1,72	6,24	4,16	5,11	1,14	15,1	7,15	308,65
RHS 50x30x4,0	4,20	50	30	4	5,35	0,146	15,25	6,10	8,05	1,69	6,69	4,46	5,58	1,12	16,5	7,71	273,50
RHS 50x30x4,5	4,61	50	30	4,5	5,87	0,145	16,16	6,46	8,67	1,66	7,05	4,70	5,99	1,10	17,7	8,18	246,31
RHS 50x30x5,0	4,99	50	30	5	6,36	0,143	16,87	6,75	9,20	1,63	7,33	4,88	6,34	1,07	18,8	8,55	224,71
RHS 50x30x6,0	5,68	50	30	6	7,23	0,139	17,77	7,11	10,04	1,57	7,65	5,10	6,89	1,03	20,2	9,05	192,73
RHS 50x25x2,5	2,62	50	25	2,5	3,34	0,141	9,89	3,95	5,11	1,72	3,28	2,62	3,12	0,99	8,4	4,60	423,52
RHS 50x25x3,0	3,07	50	25	3	3,91	0,140	11,17	4,47	5,86	1,69	3,67	2,93	3,56	0,97	9,6	5,18	357,45

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 50x25x3,5	3,49	50	25	3,5	4,44	0,138	12,25	4,90	6,54	1,66	3,98	3,19	3,96	0,95	10,7	5,66	310,45
RHS 50x25x4,0	3,88	50	25	4	4,95	0,136	13,13	5,25	7,13	1,63	4,23	3,38	4,29	0,92	11,6	6,05	275,40
RHS 50x25x4,5	4,25	50	25	4,5	5,42	0,135	13,82	5,53	7,64	1,60	4,41	3,53	4,58	0,90	12,3	6,36	248,31
RHS 50x25x5,0	4,60	50	25	5	5,86	0,133	14,33	5,73	8,08	1,56	4,54	3,63	4,82	0,88	12,9	6,59	226,82
RHS 50x25x6,0	5,21	50	25	6	6,63	0,129	14,84	5,94	8,72	1,50	4,65	3,72	5,15	0,84	13,5	6,82	195,08
RHS 55x25x2,0	2,31	55	25	2	2,94	0,153	10,69	3,89	4,97	1,91	3,07	2,46	2,85	1,02	8,0	4,34	521,39
RHS 55x35x2,0	2,62	55	35	2	3,34	0,173	13,50	4,91	6,03	2,01	6,69	3,82	4,41	1,42	14,6	6,38	518,83
RHS 60x20x3,0	3,30	60	20	3	4,21	0,150	15,62	5,21	7,11	1,93	2,56	2,56	3,14	0,78	7,9	4,75	355,73
RHS 60x25x3,0	3,54	60	25	3	4,51	0,160	18,06	6,02	7,97	2,00	4,40	3,52	4,22	0,99	12,3	6,35	354,24
RHS 60x30x3,0	3,77	60	30	3	4,81	0,170	20,50	6,83	8,82	2,06	6,80	4,53	5,39	1,19	17,5	7,95	352,93
RHS 60x30x4,0	4,83	60	30	4	6,15	0,166	24,70	8,23	10,92	2,00	8,06	5,37	6,62	1,14	21,5	9,52	270,44
RHS 60x40x2,0	2,93	60	40	2	3,74	0,193	18,41	6,14	7,47	2,22	9,83	4,92	5,65	1,62	20,7	8,12	516,81
RHS 60x40x2,5	3,60	60	40	2,5	4,59	0,191	22,07	7,36	9,06	2,19	11,74	5,87	6,84	1,60	25,1	9,72	417,11
RHS 60x40x3,0	4,25	60	40	3	5,41	0,190	25,38	8,46	10,53	2,17	13,44	6,72	7,94	1,58	29,3	11,17	350,76
RHS 60x40x4,0	5,45	60	40	4	6,95	0,186	30,99	10,33	13,16	2,11	16,28	8,14	9,89	1,53	36,7	13,65	268,09
RHS 60x30x2,0	2,62	60	30	2	3,34	0,173	15,05	5,02	6,31	2,12	5,08	3,39	3,89	1,23	12,6	5,88	518,83
RHS 60x40x5,0	6,56	60	40	5	8,36	0,183	35,33	11,78	15,38	2,06	18,43	9,21	11,52	1,48	42,8	15,60	218,80
RHS 60x40x6,0	7,56	60	40	6	9,63	0,179	38,50	12,83	17,20	2,00	19,95	9,97	12,84	1,44	47,8	17,07	186,23
RHS 60x50x3,0	4,72	60	50	3	6,01	0,210	30,26	10,09	12,24	2,24	22,79	9,11	10,80	1,95	42,6	14,41	349,02
RHS 60x50x4,0	6,08	60	50	4	7,75	0,206	37,27	12,42	15,40	2,19	27,98	11,19	13,57	1,90	53,9	17,81	266,22
RHS 60x40x2,0	2,93	60	40	2	3,74	0,193	18,41	6,14	7,47	2,22	9,83	4,92	5,65	1,62	20,7	8,12	516,81
RHS 60x40x3,0	4,25	60	40	3	5,41	0,190	25,38	8,46	10,53	2,17	13,44	6,72	7,94	1,58	29,3	11,17	350,76
RHS 60x40x3,5	4,86	60	40	3,5	6,19	0,188	28,35	9,45	11,90	2,14	14,95	7,48	8,96	1,55	33,1	12,48	303,46
RHS 60x40x4,0	5,45	60	40	4	6,95	0,186	30,99	10,33	13,16	2,11	16,28	8,14	9,89	1,53	36,7	13,65	268,09
RHS 60x40x4,5	6,02	60	40	4,5	7,67	0,185	33,31	11,10	14,32	2,08	17,44	8,72	10,75	1,51	39,9	14,69	240,66
RHS 60x40x5,0	6,56	60	40	5	8,36	0,183	35,33	11,78	15,38	2,06	18,43	9,21	11,52	1,48	42,8	15,60	218,80
RHS 60x40x6,0	7,56	60	40	6	9,63	0,179	38,50	12,83	17,20	2,00	19,95	9,97	12,84	1,44	47,8	17,07	186,23
RHS 60x40x7,0	8,13	60	40	7	10,36	0,170	36,81	12,27	17,34	1,89	19,28	9,64	13,00	1,36	49,0	17,27	164,09
RHS 60x40x8,0	8,83	60	40	8	11,24	0,166	36,77	12,26	18,01	1,81	19,30	9,65	13,48	1,31	49,9	17,47	147,36
RHS 60x20x2,0	2,31	60	20	2	2,94	0,153	11,68	3,89	5,15	1,99	1,99	1,99	2,32	0,82	5,9	3,65	521,39
RHS 60x20x2,5	2,82	60	20	2,5	3,59	0,151	13,80	4,60	6,18	1,96	2,31	2,31	2,75	0,80	7,0	4,26	421,88
RHS 60x20x3,0	3,30	60	20	3	4,21	0,150	15,62	5,21	7,11	1,93	2,56	2,56	3,14	0,78	7,9	4,75	355,73
RHS 60x20x3,5	3,76	60	20	3,5	4,79	0,148	17,16	5,72	7,95	1,89	2,76	2,76	3,47	0,76	8,6	5,15	308,65
RHS 60x20x4,0	4,20	60	20	4	5,35	0,146	18,42	6,14	8,68	1,86	2,90	2,90	3,75	0,74	9,2	5,46	273,50
RHS 60x20x4,5	4,61	60	20	4,5	5,87	0,145	19,42	6,47	9,33	1,82	3,01	3,01	3,98	0,72	9,7	5,68	246,31
RHS 60x20x5,0	4,99	60	20	5	6,36	0,143	20,16	6,72	9,88	1,78	3,07	3,07	4,17	0,69	10,0	5,82	224,71

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation		Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 60x40x2,0	2,93	60	40	2	3,74	0,193	18,41	6,14	7,47	2,22	9,83	4,92	5,65	1,62	20,7	8,12	516,81
RHS 60x40x2,5	3,60	60	40	2,5	4,59	0,191	22,07	7,36	9,06	2,19	11,74	5,87	6,84	1,60	25,1	9,72	417,11
RHS 60x15x2,0	2,15	60	15	2	2,74	0,143	10,00	3,33	4,57	1,91	1,01	1,35	1,61	0,61	3,3	2,55	522,96
RHS 60x15x2,5	2,62	60	15	2,5	3,34	0,141	11,73	3,91	5,46	1,87	1,15	1,53	1,89	0,59	3,8	2,91	423,52
RHS 60x15x3,0	3,07	60	15	3	3,91	0,140	13,18	4,39	6,26	1,84	1,25	1,67	2,12	0,57	4,2	3,18	357,45
RHS 60x15x3,5	3,49	60	15	3,5	4,44	0,138	14,36	4,79	6,96	1,80	1,32	1,76	2,31	0,54	4,5	3,37	310,45
RHS 60x15x4,0	3,88	60	15	4	4,95	0,136	15,28	5,09	7,56	1,76	1,36	1,81	2,46	0,52	4,7	3,49	275,40
RHS 70x30x3,0	4,25	70	30	3	5,41	0,190	30,57	8,74	11,38	2,38	7,90	5,26	6,20	1,21	21,5	9,41	350,76
RHS 70x30x4,0	5,45	70	30	4	6,95	0,186	37,23	10,64	14,20	2,31	9,42	6,28	7,66	1,16	26,5	11,33	268,09
RHS 70x40x3,0	4,72	70	40	3	6,01	0,210	37,31	10,66	13,39	2,49	15,50	7,75	9,05	1,61	36,5	13,23	349,02
RHS 70x40x4,0	6,08	70	40	4	7,75	0,206	45,95	13,13	16,84	2,44	18,88	9,44	11,33	1,56	45,8	16,25	266,22
RHS 70x40x5,0	7,34	70	40	5	9,36	0,203	52,88	15,11	19,81	2,38	21,51	10,75	13,27	1,52	53,8	18,67	216,79
RHS 70x20x2,0	2,62	70	20	2	3,34	0,173	17,60	5,03	6,72	2,30	2,32	2,32	2,68	0,83	7,1	4,31	518,83
RHS 70x30x2,0	2,93	70	30	2	3,74	0,193	22,22	6,35	8,08	2,44	5,86	3,91	4,45	1,25	15,4	6,93	516,81
RHS 70x40x6,0	8,50	70	40	6	10,83	0,199	58,20	16,63	22,31	2,32	23,45	11,73	14,88	1,47	60,3	20,55	184,07
RHS 70x50x2,0	3,56	70	50	2	4,54	0,233	31,48	8,99	10,80	2,63	18,76	7,50	8,58	2,03	37,5	12,20	513,85
RHS 70x50x2,5	4,39	70	50	2,5	5,59	0,231	38,01	10,86	13,16	2,61	22,59	9,04	10,45	2,01	45,8	14,72	414,05
RHS 70x50x3,0	5,19	70	50	3	6,61	0,230	44,05	12,59	15,40	2,58	26,10	10,44	12,21	1,99	53,6	17,06	347,60
RHS 70x50x4,0	6,71	70	50	4	8,55	0,226	54,67	15,62	19,48	2,53	32,22	12,89	15,41	1,94	68,1	21,19	264,70
RHS 70x50x5,0	8,13	70	50	5	10,36	0,223	63,46	18,13	23,06	2,48	37,20	14,88	18,20	1,90	80,8	24,64	215,17
RHS 70x50x6,0	9,45	70	50	6	12,03	0,219	70,52	20,15	26,15	2,42	41,14	16,46	20,60	1,85	91,7	27,47	182,33
RHS 70x40x2,0	3,25	70	40	2	4,14	0,213	26,85	7,67	9,44	2,55	11,28	5,64	6,41	1,65	25,7	9,56	515,19
RHS 70x30x2,0	2,93	70	30	2	3,74	0,193	22,22	6,35	8,08	2,44	5,86	3,91	4,45	1,25	15,4	6,93	516,81
RHS 70x30x2,5	3,60	70	30	2,5	4,59	0,191	26,62	7,61	9,79	2,41	6,95	4,63	5,36	1,23	18,6	8,24	417,11
RHS 70x50x2,0	3,56	70	50	2	4,54	0,233	31,48	8,99	10,80	2,63	18,76	7,50	8,58	2,03	37,5	12,20	513,85
RHS 70x50x2,5	4,39	70	50	2,5	5,59	0,231	38,01	10,86	13,16	2,61	22,59	9,04	10,45	2,01	45,8	14,72	414,05
RHS 70x50x3,0	5,19	70	50	3	6,61	0,230	44,05	12,59	15,40	2,58	26,10	10,44	12,21	1,99	53,6	17,06	347,60
RHS 70x50x3,5	5,96	70	50	3,5	7,59	0,228	49,60	14,17	17,50	2,56	29,31	11,72	13,86	1,96	61,1	19,21	300,19
RHS 70x50x4,0	6,71	70	50	4	8,55	0,226	54,67	15,62	19,48	2,53	32,22	12,89	15,41	1,94	68,1	21,19	264,70
RHS 70x50x4,5	7,43	70	50	4,5	9,47	0,225	59,29	16,94	21,33	2,50	34,85	13,94	16,86	1,92	74,6	23,00	237,15
RHS 70x50x5,0	8,13	70	50	5	10,36	0,223	63,46	18,13	23,06	2,48	37,20	14,88	18,20	1,90	80,8	24,64	215,17
RHS 70x50x6,0	9,45	70	50	6	12,03	0,219	70,52	20,15	26,15	2,42	41,14	16,46	20,60	1,85	91,7	27,47	182,33
RHS 70x50x7,0	10,33	70	50	7	13,16	0,210	70,80	20,23	27,28	2,32	41,52	16,61	21,54	1,78	98,3	28,89	159,57
RHS 70x50x8,0	11,34	70	50	8	14,44	0,206	73,18	20,91	28,99	2,25	42,87	17,15	22,86	1,72	103,8	30,18	142,40
RHS 70x30x3,0	4,25	70	30	3	5,41	0,190	30,57	8,74	11,38	2,38	7,90	5,26	6,20	1,21	21,5	9,41	350,76
RHS 70x30x3,5	4,86	70	30	3,5	6,19	0,188	34,11	9,74	12,84	2,35	8,72	5,81	6,97	1,19	24,2	10,44	303,46

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 70x30x4,0	5,45	70	30	4	6,95	0,186	37,23	10,64	14,20	2,31	9,42	6,28	7,66	1,16	26,5	11,33	268,09
RHS 70x30x4,5	6,02	70	30	4,5	7,67	0,185	39,95	11,42	15,43	2,28	10,01	6,67	8,29	1,14	28,6	12,11	240,66
RHS 70x30x5,0	6,56	70	30	5	8,36	0,183	42,30	12,08	16,56	2,25	10,49	6,99	8,84	1,12	30,4	12,76	218,80
RHS 70x30x6,0	7,56	70	30	6	9,63	0,179	45,88	13,11	18,47	2,18	11,18	7,45	9,77	1,08	33,3	13,72	186,23
RHS 70x30x7,0	8,13	70	30	7	10,36	0,170	42,90	12,26	18,46	2,04	10,66	7,11	9,79	1,01	32,7	13,46	164,09
RHS 80x40x4,5	7,43	80	40	4,5	9,47	0,225	70,22	17,56	22,89	2,72	23,14	11,57	13,94	1,56	60,3	20,37	237,15
RHS 80x40x5,0	8,13	80	40	5	10,36	0,223	75,11	18,78	24,74	2,69	24,59	12,30	15,02	1,54	65,0	21,74	215,17
RHS 80x40x6,0	9,45	80	40	6	12,03	0,219	83,32	20,83	28,03	2,63	26,96	13,48	16,92	1,50	73,1	24,04	182,33
RHS 80x40x7,0	10,33	80	40	7	13,16	0,210	82,78	20,70	29,10	2,51	27,02	13,51	17,62	1,43	76,9	24,95	159,57
RHS 80x40x8,0	11,34	80	40	8	14,44	0,206	85,09	21,27	30,85	2,43	27,66	13,83	18,60	1,38	80,1	25,76	142,40
RHS 80x60x2,0	4,19	80	60	2	5,34	0,273	49,53	12,38	14,73	3,05	31,87	10,62	12,11	2,44	61,2	17,08	511,77
RHS 80x60x2,5	5,17	80	60	2,5	6,59	0,271	60,13	15,03	18,02	3,02	38,61	12,87	14,81	2,42	75,1	20,73	411,92
RHS 80x60x3,0	6,13	80	60	3	7,81	0,270	70,05	17,51	21,16	3,00	44,89	14,96	17,37	2,40	88,3	24,14	345,40
RHS 80x60x3,5	7,06	80	60	3,5	8,99	0,268	79,30	19,83	24,15	2,97	50,72	16,91	19,81	2,37	101,0	27,34	297,94
RHS 80x60x4,0	7,97	80	60	4	10,15	0,266	87,92	21,98	26,99	2,94	56,12	18,71	22,12	2,35	113,1	30,32	262,38
RHS 80x60x4,5	8,85	80	60	4,5	11,27	0,265	95,90	23,98	29,69	2,92	61,09	20,36	24,31	2,33	124,6	33,10	234,77
RHS 80x60x5,0	9,70	80	60	5	12,36	0,263	103,28	25,82	32,24	2,89	65,66	21,89	26,38	2,31	135,5	35,67	212,71
RHS 80x60x6,0	11,33	80	60	6	14,43	0,259	116,25	29,06	36,91	2,84	73,63	24,54	30,16	2,26	155,6	40,25	179,73
RHS 80x60x7,0	12,53	80	60	7	15,96	0,250	120,20	30,05	39,32	2,74	76,36	25,45	32,18	2,19	170,8	43,28	156,64
RHS 80x60x8,0	13,85	80	60	8	17,64	0,246	126,73	31,68	42,37	2,68	80,38	26,79	34,65	2,13	184,0	46,04	139,25
RHS 80x20x3,0	4,25	80	20	3	5,41	0,190	34,45	8,61	11,92	2,52	3,44	3,44	4,16	0,80	11,3	6,50	350,76
RHS 80x25x3,0	4,48	80	25	3	5,71	0,200	38,90	9,73	13,07	2,61	5,86	4,69	5,54	1,01	17,9	8,68	349,84
RHS 80x30x3,0	4,72	80	30	3	6,01	0,210	43,35	10,84	14,23	2,69	8,99	6,00	7,01	1,22	25,6	10,87	349,02
RHS 80x30x4,0	6,08	80	30	4	7,75	0,206	53,23	13,31	17,87	2,62	10,78	7,19	8,70	1,18	31,7	13,15	266,22
RHS 80x40x2,0	3,56	80	40	2	4,54	0,233	37,36	9,34	11,61	2,87	12,72	6,36	7,17	1,67	30,9	11,00	513,85
RHS 80x40x2,5	4,39	80	40	2,5	5,59	0,231	45,11	11,28	14,15	2,84	15,26	7,63	8,72	1,65	37,6	13,24	414,05
RHS 80x40x3,0	5,19	80	40	3	6,61	0,230	52,25	13,06	16,54	2,81	17,56	8,78	10,16	1,63	43,9	15,28	347,60
RHS 80x40x4,0	6,71	80	40	4	8,55	0,226	64,79	16,20	20,91	2,75	21,49	10,74	12,77	1,59	55,2	18,84	264,70
RHS 80x40x5,0	8,13	80	40	5	10,36	0,223	75,11	18,78	24,74	2,69	24,59	12,30	15,02	1,54	65,0	21,74	215,17
RHS 80x45x3,0	5,42	80	45	3	6,91	0,240	56,70	14,17	17,69	2,86	23,06	10,25	11,85	1,83	54,1	17,50	346,98
RHS 80x45x4,0	7,02	80	45	4	8,95	0,236	70,57	17,64	22,43	2,81	28,42	12,63	14,96	1,78	68,6	21,71	264,04
RHS 80x50x3,0	5,66	80	50	3	7,21	0,250	61,15	15,29	18,85	2,91	29,42	11,77	13,62	2,02	65,0	19,71	346,41
RHS 80x50x4,0	7,34	80	50	4	9,35	0,246	76,36	19,09	23,95	2,86	36,46	14,59	17,25	1,98	82,7	24,57	263,44
RHS 80x50x5,0	8,91	80	50	5	11,36	0,243	89,19	22,30	28,49	2,80	42,29	16,92	20,45	1,93	98,4	28,69	213,83
RHS 80x50x6,0	10,39	80	50	6	13,23	0,239	99,78	24,95	32,47	2,75	46,99	18,79	23,24	1,88	112,1	32,12	180,91
RHS 80x60x2,0	4,19	80	60	2	5,34	0,273	49,53	12,38	14,73	3,05	31,87	10,62	12,11	2,44	61,2	17,08	511,77

