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DESIGN EXAMPLES FOR SECTIONS “C” and “Z”

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UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

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1 Introduction

Steel structures currently represent a significant percentage of the total build area. Steel elements are used in a wide variety of structural solutions, covering a range of architectural needs. The trend of the continuous development of the built environment in a market governed by economic considerations has been to push the field of engineering, research and innovation, towards finding alternatives, and solutions. In the field of steel construction, the concept of a "light structure" has been developed in the last decades, which has arisen precisely in order to cover the needs of the existing built environment. This is based on the principle of cost-benefit analysis. This concept, different from that of the hot-rolled steel profile, is based on the use of cold-rolled formes sections of thin steel sheet. The numerous advantages that these profiles confer have aroused the interest of both developers and research centers, which has turned this segment into a dynamic and competitive branch. Initially, these sections were used as non-structural elements, for example, as bulkheads in partition panels or even as cover fittings, and later they were used as elements in the composition of secondary and closing structures under various constructive systems: purlins (horizontal and vertical), load-bearing elements of curtain walls etc. At present their use as load-bearing elements in the main structures is increasing rapidly, due to their technical-economic efficiency. The number of market players producing and implementing systems based on these elements is also increasing, in parallel with the maturation of technologies that provide production solutions with ever lower costs. Due to the current competition and the fact that these typologies of sections are not standardized (as hot-rolled ones are), an explosion of sectional variations appeared, the most intensely used for linear elements, being "C" and "Z".

As for the design of light structures, which made it possible to develop this industry, a rather complicated methodological reality can be observed. Calculation of cold-formed sections involves solving specific problems governed by complex phenomena of sectional instability. In addition to the appearance of local instability, due to the large swells of the component walls, the phenomena due to the cold forming process are also added. By cold bending, the physicomechanical characteristics of the material change, leading to the following phenomena: the ecruising of the material and the belonging of the residual stresses.

The evaluation and verification methodologies present in the calculation legislation cannot cover the whole spectrum of sectional variations, with generally valid simplified calculation relations. In the current regulations, the evaluation and verification of sections is based on the adoption of reduced sectional dimensions compared to the gross section, called effective dimensions, as an effect of their local instability. Sectional instability is manifested by two distinct ways of buckling: local buckling and distorted buckling. For the assessment of effective dimensions due to local buckling, there are standardized calculation methodologies that can be applied at the general level to any sectional configuration. This is possible by decomposing the section into flat panels (or sectional walls). A more detailed analysis, based on laboratory tests and/or advanced numerical calculations, is required for the calculation of the reduced dimensions related to the distortion buckling, due to the complexity of the phenomenon.

This work presents the methodology for calculating effective widths for cold-formed Sections" C "and" Z ", according to Eurocode 3 (SR EN 1993-1-3), where a simplified procedure for calculating distorted buckling is detailed.

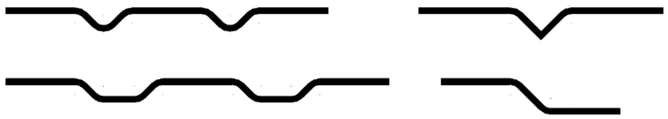
2 Sections of thin-walled profiles

2.1 Section types

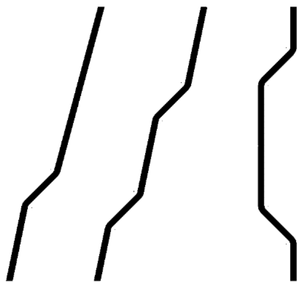
The range of profiles and their shape is varied and continuously enriched, which emphasizes the mobility and timeliness of this branch of the construction industry. A classification of cold-rolled sections can be made according to their form. The atypical geometry compared to the standardized geometry of hot laminates, usually more complex consists of walls of uniform thickness which can be stiffened either by marginal rebords (Figure 2.1 a,b), in case of flanges, or true intermediate stiffeners, in webs cases (Figure 2.1 c.) or interior panels (Figure 2.1d.).

a. Simple marginal stiffeners

b. Double marginal stiffeners



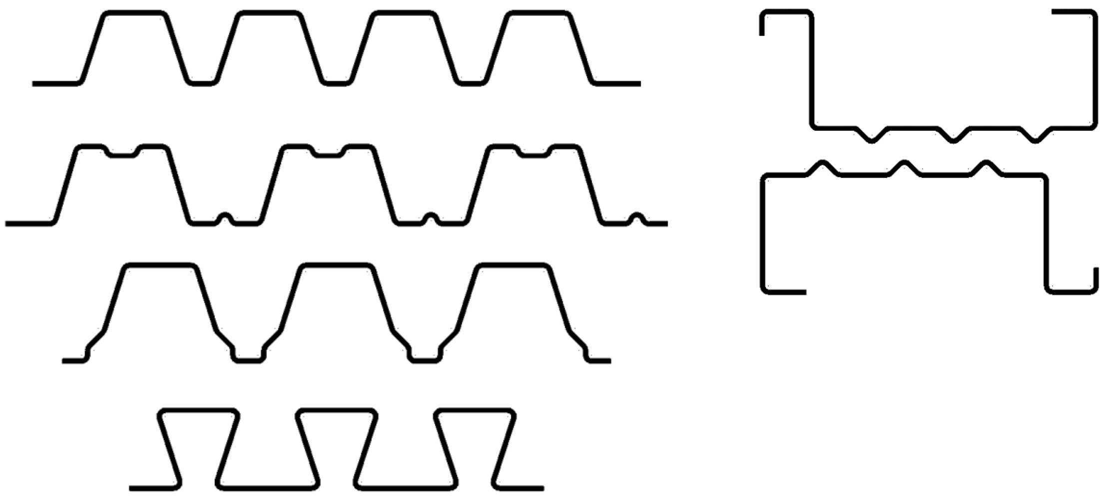
c. Intermediate stiffeners for flanges



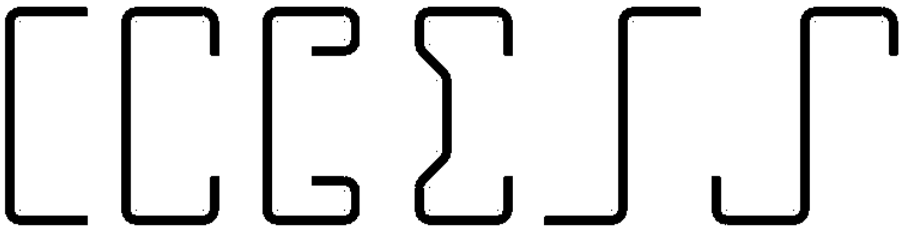
d. Intermediate stiffeners for web

Figure 2.1 - Types of stiffeners of cold-formed members

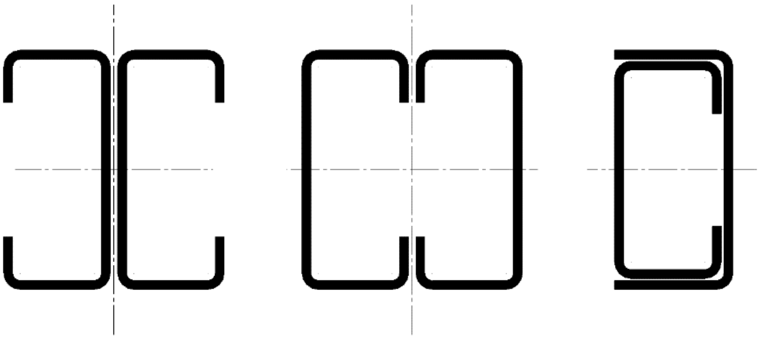
In Figure 2.2 several specimens of sections are shown:



a. Profiled sheeting



b. Simple sections used for elements in compresion or in tension



c. Compound sections used for elements in compresion or in tension

Figure 2.2 - Types of cold-formed members

2.1.1 Manufacturing technologies

Thin-walled profiles are produced by cold profiling of steel strips, delivered in the form of a sheet, with widths ranging from 1000 to 1500 mm. The dimensions of the steel sheets have a direct influence on the maximum dimensions of the sections obtained by their processing, the width deployed is thus limited higher than that of the steel sheet. The thickness of the sheets used for cold forming is also limited higher on technological considerations, depending on the profiling capacity of the machine. The thicknesses have values between 0.4 and 4 mm.

The predominant technological processes currently used to obtain light sections are *cold rolling, bending, and pressing*.

Bending and pressing are slower production processes because the forming operation requires more bending / pressing steps (for each corner of the profile separately), requiring qualified personnel as well. This technology can be used in any steel manufactory work due to moderate acquisition costs, but it is suitable for small-scale production with small quantities of finished elements, because the productivity of the machine is low.

Cold rolling is a production process with high efficiency and reduced labor. The laminator or rolling strip consists of a succession of rollers over which the steel strip slides. These rollers produce small consecutive bends; the profiling will be ready progressively as the steel strip advances (Figure 2.3). This type of machine is widely used due to the high efficiency and fast production that requires a small number of workers. However, it also has some weaknesses, among which the production long pauses in between the calibration processes of the machine. A calibration process should be performed each time a section of different sizes is desired. After calibration, the production is easy and efficient, but any stop of the strip presents significant stagnation with a high impact on productivity. Therefore, cold rolling is used only for large quantities of elements.

Large manufacturers have generated their own ranges of sections through research activities to obtain the best mechanical characteristics. The shape of the sections began to be influenced also by the production technology. Profiles with equal flanges can be seen for several variations of sheet height or thickness, to facilitate the calibration process.

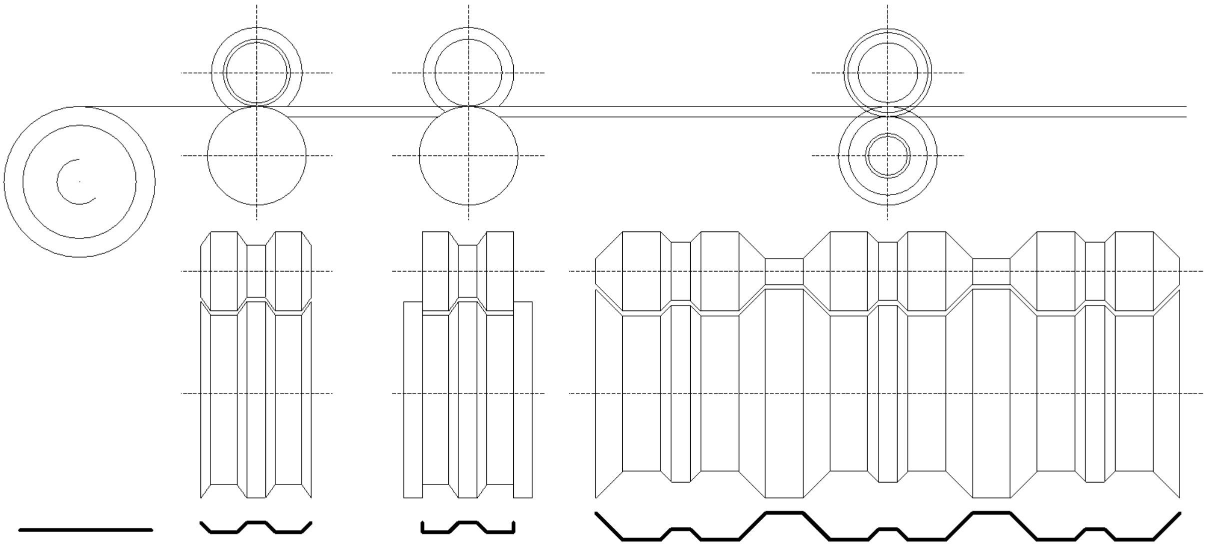


Figure 2.3 – Cold form members

2.1.2 Corrosion protection

Due to the small thickness of the base material, the durability of the profiles is strongly influenced by the phenomenon of corrosion. Among the usual methods used to prevent corrosion, or to delay it, the following can be included: painting, metallization, protection with plastics or the use of stainless steels improved by alloying. An advantage of cold forming is the possibility of pre-treating the base material against corrosion, so the painted or galvanized sheet can be used to obtain profiles.

The most economical treatment is painting and consists of applying a coat of paint over one or more coats of primer. The thickness and number of layers are chosen depending on the aggressiveness of the environment to which the bars are exposed.

The hardening process is the application of a thin layer of protective metal on the surface of the profile, either by immersion in the thank with molten metal or by spraying. The most used steel is zinc, for normal operating conditions it is used in the form of Z275, 275g/m^2. The immersion process is carried out by inserting the element or sheet into the zinc bath at the temperature of 450^O with the speed of 200 m/min, after which the excess coating material is removed by blowing.

The thickness of the zinc layer recommended for the protection of profiles used inside buildings is 20 m on each side of the element. Among other metals used for protection, we can include aluminum (usually mixed with zinc), nickel, and chromium. Both nickel and chromium have a small share of use in the construction domain. Hardening in contrast to painting has a higher degree of protection against corrosion; the surface is not sensitive to scratches and aging.

2.1.3 Thin wall materials

The standardized base material used in profiling according to the European standard:

- Hot-rolled strip of non-alloy construction steel: S235, S275, S355 according to the legislation EN 10025 : part 2
- Hot-rolled strip of fine-grained weldable construction steel, normalized / normalized rolled: S275 N, S355 N, S420 N, S460 N, S275 NL, S355 NL, S420 NL, S460 NL according to the legislation EN 10025 : part 3
- Hot-rolled strip of fine-grained weldable construction steel, thermomechanical laminate: S275 M, S355 M, S420 M, S460 M, S275 ML, S355 ML, S420 ML, S460 ML according to the legislation EN 10025: part 4

- Strip of structural steel obtained by cold rolling: CR 220, CR 250, CR 320 according to the legislation ISO 4997
- Carbon steel sheet for construction protected by immersion in the zinc bath: S220GD+Z, S250GD+Z, S280GD+Z, S320GD+Z, S350GD+Z according to the legislation EN 10326
- High strength steels for cold forming: S315 MC, S355 MC, S420 MC, S460 MC, S500 MC, S550 MC, S600 MC, S650 MC, S700 MC, according to the legislation EN10149 : part 2
- - Microalloyed steels with high yield strength : H240LA, H280LA, H320LA, H360LA, H400LA according to the legislation EN 10292
- Carbon steel sheet for construction protected by immersion in zinc – aluminum bath (ZA) : S220GD+ZA, S250GD+ZA, S280GD+ZA, S320GD+ZA, S350GD+ZA according to the legislation EN 10326
- Carbon steel sheet for construction protected by immersion in aluminum – zinc bath (AZ) : S220GD+ AZ, S250GD+ AZ, S280GD+ AZ, S320GD+ AZ, S350GD+ AZ according to the legislation EN 10326

For the steel sheet with a thickness of less than 3 mm and sheets with a width of more than 600 mm , low values of the strength will be considered. With a frame coefficient of 0.9.

The usual steels used and which are caught in the calculation methodology of the Eurocode set of rules have the following physicomechanical characteristics:

Modulus of elasticity:	E = 210000 N/mm^2
Poisson's coefficient:	$\nu = 0{,}3$
Transversal modulus of elasticity:	$G = E/2(1+\nu) = 80796$ N/mm^2
Density :	$\rho = 7850$ kg/m^3

2.1.4 Effects of the manufacturing process on the characteristics of the elements

The manufacturing process has a major influence due to the material characteristics of the finite products. The steel properties in the finished element are different from the ones in the base material.

2.1.4.1 Cold hardening

The base material is usually made out of ductile steel, which has yielding strength in the characteristic curve. Cold forming (rolling, flexion, or pressing)is a process of pressing a plastic deformation on the steel sheet which modifies the properties of the base material, especially in the corner areas and adjacent areas, by consuming a significant amount of the yielding strength. This phenomenon called cold hardening has the effect of increasing the yielding strength limit (f_y) and the failure limit (f_u), but the changes in the yielding strength limit are much more substantial. An increase of the strength material is obtained due to the cold hardening process. In Figure 2.4 characteristic curves can be observed ($\sigma-\varepsilon$) for the base material and also after the cold forming process.

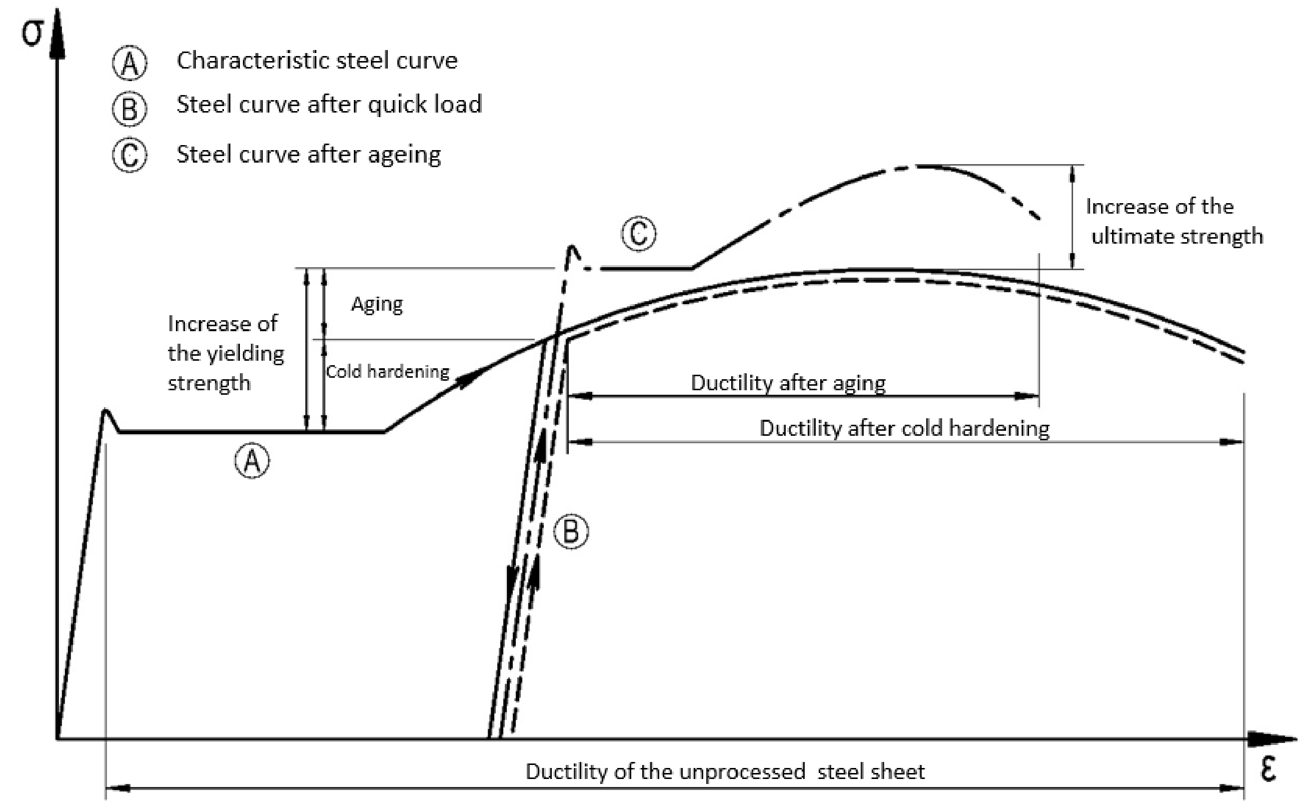


Figure 2.4 – Characteristic curve σ–ε for steel (Britvec, Chajes, Warren, Uribe, & Winter, 1970)

The yielding limit for steel without yielding strength, as the one in cold-formed sections (Figure 2.4 curve C), is considered to be the stress corresponding to a residual deformation of 0.2% and is called the conventional yield strength. Its value is higher than the basic material due to cold hardening process and can be determined analytically as the average yield limit for the entire section, due to the calculation relations provided by the European prescription. The influence of the number of bends (areas affected by plastic deformations) and the way of formation can be observed.

$$f_{ya} = f_{yb} + (f_u - f_{yb})\frac{k \cdot n \cdot t^2}{A_g} \leq \frac{(f_u + f_{yb})}{2} \quad (2.1)$$

where :

f_{ya} - Nominal value of the yield strength of the section

f_{yb} - Design value of the yield strength of the base material

A_g - gross section area

k - forming coefficient

k = 7 – cold rolled sections

k = 5 – other forming procedures

n - the bends number at 90^O with an inner radius of $r \leq 5t$, angle fractions of 90^O are considered fractions of n

t - the calculation thickness of the steel strip excluding the thickness of the protection layers

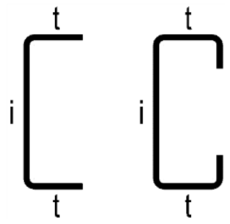
2.2 Section geometry

The section of cold-formed elements, although continuous, it is considered to be composed of a finite number of interconnected walls. Theoretical fragmentation of the section into component walls is fulfilled by following the bending points of the entire section.

Classification of the component walls that make up a cold-formed section can be carried out according to several criteria:

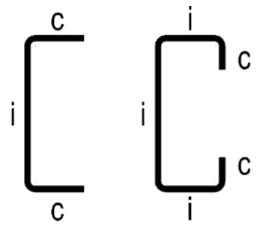
1. By role in the section

- flange (*t*)
- web (*i*)

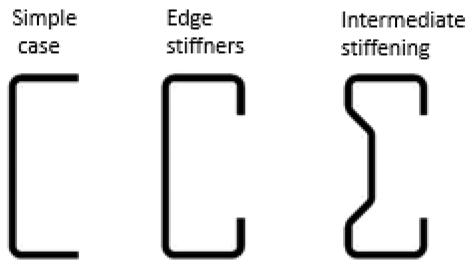


2. By wall position

- interior wall (*i*)
- wall in the console (*c*)



3. By the geometry of the wall



- Simple case
- Stiffened wall
    - edge
    - intermediate

2.2.1 Axis conventions

Axis convention notation of the cold formed sections have the same rules as the rolled steel profiles sections (Ec3-1-1).

The convention for marking the axis of the bars is the following:

x-x - longitudinal axis of the element

y-y - transversal axis of the element

z-z - axis of the cross-section

For steel sections, the conventions used for transverse axes they are as follows (Figure 2.5):

- in general

y-y - axis of the cross section parallel to the flanges

z-z - axis of the cross-section perpendicular to the flanges

y-y - axis parallel to the smallest leg

z-z - axis perpendicular to the smallest leg

• for asymmetric sections, whose main axes of inertia do not coincide with the y-y and / or z-z axes previously defined, their notation is performed as follows:

u-u - major axis of inertia (when it does not coincide with the axis y-y)

v-v - minor axis of inertia (when it does not coincide with the axis z-z)

- For structural steel sheets, the y-y axis will be considered parallel to the plane of the sheet, and the z-z axis will be regular on it.

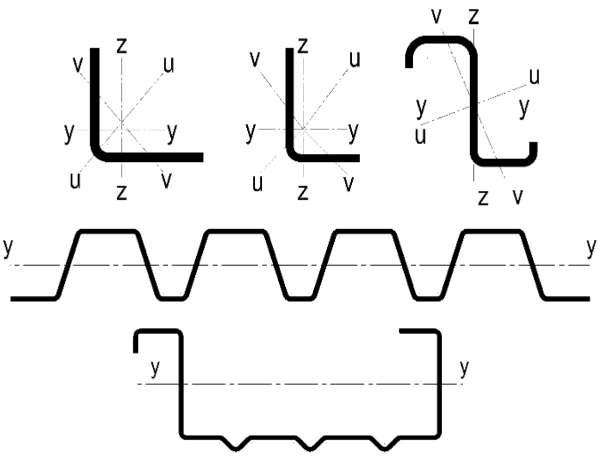


Figure 2.5 – Axis of sections

2.2.2 Ranges and tolerances for thickness

Because the section is obtained from the cold rolling process of the steel sheet, the thickness of the entire section can be considered uniform. Section thickness, noted ”tnom”, is called nominal thickness. The obtained value after the rolling will be considered equal to the initial thickness of the sheet, only if by processing the area of the section is not reduced by more than 2%; otherwise, the thickness of the section will decrease proportionally to the reduction recorded at the area level.

The measurable nominal thickness is composed of the core thickness of the sheet, noted ”t_{cor}”, to which the thickness of the corrosion protection layers is added. The layer size of the steel is calculated by the relations:

$$t_{cor} = t_{nom} - t_{prot}$$

t_{prot} : the sum thickness of the corrosion protection layers.

For the usual cases, anticorrosive protection is achieved by galvanizing with Z275, and the thickness summed on both sides can be considered t_{zinc} = 0,04 mm.

The calculation thickness of the sheet is noted with ”t”, it is determined according to the tolerance, allowed in the galvanizing process true immersion, regulated by EN 10143. For low tolerances (high accuracy), thickness ”t” can be considered equal to the thickness of the steel core ”t_{cor}”, but for normal tolerances it will be considered with a corrected value of the size of the steel core.

For special tolerances (S) with tol ≤ 5% → $t = t_{cor}$

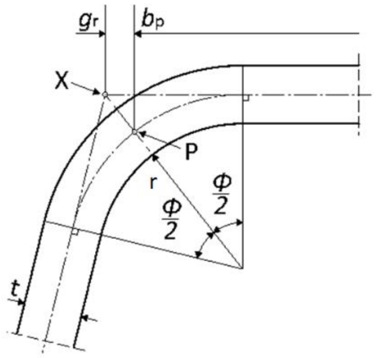
For normal tolerances with tol > 5% → $t = t_{cor} = \frac{100-tol}{95}$

2.2.3 Influence of rounding at corners and size of the sectional walls

For any of the cold forming processes, a bending radius size is required. Bending radius is the radius of connection of two consecutive walls measured at the inner face of the sheet. Usually, in current practice, the radius of curvature is not less than the minimum thicknesses of the steel sheet used. In the case of laminating strips, where sections of different thickness can be made for a roll configuration, the bending radius with constant value will be chosen according to the maximum sheet thickness that can be used. The r / t ratio is inversely proportional to the plastic elongation of the fibers on the outer face of the corner area and thus the higher the radius is chosen in relation to the thickness of the sheet, the less pronounced the hardening phenomenon is in the corner areas.

The curvature in the corner area has an influence on the dimensions of the component walls and implicitly on the sectional characteristics. There are three methods approved by the European standard that aims to influence the rounding of the corner on the sectional characteristics of the cold-formed profiles: (a) exact method, (b) approximate method, and (c) semi-exact method.

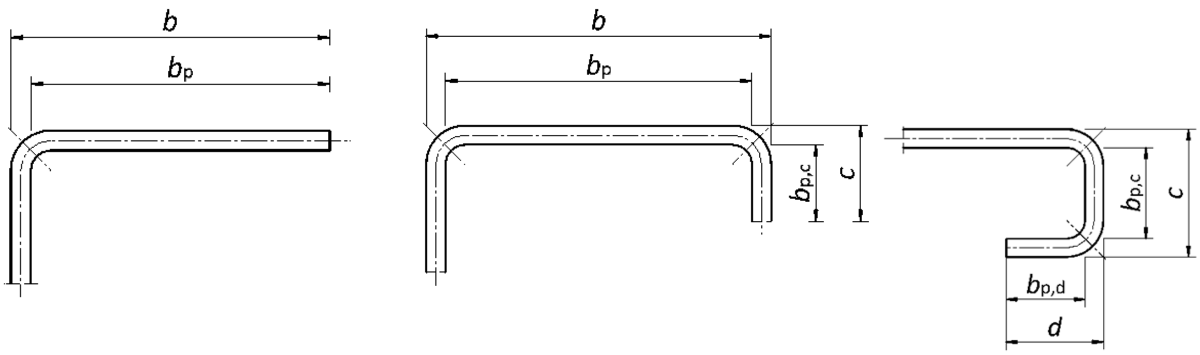
a. The exact method involves using the influence of the corners on the length of the sectional walls. Section length (b_p) is measured from the middle of the median axis of the corner portion (Figure 2.6 a. ”point P”).



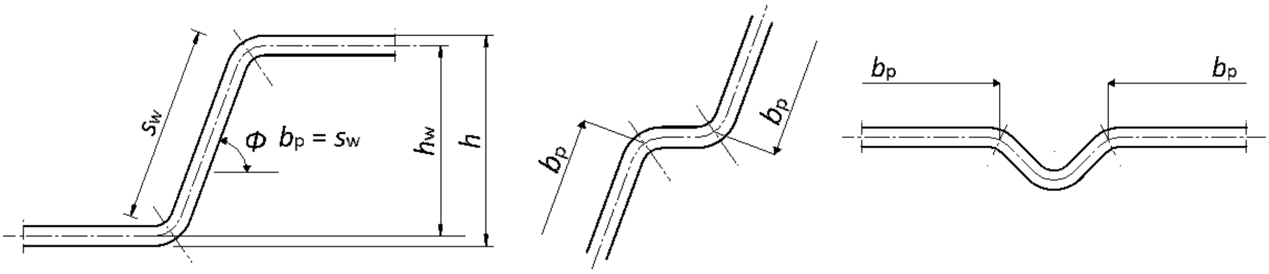
$$r_m = r + \frac{t}{2}$$

$$g_r = r_m\left(\tan\left(\frac{\Phi}{2}\right) - \sin\left(\frac{\Phi}{2}\right)\right)$$

a. Wall length influenced by the corner geometry



b. Flanges length influenced by the corner geometry

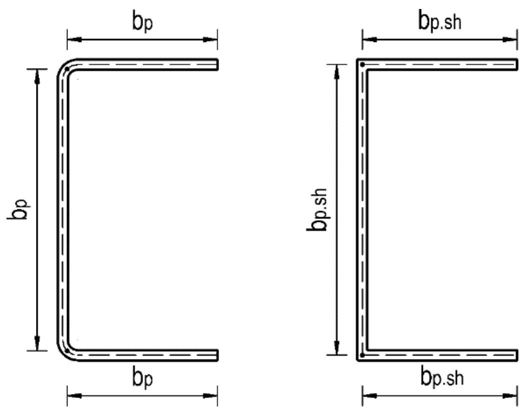


c. Web length influenced by the corner geometry

Figure 2.6 – Sectional walls length influenced by the rounded corners

b. The approximate method involves neglecting the influence of the corners, the section being thus idealized modeled with straight corners (Figure 2.7). Section length (b_p) in this case it is measured from the point of intersection of the section axes (Figure 2.6.a. ”point X”). It can be noted that the width of the walls thus determined is larger than in the case of the exact method, which leads to increased results of the sectional characteristics. Under these conditions the approximate calculation method can only be used if the radius of curvature”r” meets the following conditions:
$r \leq 5t$
$r \leq 0{,}10 b_p$, for all component walls of the section, including those in tension

However, for the geometric characteristics of the stiffeners, the influence of the rounded corners will always be taken into account.



basic member idealized member

Figure 2.7 – Widths of sectional walls neglecting the influence of rounding the corners

c. The semi-exact method assumes consideration of the influence of the rounding of the corners on the sectional characteristics, in the form of a correction imposed on the result obtained by the approximate method. Thus, this method involves two stages :
   i. Calculation of the characteristics of the modeled section simplified with straight corners (A_g, I_g, I_w)
   ii. Values correction obtained through the factor δ :

$$A_g \approx A_{g.sh}(1-\delta)$$
$$I_g \approx I_{g.sh}(1-2\delta)$$
$$I_w \approx I_{w.sh}(1-4\delta)$$

with,

$$\delta = 0{,}43 \sum_{j=1}^{n} r_j \frac{\phi_j}{90°} \Big/ \sum_{i=1}^{m} b_{p,i}$$

where,

$A_{g.sh}$, $I_{g.sh}$, $I_{w.sh}$ – represents the gross characteristics of the idealized section (with straight corners)

A_g, I_g, I_w - represents the final gross characteristics of the sections

m – number of sectional walls

n – corner numbers

r_j – radius of curvature of the corner „j"

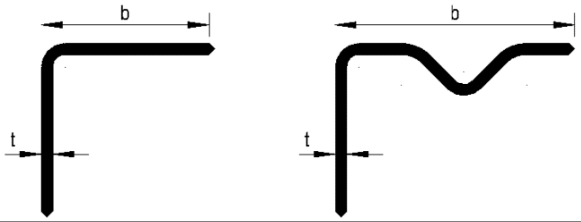
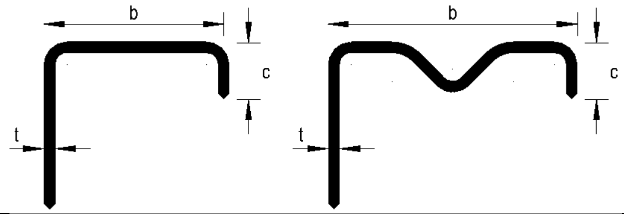
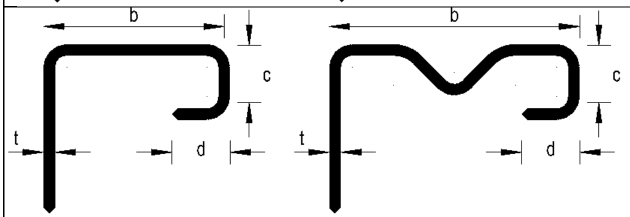
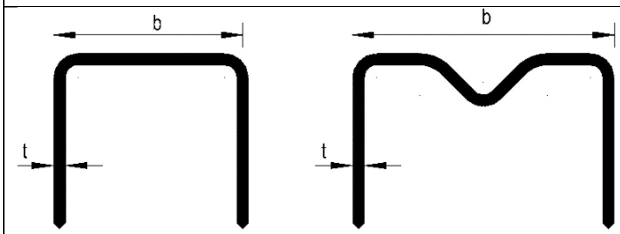
$b_{p.i}$ – wall width „i" , considering the section with the straight corners

This method can be applied also to the characteristics of the effective section. In this case, the design was performed by using straight corners.

Sections formed of cold profiled sheets almost always fall into Section Class 4 due to the large slenderness of the constituent walls.

The technical framework of the European standard for the calculation of thin-walled steel structures offers specific calculation methods if the slenderness of the component walls does not exceed the maximum limit specified in the legislation. This limitation arises from the need to fit the sections within a range of values validated by experimental tests, and any exceeding of the mentioned limit values leads to an uncertain structural response to be validated by analyses and experimental tests.

The permissible upper limit of slenderness differs depending on the type of inner wall according to the Table 2.1:

Component walls of the cross section	Maximum values
	(1). Flange without edge stiffeness $b/t \leq 50$
	(2). Flange with simple edge stiffeness $b/t \leq 60$ $c/t \leq 50$
	(3). Flange with double edge stiffeness $b/t \leq 90$ $c/t \leq 60$ $d/t \leq 50$
	(4). Interior flange $b/t \leq 500$

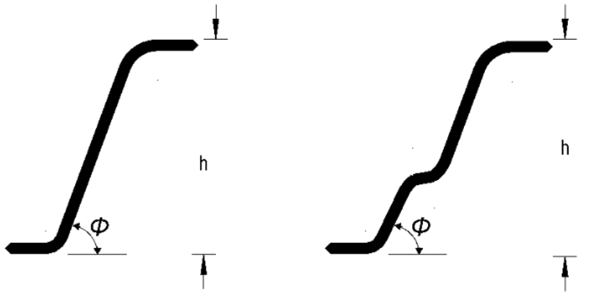
	(5). web $45° \leq \Phi \leq 90°$ $h/t \leq 500 sin\Phi$

Table 2.1 - Maximum limit of Wall slenderness

For the mechanical response of a cantilevered wall to correspond to the mechanism described by the calculation relations of Eurocode 3, that is, to ensure sufficient stiffness of the ledge and to prevent the buckling, before ensuring torsional buckling of the considered stiffened wall, the following proportions must be taken into account:

$$0,2 \leq c/b \leq 0,6$$

$$0,1 \leq d/b \leq 0,3$$

If the values of the ratios are below the minimum permissible limits. Then the stiffness flanges cantilever will be ignored, and the stiffness widths (simple or double) will take the values: c=0 and d=0

3 Specific elements of thin-walled bars stability

Steel structural elements, in general, are flexible and, based on this consideration the structural design is governed by the evaluation of the stability of the elements. In the case of Class 4 sections, due to the large thinness of the component walls, the phenomenon of local stability loss becomes much more complex, since, in the procedure for designing these sections, both the modes of loss of overall stability and the sectional ones must be evaluated

Global buckling is a linear form of local stability loss, which is manifested by bending buckling, represented by the curve of the axis of the bar when requested at compression, represented by lateral bending of the axis coupled with the torsion of the section when the element subjected in bending. Sometimes global buckling is also referred to as rigid body buckling because the section moves like a rigid body without any distortion.

Section buckling, in contrast to the global one, is a mode of stability loss that manifests itself locally, on a segment of limited length of the length of the bar and can occur repeatedly along the same element. It manifests itself in two distinct forms: (a)distortion buckling and (B)local buckling.

Distortion buckling, or sectional distortion, is distinct at the sectional level by the displacement of its supports (corner) joints. The displacement of the joints differs in amplitude from section to section, but the axis of the bar remains unformed. In the case of linear elements with cold-formed sections, distortion is manifested especially on the edge joints of the flanges, by a rotation of the flange-stiffening assembly around the web. The phenomenon is all the more striking since the edge, which acts as a support element of the flange, has lower stiffness.

Local buckling is a way of stability loss noticeable by local deformation of one or more walls of the profile. As a result of the loss of stability, the axis of the bar remains uniform and the corner of the section retain their position, causing deformation in the wall panels bordered by them. The amplitude of the deformation, like distortion, varies from section to section, and its alloy viewed along the element has a tide appearance.

The aforementioned buckling modes can occur at the level of the elements either individually, in a clearly defined form, or in coupled mode, in which case the modes interact and the formed yielding mechanism increases in complexity.

Sectional buckling as a local stability loss definitively for class sections 4 (when they are working in compression or tension) indicated true the two modes of forming, buckling and/or distortion, materializes at the level of the compressed sectional walls at values of stresses below the yielding limit of the steel. Under these conditions, noting that the sectional buckling is initiated before the plasticization of the fibers of the section, the element did not give way but its rigidity decreased significantly.

The reduction in stiffness of the section is due both to the end-of-life of certain portions of the walls, due to buckling, and due to the general change in the geometry of the section by rotating the walls.

The calculation of Class 4 sections (see 3.1), involves the use in the load-bearing capacity assessment relations of reduced sectional characteristics, compared to gross ones, due to sectional instability. The calculation of the reduced characteristics, called effective characteristics, is carried out in two distinct stages: (a) by using small (or effective) widths features of the constituent walls, due to the buckling phenomenon (see 3.2) and (b) by adopting a reduced thickness of portions of the section, due to sectional distortion (see 3.3).

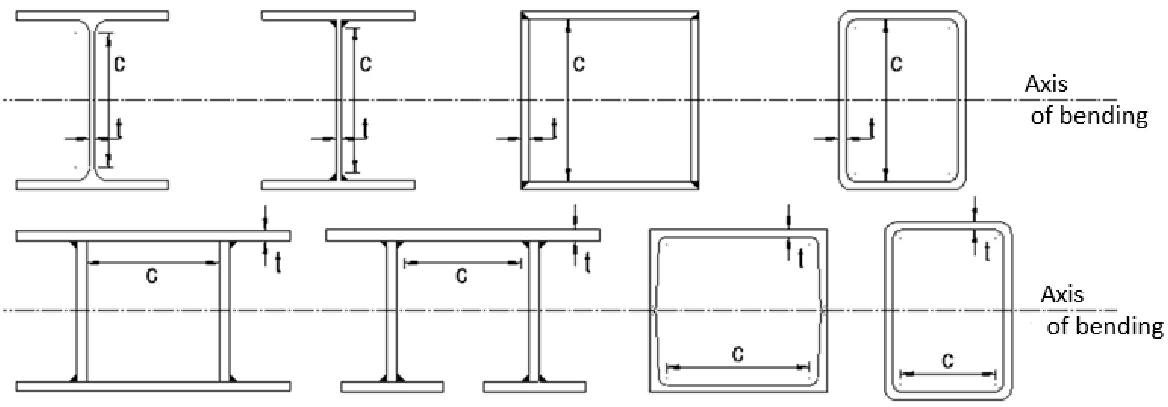
3.1 Class section

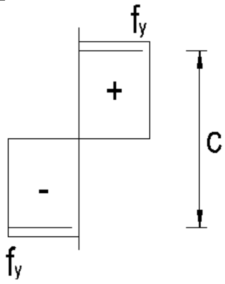
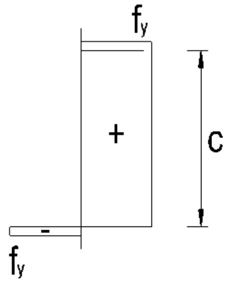
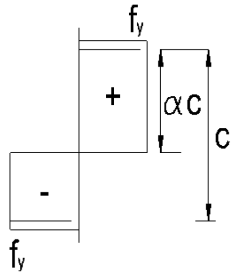
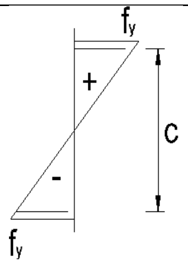
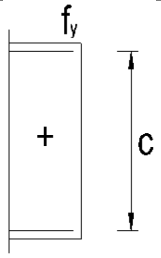
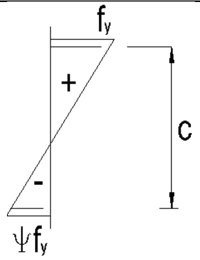
Steel sections are divided in classes based on the internal compression parts. The role of cross section classification is to identify the extent to which the resistance and rotation capacity of cross sections is limited by its local buckling resistance. Four classes of cross-sections are defined (Eurocode 3), as follows:

- Class 1 cross-sections are those which can form the 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 moment resistance but have limited rotation capacity because of local buckling.
- Class 3 cross-sections are those in which the stress in the extreme compression fiber of the steel member assuming an elastic distribution of stresses can reach the yield strength, but local buckling is liable to prevent development of the plastic moment resistance.
- Class 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.

A section is framed in one of four classes based on the individual slenderness of the component walls. Each wall component of the section will be classified, and the section class will be considered the maximum class (the most unfavorable). For example, a section for which the flanges are classified in the class 1, and the web is framed in the class 3 will be considered Class 3.

The classification boundaries of interior walls are different from those of cantilever walls, due to the predisposition to different ways of their local buckling. For interior walls, the class classification values, according to the information provided by the European standard, are found in Table 3.1, and for cantilevered walls, the values are in Table 3.2. The differentiation of the boundaries of framing based on the type of sectional wall is also noted.

<table>
<tr><td colspan="4">Internal compression parts</td></tr>
<tr><td colspan="4">
</td></tr>
<tr><td>Class</td><td>Part subjected to bending</td><td>Part subjected to compression</td><td>Part subjected to bending and compression</td></tr>
</table>

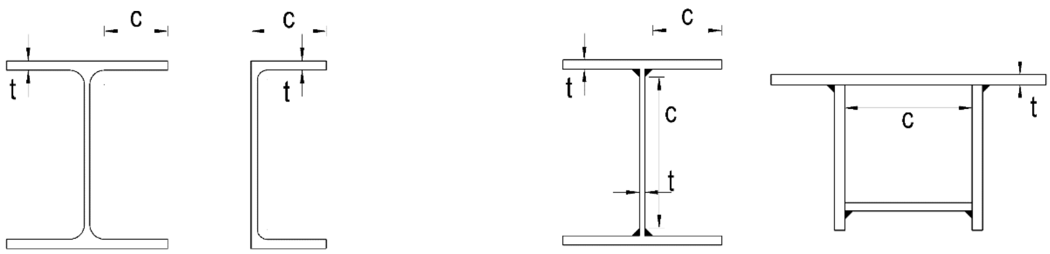
Stress distribution in parts (compression positive)			
1	$c/t \leq 72\varepsilon$	$c/t \leq 33\varepsilon$	when $\alpha > 0{,}5$: $c/t \leq \frac{396\varepsilon}{13\alpha - 1}$ when $\alpha \leq 0{,}5$: $c/t \leq \frac{36\varepsilon}{\alpha}$
2	$c/t \leq 83\varepsilon$	$c/t \leq 38\varepsilon$	when $\alpha > 0{,}5$: $c/t \leq \frac{456\varepsilon}{13\alpha - 1}$ when $\alpha \leq 0{,}5$: $c/t \leq \frac{41{,}5\varepsilon}{\alpha}$
Stress distribution in parts (compression positive)			
3	$c/t \leq 124\varepsilon$	$c/t \leq 42\varepsilon$	when $\psi > -1$: $c/t \leq \frac{42\varepsilon}{0{,}67 + 0{,}33\psi}$ when $\psi \leq -1^{*)}$: $c/t \leq 62\varepsilon(1-\psi)\sqrt{(-\psi)}$

$\varepsilon = \sqrt{235/f_y}$						
	f_y	235	275	355	420	460
	ε	1.00	0,92	0,81	0,75	0,71

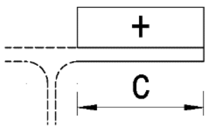
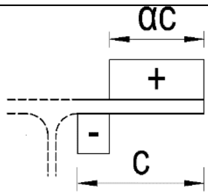
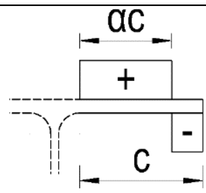
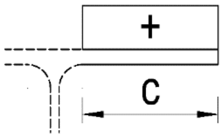
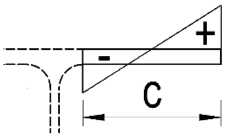
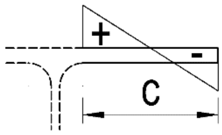
Table 3.1 - Maximum width-to-thickness ratios for compression parts

(*) It is used when the $\sigma \leq f_y$ or $\varepsilon_y > {f_y}/{E}$

Outstand flanges



Rolled sections | Welded sections

Class	Part subjected to compression	Part subjected to bending and compression: Tip in compression	Part subjected to bending and compression: Tip in tension
Stress distribution in parts (compression positive)			
1	$c/t \leq 9\varepsilon$	$c/t \leq \frac{9\varepsilon}{\alpha}$	$c/t \leq \frac{9\varepsilon}{\alpha\sqrt{\alpha}}$
2	$c/t \leq 10\varepsilon$	$c/t \leq \frac{10\varepsilon}{\alpha}$	$c/t \leq \frac{10\varepsilon}{\alpha\sqrt{\alpha}}$
Stress distribution in parts (compression positive)			
3	$c/t \leq 14\varepsilon$	$c/t \leq 21\varepsilon\sqrt{k_\sigma}$ For k_σ a see EN 1993-1-5	

$\varepsilon = \sqrt{235/f_y}$						
	f_y	235	275	355	420	460
	ε	1.00	0,92	0,81	0,75	0,71

Table 3.2 - Maximum width-to-thickness ratios for compression parts

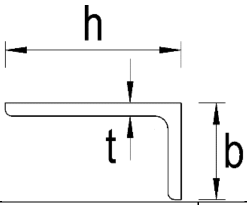
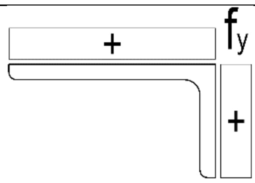
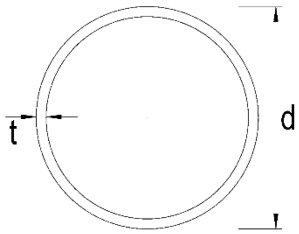
<table>
<tr><td>
</td><td colspan="6">Angles
See also console flanges
Does not apply to angles in continuous with other components</td></tr>
<tr><td></td><td colspan="6">Section in compression</td></tr>
<tr><td>Stress distribution across section (compression positive)</td><td colspan="6">
</td></tr>
<tr><td>3</td><td colspan="6">$\frac{h}{t} \leq 15\varepsilon : \ \frac{b+h}{2t} \leq 11{,}5\varepsilon$</td></tr>
<tr><td colspan="7">Tubular sections

</td></tr>
<tr><td>Class</td><td colspan="6">Section in bending and/or compression</td></tr>
<tr><td>1</td><td colspan="6">$d/t \leq 50\varepsilon^2$</td></tr>
<tr><td>2</td><td colspan="6">$d/t \leq 70\varepsilon^2$</td></tr>
<tr><td>3</td><td colspan="6">$d/t \leq 90\varepsilon^2$
NOTE: for $d/t > 90\varepsilon^2$ see EN 1993-1-6.</td></tr>
<tr><td rowspan="3">$\varepsilon = \sqrt{235/f_y}$</td><td>$f_y$</td><td>235</td><td>275</td><td>355</td><td>420</td><td>460</td></tr>
<tr><td>ε</td><td>1,00</td><td>0.92</td><td>0,81</td><td>0,75</td><td>0,71</td></tr>
<tr><td>ε^2</td><td>1,00</td><td>0,85</td><td>0,66</td><td>0,56</td><td>0,51</td></tr>
</table>

Table 3.3 - Maximum width-to-thickness ratios for compression parts

3.2 Local buckling

The effective dimensions are determined only for the walls subjected to compression and depend on the alloy of the stress curve. At the level of a uniform compressed wall, for example, the theoretical distribution of stresses is uniform. For ”low” values of the stresses, below the limit of the critical value producing the buckling ($\sigma < \sigma_{cr}$), the alloy of their distribution curve is uniform (Figure 3.1.a). If the compressive stress is increased, so that the theoretical value of the internal stresses exceeds the limit of the critical buckling value ($\sigma_{cr} < \sigma < f_y$) to the wall level, the buckling process will be initiated. Buckling is not noticeable on the entire width of the wall but a segment of its length. The location of the buckling segment is related to the stress distribution and the support conditions of the wall in question. In the case of a wall rigid at both ends, buckling can be is seen in the median portion of the compressed area, and for a wall embedded only at one end, buckling can manifest on the free end. Because the critical stress (σ_{cr}) has a value below the plastic limit of the steel ($\sigma < f_y$), the section of the element has not exhausted its bearing capacity at the moment when internal stress reaches this threshold. On the length of the segment, marked by the loss of the stability, no stress can occur that exceeds the critical value (σ_{cr}), the redundancy of the stress being distributed to the stiffer portions of the wall. This fact leads to a change of the characteristics of the distribution different for the uniform form (Figure 3.1.b).

Due to the increase of the stress effort ($N = N_{L.cr}$) of the level of the stable segments, the stress is reaching the yielding strength of the steel ($\sigma = f_y$), thus the fracture of the section can be observed (Figure 3.1.c). The value of the stress at which the yield was obtained is, due to the uniform non-distribution of the stresses, lower than the elastic capable stress of the section, $N_{L.cr} < N_{c.RD}$.

Following these observations, the evaluation of the stability phenomenon can be materialized by taking into account the analytical relations of elastic calculation, performed on small dimensions of the walls. The effective dimensions of the walls will be determined valorically considering that at their level, under the action of the critical effort of buckling ($N_{L.cr}$), can be obtained, true elastic distribution, a value of the stress equal to the yielding strength of the steel (Figure 3.1.d).

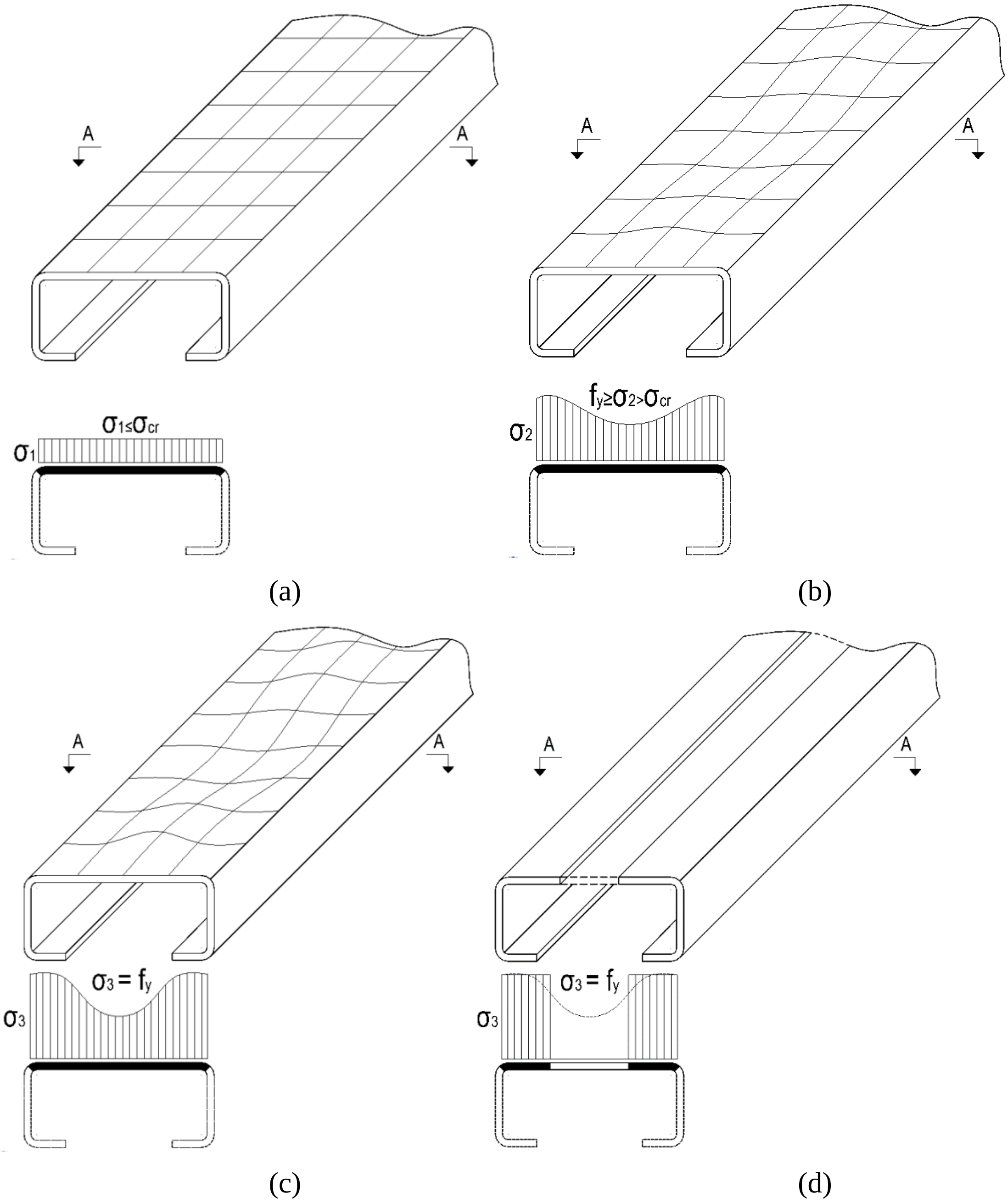


Figure 3.1 – Buckling of the sectional wall and the variation of stresses at its level

3.2.1 Design of the effective width of a sectional panel

Cold-formed sections are considered in the calculation to be composed of plane sectional walls. These walls are considered mathematically infinitely long, in the longitudinal direction, and in the transverse direction bordered, either at both ends or only at one end. Walls subjected to compressive stresses are susceptible to buckling in the strips furthest from the stiffened ends. The critical buckling tension of a uniformly compressed plate can be calculated by the relation:

$$\sigma_{cr} = \frac{k\pi^2 E}{12(1-\upsilon^2)}\left(\frac{t}{b}\right)^2 \tag{3.1}$$

The parameters " t " and " b "are the geometric characteristics of the panel, the thickness and width of the panel, respectively, and" k" is the buckling coefficient. This coefficient takes into account the supporting conditions of the panel at the two ends as well as the stress distribution at its level. This coefficient takes into account the conditions of support of the panel at the two ends and the stress distribution at this level for panels subjected to uniform compression and bordered on both ends; the coefficient " k" has the value 4, but for panels bordered on one end, its value drops sharply to the value of 0.425, thus greatly reducing the stability resistance (Figure 3.2). It is thus noted that the marginal (non-rigid) sectional walls have a much-diminished strength performance compared to the interior ones.

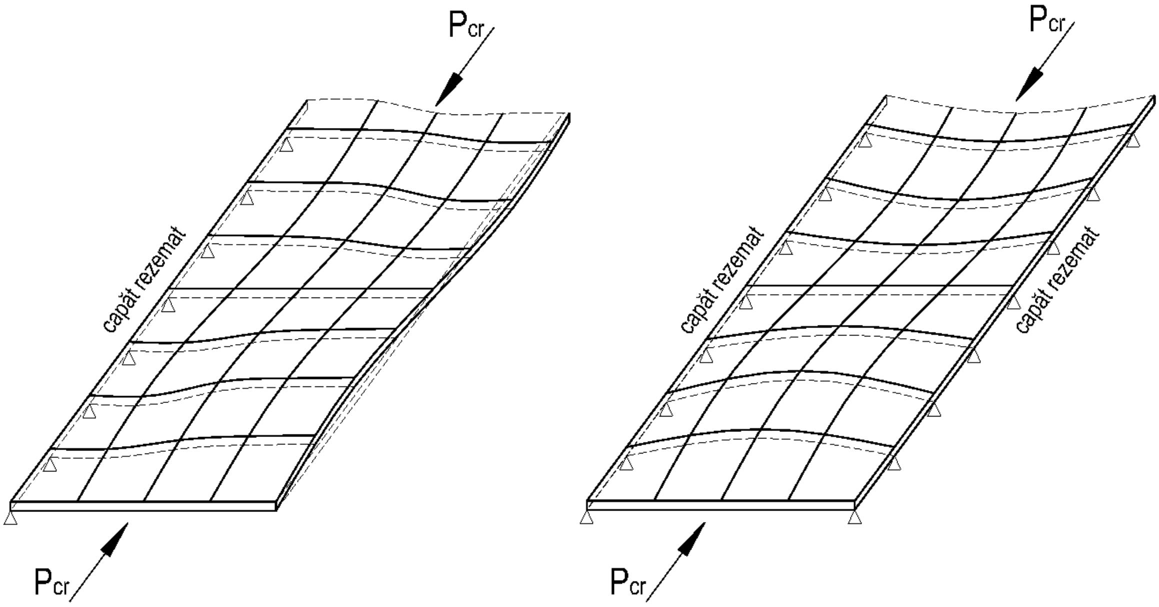


Figure 3.2 – Plates buckling for different supports conditions

Starting from relation (3.1), the active (effective) width of a sectional wall can be determined by equalizing the value of the critical stress, which is usually below the limit of plasticization of the steel.

$$\sigma_{max} = \frac{k\pi^2 E}{12(1-\upsilon^2)}\left(\frac{t}{b_{eff}}\right)^2 = f_y \tag{3.2}$$

$$\Rightarrow \qquad b_{eff} = t\sqrt{\frac{k\pi^2 E}{12(1-\upsilon^2)f_y}}$$

b_{eff} – reduced wall thickness

For an effective size formulation as the allowable thickness of the panel, the following form was obtained by applying relations (3.1) and (3.2):

$$\bar{\lambda}_p = \sqrt{\frac{f_y}{\sigma_{cr}}} = \sqrt{\frac{\frac{k\pi^2 E}{12(1-\upsilon^2)}\left(\frac{t}{b_{eff}}\right)^2}{\frac{k\pi^2 E}{12(1-\upsilon^2)}\left(\frac{t}{b}\right)^2}} = \frac{b}{b_{eff}} = \frac{b}{t\sqrt{\frac{k\pi^2 E}{12(1-\upsilon^2)f_y}}} = \frac{b}{t}\cdot\frac{1052}{\sqrt{k}}\sqrt{\frac{f_y}{E}} \tag{3.3}$$

$$\Rightarrow \quad \bar{\lambda}_p = \frac{b}{t\cdot 28{,}4\cdot\varepsilon\cdot\sqrt{k}} \quad ,where: \varepsilon = \sqrt{\frac{235}{f_y}} \tag{3.4}$$

The design method, the small dimensions of the plate element without longitudinal stiffeners, according to the legislation SR EN 1993-1-5, depending on the type of the wall (inside or cantilevered) and on the distribution of tensions at its level, is calculated using the relations shown in Table 3.3 and table 3.4. The reduction factor is designed according to relations (3.5) and (3.6) based on the relative slenderness obtained analytically by (3.7).

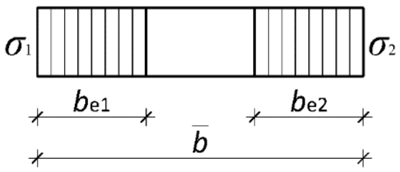
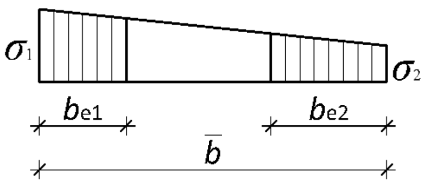
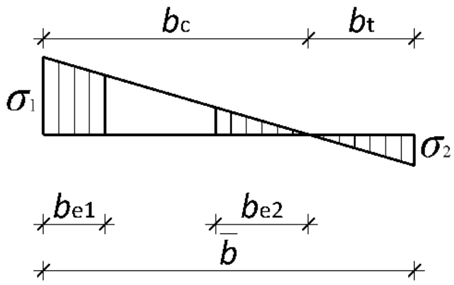
Interior walls in compression			
ID	Stress distribution (positive compression) $\psi = \sigma_2/\sigma_1$	Effective width b_{eff}	Buckling factor k_σ
1	$\psi = 1$ 	$b_{eff} = \rho\,\bar{b}$ $b_{e1} = 0{,}5 b_{eff}$ $b_{e2} = 0{,}5 b_{eff}$	$k_\sigma = 4{,}0$
2	$1 > \psi \geq 0$ 	$b_{eff} = \rho\,\bar{b}$ $b_{e1} = \frac{2}{5-\psi} b_{eff}$ $b_{e2} = b_{eff} - b_{e1}$	$1 > \psi > 0$ $k_\sigma = 8{,}2/(1{,}05+\psi)$ $\psi = 0$ $k_\sigma = 7{,}81$
3	$\psi < 0$ 	$b_{eff} = \rho\, b_c$ $b_c = \bar{b}/(1-\psi)$ $b_{e1} = 0{,}4 b_{eff}$ $b_{e2} = 0{,}6 b_{eff}$	$1 > \psi > -1$ $k_\sigma = 7{,}81 - 6{,}29\psi + 9{,}78\psi^2$ $\psi = -1 \Rightarrow k_\sigma = 23{,}9$ $-1 > \psi > -3$ $k_\sigma = 5{,}98(1-\psi)^2$
Alternatively, the value of the coefficient k_σ can be determined with the relations: For : $1 \geq \psi \geq -1$ $k_\sigma = \frac{16}{\sqrt{(1+\psi)^2 + 0{,}112(1-\psi)^2} + (1+\psi)}$			

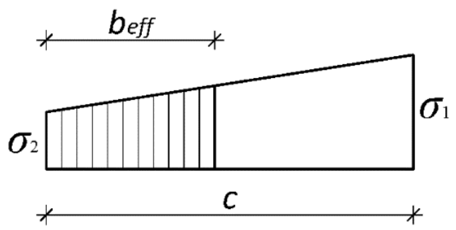
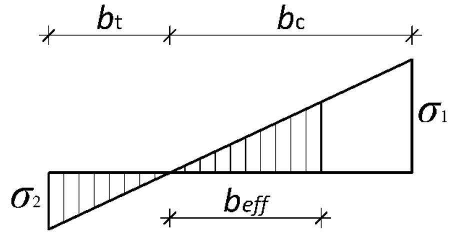
Table 3.3 - Effective widths for interior panel in compression

<table>
<tr><th colspan="4">Panels cantilever in compression</th></tr>
<tr><th>ID</th><th>Stress distribution
(positive compression)
$\psi = \sigma_2/\sigma_1$</th><th>Effective width

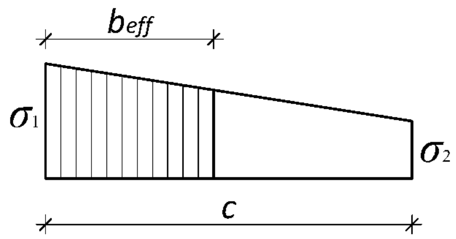
b_{eff}</th><th>Buckling factor

k_σ</th></tr>
<tr><td rowspan="2">1</td><td>$1 > \psi \geq 0$</td><td rowspan="2">$b_{eff} = \rho\ c$</td><td rowspan="4">$1 \geq \psi \geq -3$

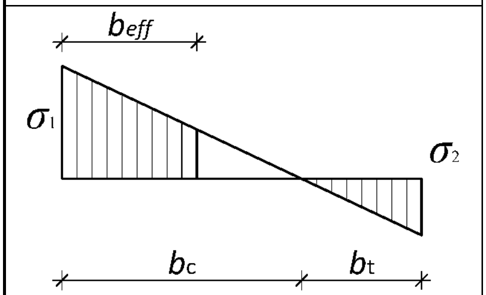
$k_\sigma = 0,57 - 0,21\psi + 0,07\psi^2$

$(\psi = 1 \Rightarrow k_\sigma = 0,43)$
$(\psi = 0 \Rightarrow k_\sigma = 0,57)$
$(\psi = -1 \Rightarrow k_\sigma = 0,85)$</td></tr>
<tr><td>
</td></tr>
<tr><td rowspan="2">2</td><td>$\psi < 0$</td><td rowspan="2">$b_{eff} = \rho\ b_c$
$b_c = c/(1-\psi)$</td></tr>
<tr><td>
</td></tr>
<tr><td rowspan="2">3</td><td>$1 > \psi \geq 0$</td><td rowspan="2">$b_{eff} = \rho\ c$</td><td rowspan="2">$1 > \psi > 0$

$k_\sigma = 0,578/(\psi + 0,34)$

$(\psi = 1 \Rightarrow k_\sigma = 0,43)$
$(\psi = 0 \Rightarrow k_\sigma = 1,70)$</td></tr>
<tr><td>
</td></tr>
<tr><td rowspan="2">4</td><td>$\psi < 0$</td><td rowspan="2">$b_{eff} = \rho\ b_c$

$b_c = c/(1-\psi)$</td><td>$0 > \psi > -1$

$k_\sigma = 1,7 - 5\psi + 17,1\psi^2$</td></tr>
<tr><td>
</td><td>$\psi = -1$

$k_\sigma = 23,8$</td></tr>
</table>

Table 3.4 - Effective widths for cantilever panels in compression

(6). Reduction factor (ρ)it is designed based on reduced slenderness ($\bar{\lambda}_p$) :

- Interior panels in compression

$if\ \bar{\lambda}_p \leq 0,673 \qquad\qquad \rho = 1,0$

$$\text{if } \bar{\lambda}_p > 0{,}673 \qquad \rho = \frac{\bar{\lambda}_p - 0{,}055(3+\psi)}{\bar{\lambda}_p^{\,2}} \leq 1{,}0 \qquad (3.5)$$

$$\text{cu, } (3+\psi) \geq 0$$

- Panels cantilever in compression

$$\text{if } \bar{\lambda}_p \leq 0{,}748 \qquad \rho = 1{,}0$$

$$\text{if } \bar{\lambda}_p > 0{,}748 \qquad \rho = \frac{\bar{\lambda}_p - 0{,}188}{\bar{\lambda}_p^{\,2}} \leq 1{,}0 \qquad (3.6)$$

(7). Reduced slenderness ($\bar{\lambda}_p$) used in relations (3.6) and (3.7):

$$\bar{\lambda}_p = \sqrt{\frac{f_y}{\sigma_{cr}}} = \frac{b_p}{t}\sqrt{\frac{12(1-\nu^2)f_{yb}}{\pi^2 E k_\sigma}} \cong 1.052\frac{b_p}{t}\sqrt{\frac{f_{yb}}{E k_\sigma}} = \frac{b_p/t}{28{,}4\varepsilon\sqrt{k_\sigma}} \qquad (3.7)$$

cu :

$\bar{b}_p$ - panel width;

σ_{cr} - critical unitary buckling effort;

t - thickness of the steel core of the sheet ($t = t_{cor}$);

f_y - yield strength; the value of the yield strength of the base material will be taken into account $f_y = f_{y.b}$ in N/mm^2;

k_σ - stability coefficient corresponding to the stress ratio ψ and the boundary conditions. For k_σ designed according to Table 3.3 and Table 3.4.

For the calculation of relative slenderness (λ_p), it is necessary to determine the factor k_σ based on the stress distribution at the level of the section byl ψ. For the design of the flanges, a ratio value of the stresses can be considered (ψ), determined at the level of the section with gross characteristics. In the case of the web, however, due to the redistribution of stress at the level of the section, at the time of initiation of local instability at the level of the flanges, factor ψ will be calculated by considering the section consisting of flanges with effective areas and the web with gross area. Optionally, coefficient ψ can be refined for all the walls of the section, considering the entire effective area determined in the previous steps.

The designed value of the relative slenderness presented above was determined on the premise that, at the section level, the effective stress in compression reaches the level of the yield limit value of the steel ($\sigma_{com.ed} = f_{yb}/\gamma_{M0}$). For cases of a request for a value below this limit, with $\sigma_{com.ed} < f_{yb}/\gamma_{M0}$, relative slenderness used in relations (3.5) and (3.6) will be able to reduce according to the relation:

$$\bar{\lambda}_{p.red} = \bar{\lambda}_p\sqrt{\frac{\sigma_{com.ed}}{f_{yb}/\gamma_{M0}}} \qquad (3.8)$$

with $\bar{\lambda}_p$ determined on the basis of the relation (3.7).

3.3 Distortion buckling

Sectional distortion buckling can occur by the change in the geometry of the section manifested by the rotation in the plane of the walls that they are in compression when the critical stress is over the limit.

Distortion buckling occurs either before or after, or concurrently with local buckling by stability loss. The moment of appearance is influenced by both the length of the bar and its sectional geometry. Sectional panels are prone to loss of stability by distortion depending on the rotational stiffness of the linear bearings on their contour. For example, a flange has a greater sensitivity to distortion buckling than a web, which is supported at both ends by panels. In the case of non-rigid flanges at the free end, the predominant sectional buckling mode is the distortion one, and for marginally stiffened ones, the sectional buckling mode and their compressive strength is greatly influenced by the geometry of the flange and its stiffness. It can also be noted that the stiffness at the rotation of the flange-web connection is affected by the slenderness of the web wall. The wider a flange is, the more the influence of the flange stiffness influences the buckling mode. In the case of a high rigidity flange, the prevailing buckling mode changes from distortion to buckling and vice versa. When the flanges of the section are short, they will not be prone to buckling, but mainly the mode of loss of stability that characterizes them is that by distortion, which will occur most often coupled with the buckling of the web.

Distortion buckling also occurs in the case of internal walls that have provided intermediate stiffeners, manifested by the lateral displacement of the joints that support the stiffening. Cold formed sections used as structural elements tend to have increasingly larger sectional gauges in order to obtain increased physical and mechanical characteristics. Since the thickness of the sheet used for cold forming is limited to the dimensions that allow the forming process, the slenderness of the sectional walls increases considerably, thus being strongly affected by the loss of stability by buckling. In the case of walls with large slenderness, the ratio of effective width to gross width is greatly diminished, becoming ineffective in terms of mechanical performance. To maximize sectional efficiency, walls with large slenderness are fragmented into panels with smaller widths by applying intermediate stiffeners. The smaller the size of the wall portions are on the edge, the lower the stiffening , and their sensitivity to buckling is translated to the distortion one. Like walls with edge stiffeners, the bearing capacity of a wall with intermediate stiffeners at distortion buckling is influenced by the stiffness at rotation of the wall-wall link on its contour.

Since distortion buckling is a mechanism for loss of stabilityis complex, for any thin-walled section, it is recommended to perform buckling analyses using numerical methods or to perform experimental tests on specimens of relevant length showing this mode of instability.

In current practice, the effects of distortion buckling on the section are materialized numerically, by applying reductions on the area of the walls sensitive to distortion, which leads to a reduction in the bending stiffness of the section.

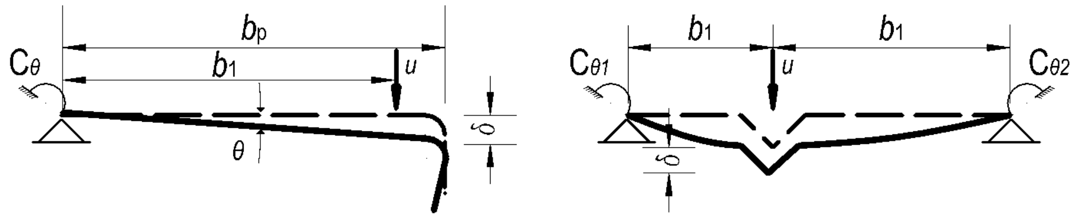
3.3.1 Design true distortion of the elements with stiffeners

Due to the multitude of sectional shapes possible for cold forming, a universal design methodology for assessing buckling by distortion is nearly impossible. European Standard Eurocode 3, Part 1.3, shows a simplified procedure for calculating the distortion buckling stiffeners of the marginal and intermediate elements. This type of sectional walls is often encountered in the composition of cold-formed structural sections. For other types of sections that do not include these elements, advanced computational analyses and/or laboratory tests are recommended.

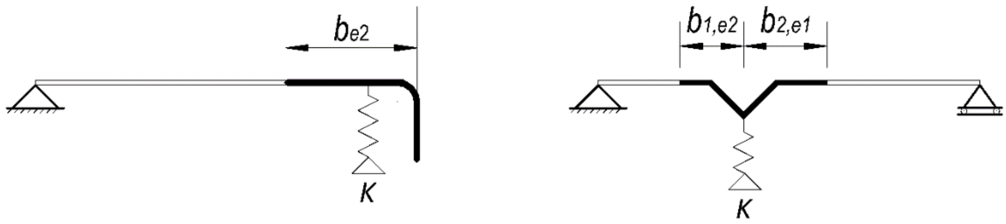
The design of rigid panels is based on the fact that they work like beams on an elastic bearing. The stiffening of the sectional wall works like on an elastic support that is replaced by a stiffened spring K, the value of which depends on the edge conditions of the wall and the bending stiffness of neighboring walls on which it is fixed. Stiffness assessment ”K” is necessary for the design of the critical distortion buckling (σ_{cr}), based on which the buckling coefficient will be calculated (χ_d) by which the area of the wall sensitive to loss of stability will be reduced.

The general method to determine the stiffness (3.9) represents the ratio between the unit force ”u” applied to the unit of length in the center of gravity of the effective portion, at a b_1 distance, and flexure ” δ” obtained from the application of the unifying force.

$$K = \frac{u}{\delta} \tag{3.9}$$



The real system

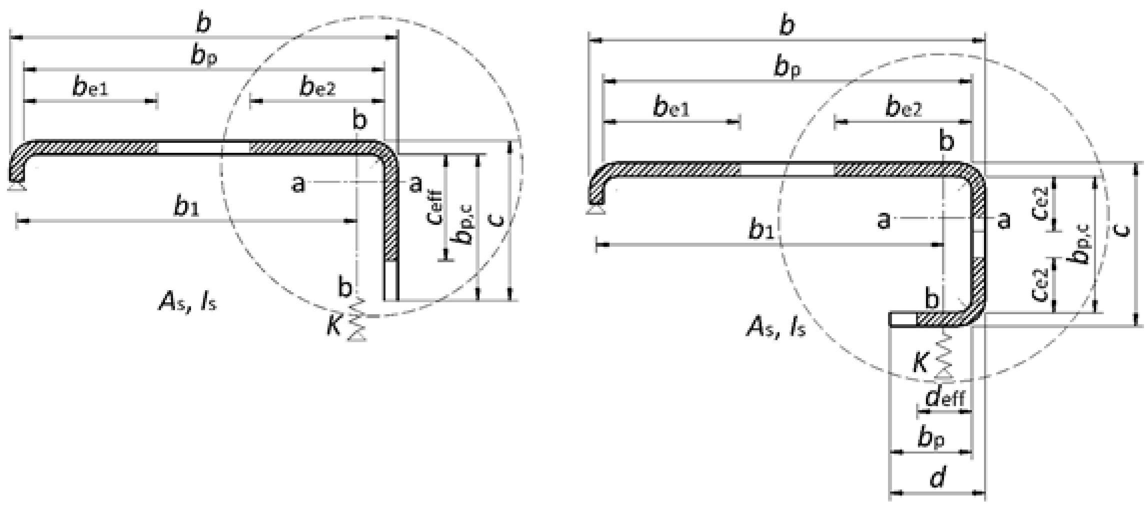


The equivalent system

Figure 3.3 Stiffeners on elastic support

3.3.1.1 Elements with marginal stiffeners

Elements with marginal stiffeners considered in the European legislation include both simple stiffeners and double stiffeners (marginal stiffening with rebate). The widths (b) or the stiffened walls, must not exceed the value $b \leq 60 \cdot t$,in the case it is simple-supported and $b \leq 90 \cdot t$ in the case it is double-stiffened. The bending angle of the stiffener is measured between its axis and the axis of the wall. The bending angle of the stiffener will be considered between 45º and 135º.



$b/t \leq 60$ $\qquad$ $b/t \leq 90$

Figure 3.4 – Edge stiffeneres

The evaluation procedure comprises a sequence of calculation steps.

(1). In the first step, the effective widths of the stiffened wall and the stiffening will be determined using the relations presented in the Table 3.3 and Table 3.4 with the value $\bar{\lambda}_p$ determined on the basis of relation (3.7), where walls will be considered as follows:

- Stiffened wall (b) : interior wall
- Simple-supported (c) according to Figure 3.4 a: cantilever wall
- Stiffening with rebate (c) according to Figure 3.4 b: interior wall
- Stiffening with rebate (d) according to Figure 3.4 b: cantilever wall

In the procedure for determining the effective widths, for the marginal stiffeners, the values of k_σ will be considered as follows:

- For simple stiffeners, the calculation of c_{eff} is achieved by using the following values of k_σ :
  - If $\frac{b_{p.c}}{b_p} \le 0.35 \Rightarrow k_\sigma = 0.5$ (3.10)
  - If $0.35 \le \frac{b_{p.c}}{b_p} \le 0.6 \Rightarrow k_\sigma = 0.5 + 0.83 \cdot \sqrt[3]{\left(\frac{b_{p.c}}{b_p} - 0.35\right)^2}$ (3.11)
- For double stiffeners, the calculation of c_{eff} and d_{eff} i is achieved by using its values k_σ according to Table 3.3 and Table 3.4.

(2). In the second step, the reduction coefficient for distortion buckling is calculated on the basis of the low distortion slenderness $\bar{\lambda}_d$ according to relations:

- If $\bar{\lambda}_d \le 0.65 \Rightarrow \chi_d = 1$ (3.12)
- If $0.65 < \bar{\lambda}_d < 1.38 \Rightarrow \chi_d = 1.47 - 0.723 \cdot \bar{\lambda}_d$ (3.13)
- If $\bar{\lambda}_d \ge 1.38 \Rightarrow \chi_d = \frac{0.66}{\bar{\lambda}_d}$ (3.14)

where :

$$\bar{\lambda}_d = \sqrt{\frac{f_{yb}}{\sigma_{cr.s}}} \qquad (3.15)$$

The critical buckling tension can be obtained either by numerical buckling analysis or by using the relation:

$$\sigma_{cr.s} = \frac{2\sqrt{K \cdot E \cdot I_s}}{A_s} \qquad (3.16)$$

where:

A_s : effective area of marginal stiffening

- for simple stiffeners: $A_s = t(b_{e2} + c_{eff})$ (3.17)

- for double stiffeners: $A_s = t(b_{e2} + c_{e1} + c_{e2} + c_{eff})$ (3.18)

I_s : effective moment of inertia of marginal stiffening

Stiffness ”K” of the resort will be determined according to the relation (3.9). The displacement value can be determined based on the relation:

$$\delta = \theta b_p + \frac{u \cdot b_p^3}{3} \cdot \frac{12(1-\nu^2)}{Et^3} \qquad (3.19)$$

with : $\theta = u\, b_p / C_\theta$, and C_θ represents stiffness to distortion (Figure 3.3).

Distortion stiffness can be determined by numerical analysis by applying unitary forces „u” in the expected direction and meaning of distortion.

For particular type sections „C” and „Z”, the European legislation provides the relation direct calculation of the spring stiffness for the usual variants of application of the unitary forces presented in Figure 3.6. Considering the notation of flanges with 1 and 2, rotational stiffness of the flange 1, can be determined with :

$$K_1 = \frac{Et^3}{4(1-\nu^2)} \cdot \frac{1}{b_1^2 h_w + b_1^3 + 0.5 b_1 b_2 h_w k_f} \qquad (3.20)$$

b_1 and b_2 : represents the distance from the point of connection flange-web to the center of gravity of the stiffener, b1 is determined for the first flange (see Figure 3.3) , and b_2 can be determined for the second flange ;

h_w : web height;

$k_f = 0$ the flange will work in tension

$k_f = 1$ for a fully symmetrical section under compression;

$k_f = \frac{A_{s2}}{A_{s1}}$ the flange will work in compression;

A_{s1} and A_{s2} : the effective areas of the stiffeners of the two flanges will be determined according to relations (3.16) and (3.17), A_{s1} representing the area of the flanges.

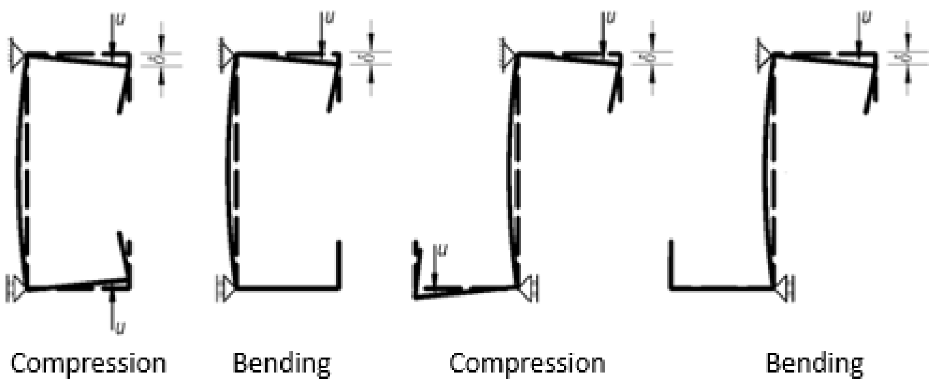


Figure 3.5 – Unit efforts applied for cold-form sections „C” and „Z”

(3). Within this stage, optionally, the value of buckling coefficient χ_d previously calculated will be improved iteratively if its value is subunitary ($\chi_d < 1$).

In the first stage, the effective wall widths were initially determined based on the reduced slenderness $\bar{\lambda}_p$, determined with relation (3.7). Their values were obtained based on the premise that the stress concentration in the most solicited point of the reached value equal to that of the yield limit of steel ($\sigma_{com.ed} = f_{yb}/\gamma_{M0}$).

To refine the result of the buckling coefficient, the calculation will resume from stage (1), where the effective widths of stiffening (b_{e2} and c_{eff} : for simple stiffeners | b_{e2}, c_{e1}, c_{e2} and d_{eff} : for double stiffeners) will be recalculated on the basis of the value of relative slenderness $\bar{\lambda}_p$ determined with the relation presented in (3.8). This time the value of the maximum compression stress is considered to be less than the yield limit of the steel determined with the relation:

$$\sigma_{com.ed} = \chi_d \cdot f_{yb}/\gamma_{M0} \qquad (3.21)$$

The third stage (3) will repeat until the following conditions are met

$$\chi_{d,n} \approx \chi_{d.n-1} \qquad , dar\ \chi_{d,n} \leq \chi_{d.n-1} \qquad (3.22)$$

(4). The final stage consists of adopting the modified effective dimensions of the stiffener. Final effective stiffening widths (b_{e2} and c_{eff} : for simple stiffeners | b_{e2}, c_{e1}, c_{e2} and d_{eff} : for double stiffeners) will be considered with the value related to the last step of itarization and the reduced thickness Tred, calculated according to the relation:

$$t_{red} = t \cdot A_{s.red}/A_s \qquad (3.23)$$

with,

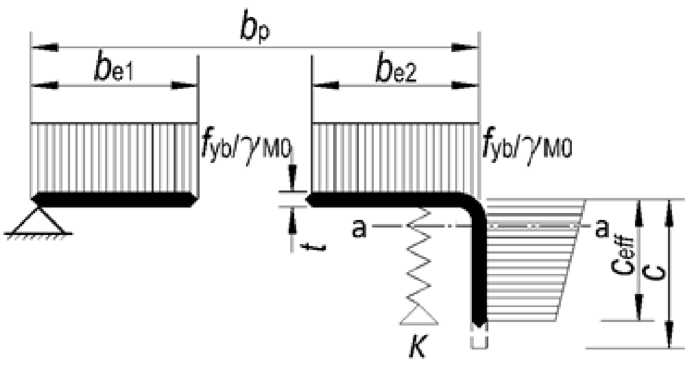
$$A_{s.red} = \chi_d \cdot A_s \frac{f_{yb}/\gamma_{M0}}{\sigma_{com.ed}} \qquad (3.24)$$

Reduced thickness t_{red} for all widths that are part of the stiffening will be used.

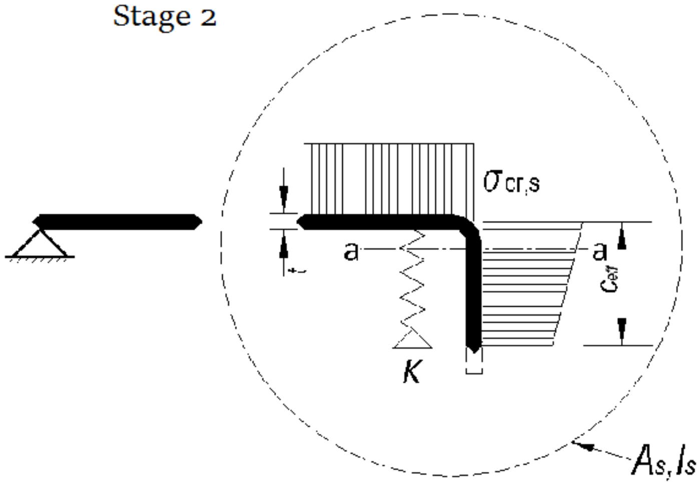
In this case $\sigma_{com.ed} = f_{yb}/\gamma_{M0}$, relation (3.23) becomes :

$$t_{red} = \chi_d \cdot t \qquad (3.25)$$

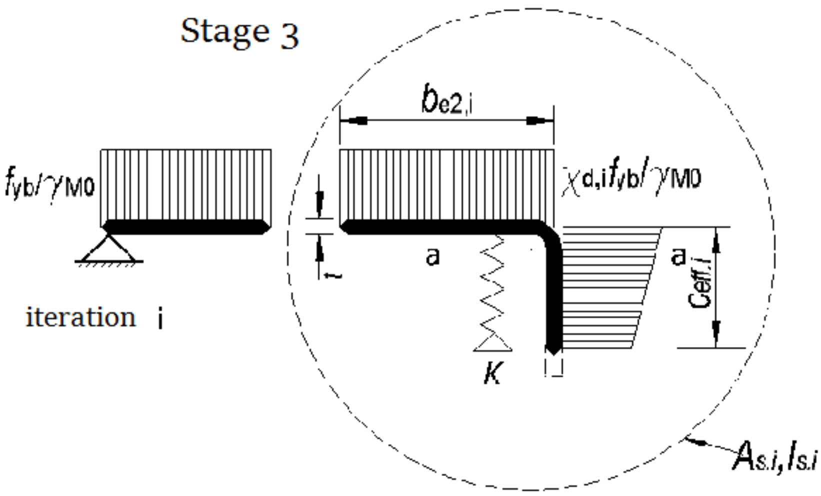
Stage 1



Stage 2



Stage 3



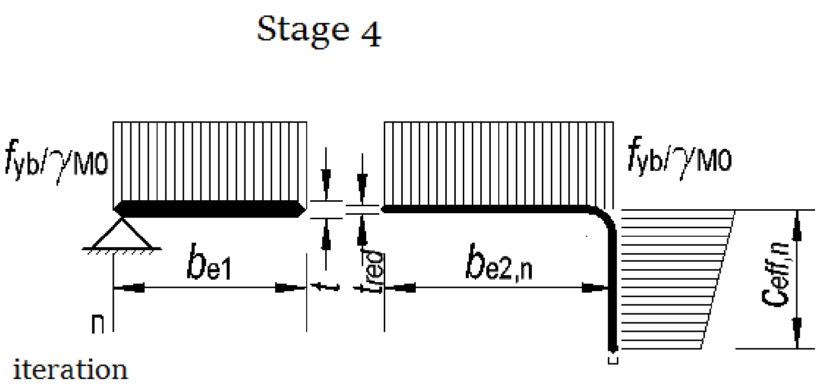
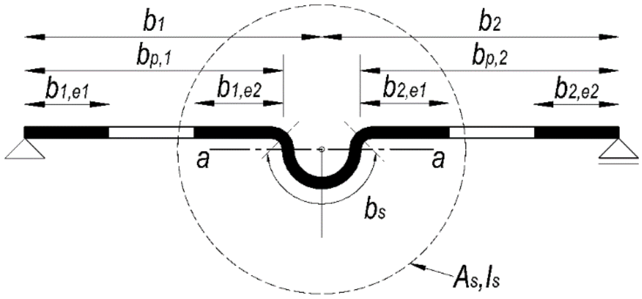


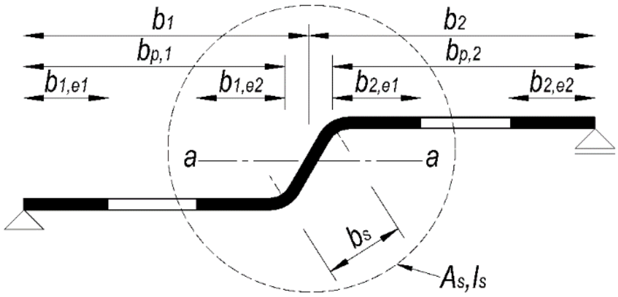
Figure 3.6 – Stress distribution and marginal stiffness dimensions used in the stepwise calculation of distortion buckling

3.3.1.2 Intermediate stiffeners within their elements

Eurocode standards provide a simplified design methodology for two geometric configurations of intermediate stiffeners. The stiffeners can be in the form of "grooves" or „folds".



grooves



folds

Figure 3.7 – Intermediate stiffeners

The evaluation procedure is similar to that used in the case of marginal stiffeners because it comprises the same sequence of design steps.

(1). At the first stage, the effective widths of the wall panels bordering the stiffening will be determined, using the relations presented in Table 3.3 and Table 3.4, where its value $\bar{\lambda}_p$ is determined based on the relation (3.7). Walls will be considered interior if they are bordered by another wall or a stiffener at the opposite end of the position of the stiffener in question.

(2). In the second step, the reduction coefficient for distortion buckling is designed based on the low distortion slenderness $\bar{\lambda}_d$, according to relations (3.12),(3.13),(3.14),(3.15),(3.16), presented in the case of marginal stiffeners, where the following parameters will be used:

A_s : the effective area of intermediate stiffening

$$A_s = t(b_{1.e2} + b_{2.e1} + b_s) \quad (3.26)$$

I_s : effective moment of inertia of intermediate stiffening

Stiffness "K" of the resort will be determined according to relation (3.9), on the basis of the displacement δ which can be determined based on the relation :

$$\delta = \frac{u \cdot b_1^2 \cdot b_2^2}{3(b_1 + b_2)} \cdot \frac{12(1 - \nu^2)}{Et^3} \quad (3.27)$$

b_1 and b_2 : represents the distances from the point of connection flange-web to the center of gravity of the stiffening related to the two ends (see Figure 3.3)

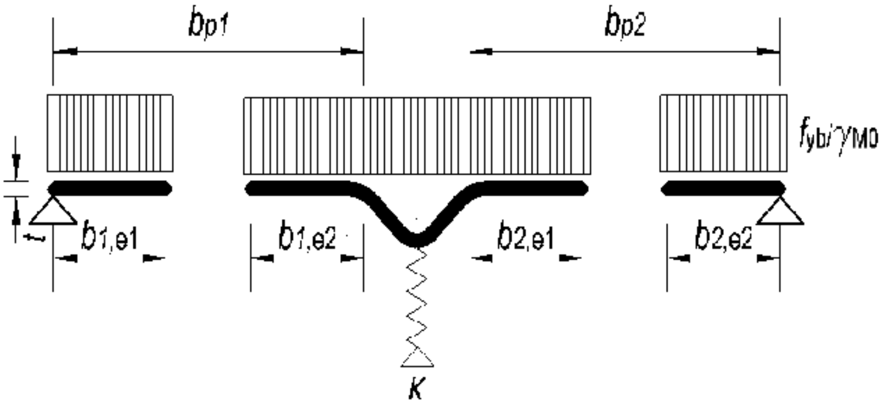
(3). Step 3 (optional) improves the value of the buckling coefficient if it is subunitary ($\chi_d < 1$). To refine its value, we will proceed as in step (3) presented for the case of marginal stiffeners.

The algorithm assumes the resumption of the calculation of effective stiffening widths ($b_{1.e2}$, $b_{2.e1}$ and b_s) presented at stage 1, with certain changes. Initially the effective dimensions were designed on the basis of relative slenderness $\bar{\lambda}_p$ determined with the relation (3.7) and taking into account that the maximum stress in compression is equal to the yield limit ($\sigma_{com.ed} = f_{yb}/\gamma_{M0}$). At the current stage, the process is resumed, but the effective widths will be determined based on the relative slenderness $\bar{\lambda}_p$ determined with relation (3.8), considering the values of the compressive stresses below the yield limit of the steel ($\sigma_{com.ed} \leq f_{yb}/\gamma_{M0}$), designed with relation (3.21).

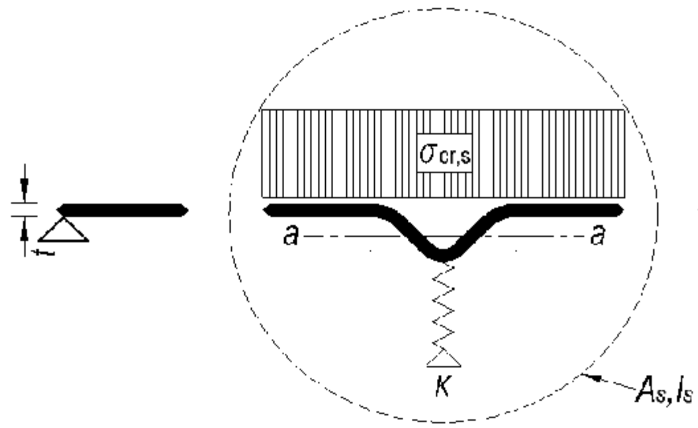
Step (3) will repeat until the conditions are fulfilled according to (3.22).

(4). The final stage, like in the case of marginal stiffeners, involves adopting the modified effective dimensions of the stiffener. The final lengths of its segments will have the values obtained in the last iteration step of step (3), and their thickness is reduced to the value t_{red}, calculated according to relation (3.23).