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 80x60x2,5	5,17	80	60	2,5	6,59	0,271	60,13	15,03	18,02	3,02	38,61	12,87	14,81	2,42	75,1	20,73	411,92
RHS 80x60x3,0	6,13	80	60	3	7,81	0,270	70,05	17,51	21,16	3,00	44,89	14,96	17,37	2,40	88,3	24,14	345,40
RHS 80x60x4,0	7,97	80	60	4	10,15	0,266	87,92	21,98	26,99	2,94	56,12	18,71	22,12	2,35	113,1	30,32	262,38
RHS 80x60x5,0	9,70	80	60	5	12,36	0,263	103,28	25,82	32,24	2,89	65,66	21,89	26,38	2,31	135,5	35,67	212,71
RHS 80x60x6,0	11,33	80	60	6	14,43	0,259	116,25	29,06	36,91	2,84	73,63	24,54	30,16	2,26	155,6	40,25	179,73
RHS 80x20x3,5	4,86	80	20	3,5	6,19	0,188	38,31	9,58	13,44	2,49	3,73	3,73	4,62	0,78	12,4	7,08	303,46
RHS 80x20x4,0	5,45	80	20	4	6,95	0,186	41,67	10,42	14,83	2,45	3,95	3,95	5,03	0,75	13,3	7,54	268,09
RHS 80x20x4,5	6,02	80	20	4,5	7,67	0,185	44,54	11,13	16,10	2,41	4,12	4,12	5,37	0,73	14,0	7,89	240,66
RHS 80x20x5,0	6,56	80	20	5	8,36	0,183	46,94	11,74	17,24	2,37	4,24	4,24	5,67	0,71	14,6	8,15	218,80
RHS 80x40x2,0	3,56	80	40	2	4,54	0,233	37,36	9,34	11,61	2,87	12,72	6,36	7,17	1,67	30,9	11,00	513,85
RHS 80x40x2,5	4,39	80	40	2,5	5,59	0,231	45,11	11,28	14,15	2,84	15,26	7,63	8,72	1,65	37,6	13,24	414,05
RHS 80x40x3,0	5,19	80	40	3	6,61	0,230	52,25	13,06	16,54	2,81	17,56	8,78	10,16	1,63	43,9	15,28	347,60
RHS 80x40x3,5	5,96	80	40	3,5	7,59	0,228	58,81	14,70	18,79	2,78	19,63	9,81	11,52	1,61	49,8	17,15	300,19
RHS 80x40x4,0	6,71	80	40	4	8,55	0,226	64,79	16,20	20,91	2,75	21,49	10,74	12,77	1,59	55,2	18,84	264,70
RHS 80x20x2,0	2,93	80	20	2	3,74	0,193	25,19	6,30	8,49	2,60	2,64	2,64	3,04	0,84	8,4	4,96	516,81
RHS 80x20x2,5	3,60	80	20	2,5	4,59	0,191	30,08	7,52	10,27	2,56	3,08	3,08	3,63	0,82	9,9	5,80	417,11
RHS 80x20x3,0	4,25	80	20	3	5,41	0,190	34,45	8,61	11,92	2,52	3,44	3,44	4,16	0,80	11,3	6,50	350,76
RHS 80x40x2,0	3,56	80	40	2	4,54	0,233	37,36	9,34	11,61	2,87	12,72	6,36	7,17	1,67	30,9	11,00	513,85
RHS 80x60x2,0	4,19	80	60	2	5,34	0,273	49,53	12,38	14,73	3,05	31,87	10,62	12,11	2,44	61,2	17,08	511,77
RHS 90x50x2,0	4,19	90	50	2	5,34	0,273	57,88	12,86	15,74	3,29	23,37	9,35	10,50	2,09	53,4	15,88	511,77
RHS 90x50x2,5	5,17	90	50	2,5	6,59	0,271	70,26	15,61	19,25	3,27	28,24	11,29	12,82	2,07	65,3	19,24	411,92
RHS 90x50x3,0	6,13	90	50	3	7,81	0,270	81,85	18,19	22,60	3,24	32,74	13,10	15,03	2,05	76,7	22,36	345,40
RHS 90x50x3,5	7,06	90	50	3,5	8,99	0,268	92,66	20,59	25,79	3,21	36,89	14,76	17,12	2,03	87,5	25,27	297,94
RHS 90x50x4,0	7,97	90	50	4	10,15	0,266	102,71	22,82	28,82	3,18	40,71	16,28	19,09	2,00	97,7	27,96	262,38
RHS 90x50x4,5	8,85	90	50	4,5	11,27	0,265	112,02	24,89	31,70	3,15	44,20	17,68	20,95	1,98	107,4	30,45	234,77
RHS 90x50x5,0	9,70	90	50	5	12,36	0,263	120,60	26,80	34,41	3,12	47,37	18,95	22,70	1,96	116,5	32,75	212,71
RHS 90x50x6,0	11,33	90	50	6	14,43	0,259	135,66	30,15	39,38	3,07	52,83	21,13	25,88	1,91	132,9	36,77	179,73
RHS 90x50x7,0	12,53	90	50	7	15,96	0,250	139,45	30,99	41,84	2,96	54,58	21,83	27,56	1,85	144,7	39,27	156,64
RHS 90x50x8,0	13,85	90	50	8	17,64	0,246	146,66	32,59	45,03	2,88	57,15	22,86	29,58	1,80	154,6	41,52	139,25
RHS 90x30x3,0	5,19	90	30	3	6,61	0,230	59,13	13,14	17,38	2,99	10,09	6,73	7,82	1,24	29,8	12,34	347,60
RHS 90x30x4,0	6,71	90	30	4	8,55	0,226	73,10	16,25	21,94	2,92	12,14	8,10	9,74	1,19	36,9	14,96	264,70
RHS 90x40x3,0	5,66	90	40	3	7,21	0,250	70,49	15,67	19,99	3,13	19,61	9,81	11,27	1,65	51,4	17,34	346,41
RHS 90x40x4,0	7,34	90	40	4	9,35	0,246	87,91	19,53	25,38	3,07	24,09	12,04	14,21	1,61	64,8	21,44	263,44
RHS 90x40x5,0	8,91	90	40	5	11,36	0,243	102,52	22,78	30,16	3,00	27,68	13,84	16,77	1,56	76,4	24,82	213,83
RHS 90x50x2,0	4,19	90	50	2	5,34	0,273	57,88	12,86	15,74	3,29	23,37	9,35	10,50	2,09	53,4	15,88	511,77
RHS 90x50x2,5	5,17	90	50	2,5	6,59	0,271	70,26	15,61	19,25	3,27	28,24	11,29	12,82	2,07	65,3	19,24	411,92

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 90x50x3,0	6,13	90	50	3	7,81	0,270	81,85	18,19	22,60	3,24	32,74	13,10	15,03	2,05	76,7	22,36	345,40
RHS 90x50x4,0	7,97	90	50	4	10,15	0,266	102,71	22,82	28,82	3,18	40,71	16,28	19,09	2,00	97,7	27,96	262,38
RHS 90x50x5,0	9,70	90	50	5	12,36	0,263	120,60	26,80	34,41	3,12	47,37	18,95	22,70	1,96	116,5	32,75	212,71
RHS 90x50x6,0	11,33	90	50	6	14,43	0,259	135,66	30,15	39,38	3,07	52,83	21,13	25,88	1,91	132,9	36,77	179,73
RHS 90x60x6,0	12,27	90	60	6	15,63	0,279	156,87	34,86	44,42	3,17	82,42	27,47	33,40	2,30	185,6	46,08	178,72
RHS 90x40x2,0	3,88	90	40	2	4,94	0,253	50,13	11,14	13,98	3,19	14,17	7,08	7,93	1,69	36,1	12,45	512,73
RHS 90x50x2,0	4,19	90	50	2	5,34	0,273	57,88	12,86	15,74	3,29	23,37	9,35	10,50	2,09	53,4	15,88	511,77
RHS 100x20x2,0	3,56	100	20	2	4,54	0,233	46,17	9,23	12,62	3,19	3,29	3,29	3,76	0,85	10,9	6,26	513,85
RHS 100x20x2,5	4,39	100	20	2,5	5,59	0,231	55,55	11,11	15,36	3,15	3,85	3,85	4,50	0,83	13,0	7,34	414,05
RHS 100x20x3,0	5,19	100	20	3	6,61	0,230	64,10	12,82	17,93	3,11	4,31	4,31	5,18	0,81	14,7	8,25	347,60
RHS 100x20x3,5	5,96	100	20	3,5	7,59	0,228	71,85	14,37	20,33	3,08	4,69	4,69	5,78	0,79	16,2	9,01	300,19
RHS 100x20x4,0	6,71	100	20	4	8,55	0,226	78,81	15,76	22,58	3,04	5,00	5,00	6,31	0,76	17,4	9,63	264,70
RHS 100x20x4,5	7,43	100	20	4,5	9,47	0,225	85,00	17,00	24,66	3,00	5,23	5,23	6,77	0,74	18,4	10,11	237,15
RHS 100x20x5,0	8,13	100	20	5	10,36	0,223	90,44	18,09	26,59	2,96	5,40	5,40	7,17	0,72	19,2	10,48	215,17
RHS 100x20x6,0	9,45	100	20	6	12,03	0,219	99,12	19,82	29,98	2,87	5,59	5,59	7,77	0,68	20,0	10,87	182,33
RHS 100x40x2,0	4,19	100	40	2	5,34	0,273	65,38	13,08	16,54	3,50	15,61	7,81	8,69	1,71	41,5	13,89	511,77
RHS 100x40x2,5	5,17	100	40	2,5	6,59	0,271	79,32	15,86	20,23	3,47	18,78	9,39	10,59	1,69	50,5	16,76	411,92
RHS 100x40x3,0	6,13	100	40	3	7,81	0,270	92,34	18,47	23,75	3,44	21,67	10,84	12,38	1,67	59,0	19,39	345,40
RHS 100x40x3,5	7,06	100	40	3,5	8,99	0,268	104,46	20,89	27,09	3,41	24,31	12,15	14,07	1,64	67,0	21,82	297,94
RHS 100x40x4,0	7,97	100	40	4	10,15	0,266	115,70	23,14	30,26	3,38	26,69	13,35	15,65	1,62	74,5	24,04	262,38
RHS 100x40x4,5	8,85	100	40	4,5	11,27	0,265	126,07	25,21	33,26	3,34	28,84	14,42	17,14	1,60	81,5	26,06	234,77
RHS 100x40x5,0	9,70	100	40	5	12,36	0,263	135,60	27,12	36,09	3,31	30,76	15,38	18,52	1,58	87,9	27,90	212,71
RHS 100x40x6,0	11,33	100	40	6	14,43	0,259	152,21	30,44	41,26	3,25	33,96	16,98	21,00	1,53	99,3	31,02	179,73
RHS 100x40x7,0	12,53	100	40	7	15,96	0,250	155,07	31,01	43,66	3,12	34,76	17,38	22,24	1,48	106,0	32,65	156,64
RHS 100x40x8,0	13,85	100	40	8	17,64	0,246	162,30	32,46	46,89	3,03	36,03	18,01	23,72	1,43	111,5	34,08	139,25
RHS 100x50x2,0	4,50	100	50	2	5,74	0,293	74,98	15,00	18,50	3,62	25,67	10,27	11,46	2,12	61,6	17,73	510,95
RHS 100x50x2,5	5,56	100	50	2,5	7,09	0,291	91,20	18,24	22,67	3,59	31,06	12,42	14,01	2,09	75,4	21,49	411,08
RHS 100x50x3,0	6,60	100	50	3	8,41	0,290	106,46	21,29	26,66	3,56	36,06	14,42	16,44	2,07	88,6	25,01	344,54
RHS 100x50x3,5	7,61	100	50	3,5	9,69	0,288	120,76	24,15	30,47	3,53	40,68	16,27	18,74	2,05	101,1	28,30	297,06
RHS 100x50x4,0	8,59	100	50	4	10,95	0,286	134,14	26,83	34,10	3,50	44,95	17,98	20,93	2,03	113,0	31,35	261,48
RHS 100x50x4,5	9,55	100	50	4,5	12,17	0,285	146,61	29,32	37,56	3,47	48,87	19,55	23,00	2,00	124,3	34,18	233,84
RHS 100x50x5,0	10,48	100	50	5	13,36	0,283	158,19	31,64	40,84	3,44	52,45	20,98	24,95	1,98	134,9	36,80	211,76
RHS 100x50x6,0	12,27	100	50	6	15,63	0,279	178,75	35,75	46,90	3,38	58,67	23,47	28,52	1,94	154,2	41,43	178,72
RHS 100x50x7,0	13,63	100	50	7	17,36	0,270	185,40	37,08	50,17	3,27	61,11	24,44	30,57	1,88	168,5	44,47	155,53
RHS 100x50x8,0	15,11	100	50	8	19,24	0,266	196,24	39,25	54,25	3,19	64,29	25,72	32,94	1,83	180,8	47,20	138,06
RHS 100x60x2,0	4,82	100	60	2	6,14	0,313	84,59	16,92	20,46	3,71	38,60	12,87	14,43	2,51	84,1	21,56	510,24

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 100x60x2,5	5,96	100	60	2,5	7,59	0,311	103,09	20,62	25,11	3,69	46,88	15,63	17,68	2,49	103,3	26,23	410,35
RHS 100x60x3,0	7,07	100	60	3	9,01	0,310	120,57	24,11	29,57	3,66	54,65	18,22	20,79	2,46	121,7	30,64	343,80
RHS 100x60x3,5	8,16	100	60	3,5	10,39	0,308	137,07	27,41	33,84	3,63	61,91	20,64	23,77	2,44	139,3	34,79	296,29
RHS 100x60x4,0	9,22	100	60	4	11,75	0,306	152,58	30,52	37,94	3,60	68,68	22,89	26,60	2,42	156,3	38,68	260,70
RHS 100x60x4,5	10,26	100	60	4,5	13,07	0,305	167,14	33,43	41,85	3,58	74,98	24,99	29,31	2,40	172,4	42,34	233,04
RHS 100x60x5,0	11,27	100	60	5	14,36	0,303	180,77	36,15	45,59	3,55	80,83	26,94	31,88	2,37	187,9	45,75	210,94
RHS 100x60x6,0	13,21	100	60	6	16,83	0,299	205,30	41,06	52,54	3,49	91,20	30,40	36,64	2,33	216,4	51,92	177,86
RHS 100x60x7,0	14,72	100	60	7	18,76	0,290	215,73	43,15	56,68	3,39	96,14	32,05	39,60	2,26	239,9	56,40	154,58
RHS 100x60x8,0	16,36	100	60	8	20,84	0,286	230,18	46,04	61,61	3,32	102,18	34,06	42,97	2,21	260,3	60,49	137,06
RHS 100x70x2,0	5,13	100	70	2	6,54	0,333	94,19	18,84	22,42	3,80	54,60	15,60	17,60	2,89	108,5	25,40	509,61
RHS 100x70x2,5	6,35	100	70	2,5	8,09	0,331	114,97	22,99	27,55	3,77	66,50	19,00	21,60	2,87	133,5	30,98	409,71
RHS 100x40x2,5	5,17	100	40	2,5	6,59	0,271	79,32	15,86	20,23	3,47	18,78	9,39	10,59	1,69	50,5	16,76	411,92
RHS 100x40x3,0	6,13	100	40	3	7,81	0,270	92,34	18,47	23,75	3,44	21,67	10,84	12,38	1,67	59,0	19,39	345,40
RHS 100x40x4,0	7,97	100	40	4	10,15	0,266	115,70	23,14	30,26	3,38	26,69	13,35	15,65	1,62	74,5	24,04	262,38
RHS 100x40x5,0	9,70	100	40	5	12,36	0,263	135,60	27,12	36,09	3,31	30,76	15,38	18,52	1,58	87,9	27,90	212,71
RHS 100x40x6,0	11,33	100	40	6	14,43	0,259	152,21	30,44	41,26	3,25	33,96	16,98	21,00	1,53	99,3	31,02	179,73
RHS 100x50x2,5	5,56	100	50	2,5	7,09	0,291	91,20	18,24	22,67	3,59	31,06	12,42	14,01	2,09	75,4	21,49	411,08
RHS 100x50x3,0	6,60	100	50	3	8,41	0,290	106,46	21,29	26,66	3,56	36,06	14,42	16,44	2,07	88,6	25,01	344,54
RHS 100x50x4,0	8,59	100	50	4	10,95	0,286	134,14	26,83	34,10	3,50	44,95	17,98	20,93	2,03	113,0	31,35	261,48
RHS 100x50x5,0	10,48	100	50	5	13,36	0,283	158,19	31,64	40,84	3,44	52,45	20,98	24,95	1,98	134,9	36,80	211,76
RHS 100x50x6,0	12,27	100	50	6	15,63	0,279	178,75	35,75	46,90	3,38	58,67	23,47	28,52	1,94	154,2	41,43	178,72
RHS 100x50x6,3	12,52	100	50	6,3	15,95	0,273	175,68	35,14	46,87	3,32	58,19	23,27	28,63	1,91	158,1	42,07	171,14
RHS 100x60x2,5	5,96	100	60	2,5	7,59	0,311	103,09	20,62	25,11	3,69	46,88	15,63	17,68	2,49	103,3	26,23	410,35
RHS 100x60x3,0	7,07	100	60	3	9,01	0,310	120,57	24,11	29,57	3,66	54,65	18,22	20,79	2,46	121,7	30,64	343,80
RHS 100x70x3,0	7,54	100	70	3	9,61	0,330	134,69	26,94	32,48	3,74	77,74	22,21	25,45	2,84	157,7	36,27	343,14
RHS 100x70x3,5	8,71	100	70	3,5	11,09	0,328	153,37	30,67	37,22	3,72	88,33	25,24	29,14	2,82	181,0	41,29	295,63
RHS 100x70x4,0	9,85	100	70	4	12,55	0,326	171,02	34,20	41,78	3,69	98,29	28,08	32,68	2,80	203,4	46,03	260,01
RHS 100x70x4,5	10,97	100	70	4,5	13,97	0,325	187,68	37,54	46,15	3,67	107,63	30,75	36,07	2,78	225,0	50,51	232,34
RHS 100x70x5,0	12,05	100	70	5	15,36	0,323	203,35	40,67	50,34	3,64	116,38	33,25	39,31	2,75	245,7	54,73	210,23
RHS 100x70x6,0	14,16	100	70	6	18,03	0,319	231,84	46,37	58,18	3,59	132,14	37,76	45,35	2,71	284,5	62,44	177,12
RHS 100x70x7,0	15,82	100	70	7	20,16	0,310	246,06	49,21	63,19	3,49	140,55	40,16	49,33	2,64	318,2	68,39	153,77
RHS 100x70x8,0	17,62	100	70	8	22,44	0,306	264,12	52,82	68,97	3,43	150,49	43,00	53,79	2,59	347,9	73,86	136,20
RHS 100x60x4,0	9,22	100	60	4	11,75	0,306	152,58	30,52	37,94	3,60	68,68	22,89	26,60	2,42	156,3	38,68	260,70
RHS 100x60x5,0	11,27	100	60	5	14,36	0,303	180,77	36,15	45,59	3,55	80,83	26,94	31,88	2,37	187,9	45,75	210,94
RHS 100x60x6,0	13,21	100	60	6	16,83	0,299	205,30	41,06	52,54	3,49	91,20	30,40	36,64	2,33	216,4	51,92	177,86
RHS 100x60x6,3	13,51	100	60	6,3	17,21	0,293	203,38	40,68	52,77	3,44	90,91	30,30	36,92	2,30	223,4	53,00	170,23

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 100x60x7,0	14,72	100	60	7	18,76	0,290	215,73	43,15	56,68	3,39	96,14	32,05	39,60	2,26	239,9	56,40	154,58
RHS 100x60x8,0	16,36	100	60	8	20,84	0,286	230,18	46,04	61,61	3,32	102,18	34,06	42,97	2,21	260,3	60,49	137,06
RHS 100x80x2,5	6,74	100	80	2,5	8,59	0,351	126,86	25,37	29,98	3,84	90,17	22,54	25,77	3,24	165,8	35,73	409,14
RHS 100x80x3,0	8,01	100	80	3	10,21	0,350	148,81	29,76	35,39	3,82	105,64	26,41	30,40	3,22	196,1	41,91	342,57
RHS 100x80x4,0	10,48	100	80	4	13,35	0,346	189,47	37,89	45,62	3,77	134,17	33,54	39,15	3,17	253,8	53,38	259,41
RHS 100x80x5,0	12,84	100	80	5	16,36	0,343	225,94	45,19	55,09	3,72	159,61	39,90	47,24	3,12	307,5	63,72	209,60
RHS 100x80x6,0	15,10	100	80	6	19,23	0,339	258,39	51,68	63,82	3,67	182,10	45,53	54,67	3,08	357,4	72,98	176,47
RHS 100x80x6,3	15,49	100	80	6,3	19,73	0,333	258,77	51,75	64,58	3,62	182,81	45,70	55,39	3,04	371,4	74,97	168,76
RHS 100x80x7,0	16,92	100	80	7	21,56	0,330	276,38	55,28	69,70	3,58	195,03	48,76	59,76	3,01	402,1	80,42	153,06
RHS 100x80x8,0	18,87	100	80	8	24,04	0,326	298,06	59,61	76,33	3,52	210,02	52,50	65,41	2,96	441,8	87,29	135,45
RHS 100x80x2,0	5,45	100	80	2	6,94	0,353	103,80	20,76	24,38	3,87	73,87	18,47	20,97	3,26	134,6	29,24	509,06
RHS 100x80x2,5	6,74	100	80	2,5	8,59	0,351	126,86	25,37	29,98	3,84	90,17	22,54	25,77	3,24	165,8	35,73	409,14
RHS 100x80x3,0	8,01	100	80	3	10,21	0,350	148,81	29,76	35,39	3,82	105,64	26,41	30,40	3,22	196,1	41,91	342,57
RHS 100x80x3,5	9,26	100	80	3,5	11,79	0,348	169,67	33,93	40,60	3,79	120,30	30,07	34,86	3,19	225,4	47,79	295,04
RHS 100x80x4,0	10,48	100	80	4	13,35	0,346	189,47	37,89	45,62	3,77	134,17	33,54	39,15	3,17	253,8	53,38	259,41
RHS 100x80x4,5	11,67	100	80	4,5	14,87	0,345	208,21	41,64	50,45	3,74	147,27	36,82	43,28	3,15	281,2	58,69	231,73
RHS 100x80x5,0	12,84	100	80	5	16,36	0,343	225,94	45,19	55,09	3,72	159,61	39,90	47,24	3,12	307,5	63,72	209,60
RHS 100x80x6,0	15,10	100	80	6	19,23	0,339	258,39	51,68	63,82	3,67	182,10	45,53	54,67	3,08	357,4	72,98	176,47
RHS 100x80x7,0	16,92	100	80	7	21,56	0,330	276,38	55,28	69,70	3,58	195,03	48,76	59,76	3,01	402,1	80,42	153,06
RHS 100x80x8,0	18,87	100	80	8	24,04	0,326	298,06	59,61	76,33	3,52	210,02	52,50	65,41	2,96	441,8	87,29	135,45
RHS 100x40x2,0	4,19	100	40	2	5,34	0,273	65,38	13,08	16,54	3,50	15,61	7,81	8,69	1,71	41,5	13,89	511,77
RHS 100x50x2,0	4,50	100	50	2	5,74	0,293	74,98	15,00	18,50	3,62	25,67	10,27	11,46	2,12	61,6	17,73	510,95
RHS 100x60x2,0	4,82	100	60	2	6,14	0,313	84,59	16,92	20,46	3,71	38,60	12,87	14,43	2,51	84,1	21,56	510,24
RHS 120x40x2,0	4,82	120	40	2	6,14	0,313	104,07	17,34	22,28	4,12	18,50	9,25	10,21	1,74	52,3	16,78	510,24
RHS 120x40x2,5	5,96	120	40	2,5	7,59	0,311	126,71	21,12	27,32	4,09	22,30	11,15	12,47	1,71	63,8	20,27	410,35
RHS 120x40x3,0	7,07	120	40	3	9,01	0,310	148,04	24,67	32,16	4,05	25,79	12,89	14,60	1,69	74,6	23,51	343,80
RHS 120x40x3,5	8,16	120	40	3,5	10,39	0,308	168,10	28,02	36,78	4,02	28,98	14,49	16,63	1,67	84,7	26,49	296,29
RHS 120x40x4,0	9,22	120	40	4	11,75	0,306	186,89	31,15	41,21	3,99	31,90	15,95	18,53	1,65	94,2	29,24	260,70
RHS 120x40x4,5	10,26	120	40	4,5	13,07	0,305	204,46	34,08	45,43	3,96	34,54	17,27	20,33	1,63	103,1	31,76	233,04
RHS 120x40x5,0	11,27	120	40	5	14,36	0,303	220,81	36,80	49,45	3,92	36,93	18,46	22,02	1,60	111,4	34,05	210,94
RHS 120x40x6,0	13,21	120	40	6	16,83	0,299	249,97	41,66	56,89	3,85	40,97	20,49	25,08	1,56	126,0	38,02	177,86
RHS 120x40x7,0	14,72	120	40	7	18,76	0,290	259,27	43,21	61,01	3,72	42,50	21,25	26,86	1,51	135,5	40,37	154,58
RHS 120x40x8,0	16,36	120	40	8	20,84	0,286	274,79	45,80	66,13	3,63	44,39	22,19	28,84	1,46	143,5	42,41	137,06
RHS 120x50x2,0	5,13	120	50	2	6,54	0,333	117,99	19,67	24,64	4,25	30,28	12,11	13,38	2,15	78,4	21,41	509,61
RHS 120x50x2,5	6,35	120	50	2,5	8,09	0,331	143,97	23,99	30,26	4,22	36,70	14,68	16,39	2,13	96,0	26,01	409,71
RHS 120x50x3,0	7,54	120	50	3	9,61	0,330	168,58	28,10	35,67	4,19	42,69	17,08	19,26	2,11	112,9	30,32	343,14
RHS 120x50x3,5	8,71	120	50	3,5	11,09	0,328	191,86	31,98	40,86	4,16	48,27	19,31	22,00	2,09	128,9	34,35	295,63