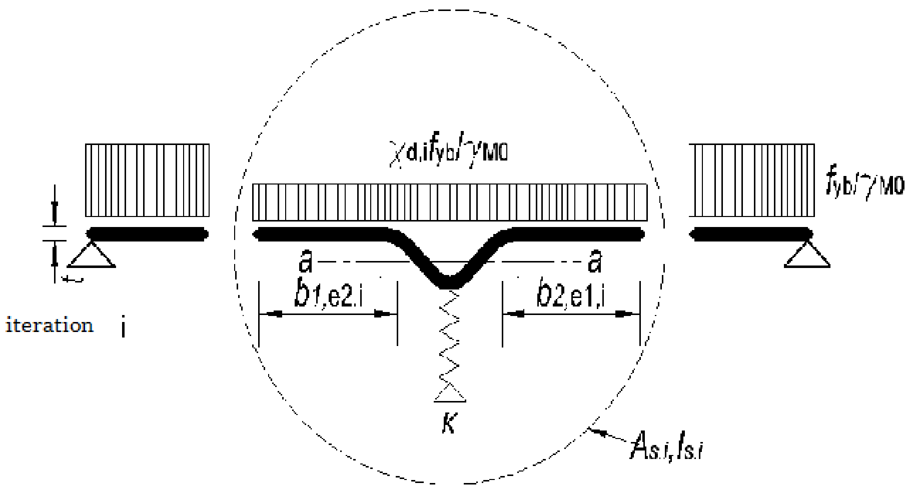
Stage 1



Stage 2



Stage 3



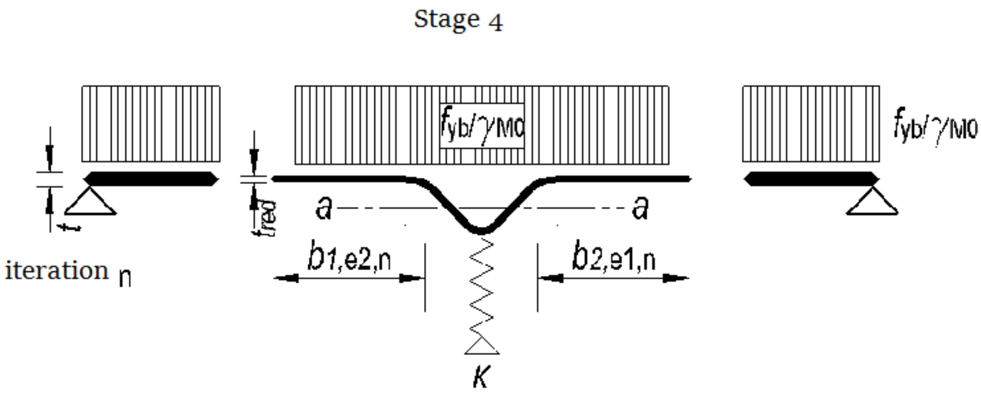


Figure 3.8 – Stress distribution and calculation dimensions of intermediate stiffening used in the stepwise design for distortion buckling

4 Design of the effective characteristics of Sections "C" and " Z”

Some of the most common cold-formed structural elements are "C" and "Z" sections. An example of a design for these types of sections is presented. In the first case, centrical compression, and the second model is in the case, of pure bending. To highlight the design steps as suggestively as possible. The structure was designed up in the form of a logical scheme from

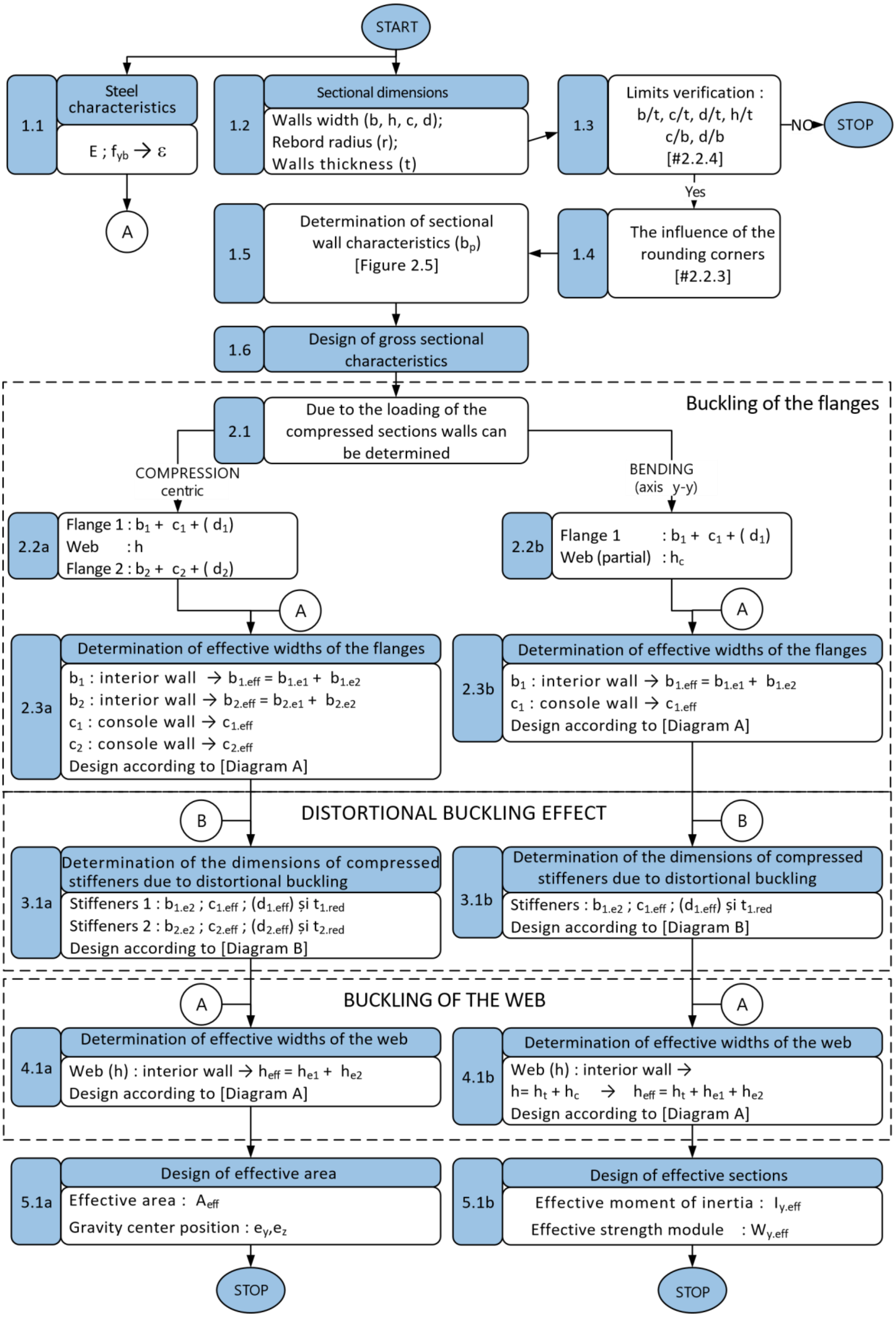


Figure 4.1, for which, the content of the sequence of the steps are described below:

Step 1.1 : The main characteristics of the steel used in the design are:

- Modulus of Elasticity E=210000 Mpa ;
- Poisson's coefficient $\nu = 0.3$ and
- Yield limit of the base material (f_{yb});

Step 1.2 : Sectional dimensions are represented by the prism of the widths of the component walls. In the case of the sections „C” and „Z” , the dimensions of the walls have the following notations: flanges width b”, the simple rebate width „c”, the double rebate width „d”, and of the web with „h”. The sectional geometric characteristics also include the calculation thickness of the walls (t) and the connection radius (r) between the inner panels measured at their inner face;

Step 1.3 : To perform the design according to the European legislation, the slenderness of the walls is limited higher. The limit values are presented in chapter 2.2.4.;

Step 1.4 : For the exact sectional characteristics, the geometry of the section is drawn as accurately as possible to the actual situation, so the corners are modeled with the inner curvature "r". The influence of the curved corner detail on the sectional characteristics is insignificant compared to the case of the section modeled with straight corners for small values of the r / t ratio. The simplified section can be used (see chapter 2.2.3);

Step 1.5 : The section can be considered in computing as consisting of flat panels. Their width is determined according to those presented in Figure 2.6, based on the dimensions described above;

Step1.6 : The calculation of the gross section characteristics can be carried out using the relations in Annex A.;

Step 2.1 : The calculation methodology presented comprises two calculation scenarios depending on the way the elements are loaded. Two request modes are thus covered: Centric compression and pure bending by Axis „y-y”;

Step 2.2 a/b: This stage comprises the first step for calculating the effective widths and involves identifying the elements required for compression as they are affected by instability phenomena. In the case of centrically compression sections (hypostasis a), all sectional walls work compression, and in the case of pure bending (hypostasis b) a flange in compression and a portion of the web panel is noted;

Step 2.3 a/b: This step is presented as a result of a more complex calculation procedure called „A” (Figure 4.2). This procedure will be detailed separately, but by applying this calculation to each wall panel in compression, its effective widths are obtained due to buckling. The design is performed based on the internal stress distribution in the wall. In the current step, the "A" procedure is applied. Only to the walls in compression that can occur at the level of the flanges. By using the distribution of the internal stresses obtained considering the gross section. In the case of centrically sections in compression (hypostasis a), the calculation procedure "A" is used for both flanges that contain two walls (b and c), where b is considered the inner wall and c is considered console wall. If the section is with double marginal stiffeners, then the design of each flange will contain three walls (b, c, and d), where b and c are considered interior and d determined as a wall in the console. In the case of sections required for pure bending (hypostasis b) the design is performed only for the compressed flange;

Step 3.1a/b : This step presents the results of the distortion buckling evaluation in the section. For Sections "C" and "Z" distortion buckling manifested on the flanges by their rotation. The numerical materialization of this instability phenomenon involves modification from the geometric characteristics of the portions of walls related to marginal stiffeners ($\mathbf{c_{eff}}$, $\mathbf{d_{eff}}$ if exist, $\mathbf{b_{e2}}$). The geometric modification involves the recalculation of the effective widths and the thickness of the panels starting from the effective dimensions previously determined in step 2.3. The design methodology for a wall with marginal stiffening is described separately under the name of the procedure „B”

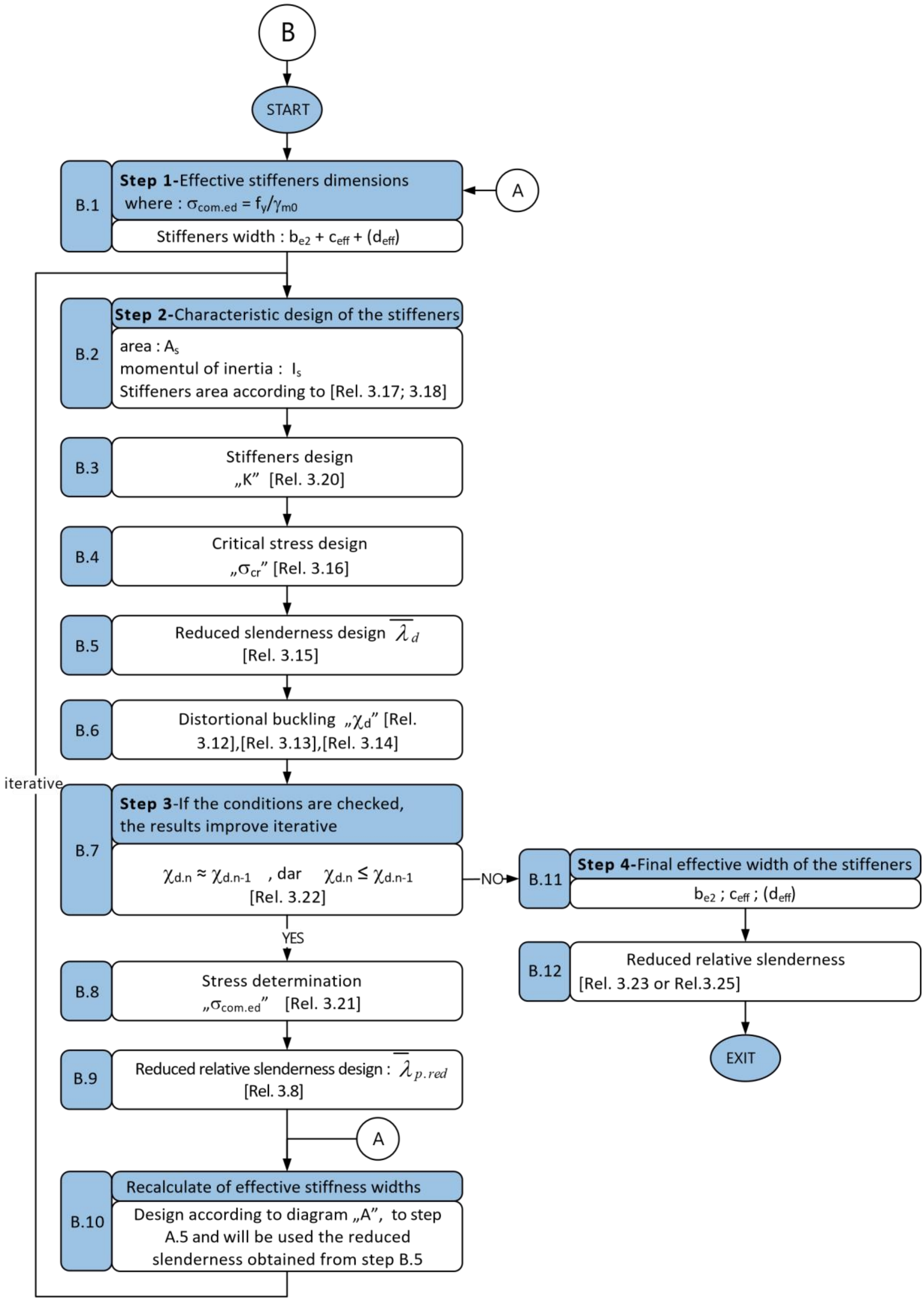


Figure 4.3. This procedure applies to the centric comresssion sections (hypostasis a) for both flanges, and the moment-resisting sections (hypostases b) for the flanges subjected to compression only;

Step 4.1a/b Within this step, the effective widths of the web are estimated by calling the calculation procedure "A" which is considered the inner wall. The calculation presented in this procedure depends on the distribution of the tensions at the wall level (ψ). The stress distribution is determined for the effective flange section. The final effective widths of the flanges were determined in the previous calculation steps 2.3 and 3.1. For the compressed sections (hypostasis a), the effective width of the web (fully compressed) , is composed of $h_{eff} = h_{e1} + h_{e2}$, and for the bent section (hypostasis b), in which case the web is partially compressed, the effective size is composed of $h_{eff} = h_t + h_{e1} + h_{e2}$, where h_t represents the stretched portion of the panel;

Step 5.1a/b : It represents the final step of the design and assumes the recomposition of the section on which is determined the sectional characteristics. The calculation is based on the relations from ANNEX A.

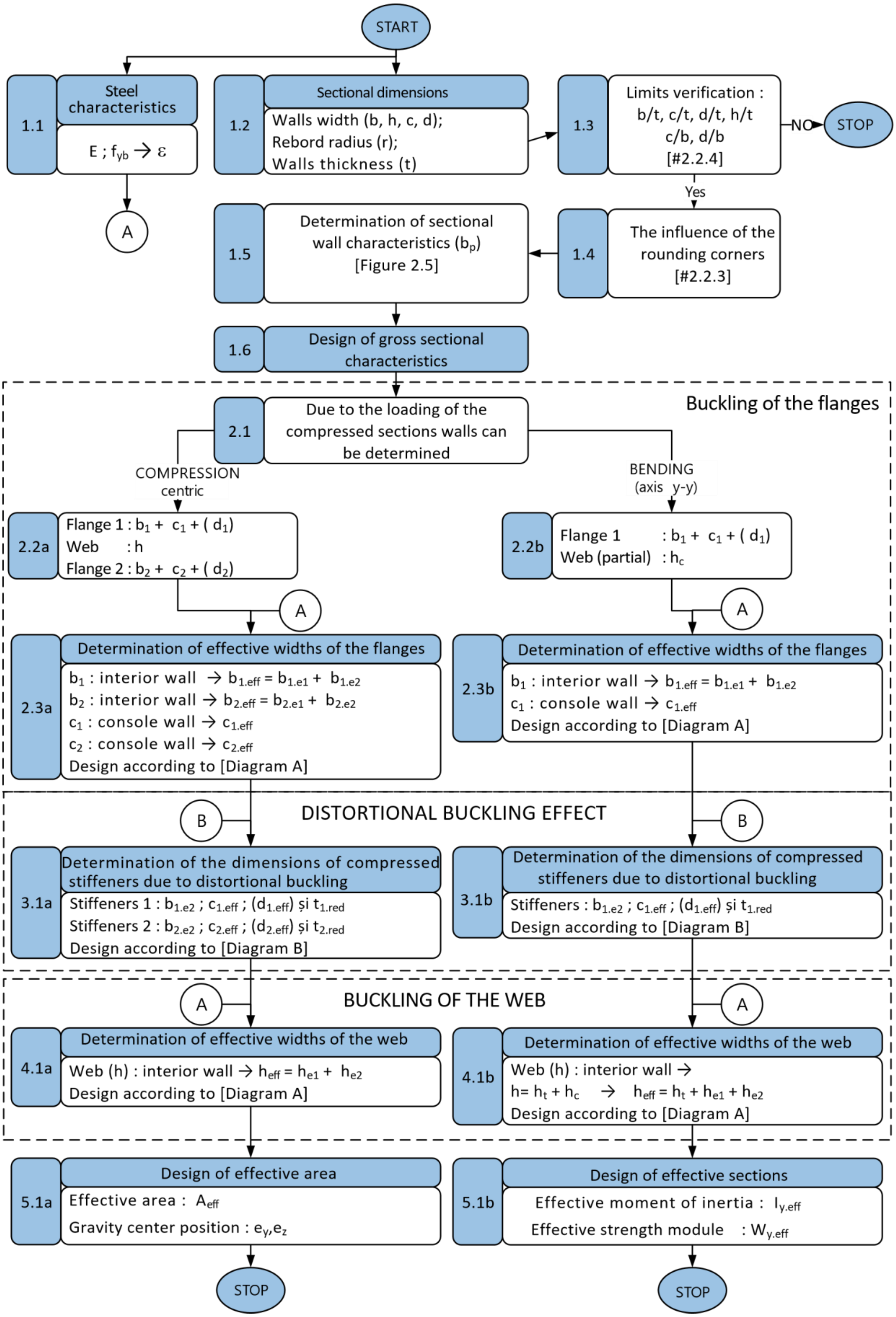


Figure 4.1 – Effective size calculation scheme for cross-sectional elements „C” and „Z”

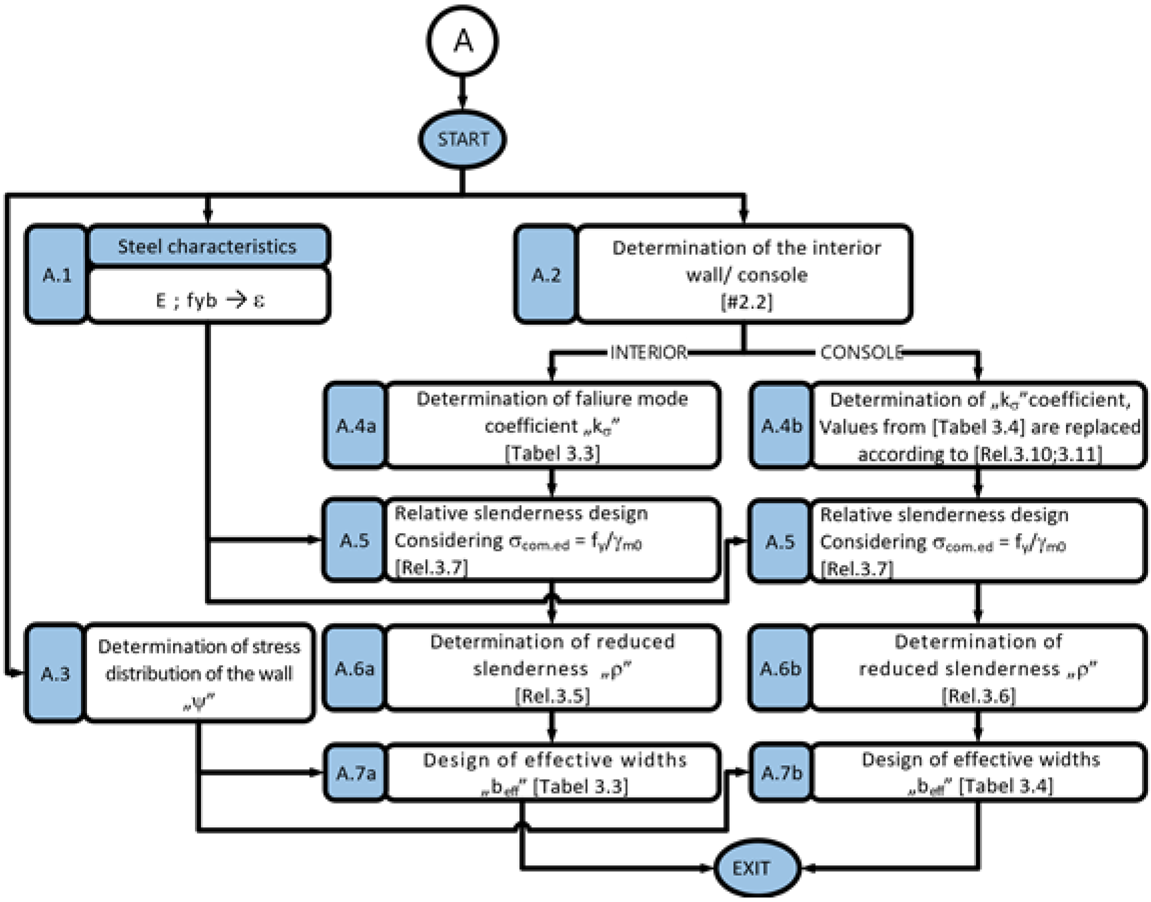


Figure 4.2 – Design scheme „A" – determination of the effective width for a sectional wall true buckling

Design scheme „A"

This logical scheme presents the calculation steps necessary to determine the effective widths of a sectional wall individually treated as a result of buckling (see Chapter 3.2);

Step A.1 : The characteristics of the steel introduced according to those specified in the case of the general scheme at the step 1.1;

Step A.2 : It is necessary to determine the type of wall according to the classifications presented in Chapter 2.2., where the wall can be considered interior or console. The calculation of effective widths differs according to this criterion, see Chapter 3.2.1.

Step A.3 : The stress distribution is determined at the level of the wall panel in the form of a ratio $\psi = \sigma_2/\sigma_1$, where σ_1 and σ_2 represents the axial forces at the two ends of the wall as shown in Table 3.3 and Table 3.4.

Step A.4a/b : Buckling coefficent k_σ, it has the meaning presented in the chapter 3.2.1. and it is calculated based on the distribution factor ψ previously determined at the step A.3. For interior walls (hypostasis a) the calculation is carried out based on the Table 3.3. For standard cantilever walls (hypostasis b) its value k_σ can be obtained from Table 3.4, but in the case of simple stiffeners the value of this coefficient is calculated according to the relations Rel.(3.10) and/or Rel.(3.11).

Step A.5 : Relative slenderness $\bar{\lambda}_p$, defines the sensitivity to buckling of the wall (see Chap 3.2.1.). Its value $\bar{\lambda}_p$ it will be determined according to Rel.(3.7);

Step A.6a/b : The reduction factor of the width ρ is calculated based on the relative slenderness and the distribution factor with the values determined in the previous steps. For interior walls (hypostasis a) will be calculated according to Rel.(3.5), and for cantilevered walls (hypostasis b) according to Rel.(3.6);

Step A7a/b : The final step of the calculation procedure " A " is due to the effective width of the wall. Depending on the width portion and its position at the level of the wall panel. The calculation is carried out according to Table 3.3 in the case of interior walls (hypostasis a) and according to Table 3.4 for cantilevered walls (hypostasis b).

Design Scheme "B"

This design procedure presents in stepwise form the methodology for evaluating the distortion buckling of a wall with marginal stiffening. In the specific case of cold formed sections „C” and „Z”, distortion is manifested on the flanges of the section that can be with single or double marginal stiffeners. The calculation involves changing the effective dimensions, initially determined by the procedure „A”, of the stiffening portion including the wall panel adjacent to the stiffening and stiffening, respectively, to which is attributed a reduced thickness due to the phenomenon of distortion.

Stage 1

Step B.1 : This step is to determine the effective widths of the flanges in compression due to buckling according to the design procedure „A”. In this step the effective width evaluation procedure will be carried out using the relative slenderness $\bar{\lambda}_p$ calculated according to Rel.(3.7) for which $\sigma_{com.ed} = f_{yb}/\gamma_{M0}$.

Stage 2

Step B.2 : This is the first step of calculation Step 2 outlined as the first iteration by which the reduced dimensions of the stiffening are determined. Within this step, the area of stiffening is calculated (A_{eff}) and its own moment of inertia (I_s) after axis a-a, where effective stiffening widths include b_{e2} + c_{eff} + (d_{eff}) see Figure 3.4 and/or Figure 3.6;

Step B.3 : Calculation of spring stiffness „K” it is determined in the general case by Rel.(3.9), but for cold sections „C” and „Z” it can be used Rel.(3.20);

Step B.4 : Calculation of the critical tension of buckling by distortion $\sigma_{cr.s}$ it is carried out by Rel.(3.16), using the parameters calculated at the step B.2 and B.3;

Step B.5 : Calculation of the relative slenderness of buckling by distortion $\bar{\lambda}_d$ it is determined with Rel.(3.15);

Step B.6 : The final step of Step 2 involves the calculation of the distortion buckling coefficient χ_d. The calculation is carried out on the basis of the relative slenderness determined at the step B.5 by using Rel. (3.12), (3.13),(3.14). Buckling coefficient χ_d it is a coefficient of reduction of the thickness of the stiffening.

Stage 3

The value of buckling coefficientχ_d obtained at the Stage 2 it was calculated from the effective widths determined at the Step B.1, where considered as the maximum compressive stress $\sigma_{com.ed} = f_{yb}/\gamma_{M0}$. For stress values below this buckling value of the coefficient will be changed. Thus χ_d, optionally, it can be iteratively improved by considering a compressive stress correlated with the new effective dimensions of the reduced stiffening according to the Step 2. Step 3 is thus an iterative calculation sequence.

Step B.7 : This step presents the exit condition from the iteration cycle. If the condition of Rel.(3.22) ($\chi_{d,n} \leq \chi_{d.n-1}$), then another iteration step is performed to refine the value of the coefficient. If the presented condition is not met, then the value of the coefficient χ_d it can no longer be improved, it will exit the iteration cycle with its last value that meets the condition from Rel.(3.22). If you choose to improve this coefficient, the first iteration is performed without the need to check the conditions in this step.

Step B.8 : It assumes the calculation of the effective compression tension from the level of stiffeners considering the reduced geometry determined in the previous iteration. The design $\sigma_{com.ed}$ it is carried out with Rel.(3.21) where χ_{d} it will be taken with the last value determined for it.

Step B.9 : For the stiffening portion, recalculate the value of the relative thinness of the buckling, referred to as reduced relative slenderness ($\bar{\lambda}_{\mathrm{p.red}}$). The reduced value is determined by Rel.(3.8) based on the stress value $\sigma_{com.ed}$ recalculated in step B.8;

Step B.10 : Requires recalculation of effective stiffening widths (b_{e2} + c_{eff} + (d_{eff})) using the calculation procedure „A”, with the mention as in step A.5 use the new relative slenderness ($\bar{\lambda}_{\mathrm{p.red}}$) with the value obtained at the Step B.9. Following this step the effective dimensions of the portions of walls related to the stiffening will change. Because the geometry of the stiffening has undergone changes, you can resume the calculation with a new iteration starting with the Step 2 (step B.2), the calculation can be resumed with a new iteration starting at the stage where the stiffening characteristics are determined using the new effective widths obtained in the previous iteration. Iterations run until the condition presented in the step B.7 is fulfilled;

Stsge 4

Step B.11 : After obtaining the final value of the buckling coefficient by distortion χ_{d}, through the refining process, the final values of the effective widths of the portions related to the stiffening are extracted.

Step B.12 : Effective final widths of stiffening are applied a thickness reduction. The thickness of these portions of the wall called reduced thickness (t_{red}), is determined based on the coefficient of buckling by final distortion χ_{d} using relations (3.23) and/or (3.25).

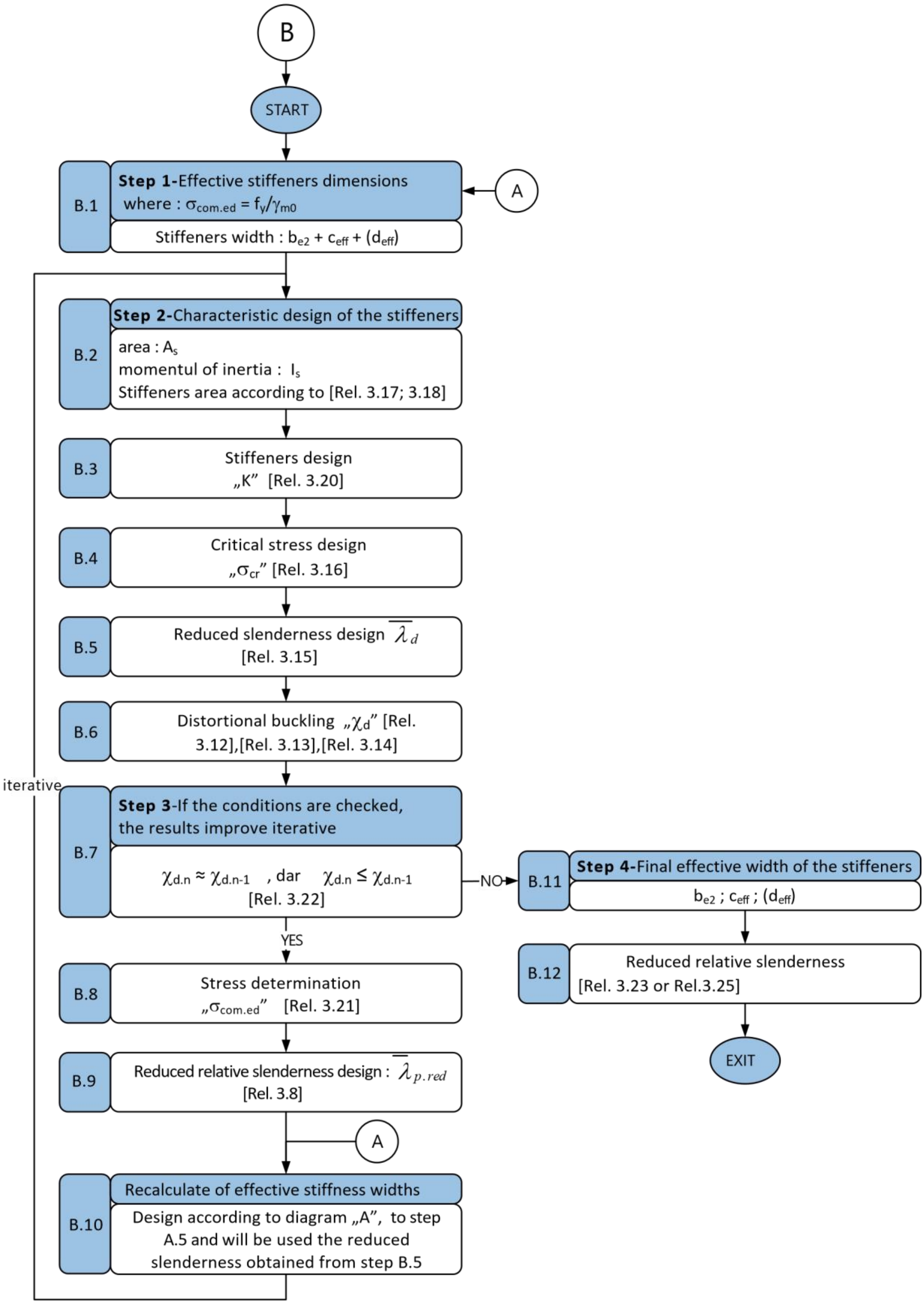


Figure 4.3 – Design scheme „B" – determination of the reduced dimensions of a marginal stiffening due to distortion buckling

4.1 Example of effective characteristics calculation for a " C” section

4.1.1 Gross sectional characteristics

The design was carried out according to the calculation steps presented above, for a Section " C " with the following characteristics:

Step 1.1 : Material characteristics:

$f_{y.b} = 350\ N/mm^2$

$E = 210000\ N/mm^2$

$G = 80769\ N/mm^2$

$\nu = 0.3$

$\gamma_{M.0} = 1$

Step 1.2 : Geometric characteristics:

$t_{nom} = 1.5\ mm$

$t = 1.42\ mm$

$c_{1,0} = 23\ mm$

$b_{1.0} = 53\ mm$

$h_0 = 200\ mm$

$b_{2,0} = 49\ mm$

$c_{2,0} = 23\ mm$

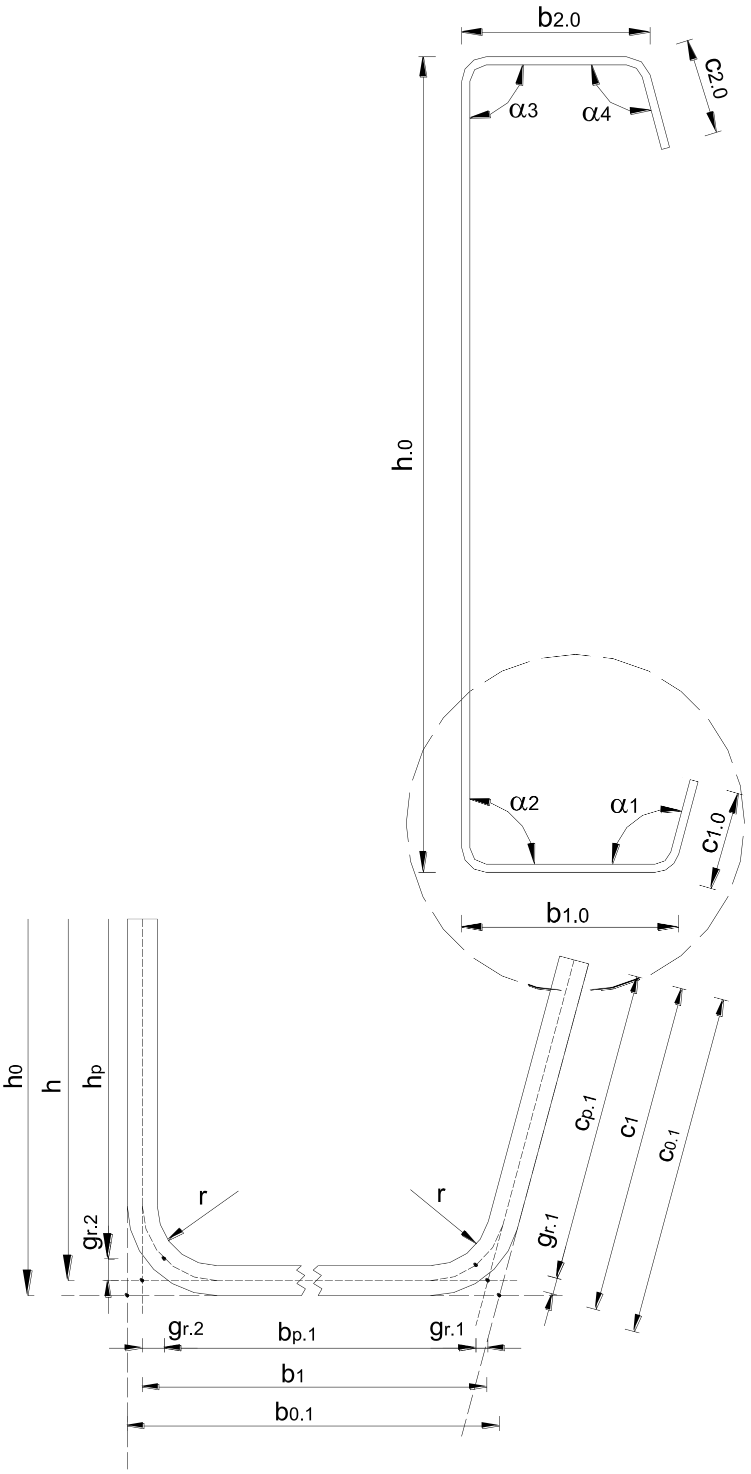
$\alpha_1 = 105°$

$\alpha_2 = 90°$

$\alpha_3 = 90°$

$\alpha_4 = 105°$

$r = 4\ mm$



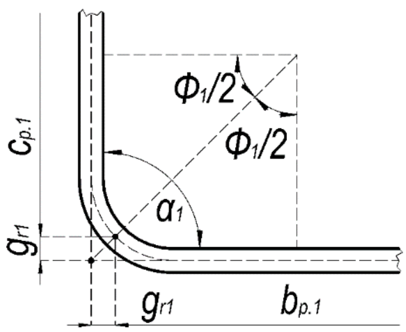
Step 1.3 : Verifying the dimensional ratios of the walls

$\frac{b}{t} \leq 60$	$\frac{b_{1.0}}{t} = \frac{53}{1.42} = 37.32 \leq 60$	Verify	Table 2.1
	$\frac{b_{2.0}}{t} = \frac{49}{1.42} = 34.51 \leq 60$	Verify	
$\frac{c}{t} \leq 50$	$\frac{c_{1.0}}{t} = \frac{c_{2.0}}{t} = \frac{23}{1.42} = 16.20 \leq 50$	Verify	
$\frac{h}{t} \leq 500 \sin \phi$	$\frac{h_0}{t} = \frac{200}{1.42} = 140.85 \leq 500$	Verify	Table 2.1
$0.2 \leq \frac{c}{b} \leq 0.6$	$0.2 \leq \frac{c_{1.0}}{b_{1.0}} = \frac{23}{53} = 0.434 \leq 0.6$ $0.2 \leq \frac{c_{2.0}}{b_{2.0}} = \frac{23}{49} = 0.469 \leq 0.6$	Verify	Table 2.1
$45° \leq \alpha \leq 135°$	$45° \leq \alpha_1 = \alpha_4 = 105° \leq 135°$	Verify	Table 2.1

Step 1.4 : Checking the size of the radius of curvature r for determining the influence on geometric characteristics

$r \leq 5t$	$4 \leq 5 \cdot 1.42 = 7.1$	Verify	Table 2.2.3
$r \leq 0.1b_p$	$4 \leq 0.1 \cdot \min(b_{1.0}, h_0, b_{2.0}) = 0.1 \cdot 49 = 4.9$	Verify	

Since the radius of connection between the walls falls within the mentioned limits, the characteristics of the gross section can be determined on an idealized section, consisting of flat elements with right corners. For a more accurate exposure, in the presented example, the length of the walls will be determined by the exact method.



Step 1.5 : Walls section lengths

Inetrior walls (b_1, b_2, h)		
$\phi = 180° - \alpha$	$\phi_1 = \phi_4 = 180° - 105° = 75°$ $\phi_2 = \phi_3 = 180° - 90° = 90°$	Figure 2.6
$b = b_0 - tg\left(\frac{\phi_1}{2}\right)\frac{t}{2} - tg\left(\frac{\phi_2}{2}\right)\frac{t}{2}$	$b_1 = 53 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - tg\left(\frac{75°}{2}\right)\frac{1.42}{2} = 51.75$ $b_2 = 49 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - tg\left(\frac{75°}{2}\right)\frac{1.42}{2} = 47.75$ $h = 200 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - \left(\frac{90°}{2}\right)\frac{1.42}{2} = 198.58$	
$g_r = \left(r + \frac{t}{2}\right)\left(tg\left(\frac{\phi}{2}\right) - \sin\left(\frac{\phi}{2}\right)\right)$	$g_{r.1} = g_{r.4} = \left(4 + \frac{1.42}{2}\right)\left(tg\left(\frac{75°}{2}\right) - \sin\left(\frac{75°}{2}\right)\right) = 0.747$ $g_{r.2} = g_{r.3} = \left(4 + \frac{142}{2}\right)\left(tg\left(\frac{90°}{2}\right) - \sin\left(\frac{90°}{2}\right)\right) = 1.38$	
$b_p = b - g_{r.1} - g_{r.2}$	$b_{p.1} = b_1 - g_{r.1} - g_{r.2} = 51.75 - 0.747 - 1.38 = 49.62$ $b_{p.2} = b_2 - g_{r.3} - g_{r.4} = 47.75 - 1.38 - 0.747 = 45.62$ $h_p = h - g_{r.2} - g_{r.3} = 198.58 - 1.38 - 1.38 = 195.82$	
Cantilever walls (c_1, c_2)		
$c = c_0 - tg\left(\frac{\phi_1}{2}\right)\frac{t}{2}$	$c_1 = c_2 = 23 - tg\left(\frac{75°}{2}\right)\frac{1.42}{2} = 22.46$	Figure 2.6
$c_p = c - g_r$	$c_{p.1} = c_{p.2} = 22.45 - 0.747 = 21.71$	

In the following table, the length of the sectional wall panels is centralized along with the joints that border them.

Number	Wall type	Wall length [mm]	Starting Point	End point
1	exterior	c_{p1}=21.71	P1	P2
2	interior	b_{p1}=49.62	P3	P4
3	interior	h_p=195.82	P5	P6
4	interior	b_{p2}=45.62	P7	P8
5	exterior	c_{p2}=21.71	P9	P10

To calculate the sectional characteristics, the relations are presented in ANNEX A. In order to use these relations, it is necessary to compose the idealized section by assigning each joint (P1 ...P10) of the global coordinates defining its position in the plane section. For this operation, it is necessary to impose a coordinate Center (y=0,z=0). In the presented example, its position was determined as indicated in the figure below.

- Horizontal coordinates (ax y-y)

$$P1_y = g_{r.2} + b_{p.1} + g_{r.1} + c_{p.1} \cdot \cos(\phi_1)$$
$$= 1.38 + 49.62 + 0.747 + 21.71 \cdot \cos(75°)$$
$$= 57.36 \text{ mm}$$

$$P2_y = g_{r.2} + b_{p.1} + g_{r.1} = 1.38 + 49.62 + 0.747$$
$$= 51.75 \text{ mm}$$

$$P3_y = g_{r.2} + b_{p.1} = 1.38 + 49.62 = 51 \text{ mm}$$

$$P4_y = g_{r.2} = 1.38 \text{ mm}$$

$$P5_y = 0 \text{ mm}$$

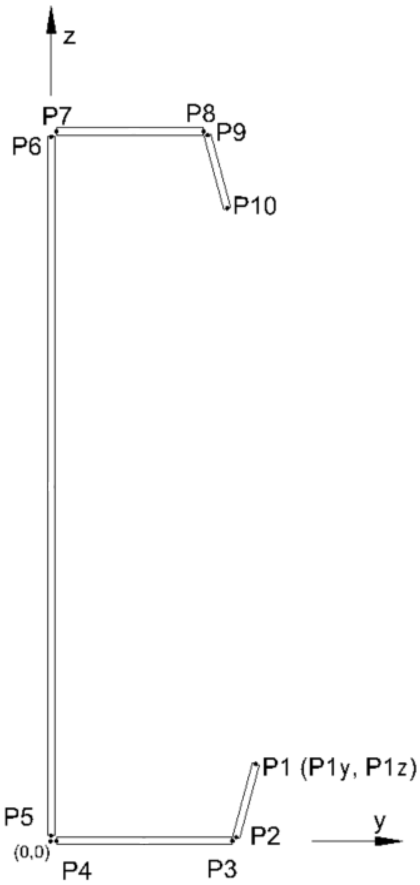
$$P6_y = 0 \text{ mml}$$

$$P7_y = g_{r.3} = 1.38 \text{ mm}$$

$$P8_y = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47 \text{ mm}$$

$$P9_y = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747$$
$$= 47.75 \text{ mm}$$

$$P10_y = g_{r.3} + b_{p.2} + g_{r.4} + c_{p.2} \cdot \cos(\phi_4)$$
$$= 1.38 + 45.62 + 0.747 + 21.71 \cdot \cos(75°)$$
$$= 53.36 \text{ mm}$$



- Vertical coordinates (ax z-z)

$$P1_z = g_{r.1} + c_{p.1} \cdot \sin(\phi_1) = 0.747 + 21.71 \cdot \sin(75°) = 21.72mm$$
$$P2_z = g_{r.1} = 0.747 \text{ mm}$$
$$P3_z = 0 \text{ mm}$$
$$P4_z = 0 \text{ mm}$$
$$P5_z = g_{r.2} = 1.38 \text{ mm}$$
$$P6_z = g_{r.2} + h_p = 1.38 + 195.82 = 197.20 \text{ mm}$$
$$P7_z = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58 \text{ mm}$$
$$P8_z = P7_z = 198.58 \text{ mm}$$
$$P9_z = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83mm$$
$$P10_z = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{p.2} \cdot \sin(\phi_4)$$
$$= 1.38 + 195.82 + 1.38 - 0.747 - 21.71 \cdot \sin(75°) = 176.86 \text{ mm}$$

The values obtained were centralized in the following table.

Coordinates of the idealized section [mm]				
Wall	*Starting point*		*End point*	
1	$P1_y$	$P1_z$	$P2_y$	$P2_z$
	57.36	21.72	51.75	0.747
2	$P3_y$	$P3_z$	$P4_y$	$P4_z$
	51	0	1.38	0
3	$P5_y$	$P5_z$	$P6_y$	$P6_z$
	0	1.38	0	197.20
4	$P7_y$	$P7_z$	$P8_y$	$P8_z$
	1.38	198.58	47	198.58
5	$P9_y$	$P9_z$	$P10_y$	$P10_z$
	47.75	197.83	53.36	176.86

Step 1.6 : Characteristics of the gross section (annex A)

Sections area

$$dA_i = \overrightarrow{\left[t_\imath \cdot \sqrt{(y_\imath - y_{\imath-1})^2 + (z_\imath - z_{\imath-1})^2}\right]}$$

$$dA_{c1} = \overrightarrow{\left[t \cdot \sqrt{\left(P2_y - P1_y\right)^2 + (P2_z - P1_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(51.75 - 57.36)^2 + (0.747 - 21.72)^2}\right]} = 30.83mm^2$$

$$dA_{b1} = \overrightarrow{\left[t \cdot \sqrt{\left(P4_y - P3_y\right)^2 + (P4_z - P3_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(1.38 - 51)^2 + (0 - 0)^2}\right]} = 70.46mm^2$$

$$dA_h = \overrightarrow{\left[t \cdot \sqrt{\left(P6_y - P5_y\right)^2 + (P6_z - P5_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(0 - 0)^2 + (197.20 - 1.38)^2}\right]} = 278.07mm^2$$

$$dA_{b2} = \overrightarrow{\left[t \cdot \sqrt{\left(P8_y - P7_y\right)^2 + (P8_z - P7_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(47 - 1.38)^2 + (198.58 - 198.58)^2}\right]} = 64.78mm^2$$

$$dA_{c2} = \overrightarrow{\left[t \cdot \sqrt{\left(P10_y - P9_y\right)^2 + (P10_z - P9_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(53.36 - 47.75)^2 + (176.86 - 197.83)^2}\right]} = 30.83mm^2$$

Section area

$$A = \sum_{i=1}^{n} dA_i$$

$$A = dA_{c1} + dA_{b1} + dA_h + dA_{b2} + dA_{c2} = 30.83 + 70.46 + 278.07 + 64.78 + 30.83 = 474.95mm^2 = 4.75cm^2$$

Relative moment to axis y and the coordinate of the center of gravity

$$S_{y0} = \sum_{i=1}^{n} (z_i + z_{i-1}) \cdot \frac{d_{Ai}}{2}$$

$$z_{gc} = \frac{S_{y0}}{A}$$

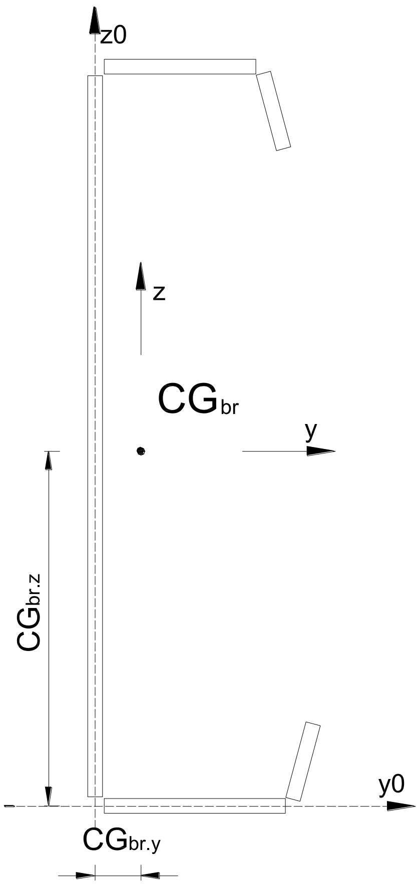
$$S_{y0} = (P2_z + P1_z) \cdot \frac{dA_{c1}}{2} + (P4_z + P3_z) \cdot \frac{dA_{b1}}{2} + (P6_z + P5_z) \cdot \frac{dA_h}{2} + (P8_z + P7_z) \cdot \frac{dA_{c2}}{2} + (P10_z + P9_z) \cdot \frac{dA_{b2}}{2}$$

$$S_{y0} = (0.747 + 21.72) \cdot \frac{30.83}{2} + (0 + 0) \cdot \frac{70.46}{2} + (197.20 + 1.38) \cdot \frac{278.07}{2} + (198.58 + 198.58) \cdot \frac{64.78}{2} + (176.86 + 197.83) \cdot \frac{30.83}{2} = 46594.3mm^3$$

$$z_{gc} = \frac{46594.3}{474.95} = 98.10mm$$

The moment of inertia according to the axis y initial and new y-axis through center of gravity

$$I_{y0} = \sum_{i=1}^{n} [(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3}$$



$$I_{y0} = [(P2_z)^2 + (P1_z)^2 + P2_z \cdot P1_z] \cdot \frac{dA_{b1}}{3} + [(P4_z)^2 + (P3_z)^2 + P4_z \cdot P3_z] \cdot \frac{dA_{c1}}{3} + [(P6_z)^2 + (P5_z)^2 + P6_z \cdot P5_z] \cdot \frac{dA_h}{3} + [(P8_z)^2 + (P7_z)^2 + P8_z \cdot P7_z] \cdot \frac{dA_{b2}}{3} + [(P10_z)^2 + (P9_z)^2 + P10_z \cdot P9_z] \cdot \frac{dA_{c2}}{3}$$

$$I_{y0} = [(0.747)^2 + (21.72)^2 + 0.747 \cdot 21.72] \cdot \frac{30.83}{3} 0 + [(197.20)^2 + (1.38)^2 + 197.20 \cdot 1.38] \cdot \frac{278.07}{3} + [(198.58)^2 + (198.58)^2 + 198.58 \cdot 198.58] \cdot \frac{64.78}{3} + [(176.86)^2 + (197.83)^2 + 176.86 \cdot 197.83] \cdot \frac{30.83}{3} = 7272475 mm^4$$

$$I_y = I_{y0} - A \cdot z_{gc}^2$$

$$I_y = 7272475 - 474.95 \cdot 98.10^2 = 2701453 mm^4$$

Static moment in ratio to the z axis and the coordinate of the center of gravity

$$S_{z0} = \sum_{i=1}^{n} (y_i + y_{i-1}) \cdot \frac{d_{Ai}}{2}$$

$$y_{gc} = \frac{S_{z0}}{A}$$

$$S_{z0} = (P2_y + P1_y) \cdot \frac{dA_{c1}}{2} + (P4_y + P3_y) \cdot \frac{dA_{b1}}{2} + (P6_y + P5_y) \cdot \frac{dA_h}{2} + (P8_y + P7_y) \cdot \frac{dA_{c2}}{2} + (P10_y + P9_y) \cdot \frac{dA_{b2}}{2}$$

$$S_{z0} = (51.75 + 57.36) \cdot \frac{30.83}{2} + (1.38 + 51) \cdot \frac{70.46}{2} + 0 + (47 + 1.38) \cdot \frac{64.78}{2} + (53.36 + 47.75) \cdot \frac{30.83}{2}] = 6652.24 mm^3$$

$$y_{gc} = \frac{6652.24}{474.95} = 14.01 mm$$

Moment of inertia according to the original z-axis and the new z-axis through the center of gravity

$$I_{z0}=\sum_{i=1}^{n}[(y_i)^2+(y_{i-1})^2+y_i\cdot(y_{i-1})]\cdot\frac{d_{Ai}}{3}$$

$$I_{z0}=\left[\left(P2_y\right)^2+\left(P1_y\right)^2+P2_y\cdot P1_y\right]\cdot\frac{dA_{b1}}{3}+\left[\left(P4_y\right)^2+\left(P3_y\right)^2+P4_y\cdot P3_y\right]\cdot\frac{dA_{c1}}{3}+\left[\left(P6_y\right)^2+\left(P5_y\right)^2+P6_y\cdot P5_y\right]\cdot\frac{dA_h}{3}+\left[\left(P8_y\right)^2+\left(P7_y\right)^2+P8_y\cdot P7_y\right]\cdot\frac{dA_{b2}}{3}+\left[\left(P10_y\right)^2+\left(P9_y\right)^2+P10_y\cdot P9_y\right]\cdot\frac{dA_{c2}}{3}$$

$$I_{z0}=[(51.75)^2+(57.36)^2+51.75\cdot 57.36]\cdot\frac{30.83}{3}+[(1.38)^2+(51)^2+1.38\cdot 51]\cdot\frac{70.46}{3}+0+[(47)^2+(1.38)^2+47\cdot 1.38]\cdot\frac{64.78}{3}+[(53.36)^2+(47.75)^2+53.36\cdot 47.75]\cdot\frac{30.83}{3}=282606\text{mm}^4$$

$$I_z=I_{z0}-A\cdot y_{gc}^2$$

$$I_z=282606-474.95\cdot 14.01^2=189434\text{cm}^4$$

Centrifugal moment of inertia concerning the y and z axes and the new axes through the center of gravity

$$I_{yz0}=\sum_{i=1}^{n}(2\cdot y_{i-1}\cdot z_{i-1}+2\cdot y_i\cdot z_i+y_{i-1}\cdot z_i+y_i\cdot z_{i-1})\cdot\frac{dA_i}{6}$$

$$I_{yz0}=(2\cdot P1_y\cdot P1_z+2\cdot P2_y\cdot P2_z+P1_y\cdot P2_z+P1_z+P2_y)\frac{dA_{c1}}{6}+(2\cdot P3_y\cdot P3_z+2\cdot P4_y\cdot P4_z+P3_y\cdot P4_z+P4_y\cdot P3_z)\cdot\frac{dA_{b1}}{6}+(2\cdot P5_y\cdot P5_z+2\cdot P6_y\cdot P6_z+P5_y\cdot P6_z+P6_y\cdot P5_z)\cdot\frac{dA_h}{6}+[2\cdot P7_y\cdot P7_z+2\cdot P8_y\cdot P8_z+P7_y\cdot P8_z+P8_y\cdot P7_z)\cdot\frac{dA_{b2}}{6}+(2\cdot P9_y\cdot P9_z+2\cdot P10_y\cdot P10_z+P9_y\cdot P10_z+P10_y\cdot P9_z)\cdot\frac{dA_{c2}}{6}$$

$$I_{yz0}=(2\cdot 57.36\cdot 21.72+2\cdot 51\cdot 0.747+57.36\cdot 0.747+51\cdot 21.72)\cdot\frac{30.83}{6}+0+0+(2\cdot 1.38\cdot 198.58+2\cdot 47\cdot 198.58+1.38\cdot 198.58+47\cdot 198.58)\cdot\frac{64.78}{6}+(2\cdot 47.75\cdot 197.83+2\cdot 53.36\cdot 176.86+47.75\cdot 176.86+53.36\cdot 197.83)\cdot\frac{30.83}{6}=622009\text{mm}^4$$

$$I_{yz}=I_{yz0}-\frac{S_{y0}\cdot S_{z0}}{A}$$

$$I_{yz}=622009-\frac{46594.3\cdot 6652.24}{474.95}=-30592.5\text{mm}^4$$

Radius of gyration

$$i_y = \sqrt{\frac{I_y}{A}} = \sqrt{\frac{2701453}{474.95}} = 75.42mm$$

$$i_z = \sqrt{\frac{I_z}{A}} = \sqrt{\frac{189434}{474.95}} = 19.97mm$$

Modulus of resistance

- Modulus of resistance relative to the axis y-y

$$z_{max} = \max\left(z_{gc}, (h_0 - t) - z_{gc}\right)$$

$$z_{max} = \max(98.10, (200 - 1.42) - 98.10) = \max(98.10\,, 100.48) = 100.48mm$$

$$z_{min} = \min(98.10\,, 100.48) = 98.10mm$$

$$W_{y.min} = \frac{I_y}{z_{max}} = \frac{2701453}{100.48} = 26885mm^3$$

$$W_{y.max} = \frac{I_y}{z_{min}} = \frac{2701453}{98.10} = 27537mm^3$$

- Modulus of resistance relative to the axis z-z

$$y_{max} = \max\left(y_{gc}, y_{max.0} - y_{gc}\right)$$

$$y_{max.0} = \max\left((b_1 + \cos(\phi_1) \cdot c_{1.0} - t), (b_2 + \cos(\phi_4) \cdot c_{2.0} - t)\right)$$

$$y_{max.0} = \max\left((51.75 + \cos(75°) \cdot 23 - 1.42), (47.75 + \cos(75°) \cdot 23 - 1.42)\right)$$
$$= \max(56.28, 52.28) = 56.28\ mm$$

$$y_{max} = \max(14.01, 56.28 - 14.01) = \max(14.01, 42.27) = 42.27\ mm$$

$$y_{min} = \min(14.01, 42.27) = 14.01\ mm$$

$$W_{z.min} = \frac{I_z}{y_{max}} = \frac{189434}{42.27} = 4481.52mm^3$$

$$W_{z.max} = \frac{I_z}{y_{min}} = \frac{189434}{14.01} = 13521mm^3$$

4.1.2 Effective sectional features

The design of the Effective section is based on both modes of sectional buckling: local buckling (veiling) and distortion buckling.

Step 2.1 : Wall panels are sensitive to instability phenomena when subjected to compression. To simplify the presented calculation method, we will consider two cases of pure request: centric compression and pure monoaxial bending. Effective sectional characteristics differ between the two distinct modes of solicitation and will be taken into account individually.

4.1.2.1 "C" section subjected to centric compression

Step 2.2 : In this step, the wall panels in compression are determined

Walls in compression:

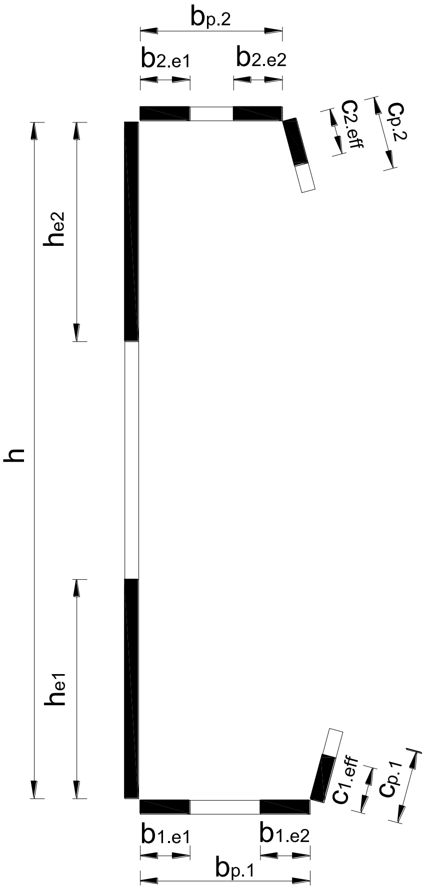
Flange 1 : b_1 : interior wall

c_1 : cantilever wall

Flange 2 : b_2 : interior wall

c_2 : interior wall

Web : h : interior wall



Step 2.3 : Each wall panel can determine the effect of distortion buckling using the procedure shown in the scheme „A" from Figure 4.2. According to the European standard, the calculation of effective widths is due to buckling, in a first step will be determined only at the flanges of the section. For each of the component walls of the flanges (b1, b2, c1, c2) calculation procedure from the scheme "A" is called.

Step A.1 : The steel characteristics take over from the step 1.1

Step A.2 : The type of Wall is considered as in step 2.2

Step A.3 : Since the section is centric compression, for both interior and cantilevered walls, we can consider $\sigma_1 = \sigma_2 \Rightarrow \psi = \frac{\sigma_2}{\sigma_1} = 1$

Step A.4-A.6 : Coefficients calculation k_σ , $\bar{\lambda}_p$, ρ

Step A.7 : Effective width

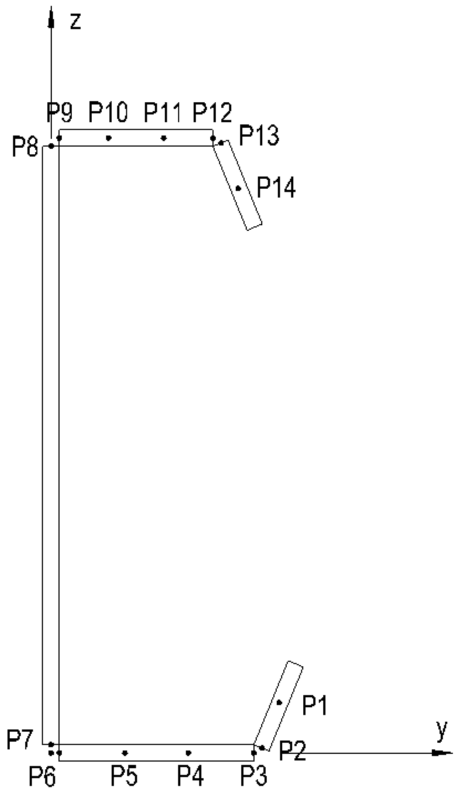
Interior walls (b_1, b_2,), Scheme **Step A.1-A.7**		
Inferior Flange (b_1)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.1}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{49.62}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 0.756$ For $\overline{\lambda_p} = 0.756 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\bar{\lambda}_p^2} = \frac{0.755 - 0.055(3+1)}{0.756^2} = 0.938$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p1} = 49.62$ mm $b_{1.eff} = b_{p1} \cdot \rho = 49.62 \cdot 0.938 = 46.53$ mm $b_{1.e1} = b_{1.e2} = 0.5 \cdot b_{1.eff} = 0.5 \cdot 46.53 = 23.26$ mm	Table 3.3 Scheme – Step A.7a

Superior flange (b_2)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{45.62}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 0.695$ For $\overline{\lambda_p} = 0.695 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\bar{\lambda}_p^2} = \frac{0.695 - 0.055(3+1)}{0.695^2} = 0.983$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p2} = 45.62$ mm $b_{2.eff} = b_{p2} \cdot \rho = 45.62 \cdot 0.983 = 44.86$ mm $b_{2.e1} = b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 44.86 = 22.43$ mm	Table 3.3 Scheme – Step A.7a

Cantilever walls (c_1, c_2) , Scheme **Step A.1-A.7**		
Stiffeners interior flange (c_1)	$\frac{c_{p.1} \cdot \sin\alpha_1}{b_{p.1}} = \frac{21.71 \cdot \sin(105°)}{49.62} = 0.423$ For $0.35 < {}^{c_{p.1}}/{}_{b_{p.1}} \leq 0.65$ $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.1} \cdot \sin\alpha_1}{b_{p.1}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.423 - 0.35)^2} = 0.644$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.1}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{21.71}{1.42}}{28.4 \cdot 0.814\sqrt{0.644}} = 0.824$ For $\overline{\lambda_p} = 0.824 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\bar{\lambda}_p^2} = \frac{0.824 - 0.188}{0.824^2} = 0.937$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p1} = 21.71$ mm $c_{1.eff} = c_{p1} \cdot \rho = 21.71 \cdot 0.937 = 20.33$ mm	Table 3.4 Scheme – Step A.7b

Stiffeners superior flange (c_2)	$\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} = \frac{21.71 \cdot \sin(105°)}{45.62} = 0.460$ For $0.35 < {c_{p.2}}/{b_{p.2}} \leq 0.65$ we use 5.13c $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.460 - 0.35)^2} = 0.690$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.81$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{21.71}{1.42}}{28.4 \cdot 0.81\sqrt{0.690}} = 0.796$ For $\overline{\lambda_p} = 0.796 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\overline{\lambda}_p^2} = \frac{0.796 - 0.188}{0.796^2} = 0.959$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p2} = 21.71$ mm $c_{2.eff} = c_{p2} \cdot \rho = 21.71 \cdot 0.959 = 20.82$ mm	Table 3.4 Scheme – Step A.7b

Following this calculation process, for the wall panels related to the flanges, the effective widths with the location distribution according to the indications in Table 3.3 and respectively Table 3.4. For the inner walls, the effective width is at the end of the panel. For the cantilever walls, the effective width is adjacent in the connections with the flanges. Due to segmented portions, it is necessary to introduce additional nodes (points of delimitation of the ends of segments), as shown in the figure on the left. An increased number of segments was obtained. The next step is to determine the coordinates for the newly introduced points (P4, P5, P10, P11) and the coordinates of the endpoints will be corrected (P1, P14).



Points Coordinates:

- Horizontal coordinates (ax y-y)

$$P1_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} + c_{1eff} \cdot \cos(\phi_1) = 1.38 + 49.62 + 0.747 + 20.33 \cdot \cos(75°) = 57.01 \text{ mm}$$

$$P2_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} = 1.38 + 49.62 + 0.747 = 51.75 \text{ mm}$$

$$P3_{e.y} = g_{r.2} + b_{p.1} = 1.38 + 49.62 = 51 \text{ mm}$$

$$P4_{e.y} = g_{r.2} + b_{p.1} - b_{1.e2} = 1.38 + 49.62 - 23.26 = 27.73 \text{ mm}$$

$$P5_{e.y} = g_{r.2} + b_{1.e1} = 1.38 + 23.26 = 24.64 \text{ mm}$$

$$P6_{e.y} = g_{r.2} = 1.38 \text{ mm}$$

$$P7_{e.y} = 0 \text{ mm}$$

$$P8_{e.y} = 0 \text{ mm}$$

$P9_{e.y} = g_{r.3} = 1.38\ \text{mm}$

$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 22.43 = 23.81\ \text{mm}$

$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 45.62 - 22.43 = 24.57\ \text{mm}$

$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47\ \text{mm}$

$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747 = 47.75\ \text{mm}$

$$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 45.62 + 0.747 + 20.83 \cdot \cos(75°) = 53.13\ \text{mm}$$

- Vertical coordinates (ax z-z)

$P1_{e.z} = g_{r.1} + c_{1eff} \cdot \sin(\phi_1) = 0.747 + 20.33 \cdot \sin(75°) = 20.39\ \text{mm}$

$P2_{e.z} = g_{r.1} = 0.747\ \text{mm}$

$P3_{e.z} = 0\ \text{mm}$

$P4_{e.z} = 0\ \text{mm}$

$P5_{e.z} = 0\ \text{mm}$

$P6_{e.z} = 0\ \text{mm}$

$P7_{e.z} = g_{r.2} = 1.38\ \text{mm}$

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 195.82 = 197.20\ \text{mm}$

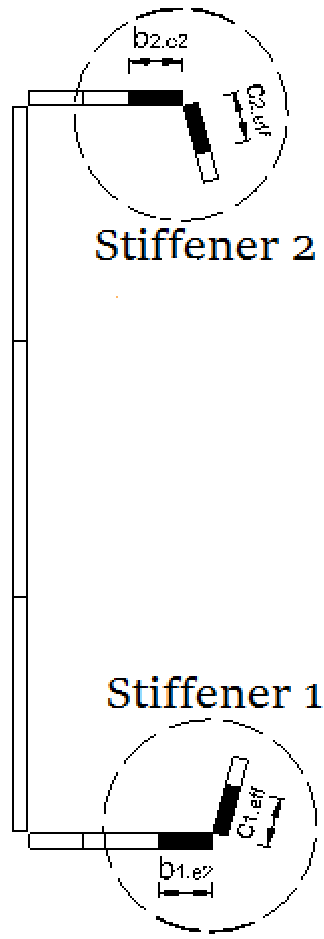
$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58\ \text{mm}$

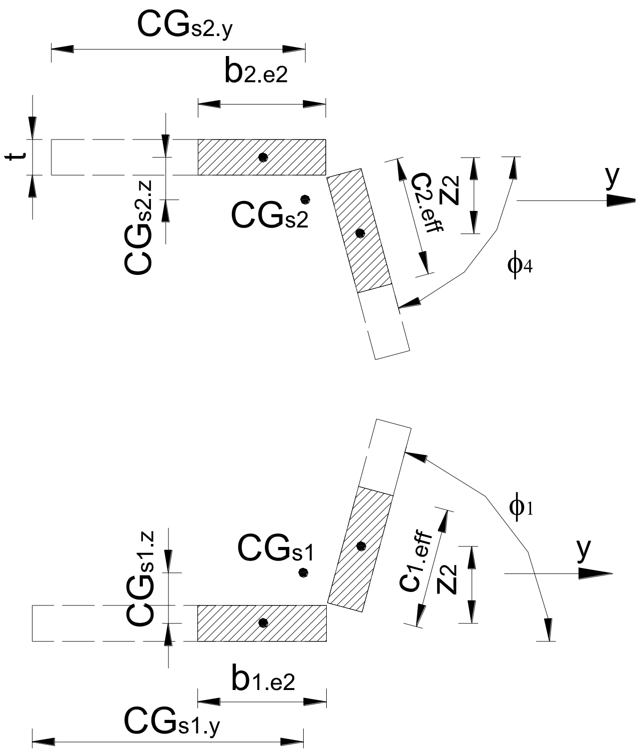
$P10_{e.z} = P11_z = P12_z = P9_z = 198.58\ \text{mm}$

$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83\ \text{mm}$

$$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4) = 1.38 + 195.82 + 1.38 - 0.747 - 20.82 \cdot \sin(75°) = 177.72\ \text{mm}$$

Step 3.1 : The calculation associated with the distortion buckling of the flanges is according to scheme " B " shown in Figure 4.2. In the case of the centric compression section, the calculation was according to scheme " B " for the two stiffeners related to the two flanges.





Step B.1 : This step indicates the need to predesgin the effective width of the flanges portions, carried out in the previous stages.

Step B.2-B.6 : The calculation for the first iteration is carried out

Iteration 1, Scheme **Step B.2-B.6**	
• **Area of stiffeners** ○ *Stiffening 1* $A_{s1} = (b_{1.e1} + c_{1.eff})t = (23.26 + 20.33) \cdot 1.42 = 61.91\ mm^2$ ○ *Stiffening 2* $A_{s2} = (b_{2.e1} + c_{2.eff})t = (22.43 + 20.82) \cdot 1.42 = 61.42\ mm^2$	Rel. (3.17) Scheme – Step B.2
• **Centers of gravity** ○ *Stiffening 1* $dA_{c1,eff} = \left[\overrightarrow{t \cdot \sqrt{\left(P2_{e,y} - P1_{e,y}\right)^2 + \left(P2_{e,z} - P1_{e,z}\right)^2}}\right]$ $dA_{c1,eff} = \left[\overrightarrow{1.42 \cdot \sqrt{(51.75 - 57.01)^2 + (0.747 - 20.39)^2}}\right] = 28.87mm^2$ $dA_{b1,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}}\right]$ $dA_{b1,e2} = \left[\overrightarrow{1.42 \cdot \sqrt{(27.73 - 51)^2 + (0 - 0)^2}}\right] = 33.04mm^2$ $S_{y0,1} = \left(P2_{e,z} + P1_{e,z}\right) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,z} + P3_{e,z}\right) \cdot \frac{dA_{b1,e2}}{2}$ $= (0.747 + 20.39) \cdot \frac{28.87}{2} + (0 + 0) \cdot \frac{33.04}{2} = 305.06mm^3$ $z_{gc,1} = \frac{305.06}{61.91} = 4.93mm$ $S_{z0,1} = \left(P2_{e,y} + P1_{e,y}\right) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1,e2}}{2}$ $= (51.75 + 57.01) \cdot \frac{28.87}{2} + (27.73 + 51) \cdot \frac{33.04}{2}$ $= 2870.38mm^3$ $y_{gc,1} = \frac{2870.38}{61.91} = 46.37mm$ ○ *Stiffening 2* $dA_{c2,eff} = \left[\overrightarrow{t \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}}\right]$ $dA_{c2,eff} = \left[\overrightarrow{1.42 \cdot \sqrt{(53.13 - 47.75)^2 + (177.72 - 197.83)^2}}\right] = 29.57mm^2$ $dA_{b2,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}}\right]$ $dA_{b2,e2} = \left[\overrightarrow{1.42 \cdot \sqrt{(47 - 24.57)^2 + (198.58 - 198.58)^2}}\right] = 31.85mm^2$ $S_{y0,2} = \left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{c2,eff}}{2} + \left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2,e2}}{2}$ $= (177.72 + 197.83) \cdot \frac{29.57}{2} + (198.58 + 198.58) \cdot \frac{31.85}{2}$ $= 11876mm^3$	ANNEX A

$z_{gc,2} = \frac{11876.6}{61.42} = 193.38\text{mm}$ $S_{z0,2} = (P14_{e,y} + P13_{e,y}) \cdot \frac{dA_{c2,eff}}{2} + (P12_{e,y} + P11_{e,y}) \cdot \frac{dA_{b2,e2}}{2}$ $= (53.13 + 47.75) \cdot \frac{29.57}{2} + (47 + 24.57) \cdot \frac{31.85}{2}$ $= 2631.12mm^3$ $y_{gc,2} = \frac{2631.12}{61.42} = 42.84\text{mm}$	
• **Moments of inertia - Y-Y axis** • *Stiffening 1* Stiffening 1 is composed of two segments bounded by the points: $(P1_e - P2_e)$ and $(P3_e - P4_e)$ $I_{s1.y} = I_{s1.y0} - A_{s1} \cdot z_{gc,1}^2$ $I_{s1.y0}$ - the moment of inertia calculated in ratio to the axis y_0-y_0 $I_{s1.y0} = (P2_{e,z}^2 + P1_{e,z}^2 + P2_{e,z} \cdot P1_{e,z}) \frac{dA_{c1,eff}}{3}$ $+ (P4_{e,z}^2 + P3_{e,z}^2 + P4_{e,z} \cdot P3_{e,z}) \frac{dA_{b1,e2}}{3}$ $I_{s1.y0} = (0.747^2 + 20.39^2 + 0.747 \cdot 20.39) \frac{28.87}{3} + 0 = 4151.22\text{mm}^4$ $I_{s1.y} = 4151.22 - 61.91 \cdot 4.93^2 = 2648 \text{ mm}^4$ ○ *Stiffening 2* *Stiffening* a 2 is composed of two segments bounded by the points: $(P11_e - 2)$ and $(P13_e - P14_e)$ $I_{s2.y} = I_{s2.y0} - A_{s2} \cdot z_{gc,2}^2$ $I_{s2.y0}$ - the moment of inertia calculated in ratio to the axis y_0-y_0 $I_{s2.y0} = (P14_{e,z}^2 + P13_{e,z}^2 + P14_{e,z} \cdot P13_{e,z}) \frac{dA_{c2,eff}}{3}$ $+ (P12_{e,z}^2 + P11_{e,z}^2 + P12_{e,z} \cdot P11_{e,z}) \frac{dA_{b2,e2}}{3}$ $I_{s2.y0} = (177.72^2 + 197.83^2 + 177.72 \cdot 197.83) \frac{29.57}{3}$ $+ (198.58^2 + 198.58^2 + 198.58 \cdot 198.58) \frac{31.85}{3}$ $= 2299473\text{mm}^4$ $I_{s2.y} = 2299476 - 61.42 \cdot 193.38^2 = 2786.62 \text{ mm}^4$	ANNEX A, Scheme – Step B2
• **Stiffness in the rotation of the flanges** • *Stiffening 1* $k_{f1} = \frac{A_{s2}}{A_{s1}} = \frac{61.42}{61.91} = 0.992$	Rel.(3.20), Scheme – Step B3

$K_1 = \frac{E \cdot t^3}{4(1-\nu^2)} \cdot \frac{1}{b_1^2 \cdot h_w + b_1^3 + 0.5 \cdot b_1 \cdot b_2 \cdot h_w \cdot k_{f1}}$ $K_1 = \frac{E \cdot t^3}{4(1-\nu^2)} \cdot \frac{1}{y_{gc,1}^2 \cdot h + y_{gc,1}^3 + 0.5 \cdot y_{gc,1} \cdot y_{gc,2} \cdot h \cdot k_{f1}}$ $K_1 = \frac{210000 \cdot 1.42^3}{4(1-0.3^2)} \cdot \frac{1}{46.37^2 \cdot 198.58 + 46.37^3 + 0.5 \cdot 46.37 \cdot 42.84 \cdot 198.58 \cdot 0.992} = 0.229$ ○ *Stiffening 2* $k_{f2} = \frac{A_{s1}}{A_{s2}} = \frac{61.91}{61.42} = 1.01$ $K_2 = \frac{E \cdot t^3}{4(1-\nu^2)} \cdot \frac{1}{y_{gc,2}^2 \cdot h + y_{gc,2}^3 + 0.5 \cdot y_{gc,2} \cdot y_{gc,1} \cdot h \cdot k_{f2}}$ $K_2 = \frac{210000 \cdot 1.42^3}{4(1-0.3^2)} \cdot \frac{1}{42.84^2 \cdot 198.58 + 42.84^3 + 0.5 \cdot 42.84 \cdot 46.37 \cdot 198.58 \cdot 1.01} = 0.257$	
• **Critical stress of elastic buckling** • *Stiffening 1* $\sigma_{cr.s1} = \frac{2\sqrt{K_1 \cdot E \cdot I_{s1}}}{A_{s1}} = \frac{2\sqrt{0.229 \cdot 210000 \cdot 2648}}{61.91} = 364.34\ N/mm^2$ ○ *Stiffening 2* $\sigma_{cr.s2} = \frac{2\sqrt{K_2 \cdot E \cdot I_{s2}}}{A_{s2}} = \frac{2\sqrt{0.257 \cdot 210000 \cdot 2786.62}}{61.42} = 399.63\ N/mm^2$	Rel. (3.16), Scheme – Step B4
• **Slenderness and reduction coefficient for buckling by distortion** • *Stiffening 1* $\overline{\lambda_{d.1}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s1}}} = \sqrt{\frac{355}{364.34}} = 0.987$ For $0.65 < \overline{\lambda_{d1}} < 1.38 \Rightarrow$ $\chi_{d.1} = 1.47 - 0.723 \cdot \overline{\lambda_{d1}} = 1.47 - 0.723 \cdot 0.987 = 0.756$ ○ *Stiffening 2* $\overline{\lambda_{d.2}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s2}}} = \sqrt{\frac{355}{399.63}} = 0.943$ For $0.65 < \overline{\lambda_{d2}} < 1.38 \Rightarrow$	Rel. (3.15) Scheme – Step B.5 Rel.(3.12), Rel.(3.13), Rel.(3.14), Scheme – Step B.6

$\chi_{d.2} = 1.47 - 0.723 \cdot \overline{\lambda_{d2}} = 1.47 - 0.723 \cdot 0.943 = 0.789$	

Step B.7-B.10 : Based on the values of the reduction factors $\overline{\lambda_{p.red}}$ be determined the next step is to recalculate in a new iteration the effective widths of the stiffeners. By using the calculation scheme „A". The iterative procedure is repeating until the conditions are reached as in the presented Step B.7.

Iteration 2, Scheme **Step B.7**		
Interior walls (b_1, b_2)		
Interior flange (b_1)	$\overline{\lambda_p} = 0.756$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.1}} = 0.756 \cdot \sqrt{0.756} = 0.658$ For $\overline{\lambda_p} = 0.658 < 0.673 \Rightarrow \rho = 1$	Rel. (3.8) Scheme – Seps, B.8, B.9
	$b_{p1} = 49.62$ mm $b_{1.eff} = b_{p1} \cdot \rho = 49.62 \cdot 1 = 49.62$ mm $b_{1.e2} = 0.5 \cdot b_{1.eff} = 0.5 \cdot 49.62 = 24.81$ mm	Scheme - Step B.10
Superior flange (b_2)	$\overline{\lambda_p} = 0.695$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 0.695 \cdot \sqrt{0.789} = 0.617$ For $\overline{\lambda_p} = 0.617 < 0.673 \Rightarrow \rho = 1$	Rel. (3.8) Schemă – Steps, B.8, B.9
	$b_{p2} = 45.62$ mm $b_{2.eff} = b_{p2} \cdot \rho = 45.62 \cdot 1 = 45.62$ mm $b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 45.62 = 22.81$ mm	Scheme – Step B.10
Cantilever walls (c_1, c_2)		
Stiffening interior flange (c_1)	$\overline{\lambda_p} = 0.824$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.1}} = 0.824 \cdot \sqrt{0.756} = 0.717$ For $\overline{\lambda_p} = 0.717 < 0.748 \Rightarrow \rho = 1$	Rel. (3.8) Scheme – Steps, B.8, B.9
	$c_{p1} = 21.71$ mm $c_{1.eff} = c_{p1} \cdot \rho = 21.71 \cdot 1 = 21.71$ mm	Scheme - Step B.10
Stiffening exterior flange (c_2)	$\overline{\lambda_p} = 0.796$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 0.796 \cdot \sqrt{0.789} = 0.707$ For $\overline{\lambda_p} = 0.707 < 0.748 \Rightarrow \rho = 1$	Rel. 3.8 Scheme – Step B.9
	$c_{p2} = 21.71$ mm $c_{2.eff} = c_{p2} \cdot \rho = 21.71 \cdot 1 = 21.71$ mm	Scheme - Step B.10

Step B.11 : At the end of the last iteration, the new effective widths of the portions related to the stiffening are obtained. The values obtained for each iteration are centralized.

Stiffener 1														
Iter.	χ_d	Flange				Rebord				Stiffeners characteristcs				
		λ_p	$\lambda_{p,red}$	ρ	$b_{1,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,1}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	0.756	-	0.938	23.26	0.824	-	0.937	20.33	61.91	0.229	2648.00	364.34	0.756
2	0.756	0.756	0.658	1.000	24.81	0.824	0.717	1.000	21.71	66.06	0.234	3203.25	379.80	0.771
3	0.771	0.756	0.664	1.000	24.81	0.824	0.724	1.000	21.71	66.06	0.234	3203.25	379.80	0.771
4	0.771	0.756	0.664	1.000	24.81	0.824	0.724	1.000	21.71	66.06	0.234	3203.25	379.80	0.771

Stiffener 2														
Iter.	χ_d	Flange				Rebord				Stiffeners characteristics				
		λ_p	$\lambda_{p,red}$	ρ	$b_{2,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,2}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	0.695	-	0.983	22.43	0.796	-	0.959	20.82	61.42	0.257	2786.62	399.63	0.789
2	0.789	0.695	0.617	1.000	22.81	0.796	0.707	1.000	21.71	63.22	0.255	3121.73	408.67	0.796
3	0.796	0.695	0.620	1.000	22.81	0.796	0.711	1.000	21.71	63.22	0.255	3121.73	408.67	0.796
4	0.796	0.695	0.620	1.000	22.81	0.796	0.711	1.000	21.71	63.22	0.255	3121.73	408.67	0.796

Step B.12 : The thickness of the effective portions of the stiffeners is reduced due to the effect of distortion buckling :

- *Stiffener 1*

$$\chi_{d.1,final} = \min(\chi_{d.1.1}, \chi_{d.1.2}, \chi_{d.1.3}, \chi_{d.1.4}) = 0.756$$

$$t_{red.s1} = \chi_{d.1,final} \cdot t = 0.756 \cdot 1.42 = 1.07 \text{ mm}$$

- *Stiffener 2*

$$\chi_{d.2,final} = \min(\chi_{d.2.1}, \chi_{d.2.2}, \chi_{d.2.3}, \chi_{d.2.4}) = 0.789$$

$$t_{red.s2} = \chi_{d.2,final} \cdot t = 0.789 \cdot 1.42 = 1.12 \text{ mm}$$

The final effective dimensions of the flanges obtained by the calculation of buckling and distortion are centralized in the following table :

	$c_{1.eff}$ [mm]	$b_{1.e1}$ [mm]	$b_{1.e2}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	21.71	23.26	24.81	22.43	22.81	21.71
thickness t	1.07	1.07	1.42	1.42	1.12	1.12

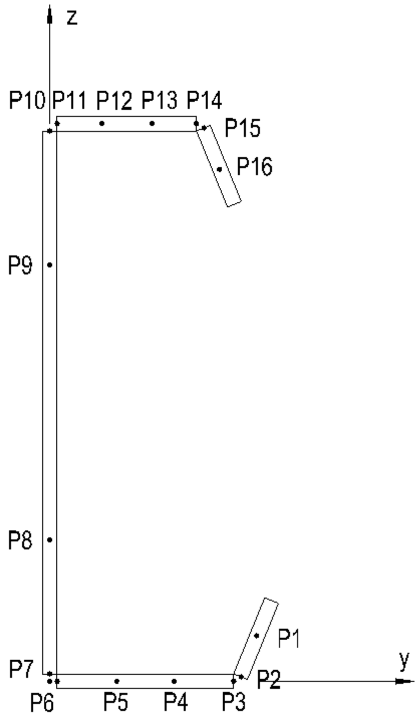
Step 4.1 : Determination of the effective width of the web due to local buckling is carried out by the design methodology presented in the scheme „A" (Figure 4.2).

Interior wall h, , Scheme **Step A.1-A.7**		
WEB (h)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{h_p}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{195.82}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 2.98$ For $\overline{\lambda_p} = 2.98 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{2.98 - 0.055(3+1)}{2.98^2} = 0.310$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$h_p = 195.82\ \text{mm}$ $h_{eff} = h_p \cdot \rho = 195.82 \cdot 0.310 = 60.78\ \text{mm}$ $h_{e1} = h_{e2} = 0.5 \cdot h_{eff} = 0.5 \cdot 60.78 = 30.39\ \text{mm}$	Table 3.3 Scheme – Step A.7a

The final effective dimensions of all the component walls of the section, obtained by the calculation of buckling and distortion, are centralized in the following table:

	$c_{1.eff}$ [mm]	$b_{1.e1}$ [mm]	$b_{1.e2}$ [mm]	$h_{.e1}$ [mm]	$h_{.e2}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	21.71	23.26	24.81	30.39	30.39	22.43	22.81	21.71
thickness t	1.07	1.07	1.42	1.42	1.42	1.42	1.12	1.12

Step 5.1 : In the final step, the physicomechanical characteristics of the effective section are calculated using the relations presented in ANNEX A. The nodes are marking the segments they are numbered according to the figure below.



- Horizontal coordinates (by Y-Y axis)
- $P1_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} + c_{1eff} \cdot \cos(\phi_1) = 1.38 + 49.62 + 0.747 + 21.71 \cdot \cos(75°) = 57.36$ mm

$P2_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} = 1.38 + 49.62 + 0.747 = 51.75$ mm

$P3_{e.y} = g_{r.2} + b_{p.1} = 1.38 + 49.62 = 51$ mm

$P4_{e.y} = g_{r.2} + b_{p.1} - b_{1.e2} = 1.38 + 49.62 - 24.81 = 26.19$ mm

$P5_{e.y} = g_{r.2} + b_{1.e1} = 1.38 + 23.26 = 24.64$ mm

$P6_{e.y} = g_{r.2} = 1.38$ mm

$P7_{e.y} = 0$ mm

$P8_{e.y} = 0$ mm

$P9_{e.y} = 0$ mm

$P10_{e.y} = 0$ mm

$P11_{e.y} = g_{r.3} = 1.38$ mm

$P12_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 22.43 = 23.81$ mm

$P13_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 45.62 - 22.81 = 24.19$ mm

$P14_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47$ mm

$P15_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747 = 47.75$ mm

$P16_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 45.62 + 0.747 + 21.71 \cdot \cos(75°) = 53.36$ mm

- Vertical coordinates (by z-z axis)
- $P1_{e.z} = g_{r.1} + c_{1eff} \cdot \sin(\phi_1) = 0.747 + 21.71 \cdot \sin(75°) = 21.72$mm

$P2_{e.z} = g_{r.1} = 0.747$ mm

$P3_{e.z} = 0$ mm

$P4_{e.z} = 0$ mm

$P5_{e.z} = 0$ mm

$P6_{e.z} = 0$ mm

$P7_{e.z} = g_{r.2} = 1.38$ mm

$P8_{e.z} = g_{r.2} + h_{e1} = 1.38 + 30.39 = 31.77$ mm

$P9_{e.z} = g_{r.2} + h_{e1} + (h_p - h_{e1} - h_{e2}) = 1.38 + 30.39 + (195.82 - 2 \cdot 30.39) = 166.81$ mm

$P10_{e.z} = g_{r.2} + h_p = 1.38 + 195.82 = 197.20$ mm

$P11_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58$ mm

$P12_{e.z} = P13_z = P14_z = P11_z = 198.58$ mm

$P15_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83$mm

$P16_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4) = 1.38 + 195.82 + 1.38 - 0.747 - 21.71 \cdot \sin(75°) = 176.86$ mm

Characteristics of the effective section (Annex A):

Area of sections

$$dA_{c1,eff} = \left[\overrightarrow{t_{red,s1} \cdot \sqrt{\left(P2_{e,y} - P1_{e,y}\right)^2 + \left(P2_{e,z} - P1_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.07 \cdot \sqrt{(51.75 - 57.36)^2 + (0.747 - 21.72)^2}}\right] = 23.31mm^2$$

$$dA_{b1,e2} = \left[\overrightarrow{t_{red,s1} \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.07 \cdot \sqrt{(26.19 - 51)^2 + 0]}}\right]$$
$$= 26.64mm^2$$

$$dA_{b1.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P6_{e,y} - P5_{e,y}\right)^2 + \left(P6_{e,z} - P5_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{(1.38 - 24.64)^2 + 0}}\right]$$
$$= 33.04mm^2$$

$$dA_{h,e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P8_{e,y} - P7_{e,y}\right)^2 + \left(P8_{e,z} - P7_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (31.77 - 1.38)^2}}\right]$$
$$= 43.16mm^2$$

$$dA_{h,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P10_{e,y} - P9_{e,y}\right)^2 + \left(P10_{e,z} - P9_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (197.20 - 166.81)^2}}\right]$$
$$= 43.16mm^2$$

$$dA_{b2.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.42 \cdot \sqrt{(23.81 - 1.38)^2 + (198.58 - 198.58)^2}}\right] = 31.85mm^2$$

$$dA_{b2.e2} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{[1.12 \cdot \sqrt{(47 - 24.19)^2 + (198.58 - 198.58)^2}}\right] = 25.54mm^2$$

$$dA_{c2,eff} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P16_{e,y} - P15_{e,y}\right)^2 + \left(P16_{e,z} - P15_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{[1.12 \cdot \sqrt{(53.36 - 47.75)^2 + (176.86 - 197.83)^2}}\right] = 24.31mm^2$$

Effective section area

$$A_{eff} = dA_{c1,eff} + dA_{b1.e2} + dA_{b1.e1} + dA_{h,e1} + dA_{h,e2} + dA_{b2.e1} + dA_{b2.e2} + dA_{c2,eff}$$
$$= 23.31 + 26.64 + 33.04 + 43.16 + 43.16 + 31.85 + 25.54 + 24.31$$
$$= 251.01mm^2$$

The static moment to the Y-axis and the coordinate of the center of gravity

$$S_{y0} = (P2_{e,z} + P1_{e,z}) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,z} + P3_{e,z}\right) \cdot \frac{dA_{b1.e2}}{2} + \left(P6_{e,z} + P5_{e,z}\right) \cdot \frac{dA_{b1.e1}}{2} + \left(P8_{e,z} + P7_{e,z}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,z} + P9_{e,z}\right) \cdot \frac{dA_{h,e2}}{2} + \left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P16_{e,z} + P15_{e,z}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{y0} = (0.747 + 21.72) \cdot \frac{23.31}{2} + 0 + 0 + (31.77 + 1.38) \cdot \frac{43.16}{2} + (197.20 + 166.81) \cdot \frac{43.16}{2} + (198.58 + 198.58) \cdot \frac{31.85}{2} + (198.58 + 198.58) \cdot \frac{25.54}{2} + (176.86 + 197.83) \cdot \frac{24.31}{2} = 24782.3\text{mm}^3$$

$$z_{gc} = \frac{24782.3}{251.01} = 98.73\text{mm}$$

Moment of inertia according to the original Y-axis and the new Y-axis through the center of gravity

$$I_{y0} = \left[\left(P2_{e,z}\right)^2 + \left(P1_{e,z}\right)^2 + P2_{e,z} \cdot P1_{e,z}\right] \cdot \frac{dA_{c1,eff}}{3} + \left[\left(P4_{e,z}\right)^2 + \left(P3_{e,z}\right)^2 + P4_{e,z} \cdot P3_{e,z}\right] \cdot \frac{dA_{b1.e2}}{3} + \left[\left(P6_{e,z}\right)^2 + \left(P5_{e,z}\right)^2 + P6_{e,z} \cdot P5_{e,z}\right] \cdot \frac{dA_{b1.e1}}{3} + \left[\left(P8_{e,z}\right)^2 + \left(P7_{e,z}\right)^2 + P8_{e,z} \cdot P7_{e,z}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,z}\right)^2 + \left(P9_{e,z}\right)^2 + P10_{e,z} \cdot P9_{e,z}\right] \cdot \frac{dA_{h,e2}}{3} + \left[\left(P12_{e,z}\right)^2 + \left(P11_{e,z}\right)^2 + P12_{e,z} \cdot P11_{e,z}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P14_{e,z}\right)^2 + \left(P13_{e,z}\right)^2 + P14_{e,z} \cdot P13_{e,z}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P16_{e,z}\right)^2 + \left(P15_{e,z}\right)^2 + P16_{e,z} \cdot P15_{e,z}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{y0} = [(0.747)^2 + (21.72)^2 + 0.747 \cdot 21.72] \cdot \frac{23.31}{3} + 0 + 0 + [(31.77)^2 + (1.38)^2 + 31.77 \cdot 1.38] \cdot \frac{43.16}{3} + [(197.20)^2 + (166.81)^2 + 197.20 \cdot 166.81] \cdot \frac{43.16}{3} + [(198.58)^2 + (198.58)^2 + 198.58 \cdot 198.58] \cdot \frac{31.85}{3} + [(198.58)^2 + (198.58)^2 + 198.58 \cdot 198.58] \cdot \frac{25.54}{3} + [(176.86)^2 + (197.83)^2 + 176.86 \cdot 197.83] \cdot \frac{24.31}{3} = 4569059\text{mm}^4$$

$$I_y = 4569059 - 251.01 \cdot 98.73^2 = 2122254\text{mm}^4$$

Static moment in ratio to the z-axis and the coordinate of the center of gravity

$$S_{z0} = (P2_{e,y} + P1_{e,y}) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1.e2}}{2} + \left(P6_{e,y} + P5_{e,y}\right) \cdot \frac{dA_{b1.e1}}{2} + \left(P8_{e,y} + P7_{e,y}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,y} + P9_{e,y}\right) \cdot \frac{dA_{h,e2}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P16_{e,y} + P15_{e,y}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{z0} = \sum_{i=1}^{n}[(51.75 + 57.36) \cdot \frac{23.31}{2} + (26.19 + 51) \cdot \frac{26.64}{2} + (1.38 + 24.64) \cdot \frac{33.04}{2} + 0 + 0 + (23.81 + 1.38) \cdot \frac{31.85}{2} + (47 + 24.19) \cdot \frac{25.54}{2} + (53.36 + 47.75) \cdot \frac{24.31}{2}] = 5269.15\text{mm}^3$$

$$y_{gc} = \frac{5269.15}{251.01} = 20.99\text{mm}$$

Moment of inertia in ratio to the original Y-axis and the new Y-axis through the center of gravity

$$I_{z0} = \left[\left(P2_{e,y}\right)^2 + \left(P1_{e,y}\right)^2 + P2_{e,y} \cdot P1_{e,y}\right] \cdot \frac{dA_{c1,eff}}{3} + \left[\left(P4_{e,y}\right)^2 + \left(P3_{e,y}\right)^2 + P4_{e,y} \cdot P3_{e,y}\right] \cdot \frac{dA_{b1.e2}}{3} + \left[\left(P6_{e,y}\right)^2 + \left(P5_{e,y}\right)^2 + P6_{e,y} \cdot P5_{e,y}\right] \cdot \frac{dA_{b1.e1}}{3} + \left[\left(P8_{e,y}\right)^2 + \left(P7_{e,y}\right)^2 + P8_{e,y} \cdot P7_{e,y}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,y}\right)^2 + \left(P9_{e,y}\right)^2 + P10_{e,y} \cdot P9_{e,y}\right] \cdot \frac{dA_{h,e2}}{3} + \left[\left(P12_{e,y}\right)^2 + \left(P11_{e,y}\right)^2 + P12_{e,y} \cdot P11_{e,y}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P14_{e,y}\right)^2 + \left(P13_{e,y}\right)^2 + P14_{e,y} \cdot P13_{e,y}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P16_{e,y}\right)^2 + \left(P15_{e,y}\right)^2 + P16_{e,y} \cdot P15_{e,y}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{z0} = [(51.75)^2 + (57.36)^2 + 51.75 \cdot 57.36] \cdot \frac{23.31}{3} + [(26.19)^2 + (51)^2 + 26.19 \cdot 51] \cdot \frac{26.64}{3} + [(1.38)^2 + (24.64)^2 + 1.38 \cdot 24.64] \cdot \frac{33.04}{3} + 0 + 0 + [(23.81)^2 + (1.38)^2 + 23.81 \cdot 1.38] \cdot \frac{31.85}{3} + [(47)^2 + (24.19)^2 + 47 \cdot 24.19] \cdot \frac{25.54}{3} + [(53.36)^2 + (47.75)^2 + 53.36 \cdot 47.75] \cdot \frac{24.31}{3} = 219627\text{mm}^4$$

$$I_z = 219627 - 251.01 \cdot 20.99^2 = 109017\text{mm}^4$$

Centrifugal moment of inertia in ratio to the Y and Z axes and the new axes through the center of gravity

$$I_{yz0} = (2\cdot P1_{e,y}\cdot P1_{e,z} + 2\cdot P2_{e,y}\cdot P2_{e,z} + P1_{e,y}\cdot P2_{e,z} + P2_{e,y}\cdot P1_{e,z})\cdot\frac{dA_{c1,eff}}{6} + (2\cdot P3_{e,y}\cdot P3_{e,z} + 2\cdot P4_{e,y}\cdot P4_{e,z} + P3_{e,y}\cdot P4_{e,z} + P4_{e,y}\cdot P3_{e,z})\cdot\frac{dA_{b1.e2}}{6} + (2\cdot P5_{e,y}\cdot P5_{e,z} + 2\cdot P6_{e,y}\cdot P6_{e,z} + P5_{e,y}\cdot P6_{e,z} + P6_{e,y}\cdot P5_{e,z})\cdot\frac{dA_{b1.e1}}{6} + (2\cdot P7_{e,y}\cdot P7_{e,z} + 2\cdot P8_{e,y}\cdot P8_{e,z} + P7_{e,y}\cdot P8_{e,z} + P8_{e,y}\cdot P7_{e,z})\cdot\frac{dA_{h,e1}}{6} + (2\cdot P9_{e,y}\cdot P9_{e,z} + 2\cdot P10_{e,y}\cdot P10_{e,z} + P9_{e,y}\cdot P10_{e,z} + P10_{e,y}\cdot P9_{e,z})\cdot\frac{dA_{h,e2}}{6} + (2\cdot P11_{e,y}\cdot P11_{e,z} + 2\cdot P12_{e,y}\cdot P12_{e,z} + P11_{e,y}\cdot P12_{e,z} + P12_{e,y}\cdot P11_{e,z})\cdot\frac{dA_{b2.e1}}{6} + (2\cdot P13_{e,y}\cdot P13_{e,z} + 2\cdot P14_{e,y}\cdot P14_{e,z} + P13_{e,y}\cdot P14_{e,z} + P14_{e,y}\cdot P13_{e,z})\cdot\frac{dA_{b2.e2}}{6} + (2\cdot P15_{e,y}\cdot P15_{e,z} + 2\cdot P16_{e,y}\cdot P16_{e,z} + P15_{e,y}\cdot P16_{e,z} + P16_{e,y}\cdot P15_{e,z})\cdot\frac{dA_{c2,eff}}{6}$$

$$I_{yz0} = (2\cdot 57.36\cdot 21.72 + 2\cdot 51.75\cdot 0.747 + 57.36\cdot 0.747 + 51.75\cdot 21.72)\cdot\frac{23.31}{6} + 0 + 0 + 0 + 0 + (2\cdot 1.38\cdot 198.58 + 2\cdot 23.81\cdot 198.58 + 1.38\cdot 198.58 + 23.81\cdot 198.58)\cdot\frac{31.85}{6} + (2\cdot 24.19\cdot 198.58 + 2\cdot 47\cdot 198.58 + 24.19\cdot 198.58 + 47\cdot 198.58)\cdot\frac{25.54}{6} + (2\cdot 47.75\cdot 197.83 + 2\cdot 53.36\cdot 176.86 + 47.75\cdot 176.86 + 53.36\cdot 197.83)\cdot\frac{24.31}{6} = 504679\text{mm}^4$$

$$I_{yz} = 504679 - \frac{24782.3\cdot 5269.15}{251.01} = -15553.4\text{mm}^4$$

Main axes of inertia

$$\alpha = \frac{1}{2}\arctan\left(\frac{2I_{yz}}{I_z - I_y}\right)\text{dacă } (I_z - I_y) \neq 0 \text{ dacă nu } \alpha = 0$$

$$\alpha = \frac{1}{2}\arctan\left(\frac{2\cdot(-15553)}{109017 - 2122254}\right) = 0.0077$$

$$I_\zeta = \frac{1}{2}[I_y + I_z + \sqrt{(I_z - I_y)^2 + 4\cdot I_{yz}^2} = \frac{1}{2}[2122254 + 109017 + \sqrt{(109017 - 2122254)^2 + 4\cdot(-15553.4)^2} = 2122375\text{mm}^4$$

$$I_\eta = \frac{1}{2}[I_y + I_z - \sqrt{(I_z - I_y)^2 + 4\cdot I_{yz}^2} = \frac{1}{2}[2122254 + 109017 - \sqrt{(109017 - 2122254)^2 + 4\cdot(-15553.4)^2} = 108897\text{mm}^4$$

Radius of gyration

$$i_y = \sqrt{\frac{I_y}{A_{eff}}} = \sqrt{\frac{2122254}{251.01}} = 91.95mm$$

$$i_z = \sqrt{\frac{I_z}{A_{eff}}} = \sqrt{\frac{109017}{251.01}} = 20.84mm$$

$$i_\zeta = \sqrt{\frac{I_\zeta}{A_{eff}}} = \sqrt{\frac{2122375}{251.01}} = 91.95mm$$

$$i_\eta = \sqrt{\frac{I_\eta}{A_{eff}}} = \sqrt{\frac{108897}{251.01}} = 20.83mm$$

Resistance module

- Resistance module in ratio to y-y axis

$$z_{max} = \max(98.73, (200 - 1.42) - 98.73) = \max(98.73\ ,99.85) = 99.85mm$$

$$z_{min} = \min(98.73, (200 - 1.42) - 98.73) = \min(98.73\ ,99.85) = 98.73mm$$

$$W_{y,min} = \frac{I_y}{z_{max}} = \frac{2122254}{99.85} = 21254mm^3$$

$$W_{y,max} = \frac{I_y}{z_{min}} = \frac{2122254}{98.73} = 21495mm^3$$

- Resistance module in ratio to z-z axis

$$y_{max} = \max(20.99{,}56.28 - 20.99) = \max(20.99{,}35.29) = 35.29mm$$

$$y_{min} = \min(20.99{,}56.28 - 20.99) = \min(20.99{,}35.29) = 20.99mm$$

$$W_{z,min} = \frac{I_z}{y_{max}} = \frac{109017}{35.29} = 3089.18mm^3$$

$$W_{z,max} = \frac{I_z}{y_{min}} = \frac{109017}{20.99} = 5193.25mm^3$$

Sectoral coordinates

$$\omega_0 = 0$$

$$\omega_{0_i} = y_{i-1} \cdot z_i - y_i \cdot z_{i-1}$$

$$\omega_{01} = 0$$

$$\omega_{0_2} = P1_{e,y} \cdot P2_{e,z} - P2_{e,y} \cdot P1_{e,z} = 57.36 \cdot 0.747 - 51.75 \cdot 21.72 = -1080.83mm^2$$

$$\omega_{0_3} = P2_{e,y} \cdot P3_{e,z} - P3_{e,y} \cdot P2_{e,z} = 51.75 \cdot 0 - 51 \cdot 0.747 = -38.09mm^2$$

$$\omega_{0_4} = P3_{e,y} \cdot P4_{e,z} - P4_{e,y} \cdot P3_{e,z} = 51 \cdot 0 - 26.19 \cdot 0 = 0mm^2$$

$$\omega_{0_5} = P4_{e,y} \cdot P5_{e,z} - P5_{e,y} \cdot P4_{e,z} = 26.19 \cdot 0 - 24.64 \cdot 0 = 0mm^2$$

$$\omega_{0_6} = P5_{e,y} \cdot P6_{e,z} - P6_{e,y} \cdot P5_{e,z} = 24.64 \cdot 0 - 1.38 \cdot 0 = 0mm^2$$

$$\omega_{0_7} = P6_{e,y} \cdot P7_{e,z} - P7_{e,y} \cdot P6_{e,z} = 1.38 \cdot 1.38 - 0 \cdot 0 = 1.90mm^2$$

$\omega_{0_8} = P7_{e,y} \cdot P8_{e,z} - P8_{e,y} \cdot P7_{e,z} = 0 \cdot 31.77 - 0 \cdot 1.38 = 0mm^2$

$\omega_{0_9} = P8_{e,y} \cdot P9_{e,z} - P9_{e,y} \cdot P8_{e,z} = 0 \cdot 166.81 - 0 \cdot 31.77 = 0mm^2$

$\omega_{0_{10}} = P9_{e,y} \cdot P10_{e,z} - P10_{e,y} \cdot P9_{e,z} = 0 \cdot 197.20 - 0 \cdot 166.81 = 0mm^2$

$\omega_{0_{11}} = P10_{e,y} \cdot P11_{e,z} - P11_{e,y} \cdot P10_{e,z} = 0 \cdot 198.58 - 1.38 \cdot 197.20 = -272.04mm^2$

$\omega_{0_{12}} = P11_{e,y} \cdot P12_{e,z} - P12_{e,y} \cdot P11_{e,z} = 1.38 \cdot 198.58 - 23.81 \cdot 198.58 = -4453.67mm^2$

$\omega_{0_{13}} = P12_{e,y} \cdot P13_{e,z} - P13_{e,y} \cdot P12_{e,z} = 23.81 \cdot 198.58 - 24.89 \cdot 198.58 = -75.82mm^2$

$\omega_{0_{14}} = P13_{e,y} \cdot P14_{e,z} - P14_{e,y} \cdot P13_{e,z} = 24.19 \cdot 198.58 - 47 \cdot 198.58 = -4529.49mm^2$

$\omega_{0_{15}} = P14_{e,y} \cdot P15_{e,z} - P15_{e,y} \cdot P14_{e,z} = 47 \cdot 197.83 - 47.75 \cdot 198.58 = -183.41mm^2$

$\omega_{0_{16}} = P15_{e,y} \cdot P16_{e,z} - P16_{e,y} \cdot P15_{e,z} = 47.75 \cdot 176.86 - 53.36 \cdot 197.83 = -2112.69mm^2$

$\omega_i = \omega_{i-1} + \omega_{0_i}$

$\omega_1 = 0 + \omega_{01} = 0mm^2$

$\omega_2 = \omega_0 + \omega_{0_2} = 0 + (-1080.83) = -1080.83mm^2$

$\omega_3 = \omega_2 + \omega_{0_3} = (-1080.83) + (-38.09) = -1118.92mm^2$

$\omega_4 = \omega_3 + \omega_{0_4} = (-1118.92) + 0 = -1118.92mm^2$

$\omega_5 = \omega_4 + \omega_{0_5} = (-1118.92) + 0 = -1118.92mm^2$

$\omega_6 = \omega_5 + \omega_{0_6} = (-1118.92) + 0 = -1118.92mm^2$

$\omega_7 = \omega_6 + \omega_{0_7} = (-1118.92) + 1.90 = -1117.02mm^2$

$\omega_8 = \omega_7 + \omega_{0_8} = (-1117.02) + 0 = -1117.02mm^2$

$\omega_9 = \omega_8 + \omega_{0_9} = (-1117.02) + 0 = -1117.02mm^2$

$\omega_{10} = \omega_9 + \omega_{0_{10}} = (-1117.02) + 0 = -1117.02mm^2$

$\omega_{11} = \omega_{10} + \omega_{0_{11}} = (-1117.02) + (-272.04) = -1389.06mm^2$

$\omega_{12} = \omega_{11} + \omega_{0_{12}} = (-1389.06) + (-4453.67) = -5842.73mm^2$

$\omega_{13} = \omega_{12} + \omega_{0_{13}} = (-5842.73) + (-75.82) = -5918.55mm^2$

$\omega_{14} = \omega_{13} + \omega_{0_{14}} = (-5918.55) + (-4529.49) = -10448.05mm^2$

$\omega_{15} = \omega_{14} + \omega_{0_{15}} = (-10448.05) + (-183.41) = -10631.45mm^2$

$\omega_{16} = \omega_{15} + \omega_{0_{16}} = (-10631.45) + (-2112.69) = -12744.14mm^2$

Average of sectoral coordinates

$$I_\omega = \sum_{i=1}^{n} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2} \qquad \omega_{mean} = \frac{I_\omega}{A}$$

$dA_2 = dA_{c1,eff}$; $dA_3 = 0$; $dA_4 = dA_{b1,e2}$; $dA_5 = 0$; $dA_6 = dA_{b1,e1}$; $dA_7 = 0$;

$dA_8 = dA_{h,e1}$; $dA_9 = 0$; $dA_{10} = dA_{h,e2}$; $dA_{11} = 0$; $dA_{12} = dA_{b2,e1}$; $dA_{13} = 0$;

$dA_{14} = dA_{b2,e2}$; $dA_{15} = 0$; $dA_{16} = dA_{c2,eff}$

$$\begin{aligned} I_\omega = \sum_{i=2}^{16} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2} \\ &= (\omega_1 + \omega_2) \cdot \frac{dA_2}{2} + (\omega_2 + \omega_3) \cdot \frac{dA_3}{2} + (\omega_3 + \omega_4) \cdot \frac{dA_4}{2} + (\omega_4 + \omega_5) \cdot \frac{dA_5}{2} \\ &+ (\omega_5 + \omega_6) \cdot \frac{dA_6}{2} + (\omega_6 + \omega_7) \cdot \frac{dA_7}{2} + (\omega_7 + \omega_8) \cdot \frac{dA_8}{2} + (\omega_8 + \omega_9) \cdot \frac{dA_9}{2} \\ &+ (\omega_9 + \omega_{10}) \cdot \frac{dA_{10}}{2} + (\omega_{10} + \omega_{11}) \cdot \frac{dA_{11}}{2} + (\omega_{11} + \omega_{12}) \cdot \frac{dA_{12}}{2} + (\omega_{12} + \omega_{13}) \\ &\cdot \frac{dA_{13}}{2} + (\omega_{13} + \omega_{14}) \cdot \frac{dA_{14}}{2} + (\omega_{14} + \omega_{15}) \cdot \frac{dA_{15}}{2} + (\omega_{15} + \omega_{16}) \cdot \frac{dA_{16}}{2} \\ &= [0 + (-1080.83)] \cdot \frac{23.31}{2} + 0 + [(-1118.92) + (-1118.92)] \cdot \frac{26.64}{2} + 0 \\ &+ [(-1118.92) + (-1118.92)] \cdot \frac{33.04}{2} + 0 + [(-1117.02) + (-1117.02)] \cdot \frac{43.16}{2} \\ &+ 0 + [(-1117.02) + (-1117.02)] \cdot \frac{43.16}{2} + 0 + [(-1389.06) + (-5842.73)] \\ &\cdot \frac{31.85}{2} + 0 + [(-5918.55) + (-10448.05)] \cdot \frac{25.54}{2} + 0 \\ &+ [(-10631.45) + (-12744.14)] \cdot \frac{24.31}{2} = -784069 mm^4 \end{aligned}$$

$$\omega_{mean} = \frac{-784069}{251.01} = -3123.7 mm^2$$

Sectoral constants

$$I_{y\omega0} = \sum_{i=1}^{n}(2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$I_{y\omega0} = \sum_{i=2}^{16}(2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,y} \cdot \omega_1 + 2 \cdot P2_{e,y} \cdot \omega_2 + P1_{e,y} \cdot \omega_2 + P2_{e,y} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,y} \cdot \omega_2 + 2 \cdot P3_{e,y} \cdot \omega_3 + P2_{e,y} \cdot \omega_3 + P3_{e,y} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,y} \cdot \omega_3 + 2 \cdot P4_{e,y} \cdot \omega_4 + P3_{e,y} \cdot \omega_4 + P4_{e,y} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,y} \cdot \omega_4 + 2 \cdot P5_{e,y} \cdot \omega_5 + P4_{e,y} \cdot \omega_5 + P5_{e,y} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,y} \cdot \omega_5 + 2 \cdot P6_{e,y} \cdot \omega_6 + P5_{e,y} \cdot \omega_6 + P6_{e,y} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,y} \cdot \omega_6 + 2 \cdot P7_{e,y} \cdot \omega_7 + P6_{e,y} \cdot \omega_7 + P7_{e,y} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,y} \cdot \omega_7 + 2 \cdot P8_{e,y} \cdot \omega_8 + P7_{e,y} \cdot \omega_8 + P8_{e,y} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,y} \cdot \omega_8 + 2 \cdot P9_{e,y} \cdot \omega_9 + P8_{e,y} \cdot \omega_9 + P9_{e,y} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,y} \cdot \omega_9 + 2 \cdot P10_{e,y} \cdot \omega_{10} + P9_{e,y} \cdot \omega_{10} + P10_{e,y} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,y} \cdot \omega_{10} + 2 \cdot P11_{e,y} \cdot \omega_{11} + P10_{e,y} \cdot \omega_{11} + P11_{e,y} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,y} \cdot \omega_{11} + 2 \cdot P12_{e,y} \cdot \omega_{12} + P11_{e,y} \cdot \omega_{12} + P12_{e,y} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,y} \cdot \omega_{12} + 2 \cdot P13_{e,y} \cdot \omega_{13} + P12_{e,y} \cdot \omega_{13} + P13_{e,y} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,y} \cdot \omega_{13} + 2 \cdot P14_{e,y} \cdot \omega_{14} + P13_{e,y} \cdot \omega_{14} + P14_{e,y} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6} + (2 \cdot P14_{e,y} \cdot \omega_{14} + 2 \cdot P15_{e,y} \cdot \omega_{15} + P14_{e,y} \cdot \omega_{15} + P15_{e,y} \cdot \omega_{14}) \cdot \frac{dA_{15}}{6} + (2 \cdot P15_{e,y} \cdot \omega_{15} + 2 \cdot P16_{e,y} \cdot \omega_{16} + P15_{e,y} \cdot \omega_{16} + P16_{e,y} \cdot \omega_{15}) \cdot \frac{dA_{16}}{6}$$

$$
\begin{aligned}
I_{y\omega 0} = {} & \left[(2\cdot 57.36\cdot 0 + 2\cdot 51.75\cdot(-1080.83) + 57.36\cdot(-1080.83) + 51.75\cdot 0)\cdot\frac{23.31}{6}\right] + 0 \\
& + \left[\big(2\cdot 51\cdot(-1118.92) + 2\cdot 26.19\cdot(-1118.92) + 51\cdot(-1118.92) + 26.19 \right. \\
& \left. \cdot(-1118.92)\big)\cdot\frac{26.64}{6}\right] + 0 \\
& + \left[\big(2\cdot 24.64\cdot(-1118.92) + 2\cdot 1.38\cdot(-1118.92) + 24.64\cdot(-1118.92) + 1.38 \right. \\
& \left. \cdot(-1118.92)\big)\cdot\frac{33.04}{6}\right] + 0 + 0 + 0 + 0 + 0 \\
& + \left[\big(2\cdot 1.38\cdot(-1389.06) + 2\cdot 23.81\cdot(-5842.73) + 1.38\cdot(-5842.73) + 23.81 \right. \\
& \left. \cdot(-1389.06)\big)\cdot\frac{31.85}{6}\right] + 0 \\
& + \left[\big(2\cdot 24.19\cdot(-5918.55) + 2\cdot 47\cdot(-10448.05) + 24.19\cdot(-10448.05) + 47 \right. \\
& \left. \cdot(-5918.55)\big)\cdot\frac{25.54}{6}\right] + 0 + [(2\cdot 47.75\cdot(-10631.45) + 2\cdot 53.36\cdot(-12744.14) \\
& + 47.75\cdot(-12744.14) + 53.36\cdot(-10631.45))\cdot\frac{24.31}{6})] = -26068864\text{mm}^5
\end{aligned}
$$

$$
I_{y\omega} = I_{y\omega 0} - \frac{S_{z0}\cdot I_\omega}{A_{eff}} = -26068864 - \frac{5269.15\cdot(-784069)}{251.01} = -9609624\text{mm}^5
$$

$$
I_{z\omega 0} = \sum_{i=1}^{n}(2\cdot z_{i-1}\cdot\omega_{i-1} + 2\cdot z_i\cdot\omega_i + z_{i-1}\cdot\omega_i + z_i\cdot\omega_{i-1})\cdot\frac{dA_i}{6}
$$

$$I_{z\omega 0} = \sum_{i=2}^{16}(2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,z} \cdot \omega_1 + 2 \cdot P2_{e,z} \cdot \omega_2 + P1_{e,z} \cdot \omega_2 + P2_{e,z} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,z} \cdot \omega_2 + 2 \cdot P3_{e,z} \cdot \omega_3 + P2_{e,z} \cdot \omega_3 + P3_{e,z} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,z} \cdot \omega_3 + 2 \cdot P4_{e,z} \cdot \omega_4 + P3_{e,z} \cdot \omega_4 + P4_{e,z} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,z} \cdot \omega_4 + 2 \cdot P5_{e,z} \cdot \omega_5 + P4_{e,z} \cdot \omega_5 + P5_{e,z} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,z} \cdot \omega_5 + 2 \cdot P6_{e,z} \cdot \omega_6 + P5_{e,z} \cdot \omega_6 + P6_{e,z} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,z} \cdot \omega_6 + 2 \cdot P7_{e,z} \cdot \omega_7 + P6_{e,z} \cdot \omega_7 + P7_{e,z} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,z} \cdot \omega_7 + 2 \cdot P8_{e,z} \cdot \omega_8 + P7_{e,z} \cdot \omega_8 + P8_{e,z} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,z} \cdot \omega_8 + 2 \cdot P9_{e,z} \cdot \omega_9 + P8_{e,z} \cdot \omega_9 + P9_{e,z} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,z} \cdot \omega_9 + 2 \cdot P10_{e,z} \cdot \omega_{10} + P9_{e,z} \cdot \omega_{10} + P10_{e,z} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,z} \cdot \omega_{10} + 2 \cdot P11_{e,z} \cdot \omega_{11} + P10_{e,z} \cdot \omega_{11} + P11_{e,z} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,z} \cdot \omega_{11} + 2 \cdot P12_{e,z} \cdot \omega_{12} + P11_{e,z} \cdot \omega_{12} + P12_{e,z} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,z} \cdot \omega_{12} + 2 \cdot P13_{e,z} \cdot \omega_{13} + P12_{e,z} \cdot \omega_{13} + P13_{e,z} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,z} \cdot \omega_{13} + 2 \cdot P14_{e,z} \cdot \omega_{14} + P13_{e,z} \cdot \omega_{14} + P14_{e,z} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6} + (2 \cdot P14_{e,z} \cdot \omega_{14} + 2 \cdot P15_{e,z} \cdot \omega_{15} + P14_{e,z} \cdot \omega_{15} + P15_{e,z} \cdot \omega_{14}) \cdot \frac{dA_{15}}{6} + (2 \cdot P15_{e,z} \cdot \omega_{15} + 2 \cdot P16_{e,z} \cdot \omega_{16} + P15_{e,z} \cdot \omega_{16} + P16_{e,z} \cdot \omega_{15}) \cdot \frac{dA_{16}}{6}$$

$$I_{z\omega0} = \left[(2\cdot 21.72\cdot 0 + 2\cdot 0.747\cdot(-1080.83) + 21.72\cdot(-1080.83) + 0.747\cdot 0)\cdot\frac{23.31}{6}\right] + 0$$
$$+ 0 + 0 + 0 + 0$$
$$+ \left[(2\cdot 1.38\cdot(-1117.02) + 2\cdot 31.77\cdot(-1117.02) + 1.38\cdot(-1117.02) + 31.77 \cdot(-1117.02))\cdot\frac{43.16}{6}\right] + 0$$
$$+ \left[(2\cdot 166.81\cdot(-1117.02) + 2\cdot 197.20\cdot(-1117.02) + 166.81\cdot(-1117.02) + 197.20\cdot(-1117.02))\cdot\frac{43.16}{6}\right] + 0$$
$$+ \left[(2\cdot 198.58\cdot(-1389.06) + 2\cdot 198.58\cdot(-5842.73) + 198.58\cdot(-5842.73) + 198.58\cdot(-1389.06))\cdot\frac{31.85}{6}\right] + 0$$
$$+ \left[(2\cdot 198.58\cdot(-5918.55) + 2\cdot 198.58\cdot(-10448.05) + 198.58\cdot(-10448.05) + 198.58\cdot(-5918.55))\cdot\frac{25.54}{6}\right] + 0$$
$$+ \left[(2\cdot 197.83\cdot(-10631.45) + 2\cdot 176.86\cdot(-12744.14) + 197.83\cdot(-12744.14) + 176.86\cdot(-10631.45))\cdot\frac{24.31}{6}\right] = -127181510\text{mm}^5$$

$$I_{z\omega} = I_{z\omega0} - \frac{S_{y0}\cdot I_\omega}{A_{eff}} = -127181510 - \frac{24782.3\cdot(-784069)}{251.01} = -49768921\text{mm}^5$$

$$I_{\omega\omega0} = \sum_{i=1}^{n}[(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i\cdot\omega_{i-1}]\frac{dA_i}{3}$$

$$I_{\omega\omega0} = \sum_{i=2}^{16}[(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i\cdot\omega_{i-1}]\frac{dA_i}{3}$$

$$= \left[((\omega_2)^2 + (\omega_1)^2 + \omega_2\cdot\omega_1)\cdot\frac{dA_2}{3}\right] + \left[((\omega_3)^2 + (\omega_2)^2 + \omega_3\cdot\omega_2)\cdot\frac{dA_3}{3}\right]$$
$$+ \left[((\omega_4)^2 + (\omega_3)^2 + \omega_4\cdot\omega_3)\cdot\frac{dA_4}{3}\right] + \left[((\omega_5)^2 + (\omega_4)^2 + \omega_5\cdot\omega_4)\cdot\frac{dA_5}{3}\right]$$
$$+ \left[((\omega_6)^2 + (\omega_5)^2 + \omega_6\cdot\omega_5)\cdot\frac{dA_6}{3}\right] + \left[((\omega_7)^2 + (\omega_6)^2 + \omega_7\cdot\omega_6)\cdot\frac{dA_7}{3}\right]$$
$$+ \left[((\omega_8)^2 + (\omega_7)^2 + \omega_8\cdot\omega_7)\cdot\frac{dA_8}{3}\right] + \left[((\omega_9)^2 + (\omega_8)^2 + \omega_9\cdot\omega_8)\cdot\frac{dA_9}{3}\right]$$
$$+ \left[((\omega_{10})^2 + (\omega_9)^2 + \omega_{10}\cdot\omega_9)\cdot\frac{dA_{10}}{3}\right] + \left[((\omega_{11})^2 + (\omega_{10})^2 + \omega_{11}\cdot\omega_{10})\cdot\frac{dA_{11}}{3}\right]$$
$$+ \left[((\omega_{12})^2 + (\omega_{11})^2 + \omega_{12}\cdot\omega_{11})\cdot\frac{dA_{12}}{3}\right]$$
$$+ \left[((\omega_{13})^2 + (\omega_{12})^2 + \omega_{13}\cdot\omega_{12})\cdot\frac{dA_{13}}{3}\right]$$
$$+ \left[((\omega_{14})^2 + (\omega_{13})^2 + \omega_{14}\cdot\omega_{13})\cdot\frac{dA_{14}}{3}\right]$$
$$+ \left[((\omega_{15})^2 + (\omega_{14})^2 + \omega_{15}\cdot\omega_{14})\cdot\frac{dA_{15}}{3}\right]$$
$$+ \left[((\omega_{16})^2 + (\omega_{15})^2 + \omega_{16}\cdot\omega_{15})\cdot\frac{dA_{16}}{3}\right]$$

$$I_{\omega\omega0} = \left\{[(-1080.83)^2 + (0)^2 + (-1080.83)\cdot 0]\cdot\frac{23.31}{3}\right\} + 0$$
$$+\left\{[(-1118.92)^2 + (-1118.92)^2 + (-1118.92)\cdot(-1118.92)]\cdot\frac{26.64}{3}\right\} + 0$$
$$+\left\{[(-1118.92)^2 + (-1118.92)^2 + (-1118.92)\cdot(-1118.92)]\cdot\frac{33.04}{3}\right\} + 0$$
$$+\left\{[(-1117.02)^2 + (-1117.02)^2 + (-1117.02)\cdot(-1117.02)]\cdot\frac{43.16}{3}\right\} + 0$$
$$+\left\{[(-1117.02)^2 + (-1117.02)^2 + (-1117.02)\cdot(-1117.02)]\cdot\frac{43.16}{3}\right\} + 0$$
$$+\left\{[(-5842.73)^2 + (-1389.06)^2 + (-5842.73)\cdot(-1389.06)]\cdot\frac{31.85}{3}\right\} + 0$$
$$+\left\{[(-10448.05)^2 + (-5918.55)^2 + (-10448.05)\cdot(-5918.55)]\cdot\frac{25.54}{3}\right\} + 0$$
$$+\left\{[(-12744.14)^2 + (-10631.45)^2 + (-12744.14)\cdot(-10631.45)]\cdot\frac{24.31}{3}\right\}$$
$$= 5744254885\text{mm}^6$$

$$I_{\omega\omega} = I_{\omega\omega0} - \frac{I_\omega^2}{A_{eff}} = 5744254885 - \frac{(-784069)^2}{251.01} = 3295056795\text{mm}^6$$

Shear Center

$$y_{sc} = \frac{I_{z\omega}\cdot I_z - I_{y\omega}\cdot I_{yz}}{I_y\cdot I_z - I_{yz}^2} = \frac{(-49768921)\cdot 109017 - (-9609624)\cdot(-15553.4)}{2122254\cdot 109017 - (-15553.4)^2} = -24.12\text{mm}$$

$$z_{sc} = \frac{-I_{y\omega}\cdot I_y + I_{z\omega}\cdot I_{yz}}{I_y\cdot I_z - I_{yz}^2} = \frac{-(-9609624)\cdot 2122254 + (-49768921)\cdot(-15553.4)}{2122254\cdot 109017 - (-15553.4)^2}$$
$$= 91.59\text{mm}$$

Sectoral moment of inertia

$$I_w = I_{\omega\omega} + z_{sc}\cdot I_{y\omega} - y_{sc}\cdot I_{z\omega}$$
$$= 3295056795 + 91.59\cdot(-9609624) - (-24.12)\cdot(-49768921)$$
$$= 1214382029\text{mm}^6$$

Tortional moment of inertia

$$I_t = \sum_{i=1}^{n} dA_i\cdot\frac{(t_i)^2}{3}$$

$$I_t = \sum_{i=2}^{16} dA_i\cdot\frac{(t_i)^2}{3}$$
$$= dA_2\cdot\frac{(t_2)^2}{3} + dA_3\cdot\frac{(t_3)^2}{3} + dA_4\cdot\frac{(t_4)^2}{3} + dA_5\cdot\frac{(t_5)^2}{3} + dA_6\cdot\frac{(t_6)^2}{3} + dA_7\cdot\frac{(t_7)^2}{3}$$
$$+ dA_8\cdot\frac{(t_8)^2}{3} + dA_9\cdot\frac{(t_9)^2}{3} + dA_{10}\cdot\frac{(t_{10})^2}{3} + dA_{11}\cdot\frac{(t_{11})^2}{3} + dA_{12}\cdot\frac{(t_{12})^2}{3} + dA_{13}$$
$$\cdot\frac{(t_{13})^2}{3} + dA_{15}\cdot\frac{(t_{15})^2}{3} + dA_{16}\cdot\frac{(t_{16})^2}{3}$$

$$I_t = 23.31 \cdot \frac{(1.07)^2}{3} + 0 + 26.64 \cdot \frac{(1.07)^2}{3} + 0 + 33.04 \cdot \frac{(1.42)^2}{3} + 0 + 43.16 \cdot \frac{(1.42)^2}{3} + 0 + 43.16 \cdot \frac{(1.42)^2}{3} + 0 + 31.85 \cdot \frac{(1.42)^2}{3} + 0 + 25.54 \cdot \frac{(1.12)^2}{3} + 0 + 24.31 \cdot \frac{(1.12)^2}{3} = 141.67 \mathrm{mm}^4$$

$$W_t = \frac{I_t}{\min(t)} = \frac{141.67}{1.07} = 131.91 \mathrm{mm}^3$$

Sectoral coordinates in ratio to shear center

$$\omega_{s_j} = \omega_j - \omega_{mean} + z_{sc} \cdot (y_j - y_{gc}) - y_{sc} \cdot (z_j - z_{gc})$$

$$\omega_{s_1} = \omega_1 - \omega_{mean} + z_{sc} \cdot (P1_{e,y} - y_{gc}) - y_{sc} \cdot (P1_{e,z} - z_{gc})$$
$$= 0 - (-3123.7) + 91.59 \cdot [57.36 - 20.99] - (-24.12) \cdot (21.72 - 98.73)$$
$$= 4597.15\text{mm}^2$$

$$\omega_{s_2} = \omega_2 - \omega_{mean} + z_{sc} \cdot (P2_{e,y} - y_{gc}) - y_{sc} \cdot (P2_{e,z} - z_{gc})$$
$$= (-1080.83) - (-3123.7) + 91.59 \cdot [51.75 - 20.99] - (-24.12)$$
$$\cdot (0.747 - 98.73) = 2495.91\text{mm}^2$$

$$\omega_{s_3} = \omega_3 - \omega_{mean} + z_{sc} \cdot (P3_{e,y} - y_{gc}) - y_{sc} \cdot (P3_{e,z} - z_{gc})$$
$$= (-1118.92) - (-3123.7) + 91.59 \cdot [51 - 20.99] - (-24.12) \cdot (0 - 98.73)$$
$$= 2371.41\text{m}^2$$

$$\omega_{s_4} = \omega_4 - \omega_{mean} + z_{sc} \cdot (P4_{e,y} - y_{gc}) - y_{sc} \cdot (P4_{e,z} - z_{gc})$$
$$= (-1118.92) - (-3123.7) + 91.59 \cdot [26.19 - 20.99] - (-24.12) \cdot (0 - 98.73)$$
$$= 99.13\text{mm}^2$$

$$\omega_{s_5} = \omega_5 - \omega_{mean} + z_{sc} \cdot (P5_{e,y} - y_{gc}) - y_{sc} \cdot (P5_{e,z} - z_{gc})$$
$$= (-1118.92) - (-3123.7) + 91.59 \cdot [24.64 - 20.99] - (-24.12) \cdot (0 - 98.73)$$
$$= -42.35\text{mm}^2$$

$$\omega_{s_6} = \omega_6 - \omega_{mean} + z_{sc} \cdot (P6_{e,y} - y_{gc}) - y_{sc} \cdot (P6_{e,z} - z_{gc})$$
$$= (-1118.92) - (-3123.7) + 91.59 \cdot [1.38 - 20.99] - (-24.12) \cdot (0 - 98.73)$$
$$= -2173.15\text{mm}^2$$

$$\omega_{s_7} = \omega_7 - \omega_{mean} + z_{sc} \cdot (P7_{e,y} - y_{gc}) - y_{sc} \cdot (P7_{e,z} - z_{gc})$$
$$= (-1117.02) - (-3123.7) + 91.59 \cdot [0 - 20.99] - (-24.12) \cdot (1.38 - 98.73)$$
$$= 2264.32\text{mm}^2$$

$$\omega_{s_8} = \omega_8 - \omega_{mean} + z_{sc} \cdot (P8_{e,y} - y_{gc}) - y_{sc} \cdot (P8_{e,z} - z_{gc})$$
$$= (-1117.02) - (-3123.7) + 91.59 \cdot [0 - 20.99] - (-24.12) \cdot (31.77 - 98.73)$$
$$= -1531.18\text{mm}^2$$

$$\omega_{s_9} = \omega_9 - \omega_{mean} + z_{sc} \cdot (P9_{e,y} - y_{gc}) - y_{sc} \cdot (P9_{e,z} - z_{gc})$$
$$= (-1117.02) - (-3123.7) + 91.59 \cdot [0 - 20.99] - (-24.12) \cdot (166.81 - 98.73)$$
$$= 1726.18\text{mm}^2$$

$$\omega_{s_{10}} = \omega_{10} - \omega_{mean} + z_{sc} \cdot (P10_{e,y} - y_{gc}) - y_{sc} \cdot (P10_{e,z} - z_{gc})$$
$$= (-1117.02) - (-3123.7) + 91.59 \cdot [0 - 20.99] - (-24.12) \cdot (197.20 - 98.73)$$
$$= 2459.32\text{mm}^2$$

$$\omega_{s_{11}} = \omega_{11} - \omega_{mean} + z_{sc} \cdot (P11_{e,y} - y_{gc}) - y_{sc} \cdot (P11_{e,z} - z_{gc})$$
$$= (-1389.06) - (-3123.7) + 91.59 \cdot [1.38 - 20.99] - (-24.12)$$
$$\cdot (198.58 - 98.73) = 2346.90\text{mm}^2$$

$$\omega_{s_{12}} = \omega_{12} - \omega_{mean} + z_{sc} \cdot (P12_{e,y} - y_{gc}) - y_{sc} \cdot (P12_{e,z} - z_{gc})$$
$$= (-5842.73) - (-3123.7) + 91.59 \cdot [23.81 - 20.99] - (-24.12)$$
$$\cdot (198.58 - 98.73) = -52.65\text{mm}^2$$

$$\omega_{s_{13}} = \omega_{13} - \omega_{mean} + z_{sc} \cdot (P13_{e,y} - y_{gc}) - y_{sc} \cdot (P13_{e,z} - z_{gc})$$
$$= (-5918.55) - (-3123.7) + 91.59 \cdot [24.19 - 20.99] - (-24.12)$$
$$\cdot (198.58 - 98.73) = -93.50\text{mm}^2$$

$$\omega_{s_{14}} = \omega_{14} - \omega_{mean} + z_{sc} \cdot \left(P14_{e,y} - y_{gc}\right) - y_{sc} \cdot \left(P14_{e,z} - z_{gc}\right) = (-10448.05) - (-3123.7) + 91.59 \cdot [47 - 20.99] - (-24.12) \cdot (198.58 - 98.73) = -2533.89\text{mm}^2$$

$$\omega_{s_{15}} = \omega_{15} - \omega_{mean} + z_{sc} \cdot \left(P15_{e,y} - y_{gc}\right) - y_{sc} \cdot \left(P15_{e,z} - z_{gc}\right) = (-10631.45) - (-3123.7) + 91.59 \cdot [47.75 - 20.99] - (-24.12) \cdot (197.83 - 98.73) = -2666.91\text{mm}^2$$

$$\omega_{s_{16}} = \omega_{16} - \omega_{mean} + z_{sc} \cdot \left(P16_{e,y} - y_{gc}\right) - y_{sc} \cdot \left(P16_{e,z} - z_{gc}\right) = (-12744.14) - (-3123.7) + 91.59 \cdot [53.36 - 20.99] - (-24.12) \cdot (176.86 - 98.73) = -4770.81\text{mm}^2$$

Maximum sectoral constant and sectoral module

$$\omega_{max} = \max(|\omega_s|) = 4770.81\text{mm}^2$$

$$W_\omega = \frac{I_w}{\omega_{max}} = \frac{1214382029}{4770.81} = 254544\text{mm}^4$$

Distance between center of shear and center of gravity

$$y_s = y_{sc} - y_{gc} = (-24.12) - 20.99 = -45.11\text{mm}$$

$$z_s = z_{sc} - z_{gc} = 91.59 - 98.73 = -7.14\text{mm}$$

Polar moment of inertia relative to shear Center

$$I_p = I_y + I_z + A_{eff} \cdot (y_s^2 + z_s^2) = 2122254 + 109017 + 251.01 \cdot [(-45.11\text{mm})^2 + (-7.14)^2] = 2754950\text{mm}^4$$

Nonsymmetric factors zj and yj

$$z_j = z_s - \frac{0.5}{I_y} \cdot \sum_{i=1}^{n} \left\{\left[\left(z_{c_i}\right)^3 + z_{c_i} \cdot \left[\frac{(z_i - z_{i-1})^2}{4} + \left(y_{c_i}\right)^2 + \frac{(y_i - y_{i-1})^2}{12}\right] + y_{c_i} \cdot \frac{(y_i - y_{i-1}) \cdot (z_i - z_{i-1})}{6}\right] \cdot dA_i\right\}$$

$$
z_j = z_s - \frac{0.5}{I_y} \cdot \Bigg\{ \Bigg[\left(z_{c_2}\right)^3 + z_{c_2} \cdot \left[\frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{4} + \left(y_{c_2}\right)^2 + \frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{12} \right] + y_{c_2}
$$

$$
\cdot \frac{\left(P2_{e,y} - P1_{e,y}\right) \cdot \left(P2_{e,z} - P1_{e,z}\right)}{6} \Bigg] \cdot dA_2
$$

$$
+ \Bigg[\left(z_{c_3}\right)^3 + z_{c_3} \cdot \left[\frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{4} + \left(y_{c_3}\right)^2 + \frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{12} \right] + y_{c_3}
$$

$$
\cdot \frac{\left(P3_{e,y} - P2_{e,y}\right) \cdot \left(P3_{e,z} - P2_{e,z}\right)}{6} \Bigg] \cdot dA_3
$$

$$
+ \Bigg[\left(z_{c_4}\right)^3 + z_{c_4} \cdot \left[\frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{4} + \left(y_{c_4}\right)^2 + \frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{12} \right] + y_{c_4}
$$

$$
\cdot \frac{\left(P4_{e,y} - P3_{e,y}\right) \cdot \left(P4_{e,z} - P3_{e,z}\right)}{6} \Bigg] \cdot dA_4
$$

$$
+ \Bigg[\left(z_{c_5}\right)^3 + z_{c_5} \cdot \left[\frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{4} + \left(y_{c_5}\right)^2 + \frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{12} \right] + y_{c_5}
$$

$$
\cdot \frac{\left(P5_{e,y} - P4_{e,y}\right) \cdot \left(P5_{e,z} - P4_{e,z}\right)}{6} \Bigg] \cdot dA_5
$$

$$
+ \Bigg[\left(z_{c_6}\right)^3 + z_{c_6} \cdot \left[\frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{4} + \left(y_{c_6}\right)^2 + \frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{12} \right] + y_{c_6}
$$

$$
\cdot \frac{\left(P6_{e,y} - P5_{e,y}\right) \cdot \left(P6_{e,z} - P5_{e,z}\right)}{6} \Bigg] \cdot dA_6
$$

$$
+ \Bigg[\left(z_{c_7}\right)^3 + z_{c_7} \cdot \left[\frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{4} + \left(y_{c_7}\right)^2 + \frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{12} \right] + y_{c_7}
$$

$$
\cdot \frac{\left(P7_{e,y} - P6_{e,y}\right) \cdot \left(P7_{e,z} - P6_{e,z}\right)}{6} \Bigg] \cdot dA_7
$$

$$
+ \Bigg[\left(z_{c_8}\right)^3 + z_{c_8} \cdot \left[\frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{4} + \left(y_{c_8}\right)^2 + \frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{12} \right] + y_{c_8}
$$

$$
\cdot \frac{\left(P8_{e,y} - P7_{e,y}\right) \cdot \left(P8_{e,z} - P7_{e,z}\right)}{6} \Bigg] \cdot dA_8
$$

$$
+ \Bigg[\left(z_{c_9}\right)^3 + z_{c_9} \cdot \left[\frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{4} + \left(y_{c_9}\right)^2 + \frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{12} \right] + y_{c_9}
$$

$$\cdot \frac{(P9_{e,y} - P8_{e,y}) \cdot (P9_{e,z} - P8_{e,z})}{6}\Bigg] \cdot dA_9$$

$$+ \left[(z_{c_{10}})^3 + z_{c_{10}} \cdot \left[\frac{(P10_{e,z} - P9_{e,z})^2}{4} + (y_{c_{10}})^2 + \frac{(P10_{e,y} - P9_{e,y})^2}{12} \right] + y_{c_{10}} \right.$$

$$\cdot \frac{(P10_{e,y} - P9_{e,y}) \cdot (P10_{e,z} - P9_{e,z})}{6}\Bigg] \cdot dA_{10}$$

$$+ \left[(z_{c_{11}})^3 + z_{c_{11}} \cdot \left[\frac{(P11_{e,z} - P10_{e,z})^2}{4} + (y_{c_{11}})^2 + \frac{(P11_{e,y} - P10_{e,y})^2}{12} \right] + y_{c_{11}} \right.$$

$$\cdot \frac{(P11_{e,y} - P10_{e,y}) \cdot (P11_{e,z} - P10_{e,z})}{6}\Bigg] \cdot dA_{11}$$

$$+ \left[(z_{c_{12}})^3 + z_{c_{12}} \cdot \left[\frac{(P12_{e,z} - P11_{e,z})^2}{4} + (y_{c_{12}})^2 + \frac{(P12_{e,y} - P11_{e,y})^2}{12} \right] + y_{c_{12}} \right.$$

$$\cdot \frac{(P12_{e,y} - P11_{e,y}) \cdot (P12_{e,z} - P11_{e,z})}{6}\Bigg] \cdot dA_{12}$$

$$+ \left[(z_{c_{13}})^3 + z_{c_{13}} \cdot \left[\frac{(P13_{e,z} - P12_{e,z})^2}{4} + (y_{c_{13}})^2 + \frac{(P13_{e,y} - P12_{e,y})^2}{12} \right] + y_{c_{13}} \right.$$

$$\cdot \frac{(P13_{e,y} - P12_{e,y}) \cdot (P13_{e,z} - P12_{e,z})}{6}\Bigg] \cdot dA_{13}$$

$$+ \left[(z_{c_{14}})^3 + z_{c_{14}} \cdot \left[\frac{(P14_{e,z} - P13_{e,z})^2}{4} + (y_{c_{14}})^2 + \frac{(P14_{e,y} - P13_{e,y})^2}{12} \right] + y_{c_{14}} \right.$$

$$\cdot \frac{(P14_{e,y} - P13_{e,y}) \cdot (P14_{e,z} - P13_{e,z})}{6}\Bigg] \cdot dA_{14}$$

$$+ \left[(z_{c_{15}})^3 + z_{c_{15}} \cdot \left[\frac{(P15_{e,z} - P14_{e,z})^2}{4} + (y_{c_{15}})^2 + \frac{(P15_{e,y} - P14_{e,y})^2}{12} \right] + y_{c_{15}} \right.$$

$$\cdot \frac{(P15_{e,y} - P14_{e,y}) \cdot (P15_{e,z} - P14_{e,z})}{6}\Bigg] \cdot dA_{15}$$

$$+ \left[(z_{c_{16}})^3 + z_{c_{16}} \cdot \left[\frac{(P16_{e,z} - P15_{e,z})^2}{4} + (y_{c_{16}})^2 + \frac{(P16_{e,y} - P15_{e,y})^2}{12} \right] + y_{c_{16}} \right.$$

$$\cdot \frac{(P16_{e,y} - P15_{e,y}) \cdot (P16_{e,z} - P15_{e,z})}{6}\Bigg] \cdot dA_{16} \Bigg\}$$

$$
\begin{aligned}
z_j = (-7.14) - \frac{0.5}{2122254} \\
\cdot \Bigg\{ \Bigg[(-87.50)^3 + (-87.50) \cdot \left[\frac{(0.747 - 21.72)^2}{4} + (33.56)^2 + \frac{(51.75 - 57.36)^2}{12} \right] \\
+ 33.56 \cdot \frac{(51.75 - 57.36) \cdot (0.747 - 21.72)}{6} \Bigg] \cdot 23.31 + 0 \\
+ \left[(-98.73)^3 + (-98.73) \cdot \left[0 + (17.60)^2 + \frac{(26.19 - 51)^2}{12} \right] + 0 \right] \cdot 26.64 + 0 \\
+ \left[(-98.73)^3 + (-98.73) \cdot \left[0 + (-7.98)^2 + \frac{(1.38 - 24.64)^2}{12} \right] + 0 \right] \cdot 33.04 + 0 \\
+ \left[(-82.16)^3 + (-82.16) \cdot \left[\frac{(31.77 - 1.38)^2}{4} + (-20.99)^2 + 0 \right] + 0 \right] \cdot 43.16 + 0 \\
+ \left[(83.27)^3 + 83.27 \cdot \left[\frac{(197.20 - 166.81)^2}{4} + (-20.99)^2 + 0 \right] + 0 \right] \cdot 43.16 + 0 \\
+ \left[(99.85)^3 + 99.85 \cdot \left[0 + (-8.40)^2 + \frac{(23.81 - 1.38)^2}{12} \right] + 0 \right] \cdot 31.85 + 0 \\
+ \left[(99.85)^3 + 99.85 \cdot \left[0 + (14.60)^2 + \frac{(47 - 24.19)^2}{12} \right] + 0 \right] \cdot 25.54 + 0 \\
+ \Bigg[(88.62)^3 + 88.62 \cdot \left[\frac{(176.86 - 197.83)^2}{4} + (29.56)^2 + \frac{(53.36 - 47.75)^2}{12} \right] \\
+ 29.56 \cdot \frac{(53.36 - 47.75) \cdot (176.86 - 197.83)}{6} \Bigg] \cdot 24.31 \Bigg\} = -7.45\text{mm}
\end{aligned}
$$

$$
\begin{aligned}
y_j = y_s - \frac{0.5}{I_z} \cdot \sum_{i=1}^{n} \Bigg[\left(y_{c_i}\right)^3 + y_{c_i} \cdot \left[\frac{(y_i - y_{i-1})^2}{4} + \left(z_{c_i}\right)^2 + \frac{(z_i - z_{i-1})^2}{12} \right] + z_{c_i} \\
\cdot \frac{(z_i - z_{i-1}) \cdot (y_i - y_{i-1})}{6} \Bigg] \cdot dA_i
\end{aligned}
$$

$$y_j = y_s - \frac{0.5}{I_z} \cdot \left\{ \left[\left(y_{c_2}\right)^3 + y_{c_2} \cdot \left[\frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{4} + \left(z_{c_2}\right)^2 + \frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{12} \right] + z_{c_2} \right.\right.$$

$$\left. \cdot \frac{\left(P2_{e,z} - P1_{e,z}\right) \cdot \left(P2_{e,y} - P1_{e,y}\right)}{6} \right] \cdot dA_2$$

$$+ \left[\left(y_{c_3}\right)^3 + y_{c_3} \cdot \left[\frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{4} + \left(z_{c_3}\right)^2 + \frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{12} \right] + z_{c_3} \right.$$

$$\left. \cdot \frac{\left(P3_{e,z} - P2_{e,z}\right) \cdot \left(P3_{e,y} - P2_{e,y}\right)}{6} \right] \cdot dA_3$$

$$+ \left[\left(y_{c_4}\right)^3 + y_{c_4} \cdot \left[\frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{4} + \left(z_{c_4}\right)^2 + \frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{12} \right] + z_{c_4} \right.$$

$$\left. \cdot \frac{\left(P4_{e,z} - P3_{e,z}\right) \cdot \left(P4_{e,y} - P3_{e,y}\right)}{6} \right] \cdot dA_4$$

$$+ \left[\left(y_{c_5}\right)^3 + y_{c_5} \cdot \left[\frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{4} + \left(z_{c_5}\right)^2 + \frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{12} \right] + z_{c_5} \right.$$

$$\left. \cdot \frac{\left(P5_{e,z} - P4_{e,z}\right) \cdot \left(P5_{e,y} - P4_{e,y}\right)}{6} \right] \cdot dA_5$$

$$+ \left[\left(y_{c_6}\right)^3 + y_{c_6} \cdot \left[\frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{4} + \left(z_{c_6}\right)^2 + \frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{12} \right] + z_{c_6} \right.$$

$$\left. \cdot \frac{\left(P6_{e,z} - P5_{e,z}\right) \cdot \left(P6_{e,y} - P5_{e,y}\right)}{6} \right] \cdot dA_6$$

$$+ \left[\left(y_{c_7}\right)^3 + y_{c_7} \cdot \left[\frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{4} + \left(z_{c_7}\right)^2 + \frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{12} \right] + z_{c_7} \right.$$

$$\left. \cdot \frac{\left(P7_{e,z} - P6_{e,z}\right) \cdot \left(P7_{e,z} - P6_{e,y}\right)}{6} \right] \cdot dA_7$$

$$+ \left[\left(y_{c_8}\right)^3 + y_{c_8} \cdot \left[\frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{4} + \left(z_{c_8}\right)^2 + \frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{12} \right] + z_{c_8} \right.$$

$$\left. \cdot \frac{\left(P8_{e,z} - P7_{e,z}\right) \cdot \left(P8_{e,y} - P7_{e,y}\right)}{6} \right] \cdot dA_8$$

$$+ \left[\left(y_{c_9}\right)^3 + y_{c_9} \cdot \left[\frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{4} + \left(z_{c_9}\right)^2 + \frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{12} \right] + z_{c_9} \right.$$

$$\cdot \frac{\left(P9_{e,z} - P8_{e,z}\right) \cdot \left(P9_{e,y} - P8_{e,y}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \Bigg[\left(y_{c_{10}}\right)^3 + y_{c_{10}} \cdot \Bigg[\frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{4} + \left(z_{c_{10}}\right)^2 + \frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{12}\Bigg] + z_{c_{10}}$$

$$\cdot \frac{\left(P10_{e,z} - P9_{e,z}\right) \cdot \left(P10_{e,y} - P9_{e,y}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \Bigg[\left(y_{c_{11}}\right)^3 + y_{c_{11}} \cdot \Bigg[\frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{4} + \left(z_{c_{11}}\right)^2 + \frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{12}\Bigg] + z_{c_{11}}$$

$$\cdot \frac{\left(P11_{e,z} - P10_{e,z}\right) \cdot \left(P11_{e,y} - P10_{e,y}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \Bigg[\left(y_{c_{12}}\right)^3 + y_{c_{12}} \cdot \Bigg[\frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{4} + \left(z_{c_{12}}\right)^2 + \frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{12}\Bigg] + z_{c_{12}}$$

$$\cdot \frac{\left(P12_{e,z} - P11_{e,z}\right) \cdot \left(P12_{e,y} - P11_{e,y}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \Bigg[\left(y_{c_{13}}\right)^3 + y_{c_{13}} \cdot \Bigg[\frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{4} + \left(z_{c_{13}}\right)^2 + \frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{12}\Bigg] + z_{c_{13}}$$

$$\cdot \frac{\left(P13_{e,z} - P12_{e,z}\right) \cdot \left(P13_{e,y} - P12_{e,y}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \Bigg[\left(y_{c_{14}}\right)^3 + y_{c_{14}} \cdot \Bigg[\frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{4} + \left(z_{c_{14}}\right)^2 + \frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{12}\Bigg] + z_{c_{14}}$$

$$\cdot \frac{\left(P14_{e,z} - P13_{e,z}\right) \cdot \left(P14_{e,y} - P13_{e,y}\right)}{6}\Bigg] \cdot dA_{14}$$

$$+ \Bigg[\left(y_{c_{15}}\right)^3 + y_{c_{15}} \cdot \Bigg[\frac{\left(P15_{e,y} - P14_{e,y}\right)^2}{4} + \left(z_{c_{15}}\right)^2 + \frac{\left(P15_{e,z} - P14_{e,z}\right)^2}{12}\Bigg] + z_{c_{15}}$$

$$\cdot \frac{\left(P15_{e,z} - P14_{e,z}\right) \cdot \left(P15_{e,z} - P14_{e,y}\right)}{6}\Bigg] \cdot dA_{15}$$

$$+ \Bigg[\left(y_{c_{16}}\right)^3 + y_{c_{16}} \cdot \Bigg[\frac{\left(P16_{e,y} - P15_{e,y}\right)^2}{4} + \left(z_{c_{16}}\right)^2 + \frac{\left(P16_{e,z} - P15_{e,z}\right)^2}{12}\Bigg] + z_{c_{16}}$$

$$\cdot \frac{\left(P16_{e,z} - P15_{e,z}\right) \cdot \left(P16_{e,y} - P15_{e,y}\right)}{6}\Bigg] \cdot dA_{16}\Bigg\}$$

$$y_j = (-45.11) - \frac{0.5}{109017}$$

$$\cdot \left\{ \left[(33.56)^3 + (33.56) \cdot \left[\frac{(51.75-57.36)^2}{4} + (-87.50)^2 + \frac{(0.747-21.72)^2}{12} \right] \right. \right.$$

$$\left. + (-87.50) \cdot \frac{(0.747-21.72)\cdot(51.75-57.36)}{6} \right] \cdot 23.31 + 0$$

$$+ \left[(17.60)^3 + (17.60) \cdot \left[\frac{(26.19-51)^2}{4} + (98.73)^2 + 0 \right] + 0 \right] \cdot 26.64 + 0$$

$$+ \left[(-7.98)^3 + (-7.98) \cdot \left[\frac{(1.38-24.64)^2}{4} + (-98.73)^2 + 0 \right] + 0 \right] \cdot 33.04 + 0$$

$$+ \left[(-20.99)^3 + (-20.99) \cdot \left[0 + (-82.16)^2 + \frac{(31.77-1.38)^2}{12} \right] + 0 \right] \cdot 43.16 + 0$$

$$+ \left[(-20.99)^3 + (-20.99) \cdot \left[0 + (83.27)^2 + \frac{(197.20-166.81)^2}{12} \right] + 0 \right] \cdot 43.16 + 0$$

$$+ \left[(-8.40)^3 + (-8.40) \cdot \left[\frac{(23.81-1.38)^2}{4} + (99.85)^2 + 0 \right] + 0 \right] \cdot 31.85 + 0$$

$$+ \left[(14.60)^3 + 14.60 \cdot \left[\frac{(47-24.19)^2}{4} + (99.85)^2 + 0 \right] + 0 \right] \cdot 25.54 + 0$$

$$+ \left[(29.56)^3 + 29.56 \cdot \left[\frac{(53.36-47.75)^2}{4} + (88.62)^2 + \frac{(176.86-197.83)^2}{12} \right] \right.$$

$$\left. \left. + 88.62 \cdot \frac{(176.86-197.83)\cdot(53.36-47.75)}{6} \right] \cdot 24.31 \right\} = -59.27\text{mm}$$

The coordinates of the center of the component of the transversal section relative to the shear Center are:

$$y_{c_i} = \frac{y_i + y_{i-1}}{2} - y_{gc}$$

$$y_{c_i} = \frac{z_i + z_{i-1}}{2} - z_{gc}$$

$$z_{c_2} = \frac{P2_{e,z} + P1_{e,z}}{2} - z_{gc} = \frac{0.747 + 21.72}{2} - 98.73 = -87.50\text{mm}$$

$$z_{c_3} = \frac{P3_{e,z} + P2_{e,z}}{2} - z_{gc} = \frac{0 + 0.747}{2} - 98.73 = -98.36\text{mm}$$

$$z_{c_4} = \frac{P4_{e,z} + P3_{e,z}}{2} - z_{gc} = 0 - 98.73 = -98.73\text{mm}$$

$$z_{c_5} = \frac{P5_{e,z} + P4_{e,z}}{2} - z_{gc} = 0 - 98.73 = -98.73\text{mm}$$

$$z_{c_6} = \frac{P6_{e,z} + P5_{e,z}}{2} - z_{gc} = 0 - 98.73 = -98.73\text{mm}$$

$$z_{c_7} = \frac{P7_{e,z} + P6_{e,z}}{2} - z_{gc} = \frac{1.38 + 0}{2} - 98.73 = -98.04\text{mm}$$

$$z_{c_8} = \frac{P8_{e,z} + P7_{e,z}}{2} - z_{gc} = \frac{31.77 + 1.38}{2} - 98.73 = -82.16\text{mm}$$

$$z_{c_9} = \frac{P9_{e,z} + P8_{e,z}}{2} - z_{gc} = \frac{166.81 + 31.77}{2} - 98.73 = 0.56\text{mm}$$

$$z_{c_{10}} = \frac{P10_{e,z} + P9_{e,z}}{2} - z_{gc} = \frac{197.20 + 166.81}{2} - 98.73 = 83.27\text{mm}$$

$$z_{c_{11}} = \frac{P11_{e,z} + P10_{e,z}}{2} - z_{gc} = \frac{198.58 + 197.20}{2} - 98.73 = 99.16mm$$
$$z_{c_{12}} = \frac{P12_{e,z} + P11_{e,z}}{2} - z_{gc} = \frac{198.58 + 198.58}{2} - 98.73 = 99.85mm$$
$$z_{c_{13}} = \frac{P13_{e,z} + P12_{e,z}}{2} - z_{gc} = \frac{198.58 + 198.58}{2} - 98.73 = 99.85mm$$
$$z_{c_{14}} = \frac{P14_{e,z} + P13_{e,z}}{2} - z_{gc} = \frac{198.58 + 198.58}{2} - 98.73 = 99.85mm$$
$$z_{c_{15}} = \frac{P15_{e,z} + P14_{e,z}}{2} - z_{gc} = \frac{197.83 + 198.58}{2} - 98.73 = 99.47mm$$
$$z_{c_{16}} = \frac{P16_{e,z} + P15_{e,z}}{2} - z_{gc} = \frac{176.86 + 197.83}{2} - 98.73 = 88.62mm$$
$$y_{c_2} = \frac{P2_{e,y} + P1_{e,y}}{2} - y_{gc} = \frac{51.75 + 57.36}{2} - 20.99 = 33.56mm$$
$$y_{c_3} = \frac{P3_{e,y} + P2_{e,y}}{2} - y_{gc} = \frac{51 + 51.75}{2} - 20.99 = 30.38mm$$
$$y_{c_4} = \frac{P4_{e,y} + P3_{e,y}}{2} - y_{gc} = \frac{26.19 + 51}{2} - 20.99 = 17.60mm$$
$$y_{c_5} = \frac{P5_{e,y} + P4_{e,y}}{2} - y_{gc} = \frac{24.64 + 26.19}{2} - 20.99 = 4.42mm$$
$$y_{c_6} = \frac{P6_{e,y} + P5_{e,y}}{2} - y_{gc} = \frac{1.38 + 24.64}{2} - 20.99 = -7.98mm$$
$$y_{c_7} = \frac{P7_{e,y} + P6_{e,y}}{2} - y_{gc} = \frac{0 + 1.38}{2} - 20.99 = -20.30mm$$
$$y_{c_8} = \frac{P8_{e,y} + P7_{e,y}}{2} - y_{gc} = 0 - 20.99 = -20.99mm$$
$$y_{c_9} = \frac{P9_{e,y} + P8_{e,y}}{2} - y_{gc} = 0 - 20.99 = -20.99mm$$
$$y_{c_{10}} = \frac{P10_{e,y} + P9_{e,y}}{2} - y_{gc} = 0 - 20.99 = -20.99mm$$
$$y_{c_{11}} = \frac{P11_{e,y} + P10_{e,y}}{2} - y_{gc} = \frac{1.38 + 0}{2} - 20.99 = -20.30mm$$
$$y_{c_{12}} = \frac{P12_{e,y} + P11_{e,y}}{2} - y_{gc} = \frac{23.81 + 1.38}{2} - 20.99 = -8.40mm$$
$$y_{c_{13}} = \frac{P13_{e,y} + P12_{e,y}}{2} - y_{gc} = \frac{24.19 + 23.81}{2} - 20.99 = 3.01mm$$
$$y_{c_{14}} = \frac{P14_{e,y} + P13_{e,y}}{2} - y_{gc} = \frac{47 + 24.19}{2} - 20.99 = 14.60mm$$
$$y_{c_{15}} = \frac{P15_{e,y} + P14_{e,y}}{2} - y_{gc} = \frac{47.75 + 47}{2} - 20.99 = 26.38mm$$
$$y_{c_{16}} = \frac{P16_{e,y} + P15_{e,y}}{2} - y_{gc} = \frac{53.36 + 47.75}{2} - 20.99 = 29.56mm$$

4.1.2.2 The bent section after the smaller flange thickness

In the case of the section that is subjected to bending moment, the design of the effective width requires the preliminary completion of Steps 1.1-1.6. according to the calculation scheme.

Step 2.2 : Walls in compression :

Flange 2 : b_2 : interior wall

c_2 : cantilever wall

Wall (partial): h_c : interior wall

Step 2.3 : The calculation of effective dimensions due to buckling is determined in the first step at the level of the component walls of the flange (b1 , b2 , c1 , c2) and in the second step at the relations in the calculation procedure presented in the form of scheme "A".

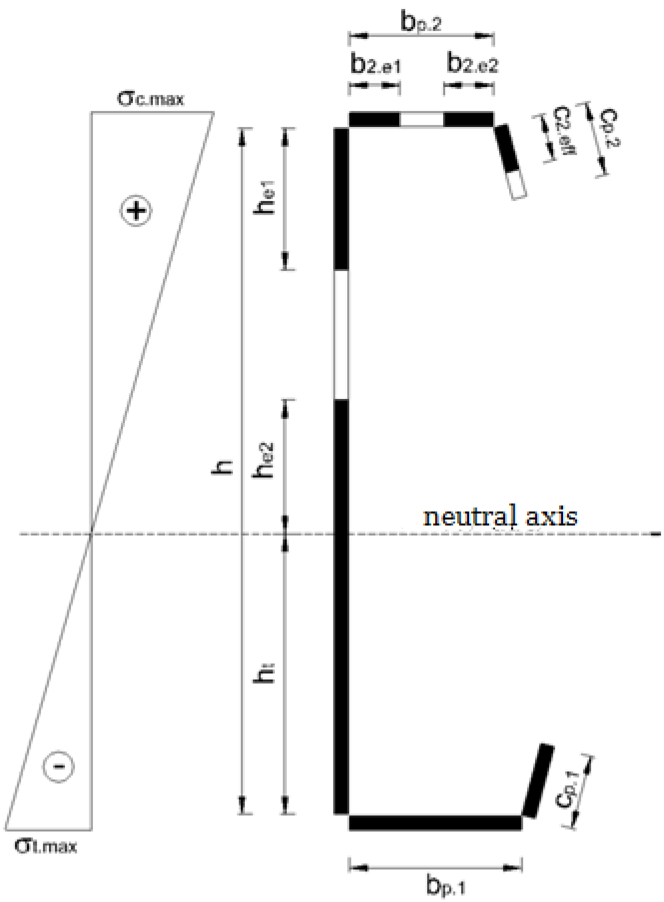
Step A1 Steel characteristics take over from the step 1.1

Step A2 The type of Wall is considered to be the one determined at step 2.2

Step A3 Since the section is compressed centrally, for both interior and cantilevered walls, stress it's considered $\sigma_1 = \sigma_2 \Rightarrow \psi = \frac{\sigma_2}{\sigma_1} = 1$

Step A4-A6. Coefficients calculation k_σ , $\bar{\lambda}_p$, ρ

Step A7. Calculation of effective width



Interior wall (b_2), Scheme **Step A.1-A.7**		
Superior flange(b_2)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{45.62}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 0.695$ For $\overline{\lambda_p} = 0.695 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{0.695 - 0.055(3+1)}{0.695^2} = 0.983$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p2} = 45.62\ \text{mm}$ $b_{2.eff} = b_{p2} \cdot \rho = 45.62 \cdot 0.983 = 44.86\ \text{mm}$ $b_{2.e1} = b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 44.86 = 22.43\ \text{mm}$	Table 3.3 Scheme – Step A.7a
Cantilever wall (c_2)		
Superior flange stiffening (c_2)	$\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} = \frac{21.71 \cdot \sin(105°)}{45.62} = 0.460$ For $0.35 < {c_{p.2}}/{b_{p.2}} \leq 0.65$ $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.460 - 0.35)^2} = 0.690$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{21.71}{1.42}}{28.4 \cdot 0.814\sqrt{0.690}} = 0.796$ For $\overline{\lambda_p} = 0.796 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\overline{\lambda}_p^2} = \frac{0.796 - 0.188}{0.796^2} = 0.959$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p2} = 21.71\ \text{mm}$	Table 3.4

	$c_{2.eff} = c_{p2} \cdot \rho = 21.71 \cdot 0.959 = 20.82$ mm	Scheme – Step A.7b

The effective segments at the level of the flanges are distributed according to the figure below. Walls composed of effective portions were assigned additional nodes. For the obtained section, the coordinates of the newly inserted points (P10, P11) will be determined and the coordinates of the edge endpoint (P14) will be corrected.

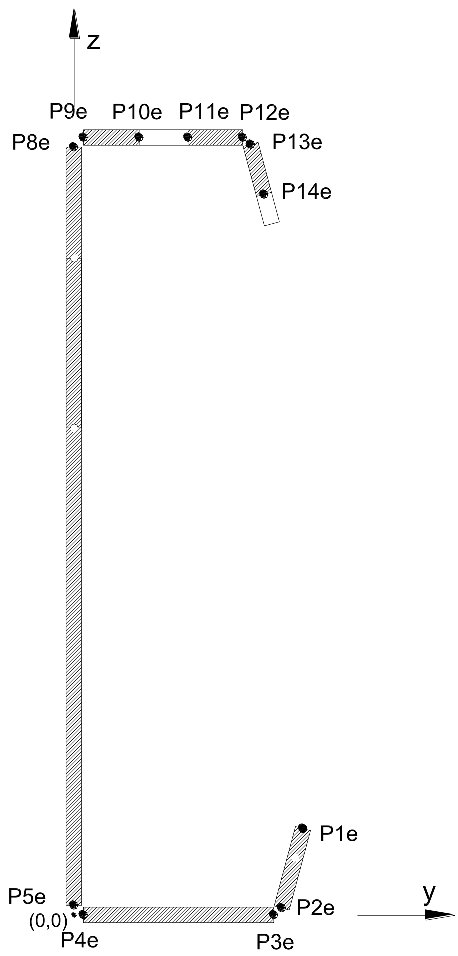
For the obtained section:

-The coordinates of the inserted points (P10, P11) can be determined

-The coordinates of the edge endpoint(P14) can be corrected

Points coordinates :

- Horizontal coordinates (Axis y-y)



$P1_{e.y} = P1_y = 57.36$ mm

$P2_{e.y} = P2_y = 51.75$ mm

$P3_{e.y} = P3_y = 51$ mm

$P4_{e.y} = P4_y = 1.38$ mm

$P5_{e.y} = P5_y = 0$ mm

$P8_{e.y} = 0$ mm

$P9_{e.y} = g_{r.3} = 1.38$ mm

$P10_{e.y} = g_{r.3} + b_{2.e1} = 1.38 + 22.43 = 23.81$ mm

$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 45.62 - 22.43 = 24.57$ mm

$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47$ mm

$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747 = 47.75$ mm

$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 45.62 + 0.747 + 20.82 \cdot \cos(75°) = 53.13$ mm

$P6_{e.y}, P7_{e.y}$ - will not be used for this step

- Vertical coordinates (Axis z-z)

$P1_{e.z} = P1_z = 21.72$ mm

$P2_{e.z} = P2_z = 0.747$ mm

$P3_z = 0$ mm

$P4_z = 0$ mm

$P5_z = 1.38$ mm

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 195.82 = 197.20$ mm

$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58$ mm

$P10_{e.z} = P11_z = P12_z = P9_z = 198.58$ mm

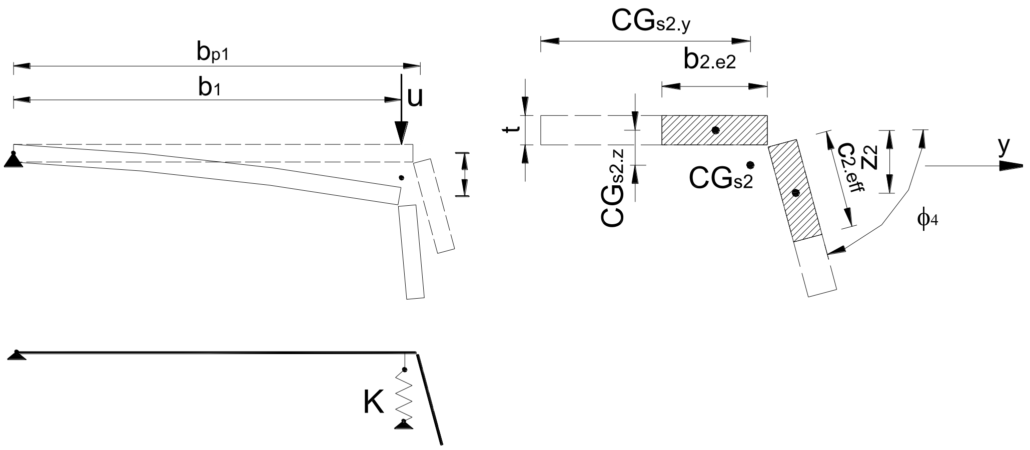
$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83$ mm

$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$

$= 1.38 + 195.82 + 1.38 - 0.747 - 20.83 \cdot \sin(75°) = 177.72 \text{ mm}$

$P6_{e.z}, P7_{e.z}$ - will not be used for this step

Step 3.1 : The distortion buckling occurs in the compressed flange. The design methodology is carried out according to scheme " B " shown in figure below and applied to the stiffening in compression portions.



Step B.1: This step indicates the need to predesign the effective dimensions of the flange portions, carried out in the previous stages.

Step B.2-B.6 : The calculation for the first iteration is carried out

Iteration 1, Scheme **Step B.2-B.6**	
• **Stiffening area in compression** $A_{s2} = (b_{2.e2} + c_{2.eff})t = (22.43 + 20.82) \cdot 1.42 = 61.42 \text{ mm}^2$	Rel. (3.17) Scheme – Step B.2
• **Centre of gravity of compressed stiffening** • $dA_{b2,e2} = \left[t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2} \right]$ $dA_{b2,e2} = \left[1.42 \cdot \sqrt{(47 - 24.57)^2 + (198.58 - 198.58)^2} \right] = 31.85 \text{mm}^2$ $dA_{c2,eff} = \left[t \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2} \right]$ $dA_{c2,eff} = \left[1.42 \cdot \sqrt{(53.13 - 47.75)^2 + (177.72 - 197.83)^2} \right] = 29.57 \text{mm}^2$	ANNEX A

$S_{y0,2} = \left[\left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{c2,eff}}{2}\right] + \left[\left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2,e2}}{2}\right]$ $= \left[(177.72 + 197.83) \cdot \frac{29.57}{2} + (198.58 + 198.58) \cdot \frac{31.8}{2}\right]$ $= 11876.6mm^3$ $z_{gc,2} = \frac{11876.6}{61.42} = 193.38mm$ $S_{z0,2} = \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{c2}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2,e2}}{2}$ $= \left[(53.13 + 47.75) \cdot \frac{29.57}{2} + (47 + 24.57) \cdot \frac{31.85}{2}\right]$ $= 2631.12mm^3$ $y_{gc,2} = \frac{2631.12}{61.42} = 42.84mm$	
• **The moment of inertia of the stiffening regard to the Y-Y axis** • Stiffening 2 it is composed of two segments bounded by the points: $(P11_e - P12_e)$ and $(P13_e - P14_e)$ $I_{s2.y0} = \left[\left(P14_{e,z}^2 + P13_{e,z}^2 + P14_{e,z} \cdot P13_{e,z}\right)\frac{dA_{c2,eff}}{3} + \left(P12_{e,z}^2 + P11_{e,z}^2 + P12_{e,z} \cdot P11_{e,z}\right)\frac{dA_{b2,e2}}{3}\right]$ $I_{s2.y0} = \left[(177.72^2 + 197.83^2 + 177.72 \cdot 197.83)\frac{29.57}{3} + (198.58^2 + 198.58^2 + 198.58 \cdot 198.58)\frac{31.85}{3}\right]$ $= 2299473mm^4$ $I_{s2.y} = 2299473 - 61.42 \cdot 193.38^2 = 2786.62\ mm^4$	ANNEX A, Scheme – Step B2
• **Rotational stiffness of the flanges in compression** • $k_{f2} = 0$ *because the section is bented (flange 1 is in tension)* $K_2 = \frac{E \cdot t^3}{4(1-\nu^2)} \cdot \frac{1}{y_{gc,2}^2 \cdot h + y_{gc,2}^3 + 0.5 \cdot y_{gc,2} \cdot y_{gc,1} \cdot h \cdot k_{f2}}$ $K_2 = \frac{210000 \cdot 1.42^3}{4 \cdot (1 - 0.3^2)} \cdot \frac{1}{42.84^2 \cdot 198.58 + 42.84^3 + 0} = 0.373$	Rel.(3.20), Scheme – Step B3
• **Critical tension of elastic buckling** • $\sigma_{cr.s2} = \frac{2\sqrt{K_2 \cdot E \cdot I_{s2}}}{A_{s1}} = \frac{2\sqrt{0.373 \cdot 210000 \cdot 2786.62}}{61.42} = 481\ N/mm^2$	Rel. (3.16), Scheme – Step B4

• **Slenderness and reduction coefficient for distorsional buckling** • $\overline{\lambda_{d.2}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s2}}} = \sqrt{\frac{355}{481}} = 0.859$ For $0.65 < \overline{\lambda_{d2}} < 1.38 \implies$ $\chi_{d.2} = 1.47 - 0.723 \cdot \overline{\lambda_{d2}} = 1.47 - 0.723 \cdot 0.859 = 0.849$	Rel. (3.15) Scheme – Step B.5 Rel.(3.12), Rel.(3.13), Rel.(3.14), Scheme – Step B.6

Step B.7-B.10. Based on the values of the reduction factors $\overline{\lambda_{p.red}}$ is determined and recalculate in a new iteration the effective widths of the stiffeners using the calculation scheme „A". The iterative procedure is repeated until the conditions presented in the Step B.7 are met.

Iteration 2, Scheme **Step B.7**		
Interior wall (b_2)		
Superior flange (b_2)	$\overline{\lambda_p} = 0.695$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 0.695 \cdot \sqrt{0.849} = 0.64$ For $\overline{\lambda_p} = 0.64 < 0.673 \Rightarrow \rho = 1$	Rel. (3.8) Scheme – Steps, B.8, B.9
	$b_{p2} = 45.62$ mm $b_{2.eff} = b_{p2} \cdot \rho = 45.62 \cdot 1 = 45.62$ mm $b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 45.62 = 22.81$ mm	Scheme - Steps B.10
Cantilever wall (c_2)		
Superior flange stiffening (c_2)	$\overline{\lambda_p} = 0.796$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 0.796 \cdot \sqrt{0.849} = 0.734$ For $\overline{\lambda_p} = 0.734 < 0.748 \Rightarrow \rho = 1$	Rel. 3.8 Scheme – Steps B.9
	$c_{p2} = 21.71$ mm $c_{2.eff} = c_{p2} \cdot \rho = 21.71 \cdot 1 = 21.71$ mm	Scheme - Step B.10

Step B.11. At the end of the last iteration, the new effective widths of the portions related to the stiffening are obtained. The values obtained for each iteration are centralized in the table below.

Stiffeners 2														
Iter.	χ_d	Flange				Rebord				Stiffenes characteristics				
		λ_p	$\lambda_{p,red}$	ρ	$b_{2,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,2}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	0.695	-	0.983	22.43	0.796	-	0.959	20.82	61.42	0.373	2786.62	481.00	0.849
2	0.849	0.695	0.640	1.000	22.81	0.796	0.734	1.000	21.71	63.22	0.372	3121.73	494.00	0.857
3	0.857	0.695	0.644	1.000	22.81	0.796	0.737	1.000	21.71	63.22	0.372	3121.73	494.00	0.857
4	0.857	0.695	0.644	1.000	22.81	0.796	0.737	1.000	21.71	63.22	0.372	3121.73	494.00	0.857

Step B.12. The reduced thicknesses of stiffeners due to distorsion buckling are obtained based on the relations (3.25) as follows:

- *Stiffening 1 (inferior flange)*

$t_{red.s1} = t = 1.42\, mm$: the thickness is non-reduced because the flange is not in compression

- *Stiffening 2 (superior flange)*

$\chi_{d.2,final} = \min(\chi_{d.2.1}, \chi_{d.2.2}, \chi_{d.2.3}, \chi_{d.2.4}) = 0.849$

$t_{red.s2} = \chi_{d.2,final} \cdot t = 0.849 \cdot 1.42 = 1.21mm$

The final effective dimensions of the superior flange obtained by the calculation of buckling and distortion are centralized in the following table:

	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	22.81	21.71
thickness **t**	1.21	1.21

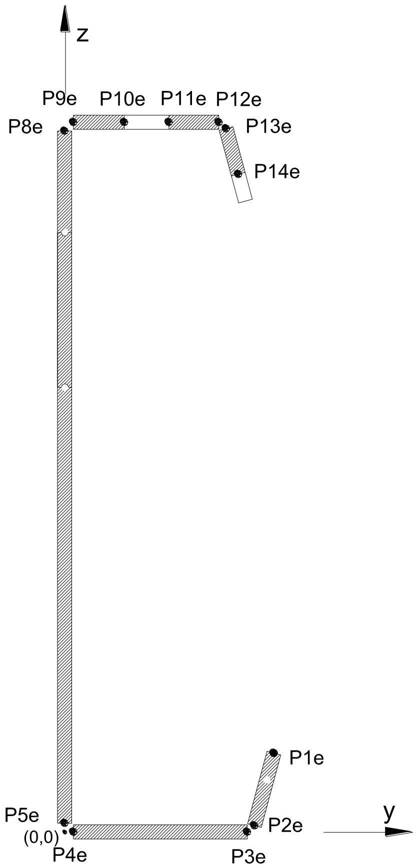
Step 4.1: Determination of the effective width of the web due to local buckling is due to the calculation methodology presented in the scheme „A” (Figure 4.2).

Step A.1: The steel characteristics take over from step 1.1

Step A.2: Interior wall

Step A.3: The calculation of sectional characteristics is by using the relations in Annex A.

- Horizontal coordinates (ax y-y)



$P1_{e.y} = P1_y = 57.36\ \text{mm}$

$P2_{e.y} = P2_y = 51.75\ \text{mm}$

$P3_{e.y} = P3_y = 51\ \text{mm}$

$P4_{e.y} = P4_y = 1.38\ \text{mm}$

$P5_{e.y} = P5_y = 0\ \text{mm}$

$P8_{e.y} = 0\ \text{mm}$

$P9_{e.y} = g_{r.3} = 1.38\ \text{mm}$

$P10_{e.y} = g_{r.3} + b_{2.e1} = 1.38 + 22.43 = 23.81\ \text{mm}$

$$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 45.62 - 22.81 = 24.19\ \text{mm}$$

$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47\ \text{mm}$

$$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747 = 47.75\ \text{mm}$$

$$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 45.62 + 0.747 + 21.71 \cdot \cos(75°) = 53.36\ \text{mm}$$

$P6_{e.y}, P7_{e.y}$ - will not be used for this calculation

- Vertical coordinates (axis z-z)

$P1_{e.z} = P1_z = 21.72\ \text{mm}$

$P2_{e.z} = P2_z = 0.747\ \text{mm}$

$P3_z = 0\ \text{mm}$

$P4_z = 0\ \text{mm}$

$P5_z = 1.38\ \text{mm}$

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 195.82 = 197.20\ \text{mm}$

$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58\ \text{mm}$

$P10_{e.z} = P11_z = P12_z = P9_z = 198.58\ \text{mm}$

$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83\ \text{mm}$

$$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4) = 1.38 + 195.82 + 1.38 - 0.747 - 21.71 \cdot \sin(75°) = 176.86\ \text{mm}$$

$P6_{e.z}, P7_{e.z}$ - will not be used for this calculation

Portion of area section

$$dA_{c1} = \overrightarrow{\left[t \cdot \sqrt{\left(P2_y - P1_y\right)^2 + (P2_z - P1_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(51.75 - 57.36)^2 + (0.747 - 21.72)^2}\right]} = 30.83\text{mm}^2$$

$$dA_{b1}=\overrightarrow{\left[t\cdot\sqrt{\left(P4_y-P3_y\right)^2+(P4_z-P3_z)^2}\right]}=\overrightarrow{\left[1.42\cdot\sqrt{(1.38-51)^2+(0-0)^2}\right]}=70.46\text{mm}^2$$

$$dA_h=\overrightarrow{\left[t\cdot\sqrt{\left(P8_y-P5_y\right)^2+(P8_z-P5_z)^2}\right]}=\overrightarrow{\left[1.42\cdot\sqrt{(0-0)^2+(197.20-1.38)^2}\right]}$$
$$=278.07\text{mm}^2$$

$$dA_{b2,e1}=\overrightarrow{\left[t\cdot\sqrt{\left(P10_y-P9_y\right)^2+(P10_z-P9_z)^2}\right]}$$
$$=\overrightarrow{\left[1.42\cdot\sqrt{(23.81-1.38)^2+(198.58-198.58)^2}\right]}=31.85\text{mm}^2$$

$$dA_{b2,e2}=\overrightarrow{\left[t_{red,s2}\cdot\sqrt{\left(P12_y-P11_y\right)^2+(P12_z-P11_z)^2}\right]}$$
$$=\overrightarrow{\left[1.21\cdot\sqrt{(47-24.19)^2+(198.58-198.58)^2}\right]}=27.49\text{mm}^2$$

$$dA_{c2,eff}=\overrightarrow{\left[t_{red,s2}\cdot\sqrt{\left(P14_y-P13_y\right)^2+(P14_z-P13_z)^2}\right]}$$
$$=\overrightarrow{\left[1.21\cdot\sqrt{(53.36-47.75)^2+(176.86-197.83)^2}\right]}=26.17\text{mm}^2$$

Area section

$$A=dA_{c1}+dA_{b1}+dA_h+dA_{b2,e1}+dA_{b2,e1}+dA_{c2}$$
$$=30.83+70.46+278.07++31.85+27.49+26.17=464.86\text{mm}^2=4.65\text{cm}^2$$

Static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{y0}=(P2_z+P1_z)\cdot\frac{dA_{c1}}{2}+(P4_z+P3_z)\cdot\frac{dA_{b1}}{2}+(P8_z+P5_z)\cdot\frac{dA_h}{2}+(P10_z+P9_z)\cdot\frac{dA_{b2,e1}}{2}$$
$$+(P12_z+P11_z)\cdot\frac{dA_{b2,e2}}{2}+(P14_z+P13_z)\cdot\frac{dA_{c2,eff}}{2}$$

$$S_{y0}=(0.747+21.72)\cdot\frac{30.83}{2}+(0+0)\cdot\frac{70.46}{2}+(197.20+1.378)\cdot\frac{278.07}{2}$$
$$+(198.58+198.58)\cdot\frac{31.85}{2}+(198.58+198.58)\cdot\frac{27.49}{2}+(176.86+197.83)$$
$$\cdot\frac{26.17}{2}=44641.8\text{mm}^3$$

$$z_{gc}=\frac{44641.8}{464.86}=96.03\text{mm}$$

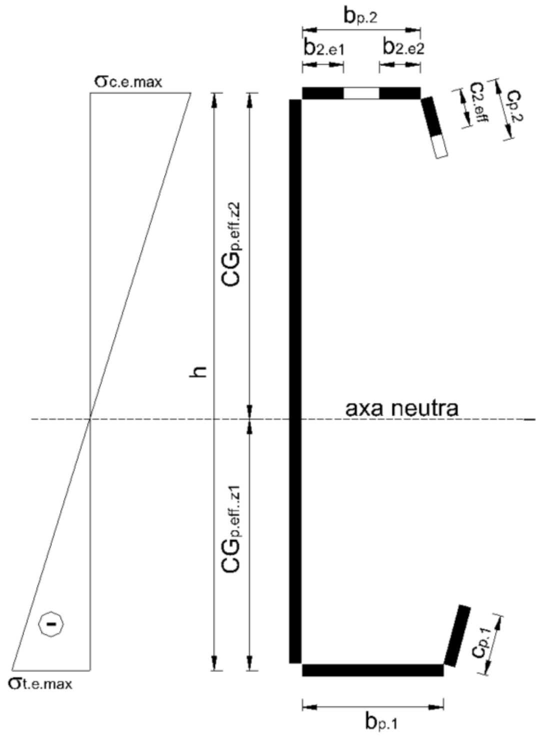
Determination of the stress distribution coefficient „ψ" :

$CG_{p.eff,z2} = h - CG_{p.eff,z1} = 198.58 - 96.03 = 102.55mm$

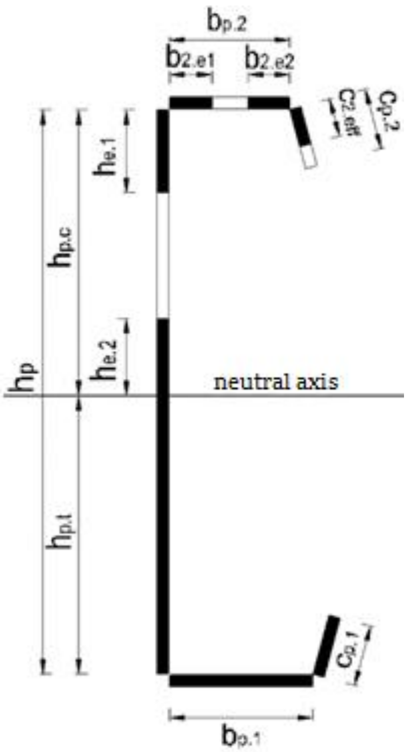
$\sigma_1 = \sigma_{c.e.max} = 355\,\frac{N}{mm^2}$

$$\sigma_2 = \sigma_{t.e.max} = -\frac{CG_{p.eff,z1} \cdot \sigma_1}{CG_{p.eff,z2}} = \frac{96.03 \cdot 355}{102.55} = -332.45\,\frac{N}{mm^2}$$

$\psi = \frac{\sigma_2}{\sigma_1} = -0.936$



Step A.4-A.7 :

Interior wall (h) – Scheme **Step A.1-A.7**		
WEB (h)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.81$ $\psi = -0.936 \Rightarrow k_\sigma = 7.81 - 6.29\psi + 9.78\psi^2 = 22.28$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{h_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{195.82}{1.42}}{28.4 \cdot 0.81\sqrt{22.28}} = 1.28$ For $\overline{\lambda_p} = 1.28 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{1.28 - 0.055(3 - 0.936)}{1.28^2} = 0.711$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$h_p = 195.82\ \text{mm}$ $h_{p.c} = \frac{\lvert\sigma_1\rvert \cdot h_p}{\lvert\sigma_1\rvert + \lvert\sigma_2\rvert} = \frac{355 \cdot 195.82}{355 + 332.45} = 101.12\text{mm}$ $h_{p.t} = h_p - h_{p.c} = 195.82 - 101.12 = 94.70\text{mm}$ $h_{eff} = h_{p.c} \cdot \rho = 101.12 \cdot 0.711 = 71.88\ \text{mm}$ $h_{e1} = 0.4 \cdot h_{eff} = 0.4 \cdot 71.88 = 28.75\ \text{mm}$ $h_{e2} = 0.6 \cdot h_{eff} = 0.6 \cdot 71.88 = 43.13\ \text{mm}$ 	Table 3.3 Scheme – Step A.7a

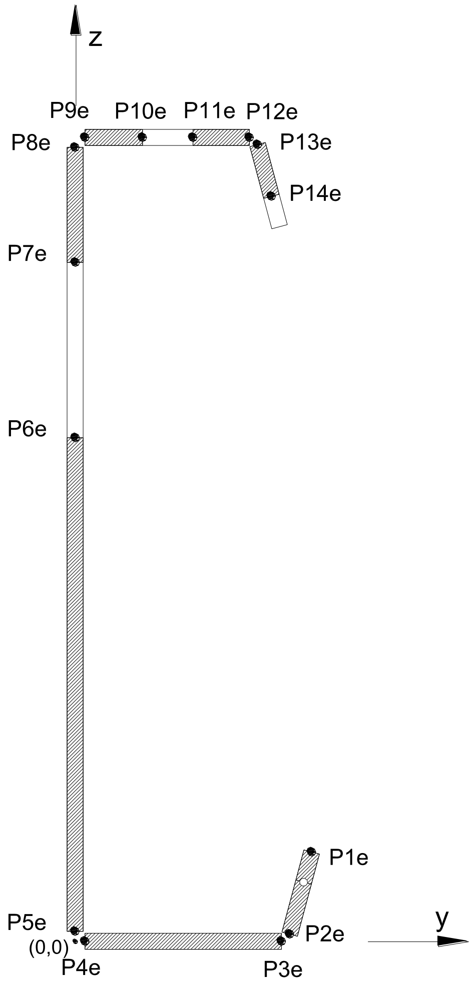
The final characteristics of the C-section bent after the small flange

Final dimensions of the effective section (Scheme Step 4.1b)

	c_{p1} [mm]	b_{p1} [mm]	$h_{.pt}+h_{.e2}$ [mm]	$h_{.e1}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	21.71	49.62	137.83	28.75	22.43	22.81	21.71
thickness **t**	1.42	1.42	1.42	1.42	1.42	1.21	1.21

Step 5.1 Calculation of the effective section of the section:

Following step 4.1 effective web wall widths were determined. It is noted its segmentation into effective and ineffective portions, respectively, delimited by the nodes P6 and P7.



Final coordinates of the joints:

- Horizontal coordinates (ax y-y)

$$P1_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} + c_{p1} \cdot \cos(\phi_1) = 1.38 + 49.62 + 0.747 + 21.71 \cdot \cos(75°) = 57.36mm$$

$$P2_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} = 1.38 + 49.62 + 0.747 = 51.75mm$$

$$P3_{e.y} = g_{r.2} + b_{p.1} = 1.38 + 49.62 = 51mm$$

$$P4_{e.y} = g_{r.2} = 1.38mm$$

$$P5_{e.y} = 0 \text{ mm}$$

$$P6_{e.y} = P7_{e.y} = P8_{e.y} = 0mm$$

$$P9_{e.y} = g_{r.3} = 1.38mm$$

$$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 22.43 = 23.81mm$$

$$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 45.62 - 22.81 = 24.19mm$$

$$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 45.62 = 47mm$$

$$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 45.62 + 0.747 = 47.75mm$$

$$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 45.62 + 0.747 + 21.71 \cdot \cos(75°) = 53.36mm$$

- Vertical coordinates (ax z-z)

$$P1_{e.z} = g_{r.1} + c_{p1} \cdot \sin(\phi_1) = 0.747 + 21.71 \cdot \sin(75°) = 21.72mm$$

$$P2_{e.z} = g_{r.1} = 0.747mm$$

$$P3_{e.z} = 0 \text{ mm}$$

$$P4_{e.z} = 0 \text{ mm}$$

$$P5_{e.z} = g_{r.2} = 1.38mm$$

$$P6_{e.z} = g_{r.2} + h_{p.t} + h_{e2} = 1.38 + 94.70 + 43.13 = 139.21mm$$

$$P7_{e.z} = g_{r.2} + h_p - h_{e1} = 1.38 + 195.82 - 28.75 = 168.45mm$$
$$P8_{e.z} = g_{r.2} + h_p = 1.38 + 195.82 = 197.20mm$$
$$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 195.82 + 1.38 = 198.58mm$$
$$P10_{e.z} = P11_z = P12_z = P9_z = 198.58mm$$
$$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 0.747 = 197.83mm$$
$$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$$
$$= 1.38 + 195.82 + 1.38 - 0.747 - 21.71 \cdot \sin(75°) = 176.86mm$$

Sectional characteristics are determined according to ANNEX A.