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 120x50x4,0	9,85	120	50	4	12,55	0,326	213,82	35,64	45,85	4,13	53,43	21,37	24,61	2,06	144,2	38,13	260,01
RHS 120x50x4,5	10,97	120	50	4,5	13,97	0,325	234,49	39,08	50,62	4,10	58,22	23,29	27,09	2,04	158,7	41,65	232,34
RHS 120x50x5,0	12,05	120	50	5	15,36	0,323	253,89	42,32	55,20	4,07	62,62	25,05	29,45	2,02	172,4	44,92	210,23
RHS 120x50x6,0	14,16	120	50	6	18,03	0,319	288,99	48,16	63,73	4,00	70,36	28,14	33,80	1,98	197,5	50,76	177,12
RHS 120x50x7,0	15,82	120	50	7	20,16	0,310	304,02	50,67	68,92	3,88	74,17	29,67	36,59	1,92	217,2	54,89	153,77
RHS 120x50x8,0	17,62	120	50	8	22,44	0,306	325,05	54,17	75,09	3,81	78,58	31,43	39,66	1,87	234,2	58,59	136,20
RHS 120x40x3,0	7,07	120	40	3	9,01	0,310	148,04	24,67	32,16	4,05	25,79	12,89	14,60	1,69	74,6	23,51	343,80
RHS 120x40x4,0	9,22	120	40	4	11,75	0,306	186,89	31,15	41,21	3,99	31,90	15,95	18,53	1,65	94,2	29,24	260,70
RHS 120x40x6,0	13,21	120	40	6	16,83	0,299	249,97	41,66	56,89	3,85	40,97	20,49	25,08	1,56	126,0	38,02	177,86
RHS 120x60x2,5	6,74	120	60	2,5	8,59	0,351	161,23	26,87	33,20	4,33	55,15	18,38	20,56	2,53	132,6	31,75	409,14
RHS 120x60x3,0	8,01	120	60	3	10,21	0,350	189,12	31,52	39,18	4,30	64,40	21,47	24,21	2,51	156,3	37,14	342,57
RHS 120x60x4,0	10,48	120	60	4	13,35	0,346	240,74	40,12	50,49	4,25	81,25	27,08	31,08	2,47	201,1	47,05	259,41
RHS 120x60x5,0	12,84	120	60	5	16,36	0,343	286,97	47,83	60,95	4,19	95,99	32,00	37,38	2,42	242,2	55,85	209,60
RHS 120x60x6,0	15,10	120	60	6	19,23	0,339	328,01	54,67	70,57	4,13	108,77	36,26	43,12	2,38	279,7	63,60	176,47
RHS 120x60x6,3	15,49	120	60	6,3	19,73	0,333	326,97	54,49	71,24	4,07	109,16	36,39	43,69	2,35	289,3	65,14	168,76
RHS 120x60x7,0	16,92	120	60	7	21,56	0,330	348,77	58,13	76,83	4,02	115,92	38,64	47,02	2,32	311,6	69,54	153,06
RHS 120x60x8,0	18,87	120	60	8	24,04	0,326	375,31	62,55	84,05	3,95	123,98	41,33	51,29	2,27	339,6	74,96	135,45
RHS 120x80x3,0	8,96	120	80	3	11,41	0,390	230,20	38,37	46,20	4,49	123,43	30,86	35,02	3,29	255,5	50,80	341,59
RHS 120x80x4,0	11,73	120	80	4	14,95	0,386	294,59	49,10	59,77	4,44	157,29	39,32	45,23	3,24	331,2	64,93	258,41
RHS 120x80x5,0	14,41	120	80	5	18,36	0,383	353,14	58,86	72,45	4,39	187,78	46,94	54,74	3,20	402,3	77,77	208,56
RHS 120x80x6,0	16,98	120	80	6	21,63	0,379	406,06	67,68	84,25	4,33	215,03	53,76	63,55	3,15	468,5	89,40	175,38
RHS 120x80x6,3	17,47	120	80	6,3	22,25	0,373	408,50	68,08	85,57	4,28	217,11	54,28	64,68	3,12	487,8	92,07	167,63
RHS 120x60x2,0	5,45	120	60	2	6,94	0,353	131,92	21,99	27,00	4,36	45,33	15,11	16,75	2,56	107,9	26,05	509,06
RHS 120x60x2,5	6,74	120	60	2,5	8,59	0,351	161,23	26,87	33,20	4,33	55,15	18,38	20,56	2,53	132,6	31,75	409,14
RHS 120x60x3,0	8,01	120	60	3	10,21	0,350	189,12	31,52	39,18	4,30	64,40	21,47	24,21	2,51	156,3	37,14	342,57
RHS 120x60x3,5	9,26	120	60	3,5	11,79	0,348	215,61	35,94	44,94	4,28	73,09	24,36	27,72	2,49	179,2	42,24	295,04
RHS 120x80x7,0	19,12	120	80	7	24,36	0,370	438,27	73,04	92,65	4,24	232,45	58,11	69,98	3,09	529,4	99,06	151,89
RHS 120x80x8,0	21,39	120	80	8	27,24	0,366	475,83	79,31	101,97	4,18	251,66	62,92	76,93	3,04	584,0	108,01	134,23
RHS 120x100x4,0	12,99	120	100	4	16,55	0,426	348,43	58,07	69,05	4,59	263,24	52,65	60,98	3,99	477,8	82,83	257,59
RHS 120x100x5,0	15,98	120	100	5	20,36	0,423	419,31	69,88	83,95	4,54	316,27	63,25	74,09	3,94	582,9	99,75	207,72
RHS 120x100x6,0	18,87	120	100	6	24,03	0,419	484,11	80,68	97,93	4,49	364,56	72,91	86,38	3,89	682,0	115,29	174,51
RHS 120x100x7,0	21,32	120	100	7	27,16	0,410	527,77	87,96	108,47	4,41	397,70	79,54	95,74	3,83	776,2	128,70	150,95
RHS 120x60x4,0	10,48	120	60	4	13,35	0,346	240,74	40,12	50,49	4,25	81,25	27,08	31,08	2,47	201,1	47,05	259,41
RHS 120x60x4,5	11,67	120	60	4,5	14,87	0,345	264,52	44,09	55,82	4,22	88,88	29,63	34,30	2,44	222,1	51,58	231,73
RHS 120x60x5,0	12,84	120	60	5	16,36	0,343	286,97	47,83	60,95	4,19	95,99	32,00	37,38	2,42	242,2	55,85	209,60
RHS 120x60x6,0	15,10	120	60	6	19,23	0,339	328,01	54,67	70,57	4,13	108,77	36,26	43,12	2,38	279,7	63,60	176,47
RHS 120x60x7,0	16,92	120	60	7	21,56	0,330	348,77	58,13	76,83	4,02	115,92	38,64	47,02	2,32	311,6	69,54	153,06

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 120x60x8,0	18,87	120	60	8	24,04	0,326	375,31	62,55	84,05	3,95	123,98	41,33	51,29	2,27	339,6	74,96	135,45
RHS 120x80x2,0	6,07	120	80	2	7,74	0,393	159,77	26,63	31,72	4,54	86,04	21,51	24,09	3,33	175,0	35,32	508,12
RHS 120x100x8,0	23,90	120	100	8	30,44	0,406	576,35	96,06	119,89	4,35	433,83	86,77	105,77	3,78	861,7	141,25	133,26
RHS 120x80x2,5	7,53	120	80	2,5	9,59	0,391	195,75	32,63	39,07	4,52	105,19	26,30	29,65	3,31	215,8	43,23	408,19
RHS 120x80x3,0	8,96	120	80	3	11,41	0,390	230,20	38,37	46,20	4,49	123,43	30,86	35,02	3,29	255,5	50,80	341,59
RHS 120x80x3,5	10,36	120	80	3,5	13,19	0,388	263,13	43,86	53,09	4,47	140,80	35,20	40,21	3,27	293,9	58,03	294,05
RHS 120x80x4,0	11,73	120	80	4	14,95	0,386	294,59	49,10	59,77	4,44	157,29	39,32	45,23	3,24	331,2	64,93	258,41
RHS 120x80x4,5	13,08	120	80	4,5	16,67	0,385	324,58	54,10	66,22	4,41	172,95	43,24	50,07	3,22	367,3	71,51	230,70
RHS 120x80x5,0	14,41	120	80	5	18,36	0,383	353,14	58,86	72,45	4,39	187,78	46,94	54,74	3,20	402,3	77,77	208,56
RHS 120x80x6,0	16,98	120	80	6	21,63	0,379	406,06	67,68	84,25	4,33	215,03	53,76	63,55	3,15	468,5	89,40	175,38
RHS 120x80x7,0	19,12	120	80	7	24,36	0,370	438,27	73,04	92,65	4,24	232,45	58,11	69,98	3,09	529,4	99,06	151,89
RHS 120x80x8,0	21,39	120	80	8	27,24	0,366	475,83	79,31	101,97	4,18	251,66	62,92	76,93	3,04	584,0	108,01	134,23
RHS 120x40x2,0	4,82	120	40	2	6,14	0,313	104,07	17,34	22,28	4,12	18,50	9,25	10,21	1,74	52,3	16,78	510,24
RHS 120x60x2,0	5,45	120	60	2	6,94	0,353	131,92	21,99	27,00	4,36	45,33	15,11	16,75	2,56	107,9	26,05	509,06
RHS 140x60x3,0	8,96	140	60	3	11,41	0,390	278,08	39,73	49,98	4,94	74,16	24,72	27,63	2,55	191,9	43,64	341,59
RHS 140x60x4,0	11,73	140	60	4	14,95	0,386	355,59	50,80	64,63	4,88	93,81	31,27	35,56	2,51	247,1	55,42	258,41
RHS 140x60x6,0	16,98	140	60	6	21,63	0,379	489,19	69,88	91,01	4,76	126,34	42,11	49,60	2,42	344,5	75,29	175,38
RHS 140x60x7,0	19,12	140	60	7	24,36	0,370	524,93	74,99	99,79	4,64	135,69	45,23	54,44	2,36	385,0	82,70	151,89
RHS 140x60x8,0	21,39	140	60	8	27,24	0,366	568,52	81,22	109,70	4,57	145,79	48,60	59,61	2,31	420,7	89,46	134,23
RHS 140x70x3,0	9,43	140	70	3	12,01	0,410	306,24	43,75	54,09	5,05	104,69	29,91	33,49	2,95	252,0	51,66	341,18
RHS 140x70x4,0	12,36	140	70	4	15,75	0,406	392,60	56,09	70,07	4,99	133,18	38,05	43,24	2,91	326,0	65,94	257,98
RHS 140x70x5,0	15,19	140	70	5	19,36	0,403	471,48	67,35	85,05	4,94	158,71	45,35	52,31	2,86	395,1	78,88	208,12
RHS 140x70x6,0	17,92	140	70	6	22,83	0,399	543,10	77,59	99,05	4,88	181,44	51,84	60,71	2,82	459,1	90,54	174,92
RHS 140x70x7,0	20,22	140	70	7	25,76	0,390	586,90	83,84	109,10	4,77	196,34	56,10	66,97	2,76	517,2	100,18	151,39
RHS 140x70x8,0	22,64	140	70	8	28,84	0,386	638,30	91,19	120,26	4,70	212,33	60,67	73,63	2,71	569,1	109,07	133,71
RHS 140x80x3,0	9,90	140	80	3	12,61	0,430	334,40	47,77	58,20	5,15	141,23	35,31	39,64	3,35	317,1	59,69	340,81
RHS 140x80x4,0	12,99	140	80	4	16,55	0,426	429,60	61,37	75,51	5,10	180,42	45,10	51,31	3,30	411,6	76,48	257,59
RHS 140x80x5,0	15,98	140	80	5	20,36	0,423	517,06	73,87	91,80	5,04	215,94	53,99	62,24	3,26	500,5	91,83	207,72
RHS 140x80x6,0	18,87	140	80	6	24,03	0,419	597,00	85,29	107,09	4,98	247,96	61,99	72,43	3,21	583,8	105,83	174,51
RHS 140x80x6,3	19,44	140	80	6,3	24,77	0,413	602,72	86,10	109,08	4,93	251,42	62,85	73,97	3,19	608,5	109,19	166,72
RHS 140x80x7,0	21,32	140	80	7	27,16	0,410	648,87	92,70	118,41	4,89	269,87	67,47	80,20	3,15	661,4	117,72	150,95
RHS 140x80x8,0	23,90	140	80	8	30,44	0,406	708,09	101,16	130,82	4,82	293,31	73,33	88,45	3,10	731,4	128,77	133,26
RHS 140x60x2,0	6,07	140	60	2	7,74	0,393	193,13	27,59	34,34	5,00	52,06	17,35	19,07	2,59	132,3	30,53	508,12
RHS 140x60x2,5	7,53	140	60	2,5	9,59	0,391	236,55	33,79	42,29	4,97	63,43	21,14	23,43	2,57	162,7	37,26	408,19
RHS 140x60x3,0	8,96	140	60	3	11,41	0,390	278,08	39,73	49,98	4,94	74,16	24,72	27,63	2,55	191,9	43,64	341,59
RHS 140x60x3,5	10,36	140	60	3,5	13,19	0,388	317,75	45,39	57,43	4,91	84,28	28,09	31,68	2,53	220,1	49,69	294,05
RHS 140x60x4,0	11,73	140	60	4	14,95	0,386	355,59	50,80	64,63	4,88	93,81	31,27	35,56	2,51	247,1	55,42	258,41

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 140x60x4,5	13,08	140	60	4,5	16,67	0,385	391,63	55,95	71,59	4,85	102,77	34,26	39,30	2,48	273,1	60,83	230,70
RHS 140x60x5,0	14,41	140	60	5	18,36	0,383	425,89	60,84	78,30	4,82	111,16	37,05	42,88	2,46	298,0	65,94	208,56
RHS 140x60x6,0	16,98	140	60	6	21,63	0,379	489,19	69,88	91,01	4,76	126,34	42,11	49,60	2,42	344,5	75,29	175,38
RHS 140x60x7,0	19,12	140	60	7	24,36	0,370	524,93	74,99	99,79	4,64	135,69	45,23	54,44	2,36	385,0	82,70	151,89
RHS 140x60x8,0	21,39	140	60	8	27,24	0,366	568,52	81,22	109,70	4,57	145,79	48,60	59,61	2,31	420,7	89,46	134,23
RHS 150x50x7,0	19,12	150	50	7	24,36	0,370	559,30	74,57	102,31	4,79	93,75	37,50	45,62	1,96	291,8	70,53	151,89
RHS 150x50x8,0	21,39	150	50	8	27,24	0,366	604,42	80,59	112,36	4,71	100,00	40,00	49,74	1,92	315,9	75,68	134,23
RHS 150x50x3,0	8,96	150	50	3	11,41	0,390	298,55	39,81	51,43	5,12	52,65	21,06	23,49	2,15	150,2	38,28	341,59
RHS 150x50x4,0	11,73	150	50	4	14,95	0,386	381,39	50,85	66,47	5,05	66,16	26,47	30,13	2,10	192,1	48,30	258,41
RHS 150x50x7,0	19,12	150	50	7	24,36	0,370	559,30	74,57	102,31	4,79	93,75	37,50	45,62	1,96	291,8	70,53	151,89
RHS 150x50x8,0	21,39	150	50	8	27,24	0,366	604,42	80,59	112,36	4,71	100,00	40,00	49,74	1,92	315,9	75,68	134,23
RHS 150x70x7,0	21,32	150	70	7	27,16	0,410	702,56	93,67	122,33	5,09	210,29	60,08	71,38	2,78	568,5	108,14	150,95
RHS 150x70x8,0	23,90	150	70	8	30,44	0,406	765,90	102,12	135,08	5,02	227,80	65,08	78,59	2,74	626,2	117,88	133,26
RHS 150x75x7,0	21,87	150	75	7	27,86	0,420	738,37	98,45	127,34	5,15	247,69	66,05	78,26	2,98	647,0	117,59	150,75
RHS 150x75x8,0	24,53	150	75	8	31,24	0,416	806,27	107,50	140,76	5,08	269,01	71,74	86,30	2,93	714,5	128,51	133,04
RHS 150x100x4,0	14,87	150	100	4	18,95	0,486	594,60	79,28	95,67	5,60	318,57	63,71	72,50	4,10	661,6	104,94	256,63
RHS 150x100x5,0	18,33	150	100	5	23,36	0,483	719,20	95,89	116,73	5,55	384,02	76,80	88,34	4,05	808,7	126,81	206,73
RHS 150x100x6,0	21,69	150	100	6	27,63	0,479	834,69	111,29	136,68	5,50	444,19	88,84	103,30	4,01	948,3	147,07	173,49
RHS 150x100x6,3	22,41	150	100	6,3	28,55	0,473	848,27	113,10	139,88	5,45	452,66	90,53	105,90	3,98	991,6	152,27	165,66
RHS 150x100x7,0	24,62	150	100	7	31,36	0,470	917,44	122,33	152,36	5,41	488,68	97,74	115,27	3,95	1082,8	165,00	149,87
RHS 150x100x8,0	27,67	150	100	8	35,24	0,466	1008,13	134,42	169,16	5,35	535,65	107,13	127,85	3,90	1205,9	181,85	132,13
RHS 150x100x10,0	33,41	150	100	10	42,57	0,457	1161,70	154,89	199,17	5,22	614,41	122,88	150,25	3,80	1425,9	210,96	107,38
RHS 150x100x12,0	37,73	150	100	12	48,06	0,438	1207,01	160,93	214,86	5,01	641,82	128,36	162,52	3,65	1572,9	228,66	91,18
RHS 150x100x12,5	38,89	150	100	12,5	49,54	0,436	1224,99	163,33	219,64	4,97	651,27	130,25	166,10	3,63	1606,3	232,86	87,93
RHS 150x50x2,0	6,07	150	50	2	7,74	0,393	207,53	27,67	35,35	5,18	37,20	14,88	16,26	2,19	104,2	26,94	508,12
RHS 150x50x2,5	7,53	150	50	2,5	9,59	0,391	254,08	33,88	43,52	5,15	45,17	18,07	19,95	2,17	127,7	32,78	408,19
RHS 150x50x3,0	8,96	150	50	3	11,41	0,390	298,55	39,81	51,43	5,12	52,65	21,06	23,49	2,15	150,2	38,28	341,59
RHS 150x50x3,5	10,36	150	50	3,5	13,19	0,388	340,98	45,46	59,08	5,08	59,64	23,86	26,88	2,13	171,7	43,45	294,05
RHS 150x50x4,0	11,73	150	50	4	14,95	0,386	381,39	50,85	66,47	5,05	66,16	26,47	30,13	2,10	192,1	48,30	258,41
RHS 150x50x4,5	13,08	150	50	4,5	16,67	0,385	419,82	55,98	73,60	5,02	72,23	28,89	33,24	2,08	211,6	52,85	230,70
RHS 150x50x5,0	14,41	150	50	5	18,36	0,383	456,29	60,84	80,48	4,99	77,87	31,15	36,20	2,06	230,1	57,11	208,56
RHS 150x50x6,0	16,98	150	50	6	21,63	0,379	523,47	69,80	93,48	4,92	87,89	35,16	41,72	2,02	264,0	64,77	175,38
RHS 160x80x4,0	14,25	160	80	4	18,15	0,466	597,71	74,71	92,86	5,74	203,54	50,89	57,39	3,35	494,1	88,03	256,92
RHS 160x80x5,0	17,55	160	80	5	22,36	0,463	721,69	90,21	113,16	5,68	244,11	61,03	69,74	3,30	601,3	105,90	207,03
RHS 160x80x6,0	20,75	160	80	6	26,43	0,459	836,01	104,50	132,32	5,62	280,89	70,22	81,31	3,26	702,1	122,27	173,80
RHS 160x80x6,3	21,42	160	80	6,3	27,29	0,453	846,48	105,81	135,11	5,57	285,72	71,43	83,25	3,24	732,3	126,31	165,98
RHS 160x80x7,0	23,52	160	80	7	29,96	0,450	913,78	114,22	146,97	5,52	307,28	76,82	90,42	3,20	796,7	136,39	150,20