Portions of area sections

$$dA_{c1} = \left[\overrightarrow{t \cdot \sqrt{\left(P2_{e,y} - P1_{e,y}\right)^2 + \left(P2_{e,z} - P1_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.42 \cdot \sqrt{(51.75 - 57.36)^2 + (0.747 - 21.72)^2}}\right] = 31.07mm^2$$

$$dA_{b1} = \left[\overrightarrow{t \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{(1.38 - 51)^2 + 0}}\right] = 70.46mm^2$$

$$dA_{h,t+h,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P6_{e,y} - P5_{e,y}\right)^2 + \left(P6_{e,z} - P5_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (139.21 - 1.38)^2}}\right]$$
$$= 195.72mm^2$$

$$dA_{h,e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P8_{e,y} - P7_{e,y}\right)^2 + \left(P8_{e,z} - P7_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (197.20 - 168.45)^2}}\right]$$
$$= 40.83mm^2$$

$$dA_{b2.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P10_{e,y} - P9_{e,y}\right)^2 + \left(P10_{e,z} - P9_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.42 \cdot \sqrt{(23.81 - 1.38)^2 + (198.58 - 198.58)^2}}\right] = 31.85mm^2$$

$$dA_{b2.e2} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.21 \cdot \sqrt{(47 - 24.19)^2 + (198.58 - 198.58)^2}}\right] = 27.49mm^2$$

$$dA_{c2,eff} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.21 \cdot \sqrt{(53.36 - 47.75)^2 + (176.86 - 197.83)^2}}\right] = 26.17mm^2$$

Effective area

$$A_{eff} = dA_{b1} + dA_{c1} + dA_{h,t+h,e2} + dA_{h,e1} + dA_{b2.e1} + dA_{b2.e2} + dA_{c2,eff}$$
$$= 31.07 + 70.46 + 195.72 + 40.83 + 31.85 + 27.49 + 26.17 = 423.58mm^2$$
$$= 4.24cm^2$$

The static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{y0.eff} = (P2_{e,z} + P1_{e,z}) \cdot \frac{dA_{c1}}{2} + (P4_{e,z} + P3_{e,z}) \cdot \frac{dA_{b1}}{2} + (P6_{e,z} + P5_{e,z}) \cdot \frac{dA_{h,t+h,e2}}{2} + (P8_{e,z} + P7_{e,z}) \cdot \frac{dA_{h,e1}}{2} + (P10_{e,z} + P9_{e,z}) \cdot \frac{dA_{b2.e1}}{2} + (P12_{e,z} + P11_{e,z}) \cdot \frac{dA_{b2.e2}}{2} + (P14_{e,z} + P13_{e,z}) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{y0.eff} = (0.747 + 21.72) \cdot \frac{31.07}{2} + 0 + (139.21 + 1.38) \cdot \frac{195.72}{2} + (197.20 + 168.45) \cdot \frac{40.83}{2} + (198.58 + 198.58) \cdot \frac{31.85}{2} + (198.58 + 198.58) \cdot \frac{27.49}{2} + (176.86 + 197.83) \cdot \frac{26.11}{2} = 38257.5\text{mm}^3$$

Position of centre of gravity (vertical coordinate) :

$$z_{gc.eff} = \frac{38257.5}{423.58} = 90.32\text{mm}$$

Moment of inertia in ratio to the original Y-axis and the new Y-axis through the center of gravity

$$I_{y0.eff} = \left[(P2_{e,z})^2 + (P1_{e,z})^2 + P2_{e,z} \cdot P1_{e,z}\right] \cdot \frac{dA_{c1}}{3} + \left[(P4_{e,z})^2 + (P3_{e,z})^2 + P4_{e,z} \cdot P3_{e,z}\right] \cdot \frac{dA_{b1}}{3} + \left[(P6_{e,z})^2 + (P5_{e,z})^2 + P6_{e,z} \cdot P5_{e,z}\right] \cdot \frac{dA_{h,t+h,e2}}{3} + \left[(P8_{e,z})^2 + (P7_{e,z})^2 + P8_{e,z} \cdot P7_{e,z}\right] \cdot \frac{dA_{h,e1}}{3} + \left[(P10_{e,z})^2 + (P9_{e,z})^2 + P10_{e,z} \cdot P9_{e,z}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[(P12_{e,z})^2 + (P11_{e,z})^2 + P12_{e,z} \cdot P11_{e,z}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[(P14_{e,z})^2 + (P13_{e,z})^2 + P14_{e,z} \cdot P13_{e,z}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{y0.eff} = \{[(0.747)^2 + (21.72)^2 + 0.747 \cdot 21.72] \cdot \frac{31.07}{3} + 0 + [(139.21)^2 + (1.38)^2 + 139.21 \cdot 1.38] \cdot \frac{195.72}{3} + [(197.20)^2 + (168.45)^2 + 197.20 \cdot 168.45] \cdot \frac{41.83}{3} + [(198.58)^2 + (198.58)^2 + 198.58 \cdot 198.58] \cdot \frac{31.85}{3} + [(198.58)^2 + (198.58)^2 + 198.58 \cdot 198.58] \cdot \frac{27.49}{3} + [(176.86)^2 + (197.83)^2 + 176.86 \cdot 197.83] \cdot \frac{26.17}{3} = 5908959\text{mm}^4$$

$$I_{y.eff} = 5908959 - 423.58 \cdot 90.32^2 = 2453585\text{mm}^4$$

The static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{z0.eff} = (P2_{e,y} + P1_{e,y}) \cdot \frac{dA_{c1}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1}}{2} + \left(P6_{e,y} + P5_{e,y}\right) \cdot \frac{dA_{h,t+h,e2}}{2} + \left(P8_{e,y} + P7_{e,y}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,y} + P9_{e,y}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{z0.eff} = (57.36 + 51.75) \cdot \frac{31.07}{2} + (1.38 + 51) \cdot \frac{70.46}{2} + 0 + 0 + (23.81 + 1.38) \cdot \frac{31.85}{2} + (47 + 24.19) \cdot \frac{27.49}{2} + (53.36 + 47.75) \cdot \frac{26.17}{2} = 6233.01\text{mm}^3$$

Position of centre of gravity (horizontal coordinate) :

$$y_{gc.eff} = \frac{6233.01}{423.58} = 14.71\text{mm}$$

Moment of inertia in ratio to the original z-axis and the new z-axis through the center of gravity

$$I_{z0.eff} = \left[\left(P2_{e,y}\right)^2 + \left(P1_{e,y}\right)^2 + P2_{e,y} \cdot P1_{e,y}\right] \cdot \frac{dA_{c1}}{3} + \left[\left(P4_{e,y}\right)^2 + \left(P3_{e,y}\right)^2 + P4_{e,y} \cdot P3_{e,y}\right] \cdot \frac{dA_{b1}}{3} + \left[\left(P6_{e,y}\right)^2 + \left(P5_{e,y}\right)^2 + P6_{e,y} \cdot P5_{e,y}\right] \cdot \frac{dA_{h,t+h,e2}}{3} + \left[\left(P8_{e,y}\right)^2 + \left(P7_{e,y}\right)^2 + P8_{e,y} \cdot P7_{e,y}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,y}\right)^2 + \left(P9_{e,y}\right)^2 + P10_{e,y} \cdot P9_{e,y}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P12_{e,y}\right)^2 + \left(P11_{e,y}\right)^2 + P12_{e,y} \cdot P11_{e,y}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P14_{e,y}\right)^2 + \left(P13_{e,y}\right)^2 + P14_{e,y} \cdot P13_{e,y}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{z0.eff} = [(51.75)^2 + (57.36)^2 + 51.75 \cdot 57.36] \cdot \frac{31.07}{3} + [(1.38)^2 + (51.75)^2 + 1.38 \cdot 51.75] \cdot \frac{70.46}{3} + 0 + 0 + [(23.81)^2 + (1.38)^2 + 23.81 \cdot 1.38] \cdot \frac{31.85}{3} + [(47)^2 + (24.19)^2 + 47 \cdot 24.19] \cdot \frac{27.49}{3} + [(53.36)^2 + (47.75)^2 + 53.36 \cdot 47.75] \cdot \frac{26.17}{3} = 263640\text{mm}^4$$

$$I_{z.eff} = 263640 - 423.58 \cdot 14.71^2 = 171922\text{mm}^4$$

Centrifugal moment of inertia in ratio to the Y and z axes and the new axes through the center of gravity

$$I_{yz0.eff} = (2 \cdot P1_{e,y} \cdot P1_{e,z} + 2 \cdot P2_{e,y} \cdot P2_{e,z} + P1_{e,y} \cdot P2_{e,z} + P2_{e,y} \cdot P1_{e,z}) \cdot \frac{dA_{c1}}{6} + (2 \cdot P3_{e,y} \cdot P3_{e,z} + 2 \cdot P4_{e,y} \cdot P4_{e,z} + P3_{e,y} \cdot P4_{e,z} + P4_{e,y} \cdot P3_{e,z}) \cdot \frac{dA_{b1}}{6} + (2 \cdot P5_{e,y} \cdot P5_{e,z} + 2 \cdot P6_{e,y} \cdot P6_{e,z} + P5_{e,y} \cdot P6_{e,z} + P6_{e,y} \cdot P5_{e,z}) \cdot \frac{dA_{h,t+h,e2}}{6} + (2 \cdot P7_{e,y} \cdot P7_{e,z} + 2 \cdot P8_{e,y} \cdot P8_{e,z} + P7_{e,y} \cdot P8_{e,z} + P8_{e,y} \cdot P7_{e,z}) \cdot \frac{dA_{h,e1}}{6} + (2 \cdot P9_{e,y} \cdot P9_{e,z} + 2 \cdot P10_{e,y} \cdot P10_{e,z} + P9_{e,y} \cdot P10_{e,z} + P10_{e,y} \cdot P9_{e,z}) \cdot \frac{dA_{b2.e1}}{6} + (2 \cdot P11_{e,y} \cdot P11_{e,z} + 2 \cdot P12_{e,y} \cdot P12_{e,z} + P11_{e,y} \cdot P12_{e,z} + P12_{e,y} \cdot P11_{e,z}) \cdot \frac{dA_{b2.e2}}{6} + (2 \cdot P13_{e,y} \cdot P13_{e,z} + 2 \cdot P14_{e,y} \cdot P14_{e,z} + P13_{e,y} \cdot P14_{e,z} + P14_{e,y} \cdot P13_{e,z}) \cdot \frac{dA_{c2,eff}}{6}$$

$$I_{yz0.eff} = (2 \cdot 57.36 \cdot 21.72 + 2 \cdot 51.75 \cdot 0.747 + 57.36 \cdot 0.747 + 51.75 \cdot 21.72) \cdot \frac{30.83}{6} + 0 + 0 + 0 + (2 \cdot 1.38 \cdot 198.58 + 2 \cdot 23.81 \cdot 198.58 + 1.38 \cdot 198.58 + 23.81 \cdot 198.58) \cdot \frac{31.85}{6} + (2 \cdot 24.19 \cdot 198.58 + 2 \cdot 47 \cdot 198.58 + 24.19 \cdot 198.58 + 47 \cdot 198.58) \cdot \frac{27.49}{6} + (2 \cdot 47.75 \cdot 197.83 + 2 \cdot 53.36 \cdot 176.86 + 47.75 \cdot 176.86 + 53.36 \cdot 197.83) \cdot \frac{26.17}{6} = 540826 \text{mm}^4$$

$$I_{yz.eff} = 540826 - \frac{38257.5 \cdot 6233.01}{423.58} = -22131.5 \text{mm}^4$$

Main axes of inertia

$$\alpha = \frac{1}{2} \arctan\left(\frac{2I_{yz.eff}}{I_{z.eff} - I_{y.eff}}\right) \text{ dacă } \left(I_{z.eff} - I_{y.eff}\right) \neq 0 \text{ dacă nu } \alpha = 0$$

$$\alpha = \frac{1}{2} \arctan\left(\frac{2 \cdot (-22131.5)}{171922 - 2453585}\right) = 0.00970$$

$$I_{\zeta} = \frac{1}{2}\left[I_{y.eff} + I_{z.eff} + \sqrt{\left(I_{z.eff} - I_{y.eff}\right)^2 + 4 \cdot I_{yz.eff}^2}\right] = \frac{1}{2}\left[2453585 + 171922 + \sqrt{(171922 - 2453585)^2 + 4 \cdot (-22131.5)^2}\right] = 2453800 \text{mm}^4$$

$$I_{\eta} = \frac{1}{2}\left[I_{y.eff} + I_{z.eff} - \sqrt{\left(I_{z.eff} - I_{y.eff}\right)^2 + 4 \cdot I_{yz.eff}^2}\right] = \frac{1}{2}\left[2453585 + 171922 - \sqrt{(171922 - 2453585)^2 + 4 \cdot (-22131.5)^2}\right] = 171707 \text{mm}^4$$

Radius of gyration

$$i_{y.eff} = \sqrt{\frac{I_{y.eff}}{A_{eff}}} = \sqrt{\frac{2453585}{423.58}} = 76.11mm$$

$$i_{z.eff} = \sqrt{\frac{I_{z.eff}}{A_{eff}}} = \sqrt{\frac{171922}{423.58}} = 20.15mm$$

$$i_{\zeta} = \sqrt{\frac{I_{\zeta}}{A_{eff}}} = \sqrt{\frac{2453800}{423.58}} = 76.11mm$$

$$i_{\eta} = \sqrt{\frac{I_{\eta}}{A_{eff}}} = \sqrt{\frac{171707}{423.58}} = 20.13mm$$

- **Resistance module**
- Resistance mode in ratio to y-y axis

$$z_{max.eff} = \max(90.32, (200 - 1.42) - 90.32) = \max(90.32,108.26) = 108.26mm$$

$$z_{min.eff} = \min(90.32, (200 - 1.42) - 90.32) = \min(90.32\ ,108.26) = 90.32mm$$

$$W_{y,min.eff} = \frac{I_{y.eff}}{z_{max.eff}} = \frac{2453585}{108.26} = 22663\ mm^3$$

$$W_{y,max.eff} = \frac{I_{y.eff}}{z_{min.eff}} = \frac{2453585}{90.32} = 27165\ mm^3$$

- Resistance mode in ratio to z-z axis

$$y_{max.eff} = \max(14.71,56.28 - 14.71) = \max(14.71,41.57) = 41.57mm$$

$$y_{min.eff} = \min(14.71,56.28 - 14.71) = \min(14.71,41.57) = 14.17mm$$

$$W_{z,min.eff} = \frac{I_{z.eff}}{y_{max.eff}} = \frac{171922}{41.57} = 4135.73mm^3$$

$$W_{z,max.eff} = \frac{I_{z.eff}}{y_{min.eff}} = \frac{171922}{14.71} = 11683mm^3$$

Sectoral coordinates

$\omega_{01} = 0$

$\omega_{0_2} = P1_{e,y} \cdot P2_{e,z} - P2_{e,y} \cdot P1_{e,z} = 57.36 \cdot 0.747 - 51.75 \cdot 21.72 = -1067.09mm^2$

$\omega_{0_3} = P2_{e,y} \cdot P3_{e,z} - P3_{e,y} \cdot P2_{e,z} = 51.75 \cdot 0 - 51 \cdot 0.747 = -38.09mm^2$

$\omega_{0_4} = P3_{e,y} \cdot P4_{e,z} - P4_{e,y} \cdot P3_{e,z} = 51 \cdot 0 - 1.38 \cdot 0 = 0mm^2$

$\omega_{0_5} = P4_{e,y} \cdot P5_{e,z} - P5_{e,y} \cdot P4_{e,z} = 1.38 \cdot 1.38 - 0 \cdot 0 = 1.90mm^2$

$\omega_{0_6} = P5_{e,y} \cdot P6_{e,z} - P6_{e,y} \cdot P5_{e,z} = 0 \cdot 139.21 - 0 \cdot 1.38 = 0mm^2$

$\omega_{0_7} = P6_{e,y} \cdot P7_{e,z} - P7_{e,y} \cdot P6_{e,z} = 0 \cdot 168.45 - 0 \cdot 139.21 = 0mm^2$

$\omega_{0_8} = P7_{e,y} \cdot P8_{e,z} - P8_{e,y} \cdot P7_{e,z} = 0 \cdot 197.20 - 0 \cdot 168.45 = 0mm^2$

$\omega_{0_9} = P8_{e,y} \cdot P9_{e,z} - P9_{e,y} \cdot P8_{e,z} = 0 \cdot 198.58 - 1.38 \cdot 197.20 = -272.04mm^2$

$\omega_{0_{10}} = P9_{e,y} \cdot P10_{e,z} - P10_{e,y} \cdot P9_{e,z} = 1.38 \cdot 198.58 - 23.81 \cdot 198.58 = -4453.67mm^2$

$\omega_{0_{11}} = P10_{e,y} \cdot P11_{e,z} - P11_{e,y} \cdot P10_{e,z} = 23.81 \cdot 198.58 - 24.19 \cdot 198.58 = -75.82mm^2$

$\omega_{0_{12}} = P11_{e,y} \cdot P12_{e,z} - P12_{e,y} \cdot P11_{e,z} = 24.19 \cdot 198.58 - 47 \cdot 198.58 = -4529.49mm^2$

$\omega_{0_{13}} = P12_{e,y} \cdot P13_{e,z} - P13_{e,y} \cdot P12_{e,z} = 47 \cdot 197.83 - 47.75 \cdot 198.58 = -183.41mm^2$

$\omega_{0_{14}} = P13_{e,y} \cdot P14_{e,z} - P14_{e,y} \cdot P13_{e,z} = 47.75 \cdot 176.86 - 53.36 \cdot 197.83 = -2112.69mm^2$

$\omega_1 = 0 + \omega_{01} = 0mm^2$

$\omega_2 = \omega_0 + \omega_{0_2} = 0 + (-1067.09) = -1067.09mm^2$

$\omega_3 = \omega_2 + \omega_{0_3} = (-1067.09) + (-38.09) = -1105.18mm^2$

$\omega_4 = \omega_3 + \omega_{0_4} = (-1105.18) + 0 = -1105.18mm^2$

$\omega_5 = \omega_4 + \omega_{0_5} = (-1105.18) + 1.90 = -1103.28mm^2$

$\omega_6 = \omega_5 + \omega_{0_6} = (-1103.28) + 0 = -1103.28mm^2$

$\omega_7 = \omega_6 + \omega_{0_7} = (-1103.28) + 0 = -1103.28mm^2$

$\omega_8 = \omega_7 + \omega_{0_8} = (-1103.28) + 0 = -1103.28mm^2$

$\omega_9 = \omega_8 + \omega_{0_9} = (-1103.28) + (-272.04) = -1375.32mm^2$

$\omega_{10} = \omega_9 + \omega_{0_{10}} = (-1375.32) + (-4453.67) = -5828.99mm^2$

$\omega_{11} = \omega_{10} + \omega_{0_{11}} = (-5828.99) + (-75.82) = -5904.81mm^2$

$\omega_{12} = \omega_{11} + \omega_{0_{12}} = (-5904.81) + (-4529.49) = -10434.31mm^2$

$\omega_{13} = \omega_{12} + \omega_{0_{13}} = (-10434.31) + (-183.41) = -10617.72mm^2$

$\omega_{14} = \omega_{13} + \omega_{0_{14}} = (-10617.72) + (-2112.69) = -12730.40mm^2$

Average sectoral coordinates

$dA_2 = dA_{c1}$; $dA_3 = 0$; $dA_4 = dA_{b1}$; $dA_5 = 0$; $dA_6 = dA_{h,t+h,e2}$; $dA_7 = 0$;

$dA_8 = dA_{h,e1}$; $dA_9 = 0$; $dA_{10} = dA_{b2,e1}$; $dA_{11} = 0$; $dA_{12} = dA_{b2,e2}$; $dA_{13} = 0$; $dA_{14} = dA_{c2,eff}$;

$$I_{\omega.eff} = \sum_{i=2}^{14} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2}$$

$$= (\omega_1 + \omega_2) \cdot \frac{dA_2}{2} + (\omega_2 + \omega_3) \cdot \frac{dA_3}{2} + (\omega_3 + \omega_4) \cdot \frac{dA_4}{2} + (\omega_4 + \omega_5) \cdot \frac{dA_5}{2} + (\omega_5 + \omega_6) \cdot \frac{dA_6}{2} + (\omega_6 + \omega_7) \cdot \frac{dA_7}{2} + (\omega_7 + \omega_8) \cdot \frac{dA_8}{2} + (\omega_8 + \omega_9) \cdot \frac{dA_9}{2} + (\omega_9 + \omega_{10}) \cdot \frac{dA_{10}}{2} + (\omega_{10} + \omega_{11}) \cdot \frac{dA_{11}}{2} + (\omega_{11} + \omega_{12}) \cdot \frac{dA_{12}}{2} + (\omega_{12} + \omega_{13}) \cdot \frac{dA_{13}}{2} + (\omega_{13} + \omega_{14}) \cdot \frac{dA_{14}}{2}$$

$$= [(0 + (-1067.09)] \cdot \frac{31.07}{2} + 0 + [(-1105.18) + (-1105.18)] \cdot \frac{70.46}{2} + 0 + [(-1103.28) + (-1103.28)] \cdot \frac{195.72}{2} + 0 + [(-1103.28) + (-1103.28)] \cdot \frac{40.83}{2} + 0 + [(-1375.32) + (-5828.99)] \cdot \frac{31.85}{2} + 0 + [(-5904.81) + (-5842.73)] \cdot \frac{31.85}{2} + 0 + [(-5918.55) + (-10434.31)] \cdot \frac{27.49}{2} + 0 + [(-10617.72) + (-12730.40)] \cdot \frac{26.17}{2} = -1000235\text{mm}^4$$

$$\omega_{mean.eff} = \frac{-1000235}{423.58} = -2361.37\text{mm}^2$$

Sectoral constants

$$I_{y\omega0.eff} = \sum_{i=2}^{14}(2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,y} \cdot \omega_1 + 2 \cdot P2_{e,y} \cdot \omega_2 + P1_{e,y} \cdot \omega_2 + P2_{e,y} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,y} \cdot \omega_2 + 2 \cdot P3_{e,y} \cdot \omega_3 + P2_{e,y} \cdot \omega_3 + P3_{e,y} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,y} \cdot \omega_3 + 2 \cdot P4_{e,y} \cdot \omega_4 + P3_{e,y} \cdot \omega_4 + P4_{e,y} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,y} \cdot \omega_4 + 2 \cdot P5_{e,y} \cdot \omega_5 + P4_{e,y} \cdot \omega_5 + P5_{e,y} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,y} \cdot \omega_5 + 2 \cdot P6_{e,y} \cdot \omega_6 + P5_{e,y} \cdot \omega_6 + P6_{e,y} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,y} \cdot \omega_6 + 2 \cdot P7_{e,y} \cdot \omega_7 + P6_{e,y} \cdot \omega_7 + P7_{e,y} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,y} \cdot \omega_7 + 2 \cdot P8_{e,y} \cdot \omega_8 + P7_{e,y} \cdot \omega_8 + P8_{e,y} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,y} \cdot \omega_8 + 2 \cdot P9_{e,y} \cdot \omega_9 + P8_{e,y} \cdot \omega_9 + P9_{e,y} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,y} \cdot \omega_9 + 2 \cdot P10_{e,y} \cdot \omega_{10} + P9_{e,y} \cdot \omega_{10} + P10_{e,y} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,y} \cdot \omega_{10} + 2 \cdot P11_{e,y} \cdot \omega_{11} + P10_{e,y} \cdot \omega_{11} + P11_{e,y} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,y} \cdot \omega_{11} + 2 \cdot P12_{e,y} \cdot \omega_{12} + P11_{e,y} \cdot \omega_{12} + P12_{e,y} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,y} \cdot \omega_{12} + 2 \cdot P13_{e,y} \cdot \omega_{13} + P12_{e,y} \cdot \omega_{13} + P13_{e,y} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,y} \cdot \omega_{13} + 2 \cdot P14_{e,y} \cdot \omega_{14} + P13_{e,y} \cdot \omega_{14} + P14_{e,y} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6}$$

$$I_{y\omega0.eff} = [2 \cdot 57.36 \cdot 0 + 2 \cdot 51.75 \cdot (-1067.09) + 57.36 \cdot (-1067.09) + 51.75 \cdot 0] \cdot \frac{31.07}{6} + 0 + [2 \cdot 51 \cdot (-1105.18) + 2 \cdot 1.38 \cdot (-1105.18) + 51 \cdot (-1105.18) + 1.38 \cdot (-1105.18)] \cdot \frac{70.46}{6} + 0 + 0 + 0 + 0 + 0 + [2 \cdot 1.38 \cdot (-1375.32) + 2 \cdot 23.81 \cdot (-5828.99) + 1.38 \cdot (-5828.99) + 23.81 \cdot (-1375.32)] \cdot \frac{31.85}{6} + 0 + [2 \cdot 24.19 \cdot (-5904.81) + 2 \cdot 47 \cdot (-10434.31) + 24.19 \cdot (-10434.31) + 47 \cdot (-5904.81)] \cdot \frac{27.49}{6} + 0 + [2 \cdot 47.75 \cdot (-10617.72) + 2 \cdot 53.36 \cdot (-12730.40) + 47.75 \cdot (-12730.40) + 53.36 \cdot (-10617.72)] \cdot \frac{26.17}{6} = -28331778\text{mm}^5$$

$$I_{y\omega.eff} = I_{y\omega0.eff} - \frac{S_{z0.eff} \cdot I_{\omega.eff}}{A_{eff}} = -28331778 - \frac{6233.01 \cdot (-1000235)}{423.58} = -13613359\text{mm}^5$$

$$I_{z\omega0.eff} = \sum_{i=2}^{14} (2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,z} \cdot \omega_1 + 2 \cdot P2_{e,z} \cdot \omega_2 + P1_{e,z} \cdot \omega_2 + P2_{e,z} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,z} \cdot \omega_2 + 2 \cdot P3_{e,z} \cdot \omega_3 + P2_{e,z} \cdot \omega_3 + P3_{e,z} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,z} \cdot \omega_3 + 2 \cdot P4_{e,z} \cdot \omega_4 + P3_{e,z} \cdot \omega_4 + P4_{e,z} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,z} \cdot \omega_4 + 2 \cdot P5_{e,z} \cdot \omega_5 + P4_{e,z} \cdot \omega_5 + P5_{e,z} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,z} \cdot \omega_5 + 2 \cdot P6_{e,z} \cdot \omega_6 + P5_{e,z} \cdot \omega_6 + P6_{e,z} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,z} \cdot \omega_6 + 2 \cdot P7_{e,z} \cdot \omega_7 + P6_{e,z} \cdot \omega_7 + P7_{e,z} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,z} \cdot \omega_7 + 2 \cdot P8_{e,z} \cdot \omega_8 + P7_{e,z} \cdot \omega_8 + P8_{e,z} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,z} \cdot \omega_8 + 2 \cdot P9_{e,z} \cdot \omega_9 + P8_{e,z} \cdot \omega_9 + P9_{e,z} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,z} \cdot \omega_9 + 2 \cdot P10_{e,z} \cdot \omega_{10} + P9_{e,z} \cdot \omega_{10} + P10_{e,z} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,z} \cdot \omega_{10} + 2 \cdot P11_{e,z} \cdot \omega_{11} + P10_{e,z} \cdot \omega_{11} + P11_{e,z} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,z} \cdot \omega_{11} + 2 \cdot P12_{e,z} \cdot \omega_{12} + P11_{e,z} \cdot \omega_{12} + P12_{e,z} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,z} \cdot \omega_{12} + 2 \cdot P13_{e,z} \cdot \omega_{13} + P12_{e,z} \cdot \omega_{13} + P13_{e,z} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,z} \cdot \omega_{13} + 2 \cdot P14_{e,z} \cdot \omega_{14} + P13_{e,z} \cdot \omega_{14} + P14_{e,z} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6}$$

$$I_{z\omega0.eff} = [2 \cdot 21.72 \cdot 0 + 2 \cdot 0.747 \cdot (-1067.09) + 21.72 \cdot (-1067.09) + 0.747 \cdot 0] \cdot \frac{31.07}{6} + 0 + 0 + 0 + [2 \cdot 1.38 \cdot (-1103.28) + 2 \cdot 139.21 \cdot (-1103.28) + 1.38 \cdot (-1103.28) + 139.21 \cdot (-1103.28)] \cdot \frac{195.72}{6} + 0 + [2 \cdot 168.45 \cdot (-1103.28) + 2 \cdot 197.20 \cdot (-1103.28) + 168.45 \cdot (-1103.28) + 197.20 \cdot (-1103.28)] \cdot \frac{40.83}{6} + 0 + [2 \cdot 198.58 \cdot (-1375.32) + 2 \cdot 198.58 \cdot (-5828.99) + 198.58 \cdot (-5828.99) + 198.58 \cdot (-1375.32)] \cdot \frac{31.85}{6} + 0 + [2 \cdot 198.58 \cdot (-5904.81) + 2 \cdot 198.58 \cdot (-10434.31) + 198.58 \cdot (-10434.31) + 198.58 \cdot (-5904.81)] \cdot \frac{27.49}{6} + 0 + [2 \cdot 197.83 \cdot (-10617.72) + 2 \cdot 176.86 \cdot (-12730.40) + 197.83 \cdot (-12730.40) + 176.86 \cdot (-10617.72)] \cdot \frac{26.17}{6} = -148061747 mm^5$$

$$I_{z\omega.eff} = I_{z\omega0.eff} - \frac{S_{y0.eff} \cdot I_{\omega.eff}}{A_{eff}} = -148061747 - \frac{38257.5 \cdot (-1000235)}{423.58} = -57721657 mm^5$$

$$I_{\omega\omega0.eff} = \sum_{i=2}^{14}[(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i \cdot \omega_{i-1}]\frac{dA_i}{3}$$

$$= \left[((\omega_2)^2 + (\omega_1)^2 + \omega_2 \cdot \omega_1) \cdot \frac{dA_2}{3}\right] + \left[((\omega_3)^2 + (\omega_2)^2 + \omega_3 \cdot \omega_2) \cdot \frac{dA_3}{3}\right]$$
$$+ \left[((\omega_4)^2 + (\omega_3)^2 + \omega_4 \cdot \omega_3) \cdot \frac{dA_4}{3}\right] + \left[((\omega_5)^2 + (\omega_4)^2 + \omega_5 \cdot \omega_4) \cdot \frac{dA_5}{3}\right]$$
$$+ \left[((\omega_6)^2 + (\omega_5)^2 + \omega_6 \cdot \omega_5) \cdot \frac{dA_6}{3}\right] + \left[((\omega_7)^2 + (\omega_6)^2 + \omega_7 \cdot \omega_6) \cdot \frac{dA_7}{3}\right]$$
$$+ \left[((\omega_8)^2 + (\omega_7)^2 + \omega_8 \cdot \omega_7) \cdot \frac{dA_8}{3}\right] + \left[((\omega_9)^2 + (\omega_8)^2 + \omega_9 \cdot \omega_8) \cdot \frac{dA_9}{3}\right]$$
$$+ \left[((\omega_{10})^2 + (\omega_9)^2 + \omega_{10} \cdot \omega_9) \cdot \frac{dA_{10}}{3}\right] + \left[((\omega_{11})^2 + (\omega_{10})^2 + \omega_{11} \cdot \omega_{10}) \cdot \frac{dA_{11}}{3}\right]$$
$$+ \left[((\omega_{12})^2 + (\omega_{11})^2 + \omega_{12} \cdot \omega_{11}) \cdot \frac{dA_{12}}{3}\right]$$
$$+ \left[((\omega_{13})^2 + (\omega_{12})^2 + \omega_{13} \cdot \omega_{12}) \cdot \frac{dA_{13}}{3}\right]$$
$$+ \left[((\omega_{14})^2 + (\omega_{13})^2 + \omega_{14} \cdot \omega_{13}) \cdot \frac{dA_{14}}{3}\right]$$

$$I_{\omega\omega0.eff} = [(-1067.09)^2 + (0)^2 + (-1067.09) \cdot 0] \cdot \frac{31.07}{3} + 0$$
$$+ [(-1105.18)^2 + (-1105.18)^2 + (-1105.18) \cdot (-1105.18)] \cdot \frac{70.46}{3} + 0$$
$$+ [(-1103.28)^2 + (-1103.28)^2 + (-1103.28) \cdot (-1103.28)] \cdot \frac{195.72}{3} + 0$$
$$+ [(-1103.28)^2 + (-1103.28)^2 + (-1103.28) \cdot (-1103.28)] \cdot \frac{40.83}{3} + 0$$
$$+ [(-5828.99)^2 + (-1375.32)^2 + (-5828.99) \cdot (-1375.32)] \cdot \frac{31.85}{3} + 0$$
$$+ [(-10434.31)^2 + (-5904.81)^2 + (-10434.31) \cdot (-5904.81)] \cdot \frac{27.49}{3} + 0$$
$$+ [(-12730.40)^2 + (-10617.72)^2 + (-12730.40) \cdot (-10617.72)] \cdot \frac{26.17}{3}$$
$$= 6309586172\text{mm}^6$$

$$I_{\omega\omega} = I_{\omega\omega0} - \frac{I_\omega^2}{A_{eff}} = 6309586172 - \frac{(-1000235)^2}{423.58} = 3947662119\text{mm}^6$$

Shear Center

$$y_{sc.eff} = \frac{I_{z\omega.eff} \cdot I_{z.eff} - I_{y\omega.eff} \cdot I_{yz.eff}}{I_{y.eff} \cdot I_{z.eff} - I_{yz.eff}^2} = \frac{(-57721657) \cdot 171922 - (-13613359) \cdot (-22131.5)}{2453585 \cdot 171922 - (-22131.5)^2}$$
$$= -24.27\text{mm}$$

$$z_{sc.eff} = \frac{-I_{y\omega.eff} \cdot I_{y.eff} + I_{z\omega.eff} \cdot I_{yz.eff}}{I_{y.eff} \cdot I_{z.eff} - I_{yz.eff}^2}$$
$$= \frac{-(-13613359) \cdot 2453585 + (-57721657) \cdot (-22131.5)}{2453585 \cdot 171922 - (-22131.5)^2} = 82.31\text{mm}$$

$$(I_{y.eff} \cdot I_{z.eff} - I_{yz.eff}^2 \neq 0)$$

Sectoral moment of inertia

$$I_{w.eff} = I_{\omega\omega.eff} + z_{sc.eff} \cdot I_{y\omega.eff} - y_{sc.eff} \cdot I_{z\omega.eff}$$
$$= 3947662119 + 82.31 \cdot (-13613359) - (-24.27) \cdot (-57721657)$$
$$= 1426405235 mm^6$$

Torsional moment of inertia

$$I_{t.eff} = \sum_{i=2}^{14} dA_i \cdot \frac{(t_i)^2}{3}$$
$$= dA_2 \cdot \frac{(t_2)^2}{3} + dA_3 \cdot \frac{(t_3)^2}{3} + dA_4 \cdot \frac{(t_4)^2}{3} + dA_5 \cdot \frac{(t_5)^2}{3} + dA_6 \cdot \frac{(t_6)^2}{3} + dA_7 \cdot \frac{(t_7)^2}{3} + dA_8 \cdot \frac{(t_8)^2}{3} + dA_9 \cdot \frac{(t_9)^2}{3} + dA_{10} \cdot \frac{(t_{10})^2}{3} + dA_{11} \cdot \frac{(t_{11})^2}{3} + dA_{12} \cdot \frac{(t_{12})^2}{3} + dA_{13} \cdot \frac{(t_{13})^2}{3}$$

$$I_{t.eff} = 31.07 \cdot \frac{(1.42)^2}{3} + 0 + 70.46 \cdot \frac{(1.42)^2}{3} + 0 + 195.72 \cdot \frac{(1.42)^2}{3} + 0 + 40.83 \cdot \frac{(1.42)^2}{3} + 0 + 31.85 \cdot \frac{(1.42)^2}{3} + 0 + 27.49 \cdot \frac{(1.21)^2}{3} + 0 + 26.17 \cdot \frac{(1.21)^2}{3} = 274.63 mm^4$$

$$W_{t.eff} = \frac{I_{t.eff}}{\min(t)} = \frac{274.63}{1.21} = 227.83 mm^3$$

Sectoral coordinates in ratio to shear

$$\omega_{s_1} = \omega_1 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P1_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P1_{e,z} - z_{gc.eff}\right)$$
$$= 0 - (-2361.37) + 82.31 \cdot [57.36 - 14.71] - (-24.27) \cdot (21.72 - 90.32)$$
$$= 4206.81 mm^2$$

$$\omega_{s_2} = \omega_2 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P2_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P2_{e,z} - z_{gc.eff}\right)$$
$$= (-1067.09) - (-2361.37) + 82.31 \cdot [51.75 - 14.71] - (-24.27) \cdot (0.747 - 90.32) = 2116.34 mm^2$$

$$\omega_{s_3} = \omega_3 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P3_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P3_{e,z} - z_{gc.eff}\right)$$
$$= (-1105.18) - (-2361.37) + 82.31 \cdot [51 - 14.71] - (-24.27) \cdot (0 - 90.32)$$
$$= 2050.73 m^2$$

$$\omega_{s_4} = \omega_4 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P4_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P4_{e,z} - z_{gc.eff}\right)$$
$$= (-1105.18) - (-2361.37) + 82.31 \cdot [1.38 - 14.71] - (-24.27) \cdot (0 - 90.32)$$
$$= -2033.26 mm^2$$

$$\omega_{s_5} = \omega_5 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P5_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P5_{e,z} - z_{gc.eff}\right)$$
$$= (-1103.28) - (-2361.37) + 82.31 \cdot [0 - 14.71] - (-24.27) \cdot (1.38 - 90.32)$$
$$= -2111.42 mm^2$$

$$\omega_{s_6} = \omega_6 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P6_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P6_{e,z} - z_{gc.eff}\right)$$
$$= (-1103.28) - (-2361.37) + 82.31 \cdot [0 - 14.71] - (-24.27) \cdot (139.21 - 90.32) = 1233.37 mm^2$$

$$\omega_{s_7} = \omega_7 - \omega_{mean.eff} + z_{sc.eff} \cdot \left(P7_{e,y} - y_{gc.eff}\right) - y_{sc} \cdot \left(P7_{e,z} - z_{gc.eff}\right)$$
$$= (-1103.28) - (-2361.37) + 82.31 \cdot [0 - 14.71] - (-24.27) \cdot (168.45 - 90.32) = 1942.96 mm^2$$

$$\omega_{s_8} = \omega_8 - \omega_{mean.eff} + z_{sc.eff} \cdot (P8_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P8_{e,z} - z_{gc.eff}) = (-1103.28) - (-2361.37) + 82.31 \cdot [0 - 14.71] - (-24.27) \cdot (197.20 - 90.32) = 2640.73 mm^2$$

$$\omega_{s_9} = \omega_9 - \omega_{mean.eff} + z_{sc.eff} \cdot (P9_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P9_{e,z} - z_{gc.eff}) = (-1375.32) - (-2361.37) + 82.31 \cdot [1.38 - 14.71] - (-24.27) \cdot (198.58 - 90.32) = 2515.71 mm^2$$

$$\omega_{s_{10}} = \omega_{10} - \omega_{mean.eff} + z_{sc.eff} \cdot (P10_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P10_{e,z} - z_{gc.eff}) = (-5828.99) - (-2361.37) + 82.31 \cdot [23.81 - 14.71] - (-24.27) \cdot (198.58 - 90.32) = -92.01 mm^2$$

$$\omega_{s_{11}} = \omega_{11} - \omega_{mean.eff} + z_{sc.eff} \cdot (P11_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P11_{e,z} - z_{gc.eff}) = (-5904.81) - (-2361.37) + 82.31 \cdot [24.19 - 14.71] - (-24.27) \cdot (198.58 - 90.32) = -136.40 mm^2$$

$$\omega_{s_{12}} = \omega_{12} - \omega_{mean.eff} + z_{sc.eff} \cdot (P12_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P12_{e,z} - z_{gc.eff}) = (-10434.31) - (-2361.37) + 82.31 \cdot [47 - 14.71] - (-24.27) \cdot (198.58 - 90.32) = -2788.52 mm^2$$

$$\omega_{s_{13}} = \omega_{13} - \omega_{mean.eff} + z_{sc.eff} \cdot (P13_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P13_{e,z} - z_{gc.eff}) = (-10617.72) - (-2361.37) + 82.31 \cdot [47.75 - 14.71] - (-24.27) \cdot (197.83 - 90.32) = -2928.58 mm^2$$

$$\omega_{s_{14}} = \omega_{14} - \omega_{mean.eff} + z_{sc.eff} \cdot (P14_{e,y} - y_{gc.eff}) - y_{sc} \cdot (P14_{e,z} - z_{gc.eff}) = (-12730.40) - (-2361.37) + 82.31 \cdot [53.36 - 14.71] - (-24.27) \cdot (176.86 - 90.32) = -5087.69 mm^2$$

Maximum sectoral constant and sectoral module

$$\omega_{max.eff} = \max(|\omega_s|) = 5087.69 mm^2$$

$$W_{\omega.eff} = \frac{I_{w.eff}}{\omega_{max.eff}} = \frac{1426405235}{5087.69} = 280364 mm^4$$

Distance between center of shear and center of gravity

$$y_{s.eff} = y_{sc.eff} - y_{gc.eff} = (-24.27) - 14.71 = -38.98 mm$$

$$z_{s.eff} = z_{sc.eff} - z_{gc.eff} = 82.31 - 90.32 = -8.01 mm$$

Polar moment of inertia in ratio to shear Center

$$I_{p.eff} = I_{y.eff} + I_{z.eff} + A_{eff} \cdot (y_{s.eff}^2 + z_{s.eff}^2) = 2453585 + 171922 + 423.58 \cdot [(-38.98)^2 + (-8.01)^2] = 3296398 mm^4$$

Nonsymmetric factors $z_{j.eff}$ and $y_{j.eff}$

$$z_j = z_s - \frac{0.5}{I_y} \cdot \sum_{i=1}^{n} \left\{ \left[(z_{c_i})^3 + z_{c_i} \cdot \left[\frac{(z_i - z_{i-1})^2}{4} + (y_{c_i})^2 + \frac{(y_i - y_{i-1})^2}{12} \right] + y_{c_i} \cdot \frac{(y_i - y_{i-1}) \cdot (z_i - z_{i-1})}{6} \right] \cdot dA_i \right\}$$

$$
\begin{aligned}
\mathrm{z}_{\mathrm{j.eff}} = z_{s.eff} - \frac{0.5}{I_{y.eff}} \\
\cdot \Bigg\{ \Bigg[\left(\mathrm{z}_{\mathrm{c}_2}\right)^3 + \mathrm{z}_{\mathrm{c}_2} \cdot \left[\frac{\left(\mathrm{P2}_{\mathrm{e,z}} - \mathrm{P1}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_2}\right)^2 + \frac{\left(\mathrm{P2}_{\mathrm{e,y}} - \mathrm{P1}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_2} \\
\cdot \frac{\left(\mathrm{P2}_{\mathrm{e,y}} - \mathrm{P1}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P2}_{\mathrm{e,z}} - \mathrm{P1}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_2 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_3}\right)^3 + \mathrm{z}_{\mathrm{c}_3} \cdot \left[\frac{\left(\mathrm{P3}_{\mathrm{e,z}} - \mathrm{P2}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_3}\right)^2 + \frac{\left(\mathrm{P3}_{\mathrm{e,y}} - \mathrm{P2}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_3} \\
\cdot \frac{\left(\mathrm{P3}_{\mathrm{e,y}} - \mathrm{P2}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P3}_{\mathrm{e,z}} - \mathrm{P2}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_3 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_4}\right)^3 + \mathrm{z}_{\mathrm{c}_4} \cdot \left[\frac{\left(\mathrm{P4}_{\mathrm{e,z}} - \mathrm{P3}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_4}\right)^2 + \frac{\left(\mathrm{P4}_{\mathrm{e,y}} - \mathrm{P3}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_4} \\
\cdot \frac{\left(\mathrm{P4}_{\mathrm{e,y}} - \mathrm{P3}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P4}_{\mathrm{e,z}} - \mathrm{P3}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_4 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_5}\right)^3 + \mathrm{z}_{\mathrm{c}_5} \cdot \left[\frac{\left(\mathrm{P5}_{\mathrm{e,z}} - \mathrm{P4}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_5}\right)^2 + \frac{\left(\mathrm{P5}_{\mathrm{e,y}} - \mathrm{P4}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_5} \\
\cdot \frac{\left(\mathrm{P5}_{\mathrm{e,y}} - \mathrm{P4}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P5}_{\mathrm{e,z}} - \mathrm{P4}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_5 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_6}\right)^3 + \mathrm{z}_{\mathrm{c}_6} \cdot \left[\frac{\left(\mathrm{P6}_{\mathrm{e,z}} - \mathrm{P5}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_6}\right)^2 + \frac{\left(\mathrm{P6}_{\mathrm{e,y}} - \mathrm{P5}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_6} \\
\cdot \frac{\left(\mathrm{P6}_{\mathrm{e,y}} - \mathrm{P5}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P6}_{\mathrm{e,z}} - \mathrm{P5}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_6 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_7}\right)^3 + \mathrm{z}_{\mathrm{c}_7} \cdot \left[\frac{\left(\mathrm{P7}_{\mathrm{e,z}} - \mathrm{P6}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_7}\right)^2 + \frac{\left(\mathrm{P7}_{\mathrm{e,y}} - \mathrm{P6}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_7} \\
\cdot \frac{\left(\mathrm{P7}_{\mathrm{e,y}} - \mathrm{P6}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P7}_{\mathrm{e,z}} - \mathrm{P6}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_7 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_8}\right)^3 + \mathrm{z}_{\mathrm{c}_8} \cdot \left[\frac{\left(\mathrm{P8}_{\mathrm{e,z}} - \mathrm{P7}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_8}\right)^2 + \frac{\left(\mathrm{P8}_{\mathrm{e,y}} - \mathrm{P7}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_8} \\
\cdot \frac{\left(\mathrm{P8}_{\mathrm{e,y}} - \mathrm{P7}_{\mathrm{e,y}}\right) \cdot \left(\mathrm{P8}_{\mathrm{e,z}} - \mathrm{P7}_{\mathrm{e,z}}\right)}{6} \Bigg] \cdot \mathrm{dA}_8 \\
+ \Bigg[\left(\mathrm{z}_{\mathrm{c}_9}\right)^3 + \mathrm{z}_{\mathrm{c}_9} \cdot \left[\frac{\left(\mathrm{P9}_{\mathrm{e,z}} - \mathrm{P8}_{\mathrm{e,z}}\right)^2}{4} + \left(\mathrm{y}_{\mathrm{c}_9}\right)^2 + \frac{\left(\mathrm{P9}_{\mathrm{e,y}} - \mathrm{P8}_{\mathrm{e,y}}\right)^2}{12} \right] + \mathrm{y}_{\mathrm{c}_9}
\end{aligned}
$$

$$\cdot \frac{\left(P9_{e,y} - P8_{e,y}\right) \cdot \left(P9_{e,z} - P8_{e,z}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \left[\left(z_{c_{10}}\right)^3 + z_{c_{10}} \cdot \left[\frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{4} + \left(y_{c_{10}}\right)^2 + \frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{12}\right] + y_{c_{10}}\right.$$

$$\cdot \frac{\left(P10_{e,y} - P9_{e,y}\right) \cdot \left(P10_{e,z} - P9_{e,z}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \left[\left(z_{c_{11}}\right)^3 + z_{c_{11}} \cdot \left[\frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{4} + \left(y_{c_{11}}\right)^2 + \frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{12}\right] + y_{c_{11}}\right.$$

$$\cdot \frac{\left(P11_{e,y} - P10_{e,y}\right) \cdot \left(P11_{e,z} - P10_{e,z}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \left[\left(z_{c_{12}}\right)^3 + z_{c_{12}} \cdot \left[\frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{4} + \left(y_{c_{12}}\right)^2 + \frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{12}\right] + y_{c_{12}}\right.$$

$$\cdot \frac{\left(P12_{e,y} - P11_{e,y}\right) \cdot \left(P12_{e,z} - P11_{e,z}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \left[\left(z_{c_{13}}\right)^3 + z_{c_{13}} \cdot \left[\frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{4} + \left(y_{c_{13}}\right)^2 + \frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{12}\right] + y_{c_{13}}\right.$$

$$\cdot \frac{\left(P13_{e,y} - P12_{e,y}\right) \cdot \left(P13_{e,z} - P12_{e,z}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \left[\left(z_{c_{14}}\right)^3 + z_{c_{14}} \cdot \left[\frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{4} + \left(y_{c_{14}}\right)^2 + \frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{12}\right] + y_{c_{14}}\right.$$

$$\left.\cdot \frac{\left(P14_{e,y} - P13_{e,y}\right) \cdot \left(P14_{e,z} - P13_{e,z}\right)}{6}\Bigg] \cdot dA_{14}\right\}$$

$$
\begin{aligned}
z_{j.eff} = (-8.01) - \frac{0.5}{2453585}
&\cdot \left\{\left[(-79.09)^3 + (-79.09)\cdot\left(\frac{(0.747-21.72)^2}{4} + (39.52)^2 + \frac{(51.75-57.36)^2}{12}\right)\right.\right. \\
&\left. + 39.52\cdot\left(\frac{(51.75-57.36)\cdot(0.747-21.72)}{6}\right)\right]\cdot 31.07 + 0 \\
&+ \left[(-90.32)^3 + (-90.32)\cdot\left(0 + (11.47)^2 + \frac{(1.38-51)^2}{12}\right) + 0\right]\cdot 70.46 + 0 \\
&+ \left[(-20.03)^3 + (-20.03)\cdot\left(\frac{(139.21-1.38)^2}{4} + (-14.71)^2 + 0\right) + 0\right]\cdot 195.72 \\
&+ 0\left[(92.51)^3 + 92.51\cdot\left[\frac{(197.20-168.45)^2}{4} + (-14.71)^2 + 0\right] + 0\right]\cdot 40.83 + 0 \\
&+ \left[(108.26)^3 + 108.26\cdot\left[0 + (-2.12)^2 + \frac{(23.81-1.38)^2}{12}\right] + 0\right]\cdot 31.85 + 0 \\
&+ \left[(108.26)^3 + 108.26\cdot\left[0 + (20.88)^2 + \frac{(47-24.19)^2}{12}\right] + 0\right]\cdot 27.49 + 0 \\
&+ \left[(97.03)^3 + 97.03\cdot\left[\frac{(176.86-197.83)^2}{4} + (35.84)^2 + \frac{(53.36-47.75)^2}{12}\right]\right. \\
&\left.\left. + 35.84\cdot\frac{(53.36-47.75)\cdot(176.86-197.83)}{6}\right]\cdot 26.17\right\} = -16.91\text{mm}
\end{aligned}
$$

$$
\begin{aligned}
y_{\mathrm{j.eff}} = y_{s.eff} - \frac{0.5}{I_{z.eff}} \\
\cdot \Bigg\{ \Bigg[\left(y_{c_2}\right)^3 + y_{c_2} \cdot \left[\frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{4} + \left(z_{c_2}\right)^2 + \frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{12} \right] + z_{c_2} \\
\cdot \frac{\left(P2_{e,z} - P1_{e,z}\right) \cdot \left(P2_{e,y} - P1_{e,y}\right)}{6} \Bigg] \cdot dA_2 \\
+ \Bigg[\left(y_{c_3}\right)^3 + y_{c_3} \cdot \left[\frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{4} + \left(z_{c_3}\right)^2 + \frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{12} \right] + z_{c_3} \\
\cdot \frac{\left(P3_{e,z} - P2_{e,z}\right) \cdot \left(P3_{e,y} - P2_{e,y}\right)}{6} \Bigg] \cdot dA_3 \\
+ \Bigg[\left(y_{c_4}\right)^3 + y_{c_4} \cdot \left[\frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{4} + \left(z_{c_4}\right)^2 + \frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{12} \right] + z_{c_4} \\
\cdot \frac{\left(P4_{e,z} - P3_{e,z}\right) \cdot \left(P4_{e,y} - P3_{e,y}\right)}{6} \Bigg] \cdot dA_4 \\
+ \Bigg[\left(y_{c_5}\right)^3 + y_{c_5} \cdot \left[\frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{4} + \left(z_{c_5}\right)^2 + \frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{12} \right] + z_{c_5} \\
\cdot \frac{\left(P5_{e,z} - P4_{e,z}\right) \cdot \left(P5_{e,y} - P4_{e,y}\right)}{6} \Bigg] \cdot dA_5 \\
+ \Bigg[\left(y_{c_6}\right)^3 + y_{c_6} \cdot \left[\frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{4} + \left(z_{c_6}\right)^2 + \frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{12} \right] + z_{c_6} \\
\cdot \frac{\left(P6_{e,z} - P5_{e,z}\right) \cdot \left(P6_{e,y} - P5_{e,y}\right)}{6} \Bigg] \cdot dA_6 \\
+ \Bigg[\left(y_{c_7}\right)^3 + y_{c_7} \cdot \left[\frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{4} + \left(z_{c_7}\right)^2 + \frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{12} \right] + z_{c_7} \\
\cdot \frac{\left(P7_{e,z} - P6_{e,z}\right) \cdot \left(P7_{e,z} - P6_{e,y}\right)}{6} \Bigg] \cdot dA_7 \\
+ \Bigg[\left(y_{c_8}\right)^3 + y_{c_8} \cdot \left[\frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{4} + \left(z_{c_8}\right)^2 + \frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{12} \right] + z_{c_8} \\
\cdot \frac{\left(P8_{e,z} - P7_{e,z}\right) \cdot \left(P8_{e,y} - P7_{e,y}\right)}{6} \Bigg] \cdot dA_8
\end{aligned}
$$

$$+\left[\left(y_{c_9}\right)^3+y_{c_9}\cdot\left[\frac{\left(P9_{e,y}-P8_{e,y}\right)^2}{4}+\left(z_{c_9}\right)^2+\frac{\left(P9_{e,z}-P8_{e,z}\right)^2}{12}\right]+z_{c_9}\cdot\frac{\left(P9_{e,z}-P8_{e,z}\right)\cdot\left(P9_{e,y}-P8_{e,y}\right)}{6}\right]\cdot dA_9$$

$$+\left[\left(y_{c_{10}}\right)^3+y_{c_{10}}\cdot\left[\frac{\left(P10_{e,y}-P9_{e,y}\right)^2}{4}+\left(z_{c_{10}}\right)^2+\frac{\left(P10_{e,z}-P9_{e,z}\right)^2}{12}\right]+z_{c_{10}}\cdot\frac{\left(P10_{e,z}-P9_{e,z}\right)\cdot\left(P10_{e,y}-P9_{e,y}\right)}{6}\right]\cdot dA_{10}$$

$$+\left[\left(y_{c_{11}}\right)^3+y_{c_{11}}\cdot\left[\frac{\left(P11_{e,y}-P10_{e,y}\right)^2}{4}+\left(z_{c_{11}}\right)^2+\frac{\left(P11_{e,z}-P10_{e,z}\right)^2}{12}\right]+z_{c_{11}}\cdot\frac{\left(P11_{e,z}-P10_{e,z}\right)\cdot\left(P11_{e,y}-P10_{e,y}\right)}{6}\right]\cdot dA_{11}$$

$$+\left[\left(y_{c_{12}}\right)^3+y_{c_{12}}\cdot\left[\frac{\left(P12_{e,y}-P11_{e,y}\right)^2}{4}+\left(z_{c_{12}}\right)^2+\frac{\left(P12_{e,z}-P11_{e,z}\right)^2}{12}\right]+z_{c_{12}}\cdot\frac{\left(P12_{e,z}-P11_{e,z}\right)\cdot\left(P12_{e,y}-P11_{e,y}\right)}{6}\right]\cdot dA_{12}$$

$$+\left[\left(y_{c_{13}}\right)^3+y_{c_{13}}\cdot\left[\frac{\left(P13_{e,y}-P12_{e,y}\right)^2}{4}+\left(z_{c_{13}}\right)^2+\frac{\left(P13_{e,z}-P12_{e,z}\right)^2}{12}\right]+z_{c_{13}}\cdot\frac{\left(P13_{e,z}-P12_{e,z}\right)\cdot\left(P13_{e,y}-P12_{e,y}\right)}{6}\right]\cdot dA_{13}$$

$$+\left[\left(y_{c_{14}}\right)^3+y_{c_{14}}\cdot\left[\frac{\left(P14_{e,y}-P13_{e,y}\right)^2}{4}+\left(z_{c_{14}}\right)^2+\frac{\left(P14_{e,z}-P13_{e,z}\right)^2}{12}\right]+z_{c_{14}}\cdot\frac{\left(P14_{e,z}-P13_{e,z}\right)\cdot\left(P14_{e,y}-P13_{e,y}\right)}{6}\right]\cdot dA_{14}\Bigg\}$$

$$
\begin{aligned}
y_{j.eff} = (-38.98) - \frac{0.5}{171922} \\
\cdot \Bigg\{ \Bigg[(39.52)^3 + 39.52 \cdot \left[\frac{(51.75-57.36)^2}{4} + (-79.09)^2 + \frac{(0.747-21.72)^2}{12} \right] \\
+ (-79.09) \cdot \frac{(0.747-21.72)\cdot(51.75-57.36)}{6} \Bigg] \cdot 30.83 + 0 \\
+ \left[(11.47)^3 + 11.47 \cdot \left[\frac{(1.38-51)^2}{4} + (-90.32)^2 + 0 \right] + 0 \right] \cdot 71.36 + 0 \\
+ \left[(-14.71)^3 + (-14.71) \cdot \left[0 + (-20.03)^2 + \frac{(139.21-1.38)^2}{12} \right] + 0 \right] \cdot 195.72 + 0 \\
+ \left[(-14.71)^3 + (-14.71) \cdot \left[0 + (92.51)^2 + \frac{(197.20-168.45)^2}{12} \right] + 0 \right] \cdot 40.83 + 0 \\
+ \left[(-2.12)^3 + (-2.12) \cdot \left[\frac{(23.81-1.38)^2}{4} + (108.26)^2 + 0 \right] + 0 \right] \cdot 31.85 + 0 \\
+ \left[(20.88)^3 + 20.88 \cdot \left[\frac{(47-24.19)^2}{4} + (108.26)^2 + 0 \right] + 0 \right] \cdot 27.49 \\
+ 0 \Bigg[(35.84)^3 + 35.84 \cdot \left[\frac{(53.36-47.75)^2}{4} + (97.03)^2 + \frac{(176.86-197.83)^2}{12} \right] \\
+ 97.03 \cdot \frac{(176.86-197.83)\cdot(53.36-47.75)}{6} \Bigg] \cdot 26.17 \Bigg\} = -101.31\text{mm}
\end{aligned}
$$

where the coordinates of the center of the parts of the transversal section in ratio to the shear Center are:

$$z_{c_2} = \frac{P2_{e,z} + P1_{e,z}}{2} - z_{gc.eff} = \frac{0.747 + 21.72}{2} - 90.32 = -79.09\text{mm}$$

$$z_{c_3} = \frac{P3_{e,z} + P2_{e,z}}{2} - z_{gc.eff} = \frac{0 + 0.747}{2} - 90.32 = -89.95\text{mm}$$

$$z_{c_4} = \frac{P4_{e,z} + P3_{e,z}}{2} - z_{gc.eff} = 0 - 90.32 = -90.32\text{mm}$$

$$z_{c_5} = \frac{P5_{e,z} + P4_{e,z}}{2} - z_{gc.eff} = \frac{1.38 + 0}{2} - 90.32 = -89.63\text{mm}$$

$$z_{c_6} = \frac{P6_{e,z} + P5_{e,z}}{2} - z_{gc.eff} = \frac{139.21 + 1.38}{2} - 90.32 = -20.03\text{mm}$$

$$z_{c_7} = \frac{P7_{e,z} + P6_{e,z}}{2} - z_{gc.eff} = \frac{168.45 + 139.21}{2} - 90.32 = 63.51\text{mm}$$

$$z_{c_8} = \frac{P8_{e,z} + P7_{e,z}}{2} - z_{gc.eff} = \frac{197.20 + 168.45}{2} - 90.32 = 92.51\text{mm}$$

$$z_{c_9} = \frac{P9_{e,z} + P8_{e,z}}{2} - z_{gc.eff} = \frac{198.58 + 197.20}{2} - 90.32 = 107.57\text{mm}$$

$$z_{c_{10}} = \frac{P10_{e,z} + P9_{e,z}}{2} - z_{gc.eff} = \frac{198.58 + 198.58}{2} - 90.32 = 108.26\text{mm}$$

$$z_{c_{11}} = \frac{P11_{e,z} + P10_{e,z}}{2} - z_{gc.eff} = \frac{198.58 + 198.58}{2} - 90.32 = 108.26\text{mm}$$

$$z_{c_{12}} = \frac{P12_{e,z} + P11_{e,z}}{2} - z_{gc.eff} = \frac{198.58 + 198.58}{2} - 90.32 = 108.26mm$$

$$z_{c_{13}} = \frac{P13_{e,z} + P12_{e,z}}{2} - z_{gc.eff} = \frac{197.83 + 198.58}{2} - 90.32 = 107.89mm$$

$$z_{c_{14}} = \frac{P14_{e,z} + P13_{e,z}}{2} - z_{gc.eff} = \frac{176.86 + 197.83}{2} - 90.32 = 97.03mm$$

$$y_{c_2} = \frac{P2_{e,y} + P1_{e,y}}{2} - y_{gc.eff} = \frac{51.75 + 57.36}{2} - 14.71 = 39.52mm$$

$$y_{c_3} = \frac{P3_{e,y} + P2_{e,y}}{2} - y_{gc.eff} = \frac{51 + 51.75}{2} - 14.71 = 36.34mm$$

$$y_{c_4} = \frac{P4_{e,y} + P3_{e,y}}{2} - y_{gc.eff} = \frac{1.38 + 51}{2} - 14.71 = 11.47mm$$

$$y_{c_5} = \frac{P5_{e,y} + P4_{e,y}}{2} - y_{gc.eff} = \frac{0 + 1.38}{2} - 14.71 = -14.03mm$$

$$y_{c_6} = \frac{P6_{e,y} + P5_{e,y}}{2} - y_{gc.eff} = 0 - 14.71 = -14.71mm$$

$$y_{c_7} = \frac{P7_{e,y} + P6_{e,y}}{2} - y_{gc.eff} = 0 - 14.71 = -14.71mm$$

$$y_{c_8} = \frac{P8_{e,y} + P7_{e,y}}{2} - y_{gc.eff} = 0 - 14.71 = -14.71mm$$

$$y_{c_9} = \frac{P9_{e,y} + P8_{e,y}}{2} - y_{gc.eff} = \frac{1.38 + 0}{2} - 14.71 = -14.03mm$$

$$y_{c_{10}} = \frac{P10_{e,y} + P9_{e,y}}{2} - y_{gc.eff} = \frac{23.81 + 1.38}{2} - 14.71 = -2.12mm$$

$$y_{c_{11}} = \frac{P11_{e,y} + P10_{e,y}}{2} - y_{gc.eff} = \frac{24.19 + 23.81}{2} - 14.71 = 9.28mm$$

$$y_{c_{12}} = \frac{P12_{e,y} + P11_{e,y}}{2} - y_{gc.eff} = \frac{47 + 24.19}{2} - 14.71 = 20.88mm$$

$$y_{c_{13}} = \frac{P13_{e,y} + P12_{e,y}}{2} - y_{gc.eff} = \frac{47.75 + 47}{2} - 14.71 = 32.66mm$$

$$y_{c_{14}} = \frac{P14_{e,y} + P13_{e,y}}{2} - y_{gc.eff} = \frac{53.36 + 47.75}{2} - 14.71 = 35.84mm$$

4.2 Example of effective characteristics design for a " Z” section

4.2.1 Gross sectional characteristics

- The calculation is according to the presented model above, " Z " type section with the following characteristics:

Step 1.1 : Material characteristics:

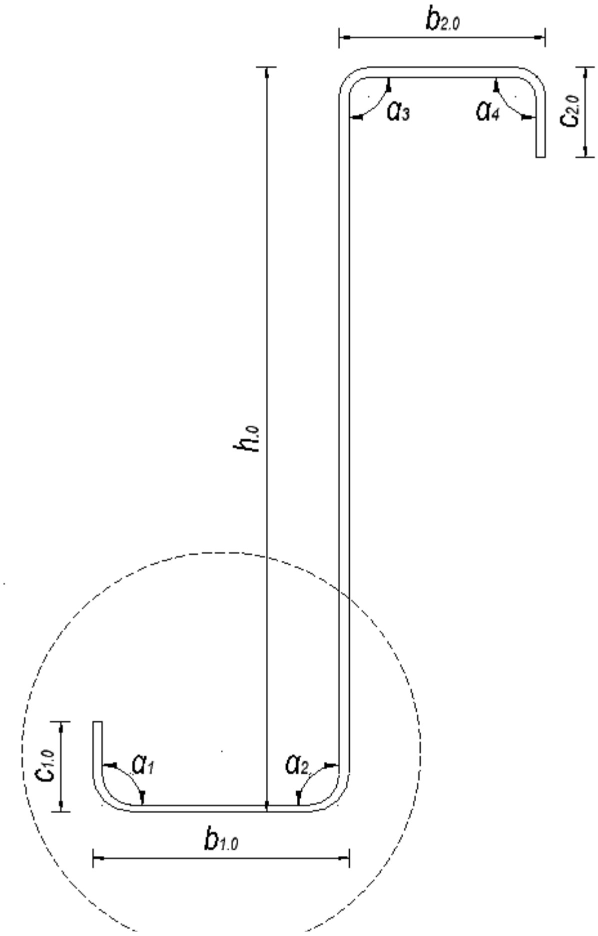
$f_{\text{y.b}} = 350\ N/mm^2$

$\text{E} = 210000\ N/mm^2$

$\text{G} = 80769\ N/mm^2$

$\nu = 0.3$

$\gamma_{M.0} = 1$



Step 1.2 : Geometric characteristics

$t_{nom} = 1.5\ mm$

$\text{t} = 1.42\ mm$

$c_{1,0} = 30\ mm$

$b_{1.0} = 85\ mm$

$h_0 = 300\ mm$

$b_{2,0} = 80\ mm$

$c_{2,0} = 30\ mm$

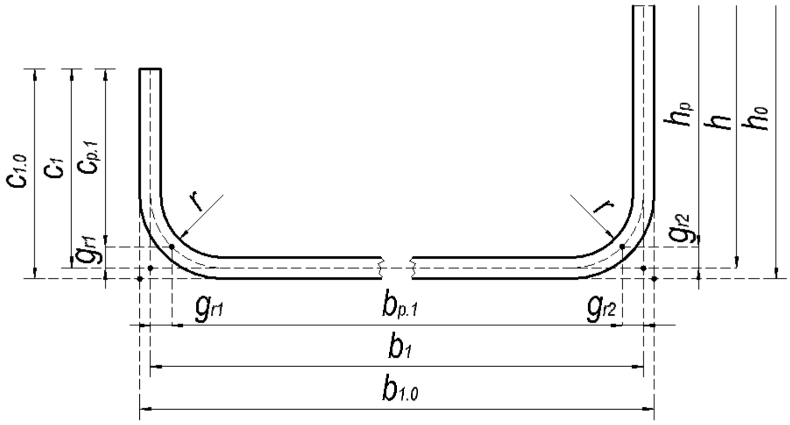
$\alpha_1 = 90°$

$\alpha_2 = 90°$

$\alpha_3 = 90°$

$\alpha_4 = 90°$

$\text{r} = 4\ mm$



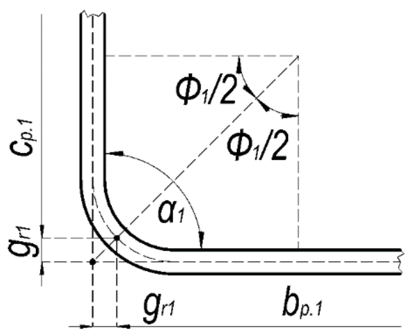
Step 1.3 : Checking the dimensional ratios of the walls

$\frac{\mathrm{b}}{\mathrm{t}} \leq 60$	$\frac{b_{1.0}}{\mathrm{t}} = \frac{85}{1.42} = 59.86 \leq 60$	Check	Table 2.1
	$\frac{b_{2.0}}{\mathrm{t}} = \frac{80}{1.42} = 56.34 \leq 60$	Check	
$\frac{\mathrm{c}}{\mathrm{t}} \leq 50$	$\frac{c_{1.0}}{\mathrm{t}} = \frac{c_{2.0}}{\mathrm{t}} = \frac{30}{1.42} = 21.13 \leq 50$	Check	
$\frac{\mathrm{h}}{\mathrm{t}} \leq 500 \sin \phi$	$\frac{h_0}{\mathrm{t}} = \frac{200}{1.42} = 211.27 \leq 500$	Check	Table 2.1
$0.2 \leq \frac{\mathrm{c}}{\mathrm{b}} \leq 0.6$	$0.2 \leq \frac{c_{1.0}}{b_{1.0}} = \frac{30}{85} = 0.353 \leq 0.6$ $0.2 \leq \frac{c_{2.0}}{b_{2.0}} = \frac{30}{80} = 0.375 \leq 0.6$	Check	Table 2.1
$45° \leq \alpha \leq 135°$	$45° \leq \alpha_1 = \alpha_4 = 90° \leq 135°$	Check	Table 2.1

Step 1.4 : Verification of the size of the radius of curvature *r* for determining the influence on geometric characteristics

$\mathrm{r} \leq 5\mathrm{t}$	$4 \leq 5 \cdot 1.42 = 7.1$	Check	Table 2.2.3
$\mathrm{r} \leq 0.1\mathrm{b_p}$	$4 \leq 0.1 \cdot \min(b_{1.0}, h_0, b_{2.0}) = 0.1 \cdot 80 = 8$	Check	

The gross sectional characteristics can be determined on an idealized section consisting of flat elements with right corners. For a more accurate exposure, in the present example, the length of the walls will be calculated exactly by taking into account the radius of curvature.

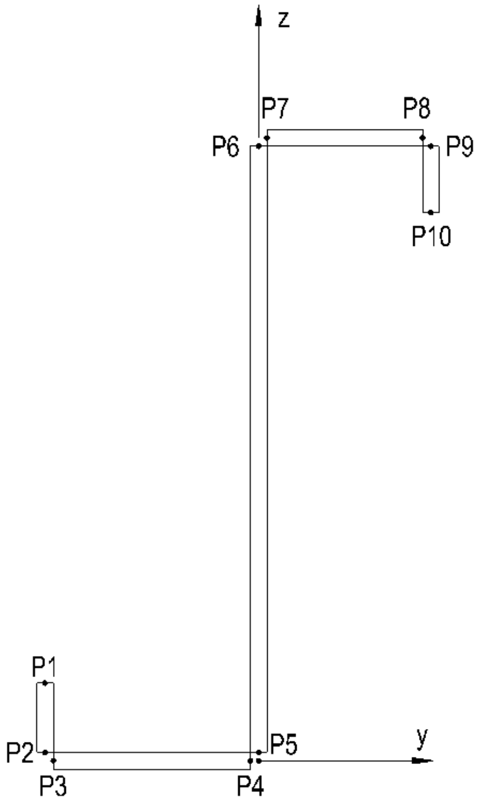


Step 1.5 : Setting the lengths of the walls of the section

Interior walls (b_1, b_2, h)		
$\phi = 180° - \alpha$	$\phi_1 = \phi_4 = 180° - 90° = 90°$ $\phi_2 = \phi_3 = 180° - 90° = 90°$	Figure 2.6
$b = b_0 - tg\left(\frac{\phi_1}{2}\right)\frac{t}{2} - tg\left(\frac{\phi_2}{2}\right)\frac{t}{2}$	$b_1 = 85 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} = 83.58mm$ $b_2 = 80 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} = 78.58mm$ $h = 300 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} - \left(\frac{90°}{2}\right)\frac{1.42}{2} = 298.58mm$	
$g_r = \left(r + \frac{t}{2}\right)\left(tg\left(\frac{\phi}{2}\right) - \sin\left(\frac{\phi}{2}\right)\right)$	$g_{r.1} = g_{r.4} = \left(4 + \frac{1.42}{2}\right)\left(tg\left(\frac{90°}{2}\right) - \sin\left(\frac{90°}{2}\right)\right) = 1.38mm$ $g_{r.2} = g_{r.3} = \left(4 + \frac{1.42}{2}\right)\left(tg\left(\frac{90°}{2}\right) - \sin\left(\frac{90°}{2}\right)\right) = 1.38mm$	
$b_p = b - g_{r.1} - g_{r.2}$	$b_{p.1} = b_1 - g_{r.1} - g_{r.2} = 83.58 - 1.38 - 1.38 = 80.82mm$ $b_{p.2} = b_2 - g_{r.3} - g_{r.4} = 78.58 - 1.38 - 1.38 = 75.82mm$ $h_p = h - g_{r.2} - g_{r.3} = 298.58 - 1.38 - 1.38 = 295.82mm$	
Cantilever walls (c_1, c_2)		
$c = c_0 - tg\left(\frac{\phi_1}{2}\right)\frac{t}{2}$	$c_1 = c_2 = 30 - tg\left(\frac{90°}{2}\right)\frac{1.42}{2} = 29.29$	Figure 2.6
$c_p = c - g_r$	$c_{p.1} = c_{p.2} = 29.29 - 1.38 = 27.91$	

wall/no	wall type	Wall length [mm]	Starting Point	End point
1	exterior	c_{p1}=27.91	P1	P2
2	interior	b_{p1}=80.82	P3	P4
3	interior	h_p=295.82	P5	P6
4	interior	b_{p2}=75.82	P7	P8
5	exterior	c_{p2}=27.91	P9	P10

In order to calculate the sectional characteristics, the relations presented in ANNEX A. To use these relations, it is necessary to compose the idealized section by assigning each node (P1 ...P10) of the global coordinates that define its position in the section plane. For this operation, it is necessary to impose a coordinate Center (y=0,z=0), the position was determined as indicated in the figure below.



- Horizontal coordinates (axis y-y)

$P1_y = -[g_{r.2} + b_{p.1} + g_{r.1} + c_{p.1} \cdot \cos(\phi_1)] = -[1.38 + 80.82 + 1.38 + 27.91 \cdot \cos(90°)] = -83.58 \text{ mm}$

$P2_y = -(g_{r.2} + b_{p.1} + g_{r.1}) = -(1.38 + 80.82 + 1.38) = -83.58 \text{ mm}$

$P3_y = -(g_{r.2} + b_{p.1}) = 1.38 + 80.82 = -82.20 \text{ mm}$

$P4_y = -g_{r.2} = -1.38 \text{ mm}$

$P5_y = 0 \text{ mm}$

$P6_y = 0 \text{ mm}$

$P7_y = g_{r.3} = 1.38 \text{ mm}$

$P8_y = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20 \text{ mm}$

$P9_y = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58 \text{ mm}$

$P10_y = g_{r.3} + b_{p.2} + g_{r.4} + c_{p.2} \cdot \cos(\phi_4) = 1.38 + 75.82 + 1.38 + 27.91 \cdot \cos(90°) = 78.58 \text{ mm}$

- Vertical coordinates (axis z-z)

$P1_z = g_{r.1} + c_{p.1} \cdot \sin(\phi_1) = 1.38 + 27.91 \cdot \sin(90°) = 29.29 \text{mm}$

$P2_z = g_{r.1} = 1.38 \text{ mm}$

$P3_z = 0 \text{ mm}$

$P4_z = 0 \text{ mm}$

$P5_z = g_{r.2} = 1.38 \text{ mm}$

$P6_z = g_{r.2} + h_p = 1.38 + 295.82 = 297.20 \text{ mm}$

$P7_z = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58 \text{ mm}$

$P8_z = P7_z = 298.58 \text{ mm}$

$P9_z = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 195.82 + 1.38 - 1.38 = 297.20 \text{mm}$

$P10_z = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{p.2} \cdot \sin(\phi_4) = 1.38 + 295.82 + 1.38 - 1.38 - 27.91 \cdot \sin(75°) = 269.29 \text{ mm}$

Coordinates of the idealized section [mm]				
Wall	*Starting point*		*End point*	
1	$P1_y$	$P1_z$	$P2_y$	$P2_z$
	-83.58	29.29	- 83.58	1.38
2	$P3_y$	$P3_z$	$P4_y$	$P4_z$
	-82.20	0	-1.38	0
3	$P5_y$	$P5_z$	$P6_y$	$P6_z$
	0	1.38	0	297.20
4	$P7_y$	$P7_z$	$P8_y$	$P8_z$
	1.38	298.58	77.20	298.58
5	$P9_y$	$P9_z$	$P10_y$	$P10_z$
	78.58	297.20	78.58	269.29

Step 1.6 : Characteristics of the raw Section (Annex A)

Portion area of the section

$$dA_i = \overrightarrow{\left[t_\imath \cdot \sqrt{(y_\imath - y_{\imath-1})^2 + (z_\imath - z_{\imath-1})^2}\right]}$$

$$dA_{c1} = \overrightarrow{\left[t \cdot \sqrt{\left(P2_y - P1_y\right)^2 + (P2_z - P1_z)^2}\right]}$$

$$= \overrightarrow{\left[1.42 \cdot \sqrt{[(-83.58) - (-83.58)]^2 + (1.38 - 29.29)^2}\right]} = 39.63\text{mm}^2$$

$$dA_{b1} = \overrightarrow{\left[t \cdot \sqrt{\left(P4_y - P3_y\right)^2 + (P4_z - P3_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{[(-1.38) - (-82.20)]^2 + (0 - 0)^2}\right]}$$

$$= 114.77\text{mm}^2$$

$$dA_h = \overrightarrow{\left[t \cdot \sqrt{\left(P6_y - P5_y\right)^2 + (P6_z - P5_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(0 - 0)^2 + (297.20 - 1.38)^2}\right]}$$

$$= 420.07\text{mm}^2$$

$$dA_{b2} = \overrightarrow{\left[t \cdot \sqrt{\left(P8_y - P7_y\right)^2 + (P8_z - P7_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(77.20 - 1.38)^2 + (298.58 - 298.58)^2}\right]}$$

$$= 107.67\text{mm}^2$$

$$dA_{c2} = \overrightarrow{\left[t \cdot \sqrt{\left(P10_y - P9_y\right)^2 + (P10_z - P9_z)^2}\right]}$$

$$= \overrightarrow{\left[1.42 \cdot \sqrt{(78.58 - 78.58)^2 + (269.29 - 297.20)^2}\right]} = 39.63\text{mm}^2$$

Section area

$$A = \sum_{i=1}^{n} dA_i$$

$$A = dA_{c1} + dA_{b1} + dA_h + dA_{b2} + dA_{c2} = 39.63 + 114.77 + 420.07 + 107.67 + 39.63$$
$$= 721.76\text{mm}^2 = 7.22\text{cm}^2$$

The static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{y0} = \sum_{i=1}^{n} (z_i + z_{i-1}) \cdot \frac{d_{Ai}}{2}$$

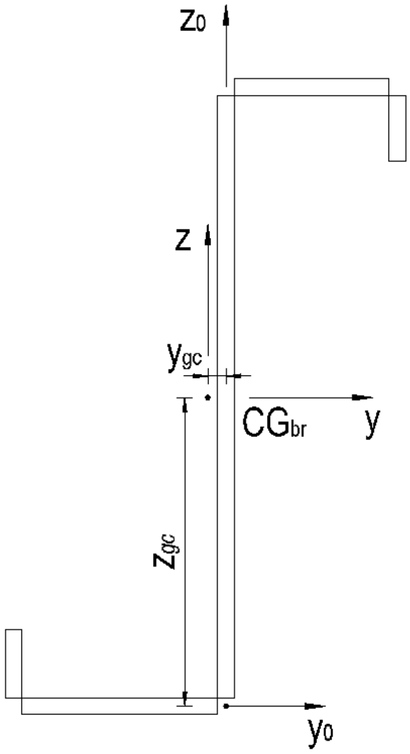
$$z_{gc} = \frac{S_{y0}}{A}$$

$$S_{y0} = (P2_z + P1_z) \cdot \frac{dA_{c1}}{2} + (P4_z + P3_z) \cdot \frac{dA_{b1}}{2} + (P6_z + P5_z) \cdot \frac{dA_h}{2} + (P8_z + P7_z) \cdot \frac{dA_{c2}}{2} + (P10_z + P9_z) \cdot \frac{dA_{b2}}{2}$$

$$S_{y0} = (1.38 + 29.29) \cdot \frac{39.63}{2} + (0 + 0) \cdot \frac{114.77}{2} + (297.20 + 1.38) \cdot \frac{420.07}{2} + (298.58 + 298.58) \cdot \frac{107.67}{2} + (297.20 + 269.29) \cdot \frac{39.63}{2} = 106692\text{mm}^3$$

$$z_{gc} = \frac{106692}{721.76} = 147.82\text{mm}$$

Moment of inertia in ratio to the original y_0 axis and the new Y-axis through the center of gravity



$$I_{y0} = \sum_{i=1}^{n} [(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3}$$

$$I_{y0} = [(P2_z)^2 + (P1_z)^2 + P2_z \cdot P1_z] \cdot \frac{dA_{b1}}{3} + [(P4_z)^2 + (P3_z)^2 + P4_z \cdot P3_z] \cdot \frac{dA_{c1}}{3} + [(P6_z)^2 + (P5_z)^2 + P6_z \cdot P5_z] \cdot \frac{dA_h}{3} + [(P8_z)^2 + (P7_z)^2 + P8_z \cdot P7_z] \cdot \frac{dA_{b2}}{3} + [(P10_z)^2 + (P9_z)^2 + P10_z \cdot P9_z] \cdot \frac{dA_{c2}}{3}$$

$$I_{y0} = [(1.38)^2 + (29.29)^2 + 1.38 \cdot 29.29] \cdot \frac{39.63}{3} + 0 + [(297.20)^2 + (1.38)^2 + 297.20 \cdot 1.38] \cdot \frac{420.07}{3} + [(298.58)^2 + (298.58)^2 + 298.58 \cdot 298.58] \cdot \frac{107.67}{3} + [(269.29)^2 + (297.20)^2 + 269.29 \cdot 297.20] \cdot \frac{39.63}{3} = 25218076\text{mm}^4$$

$$I_y = I_{y0} - A \cdot z_{gc}^2$$

$$I_y = 25218076 - 721.76 \cdot 147.82^2 = 9446707\text{mm}^4$$

The Static moment in ratio to the z-axis and the coordinate of the center of gravity

$$S_{z0} = \sum_{i=1}^{n} (y_i + y_{i-1}) \cdot \frac{d_{Ai}}{2}$$

$$y_{gc} = \frac{S_{z0}}{A}$$

$$S_{z0} = (P2_y + P1_y) \cdot \frac{dA_{c1}}{2} + \left(P4_y + P3_y\right) \cdot \frac{dA_{b1}}{2} + \left(P6_y + P5_y\right) \cdot \frac{dA_h}{2} + \left(P8_y + P7_y\right) \cdot \frac{dA_{c2}}{2} + \left(P10_y + P9_y\right) \cdot \frac{dA_{b2}}{2}$$

$$S_{z0} = [(-83.58) + (-83.58)] \cdot \frac{39.63}{2} + [(-1.38) + (-82.20)] \cdot \frac{114.77}{2} + 0 + (77.20 + 1.38) \cdot \frac{107.67}{2} + (78.58 + 78.58) \cdot \frac{39.63}{2} = -764.04\text{mm}^3$$

$$y_{gc} = \frac{-764.04}{721.76} = -1.06\text{mm}$$

Moment of inertia in ratio to the original z_0 axis and the new z-axis through the center of gravity

$$I_{z0} = \sum_{i=1}^{n} [(y_i)^2 + (y_{i-1})^2 + y_i \cdot (y_{i-1})] \cdot \frac{d_{Ai}}{3}$$

$$I_{z0} = \left[\left(P2_y\right)^2 + \left(P1_y\right)^2 + P2_y \cdot P1_y\right] \cdot \frac{dA_{b1}}{3} + \left[\left(P4_y\right)^2 + \left(P3_y\right)^2 + P4_y \cdot P3_y\right] \cdot \frac{dA_{c1}}{3} + \left[\left(P6_y\right)^2 + \left(P5_y\right)^2 + P6_y \cdot P5_y\right] \cdot \frac{dA_h}{3} + \left[\left(P8_y\right)^2 + \left(P7_y\right)^2 + P8_y \cdot P7_y\right] \cdot \frac{dA_{b2}}{3} + \left[\left(P10_y\right)^2 + \left(P9_y\right)^2 + P10_y \cdot P9_y\right] \cdot \frac{dA_{c2}}{3}$$

$$I_{z0} = [(-83.58)^2 + (-83.58)^2 + (-83.58) \cdot (-83.58)] \cdot \frac{39.63}{3} + [(-1.38)^2 + (-82.20)^2 + (-1.38) \cdot (-82.20)] \cdot \frac{114.77}{3} + 0 + [(77.20)^2 + (1.38)^2 + 77.20 \cdot 1.38] \cdot \frac{107.67}{3} + [(78.58)^2 + (78.58)^2 + 78.58 \cdot 78.58] \cdot \frac{39.63}{3} = 1002267\text{mm}^4$$

$$I_z = I_{z0} - A \cdot y_{gc}^2$$

$$I_z = 1002267 - 721.76 \cdot (-1.06)^2 = 1001458\text{mm}^4$$

Centrifugal moment of inertia in ratio to the y_0 and z_0 and the new axes through the center of gravity

$$I_{yz0} = \sum_{i=1}^{n} (2 \cdot y_{i-1} \cdot z_{i-1} + 2 \cdot y_i \cdot z_i + y_{i-1} \cdot z_i + y_i \cdot z_{i-1}) \cdot \frac{dA_i}{6}$$

$$I_{yz0} = (2 \cdot P1_y \cdot P1_z + 2 \cdot P2_y \cdot P2_z + P1_y \cdot P2_z + P1_z + P2_y) \frac{dA_{c1}}{6} + (2 \cdot P3_y \cdot P3_z + 2 \cdot P4_y \cdot P4_z + P3_y \cdot P4_z + P4_y \cdot P3_z) \cdot \frac{dA_{b1}}{6} + (2 \cdot P5_y \cdot P5_z + 2 \cdot P6_y \cdot P6_z + P5_y \cdot P6_z + P6_y \cdot P5_z) \cdot \frac{dA_h}{6} + [2 \cdot P7_y \cdot P7_z + 2 \cdot P8_y \cdot P8_z + P7_y \cdot P8_z + P8_y \cdot P7_z) \cdot \frac{dA_{b2}}{6} + (2 \cdot P9_y \cdot P9_z + 2 \cdot P10_y \cdot P10_z + P9_y \cdot P10_z + P10_y \cdot P9_z) \cdot \frac{dA_{c2}}{6}$$

$$I_{yz0} = [2 \cdot (-83.58) \cdot 29.29 + 2 \cdot (-83.58) \cdot 1.38 + (-83.58) \cdot 1.38 + (-83.58) \cdot 29.29] \cdot \frac{39.63}{6} + 0 + 0 + (2 \cdot 1.38 \cdot 298.58 + 2 \cdot 77.20 \cdot 298.58 + 1.38 \cdot 298.58 + 77.20 \cdot 298.58) \cdot \frac{107.67}{6} + (2 \cdot 78.58 \cdot 297.20 + 2 \cdot 78.58 \cdot 269.29 + 78.58 \cdot 269.29 + 78.58 \cdot 297.20) \cdot \frac{39.63}{6} = 2094377 mm^4$$

$$I_{yz} = I_{yz0} - \frac{S_{y0} \cdot S_{z0}}{A}$$

$$I_{yz} = 2094377 - \frac{106692 \cdot (-764.04)}{721.76} = 2207318 mm^4$$

Radius of gravity

$$i_y = \sqrt{\frac{I_y}{A}} = \sqrt{\frac{9446707}{721.76}} = 114,4mm$$

$$i_z = \sqrt{\frac{I_z}{A}} = \sqrt{\frac{1001458}{721.76}} = 37,25mm$$

Resistance module

Resistance mode in ratio to Axis y-y

$$z_{max} = \max\left(z_{gc}, (h_0 - t) - z_{gc}\right)$$

$$z_{max} = \max(147.82, (300 - 1.42) - 147.82) = \max(147.82\ , 150.76) = \ \ 150.76mm$$

$$z_{min} = \min(147.82\ , 150.76) = 147.82mm$$

$$W_{y.min} = \frac{I_y}{z_{max}} = \frac{9446707}{150,76} = 626661mm^3$$

$$W_{y.max} = \frac{I_y}{z_{min}} = \frac{9446707}{147.82} = 63907mm^3$$

- Resistance module in ratio to Axis z-z

$$y_{max} = \max\left(b_1 + \cos(\phi_1) \cdot c_{1.0} + y_{gc}\ , b_2 + \cos(\phi_4) \cdot c_{2.0} - y_{gc}\right)$$

$$y_{max.0} = \max\left((b_1 + \cos(\phi_1) \cdot c_{1.0} - t), (b_2 + \cos(\phi_4) \cdot c_{2.0} - t)\right)$$

$$y_{max.0} = \max\left((83.58 + \cos(90°) \cdot 29.29 - 1.42), (78.58 + \cos(90°) \cdot 29.29 - 1.42)\right) = \max(82.16, 77.16) = 82.16\ mm$$

$$y_{max} = \max\left(83.58 + \cos(90°) \cdot 29.29 + (-1.06), 78.58 + \cos(90°) \cdot 29.29 - (-1.06)\right) = \max(82.52, 79,64) = 82.52\ mm$$

$$y_{min} = \min(82.52, 79{,}64) = 79{,}64 \text{ mm}$$

$$W_{z.min} = \frac{I_z}{y_{max}} = \frac{1001458}{82.52} = 12136\text{mm}^3$$

$$W_{z.max} = \frac{I_z}{y_{min}} = \frac{1001458}{79.64} = 12574.8\text{mm}^3$$

4.2.2 Effective sectional characteristics

The calculation of the effective section is determined taking into account both modes of sectional buckling: local buckling and distortion buckling.

Step 2.1 : Wall panels are sensitive to instability phenomena subjected to compression. To simplify the calculation procedure presented, we will consider, as in the case of Section "C" presented above, two types of pure stress: centric compression and pure monoaxial bending.

4.2.2.1 Z section subjected for centric compression

Step 2.2 : In this step, walls panels subjected to compression are determined

Classification of walls:

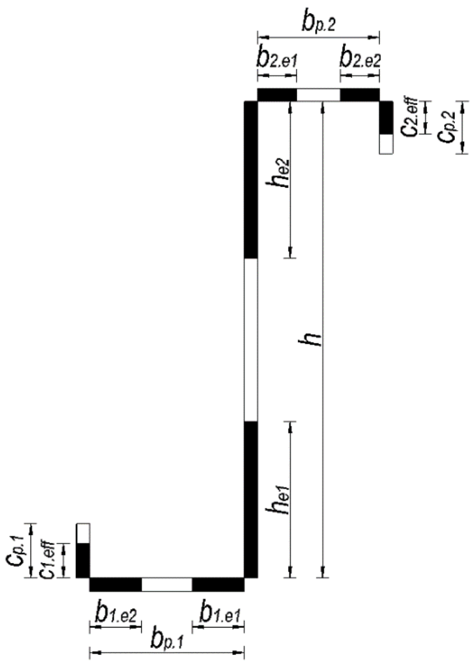
Flange 1 : b_1 : interior wall

c_1 : cantilever wall

Flange 2 : b_2 : interior wall

c_2 : cantilever wall

Web : h : interior wall



Step 2.3 : The wall panel buckling effect can be determined by using the procedure shown in scheme "A". For each of the component walls of the flanges (b1, b2, c1, c2) the calculation procedure from the scheme " A".

Step A.1 : The characteristics of the Steel take over from the step 1.1

Step A.2 : The type of wall will be considered as determined in step

Step A.3 : Since the section is centrical compression, for both interior and cantilevered walls, stress is considered $\sigma_1 = \sigma_2 \Rightarrow \psi = \frac{\sigma_2}{\sigma_1} = 1$

Step A.4-A.6 : Calculation of the coefficients k_σ , $\bar{\lambda}_p$, ρ

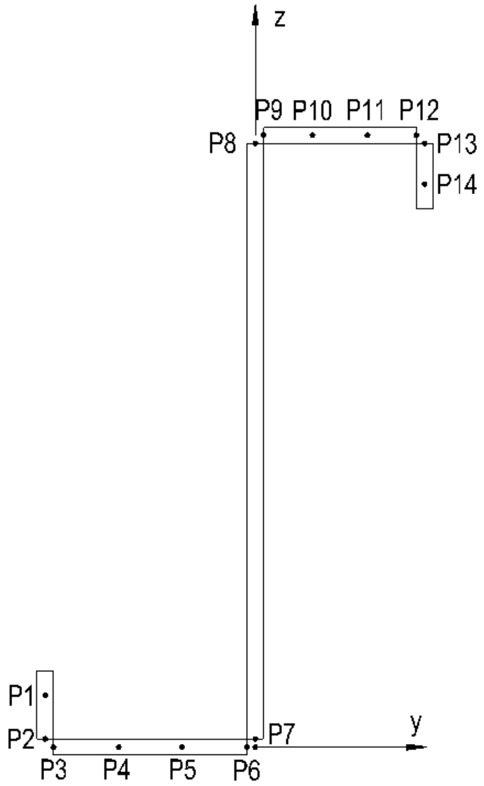
Step A.7 : Determination of effective width

Interior walls (b_1, b_2,), Scheme **Step A.1-A.7**		
Inferior flange (b_1)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.1}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{80.82}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 1.23$ For $\overline{\lambda_p} = 1.23 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{1.23 - 0.055(3+1)}{1.23^2} = 0.667$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p1} = 80.82$ mm $b_{1.eff} = b_{p1} \cdot \rho = 80.82 \cdot 0.667 = 53.90$ mm $b_{1.e1} = b_{1.e2} = 0.5 \cdot b_{1.eff} = 0.5 \cdot 53.90 = 26.95$mm	Table 3.3 Scheme – Step A.7a
Superior flange (b_2)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{75.82}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 1.16$ For $\overline{\lambda_p} = 1.16 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{1.16 - 0.055(3+1)}{1.16^2} = 0.701$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p2} = 75.82$ mm $b_{2.eff} = b_{p2} \cdot \rho = 75.82 \cdot 0.701 = 53.13$ mm $b_{2.e1} = b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 53.13 = 26.56$ mm	Table 3.3 Scheme – Step A.7a

Cantilever walls (c_1, c_2) , Scheme **Step A.1-A.7**		
Inferior flange stiffening (c_1)	$\frac{c_{p.1} \cdot \sin\alpha_1}{b_{p.1}} = \frac{27.91 \cdot \sin(90°)}{80.82} = 0.345$ For $0.35 < c_{p.1}/b_{p.1} \le 0.65$ $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.1} \cdot \sin\alpha_1}{b_{p.1}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.345 - 0.35)^2} = 0.500$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.1}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{27.91}{1.42}}{28.4 \cdot 0.814\sqrt{0.500}} = 1.203$ For $\overline{\lambda_p} = 1.203 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\overline{\lambda}_p^2} = \frac{1.203 - 0.188}{1.203^2} = 0.701$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p1} = 27.91\ \text{mm}$ $c_{1.eff} = c_{p1} \cdot \rho = 27.91 \cdot 0.701 = 19.58\ \text{mm}$	Table 3.4 Scheme – Step A.7b
Superior flange stiffening (c_2)	$\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} = \frac{27.91 \cdot \sin(90°)}{75.82} = 0.368$ For $0.35 < c_{p.2}/b_{p.2} \le 0.65$ $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.368 - 0.35)^2} = 0.557$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{27.91}{1.42}}{28.4 \cdot 0.814\sqrt{0.557}} = 1.140$ For $\overline{\lambda_p} = 1.140 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\overline{\lambda}_p^2} = \frac{1.140 - 0.188}{1.140^2} = 0.733$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p2} = 27.91\ \text{mm}$ $c_{2.eff} = c_{p2} \cdot \rho = 27.91 \cdot 0.733 = 20.45\ \text{mm}$	Table 3.4 Scheme – Step A.7b

Following this calculation process: for the wall panels related to the flanges, effective widths were obtained with the distribution of the location according to the indications in Table 3.3 and Table 3.4.

The partitioning of the flanges makes it necessary to introduce additional nodes, as shown in the figure, obtaining a section consisting of an increased number of segments, for which the coordinates of the newly introduced points (P4, P5, P10, P11) will be determined and the coordinates of the endpoints (P1, P14)



Point Coordinates:

- Horizontal coordinates (axis y-y)

$$P1_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} + c_{1eff} \cdot \cos(\phi_1) = -[1.38 + 80.82 + 1.38 + 19.58 \cdot \cos(90°)] = -83.58\ \text{mm}$$

$$P2_{e.y} = g_{r.2} + b_{p.1} + g_{r.1} = -(1.38 + 80.82 + 1.38) = -83.58\ \text{mm}$$

$$P3_{e.y} = g_{r.2} + b_{p.1} = -(1.38 + 80.82) = -82.20\text{mm}$$

$$P4_{e.y} = g_{r.2} + b_{p.1} - b_{1.e2} = -(1.38 + 80.82 - 26.95) = -55.25\text{mm}$$

$$P5_{e.y} = g_{r.2} + b_{1.e1} = -(1.38 + 26.95) = -28.33\text{mm}$$

$$P6_{e.y} = g_{r.2} = -1.38\ \text{mm}$$

$$P7_{e.y} = 0\ \text{mm}$$

$$P8_{e.y} = 0\ \text{mm}$$

$$P9_{e.y} = g_{r.3} = -1.38\ \text{mm}$$

$$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 26.56 = 27.94\text{mm}$$

$$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 75.82 - 26.56 = 50.64\text{mm}$$

$$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20\text{mm}$$

$$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58\text{mm}$$

$$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 75.82 + 1.38 + 20.45 \cdot \cos(90°) = 78.58\ \text{mm}$$

- Vertical coordinates (axis z-z)

$$P1_{e.z} = g_{r.1} + c_{1eff} \cdot \sin(\phi_1) = 1.38 + 19.58 \cdot \sin(90°) = 20.95\text{mm}$$

$$P2_{e.z} = g_{r.1} = 1.38\text{mm}$$

$$P3_{e.z} = 0\ \text{mm}$$

$$P4_{e.z} = 0\ \text{mm}$$

$$P5_{e.z} = 0\ \text{mm}$$

$$P6_{e.z} = 0\ \text{mm}$$

$$P7_{e.z} = g_{r.2} = 1.38\ \text{mm}$$

$$P8_{e.z} = g_{r.2} + h_p = 1.38 + 295.82 = 297.20\ \text{mm}$$

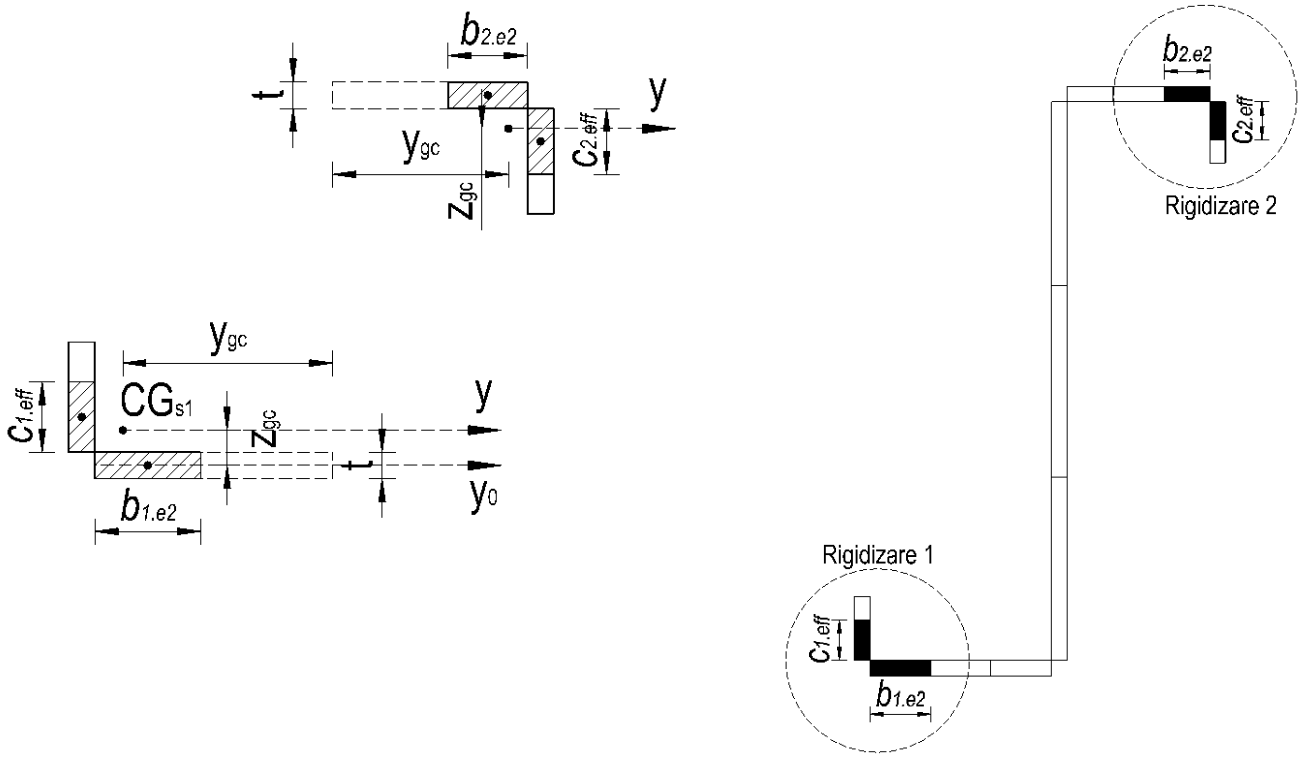
$$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58\ \text{mm}$$

$$P10_{e.z} = P13_z = P14_z = P11_z = 298.58\ \text{mm}$$

$$P11_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 295.82 + 1.38 - 1.38 = 297.20\ \text{mm}$$

$$P12_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$$
$$= 1.38 + 295.82 + 1.38 - 1.38 - 20.45 \cdot \sin(75°) = 276.75 \text{ mm}$$

Step 3.1 : At this step, the calculation associated with the distortion buckling is designed at the level of the flanges. The calculation methodology is carried out according to scheme " B " and applied to the stiffening portions in compression. In the case of the centric section in compression, the calculation according to scheme "B" was classified for the two stiffeners related to the two flanges.