8. FERPINTA PROFILE TABLES

Designation	Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 160x80x8,0	26,41	160	80	8	33,64	0,446	1001,22	125,15	162,86	5,46	334,95	83,74	99,97	3,16	882,3	149,54	132,47
RHS 160x80x10,0	31,84	160	80	10	40,57	0,437	1146,34	143,29	190,95	5,32	379,81	94,95	116,68	3,06	1030,7	171,57	107,74
RHS 160x80x12,0	35,84	160	80	12	45,66	0,418	1170,66	146,33	203,97	5,06	391,28	97,82	125,02	2,93	1111,0	182,61	91,59
RHS 160x80x12,5	36,93	160	80	12,5	47,04	0,416	1184,62	148,08	208,16	5,02	395,75	98,94	127,49	2,90	1129,0	185,22	88,35
RHS 160x90x7,0	24,62	160	90	7	31,36	0,470	995,77	124,47	157,68	5,64	405,31	90,07	105,75	3,60	986,6	156,73	149,87
RHS 160x90x8,0	27,67	160	90	8	35,24	0,466	1093,73	136,72	175,02	5,57	443,46	98,55	117,19	3,55	1096,5	172,44	132,13
RHS 160x120x7,0	27,91	160	120	7	35,56	0,530	1241,74	155,22	189,81	5,91	796,26	132,71	155,93	4,73	1621,5	217,92	149,04
RHS 160x120x8,0	31,43	160	120	8	40,04	0,526	1371,23	171,40	211,50	5,85	877,92	146,32	173,65	4,68	1813,9	241,38	131,28
RHS 160x140x7,0	30,11	160	140	7	38,36	0,570	1405,71	175,71	211,23	6,05	1144,62	163,52	192,89	5,46	2087,3	258,79	148,59
RHS 160x140x8,0	33,95	160	140	8	43,24	0,566	1556,23	194,53	235,82	6,00	1266,34	180,91	215,30	5,41	2340,5	287,45	130,81
RHS 180x80x7,0	25,71	180	80	7	32,76	0,490	1238,61	137,62	178,33	6,15	344,70	86,18	100,64	3,24	934,4	155,07	149,57
RHS 180x80x8,0	28,92	180	80	8	36,84	0,486	1361,65	151,29	198,10	6,08	376,59	94,15	111,49	3,20	1036,0	170,32	131,82
RHS 180x100x4,0	16,76	180	100	4	21,35	0,546	926,04	102,89	125,89	6,59	373,89	74,78	84,02	4,18	853,8	127,06	255,89
RHS 180x100x5,0	20,69	180	100	5	26,36	0,543	1124,20	124,91	154,02	6,53	451,77	90,35	102,59	4,14	1044,8	153,88	205,96
RHS 180x100x6,0	24,52	180	100	6	31,23	0,539	1309,61	145,51	180,83	6,48	523,83	104,77	120,22	4,10	1226,7	178,88	172,70
RHS 180x100x6,3	25,38	180	100	6,3	32,33	0,533	1334,99	148,33	185,54	6,43	535,75	107,15	123,61	4,07	1283,4	185,46	164,85
RHS 180x100x7,0	27,91	180	100	7	35,56	0,530	1448,23	160,91	202,55	6,38	579,67	115,93	134,80	4,04	1403,0	201,33	149,04
RHS 180x100x8,0	31,43	180	100	8	40,04	0,526	1598,49	177,61	225,62	6,32	637,47	127,49	149,93	3,99	1565,2	222,49	131,28
RHS 180x100x10,0	38,12	180	100	10	48,57	0,517	1859,47	206,61	267,51	6,19	736,41	147,28	177,25	3,89	1858,6	259,61	106,47
RHS 180x100x12,0	43,38	180	100	12	55,26	0,498	1965,14	218,35	292,35	5,96	782,08	156,42	194,20	3,76	2072,9	284,53	90,16
RHS 180x100x12,5	44,78	180	100	12,5	57,04	0,496	2001,02	222,34	299,58	5,92	795,80	159,16	198,91	3,74	2121,7	290,41	86,88
RHS 180x120x7,0	30,11	180	120	7	38,36	0,570	1657,85	184,21	226,77	6,57	885,76	147,63	171,75	4,81	1925,6	247,70	148,59
RHS 180x120x8,0	33,95	180	120	8	43,24	0,566	1835,33	203,93	253,14	6,51	978,44	163,07	191,57	4,76	2156,3	274,82	130,81
RHS 180x140x7,0	32,31	180	140	7	41,16	0,610	1867,46	207,50	250,99	6,74	1268,55	181,22	211,51	5,55	2491,2	294,14	148,20
RHS 180x140x8,0	36,46	180	140	8	46,44	0,606	2072,18	230,24	280,66	6,68	1405,90	200,84	236,42	5,50	2796,6	327,23	130,41
RHS 200x150x8,0	40,23	200	150	8	51,24	0,666	2828,55	282,85	344,06	7,43	1815,54	242,07	282,76	5,95	3664,9	396,44	129,90
RHS 200x160x3,0	16,49	200	160	3	21,01	0,710	1273,64	127,36	148,71	7,79	907,55	113,44	127,93	6,57	1638,0	179,44	337,82
RHS 200x160x4,0	21,78	200	160	4	27,75	0,706	1660,76	166,08	195,08	7,74	1181,90	147,74	167,74	6,53	2153,4	233,90	254,53
RHS 200x160x5,0	26,97	200	160	5	34,36	0,703	2029,75	202,98	239,87	7,69	1442,69	180,34	206,16	6,48	2653,4	285,82	204,57
RHS 200x160x6,0	32,05	200	160	6	40,83	0,699	2380,97	238,10	283,11	7,64	1690,22	211,28	243,20	6,43	3138,0	335,27	171,28
RHS 200x160x7,0	36,70	200	160	7	46,76	0,690	2672,39	267,24	320,56	7,56	1897,65	237,21	275,49	6,37	3621,2	381,54	147,56
RHS 200x160x8,0	41,48	200	160	8	52,84	0,686	2976,09	297,61	359,42	7,50	2111,24	263,91	308,78	6,32	4075,5	425,87	129,76
RHS 200x80x8,0	31,43	200	80	8	40,04	0,526	1795,76	179,58	236,54	6,70	418,23	104,56	123,01	3,23	1191,8	191,11	131,28
RHS 200x100x4,0	18,01	200	100	4	22,95	0,586	1199,71	119,97	148,04	7,23	410,78	82,16	91,70	4,23	985,4	141,81	255,48
RHS 200x100x5,0	22,26	200	100	5	28,36	0,583	1459,25	145,93	181,37	7,17	496,94	99,39	112,09	4,19	1206,3	171,94	205,54
RHS 200x100x6,0	26,40	200	100	6	33,63	0,579	1703,31	170,33	213,27	7,12	576,91	115,38	131,50	4,14	1417,0	200,10	172,27

8.1 STRUCTURAL STEEL HOLLOW SECTIONS ACCORDING TO EN10219

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 200x100x6,3	27,36	200	100	6,3	34,85	0,573	1739,24	173,92	219,13	7,06	591,15	118,23	135,41	4,12	1482,8	207,60	164,41
RHS 200x100x7,0	30,11	200	100	7	38,36	0,570	1889,81	188,98	239,50	7,02	640,33	128,07	147,82	4,09	1621,8	225,57	148,59
RHS 200x100x8,0	33,95	200	100	8	43,24	0,566	2090,84	209,08	267,26	6,95	705,36	141,07	164,65	4,04	1810,7	249,60	130,81
RHS 200x100x10,0	41,26	200	100	10	52,57	0,557	2444,40	244,44	318,08	6,82	817,74	163,55	195,25	3,94	2154,1	292,07	105,98
RHS 200x100x12,0	47,15	200	100	12	60,06	0,538	2606,70	260,67	350,01	6,59	875,58	175,12	215,32	3,82	2414,4	321,81	89,61
RHS 200x100x12,5	48,70	200	100	12,5	62,04	0,536	2658,89	265,89	359,13	6,55	892,15	178,43	220,78	3,79	2473,8	328,83	86,33
RHS 200x120x4,0	19,27	200	120	4	24,55	0,626	1353,39	135,34	163,72	7,43	617,66	102,94	115,45	5,02	1345,3	172,49	255,12
RHS 200x120x5,0	23,83	200	120	5	30,36	0,623	1649,42	164,94	200,87	7,37	750,14	125,02	141,45	4,97	1652,0	209,87	205,17
RHS 200x120x6,0	28,29	200	120	6	36,03	0,619	1929,20	192,92	236,55	7,32	874,35	145,72	166,33	4,93	1946,7	245,12	171,90
RHS 200x120x6,3	29,34	200	120	6,3	37,37	0,613	1975,70	197,57	243,54	7,27	897,66	149,61	171,52	4,90	2040,2	254,71	164,03
RHS 200x120x7,0	32,31	200	120	7	41,16	0,610	2150,67	215,07	266,52	7,23	975,25	162,54	187,57	4,87	2237,0	277,50	148,20
RHS 200x120x8,0	36,46	200	120	8	46,44	0,606	2385,92	238,59	297,98	7,17	1078,97	179,83	209,49	4,82	2507,0	308,27	130,41
RHS 200x120x10,0	44,40	200	120	10	56,57	0,597	2805,73	280,57	356,08	7,04	1262,14	210,36	249,82	4,72	3007,0	363,69	105,55
RHS 200x120x12,0	50,91	200	120	12	64,86	0,578	3031,41	303,14	395,13	6,84	1367,87	227,98	277,77	4,59	3418,9	405,70	89,15
RHS 200x120x12,5	52,63	200	120	12,5	67,04	0,576	3099,00	309,90	406,00	6,80	1397,43	232,91	285,33	4,57	3513,8	415,67	85,86
RHS 200x150x7,0	35,61	200	150	7	45,36	0,670	2541,96	254,20	307,05	7,49	1633,73	217,83	252,46	6,00	3258,9	355,51	147,71
RHS 220x120x7,0	34,51	220	120	7	43,96	0,650	2725,81	247,80	309,08	7,87	1064,75	177,46	203,39	4,92	2554,3	307,30	147,86
RHS 220x120x8,0	38,97	220	120	8	49,64	0,646	3029,40	275,40	346,02	7,81	1179,49	196,58	227,41	4,87	2864,4	341,73	130,06
RHS 220x140x6,0	32,05	220	140	6	40,83	0,699	2713,97	246,72	299,46	8,15	1351,66	193,09	219,65	5,75	2890,8	320,95	171,28
RHS 220x140x7,0	36,70	220	140	7	46,76	0,690	3043,51	276,68	338,90	8,07	1516,43	216,63	248,75	5,69	3331,9	364,87	147,56
RHS 220x140x8,0	41,48	220	140	8	52,84	0,686	3389,12	308,10	379,94	8,01	1685,02	240,72	278,66	5,65	3745,7	406,85	129,76
RHS 250x100x7,0	35,61	250	100	7	45,36	0,670	3341,65	267,33	344,15	8,58	791,97	158,39	180,37	4,18	2181,6	286,17	147,71
RHS 250x100x8,0	40,23	250	100	8	51,24	0,666	3714,08	297,13	385,37	8,51	875,06	175,01	201,45	4,13	2438,7	317,41	129,90
RHS 250x150x4,0	24,29	250	150	4	30,95	0,786	2696,87	215,75	259,61	9,33	1234,24	164,57	183,27	6,32	2664,7	275,38	254,06
RHS 250x150x5,0	30,11	250	150	5	38,36	0,783	3304,18	264,33	319,76	9,28	1507,95	201,06	225,48	6,27	3284,5	336,90	204,10
RHS 250x150x6,0	35,82	250	150	6	45,63	0,779	3885,56	310,84	378,05	9,23	1768,35	235,78	266,28	6,23	3885,8	395,65	170,80
RHS 250x150x6.3	37,25	250	150	6,3	47,45	0,773	4001,43	320,11	390,90	9,18	1824,59	243,28	275,68	6,20	4077,7	412,18	162,90
RHS 250x150x7,0	41,10	250	150	7	52,36	0,770	4375,30	350,02	429,20	9,14	1991,87	265,58	302,51	6,17	4485,1	450,92	147,06
RHS 250x150x8,0	46,51	250	150	8	59,24	0,766	4885,79	390,86	482,17	9,08	2219,25	295,90	339,56	6,12	5050,4	503,96	129,24
RHS 250x150x10,0	56,96	250	150	10	72,57	0,757	5825,01	466,00	582,00	8,96	2634,20	351,23	409,17	6,02	6120,7	602,08	104,33
RHS 250x150x12,0	65,99	250	150	12	84,06	0,738	6457,90	516,63	657,96	8,77	2925,29	390,04	463,26	5,90	7088,5	684,43	87,82
RHS 250x150x12,5	68,33	250	150	12,5	87,04	0,736	6632,67	530,61	678,30	8,73	3002,33	400,31	477,46	5,87	7314,5	704,10	84,51
RHS 250x200x4,0	27,43	250	200	4	34,95	0,886	3302,08	264,17	308,81	9,72	2352,35	235,23	265,64	8,20	4253,8	372,15	253,60
RHS 250x200x5,0	34,03	250	200	5	43,36	0,883	4054,59	324,37	381,01	9,67	2885,50	288,55	327,62	8,16	5257,4	456,84	203,62
RHS 250x200x6,0	40,53	250	200	6	51,63	0,879	4778,78	382,30	451,25	9,62	3397,47	339,75	387,87	8,11	6237,0	538,36	170,32
RHS 250x200x7,0	46,60	250	200	7	59,36	0,870	5408,94	432,72	514,25	9,55	3846,24	384,62	442,15	8,05	7220,5	615,99	146,56

8. FERPINTA PROFILE TABLES

Designation	Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
RHS 250x200x8,0	52,79	250	200	8	67,24	0,866	6057,50	484,60	578,97	9,49	4303,96	430,40	497,66	8,00	8156,0	690,98	128,74
RHS 260x140x6,0	35,82	260	140	6	45,63	0,779	4081,53	313,96	385,92	9,46	1567,27	223,90	251,81	5,86	3646,2	382,52	170,80
RHS 260x140x8,0	46,51	260	140	8	59,24	0,766	5128,80	394,52	492,03	9,30	1964,15	280,59	320,90	5,76	4731,1	486,51	129,24
RHS 260x180x5,0	33,25	260	180	5	42,36	0,863	4121,36	317,03	377,44	9,86	2349,53	261,06	294,02	7,45	4694,9	425,87	203,71
RHS 260x180x6,0	39,59	260	180	6	50,43	0,859	4855,87	373,53	446,88	9,81	2763,43	307,05	347,87	7,40	5565,7	501,44	170,40
RHS 260x180x6,3	41,20	260	180	6,3	52,49	0,853	5012,66	385,59	462,88	9,77	2856,31	317,37	360,63	7,38	5844,3	522,95	162,50
RHS 260x180x8,0	51,53	260	180	8	65,64	0,846	6145,21	472,71	572,67	9,68	3493,23	388,14	445,78	7,29	7266,7	642,43	128,83
RHS 260x180x10,0	63,24	260	180	10	80,57	0,837	7363,31	566,41	693,78	9,56	4174,13	463,79	539,51	7,20	8850,3	771,94	103,90
RHS 260x180x12,0	73,52	260	180	12	93,66	0,818	8245,01	634,23	789,87	9,38	4679,25	519,92	614,91	7,07	10328,3	884,40	87,36
RHS 260x180x12,5	76,18	260	180	12,5	97,04	0,816	8482,47	652,50	815,26	9,35	4811,85	534,65	634,58	7,04	10676,0	911,40	84,05
RHS 300x150x4,0	27,43	300	150	4	34,95	0,886	4196,67	279,78	341,98	10,96	1447,46	192,99	212,47	6,44	3417,1	332,23	253,60
RHS 300x150x5,0	34,03	300	150	5	43,36	0,883	5153,13	343,54	421,90	10,90	1770,87	236,12	261,73	6,39	4214,3	406,98	203,62
RHS 300x150x6,0	40,53	300	150	6	51,63	0,879	6073,51	404,90	499,63	10,85	2079,57	277,28	309,48	6,35	4988,5	478,60	170,32
RHS 300x150x6,3	42,19	300	150	6,3	53,75	0,873	6265,59	417,71	517,39	10,80	2150,03	286,67	320,94	6,32	5234,4	498,91	162,41
RHS 300x150x8,0	52,79	300	150	8	67,24	0,866	7683,57	512,24	640,27	10,69	2622,95	349,73	396,36	6,25	6490,6	611,52	128,74
RHS 300x150x10,0	64,81	300	150	10	82,57	0,857	9209,37	613,96	775,91	10,56	3125,03	416,67	479,17	6,15	7878,6	732,81	103,80
RHS 300x150x12,0	75,41	300	150	12	96,06	0,838	10298,07	686,54	883,11	10,35	3498,05	466,41	546,06	6,03	9153,1	836,91	87,26
RHS 300x150x12,5	78,14	300	150	12,5	99,54	0,836	10594,23	706,28	911,53	10,32	3594,78	479,30	563,39	6,01	9451,9	861,80	83,94
RHS 300x200x4,0	30,57	300	200	4	38,95	0,986	5072,88	338,19	401,18	11,41	2736,56	273,66	304,84	8,38	5527,0	448,98	253,23
RHS 300x200x5,0	37,96	300	200	5	48,36	0,983	6241,05	416,07	495,65	11,36	3360,92	336,09	376,37	8,34	6835,8	551,89	203,25
RHS 300x200x6,0	45,24	300	200	6	57,63	0,979	7370,23	491,35	587,83	11,31	3962,19	396,22	446,07	8,29	8115,2	651,24	169,94
RHS 300x200x6,3	47,14	300	200	6,3	60,05	0,973	7624,39	508,29	609,91	11,27	4103,82	410,38	463,19	8,27	8523,5	679,80	162,03
RHS 300x200x7,0	52,09	300	200	7	66,36	0,970	8365,75	557,72	671,39	11,23	4498,39	449,84	509,70	8,23	9400,0	746,32	146,17
RHS 300x200x8,0	59,07	300	200	8	75,24	0,966	9389,27	625,95	757,07	11,17	5041,67	504,17	574,46	8,19	10626,5	838,38	128,34
RHS 300x200x10,0	72,66	300	200	10	92,57	0,957	11312,70	754,18	920,91	11,05	6057,73	605,77	698,08	8,09	12987,1	1012,19	103,39
RHS 300x200x12,0	84,83	300	200	12	108,06	0,938	12787,83	852,52	1055,91	10,88	6853,74	685,37	801,21	7,96	15235,6	1167,14	86,82
RHS 300x200x12,5	87,95	300	200	12,5	112,04	0,936	13178,86	878,59	1091,22	10,85	7059,94	705,99	827,88	7,94	15767,7	1204,48	83,50
RHS 300x100x4,0	24,29	300	100	4	30,95	0,786	3320,46	221,36	282,78	10,36	595,21	119,04	130,10	4,39	1667,9	215,55	254,06
RHS 300x100x5,0	30,11	300	100	5	38,36	0,783	4065,22	271,01	348,15	10,29	722,77	144,55	159,59	4,34	2043,8	262,23	204,10
RHS 300x100x6,0	35,82	300	100	6	45,63	0,779	4776,79	318,45	411,43	10,23	842,35	168,47	187,90	4,30	2403,5	306,21	170,80
RHS 300x100x6,3	37,25	300	100	6,3	47,45	0,773	4906,80	327,12	424,88	10,17	868,12	173,62	194,45	4,28	2515,2	318,32	162,90
RHS 300x100x8,0	46,51	300	100	8	59,24	0,766	5977,86	398,52	523,47	10,05	1044,77	208,95	238,25	4,20	3080,3	385,24	129,24
RHS 300x100x10,0	56,96	300	100	10	72,57	0,757	7106,03	473,74	630,91	9,90	1224,41	244,88	285,25	4,11	3681,0	454,51	104,33
RHS 300x100x12,0	65,99	300	100	12	84,06	0,738	7808,31	520,55	710,31	9,64	1343,10	268,62	320,92	4,00	4177,5	508,49	87,82
RHS 300x100x12,5	68,33	300	100	12,5	87,04	0,736	8009,59	533,97	731,85	9,59	1373,92	274,78	330,16	3,97	4291,5	521,17	84,51

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

8.2 Structural steel hollow sections in high strength steel

Sections 8.2.1, 8.2.2 and 8.2.3 present the list of circular hollow sections, *FERPINTA* CHS; square hollow sections, *FERPINTA* SHS; and rectangular hollow sections, *FERPINTA* RHS; respectively. Listed profiles are produced in steel grades S460 MC; S500 MC; S550 MC; S600 MC; S650 MC; and S700 MC. Since there is no product standard for these steels at the moment, as a simplification, presented properties in sections 8.2.1 to 8.2.3 are determined according to EN 10219.

8.2.1 Circular hollow sections, *FERPINTA* CHS

Designation	Dimensions			Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	It [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 48,2x1,5	1,73	48,2	1,5	2,20	0,151	6,01	2,49	3,27	1,65	12,01	4,98	688,08
CHS 48,2x2,0	2,28	48,2	2	2,90	0,151	7,76	3,22	4,27	1,63	15,52	6,44	521,65
CHS 48,2x2,3	2,60	48,2	2,3	3,32	0,151	8,76	3,63	4,85	1,62	17,51	7,27	456,57
CHS 48,2x2,5	2,82	48,2	2,5	3,59	0,151	9,40	3,90	5,23	1,62	18,80	7,80	421,88
CHS 48,2x3,0	3,34	48,2	3	4,26	0,151	10,93	4,53	6,14	1,60	21,85	9,07	355,46
CHS 48,2x3,2	3,55	48,2	3,2	4,52	0,151	11,51	4,78	6,49	1,60	23,02	9,55	334,72
CHS 48,2x3,5	3,86	48,2	3,5	4,92	0,151	12,35	5,12	7,01	1,59	24,70	10,25	308,09
CHS 48,2x4,0	4,36	48,2	4	5,55	0,151	13,68	5,67	7,84	1,57	27,35	11,35	272,62
CHS 48,2x4,5	4,85	48,2	4,5	6,18	0,151	14,90	6,18	8,62	1,55	29,81	12,37	245,11
CHS 48,2x5,0	5,33	48,2	5	6,79	0,151	16,04	6,66	9,37	1,54	32,08	13,31	223,15
CHS 48,2x6,0	6,24	48,2	6	7,95	0,151	18,07	7,50	10,76	1,51	36,13	14,99	190,36
CHS 48,2x7,0	7,11	48,2	7	9,06	0,151	19,78	8,21	12,00	1,48	39,56	16,41	167,13
CHS 48,2x8,0	7,93	48,2	8	10,10	0,151	21,22	8,80	13,10	1,45	42,44	17,61	149,88
CHS 50x1,5	1,79	50	1,5	2,29	0,157	6,73	2,69	3,53	1,72	13,45	5,38	687,29
CHS 50x2,0	2,37	50	2	3,02	0,157	8,70	3,48	4,61	1,70	17,40	6,96	520,83
CHS 50x2,3	2,71	50	2,3	3,45	0,157	9,83	3,93	5,24	1,69	19,65	7,86	455,75
CHS 50x2,5	2,93	50	2,5	3,73	0,157	10,55	4,22	5,65	1,68	21,10	8,44	421,05
CHS 50x3,0	3,48	50	3	4,43	0,157	12,28	4,91	6,64	1,67	24,56	9,82	354,61
CHS 50x3,2	3,69	50	3,2	4,70	0,157	12,94	5,18	7,02	1,66	25,88	10,35	333,87
CHS 50x3,5	4,01	50	3,5	5,11	0,157	13,90	5,56	7,58	1,65	27,80	11,12	307,22
CHS 50x4,0	4,54	50	4	5,78	0,157	15,41	6,16	8,49	1,63	30,81	12,32	271,74
CHS 50x4,5	5,05	50	4,5	6,43	0,157	16,81	6,72	9,35	1,62	33,62	13,45	244,20
CHS 50x5,0	5,55	50	5	7,07	0,157	18,11	7,25	10,17	1,60	36,23	14,49	222,22
CHS 50x6,0	6,51	50	6	8,29	0,157	20,44	8,18	11,69	1,57	40,89	16,36	189,39
CHS 50x7,0	7,42	50	7	9,46	0,157	22,43	8,97	13,06	1,54	44,87	17,95	166,11
CHS 50x8,0	8,29	50	8	10,56	0,157	24,12	9,65	14,28	1,51	48,24	19,30	148,81
CHS 50,8x1,5	1,82	50,8	1,5	2,32	0,160	7,06	2,78	3,65	1,74	14,13	5,56	686,95
CHS 50,8x2,0	2,41	50,8	2	3,07	0,160	9,14	3,60	4,77	1,73	18,29	7,20	520,49

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 50,8x2,3	2,75	50,8	2,3	3,50	0,160	10,33	4,07	5,41	1,72	20,65	8,13	455,40
CHS 50,8x2,5	2,98	50,8	2,5	3,79	0,160	11,09	4,37	5,84	1,71	22,18	8,73	420,70
CHS 50,8x3,0	3,54	50,8	3	4,51	0,160	12,92	5,09	6,86	1,69	25,83	10,17	354,25
CHS 50,8x3,2	3,76	50,8	3,2	4,79	0,160	13,61	5,36	7,26	1,69	27,23	10,72	333,51
CHS 50,8x3,5	4,08	50,8	3,5	5,20	0,160	14,62	5,76	7,84	1,68	29,25	11,52	306,86
CHS 50,8x4,0	4,62	50,8	4	5,88	0,160	16,22	6,39	8,78	1,66	32,44	12,77	271,37
CHS 50,8x4,5	5,14	50,8	4,5	6,55	0,160	17,71	6,97	9,68	1,64	35,41	13,94	243,82
CHS 50,8x5,0	5,65	50,8	5	7,19	0,160	19,09	7,52	10,53	1,63	38,18	15,03	221,83
CHS 50,8x6,0	6,63	50,8	6	8,44	0,160	21,57	8,49	12,11	1,60	43,13	16,98	188,99
CHS 50,8x7,0	7,56	50,8	7	9,63	0,160	23,69	9,33	13,54	1,57	47,38	18,65	165,69
CHS 50,8x8,0	8,44	50,8	8	10,76	0,160	25,49	10,04	14,83	1,54	50,98	20,07	148,36
CHS 60,3x1,5	2,18	60,3	1,5	2,77	0,189	11,98	3,97	5,19	2,08	23,97	7,95	683,67
CHS 60,3x2,0	2,88	60,3	2	3,66	0,189	15,58	5,17	6,80	2,06	31,16	10,34	517,15
CHS 60,3x2,3	3,29	60,3	2,3	4,19	0,189	17,65	5,85	7,74	2,05	35,30	11,71	452,02
CHS 60,3x2,5	3,56	60,3	2,5	4,54	0,189	18,99	6,30	8,36	2,05	37,99	12,60	417,30
CHS 60,3x3,0	4,24	60,3	3	5,40	0,189	22,22	7,37	9,86	2,03	44,45	14,74	350,79
CHS 60,3x3,2	4,51	60,3	3,2	5,74	0,189	23,47	7,78	10,44	2,02	46,94	15,57	330,01
CHS 60,3x3,5	4,90	60,3	3,5	6,25	0,189	25,28	8,39	11,31	2,01	50,56	16,77	303,32
CHS 60,3x4,0	5,55	60,3	4	7,07	0,189	28,17	9,34	12,70	2,00	56,35	18,69	267,76
CHS 60,3x4,5	6,19	60,3	4,5	7,89	0,189	30,90	10,25	14,04	1,98	61,80	20,50	240,14
CHS 60,3x5,0	6,82	60,3	5	8,69	0,189	33,48	11,10	15,33	1,96	66,95	22,21	218,08
CHS 60,3x6,0	8,03	60,3	6	10,24	0,189	38,18	12,66	17,76	1,93	76,37	25,33	185,08
CHS 60,3x7,0	9,20	60,3	7	11,72	0,189	42,34	14,04	20,00	1,90	84,68	28,09	161,62
CHS 60,3x8,0	10,32	60,3	8	13,14	0,189	45,99	15,25	22,05	1,87	91,99	30,51	144,12
CHS 65x1,5	2,35	65	1,5	2,99	0,204	15,09	4,64	6,05	2,25	30,18	9,29	682,41
CHS 65x2,0	3,11	65	2	3,96	0,204	19,66	6,05	7,94	2,23	39,32	12,10	515,87
CHS 65x2,3	3,56	65	2,3	4,53	0,204	22,29	6,86	9,05	2,22	44,59	13,72	450,73
CHS 65x2,5	3,85	65	2,5	4,91	0,204	24,01	7,39	9,77	2,21	48,01	14,77	416,00
CHS 65x3,0	4,59	65	3	5,84	0,204	28,14	8,66	11,54	2,19	56,29	17,32	349,46
CHS 65x3,2	4,88	65	3,2	6,21	0,204	29,74	9,15	12,23	2,19	59,48	18,30	328,68
CHS 65x3,5	5,31	65	3,5	6,76	0,204	32,07	9,87	13,25	2,18	64,15	19,74	301,97
CHS 65x4,0	6,02	65	4	7,67	0,204	35,81	11,02	14,91	2,16	71,61	22,04	266,39
CHS 65x4,5	6,71	65	4,5	8,55	0,204	39,35	12,11	16,50	2,14	78,70	24,21	238,75
CHS 65x5,0	7,40	65	5	9,42	0,204	42,71	13,14	18,04	2,13	85,41	26,28	216,67
CHS 65x6,0	8,73	65	6	11,12	0,204	48,89	15,04	20,96	2,10	97,78	30,09	183,62
CHS 65x7,0	10,01	65	7	12,75	0,204	54,42	16,74	23,66	2,07	108,83	33,49	160,10

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation	Dimensions			Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 65x8,0	11,25	65	8	14,33	0,204	59,33	18,25	26,16	2,04	118,65	36,51	142,54
CHS 75x1,5	2,72	75	1,5	3,46	0,236	23,40	6,24	8,10	2,60	46,80	12,48	680,27
CHS 75x2,0	3,60	75	2	4,59	0,236	30,58	8,15	10,66	2,58	61,15	16,31	513,70
CHS 75x2,3	4,12	75	2,3	5,25	0,236	34,74	9,26	12,16	2,57	69,48	18,53	448,54
CHS 75x2,5	4,47	75	2,5	5,69	0,236	37,46	9,99	13,15	2,56	74,91	19,98	413,79
CHS 75x3,0	5,33	75	3	6,79	0,236	44,05	11,75	15,56	2,55	88,10	23,49	347,22
CHS 75x3,2	5,67	75	3,2	7,22	0,236	46,61	12,43	16,51	2,54	93,21	24,86	326,43
CHS 75x3,5	6,17	75	3,5	7,86	0,236	50,36	13,43	17,91	2,53	100,72	26,86	299,70
CHS 75x4,0	7,00	75	4	8,92	0,236	56,40	15,04	20,19	2,51	112,80	30,08	264,08
CHS 75x4,5	7,82	75	4,5	9,97	0,236	62,17	16,58	22,40	2,50	124,35	33,16	236,41
CHS 75x5,0	8,63	75	5	11,00	0,236	67,69	18,05	24,54	2,48	135,38	36,10	214,29
CHS 75x6,0	10,21	75	6	13,01	0,236	77,99	20,80	28,64	2,45	155,98	41,59	181,16
CHS 75x7,0	11,74	75	7	14,95	0,236	87,35	23,29	32,48	2,42	174,70	46,59	157,56
CHS 75x8,0	13,22	75	8	16,84	0,236	95,83	25,56	36,08	2,39	191,67	51,11	139,93
CHS 76,1x1,5	2,76	76,1	1,5	3,52	0,239	24,46	6,43	8,35	2,64	48,93	12,86	680,07
CHS 76,1x2,0	3,65	76,1	2	4,66	0,239	31,98	8,40	10,98	2,62	63,96	16,81	513,50
CHS 76,1x2,3	4,19	76,1	2,3	5,33	0,239	36,34	9,55	12,53	2,61	72,68	19,10	448,33
CHS 76,1x2,5	4,54	76,1	2,5	5,78	0,239	39,19	10,30	13,55	2,60	78,37	20,60	413,59
CHS 76,1x3,0	5,41	76,1	3	6,89	0,239	46,10	12,11	16,04	2,59	92,19	24,23	347,01
CHS 76,1x3,2	5,75	76,1	3,2	7,33	0,239	48,78	12,82	17,02	2,58	97,56	25,64	326,22
CHS 76,1x3,5	6,27	76,1	3,5	7,98	0,239	52,72	13,85	18,46	2,57	105,43	27,71	299,49
CHS 76,1x4,0	7,11	76,1	4	9,06	0,239	59,06	15,52	20,81	2,55	118,11	31,04	263,87
CHS 76,1x4,5	7,95	76,1	4,5	10,12	0,239	65,12	17,11	23,10	2,54	130,24	34,23	236,19
CHS 76,1x5,0	8,77	76,1	5	11,17	0,239	70,92	18,64	25,32	2,52	141,84	37,28	214,06
CHS 76,1x6,0	10,37	76,1	6	13,21	0,239	81,76	21,49	29,56	2,49	163,52	42,97	180,93
CHS 76,1x7,0	11,93	76,1	7	15,20	0,239	91,63	24,08	33,54	2,46	183,26	48,16	157,33
CHS 76,1x8,0	13,44	76,1	8	17,12	0,239	100,59	26,44	37,27	2,42	201,17	52,87	139,68
CHS 88,9x1,5	3,23	88,9	1,5	4,12	0,279	39,34	8,85	11,46	3,09	78,68	17,70	678,11
CHS 88,9x2,0	4,29	88,9	2	5,46	0,279	51,57	11,60	15,11	3,07	103,14	23,20	511,51
CHS 88,9x2,3	4,91	88,9	2,3	6,26	0,279	58,70	13,21	17,25	3,06	117,40	26,41	446,33
CHS 88,9x2,5	5,33	88,9	2,5	6,79	0,279	63,37	14,26	18,67	3,06	126,75	28,51	411,57
CHS 88,9x3,0	6,36	88,9	3	8,10	0,279	74,76	16,82	22,15	3,04	149,53	33,64	344,97
CHS 88,9x3,2	6,76	88,9	3,2	8,62	0,279	79,21	17,82	23,51	3,03	158,41	35,64	324,17
CHS 88,9x3,5	7,37	88,9	3,5	9,39	0,279	85,75	19,29	25,54	3,02	171,50	38,58	297,42
CHS 88,9x4,0	8,38	88,9	4	10,67	0,279	96,34	21,67	28,85	3,00	192,68	43,35	261,78
CHS 88,9x4,5	9,37	88,9	4,5	11,93	0,279	106,54	23,97	32,09	2,99	213,09	47,94	234,07

8. FERPINTA PROFILE TABLES

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 88,9x5,0	10,35	88,9	5	13,18	0,279	116,37	26,18	35,24	2,97	232,75	52,36	211,92
CHS 88,9x6,0	12,27	88,9	6	15,63	0,279	134,94	30,36	41,31	2,94	269,88	60,72	178,73
CHS 88,9x7,0	14,14	88,9	7	18,01	0,279	152,11	34,22	47,07	2,91	304,23	68,44	155,07
CHS 88,9x8,0	15,96	88,9	8	20,33	0,279	167,97	37,79	52,53	2,87	335,93	75,58	137,36
CHS 100x1,5	3,64	100	1,5	4,64	0,314	56,31	11,26	14,55	3,48	112,61	22,52	676,82
CHS 100x2,0	4,83	100	2	6,16	0,314	73,95	14,79	19,21	3,47	147,90	29,58	510,20
CHS 100x2,3	5,54	100	2,3	7,06	0,314	84,28	16,86	21,96	3,46	168,56	33,71	445,02
CHS 100x2,5	6,01	100	2,5	7,66	0,314	91,05	18,21	23,77	3,45	182,11	36,42	410,26
CHS 100x3,0	7,18	100	3	9,14	0,314	107,62	21,52	28,24	3,43	215,25	43,05	343,64
CHS 100x3,2	7,64	100	3,2	9,73	0,314	114,11	22,82	30,00	3,42	228,21	45,64	322,83
CHS 100x3,5	8,33	100	3,5	10,61	0,314	123,67	24,73	32,61	3,41	247,35	49,47	296,08
CHS 100x4,0	9,47	100	4	12,06	0,314	139,22	27,84	36,89	3,40	278,43	55,69	260,42
CHS 100x4,5	10,60	100	4,5	13,50	0,314	154,26	30,85	41,07	3,38	308,51	61,70	232,69
CHS 100x5,0	11,71	100	5	14,92	0,314	168,81	33,76	45,17	3,36	337,62	67,52	210,53
CHS 100x6,0	13,91	100	6	17,72	0,314	196,50	39,30	53,09	3,33	393,00	78,60	177,30
CHS 100x7,0	16,05	100	7	20,45	0,314	222,36	44,47	60,66	3,30	444,72	88,94	153,61
CHS 100x8,0	18,15	100	8	23,12	0,314	246,48	49,30	67,88	3,26	492,96	98,59	135,87
CHS 101,6x1,5	3,70	101,6	1,5	4,72	0,319	59,10	11,63	15,03	3,54	118,19	23,27	676,66
CHS 101,6x2,0	4,91	101,6	2	6,26	0,319	77,63	15,28	19,84	3,52	155,26	30,56	510,04
CHS 101,6x2,3	5,63	101,6	2,3	7,18	0,319	88,48	17,42	22,68	3,51	176,97	34,84	444,85
CHS 101,6x2,5	6,11	101,6	2,5	7,78	0,319	95,61	18,82	24,56	3,50	191,22	37,64	410,09
CHS 101,6x3,0	7,29	101,6	3	9,29	0,319	113,04	22,25	29,17	3,49	226,07	44,50	343,48
CHS 101,6x3,2	7,77	101,6	3,2	9,89	0,319	119,85	23,59	31,00	3,48	239,71	47,19	322,66
CHS 101,6x3,5	8,47	101,6	3,5	10,79	0,319	129,92	25,58	33,70	3,47	259,85	51,15	295,91
CHS 101,6x4,0	9,63	101,6	4	12,26	0,319	146,28	28,80	38,12	3,45	292,57	57,59	260,25
CHS 101,6x4,5	10,78	101,6	4,5	13,73	0,319	162,13	31,92	42,46	3,44	324,26	63,83	232,52
CHS 101,6x5,0	11,91	101,6	5	15,17	0,319	177,47	34,93	46,70	3,42	354,94	69,87	210,35
CHS 101,6x6,0	14,15	101,6	6	18,02	0,319	206,68	40,68	54,91	3,39	413,35	81,37	177,13
CHS 101,6x7,0	16,33	101,6	7	20,80	0,319	233,99	46,06	62,76	3,35	467,99	92,12	153,43
CHS 101,6x8,0	18,47	101,6	8	23,52	0,319	259,50	51,08	70,26	3,32	519,00	102,17	135,68
CHS 108x1,5	3,94	108	1,5	5,02	0,339	71,17	13,18	17,01	3,77	142,34	26,36	676,06
CHS 108x2,0	5,23	108	2	6,66	0,339	93,58	17,33	22,47	3,75	187,15	34,66	509,43
CHS 108x2,3	6,00	108	2,3	7,64	0,339	106,71	19,76	25,70	3,74	213,43	39,52	444,24
CHS 108x2,5	6,50	108	2,5	8,29	0,339	115,35	21,36	27,83	3,73	230,69	42,72	409,48
CHS 108x3,0	7,77	108	3	9,90	0,339	136,49	25,28	33,08	3,71	272,98	50,55	342,86
CHS 108x3,2	8,27	108	3,2	10,54	0,339	144,78	26,81	35,16	3,71	289,55	53,62	322,04

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 108x3,5	9,02	108	3,5	11,49	0,339	157,02	29,08	38,24	3,70	314,05	58,16	295,28
CHS 108x4,0	10,26	108	4	13,07	0,339	176,95	32,77	43,29	3,68	353,91	65,54	259,62
CHS 108x4,5	11,49	108	4,5	14,63	0,339	196,30	36,35	48,24	3,66	392,59	72,70	231,88
CHS 108x5,0	12,70	108	5	16,18	0,339	215,06	39,83	53,09	3,65	430,12	79,65	209,71
CHS 108x6,0	15,09	108	6	19,23	0,339	250,91	46,46	62,50	3,61	501,81	92,93	176,47
CHS 108x7,0	17,44	108	7	22,21	0,339	284,58	52,70	71,52	3,58	569,16	105,40	152,76
CHS 108x8,0	19,73	108	8	25,13	0,339	316,17	58,55	80,17	3,55	632,34	117,10	135,00
CHS 114,3x1,5	4,17	114,3	1,5	5,32	0,359	84,56	14,80	19,09	3,99	169,12	29,59	675,53
CHS 114,3x2,0	5,54	114,3	2	7,06	0,359	111,27	19,47	25,23	3,97	222,53	38,94	508,90
CHS 114,3x2,3	6,35	114,3	2,3	8,09	0,359	126,95	22,21	28,86	3,96	253,90	44,43	443,71
CHS 114,3x2,5	6,89	114,3	2,5	8,78	0,359	137,26	24,02	31,25	3,95	274,52	48,03	408,94
CHS 114,3x3,0	8,23	114,3	3	10,49	0,359	162,55	28,44	37,17	3,94	325,10	56,88	342,32
CHS 114,3x3,2	8,77	114,3	3,2	11,17	0,359	172,47	30,18	39,51	3,93	344,94	60,36	321,50
CHS 114,3x3,5	9,56	114,3	3,5	12,18	0,359	187,15	32,75	42,98	3,92	374,29	65,49	294,74
CHS 114,3x4,0	10,88	114,3	4	13,86	0,359	211,07	36,93	48,69	3,90	422,13	73,86	259,07
CHS 114,3x4,5	12,19	114,3	4,5	15,52	0,359	234,32	41,00	54,28	3,89	468,64	82,00	231,33
CHS 114,3x5,0	13,48	114,3	5	17,17	0,359	256,92	44,96	59,77	3,87	513,84	89,91	209,15
CHS 114,3x6,0	16,03	114,3	6	20,41	0,359	300,21	52,53	70,45	3,83	600,42	105,06	175,90
CHS 114,3x7,0	18,52	114,3	7	23,60	0,359	341,04	59,67	80,71	3,80	682,07	119,35	152,18
CHS 114,3x8,0	20,97	114,3	8	26,72	0,359	379,49	66,40	90,57	3,77	758,98	132,81	134,41
CHS 120x1,5	4,38	120	1,5	5,58	0,377	98,03	16,34	21,06	4,19	196,07	32,68	675,11
CHS 120x2,0	5,82	120	2	7,41	0,377	129,08	21,51	27,85	4,17	258,16	43,03	508,47
CHS 120x2,3	6,68	120	2,3	8,50	0,377	147,33	24,55	31,87	4,16	294,65	49,11	443,28
CHS 120x2,5	7,24	120	2,5	9,23	0,377	159,33	26,56	34,52	4,16	318,67	53,11	408,51
CHS 120x3,0	8,66	120	3	11,03	0,377	188,81	31,47	41,08	4,14	377,62	62,94	341,88
CHS 120x3,2	9,22	120	3,2	11,74	0,377	200,38	33,40	43,67	4,13	400,77	66,79	321,06
CHS 120x3,5	10,06	120	3,5	12,81	0,377	217,52	36,25	47,52	4,12	435,04	72,51	294,30
CHS 120x4,0	11,44	120	4	14,58	0,377	245,48	40,91	53,85	4,10	490,95	81,83	258,62
CHS 120x4,5	12,82	120	4,5	16,33	0,377	272,69	45,45	60,06	4,09	545,39	90,90	230,88
CHS 120x5,0	14,18	120	5	18,06	0,377	299,19	49,86	66,17	4,07	598,38	99,73	208,70
CHS 120x6,0	16,87	120	6	21,49	0,377	350,05	58,34	78,05	4,04	700,10	116,68	175,44
CHS 120x7,0	19,51	120	7	24,85	0,377	398,16	66,36	89,50	4,00	796,32	132,72	151,71
CHS 120x8,0	22,10	120	8	28,15	0,377	443,62	73,94	100,52	3,97	887,25	147,87	133,93
CHS 127x1,5	4,64	127	1,5	5,91	0,399	116,45	18,34	23,63	4,44	232,90	36,68	674,63
CHS 127x2,0	6,17	127	2	7,85	0,399	153,44	24,16	31,25	4,42	306,87	48,33	508,00
CHS 127x2,3	7,07	127	2,3	9,01	0,399	175,20	27,59	35,77	4,41	350,40	55,18	442,80