Step B.1 : This step indicates the need to precalculate the effective dimensions of the flange portions, determined in the previous stages.

Step B.2-B.6 : The calculation for the first iteration is determined:

Iteration 1, Scheme **Step B.2-B.6**	
• **Stiffeners area** ○ *Stiffener 1* $A_{s1} = (b_{1.e2} + c_{1.eff})t = (26.95 + 19.58) \cdot 1.42 = 66.07 \text{ mm}^2$ ○ *Stiffener 2* $A_{s2} = (b_{2.e2} + c_{2.eff})t = (26.56 + 20.45) \cdot 1.42 = 66.76 \text{ mm}^2$	Rel. (3.17) Scheme – Step B.2

- **Centers of gravity**
  - *Stiffener 1*

$$dA_{c1,eff} = \left[\overrightarrow{1.42 \cdot \sqrt{[(-83.58) - (-83.58)]^2 + (1.38 - 20.95)^2}}\right] = 27.80mm^2$$

$$dA_{b1,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}}\right]$$

$$dA_{b1,e2} = \left[\overrightarrow{1.42 \cdot \sqrt{[(-55.25) - (-82.20)]^2 + (0 - 0)^2}}\right] = 38.27mm^2$$

$$S_{y0,1} = \left(P2_{e,z} + P1_{e,z}\right) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,z} + P3_{e,z}\right) \cdot \frac{dA_{b1,e2}}{2}$$
$$= (1.38 + 20.95) \cdot \frac{27.80}{2} + (0 + 0) \cdot \frac{38.27}{2} = 310.42mm^3$$

$$z_{gc,1} = \frac{310.42}{66.07} = 4.70mm$$

$$S_{z0,1} = \left(P2_{e,y} + P1_{e,y}\right) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1,e2}}{2}$$
$$= [(-83.58) + (-83.58)] \cdot \frac{27.80}{2} + [(-55.25) + (-82.20)] \cdot \frac{38.27}{2}$$
$$= -4953.36mm^3$$

$$y_{gc,1} = \frac{-4953.36}{66.07} = -74.98mm$$

  - *Stiffeners 2*

$$dA_{c2,eff} = \left[\overrightarrow{t \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}}\right]$$

$$dA_{c2,eff} = \left[\overrightarrow{1.42 \cdot \sqrt{(78.58 - 78.58)^2 + (276.75 - 297.20)^2}}\right] = 29.04mm^2$$

$$dA_{b2,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}}\right]$$

$$dA_{b2,e2} = \left[\overrightarrow{1.42 \cdot \sqrt{(77.20 - 50.64)^2 + (298.58 - 298.58)^2}}\right] = 37.72mm^2$$

$$S_{y0,2} = \left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{c2,eff}}{2} + \left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2,e2}}{2}$$
$$= (276.75 + 297.20) \cdot \frac{29.04}{2} + (298.58 + 298.58) \cdot \frac{37.72}{2}$$
$$= 19597mm^3$$

$$z_{gc,2} = \frac{19597}{66.76} = 293.53mm$$

$$S_{z0,2} = \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{c2,eff}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2,e2}}{2}$$
$$= (78.58 + 78.58) \cdot \frac{29.04}{2} + (77.20 + 50.64) \cdot \frac{37.72}{2}$$
$$= 4693.20mm^3$$

$$y_{gc,2} = \frac{4693.20}{66.76} = 70.30mm$$

• **Moments of inertia in ratio to the axis y-y** ◦ *Stiffeners 1* Stiffener 1 is composed of two segments bounded by the points : $(P1_e - P2_e)$ and $(P3_e - P4_e)$ $I_{s1.y} = I_{s1.y0} - A_{s1} \cdot z_{gc,1}^2$ $I_{s1.y0}$ - the moment of inertia calculated in ratio to the axis y_0-y_0 $I_{s1.y0} = \sum_{i=1}^{n}[(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3}$ $I_{s1.y0} = \left(P2_{e,z}^2 + P1_{e,z}^2 + P2_{e,z} \cdot P1_{e,z}\right)\frac{dA_{c1,eff}}{3} + \left(P4_{e,z}^2 + P3_{e,z}^2 + P4_{e,z} \cdot P3_{e,z}\right)\frac{dA_{b1,e2}}{3}$ $I_{s1.y0} = (1.38^2 + 20.95^2 + 1.38 \cdot 20.95)\frac{27.80}{3} + 0 = 4354.11 mm^4$ $I_{s1.y} = 4354.11 - 66.07 \cdot 4.70^2 = 2895.62\ mm^4$ ◦ *Stiffener 2* Stiffener 2 is composed of two segments bounded by the points: $(P11_e - P12_e)$ and $(P13_e - P14_e)$ $I_{s2.y} = I_{s2.y0} - A_{s2} \cdot z_{gc,2}^2$ $I_{s2.y0}$ - the moment of inertia calculated in ratio to the axis y_0-y_0 $I_{s2.y0} = \sum_{i=1}^{n}[(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3}$ $I_{s2.y0} = \left(P14_{e,z}^2 + P13_{e,z}^2 + P14_{e,z} \cdot P13_{e,z}\right)\frac{dA_{c2,eff}}{3} + \left(P12_{e,z}^2 + P11_{e,z}^2 + P12_{e,z} \cdot P11_{e,z}\right)\frac{dA_{b2,e2}}{3}$ $I_{s2.y0} = (276.75^2 + 297.20^2 + 276.75 \cdot 297.20)\frac{29.04}{3} + (298.58^2 + 298.58^2 + 298.58 \cdot 298.58)\frac{37.72}{3} = 5755572 mm^4$ $I_{s2.y} = 5755572 - 66.76 \cdot 293.53^2 = 3222.49\ mm^4$	ANNEX A, Scheme – Step B2

• **Stiffness in the rotation of the flanges** ○ *Stiffener 1* $k_{f1}=\frac{A_{s2}}{A_{s1}}=\frac{66.76}{66.07}=1.011$ $K_1=\frac{E\cdot t^3}{4(1-\nu^2)}\cdot\frac{1}{b_1^2\cdot h_w+b_1^3+0.5\cdot b_1\cdot b_2\cdot h_w\cdot k_{f1}}$ $K_1=\frac{E\cdot t^3}{4(1-\nu^2)}\cdot\frac{1}{y_{gc,1}^2\cdot h+y_{gc,1}^3+0.5\cdot y_{gc,1}\cdot y_{gc,2}\cdot h\cdot k_{f1}}$ $K_1=\frac{210000\cdot 1.42^3}{4(1-0.3^2)}\cdot\frac{1}{(-74.98)^2\cdot 298.58+(-74.98)^3+0.5\cdot(-74.98)\cdot 70.30\cdot 298.58\cdot 1.011}=0.358$ ○ *Stiffener 2* $k_{f2}=\frac{A_{s1}}{A_{s2}}=\frac{66.07}{66.76}=0.990$ $K_2=\frac{E\cdot t^3}{4(1-\nu^2)}\cdot\frac{1}{y_{gc,2}^2\cdot h+y_{gc,2}^3+0.5\cdot y_{gc,2}\cdot y_{gc,1}\cdot h\cdot k_{f2}}$ $K_2=\frac{210000\cdot 1.42^3}{4(1-0.3^2)}\cdot\frac{1}{70.30^2\cdot 298.58+70.30^3+0.5\cdot 70.30\cdot(-74.98)\cdot 298.58\cdot 0.990}=0.158$	Rel.(3.20), Scheme – Step B3
• **Critical stress of elastic buckling** ○ *Stiffener 1* $\sigma_{cr.s1}=\frac{2\sqrt{K_1\cdot E\cdot I_{s1}}}{A_{s1}}=\frac{2\sqrt{0.358\cdot 210000\cdot 2895.62}}{66.07}=446.46\ N/mm^2$ ○ *Stiffener 2* $\sigma_{cr.s2}=\frac{2\sqrt{K_2\cdot E\cdot I_{s2}}}{A_{s2}}=\frac{2\sqrt{0.158\cdot 210000\cdot 3222.49}}{61.42}=309.95\ N/mm^2$	Rel. (3.16), Scheme – Step B4

• **Slenderness and reduction coefficient for distorsion buckling** ○ *Stiffener 1* $\overline{\lambda_{d.1}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s1}}} = \sqrt{\frac{355}{446.46}} = 0.892$ For $0.65 < \overline{\lambda_{d1}} < 1.38 \implies$ $\chi_{d.1} = 1.47 - 0.723 \cdot \overline{\lambda_{d1}} = 1.47 - 0.723 \cdot 0.892 = 0.825$ ○ *Stiffener 2* $\overline{\lambda_{d.2}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s2}}} = \sqrt{\frac{355}{309.95}} = 1.17$ For $0.65 < \overline{\lambda_{d2}} < 1.38 \implies$ $\chi_{d.2} = 1.47 - 0.723 \cdot \overline{\lambda_{d2}} = 1.47 - 0.723 \cdot 1.17 = 0.696$	Rel. (3.15) Scheme – Step B.5 Rel.(3.12), Rel.(3.13), Rel.(3.14), Scheme – Step B.6

Step B.7-B.10 : Based on the values of the reduction factors are determined $\overline{\lambda_{p.red}}$ and recalculate a new iteration og the effective widths of the stiffeners using the calculation scheme „A". The iterative procedure is repeated until the conditions presented in the Step B.7 are met.

Iteration 2, Scheme **Step B.7**		
Interior walls (b_1, b_2)		
Inferior flange (b_1)	$\overline{\lambda_p} = 1.23$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.1}} = 1.23 \cdot \sqrt{0.825} = 1.12$ For $\overline{\lambda_p} = 1.12 > 0.673 =>$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{1.12 - 0.055(3+1)}{1.12^2} = 0.718 \leq 1$	Rel. (3.8) Scheme – Steps, B.8, B.9
	$b_{p1} = 80.82$ mm $b_{1.eff} = b_{p1} \cdot \rho = 80.82 \cdot 0.718 = 58.03$ mm $b_{1.e2} = 0.5 \cdot b_{1.eff} = 0.5 \cdot 58.03 = 29.02$ mm	Scheme - Step B.10
Superior flange (b_2)	$\overline{\lambda_p} = 1.16$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 1.16 \cdot \sqrt{0.696} = 0.964$ For $\overline{\lambda_p} = 0.964 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{0.964 - 0.055(3+1)}{0.964^2} = 0.801 \leq 1$	Rel. (3.8) Scheme – Steps, B.8, B.9
	$b_{p2} = 75.82$ mm $b_{2.eff} = b_{p2} \cdot \rho = 75.82 \cdot 0.801 = 60.70$ mm $b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 60.70 = 30.35$ mm	Scheme – Step B.10

Cantilever walls (c_1, c_2)		
Inferior flange stiffening	$\overline{\lambda_p} = 1.20$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.1}} = 1.20 \cdot \sqrt{0.825} = 1.09$ For $\overline{\lambda_p} = 1.09 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{1.09 - 0.055(3+1)}{1.09^2} = 0.758 \leq 1$	Rel. (3.8) Scheme – Steps, B.8, B.9
	$c_{p1} = 27.91$ mm $c_{1.eff} = c_{p1} \cdot \rho = 27.91 \cdot 0.758 = 21.15$ mm	Scheme - Step B.10
Superior flange stiffening	$\overline{\lambda_p} = 1.14$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 1.14 \cdot \sqrt{0.696} = 0.951$ For $\overline{\lambda_p} = 0.951 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{0.951 - 0.055(3+1)}{0.951^2} = 0.844 \leq 1$	Rel. 3.8 Scheme – Step B.9
	$c_{p2} = 27.91$ mm $c_{2.eff} = c_{p2} \cdot \rho = 27.91 \cdot 0.844 = 23.55$ mm	Scheme - Step B.10

Step B.11 : At the end of the last iteration, we obtained the new effective widths of the portions related to the stiffening. The obtained values obtained are centralized in a table for each iteration.

Stiffener 1														
Iter.	χ_d	Flange				Rebord				Stiffening characteristics				
		λ_p	$\lambda_{p,red}$	ρ	$b_{1,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,1}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	1.23	-	0.667	26.95	1.20	-	0.701	19.58	66.07	0.358	2895.62	446.46	0.825
2	0.825	1.23	1.12	0.718	29.02	1.20	1.09	0.758	21.15	71.23	0.399	3600.20	487.59	0.853
3	0.853	1.23	1.14	0.709	28.65	1.20	1.11	0.748	20.87	70.32	0.399	3468.82	484.85	0.851
4	0.851	1.23	1.14	0.710	28.68	1.20	1.11	0.748	20.89	70.38	0.399	3476.78	485.32	0.852
5	0.852	1.23	1.14	0.710	28.67	1.20	1.11	0.748	20.88	70.37	0.399	3475.40	485.29	0.852

Stiffener 2														
Iter.	χ_d	Flange				Rebord				Stiffening characteristics				
		λ_p	$\lambda_{p,red}$	ρ	$b_{2,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,2}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	1.16	-	0.701	26.56	1.14	-	0.733	20.45	66.76	0.158	3222.49	309.95	0.696
2	0.696	1.16	0.964	0.801	30.35	1.14	0.951	0.844	23.55	76.54	0.158	4803.88	329.42	0.719
3	0.719	1.16	0.980	0.791	30.00	1.14	0.967	0.833	23.26	75.63	0.157	4637.85	326.95	0.717
4	0.717	1.16	0.978	0.792	30.04	1.14	0.965	0.835	23.29	75.74	0.157	4657.55	327.17	0.717

- **Step B.12 :** The thickness of the effective portions of the stiffeners is reduced due to the effect of distortion buckling:
  - *Stiffening 1*

$\chi_{d.1,final} = \min(\chi_{d.1.1}, \chi_{d.1.2}, \chi_{d.1.3}, \chi_{d.1.4}, \chi_{d.1.5}) = 0.825$

$t_{red.s1} = \chi_{d.1,final} \cdot t = 0.825 \cdot 1.42 = 1.17\ mm$

  - *Stiffening 2*

$\chi_{d.2,final} = \min(\chi_{d.2.1}, \chi_{d.2.2}, \chi_{d.2.3}, \chi_{d.2.4}) = 0.696$

$t_{red.s2} = \chi_{d.2,final} \cdot t = 0.696 \cdot 1.42 = 0.989\ mm$

The final effective dimensions of the flanges obtained by the calculation of buckling by veiling and distortion are centralized in the following table:

	$c_{1.eff}$ [mm]	$b_{1.e2}$ [mm]	$b_{1.e1}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	20.88	28.67	26.95	26.56	30.04	23.29
thickness t	1.17	1.17	1.42	1.42	0.989	0.989

Step 4.1 : The effective width of the web due to local buckling is determined by the calculation methodology presented in the scheme „A" (Figure 4.2).

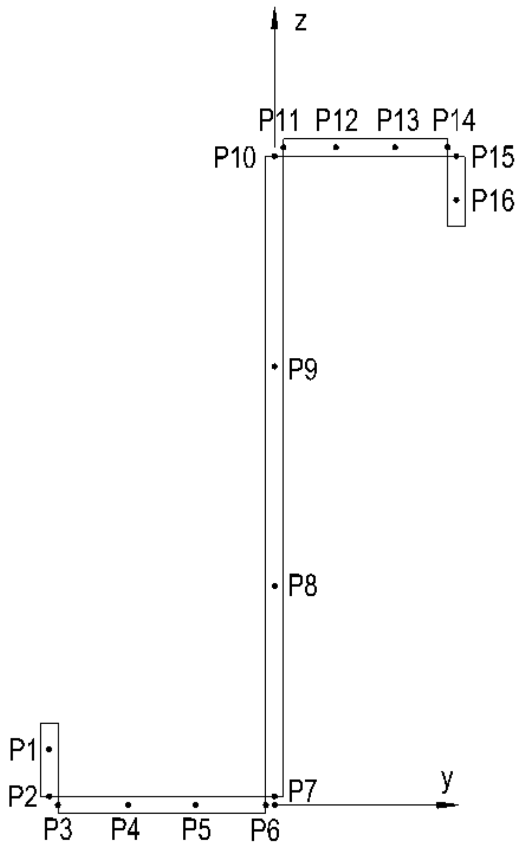
Interior wall h, , Scheme **Step A.1-A.7**		
Web (h)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{h_p}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{295.82}{1.42}}{28.4 \cdot 0.81\sqrt{4}} = 4.51$ For $\overline{\lambda_p} = 4.51 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\bar{\lambda}_p^2} = \frac{4.51 - 0.055(3+1)}{4.51^2} = 0.211$	Rel. (3.7) Schems – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$h_p = 295.82\ mm$ $h_{eff} = h_p \cdot \rho = 295.82 \cdot 0.211 = 62.42\ mm$ $h_{e1} = h_{e2} = 0.5 \cdot h_{eff} = 0.5 \cdot 62.42 = 31.21\ mm$	Table 3.3 Scheme – Step A.7a

The final effective dimensions of all the component walls of the section, obtained by the calculation of buckling by veiling and distortion are centralized in the following table:

	$c_{1.eff}$ [mm]	$b_{1.e2}$ [mm]	$b_{1.e1}$ [mm]	$h_{.e1}$ [mm]	$h_{.e2}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	20.88	28.67	26.95	31.21	31.21	26.56	30.04	23.29
thickness t	1.17	1.17	1.42	1.42	1.42	1.42	0.989	0.989

Step 5.1 : In the final step, the physicomechanical characteristics of the effective section are calculated using the relations shown in Annex A. for the application of the relations, coordinates are assigned to the nodes of the section.

- **Horizontal coordinates** (axis y-y)



$$P1_{e.y} = -\left[g_{r.2} + b_{p.1} + g_{r.1} + c_{1eff} \cdot \cos(\phi_1)\right] = -[1.38 + 80.82 + 1.38 + 20.88 \cdot \cos(90°)] = -83.58 \text{ mm}$$

$$P2_{e.y} = -\left(g_{r.2} + b_{p.1} + g_{r.1}\right) = -(1.38 + 80.82 + 1.38) = -83.58 \text{ mm}$$

$$P3_{e.y} = -\left(g_{r.2} + b_{p.1}\right) = -(1.38 + 80.82) = -82.20 \text{ mm}$$

$$P4_{e.y} = -\left(g_{r.2} + b_{p.1} - b_{1.e2}\right) = -(1.38 + 80.82 - 28.67) = -53.53 \text{ mm}$$

$$P5_{e.y} = -(g_{r.2} + b_{1.e1}) = -(1.38 + 26.95) = -28.33 \text{ mm}$$

$$P6_{e.y} = -g_{r.2} = -1.38 \text{ mm}$$

$$P7_{e.y} = 0 \text{ mm}$$

$$P8_{e.y} = 0 \text{ mm}$$

$$P9_{e.y} = 0 \text{ mm}$$

$$P10_{e.y} = 0 \text{ mm}$$

$$P11_{e.y} = g_{r.3} = 1.38 \text{ mm}$$

$$P12_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 26.56 = 27.94 \text{ mm}$$

$$P13_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 75.82 - 30.04 = 47.16 \text{ mm}$$

$$P14_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20 \text{mm}$$

$$P15_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58 \text{ mm}$$

$$P16_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 75.82 + 1.38 + 23.29 \cdot \cos(90°) = 78.58 \text{ mm}$$

- Vertical coordinates (axis z-z)

$$P1_{e.z} = g_{r.1} + c_{1eff} \cdot \sin(\phi_1) = 1.38 + 20.88 \cdot \sin(90°) = 22.26 \text{mm}$$

$$P2_{e.z} = g_{r.1} = 1.38 \text{ mm}$$

$$P3_{e.z} = 0 \text{ mm}$$

$$P4_{e.z} = 0 \text{ mm}$$

$$P5_{e.z} = 0 \text{ mm}$$

$$P6_{e.z} = 0 \text{ mm}$$

$$P7_{e.z} = g_{r.2} = 1.38 \text{ mm}$$

$$P8_{e.z} = g_{r.2} + h_{e1} = 1.38 + 31.21 = 32.59 \text{ mm}$$

$$P9_{e.z} = g_{r.2} + h_{e1} + \left(h_p - h_{e1} - h_{e2}\right) = 1.38 + 31.21 + (295.82 - 2 \cdot 31.21) = 265.99 \text{ mm}$$

$$P10_{e.z} = g_{r.2} + h_p = 1.38 + 295.82 = 297.20 \text{ mm}$$

$$P11_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58\text{ mm}$$

$$P12_{e.z} = P13_z = P14_z = P11_z = 298.58\text{ mm}$$

$$P15_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 295.82 + 1.38 - 1.38 = 297.20\text{mm}$$

$$P16_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$$
$$= 1.38 + 295.82 + 1.38 - 1.38 - 23.29 \cdot \sin(90°) = 273.91\text{ mm}$$

Characteristics of the effective section (Annex A) :

Portion area section

$$dA_{c1,eff} = \left[\overrightarrow{t_{red,s1} \cdot \sqrt{\left(P2_{e,y} - P1_{e,y}\right)^2 + \left(P2_{e,z} - P1_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.17 \cdot \sqrt{[(-83.58) - (-83.58)]^2 + (1.38 - 22.26)^2}}\right] = 24.47\text{mm}^2$$

$$dA_{b1,e2} = \left[\overrightarrow{t_{red,s1} \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.17 \cdot \sqrt{[(-53.53) - (-82.20)]^2 + 0}}\right] = 33.60\text{mm}^2$$

$$dA_{b1.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P6_{e,y} - P5_{e,y}\right)^2 + \left(P6_{e,z} - P5_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{[(-1.38) - (-28.33)]^2 + 0}}\right]$$
$$= 38.27\text{mm}^2$$

$$dA_{h,e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P8_{e,y} - P7_{e,y}\right)^2 + \left(P8_{e,z} - P7_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (32.59 - 1.38)^2}}\right]$$
$$= 44.32\text{mm}^2$$

$$dA_{h,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P10_{e,y} - P9_{e,y}\right)^2 + \left(P10_{e,z} - P9_{e,z}\right)^2}}\right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (297.20 - 265.99)^2}}\right]$$
$$= 44.32\text{mm}^2$$

$$dA_{b2.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{1.42 \cdot \sqrt{(27.94 - 1.38)^2 + (298.58 - 298.58)^2}}\right] = 37.72\text{mm}^2$$

$$dA_{b2.e2} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{[0.989 \cdot \sqrt{(77.20 - 47.16)^2 + (298.58 - 298.58)^2}}\right] = 29.70\text{mm}^2$$

$$dA_{c2,eff} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P16_{e,y} - P15_{e,y}\right)^2 + \left(P16_{e,z} - P15_{e,z}\right)^2}}\right]$$
$$= \left[\overrightarrow{[0.989 \cdot \sqrt{(78.58 - 78.58)^2 + (273.91 - 297.20)^2}}\right] = 23.03\text{mm}^2$$

Effective section area

$$A_{eff} = dA_{c1,eff} + dA_{b1.e2} + dA_{b1.e1} + dA_{h,e1} + dA_{h,e2} + dA_{b2.e1} + dA_{b2.e2} + dA_{c2,eff}$$
$$= 24.47 + 33.60 + 38.27 + 44.32 + 44.32 + 37.72 + 29.70 + 23.03$$
$$= 275.43\text{mm}^2$$

The static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{y0} = (P2_{e,z} + P1_{e,z}) \cdot \frac{dA_{c1,eff}}{2} + (P4_{e,z} + P3_{e,z}) \cdot \frac{dA_{b1.e2}}{2} + (P6_{e,z} + P5_{e,z}) \cdot \frac{dA_{b1.e1}}{2} + (P8_{e,z} + P7_{e,z}) \cdot \frac{dA_{h,e1}}{2} + (P10_{e,z} + P9_{e,z}) \cdot \frac{dA_{h,e2}}{2} + (P12_{e,z} + P11_{e,z}) \cdot \frac{dA_{b2.e1}}{2} + (P14_{e,z} + P13_{e,z}) \cdot \frac{dA_{b2.e2}}{2} + (P16_{e,z} + P15_{e,z}) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{y0} = (1.38 + 22.26) \cdot \frac{24.47}{2} + 0 + 0 + (32.59 + 1.38) \cdot \frac{44.32}{2} + (297.20 + 265.99) \cdot \frac{44.32}{2} + (298.58 + 298.58) \cdot \frac{37.72}{2} + (298.58 + 298.58) \cdot \frac{29.70}{2} + (273.91 + 297.20) \cdot \frac{23.03}{2} = 40227.5\text{mm}^3$$

$$z_{gc} = \frac{40227.5}{275.43} = 146.05\text{mm}$$

Moment of inertia in ratio to the original Y-axis and the new Y-axis through the center of gravity

$$I_{y0} = \left[(P2_{e,z})^2 + (P1_{e,z})^2 + P2_{e,z} \cdot P1_{e,z}\right] \cdot \frac{dA_{c1,eff}}{3} + \left[(P4_{e,z})^2 + (P3_{e,z})^2 + P4_{e,z} \cdot P3_{e,z}\right] \cdot \frac{dA_{b1.e2}}{3} + \left[(P6_{e,z})^2 + (P5_{e,z})^2 + P6_{e,z} \cdot P5_{e,z}\right] \cdot \frac{dA_{b1.e1}}{3} + \left[(P8_{e,z})^2 + (P7_{e,z})^2 + P8_{e,z} \cdot P7_{e,z}\right] \cdot \frac{dA_{h,e1}}{3} + \left[(P10_{e,z})^2 + (P9_{e,z})^2 + P10_{e,z} \cdot P9_{e,z}\right] \cdot \frac{dA_{h,e2}}{3} + \left[(P12_{e,z})^2 + (P11_{e,z})^2 + P12_{e,z} \cdot P11_{e,z}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[(P14_{e,z})^2 + (P13_{e,z})^2 + P14_{e,z} \cdot P13_{e,z}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[(P16_{e,z})^2 + (P15_{e,z})^2 + P16_{e,z} \cdot P15_{e,z}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{y0} = [(1.38)^2 + (22.26)^2 + 1.38 \cdot 22.26] \cdot \frac{24.47}{3} + 0 + 0 + [(32.59)^2 + (1.38)^2 + 32.59 \cdot 1.38] \cdot \frac{44.32}{3} + [(297.20)^2 + (265.99)^2 + 297.20 \cdot 265.99] \cdot \frac{44.32}{3} + [(298.58)^2 + (298.58)^2 + 298.58 \cdot 298.58] \cdot \frac{37.72}{3} + [(298.58)^2 + (298.58)^2 + 298.58 \cdot 298.58] \cdot \frac{29.70}{3} + [(273.91)^2 + (297.20)^2 + 273.91 \cdot 297.20] \cdot \frac{23.03}{3} = 11427701\text{mm}^4$$

$$I_y = 11427701 - 275.43 \cdot 146.05^2 = 5552319\text{mm}^4$$

The static moment in ratio to the z-axis and the coordinate of the center of gravity

$$S_{z0} = (P2_{e,y} + P1_{e,y}) \cdot \frac{dA_{c1,eff}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1.e2}}{2} + \left(P6_{e,y} + P5_{e,y}\right) \cdot \frac{dA_{b1.e1}}{2} + \left(P8_{e,y} + P7_{e,y}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,y} + P9_{e,y}\right) \cdot \frac{dA_{h,e2}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P16_{e,y} + P15_{e,y}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{z0} = [(-83.58) + (-83.58)] \cdot \frac{24.47}{2} + [(-53.53) + (-82.20)] \cdot \frac{33.60}{2} + [(-1.38) + (-28.33)] \cdot \frac{38.27}{2} + 0 + 0 + (27.94 + 1.38) \cdot \frac{37.72}{2} + (77.20 + 47.16) \cdot \frac{29.70}{2} + (78.58 + 78.58) \cdot \frac{23.03}{2} = -685.16\text{mm}^3$$

$$y_{gc} = \frac{-685.16}{275.43} = -2.49\text{mm}$$

Moment of inertia in ratio to the original z-axis and the new z-axis through the center of gravity

$$I_{z0} = \left[\left(P2_{e,y}\right)^2 + \left(P1_{e,y}\right)^2 + P2_{e,y} \cdot P1_{e,y}\right] \cdot \frac{dA_{c1,eff}}{3} + \left[\left(P4_{e,y}\right)^2 + \left(P3_{e,y}\right)^2 + P4_{e,y} \cdot P3_{e,y}\right] \cdot \frac{dA_{b1.e2}}{3} + \left[\left(P6_{e,y}\right)^2 + \left(P5_{e,y}\right)^2 + P6_{e,y} \cdot P5_{e,y}\right] \cdot \frac{dA_{b1.e1}}{3} + \left[\left(P8_{e,y}\right)^2 + \left(P7_{e,y}\right)^2 + P8_{e,y} \cdot P7_{e,y}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,y}\right)^2 + \left(P9_{e,y}\right)^2 + P10_{e,y} \cdot P9_{e,y}\right] \cdot \frac{dA_{h,e2}}{3} + \left[\left(P12_{e,y}\right)^2 + \left(P11_{e,y}\right)^2 + P12_{e,y} \cdot P11_{e,y}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P14_{e,y}\right)^2 + \left(P13_{e,y}\right)^2 + P14_{e,y} \cdot P13_{e,y}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P16_{e,y}\right)^2 + \left(P15_{e,y}\right)^2 + P16_{e,y} \cdot P15_{e,y}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{z0} = [(-83.58)^2 + (-83.58)^2 + (-83.58) \cdot (-83.58)] \cdot \frac{24.47}{3} + [(-53.53)^2 + (-82.20)^2 + (-53.53) \cdot (-82.20)] \cdot \frac{33.60}{3} + [(-1.38)^2 + (-28.33)^2 + (-1.38) \cdot (-28.33)] \cdot \frac{38.27}{3} + 0 + 0 + [(27.94)^2 + (1.38)^2 + 27.94 \cdot 1.38] \cdot \frac{37.72}{3} + [(77.20)^2 + (47.16)^2 + 77.20 \cdot 47.16] \cdot \frac{29.70}{3} + [(78.58)^2 + (78.58)^2 + 78.58 \cdot 78.58] \cdot \frac{23.03}{3} = 608364\text{mm}^4$$

$$I_z = 608364 - 275.43 \cdot (-2.49)^2 = 606659\text{mm}^4$$

Centrifugal moment of inertia in ratio to the Y and z axes and the new axes through the center of gravity

$$I_{yz0} = (2 \cdot P1_{e,y} \cdot P1_{e,z} + 2 \cdot P2_{e,y} \cdot P2_{e,z} + P1_{e,y} \cdot P2_{e,z} + P2_{e,y} \cdot P1_{e,z}) \cdot \frac{dA_{c1,eff}}{6} + (2 \cdot P3_{e,y} \cdot P3_{e,z} + 2 \cdot P4_{e,y} \cdot P4_{e,z} + P3_{e,y} \cdot P4_{e,z} + P4_{e,y} \cdot P3_{e,z}) \cdot \frac{dA_{b1.e2}}{6} + (2 \cdot P5_{e,y} \cdot P5_{e,z} + 2 \cdot P6_{e,y} \cdot P6_{e,z} + P5_{e,y} \cdot P6_{e,z} + P6_{e,y} \cdot P5_{e,z}) \cdot \frac{dA_{b1.e1}}{6} + (2 \cdot P7_{e,y} \cdot P7_{e,z} + 2 \cdot P8_{e,y} \cdot P8_{e,z} + P7_{e,y} \cdot P8_{e,z} + P8_{e,y} \cdot P7_{e,z}) \cdot \frac{dA_{h,e1}}{6} + (2 \cdot P9_{e,y} \cdot P9_{e,z} + 2 \cdot P10_{e,y} \cdot P10_{e,z} + P9_{e,y} \cdot P10_{e,z} + P10_{e,y} \cdot P9_{e,z}) \cdot \frac{dA_{h,e2}}{6} + (2 \cdot P11_{e,y} \cdot P11_{e,z} + 2 \cdot P12_{e,y} \cdot P12_{e,z} + P11_{e,y} \cdot P12_{e,z} + P12_{e,y} \cdot P11_{e,z}) \cdot \frac{dA_{b2.e1}}{6} + (2 \cdot P13_{e,y} \cdot P13_{e,z} + 2 \cdot P14_{e,y} \cdot P14_{e,z} + P13_{e,y} \cdot P14_{e,z} + P14_{e,y} \cdot P13_{e,z}) \cdot \frac{dA_{b2.e2}}{6} + (2 \cdot P15_{e,y} \cdot P15_{e,z} + 2 \cdot P16_{e,y} \cdot P16_{e,z} + P15_{e,y} \cdot P16_{e,z} + P16_{e,y} \cdot P15_{e,z}) \cdot \frac{dA_{c2,eff}}{6}$$

$$I_{yz0} = [2 \cdot (-83.58) \cdot 22.26 + 2 \cdot (-83.58) \cdot 1.38 + (-83.58) \cdot 1.38 + (-83.58) \cdot 22.26] \cdot \frac{24.47}{6} + 0 + 0 + 0 + 0 + (2 \cdot 1.38 \cdot 298.58 + 2 \cdot 27.94 \cdot 298.58 + 1.38 \cdot 298.58 + 27.94 \cdot 298.58) \cdot \frac{37.72}{6} + (2 \cdot 47.16 \cdot 298.58 + 2 \cdot 77.20 \cdot 298.58 + 47.16 \cdot 298.58 + 77.20 \cdot 298.58) \cdot \frac{29.70}{6} + (2 \cdot 78.58 \cdot 297.20 + 2 \cdot 78.58 \cdot 273.91 + 78.58 \cdot 273.91 + 78.58 \cdot 297.20) \cdot \frac{23.03}{6} = 1209040 mm^4$$

$$I_{yz} = 1209040 - \frac{40227.5 \cdot (-685.16)}{275.43} = 1309110 mm^4$$

Main axes of inertia

$$\alpha = \frac{1}{2} \arctan\left(\frac{2I_{yz}}{I_z - I_y}\right) \text{ dacă } (I_z - I_y) \neq 0 \text{ dacă nu } \alpha = 0$$

$$\alpha = \frac{1}{2} \arctan\left(\frac{2 \cdot 1309110}{606659 - 5552319}\right) = -0.24$$

$$I_\zeta = \frac{1}{2}[I_y + I_z + \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2} = \frac{1}{2}[5552319 + 606659 + \sqrt{(606659 - 5552319)^2 + 4 \cdot 1309110^2} = 5877464 mm^4$$

$$I_\eta = \frac{1}{2}[I_y + I_z - \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2} = \frac{1}{2}[5552319 + 606659 - \sqrt{(606659 - 5552319)^2 + 4 \cdot 1309110^2} = 281515 mm^4$$

Radius of gyration

$$i_y = \sqrt{\frac{I_y}{A_{eff}}} = \sqrt{\frac{5552319}{275.43}} = 141.98\text{mm}$$

$$i_z = \sqrt{\frac{I_z}{A_{eff}}} = \sqrt{\frac{606659}{275.43}} = 46.93\text{mm}$$

$$i_\zeta = \sqrt{\frac{I_\zeta}{A_{eff}}} = \sqrt{\frac{5877464}{275.43}} = 146.08\text{mm}$$

$$i_\eta = \sqrt{\frac{I_\eta}{A_{eff}}} = \sqrt{\frac{281515}{275.43}} = 31.97\text{mm}$$

- **Resistance module**
- Resistance mode in ratio to y-y axis

$$z_{max} = \max(146.05, (200 - 1.42) - 146.05) = \max(146.05\ ,152.53) = 152.53\text{mm}$$

$$z_{min} = \min(146.05, (200 - 1.42) - 146.05) = \min(146.05\ ,152.53) = 146.05\text{mm}$$

$$W_{y,min} = \frac{I_y}{z_{max}} = \frac{2122254}{152.53} = 21254\text{mm}^3$$

$$W_{y,max} = \frac{I_y}{z_{min}} = \frac{2122254}{146.05} = 21495\text{mm}^3$$

- Resistance mode in ratio to z-z axis

$$y_{max} = \max(2.49,56.28 - 2.49) = \max(2.49,35.29) = 35.29\text{mm}$$

$$y_{min} = \min(2.49,56.28 - 2.49) = \min(2.49,35.29) = 2.49\text{mm}$$

$$W_{z,min} = \frac{I_z}{y_{max}} = \frac{109017}{35.29} = 3089.18\text{mm}^3$$

$$W_{z,max} = \frac{I_z}{y_{min}} = \frac{109017}{2.49} = -82.2093.25\text{mm}^3$$

Sectoral coordinates

$$\omega_0 = 0$$

$$\omega_{0_i} = y_{i-1} \cdot z_i - y_i \cdot z_{i-1}$$

$$\omega_{01} = 0$$

$$\omega_{0_2} = P1_{e,y} \cdot P2_{e,z} - P2_{e,y} \cdot P1_{e,z} = (-83.58) \cdot 1.38 - (-83.58) \cdot 22.26 = 1745.45\text{mm}^2$$

$$\omega_{0_3} = P2_{e,y} \cdot P3_{e,z} - P3_{e,y} \cdot P2_{e,z} = (-83.58) \cdot 0 - (-82.20) \cdot 1.38 = 113.40\text{mm}^2$$

$$\omega_{0_4} = P3_{e,y} \cdot P4_{e,z} - P4_{e,y} \cdot P3_{e,z} = (-82.20) \cdot 0 - (-53.53) \cdot 0 = 0\text{mm}^2$$

$\omega_{0_5} = P4_{e,y} \cdot P5_{e,z} - P5_{e,y} \cdot P4_{e,z} = (-53.53) \cdot 0 - (-28.33) \cdot 0 = 0mm^2$

$\omega_{0_6} = P5_{e,y} \cdot P6_{e,z} - P6_{e,y} \cdot P5_{e,z} = (-28.33) \cdot 0 - (-1.38) \cdot 0 = 0mm^2$

$\omega_{0_7} = P6_{e,y} \cdot P7_{e,z} - P7_{e,y} \cdot P6_{e,z} = (-1.38) \cdot 1.38 - 0 \cdot 0 = -1.90mm^2$

$\omega_{0_8} = P7_{e,y} \cdot P8_{e,z} - P8_{e,y} \cdot P7_{e,z} = 0 \cdot 32.59 - 0 \cdot 1.38 = 0mm^2$

$\omega_{0_9} = P8_{e,y} \cdot P9_{e,z} - P9_{e,y} \cdot P8_{e,z} = 0 \cdot 265.99 - 0 \cdot 32.59 = 0mm^2$

$\omega_{0_{10}} = P9_{e,y} \cdot P10_{e,z} - P10_{e,y} \cdot P9_{e,z} = 0 \cdot 297.20 - 0 \cdot 265.99 = 0mm^2$

$\omega_{0_{11}} = P10_{e,y} \cdot P11_{e,z} - P11_{e,y} \cdot P10_{e,z} = 0 \cdot 298.58 - 1.38 \cdot 297.20 = -410mm^2$

$\omega_{0_{12}} = P11_{e,y} \cdot P12_{e,z} - P12_{e,y} \cdot P11_{e,z} = 1.38 \cdot 298.58 - 27.94 \cdot 298.58 = -7931.44mm^2$

$\omega_{0_{13}} = P12_{e,y} \cdot P13_{e,z} - P13_{e,y} \cdot P12_{e,z} = 27.94 \cdot 298.58 - 24.89 \cdot 298.58 = -5738.36mm^2$

$\omega_{0_{14}} = P13_{e,y} \cdot P14_{e,z} - P14_{e,y} \cdot P13_{e,z} = 47.16 \cdot 298.58 - 72.20 \cdot 298.58 = -8968.82mm^2$

$\omega_{0_{15}} = P14_{e,y} \cdot P15_{e,z} - P15_{e,y} \cdot P14_{e,z} = 72.20 \cdot 297.20 - 78.58 \cdot 298.58 = -518.40mm^2$

$\omega_{0_{16}} = P15_{e,y} \cdot P16_{e,z} - P16_{e,y} \cdot P15_{e,z} = 78.58 \cdot 273.91 - 78.58 \cdot 297.20 = -1830.28mm^2$

$\omega_i = \omega_{i-1} + \omega_{0_i}$

$\omega_1 = 0 + \omega_{01} = 0mm^2$

$\omega_2 = \omega_0 + \omega_{0_2} = 0 + 1745.45 = 1745.45mm^2$

$\omega_3 = \omega_2 + \omega_{0_3} = 1745.45 + 113.40 = 1858.85mm^2$

$\omega_4 = \omega_3 + \omega_{0_4} = 1858.85 + 0 = 1858.85mm^2$

$\omega_5 = \omega_4 + \omega_{0_5} = 1858.85 + 0 = 1858.85mm^2$

$\omega_6 = \omega_5 + \omega_{0_6} = 1858.85 + 0 = 1858.85mm^2$

$\omega_7 = \omega_6 + \omega_{0_7} = 1858.85 + (-1.90) = 1856.95mm^2$

$\omega_8 = \omega_7 + \omega_{0_8} = 1856.95 + 0 = 1856.95mm^2$

$\omega_9 = \omega_8 + \omega_{0_9} = 1856.95 + 0 = 1856.95mm^2$

$\omega_{10} = \omega_9 + \omega_{0_{10}} = 1856.95 + 0 = 1856.95mm^2$

$\omega_{11} = \omega_{10} + \omega_{0_{11}} = 1856.95 + (-410) = 1446.95mm^2$

$\omega_{12} = \omega_{11} + \omega_{0_{12}} = 1446.95 + (-7931.44) = -6484.49mm^2$

$\omega_{13} = \omega_{12} + \omega_{0_{13}} = (-6484.49) + (-5738.36) = -12222.85mm^2$

$\omega_{14} = \omega_{13} + \omega_{0_{14}} = (-12222.85) + (-8968.82) = -21191.67mm^2$

$\omega_{15} = \omega_{14} + \omega_{0_{15}} = (-21191.67) + (-518.40) = -21710.07mm^2$

$\omega_{16} = \omega_{15} + \omega_{0_{16}} = (-21710.07) + (-1830.28) = -23540.34mm^2$

Mean of the sectoral coordinates

$$I_{\omega} = \sum_{i=1}^{n} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2} \qquad \omega_{mean} = \frac{I_{\omega}}{A}$$

$dA_2 = dA_{c1,eff}$; $dA_3 = 0$; $dA_4 = dA_{b1,e2}$; $dA_5 = 0$; $dA_6 = dA_{b1,e1}$; $dA_7 = 0$;

$dA_8 = dA_{h,e1}$; $dA_9 = 0$; $dA_{10} = dA_{h,e2}$; $dA_{11} = 0$; $dA_{12} = dA_{b2,e1}$; $dA_{13} = 0$;

$dA_{14} = dA_{b2,e2}$; $dA_{15} = 0$; $dA_{16} = dA_{c2,eff}$

$$\begin{aligned} I_{\omega} = \sum_{i=2}^{16} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2} \\ &= (\omega_1 + \omega_2) \cdot \frac{dA_2}{2} + (\omega_2 + \omega_3) \cdot \frac{dA_3}{2} + (\omega_3 + \omega_4) \cdot \frac{dA_4}{2} + (\omega_4 + \omega_5) \cdot \frac{dA_5}{2} \\ &+ (\omega_5 + \omega_6) \cdot \frac{dA_6}{2} + (\omega_6 + \omega_7) \cdot \frac{dA_7}{2} + (\omega_7 + \omega_8) \cdot \frac{dA_8}{2} + (\omega_8 + \omega_9) \cdot \frac{dA_9}{2} \\ &+ (\omega_9 + \omega_{10}) \cdot \frac{dA_{10}}{2} + (\omega_{10} + \omega_{11}) \cdot \frac{dA_{11}}{2} + (\omega_{11} + \omega_{12}) \cdot \frac{dA_{12}}{2} + (\omega_{12} + \omega_{13}) \\ &\cdot \frac{dA_{13}}{2} + (\omega_{13} + \omega_{14}) \cdot \frac{dA_{14}}{2} + (\omega_{14} + \omega_{15}) \cdot \frac{dA_{15}}{2} + (\omega_{15} + \omega_{16}) \cdot \frac{dA_{16}}{2} \\ &= [0 + 1745.45] \cdot \frac{24.47}{2} + 0 + [1858.85 + 1858.85] \cdot \frac{33.60}{2} + 0 \\ &+ [1858.85 + 1858.85] \cdot \frac{38.27}{2} + 0 + [1856.95 + 1856.95] \cdot \frac{44.32}{2} + 0 \\ &+ [1856.95 + 1856.95] \cdot \frac{44.32}{2} + 0 + [1446.95 + (-6484.49)] \cdot \frac{37.72}{2} + 0 \\ &+ [(-12222.85) + (-21191.67)] \cdot \frac{29.70}{2} + 0 + [(-21710.07) + (-23540.34)] \\ &\cdot \frac{23.03}{2} = -792638 mm^4 \end{aligned}$$

$$\omega_{mean} = \frac{-792638}{275.43} = -2877.83 mm^2$$

Sectoral constants

$$I_{y\omega 0} = \sum_{i=1}^{n} (2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$I_{y\omega0} = \sum_{i=2}^{16}(2\cdot y_{i-1}\cdot\omega_{i-1} + 2\cdot y_i\cdot\omega_i + y_{i-1}\cdot\omega_i + y_i\cdot\omega_{i-1})\cdot\frac{dA_i}{6}$$

$$= (2\cdot P1_{e,y}\cdot\omega_1 + 2\cdot P2_{e,y}\cdot\omega_2 + P1_{e,y}\cdot\omega_2 + P2_{e,y}\cdot\omega_1)\cdot\frac{dA_2}{6} + (2\cdot P2_{e,y}\cdot\omega_2 + 2\cdot P3_{e,y}\cdot\omega_3 + P2_{e,y}\cdot\omega_3 + P3_{e,y}\cdot\omega_2)\cdot\frac{dA_3}{6} + (2\cdot P3_{e,y}\cdot\omega_3 + 2\cdot P4_{e,y}\cdot\omega_4 + P3_{e,y}\cdot\omega_4 + P4_{e,y}\cdot\omega_3)\cdot\frac{dA_4}{6} + (2\cdot P4_{e,y}\cdot\omega_4 + 2\cdot P5_{e,y}\cdot\omega_5 + P4_{e,y}\cdot\omega_5 + P5_{e,y}\cdot\omega_4)\cdot\frac{dA_5}{6} + (2\cdot P5_{e,y}\cdot\omega_5 + 2\cdot P6_{e,y}\cdot\omega_6 + P5_{e,y}\cdot\omega_6 + P6_{e,y}\cdot\omega_5)\cdot\frac{dA_6}{6} + (2\cdot P6_{e,y}\cdot\omega_6 + 2\cdot P7_{e,y}\cdot\omega_7 + P6_{e,y}\cdot\omega_7 + P7_{e,y}\cdot\omega_6)\cdot\frac{dA_7}{6} + (2\cdot P7_{e,y}\cdot\omega_7 + 2\cdot P8_{e,y}\cdot\omega_8 + P7_{e,y}\cdot\omega_8 + P8_{e,y}\cdot\omega_7)\cdot\frac{dA_8}{6} + (2\cdot P8_{e,y}\cdot\omega_8 + 2\cdot P9_{e,y}\cdot\omega_9 + P8_{e,y}\cdot\omega_9 + P9_{e,y}\cdot\omega_8)\cdot\frac{dA_9}{6} + (2\cdot P9_{e,y}\cdot\omega_9 + 2\cdot P10_{e,y}\cdot\omega_{10} + P9_{e,y}\cdot\omega_{10} + P10_{e,y}\cdot\omega_9)\cdot\frac{dA_{10}}{6} + (2\cdot P10_{e,y}\cdot\omega_{10} + 2\cdot P11_{e,y}\cdot\omega_{11} + P10_{e,y}\cdot\omega_{11} + P11_{e,y}\cdot\omega_{10})\cdot\frac{dA_{11}}{6} + (2\cdot P11_{e,y}\cdot\omega_{11} + 2\cdot P12_{e,y}\cdot\omega_{12} + P11_{e,y}\cdot\omega_{12} + P12_{e,y}\cdot\omega_{11})\cdot\frac{dA_{12}}{6} + (2\cdot P12_{e,y}\cdot\omega_{12} + 2\cdot P13_{e,y}\cdot\omega_{13} + P12_{e,y}\cdot\omega_{13} + P13_{e,y}\cdot\omega_{12})\cdot\frac{dA_{13}}{6} + (2\cdot P13_{e,y}\cdot\omega_{13} + 2\cdot P14_{e,y}\cdot\omega_{14} + P13_{e,y}\cdot\omega_{14} + P14_{e,y}\cdot\omega_{13})\cdot\frac{dA_{14}}{6} + (2\cdot P14_{e,y}\cdot\omega_{14} + 2\cdot P15_{e,y}\cdot\omega_{15} + P14_{e,y}\cdot\omega_{15} + P15_{e,y}\cdot\omega_{14})\cdot\frac{dA_{15}}{6} + (2\cdot P15_{e,y}\cdot\omega_{15} + 2\cdot P16_{e,y}\cdot\omega_{16} + P15_{e,y}\cdot\omega_{16} + P16_{e,y}\cdot\omega_{15})\cdot\frac{dA_{16}}{6}$$

$$I_{y\omega0} = [2\cdot(-83.58)\cdot 0 + 2\cdot(-83.58)\cdot 1745.45 + (-83.58)\cdot 1745.45 + (-83.58)\cdot 0]\cdot\frac{24.47}{6} + 0 + [2\cdot(-82.20)\cdot 1858.85 + 2\cdot(-53.53)\cdot 1858.85 + (-82.20)\cdot 1858.85 + (-53.53)\cdot 1858.85]\cdot\frac{33.60}{6} + 0 + [2\cdot(-28.33)\cdot 1858.85 + 2\cdot(-1.38)\cdot 1858.85 + (-28.33)\cdot 1858.85 + (-1.38)\cdot 1858.85]\cdot\frac{38.27}{6} + 0 + 0 + 0 + 0 + 0 + [2\cdot 1.38\cdot 1446.95 + 2\cdot 27.94\cdot(-6484.49) + 1.38\cdot(-6484.49) + 27.94\cdot 1446.95]\cdot\frac{37.72}{6} + 0 + [2\cdot 47.16\cdot(-12222.85) + 2\cdot 72.20\cdot(-21191.67) + 47.16\cdot(-21191.67) + 72.20\cdot(-12222.85)]\cdot\frac{29.70}{6} + 0 + [2\cdot 78.58\cdot(-21710.07) + 2\cdot 78.58\cdot(-23540.34) + 78.58\cdot(-23540.34) + 78.58\cdot(-21710.07)]\cdot\frac{23.03}{6} = -81596372\text{mm}^5$$

$$I_{y\omega} = I_{y\omega0} - \frac{S_{z0}\cdot I_\omega}{A_{eff}} = -81596372 - \frac{(-685.16)\cdot(-792638)}{275.43} = -83568159\text{mm}^5$$

$$I_{z\omega 0} = \sum_{i=1}^{n} (2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$I_{z\omega 0} = \sum_{i=2}^{16} (2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,z} \cdot \omega_1 + 2 \cdot P2_{e,z} \cdot \omega_2 + P1_{e,z} \cdot \omega_2 + P2_{e,z} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,z} \cdot \omega_2 + 2 \cdot P3_{e,z} \cdot \omega_3 + P2_{e,z} \cdot \omega_3 + P3_{e,z} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,z} \cdot \omega_3 + 2 \cdot P4_{e,z} \cdot \omega_4 + P3_{e,z} \cdot \omega_4 + P4_{e,z} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,z} \cdot \omega_4 + 2 \cdot P5_{e,z} \cdot \omega_5 + P4_{e,z} \cdot \omega_5 + P5_{e,z} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,z} \cdot \omega_5 + 2 \cdot P6_{e,z} \cdot \omega_6 + P5_{e,z} \cdot \omega_6 + P6_{e,z} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,z} \cdot \omega_6 + 2 \cdot P7_{e,z} \cdot \omega_7 + P6_{e,z} \cdot \omega_7 + P7_{e,z} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,z} \cdot \omega_7 + 2 \cdot P8_{e,z} \cdot \omega_8 + P7_{e,z} \cdot \omega_8 + P8_{e,z} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,z} \cdot \omega_8 + 2 \cdot P9_{e,z} \cdot \omega_9 + P8_{e,z} \cdot \omega_9 + P9_{e,z} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,z} \cdot \omega_9 + 2 \cdot P10_{e,z} \cdot \omega_{10} + P9_{e,z} \cdot \omega_{10} + P10_{e,z} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,z} \cdot \omega_{10} + 2 \cdot P11_{e,z} \cdot \omega_{11} + P10_{e,z} \cdot \omega_{11} + P11_{e,z} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,z} \cdot \omega_{11} + 2 \cdot P12_{e,z} \cdot \omega_{12} + P11_{e,z} \cdot \omega_{12} + P12_{e,z} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,z} \cdot \omega_{12} + 2 \cdot P13_{e,z} \cdot \omega_{13} + P12_{e,z} \cdot \omega_{13} + P13_{e,z} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,z} \cdot \omega_{13} + 2 \cdot P14_{e,z} \cdot \omega_{14} + P13_{e,z} \cdot \omega_{14} + P14_{e,z} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6} + (2 \cdot P14_{e,z} \cdot \omega_{14} + 2 \cdot P15_{e,z} \cdot \omega_{15} + P14_{e,z} \cdot \omega_{15} + P15_{e,z} \cdot \omega_{14}) \cdot \frac{dA_{15}}{6} + (2 \cdot P15_{e,z} \cdot \omega_{15} + 2 \cdot P16_{e,z} \cdot \omega_{16} + P15_{e,z} \cdot \omega_{16} + P16_{e,z} \cdot \omega_{15}) \cdot \frac{dA_{16}}{6}$$

$$I_{z\omega 0} = [2 \cdot 22.26 \cdot 0 + 2 \cdot 1.38 \cdot 1745.45 + 22.26 \cdot 1745.45 + 1.38 \cdot 0] \cdot \frac{24.47}{6} + 0 + 0 + 0 + 0 + 0 + [2 \cdot 1.38 \cdot 1856.95 + 2 \cdot 32.59 \cdot 1856.95 + 1.38 \cdot 1856.95 + 32.59 \cdot 1856.95] \cdot \frac{44.32}{6} + 0 + [2 \cdot 265.99 \cdot 1856.95 + 2 \cdot 297.20 \cdot 1856.95 + 265.99 \cdot 1856.95 + 297.20 \cdot 1856.95] \cdot \frac{44.32}{6} + 0 + [2 \cdot 298.58 \cdot 1446.95 + 2 \cdot 298.58 \cdot (-6484.49) + 298.58 \cdot (-6484.49) + 298.58 \cdot 1446.95] \cdot \frac{37.72}{6} + 0 + [2 \cdot 298.58 \cdot (-12222.85) + 2 \cdot 298.58 \cdot (-21191.67) + 298.58 \cdot (-21191.67) + 298.58 \cdot (-12222.85)] \cdot \frac{29.70}{6} + 0 + [2 \cdot 297.20 \cdot (-21710.07) + 2 \cdot 273.91 \cdot (-23540.34) + 297.20 \cdot (-23540.34) + 273.91 \cdot (-21710.07)] \cdot \frac{23.03}{6} = -300459287 mm^5$$

$$I_{z\omega} = I_{z\omega 0} - \frac{S_{y0} \cdot I_{\omega}}{A_{eff}} = -300459287 - \frac{40227.5 \cdot (-792638)}{275.43} = -184691282\text{mm}^5$$

$$I_{\omega\omega 0} = \sum_{i=1}^{n} [(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i \cdot \omega_{i-1}] \frac{dA_i}{3}$$

$$I_{\omega\omega 0} = \sum_{i=1}^{n} [(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i \cdot \omega_{i-1}] \frac{dA_i}{3}$$

$$\begin{aligned}
I_{\omega\omega 0} = \sum_{i=2}^{16} [(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i \cdot \omega_{i-1}] \frac{dA_i}{3} \\
&= \left[((\omega_2)^2 + (\omega_1)^2 + \omega_2 \cdot \omega_1) \cdot \frac{dA_2}{3}\right] + \left[((\omega_3)^2 + (\omega_2)^2 + \omega_3 \cdot \omega_2) \cdot \frac{dA_3}{3}\right] \\
&+ \left[((\omega_4)^2 + (\omega_3)^2 + \omega_4 \cdot \omega_3) \cdot \frac{dA_4}{3}\right] + \left[((\omega_5)^2 + (\omega_4)^2 + \omega_5 \cdot \omega_4) \cdot \frac{dA_5}{3}\right] \\
&+ \left[((\omega_6)^2 + (\omega_5)^2 + \omega_6 \cdot \omega_5) \cdot \frac{dA_6}{3}\right] + \left[((\omega_7)^2 + (\omega_6)^2 + \omega_7 \cdot \omega_6) \cdot \frac{dA_7}{3}\right] \\
&+ \left[((\omega_8)^2 + (\omega_7)^2 + \omega_8 \cdot \omega_7) \cdot \frac{dA_8}{3}\right] + \left[((\omega_9)^2 + (\omega_8)^2 + \omega_9 \cdot \omega_8) \cdot \frac{dA_9}{3}\right] \\
&+ \left[((\omega_{10})^2 + (\omega_9)^2 + \omega_{10} \cdot \omega_9) \cdot \frac{dA_{10}}{3}\right] + \left[((\omega_{11})^2 + (\omega_{10})^2 + \omega_{11} \cdot \omega_{10}) \cdot \frac{dA_{11}}{3}\right] \\
&+ \left[((\omega_{12})^2 + (\omega_{11})^2 + \omega_{12} \cdot \omega_{11}) \cdot \frac{dA_{12}}{3}\right] \\
&+ \left[((\omega_{13})^2 + (\omega_{12})^2 + \omega_{13} \cdot \omega_{12}) \cdot \frac{dA_{13}}{3}\right] \\
&+ \left[((\omega_{14})^2 + (\omega_{13})^2 + \omega_{14} \cdot \omega_{13}) \cdot \frac{dA_{14}}{3}\right] \\
&+ \left[((\omega_{15})^2 + (\omega_{14})^2 + \omega_{15} \cdot \omega_{14}) \cdot \frac{dA_{15}}{3}\right] \\
&+ \left[((\omega_{16})^2 + (\omega_{15})^2 + \omega_{16} \cdot \omega_{15}) \cdot \frac{dA_{16}}{3}\right]
\end{aligned}$$

$$\begin{aligned}
I_{\omega\omega 0} = [1745.45^2 + (0)^2 + 1745.45 \cdot 0] \cdot \frac{24.47}{3} + 0 \\
&+ [1858.85^2 + 1858.85^2 + 1858.85 \cdot 1858.85] \cdot \frac{33.60}{3} + 0 \\
&+ [1858.85^2 + 1858.85^2 + 1858.85 \cdot 1858.85] \cdot \frac{38.27}{3} + 0 \\
&+ [1856.95^2 + 1856.95^2 + 1856.95 \cdot 1856.95] \cdot \frac{44.32}{3} + 0 \\
&+ [1856.95^2 + 1856.95^2 + 1856.95 \cdot 1856.95] \cdot \frac{44.32}{3} + 0 \\
&+ [(-6484.49)^2 + 1446.95^2 + (-6484.49) \cdot 1446.95] \cdot \frac{37.72}{3} + 0 \\
&+ [(-21191.67)^2 + (-12222.85)^2 + (-21191.67) \cdot (-12222.85)] \cdot \frac{29.70}{3} + 0 \\
&+ [(-23540.34)^2 + (-21710.07)^2 + (-23540.34) \cdot (-21710.07)] \cdot \frac{23.03}{3} \\
&= 21299016466\text{mm}^6
\end{aligned}$$

$$I_{\omega\omega} = I_{\omega\omega0} - \frac{I_{\omega}^2}{A_{eff}} = 21299016466 - \frac{(-792638)^2}{275.43} = 19017933912mm^6$$

Shear Center

$$y_{sc} = \frac{I_{z\omega} \cdot I_z - I_{y\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} = \frac{(-184691282) \cdot 606659 - (-83568159) \cdot 1309110}{5552319 \cdot 606659 - 1309110^2} = -1.60mm$$

$$z_{sc} = \frac{-I_{y\omega} \cdot I_y + I_{z\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} = \frac{-(-83568159) \cdot 5552319 + (-184691282) \cdot 1309110}{5552319 \cdot 606659 - 1309110^2}$$
$$= 134.30mm$$

Sectoral moment of inertia

$$I_w = I_{\omega\omega} + z_{sc} \cdot I_{y\omega} - y_{sc} \cdot I_{z\omega}$$
$$= 19017933912 + 134.30 \cdot (-83568159) - (-1.60) \cdot (-184691282)$$
$$= 7499345573mm^6$$

Torsonal Moment of inertia

$$I_t = \sum_{i=1}^{n} dA_i \cdot \frac{(t_i)^2}{3}$$

$$I_t = \sum_{i=2}^{16} dA_i \cdot \frac{(t_i)^2}{3}$$
$$= dA_2 \cdot \frac{(t_2)^2}{3} + dA_3 \cdot \frac{(t_3)^2}{3} + dA_4 \cdot \frac{(t_4)^2}{3} + dA_5 \cdot \frac{(t_5)^2}{3} + dA_6 \cdot \frac{(t_6)^2}{3} + dA_7 \cdot \frac{(t_7)^2}{3}$$
$$+ dA_8 \cdot \frac{(t_8)^2}{3} + dA_9 \cdot \frac{(t_9)^2}{3} + dA_{10} \cdot \frac{(t_{10})^2}{3} + dA_{11} \cdot \frac{(t_{11})^2}{3} + dA_{12} \cdot \frac{(t_{12})^2}{3} + dA_{13}$$
$$\cdot \frac{(t_{13})^2}{3} + dA_{15} \cdot \frac{(t_{15})^2}{3} + dA_{16} \cdot \frac{(t_{16})^2}{3}$$

$$I_t = 24.47 \cdot \frac{(1.17)^2}{3} + 0 + 33.60 \cdot \frac{(1.17)^2}{3} + 0 + 38.27 \cdot \frac{(1.42)^2}{3} + 0 + 44.32 \cdot \frac{(1.42)^2}{3} + 0$$
$$+ 44.32 \cdot \frac{(1.42)^2}{3} + 0 + 37.72 \cdot \frac{(1.42)^2}{3} + 0 + 29.70 \cdot \frac{(0.989)^2}{3} + 0 + 23.03$$
$$\cdot \frac{(0.989)^2}{3} = 154.42mm^4$$

$$W_t = \frac{I_t}{\min(t)} = \frac{154.42}{0.989} = 156.19mm^3$$

Sectoral coordinates relative to shear center

$$\omega_{s_j} = \omega_j - \omega_{mean} + z_{sc} \cdot (y_j - y_{gc}) - y_{sc} \cdot (z_j - z_{gc})$$

$$\omega_{s_1} = \omega_1 - \omega_{mean} + z_{sc} \cdot (P1_{e,y} - y_{gc}) - y_{sc} \cdot (P1_{e,z} - z_{gc})$$
$$= 0 - (-2877.83) + 134.30 \cdot [(-83.58) - (-2.49)] - (-1.60)$$
$$\cdot (22.26 - 146.05) = -8210.91mm^2$$

$$\omega_{s_2} = \omega_2 - \omega_{mean} + z_{sc} \cdot (P2_{e,y} - y_{gc}) - y_{sc} \cdot (P2_{e,z} - z_{gc})$$
$$= 1745.45 - (-2877.83) + 134.30 \cdot [(-83.58) - (-2.49)] - (-1.60) \cdot (1.38 - 146.05) = -6498.84\text{mm}^2$$

$$\omega_{s_3} = \omega_3 - \omega_{mean} + z_{sc} \cdot (P3_{e,y} - y_{gc}) - y_{sc} \cdot (P3_{e,z} - z_{gc})$$
$$= 1858.85 - (-2877.83) + 134.30 \cdot [(-82.20) - (-2.49)] - (-1.60) \cdot (0 - 146.05) = -6202.37\text{m}^2$$

$$\omega_{s_4} = \omega_4 - \omega_{mean} + z_{sc} \cdot (P4_{e,y} - y_{gc}) - y_{sc} \cdot (P4_{e,z} - z_{gc})$$
$$= 1858.85 - (-2877.83) + 134.30 \cdot [(-53.53) - (-2.49)] - (-1.60) \cdot (0 - 146.05) = -2351.56\text{mm}^2$$

$$\omega_{s_5} = \omega_5 - \omega_{mean} + z_{sc} \cdot (P5_{e,y} - y_{gc}) - y_{sc} \cdot (P5_{e,z} - z_{gc})$$
$$= 1858.85 - (-2877.83) + 134.30 \cdot [(-28.33) - (-2.49)] - (-1.60) \cdot (0 - 146.05) = 1032.55\text{mm}^2$$

$$\omega_{s_6} = \omega_6 - \omega_{mean} + z_{sc} \cdot (P6_{e,y} - y_{gc}) - y_{sc} \cdot (P6_{e,z} - z_{gc})$$
$$= 1858.85 - (-2877.83) + 134.30 \cdot [(-1.38) - (-2.49)] - (-1.60) \cdot (0 - 146.05) = 4652.04\text{mm}^2$$

$$\omega_{s_7} = \omega_7 - \omega_{mean} + z_{sc} \cdot (P7_{e,y} - y_{gc}) - y_{sc} \cdot (P7_{e,z} - z_{gc})$$
$$= 1856.95 - (-2877.83) + 134.30 \cdot [0 - (-2.49)] - (-1.60) \cdot (1.38 - 146.05) = 4837.62\text{mm}^2$$

$$\omega_{s_8} = \omega_8 - \omega_{mean} + z_{sc} \cdot (P8_{e,y} - y_{gc}) - y_{sc} \cdot (P8_{e,z} - z_{gc})$$
$$= 1856.95 - (-2877.83) + 134.30 \cdot [0 - (-2.49)] - (-1.60) \cdot (32.59 - 146.05) = 4887.51\text{mm}^2$$

$$\omega_{s_9} = \omega_9 - \omega_{mean} + z_{sc} \cdot (P9_{e,y} - y_{gc}) - y_{sc} \cdot (P9_{e,z} - z_{gc})$$
$$= 1856.95 - (-2877.83) + 134.30 \cdot [0 - (-2.49)] - (-1.60) \cdot (265.99 - 146.05) = 5260.58\text{mm}^2$$

$$\omega_{s_{10}} = \omega_{10} - \omega_{mean} + z_{sc} \cdot (P10_{e,y} - y_{gc}) - y_{sc} \cdot (P10_{e,z} - z_{gc})$$
$$= 1856.95 - (-2877.83) + 134.30 \cdot [0 - (-2.49)] - (-1.60) \cdot (297.20 - 146.05) = 5310.47\text{mm}^2$$

$$\omega_{s_{11}} = \omega_{11} - \omega_{mean} + z_{sc} \cdot (P11_{e,y} - y_{gc}) - y_{sc} \cdot (P11_{e,z} - z_{gc})$$
$$= 1446.95 - (-2877.83) + 134.30 \cdot [1.38 - (-2.49)] - (-1.60) \cdot (298.58 - 146.05) = 5087.95\text{mm}^2$$

$$\omega_{s_{12}} = \omega_{12} - \omega_{mean} + z_{sc} \cdot (P12_{e,y} - y_{gc}) - y_{sc} \cdot (P12_{e,z} - z_{gc})$$
$$= (-6484.49) - (-2877.83) + 134.30 \cdot [27.94 - (-2.49)] - (-1.60) \cdot (298.58 - 146.05) = 724.09\text{mm}^2$$

$$\omega_{s_{13}} = \omega_{13} - \omega_{mean} + z_{sc} \cdot (P13_{e,y} - y_{gc}) - y_{sc} \cdot (P13_{e,z} - z_{gc})$$
$$= (-12222.85) - (-2877.83) + 134.30 \cdot [47.16 - (-2.49)] - (-1.60) \cdot (298.58 - 146.05) = -2433.14\text{mm}^2$$

$$\omega_{s_{14}} = \omega_{14} - \omega_{mean} + z_{sc} \cdot (P14_{e,y} - y_{gc}) - y_{sc} \cdot (P14_{e,z} - z_{gc})$$
$$= (-21191.67) - (-2877.83) + 134.30 \cdot [72.20 - (-2.49)] - (-1.60) \cdot (298.58 - 146.05) = -7367.76\text{mm}^2$$

$$\omega_{s_{15}} = \omega_{15} - \omega_{mean} + z_{sc} \cdot (P15_{e,y} - y_{gc}) - y_{sc} \cdot (P15_{e,z} - z_{gc})$$
$$= (-21710.07) - (-2877.83) + 134.30 \cdot [78.58 - (-2.49)] - (-1.60) \cdot (297.20 - 146.05) = -7703.09\text{mm}^2$$

$$\omega_{s_{16}} = \omega_{16} - \omega_{mean} + z_{sc} \cdot \left(P16_{e,y} - y_{gc}\right) - y_{sc} \cdot \left(P16_{e,z} - z_{gc}\right) = (-23540.34) - (-2877.83) + 134.30 \cdot [78.58 - (-2.49)] - (-1.60) \cdot (273.91 - 146.05) = -9570.60\text{mm}^2$$

Maximum sectoral constant and sectoral module

$$\omega_{max} = \max(|\omega_s|) = 9570.60\text{mm}^2$$

$$W_\omega = \frac{I_w}{\omega_{max}} = \frac{7499345573}{9570.60} = 783581\text{mm}^4$$

Distance between centre of shear and center of gravity

$$y_s = y_{sc} - y_{gc} = (-1.60) - (-2.49) = 0.89\text{mm}$$

$$z_s = z_{sc} - z_{gc} = 134.30 - 146.05 = -11.75\text{mm}$$

Polar moment of inertia relative to shear Center

$$I_p = I_y + I_z + A_{eff} \cdot (y_s^2 + z_s^2) = 5552319 + 606659 + 275.43 \cdot [0.89^2 + (-11.75)^2] = 6197236\text{mm}^4$$

Nonsymetryc factors z_j and y_j

$$z_j = z_s - \frac{0.5}{I_y} \cdot \sum_{i=1}^{n} \left\{ \left[\left(z_{c_i}\right)^3 + z_{c_i} \cdot \left[\frac{(z_i - z_{i-1})^2}{4} + \left(y_{c_i}\right)^2 + \frac{(y_i - y_{i-1})^2}{12} \right] + y_{c_i} \cdot \frac{(y_i - y_{i-1}) \cdot (z_i - z_{i-1})}{6} \right] \cdot dA_i \right\}$$

$$z_j = z_s - \frac{0.5}{I_y} \cdot \Bigg\{ \Bigg[\left(z_{c_2}\right)^3 + z_{c_2} \cdot \left[\frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{4} + \left(y_{c_2}\right)^2 + \frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{12} \right] + y_{c_2}$$

$$\cdot \frac{\left(P2_{e,y} - P1_{e,y}\right) \cdot \left(P2_{e,z} - P1_{e,z}\right)}{6} \Bigg] \cdot dA_2$$

$$+ \Bigg[\left(z_{c_3}\right)^3 + z_{c_3} \cdot \left[\frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{4} + \left(y_{c_3}\right)^2 + \frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{12} \right] + y_{c_3}$$

$$\cdot \frac{\left(P3_{e,y} - P2_{e,y}\right) \cdot \left(P3_{e,z} - P2_{e,z}\right)}{6} \Bigg] \cdot dA_3$$

$$+ \Bigg[\left(z_{c_4}\right)^3 + z_{c_4} \cdot \left[\frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{4} + \left(y_{c_4}\right)^2 + \frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{12} \right] + y_{c_4}$$

$$\cdot \frac{\left(P4_{e,y} - P3_{e,y}\right) \cdot \left(P4_{e,z} - P3_{e,z}\right)}{6} \Bigg] \cdot dA_4$$

$$+ \Bigg[\left(z_{c_5}\right)^3 + z_{c_5} \cdot \left[\frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{4} + \left(y_{c_5}\right)^2 + \frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{12} \right] + y_{c_5}$$

$$\cdot \frac{\left(P5_{e,y} - P4_{e,y}\right) \cdot \left(P5_{e,z} - P4_{e,z}\right)}{6} \Bigg] \cdot dA_5$$

$$+ \Bigg[\left(z_{c_6}\right)^3 + z_{c_6} \cdot \left[\frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{4} + \left(y_{c_6}\right)^2 + \frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{12} \right] + y_{c_6}$$

$$\cdot \frac{\left(P6_{e,y} - P5_{e,y}\right) \cdot \left(P6_{e,z} - P5_{e,z}\right)}{6} \Bigg] \cdot dA_6$$

$$+ \Bigg[\left(z_{c_7}\right)^3 + z_{c_7} \cdot \left[\frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{4} + \left(y_{c_7}\right)^2 + \frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{12} \right] + y_{c_7}$$

$$\cdot \frac{\left(P7_{e,y} - P6_{e,y}\right) \cdot \left(P7_{e,z} - P6_{e,z}\right)}{6} \Bigg] \cdot dA_7$$

$$+ \Bigg[\left(z_{c_8}\right)^3 + z_{c_8} \cdot \left[\frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{4} + \left(y_{c_8}\right)^2 + \frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{12} \right] + y_{c_8}$$

$$\cdot \frac{\left(P8_{e,y} - P7_{e,y}\right) \cdot \left(P8_{e,z} - P7_{e,z}\right)}{6} \Bigg] \cdot dA_8$$

$$+ \Bigg[\left(z_{c_9}\right)^3 + z_{c_9} \cdot \left[\frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{4} + \left(y_{c_9}\right)^2 + \frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{12} \right] + y_{c_9}$$

$$\cdot \frac{\left(P9_{e,y} - P8_{e,y}\right) \cdot \left(P9_{e,z} - P8_{e,z}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \left[\left(z_{c_{10}}\right)^3 + z_{c_{10}} \cdot \left[\frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{4} + \left(y_{c_{10}}\right)^2 + \frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{12}\right] + y_{c_{10}}\right.$$

$$\cdot \frac{\left(P10_{e,y} - P9_{e,y}\right) \cdot \left(P10_{e,z} - P9_{e,z}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \left[\left(z_{c_{11}}\right)^3 + z_{c_{11}} \cdot \left[\frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{4} + \left(y_{c_{11}}\right)^2 + \frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{12}\right] + y_{c_{11}}\right.$$

$$\cdot \frac{\left(P11_{e,y} - P10_{e,y}\right) \cdot \left(P11_{e,z} - P10_{e,z}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \left[\left(z_{c_{12}}\right)^3 + z_{c_{12}} \cdot \left[\frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{4} + \left(y_{c_{12}}\right)^2 + \frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{12}\right] + y_{c_{12}}\right.$$

$$\cdot \frac{\left(P12_{e,y} - P11_{e,y}\right) \cdot \left(P12_{e,z} - P11_{e,z}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \left[\left(z_{c_{13}}\right)^3 + z_{c_{13}} \cdot \left[\frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{4} + \left(y_{c_{13}}\right)^2 + \frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{12}\right] + y_{c_{13}}\right.$$

$$\cdot \frac{\left(P13_{e,y} - P12_{e,y}\right) \cdot \left(P13_{e,z} - P12_{e,z}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \left[\left(z_{c_{14}}\right)^3 + z_{c_{14}} \cdot \left[\frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{4} + \left(y_{c_{14}}\right)^2 + \frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{12}\right] + y_{c_{14}}\right.$$

$$\cdot \frac{\left(P14_{e,y} - P13_{e,y}\right) \cdot \left(P14_{e,z} - P13_{e,z}\right)}{6}\Bigg] \cdot dA_{14}$$

$$+ \left[\left(z_{c_{15}}\right)^3 + z_{c_{15}} \cdot \left[\frac{\left(P15_{e,z} - P14_{e,z}\right)^2}{4} + \left(y_{c_{15}}\right)^2 + \frac{\left(P15_{e,y} - P14_{e,y}\right)^2}{12}\right] + y_{c_{15}}\right.$$

$$\cdot \frac{\left(P15_{e,y} - P14_{e,y}\right) \cdot \left(P15_{e,z} - P14_{e,z}\right)}{6}\Bigg] \cdot dA_{15}$$

$$+ \left[\left(z_{c_{16}}\right)^3 + z_{c_{16}} \cdot \left[\frac{\left(P16_{e,z} - P15_{e,z}\right)^2}{4} + \left(y_{c_{16}}\right)^2 + \frac{\left(P16_{e,y} - P15_{e,y}\right)^2}{12}\right] + y_{c_{16}}\right.$$

$$\cdot \frac{\left(P16_{e,y} - P15_{e,y}\right) \cdot \left(P16_{e,z} - P15_{e,z}\right)}{6}\Bigg] \cdot dA_{16}\Bigg\}$$

$$
\begin{aligned}
z_j = (-11.75) - \frac{0.5}{5552319} & \cdot \left\{\left[(-134.23)^3 + (-134.23)\right.\right. \\
& \cdot \left[\frac{(1.38-22.26)^2}{4} + (-81.09)^2 + \frac{[(-83.58)-(-83.58)]^2}{12}\right] + (-81.09) \\
& \cdot \left.\frac{[(-83.58)-(-83.58)]\cdot(1.38-22.26)}{6}\right] \cdot 24.47 + 0 \\
& + \left[(-146.05)^3 + (-146.05)\cdot\left[0 + (-65.38)^2 + \frac{[(-53.53)-(-82.20)]^2}{12}\right] + 0\right] \\
& \cdot 33.60 + 0 \\
& + \left[(-146.05)^3 + (-146.05)\cdot\left[0 + (-12.37)^2 + \frac{[(-1.38)-(-28.33)]^2}{12}\right] + 0\right] \\
& \cdot 38.27 + 0 + \left[(-129.07)^3 + (-129.07)\cdot\left[\frac{(32.59-1.38)^2}{4} + (-2.49)^2 + 0\right] + 0\right] \\
& \cdot 44.32 + 0 + \left[(186.79)^3 + 186.79\cdot\left[\frac{(297.20-265.99)^2}{4} + (-2.49)^2 + 0\right] + 0\right] \\
& \cdot 44.32 + 0 + \left[(152.53)^3 + 152.53\cdot\left[0 + 17.15^2 + \frac{(27.94-1.38)^2}{12}\right] + 0\right] \cdot 37.72 \\
& + 0 + \left[(152.53)^3 + 152.53\cdot\left[0 + (64.67)^2 + \frac{(72.20-47.16)^2}{12}\right] + 0\right] \cdot 29.70 + 0 \\
& + \left[(139.50)^3 + 139.50\cdot\left[\frac{(273.91-297.20)^2}{4} + (81.07)^2 + \frac{(78.58-78.58)^2}{12}\right]\right. \\
& \left.\left. + 81.07\cdot\frac{(78.58-78.58)\cdot(273.91-297.20)}{6}\right] \cdot 23.03\right\} = -14.65\text{mm}
\end{aligned}
$$

$$
\begin{aligned}
y_j = y_s - \frac{0.5}{I_z}\cdot\sum_{i=1}^{n} & \left[\left(y_{c_i}\right)^3 + y_{c_i}\cdot\left[\frac{(y_i-y_{i-1})^2}{4} + \left(z_{c_i}\right)^2 + \frac{(z_i-z_{i-1})^2}{12}\right] + z_{c_i}\right. \\
& \left.\cdot\frac{(z_i-z_{i-1})\cdot(y_i-y_{i-1})}{6}\right]\cdot dA_i
\end{aligned}
$$

$$
\begin{aligned}
y_j = y_s - \frac{0.5}{I_z} \cdot \Bigg\{ & \Bigg[\left(y_{c_2}\right)^3 + y_{c_2} \cdot \left[\frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{4} + \left(z_{c_2}\right)^2 + \frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{12} \right] + z_{c_2} \\
& \cdot \frac{\left(P2_{e,z} - P1_{e,z}\right) \cdot \left(P2_{e,y} - P1_{e,y}\right)}{6} \Bigg] \cdot dA_2 \\
& + \Bigg[\left(y_{c_3}\right)^3 + y_{c_3} \cdot \left[\frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{4} + \left(z_{c_3}\right)^2 + \frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{12} \right] + z_{c_3} \\
& \cdot \frac{\left(P3_{e,z} - P2_{e,z}\right) \cdot \left(P3_{e,y} - P2_{e,y}\right)}{6} \Bigg] \cdot dA_3 \\
& + \Bigg[\left(y_{c_4}\right)^3 + y_{c_4} \cdot \left[\frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{4} + \left(z_{c_4}\right)^2 + \frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{12} \right] + z_{c_4} \\
& \cdot \frac{\left(P4_{e,z} - P3_{e,z}\right) \cdot \left(P4_{e,y} - P3_{e,y}\right)}{6} \Bigg] \cdot dA_4 \\
& + \Bigg[\left(y_{c_5}\right)^3 + y_{c_5} \cdot \left[\frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{4} + \left(z_{c_5}\right)^2 + \frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{12} \right] + z_{c_5} \\
& \cdot \frac{\left(P5_{e,z} - P4_{e,z}\right) \cdot \left(P5_{e,y} - P4_{e,y}\right)}{6} \Bigg] \cdot dA_5 \\
& + \Bigg[\left(y_{c_6}\right)^3 + y_{c_6} \cdot \left[\frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{4} + \left(z_{c_6}\right)^2 + \frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{12} \right] + z_{c_6} \\
& \cdot \frac{\left(P6_{e,z} - P5_{e,z}\right) \cdot \left(P6_{e,y} - P5_{e,y}\right)}{6} \Bigg] \cdot dA_6 \\
& + \Bigg[\left(y_{c_7}\right)^3 + y_{c_7} \cdot \left[\frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{4} + \left(z_{c_7}\right)^2 + \frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{12} \right] + z_{c_7} \\
& \cdot \frac{\left(P7_{e,z} - P6_{e,z}\right) \cdot \left(P7_{e,z} - P6_{e,y}\right)}{6} \Bigg] \cdot dA_7 \\
& + \Bigg[\left(y_{c_8}\right)^3 + y_{c_8} \cdot \left[\frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{4} + \left(z_{c_8}\right)^2 + \frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{12} \right] + z_{c_8} \\
& \cdot \frac{\left(P8_{e,z} - P7_{e,z}\right) \cdot \left(P8_{e,y} - P7_{e,y}\right)}{6} \Bigg] \cdot dA_8 \\
& + \Bigg[\left(y_{c_9}\right)^3 + y_{c_9} \cdot \left[\frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{4} + \left(z_{c_9}\right)^2 + \frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{12} \right] + z_{c_9}
\end{aligned}
$$

$$\cdot \frac{\left(P9_{e,z} - P8_{e,z}\right) \cdot \left(P9_{e,y} - P8_{e,y}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \Bigg[\left(y_{c_{10}}\right)^3 + y_{c_{10}} \cdot \Bigg[\frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{4} + \left(z_{c_{10}}\right)^2 + \frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{12}\Bigg] + z_{c_{10}}$$

$$\cdot \frac{\left(P10_{e,z} - P9_{e,z}\right) \cdot \left(P10_{e,y} - P9_{e,y}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \Bigg[\left(y_{c_{11}}\right)^3 + y_{c_{11}} \cdot \Bigg[\frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{4} + \left(z_{c_{11}}\right)^2 + \frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{12}\Bigg] + z_{c_{11}}$$

$$\cdot \frac{\left(P11_{e,z} - P10_{e,z}\right) \cdot \left(P11_{e,y} - P10_{e,y}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \Bigg[\left(y_{c_{12}}\right)^3 + y_{c_{12}} \cdot \Bigg[\frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{4} + \left(z_{c_{12}}\right)^2 + \frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{12}\Bigg] + z_{c_{12}}$$

$$\cdot \frac{\left(P12_{e,z} - P11_{e,z}\right) \cdot \left(P12_{e,y} - P11_{e,y}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \Bigg[\left(y_{c_{13}}\right)^3 + y_{c_{13}} \cdot \Bigg[\frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{4} + \left(z_{c_{13}}\right)^2 + \frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{12}\Bigg] + z_{c_{13}}$$

$$\cdot \frac{\left(P13_{e,z} - P12_{e,z}\right) \cdot \left(P13_{e,y} - P12_{e,y}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \Bigg[\left(y_{c_{14}}\right)^3 + y_{c_{14}} \cdot \Bigg[\frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{4} + \left(z_{c_{14}}\right)^2 + \frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{12}\Bigg] + z_{c_{14}}$$

$$\cdot \frac{\left(P14_{e,z} - P13_{e,z}\right) \cdot \left(P14_{e,y} - P13_{e,y}\right)}{6}\Bigg] \cdot dA_{14}$$

$$+ \Bigg[\left(y_{c_{15}}\right)^3 + y_{c_{15}} \cdot \Bigg[\frac{\left(P15_{e,y} - P14_{e,y}\right)^2}{4} + \left(z_{c_{15}}\right)^2 + \frac{\left(P15_{e,z} - P14_{e,z}\right)^2}{12}\Bigg] + z_{c_{15}}$$

$$\cdot \frac{\left(P15_{e,z} - P14_{e,z}\right) \cdot \left(P15_{e,z} - P14_{e,y}\right)}{6}\Bigg] \cdot dA_{15}$$

$$+ \Bigg[\left(y_{c_{16}}\right)^3 + y_{c_{16}} \cdot \Bigg[\frac{\left(P16_{e,y} - P15_{e,y}\right)^2}{4} + \left(z_{c_{16}}\right)^2 + \frac{\left(P16_{e,z} - P15_{e,z}\right)^2}{12}\Bigg] + z_{c_{16}}$$

$$\cdot \frac{\left(P16_{e,z} - P15_{e,z}\right) \cdot \left(P16_{e,y} - P15_{e,y}\right)}{6}\Bigg] \cdot dA_{16}\Bigg\}$$

$$
\begin{aligned}
y_j = (0.89) - \frac{0.5}{606659}
&\cdot \Bigg\{\Bigg[(-81.09)^3 + (-81.09) \\
&\cdot \left[\frac{[(-83.58) - (-83.58)]^2}{4} + (-134.23)^2 + \frac{(1.38 - 22.26)^2}{12}\right] + (-134.23) \\
&\cdot \frac{(1.38 - 22.26) \cdot [(-83.58) - (-83.58)]}{6}\Bigg] \cdot 24.47 + 0 \\
&+ \left[(-65.38)^3 + (-65.38) \cdot \left[\frac{[(-53.53) - (-82.20)]^2}{4} + (-146.05)^2 + 0\right] + 0\right] \\
&\cdot 33.60 + 0 \\
&+ \left[(-12.37)^3 + (-12.37) \cdot \left[\frac{[(-1.38) - (-28.33)]^2}{4} + (-146.05)^2 + 0\right] + 0\right] \\
&\cdot 38.27 + 0 + \left[(2.49)^3 + (2.49) \cdot \left[0 + (-129.07)^2 + \frac{(32.59 - 1.38)^2}{12}\right] + 0\right] \cdot 44.32 \\
&+ 0 + \left[(2.49)^3 + (2.49) \cdot \left[0 + (151.84)^2 + \frac{(297.20 - 265.99)^2}{12}\right] + 0\right] \cdot 44.32 + 0 \\
&+ \left[(17.15)^3 + (17.15) \cdot \left[\frac{(27.94 - 1.38)^2}{4} + (152.53)^2 + 0\right] + 0\right] \cdot 37.72 + 0 \\
&+ \left[(64.67)^3 + 64.67 \cdot \left[\frac{(72.20 - 47.16)^2}{4} + (152.53)^2 + 0\right] + 0\right] \cdot 29.70 + 0 \\
&+ \Bigg[(81.07)^3 + 81.07 \cdot \left[\frac{(78.58 - 78.58)^2}{4} + (139.50)^2 + \frac{(273.91 - 297.20)^2}{12}\right] \\
&+ 139.50 \cdot \frac{(273.91 - 297.20) \cdot (78.58 - 78.58)}{6}\Bigg] \cdot 23.03\Bigg\} = -3.41\text{mm}
\end{aligned}
$$

where the coordinates of the center of the parts of the transversal section relative to the shear Center are:

$$y_{c_i} = \frac{y_i + y_{i-1}}{2} - y_{gc}$$

$$y_{c_i} = \frac{z_i + z_{i-1}}{2} - z_{gc}$$

$$z_{c_2} = \frac{P2_{e,z} + P1_{e,z}}{2} - z_{gc} = \frac{1.38 + 22.26}{2} - 146.05 = -134.23\text{mm}$$

$$z_{c_3} = \frac{P3_{e,z} + P2_{e,z}}{2} - z_{gc} = \frac{0 + 1.38}{2} - 146.05 = -145.36\text{mm}$$

$$z_{c_4} = \frac{P4_{e,z} + P3_{e,z}}{2} - z_{gc} = 0 - 146.05 = -146.05\text{mm}$$

$$z_{c_5} = \frac{P5_{e,z} + P4_{e,z}}{2} - z_{gc} = 0 - 146.05 = -146.05\text{mm}$$

$$z_{c_6} = \frac{P6_{e,z} + P5_{e,z}}{2} - z_{gc} = 0 - 146.05 = -146.05\text{mm}$$

$$z_{c_7} = \frac{P7_{e,z} + P6_{e,z}}{2} - z_{gc} = \frac{1.38 + 0}{2} - 146.05 = -145.36\text{mm}$$

$$z_{c_8} = \frac{P8_{e,z} + P7_{e,z}}{2} - z_{gc} = \frac{32.59 + 1.38}{2} - 146.05 = -129.07\text{mm}$$

$$z_{c_9} = \frac{P9_{e,z} + P8_{e,z}}{2} - z_{gc} = \frac{265.99 + 32.59}{2} - 146.05 = 3.24\text{mm}$$

$$z_{c_{10}} = \frac{P10_{e,z} + P9_{e,z}}{2} - z_{gc} = \frac{297.20 + 265.99}{2} - 146.05 = 135.54\text{mm}$$

$$z_{c_{11}} = \frac{P11_{e,z} + P10_{e,z}}{2} - z_{gc} = \frac{298.58 + 297.20}{2} - 146.05 = 151.84\text{mm}$$

$$z_{c_{12}} = \frac{P12_{e,z} + P11_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 146.05 = 152.53\text{mm}$$

$$z_{c_{13}} = \frac{P13_{e,z} + P12_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 146.05 = 152.53\text{mm}$$

$$z_{c_{14}} = \frac{P14_{e,z} + P13_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 146.05 = 152.53\text{mm}$$

$$z_{c_{15}} = \frac{P15_{e,z} + P14_{e,z}}{2} - z_{gc} = \frac{297.20 + 298.58}{2} - 146.05 = 151.84\text{mm}$$

$$z_{c_{16}} = \frac{P16_{e,z} + P15_{e,z}}{2} - z_{gc} = \frac{273.91 + 297.20}{2} - 146.05 = 139.50\text{mm}$$

$$y_{c_2} = \frac{P2_{e,y} + P1_{e,y}}{2} - y_{gc} = \frac{(-83.58) + (-83.58)}{2} - (-2.49) = -81.09\text{mm}$$

$$y_{c_3} = \frac{P3_{e,y} + P2_{e,y}}{2} - y_{gc} = \frac{(-82.20) + (-83.58)}{2} - (-2.49) = -80.40\text{mm}$$

$$y_{c_4} = \frac{P4_{e,y} + P3_{e,y}}{2} - y_{gc} = \frac{(-53.53) + (-82.20)}{2} - (-2.49) = -65.38\text{mm}$$

$$y_{c_5} = \frac{P5_{e,y} + P4_{e,y}}{2} - y_{gc} = \frac{(-28.33) + (-53.53)}{2} - (-2.49) = -38.44\text{mm}$$

$$y_{c_6} = \frac{P6_{e,y} + P5_{e,y}}{2} - y_{gc} = \frac{(-1.38) + -(-28.33)}{2} - (-2.49) = -12.37\text{mm}$$

$$y_{c_7} = \frac{P7_{e,y} + P6_{e,y}}{2} - y_{gc} = \frac{0 + (-1.38)}{2} - (-2.49) = 1.80\text{mm}$$

$$y_{c_8} = \frac{P8_{e,y} + P7_{e,y}}{2} - y_{gc} = 0 - (-2.49) = 2.49\text{mm}$$

$$y_{c_9} = \frac{P9_{e,y} + P8_{e,y}}{2} - y_{gc} = 0 - (-2.49) = 2.49\text{mm}$$

$$y_{c_{10}} = \frac{P10_{e,y} + P9_{e,y}}{2} - y_{gc} = 0 - (-2.49) = 2.49\text{mm}$$

$$y_{c_{11}} = \frac{P11_{e,y} + P10_{e,y}}{2} - y_{gc} = \frac{1.38 + 0}{2} - (-2.49) = 3.18\text{mm}$$

$$y_{c_{12}} = \frac{P12_{e,y} + P11_{e,y}}{2} - y_{gc} = \frac{27.94 + 1.38}{2} - (-2.49) = 17.15\text{mm}$$

$$y_{c_{13}} = \frac{P13_{e,y} + P12_{e,y}}{2} - y_{gc} = \frac{47.16 + 27.94}{2} - (-2.49) = 40.04\text{mm}$$

$$y_{c_{14}} = \frac{P14_{e,y} + P13_{e,y}}{2} - y_{gc} = \frac{72.20 + 47.16}{2} - (-2.49) = 64.67\text{mm}$$

$$y_{c_{15}} = \frac{P15_{e,y} + P14_{e,y}}{2} - y_{gc} = \frac{78.58 + 72.20}{2} - (-2.49) = 80.38\text{mm}$$

$$y_{c_{16}} = \frac{P16_{e,y} + P15_{e,y}}{2} - y_{gc} = \frac{78.58 + 78.58}{2} - (-2.49) = 81.07\text{mm}$$

4.2.2.2 The bent section after the small flange

In the case of the section subjected to bending, calculating the effective width requires preliminary completion (Steps 1.1-1.6). According to the calculation scheme shown in the figure below. Like the one in the case of the one subjected to centric compression.

Step 2.2 : Walls in compression:

Flange 2 : b_2 : interior wall

c_2 : cantilever wall

Web (partial):h_c : interior wall

Step 2.3 : By using the relations in scheme (A) at the calculation of effective dimensions due to buckling is determined at the level of the component walls of the flange (b1 , b2 , c1 , c2).

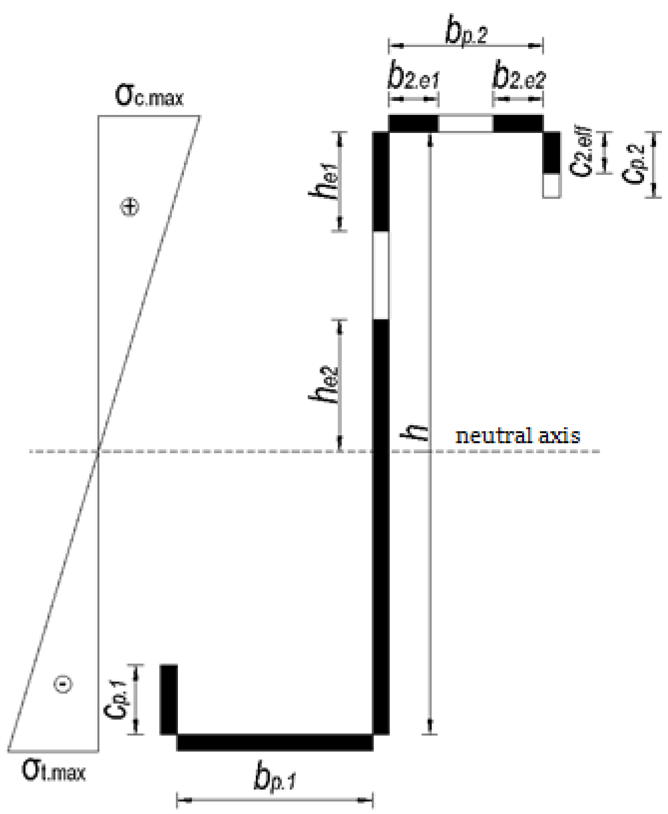
Step A.1 : The steel characteristics were chosen from the step 1.1

Step A.2 : The type of Wall considered being the one determined at step 2.2

Step A.3 :Since the section is centrical tension, for both interior and cantilevered walls, it is considered $\sigma_1 = \sigma_2 \Rightarrow \psi = \frac{\sigma_2}{\sigma_1} = 1$

Step A4-A6. Calculation of the coefficients k_σ , $\bar{\lambda}_p$, ρ

Step A7. Determination of effective width

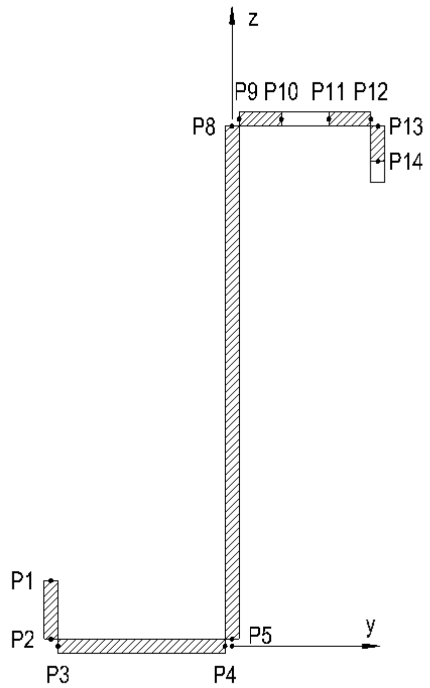


Interior wall (b_2), Scheme **Step A.1-A.7**		
Superior flange (b_2)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = 1 \Rightarrow k_\sigma = 4$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{b_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{75.82}{1.42}}{28.4 \cdot 0.814\sqrt{4}} = 1.16$ For $\overline{\lambda_p} = 1.16 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\bar{\lambda}_p^2} = \frac{1.16 - 0.055(3+1)}{1.16^2} = 0.701$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$b_{p2} = 75.82\ \text{mm}$ $b_{2.eff} = b_{p2} \cdot \rho = 75.82 \cdot 0.701 = 53.13\ \text{mm}$ $b_{2.e1} = b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 78.58 = 26.56\ \text{mm}$	Table 3.3 Scheme – Step A.7a
Cantilever wall (c_2)		
Superior flange stiffening (c_2)	$\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} = \frac{27.91 \cdot \sin(90°)}{75.82} = 0.368$ For $0.35 < {c_{p.2}}/{b_{p.2}} \leq 0.65$ we use the relation 5.13c $k_\sigma = 0.5 + 0.83\sqrt[3]{\left(\frac{c_{p.2} \cdot \sin\alpha_4}{b_{p.2}} - 0.35\right)^2}$ $= 0.5 + 0.83\sqrt[3]{(0.368 - 0.35)^2} = 0.557$ $\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$	Rel.(3.10) Rel.(3.11) Scheme – Steps A.1, A.2, A.3, A.4b
	$\overline{\lambda_p} = \frac{\frac{c_{p.2}}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{27.91}{1.42}}{28.4 \cdot 0.814\sqrt{0.557}} = 1.140$ For $\overline{\lambda_p} = 1.140 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.188}{\bar{\lambda}_p^2} = \frac{1.140 - 0.188}{1.140^2} = 0.733$	Rel. (3.7) Scheme – Step A.5 Rel. (3.6) Scheme – Step A.6b
	$c_{p2} = 27.91\ \text{mm}$ $c_{2.eff} = c_{p2} \cdot \rho = 27.91 \cdot 0.733 = 20.45\ \text{mm}$	Table 3.4 Scheme – Step A.7b

The effective segments at the level of the flanges are distributed according to the figure below. For the obtained section, the coordinates of the inserted points (P10, P11) are determined and the coordinates of the edge endpoint (P14) will be corrected.