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
CHS 127x2,5	7,68	127	2,5	9,78	0,399	189,53	29,85	38,76	4,40	379,06	59,70	408,03
CHS 127x3,0	9,17	127	3	11,69	0,399	224,75	35,39	46,14	4,39	449,50	70,79	341,40
CHS 127x3,2	9,77	127	3,2	12,45	0,399	238,60	37,57	49,06	4,38	477,19	75,15	320,58
CHS 127x3,5	10,66	127	3,5	13,58	0,399	259,11	40,80	53,40	4,37	518,21	81,61	293,81
CHS 127x4,0	12,13	127	4	15,46	0,399	292,61	46,08	60,54	4,35	585,23	92,16	258,13
CHS 127x4,5	13,59	127	4,5	17,32	0,399	325,29	51,23	67,56	4,33	650,57	102,45	230,39
CHS 127x5,0	15,04	127	5	19,16	0,399	357,14	56,24	74,46	4,32	714,28	112,48	208,20
CHS 127x6,0	17,90	127	6	22,81	0,399	418,44	65,90	87,92	4,28	836,88	131,79	174,93
CHS 127x7,0	20,72	127	7	26,39	0,399	476,63	75,06	100,91	4,25	953,25	150,12	151,19
CHS 127x8,0	23,48	127	8	29,91	0,399	531,80	83,75	113,46	4,22	1063,60	167,50	133,40

8.2.2 Square hollow sections, *FERPINTA* SHS

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 40x1,5	1,77	40	1,5	2,25	0,155	5,49	2,75	3,22	1,56	8,7	4,13	687,59
SHS 40x2,0	2,31	40	2	2,94	0,153	6,94	3,47	4,13	1,54	11,3	5,23	521,39
SHS 40x2,3	2,62	40	2,3	3,33	0,152	7,73	3,86	4,64	1,52	12,7	5,83	456,47
SHS 40x2,5	2,82	40	2,5	3,59	0,151	8,22	4,11	4,97	1,51	13,6	6,21	421,88
SHS 40x3,0	3,30	40	3	4,21	0,150	9,32	4,66	5,72	1,49	15,8	7,07	355,73
SHS 40x3,2	3,49	40	3,2	4,45	0,149	9,72	4,86	6,01	1,48	16,6	7,39	335,11
SHS 40x3,5	3,76	40	3,5	4,79	0,148	10,27	5,14	6,41	1,46	17,7	7,83	308,65
SHS 40x4,0	4,20	40	4	5,35	0,146	11,07	5,54	7,01	1,44	19,4	8,48	273,50
SHS 40x4,5	4,61	40	4,5	5,87	0,145	11,73	5,87	7,55	1,41	21,0	9,03	246,31
SHS 40x5,0	4,99	40	5	6,36	0,143	12,26	6,13	8,02	1,39	22,3	9,49	224,71
SHS 40x6,0	5,68	40	6	7,23	0,139	12,94	6,47	8,76	1,34	24,4	10,14	192,73
SHS 40x7,0	5,93	40	7	7,56	0,130	11,55	5,77	8,38	1,24	23,2	9,65	171,96
SHS 40x8,0	6,31	40	8	8,04	0,126	10,94	5,47	8,36	1,17	22,3	9,29	156,25
SHS 50x1,5	2,24	50	1,5	2,85	0,195	11,07	4,43	5,15	1,97	17,4	6,65	683,19
SHS 50x2,0	2,93	50	2	3,74	0,193	14,15	5,66	6,66	1,95	22,6	8,51	516,81
SHS 50x2,3	3,34	50	2,3	4,25	0,192	15,86	6,34	7,52	1,93	25,6	9,55	451,78
SHS 50x2,5	3,60	50	2,5	4,59	0,191	16,94	6,78	8,07	1,92	27,5	10,22	417,11
SHS 50x3,0	4,25	50	3	5,41	0,190	19,47	7,79	9,39	1,90	32,1	11,76	350,76
SHS 50x3,2	4,50	50	3,2	5,73	0,189	20,40	8,16	9,89	1,89	33,9	12,34	330,05
SHS 50x3,5	4,86	50	3,5	6,19	0,188	21,73	8,69	10,61	1,87	36,4	13,17	303,46
SHS 50x4,0	5,45	50	4	6,95	0,186	23,74	9,49	11,73	1,85	40,4	14,43	268,09

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation		Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 50x4,5	6,02	50	4,5	7,67	0,185	25,50	10,20	12,76	1,82	44,1	15,56	240,66
SHS 50x5,0	6,56	50	5	8,36	0,183	27,04	10,82	13,70	1,80	47,5	16,56	218,80
SHS 50x6,0	7,56	50	6	9,63	0,179	29,45	11,78	15,32	1,75	53,2	18,20	186,23
SHS 50x7,0	8,13	50	7	10,36	0,170	28,47	11,39	15,52	1,66	55,1	18,56	164,09
SHS 50x8,0	8,83	50	8	11,24	0,166	28,59	11,43	16,14	1,59	56,7	18,91	147,36
SHS 60x1,5	2,71	60	1,5	3,45	0,235	19,52	6,51	7,53	2,38	30,5	9,77	680,32
SHS 60x2,0	3,56	60	2	4,54	0,233	25,14	8,38	9,79	2,35	39,8	12,59	513,85
SHS 60x2,3	4,06	60	2,3	5,17	0,232	28,31	9,44	11,09	2,34	45,2	14,19	448,75
SHS 60x2,5	4,39	60	2,5	5,59	0,231	30,34	10,11	11,93	2,33	48,7	15,22	414,05
SHS 60x3,0	5,19	60	3	6,61	0,230	35,13	11,71	13,95	2,31	57,1	17,65	347,60
SHS 60x3,2	5,50	60	3,2	7,01	0,229	36,94	12,31	14,73	2,30	60,3	18,57	326,85
SHS 60x3,5	5,96	60	3,5	7,59	0,228	39,53	13,18	15,86	2,28	65,1	19,90	300,19
SHS 60x4,0	6,71	60	4	8,55	0,226	43,55	14,52	17,64	2,26	72,6	21,97	264,70
SHS 60x4,5	7,43	60	4,5	9,47	0,225	47,20	15,73	19,32	2,23	79,8	23,87	237,15
SHS 60x5,0	8,13	60	5	10,36	0,223	50,49	16,83	20,88	2,21	86,4	25,61	215,17
SHS 60x6,0	9,45	60	6	12,03	0,219	56,07	18,69	23,68	2,16	98,4	28,62	182,33
SHS 60x7,0	10,33	60	7	13,16	0,210	56,58	18,86	24,76	2,07	106,0	30,21	159,57
SHS 60x8,0	11,34	60	8	14,44	0,206	58,57	19,52	26,33	2,01	112,5	31,66	142,40
SHS 70x1,5	3,18	70	1,5	4,05	0,275	31,46	8,99	10,36	2,79	48,8	13,49	678,30
SHS 70x2,0	4,19	70	2	5,34	0,273	40,73	11,64	13,52	2,76	64,0	17,48	511,77
SHS 70x2,3	4,78	70	2,3	6,09	0,272	46,01	13,14	15,35	2,75	72,7	19,75	446,64
SHS 70x2,5	5,17	70	2,5	6,59	0,271	49,41	14,12	16,54	2,74	78,5	21,22	411,92
SHS 70x3,0	6,13	70	3	7,81	0,270	57,53	16,44	19,42	2,71	92,4	24,74	345,40
SHS 70x3,2	6,51	70	3,2	8,29	0,269	60,62	17,32	20,53	2,70	97,8	26,08	324,63
SHS 70x3,5	7,06	70	3,5	8,99	0,268	65,09	18,60	22,15	2,69	105,8	28,03	297,94
SHS 70x4,0	7,97	70	4	10,15	0,266	72,12	20,61	24,76	2,67	118,5	31,11	262,38
SHS 70x4,5	8,85	70	4,5	11,27	0,265	78,63	22,47	27,22	2,64	130,7	33,98	234,77
SHS 70x5,0	9,70	70	5	12,36	0,263	84,63	24,18	29,56	2,62	142,2	36,65	212,71
SHS 70x6,0	11,33	70	6	14,43	0,259	95,17	27,19	33,83	2,57	163,5	41,41	179,73
SHS 70x7,0	12,53	70	7	15,96	0,250	98,70	28,20	36,10	2,49	180,0	44,62	156,64
SHS 70x8,0	13,85	70	8	17,64	0,246	104,11	29,74	38,91	2,43	194,4	47,56	139,25
SHS 80x1,5	3,65	80	1,5	4,65	0,315	47,48	11,87	13,64	3,19	73,4	17,81	676,80
SHS 80x2,0	4,82	80	2	6,14	0,313	61,70	15,42	17,85	3,17	96,3	23,16	510,24
SHS 80x2,3	5,50	80	2,3	7,01	0,312	69,86	17,46	20,30	3,16	109,7	26,23	445,09
SHS 80x2,5	5,96	80	2,5	7,59	0,311	75,15	18,79	21,90	3,15	118,5	28,22	410,35
SHS 80x3,0	7,07	80	3	9,01	0,310	87,84	21,96	25,78	3,12	139,9	33,02	343,80

8. FERPINTA PROFILE TABLES

Designation	Dimensions		Area	Surface	Section properties				Other properties		
-	G [kg/m]	D [mm]	T [mm]	A [cm²]	A_L [m²/m]	I [cm⁴]	W_{el} [cm³]	W_{pl} [cm³]	i [cm]	I_t [cm⁴]	W_t [cm³]	A_m/V [m⁻¹]
SHS 80x3,2	7,51	80	3,2	9,57	0,309	92,71	23,18	27,29	3,11	148,3	34,87	323,01
SHS 80x3,5	8,16	80	3,5	10,39	0,308	99,80	24,95	29,50	3,10	160,6	37,56	296,29
SHS 80x4,0	9,22	80	4	11,75	0,306	111,04	27,76	33,07	3,07	180,4	41,84	260,70
SHS 80x4,5	10,26	80	4,5	13,07	0,305	121,58	30,40	36,48	3,05	199,5	45,88	233,04
SHS 80x5,0	11,27	80	5	14,36	0,303	131,44	32,86	39,74	3,03	217,8	49,68	210,94
SHS 80x6,0	13,21	80	6	16,83	0,299	149,18	37,29	45,79	2,98	252,1	56,59	177,86
SHS 80x7,0	14,72	80	7	18,76	0,290	157,61	39,40	49,54	2,90	281,4	61,81	154,58
SHS 80x8,0	16,36	80	8	20,84	0,286	168,38	42,09	53,89	2,84	307,1	66,61	137,06
SHS 90x1,5	4,12	90	1,5	5,25	0,355	68,18	15,15	17,37	3,60	105,0	22,73	675,64
SHS 90x2,0	5,45	90	2	6,94	0,353	88,86	19,75	22,78	3,58	138,1	29,64	509,06
SHS 90x2,3	6,23	90	2,3	7,93	0,352	100,79	22,40	25,93	3,56	157,5	33,63	443,89
SHS 90x2,5	6,74	90	2,5	8,59	0,351	108,55	24,12	28,00	3,56	170,3	36,23	409,14
SHS 90x3,0	8,01	90	3	10,21	0,350	127,28	28,29	33,04	3,53	201,4	42,51	342,57
SHS 90x3,2	8,51	90	3,2	10,85	0,349	134,51	29,89	35,01	3,52	213,6	44,93	321,77
SHS 90x3,5	9,26	90	3,5	11,79	0,348	145,06	32,24	37,90	3,51	231,6	48,49	295,04
SHS 90x4,0	10,48	90	4	13,35	0,346	161,92	35,98	42,58	3,48	260,8	54,17	259,41
SHS 90x4,5	11,67	90	4,5	14,87	0,345	177,87	39,53	47,09	3,46	289,0	59,58	231,73
SHS 90x5,0	12,84	90	5	16,36	0,343	192,93	42,87	51,41	3,43	316,3	64,70	209,60
SHS 90x6,0	15,10	90	6	19,23	0,339	220,48	48,99	59,54	3,39	367,8	74,16	176,47
SHS 90x7,0	16,92	90	7	21,56	0,330	236,13	52,47	65,08	3,31	414,2	81,78	153,06
SHS 90x8,0	18,87	90	8	24,04	0,326	254,59	56,58	71,27	3,25	455,6	88,83	135,45
SHS 100x1,5	4,59	100	1,5	5,85	0,395	94,16	18,83	21,54	4,01	144,7	28,25	674,72
SHS 100x2,0	6,07	100	2	7,74	0,393	123,01	24,60	28,30	3,99	190,5	36,92	508,12
SHS 100x2.3	6,95	100	2,3	8,85	0,392	139,73	27,95	32,26	3,97	217,5	41,95	442,95
SHS 100x2,5	7,53	100	2,5	9,59	0,391	150,63	30,13	34,86	3,96	235,2	45,23	408,19
SHS 100x3,0	8,96	100	3	11,41	0,390	177,05	35,41	41,21	3,94	278,7	53,19	341,59
SHS 100x3,2	9,52	100	3,2	12,13	0,389	187,28	37,46	43,69	3,93	295,7	56,28	320,79
SHS 100x3,5	10,36	100	3,5	13,19	0,388	202,28	40,46	47,35	3,92	320,9	60,81	294,05
SHS 100x4,0	11,73	100	4	14,95	0,386	226,35	45,27	53,30	3,89	362,0	68,10	258,41
SHS 100x4,5	13,08	100	4,5	16,67	0,385	249,29	49,86	59,04	3,87	401,9	75,07	230,70
SHS 100x5,0	14,41	100	5	18,36	0,383	271,10	54,22	64,59	3,84	440,5	81,72	208,56
SHS 100x6,0	16,98	100	6	21,63	0,379	311,47	62,29	75,10	3,79	514,2	94,12	175,38
SHS 100x7,0	19,12	100	7	24,36	0,370	337,04	67,41	82,72	3,72	582,7	104,53	151,89
SHS 100x8,0	21,39	100	8	27,24	0,366	365,94	73,19	91,05	3,67	644,5	114,23	134,23

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

8.2.3 Rectangular hollow section, *FERPINTA* RHS

Designation		Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 50x25x1,5	1,65	50	25	1,5	2,10	0,145	6,65	2,66	3,33	1,78	2,25	1,80	2,05	1,04	5,5	3,13	689,08
RHS 50x25x2,0	2,15	50	25	2	2,74	0,143	8,38	3,35	4,26	1,75	2,81	2,25	2,62	1,01	7,1	3,92	522,96
RHS 50x25x2,3	2,44	50	25	2,3	3,10	0,142	9,31	3,72	4,78	1,73	3,10	2,48	2,92	1,00	7,9	4,34	458,07
RHS 50x25x2,5	2,62	50	25	2,5	3,34	0,141	9,89	3,95	5,11	1,72	3,28	2,62	3,12	0,99	8,4	4,60	423,52
RHS 50x25x3,0	3,07	50	25	3	3,91	0,140	11,17	4,47	5,86	1,69	3,67	2,93	3,56	0,97	9,6	5,18	357,45
RHS 50x25x3,2	3,24	50	25	3,2	4,13	0,139	11,63	4,65	6,14	1,68	3,80	3,04	3,73	0,96	10,1	5,38	336,86
RHS 50x25x3,5	3,49	50	25	3,5	4,44	0,138	12,25	4,90	6,54	1,66	3,98	3,19	3,96	0,95	10,7	5,66	310,45
RHS 50x25x4,0	3,88	50	25	4	4,95	0,136	13,13	5,25	7,13	1,63	4,23	3,38	4,29	0,92	11,6	6,05	275,40
RHS 50x25x4,5	4,25	50	25	4,5	5,42	0,135	13,82	5,53	7,64	1,60	4,41	3,53	4,58	0,90	12,3	6,36	248,31
RHS 50x25x5,0	4,60	50	25	5	5,86	0,133	14,33	5,73	8,08	1,56	4,54	3,63	4,82	0,88	12,9	6,59	226,82
RHS 50x25x6,0	5,21	50	25	6	6,63	0,129	14,84	5,94	8,72	1,50	4,65	3,72	5,15	0,84	13,5	6,82	195,08
RHS 60x15x1,5	1,65	60	15	1,5	2,10	0,145	7,97	2,66	3,58	1,95	0,84	1,12	1,28	0,63	2,7	2,09	689,08
RHS 60x15x2,0	2,15	60	15	2	2,74	0,143	10,00	3,33	4,57	1,91	1,01	1,35	1,61	0,61	3,3	2,55	522,96
RHS 60x15x2,3	2,44	60	15	2,3	3,10	0,142	11,07	3,69	5,12	1,89	1,10	1,47	1,78	0,60	3,6	2,78	458,07
RHS 60x15x2,5	2,62	60	15	2,5	3,34	0,141	11,73	3,91	5,46	1,87	1,15	1,53	1,89	0,59	3,8	2,91	423,52
RHS 60x15x3,0	3,07	60	15	3	3,91	0,140	13,18	4,39	6,26	1,84	1,25	1,67	2,12	0,57	4,2	3,18	357,45
RHS 60x15x3,2	3,24	60	15	3,2	4,13	0,139	13,69	4,56	6,55	1,82	1,28	1,71	2,20	0,56	4,3	3,27	336,86
RHS 60x15x3,5	3,49	60	15	3,5	4,44	0,138	14,36	4,79	6,96	1,80	1,32	1,76	2,31	0,54	4,5	3,37	310,45
RHS 60x15x4,0	3,88	60	15	4	4,95	0,136	15,28	5,09	7,56	1,76	1,36	1,81	2,46	0,52	4,7	3,49	275,40
RHS 45x35x1,5	1,77	45	35	1,5	2,25	0,155	6,54	2,90	3,48	1,70	4,44	2,54	2,93	1,40	8,5	4,05	687,59
RHS 45x35x2,0	2,31	45	35	2	2,94	0,153	8,27	3,68	4,46	1,68	5,60	3,20	3,75	1,38	10,9	5,13	521,39
RHS 45x35x2,3	2,62	45	35	2,3	3,33	0,152	9,21	4,09	5,01	1,66	6,22	3,56	4,21	1,37	12,3	5,72	456,47
RHS 45x35x2,5	2,82	45	35	2,5	3,59	0,151	9,80	4,35	5,36	1,65	6,61	3,78	4,51	1,36	13,1	6,09	421,88
RHS 45x35x3,0	3,30	45	35	3	4,21	0,150	11,13	4,95	6,18	1,63	7,49	4,28	5,19	1,33	15,2	6,93	355,73
RHS 45x35x3,2	3,49	45	35	3,2	4,45	0,149	11,61	5,16	6,49	1,62	7,80	4,46	5,44	1,32	15,9	7,23	335,11
RHS 45x35x3,5	3,76	45	35	3,5	4,79	0,148	12,27	5,45	6,92	1,60	8,24	4,71	5,80	1,31	17,0	7,66	308,65
RHS 45x35x4,0	4,20	45	35	4	5,35	0,146	13,24	5,88	7,58	1,57	8,86	5,06	6,35	1,29	18,7	8,29	273,50
RHS 45x35x4,5	4,61	45	35	4,5	5,87	0,145	14,03	6,24	8,17	1,55	9,37	5,35	6,83	1,26	20,1	8,82	246,31
RHS 45x35x5,0	4,99	45	35	5	6,36	0,143	14,67	6,52	8,67	1,52	9,77	5,58	7,25	1,24	21,4	9,26	224,71
RHS 45x35x6,0	5,68	45	35	6	7,23	0,139	15,49	6,88	9,48	1,46	10,28	5,87	7,90	1,19	23,3	9,87	192,73
RHS 50x30x1,5	1,77	50	30	1,5	2,25	0,155	7,54	3,01	3,70	1,83	3,42	2,28	2,60	1,23	7,6	3,83	687,59
RHS 50x30x2,0	2,31	50	30	2	2,94	0,153	9,54	3,81	4,74	1,80	4,29	2,86	3,33	1,21	9,8	4,84	521,39
RHS 50x30x2,3	2,62	50	30	2,3	3,33	0,152	10,62	4,25	5,33	1,79	4,76	3,17	3,73	1,20	11,0	5,38	456,47
RHS 50x30x2,5	2,82	50	30	2,5	3,59	0,151	11,30	4,52	5,70	1,77	5,05	3,37	3,98	1,19	11,7	5,72	421,88