Points coordinates :

- Horizontal coordinates (axis y-y)



$P1_{e.y} = -\left[g_{r.2} + b_{p.1} + g_{r.1} + c_{p.1} \cdot \cos(\phi_1)\right]$
$= -[1.38 + 80.82 + 1.38 + 27.91 \cdot \cos(90°)]$
$= -83.58 \text{ mm}$

$P2_{e.y} = -\left(g_{r.2} + b_{p.1} + g_{r.1}\right) = -(1.38 + 80.82 + 1.38)$
$= -83.58 \text{ mm}$

$P3_{e.y} = -\left(g_{r.2} + b_{p.1}\right) = -(1.38 + 80.82) = -82.20\text{mm}$

$P4_{e.y} = g_{r.2} = -1.38\text{mm}$

$P5_{e.y} = 0\text{mm}$

$P8_{e.y} = 0 \text{ mm}$

$P9_{e.y} = g_{r.2} = 1.38\text{mm}$

$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 26.56 = 27.94\text{mm}$

$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 75.82 - 26.56$
$= 50.64\text{mm}$

$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20\text{mm}$

$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58\text{mm}$

$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 75.82 + 1.38 + 20.45 \cdot \cos(90°)$
$= 78.58 \text{ mm}$

$P6_{e.y}, P7_{e.y}$ - will not be considered for this calculation

- Vertical coordinates (axis z-z)

$P1_{e.z} = g_{r.1} + c_{p.1} \cdot \sin(\phi_1) = 1.38 + 27.91 \cdot \sin(90°) = 29.29\text{mm}$

$P2_{e.z} = g_{r.1} = 1.38\text{mm}$

$P3_{e.z} = 0 \text{ mm}$

$P4_{e.z} = 0 \text{ mm}$

$P5_{e.z} = g_{r.2} = 1.38\text{mm}$

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 295.82 = 297.20\text{mm}$

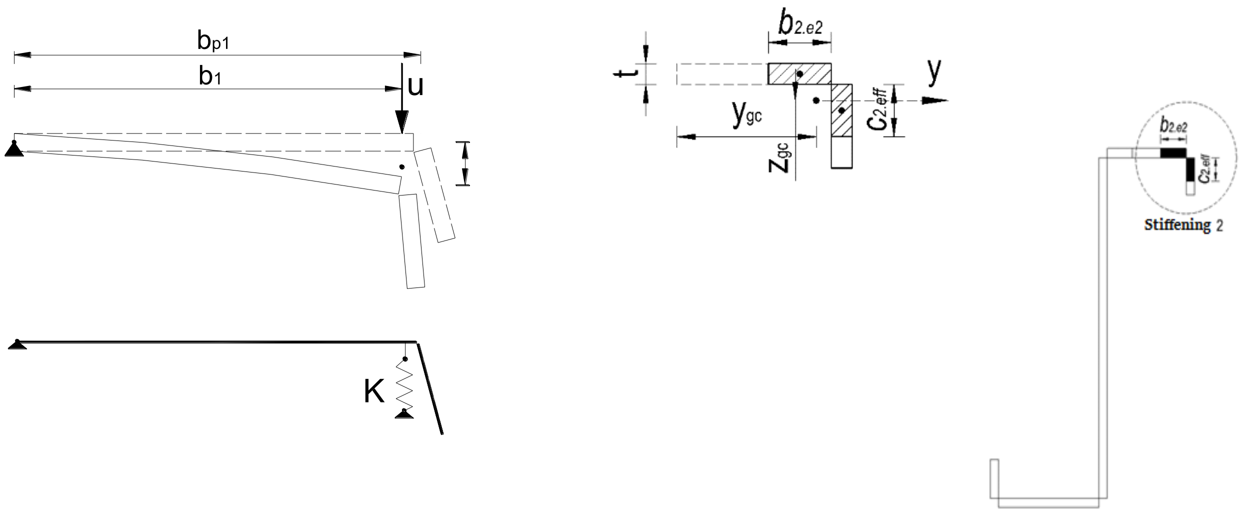
$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58 \text{ mm}$

$P10_{e.z} = P11_{e.z} = P12_{e.z} = 298.58 \text{ mm}$

$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 295.82 + 1.38 - 1.38 = 297.20 \text{ mm}$

$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$
$= 1.38 + 295.82 + 1.38 - 1.38 - 20.45 \cdot \sin(75°) = 276.75 \text{ mm}$

Step 3.1 : The calculation is associated with distortion buckling at the flange in compression. The calculation methodology is carried out according to the scheme "B" shown in the figure below and is subjected to the compressed stiffening portions.



Step B.1: This step indicates the need to precalculate the effective dimensions of the flange portions, carried out in the previous stages.

Step B.2-B.6 : Calculation for the first iteration:

Iteration 1, Scheme **Step B.2-B.6**	
• **Compression stiffening area** • $A_{s2} = (b_{2.e2} + c_{2.eff})t = (26.56 + 20.45) \cdot 1.42 = 66.76\ mm^2$	Rel. (3.17) Scheme – Step B.2
• **Center of gravity at the level of stiffening compression** $dA_{b2,e2} = \left[t \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2} \right]$ $dA_{b2,e2} = \left[1.42 \cdot \sqrt{(77.20 - 50.64)^2 + (298.58 - 298.58)^2} \right] = 37.72mm^2$ $dA_{c2,eff} = \left[t \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2} \right]$ $dA_{c2,eff} = \left[1.42 \cdot \sqrt{(78.58 - 78.58)^2 + (276.75 - 297.20)^2} \right] = 29.04mm^2$ $S_{y0,2} = \left[\left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{c2}}{2} \right] + \left[\left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2,e2}}{2} \right] = \left[(276.75 + 297.20) \cdot \frac{29.04}{2} + (298.58 + 298.58) \cdot \frac{37.72}{2} \right] = 19597mm^3$ $z_{gc,2} = \frac{19597}{66.76} = 293.53mm$	ANNEX A

$$S_{z0,2} = (P14_{e,y} + P13_{e,y}) \cdot \frac{dA_{c2}}{2} + (P12_{e,y} + P11_{e,y}) \cdot \frac{dA_{b2,e2}}{2}$$ $$= \left[(78.58 + 78.58) \cdot \frac{29.04}{2} + (77.20 + 50.64) \cdot \frac{37.72}{2}\right]$$ $$= 4693.20\text{mm}^3$$ $$y_{gc,2} = \frac{4693.20}{66.76} = 70.30\text{mm}$$	
• **Moments of inertia relative to the axis y-y** ○ *Stiffening 2* Stiffening 2 is composed of two segments bounded by the points : $(P11_e - P12_e)$ and $(P13_e - P14_e)$ $$I_{s2.y} = I_{s2.y0} - A_{s2} \cdot z_{gc,2}^2$$ $I_{s2.y0}$ - the moment of inertia calculated in ratio to the axis y_0-y_0 $$I_{s2.y0} = \sum_{i=1}^{n} [(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3}$$ $$I_{s2.y0} = (P12_{e,z}^2 + P11_{e,z}^2 + P12_{e,z} \cdot P11_{e,z}) \frac{dA_{b2,e2}}{3} + (P14_{e,z}^2 + P13_{e,z}^2 + P14_{e,z} \cdot P13_{e,z}) \frac{dA_{c2,eff}}{3}$$ $$I_{s2.y0} = (298.58^2 + 298.58^2 + 298.58 \cdot 298.58) \frac{29.04}{3} + (276.75^2 + 297.20^2 + 276.75 \cdot 297.20) \frac{37.72}{3}$$ $$= 5755572\text{mm}^4$$ $$I_{s2.y} = 5755572 - 66.76 \cdot 293.53^2 = 3222.49\ \text{mm}^4$$	ANNEX A, Scheme – Step B2
• **Stiffness in the rotation of the flanges** • *Stiffening 2* $k_{f2} = 0$ *(since the section is bented - the first flange is in tension)* $$K_2 = \frac{E \cdot t^3}{4(1-\nu^2)} \cdot \frac{1}{y_{gc,2}^2 \cdot h + y_{gc,2}^3 + 0.5 \cdot y_{gc,2} \cdot y_{gc,1} \cdot h \cdot k_{f2}}$$ $$K_2 = \frac{210000 \cdot 1.42^3}{4(1-0.3^2)} \cdot \frac{1}{70.30^2 \cdot 298.58 + 70.30^3 + 0} = 0.0906$$	Rel.(3.20), Scheme – Step B3
• Critical stress of elastic buckling ○ *Stiffening 2* $$\sigma_{cr.s2} = \frac{2\sqrt{K_2 \cdot E \cdot I_{s2}}}{A_{s2}} = \frac{2\sqrt{0.0906 \cdot 210000 \cdot 3222.49}}{66.76} = 234.59\ \text{N/mm}^2$$	Rel. (3.16), Scheme – Step B4

• **Slenderness and reduction coefficient for buckling by distortion** *Stiffening 2* $\overline{\lambda_{d.2}} = \sqrt{\frac{f_{y.b}}{\sigma_{cr.s2}}} = \sqrt{\frac{355}{234.59}} = 1.23$ For $0.65 < \overline{\lambda_{d2}} < 1.38 \Rightarrow$ $\chi_{d.2} = 1.47 - 0.723 \cdot \overline{\lambda_{d2}} = 1.47 - 0.723 \cdot 1.23 = 0.581$	Rel. (3.15) Scheme – Step B.5 Rel.(3.12), Rel.(3.13), Rel.(3.14), Scheme – Step B.6

Step B.7-B.10. Based on the reduction factor values $\overline{\lambda_{p.red}}$ s determined and recalculated in a new iteration the effective widths of the stiffeners using the calculation scheme „A". The iterative procedure is repeated until the conditions presented in Step B.7are met.

Iteration 2, Scheme **Step B.7**		
Interior wall (b_2)		
Stiffening Superior flangesuper (b_2)	$\overline{\lambda_p} = 1.16$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 1.16 \cdot \sqrt{0.581} = 0.880$ For $\overline{\lambda_p} = 0.880 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{0.880 - 0.055(3+1)}{0.880^2} = 0.852$ ≤ 1	Rel. (3.8) Scheme – Steps, B.8, B.9
	$b_{p2} = 75.82$ mm $b_{2.eff} = b_{p2} \cdot \rho = 75.82 \cdot 0.852 = 64.60$ mm $b_{2.e2} = 0.5 \cdot b_{2.eff} = 0.5 \cdot 64.60 = 32.30$ mm	Scheme - Step B.10
Cantilever walls (c_2)		
Stiffening superior flange (c_2)	$\overline{\lambda_p} = 1.14$ $\overline{\lambda_{p.red}} = \overline{\lambda_p} \cdot \sqrt{\chi_{d.2}} = 1.14 \cdot \sqrt{0.581} = 0.868$ For $\overline{\lambda_p} = 0.868 > 0.748 \Rightarrow$ $\rho = \frac{\overline{\lambda_{p.red}} - 0.055(3+\psi)}{\overline{\lambda_{p.red}}^2} = \frac{0.868 - 0.055(3+1)}{0.868^2} = 0.90$ ≤ 1	Rel. 3.8 Scheme – Step B.9
	$c_{p2} = 27.91$ mm $c_{2.eff} = c_{p2} \cdot \rho = 27.91 \cdot 0.90 = 25.18$ mm	Scheme - Step B.10

Step B.11. At the end of the last iteration, we obtained the new effective widths of the portions related to the stiffening. The values obtained for each iteration is centralized in the table below.

Stiffening 2														
Iter.	χ_d	Flange				Rebord				Stiffening characteristics				
		λ_p	$\lambda_{p,red}$	ρ	$b_{2,e2}$ [mm]	λ_p	$\lambda_{p,red}$	ρ	$c_{eff,2}$ [mm]	A_s [mm^2]	K [N/mm^2]	I_s [mm^4]	$\sigma_{cr,s}$ [N/mm^2]	χ_d
1	1.000	1.16	-	0.701	26.56	1.14	-	0.733	20.45	66.76	0.091	3222.49	234.59	0.581
2	0.581	1.16	0.880	0.852	32.30	1.14	0.868	0.902	25.18	81.63	0.095	5812.89	264.13	0.632
3	0.632	1.16	0.918	0.828	31.39	1.14	0.906	0.875	24.42	79.25	0.094	5324.30	259.36	0.624
4	0.624	1.16	0.913	0.831	31.52	1.14	0.900	0.879	24.53	79.59	0.095	5392.84	260.05	0.625
5	0.625	1.16	0.914	0.831	31.50	1.14	0.901	0.878	24.51	79.54	0.095	5382.77	259.95	0.625

Step B.12. The reduced thicknesses of the stiffeners, due to buckling by distortion, are obtained based on the relation (3.25):

- *a stiffening 1 (inferior flange)*

$t_{red.s1} = t = 1.42\ mm$: the thickness is unreduced because the flange is not in compression

- *a stiffening 2 (superior flange)*

$\chi_{d.2,final} = \min(\chi_{d.2.1}, \chi_{d.2.2}, \chi_{d.2.3}, \chi_{d.2.4}, \chi_{d.2.5}) = 0.581$

$t_{red.s2} = \chi_{d.2,final} \cdot t = 0.581 \cdot 1.42 = 0.82\text{mm}$

The final effective dimensions of the superior flange were obtained by determination of distortion buckling and centralized in the following table:

	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	31.50	24.51
thickness **t**	0.824	0.824

Step 4.1: Determination of the effective width of the web due to local buckling by the calculation methodology presented in the scheme „A"

Step A.1: The characteristics of the Steel take over from step 1.1

Step A.2: Interior wall

Step A.3: Calculation of sectional characteristics considering the flange effectiveness is carried out by using the relations from ANNEX A.

- Horizontal coordinates (axis y-y)

$$P1_{e.y} = -[g_{r.2} + b_{p.1} + g_{r.1} + c_{p.1} \cdot \cos(\phi_1)] = -[1.38 + 80.82 + 1.38 + 27.91 \cdot \cos(90°)] = -83.58\text{ mm}$$

$$P2_{e.y} = -(g_{r.2} + b_{p.1} + g_{r.1}) = -(1.38 + 80.82 + 1.38) = -83.58\text{ mm}$$

$$P3_{e.y} = -(g_{r.2} + b_{p.1}) = -(1.38 + 80.82) = -82.20\text{mm}$$

$$P4_{e.y} = g_{r.2} = -1.38\text{mm}$$

$$P5_{e.y} = 0\text{mm}$$

$$P8_{e.y} = 0\text{ mm}$$

$$P9_{e.y} = g_{r.2} = 1.38\text{mm}$$

$$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 26.56 = 27.94\text{mm}$$

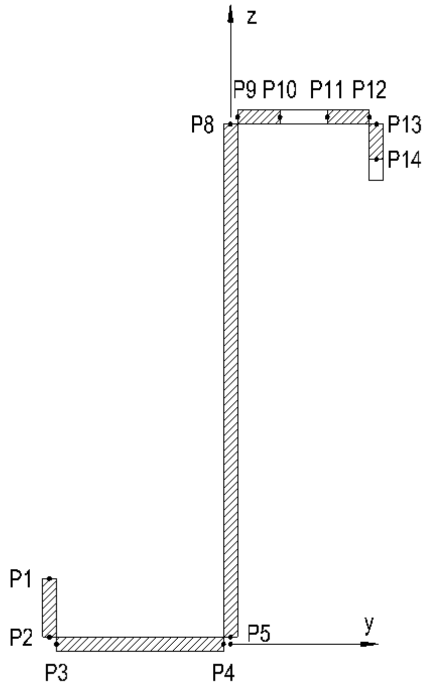
$$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 75.82 - 31.50 = 45.70\text{mm}$$

$$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20\text{mm}$$

$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58mm$

$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4)$
$= 1.38 + 75.82 + 1.38 + 24.51 \cdot \cos(90°) = 78.58\ mm$

$P6_{e.y}, P7_{e.y}$ - will not be used for this calculation



- Vertical coordinates (axis z-z)

$P1_{e.z} = g_{r.1} + c_{p.1} \cdot \sin(\phi_1) = 1.38 + 27.91 \cdot \sin(90°) = 29.29mm$

$P2_{e.z} = g_{r.1} = 1.38mm$

$P3_{e.z} = 0\ mm$

$P4_{e.z} = 0\ mm$

$P5_{e.z} = g_{r.2} = 1.38mm$

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 295.82 = 297.20mm$

$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58\ mm$

$P10_{e.z} = P11_{e.z} = P12_{e.z} = 298.58\ mm$

$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 295.82 + 1.38 - 1.38$
$= 297.20\ mm$

$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4)$
$= 1.38 + 295.82 + 1.38 - 1.38 - 24.51 \cdot \sin(90°) = 272.69\ mm$

Observation : $P6_{e.z}, P7_{e.z}$ - will not be used for this calculation

Area of portions of the sections

$$dA_{c1} = \overrightarrow{\left[t \cdot \sqrt{\left(P2_y - P1_y\right)^2 + (P2_z - P1_z)^2}\right]}$$
$$= \overrightarrow{\left[1.42 \cdot \sqrt{[(-83.58) - (-83.58)]^2 + (1.38 - 29.29)^2}\right]} = 39.63mm^2$$

$$dA_{b1} = \overrightarrow{\left[t \cdot \sqrt{\left(P4_y - P3_y\right)^2 + (P4_z - P3_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{[(-1.38) - (-82.20)]^2 + (0 - 0)^2}\right]}$$
$$= 114.77mm^2$$

$$dA_h = \overrightarrow{\left[t \cdot \sqrt{\left(P8_y - P5_y\right)^2 + (P8_z - P5_z)^2}\right]} = \overrightarrow{\left[1.42 \cdot \sqrt{(0 - 0)^2 + (297.20 - 1.38)^2}\right]}$$
$$= 420.07mm^2$$

$$dA_{b2,e1} = \overrightarrow{\left[t \cdot \sqrt{\left(P10_y - P9_y\right)^2 + (P10_z - P9_z)^2}\right]}$$
$$= \overrightarrow{\left[1.42 \cdot \sqrt{(27.94 - 1.38)^2 + (298.58 - 298.58)^2}\right]} = 37.72mm^2$$

$$dA_{b2,e2} = \overrightarrow{\left[t_{red,s2} \cdot \sqrt{\left(P12_y - P11_y\right)^2 + (P12_z - P11_z)^2}\right]}$$
$$= \overrightarrow{\left[0.82 \cdot \sqrt{(77.20 - 45.72)^2 + (298.58 - 298.58)^2}\right]} = 25.97mm^2$$

$$dA_{c2,eff} = \overrightarrow{\left[t_{red,s2} \cdot \sqrt{\left(P14_y - P13_y\right)^2 + (P14_z - P13_z)^2}\right]}$$
$$= \overrightarrow{\left[0.82 \cdot \sqrt{(78.58 - 78.58)^2 + (272.69 - 297.20)^2}\right]} = 20.21mm^2$$

Section area

$$A = dA_{c1} + dA_{b1} + dA_{h} + dA_{b2,e1} + dA_{b2,e1} + dA_{c2}$$
$$= 39.63 + 114.77 + 420.07 + 37.72 + 25.97 + 20.21 = 658.37\text{mm}^2$$

The static moment in ratio to the Y-axis and the coordinate of the center of gravity

$$S_{y0} = (P2_z + P1_z) \cdot \frac{dA_{c1}}{2} + (P4_z + P3_z) \cdot \frac{dA_{b1}}{2} + (P8_z + P5_z) \cdot \frac{dA_{h}}{2} + (P10_z + P9_z) \cdot \frac{dA_{b2,e1}}{2} + (P12_z + P11_z) \cdot \frac{dA_{b2,e2}}{2} + (P14_z + P13_z) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{y0} = (1.38 + 29.29) \cdot \frac{39.63}{2} + (0 + 0) \cdot \frac{114.77}{2} + (297.20 + 1.38) \cdot \frac{420.07}{2} + (298.58 + 298.58) \cdot \frac{37.72}{2} + (298.58 + 298.58) \cdot \frac{25.97}{2} + (272.69 + 297.20) \cdot \frac{20.21}{2} = 88095.70\text{mm}^3$$

$$z_{gc} = \frac{88095.70}{658.37} = 133.81\text{mm}$$

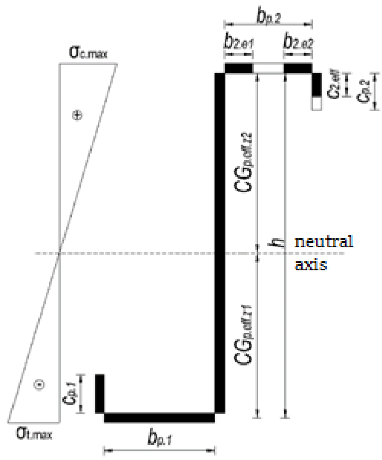
Determination of the stress distribution coefficient „ψ” :

$$CG_{p.eff,z2} = h - CG_{p.eff,z1} = 298.58 - 133.81 = 164.77\text{mm}$$

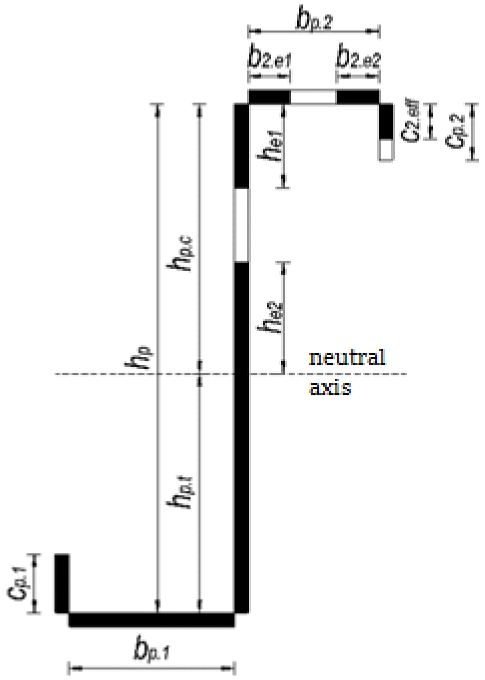
$$\sigma_1 = \sigma_{c.e.max} = 355\frac{\text{N}}{\text{mm}^2}$$

$$\sigma_2 = \sigma_{t.e.max} = -\frac{CG_{p.eff,z1} \cdot \sigma_1}{CG_{p.eff,z2}} = \frac{133.81 \cdot 355}{164.77} = -288.29\frac{\text{N}}{\text{mm}^2}$$

$$\psi = \frac{\sigma_2}{\sigma_1} = \frac{-288.29}{355} = -0.812$$



Step A.4-A.7 :

Interior wall (h) – Scheme **Step A.1-A.7**		
WEB (h)	$\varepsilon = \sqrt{\frac{235}{f_y}} = \sqrt{\frac{235}{355}} = 0.814$ For $\psi = -0.812 \Rightarrow k_\sigma = 7.81 - 6.29\psi + 9.78\psi^2 = 19.37$	Table 3.3 Scheme – Steps A.1, A.2, A.3, A4a
	$\overline{\lambda_p} = \frac{\frac{h_p}{t}}{28.4 \cdot \varepsilon\sqrt{k_\sigma}} = \frac{\frac{295.82}{1.42}}{28.4 \cdot 0.814\sqrt{19.37}} = 2.07$ For $\overline{\lambda_p} = 2.07 > 0.673 \Rightarrow$ $\rho = \frac{\overline{\lambda_p} - 0.055(3+\psi)}{\overline{\lambda}_p^2} = \frac{2.07 - 0.055(3 - 0.812)}{2.07^2} = 0.455$	Rel. (3.7) Scheme – Step A.5 Rel. (3.5) Scheme – Step A.6a
	$h_p = 295.82\ \text{mm}$ $h_{p.c} = \frac{\lvert\sigma_1\rvert \cdot h_p}{\lvert\sigma_1\rvert + \lvert\sigma_2\rvert} = \frac{355 \cdot 295.82}{355 + 288.29} = 163.25\text{mm}$ $h_{p.t} = h_p - h_{p.c} = 295.82 - 163.25 = 132.57\text{mm}$ $h_{eff} = h_{p.c} \cdot \rho = 163.25 \cdot 0.455 = 74.36\ \text{mm}$ $h_{e1} = 0.4 \cdot h_{eff} = 0.4 \cdot 74.36 = 29.74\ \text{mm}$ $h_{e2} = 0.6 \cdot h_{eff} = 0.6 \cdot 74.36 = 44.61\ \text{mm}$  	Table 3.3 Scheme – Step A.7a

The final characteristics of the C-section bent after the small flange

The effective section (Scheme Step 4.1b)

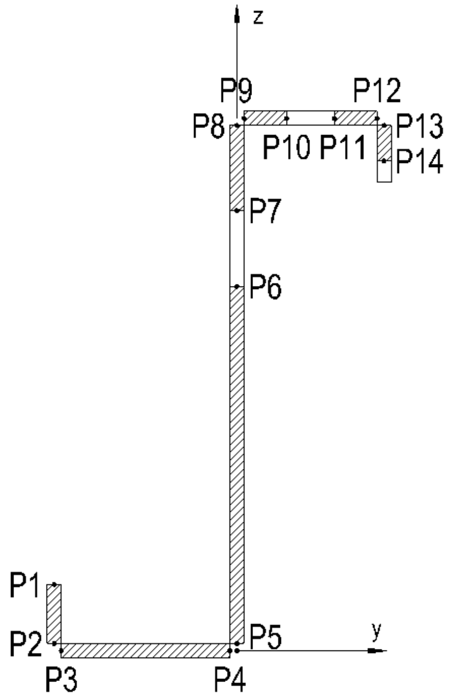
	c_{p1} [mm]	b_{p1} [mm]	$h_{.pt}$+$h_{.e2}$ [mm]	$h_{.e1}$ [mm]	$b_{2.e1}$ [mm]	$b_{2.e2}$ [mm]	$c_{2.eff}$ [mm]
length	27.91	80.82	177.19	29.74	26.56	31.50	24.51
thickness **t**	1.42	1.42	1.42	1.42	1.42	0.824	0.824

Step 5.1 Calculation of the effective section of the section:

Following step 4.1 effective widths of the web wall were determined. Its segmentation into effective and respectively ineffective portions is delimited by nodes P6 and P7.

Node final coordinates :

- Horizontal coordinates (axis y-y)



$P1_{e.y} = -[g_{r.2} + b_{p.1} + g_{r.1} + c_{p1} \cdot \cos(\phi_1)] = -[1.38 + 80.82 + 1.38 + 27.91 \cdot \cos(90°)] = -83.58mm$

$P2_{e.y} = -(g_{r.2} + b_{p.1} + g_{r.1}) = -[1.38 + 80.82 + 1.38] = -83.58mm$

$P3_{e.y} = -(g_{r.2} + b_{p.1}) = -(1.38 + 80.82) = -82.20mm$

$P4_{e.y} = -g_{r.2} = -1.38mm$

$P5_{e.y} = 0\ mm$

$P6_{e.y} = P7_{e.y} = P8_{e.y} = 0mm$

$P9_{e.y} = g_{r.3} = 1.38mm$

$P10_{e.y} = g_{r.3} + b_{2,e1} = 1.38 + 26.56 = 27.94mm$

$P11_{e.y} = g_{r.3} + b_{p.2} - b_{2.e2} = 1.38 + 75.82 - 31.50 = 45.70mm$

$P12_{e.y} = g_{r.3} + b_{p.2} = 1.38 + 75.82 = 77.20mm$

$P13_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} = 1.38 + 75.82 + 1.38 = 78.58mm$

$P14_{e.y} = g_{r.3} + b_{p.2} + g_{r.4} + c_{2eff} \cdot \cos(\phi_4) = 1.38 + 75.82 + 1.38 + 24.51 \cdot \cos(90°) = 78.58mm$

- Vertical coordinates (axis z-z)

$P1_{e.z} = g_{r.1} + c_{p1} \cdot \sin(\phi_1) = 1.38 + 27.91 \cdot \sin(90°) = 29.29mm$

$P2_{e.z} = g_{r.1} = 1.38mm$

$P3_{e.z} = 0\ mm$

$P4_{e.z} = 0\ mm$

$P5_{e.z} = g_{r.2} = 1.38mm$

$P6_{e.z} = g_{r.2} + h_{p.t} + h_{e2} = 1.38 + 132.57 + 44.61 = 178.57mm$

$P7_{e.z} = g_{r.2} + h_p - h_{e1} = 1.38 + 295.82 - 29.74 = 267.46mm$

$P8_{e.z} = g_{r.2} + h_p = 1.38 + 295.82 = 297.20mm$

$P9_{e.z} = g_{r.2} + h_p + g_{r.3} = 1.38 + 295.82 + 1.38 = 298.58mm$
$P10_{e.z} = P11_z = P12_z = P9_z = 298.58mm$
$P13_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} = 1.38 + 295.82 + 1.38 - 1.38 = 297.20mm$
$$P14_{e.z} = g_{r.2} + h_p + g_{r.3} - g_{r.4} - c_{2eff} \cdot \sin(\phi_4) = 1.38 + 295.82 + 1.38 - 1.38 - 24.51 \cdot \sin(90°) = 272.69mm$$

Sectional characteristics are determined according to ANNEX A.

Portion area of sections

$$dA_{c1} = \left[\overrightarrow{t \cdot \sqrt{\left(P2_{e,y} - P1_{e,y}\right)^2 + \left(P2_{e,z} - P1_{e,z}\right)^2}} \right] = \left[\overrightarrow{1.42 \cdot \sqrt{[(-83.58) - (-83.58)]^2 + (1.38 - 29.29)^2}} \right] = 39.63mm^2$$

$$dA_{b1} = \left[\overrightarrow{t \cdot \sqrt{\left(P4_{e,y} - P3_{e,y}\right)^2 + \left(P4_{e,z} - P3_{e,z}\right)^2}} \right] = \left[\overrightarrow{1.42 \cdot \sqrt{[(-1.38) - (-82.20)]^2 + 0}} \right] = 114.77mm^2$$

$$dA_{h,t+h,e2} = \left[\overrightarrow{t \cdot \sqrt{\left(P6_{e,y} - P5_{e,y}\right)^2 + \left(P6_{e,z} - P5_{e,z}\right)^2}} \right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (178.57 - 1.38)^2}} \right] = 251.60mm^2$$

$$dA_{h,e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P8_{e,y} - P7_{e,y}\right)^2 + \left(P8_{e,z} - P7_{e,z}\right)^2}} \right] = \left[\overrightarrow{1.42 \cdot \sqrt{0 + (297.20 - 267.46)^2}} \right] = 42.23mm^2$$

$$dA_{b2.e1} = \left[\overrightarrow{t \cdot \sqrt{\left(P10_{e,y} - P9_{e,y}\right)^2 + \left(P10_{e,z} - P9_{e,z}\right)^2}} \right] = \left[\overrightarrow{1.42 \cdot \sqrt{(27.94 - 1.38)^2 + (298.58 - 298.58)^2}} \right] = 37.72mm^2$$

$$dA_{b2.e2} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P12_{e,y} - P11_{e,y}\right)^2 + \left(P12_{e,z} - P11_{e,z}\right)^2}} \right] = \left[\overrightarrow{0.82 \cdot \sqrt{(77.20 - 45.70)^2 + (298.58 - 298.58)^2}} \right] = 25.97mm^2$$

$$dA_{c2,eff} = \left[\overrightarrow{t_{red,s2} \cdot \sqrt{\left(P14_{e,y} - P13_{e,y}\right)^2 + \left(P14_{e,z} - P13_{e,z}\right)^2}} \right] = \left[\overrightarrow{0.82 \cdot \sqrt{(78.58 - 78.58)^2 + (272.69 - 297.20)^2}} \right] = 20.21mm^2$$

Effective area

$$A_{eff} = dA_{b1} + dA_{c1} + dA_{h,t+h,e2} + dA_{h,e1} + dA_{b2.e1} + dA_{b2.e2} + dA_{c2,eff} = 39.63 + 114.77 + 251.60 + 42.23 + 37.72 + 25.97 + 20.21 = 532.14mm^2$$

Static moment in ratio to the Y axis and the coordinate of the center of gravity

$$S_{y0} = (P2_{e,z} + P1_{e,z}) \cdot \frac{dA_{c1}}{2} + \left(P4_{e,z} + P3_{e,z}\right) \cdot \frac{dA_{b1}}{2} + \left(P6_{e,z} + P5_{e,z}\right) \cdot \frac{dA_{h,t+h,e2}}{2} + \left(P8_{e,z} + P7_{e,z}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,z} + P9_{e,z}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P12_{e,z} + P11_{e,z}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P14_{e,z} + P13_{e,z}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{y0} = (1.38 + 29.29) \cdot \frac{39.63}{2} + 0 + (178.57 + 1.38) \cdot \frac{251.60}{2} + (297.20 + 267.46) \cdot \frac{42.23}{2} + (298.58 + 298.58) \cdot \frac{37.72}{2} + (298.58 + 298.58) \cdot \frac{25.97}{2} + (272.20 + 297.20) \cdot \frac{20.21}{2} = 59945.6\text{mm}^3$$

Position of center of gravity (vertical coordinates) :

$$z_{gc} = \frac{59945.6}{532.14} = 112.65\text{mm}$$

Moment of inertia in ratio to the original Y axis and the new Y axis through the center of gravity

$$I_{y0} = \left[\left(P2_{e,z}\right)^2 + \left(P1_{e,z}\right)^2 + P2_{e,z} \cdot P1_{e,z}\right] \cdot \frac{dA_{c1}}{3} + \left[\left(P4_{e,z}\right)^2 + \left(P3_{e,z}\right)^2 + P4_{e,z} \cdot P3_{e,z}\right] \cdot \frac{dA_{b1}}{3} + \left[\left(P6_{e,z}\right)^2 + \left(P5_{e,z}\right)^2 + P6_{e,z} \cdot P5_{e,z}\right] \cdot \frac{dA_{h,t+h,e2}}{3} + \left[\left(P8_{e,z}\right)^2 + \left(P7_{e,z}\right)^2 + P8_{e,z} \cdot P7_{e,z}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,z}\right)^2 + \left(P9_{e,z}\right)^2 + P10_{e,z} \cdot P9_{e,z}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P12_{e,z}\right)^2 + \left(P11_{e,z}\right)^2 + P12_{e,z} \cdot P11_{e,z}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P14_{e,z}\right)^2 + \left(P13_{e,z}\right)^2 + P14_{e,z} \cdot P13_{e,z}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{y0} = \{[(1.38)^2 + (29.29)^2 + 1.38 \cdot 29.29] \cdot \frac{39.63}{3} + 0 + [(178.57)^2 + (1.38)^2 + 178.57 \cdot 1.38] \cdot \frac{251.60}{3} + [(297.20)^2 + (267.46)^2 + 297.20 \cdot 267.46] \cdot \frac{42.23}{3} + [(298.58)^2 + (298.58)^2 + 298.58 \cdot 298.58] \cdot \frac{37.72}{3} + [(298.58)^2 + (298.58)^2 + 298.58 \cdot 298.58] \cdot \frac{25.97}{3} + [(272.69)^2 + (297.20)^2 + 272.69 \cdot 297.20] \cdot \frac{20.21}{3} = 13396712\text{mm}^4$$

$$I_y = 13396712 - 532.14 \cdot 112.65^2 = 6643852\text{mm}^4$$

Static moment in ratio to the Y axis and the coordinate of the center of gravity

$$S_{z0} = (P2_{e,y} + P1_{e,y}) \cdot \frac{dA_{c1}}{2} + \left(P4_{e,y} + P3_{e,y}\right) \cdot \frac{dA_{b1}}{2} + \left(P6_{e,y} + P5_{e,y}\right) \cdot \frac{dA_{h,t+h,e2}}{2} + \left(P8_{e,y} + P7_{e,y}\right) \cdot \frac{dA_{h,e1}}{2} + \left(P10_{e,y} + P9_{e,y}\right) \cdot \frac{dA_{b2.e1}}{2} + \left(P12_{e,y} + P11_{e,y}\right) \cdot \frac{dA_{b2.e2}}{2} + \left(P14_{e,y} + P13_{e,y}\right) \cdot \frac{dA_{c2,eff}}{2}$$

$$S_{z0} = [(-83.58) - (-83.58)] \cdot \frac{39.63}{2} + [(-1.38) - (-82.20)] \cdot \frac{114.77}{2} + 0 + 0 + (27.94 + 1.38) \cdot \frac{37.72}{2} + (72.20 + 45.70) \cdot \frac{25.97}{2} + (78.58 + 78.58) \cdot \frac{20.21}{2} = -4371.44\text{mm}^3$$

Position of center of gravity (horizontal coordinate) :

$$y_{gc} = \frac{-4371.44}{532.14} = -8.21\text{mm}$$

Moment of inertia in ratio to the original z-axis and the new z-axis through the center of gravity

$$I_{z0} = \left[\left(P2_{e,y}\right)^2 + \left(P1_{e,y}\right)^2 + P2_{e,y} \cdot P1_{e,y}\right] \cdot \frac{dA_{c1}}{3} + \left[\left(P4_{e,y}\right)^2 + \left(P3_{e,y}\right)^2 + P4_{e,y} \cdot P3_{e,y}\right] \cdot \frac{dA_{b1}}{3} + \left[\left(P6_{e,y}\right)^2 + \left(P5_{e,y}\right)^2 + P6_{e,y} \cdot P5_{e,y}\right] \cdot \frac{dA_{h,t+h,e2}}{3} + \left[\left(P8_{e,y}\right)^2 + \left(P7_{e,y}\right)^2 + P8_{e,y} \cdot P7_{e,y}\right] \cdot \frac{dA_{h,e1}}{3} + \left[\left(P10_{e,y}\right)^2 + \left(P9_{e,y}\right)^2 + P10_{e,y} \cdot P9_{e,y}\right] \cdot \frac{dA_{b2.e1}}{3} + \left[\left(P12_{e,y}\right)^2 + \left(P11_{e,y}\right)^2 + P12_{e,y} \cdot P11_{e,y}\right] \cdot \frac{dA_{b2.e2}}{3} + \left[\left(P14_{e,y}\right)^2 + \left(P13_{e,y}\right)^2 + P14_{e,y} \cdot P13_{e,y}\right] \cdot \frac{dA_{c2,eff}}{3}$$

$$I_{z0} = [(-83.58)^2 + (-83.58)^2 + (-83.58) \cdot (-83.58)] \cdot \frac{39.63}{3} + [(-1.38)^2 + (-82.20)^2 + (-1.38) \cdot (-82.20)] \cdot \frac{114.77}{3} + 0 + 0 + [(27.94)^2 + (1.38)^2 + 27.94 \cdot 1.38] \cdot \frac{37.72}{3} + [(77.20)^2 + (45.70)^2 + 77.20 \cdot 45.70] \cdot \frac{25.97}{3} + [(78.58)^2 + (78.58)^2 + 78.58 \cdot 78.58] \cdot \frac{20.21}{3} = 775097\text{mm}^4$$

$$I_z = 775097 - 532.14 \cdot (-8.21)^2 = 739187\text{mm}^4$$

Centrifugal moment of inertia in ratio to the Y and z axes and the new axes through the center of gravity

$$I_{yz0} = (2 \cdot P1_{e,y} \cdot P1_{e,z} + 2 \cdot P2_{e,y} \cdot P2_{e,z} + P1_{e,y} \cdot P2_{e,z} + P2_{e,y} \cdot P1_{e,z}) \cdot \frac{dA_{c1}}{6} + (2 \cdot P3_{e,y} \cdot P3_{e,z} + 2 \cdot P4_{e,y} \cdot P4_{e,z} + P3_{e,y} \cdot P4_{e,z} + P4_{e,y} \cdot P3_{e,z}) \cdot \frac{dA_{b1}}{6} + (2 \cdot P5_{e,y} \cdot P5_{e,z} + 2 \cdot P6_{e,y} \cdot P6_{e,z} + P5_{e,y} \cdot P6_{e,z} + P6_{e,y} \cdot P5_{e,z}) \cdot \frac{dA_{h,t+h,e2}}{6} + (2 \cdot P7_{e,y} \cdot P7_{e,z} + 2 \cdot P8_{e,y} \cdot P8_{e,z} + P7_{e,y} \cdot P8_{e,z} + P8_{e,y} \cdot P7_{e,z}) \cdot \frac{dA_{h,e1}}{6} + (2 \cdot P9_{e,y} \cdot P9_{e,z} + 2 \cdot P10_{e,y} \cdot P10_{e,z} + P9_{e,y} \cdot P10_{e,z} + P10_{e,y} \cdot P9_{e,z}) \cdot \frac{dA_{b2.e1}}{6} + (2 \cdot P11_{e,y} \cdot P11_{e,z} + 2 \cdot P12_{e,y} \cdot P12_{e,z} + P11_{e,y} \cdot P12_{e,z} + P12_{e,y} \cdot P11_{e,z}) \cdot \frac{dA_{b2.e2}}{6} + (2 \cdot P13_{e,y} \cdot P13_{e,z} + 2 \cdot P14_{e,y} \cdot P14_{e,z} + P13_{e,y} \cdot P14_{e,z} + P14_{e,y} \cdot P13_{e,z}) \cdot \frac{dA_{c2,eff}}{6}$$

$$I_{yz0} = [2 \cdot (-83.58) \cdot 29.29 + 2 \cdot (-83.58) \cdot 1.38 + (-83.58) \cdot 1.38 + (-83.58) \cdot 29.29] \cdot \frac{39.63}{6} + 0 + 0 + 0 + (2 \cdot 1.38 \cdot 298.58 + 2 \cdot 27.94 \cdot 298.58 + 1.38 \cdot 298.58 + 27.94 \cdot 298.58) \cdot \frac{37.72}{6} + (2 \cdot 45.70 \cdot 298.58 + 2 \cdot 77.20 \cdot 298.58 + 45.70 \cdot 298.58 + 77.20 \cdot 298.58) \cdot \frac{25.97}{6} + (2 \cdot 78.58 \cdot 297.20 + 2 \cdot 78.58 \cdot 272.69 + 78.58 \cdot 272.69 + 78.58 \cdot 297.20) \cdot \frac{20.21}{6} = 1043383\text{mm}^4$$

$$I_{yz} = 1043383 - \frac{59945.6 \cdot (-4371.44)}{532.14} = 1535825\text{mm}^4$$

Main axes of inertia

$$\alpha = \frac{1}{2}\arctan\left(\frac{2I_{yz}}{I_z - I_y}\right) \text{dacă } (I_z - I_y) \neq 0 \text{ dacă nu } \alpha = 0$$

$$\alpha = \frac{1}{2}\arctan\left(\frac{2 \cdot 1535825}{739187 - 6643852}\right) = -0.24$$

$$I_\zeta = \frac{1}{2}[I_y + I_z + \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2} = \frac{1}{2}[6643852 + 739187 + \sqrt{(739187 - 6643852)^2 + 4 \cdot 1535825^2} = 7019435\text{mm}^4$$

$$I_\eta = \frac{1}{2}[I_y + I_z - \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2} = \frac{1}{2}[6643852 + 739187 - \sqrt{(739187 - 6643852)^2 + 4 \cdot 1535825^2} = 363603\text{mm}^4$$

Radius of gyration

$$i_y = \sqrt{\frac{I_y}{A_{eff}}} = \sqrt{\frac{6643852}{532.14}} = 111.74mm$$

$$i_z = \sqrt{\frac{I_z}{A_{eff}}} = \sqrt{\frac{739187}{532.14}} = 37.27mm$$

$$i_\zeta = \sqrt{\frac{I_\zeta}{A_{eff}}} = \sqrt{\frac{7019435}{532.14}} = 114.85mm$$

$$i_\eta = \sqrt{\frac{I_\eta}{A_{eff}}} = \sqrt{\frac{363603}{532.14}} = 26.14mm$$

Modulus of resistance

Modulus of resistance in ratio to y-y

$$z_{max} = \max(112.65, (200 - 1.42) - 112.65) = \max(112.65, 185.93) = 185.93mm$$

$$z_{min} = \min(112.65, (200 - 1.42) - 112.65) = \min(112.65\ , 185.93) = 112.65mm$$

$$W_{y,min} = \frac{I_y}{z_{max}} = \frac{2453585}{185.93} = 22663\ mm^3$$

$$W_{y,max} = \frac{I_y}{z_{min}} = \frac{2453585}{112.65} = 27165\ mm^3$$

- Modulus of resistance in ratio to z-z

$$y_{max} = \max(14.71, 56.28 - 14.71) = \max(14.71, 41.57) = 41.57mm$$

$$y_{min} = \min(14.71, 56.28 - 14.71) = \min(14.71, 41.57) = 14.17mm$$

$$W_{z,min} = \frac{I_z}{y_{max}} = \frac{739187}{41.57} = 4135.73mm^3$$

$$W_{z,max} = \frac{I_z}{y_{min}} = \frac{739187}{14.71} = 11683mm^3$$

Sectoral coordinates

$$\omega_{01} = 0$$

$$\omega_{0_2} = P1_{e,y} \cdot P2_{e,z} - P2_{e,y} \cdot P1_{e,z} = (-83.58) \cdot 1.38 - (-83.58) \cdot 29.29 = 2332.76mm^2$$

$$\omega_{0_3} = P2_{e,y} \cdot P3_{e,z} - P3_{e,y} \cdot P2_{e,z} = (-83.58) \cdot 0 - (-82.20) \cdot 1.38 = 113.40mm^2$$

$$\omega_{0_4} = P3_{e,y} \cdot P4_{e,z} - P4_{e,y} \cdot P3_{e,z} = (-82.20) \cdot 0 - 1.38 \cdot 0 = 0mm^2$$

$$\omega_{0_5} = P4_{e,y} \cdot P5_{e,z} - P5_{e,y} \cdot P4_{e,z} = (-1.38) \cdot 1.38 - 0 \cdot 0 = -1.90mm^2$$

$$\omega_{0_6} = P5_{e,y} \cdot P6_{e,z} - P6_{e,y} \cdot P5_{e,z} = 0 \cdot 178.57 - 0 \cdot 1.38 = 0mm^2$$

$$\omega_{0_7} = P6_{e,y} \cdot P7_{e,z} - P7_{e,y} \cdot P6_{e,z} = 0 \cdot 267.46 - 0 \cdot 178.57 = 0mm^2$$

$$\omega_{0_8} = P7_{e,y} \cdot P8_{e,z} - P8_{e,y} \cdot P7_{e,z} = 0 \cdot 297.20 - 0 \cdot 267.46 = 0mm^2$$

$\omega_{0_9} = P8_{e,y} \cdot P9_{e,z} - P9_{e,y} \cdot P8_{e,z} = 0 \cdot 298.58 - 1.38 \cdot 297.20 = -410mm^2$

$\omega_{0_{10}} = P9_{e,y} \cdot P10_{e,z} - P10_{e,y} \cdot P9_{e,z} = 1.38 \cdot 298.58 - 27.94 \cdot 298.58 = -7931.44mm^2$

$\omega_{0_{11}} = P10_{e,y} \cdot P11_{e,z} - P11_{e,y} \cdot P10_{e,z} = 27.94 \cdot 298.58 - 45.70 \cdot 298.58 = -5301mm^2$

$\omega_{0_{12}} = P11_{e,y} \cdot P12_{e,z} - P12_{e,y} \cdot P11_{e,z} = 45.70 \cdot 298.58 - 77.20 \cdot 298.58 = -9406.18mm^2$

$\omega_{0_{13}} = P12_{e,y} \cdot P13_{e,z} - P13_{e,y} \cdot P12_{e,z} = 77.20 \cdot 297.20 - 78.58 \cdot 298.58 = -518.40mm^2$

$\omega_{0_{14}} = P13_{e,y} \cdot P14_{e,z} - P14_{e,y} \cdot P13_{e,z} = 78.58 \cdot 272.69 - 78.58 \cdot 297.20 = -1926.20mm^2$

$\omega_1 = 0 + \omega_{01} = 0mm^2$

$\omega_2 = \omega_0 + \omega_{0_2} = 0 + 2332.76 = 2332.76mm^2$

$\omega_3 = \omega_2 + \omega_{0_3} = 2332.76 + 113.40 = 2446.16mm^2$

$\omega_4 = \omega_3 + \omega_{0_4} = 2446.16 + 0 = 2446.16mm^2$

$\omega_5 = \omega_4 + \omega_{0_5} = 2446.16 + (-1.90) = 2444.25mm^2$

$\omega_6 = \omega_5 + \omega_{0_6} = 2444.25 + 0 = 2444.25mm^2$

$\omega_7 = \omega_6 + \omega_{0_7} = 2444.25 + 0 = 2444.25mm^2$

$\omega_8 = \omega_7 + \omega_{0_8} = 2444.25 + 0 = 2444.25mm^2$

$\omega_9 = \omega_8 + \omega_{0_9} = 2444.25 + (-410) = 2034.26mm^2$

$\omega_{10} = \omega_9 + \omega_{0_{10}} = 2034.26 + (-7931.44) = -5897.19mm^2$

$\omega_{11} = \omega_{10} + \omega_{0_{11}} = (-5897.19) + (-5301) = -11198.19mm^2$

$\omega_{12} = \omega_{11} + \omega_{0_{12}} = (-11198.19) + (-9406.18) = -20604.36mm^2$

$\omega_{13} = \omega_{12} + \omega_{0_{13}} = (-20604.36) + (-518.40) = -21122.76mm^2$

$\omega_{14} = \omega_{13} + \omega_{0_{14}} = (-21122.76) + (-1926.20) = -23048.96mm^2$

Sectoral coordinates mean

$dA_2 = dA_{c1}$; $dA_3 = 0$; $dA_4 = dA_{b1}$; $dA_5 = 0$; $dA_6 = dA_{h,t+h,e2}$; $dA_7 = 0$;

$dA_8 = dA_{h,e1}$; $dA_9 = 0$; $dA_{10} = dA_{b2,e1}$; $dA_{11} = 0$; $dA_{12} = dA_{b2,e2}$; $dA_{13} = 0$; $dA_{14} = dA_{c2,eff}$;

$$I_\omega = \sum_{i=2}^{14}(\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2}$$

$$= (\omega_1 + \omega_2) \cdot \frac{dA_2}{2} + (\omega_2 + \omega_3) \cdot \frac{dA_3}{2} + (\omega_3 + \omega_4) \cdot \frac{dA_4}{2} + (\omega_4 + \omega_5) \cdot \frac{dA_5}{2} + (\omega_5 + \omega_6) \cdot \frac{dA_6}{2} + (\omega_6 + \omega_7) \cdot \frac{dA_7}{2} + (\omega_7 + \omega_8) \cdot \frac{dA_8}{2} + (\omega_8 + \omega_9) \cdot \frac{dA_9}{2} + (\omega_9 + \omega_{10}) \cdot \frac{dA_{10}}{2} + (\omega_{10} + \omega_{11}) \cdot \frac{dA_{11}}{2} + (\omega_{11} + \omega_{12}) \cdot \frac{dA_{12}}{2} + (\omega_{12} + \omega_{13}) \cdot \frac{dA_{13}}{2} + (\omega_{13} + \omega_{14}) \cdot \frac{dA_{14}}{2}$$

$$= [0 + 2332.76] \cdot \frac{39.63}{2} + 0 + [2446.16 + 2446.16] \cdot \frac{114.77}{2} + 0 + [2444.25 + 2444.25] \cdot \frac{251.60}{2} + 0 + [2444.25 + 2444.25] \cdot \frac{42.23}{2} + 0 + [2034.26 + (-5897.19)] \cdot \frac{37.72}{2} + 0 + [(-11198.19) + (-20604.36)] \cdot \frac{25.97}{2} + 0 + [(-21122.76) + (-23048.96)] \cdot \frac{20.21}{2} = 112967\text{mm}^4$$

$$\omega_{mean} = \frac{112967}{532.14} = 212.29\text{mm}^2$$

Sectoral coordinates

$$I_{y\omega 0} = \sum_{i=2}^{14}(2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$

$$= (2 \cdot P1_{e,y} \cdot \omega_1 + 2 \cdot P2_{e,y} \cdot \omega_2 + P1_{e,y} \cdot \omega_2 + P2_{e,y} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,y} \cdot \omega_2 + 2 \cdot P3_{e,y} \cdot \omega_3 + P2_{e,y} \cdot \omega_3 + P3_{e,y} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,y} \cdot \omega_3 + 2 \cdot P4_{e,y} \cdot \omega_4 + P3_{e,y} \cdot \omega_4 + P4_{e,y} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,y} \cdot \omega_4 + 2 \cdot P5_{e,y} \cdot \omega_5 + P4_{e,y} \cdot \omega_5 + P5_{e,y} \cdot \omega_4) \cdot \frac{dA_5}{6} + (2 \cdot P5_{e,y} \cdot \omega_5 + 2 \cdot P6_{e,y} \cdot \omega_6 + P5_{e,y} \cdot \omega_6 + P6_{e,y} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,y} \cdot \omega_6 + 2 \cdot P7_{e,y} \cdot \omega_7 + P6_{e,y} \cdot \omega_7 + P7_{e,y} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,y} \cdot \omega_7 + 2 \cdot P8_{e,y} \cdot \omega_8 + P7_{e,y} \cdot \omega_8 + P8_{e,y} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,y} \cdot \omega_8 + 2 \cdot P9_{e,y} \cdot \omega_9 + P8_{e,y} \cdot \omega_9 + P9_{e,y} \cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,y} \cdot \omega_9 + 2 \cdot P10_{e,y} \cdot \omega_{10} + P9_{e,y} \cdot \omega_{10} + P10_{e,y} \cdot \omega_9) \cdot \frac{dA_{10}}{6} + (2 \cdot P10_{e,y} \cdot \omega_{10} + 2 \cdot P11_{e,y} \cdot \omega_{11} + P10_{e,y} \cdot \omega_{11} + P11_{e,y} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2 \cdot P11_{e,y} \cdot \omega_{11} + 2 \cdot P12_{e,y} \cdot \omega_{12} + P11_{e,y} \cdot \omega_{12} + P12_{e,y} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,y} \cdot \omega_{12} + 2 \cdot P13_{e,y} \cdot \omega_{13} + P12_{e,y} \cdot \omega_{13} + P13_{e,y} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,y} \cdot \omega_{13} + 2 \cdot P14_{e,y} \cdot \omega_{14} + P13_{e,y} \cdot \omega_{14} + P14_{e,y} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6}$$

$$I_{y\omega0} = [2 \cdot (-83.58) \cdot 0 + 2 \cdot (-83.58) \cdot 2332.76 + (-83.58) \cdot 2332.76 + (-83.58) \cdot 0] \cdot \frac{39.63}{6}$$
$$+ 0$$
$$+ [2 \cdot (-82.20) \cdot 2446.16 + 2 \cdot (-1.38) \cdot 2446.16 + (-82.20) \cdot 2446.16$$
$$+ (-1.38) \cdot 2446.16] \cdot \frac{114.77}{6} + 0 + 0 + 0 + 0 + 0$$
$$+ [2 \cdot 1.38 \cdot 2034.26 + 2 \cdot 27.94 \cdot (-5897.19) + 1.38 \cdot (-5897.19) + 27.94$$
$$\cdot 2034.26] \cdot \frac{37.72}{6} + 0$$
$$+ [2 \cdot 45.70 \cdot (-11198.19) + 2 \cdot 77.20 \cdot (-20604.36) + 45.70 \cdot (-20604.36)$$
$$+ 77.20 \cdot (-11198.19)] \cdot \frac{25.97}{6} + 0 + [2 \cdot 78.58 \cdot (-21122.76) + 2 \cdot 78.58$$
$$\cdot (-23048.96) + 78.58 \cdot (-23048.96) + 78.58 \cdot (-21122.76)] \cdot \frac{20.21}{6}$$
$$= -78420206\text{mm}^5$$

$$I_{y\omega} = I_{y\omega0} - \frac{S_{z0} \cdot I_\omega}{A_{eff}} = -78420206 - \frac{(-4371.44) \cdot 112967}{532.14} = -77492197\text{mm}^5$$

$$I_{z\omega0} = \sum_{i=2}^{14} (2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6}$$
$$= (2 \cdot P1_{e,z} \cdot \omega_1 + 2 \cdot P2_{e,z} \cdot \omega_2 + P1_{e,z} \cdot \omega_2 + P2_{e,z} \cdot \omega_1) \cdot \frac{dA_2}{6} + (2 \cdot P2_{e,z} \cdot \omega_2 + 2$$
$$\cdot P3_{e,z} \cdot \omega_3 + P2_{e,z} \cdot \omega_3 + P3_{e,z} \cdot \omega_2) \cdot \frac{dA_3}{6} + (2 \cdot P3_{e,z} \cdot \omega_3 + 2 \cdot P4_{e,z} \cdot \omega_4 + P3_{e,z}$$
$$\cdot \omega_4 + P4_{e,z} \cdot \omega_3) \cdot \frac{dA_4}{6} + (2 \cdot P4_{e,z} \cdot \omega_4 + 2 \cdot P5_{e,z} \cdot \omega_5 + P4_{e,z} \cdot \omega_5 + P5_{e,z} \cdot \omega_4)$$
$$\cdot \frac{dA_5}{6} + (2 \cdot P5_{e,z} \cdot \omega_5 + 2 \cdot P6_{e,z} \cdot \omega_6 + P5_{e,z} \cdot \omega_6 + P6_{e,z} \cdot \omega_5) \cdot \frac{dA_6}{6} + (2 \cdot P6_{e,z}$$
$$\cdot \omega_6 + 2 \cdot P7_{e,z} \cdot \omega_7 + P6_{e,z} \cdot \omega_7 + P7_{e,z} \cdot \omega_6) \cdot \frac{dA_7}{6} + (2 \cdot P7_{e,z} \cdot \omega_7 + 2 \cdot P8_{e,z} \cdot \omega_8$$
$$+ P7_{e,z} \cdot \omega_8 + P8_{e,z} \cdot \omega_7) \cdot \frac{dA_8}{6} + (2 \cdot P8_{e,z} \cdot \omega_8 + 2 \cdot P9_{e,z} \cdot \omega_9 + P8_{e,z} \cdot \omega_9 + P9_{e,z}$$
$$\cdot \omega_8) \cdot \frac{dA_9}{6} + (2 \cdot P9_{e,z} \cdot \omega_9 + 2 \cdot P10_{e,z} \cdot \omega_{10} + P9_{e,z} \cdot \omega_{10} + P10_{e,z} \cdot \omega_9) \cdot \frac{dA_{10}}{6}$$
$$+ (2 \cdot P10_{e,z} \cdot \omega_{10} + 2 \cdot P11_{e,z} \cdot \omega_{11} + P10_{e,z} \cdot \omega_{11} + P11_{e,z} \cdot \omega_{10}) \cdot \frac{dA_{11}}{6} + (2$$
$$\cdot P11_{e,z} \cdot \omega_{11} + 2 \cdot P12_{e,z} \cdot \omega_{12} + P11_{e,z} \cdot \omega_{12} + P12_{e,z} \cdot \omega_{11}) \cdot \frac{dA_{12}}{6} + (2 \cdot P12_{e,z}$$
$$\cdot \omega_{12} + 2 \cdot P13_{e,z} \cdot \omega_{13} + P12_{e,z} \cdot \omega_{13} + P13_{e,z} \cdot \omega_{12}) \cdot \frac{dA_{13}}{6} + (2 \cdot P13_{e,z} \cdot \omega_{13} + 2$$
$$\cdot P14_{e,z} \cdot \omega_{14} + P13_{e,z} \cdot \omega_{14} + P14_{e,z} \cdot \omega_{13}) \cdot \frac{dA_{14}}{6}$$

$$I_{z\omega0} = [2\cdot29.29\cdot0 + 2\cdot1.38\cdot2332.76 + 29.29\cdot2332.76 + 1.38\cdot0]\cdot\frac{39.63}{6} + 0 + 0 + 0$$
$$+ [2\cdot1.38\cdot2444.25 + 2\cdot178.57\cdot2444.25 + 1.38\cdot2444.25 + 178.57\cdot2444.25]\cdot\frac{251.60}{6} + 0$$
$$+ [2\cdot267.46\cdot2444.25 + 2\cdot297.20\cdot2444.25 + 267.46\cdot2444.25 + 297.20\cdot2444.25]\cdot\frac{42.23}{6} + 0$$
$$+ [2\cdot298.58\cdot2034.26 + 2\cdot298.58\cdot(-5897.19) + 298.58\cdot(-5897.19) + 298.58\cdot2034.26]\cdot\frac{37.72}{6} + 0$$
$$+ [2\cdot298.58\cdot(-11198.19) + 2\cdot298.58\cdot(-20604.36) + 298.58\cdot(-20604.36) + 298.58\cdot(-11198.19)]\cdot\frac{25.97}{6} + 0$$
$$+ [2\cdot297.20\cdot(-21122.76) + 2\cdot272.69\cdot(-23048.96) + 297.20\cdot(-23048.96) + 272.69\cdot(-21122.76)]\cdot\frac{20.21}{6} = -187202576\text{mm}^5$$

$$I_{z\omega} = I_{z\omega0} - \frac{S_{y0}\cdot I_\omega}{A_{eff}} = -187202576 - \frac{59945.6\cdot112967}{532.14} = -199928376\text{mm}^5$$

$$I_{\omega\omega0} = \sum_{i=2}^{14}[(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i\cdot\omega_{i-1}]\frac{dA_i}{3}$$
$$= \left[((\omega_2)^2 + (\omega_1)^2 + \omega_2\cdot\omega_1)\cdot\frac{dA_2}{3}\right] + \left[((\omega_3)^2 + (\omega_2)^2 + \omega_3\cdot\omega_2)\cdot\frac{dA_3}{3}\right]$$
$$+ \left[((\omega_4)^2 + (\omega_3)^2 + \omega_4\cdot\omega_3)\cdot\frac{dA_4}{3}\right] + \left[((\omega_5)^2 + (\omega_4)^2 + \omega_5\cdot\omega_4)\cdot\frac{dA_5}{3}\right]$$
$$+ \left[((\omega_6)^2 + (\omega_5)^2 + \omega_6\cdot\omega_5)\cdot\frac{dA_6}{3}\right] + \left[((\omega_7)^2 + (\omega_6)^2 + \omega_7\cdot\omega_6)\cdot\frac{dA_7}{3}\right]$$
$$+ \left[((\omega_8)^2 + (\omega_7)^2 + \omega_8\cdot\omega_7)\cdot\frac{dA_8}{3}\right] + \left[((\omega_9)^2 + (\omega_8)^2 + \omega_9\cdot\omega_8)\cdot\frac{dA_9}{3}\right]$$
$$+ \left[((\omega_{10})^2 + (\omega_9)^2 + \omega_{10}\cdot\omega_9)\cdot\frac{dA_{10}}{3}\right] + \left[((\omega_{11})^2 + (\omega_{10})^2 + \omega_{11}\cdot\omega_{10})\cdot\frac{dA_{11}}{3}\right]$$
$$+ \left[((\omega_{12})^2 + (\omega_{11})^2 + \omega_{12}\cdot\omega_{11})\cdot\frac{dA_{12}}{3}\right]$$
$$+ \left[((\omega_{13})^2 + (\omega_{12})^2 + \omega_{13}\cdot\omega_{12})\cdot\frac{dA_{13}}{3}\right]$$
$$+ \left[((\omega_{14})^2 + (\omega_{13})^2 + \omega_{14}\cdot\omega_{13})\cdot\frac{dA_{14}}{3}\right]$$

$$
\begin{aligned}
I_{\omega\omega 0} = {} & [2332.76^2 + (0)^2 + 2332.76 \cdot 0] \cdot \frac{39.63}{3} + 0 \\
& + [2446.16^2 + 2446.16^2 + 2446.16 \cdot 2446.16] \cdot \frac{114.77}{3} + 0 \\
& + [2444.25^2 + 2444.25^2 + 2444.25 \cdot 2444.25] \cdot \frac{251.60}{3} + 0 \\
& + [2444.25^2 + 2444.25^2 + 2444.25 \cdot 2444.25] \cdot \frac{42.23}{3} + 0 \\
& + [(-5897.19)^2 + 2034.26^2 + (-5897.19) \cdot 2034.26] \cdot \frac{37.72}{3} + 0 \\
& + [(-20604.36)^2 + (-11198.19)^2 + (-20604.36) \cdot (-11198.19)] \cdot \frac{25.97}{3} + 0 \\
& + [(-23048.96)^2 + (-21122.76)^2 + (-23048.96) \cdot (-21122.76)] \cdot \frac{20.21}{3} \\
& = 19475630786\text{mm}^6
\end{aligned}
$$

$$I_{\omega\omega} = I_{\omega\omega 0} - \frac{I_\omega^2}{A_{eff}} = 19475630786 - \frac{112967^2}{532.14} = 19451648949\text{mm}^6$$

Shear center

$$y_{sc} = \frac{I_{z\omega} \cdot I_z - I_{y\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} = \frac{(-199928376) \cdot 739187 - (-77492197) \cdot 1535825}{6643852 \cdot 739187 - 1535825^2} = -11.27\text{mm}$$

$$z_{sc} = \frac{-I_{y\omega} \cdot I_y + I_{z\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} = \frac{-(-77492197) \cdot 6643852 + (-199928376) \cdot 1535825}{6643852 \cdot 739187 - 1535825^2} = 81.41\text{mm}$$

$(I_y \cdot I_z - I_{yz}^2 \neq 0)$

Sectoral moment of inertia

$$
\begin{aligned}
I_w &= I_{\omega\omega} + z_{sc} \cdot I_{y\omega} - y_{sc} \cdot I_{z\omega} \\
&= 19451648949 + 81.41 \cdot (-77492197) - (-11.27) \cdot (-199928376) \\
&= 10889078563\text{mm}^6
\end{aligned}
$$

Torsional moment of inertia

$$
\begin{aligned}
I_t = {} & \sum_{i=2}^{14} dA_i \cdot \frac{(t_i)^2}{3} \\
& = dA_2 \cdot \frac{(t_2)^2}{3} + dA_3 \cdot \frac{(t_3)^2}{3} + dA_4 \cdot \frac{(t_4)^2}{3} + dA_5 \cdot \frac{(t_5)^2}{3} + dA_6 \cdot \frac{(t_6)^2}{3} + dA_7 \cdot \frac{(t_7)^2}{3} \\
& + dA_8 \cdot \frac{(t_8)^2}{3} + dA_9 \cdot \frac{(t_9)^2}{3} + dA_{10} \cdot \frac{(t_{10})^2}{3} + dA_{11} \cdot \frac{(t_{11})^2}{3} + dA_{12} \cdot \frac{(t_{12})^2}{3} + dA_{13} \\
& \cdot \frac{(t_{13})^2}{3}
\end{aligned}
$$

$$
\begin{aligned}
I_t = {} & 39.63 \cdot \frac{(1.42)^2}{3} + 0 + 114.77 \cdot \frac{(1.42)^2}{3} + 0 + 251.60 \cdot \frac{(1.42)^2}{3} + 0 + 42.23 \cdot \frac{(1.42)^2}{3} + 0 \\
& + 37.72 \cdot \frac{(1.42)^2}{3} + 0 + 25.97 \cdot \frac{(0.824)^2}{3} + 0 + 20.21 \cdot \frac{(0.824)^2}{3} = 337.09\text{mm}^4
\end{aligned}
$$

$$W_t = \frac{I_t}{\min(t)} = \frac{337.09}{0.824} = 408.86\text{mm}^3$$

Sectoral coordinates in ratio to shear center

$$\omega_{s_1} = \omega_1 - \omega_{mean} + z_{sc} \cdot (P1_{e,y} - y_{gc}) - y_{sc} \cdot (P1_{e,z} - z_{gc})$$
$$= 0 - 212.29 + 81.41 \cdot [(-83.58) - (-8.21)] - (-11.27) \cdot (29.29 - 112.65)$$
$$= -7287.70 mm^2$$

$$\omega_{s_2} = \omega_2 - \omega_{mean} + z_{sc} \cdot (P2_{e,y} - y_{gc}) - y_{sc} \cdot (P2_{e,z} - z_{gc})$$
$$= 2332.76 - 212.29 + 81.41 \cdot [(-83.58) - (-8.21)] - (-11.27)$$
$$\cdot (1.38 - 112.65) = -5269.56 mm^2$$

$$\omega_{s_3} = \omega_3 - \omega_{mean} + z_{sc} \cdot (P3_{e,y} - y_{gc}) - y_{sc} \cdot (P3_{e,z} - z_{gc})$$
$$= 2446.16 - 212.29 + 81.41 \cdot [(-82.20) - (-8.21)] - (-11.27) \cdot (0 - 112.65)$$
$$= 5059.40 m^2$$

$$\omega_{s_4} = \omega_4 - \omega_{mean} + z_{sc} \cdot (P4_{e,y} - y_{gc}) - y_{sc} \cdot (P4_{e,z} - z_{gc})$$
$$= 2446.16 - 212.29 + 81.41 \cdot [(-1.38) - (-8.21)] - (-11.27) \cdot (0 - 112.65)$$
$$= 1520.54 mm^2$$

$$\omega_{s_5} = \omega_5 - \omega_{mean} + z_{sc} \cdot (P5_{e,y} - y_{gc}) - y_{sc} \cdot (P5_{e,z} - z_{gc})$$
$$= 2444.25 - 212.29 + 81.41 \cdot [0 - (-8.21)] - (-11.27) \cdot (1.38 - 112.65)$$
$$= 1646.49 mm^2$$

$$\omega_{s_6} = \omega_6 - \omega_{mean} + z_{sc} \cdot (P6_{e,y} - y_{gc}) - y_{sc} \cdot (P6_{e,z} - z_{gc})$$
$$= 2444.25 - 212.29 + 81.41 \cdot [0 - (-8.21)] - (-11.27) \cdot (178.57 - 112.65)$$
$$= 3643.78 mm^2$$

$$\omega_{s_7} = \omega_7 - \omega_{mean} + z_{sc} \cdot (P7_{e,y} - y_{gc}) - y_{sc} \cdot (P7_{e,z} - z_{gc})$$
$$= 2444.25 - 212.29 + 81.41 \cdot [0 - (-8.21)] - (-11.27) \cdot (267.46 - 112.65)$$
$$= 4645.80 mm^2$$

$$\omega_{s_8} = \omega_8 - \omega_{mean} + z_{sc} \cdot (P8_{e,y} - y_{gc}) - y_{sc} \cdot (P8_{e,z} - z_{gc})$$
$$= 2444.25 - 212.29 + 81.41 \cdot [0 - (-8.21)] - (-11.27) \cdot (297.20 - 112.65)$$
$$= 4981.06 mm^2$$

$$\omega_{s_9} = \omega_9 - \omega_{mean} + z_{sc} \cdot (P9_{e,y} - y_{gc}) - y_{sc} \cdot (P9_{e,z} - z_{gc})$$
$$= 2034.26 - 212.29 + 81.41 \cdot [1.38 - (-8.21)] - (-11.27) \cdot (298.58 - 112.65)$$
$$= 4698.93 mm^2$$

$$\omega_{s_{10}} = \omega_{10} - \omega_{mean} + z_{sc} \cdot (P10_{e,y} - y_{gc}) - y_{sc} \cdot (P10_{e,z} - z_{gc})$$
$$= (-5897.19) - 212.29 + 81.41 \cdot [27.94 - (-8.21)] - (-11.27)$$
$$\cdot (298.58 - 112.65) = -1069.85 mm^2$$

$$\omega_{s_{11}} = \omega_{11} - \omega_{mean} + z_{sc} \cdot (P11_{e,y} - y_{gc}) - y_{sc} \cdot (P11_{e,z} - z_{gc})$$
$$= (-11198.19) - 212.29 + 81.41 \cdot [45.70 - (-8.21)] - (-11.27)$$
$$\cdot (298.58 - 112.65) = -4925.43 mm^2$$

$$\omega_{s_{12}} = \omega_{12} - \omega_{mean} + z_{sc} \cdot (P12_{e,y} - y_{gc}) - y_{sc} \cdot (P12_{e,z} - z_{gc})$$
$$= (-20604.36) - 212.29 + 81.41 \cdot [77.20 - (-8.21)] - (-11.27)$$
$$\cdot (298.58 - 112.65) = -11766.82 mm^2$$

$$\omega_{s_{13}} = \omega_{13} - \omega_{mean} + z_{sc} \cdot (P13_{e,y} - y_{gc}) - y_{sc} \cdot (P13_{e,z} - z_{gc})$$
$$= (-21122.76) - 212.29 + 81.41 \cdot [78.58 - (-8.21)] - (-11.27)$$
$$\cdot (297.20 - 112.65) = -12188.46 mm^2$$

$$\omega_{s_{14}} = \omega_{14} - \omega_{mean} + z_{sc} \cdot (P14_{e,y} - y_{gc}) - y_{sc} \cdot (P14_{e,z} - z_{gc})$$
$$= (-23048.96) - 212.29 + 81.41 \cdot [78.58 - (-8.21)] - (-11.27)$$
$$\cdot (272.69 - 112.65) = -14390.97 mm^2$$

Maximum sectoral constant and sectoral module

$$\omega_{max} = \max(|\omega_s|) = 14390.97\text{mm}^2$$

$$W_\omega = \frac{I_w}{\omega_{max}} = \frac{10889078563}{14390.97} = 756660\text{mm}^4$$

Distance between center of shear and center of gravity

$$y_s = y_{sc} - y_{gc} = (-11.27) - (-8.21) = -3.06\text{mm}$$

$$z_s = z_{sc} - z_{gc} = 81.41 - 112.65 = -31.24\text{mm}$$

Polar moment of inertia in ratio to shear Center

$$I_p = I_y + I_z + A_{eff} \cdot (y_s^2 + z_s^2) = 2453585 + 739187 + 532.14 \cdot [(-3.06)^2 + (-31.24)^2] = 7907220\text{mm}^4$$

Nonsymetric factors z_j and y_j

$$z_j = z_s - \frac{0.5}{I_y} \cdot \sum_{i=1}^{n} \left\{ \left[\left(z_{c_i}\right)^3 + z_{c_i} \cdot \left[\frac{(z_i - z_{i-1})^2}{4} + \left(y_{c_i}\right)^2 + \frac{(y_i - y_{i-1})^2}{12} \right] + y_{c_i} \cdot \frac{(y_i - y_{i-1}) \cdot (z_i - z_{i-1})}{6} \right] \cdot dA_i \right\}$$

$$
\begin{aligned}
z_j = z_s - \frac{0.5}{I_y} \cdot \Bigg\{ & \Bigg[\left(z_{c_2}\right)^3 + z_{c_2} \cdot \Bigg[\frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{4} + \left(y_{c_2}\right)^2 + \frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{12} \Bigg] + y_{c_2} \\
& \cdot \frac{\left(P2_{e,y} - P1_{e,y}\right) \cdot \left(P2_{e,z} - P1_{e,z}\right)}{6} \Bigg] \cdot dA_2 \\
& + \Bigg[\left(z_{c_3}\right)^3 + z_{c_3} \cdot \Bigg[\frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{4} + \left(y_{c_3}\right)^2 + \frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{12} \Bigg] + y_{c_3} \\
& \cdot \frac{\left(P3_{e,y} - P2_{e,y}\right) \cdot \left(P3_{e,z} - P2_{e,z}\right)}{6} \Bigg] \cdot dA_3 \\
& + \Bigg[\left(z_{c_4}\right)^3 + z_{c_4} \cdot \Bigg[\frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{4} + \left(y_{c_4}\right)^2 + \frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{12} \Bigg] + y_{c_4} \\
& \cdot \frac{\left(P4_{e,y} - P3_{e,y}\right) \cdot \left(P4_{e,z} - P3_{e,z}\right)}{6} \Bigg] \cdot dA_4 \\
& + \Bigg[\left(z_{c_5}\right)^3 + z_{c_5} \cdot \Bigg[\frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{4} + \left(y_{c_5}\right)^2 + \frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{12} \Bigg] + y_{c_5} \\
& \cdot \frac{\left(P5_{e,y} - P4_{e,y}\right) \cdot \left(P5_{e,z} - P4_{e,z}\right)}{6} \Bigg] \cdot dA_5 \\
& + \Bigg[\left(z_{c_6}\right)^3 + z_{c_6} \cdot \Bigg[\frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{4} + \left(y_{c_6}\right)^2 + \frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{12} \Bigg] + y_{c_6} \\
& \cdot \frac{\left(P6_{e,y} - P5_{e,y}\right) \cdot \left(P6_{e,z} - P5_{e,z}\right)}{6} \Bigg] \cdot dA_6 \\
& + \Bigg[\left(z_{c_7}\right)^3 + z_{c_7} \cdot \Bigg[\frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{4} + \left(y_{c_7}\right)^2 + \frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{12} \Bigg] + y_{c_7} \\
& \cdot \frac{\left(P7_{e,y} - P6_{e,y}\right) \cdot \left(P7_{e,z} - P6_{e,z}\right)}{6} \Bigg] \cdot dA_7 \\
& + \Bigg[\left(z_{c_8}\right)^3 + z_{c_8} \cdot \Bigg[\frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{4} + \left(y_{c_8}\right)^2 + \frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{12} \Bigg] + y_{c_8} \\
& \cdot \frac{\left(P8_{e,y} - P7_{e,y}\right) \cdot \left(P8_{e,z} - P7_{e,z}\right)}{6} \Bigg] \cdot dA_8 \\
& + \Bigg[\left(z_{c_9}\right)^3 + z_{c_9} \cdot \Bigg[\frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{4} + \left(y_{c_9}\right)^2 + \frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{12} \Bigg] + y_{c_9}
\end{aligned}
$$

$$\cdot \frac{\left(P9_{e,y} - P8_{e,y}\right) \cdot \left(P9_{e,z} - P8_{e,z}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \left[\left(z_{c_{10}}\right)^3 + z_{c_{10}} \cdot \left[\frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{4} + \left(y_{c_{10}}\right)^2 + \frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{12}\right] + y_{c_{10}}\right.$$

$$\cdot \frac{\left(P10_{e,y} - P9_{e,y}\right) \cdot \left(P10_{e,z} - P9_{e,z}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \left[\left(z_{c_{11}}\right)^3 + z_{c_{11}} \cdot \left[\frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{4} + \left(y_{c_{11}}\right)^2 + \frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{12}\right] + y_{c_{11}}\right.$$

$$\cdot \frac{\left(P11_{e,y} - P10_{e,y}\right) \cdot \left(P11_{e,z} - P10_{e,z}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \left[\left(z_{c_{12}}\right)^3 + z_{c_{12}} \cdot \left[\frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{4} + \left(y_{c_{12}}\right)^2 + \frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{12}\right] + y_{c_{12}}\right.$$

$$\cdot \frac{\left(P12_{e,y} - P11_{e,y}\right) \cdot \left(P12_{e,z} - P11_{e,z}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \left[\left(z_{c_{13}}\right)^3 + z_{c_{13}} \cdot \left[\frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{4} + \left(y_{c_{13}}\right)^2 + \frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{12}\right] + y_{c_{13}}\right.$$

$$\cdot \frac{\left(P13_{e,y} - P12_{e,y}\right) \cdot \left(P13_{e,z} - P12_{e,z}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \left[\left(z_{c_{14}}\right)^3 + z_{c_{14}} \cdot \left[\frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{4} + \left(y_{c_{14}}\right)^2 + \frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{12}\right] + y_{c_{14}}\right.$$

$$\cdot \frac{\left(P14_{e,y} - P13_{e,y}\right) \cdot \left(P14_{e,z} - P13_{e,z}\right)}{6}\Bigg] \cdot dA_{14}\Bigg\}$$

$$
\begin{aligned}
z_j = {} & (-31.24) - \frac{0.5}{6643852} \\
& \cdot \left\{ \left[(-97.32)^3 + (-97.32) \right. \right. \\
& \cdot \left(\frac{(1.38 - 29.29)^2}{4} + (-75.37)^2 + \frac{[(-83.58) - (-83.58)]^2}{12} \right) + (-75.37) \\
& \left. \cdot \left(\frac{[(-83.58) - (-83.58)] \cdot (1.38 - 29.29)}{6} \right) \right] \cdot 39.63 + 0 \\
& + \left[(-112.65)^3 + (-112.65) \cdot \left(0 + (-33.58)^2 + \frac{[(-1.38) - (-82.20)]^2}{12} \right) + 0 \right] \\
& \cdot 114.77 + 0 + \left[(-22.68)^3 + (-22.68) \cdot \left(\frac{(178.57 - 1.38)^2}{4} + (8.2)^2 + 0 \right) + 0 \right] \\
& \left. \cdot 251.60 + 0 \right\} \\
+ & \left[(169.68)^3 + 169.68 \cdot \left[\frac{(297.20 - 267.46)^2}{4} + (8.21)^2 + 0 \right] + 0 \right] \cdot 42.23 + 0 \\
& + \left[(185.93)^3 + 185.93 \cdot \left[0 + (22.88)^2 + \frac{(27.94 - 1.38)^2}{12} \right] + 0 \right] \cdot 37.72 + 0 \\
& + \left[(185.93)^3 + 185.93 \cdot \left[0 + (69.66)^2 + \frac{(77.20 - 45.70)^2}{12} \right] + 0 \right] \cdot 25.97 + 0 \\
& + \left[(172.29)^3 + 172.29 \cdot \left[\frac{(272.69 - 297.20)^2}{4} + (86.79)^2 + \frac{(78.58 - 78.58)^2}{12} \right] \right. \\
& \left. + 86.79 \cdot \frac{(78.58 - 78.58) \cdot (272.69 - 297.20)}{6} \right] \cdot 20.21 \\
= {} & -67.58\text{mm}
\end{aligned}
$$

$$
y_j = y_s - \frac{0.5}{I_z} \cdot \left\{ \left[\left(y_{c_2}\right)^3 + y_{c_2} \cdot \left[\frac{\left(P2_{e,y} - P1_{e,y}\right)^2}{4} + \left(z_{c_2}\right)^2 + \frac{\left(P2_{e,z} - P1_{e,z}\right)^2}{12} \right] + z_{c_2} \right. \right.
$$

$$
\left. \cdot \frac{\left(P2_{e,z} - P1_{e,z}\right) \cdot \left(P2_{e,y} - P1_{e,y}\right)}{6} \right] \cdot dA_2
$$

$$
+ \left[\left(y_{c_3}\right)^3 + y_{c_3} \cdot \left[\frac{\left(P3_{e,y} - P2_{e,y}\right)^2}{4} + \left(z_{c_3}\right)^2 + \frac{\left(P3_{e,z} - P2_{e,z}\right)^2}{12} \right] + z_{c_3} \right.
$$

$$
\left. \cdot \frac{\left(P3_{e,z} - P2_{e,z}\right) \cdot \left(P3_{e,y} - P2_{e,y}\right)}{6} \right] \cdot dA_3
$$

$$
+ \left[\left(y_{c_4}\right)^3 + y_{c_4} \cdot \left[\frac{\left(P4_{e,y} - P3_{e,y}\right)^2}{4} + \left(z_{c_4}\right)^2 + \frac{\left(P4_{e,z} - P3_{e,z}\right)^2}{12} \right] + z_{c_4} \right.
$$

$$
\left. \cdot \frac{\left(P4_{e,z} - P3_{e,z}\right) \cdot \left(P4_{e,y} - P3_{e,y}\right)}{6} \right] \cdot dA_4
$$

$$
+ \left[\left(y_{c_5}\right)^3 + y_{c_5} \cdot \left[\frac{\left(P5_{e,y} - P4_{e,y}\right)^2}{4} + \left(z_{c_5}\right)^2 + \frac{\left(P5_{e,z} - P4_{e,z}\right)^2}{12} \right] + z_{c_5} \right.
$$

$$
\left. \cdot \frac{\left(P5_{e,z} - P4_{e,z}\right) \cdot \left(P5_{e,y} - P4_{e,y}\right)}{6} \right] \cdot dA_5
$$

$$
+ \left[\left(y_{c_6}\right)^3 + y_{c_6} \cdot \left[\frac{\left(P6_{e,y} - P5_{e,y}\right)^2}{4} + \left(z_{c_6}\right)^2 + \frac{\left(P6_{e,z} - P5_{e,z}\right)^2}{12} \right] + z_{c_6} \right.
$$

$$
\left. \cdot \frac{\left(P6_{e,z} - P5_{e,z}\right) \cdot \left(P6_{e,y} - P5_{e,y}\right)}{6} \right] \cdot dA_6
$$

$$
+ \left[\left(y_{c_7}\right)^3 + y_{c_7} \cdot \left[\frac{\left(P7_{e,y} - P6_{e,y}\right)^2}{4} + \left(z_{c_7}\right)^2 + \frac{\left(P7_{e,z} - P6_{e,z}\right)^2}{12} \right] + z_{c_7} \right.
$$

$$
\left. \cdot \frac{\left(P7_{e,z} - P6_{e,z}\right) \cdot \left(P7_{e,z} - P6_{e,y}\right)}{6} \right] \cdot dA_7
$$

$$
+ \left[\left(y_{c_8}\right)^3 + y_{c_8} \cdot \left[\frac{\left(P8_{e,y} - P7_{e,y}\right)^2}{4} + \left(z_{c_8}\right)^2 + \frac{\left(P8_{e,z} - P7_{e,z}\right)^2}{12} \right] + z_{c_8} \right.
$$

$$
\left. \cdot \frac{\left(P8_{e,z} - P7_{e,z}\right) \cdot \left(P8_{e,y} - P7_{e,y}\right)}{6} \right] \cdot dA_8
$$

$$
+ \left[\left(y_{c_9}\right)^3 + y_{c_9} \cdot \left[\frac{\left(P9_{e,y} - P8_{e,y}\right)^2}{4} + \left(z_{c_9}\right)^2 + \frac{\left(P9_{e,z} - P8_{e,z}\right)^2}{12} \right] + z_{c_9} \right.
$$

$$\cdot \frac{\left(P9_{e,z} - P8_{e,z}\right) \cdot \left(P9_{e,y} - P8_{e,y}\right)}{6}\Bigg] \cdot dA_9$$

$$+ \left[\left(y_{c_{10}}\right)^3 + y_{c_{10}} \cdot \left[\frac{\left(P10_{e,y} - P9_{e,y}\right)^2}{4} + \left(z_{c_{10}}\right)^2 + \frac{\left(P10_{e,z} - P9_{e,z}\right)^2}{12}\right] + z_{c_{10}}\right.$$

$$\cdot \frac{\left(P10_{e,z} - P9_{e,z}\right) \cdot \left(P10_{e,y} - P9_{e,y}\right)}{6}\Bigg] \cdot dA_{10}$$

$$+ \left[\left(y_{c_{11}}\right)^3 + y_{c_{11}} \cdot \left[\frac{\left(P11_{e,y} - P10_{e,y}\right)^2}{4} + \left(z_{c_{11}}\right)^2 + \frac{\left(P11_{e,z} - P10_{e,z}\right)^2}{12}\right] + z_{c_{11}}\right.$$

$$\cdot \frac{\left(P11_{e,z} - P10_{e,z}\right) \cdot \left(P11_{e,y} - P10_{e,y}\right)}{6}\Bigg] \cdot dA_{11}$$

$$+ \left[\left(y_{c_{12}}\right)^3 + y_{c_{12}} \cdot \left[\frac{\left(P12_{e,y} - P11_{e,y}\right)^2}{4} + \left(z_{c_{12}}\right)^2 + \frac{\left(P12_{e,z} - P11_{e,z}\right)^2}{12}\right] + z_{c_{12}}\right.$$

$$\cdot \frac{\left(P12_{e,z} - P11_{e,z}\right) \cdot \left(P12_{e,y} - P11_{e,y}\right)}{6}\Bigg] \cdot dA_{12}$$

$$+ \left[\left(y_{c_{13}}\right)^3 + y_{c_{13}} \cdot \left[\frac{\left(P13_{e,y} - P12_{e,y}\right)^2}{4} + \left(z_{c_{13}}\right)^2 + \frac{\left(P13_{e,z} - P12_{e,z}\right)^2}{12}\right] + z_{c_{13}}\right.$$

$$\cdot \frac{\left(P13_{e,z} - P12_{e,z}\right) \cdot \left(P13_{e,y} - P12_{e,y}\right)}{6}\Bigg] \cdot dA_{13}$$

$$+ \left[\left(y_{c_{14}}\right)^3 + y_{c_{14}} \cdot \left[\frac{\left(P14_{e,y} - P13_{e,y}\right)^2}{4} + \left(z_{c_{14}}\right)^2 + \frac{\left(P14_{e,z} - P13_{e,z}\right)^2}{12}\right] + z_{c_{14}}\right.$$

$$\left.\cdot \frac{\left(P14_{e,z} - P13_{e,z}\right) \cdot \left(P14_{e,y} - P13_{e,y}\right)}{6}\Bigg] \cdot dA_{14}\right\}$$

$$
\begin{aligned}
y_j = (-3.06) - \frac{0.5}{739187}
&\cdot \Bigg\{\Bigg[\Bigg[(-75.37)^3 + (-75.37) \\
&\cdot \left[\frac{[(-83.58)-(-83.58)]^2}{4} + (-97.32)^2 + \frac{(1.38-29.29)^2}{12}\right] + (-97.32) \\
&\cdot \frac{(1.38-29.29)\cdot[(-83.58)-(-83.58)]}{6}\Bigg] \cdot 39.63 + 0 \\
&+ \left[(-33.58)^3 + (-33.58)\cdot\left[\frac{[(-1.38)-(-82.20)]^2}{4} + (-112.65)^2 + 0\right] + 0\right] \\
&\cdot 114.77 + 0 + \left[(8.21)^3 + (8.21)\cdot\left[0 + (-22.68)^2 + \frac{(178.57-1.38)^2}{12}\right] + 0\right] \\
&\cdot 251.60 + 0 + \left[(8.21)^3 + (8.21)\cdot\left[0 + (169.68)^2 + \frac{(297.20-267.46)^2}{12}\right] + 0\right] \\
&\cdot 42.23 + 0 + \left[(22.88)^3 + (22.88)\cdot\left[\frac{(27.94-1.38)^2}{4} + (185.93)^2 + 0\right] + 0\right] \\
&\cdot 37.72 + 0 + \left[69.66^3 + 69.66\cdot\left[\frac{(77.20-45.70)^2}{4} + (185.93)^2 + 0\right] + 0\right] \cdot 25.97 \\
&+ 0\Bigg[(86.79)^3 + 86.79\cdot\left[\frac{(78.58-78.58)^2}{4} + (172.29)^2 + \frac{(272.69-297.20)^2}{12}\right] \\
&+ 172.29\cdot\frac{(272.69-297.20)\cdot(78.58-78.58)}{6}\Bigg]\cdot 20.21\Bigg\} = -56.67\text{mm}
\end{aligned}
$$

where the coordinates of the center of the parts of the transversal section relative to the shear Center are:

$$z_{c_2} = \frac{P2_{e,z} + P1_{e,z}}{2} - z_{gc} = \frac{1.38 + 29.29}{2} - 112.65 = -97.32\text{mm}$$

$$z_{c_3} = \frac{P3_{e,z} + P2_{e,z}}{2} - z_{gc} = \frac{0 + 1.38}{2} - 112.65 = -111.96mm$$

$$z_{c_4} = \frac{P4_{e,z} + P3_{e,z}}{2} - z_{gc} = 0 - 112.65 = -112.65mm$$

$$z_{c_5} = \frac{P5_{e,z} + P4_{e,z}}{2} - z_{gc} = \frac{1.38 + 0}{2} - 112.65 = -111.96mm$$

$$z_{c_6} = \frac{P6_{e,z} + P5_{e,z}}{2} - z_{gc} = \frac{178.57 + 1.38}{2} - 112.65 = -22.68mm$$

$$z_{c_7} = \frac{P7_{e,z} + P6_{e,z}}{2} - z_{gc} = \frac{267.46 + 178.57}{2} - 112.65 = 110.36mm$$

$$z_{c_8} = \frac{P8_{e,z} + P7_{e,z}}{2} - z_{gc} = \frac{297.20 + 267.46}{2} - 112.65 = 169.68mm$$

$$z_{c_9} = \frac{P9_{e,z} + P8_{e,z}}{2} - z_{gc} = \frac{298.58 + 297.20}{2} - 112.65 = 185.24mm$$

$$z_{c_{10}} = \frac{P10_{e,z} + P9_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 112.65 = 185.93mm$$

$$z_{c_{11}} = \frac{P11_{e,z} + P10_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 112.65 = 185.93mm$$

$$z_{c_{12}} = \frac{P12_{e,z} + P11_{e,z}}{2} - z_{gc} = \frac{298.58 + 298.58}{2} - 112.65 = 185.93mm$$

$$z_{c_{13}} = \frac{P13_{e,z} + P12_{e,z}}{2} - z_{gc} = \frac{297.20 + 298.58}{2} - 112.65 = 185.24mm$$

$$z_{c_{14}} = \frac{P14_{e,z} + P13_{e,z}}{2} - z_{gc} = \frac{272.69 + 297.20}{2} - 112.65 = 172.29mm$$

$$y_{c_{2}} = \frac{P2_{e,y} + P1_{e,y}}{2} - y_{gc} = \frac{(-83.58) + (-83.58)}{2} + 8.21 = -75.37mm$$

$$y_{c_{3}} = \frac{P3_{e,y} + P2_{e,y}}{2} - y_{gc} = \frac{(-82.20) + (-83.58)}{2} + 8.21 = -74.68mm$$

$$y_{c_{4}} = \frac{P4_{e,y} + P3_{e,y}}{2} - y_{gc} = \frac{(-1.38) + (-82.20)}{2} + 8.21 = -33.58mm$$

$$y_{c_{5}} = \frac{P5_{e,y} + P4_{e,y}}{2} - y_{gc} = \frac{0 + (-1.38)}{2} + 8.21 = 7.53mm$$

$$y_{c_{6}} = \frac{P6_{e,y} + P5_{e,y}}{2} - y_{gc} = 0 + 8.21 = 8.21mm$$

$$y_{c_{7}} = \frac{P7_{e,y} + P6_{e,y}}{2} - y_{gc} = 0 + 8.21 = 8.21mm$$

$$y_{c_{8}} = \frac{P8_{e,y} + P7_{e,y}}{2} - y_{gc} = 0 + 8.21 = 8.21mm$$

$$y_{c_{9}} = \frac{P9_{e,y} + P8_{e,y}}{2} - y_{gc} = \frac{1.38 + 0}{2} + 8.21 = 8.90mm$$

$$y_{c_{10}} = \frac{P10_{e,y} + P9_{e,y}}{2} - y_{gc} = \frac{27.94 + 1.38}{2} + 8.21 = 22.88mm$$

$$y_{c_{11}} = \frac{P11_{e,y} + P10_{e,y}}{2} - y_{gc} = \frac{45.70 + 27.94}{2} + 8.21 = 9.28mm$$

$$y_{c_{12}} = \frac{P12_{e,y} + P11_{e,y}}{2} - y_{gc} = \frac{77.20 + 45.70}{2} + 8.21 = 20.88mm$$

$$y_{c_{13}} = \frac{P13_{e,y} + P12_{e,y}}{2} - y_{gc} = \frac{78.58 + 77.20}{2} - 8.21 = 86.11mm$$

$$y_{c_{14}} = \frac{P14_{e,y} + P13_{e,y}}{2} - y_{gc} = \frac{78.58 + 78.58}{2} - 8.21 = 86.79mm$$

ANNEX A

The cross-sectional properties of thin-walled bars can be determined by considering the section composed of flat elements connected in nodes with right corners. The relations are as set out in SR EN 1993-1-3 Annex C1, used for open cross-sections.