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 50x30x3,0	3,30	50	30	3	4,21	0,150	12,83	5,13	6,57	1,75	5,70	3,80	4,58	1,16	13,5	6,49	355,73
RHS 50x30x3,2	3,49	50	30	3,2	4,45	0,149	13,38	5,35	6,89	1,73	5,93	3,95	4,80	1,15	14,2	6,77	335,11
RHS 50x30x3,5	3,76	50	30	3,5	4,79	0,148	14,15	5,66	7,35	1,72	6,24	4,16	5,11	1,14	15,1	7,15	308,65
RHS 50x30x4,0	4,20	50	30	4	5,35	0,146	15,25	6,10	8,05	1,69	6,69	4,46	5,58	1,12	16,5	7,71	273,50
RHS 50x30x4,5	4,61	50	30	4,5	5,87	0,145	16,16	6,46	8,67	1,66	7,05	4,70	5,99	1,10	17,7	8,18	246,31
RHS 50x30x5,0	4,99	50	30	5	6,36	0,143	16,87	6,75	9,20	1,63	7,33	4,88	6,34	1,07	18,8	8,55	224,71
RHS 50x30x6,0	5,68	50	30	6	7,23	0,139	17,77	7,11	10,04	1,57	7,65	5,10	6,89	1,03	20,2	9,05	192,73
RHS 60x20x1,5	1,77	60	20	1,5	2,25	0,155	9,25	3,08	4,02	2,03	1,61	1,61	1,83	0,85	4,7	2,94	687,59
RHS 60x20x2,0	2,31	60	20	2	2,94	0,153	11,68	3,89	5,15	1,99	1,99	1,99	2,32	0,82	5,9	3,65	521,39
RHS 60x20x2,3	2,62	60	20	2,3	3,33	0,152	12,99	4,33	5,78	1,97	2,19	2,19	2,58	0,81	6,6	4,03	456,47
RHS 60x20x2,5	2,82	60	20	2,5	3,59	0,151	13,80	4,60	6,18	1,96	2,31	2,31	2,75	0,80	7,0	4,26	421,88
RHS 60x20x3,0	3,30	60	20	3	4,21	0,150	15,62	5,21	7,11	1,93	2,56	2,56	3,14	0,78	7,9	4,75	355,73
RHS 60x20x3,2	3,49	60	20	3,2	4,45	0,149	16,27	5,42	7,46	1,91	2,65	2,65	3,27	0,77	8,2	4,92	335,11
RHS 60x20x3,5	3,76	60	20	3,5	4,79	0,148	17,16	5,72	7,95	1,89	2,76	2,76	3,47	0,76	8,6	5,15	308,65
RHS 60x20x4,0	4,20	60	20	4	5,35	0,146	18,42	6,14	8,68	1,86	2,90	2,90	3,75	0,74	9,2	5,46	273,50
RHS 60x20x4,5	4,61	60	20	4,5	5,87	0,145	19,42	6,47	9,33	1,82	3,01	3,01	3,98	0,72	9,7	5,68	246,31
RHS 60x20x5,0	4,99	60	20	5	6,36	0,143	20,16	6,72	9,88	1,78	3,07	3,07	4,17	0,69	10,0	5,82	224,71
RHS 60x40x1,5	2,24	60	40	1,5	2,85	0,195	14,39	4,80	5,77	2,25	7,71	3,86	4,38	1,64	16,0	6,35	683,19
RHS 60x40x2,0	2,93	60	40	2	3,74	0,193	18,41	6,14	7,47	2,22	9,83	4,92	5,65	1,62	20,7	8,12	516,81
RHS 60x40x2,3	3,34	60	40	2,3	4,25	0,192	20,65	6,88	8,44	2,20	11,00	5,50	6,38	1,61	23,4	9,10	451,78
RHS 60x40x2,5	3,60	60	40	2,5	4,59	0,191	22,07	7,36	9,06	2,19	11,74	5,87	6,84	1,60	25,1	9,72	417,11
RHS 60x40x3,0	4,25	60	40	3	5,41	0,190	25,38	8,46	10,53	2,17	13,44	6,72	7,94	1,58	29,3	11,17	350,76
RHS 60x40x3,2	4,50	60	40	3,2	5,73	0,189	26,61	8,87	11,09	2,16	14,07	7,03	8,36	1,57	30,9	11,72	330,05
RHS 60x40x3,5	4,86	60	40	3,5	6,19	0,188	28,35	9,45	11,90	2,14	14,95	7,48	8,96	1,55	33,1	12,48	303,46
RHS 60x40x4,0	5,45	60	40	4	6,95	0,186	30,99	10,33	13,16	2,11	16,28	8,14	9,89	1,53	36,7	13,65	268,09
RHS 60x40x4,5	6,02	60	40	4,5	7,67	0,185	33,31	11,10	14,32	2,08	17,44	8,72	10,75	1,51	39,9	14,69	240,66
RHS 60x40x5,0	6,56	60	40	5	8,36	0,183	35,33	11,78	15,38	2,06	18,43	9,21	11,52	1,48	42,8	15,60	218,80
RHS 60x40x6,0	7,56	60	40	6	9,63	0,179	38,50	12,83	17,20	2,00	19,95	9,97	12,84	1,44	47,8	17,07	186,23
RHS 60x40x7,0	8,13	60	40	7	10,36	0,170	36,81	12,27	17,34	1,89	19,28	9,64	13,00	1,36	49,0	17,27	164,09
RHS 60x40x8,0	8,83	60	40	8	11,24	0,166	36,77	12,26	18,01	1,81	19,30	9,65	13,48	1,31	49,9	17,47	147,36
RHS 70x30x1,5	2,24	70	30	1,5	2,85	0,195	17,38	4,97	6,25	2,47	4,63	3,09	3,45	1,27	12,0	5,45	683,19
RHS 70x30x2,0	2,93	70	30	2	3,74	0,193	22,22	6,35	8,08	2,44	5,86	3,91	4,45	1,25	15,4	6,93	516,81
RHS 70x30x2,3	3,34	70	30	2,3	4,25	0,192	24,91	7,12	9,12	2,42	6,53	4,35	5,00	1,24	17,4	7,73	451,78
RHS 70x30x2,5	3,60	70	30	2,5	4,59	0,191	26,62	7,61	9,79	2,41	6,95	4,63	5,36	1,23	18,6	8,24	417,11
RHS 70x30x3,0	4,25	70	30	3	5,41	0,190	30,57	8,74	11,38	2,38	7,90	5,26	6,20	1,21	21,5	9,41	350,76
RHS 70x30x3,2	4,50	70	30	3,2	5,73	0,189	32,04	9,15	11,98	2,37	8,24	5,49	6,51	1,20	22,6	9,84	330,05

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation		Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 70x30x3,5	4,86	70	30	3,5	6,19	0,188	34,11	9,74	12,84	2,35	8,72	5,81	6,97	1,19	24,2	10,44	303,46
RHS 70x30x4,0	5,45	70	30	4	6,95	0,186	37,23	10,64	14,20	2,31	9,42	6,28	7,66	1,16	26,5	11,33	268,09
RHS 70x30x4,5	6,02	70	30	4,5	7,67	0,185	39,95	11,42	15,43	2,28	10,01	6,67	8,29	1,14	28,6	12,11	240,66
RHS 70x30x5,0	6,56	70	30	5	8,36	0,183	42,30	12,08	16,56	2,25	10,49	6,99	8,84	1,12	30,4	12,76	218,80
RHS 70x30x6,0	7,56	70	30	6	9,63	0,179	45,88	13,11	18,47	2,18	11,18	7,45	9,77	1,08	33,3	13,72	186,23
RHS 70x30x7,0	8,13	70	30	7	10,36	0,170	42,90	12,26	18,46	2,04	10,66	7,11	9,79	1,01	32,7	13,46	164,09
RHS 80x20x1,5	2,24	80	20	1,5	2,85	0,195	19,74	4,94	6,57	2,63	2,13	2,13	2,38	0,86	6,6	3,97	683,19
RHS 80x20x2,0	2,93	80	20	2	3,74	0,193	25,19	6,30	8,49	2,60	2,64	2,64	3,04	0,84	8,4	4,96	516,81
RHS 80x20x2,3	3,34	80	20	2,3	4,25	0,192	28,19	7,05	9,57	2,57	2,91	2,91	3,40	0,83	9,3	5,48	451,78
RHS 80x20x2,5	3,60	80	20	2,5	4,59	0,191	30,08	7,52	10,27	2,56	3,08	3,08	3,63	0,82	9,9	5,80	417,11
RHS 80x20x3,0	4,25	80	20	3	5,41	0,190	34,45	8,61	11,92	2,52	3,44	3,44	4,16	0,80	11,3	6,50	350,76
RHS 80x20x3,2	4,50	80	20	3,2	5,73	0,189	36,06	9,01	12,54	2,51	3,56	3,56	4,35	0,79	11,7	6,75	330,05
RHS 80x20x3,5	4,86	80	20	3,5	6,19	0,188	38,31	9,58	13,44	2,49	3,73	3,73	4,62	0,78	12,4	7,08	303,46
RHS 80x20x4,0	5,45	80	20	4	6,95	0,186	41,67	10,42	14,83	2,45	3,95	3,95	5,03	0,75	13,3	7,54	268,09
RHS 80x20x4,5	6,02	80	20	4,5	7,67	0,185	44,54	11,13	16,10	2,41	4,12	4,12	5,37	0,73	14,0	7,89	240,66
RHS 80x20x5,0	6,56	80	20	5	8,36	0,183	46,94	11,74	17,24	2,37	4,24	4,24	5,67	0,71	14,6	8,15	218,80
RHS 70x50x1,5	2,71	70	50	1,5	3,45	0,235	24,42	6,98	8,30	2,66	14,59	5,84	6,61	2,06	28,7	9,47	680,32
RHS 70x50x2,0	3,56	70	50	2	4,54	0,233	31,48	8,99	10,80	2,63	18,76	7,50	8,58	2,03	37,5	12,20	513,85
RHS 70x50x2,3	4,06	70	50	2,3	5,17	0,232	35,46	10,13	12,23	2,62	21,10	8,44	9,72	2,02	42,5	13,74	448,75
RHS 70x50x2,5	4,39	70	50	2,5	5,59	0,231	38,01	10,86	13,16	2,61	22,59	9,04	10,45	2,01	45,8	14,72	414,05
RHS 70x50x3,0	5,19	70	50	3	6,61	0,230	44,05	12,59	15,40	2,58	26,10	10,44	12,21	1,99	53,6	17,06	347,60
RHS 70x50x3,2	5,50	70	50	3,2	7,01	0,229	46,33	13,24	16,25	2,57	27,42	10,97	12,88	1,98	56,7	17,94	326,85
RHS 70x50x3,5	5,96	70	50	3,5	7,59	0,228	49,60	14,17	17,50	2,56	29,31	11,72	13,86	1,96	61,1	19,21	300,19
RHS 70x50x4,0	6,71	70	50	4	8,55	0,226	54,67	15,62	19,48	2,53	32,22	12,89	15,41	1,94	68,1	21,19	264,70
RHS 70x50x4,5	7,43	70	50	4,5	9,47	0,225	59,29	16,94	21,33	2,50	34,85	13,94	16,86	1,92	74,6	23,00	237,15
RHS 70x50x5,0	8,13	70	50	5	10,36	0,223	63,46	18,13	23,06	2,48	37,20	14,88	18,20	1,90	80,8	24,64	215,17
RHS 70x50x6,0	9,45	70	50	6	12,03	0,219	70,52	20,15	26,15	2,42	41,14	16,46	20,60	1,85	91,7	27,47	182,33
RHS 70x50x7,0	10,33	70	50	7	13,16	0,210	70,80	20,23	27,28	2,32	41,52	16,61	21,54	1,78	98,3	28,89	159,57
RHS 70x50x8,0	11,34	70	50	8	14,44	0,206	73,18	20,91	28,99	2,25	42,87	17,15	22,86	1,72	103,8	30,18	142,40
RHS 80x40x1,5	2,71	80	40	1,5	3,45	0,235	28,99	7,25	8,93	2,90	9,94	4,97	5,53	1,70	23,8	8,57	680,32
RHS 80x40x2,0	3,56	80	40	2	4,54	0,233	37,36	9,34	11,61	2,87	12,72	6,36	7,17	1,67	30,9	11,00	513,85
RHS 80x40x2,3	4,06	80	40	2,3	5,17	0,232	42,08	10,52	13,15	2,85	14,27	7,14	8,11	1,66	35,0	12,37	448,75
RHS 80x40x2,5	4,39	80	40	2,5	5,59	0,231	45,11	11,28	14,15	2,84	15,26	7,63	8,72	1,65	37,6	13,24	414,05
RHS 80x40x3,0	5,19	80	40	3	6,61	0,230	52,25	13,06	16,54	2,81	17,56	8,78	10,16	1,63	43,9	15,28	347,60
RHS 80x40x3,2	5,50	80	40	3,2	7,01	0,229	54,94	13,74	17,46	2,80	18,41	9,21	10,72	1,62	46,3	16,05	326,85
RHS 80x40x3,5	5,96	80	40	3,5	7,59	0,228	58,81	14,70	18,79	2,78	19,63	9,81	11,52	1,61	49,8	17,15	300,19

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 80x40x4,0	6,71	80	40	4	8,55	0,226	64,79	16,20	20,91	2,75	21,49	10,74	12,77	1,59	55,2	18,84	264,70
RHS 80x40x4,5	7,43	80	40	4,5	9,47	0,225	70,22	17,56	22,89	2,72	23,14	11,57	13,94	1,56	60,3	20,37	237,15
RHS 80x40x5,0	8,13	80	40	5	10,36	0,223	75,11	18,78	24,74	2,69	24,59	12,30	15,02	1,54	65,0	21,74	215,17
RHS 80x40x6,0	9,45	80	40	6	12,03	0,219	83,32	20,83	28,03	2,63	26,96	13,48	16,92	1,50	73,1	24,04	182,33
RHS 80x40x7,0	10,33	80	40	7	13,16	0,210	82,78	20,70	29,10	2,51	27,02	13,51	17,62	1,43	76,9	24,95	159,57
RHS 80x40x8,0	11,34	80	40	8	14,44	0,206	85,09	21,27	30,85	2,43	27,66	13,83	18,60	1,38	80,1	25,76	142,40
RHS 100x20x1,5	2,71	100	20	1,5	3,45	0,235	35,94	7,19	9,72	3,23	2,64	2,64	2,94	0,87	8,6	5,00	680,32
RHS 100x20x2,0	3,56	100	20	2	4,54	0,233	46,17	9,23	12,62	3,19	3,29	3,29	3,76	0,85	10,9	6,26	513,85
RHS 100x20x2,3	4,06	100	20	2,3	5,17	0,232	51,89	10,38	14,29	3,17	3,64	3,64	4,21	0,84	12,2	6,93	448,75
RHS 100x20x2,5	4,39	100	20	2,5	5,59	0,231	55,55	11,11	15,36	3,15	3,85	3,85	4,50	0,83	13,0	7,34	414,05
RHS 100x20x3,0	5,19	100	20	3	6,61	0,230	64,10	12,82	17,93	3,11	4,31	4,31	5,18	0,81	14,7	8,25	347,60
RHS 100x20x3,2	5,50	100	20	3,2	7,01	0,229	67,30	13,46	18,91	3,10	4,47	4,47	5,42	0,80	15,3	8,57	326,85
RHS 100x20x3,5	5,96	100	20	3,5	7,59	0,228	71,85	14,37	20,33	3,08	4,69	4,69	5,78	0,79	16,2	9,01	300,19
RHS 100x20x4,0	6,71	100	20	4	8,55	0,226	78,81	15,76	22,58	3,04	5,00	5,00	6,31	0,76	17,4	9,63	264,70
RHS 100x20x4,5	7,43	100	20	4,5	9,47	0,225	85,00	17,00	24,66	3,00	5,23	5,23	6,77	0,74	18,4	10,11	237,15
RHS 100x20x5,0	8,13	100	20	5	10,36	0,223	90,44	18,09	26,59	2,96	5,40	5,40	7,17	0,72	19,2	10,48	215,17
RHS 100x20x6,0	9,45	100	20	6	12,03	0,219	99,12	19,82	29,98	2,87	5,59	5,59	7,77	0,68	20,0	10,87	182,33
RHS 80x60x1,5	3,18	80	60	1,5	4,05	0,275	38,23	9,56	11,28	3,07	24,66	8,22	9,28	2,47	46,8	13,19	678,30
RHS 80x60x2,0	4,19	80	60	2	5,34	0,273	49,53	12,38	14,73	3,05	31,87	10,62	12,11	2,44	61,2	17,08	511,77
RHS 80x60x2,3	4,78	80	60	2,3	6,09	0,272	55,97	13,99	16,72	3,03	35,97	11,99	13,74	2,43	69,6	19,29	446,64
RHS 80x60x2,5	5,17	80	60	2,5	6,59	0,271	60,13	15,03	18,02	3,02	38,61	12,87	14,81	2,42	75,1	20,73	411,92
RHS 80x60x3,0	6,13	80	60	3	7,81	0,270	70,05	17,51	21,16	3,00	44,89	14,96	17,37	2,40	88,3	24,14	345,40
RHS 80x60x3,2	6,51	80	60	3,2	8,29	0,269	73,83	18,46	22,37	2,98	47,28	15,76	18,36	2,39	93,5	25,45	324,63
RHS 80x60x3,5	7,06	80	60	3,5	8,99	0,268	79,30	19,83	24,15	2,97	50,72	16,91	19,81	2,37	101,0	27,34	297,94
RHS 80x60x4,0	7,97	80	60	4	10,15	0,266	87,92	21,98	26,99	2,94	56,12	18,71	22,12	2,35	113,1	30,32	262,38
RHS 80x60x4,5	8,85	80	60	4,5	11,27	0,265	95,90	23,98	29,69	2,92	61,09	20,36	24,31	2,33	124,6	33,10	234,77
RHS 80x60x5,0	9,70	80	60	5	12,36	0,263	103,28	25,82	32,24	2,89	65,66	21,89	26,38	2,31	135,5	35,67	212,71
RHS 80x60x6,0	11,33	80	60	6	14,43	0,259	116,25	29,06	36,91	2,84	73,63	24,54	30,16	2,26	155,6	40,25	179,73
RHS 80x60x7,0	12,53	80	60	7	15,96	0,250	120,20	30,05	39,32	2,74	76,36	25,45	32,18	2,19	170,8	43,28	156,64
RHS 80x60x8,0	13,85	80	60	8	17,64	0,246	126,73	31,68	42,37	2,68	80,38	26,79	34,65	2,13	184,0	46,04	139,25
RHS 90x50x1,5	3,18	90	50	1,5	4,05	0,275	44,68	9,93	12,06	3,32	18,12	7,25	8,06	2,11	40,9	12,29	678,30
RHS 90x50x2,0	4,19	90	50	2	5,34	0,273	57,88	12,86	15,74	3,29	23,37	9,35	10,50	2,09	53,4	15,88	511,77
RHS 90x50x2,3	4,78	90	50	2,3	6,09	0,272	65,41	14,53	17,87	3,28	26,33	10,53	11,91	2,08	60,6	17,92	446,64
RHS 90x50x2,5	5,17	90	50	2,5	6,59	0,271	70,26	15,61	19,25	3,27	28,24	11,29	12,82	2,07	65,3	19,24	411,92
RHS 90x50x3,0	6,13	90	50	3	7,81	0,270	81,85	18,19	22,60	3,24	32,74	13,10	15,03	2,05	76,7	22,36	345,40
RHS 90x50x3,2	6,51	90	50	3,2	8,29	0,269	86,27	19,17	23,90	3,23	34,44	13,78	15,88	2,04	81,1	23,55	324,63

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation		Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 90x50x3,5	7,06	90	50	3,5	8,99	0,268	92,66	20,59	25,79	3,21	36,89	14,76	17,12	2,03	87,5	25,27	297,94
RHS 90x50x4,0	7,97	90	50	4	10,15	0,266	102,71	22,82	28,82	3,18	40,71	16,28	19,09	2,00	97,7	27,96	262,38
RHS 90x50x4,5	8,85	90	50	4,5	11,27	0,265	112,02	24,89	31,70	3,15	44,20	17,68	20,95	1,98	107,4	30,45	234,77
RHS 90x50x5,0	9,70	90	50	5	12,36	0,263	120,60	26,80	34,41	3,12	47,37	18,95	22,70	1,96	116,5	32,75	212,71
RHS 90x50x6,0	11,33	90	50	6	14,43	0,259	135,66	30,15	39,38	3,07	52,83	21,13	25,88	1,91	132,9	36,77	179,73
RHS 90x50x7,0	12,53	90	50	7	15,96	0,250	139,45	30,99	41,84	2,96	54,58	21,83	27,56	1,85	144,7	39,27	156,64
RHS 90x50x8,0	13,85	90	50	8	17,64	0,246	146,66	32,59	45,03	2,88	57,15	22,86	29,58	1,80	154,6	41,52	139,25
RHS 100x40x1,5	3,18	100	40	1,5	4,05	0,275	50,49	10,10	12,68	3,53	12,16	6,08	6,69	1,73	31,9	10,80	678,30
RHS 100x40x2,0	4,19	100	40	2	5,34	0,273	65,38	13,08	16,54	3,50	15,61	7,81	8,69	1,71	41,5	13,89	511,77
RHS 100x40x2,3	4,78	100	40	2,3	6,09	0,272	73,85	14,77	18,78	3,48	17,54	8,77	9,85	1,70	47,0	15,64	446,64
RHS 100x40x2,5	5,17	100	40	2,5	6,59	0,271	79,32	15,86	20,23	3,47	18,78	9,39	10,59	1,69	50,5	16,76	411,92
RHS 100x40x3,0	6,13	100	40	3	7,81	0,270	92,34	18,47	23,75	3,44	21,67	10,84	12,38	1,67	59,0	19,39	345,40
RHS 100x40x3,2	6,51	100	40	3,2	8,29	0,269	97,29	19,46	25,11	3,43	22,76	11,38	13,07	1,66	62,3	20,39	324,63
RHS 100x40x3,5	7,06	100	40	3,5	8,99	0,268	104,46	20,89	27,09	3,41	24,31	12,15	14,07	1,64	67,0	21,82	297,94
RHS 100x40x4,0	7,97	100	40	4	10,15	0,266	115,70	23,14	30,26	3,38	26,69	13,35	15,65	1,62	74,5	24,04	262,38
RHS 100x40x4,5	8,85	100	40	4,5	11,27	0,265	126,07	25,21	33,26	3,34	28,84	14,42	17,14	1,60	81,5	26,06	234,77
RHS 100x40x5,0	9,70	100	40	5	12,36	0,263	135,60	27,12	36,09	3,31	30,76	15,38	18,52	1,58	87,9	27,90	212,71
RHS 100x40x6,0	11,33	100	40	6	14,43	0,259	152,21	30,44	41,26	3,25	33,96	16,98	21,00	1,53	99,3	31,02	179,73
RHS 100x40x7,0	12,53	100	40	7	15,96	0,250	155,07	31,01	43,66	3,12	34,76	17,38	22,24	1,48	106,0	32,65	156,64
RHS 100x40x8,0	13,85	100	40	8	17,64	0,246	162,30	32,46	46,89	3,03	36,03	18,01	23,72	1,43	111,5	34,08	139,25
RHS 100x50x1,5	3,42	100	50	1,5	4,35	0,295	57,77	11,55	14,16	3,64	19,89	7,96	8,79	2,14	47,1	13,70	677,49
RHS 100x50x2,0	4,50	100	50	2	5,74	0,293	74,98	15,00	18,50	3,62	25,67	10,27	11,46	2,12	61,6	17,73	510,95
RHS 100x50x2,3	5,14	100	50	2,3	6,55	0,292	84,83	16,97	21,03	3,60	28,95	11,58	13,01	2,10	69,9	20,02	445,81
RHS 100x50x2,5	5,56	100	50	2,5	7,09	0,291	91,20	18,24	22,67	3,59	31,06	12,42	14,01	2,09	75,4	21,49	411,08
RHS 100x50x3,0	6,60	100	50	3	8,41	0,290	106,46	21,29	26,66	3,56	36,06	14,42	16,44	2,07	88,6	25,01	344,54
RHS 100x50x3,2	7,01	100	50	3,2	8,93	0,289	112,29	22,46	28,20	3,55	37,95	15,18	17,37	2,06	93,7	26,35	323,76
RHS 100x50x3,5	7,61	100	50	3,5	9,69	0,288	120,76	24,15	30,47	3,53	40,68	16,27	18,74	2,05	101,1	28,30	297,06
RHS 100x50x4,0	8,59	100	50	4	10,95	0,286	134,14	26,83	34,10	3,50	44,95	17,98	20,93	2,03	113,0	31,35	261,48
RHS 100x50x4,5	9,55	100	50	4,5	12,17	0,285	146,61	29,32	37,56	3,47	48,87	19,55	23,00	2,00	124,3	34,18	233,84
RHS 100x50x5,0	10,48	100	50	5	13,36	0,283	158,19	31,64	40,84	3,44	52,45	20,98	24,95	1,98	134,9	36,80	211,76
RHS 100x50x6,0	12,27	100	50	6	15,63	0,279	178,75	35,75	46,90	3,38	58,67	23,47	28,52	1,94	154,2	41,43	178,72
RHS 100x50x7,0	13,63	100	50	7	17,36	0,270	185,40	37,08	50,17	3,27	61,11	24,44	30,57	1,88	168,5	44,47	155,53
RHS 100x50x8,0	15,11	100	50	8	19,24	0,266	196,24	39,25	54,25	3,19	64,29	25,72	32,94	1,83	180,8	47,20	138,06
RHS 100x60x1,5	3,65	100	60	1,5	4,65	0,315	65,05	13,01	15,63	3,74	29,79	9,93	11,04	2,53	64,2	16,61	676,80
RHS 100x60x2,0	4,82	100	60	2	6,14	0,313	84,59	16,92	20,46	3,71	38,60	12,87	14,43	2,51	84,1	21,56	510,24
RHS 100x60x2,3	5,50	100	60	2,3	7,01	0,312	95,81	19,16	23,27	3,70	43,63	14,54	16,40	2,49	95,7	24,40	445,09