The calculation involves dividing the cross-section into" n " portions, which are numbered from 1 to n, and the nodes formed in their Junction areas are numbered from 0 to n.A flat portion (i), called the sectional wall is bordered by nodes (i-1) and (i). Each sectional Wall (s) is assigned a thickness (ti). Thus we will have:

Nods : j = 0 .. n

Sectional walls: i = 0 .. n

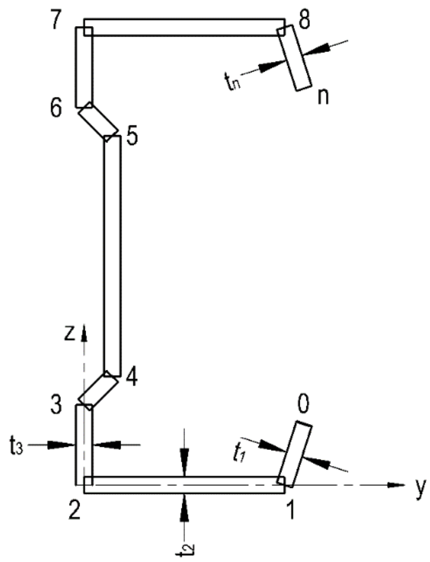


Figure A.1 – Cross-section

To make up the entire section. The sectional walls must be placed consecutively in the correct position by assigning Cartesian coordinate sectional nodes (x,y). The following relations determine the geometric characteristics of the entire section.

Section area

$$A = \sum_{i=1}^{n} dA_i \tag{A.1}$$

, where :

Area of a sectional wall:

$$dA_i = \overrightarrow{[t_\iota \cdot \sqrt{(y_\iota - y_{\iota-1})^2 + (z_\iota - z_{\iota-1})^2}]} \tag{A.2}$$

Static moment in ratio to the Y axis and the coordinate of the center of gravity

$$S_{y0} = \sum_{i=1}^{n} (z_i + z_{i-1}) \cdot \frac{d_{Ai}}{2} \tag{A.3}$$

$$z_{gc} = \frac{S_{y0}}{A} \tag{A.4}$$

Moment of inertia in ratio to the original Y-axis and the new Y-axis through the center of gravity

$$I_{y0} = \sum_{i=1}^{n} [(z_i)^2 + (z_{i-1})^2 + z_i \cdot (z_{i-1})] \cdot \frac{d_{Ai}}{3} \tag{A.5}$$

$$I_y = I_{y0} - A \cdot z_{gc}^2 \tag{A.6}$$

The static moment in ratio to the z-axis and the coordinate of the center of gravity

$$S_{z0} = \sum_{i=1}^{n} (y_i + y_{i-1}) \cdot \frac{d_{Ai}}{2} \tag{A.7}$$

$$y_{gc} = \frac{S_{z0}}{A} \tag{A.8}$$

Moment of inertia in ratio to the original z-axis and the new z-axis through the center of gravity

$$I_{z0} = \sum_{i=1}^{n} [(y_i)^2 + (y_{i-1})^2 + y_i \cdot (y_{i-1})] \cdot \frac{d_{Ai}}{3} \tag{A.9}$$

$$I_z = I_{z0} - A \cdot y_{gc}^2 \tag{A.10}$$

Moment of inertia centrifugal in ratio to the Y and z axes and the new axes through the center of gravity

$$I_{yz0} = \sum_{i=1}^{n} (2 \cdot y_{i-1} \cdot z_{i-1} + 2 \cdot y_i \cdot z_i + y_{i-1} \cdot z_i + y_i \cdot z_{i-1}) \cdot \frac{dA_i}{6} \tag{A.11}$$

$$I_{yz} = I_{yz0} - \frac{S_{y0} \cdot S_{z0}}{A} \tag{A.12}$$

Main axes of inertia

$$\alpha = \frac{1}{2} arctan\left(\frac{2I_{yz}}{I_z - I_y}\right) \text{dacă } (I_z - I_y) \neq 0 \text{ dacă } nu\ \alpha = 0$$

$$I_\zeta = \frac{1}{2}\left[I_y + I_z + \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2}\right] \tag{A.13}$$

$$I_\eta = \frac{1}{2}\left[I_y + I_z - \sqrt{(I_z - I_y)^2 + 4 \cdot I_{yz}^2}\right] \tag{A.14}$$

Sectoral coordinates

$$\omega_0 = 0$$

$$\omega_{0_i} = y_{i-1} \cdot z_i - y_i \cdot z_{i-1} \tag{A.15}$$

$$\omega_i = \omega_{i-1} + \omega_{0_i} \tag{A.16}$$

Average of sectoral coordinates

$$I_\omega = \sum_{i=1}^{n} (\omega_{i-1} + \omega_i) \cdot \frac{dA_i}{2} \tag{A.17}$$

$$\omega_{mean} = \frac{I_\omega}{A} \tag{A.18}$$

Sectoral constants

$$I_{y\omega 0} = \sum_{i=1}^{n} (2 \cdot y_{i-1} \cdot \omega_{i-1} + 2 \cdot y_i \cdot \omega_i + y_{i-1} \cdot \omega_i + y_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6} \tag{A.19}$$

$$I_{y\omega} = I_{y\omega 0} - \frac{S_{z0} \cdot I_\omega}{A} \tag{A.20}$$

$$I_{z\omega 0} = \sum_{i=1}^{n} (2 \cdot z_{i-1} \cdot \omega_{i-1} + 2 \cdot z_i \cdot \omega_i + z_{i-1} \cdot \omega_i + z_i \cdot \omega_{i-1}) \cdot \frac{dA_i}{6} \tag{A.21}$$

$$I_{z\omega} = I_{z\omega 0} - \frac{S_{y0} \cdot I_\omega}{A} \tag{A.22}$$

$$I_{\omega\omega 0} = \sum_{i=2}^{16} [(\omega_i)^2 + (\omega_{i-1})^2 + \omega_i \cdot \omega_{i-1}] \frac{dA_i}{3} \tag{A.23}$$

$$I_{\omega\omega} = I_{\omega\omega 0} - \frac{I_\omega^2}{A} \tag{A.24}$$

Shear Center

$$y_{sc} = \frac{I_{z\omega} \cdot I_z - I_{y\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} \tag{A.25}$$

$$z_{sc} = \frac{-I_{y\omega} \cdot I_y + I_{z\omega} \cdot I_{yz}}{I_y \cdot I_z - I_{yz}^2} \tag{A.26}$$

,where :

$(I_y I_z - I_{yz}^2 \neq 0)$

Sectoral moment of inertia

$$I_w = I_{\omega\omega} + z_{sc} \cdot I_{y\omega} - y_{sc} \cdot I_{z\omega} \tag{A.27}$$

Torsional Moment of inertia

$$I_t = \sum_{i=1}^{n} dA_i \cdot \frac{(t_i)^2}{3} \tag{A.28}$$

$$W_t = \frac{I_t}{min(t)} \tag{A.29}$$

Sectoral coordinates relative to shear centre

$$\omega_{s_j} = \omega_j - \omega_{mean} + z_{sc} \cdot (y_j - y_{gc}) - y_{sc} \cdot (z_j - z_{gc}) \tag{A.30}$$

Maximum sectoral constant and sectoral module

$$W_\omega = \frac{I_w}{\omega_{max}} \tag{A.31}$$

,where :

$\omega_{max} = max(|\omega_s|)$

Distance between the shear center and center of gravity

$$y_s = y_{sc} - y_{gc} \tag{A.32}$$

$$z_s = z_{sc} - z_{gc} \tag{A.33}$$

Polar moment of inertia relative to shear Center

$$I_p = I_y + I_z + A \cdot (y_s^2 + z_s^2) \tag{A.34}$$

Nonsymetric factors z_j and y_j

$$z_j = z_s - \frac{0.5}{I_y} \cdot \sum_{i=1}^{n} \left\{ \left[(z_{c_i})^3 + z_{c_i} \cdot \left[\frac{(z_i - z_{i-1})^2}{4} + (y_{c_i})^2 + \frac{(y_i - y_{i-1})^2}{12} \right] + y_{c_i} \cdot \frac{(y_i - y_{i-1}) \cdot (z_i - z_{i-1})}{6} \right] \cdot dA_i \right\} \tag{A.35}$$

$$y_j = y_s - \frac{0.5}{I_z} \cdot \sum_{i=1}^{n} \left\{ \left[(y_{c_i})^3 + y_{c_i} \cdot \left[\frac{(y_i - y_{i-1})^2}{4} + (z_{c_i})^2 + \frac{(z_i - z_{i-1})^2}{12} \right] + z_{c_i} \cdot \frac{(z_i - z_{i-1}) \cdot (y_i - y_{i-1})}{6} \right] \cdot dA_i \right\} \tag{A.36}$$

, where the coordinates of the center of the sectional walls relative to the shear Center are:

$$y_{c_i} = \frac{y_i + y_{i-1}}{2} - y_{gc} \tag{A.37}$$

$$z_{c_i} = \frac{z_i + z_{i-1}}{2} - z_{gc} \tag{A.38}$$

NOTE: $z_j = 0$ $(y_j = 0)$ for sections where the y axis (axis z) it is the axis of symmetry .

ANNEX B

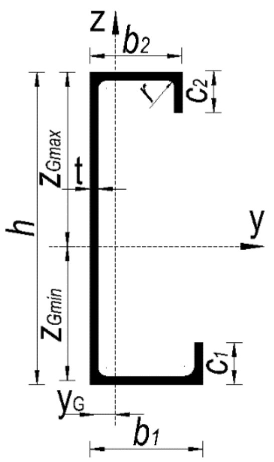
This appendix contains a set of predesigned sectional characteristics for sections „C” and „Z” with dimensions of the walls parameterized within the limits of the proportions allowed by the European legislation for the calculation by the simplified method.

Parameterization was performed for the following dimensions:

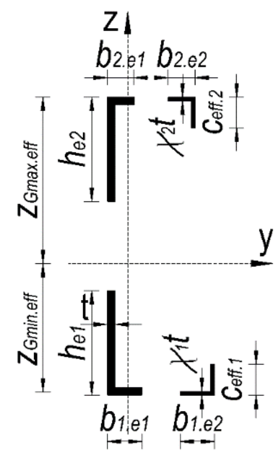
- sheet thickness „t” considered with calculation values (Ex : for a net value t_{net} = 1.2 we have a thickness calculation t=1.12 mm) ;
- section height „h” ;
- width of the flanges „b_1”, „b_2” , chosen by parameterization in tandem, by choosing the size of a single sole following the height of the profile to fit within the permissible limits. The second flange was chosen through the lens of the size of the first flange but reduced by 5 mm ”c” ; for this, two sizes were chosen for each flange width. For both flanges, the rims that have the same value were chosen.

B.1. Effective sectional characteristics for parameterized " C " sections

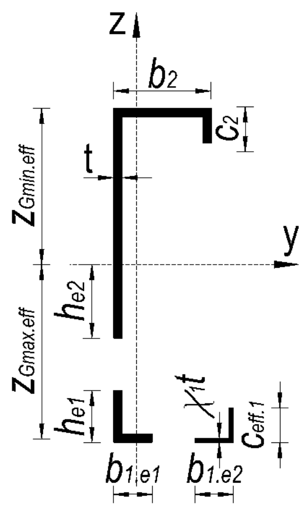
The dimensions were noted according to the figures:



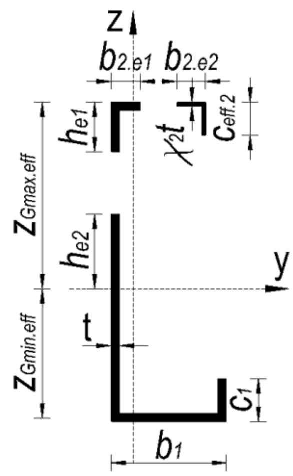
Gross section



Effective section for members in compression



Effective bent section
Flange 1 compression



Effective bent section
Flange 2 compression

[mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
0.92	C 100/35/12	100	35	30	12	1.00	3.00	1.30	163.04	48.14	9.05	23.97	2.39	4.98	46.00	48.91
0.92	C 100/35/18	100	35	30	18	1.00	3.00	1.38	174.08	48.23	10.48	25.32	2.93	5.25	49.11	72.14
0.92	C 100/40/14	100	40	35	18	1.00	3.00	1.40	179.60	48.97	11.90	27.18	3.78	5.55	50.67	88.86
0.92	C 100/40/21	100	40	35	21	1.00	3.00	1.50	188.80	48.33	13.15	28.10	4.37	5.81	53.27	119.19
0.92	C 120/40/14	120	40	35	14	1.00	3.00	1.54	194.32	58.13	10.35	41.12	3.82	7.07	54.82	113.14
0.92	C 120/40/21	120	40	35	21	1.00	3.00	1.64	207.20	58.22	11.98	43.46	4.66	7.46	58.46	165.01
0.92	C 120/45/16	120	45	40	16	1.00	3.00	1.64	207.20	58.22	12.69	45.13	5.44	7.75	58.46	168.67
0.92	C 120/45/24	120	45	40	24	1.00	3.00	1.76	221.92	58.31	14.61	47.50	6.60	8.15	62.61	253.65
0.92	C 150/50/18	150	50	45	18	1.00	4.00	1.95	245.52	73.14	13.36	81.72	7.86	11.17	69.27	372.41
0.92	C 150/50/27	150	50	45	27	1.00	4.00	2.08	262.08	73.23	15.46	86.30	9.58	11.78	73.94	546.46
0.92	C 150/55/20	150	55	50	20	1.00	4.00	2.05	258.40	73.21	15.71	87.99	10.42	12.02	72.90	511.07
0.92	C 150/55/30	150	55	50	30	1.00	4.00	2.19	276.80	73.30	18.10	92.61	12.64	12.63	78.09	768.67
1.12	C 100/35/12	100	35	30	12	1.20	3.00	1.57	197.32	48.04	8.96	28.83	2.85	6.00	82.51	57.89
1.12	C 100/35/18	100	35	30	18	1.20	3.00	1.67	210.76	48.13	10.39	30.49	3.49	6.33	88.13	85.60
1.12	C 100/40/14	100	40	35	14	1.20	3.00	1.69	213.00	48.14	11.34	32.19	4.30	6.69	89.06	92.47
1.12	C 100/40/21	100	40	35	21	1.20	3.00	1.81	228.68	48.23	13.05	33.85	5.23	7.02	95.62	141.83
1.12	C 120/40/14	120	40	35	14	1.20	3.00	1.87	235.40	58.03	10.26	49.57	4.56	8.54	98.43	134.49
1.12	C 120/40/21	120	40	35	21	1.20	3.00	1.99	251.08	58.11	11.89	52.41	5.57	9.02	104.98	196.55

t [mm]	Profile type	Subjected to compression Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
0.92	C 100/35/12	98.95	20.17	1.52	48.51	50.57	12.24	20.92	4.16	3.99	1.24	0.73	45.15	12.38	3.19	0.37	24.18	39.69
0.92	C 100/35/18	110.37	21.93	1.87	48.80	50.28	14.11	19.05	4.49	4.36	1.32	0.98	44.58	13.01	3.63	0.57	28.05	58.35
0.92	C 100/40/14	105.08	21.42	2.21	49.47	49.61	14.62	23.54	4.33	4.32	1.51	0.94	45.15	14.49	3.19	1.22	24.90	61.75
0.92	C 100/40/21	114.06	22.72	2.58	49.46	49.62	16.28	21.88	4.59	4.58	1.59	1.18	44.63	15.05	3.13	1.12	27.81	83.37
0.92	C 120/40/14	104.37	31.54	2.17	59.43	59.65	14.30	23.86	5.31	5.29	1.52	0.91	54.97	14.43	3.95	1.30	24.38	84.85
0.92	C 120/40/21	113.63	33.69	2.57	59.47	59.61	16.03	22.13	5.67	5.65	1.60	1.16	54.45	15.03	4.04	1.26	27.22	113.02
0.92	C 120/45/16	106.73	32.16	2.92	59.14	59.94	16.29	26.87	5.44	5.37	1.79	1.09	54.89	16.55	3.60	1.72	24.11	119.07
0.92	C 120/45/24	115.04	34.09	3.38	59.43	59.65	18.04	25.12	5.74	5.72	1.88	1.35	54.44	17.15	3.43	1.34	26.55	152.30
0.92	C 150/50/18	106.33	51.42	3.61	73.78	75.30	17.55	30.61	6.97	6.83	2.05	1.18	69.54	18.42	4.19	2.16	23.18	226.91
0.92	C 150/50/27	114.71	54.74	4.21	74.23	74.85	19.58	28.58	7.37	7.31	2.15	1.47	69.08	19.16	4.11	1.62	25.28	286.88
0.92	C 150/55/20	106.43	51.41	4.46	73.75	75.33	19.08	34.08	6.97	6.82	2.34	1.31	69.50	20.47	3.37	2.12	22.75	284.59
0.92	C 150/55/30	114.61	54.64	5.20	74.12	74.96	21.29	31.87	7.37	7.29	2.44	1.63	69.05	21.30	3.20	1.66	24.59	358.39
1.12	C 100/35/12	132.52	25.93	2.02	47.98	50.90	11.80	20.96	5.40	5.09	1.71	0.96	44.23	12.34	2.85	0.06	50.36	50.56
1.12	C 100/35/18	150.31	28.60	2.57	48.03	50.85	13.96	18.80	5.95	5.62	1.84	1.37	43.62	13.08	3.58	0.10	60.39	79.52
1.12	C 100/40/14	144.52	28.51	2.97	48.36	50.52	14.34	23.42	5.89	5.64	2.07	1.27	44.41	14.33	3.00	0.22	53.61	79.41
1.12	C 100/40/21	162.14	30.98	3.66	48.53	50.35	16.55	21.21	6.38	6.15	2.21	1.73	43.71	15.02	3.50	0.30	63.02	122.08
1.12	C 120/40/14	144.05	42.24	2.94	58.18	60.70	14.03	23.73	7.26	6.96	2.09	1.24	54.15	14.28	3.78	0.15	52.68	110.32
1.12	C 120/40/21	161.90	46.27	3.65	58.38	60.50	16.30	21.46	7.92	7.65	2.24	1.70	53.46	15.02	4.42	0.27	61.83	164.59

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																		
0.92	(*) C 100/35/12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.92		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.92	C 100/35/18	1	24.00	2.69	49.09	49.99	10.10	23.06	4.89	4.80	2.67	1.17	38.10	12.77	0.38	0.86	45.22	66.27
0.92		2	24.51	2.81	46.85	52.23	10.58	22.58	5.23	4.69	2.65	1.24	38.31	12.97	0.10	1.38	46.54	67.03
0.92	C 100/40/14	1	24.38	3.24	48.53	50.55	10.63	27.53	5.02	4.82	3.04	1.18	38.52	14.03	0.81	2.31	44.06	72.20
0.92		2	25.03	3.40	45.84	53.24	11.41	26.75	5.46	4.70	2.98	1.27	38.90	14.33	0.03	2.40	45.03	72.20
0.92	C 100/40/21	1	25.69	3.87	48.29	50.79	12.15	26.01	5.32	5.06	3.19	1.49	38.30	14.87	1.00	2.46	47.40	102.55
0.92		2	26.27	4.05	45.75	53.33	12.96	25.20	5.74	4.93	3.13	1.61	38.64	15.18	0.19	2.58	48.36	102.05
0.92	C 120/40/14	1	36.59	3.31	59.32	59.76	9.91	28.25	6.17	6.12	3.34	1.17	45.82	13.78	0.44	1.19	46.72	100.97
0.92		2	37.30	3.50	53.61	65.47	10.71	27.45	6.96	5.70	3.27	1.27	46.20	14.14	0.35	4.52	47.48	100.76
0.92	C 120/40/21	1	38.79	3.99	59.35	59.73	11.39	26.77	6.54	6.49	3.50	1.49	45.76	14.68	0.59	1.51	50.03	139.30
0.92		2	39.37	4.19	53.55	65.53	12.24	25.92	7.35	6.01	3.43	1.62	46.09	15.04	0.25	4.67	50.76	137.95
0.92	C 120/45/16	1	38.86	4.57	57.77	61.31	11.67	31.49	6.73	6.34	3.92	1.45	46.10	15.81	1.03	3.09	48.70	144.55
0.92		2	39.23	4.85	52.11	66.97	12.87	30.29	7.53	5.86	3.77	1.60	46.50	16.35	0.18	6.11	48.79	144.67
0.92	C 120/45/24	1	41.02	5.49	57.38	61.70	13.38	29.78	7.15	6.65	4.10	1.84	45.91	16.79	1.23	3.40	52.17	201.77
0.92		2	41.15	5.75	51.91	67.17	14.60	28.56	7.93	6.13	3.94	2.01	46.25	17.29	0.02	6.40	52.11	197.19
0.92	C 150/50/18	1	66.68	6.18	72.73	76.35	12.31	35.85	9.17	8.73	5.02	1.72	57.12	17.39	1.06	3.21	54.36	294.21
0.92		2	65.50	6.59	61.36	87.72	13.87	34.29	10.68	7.47	4.75	1.92	57.31	18.18	0.51	11.79	53.29	291.10
0.92	C 150/50/27	1	70.65	7.49	72.02	77.06	14.20	33.96	9.81	9.17	5.27	2.20	57.01	18.56	1.26	3.83	57.97	403.95
0.92		2	68.89	7.85	61.09	87.99	15.81	32.35	11.28	7.83	4.97	2.43	57.13	19.29	0.35	12.14	56.66	388.66
0.92	C 150/55/20	1	69.78	8.02	70.51	78.57	14.04	39.12	9.90	8.88	5.71	2.05	57.29	19.42	1.67	5.36	56.41	388.59
0.92		2	67.43	8.48	59.41	89.67	15.99	37.17	11.35	7.52	5.30	2.28	57.41	20.36	0.28	13.81	54.37	379.12
0.92	C 150/55/30	1	73.59	9.67	69.79	79.29	16.14	37.02	10.54	9.28	5.99	2.61	57.03	20.67	1.96	5.99	60.14	537.77
0.92		2	70.74	10.08	59.19	89.89	18.20	34.96	11.95	7.87	5.54	2.88	57.08	21.55	0.10	14.11	57.90	513.17
1.12	(*) C 100/35/12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12	C 100/35/18	1	30.07	3.43	48.01	50.87	10.41	22.35	6.26	5.91	3.29	1.53	38.09	12.85	0.02	0.12	85.82	84.23
1.12		2	30.49	3.49	48.13	50.75	10.39	22.37	6.33	6.01	3.36	1.56	38.03	12.87	0.00	0.00	88.13	85.60
1.12	C 100/40/14	1	31.00	4.04	49.30	49.58	10.83	26.93	6.29	6.25	3.74	1.50	38.67	13.97	0.51	1.16	83.45	88.60
1.12		2	31.60	4.21	47.56	51.32	11.12	26.64	6.64	6.16	3.79	1.58	38.75	14.15	0.21	0.58	86.11	89.79
1.12	C 100/40/21	1	32.95	4.98	49.02	49.86	12.65	25.11	6.72	6.61	3.94	1.98	38.44	14.95	0.40	0.79	91.22	133.61
1.12		2	33.64	5.16	47.97	50.91	12.91	24.85	7.01	6.61	4.00	2.08	38.49	15.07	0.14	0.26	94.54	136.60
1.12	(*) C 120/40/14	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12	C 120/40/21	1	50.43	5.23	58.65	60.23	11.60	26.16	8.60	8.37	4.51	2.00	45.71	14.72	0.29	0.54	98.40	183.93
1.12		2	51.09	5.40	56.80	62.08	12.00	25.76	8.99	8.23	4.50	2.09	45.87	14.91	0.11	1.31	100.62	186.26

(*)For sections marked the effective sectional characteristics are not highlighted because for the application case that section falls within Class 3. For the section concerned, the characteristics of the gross section will be used in the calculation.

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
1.12	C 120/45/16	120	45	40	16	1.20	4.00	1.98	248.46	58.10	12.51	53.52	6.39	9.21	103.89	197.01
1.12	C 120/45/24	120	45	40	24	1.20	4.00	2.12	266.38	58.19	14.45	56.40	7.80	9.69	111.38	298.71
1.12	C 150/50/18	150	50	45	18	1.20	4.00	2.36	297.74	73.04	13.27	98.71	9.43	13.51	124.49	444.98
1.12	C 150/50/27	150	50	45	27	1.20	4.00	2.52	317.90	73.13	15.37	104.28	11.51	14.26	132.92	653.99
1.12	C 150/55/20	150	55	50	20	1.20	4.00	2.49	313.42	73.11	15.61	106.32	12.52	14.54	131.05	611.53
1.12	C 150/55/30	150	55	50	30	1.20	4.00	2.66	335.82	73.20	18.00	111.95	15.21	15.29	140.42	921.14
1.12	C 150/60/22	150	60	55	22	1.20	4.00	2.61	329.10	73.17	18.04	113.84	16.16	15.56	137.61	818.97
1.12	C 150/60/33	150	60	55	33	1.20	4.00	2.80	353.74	73.26	20.71	119.43	19.55	16.30	147.91	1265.27
1.12	C 180/60/22	180	60	55	22	1.20	4.00	2.87	362.70	88.06	16.37	174.82	17.15	19.85	151.66	1183.30
1.12	C 180/60/33	180	60	55	33	1.20	4.00	3.07	387.34	88.15	18.92	184.48	20.86	20.93	161.96	1738.28
1.12	C 180/65/24	180	65	60	24	1.20	4.00	3.00	378.38	88.12	18.72	185.80	21.68	21.09	158.21	1537.80
1.12	C 180/65/36	180	65	60	36	1.20	4.00	3.21	405.26	88.20	21.55	195.51	26.26	22.17	169.45	2306.57
1.42	C 120/45/16	120	45	40	16	1.50	4.00	2.49	312.80	57.94	12.36	66.91	7.90	11.55	210.25	241.72
1.42	C 120/45/24	120	45	40	24	1.50	4.00	2.67	335.52	58.04	14.31	70.56	9.67	12.16	225.52	367.60
1.42	C 150/50/18	150	50	45	18	1.50	4.00	2.98	375.28	72.88	13.13	123.68	11.69	16.97	252.24	548.47
1.42	C 150/50/27	150	50	45	27	1.50	4.00	3.18	400.84	72.97	15.23	130.75	14.31	17.92	269.42	808.09
1.42	C 150/55/20	150	55	50	20	1.50	4.00	3.13	395.16	72.96	15.47	133.30	15.56	18.27	265.60	755.42
1.42	C 150/55/30	150	55	50	30	1.50	4.00	3.36	423.56	73.04	17.85	140.43	18.94	19.23	284.69	1140.49

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
1.12	C 120/45/16	152.39	44.58	4.04	58.88	60.00	16.46	26.30	7.57	7.43	2.46	1.54	54.09	16.28	3.95	0.78	54.68	159.79
1.12	C 120/45/24	167.39	47.75	4.82	59.17	59.71	18.56	24.20	8.07	8.00	2.60	1.99	53.41	16.97	4.10	0.98	62.02	224.90
1.12	C 150/50/18	156.52	73.99	5.26	74.28	74.60	18.24	29.52	9.96	9.92	2.88	1.78	68.76	18.34	4.98	1.56	53.60	328.45
1.12	C 150/50/27	169.44	78.69	6.14	74.43	74.45	20.30	27.46	10.57	10.57	3.03	2.24	68.15	19.04	4.93	1.30	59.43	427.53
1.12	C 150/55/20	158.73	74.90	6.64	74.03	74.85	20.17	32.59	10.12	10.01	3.29	2.04	68.69	20.45	4.55	1.74	52.96	425.21
1.12	C 150/55/30	170.86	79.33	7.66	74.31	74.57	22.28	30.48	10.67	10.64	3.44	2.51	68.14	21.17	4.28	1.37	58.17	541.03
1.12	C 150/60/22	159.55	75.23	8.10	73.96	74.92	21.88	35.88	10.17	10.04	3.70	2.26	68.67	22.53	3.84	1.75	52.06	526.53
1.12	C 150/60/33	171.48	79.57	9.32	74.22	74.66	24.17	33.59	10.72	10.66	3.86	2.78	68.12	23.32	3.46	1.40	56.84	667.13
1.12	C 180/60/22	158.14	110.16	7.94	88.80	90.08	21.37	36.39	12.41	12.23	3.72	2.18	83.46	22.41	4.99	2.02	51.02	722.55
1.12	C 180/60/33	170.17	116.99	9.20	89.12	89.76	23.72	34.04	13.13	13.03	3.88	2.70	82.91	23.25	4.81	1.61	55.51	905.67
1.12	C 180/65/24	158.09	110.03	9.45	88.72	90.16	22.87	39.89	12.40	12.20	4.13	2.37	83.42	24.45	4.15	2.05	50.15	869.56
1.12	C 180/65/36	170.03	116.81	10.96	89.03	89.85	25.44	37.32	13.12	13.00	4.31	2.94	82.89	25.39	3.89	1.64	54.24	1089.34
1.42	C 120/45/16	217.99	60.83	5.70	57.93	60.65	15.82	26.34	10.50	10.03	3.60	2.16	52.83	16.17	3.46	0.01	133.48	213.77
1.42	C 120/45/24	247.78	66.84	7.23	58.01	60.57	18.65	23.51	11.52	11.03	3.88	3.08	51.94	17.08	4.35	0.03	160.47	345.22
1.42	C 150/50/18	232.60	106.22	7.61	73.00	75.58	17.91	29.25	14.55	14.05	4.25	2.60	67.58	18.09	4.78	0.11	137.31	453.46
1.42	C 150/50/27	260.98	116.05	9.42	73.21	75.37	20.74	26.42	15.85	15.40	4.54	3.57	66.68	19.00	5.52	0.23	160.80	675.24
1.42	C 150/55/20	244.84	112.03	9.94	73.64	74.94	20.39	31.77	15.21	14.95	4.88	3.13	67.64	20.15	4.92	0.69	141.77	616.78
1.42	C 150/55/30	268.93	119.99	11.84	73.99	74.59	22.98	29.18	16.22	16.09	5.15	4.06	66.80	20.98	5.12	0.95	161.01	866.38

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
1.12	C 120/45/16	1	50.03	5.86	58.96	59.92	11.85	30.91	8.49	8.35	4.95	1.90	46.06	15.77	0.66	1.82	94.37	184.87
1.12		2	50.99	6.08	55.94	62.94	12.48	30.28	9.12	8.10	4.87	2.01	46.40	16.02	0.03	2.16	95.98	184.73
1.12	C 120/45/24	1	52.91	7.11	58.77	60.11	13.66	29.10	9.00	8.80	5.20	2.44	45.85	16.80	0.80	1.92	101.76	266.21
1.12		2	54.02	7.36	56.10	62.78	14.32	28.44	9.63	8.60	5.14	2.59	46.17	17.04	0.13	2.09	103.88	266.61
1.12	C 150/50/18	1	87.11	8.13	74.12	74.76	12.67	35.09	11.75	11.65	6.41	2.32	57.32	17.51	0.59	1.72	105.24	391.22
1.12		2	87.96	8.52	66.51	82.37	13.68	34.08	13.22	10.68	6.23	2.50	57.72	17.96	0.41	6.53	105.85	392.16
1.12	C 150/50/27	1	92.28	9.80	73.58	75.30	14.57	33.19	12.54	12.26	6.73	2.95	57.21	18.64	0.80	2.17	112.74	540.36
1.12		2	92.63	10.17	66.29	82.59	15.60	32.16	13.97	11.22	6.52	3.16	57.55	19.07	0.23	6.84	113.00	532.12
1.12	C 150/55/20	1	91.42	10.55	72.17	76.71	14.47	38.29	12.67	11.92	7.29	2.75	57.60	19.56	1.15	3.60	108.89	521.07
1.12		2	91.37	11.02	64.87	84.01	15.81	36.95	14.08	10.88	6.97	2.98	58.01	20.15	0.20	8.24	108.04	518.43
1.12	C 150/55/30	1	96.44	12.65	71.60	77.28	16.56	36.20	13.47	12.48	7.64	3.49	57.34	20.76	1.44	4.08	116.58	724.69
1.12		2	95.86	13.09	64.59	84.29	17.95	34.81	14.84	11.37	7.29	3.76	57.69	21.32	0.05	8.61	115.37	706.91
1.12	C 150/60/22	1	95.28	13.34	70.25	78.63	16.27	41.49	13.56	12.12	8.20	3.22	57.75	21.61	1.77	5.46	112.46	674.21
1.12		2	94.21	13.87	63.15	85.73	17.97	39.79	14.92	10.99	7.72	3.49	58.18	22.32	0.07	10.02	110.07	663.67
1.12	C 150/60/33	1	100.12	15.95	69.70	79.18	18.58	39.18	14.36	12.64	8.58	4.07	57.35	22.89	2.13	5.92	120.36	946.59
1.12		2	98.58	16.43	62.92	85.96	20.36	37.40	15.67	11.47	8.07	4.39	57.73	23.56	0.35	10.34	117.68	916.63
1.12	C 180/60/22	1	143.44	13.68	86.88	92.00	15.15	42.61	16.51	15.59	9.03	3.21	68.72	21.22	1.22	3.94	119.74	941.69
1.12		2	139.78	14.30	73.79	105.09	16.84	40.92	18.94	13.30	8.49	3.49	68.88	22.03	0.47	14.27	116.50	924.18
1.12	C 180/60/33	1	151.57	16.45	85.96	92.92	17.38	40.38	17.63	16.31	9.46	4.07	68.54	22.58	1.53	4.78	127.60	1282.45
1.12		2	146.96	17.01	73.48	105.40	19.18	38.58	20.00	13.94	8.87	4.41	68.64	23.35	0.27	14.67	123.92	1234.81
1.12	C 180/65/24	1	148.78	16.95	84.66	94.22	16.87	45.89	17.57	15.79	10.05	3.69	68.88	23.25	1.85	6.10	123.38	1182.49
1.12		2	143.14	17.62	71.84	107.04	18.94	43.82	19.93	13.37	9.30	4.02	68.99	24.20	0.22	16.28	118.44	1150.29
1.12	C 180/65/36	1	156.70	20.36	83.76	95.12	19.33	43.43	18.71	16.47	10.53	4.69	68.54	24.71	2.22	6.91	131.49	1625.35
1.12		2	150.20	20.93	71.58	107.30	21.55	41.21	20.99	14.00	9.71	5.08	68.60	25.61	0.00	16.63	126.15	1554.95
1.42	C 120/45/16	1	65.20	7.55	58.71	59.87	12.01	30.15	11.10	10.89	6.29	2.50	46.12	15.70	0.36	0.77	200.15	233.76
1.42		2	66.10	7.79	57.50	61.08	12.20	29.96	11.50	10.82	6.39	2.60	46.15	15.84	0.16	0.45	205.58	237.14
1.42	C 120/45/24	1	69.84	9.52	57.93	60.65	14.33	27.83	12.05	11.52	6.64	3.42	45.92	16.95	0.03	0.10	220.99	362.60
1.42		2	70.56	9.67	58.04	60.54	14.31	27.85	12.16	11.65	6.76	3.47	45.86	16.97	0.00	0.00	225.52	367.60
1.42	C 150/50/18	1	118.41	10.90	73.99	74.59	12.64	34.52	16.00	15.87	8.62	3.16	57.21	17.36	0.48	1.11	234.42	519.55
1.42		2	119.19	11.22	70.81	77.77	13.09	34.07	16.83	15.33	8.57	3.29	57.43	17.62	0.03	2.07	236.95	520.69
1.42	C 150/50/27	1	126.64	13.52	73.64	74.94	14.87	32.29	17.20	16.90	9.10	4.19	57.15	18.67	0.36	0.66	254.80	757.56
1.42		2	127.69	13.85	71.48	77.10	15.27	31.89	17.87	16.56	9.07	4.34	57.30	18.87	0.04	1.50	258.88	764.58
1.42	C 150/55/20	1	125.71	14.43	73.53	75.05	14.71	37.45	17.10	16.75	9.81	3.85	57.67	19.54	0.76	2.10	243.75	712.74
1.42		2	127.38	14.81	70.45	78.13	15.34	36.82	18.08	16.30	9.66	4.02	58.03	19.79	0.13	2.50	246.44	711.39
1.42	C 150/55/30	1	132.89	17.45	73.34	75.24	16.93	35.23	18.12	17.66	10.30	4.95	57.40	20.80	0.92	2.19	262.90	1023.16
1.42		2	134.94	17.90	70.65	77.93	17.61	34.55	19.10	17.32	10.17	5.18	57.74	21.03	0.24	2.39	266.78	1023.60

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.42	C 150/60/22	150	60	55	22	1.50	4.00	3.29	415.04	73.02	17.89	142.80	20.12	19.56	278.96	1013.49
1.42	C 150/60/33	150	60	55	33	1.50	4.00	3.54	446.28	73.11	20.57	149.88	24.38	20.50	299.96	1569.19
1.42	C 180/60/22	180	60	55	22	1.50	4.00	3.63	457.64	87.90	16.23	219.51	21.36	24.97	307.60	1466.09
1.42	C 180/60/33	180	60	55	33	1.50	4.00	3.87	488.88	87.99	18.77	231.75	26.02	26.34	328.59	2157.90
1.42	C 180/65/24	180	65	60	24	1.50	4.00	3.78	477.52	87.96	18.57	233.38	27.03	26.53	320.96	1908.11
1.42	C 180/65/36	180	65	60	36	1.50	4.00	4.05	511.60	88.05	21.40	245.70	32.80	27.90	343.87	2867.28
1.42	C 180/70/26	180	70	65	26	1.50	4.00	3.94	497.40	88.02	20.98	247.11	33.55	28.08	334.32	2439.07
1.42	C 180/70/39	180	70	65	39	1.50	4.00	4.23	534.32	88.10	24.10	259.37	40.56	29.44	359.14	3743.79
1.42	C 200/65/24	200	65	60	24	1.50	4.00	4.00	505.92	97.90	17.53	299.34	27.96	30.58	340.05	2368.20
1.42	C 200/65/36	200	65	60	36	1.50	4.00	4.27	540.00	97.98	20.28	316.09	34.04	32.26	362.95	3463.04
1.42	C 200/70/26	200	70	65	26	1.50	4.00	4.16	525.80	97.95	19.85	316.54	34.73	32.32	353.41	3014.04
1.42	C 200/70/39	200	70	65	39	1.50	4.00	4.45	562.72	98.04	22.88	333.42	42.12	34.01	378.22	4490.34
1.42	C 200/75/28	200	75	70	28	1.50	4.00	4.32	545.68	98.00	22.24	333.57	42.42	34.04	366.77	3777.76
1.42	C 200/75/42	200	75	70	42	1.50	4.00	4.63	585.44	98.09	25.56	350.44	51.28	35.73	393.50	5736.54
1.42	C 200/80/30	200	80	75	30	1.50	4.00	4.47	565.56	98.04	24.68	350.44	51.06	35.74	380.13	4673.41
1.42	C 200/80/45	200	80	75	45	1.50	4.00	4.81	608.16	98.13	28.28	367.16	61.55	37.42	408.77	7235.39
1.42	C 220/70/26	220	70	65	26	1.50	4.00	4.38	554.20	107.89	18.83	396.49	35.79	36.75	372.50	3666.97
1.42	C 220/70/39	220	70	65	39	1.50	4.00	4.67	591.12	107.98	21.78	418.72	43.54	38.78	397.31	5333.75

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	C 150/60/22	252.45	115.28	12.56	74.28	74.30	22.73	34.43	15.52	15.52	5.53	3.65	67.58	22.31	4.84	1.26	142.96	812.43
1.42	C 150/60/33	272.92	121.83	14.53	74.21	74.37	25.13	32.03	16.42	16.38	5.78	4.54	66.81	23.08	4.57	1.10	159.06	1082.05
1.42	C 180/60/22	251.06	170.11	12.39	89.27	89.31	22.24	34.92	19.06	19.05	5.57	3.55	82.32	22.21	6.02	1.41	140.10	1113.92
1.42	C 180/60/33	271.97	180.78	14.45	89.23	89.35	24.75	32.41	20.26	20.23	5.84	4.46	81.53	23.05	5.97	1.23	155.69	1463.87
1.42	C 180/65/24	255.06	172.39	15.16	89.02	89.56	24.32	37.84	19.37	19.25	6.23	4.01	82.21	24.38	5.75	1.60	139.06	1402.32
1.42	C 180/65/36	274.28	182.28	17.39	89.24	89.34	26.78	35.38	20.43	20.40	6.49	4.91	81.52	25.18	5.38	1.29	153.16	1783.11
1.42	C 180/70/26	256.65	173.38	17.97	88.94	89.64	26.11	41.05	19.49	19.34	6.88	4.38	82.19	26.46	5.13	1.63	137.20	1683.20
1.42	C 180/70/39	275.65	183.12	20.58	89.15	89.43	28.74	38.42	20.54	20.48	7.16	5.36	81.51	27.32	4.64	1.33	150.42	2133.01
1.42	C 200/65/24	254.00	215.31	15.01	98.99	99.59	24.02	38.14	21.75	21.62	6.25	3.94	92.07	24.31	6.49	1.69	137.37	1684.93
1.42	C 200/65/36	273.40	228.25	17.30	99.21	99.37	26.53	35.63	23.01	22.97	6.52	4.85	91.37	25.15	6.25	1.39	151.12	2129.79
1.42	C 200/70/26	255.59	216.51	17.80	98.87	99.71	25.79	41.37	21.90	21.71	6.90	4.30	92.04	26.39	5.94	1.76	135.60	2022.88
1.42	C 200/70/39	274.67	229.23	20.46	99.11	99.47	28.45	38.71	23.13	23.04	7.19	5.28	91.35	27.29	5.57	1.44	148.42	2543.72
1.42	C 200/75/28	256.26	216.94	20.76	98.79	99.79	27.44	44.72	21.96	21.74	7.57	4.64	92.01	28.46	5.20	1.79	133.68	2382.86
1.42	C 200/75/42	275.21	229.55	23.85	99.03	99.55	30.31	41.85	23.18	23.06	7.87	5.70	91.33	29.44	4.75	1.47	145.67	2991.74
1.42	C 200/80/30	256.28	216.80	23.89	98.73	99.85	29.00	48.16	21.96	21.71	8.24	4.96	91.98	30.53	4.32	1.81	131.74	2766.38
1.42	C 200/80/45	275.14	229.36	27.46	98.96	99.62	32.08	45.08	23.18	23.03	8.56	6.09	91.30	31.59	3.80	1.48	142.93	3471.99
1.42	C 220/70/26	254.47	264.27	17.63	108.79	109.79	25.49	41.67	24.29	24.07	6.92	4.23	101.91	26.32	6.65	1.90	134.12	2391.29
1.42	C 220/70/39	273.64	280.37	20.32	109.07	109.51	28.19	38.97	25.71	25.60	7.21	5.22	101.22	27.25	6.41	1.54	146.57	2989.96

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	C 150/60/22	1	131.79	18.46	72.12	76.46	16.71	40.45	18.27	17.24	11.05	4.56	57.95	21.69	1.18	3.44	251.57	946.30
1.42		2	133.54	18.97	69.47	79.11	17.62	39.54	19.22	16.88	10.76	4.80	58.40	22.01	0.27	3.55	253.41	944.74
1.42	C 150/60/33	1	138.50	21.99	71.75	76.83	19.02	38.14	19.30	18.03	11.56	5.77	57.54	22.93	1.54	3.72	270.70	1345.40
1.42		2	139.90	22.53	69.23	79.35	19.99	37.17	20.21	17.63	11.27	6.06	57.96	23.26	0.58	3.88	272.18	1335.09
1.42	C 180/60/22	1	197.83	18.94	88.84	89.74	15.63	41.53	22.27	22.04	12.12	4.56	68.97	21.34	0.60	1.84	266.24	1322.93
1.42		2	199.09	19.51	81.24	97.34	16.55	40.61	24.51	20.45	11.79	4.80	69.40	21.73	0.32	6.66	266.96	1315.64
1.42	C 180/60/33	1	209.13	22.69	88.19	90.39	17.88	39.28	23.71	23.14	12.69	5.78	68.79	22.66	0.90	2.39	285.23	1821.14
1.42		2	209.76	23.30	81.02	97.56	18.88	38.28	25.89	21.50	12.34	6.09	69.17	23.06	0.11	6.98	285.45	1799.57
1.42	C 180/65/24	1	205.89	23.51	86.98	91.60	17.44	44.72	23.67	22.48	13.48	5.26	69.26	23.40	1.13	3.64	273.59	1678.64
1.42		2	205.89	24.24	79.72	98.86	18.69	43.47	25.83	20.83	12.97	5.58	69.72	23.92	0.12	8.24	271.72	1670.53
1.42	C 180/65/36	1	216.94	28.06	86.30	92.28	19.89	42.27	25.14	23.51	14.11	6.64	68.93	24.79	1.51	4.22	293.00	2324.49
1.42		2	216.02	28.73	79.37	99.21	21.21	40.95	27.22	21.77	13.54	7.02	69.35	25.29	0.19	8.68	290.37	2280.16
1.42	C 180/70/26	1	213.24	28.66	85.13	93.45	19.26	47.90	25.05	22.82	14.88	5.98	69.44	25.46	1.73	5.43	280.77	2086.23
1.42		2	211.59	29.43	78.05	100.53	20.83	46.33	27.11	21.05	14.13	6.35	69.94	26.09	0.15	9.97	275.92	2059.86
1.42	C 180/70/39	1	224.00	34.13	84.48	94.10	21.93	45.23	26.52	23.80	15.57	7.55	68.98	26.93	2.17	6.00	300.65	2913.19
1.42		2	221.51	34.82	77.73	100.85	23.60	43.56	28.50	21.96	14.76	7.99	69.44	27.53	0.50	10.37	295.14	2840.43
1.42	C 200/65/24	1	260.52	23.86	98.23	100.35	16.75	45.41	26.52	25.96	14.25	5.25	76.55	23.17	0.78	2.46	283.32	2042.10
1.42		2	259.08	24.65	87.21	111.37	18.01	44.15	29.71	23.26	13.69	5.58	76.93	23.73	0.48	10.68	280.62	2029.49
1.42	C 200/65/36	1	275.35	28.57	97.33	101.25	19.15	43.01	28.29	27.20	14.92	6.64	76.38	24.60	1.12	3.26	302.65	2779.23
1.42		2	272.56	29.30	86.83	111.75	20.49	41.67	31.39	24.39	14.30	7.03	76.71	25.15	0.22	11.15	299.02	2719.34
1.42	C 200/70/26	1	269.91	29.09	96.18	102.40	18.51	48.65	28.06	26.36	15.72	5.98	76.80	25.21	1.34	4.45	290.61	2530.56
1.42		2	266.03	29.94	85.42	113.16	20.08	47.08	31.14	23.51	14.91	6.36	77.19	25.90	0.23	12.53	284.75	2494.83
1.42	C 200/70/39	1	284.47	34.76	95.29	103.29	21.13	46.03	29.85	27.54	16.45	7.55	76.48	26.74	1.75	5.25	310.43	3469.07
1.42		2	279.29	35.51	85.05	113.53	22.82	44.34	32.84	24.60	15.56	8.01	76.82	27.39	0.06	12.99	303.69	3372.48
1.42	C 200/75/28	1	278.53	34.95	94.17	104.41	20.28	51.88	29.58	26.68	17.23	6.74	76.96	27.26	1.95	6.41	297.83	3084.20
1.42		2	272.16	35.82	83.62	114.96	22.20	49.96	32.55	23.67	16.13	7.17	77.35	28.06	0.04	14.38	288.78	3019.49
1.42	C 200/75/42	1	292.76	41.70	93.31	105.27	23.13	49.03	31.37	27.81	18.03	8.51	76.50	28.87	2.42	7.18	318.14	4263.23
1.42		2	285.19	42.42	83.29	115.29	25.19	46.97	34.24	24.74	16.84	9.03	76.84	29.63	0.36	14.79	308.32	4122.48
1.42	C 200/80/30	1	286.45	41.47	92.22	106.36	22.08	55.08	31.06	26.93	18.78	7.53	77.04	29.31	2.61	8.32	304.99	3705.53
1.42		2	277.56	42.29	81.82	116.76	24.36	52.80	33.92	23.77	17.36	8.01	77.43	30.23	0.33	16.23	292.79	3605.86
1.42	C 200/80/45	1	300.30	49.42	91.42	107.16	25.16	52.00	32.85	28.02	19.64	9.50	76.45	31.01	3.13	9.03	325.82	5169.13
1.42		2	290.36	50.02	81.57	117.01	27.61	49.55	35.60	24.82	18.12	10.10	76.79	31.87	0.67	16.56	312.96	4976.88
1.42	C 220/70/26	1	334.09	29.47	107.45	111.13	17.82	49.34	31.09	30.06	16.54	5.97	84.07	24.97	1.02	3.24	300.37	3021.66
1.42		2	327.13	30.41	92.62	125.96	19.39	47.77	35.32	25.97	15.68	6.37	84.29	25.70	0.56	15.27	293.54	2975.24
1.42	C 220/70/39	1	353.07	35.32	106.32	112.26	20.40	46.76	33.21	31.45	17.32	7.55	83.90	26.54	1.39	4.28	320.12	4081.75
1.42		2	344.23	36.15	92.21	126.37	22.10	45.06	37.33	27.24	16.36	8.02	84.07	27.25	0.31	15.77	312.23	3958.51

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.42	C 220/75/28	220	75	70	28	1.50	4.00	4.54	574.08	107.94	21.14	417.37	43.75	38.67	385.86	4579.99
1.42	C 220/75/42	220	75	70	42	1.50	4.00	4.85	613.84	108.03	24.37	439.81	53.05	40.71	412.58	6775.46
1.42	C 220/80/30	220	80	75	30	1.50	4.00	4.70	593.96	107.98	23.50	438.06	52.71	40.57	399.22	5645.49
1.42	C 220/80/45	220	80	75	45	1.50	4.00	5.03	636.56	108.07	27.02	460.54	63.72	42.61	427.86	8497.62
1.42	C 220/85/32	220	85	80	32	1.50	4.00	4.85	613.84	108.03	25.92	458.57	62.71	42.45	412.58	6880.09
1.42	C 220/85/48	220	85	80	48	1.50	4.00	5.21	659.28	108.11	29.73	480.94	75.61	44.48	443.13	10539.69
1.42	C 250/80/22.5	250	80	75	23	1.50	4.00	4.86	615.26	122.86	20.06	571.16	48.43	46.49	413.54	5975.00
1.42	C 250/80/37.5	250	80	75	38	1.50	4.00	5.20	657.86	122.95	23.68	609.69	60.96	49.59	442.17	8879.61
1.42	C 250/85/24	250	85	80	24	1.50	4.00	5.01	633.72	122.90	22.20	597.51	57.77	48.62	425.95	7203.44
1.42	C 250/85/40	250	85	80	40	1.50	4.00	5.36	679.16	122.99	26.14	636.92	72.49	51.79	456.49	10854.80
1.92	C 150/50/18	150	50	45	18	2.00	4.00	3.99	502.46	72.63	12.89	163.94	15.23	22.57	617.42	707.22
1.92	C 150/50/27	150	50	45	27	2.00	4.00	4.26	537.02	72.72	14.99	173.49	18.71	23.86	659.89	1046.37
1.92	C 150/55/20	150	55	50	20	2.00	4.00	4.20	529.34	72.70	15.22	176.87	20.35	24.33	650.45	977.71
1.92	C 150/55/30	150	55	50	30	2.00	4.00	4.50	567.74	72.79	17.61	186.51	24.85	25.62	697.64	1481.82
1.92	C 150/60/22	150	60	55	22	2.00	4.00	4.41	556.22	72.76	17.64	189.64	26.40	26.06	683.48	1315.72
1.92	C 150/60/33	150	60	55	33	2.00	4.00	4.74	598.46	72.85	20.32	199.22	32.07	27.35	735.39	2044.64
1.92	C 180/60/22	180	60	55	22	2.00	4.00	4.87	613.82	87.65	15.99	292.01	28.02	33.32	754.26	1907.07
1.92	C 180/60/33	180	60	55	33	2.00	4.00	5.20	656.06	87.74	18.54	308.56	34.24	35.17	806.17	2816.30

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	C 220/75/28	255.03	264.69	20.54	108.71	109.87	27.10	45.06	24.35	24.09	7.58	4.56	101.88	28.38	5.96	1.94	132.26	2811.69
1.42	C 220/75/42	274.07	280.68	23.68	108.98	109.60	30.01	42.15	25.76	25.61	7.89	5.62	101.20	29.39	5.63	1.58	143.87	3511.67
1.42	C 220/80/30	254.94	264.41	23.61	108.63	109.95	28.62	48.54	24.34	24.05	8.25	4.86	101.84	30.43	5.11	1.96	130.40	3258.19
1.42	C 220/80/45	273.90	280.35	27.24	108.91	109.67	31.74	45.42	25.74	25.56	8.58	6.00	101.17	31.54	4.72	1.60	141.20	4069.75
1.42	C 220/85/32	254.30	263.55	26.80	108.57	110.01	30.03	52.13	24.27	23.96	8.93	5.14	101.80	32.46	4.10	1.98	128.58	3727.24
1.42	C 220/85/48	273.24	279.50	30.99	108.85	109.73	33.39	48.77	25.68	25.47	9.28	6.35	101.14	33.68	3.66	1.62	138.62	4661.35
1.42	C 250/80/22.5	240.50	329.93	20.29	124.05	124.53	25.62	51.54	26.60	26.49	7.92	3.94	117.12	29.05	5.57	1.67	123.21	3362.72
1.42	C 250/80/37.5	264.10	357.30	25.41	123.75	124.83	30.00	47.16	28.87	28.62	8.47	5.39	116.31	31.02	6.31	1.88	134.44	4628.16
1.42	C 250/85/24	240.92	329.97	23.32	124.25	124.33	27.07	55.09	26.56	26.54	8.62	4.23	117.03	31.11	4.86	1.44	122.36	3915.25
1.42	C 250/85/40	263.30	355.99	28.85	123.68	124.90	31.49	50.67	28.78	28.50	9.16	5.69	116.28	33.10	5.35	1.91	132.29	5287.49
1.92	C 150/50/18	359.22	152.92	11.63	72.57	75.51	16.73	29.43	21.07	20.25	6.95	3.95	65.25	18.00	3.84	0.05	415.76	648.17
1.92	C 150/50/27	404.39	167.76	14.73	72.51	75.57	19.77	26.39	23.14	22.20	7.45	5.58	64.41	19.09	4.78	0.21	493.66	1009.21
1.92	C 150/55/20	381.88	163.87	15.29	72.69	75.39	19.27	31.89	22.54	21.74	7.93	4.79	65.51	20.01	4.05	0.00	435.47	886.58
1.92	C 150/55/30	432.85	179.81	19.34	72.75	75.33	22.72	28.44	24.72	23.87	8.51	6.80	64.45	21.14	5.11	0.04	523.34	1422.66
1.92	C 150/60/22	404.12	174.48	19.56	72.80	75.28	21.84	34.32	23.97	23.18	8.96	5.70	65.71	22.00	4.19	0.04	454.24	1180.75
1.92	C 150/60/33	459.09	190.75	24.58	72.96	75.12	25.61	30.55	26.14	25.39	9.60	8.04	64.46	23.14	5.29	0.11	546.63	1935.30
1.92	C 180/60/22	403.97	259.95	19.43	87.58	90.50	21.37	34.79	29.68	28.73	9.09	5.59	80.22	21.93	5.38	0.06	447.66	1645.44
1.92	C 180/60/33	459.06	286.48	24.60	87.74	90.34	25.19	30.97	32.65	31.71	9.76	7.94	79.00	23.15	6.66	0.01	537.33	2582.97

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	C 220/75/28	1	344.89	35.41	105.25	113.33	19.54	52.62	32.77	30.43	18.12	6.73	84.29	27.01	1.60	5.39	307.69	3673.63
1.42		2	334.41	36.38	90.69	127.89	21.46	50.70	36.87	26.15	16.96	7.18	84.48	27.87	0.32	17.25	297.51	3591.47
1.42	C 220/75/42	1	363.56	42.38	104.14	114.44	22.34	49.82	34.91	31.77	18.97	8.51	83.96	28.67	2.03	6.42	327.97	4999.12
1.42		2	351.29	43.18	90.31	128.27	24.42	47.74	38.90	27.39	17.69	9.05	84.11	29.49	0.04	17.72	316.77	4820.63
1.42	C 220/80/30	1	354.83	42.02	103.11	115.47	21.28	55.88	34.41	30.73	19.74	7.52	84.42	29.05	2.22	7.49	314.98	4402.60
1.42		2	340.80	42.96	88.76	129.82	23.56	53.60	38.40	26.25	18.24	8.02	84.58	30.03	0.06	19.22	301.45	4277.33
1.42	C 220/80/45	1	373.13	50.24	102.03	116.55	24.31	52.85	36.57	32.02	20.66	9.51	83.95	30.80	2.71	8.47	335.78	6040.63
1.42		2	357.46	50.94	88.44	130.14	26.78	50.38	40.42	27.47	19.02	10.11	84.07	31.74	0.24	19.63	321.33	5797.55
1.42	C 220/85/32	1	363.98	49.30	101.01	117.57	23.03	59.13	36.03	30.96	21.40	8.34	84.47	31.09	2.89	9.54	322.26	5210.27
1.42		2	346.40	50.16	86.85	131.73	25.70	56.46	39.89	26.30	19.52	8.88	84.60	32.19	0.22	21.18	305.42	5034.48
1.42	C 220/85/48	1	381.85	58.92	100.01	118.57	26.31	55.85	38.18	32.20	22.40	10.55	83.87	32.94	3.42	10.46	343.59	7213.35
1.42		2	362.82	59.43	86.62	131.96	29.19	52.97	41.89	27.50	20.36	11.22	83.95	33.98	0.53	21.49	325.94	6896.65
1.42	C 250/80/22.5	1	456.84	37.82	120.77	127.81	18.51	58.65	37.83	35.74	20.43	6.45	95.21	27.39	1.55	4.96	319.53	4669.24
1.42		2	431.68	38.81	98.84	149.74	20.54	56.62	43.67	28.83	18.89	6.85	94.83	28.43	0.48	24.01	303.96	4501.51
1.42	C 250/80/37.5	1	487.93	47.39	119.19	129.39	21.81	55.35	40.94	37.71	21.73	8.56	95.30	29.70	1.87	6.44	340.57	6544.32
1.42		2	462.11	48.31	98.83	149.75	24.15	53.01	46.76	30.86	20.01	9.11	95.01	30.72	0.47	24.12	324.68	6289.53
1.42	C 250/85/24	1	469.66	44.61	118.49	130.09	20.12	62.04	39.64	36.10	22.17	7.19	95.41	29.40	2.09	7.19	326.69	5542.23
1.42		2	439.23	45.54	96.87	151.71	22.50	59.66	45.34	28.95	20.24	7.63	94.95	30.57	0.30	26.03	307.82	5319.96
1.42	C 250/85/40	1	500.28	55.58	116.84	131.74	23.61	58.55	42.82	37.98	23.54	9.49	95.36	31.78	2.53	8.75	348.27	7749.94
1.42		2	469.01	56.39	96.76	151.82	26.36	55.80	48.47	30.89	21.39	10.11	94.97	32.93	0.22	26.23	328.84	7411.16
1.92	C 150/50/18	1	161.22	14.81	72.97	75.11	12.72	33.44	22.09	21.46	11.65	4.43	57.07	17.30	0.17	0.34	598.35	692.38
1.92		2	163.28	15.15	72.44	75.64	12.83	33.33	22.54	21.59	11.82	4.55	57.08	17.39	0.06	0.18	612.83	702.77
1.92	C 150/50/27	1	172.51	18.60	72.30	75.78	15.13	31.03	23.86	22.77	12.29	5.99	56.94	18.70	0.14	0.41	653.77	1040.01
1.92		2	173.49	18.71	72.72	75.36	14.99	31.17	23.86	23.02	12.48	6.00	56.84	18.67	0.00	0.00	659.89	1046.37
1.92	C 150/55/20	1	173.53	19.70	73.34	74.74	14.93	36.23	23.66	23.22	13.20	5.44	57.70	19.45	0.29	0.64	626.83	953.86
1.92		2	175.43	20.14	72.31	75.77	15.08	36.08	24.26	23.15	13.35	5.58	57.72	19.56	0.14	0.38	640.36	965.48
1.92	C 150/55/30	1	185.59	24.70	72.42	75.66	17.76	33.40	25.63	24.53	13.91	7.40	57.41	20.95	0.15	0.37	691.85	1473.88
1.92		2	186.51	24.85	72.79	75.29	17.61	33.55	25.62	24.77	14.11	7.41	57.32	20.92	0.00	0.00	697.64	1481.82
1.92	C 150/60/22	1	185.57	25.47	73.70	74.38	17.20	38.96	25.18	24.95	14.80	6.54	58.24	21.58	0.44	0.94	654.78	1278.91
1.92		2	187.31	26.00	72.17	75.91	17.41	38.75	25.95	24.68	14.93	6.71	58.27	21.71	0.23	0.59	667.32	1291.50
1.92	C 150/60/33	1	197.77	31.62	72.80	75.28	20.30	35.86	27.16	26.27	15.57	8.82	57.78	23.10	0.02	0.05	724.76	2005.97
1.92		2	199.18	32.05	72.84	75.24	20.31	35.85	27.35	26.47	15.78	8.94	57.70	23.15	0.01	0.02	735.12	2039.98
1.92	C 180/60/22	1	284.96	26.81	89.01	89.07	15.44	40.72	32.01	31.99	17.36	6.58	68.70	21.07	0.55	1.36	721.29	1844.44
1.92		2	287.34	27.43	86.76	91.32	15.69	40.47	33.12	31.47	17.49	6.78	68.77	21.25	0.30	0.88	732.77	1859.06
1.92	C 180/60/33	1	305.34	33.63	87.94	90.14	18.41	37.75	34.72	33.88	18.26	8.91	68.60	22.77	0.12	0.21	789.73	2762.78
1.92		2	308.48	34.22	87.72	90.36	18.53	37.63	35.17	34.14	18.47	9.09	68.58	22.84	0.01	0.02	805.90	2810.62

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	C 180/65/24	180	65	60	24	2.00	4.00	5.08	640.70	87.71	18.33	310.68	35.55	35.42	787.29	2488.25
1.92	C 180/65/36	180	65	60	36	2.00	4.00	5.44	686.78	87.80	21.16	327.34	43.26	37.28	843.92	3750.77
1.92	C 180/70/26	180	70	65	26	2.00	4.00	5.29	667.58	87.76	20.74	329.16	44.21	37.51	820.32	3187.39
1.92	C 180/70/39	180	70	65	39	2.00	4.00	5.68	717.50	87.85	23.86	345.74	53.58	39.36	881.66	4907.08
1.92	C 200/65/24	200	65	60	24	2.00	4.00	5.38	679.10	97.64	17.29	398.83	36.77	40.85	834.48	3091.31
1.92	C 200/65/36	200	65	60	36	2.00	4.00	5.74	725.18	97.73	20.04	421.47	44.89	43.13	891.10	4533.91
1.92	C 200/70/26	200	70	65	26	2.00	4.00	5.59	705.98	97.69	19.61	421.99	45.77	43.20	867.51	3942.62
1.92	C 200/70/39	200	70	65	39	2.00	4.00	5.98	755.90	97.78	22.64	444.81	55.66	45.49	928.85	5890.28
1.92	C 200/75/28	200	75	70	28	2.00	4.00	5.80	732.86	97.74	21.99	444.92	56.01	45.52	900.54	4950.52
1.92	C 200/75/42	200	75	70	42	2.00	4.00	6.22	786.62	97.83	25.31	467.73	67.87	47.81	966.60	7537.68
1.92	C 200/80/30	200	80	75	30	2.00	4.00	6.01	759.74	97.79	24.44	467.63	67.53	47.82	933.57	6133.81
1.92	C 200/80/45	200	80	75	45	2.00	4.00	6.46	817.34	97.88	28.04	490.24	81.57	50.09	1004.35	9521.23
1.92	C 220/70/26	220	70	65	26	2.00	4.00	5.89	744.38	107.63	18.60	528.94	47.17	49.14	914.69	4800.62
1.92	C 220/70/39	220	70	65	39	2.00	4.00	6.28	794.30	107.72	21.55	559.00	57.53	51.89	976.04	7001.51
1.92	C 220/75/28	220	75	70	28	2.00	4.00	6.10	771.26	107.68	20.90	557.06	57.77	51.73	947.72	6006.61
1.92	C 220/75/42	220	75	70	42	2.00	4.00	6.52	825.02	107.77	24.14	587.40	70.21	54.50	1013.78	8908.68
1.92	C 220/80/30	220	80	75	30	2.00	4.00	6.31	798.14	107.73	23.26	584.94	69.71	54.30	980.75	7415.47
1.92	C 220/80/45	220	80	75	45	2.00	4.00	6.76	855.74	107.82	26.78	615.33	84.46	57.07	1051.53	11189.22

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	C 180/65/24	425.14	274.75	24.30	87.74	90.34	23.91	37.25	31.31	30.41	10.17	6.52	80.39	23.91	5.58	0.03	464.50	2125.93
1.92	C 180/65/36	476.59	298.87	29.88	87.94	90.14	27.58	33.58	33.99	33.15	10.83	8.90	79.19	25.04	6.42	0.14	545.39	3210.64
1.92	C 180/70/26	443.26	287.05	29.82	88.32	89.76	26.42	39.74	32.50	31.98	11.29	7.50	80.47	25.94	5.68	0.56	477.34	2696.97
1.92	C 180/70/39	489.12	307.81	35.63	88.60	89.48	29.86	36.30	34.74	34.40	11.93	9.82	79.33	26.99	6.00	0.75	547.62	3893.79
1.92	C 200/65/24	424.33	344.78	24.17	97.61	100.47	23.62	37.54	35.32	34.32	10.23	6.44	90.14	23.87	6.33	0.03	459.78	2571.61
1.92	C 200/65/36	476.12	376.64	29.86	97.84	100.24	27.34	33.82	38.50	37.57	10.92	8.83	88.94	25.04	7.30	0.11	539.33	3818.96
1.92	C 200/70/26	442.16	360.00	29.66	98.26	99.82	26.10	40.06	36.64	36.06	11.36	7.40	90.23	25.90	6.49	0.56	472.18	3248.84
1.92	C 200/70/39	488.63	387.78	35.59	98.53	99.55	29.60	36.56	39.36	38.96	12.02	9.74	89.08	26.99	6.96	0.75	541.49	4622.80
1.92	C 200/75/28	455.46	370.66	35.78	98.70	99.38	28.53	42.63	37.56	37.30	12.54	8.39	90.21	28.03	6.54	0.95	479.14	4038.15
1.92	C 200/75/42	495.70	393.74	41.85	98.88	99.20	31.79	39.37	39.82	39.69	13.16	10.63	89.12	29.06	6.48	1.05	537.95	5506.89
1.92	C 200/80/30	464.01	376.76	42.36	99.03	99.05	30.83	45.33	38.04	38.04	13.74	9.35	90.11	30.22	6.39	1.24	479.50	4924.08
1.92	C 200/80/45	500.15	397.30	48.62	98.98	99.10	33.93	42.23	40.14	40.09	14.33	11.51	89.13	31.18	5.89	1.10	532.12	6469.89
1.92	C 220/70/26	440.90	441.14	29.47	108.20	109.88	25.81	40.35	40.77	40.15	11.42	7.30	100.03	25.85	7.22	0.57	467.29	3851.93
1.92	C 220/70/39	487.92	477.04	35.53	108.47	109.61	29.37	36.79	43.98	43.52	12.10	9.66	98.88	26.99	7.82	0.75	535.64	5419.79
1.92	C 220/75/28	454.19	454.33	35.55	108.62	109.46	28.22	42.94	41.83	41.51	12.60	8.28	100.02	27.98	7.32	0.94	474.10	4771.44
1.92	C 220/75/42	495.02	484.39	41.76	108.89	109.19	31.55	39.61	44.49	44.36	13.24	10.54	98.92	29.05	7.41	1.11	532.16	6447.33
1.92	C 220/80/30	462.77	462.05	42.07	109.03	109.05	30.49	45.67	42.38	42.37	13.80	9.21	99.92	30.15	7.23	1.32	474.54	5798.04
1.92	C 220/80/45	499.36	488.65	48.49	108.99	109.09	33.66	42.50	44.84	44.79	14.41	11.41	98.92	31.16	6.88	1.17	526.35	7565.21

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
1.92	C 180/65/24	1	302.20	33.90	88.62	89.46	17.60	43.56	34.10	33.78	19.26	7.78	69.29	23.21	0.73	1.75	748.47	2397.43
1.92		2	304.45	34.64	86.57	91.51	17.91	43.25	35.17	33.27	19.34	8.01	69.39	23.41	0.42	1.14	758.83	2411.44
1.92	C 180/65/36	1	321.73	41.67	88.85	89.23	20.59	40.57	36.21	36.06	20.23	10.27	69.02	24.84	0.57	1.06	815.99	3556.55
1.92		2	324.54	42.50	87.20	90.88	20.85	40.31	37.22	35.71	20.38	10.54	69.05	24.99	0.31	0.59	830.79	3599.37
1.92	C 180/70/26	1	317.25	42.04	87.69	90.39	19.71	46.45	36.18	35.10	21.33	9.05	69.68	25.36	1.03	2.63	773.78	3063.77
1.92		2	321.05	42.89	86.34	91.74	20.19	45.97	37.19	34.99	21.24	9.33	69.93	25.56	0.55	1.42	784.20	3071.34
1.92	C 180/70/39	1	334.88	50.80	87.71	90.37	22.68	43.48	38.18	37.06	22.40	11.68	69.19	26.95	1.18	2.52	839.38	4498.99
1.92		2	339.63	51.80	86.62	91.46	23.19	42.97	39.21	37.13	22.33	12.05	69.44	27.12	0.67	1.23	853.11	4522.93
1.92	C 200/65/24	1	384.65	34.64	99.02	99.06	16.70	44.46	38.85	38.83	20.74	7.79	76.38	22.92	0.59	1.38	783.32	2945.54
1.92		2	385.47	35.31	95.14	102.94	17.15	44.01	40.51	37.45	20.59	8.02	76.60	23.18	0.14	2.50	787.25	2946.73
1.92	C 200/65/36	1	411.07	42.83	98.49	99.59	19.61	41.55	41.74	41.28	21.84	10.31	76.28	24.62	0.43	0.76	851.34	4279.96
1.92		2	412.89	43.54	96.01	102.07	20.01	41.15	43.00	40.45	21.76	10.58	76.43	24.82	0.03	1.72	860.35	4309.33
1.92	C 200/70/26	1	403.19	42.92	98.18	99.90	18.78	47.38	41.06	40.36	22.86	9.06	76.89	25.09	0.83	2.20	806.84	3742.72
1.92		2	405.97	43.72	94.87	103.21	19.37	46.79	42.79	39.34	22.57	9.34	77.23	25.34	0.23	2.82	811.75	3736.32
1.92	C 200/70/39	1	427.06	52.11	98.14	99.94	21.70	44.46	43.52	42.73	24.02	11.72	76.57	26.75	0.95	2.16	872.10	5379.21
1.92		2	431.27	53.03	95.28	102.80	22.32	43.84	45.27	41.95	23.75	12.10	76.91	26.97	0.32	2.51	880.91	5385.19
1.92	C 200/75/28	1	419.17	52.28	96.98	101.10	20.84	50.32	43.22	41.46	25.09	10.39	77.23	27.27	1.15	3.36	828.47	4682.39
1.92		2	422.71	53.15	94.10	103.98	21.63	49.53	44.92	40.65	24.57	10.73	77.69	27.55	0.36	3.64	831.53	4662.22
1.92	C 200/75/42	1	441.25	62.49	96.58	101.50	23.79	47.37	45.69	43.47	26.27	13.19	76.75	28.89	1.53	3.67	891.58	6654.69
1.92		2	444.54	63.51	93.94	104.14	24.66	46.50	47.32	42.69	25.75	13.66	77.19	29.17	0.65	3.89	895.38	6624.58
1.92	C 200/80/30	1	433.21	62.46	95.56	102.52	22.83	53.33	45.33	42.26	27.36	11.71	77.46	29.41	1.60	4.73	847.01	5740.81
1.92		2	435.88	63.50	92.91	105.17	23.89	52.27	46.92	41.44	26.58	12.15	77.99	29.77	0.54	4.88	846.10	5721.63
1.92	C 200/80/45	1	454.32	74.02	95.05	103.03	25.89	50.27	47.80	44.09	28.59	14.73	76.86	31.03	2.15	5.16	910.52	8121.50
1.92		2	455.98	75.06	92.51	105.57	27.04	49.12	49.29	43.19	27.76	15.28	77.37	31.39	1.00	5.37	908.33	8044.08
1.92	C 220/70/26	1	498.19	43.47	108.65	109.43	18.12	48.04	45.85	45.53	23.99	9.05	84.18	24.87	0.48	1.02	830.82	4473.17
1.92		2	500.41	44.33	102.89	115.19	18.73	47.43	48.63	43.44	23.67	9.35	84.51	25.16	0.14	4.74	834.38	4461.51
1.92	C 220/70/39	1	529.33	52.97	108.80	109.28	21.01	45.15	48.65	48.44	25.21	11.73	84.04	26.58	0.54	1.08	895.74	6322.96
1.92		2	533.32	53.94	103.41	114.67	21.65	44.51	51.57	46.51	24.91	12.12	84.37	26.83	0.10	4.31	903.12	6319.84
1.92	C 220/75/28	1	518.04	52.96	108.10	109.98	20.13	51.03	47.92	47.10	26.31	10.38	84.59	27.05	0.77	2.30	852.57	5578.59
1.92		2	520.99	53.92	102.13	115.95	20.94	50.22	51.01	44.93	25.75	10.74	85.04	27.36	0.04	5.56	854.05	5549.46
1.92	C 220/75/42	1	547.06	63.53	107.55	110.53	23.04	48.12	50.86	49.50	27.57	13.20	84.27	28.72	1.09	2.75	915.44	7797.15
1.92		2	549.64	64.62	102.01	116.07	23.94	47.22	53.88	47.35	26.99	13.68	84.70	29.04	0.19	5.76	917.53	7747.67
1.92	C 220/80/30	1	535.57	63.35	106.56	111.52	22.08	54.08	50.26	48.03	28.69	11.71	84.88	29.19	1.18	3.79	871.35	6829.74
1.92		2	537.02	64.43	100.87	117.21	23.14	53.02	53.24	45.82	27.84	12.15	85.40	29.58	0.12	6.86	868.46	6788.83
1.92	C 220/80/45	1	563.44	75.27	105.85	112.23	25.10	51.06	53.23	50.20	29.99	14.74	84.43	30.86	1.69	4.42	934.62	9485.55
1.92		2	563.52	76.38	100.46	117.62	26.27	49.89	56.09	47.91	29.08	15.31	84.92	31.26	0.51	7.35	930.24	9375.28

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	C 220/85/32	220	85	80	32	2.00	4.00	6.52	825.02	107.77	25.68	612.56	83.05	56.84	1013.78	9049.44
1.92	C 220/85/48	220	85	80	48	2.00	4.00	7.01	886.46	107.86	29.48	642.81	100.33	59.60	1089.28	13895.94
1.92	C 250/80/22.5	250	80	75	23	2.00	4.00	6.54	826.94	122.60	19.82	762.96	63.95	62.23	1016.14	7842.53
1.92	C 250/80/37.5	250	80	75	38	2.00	4.00	6.99	884.54	122.69	23.45	815.07	80.73	66.43	1086.92	11689.86
1.92	C 250/85/24	250	85	80	24	2.00	4.00	6.73	851.90	122.64	21.96	798.47	76.39	65.11	1046.81	9468.57
1.92	C 250/85/40	250	85	80	40	2.00	4.00	7.22	913.34	122.74	25.90	851.76	96.12	69.40	1122.31	14308.49
1.92	C 250/90/25.5	250	90	85	26	2.00	4.00	6.93	876.86	122.68	24.16	833.81	90.22	67.96	1077.49	11312.92
1.92	C 250/90/42.5	250	90	85	43	2.00	4.00	7.44	942.14	122.78	28.41	888.03	113.18	72.33	1157.70	17339.67
1.92	C 250/95/27	250	95	90	27	2.00	4.00	7.13	901.82	122.72	26.40	868.97	105.49	70.81	1108.16	13393.00
1.92	C 250/95/45	250	95	90	45	2.00	4.00	7.67	970.94	122.81	30.97	923.92	131.97	75.23	1193.09	20828.78
1.92	C 250/100/28.5	250	100	95	29	2.00	4.00	7.32	926.78	122.76	28.69	903.96	122.24	73.64	1138.83	15727.15
1.92	C 250/100/47.5	250	100	95	48	2.00	4.00	7.89	999.74	122.85	33.58	959.42	152.54	78.10	1228.48	24824.90
1.92	C 300/95/27	300	95	90	27	2.00	4.00	7.88	997.82	147.61	23.86	1332.42	111.54	90.27	1226.12	19828.15
1.92	C 300/95/45	300	95	90	45	2.00	4.00	8.42	1066.94	147.70	28.19	1422.45	140.35	96.31	1311.06	29429.83
1.92	C 300/100/28.5	300	100	95	29	2.00	4.00	8.08	1022.78	147.64	26.00	1383.68	129.40	93.72	1256.79	23201.73
1.92	C 300/100/47.5	300	100	95	48	2.00	4.00	8.65	1095.74	147.73	30.63	1475.44	162.42	99.87	1346.45	34837.65
1.92	C 300/105/30	300	105	100	30	2.00	4.00	8.27	1047.74	147.67	28.18	1434.74	148.92	97.16	1287.46	26950.57
1.92	C 300/105/50	300	105	100	50	2.00	4.00	8.87	1124.54	147.77	33.13	1527.93	186.48	103.40	1381.83	40949.91

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	C 220/85/32	467.97	466.38	48.87	108.85	109.23	32.57	48.59	42.84	42.70	15.01	10.06	99.83	32.32	6.89	1.45	471.48	6876.34
1.92	C 220/85/48	502.54	491.69	55.72	109.02	109.06	35.72	45.44	45.10	45.08	15.60	12.26	98.92	33.30	6.24	1.21	519.83	8773.23
1.92	C 250/80/22.5	422.82	561.60	34.19	123.59	124.49	26.27	49.89	45.44	45.11	13.01	6.85	115.25	28.44	6.46	0.99	420.11	5428.93
1.92	C 250/80/37.5	483.18	628.99	45.76	124.03	124.05	32.06	44.10	50.71	50.70	14.27	10.38	114.09	30.78	8.61	1.33	497.27	8511.06
1.92	C 250/85/24	430.90	572.46	40.22	123.94	124.14	28.31	52.85	46.19	46.11	14.21	7.61	115.26	30.55	6.35	1.30	423.34	6484.34
1.92	C 250/85/40	486.35	632.99	52.59	123.96	124.12	34.02	47.14	51.06	51.00	15.46	11.16	114.08	32.88	8.12	1.39	491.78	9868.07
1.92	C 250/90/25.5	437.49	580.95	46.87	124.02	124.06	30.35	55.81	46.84	46.83	15.44	8.40	115.23	32.73	6.19	1.34	425.80	7672.71
1.92	C 250/90/42.5	488.53	635.62	59.85	123.88	124.20	35.92	50.24	51.31	51.18	16.66	11.91	114.06	35.00	7.51	1.42	485.85	11322
1.92	C 250/95/27	443.46	588.42	54.14	123.99	124.09	32.39	58.77	47.46	47.42	16.71	9.21	115.19	34.94	5.99	1.37	427.76	8996.70
1.92	C 250/95/45	489.88	637.12	67.53	123.82	124.26	37.76	53.40	51.46	51.27	17.88	12.65	114.04	37.13	6.79	1.45	479.68	12868
1.92	C 250/100/28.5	446.99	592.35	61.56	123.98	124.10	34.24	61.92	47.78	47.73	17.98	9.94	115.12	37.11	5.55	1.35	426.78	10382
1.92	C 250/100/47.5	490.52	637.66	75.61	123.76	124.32	39.54	56.62	51.52	51.29	19.12	13.36	114.02	39.26	5.97	1.47	473.43	14505
1.92	C 300/95/27	438.51	857.81	52.42	148.94	149.14	31.38	59.78	57.59	57.52	16.71	8.77	139.86	34.58	7.51	1.53	419.50	12346
1.92	C 300/95/45	486.17	935.37	66.56	148.72	149.36	37.02	54.14	62.89	62.63	17.98	12.30	138.71	37.00	8.84	1.66	468.92	17592
1.92	C 300/100/28.5	442.25	864.33	59.66	148.94	149.14	33.19	62.97	58.03	57.95	17.98	9.47	139.80	36.73	7.19	1.50	419.30	14217
1.92	C 300/100/47.5	486.55	935.69	74.43	148.66	149.42	38.73	57.43	62.94	62.62	19.22	12.96	138.68	39.11	8.10	1.69	462.98	19786
1.92	C 300/105/30	443.11	864.86	66.71	148.85	149.23	34.71	66.45	58.10	57.96	19.22	10.04	139.71	38.80	6.52	1.55	416.30	16083
1.92	C 300/105/50	486.32	934.81	82.63	148.60	149.48	40.37	60.79	62.91	62.54	20.47	13.59	138.64	41.22	7.24	1.71	457.09	22087

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	C 220/85/32	1	551.28	74.39	104.88	113.20	23.94	57.22	52.57	48.70	31.08	13.00	85.10	31.26	1.74	5.43	888.99	8156.24
1.92		2	550.40	75.60	99.36	118.72	25.30	55.86	55.39	46.36	29.89	13.53	85.68	31.75	0.38	8.41	879.83	8096.73
1.92	C 220/85/48	1	578.60	88.23	104.17	113.91	27.17	53.99	55.54	50.79	32.48	16.34	84.51	33.00	2.32	6.05	953.43	11405
1.92		2	576.10	89.28	98.92	119.16	28.63	52.53	58.24	48.35	31.18	17.00	85.06	33.49	0.85	8.94	942.48	11220
1.92	C 250/80/22.5	1	677.94	54.82	122.61	125.47	18.68	57.48	55.29	54.03	29.35	9.54	95.48	27.15	1.14	2.87	866.70	6820.57
1.92		2	672.35	56.25	111.04	137.04	19.83	56.33	60.55	49.06	28.37	9.99	95.93	27.75	0.01	11.56	854.27	6714.30
1.92	C 250/80/37.5	1	734.65	71.29	123.04	125.04	22.68	53.48	59.71	58.75	31.44	13.33	95.85	29.86	0.77	2.35	940.61	10228
1.92		2	732.25	72.48	112.47	135.61	23.80	52.36	65.11	54.00	30.46	13.84	96.28	30.29	0.35	10.23	934.65	10128
1.92	C 250/85/24	1	701.12	65.26	121.09	126.99	20.48	60.68	57.90	55.21	31.86	10.75	95.91	29.26	1.48	4.35	886.60	8210.74
1.92		2	692.11	66.67	109.78	138.30	21.84	59.32	63.05	50.04	30.52	11.24	96.39	29.91	0.12	12.86	868.68	8056.02
1.92	C 250/85/40	1	755.59	83.63	121.11	126.97	24.58	56.58	62.39	59.51	34.03	14.78	96.08	31.96	1.33	4.24	959.09	12212
1.92		2	748.79	84.81	110.75	137.33	25.98	55.18	67.61	54.53	32.64	15.37	96.54	32.49	0.08	11.98	945.86	12027
1.92	C 250/90/25.5	1	723.29	76.85	119.59	128.49	22.32	63.84	60.48	56.29	34.43	12.04	96.27	31.38	1.84	5.81	906.19	9781.48
1.92		2	710.76	78.15	108.49	139.59	23.90	62.26	65.51	50.92	32.70	12.55	96.77	32.09	0.26	14.19	882.70	9567.95
1.92	C 250/90/42.5	1	775.13	97.16	119.20	128.88	26.49	59.67	65.03	60.15	36.67	16.28	96.23	34.07	1.92	6.10	977.32	14427
1.92		2	763.84	98.24	109.03	139.05	28.20	57.96	70.06	54.93	34.84	16.95	96.73	34.69	0.22	13.75	956.76	14140
1.92	C 250/95/27	1	744.52	89.63	118.10	129.98	24.18	66.98	63.04	57.28	37.06	13.38	96.57	33.51	2.22	7.26	925.49	11545
1.92		2	728.42	90.74	107.20	140.88	26.00	65.16	67.95	51.70	34.90	13.93	97.10	34.27	0.40	15.52	896.42	11262
1.92	C 250/95/45	1	793.37	111.94	117.34	130.74	28.42	62.74	67.62	60.68	39.38	17.84	96.32	36.18	2.55	7.93	995.38	16887
1.92		2	777.54	112.80	107.31	140.77	30.45	60.71	72.45	55.24	37.04	18.58	96.85	36.89	0.52	15.50	967.50	16479
1.92	C 250/100/28.5	1	763.26	103.26	116.44	131.64	25.99	70.17	65.55	57.98	39.73	14.72	96.76	35.59	2.70	8.88	943.15	13457
1.92		2	742.33	104.02	105.62	142.46	28.07	68.09	70.28	52.11	37.06	15.28	97.30	36.42	0.63	17.13	906.94	13065
1.92	C 250/100/47.5	1	810.41	127.98	115.51	132.57	30.37	65.79	70.16	61.13	42.14	19.45	96.36	38.29	3.21	9.72	1013.35	19603
1.92		2	790.02	128.51	105.61	142.47	32.73	63.43	74.80	55.45	39.26	20.26	96.92	39.09	0.84	17.24	978.17	19056
1.92	C 300/95/27	1	1116.26	91.37	146.09	151.99	22.43	68.73	76.41	73.44	40.74	13.29	114.64	32.80	1.44	4.38	986.25	16331
1.92		2	1077.48	92.91	125.04	173.04	24.25	66.91	86.17	62.27	38.32	13.89	114.71	33.69	0.38	22.57	951.00	15903
1.92	C 300/95/45	1	1195.95	115.18	144.87	153.21	26.57	64.59	82.56	78.06	43.36	17.83	114.83	35.64	1.62	5.51	1055.59	23291
1.92		2	1156.86	116.41	125.33	172.75	28.61	62.55	92.31	66.97	40.69	18.61	114.96	36.47	0.42	22.37	1020.83	22652
1.92	C 300/100/28.5	1	1145.13	105.36	144.16	153.92	24.14	72.02	79.44	74.40	43.64	14.63	114.95	34.87	1.86	6.28	1004.54	18981
1.92		2	1097.34	106.58	123.31	174.77	26.21	69.95	88.99	62.79	40.66	15.24	114.98	35.83	0.21	24.33	961.54	18392
1.92	C 300/100/47.5	1	1222.42	131.72	142.67	155.41	28.41	67.75	85.68	78.66	46.37	19.44	114.96	37.74	2.23	7.68	1074.13	26922
1.92		2	1174.34	132.66	123.38	174.70	30.79	65.37	95.18	67.22	43.08	20.29	115.06	38.67	0.16	24.36	1031.13	26072
1.92	C 300/105/30	1	1171.04	120.27	142.11	155.97	25.81	75.35	82.41	75.08	46.59	15.96	115.17	36.91	2.37	8.30	1021.91	21824
1.92		2	1114.65	121.21	121.48	176.60	28.19	72.97	91.75	63.12	42.99	16.61	115.16	37.97	0.01	26.19	971.34	21074
1.92	C 300/105/50	1	1247.24	149.60	140.52	157.56	30.26	70.90	88.76	79.16	49.44	21.10	115.03	39.84	2.87	9.79	1092.64	30886
1.92		2	1190.19	150.12	121.44	176.64	33.01	68.15	98.01	67.38	45.47	22.03	115.09	40.87	0.12	26.33	1041.46	29797

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	C 300/115/33	300	115	110	33	2.00	4.00	8.66	1097.66	147.74	32.67	1536.22	193.14	103.98	1348.80	35674.67
1.92	C 300/115/55	300	115	110	55	2.00	4.00	9.33	1182.14	147.83	38.24	1631.50	240.81	110.36	1452.61	55549.31
1.92	C 330/105/30	330	105	100	30	2.00	4.00	8.72	1105.34	162.62	26.72	1794.40	153.26	110.35	1358.24	33110.71
1.92	C 330/105/50	330	105	100	50	2.00	4.00	9.33	1182.14	162.71	31.51	1914.67	192.49	117.68	1452.61	49154.14
1.92	C 330/115/33	330	115	110	33	2.00	4.00	9.12	1155.26	162.68	31.04	1918.27	198.99	117.92	1419.58	43690.12
1.92	C 330/115/55	330	115	110	55	2.00	4.00	9.78	1239.74	162.77	36.46	2042.31	248.84	125.47	1523.39	66268.24
1.92	C 350/105/30	350	105	100	30	2.00	4.00	9.03	1143.74	172.58	25.82	2061.65	155.91	119.46	1405.43	37645.13
1.92	C 350/105/50	350	105	100	50	2.00	4.00	9.63	1220.54	172.67	30.52	2201.89	196.18	127.52	1499.80	55169.07
1.92	C 350/115/33	350	115	110	33	2.00	4.00	9.42	1193.66	172.64	30.04	2201.69	202.57	127.53	1466.77	49587.89
1.92	C 350/115/55	350	115	110	55	2.00	4.00	10.08	1278.14	172.73	35.37	2347.03	253.79	135.88	1570.58	74119.66
2.42	C 150/50/18	150	50	45	18	2.50	4.00	4.98	627.05	72.37	12.65	202.52	18.49	27.99	1224.09	849.59
2.42	C 150/50/27	150	50	45	27	2.50	4.00	5.33	670.61	72.46	14.75	214.56	22.80	29.61	1309.12	1262.46
2.42	C 150/55/20	150	55	50	20	2.50	4.00	5.25	660.93	72.44	14.98	218.74	24.80	30.20	1290.23	1179.03
2.42	C 150/55/30	150	55	50	30	2.50	4.00	5.63	709.33	72.53	17.37	230.89	30.38	31.83	1384.71	1794.09
2.42	C 150/60/22	150	60	55	22	2.50	4.00	5.52	694.81	72.50	17.39	234.74	32.26	32.38	1356.36	1591.61
2.42	C 150/60/33	150	60	55	33	2.50	4.00	5.93	748.05	72.60	20.08	246.82	39.32	34.00	1460.30	2482.70
2.42	C 180/60/22	180	60	55	22	2.50	4.00	6.09	767.41	87.39	15.75	362.06	34.25	41.43	1498.09	2311.58
2.42	C 180/60/33	180	60	55	33	2.50	4.00	6.50	820.65	87.48	18.30	382.92	41.99	43.77	1602.02	3425.31

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	C 300/115/33	442.82	861.69	81.49	148.71	149.37	37.48	73.68	57.94	57.69	21.74	11.06	139.50	42.90	4.81	1.63	410.19	20098
1.92	C 300/115/55	484.34	930.06	99.93	148.51	149.57	43.45	67.71	62.63	62.18	23.00	14.76	138.57	45.42	5.21	1.74	445.78	26976
1.92	C 330/105/30	440.00	1051.05	65.36	163.82	164.26	34.07	67.09	64.16	63.99	19.19	9.74	154.56	38.54	7.35	1.65	412.54	18897
1.92	C 330/105/50	483.68	1139.33	81.76	163.53	164.55	39.89	61.27	69.67	69.24	20.50	13.34	153.48	41.11	8.37	1.85	451.68	25997
1.92	C 330/115/33	440.74	1050.16	80.19	163.88	164.20	36.91	74.25	64.08	63.95	21.73	10.80	154.36	42.65	5.87	1.20	408.07	23646
1.92	C 330/115/55	481.36	1132.78	98.69	163.42	164.66	42.86	68.30	69.32	68.80	23.03	14.45	153.40	45.28	6.40	1.89	440.80	31671
1.92	C 350/105/30	437.94	1184.59	64.48	173.79	174.29	33.66	67.50	68.16	67.97	19.16	9.55	164.47	38.37	7.84	1.71	410.23	20867
1.92	C 350/105/50	481.90	1286.34	81.18	173.47	174.61	39.58	61.58	74.15	73.67	20.51	13.18	163.38	41.04	9.06	1.94	448.31	28761
1.92	C 350/115/33	439.36	1185.76	79.34	173.50	174.58	36.55	74.61	68.35	67.92	21.71	10.63	164.28	42.50	6.51	0.85	406.76	26142
1.92	C 350/115/55	479.37	1278.39	97.86	173.36	174.72	42.49	68.67	73.74	73.17	23.03	14.25	163.30	45.18	7.12	1.99	437.71	34980
2.42	C 150/50/18	498.11	197.90	15.75	72.36	75.22	15.62	29.54	27.35	26.31	10.08	5.33	63.03	17.78	2.98	0.01	958.37	826.77
2.42	C 150/50/27	545.42	211.74	19.45	72.15	75.43	18.14	27.02	29.35	28.07	10.72	7.20	62.31	18.88	3.39	0.31	1064.74	1245.02
2.42	C 150/55/20	528.44	212.42	20.82	72.47	75.11	18.14	32.02	29.31	28.28	11.48	6.50	63.40	19.85	3.16	0.03	1004.82	1136.65
2.42	C 150/55/30	584.14	228.07	25.79	72.26	75.32	21.10	29.06	31.56	30.28	12.23	8.88	62.48	21.01	3.72	0.27	1140.33	1771.00
2.42	C 150/60/22	558.30	226.53	26.76	72.56	75.02	20.69	34.47	31.22	30.20	12.93	7.76	63.70	21.89	3.29	0.06	1049.22	1520.59
2.42	C 150/60/33	622.86	244.00	33.26	72.36	75.22	24.11	31.05	33.72	32.44	13.79	10.71	62.59	23.11	4.04	0.24	1215.91	2453.08
2.42	C 180/60/22	561.70	341.09	26.74	87.35	90.23	20.19	34.97	39.05	37.80	13.24	7.64	77.93	21.82	4.44	0.04	1041.39	2145.42
2.42	C 180/60/33	630.51	372.97	33.69	87.12	90.46	23.80	31.36	42.81	41.23	14.16	10.74	76.91	23.12	5.50	0.36	1229.77	3331.67