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 100x60x2,5	5,96	100	60	2,5	7,59	0,311	103,09	20,62	25,11	3,69	46,88	15,63	17,68	2,49	103,3	26,23	410,35
RHS 100x60x3,0	7,07	100	60	3	9,01	0,310	120,57	24,11	29,57	3,66	54,65	18,22	20,79	2,46	121,7	30,64	343,80
RHS 100x60x3,2	7,51	100	60	3,2	9,57	0,309	127,29	25,46	31,30	3,65	57,61	19,20	22,00	2,45	128,8	32,33	323,01
RHS 100x60x3,5	8,16	100	60	3,5	10,39	0,308	137,07	27,41	33,84	3,63	61,91	20,64	23,77	2,44	139,3	34,79	296,29
RHS 100x60x4,0	9,22	100	60	4	11,75	0,306	152,58	30,52	37,94	3,60	68,68	22,89	26,60	2,42	156,3	38,68	260,70
RHS 100x60x4,5	10,26	100	60	4,5	13,07	0,305	167,14	33,43	41,85	3,58	74,98	24,99	29,31	2,40	172,4	42,34	233,04
RHS 100x60x5,0	11,27	100	60	5	14,36	0,303	180,77	36,15	45,59	3,55	80,83	26,94	31,88	2,37	187,9	45,75	210,94
RHS 100x60x6,0	13,21	100	60	6	16,83	0,299	205,30	41,06	52,54	3,49	91,20	30,40	36,64	2,33	216,4	51,92	177,86
RHS 100x60x7,0	14,72	100	60	7	18,76	0,290	215,73	43,15	56,68	3,39	96,14	32,05	39,60	2,26	239,9	56,40	154,58
RHS 100x60x8,0	16,36	100	60	8	20,84	0,286	230,18	46,04	61,61	3,32	102,18	34,06	42,97	2,21	260,3	60,49	137,06
RHS 120x40x1,5	3,65	120	40	1,5	4,65	0,315	80,10	13,35	17,03	4,15	14,39	7,19	7,84	1,76	40,2	13,02	676,80
RHS 120x40x2,0	4,82	120	40	2	6,14	0,313	104,07	17,34	22,28	4,12	18,50	9,25	10,21	1,74	52,3	16,78	510,24
RHS 120x40x2,3	5,50	120	40	2,3	7,01	0,312	117,81	19,64	25,33	4,10	20,82	10,41	11,58	1,72	59,3	18,91	445,09
RHS 120x40x2,5	5,96	120	40	2,5	7,59	0,311	126,71	21,12	27,32	4,09	22,30	11,15	12,47	1,71	63,8	20,27	410,35
RHS 120x40x3,0	7,07	120	40	3	9,01	0,310	148,04	24,67	32,16	4,05	25,79	12,89	14,60	1,69	74,6	23,51	343,80
RHS 120x40x3,2	7,51	120	40	3,2	9,57	0,309	156,22	26,04	34,03	4,04	27,10	13,55	15,43	1,68	78,7	24,73	323,01
RHS 120x40x3,5	8,16	120	40	3,5	10,39	0,308	168,10	28,02	36,78	4,02	28,98	14,49	16,63	1,67	84,7	26,49	296,29
RHS 120x40x4,0	9,22	120	40	4	11,75	0,306	186,89	31,15	41,21	3,99	31,90	15,95	18,53	1,65	94,2	29,24	260,70
RHS 120x40x4,5	10,26	120	40	4,5	13,07	0,305	204,46	34,08	45,43	3,96	34,54	17,27	20,33	1,63	103,1	31,76	233,04
RHS 120x40x5,0	11,27	120	40	5	14,36	0,303	220,81	36,80	49,45	3,92	36,93	18,46	22,02	1,60	111,4	34,05	210,94
RHS 120x40x6,0	13,21	120	40	6	16,83	0,299	249,97	41,66	56,89	3,85	40,97	20,49	25,08	1,56	126,0	38,02	177,86
RHS 120x40x7,0	14,72	120	40	7	18,76	0,290	259,27	43,21	61,01	3,72	42,50	21,25	26,86	1,51	135,5	40,37	154,58
RHS 120x40x8,0	16,36	120	40	8	20,84	0,286	274,79	45,80	66,13	3,63	44,39	22,19	28,84	1,46	143,5	42,41	137,06
RHS 100x70x1,5	3,89	100	70	1,5	4,95	0,335	72,33	14,47	17,11	3,82	42,02	12,01	13,44	2,91	82,7	19,52	676,18
RHS 100x70x2,0	5,13	100	70	2	6,54	0,333	94,19	18,84	22,42	3,80	54,60	15,60	17,60	2,89	108,5	25,40	509,61
RHS 100x70x2,3	5,87	100	70	2,3	7,47	0,332	106,79	21,36	25,52	3,78	61,82	17,66	20,02	2,88	123,6	28,78	444,45
RHS 100x70x2,5	6,35	100	70	2,5	8,09	0,331	114,97	22,99	27,55	3,77	66,50	19,00	21,60	2,87	133,5	30,98	409,71
RHS 100x70x3,0	7,54	100	70	3	9,61	0,330	134,69	26,94	32,48	3,74	77,74	22,21	25,45	2,84	157,7	36,27	343,14
RHS 100x70x3,2	8,01	100	70	3,2	10,21	0,329	142,29	28,46	34,40	3,73	82,05	23,44	26,94	2,84	167,1	38,31	322,35
RHS 100x70x3,5	8,71	100	70	3,5	11,09	0,328	153,37	30,67	37,22	3,72	88,33	25,24	29,14	2,82	181,0	41,29	295,63
RHS 100x70x4,0	9,85	100	70	4	12,55	0,326	171,02	34,20	41,78	3,69	98,29	28,08	32,68	2,80	203,4	46,03	260,01
RHS 100x70x4,5	10,97	100	70	4,5	13,97	0,325	187,68	37,54	46,15	3,67	107,63	30,75	36,07	2,78	225,0	50,51	232,34
RHS 100x70x5,0	12,05	100	70	5	15,36	0,323	203,35	40,67	50,34	3,64	116,38	33,25	39,31	2,75	245,7	54,73	210,23
RHS 100x70x6,0	14,16	100	70	6	18,03	0,319	231,84	46,37	58,18	3,59	132,14	37,76	45,35	2,71	284,5	62,44	177,12
RHS 100x70x7,0	15,82	100	70	7	20,16	0,310	246,06	49,21	63,19	3,49	140,55	40,16	49,33	2,64	318,2	68,39	153,77
RHS 100x70x8,0	17,62	100	70	8	22,44	0,306	264,12	52,82	68,97	3,43	150,49	43,00	53,79	2,59	347,9	73,86	136,20

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation		Dimensions			Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 120x50x1,5	3,89	120	50	1,5	4,95	0,335	90,64	15,11	18,81	4,28	23,42	9,37	10,24	2,17	60,0	16,53	676,18
RHS 120x50x2,0	5,13	120	50	2	6,54	0,333	117,99	19,67	24,64	4,25	30,28	12,11	13,38	2,15	78,4	21,41	509,61
RHS 120x50x2,3	5,87	120	50	2,3	7,47	0,332	133,74	22,29	28,04	4,23	34,19	13,68	15,20	2,14	89,1	24,20	444,45
RHS 120x50x2,5	6,35	120	50	2,5	8,09	0,331	143,97	23,99	30,26	4,22	36,70	14,68	16,39	2,13	96,0	26,01	409,71
RHS 120x50x3,0	7,54	120	50	3	9,61	0,330	168,58	28,10	35,67	4,19	42,69	17,08	19,26	2,11	112,9	30,32	343,14
RHS 120x50x3,2	8,01	120	50	3,2	10,21	0,329	178,05	29,68	37,77	4,18	44,97	17,99	20,37	2,10	119,4	31,96	322,35
RHS 120x50x3,5	8,71	120	50	3,5	11,09	0,328	191,86	31,98	40,86	4,16	48,27	19,31	22,00	2,09	128,9	34,35	295,63
RHS 120x50x4,0	9,85	120	50	4	12,55	0,326	213,82	35,64	45,85	4,13	53,43	21,37	24,61	2,06	144,2	38,13	260,01
RHS 120x50x4,5	10,97	120	50	4,5	13,97	0,325	234,49	39,08	50,62	4,10	58,22	23,29	27,09	2,04	158,7	41,65	232,34
RHS 120x50x5,0	12,05	120	50	5	15,36	0,323	253,89	42,32	55,20	4,07	62,62	25,05	29,45	2,02	172,4	44,92	210,23
RHS 120x50x6,0	14,16	120	50	6	18,03	0,319	288,99	48,16	63,73	4,00	70,36	28,14	33,80	1,98	197,5	50,76	177,12
RHS 120x50x7,0	15,82	120	50	7	20,16	0,310	304,02	50,67	68,92	3,88	74,17	29,67	36,59	1,92	217,2	54,89	153,77
RHS 120x50x8,0	17,62	120	50	8	22,44	0,306	325,05	54,17	75,09	3,81	78,58	31,43	39,66	1,87	234,2	58,59	136,20
RHS 100x80x1,5	4,12	100	80	1,5	5,25	0,355	79,60	15,92	18,59	3,89	56,72	14,18	15,99	3,29	102,4	22,43	675,64
RHS 100x80x2,0	5,45	100	80	2	6,94	0,353	103,80	20,76	24,38	3,87	73,87	18,47	20,97	3,26	134,6	29,24	509,06
RHS 100x80x2,3	6,23	100	80	2,3	7,93	0,352	117,77	23,55	27,77	3,85	83,75	20,94	23,87	3,25	153,5	33,17	443,89
RHS 100x80x2,5	6,74	100	80	2,5	8,59	0,351	126,86	25,37	29,98	3,84	90,17	22,54	25,77	3,24	165,8	35,73	409,14
RHS 100x80x3,0	8,01	100	80	3	10,21	0,350	148,81	29,76	35,39	3,82	105,64	26,41	30,40	3,22	196,1	41,91	342,57
RHS 100x80x3,2	8,51	100	80	3,2	10,85	0,349	157,28	31,46	37,50	3,81	111,60	27,90	32,20	3,21	208,0	44,30	321,77
RHS 100x80x3,5	9,26	100	80	3,5	11,79	0,348	169,67	33,93	40,60	3,79	120,30	30,07	34,86	3,19	225,4	47,79	295,04
RHS 100x80x4,0	10,48	100	80	4	13,35	0,346	189,47	37,89	45,62	3,77	134,17	33,54	39,15	3,17	253,8	53,38	259,41
RHS 100x80x4,5	11,67	100	80	4,5	14,87	0,345	208,21	41,64	50,45	3,74	147,27	36,82	43,28	3,15	281,2	58,69	231,73
RHS 100x80x5,0	12,84	100	80	5	16,36	0,343	225,94	45,19	55,09	3,72	159,61	39,90	47,24	3,12	307,5	63,72	209,60
RHS 100x80x6,0	15,10	100	80	6	19,23	0,339	258,39	51,68	63,82	3,67	182,10	45,53	54,67	3,08	357,4	72,98	176,47
RHS 100x80x7,0	16,92	100	80	7	21,56	0,330	276,38	55,28	69,70	3,58	195,03	48,76	59,76	3,01	402,1	80,42	153,06
RHS 100x80x8,0	18,87	100	80	8	24,04	0,326	298,06	59,61	76,33	3,52	210,02	52,50	65,41	2,96	441,8	87,29	135,45
RHS 120x60x1,5	4,12	120	60	1,5	5,25	0,355	101,17	16,86	20,59	4,39	34,93	11,64	12,79	2,58	82,3	20,03	675,64
RHS 120x60x2,0	5,45	120	60	2	6,94	0,353	131,92	21,99	27,00	4,36	45,33	15,11	16,75	2,56	107,9	26,05	509,06
RHS 120x60x2,3	6,23	120	60	2,3	7,93	0,352	149,68	24,95	30,75	4,34	51,30	17,10	19,05	2,54	122,8	29,50	443,89
RHS 120x60x2,5	6,74	120	60	2,5	8,59	0,351	161,23	26,87	33,20	4,33	55,15	18,38	20,56	2,53	132,6	31,75	409,14
RHS 120x60x3,0	8,01	120	60	3	10,21	0,350	189,12	31,52	39,18	4,30	64,40	21,47	24,21	2,51	156,3	37,14	342,57
RHS 120x60x3,2	8,51	120	60	3,2	10,85	0,349	199,88	33,31	41,51	4,29	67,95	22,65	25,63	2,50	165,6	39,21	321,77
RHS 120x60x3,5	9,26	120	60	3,5	11,79	0,348	215,61	35,94	44,94	4,28	73,09	24,36	27,72	2,49	179,2	42,24	295,04
RHS 120x60x4,0	10,48	120	60	4	13,35	0,346	240,74	40,12	50,49	4,25	81,25	27,08	31,08	2,47	201,1	47,05	259,41
RHS 120x60x4,5	11,67	120	60	4,5	14,87	0,345	264,52	44,09	55,82	4,22	88,88	29,63	34,30	2,44	222,1	51,58	231,73
RHS 120x60x5,0	12,84	120	60	5	16,36	0,343	286,97	47,83	60,95	4,19	95,99	32,00	37,38	2,42	242,2	55,85	209,60

8. FERPINTA PROFILE TABLES

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 120x60x6,0	15,10	120	60	6	19,23	0,339	328,01	54,67	70,57	4,13	108,77	36,26	43,12	2,38	279,7	63,60	176,47
RHS 120x60x7,0	16,92	120	60	7	21,56	0,330	348,77	58,13	76,83	4,02	115,92	38,64	47,02	2,32	311,6	69,54	153,06
RHS 120x60x8,0	18,87	120	60	8	24,04	0,326	375,31	62,55	84,05	3,95	123,98	41,33	51,29	2,27	339,6	74,96	135,45
RHS 120x80x1,5	4,59	120	80	1,5	5,85	0,395	122,23	20,37	24,14	4,57	65,97	16,49	18,35	3,36	133,0	27,05	674,72
RHS 120x80x2,0	6,07	120	80	2	7,74	0,393	159,77	26,63	31,72	4,54	86,04	21,51	24,09	3,33	175,0	35,32	508,12
RHS 120x80x2,3	6,95	120	80	2,3	8,85	0,392	181,54	30,26	36,16	4,53	97,64	24,41	27,44	3,32	199,6	40,11	442,95
RHS 120x80x2,5	7,53	120	80	2,5	9,59	0,391	195,75	32,63	39,07	4,52	105,19	26,30	29,65	3,31	215,8	43,23	408,19
RHS 120x80x3,0	8,96	120	80	3	11,41	0,390	230,20	38,37	46,20	4,49	123,43	30,86	35,02	3,29	255,5	50,80	341,59
RHS 120x80x3,2	9,52	120	80	3,2	12,13	0,389	243,55	40,59	48,98	4,48	130,48	32,62	37,12	3,28	271,0	53,73	320,79
RHS 120x80x3,5	10,36	120	80	3,5	13,19	0,388	263,13	43,86	53,09	4,47	140,80	35,20	40,21	3,27	293,9	58,03	294,05
RHS 120x80x4,0	11,73	120	80	4	14,95	0,386	294,59	49,10	59,77	4,44	157,29	39,32	45,23	3,24	331,2	64,93	258,41
RHS 120x80x4,5	13,08	120	80	4,5	16,67	0,385	324,58	54,10	66,22	4,41	172,95	43,24	50,07	3,22	367,3	71,51	230,70
RHS 120x80x5,0	14,41	120	80	5	18,36	0,383	353,14	58,86	72,45	4,39	187,78	46,94	54,74	3,20	402,3	77,77	208,56
RHS 120x80x6,0	16,98	120	80	6	21,63	0,379	406,06	67,68	84,25	4,33	215,03	53,76	63,55	3,15	468,5	89,40	175,38
RHS 120x80x7,0	19,12	120	80	7	24,36	0,370	438,27	73,04	92,65	4,24	232,45	58,11	69,98	3,09	529,4	99,06	151,89
RHS 120x80x8,0	21,39	120	80	8	27,24	0,366	475,83	79,31	101,97	4,18	251,66	62,92	76,93	3,04	584,0	108,01	134,23
RHS 140x60x1,5	4,59	140	60	1,5	5,85	0,395	147,79	21,11	26,14	5,03	40,06	13,35	14,55	2,62	100,9	23,46	674,72
RHS 140x60x2,0	6,07	140	60	2	7,74	0,393	193,13	27,59	34,34	5,00	52,06	17,35	19,07	2,59	132,3	30,53	508,12
RHS 140x60x2,3	6,95	140	60	2,3	8,85	0,392	219,41	31,34	39,14	4,98	58,96	19,65	21,71	2,58	150,7	34,61	442,95
RHS 140x60x2,5	7,53	140	60	2,5	9,59	0,391	236,55	33,79	42,29	4,97	63,43	21,14	23,43	2,57	162,7	37,26	408,19
RHS 140x60x3,0	8,96	140	60	3	11,41	0,390	278,08	39,73	49,98	4,94	74,16	24,72	27,63	2,55	191,9	43,64	341,59
RHS 140x60x3,2	9,52	140	60	3,2	12,13	0,389	294,17	42,02	52,99	4,93	78,28	26,09	29,27	2,54	203,3	46,10	320,79
RHS 140x60x3,5	10,36	140	60	3,5	13,19	0,388	317,75	45,39	57,43	4,91	84,28	28,09	31,68	2,53	220,1	49,69	294,05
RHS 140x60x4,0	11,73	140	60	4	14,95	0,386	355,59	50,80	64,63	4,88	93,81	31,27	35,56	2,51	247,1	55,42	258,41
RHS 140x60x4,5	13,08	140	60	4,5	16,67	0,385	391,63	55,95	71,59	4,85	102,77	34,26	39,30	2,48	273,1	60,83	230,70
RHS 140x60x5,0	14,41	140	60	5	18,36	0,383	425,89	60,84	78,30	4,82	111,16	37,05	42,88	2,46	298,0	65,94	208,56
RHS 140x60x6,0	16,98	140	60	6	21,63	0,379	489,19	69,88	91,01	4,76	126,34	42,11	49,60	2,42	344,5	75,29	175,38
RHS 140x60x7,0	19,12	140	60	7	24,36	0,370	524,93	74,99	99,79	4,64	135,69	45,23	54,44	2,36	385,0	82,70	151,89
RHS 140x60x8,0	21,39	140	60	8	27,24	0,366	568,52	81,22	109,70	4,57	145,79	48,60	59,61	2,31	420,7	89,46	134,23
RHS 150x50x1,5	4,59	150	50	1,5	5,85	0,395	158,88	21,18	26,91	5,21	28,71	11,49	12,43	2,22	79,7	20,76	674,72
RHS 150x50x2,0	6,07	150	50	2	7,74	0,393	207,53	27,67	35,35	5,18	37,20	14,88	16,26	2,19	104,2	26,94	508,12
RHS 150x50x2,3	6,95	150	50	2,3	8,85	0,392	235,71	31,43	40,28	5,16	42,04	16,82	18,49	2,18	118,5	30,49	442,95
RHS 150x50x2,5	7,53	150	50	2,5	9,59	0,391	254,08	33,88	43,52	5,15	45,17	18,07	19,95	2,17	127,7	32,78	408,19
RHS 150x50x3,0	8,96	150	50	3	11,41	0,390	298,55	39,81	51,43	5,12	52,65	21,06	23,49	2,15	150,2	38,28	341,59
RHS 150x50x3,2	9,52	150	50	3,2	12,13	0,389	315,76	42,10	54,52	5,10	55,50	22,20	24,86	2,14	158,9	40,38	320,79
RHS 150x50x3,5	10,36	150	50	3,5	13,19	0,388	340,98	45,46	59,08	5,08	59,64	23,86	26,88	2,13	171,7	43,45	294,05

8.2 STRUCTURAL STEEL HOLLOW SECTIONS IN HIGH STRENGTH STEEL

Designation	Dimensions				Area	Surface	Section properties, y-y axis				Section properties, z-z axis				Other properties		
-	G [kg/m]	H [mm]	B [mm]	T [mm]	A [cm²]	A_L [m²/m]	I_y [cm⁴]	$W_{el,y}$ [cm³]	$W_{pl,y}$ [cm³]	i_y [cm]	I_z [cm⁴]	$W_{el,z}$ [cm³]	$W_{pl,z}$ [cm³]	i_z [cm]	I_t [cm⁴]	W_t [cm³]	Am/V [m⁻¹]
RHS 150x50x4,0	11,73	150	50	4	14,95	0,386	381,39	50,85	66,47	5,05	66,16	26,47	30,13	2,10	192,1	48,30	258,41
RHS 150x50x4,5	13,08	150	50	4,5	16,67	0,385	419,82	55,98	73,60	5,02	72,23	28,89	33,24	2,08	211,6	52,85	230,70
RHS 150x50x5,0	14,41	150	50	5	18,36	0,383	456,29	60,84	80,48	4,99	77,87	31,15	36,20	2,06	230,1	57,11	208,56
RHS 150x50x6,0	16,98	150	50	6	21,63	0,379	523,47	69,80	93,48	4,92	87,89	35,16	41,72	2,02	264,0	64,77	175,38
RHS 150x50x7,0	19,12	150	50	7	24,36	0,370	559,30	74,57	102,31	4,79	93,75	37,50	45,62	1,96	291,8	70,53	151,89
RHS 150x50x8,0	21,39	150	50	8	27,24	0,366	604,42	80,59	112,36	4,71	100,00	40,00	49,74	1,92	315,9	75,68	134,23

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