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	C 300/115/33	1	1218.13	153.37	138.02	160.06	29.15	82.01	88.26	76.11	52.61	18.70	115.41	40.95	3.52	12.32	1056.46	28145
1.92		2	1143.56	153.23	117.70	180.38	32.18	78.98	97.16	63.40	47.61	19.40	115.32	42.21	0.49	30.03	990.36	26907
1.92	C 300/115/55	1	1292.28	189.58	136.37	161.71	34.02	77.14	94.76	79.91	55.73	24.58	114.99	44.04	4.22	13.88	1129.66	39855
1.92		2	1217.47	188.75	117.63	180.45	37.54	73.62	103.50	67.47	50.29	25.64	114.99	45.28	0.70	30.20	1062.41	38200
1.92	C 330/105/30	1	1448.52	121.45	159.00	169.08	24.78	76.38	91.10	85.67	49.02	15.90	125.94	36.47	1.94	6.47	1058.61	26122
1.92		2	1365.89	122.71	131.61	196.47	27.13	74.03	103.78	69.52	45.23	16.58	125.47	37.61	0.42	31.00	1003.93	25194
1.92	C 330/105/50	1	1546.80	151.80	157.06	171.02	29.16	72.00	98.48	90.45	52.06	21.08	126.05	39.49	2.36	8.31	1129.04	36560
1.92		2	1462.39	152.62	131.62	196.46	31.90	69.26	111.11	74.44	47.84	22.04	125.69	40.61	0.39	31.09	1073.11	35203
1.92	C 330/115/33	1	1507.76	155.03	154.56	173.52	28.02	83.14	97.55	86.89	55.33	18.65	126.30	40.50	3.02	10.84	1093.75	33639
1.92		2	1400.08	155.29	127.61	200.47	31.02	80.14	109.71	69.84	50.06	19.38	125.66	41.85	0.02	35.06	1022.78	32124
1.92	C 330/115/55	1	1603.87	192.39	152.50	175.58	32.80	78.36	105.17	91.34	58.65	24.55	126.11	43.68	3.66	12.81	1166.75	46981
1.92		2	1494.49	191.94	127.51	200.57	36.32	74.84	117.20	74.51	52.85	25.65	125.60	45.01	0.14	35.26	1093.69	44924
1.92	C 350/105/30	1	1651.92	122.14	170.43	177.65	24.13	77.03	96.93	92.99	50.62	15.86	133.04	36.18	1.69	5.07	1082.95	29202
1.92		2	1548.24	123.62	138.24	209.84	26.47	74.69	112.00	73.78	46.71	16.55	132.22	37.36	0.65	34.34	1025.68	28141
1.92	C 350/105/50	1	1766.63	153.13	168.27	179.81	28.47	72.69	104.99	98.25	53.79	21.07	133.33	39.25	2.05	7.14	1153.18	40631
1.92		2	1660.22	154.18	138.29	209.79	31.20	69.96	120.05	79.14	49.41	22.04	132.64	40.42	0.68	34.38	1094.26	39079
1.92	C 350/115/33	1	1720.07	155.96	165.76	182.32	27.31	83.85	103.77	94.34	57.12	18.60	133.48	40.19	2.74	9.68	1118.46	37544
1.92		2	1586.08	156.55	134.10	213.98	30.29	80.87	118.28	74.12	51.68	19.36	132.42	41.60	0.25	38.54	1044.44	35855
1.92	C 350/115/55	1	1832.69	194.10	163.43	184.65	32.04	79.12	112.14	99.25	60.58	24.53	133.46	43.43	3.33	11.92	1191.33	52083
1.92		2	1695.61	193.93	133.99	214.09	35.55	75.61	126.54	79.20	54.56	25.65	132.56	44.83	0.18	38.74	1114.62	49735
2.42	C 150/50/18	1	201.18	18.38	71.90	75.68	12.78	32.38	27.98	26.58	14.38	5.68	56.95	17.21	0.13	0.47	1210.64	843.37
2.42		2	202.52	18.49	72.37	75.21	12.65	32.51	27.99	26.93	14.62	5.69	56.83	17.17	0.00	0.00	1224.09	849.59
2.42	C 150/50/27	1	213.33	22.66	72.04	75.54	14.89	30.27	29.61	28.24	15.22	7.49	56.67	18.47	0.14	0.42	1296.80	1254.67
2.42		2	214.56	22.80	72.46	75.12	14.75	30.41	29.61	28.56	15.45	7.50	56.56	18.44	0.00	0.00	1309.12	1262.46
2.42	C 150/55/20	1	216.95	24.53	72.21	75.37	15.04	35.12	30.05	28.78	16.31	6.99	57.61	19.37	0.07	0.23	1270.75	1167.54
2.42		2	218.74	24.80	72.44	75.14	14.98	35.18	30.20	29.11	16.55	7.05	57.53	19.37	0.00	0.00	1290.23	1179.03
2.42	C 150/55/30	1	229.73	30.20	72.16	75.42	17.52	32.64	31.84	30.46	17.24	9.25	57.15	20.72	0.15	0.37	1373.06	1784.34
2.42		2	230.89	30.38	72.53	75.05	17.37	32.79	31.83	30.76	17.49	9.27	57.05	20.70	0.00	0.00	1384.71	1794.09
2.42	C 150/60/22	1	232.41	31.79	72.51	75.07	17.37	37.79	32.05	30.96	18.30	8.41	58.16	21.51	0.02	0.00	1329.76	1572.05
2.42		2	234.74	32.26	72.50	75.08	17.39	37.77	32.38	31.27	18.55	8.54	58.13	21.55	0.00	0.00	1356.36	1591.61
2.42	C 150/60/33	1	245.72	39.09	72.26	75.32	20.23	34.93	34.00	32.62	19.32	11.19	57.53	22.95	0.15	0.33	1449.25	2470.83
2.42		2	246.82	39.32	72.60	74.98	20.08	35.08	34.00	32.92	19.59	11.21	57.44	22.93	0.00	0.00	1460.30	2482.70
2.42	C 180/60/22	1	357.41	33.55	87.66	89.92	15.61	39.55	40.77	39.75	21.49	8.48	68.65	21.04	0.14	0.27	1461.81	2273.98
2.42		2	361.14	34.14	87.25	90.33	15.70	39.46	41.39	39.98	21.74	8.65	68.66	21.11	0.05	0.14	1490.84	2302.54
2.42	C 180/60/33	1	381.17	41.78	87.08	90.50	18.44	36.72	43.77	42.12	22.66	11.38	68.41	22.65	0.14	0.40	1589.86	3408.54
2.42		2	382.92	41.99	87.48	90.10	18.30	36.86	43.77	42.50	22.94	11.39	68.31	22.62	0.00	0.00	1602.02	3425.0

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	C 180/65/24	180	65	60	24	2.50	4.00	6.35	801.29	87.45	18.08	385.49	43.58	44.08	1564.23	3023.75
2.42	C 180/65/36	180	65	60	36	2.50	4.00	6.81	859.37	87.54	20.92	406.48	53.16	46.43	1677.61	4572.58
2.42	C 180/70/26	180	70	65	26	2.50	4.00	6.62	835.17	87.50	20.49	408.67	54.31	46.70	1630.37	3881.74
2.42	C 180/70/39	180	70	65	39	2.50	4.00	7.11	898.09	87.59	23.61	429.57	65.98	49.04	1753.19	5994.32
2.42	C 200/65/24	200	65	60	24	2.50	4.00	6.73	849.69	97.38	17.05	495.29	45.07	50.86	1658.71	3760.38
2.42	C 200/65/36	200	65	60	36	2.50	4.00	7.19	907.77	97.47	19.81	523.83	55.17	53.74	1772.09	5532.02
2.42	C 200/70/26	200	70	65	26	2.50	4.00	7.00	883.57	97.44	19.37	524.36	56.23	53.81	1724.85	4806.21
2.42	C 200/70/39	200	70	65	39	2.50	4.00	7.49	946.49	97.53	22.41	553.12	68.54	56.71	1847.68	7201.14
2.42	C 200/75/28	200	75	70	28	2.50	4.00	7.26	917.45	97.49	21.75	553.14	68.93	56.74	1790.99	6045.96
2.42	C 200/75/42	200	75	70	42	2.50	4.00	7.80	985.21	97.58	25.07	581.89	83.71	59.63	1923.26	9230.92
2.42	C 200/80/30	200	80	75	30	2.50	4.00	7.53	951.33	97.53	24.19	581.64	83.24	59.64	1857.13	7503.04
2.42	C 200/80/45	200	80	75	45	2.50	4.00	8.10	1023.93	97.62	27.80	610.15	100.75	62.50	1998.85	11677.59
2.42	C 220/70/26	220	70	65	26	2.50	4.00	7.38	931.97	107.38	18.36	657.72	57.95	61.25	1819.33	5856.97
2.42	C 220/70/39	220	70	65	39	2.50	4.00	7.87	994.89	107.47	21.32	695.61	70.85	64.73	1942.16	8565.67
2.42	C 220/75/28	220	75	70	28	2.50	4.00	7.64	965.85	107.43	20.66	693.04	71.10	64.51	1885.47	7341.67
2.42	C 220/75/42	220	75	70	42	2.50	4.00	8.18	1033.61	107.52	23.90	731.27	86.61	68.01	2017.75	10917.18
2.42	C 220/80/30	220	80	75	30	2.50	4.00	7.91	999.73	107.47	23.02	728.03	85.93	67.74	1951.61	9077.97
2.42	C 220/80/45	220	80	75	45	2.50	4.00	8.48	1072.33	107.56	26.54	766.34	104.32	71.25	2093.33	13732.00

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 180/65/24	590.61	361.13	33.57	87.45	90.13	22.72	37.44	41.29	40.07	14.77	8.97	78.20	23.84	4.64	0.00	1082.08	2782.44
2.42	C 180/65/36	667.42	395.42	42.31	87.43	90.15	26.77	33.39	45.23	43.86	15.81	12.67	76.97	25.18	5.85	0.11	1294.95	4438.94
2.42	C 180/70/26	619.08	380.67	41.36	87.54	90.04	25.29	39.87	43.49	42.28	16.36	10.37	78.42	25.85	4.80	0.04	1121.16	3542.11
2.42	C 180/70/39	702.94	416.54	52.06	87.59	89.99	29.73	35.43	47.56	46.29	17.51	14.69	76.98	27.21	6.12	0.00	1352.26	5792.80
2.42	C 200/65/24	591.47	455.97	33.49	97.32	100.26	22.43	37.73	46.85	45.48	14.93	8.88	87.80	23.80	5.37	0.06	1074.99	3389.95
2.42	C 200/65/36	668.79	501.80	42.38	97.38	100.20	26.51	33.65	51.53	50.08	15.99	12.59	86.62	25.17	6.70	0.09	1288.03	5278.97
2.42	C 200/70/26	619.63	480.22	41.25	97.42	100.16	24.96	40.20	49.29	47.94	16.53	10.26	88.03	25.80	5.59	0.02	1113.04	4297.23
2.42	C 200/70/39	703.32	527.83	52.09	97.47	100.11	29.43	35.73	54.15	52.73	17.70	14.58	86.63	27.22	7.02	0.06	1340.04	6832.23
2.42	C 200/75/28	647.39	503.91	50.00	97.50	100.08	27.52	42.64	51.68	50.35	18.17	11.72	88.23	27.79	5.77	0.02	1149.67	5362.21
2.42	C 200/75/42	733.97	551.27	62.58	97.69	99.89	32.20	37.96	56.43	55.19	19.44	16.48	86.67	29.20	7.13	0.12	1378.62	8578.29
2.42	C 200/80/30	674.75	527.07	59.76	97.58	100.00	30.09	45.07	54.01	52.71	19.86	13.26	88.38	29.76	5.90	0.05	1184.99	6601.44
2.42	C 200/80/45	755.84	570.50	73.01	97.75	99.83	34.57	40.59	58.36	57.15	21.12	17.99	86.88	31.08	6.77	0.13	1394.33	10178
2.42	C 220/70/26	619.66	591.62	41.12	107.30	110.28	24.68	40.48	55.14	53.65	16.66	10.16	97.71	25.76	6.32	0.08	1104.88	5127.86
2.42	C 220/70/39	703.18	652.63	52.07	107.35	110.23	29.16	36.00	60.79	59.21	17.86	14.46	96.34	27.21	7.84	0.11	1328.01	7973.14
2.42	C 220/75/28	647.12	620.38	49.82	107.39	110.19	27.21	42.95	57.77	56.30	18.31	11.60	97.91	27.75	6.55	0.04	1140.62	6376.88
2.42	C 220/75/42	734.12	681.63	62.63	107.61	109.97	31.94	38.22	63.35	61.98	19.61	16.39	96.36	29.21	8.05	0.09	1366.55	10001
2.42	C 220/80/30	674.18	648.51	59.55	107.47	110.11	29.75	45.41	60.34	58.90	20.01	13.11	98.08	29.72	6.74	0.00	1175.09	7823.68
2.42	C 220/80/45	755.76	704.85	73.05	107.67	109.91	34.30	40.86	65.46	64.13	21.30	17.88	96.57	31.09	7.76	0.11	1381.63	11845

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 180/65/24	1	379.78	42.53	88.00	89.58	17.83	42.33	43.16	42.39	23.85	10.05	69.28	23.18	0.25	0.55	1519.30	2966.04
2.42		2	383.24	43.25	87.12	90.46	17.96	42.20	43.99	42.37	24.08	10.25	69.29	23.28	0.12	0.33	1546.53	2997.18
2.42	C 180/65/36	1	404.81	52.90	87.17	90.41	21.07	39.09	46.44	44.78	25.11	13.53	68.87	24.90	0.15	0.37	1666.00	4552.42
2.42		2	406.48	53.16	87.54	90.04	20.92	39.24	46.43	45.14	25.41	13.55	68.77	24.87	0.00	0.00	1677.61	4572.58
2.42	C 180/70/26	1	401.77	52.83	88.33	89.25	20.11	45.05	45.49	45.01	26.27	11.73	69.82	25.32	0.38	0.82	1575.90	3796.36
2.42		2	404.94	53.69	86.98	90.60	20.28	44.88	46.56	44.69	26.47	11.96	69.85	25.43	0.20	0.53	1601.29	3829.47
2.42	C 180/70/39	1	427.97	65.66	87.26	90.32	23.76	41.40	49.05	47.38	27.63	15.86	69.25	27.12	0.15	0.34	1742.09	5970.54
2.42		2	429.57	65.98	87.59	89.99	23.61	41.55	49.04	47.74	27.94	15.88	69.16	27.10	0.00	0.00	1753.19	5994.32
2.42	C 200/65/24	1	487.17	43.81	98.15	99.43	16.74	43.42	49.63	49.00	26.17	10.09	76.20	22.85	0.32	0.77	1607.98	3678.83
2.42		2	491.33	44.58	96.90	100.68	16.89	43.27	50.71	48.80	26.40	10.30	76.24	22.96	0.16	0.49	1634.18	3713.78
2.42	C 200/65/36	1	521.63	54.92	97.06	100.52	19.94	40.22	53.74	51.90	27.54	13.66	76.07	24.68	0.14	0.41	1759.84	5507.49
2.42		2	523.83	55.17	97.47	100.11	19.81	40.35	53.74	52.33	27.85	13.67	75.96	24.65	0.00	0.00	1772.09	5532.02
2.42	C 200/70/26	1	514.66	54.47	98.51	99.07	18.92	46.24	52.24	51.95	28.80	11.78	76.84	25.00	0.45	1.08	1664.33	4687.77
2.42		2	518.44	55.39	96.73	100.85	19.11	46.05	53.60	51.41	28.98	12.03	76.89	25.13	0.25	0.70	1688.44	4724.04
2.42	C 200/70/39	1	551.03	68.24	97.15	100.43	22.55	42.61	56.72	54.87	30.26	16.01	76.54	26.94	0.14	0.38	1835.96	7172.12
2.42		2	553.12	68.54	97.53	100.05	22.41	42.75	56.71	55.28	30.59	16.03	76.45	26.91	0.00	0.00	1847.68	7201.14
2.42	C 200/75/28	1	541.71	66.57	98.71	98.87	21.15	49.01	54.88	54.79	31.48	13.58	77.40	27.13	0.60	1.38	1719.88	5878.66
2.42		2	545.11	67.65	96.56	101.02	21.39	48.77	56.45	53.96	31.62	13.87	77.46	27.29	0.35	0.92	1741.86	5915.11
2.42	C 200/75/42	1	577.56	82.43	97.74	99.84	24.94	45.22	59.09	57.85	33.06	18.23	76.93	29.06	0.13	0.16	1894.78	9025.83
2.42		2	581.34	83.43	97.48	100.10	25.00	45.16	59.64	58.08	33.37	18.48	76.88	29.12	0.07	0.09	1920.24	9143.16
2.42	C 200/80/30	1	568.33	80.18	98.37	99.21	23.42	51.74	57.77	57.29	34.23	15.50	77.90	29.26	0.76	1.68	1774.70	7272.05
2.42		2	571.34	81.40	96.38	101.20	23.72	51.44	59.28	56.46	34.31	15.82	77.97	29.43	0.46	1.15	1794.51	7307.35
2.42	C 200/80/45	1	602.64	97.77	98.49	99.09	27.23	47.93	61.19	60.82	35.91	20.40	77.27	31.12	0.57	0.87	1947.02	11082
2.42		2	606.73	99.23	97.12	100.46	27.46	47.70	62.47	60.40	36.14	20.80	77.28	31.25	0.34	0.50	1977.12	11201
2.42	C 220/70/26	1	644.65	55.90	108.72	108.86	17.85	47.31	59.30	59.22	31.32	11.81	83.73	24.66	0.51	1.34	1753.41	5697.26
2.42		2	649.05	56.89	106.49	111.09	18.06	47.10	60.95	58.43	31.50	12.08	83.81	24.81	0.30	0.89	1776.17	5736.24
2.42	C 220/70/39	1	691.82	70.37	107.24	110.34	21.38	43.78	64.51	62.70	32.91	16.07	83.69	26.69	0.06	0.23	1922.62	8512.33
2.42		2	695.61	70.85	107.47	110.11	21.32	43.84	64.73	63.17	33.24	16.16	83.62	26.69	0.00	0.00	1942.16	8565.67
2.42	C 220/75/28	1	677.75	68.38	108.48	109.10	19.99	50.17	62.48	62.12	34.21	13.63	84.38	26.80	0.67	1.67	1808.77	7119.10
2.42		2	681.64	69.53	106.30	111.28	20.26	49.90	64.12	61.25	34.33	13.93	84.46	26.98	0.40	1.13	1829.16	7156.86
2.42	C 220/75/42	1	724.63	85.12	107.86	109.72	23.70	46.46	67.18	66.05	35.92	18.32	84.14	28.84	0.20	0.35	1981.74	10677
2.42		2	730.52	86.31	107.41	110.17	23.83	46.33	68.01	66.31	36.22	18.63	84.13	28.92	0.07	0.10	2014.72	10820
2.42	C 220/80/30	1	710.34	82.41	108.11	109.47	22.18	52.98	65.71	64.89	37.16	15.55	84.95	28.93	0.84	2.00	1863.42	8774.54
2.42		2	713.72	83.73	106.10	111.48	22.50	52.66	67.27	64.02	37.21	15.90	85.05	29.13	0.52	1.37	1881.41	8809.19
2.42	C 220/80/45	1	755.51	100.99	108.69	108.89	25.91	49.25	69.51	69.39	38.98	20.51	84.54	30.91	0.63	1.13	2034.25	13060
2.42		2	760.34	102.53	106.88	110.70	26.16	49.00	71.14	68.68	39.19	20.93	84.57	31.06	0.38	0.68	2062.99	13186

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	C 220/85/32	220	85	80	32	2.50	4.00	8.18	1033.61	107.52	25.43	762.72	102.52	70.94	2017.75	11093.58
2.42	C 220/85/48	220	85	80	48	2.50	4.00	8.78	1111.05	107.61	29.24	800.84	124.08	74.42	2168.92	17076.03
2.42	C 250/80/22.5	250	80	75	23	2.50	4.00	8.19	1036.03	122.34	19.58	949.99	78.69	77.65	2022.47	9593.38
2.42	C 250/80/37.5	250	80	75	38	2.50	4.00	8.76	1108.63	122.44	23.21	1015.66	99.64	82.95	2164.20	14343.37
2.42	C 250/85/24	250	85	80	24	2.50	4.00	8.44	1067.49	122.39	21.72	994.60	94.15	81.27	2083.89	11599.47
2.42	C 250/85/40	250	85	80	40	2.50	4.00	9.05	1144.93	122.48	25.67	1061.75	118.79	86.69	2235.06	17579.27
2.42	C 250/90/25.5	250	90	85	26	2.50	4.00	8.69	1098.95	122.43	23.91	1038.98	111.35	84.87	2145.30	13876.81
2.42	C 250/90/42.5	250	90	85	43	2.50	4.00	9.33	1181.23	122.52	28.17	1107.33	140.04	90.38	2305.92	21327.96
2.42	C 250/95/27	250	95	90	27	2.50	4.00	8.94	1130.41	122.46	26.15	1083.15	130.34	88.45	2206.71	16447.13
2.42	C 250/95/45	250	95	90	45	2.50	4.00	9.62	1217.53	122.56	30.73	1152.41	163.45	94.03	2376.78	25646.11
2.42	C 250/100/28.5	250	100	95	29	2.50	4.00	9.18	1161.87	122.50	28.44	1127.11	151.20	92.01	2268.13	19333.34
2.42	C 250/100/47.5	250	100	95	48	2.50	4.00	9.90	1253.83	122.60	33.33	1197.00	189.10	97.64	2447.65	30595.02
2.42	C 300/95/27	300	95	90	27	2.50	4.00	9.89	1251.41	147.35	23.63	1662.52	137.82	112.83	2442.92	24380.19
2.42	C 300/95/45	300	95	90	45	2.50	4.00	10.57	1338.53	147.44	27.95	1775.99	173.84	120.45	2612.99	36275.57
2.42	C 300/100/28.5	300	100	95	29	2.50	4.00	10.13	1282.87	147.39	25.76	1726.95	160.07	117.17	2504.34	28557.26
2.42	C 300/100/47.5	300	100	95	48	2.50	4.00	10.85	1374.83	147.48	30.40	1842.60	201.36	124.94	2683.85	42980.17
2.42	C 300/105/30	300	105	100	30	2.50	4.00	10.38	1314.33	147.42	27.94	1791.12	184.39	121.50	2565.75	33201.68
2.42	C 300/105/50	300	105	100	50	2.50	4.00	11.14	1411.13	147.51	32.89	1908.58	231.37	129.38	2754.72	50562.38

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 220/85/32	698.08	672.81	70.30	107.97	109.61	32.28	47.88	62.31	61.39	21.78	14.68	98.17	31.73	6.85	0.46	1203.00	9486.96
2.42	C 220/85/48	773.50	723.84	84.30	108.14	109.44	36.60	43.56	66.94	66.14	23.04	19.35	96.74	33.01	7.36	0.53	1389.20	13855
2.42	C 250/80/22.5	618.54	790.49	49.03	122.36	125.22	25.79	49.37	64.60	63.13	19.01	9.93	113.05	28.15	6.22	0.02	1032.58	7467.45
2.42	C 250/80/37.5	721.90	904.69	67.66	122.33	125.25	32.17	42.99	73.95	72.23	21.03	15.74	111.95	30.61	8.96	0.11	1283.79	12477
2.42	C 250/85/24	638.32	818.60	57.82	122.98	124.60	27.97	52.19	66.57	65.70	20.67	11.08	113.24	30.10	6.26	0.59	1053.78	8938.67
2.42	C 250/85/40	746.18	934.97	79.50	122.99	124.59	34.78	45.38	76.02	75.04	22.86	17.52	111.94	32.64	9.11	0.51	1305.57	15127
2.42	C 250/90/25.5	654.16	840.52	67.43	123.18	124.40	30.10	55.06	68.23	67.57	22.40	12.25	113.35	32.11	6.19	0.75	1067.30	10587
2.42	C 250/90/42.5	759.53	952.04	91.35	123.49	124.09	37.05	48.11	77.09	76.72	24.66	18.99	111.96	34.68	8.87	0.97	1306.53	17676
2.42	C 250/95/27	668.56	860.17	77.94	123.28	124.30	32.23	57.93	69.78	69.20	24.18	13.45	113.43	34.14	6.08	0.81	1078.05	12425
2.42	C 250/95/45	767.03	961.69	103.66	123.68	123.90	39.16	51.00	77.75	77.62	26.47	20.33	111.97	36.76	8.43	1.12	1298.75	20262
2.42	C 250/100/28.5	680.95	876.62	89.41	123.60	123.98	34.36	60.80	70.93	70.70	26.02	14.70	113.46	36.23	5.92	1.09	1086.78	14475
2.42	C 250/100/47.5	772.50	968.50	116.73	123.75	123.83	41.23	53.93	78.26	78.21	28.31	21.64	111.97	38.87	7.90	1.16	1288.39	23027
2.42	C 300/95/27	663.25	1261.31	76.31	148.23	149.35	31.36	58.80	85.09	84.45	24.33	12.98	137.90	33.92	7.74	0.88	1059.42	17344
2.42	C 300/95/45	764.43	1424.32	102.98	148.70	148.88	38.52	51.64	95.79	95.67	26.73	19.94	136.50	36.70	10.57	1.25	1272.20	27682
2.42	C 300/100/28.5	675.76	1286.10	87.44	148.42	149.16	33.43	61.73	86.65	86.22	26.16	14.16	137.96	35.97	7.67	1.03	1067.69	20121
2.42	C 300/100/47.5	769.63	1433.90	115.89	148.78	148.80	40.54	54.62	96.38	96.37	28.59	21.22	136.50	38.80	10.14	1.30	1261.96	31396
2.42	C 300/105/30	757.12	1447.63	246.90	144.20	153.38	3.82	98.98	100.39	94.38	646.16	24.94	138.28	57.11	2.66	3.22	1376.31	29879
2.42	C 300/105/50	826.98	1550.30	314.97	146.35	151.23	2.47	97.69	105.93	102.51	1274.58	32.24	136.92	61.71	1.22	1.17	1555.15	38314

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 220/85/32	1	739.68	98.07	107.35	110.23	24.33	55.83	68.90	67.10	40.31	17.57	85.36	31.08	1.10	2.71	1914.78	10697
2.42		2	745.32	99.53	105.90	111.68	24.79	55.37	70.38	66.73	40.16	17.98	85.58	31.28	0.64	1.62	1932.95	10717
2.42	C 220/85/48	1	781.65	118.59	107.58	110.00	28.04	52.12	72.65	71.06	42.29	22.76	84.75	33.01	1.19	2.39	2082.03	15796
2.42		2	789.11	120.33	106.33	111.25	28.51	51.65	74.22	70.93	42.20	23.30	84.96	33.18	0.73	1.28	2108.31	15876
2.42	C 250/80/22.5	1	905.35	72.00	122.12	125.46	18.36	56.80	74.14	72.16	39.22	12.68	95.04	26.80	1.22	3.12	1876.14	8917.28
2.42		2	902.86	73.57	118.01	129.57	18.99	56.17	76.51	69.68	38.74	13.10	95.38	27.23	0.59	4.34	1868.34	8868.48
2.42	C 250/80/37.5	1	993.19	96.32	123.24	124.34	22.86	52.30	80.59	79.88	42.14	18.42	95.62	29.78	0.36	0.80	2073.87	13935
2.42		2	995.30	97.30	120.49	127.09	23.20	51.96	82.60	78.32	41.94	18.73	95.78	29.95	0.01	1.95	2085.96	13968
2.42	C 250/85/24	1	940.87	85.77	121.27	126.31	20.22	59.94	77.58	74.49	42.42	14.31	95.63	28.87	1.50	3.92	1919.25	10734
2.42		2	941.46	87.59	117.68	129.90	21.00	59.16	80.00	72.48	41.71	14.80	96.10	29.31	0.72	4.71	1912.12	10663
2.42	C 250/85/40	1	1029.47	113.91	123.38	124.20	25.02	55.14	83.44	82.89	45.53	20.66	96.03	31.94	0.65	1.72	2119.93	16922
2.42		2	1036.03	115.33	120.17	127.41	25.55	54.61	86.22	81.31	45.15	21.12	96.32	32.14	0.12	2.32	2136.36	16997
2.42	C 250/90/25.5	1	974.62	101.04	120.34	127.24	22.10	63.06	80.99	76.60	45.72	16.02	96.14	30.96	1.81	4.81	1960.72	12793
2.42		2	974.41	102.96	116.95	130.63	23.02	62.14	83.32	74.59	44.72	16.57	96.67	31.42	0.89	5.48	1948.38	12677
2.42	C 250/90/42.5	1	1058.78	132.41	121.85	125.73	27.01	58.15	86.89	84.21	49.02	22.77	96.30	34.06	1.16	3.21	2158.05	20084
2.42		2	1066.42	133.97	119.06	128.52	27.76	57.40	89.57	82.98	48.25	23.34	96.74	34.29	0.41	3.46	2168.21	20085
2.42	C 250/95/27	1	1005.69	117.91	119.25	128.33	24.00	66.16	84.33	78.37	49.14	17.82	96.55	33.06	2.16	5.87	2001.37	15115
2.42		2	1005.31	119.81	116.11	131.47	25.08	65.08	86.58	76.47	47.77	18.41	97.17	33.55	1.07	6.35	1982.24	14932
2.42	C 250/95/45	1	1086.32	152.58	120.32	127.26	29.01	61.15	90.29	85.36	52.59	24.95	96.51	36.17	1.71	4.70	2195.12	23612
2.42		2	1090.75	154.11	117.62	129.96	30.00	60.16	92.74	83.93	51.37	25.62	97.03	36.47	0.73	4.94	2193.32	23510
2.42	C 250/100/28.5	1	1034.63	136.44	118.06	129.52	25.91	69.25	87.63	79.88	52.67	19.70	96.87	35.18	2.54	7.02	2041.33	17720
2.42		2	1032.18	138.19	115.04	132.54	27.17	67.99	89.72	77.88	50.86	20.33	97.57	35.70	1.27	7.46	2013.13	17454
2.42	C 250/100/47.5	1	1112.23	174.47	118.79	128.79	31.03	64.13	93.63	86.36	56.23	27.21	96.67	38.29	2.30	6.19	2231.39	27527
2.42		2	1113.29	175.86	116.16	131.42	32.26	62.90	95.84	84.71	54.51	27.96	97.27	38.66	1.07	6.44	2217.34	27300
2.42	C 300/95/27	1	1504.72	120.30	147.11	150.47	22.34	67.82	102.28	100.00	53.84	17.74	114.63	32.41	1.28	3.12	2124.22	21531
2.42		2	1492.00	122.58	135.47	162.11	23.45	66.71	110.13	92.04	52.27	18.38	115.12	33.00	0.17	11.88	2095.48	21241
2.42	C 300/95/45	1	1633.70	157.11	148.06	149.52	27.24	62.92	110.34	109.26	57.67	24.97	115.12	35.70	0.71	2.07	2314.35	32558
2.42		2	1631.61	158.93	137.60	159.98	28.27	61.89	118.58	101.99	56.22	25.68	115.59	36.07	0.32	9.85	2304.66	32345
2.42	C 300/100/28.5	1	1547.97	139.27	145.68	151.90	24.15	71.01	106.26	101.91	57.67	19.61	115.08	34.52	1.61	4.51	2164.50	25158
2.42		2	1532.10	141.45	134.39	163.19	25.44	69.72	114.00	93.89	55.59	20.29	115.65	35.14	0.31	12.99	2126.32	24744
2.42	C 300/100/47.5	1	1673.27	179.70	146.22	151.36	29.16	66.00	114.44	110.55	61.63	27.23	115.37	37.81	1.24	3.88	2351.48	37804
2.42		2	1663.97	181.40	135.94	161.64	30.44	64.72	122.40	102.94	59.60	28.03	115.89	38.26	0.04	11.54	2327.88	37397
2.42	C 300/105/30	1	1622.73	255.10	146.59	150.99	2.18	102.34	110.70	107.47	1171.59	24.93	116.07	46.02	3.34	3.57	2263.10	41210
2.42		2	1568.01	246.41	133.15	164.43	5.39	100.55	117.76	95.36	457.30	24.51	116.07	46.01	4.23	14.27	2155.29	38189
2.42	C 300/105/50	1	1738.17	339.23	146.16	151.42	2.74	102.90	118.92	114.79	1240.25	32.97	116.03	51.26	3.99	3.91	2458.15	56864
2.42		2	1693.96	335.21	134.27	163.31	5.72	100.88	126.16	103.73	585.71	33.23	116.13	51.66	4.47	13.25	2350.36	54146

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	C 300/115/33	300	115	110	33	2.50	4.00	10.87	1377.25	147.48	32.42	1918.67	239.53	130.09	2688.58	44018.44
2.42	C 300/115/55	300	115	110	55	2.50	4.00	11.71	1483.73	147.58	37.99	2038.76	299.21	138.15	2896.44	68686.79
2.42	C 300/120/34.5	300	120	115	35	2.50	4.00	11.12	1408.71	147.51	34.72	1982.06	270.48	134.37	2749.99	50257.10
2.42	C 300/120/57.5	300	120	115	58	2.50	4.00	11.99	1520.03	147.61	40.60	2102.97	337.18	142.47	2967.30	79406.38
2.42	C 330/105/30	330	105	100	30	2.50	4.00	10.95	1386.93	162.36	26.48	2241.17	189.76	138.04	2707.48	40813.75
2.42	C 330/105/50	330	105	100	50	2.50	4.00	11.71	1483.73	162.45	31.28	2392.76	238.84	147.29	2896.44	60722.60
2.42	C 330/115/33	330	115	110	33	2.50	4.00	11.44	1449.85	162.42	30.80	2396.90	246.78	147.57	2830.30	53938.82
2.42	C 330/115/55	330	115	110	55	2.50	4.00	12.28	1556.33	162.52	36.22	2553.25	309.20	157.11	3038.17	81979.61
2.42	C 330/125/36	330	125	120	36	2.50	4.00	11.94	1512.77	162.48	35.27	2551.49	313.25	157.03	2953.13	69731.27
2.42	C 330/125/60	330	125	120	60	2.50	4.00	12.85	1628.93	162.57	41.32	2711.07	390.91	166.76	3179.89	108361.46
2.42	C 350/105/30	350	105	100	30	2.50	4.00	11.33	1435.33	172.32	25.58	2575.67	193.04	149.47	2801.96	46418.11
2.42	C 350/105/50	350	105	100	50	2.50	4.00	12.09	1532.13	172.42	30.29	2752.43	243.43	159.64	2990.93	68173.03
2.42	C 350/115/33	350	115	110	33	2.50	4.00	11.82	1498.25	172.39	29.80	2751.77	251.22	159.63	2924.79	61239.80
2.42	C 350/115/55	350	115	110	55	2.50	4.00	12.66	1604.73	172.48	35.13	2934.95	315.36	170.16	3132.65	91718.27
2.42	C 350/125/36	350	125	120	36	2.50	4.00	12.32	1561.17	172.44	34.18	2926.63	319.08	169.72	3047.62	79025.55
2.42	C 350/125/60	350	125	120	60	2.50	4.00	13.23	1677.33	172.54	40.13	3114.56	398.94	180.52	3274.37	120805.82
2.42	C 350/135/39	350	135	130	39	2.50	4.00	12.81	1624.09	172.50	38.69	3100.27	397.14	179.73	3170.44	100118.96
2.42	C 350/135/65	350	135	130	65	2.50	4.00	13.80	1749.93	172.59	45.26	3291.38	494.77	190.71	3416.10	156327.85

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 300/115/33	780.26	1488.98	319.37	143.62	153.96	4.65	109.81	103.68	96.71	687.15	29.08	138.14	63.98	3.43	3.86	1414.34	38876
2.42	C 300/115/55	839.31	1573.44	389.40	145.66	151.92	3.15	108.31	108.02	103.57	1235.10	35.95	136.92	68.11	1.84	1.92	1556.56	47758
2.42	C 300/120/34.5	709.49	1348.02	141.80	148.78	148.80	41.65	73.51	90.61	90.59	34.05	19.29	137.84	44.71	6.93	1.29	1086.88	34303
2.42	C 300/120/57.5	780.16	1452.01	174.57	148.57	149.01	48.15	67.01	97.73	97.44	36.26	26.05	136.42	47.30	7.55	1.41	1213.32	48511
2.42	C 330/105/30	682.66	1592.33	98.17	163.69	163.89	34.94	65.22	97.28	97.16	28.09	15.05	152.73	37.92	8.47	1.32	1063.71	27502
2.42	C 330/105/50	771.40	1764.85	128.82	163.70	163.88	42.12	58.04	107.81	107.69	30.58	22.20	151.26	40.87	10.84	1.43	1236.15	41655
2.42	C 330/115/33	698.81	1628.76	124.91	163.76	163.82	38.98	71.18	99.46	99.42	32.04	17.55	152.67	42.28	8.18	1.39	1072.99	35788
2.42	C 330/115/55	776.21	1774.94	157.88	163.58	164.00	45.86	64.30	108.51	108.23	34.43	24.55	151.22	45.10	9.64	1.49	1212.02	51653
2.42	C 330/125/36	708.35	1648.06	153.86	163.70	163.88	42.68	77.48	100.67	100.57	36.05	19.86	152.53	46.61	7.41	1.40	1070.67	45056
2.42	C 330/125/60	777.95	1777.68	189.49	163.48	164.10	49.41	70.75	108.74	108.33	38.35	26.78	151.16	49.35	8.09	1.52	1187.01	62630
2.42	C 350/105/30	680.46	1798.77	97.24	173.69	173.89	34.61	65.55	103.56	103.44	28.10	14.83	162.59	37.80	9.02	1.36	1057.15	30542
2.42	C 350/105/50	769.81	1998.47	128.34	173.68	173.90	41.88	58.28	115.07	114.92	30.64	22.02	161.12	40.83	11.59	1.48	1226.98	46147
2.42	C 350/115/33	696.38	1839.66	123.67	173.75	173.83	38.59	71.57	105.88	105.83	32.04	17.28	162.53	42.14	8.79	1.44	1066.25	39664
2.42	C 350/115/55	774.41	2009.38	157.19	173.55	174.03	45.58	64.58	115.78	115.46	34.49	24.34	161.08	45.05	10.45	1.55	1203.13	57157
2.42	C 350/125/36	705.92	1861.85	152.31	173.69	173.89	42.25	77.91	107.19	107.07	36.05	19.55	162.40	46.45	8.07	1.45	1064.59	49860
2.42	C 350/125/60	775.93	2011.96	188.54	173.45	174.13	49.08	71.08	116.00	115.54	38.42	26.53	161.03	49.29	8.95	1.60	1178.51	69226
2.42	C 350/135/39	707.71	1862.04	181.38	173.58	174.00	45.30	84.86	107.28	107.01	40.04	21.37	162.21	50.62	6.61	1.51	1051.73	60562
2.42	C 350/135/65	775.05	2008.10	222.12	173.37	174.21	52.38	77.78	115.83	115.27	42.41	28.56	160.96	53.53	7.12	1.62	1154.24	82266

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 300/115/33	1	1708.78	337.12	144.09	153.49	3.25	113.41	118.59	111.33	1036.57	29.73	116.81	51.88	4.47	6.01	2350.76	54202
2.42		2	1635.12	322.20	130.62	166.96	7.00	112.16	125.18	97.94	460.20	28.73	116.78	51.84	5.78	16.86	2211.47	49538
2.42	C 300/115/55	1	1813.95	436.01	142.87	154.71	4.70	114.86	126.96	117.25	927.52	37.96	116.38	57.06	6.01	7.13	2538.97	73161
2.42		2	1747.66	427.99	130.92	166.66	8.15	113.31	133.49	104.87	524.99	37.77	116.46	57.63	6.84	16.65	2394.00	68463
2.42	C 300/120/34.5	1	1705.07	232.98	139.95	157.63	31.60	83.56	121.84	108.17	73.73	27.88	116.33	43.00	3.12	10.12	2319.25	43788
2.42		2	1664.06	233.29	129.22	168.36	33.74	81.42	128.78	98.84	69.14	28.65	117.04	43.82	0.98	18.29	2235.81	42612
2.42	C 300/120/57.5	1	1811.04	288.92	139.04	158.54	36.94	78.22	130.25	114.23	78.21	36.94	115.84	46.27	3.66	10.93	2495.72	64210
2.42		2	1771.69	288.58	129.26	168.32	39.38	75.78	137.06	105.26	73.28	38.08	116.55	47.04	1.22	18.34	2415.50	62638
2.42	C 330/105/30	1	1963.40	161.63	161.11	166.47	25.00	75.16	121.87	117.94	64.66	21.50	126.29	36.23	1.48	4.11	2277.06	35072
2.42		2	1926.49	163.89	144.30	183.28	26.49	73.67	133.51	105.11	61.86	22.25	126.72	36.96	0.02	18.07	2222.00	34379
2.42	C 330/105/50	1	2118.34	207.23	161.08	166.50	30.03	70.13	131.51	127.22	69.00	29.55	126.67	39.62	1.25	4.05	2459.46	51626
2.42		2	2088.00	208.91	145.64	181.94	31.60	68.56	143.37	114.76	66.12	30.47	127.12	40.21	0.32	16.81	2415.53	50801
2.42	C 330/115/33	1	2061.14	209.12	157.99	169.59	28.62	81.54	130.46	121.53	73.06	25.65	127.05	40.47	2.17	7.17	2355.37	46129
2.42		2	2007.29	210.61	141.64	185.94	30.55	79.61	141.72	107.95	68.94	26.46	127.52	41.31	0.25	20.78	2277.42	45011
2.42	C 330/115/55	1	2204.54	262.67	157.12	170.46	33.82	76.34	140.31	129.33	77.67	34.41	127.00	43.84	2.40	7.95	2532.58	66991
2.42		2	2152.43	263.40	142.05	185.53	35.97	74.19	151.52	116.02	73.23	35.50	127.49	44.60	0.25	20.46	2458.38	65442
2.42	C 330/125/36	1	2146.47	263.07	154.59	172.99	32.20	87.96	138.85	124.08	81.70	29.91	127.52	44.64	3.07	10.51	2427.34	58995
2.42		2	2071.62	263.04	138.51	189.07	34.63	85.53	149.57	109.57	75.97	30.75	128.01	45.62	0.64	23.97	2322.04	57207
2.42	C 330/125/60	1	2281.93	326.17	153.28	174.30	37.65	82.51	148.87	130.92	86.63	39.53	127.13	48.06	3.66	11.73	2604.90	85012
2.42		2	2207.90	325.16	138.49	189.09	40.45	79.71	159.42	116.77	80.39	40.79	127.66	48.99	0.87	24.08	2500.58	82534
2.42	C 350/105/30	1	2237.14	162.60	172.51	175.07	24.38	75.78	129.68	127.79	66.69	21.46	133.43	35.97	1.20	2.74	2325.31	39315
2.42		2	2187.44	165.07	151.58	196.00	25.88	74.28	144.31	111.60	63.78	22.22	133.72	36.73	0.30	20.75	2266.31	38516
2.42	C 350/105/50	1	2417.16	209.12	172.36	175.22	29.38	70.78	140.24	137.95	71.19	29.54	134.00	39.42	0.92	2.80	2506.74	57426
2.42		2	2375.30	210.98	153.08	194.50	30.95	69.21	155.17	122.12	68.18	30.48	134.34	40.04	0.65	19.34	2458.85	56464
2.42	C 350/115/33	1	2348.65	210.43	169.20	178.38	27.94	82.22	138.81	131.67	75.31	25.59	134.27	40.19	1.86	5.99	2403.90	51619
2.42		2	2277.95	212.18	148.84	198.74	29.87	80.29	153.05	114.62	71.04	26.43	134.58	41.07	0.06	23.55	2321.25	50342
2.42	C 350/115/55	1	2516.29	265.11	168.16	179.42	33.09	77.07	149.63	140.25	80.11	34.40	134.41	43.63	2.04	6.94	2580.55	74356
2.42		2	2447.28	266.05	149.34	198.24	35.25	74.91	163.87	123.45	75.47	35.52	134.75	44.43	0.12	23.14	2501.21	72566
2.42	C 350/125/36	1	2446.51	264.82	165.62	181.96	31.45	88.71	147.72	134.45	84.20	29.85	134.82	44.36	2.73	9.52	2476.54	65905
2.42		2	2349.99	265.08	145.60	201.98	33.88	86.28	161.40	116.35	78.25	30.72	135.11	45.38	0.30	26.84	2365.73	63872
2.42	C 350/125/60	1	2605.48	329.24	164.09	183.49	36.86	83.30	158.78	141.99	89.32	39.52	134.59	47.85	3.27	10.96	2653.62	94151
2.42		2	2509.14	328.47	145.62	201.96	39.67	80.49	172.30	124.24	82.81	40.81	134.95	48.83	0.46	26.91	2542.93	91299
2.42	C 350/135/39	1	2531.15	325.62	161.83	185.75	34.89	95.27	156.41	136.26	93.33	34.18	135.11	48.46	3.80	13.26	2544.97	82129
2.42		2	2407.94	323.91	142.10	205.48	37.92	92.24	169.46	117.18	85.42	35.12	135.39	49.66	0.77	30.40	2405.08	79173
2.42	C 350/135/65	1	2685.72	401.88	160.16	187.42	40.68	89.48	167.69	143.30	98.80	44.91	134.60	52.07	4.59	14.84	2726.41	116993
2.42		2	2562.20	398.45	141.96	205.62	44.18	85.98	180.48	124.61	90.18	46.34	134.95	53.22	1.08	30.63	2584.87	112839

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	C 400/125/36	400	125	120	36	2.50	4.00	13.27	1682.17	197.36	31.72	4003.19	332.20	202.84	3283.82	105409.93
2.42	C 400/125/60	400	125	120	60	2.50	4.00	14.18	1798.33	197.45	37.43	4272.15	417.11	216.36	3510.58	155927.90
2.42	C 400/135/39	400	135	130	39	2.50	4.00	13.76	1745.09	197.41	36.01	4232.81	414.00	214.42	3406.65	133049.28
2.42	C 400/135/65	400	135	130	65	2.50	4.00	14.75	1870.93	197.50	42.33	4509.19	517.95	228.31	3652.31	200316.67
2.42	C 400/145/42	400	145	140	42	2.50	4.00	14.25	1808.01	197.46	40.42	4461.03	507.11	225.92	3529.48	165325.34
2.42	C 400/145/70	400	145	140	70	2.50	4.00	15.32	1943.53	197.55	47.37	4742.95	632.40	240.09	3794.03	253495.70
2.92	C 150/50/18	150	50	45	18	3.00	4.00	5.96	749.06	72.11	12.41	239.45	21.47	33.21	2128.92	976.46
2.92	C 150/50/27	150	50	45	27	3.00	4.00	6.37	801.62	72.20	14.52	253.98	26.59	35.18	2278.30	1457.49
2.92	C 150/55/20	150	55	50	20	3.00	4.00	6.28	789.94	72.18	14.73	258.92	28.91	35.87	2245.11	1360.45
2.92	C 150/55/30	150	55	50	30	3.00	4.00	6.74	848.34	72.27	17.13	273.57	35.55	37.85	2411.09	2078.66
2.92	C 150/60/22	150	60	55	22	3.00	4.00	6.60	830.82	72.25	17.15	278.12	37.74	38.50	2361.29	1842.41
2.92	C 150/60/33	150	60	55	33	3.00	4.00	7.10	895.06	72.34	19.83	292.69	46.14	40.46	2543.87	2885.01
2.92	C 180/60/22	180	60	55	22	3.00	4.00	7.29	918.42	87.13	15.51	429.70	40.07	49.32	2610.26	2681.24
2.92	C 180/60/33	180	60	55	33	3.00	4.00	7.79	982.66	87.22	18.06	454.87	49.28	52.15	2792.84	3986.98
2.92	C 180/65/24	180	65	60	24	3.00	4.00	7.61	959.30	87.19	17.84	457.84	51.11	52.51	2726.45	3516.48
2.92	C 180/65/36	180	65	60	36	3.00	4.00	8.16	1029.38	87.28	20.68	483.16	62.54	55.36	2925.63	5335.13
2.92	C 180/70/26	180	70	65	26	3.00	4.00	7.93	1000.18	87.25	20.24	485.67	63.84	55.67	2842.64	4524.25
2.92	C 180/70/39	180	70	65	39	3.00	4.00	8.53	1076.10	87.34	23.37	510.89	77.76	58.50	3058.41	7008.31

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 400/125/36	699.77	2450.37	148.51	198.66	198.92	41.24	78.92	123.35	123.18	36.01	18.82	187.13	46.07	9.52	1.56	1050.70	62729
2.42	C 400/125/60	770.73	2658.68	186.12	198.36	199.22	48.31	71.85	134.03	133.45	38.53	25.91	185.73	49.14	10.89	1.77	1158.83	87057
2.42	C 400/135/39	700.74	2448.72	176.28	198.52	199.06	44.11	86.05	123.35	123.01	39.96	20.49	186.94	50.16	8.11	1.65	1038.84	75731
2.42	C 400/135/65	769.30	2651.78	218.87	198.27	199.31	51.48	78.68	133.75	133.05	42.51	27.82	185.66	53.34	9.15	1.81	1135.67	103181
2.42	C 400/145/42	701.24	2445.22	206.60	198.59	198.99	46.93	93.23	123.13	122.88	44.02	22.16	186.74	54.28	6.51	1.13	1029.87	90198.
2.42	C 400/145/70	765.91	2638.01	253.34	198.19	199.39	54.43	85.73	133.11	132.30	46.55	29.55	185.59	57.51	7.05	1.84	1113.69	120285
2.92	C 150/50/18	641.65	238.22	19.54	71.87	75.21	14.49	29.67	33.15	31.67	13.49	6.59	60.93	17.45	2.08	0.24	1823.67	970.96
2.92	C 150/50/27	694.21	252.75	23.98	71.99	75.09	16.76	27.40	35.11	33.66	14.30	8.75	60.34	18.58	2.25	0.21	1973.05	1449.93
2.92	C 150/55/20	682.41	257.62	26.20	71.98	75.10	17.05	32.11	35.79	34.30	15.37	8.16	61.44	19.60	2.31	0.20	1938.78	1352.73
2.92	C 150/55/30	740.93	272.34	31.94	72.09	74.99	19.62	29.54	37.78	36.32	16.28	10.81	60.63	20.76	2.48	0.18	2105.84	2068.63
2.92	C 150/60/22	721.55	276.03	33.95	72.23	74.85	19.62	34.54	38.22	36.88	17.30	9.83	61.85	21.69	2.47	0.02	2040.38	1825.75
2.92	C 150/60/33	787.65	291.46	41.34	72.18	74.90	22.54	31.62	40.38	38.91	18.34	13.07	60.83	22.91	2.70	0.16	2238.62	2872.12
2.92	C 180/60/22	731.77	419.92	34.15	87.13	89.95	19.10	35.06	48.19	46.69	17.88	9.74	75.75	21.60	3.59	0.00	2048.89	2608.87
2.92	C 180/60/33	801.68	449.04	42.04	86.93	90.15	22.14	32.02	51.66	49.81	18.99	13.13	74.84	22.90	4.08	0.30	2278.49	3933.74
2.92	C 180/65/24	768.37	445.11	43.05	87.22	89.86	21.61	37.55	51.03	49.54	19.92	11.46	76.11	23.67	3.77	0.03	2130.41	3395.19
2.92	C 180/65/36	848.40	477.34	53.14	87.02	90.06	25.09	34.07	54.86	53.00	21.18	15.60	75.01	25.03	4.41	0.27	2411.27	5267.93
2.92	C 180/70/26	804.49	469.70	53.20	87.30	89.78	24.15	40.01	53.80	52.32	22.03	13.30	76.41	25.72	3.91	0.06	2208.91	4335.57
2.92	C 180/70/39	895.12	505.07	65.88	87.10	89.98	28.09	36.07	57.99	56.13	23.45	18.27	75.12	27.13	4.72	0.24	2544.06	6925.35

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	C 400/125/36	1	3293.55	268.61	193.73	203.85	29.74	90.42	170.00	161.57	90.33	29.71	152.84	43.65	1.98	6.49	2598.55	84914
2.42		2	3127.16	269.63	162.92	234.66	32.14	88.02	191.94	133.26	83.90	30.63	152.49	44.78	0.42	34.44	2474.88	82171
2.42	C 400/125/60	1	3520.31	336.12	191.66	205.92	35.03	85.13	183.68	170.95	95.94	39.48	153.04	47.29	2.39	8.47	2774.40	119278
2.42		2	3351.66	336.06	163.05	234.53	37.84	82.32	205.56	142.91	88.80	40.83	152.81	48.39	0.42	34.41	2648.92	115383
2.42	C 400/135/39	1	3409.11	330.29	189.43	208.15	33.02	97.14	179.97	163.78	100.04	34.00	153.29	47.71	2.99	10.74	2668.46	105342
2.42		2	3200.02	329.52	159.08	238.50	36.02	94.14	201.16	134.17	91.49	35.00	152.82	49.04	0.01	38.33	2513.36	101382
2.42	C 400/135/65	1	3631.65	410.36	187.16	210.42	38.69	91.47	194.04	172.59	106.06	44.86	153.18	51.49	3.64	12.92	2849.04	147517
2.42		2	3418.88	407.76	158.99	238.59	42.21	87.95	215.04	143.30	96.60	46.36	152.84	52.78	0.12	38.51	2689.82	141863
2.42	C 400/145/42	1	3512.97	398.57	185.12	212.46	36.26	103.90	189.77	165.35	109.92	38.36	153.53	51.71	4.16	15.00	2738.11	127702
2.42		2	3258.66	394.93	155.07	242.51	39.91	100.25	210.15	134.37	98.95	39.40	152.93	53.24	0.51	42.39	2550.58	121923
2.42	C 400/145/70	1	3732.22	493.68	182.82	214.76	42.40	97.76	204.15	173.79	116.44	50.50	153.14	55.70	4.97	17.21	2923.80	179498
2.42		2	3475.83	487.40	155.01	242.57	46.67	93.49	224.24	143.29	104.42	52.14	152.69	57.18	0.70	42.54	2731.45	171757
2.92	C150/50/18	1	237.87	21.35	71.62	75.46	12.55	31.61	33.21	31.52	17.01	6.75	56.66	16.97	0.14	0.48	2105.65	969.35
2.92		2	239.45	21.47	72.11	74.97	12.41	31.75	33.21	31.94	17.31	6.76	56.54	16.93	0.00	0.00	2128.92	976.46
2.92	C150/50/27	1	252.51	26.43	71.78	75.30	14.66	29.50	35.18	33.53	18.03	8.96	56.39	18.24	0.14	0.42	2256.55	1448.37
2.92		2	253.98	26.59	72.20	74.88	14.52	29.64	35.18	33.92	18.32	8.97	56.29	18.21	0.00	0.00	2278.30	1457.49
2.92	C150/55/20	1	257.42	28.74	71.75	75.33	14.88	34.28	35.88	34.17	19.32	8.38	57.37	19.17	0.15	0.43	2223.04	1351.45
2.92		2	258.92	28.91	72.18	74.90	14.73	34.43	35.87	34.57	19.62	8.40	57.25	19.13	0.00	0.00	2245.11	1360.45
2.92	C150/55/30	1	272.18	35.34	71.90	75.18	17.28	31.88	37.86	36.20	20.45	11.08	56.89	20.50	0.15	0.38	2390.54	2067.21
2.92		2	273.57	35.55	72.27	74.81	17.13	32.03	37.85	36.57	20.75	11.10	56.79	20.47	0.00	0.00	2411.09	2078.66
2.92	C150/60/22	1	276.70	37.52	71.86	75.22	17.30	36.86	38.51	36.78	21.69	10.18	57.97	21.35	0.15	0.39	2340.31	1831.35
2.92		2	278.12	37.74	72.25	74.83	17.15	37.01	38.50	37.17	22.01	10.20	57.86	21.31	0.00	0.00	2361.29	1842.41
2.92	C150/60/33	1	291.37	45.87	72.00	75.08	19.98	34.18	40.47	38.81	22.95	13.42	57.28	22.72	0.15	0.34	2524.39	2871.04
2.92		2	292.69	46.14	72.34	74.74	19.83	34.33	40.46	39.16	23.26	13.44	57.18	22.70	0.00	0.00	2543.87	2885.01
2.92	C180/60/22	1	427.43	39.87	86.66	90.42	15.65	38.51	49.32	47.27	25.48	10.35	68.52	20.93	0.14	0.47	2587.32	2665.70
2.92		2	429.70	40.07	87.13	89.95	15.51	38.65	49.32	47.77	25.84	10.37	68.40	20.89	0.00	0.00	2610.26	2681.24
2.92	C180/60/33	1	452.75	49.03	86.82	90.26	18.20	35.96	52.15	50.16	26.93	13.64	68.14	22.42	0.14	0.41	2771.40	3967.24
2.92		2	454.87	49.28	87.22	89.86	18.06	36.10	52.15	50.62	27.28	13.65	68.04	22.39	0.00	0.00	2792.84	3986.98
2.92	C180/65/24	1	454.97	50.72	86.91	90.17	17.92	41.24	52.35	50.46	28.29	12.30	69.17	23.09	0.09	0.28	2695.29	3490.47
2.92		2	457.84	51.11	87.19	89.89	17.84	41.32	52.51	50.93	28.65	12.37	69.08	23.08	0.00	0.00	2726.45	3516.48
2.92	C180/65/36	1	481.15	62.23	86.91	90.17	20.83	38.33	55.36	53.36	29.88	16.23	68.61	24.67	0.15	0.37	2905.16	5311.33
2.92		2	483.16	62.54	87.28	89.80	20.68	38.48	55.36	53.81	30.24	16.25	68.51	24.65	0.00	0.00	2925.63	5335.13
2.92	C180/70/26	1	481.86	63.13	87.20	89.88	20.24	43.92	55.26	53.61	31.18	14.38	69.73	25.24	0.00	0.05	2799.14	4480.61
2.92		2	485.67	63.84	87.25	89.83	20.24	43.92	55.67	54.06	31.54	14.54	69.68	25.26	0.00	0.00	2842.64	4524.25
2.92	C180/70/39	1	508.97	77.38	87.00	90.08	23.52	40.64	58.50	56.50	32.90	19.04	68.99	26.90	0.15	0.34	3038.83	6980.21
2.92		2	510.89	77.76	87.34	89.74	23.37	40.79	58.50	56.93	33.27	19.06	68.90	26.88	0.00	0.00	3058.41	7008.31

t [mm]	Profile type	Sectional dimensions h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	Geometric characteristics of the gross section A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.92	C 200/65/24	200	65	60	24	3.00	4.00	8.07	1017.70	97.13	16.82	588.75	52.87	60.62	2892.43	4377.60
2.92	C 200/65/36	200	65	60	36	3.00	4.00	8.62	1087.78	97.22	19.57	623.19	64.90	64.10	3091.61	6460.11
2.92	C 200/70/26	200	70	65	26	3.00	4.00	8.39	1058.58	97.18	19.12	623.68	66.10	64.18	3008.62	5607.31
2.92	C 200/70/39	200	70	65	39	3.00	4.00	8.98	1134.50	97.27	22.17	658.39	80.78	67.69	3224.39	8426.10
2.92	C 200/75/28	200	75	70	28	3.00	4.00	8.71	1099.46	97.23	21.50	658.27	81.18	67.70	3124.80	7066.89
2.92	C 200/75/42	200	75	70	42	3.00	4.00	9.35	1181.22	97.32	24.83	692.96	98.83	71.20	3357.18	10819.90
2.92	C 200/80/30	200	80	75	30	3.00	4.00	9.03	1140.34	97.28	23.94	692.52	98.20	71.19	3240.99	8784.25
2.92	C 200/80/45	200	80	75	45	3.00	4.00	9.72	1227.94	97.37	27.55	726.91	119.12	74.66	3489.96	13708.61
2.92	C 220/70/26	220	70	65	26	3.00	4.00	8.85	1116.98	107.12	18.13	782.86	68.12	73.08	3174.60	6838.89
2.92	C 220/70/39	220	70	65	39	3.00	4.00	9.44	1192.90	107.21	21.08	828.58	83.51	77.28	3390.37	10029.83
2.92	C 220/75/28	220	75	70	28	3.00	4.00	9.17	1157.86	107.17	20.42	825.32	83.75	77.01	3290.78	8588.39
2.92	C 220/75/42	220	75	70	42	3.00	4.00	9.81	1239.62	107.26	23.66	871.46	102.26	81.25	3523.16	12805.04
2.92	C 220/80/30	220	80	75	30	3.00	4.00	9.49	1198.74	107.22	22.77	867.39	101.38	80.90	3406.97	10636.58
2.92	C 220/80/45	220	80	75	45	3.00	4.00	10.18	1286.34	107.31	26.30	913.61	123.35	85.14	3655.94	16130.60
2.92	C 220/85/32	220	85	80	32	3.00	4.00	9.81	1239.62	107.26	25.18	909.09	121.12	84.75	3523.16	13016.52
2.92	C 220/85/48	220	85	80	48	3.00	4.00	10.54	1333.06	107.35	29.00	955.09	146.89	88.97	3788.73	20085.19
2.92	C 250/80/22.5	250	80	75	23	3.00	4.00	9.83	1242.54	122.09	19.34	1132.28	92.68	92.74	3531.46	11231.41
2.92	C 250/80/37.5	250	80	75	38	3.00	4.00	10.52	1330.14	122.18	22.98	1211.52	117.71	99.16	3780.43	16845.00

Subjected to compression

t [mm]	Profile type	Geometric characteristics of the transversal effective cross section A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 200/65/24	771.99	564.87	43.05	97.10	99.98	21.29	37.87	58.17	56.50	20.22	11.37	85.54	23.61	4.47	0.03	2124.09	4160.93
2.92	C 200/65/36	855.34	610.86	53.58	96.86	100.22	24.89	34.27	63.07	60.95	21.53	15.63	84.51	25.03	5.32	0.36	2431.00	6327.46
2.92	C 200/70/26	807.77	595.46	53.20	97.19	99.89	23.81	40.35	61.27	59.61	22.35	13.18	85.86	25.66	4.68	0.01	2200.63	5290.32
2.92	C 200/70/39	902.06	646.07	66.42	96.95	100.13	27.88	36.28	66.64	64.52	23.82	18.31	84.63	27.14	5.71	0.33	2563.78	8261.75
2.92	C 200/75/28	843.09	625.39	64.67	97.26	99.82	26.35	42.81	64.30	62.65	24.54	15.11	86.13	27.69	4.85	0.03	2274.46	6619.36
2.92	C 200/75/42	948.78	680.64	80.99	97.02	100.06	30.91	38.25	70.15	68.03	26.20	21.17	84.70	29.22	6.08	0.30	2696.56	10620
2.92	C 200/80/30	877.98	654.69	77.48	97.34	99.74	28.92	45.24	67.26	65.64	26.79	17.13	86.35	29.71	4.98	0.06	2345.81	8169.64
2.92	C 200/80/45	993.70	713.26	97.12	97.25	99.83	33.92	40.24	73.34	71.45	28.63	24.14	84.72	31.26	6.37	0.12	2814.14	13437
2.92	C 220/70/26	809.98	736.99	53.14	107.07	110.01	23.51	40.65	68.83	66.99	22.61	13.07	95.39	25.61	5.38	0.05	2191.02	6346.59
2.92	C 220/70/39	907.70	805.85	66.86	106.79	110.29	27.71	36.45	75.46	73.07	24.13	18.34	94.22	27.14	6.62	0.42	2579.81	9743.69
2.92	C 220/75/28	844.97	773.40	64.59	107.15	109.93	26.03	43.13	72.18	70.36	24.82	14.97	95.67	27.65	5.61	0.02	2263.13	7913.34
2.92	C 220/75/42	952.75	847.16	81.32	107.05	110.03	30.67	38.49	79.14	76.99	26.51	21.13	94.30	29.22	7.01	0.21	2698.47	12427
2.92	C 220/80/30	879.53	809.07	77.39	107.23	109.85	28.57	45.59	75.45	73.65	27.09	16.98	95.91	29.66	5.80	0.01	2332.81	9732.35
2.92	C 220/80/45	996.60	886.66	97.43	107.28	109.80	33.64	40.52	82.65	80.75	28.96	24.04	94.32	31.27	7.34	0.03	2807.24	15616
2.92	C 220/85/32	913.67	844.01	91.59	107.30	109.78	31.13	48.03	78.66	76.88	29.42	19.07	96.11	31.66	5.95	0.04	2400.26	11828
2.92	C 220/85/48	1038.43	923.61	115.13	107.35	109.73	36.58	42.58	86.04	84.17	31.47	27.04	94.31	33.30	7.58	0.00	2899.46	19348
2.92	C 250/80/22.5	815.31	996.75	64.36	122.10	124.98	24.81	49.35	81.63	79.75	25.94	13.04	110.57	28.10	5.47	0.01	2062.64	9442.96
2.92	C 250/80/37.5	940.26	1132.18	87.96	122.10	124.98	30.86	43.30	92.73	90.59	28.50	20.31	109.73	30.59	7.88	0.09	2548.84	15553

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 200/65/24	1	584.07	52.29	96.99	100.09	16.83	42.33	60.22	58.35	31.07	12.35	76.11	22.77	0.01	0.14	2850.25	4335.66
2.92		2	588.75	52.87	97.13	99.95	16.82	42.34	60.62	58.90	31.44	12.48	76.06	22.79	0.00	0.00	2892.43	4377.60
2.92	C 200/65/36	1	620.55	64.61	96.80	100.28	19.71	39.45	64.10	61.88	32.78	16.38	75.79	24.46	0.14	0.41	3070.01	6431.16
2.92		2	623.19	64.90	97.22	99.86	19.57	39.59	64.10	62.40	33.16	16.39	75.69	24.43	0.00	0.00	3091.61	6460.11
2.92	C 200/70/26	1	617.73	65.16	97.30	99.78	19.05	45.11	63.49	61.91	34.20	14.44	76.76	24.93	0.07	0.12	2953.52	5540.43
2.92		2	623.33	66.05	97.15	99.93	19.11	45.05	64.16	62.37	34.56	14.66	76.75	24.98	0.01	0.03	3005.28	5602.62
2.92	C 200/70/39	1	655.87	80.42	96.89	100.19	22.31	41.85	67.69	65.46	36.05	19.22	76.28	26.71	0.14	0.38	3203.69	8391.71
2.92		2	658.39	80.78	97.27	99.81	22.17	41.99	67.69	65.97	36.44	19.24	76.18	26.68	0.00	0.00	3224.39	8426.10
2.92	C 200/75/28	1	650.88	79.78	97.60	99.48	21.33	47.83	66.69	65.43	37.41	16.68	77.34	27.08	0.18	0.37	3055.33	6965.71
2.92		2	656.10	80.84	97.02	100.06	21.42	47.74	67.62	65.57	37.74	16.93	77.34	27.15	0.08	0.21	3104.23	7032.77
2.92	C 200/75/42	1	690.54	98.39	96.97	100.11	24.98	44.18	71.21	68.98	39.39	22.27	76.69	28.95	0.15	0.35	3337.29	10780
2.92		2	692.96	98.83	97.32	99.76	24.83	44.33	71.20	69.46	39.80	22.29	76.59	28.92	0.00	0.00	3357.18	10820
2.92	C 200/80/30	1	683.53	96.23	97.90	99.18	23.65	50.51	69.82	68.92	40.69	19.05	77.84	29.21	0.29	0.62	3155.78	8636.97
2.92		2	688.36	97.46	96.89	100.19	23.78	50.38	71.04	68.71	40.98	19.35	77.86	29.30	0.16	0.39	3201.73	8707.96
2.92	C 200/80/45	1	724.58	118.61	97.05	100.03	27.70	46.46	74.66	72.43	42.81	25.53	77.03	31.16	0.15	0.32	3470.83	13662
2.92		2	726.91	119.12	97.37	99.71	27.55	46.61	74.66	72.90	43.24	25.56	76.94	31.15	0.00	0.00	3489.96	13709
2.92	C 220/70/26	1	774.24	66.94	107.42	109.66	17.98	46.18	72.08	70.60	37.22	14.50	83.67	24.60	0.14	0.30	3109.07	6742.43
2.92		2	780.90	67.89	106.95	110.13	18.07	46.09	73.01	70.91	37.57	14.73	83.68	24.67	0.06	0.17	3159.46	6812.51
2.92	C 220/70/39	1	825.36	83.17	106.79	110.29	21.22	42.94	77.29	74.84	39.20	19.37	83.45	26.49	0.14	0.42	3368.65	9988.81
2.92		2	828.58	83.51	107.21	109.87	21.08	43.08	77.28	75.42	39.61	19.39	83.34	26.46	0.00	0.00	3390.37	10030
2.92	C 220/75/28	1	814.83	82.03	107.74	109.34	20.17	48.99	75.63	74.52	40.67	16.74	84.33	26.76	0.25	0.57	3210.40	8446.20
2.92		2	820.98	83.16	106.81	110.27	20.29	48.87	76.86	74.45	40.98	17.02	84.35	26.85	0.13	0.36	3257.60	8520.66
2.92	C 220/75/42	1	868.36	101.84	106.88	110.20	23.80	45.36	81.25	78.80	42.79	22.45	83.95	28.75	0.14	0.39	3502.25	12757
2.92		2	871.46	102.26	107.26	109.82	23.66	45.50	81.25	79.35	43.22	22.47	83.85	28.72	0.00	0.00	3523.16	12805
2.92	C 220/80/30	1	854.83	99.01	108.06	109.02	22.40	51.76	79.10	78.41	44.19	19.13	84.92	28.90	0.37	0.85	3310.41	10434
2.92		2	860.48	100.33	106.66	110.42	22.56	51.60	80.67	77.93	44.46	19.44	84.95	29.01	0.21	0.55	3354.33	10511
2.92	C 220/80/45	1	910.63	122.86	106.95	110.13	26.45	47.71	85.15	82.69	46.46	25.75	84.37	30.99	0.15	0.36	3635.80	16075
2.92		2	913.61	123.35	107.31	109.77	26.30	47.86	85.14	83.23	46.90	25.77	84.28	30.97	0.00	0.00	3655.94	16131
2.92	C 220/85/32	1	894.27	117.98	108.38	108.70	24.68	54.48	82.51	82.27	47.80	21.66	85.45	31.04	0.50	1.12	3409.19	12736
2.92		2	899.40	119.47	106.51	110.57	24.89	54.27	84.44	81.34	48.01	22.01	85.49	31.16	0.30	0.75	3449.75	12814
2.92	C 220/85/48	1	952.21	146.31	107.02	110.06	29.15	50.01	88.98	86.52	50.20	29.25	84.73	33.21	0.15	0.33	3769.29	20022
2.92		2	955.09	146.89	107.35	109.73	29.00	50.16	88.97	87.04	50.66	29.28	84.64	33.20	0.00	0.00	3788.73	20085
2.92	C 250/80/22.5	1	1099.81	87.44	122.27	124.81	18.35	55.81	89.95	88.12	47.65	15.67	94.82	26.74	0.99	2.73	3366.21	10743
2.92		2	1104.06	89.22	120.22	126.86	18.71	55.45	91.84	87.03	47.68	16.09	94.99	27.00	0.63	1.87	3388.54	10765
2.92	C 250/80/37.5	1	1201.53	116.28	122.38	124.70	22.88	51.28	98.18	96.35	50.82	22.68	95.43	29.69	0.10	0.19	3719.77	16672
2.92		2	1210.34	117.56	122.11	124.97	22.95	51.21	99.12	96.85	51.22	22.96	95.42	29.74	0.03	0.08	3773.04	16821.

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section								
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.92	C 250/85/24	250	85	80	24	3.00	4.00	10.13	1280.50	122.13	21.48	1185.92	111.06	97.10	3639.34	13600.41
2.92	C 250/85/40	250	85	80	40	3.00	4.00	10.86	1373.94	122.23	25.43	1266.95	140.52	103.66	3904.91	20672.55
2.92	C 250/90/25.5	250	90	85	23	3.00	4.00	10.29	1300.94	122.15	22.85	1221.42	124.93	99.99	3697.44	15012.26
2.92	C 250/90/42.5	250	90	85	43	3.00	4.00	11.21	1417.74	122.27	27.93	1321.76	165.85	108.10	4029.40	25110.23
2.92	C 250/95/27	250	95	90	27	3.00	4.00	10.73	1356.42	122.21	25.90	1292.41	154.15	105.75	3855.12	19332.16
2.92	C 250/95/45	250	95	90	45	3.00	4.00	11.55	1461.54	122.31	30.48	1375.98	193.77	112.50	4153.88	30225.81
2.92	C 250/100/28.5	250	100	95	29	3.00	4.00	11.02	1394.38	122.25	28.19	1345.27	179.01	110.05	3963.01	22748.29
2.92	C 250/100/47.5	250	100	95	48	3.00	4.00	11.90	1505.34	122.34	33.08	1429.60	224.38	116.85	4278.37	36092.55
2.92	C 300/95/27	300	95	90	27	3.00	4.00	11.87	1502.42	147.10	23.39	1985.74	163.00	135.00	4270.07	28692.85
2.92	C 300/95/45	300	95	90	45	3.00	4.00	12.70	1607.54	147.19	27.72	2122.66	206.11	144.21	4568.83	42799.86
2.92	C 300/100/28.5	300	100	95	29	3.00	4.00	12.17	1540.38	147.13	25.52	2063.26	189.52	140.23	4377.96	33643.49
2.92	C 300/100/47.5	300	100	95	48	3.00	4.00	13.04	1651.34	147.23	30.16	2202.81	238.95	149.62	4693.32	50756.75
2.92	C 300/105/30	300	105	100	30	3.00	4.00	12.47	1578.34	147.17	27.69	2140.47	218.53	145.45	4485.84	39151.32
2.92	C 300/105/50	300	105	100	50	3.00	4.00	13.39	1695.14	147.26	32.65	2282.21	274.80	154.98	4817.81	59760.27
2.92	C 300/115/33	300	115	110	33	3.00	4.00	13.06	1654.26	147.23	32.17	2293.94	284.35	155.81	4701.62	51989.18
2.92	C 300/115/55	300	115	110	55	3.00	4.00	14.07	1782.74	147.32	37.75	2438.84	355.87	165.54	5066.78	81298.91
2.92	C 300/120/34.5	300	120	115	35	3.00	4.00	13.36	1692.22	147.26	34.46	2370.22	321.32	160.96	4809.51	59398.62
2.92	C 300/120/57.5	300	120	115	58	3.00	4.00	14.42	1826.54	147.35	40.36	2516.11	401.28	170.75	5191.26	94046.43

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 250/85/24	844.53	1038.31	76.19	122.18	124.90	27.07	52.09	84.98	83.13	28.15	14.63	110.88	30.04	5.59	0.05	2115.75	11338
2.92	C 250/85/40	977.90	1179.85	104.02	122.17	124.91	33.60	45.56	96.57	94.46	30.96	22.83	109.84	32.61	8.17	0.06	2626.22	18981
2.92	C 250/90/25.5	873.35	1079.12	89.21	122.25	124.83	29.34	54.82	88.27	86.45	30.41	16.27	111.16	31.96	5.67	0.08	2167.33	13470
2.92	C 250/90/42.5	1015.12	1226.50	121.72	122.24	124.84	36.36	47.80	100.34	98.25	33.48	25.46	109.92	34.63	8.43	0.03	2701.24	22928
2.92	C 250/95/27	901.77	1119.22	103.45	122.32	124.76	31.62	57.54	91.50	89.71	32.72	17.98	111.41	33.87	5.71	0.11	2217.50	15852
2.92	C 250/95/45	1051.93	1272.19	141.11	122.30	124.78	39.13	50.03	104.02	101.96	36.07	28.20	109.97	36.63	8.64	0.00	2774.03	27448
2.92	C 250/100/28.5	927.45	1155.10	118.91	122.69	124.39	33.87	60.29	94.15	92.86	35.11	19.72	111.60	35.81	5.68	0.44	2259.71	18500
2.92	C 250/100/47.5	1083.52	1310.27	161.75	122.72	124.36	41.80	52.36	106.77	105.36	38.70	30.89	109.97	38.64	8.71	0.38	2820.95	32488
2.92	C 300/95/27	899.10	1654.93	101.96	147.12	149.96	30.81	58.35	112.49	110.35	33.09	17.47	135.67	33.67	7.43	0.02	2187.35	22394
2.92	C 300/95/45	1049.17	1893.72	140.43	147.08	150.00	38.42	50.74	128.75	126.25	36.55	27.68	134.35	36.59	10.70	0.11	2721.53	37315
2.92	C 300/100/28.5	924.06	1706.11	117.14	147.56	149.52	33.01	61.15	115.62	114.11	35.49	19.16	135.88	35.60	7.49	0.43	2227.65	26041
2.92	C 300/100/47.5	1079.94	1949.38	160.91	147.59	149.49	41.04	53.12	132.08	130.40	39.21	30.29	134.35	38.60	10.88	0.37	2765.28	43878
2.92	C 300/105/30	944.49	1747.16	133.50	147.89	149.19	35.15	64.01	118.14	117.11	37.98	20.86	136.01	37.60	7.46	0.73	2255.08	30053
2.92	C 300/105/50	1100.66	1986.81	181.72	148.04	149.04	43.43	55.73	134.21	133.31	41.84	32.61	134.35	40.63	10.78	0.78	2777.20	50474
2.92	C 300/115/33	979.51	1815.94	170.07	148.05	149.03	39.41	69.75	122.66	121.85	43.16	24.38	136.16	41.67	7.24	0.82	2293.50	39261
2.92	C 300/115/55	1119.47	2021.93	224.56	148.45	148.63	47.67	61.49	136.20	136.04	47.11	36.52	134.39	44.79	9.92	1.13	2750.91	63422
2.92	C 300/120/34.5	993.78	1842.98	190.46	148.37	148.71	41.53	72.63	124.22	123.93	45.86	26.23	136.18	43.78	7.07	1.11	2308.05	44535
2.92	C 300/120/57.5	1125.78	2033.20	247.65	148.51	148.57	49.73	64.43	136.91	136.85	49.80	38.43	134.39	46.90	9.37	1.16	2731.98	70459

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 250/85/24	1	1149.17	104.50	121.85	125.23	20.30	58.86	94.31	91.76	51.48	17.75	95.52	28.81	1.18	3.10	3454.70	12968
2.92		2	1152.49	106.49	119.97	127.11	20.71	58.45	96.06	90.67	51.42	18.22	95.72	29.10	0.77	2.16	3471.80	12977
2.92	C 250/85/40	1	1254.54	138.45	122.69	124.39	25.23	53.93	102.25	100.85	54.88	25.67	95.97	31.88	0.20	0.46	3828.02	20414
2.92		2	1262.72	139.92	121.96	125.12	25.33	53.83	103.53	100.92	55.24	25.99	95.98	31.95	0.10	0.27	3878.32	20573
2.92	C 250/90/25.5	1	1197.99	123.44	121.43	125.65	22.28	61.88	98.65	95.35	55.40	19.95	96.17	30.87	1.38	3.47	3542.28	15485
2.92		2	1200.37	125.64	119.73	127.35	22.75	61.41	100.26	94.25	55.22	20.46	96.38	31.18	0.91	2.45	3554.12	15475
2.92	C 250/90/42.5	1	1306.71	163.00	123.00	124.08	27.62	56.54	106.24	105.31	59.03	28.83	96.45	34.07	0.32	0.73	3934.98	24738
2.92		2	1314.25	164.67	121.81	125.27	27.76	56.40	107.89	104.91	59.33	29.20	96.47	34.15	0.17	0.46	3982.24	24905
2.92	C 250/95/27	1	1246.27	144.32	121.03	126.05	24.30	64.86	102.97	98.87	59.39	22.25	96.76	32.93	1.60	3.84	3629.01	18315
2.92		2	1247.71	146.73	119.47	127.61	24.84	64.32	104.43	97.78	59.08	22.81	97.00	33.26	1.07	2.74	3635.57	18282
2.92	C 250/95/45	1	1358.06	190.01	123.30	123.78	30.04	59.12	110.14	109.72	63.25	32.14	96.88	36.24	0.44	1.00	4040.71	29707
2.92		2	1364.96	191.87	121.65	125.43	30.22	58.94	112.20	108.82	63.49	32.56	96.92	36.34	0.26	0.65	4084.87	29880
2.92	C 250/100/28.5	1	1290.92	167.20	120.34	126.74	26.29	67.87	107.27	101.86	63.59	24.64	97.23	34.99	1.90	4.49	3711.85	21491
2.92		2	1294.53	169.81	119.22	127.86	26.96	67.20	108.58	101.24	63.00	25.27	97.57	35.34	1.23	3.03	3716.22	21418
2.92	C 250/100/47.5	1	1403.66	218.89	123.02	124.06	32.34	61.82	114.10	113.15	67.68	35.41	97.19	38.38	0.74	1.72	4131.21	35204
2.92		2	1413.61	221.31	121.41	125.67	32.69	61.47	116.43	112.49	67.70	36.00	97.31	38.50	0.39	0.93	4179.09	35480
2.92	C 300/95/27	1	1896.81	149.86	146.22	150.86	21.95	67.21	129.72	125.73	68.27	22.30	114.09	32.07	1.44	3.76	3975.20	26742
2.92		2	1889.26	152.31	142.04	155.04	22.62	66.54	133.01	121.86	67.34	22.89	114.47	32.50	0.77	5.05	3950.60	26571
2.92	C 300/95/45	1	2079.67	199.86	148.19	148.89	27.29	61.87	140.33	139.68	73.24	32.30	114.77	35.58	0.43	1.00	4393.45	41673
2.92		2	2082.49	201.44	145.02	152.06	27.65	61.51	143.60	136.95	72.85	32.75	114.95	35.75	0.07	2.17	4411.66	41741
2.92	C 300/100/28.5	1	1960.71	173.64	145.51	151.57	23.83	70.33	134.75	129.36	72.87	24.69	114.72	34.14	1.69	4.44	4053.07	31244
2.92		2	1956.42	176.36	141.71	155.37	24.62	69.54	138.06	125.92	71.64	25.36	115.19	34.59	0.90	5.42	4027.58	31009
2.92	C 300/100/47.5	1	2146.67	230.52	148.15	148.93	29.51	64.65	144.90	144.14	78.13	35.66	115.23	37.76	0.65	1.70	4479.63	49173
2.92		2	2154.16	232.56	144.72	152.36	30.00	64.16	148.85	141.39	77.53	36.24	115.49	37.95	0.16	2.51	4502.66	49274
2.92	C 300/105/30	1	2020.01	199.53	144.60	152.48	25.70	73.46	139.70	132.47	77.63	27.16	115.24	36.22	1.99	5.32	4126.49	36234
2.92		2	2016.61	202.39	141.08	156.00	26.63	72.53	142.94	129.27	76.01	27.90	115.81	36.69	1.07	6.08	4095.14	35905
2.92	C 300/105/50	1	2199.92	261.99	146.72	150.36	31.51	67.65	149.94	146.31	83.14	38.73	115.53	39.87	1.14	3.10	4548.17	56846
2.92		2	2212.12	264.40	143.81	153.27	32.22	66.94	153.82	144.33	82.06	39.50	115.96	40.09	0.43	3.45	4565.50	56878
2.92	C 300/115/33	1	2129.50	258.23	142.51	154.57	29.50	79.66	149.42	137.77	87.54	32.42	116.07	40.42	2.67	7.34	4269.49	47845
2.92		2	2123.21	260.78	139.36	157.72	30.73	78.43	152.35	134.62	84.86	33.25	116.81	40.94	1.44	7.87	4213.52	47195
2.92	C 300/115/55	1	2296.03	332.20	143.69	153.39	35.52	73.64	159.79	149.69	93.51	45.11	115.95	44.10	2.22	6.06	4678.30	74476
2.92		2	2298.13	334.15	140.97	156.11	36.67	72.49	163.02	147.21	91.11	46.10	116.56	44.45	1.07	6.35	4655.08	74011
2.92	C 300/120/34.5	1	2179.43	291.20	141.34	155.74	31.42	82.74	154.20	139.94	92.69	35.19	116.38	42.54	3.05	8.48	4339.41	54541
2.92		2	2168.45	293.31	138.24	158.84	32.82	81.34	156.86	136.52	89.36	36.06	117.18	43.10	1.64	9.02	4266.72	53676
2.92	C 300/120/57.5	1	2340.54	371.08	142.18	154.90	37.55	76.61	164.61	151.10	98.83	48.43	116.09	46.23	2.81	7.54	4741.57	84506
2.92		2	2336.72	372.52	139.50	157.58	38.94	75.22	167.50	148.29	95.68	49.52	116.79	46.63	1.42	7.85	4696.79	83719

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
2.92	C 330/105/30	330	105	100	30	3.00	4.00	13.16	1665.94	162.11	26.24	2679.56	224.89	165.30	4734.82	48154.88
2.92	C 330/105/50	330	105	100	50	3.00	4.00	14.07	1782.74	162.20	31.04	2862.47	283.68	176.48	5066.78	71804.60
2.92	C 330/115/33	330	115	110	33	3.00	4.00	13.75	1741.86	162.17	30.55	2867.00	292.96	176.79	4950.59	63741.84
2.92	C 330/115/55	330	115	110	55	3.00	4.00	14.76	1870.34	162.26	35.98	3055.64	367.77	188.31	5315.75	97078.77
2.92	C 330/125/36	330	125	120	36	3.00	4.00	14.35	1817.78	162.23	35.02	3053.04	372.38	188.20	5166.37	82513.17
2.92	C 330/125/60	330	125	120	60	3.00	4.00	15.45	1957.94	162.32	41.07	3245.60	465.51	199.95	5564.72	128473.24
2.92	C 350/105/30	350	105	100	30	3.00	4.00	13.61	1724.34	172.07	25.35	3080.36	228.78	179.02	4900.80	54785.09
2.92	C 350/105/50	350	105	100	50	3.00	4.00	14.53	1841.14	172.16	30.06	3293.64	289.13	191.31	5232.76	80638.37
2.92	C 350/115/33	350	115	110	33	3.00	4.00	14.21	1800.26	172.13	29.56	3292.33	298.24	191.27	5116.57	72393.18
2.92	C 350/115/55	350	115	110	55	3.00	4.00	15.22	1928.74	172.23	34.89	3513.36	375.10	204.00	5481.73	108641.79
2.92	C 350/125/36	350	125	120	36	3.00	4.00	14.81	1876.18	172.19	33.93	3502.81	379.32	203.43	5332.35	93541.10
2.92	C 350/125/60	350	125	120	60	3.00	4.00	15.91	2016.34	172.28	39.88	3729.57	475.08	216.48	5730.70	143265.97
2.92	C 350/135/39	350	135	130	39	3.00	4.00	15.40	1952.10	172.24	38.44	3711.83	472.67	215.50	5548.12	118640.66
2.92	C 350/135/65	350	135	130	65	3.00	4.00	16.59	2103.94	172.34	45.02	3942.43	589.79	228.76	5979.67	185580.21
2.92	C 400/125/36	400	125	120	36	3.00	4.00	15.95	2022.18	197.11	31.48	4793.96	394.91	243.22	5747.30	124854.85
2.92	C 400/125/60	400	125	120	60	3.00	4.00	17.05	2162.34	197.20	37.19	5118.49	496.74	259.56	6145.65	185025.61
2.92	C 400/135/39	400	135	130	39	3.00	4.00	16.55	2098.10	197.16	35.76	5070.45	492.74	257.18	5963.07	157767.04
2.92	C 400/135/65	400	135	130	65	3.00	4.00	17.74	2249.94	197.25	42.10	5403.92	617.45	273.96	6394.62	237933.44

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.92	C 330/105/30	941.43	2137.03	132.19	162.85	164.23	34.67	64.49	131.23	130.13	38.13	20.50	150.66	37.47	8.43	0.75	2236.02	35878
2.92	C 330/105/50	1098.89	2441.12	181.26	162.95	164.13	43.07	56.09	149.81	148.73	42.09	32.31	149.04	40.61	12.02	0.75	2747.79	59447
2.92	C 330/115/33	975.63	2219.34	168.30	163.03	164.05	38.86	70.30	136.13	135.28	43.31	23.94	150.82	41.53	8.30	0.86	2272.81	46714
2.92	C 330/115/55	1117.73	2484.38	223.87	163.46	163.62	47.26	61.90	151.99	151.84	47.37	36.16	149.09	44.75	11.28	1.20	2722.08	74553
2.92	C 330/125/36	1002.13	2280.41	209.96	163.42	163.66	43.04	76.12	139.54	139.34	48.78	27.58	150.85	45.77	8.02	1.20	2298.59	59626
2.92	C 330/125/60	1128.85	2508.59	270.83	163.50	163.58	51.29	67.87	153.43	153.36	52.81	39.90	149.07	48.98	10.21	1.26	2682.88	91377
2.92	C 350/105/30	939.25	2418.35	131.31	172.83	174.25	34.37	64.79	139.93	138.78	38.21	20.27	160.46	37.39	9.02	0.76	2223.90	40023
2.92	C 350/105/50	1097.46	2769.69	180.90	172.90	174.18	42.84	56.32	160.19	159.01	42.22	32.12	158.86	40.60	12.79	0.74	2728.87	65849
2.92	C 350/115/33	972.93	2510.18	167.11	173.01	174.07	38.51	70.65	145.09	144.21	43.39	23.65	160.62	41.44	8.95	0.88	2259.71	52009
2.92	C 350/115/55	1116.36	2819.00	223.35	173.47	173.61	47.00	62.16	162.51	162.37	47.52	35.93	158.91	44.73	12.11	1.24	2703.62	82487
2.92	C 350/125/36	999.73	2580.64	208.36	173.42	173.66	42.65	76.51	148.81	148.61	48.85	27.23	160.67	45.65	8.72	1.23	2285.26	66237
2.92	C 350/125/60	1127.26	2845.93	270.10	173.49	173.59	51.00	68.16	164.04	163.94	52.96	39.63	158.89	48.95	11.12	1.31	2664.64	100996
2.92	C 350/135/39	1020.23	2631.47	255.40	173.52	173.56	46.79	82.37	151.65	151.62	54.58	31.01	160.60	50.03	8.36	1.28	2302.96	82953
2.92	C 350/135/65	1134.04	2861.85	321.01	173.40	173.68	54.85	74.31	165.05	164.77	58.53	43.20	158.86	53.20	9.83	1.35	2621.16	121335
2.92	C 400/125/36	993.36	3409.67	204.34	198.43	198.65	41.76	77.40	171.83	171.64	48.93	26.40	185.27	45.35	10.28	1.32	2254.15	84083
2.92	C 400/125/60	1122.80	3780.94	268.12	198.45	198.63	50.35	68.81	190.52	190.35	53.25	38.96	183.51	48.87	13.16	1.43	2621.66	127144
2.92	C 400/135/39	1013.24	3475.98	250.27	198.53	198.55	45.79	83.37	175.08	175.07	54.66	30.02	185.22	49.70	10.02	1.39	2271.11	104887
2.92	C 400/135/65	1129.04	3800.40	318.32	198.34	198.74	54.11	75.05	191.61	191.23	58.83	42.41	183.47	53.10	12.01	1.48	2579.18	152415

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 330/105/30	1	2492.50	201.65	161.31	165.77	24.76	74.40	154.52	150.36	81.44	27.10	126.03	35.85	1.48	3.67	4256.56	43682
2.92		2	2480.90	204.76	152.93	174.15	25.71	73.45	162.23	142.45	79.65	27.88	126.56	36.36	0.53	9.18	4216.53	43244
2.92	C 330/105/50	1	2722.08	266.02	163.47	163.61	30.50	68.66	166.51	166.38	87.23	38.74	126.67	39.60	0.55	1.41	4673.36	67321
2.92		2	2731.33	268.58	156.07	171.01	31.23	67.93	175.01	159.72	86.01	39.54	127.09	39.85	0.19	6.13	4683.61	67293
2.92	C 330/115/33	1	2627.97	261.06	159.03	168.05	28.45	80.71	165.25	156.38	91.75	32.35	127.01	40.03	2.10	5.88	4399.79	57494
2.92		2	2610.61	263.93	151.17	175.91	29.70	79.46	172.69	148.41	88.86	33.22	127.69	40.60	0.85	11.00	4333.84	56672
2.92	C 330/115/55	1	2841.75	337.39	160.13	166.95	34.41	74.75	177.47	170.21	98.05	45.13	127.20	43.83	1.57	4.69	4804.90	87878
2.92		2	2836.52	339.57	153.08	174.00	35.59	73.57	185.30	163.02	95.42	46.15	127.78	44.21	0.40	9.19	4772.77	87228
2.92	C 330/125/36	1	2749.26	330.36	156.44	170.64	32.20	86.96	175.74	161.12	102.59	37.99	127.71	44.27	2.82	8.41	4539.33	74109
2.92		2	2718.11	332.23	148.81	178.27	33.82	85.34	182.66	152.47	98.24	38.93	128.50	44.93	1.20	13.42	4437.98	72731
2.92	C 330/125/60	1	2950.19	419.08	156.80	170.28	38.36	80.80	188.14	173.26	109.26	51.86	127.53	48.06	2.72	7.96	4932.20	112159
2.92		2	2927.04	420.03	149.94	177.14	40.03	79.13	195.22	165.23	104.92	53.08	128.26	48.59	1.04	12.38	4853.73	110637
2.92	C 350/105/30	1	2838.51	202.91	172.60	174.48	24.17	74.99	164.45	162.69	83.94	27.06	133.17	35.60	1.18	2.41	4342.36	49062
2.92		2	2819.53	206.19	160.66	186.42	25.13	74.03	175.50	151.25	82.05	27.85	133.65	36.14	0.22	11.41	4296.71	48540
2.92	C 350/105/50	1	3104.63	268.50	172.29	174.79	29.86	69.30	180.20	177.62	89.90	38.75	134.03	39.42	0.19	0.12	4755.97	74876
2.92		2	3110.68	271.17	164.08	183.00	30.61	68.55	189.58	169.98	88.59	39.56	134.43	39.69	0.55	8.08	4761.64	74801
2.92	C 350/115/33	1	2992.98	262.75	170.20	176.88	27.80	81.36	175.85	169.21	94.51	32.30	134.24	39.77	1.76	4.75	4485.69	64455
2.92		2	2964.98	265.85	158.86	188.22	29.06	80.10	186.64	157.53	91.48	33.19	134.85	40.38	0.50	13.27	4412.90	63506
2.92	C 350/115/55	1	3241.66	340.58	171.24	175.84	33.71	75.45	189.30	184.35	101.03	45.14	134.63	43.64	1.18	3.61	4888.39	97534
2.92		2	3229.66	342.92	161.00	186.08	34.90	74.26	200.60	173.57	98.25	46.18	135.18	44.05	0.01	11.22	4850.54	96747
2.92	C 350/125/36	1	3131.12	332.58	167.45	179.63	31.48	87.68	186.99	174.31	105.63	37.93	135.02	44.00	2.45	7.44	4625.62	82937
2.92		2	3086.76	334.72	156.46	190.62	33.11	86.05	197.28	161.94	101.09	38.90	135.73	44.70	0.82	15.73	4516.73	81360
2.92	C 350/125/60	1	3366.06	423.09	167.71	179.37	37.60	81.56	200.71	187.66	112.54	51.87	135.03	47.87	2.29	7.09	5016.73	124222
2.92		2	3331.28	424.24	157.73	189.35	39.29	79.87	211.20	175.93	107.98	53.12	135.70	48.43	0.59	14.56	4930.61	122435
2.92	C 350/135/39	1	3261.04	412.85	164.72	182.36	35.25	93.91	197.98	178.82	117.12	43.96	135.62	48.26	3.19	10.12	4762.40	104751
2.92		2	3198.30	413.27	153.97	193.11	37.28	91.88	207.72	165.62	110.84	44.98	136.44	49.04	1.16	18.27	4616.20	102363
2.92	C 350/135/65	1	3479.22	516.52	164.24	182.84	41.52	87.64	211.84	190.28	124.40	58.94	135.24	52.11	3.50	10.51	5142.51	155272
2.92		2	3421.12	515.50	154.44	192.64	43.77	85.39	221.51	177.60	117.78	60.37	136.03	52.81	1.25	17.89	5007.69	152186
2.92	C 400/125/36	1	4208.26	337.44	195.49	201.59	29.84	89.32	215.27	208.75	113.09	37.78	153.08	43.35	1.64	4.48	4838.96	107318
2.92		2	4118.93	340.26	175.12	221.96	31.48	87.68	235.20	185.57	108.10	38.81	153.52	44.12	0.01	21.98	4712.17	105159
2.92	C 400/125/60	1	4540.57	432.15	195.47	201.61	35.84	83.32	232.29	225.21	120.58	51.87	153.57	47.38	1.35	4.41	5225.72	157504
2.92		2	4465.61	433.84	176.76	220.32	37.56	81.60	252.63	202.69	115.49	53.17	154.04	48.01	0.37	20.44	5121.55	154963
2.92	C 400/135/39	1	4383.35	419.08	192.36	204.72	33.45	95.71	227.87	214.12	125.29	43.79	153.87	47.58	2.31	7.56	4976.82	135057
2.92		2	4263.64	420.32	172.45	224.63	35.49	93.67	247.23	189.81	118.42	44.87	154.35	48.46	0.27	24.70	4809.76	131844
2.92	C 400/135/65	1	4695.77	527.70	191.49	205.59	39.62	89.54	245.22	228.40	133.20	58.93	153.93	51.60	2.48	8.34	5354.14	196009
2.92		2	4581.65	527.31	173.15	223.93	41.90	87.26	264.61	204.60	125.85	60.43	154.45	52.40	0.20	24.10	5196.67	191704

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section								
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
2.92	C 400/145/42	400	145	140	42	3.00	4.00	17.14	2174.02	197.21	40.18	5345.23	604.16	271.05	6178.85	196224.59
2.92	C 400/145/70	400	145	140	70	3.00	4.00	18.43	2337.54	197.30	47.13	5685.40	754.53	288.16	6643.59	301356.94
2.92	C 400/155/45	400	155	150	45	3.00	4.00	17.74	2249.94	197.25	44.71	5618.36	729.81	284.83	6394.62	240779.87
2.92	C 400/155/75	400	155	150	75	3.00	4.00	19.12	2425.14	197.34	52.28	5963.09	908.68	302.17	6892.56	376747.16
3.92	C 200/67/24	200	67	60	24	4.00	4.00	10.74	1353.79	96.05	16.71	774.10	69.96	80.59	6934.30	5646.37
3.92	C 200/67/36	200	67	60	36	4.00	4.00	11.48	1447.87	96.18	19.50	820.35	86.24	85.29	7416.19	8378.71
3.92	C 200/72/26	200	72	65	26	4.00	4.00	11.17	1408.67	96.13	19.03	820.62	87.55	85.37	7215.40	7249.07
3.92	C 200/72/39	200	72	65	39	4.00	4.00	11.97	1510.59	96.26	22.10	867.24	107.40	90.09	7737.45	10950.00
3.92	C 200/77/28	200	77	70	28	4.00	4.00	11.60	1463.55	96.20	21.40	866.68	107.62	90.09	7496.50	9153.40
3.92	C 200/77/42	200	77	70	42	4.00	4.00	12.47	1573.31	96.33	24.77	913.26	131.45	94.81	8058.71	14084.27
3.92	C 200/82/30	200	82	75	30	4.00	4.00	12.03	1518.43	96.27	23.84	912.28	130.26	94.76	7777.61	11396.21
3.92	C 200/82/45	200	82	75	45	4.00	4.00	12.96	1636.03	96.40	27.49	958.47	158.50	99.43	8379.97	17870.29
3.92	C 220/72/26	220	72	65	26	4.00	4.00	11.79	1487.07	106.05	18.02	1031.26	90.24	97.25	7616.98	8855.98
3.92	C 220/72/39	220	72	65	39	4.00	4.00	12.59	1588.99	106.17	21.01	1092.66	111.04	102.91	8139.02	13052.51
3.92	C 220/77/28	220	77	70	28	4.00	4.00	12.22	1541.95	106.12	20.32	1087.84	111.02	102.51	7898.08	11142.36
3.92	C 220/77/42	220	77	70	42	4.00	4.00	13.08	1651.71	106.25	23.59	1149.80	136.03	108.22	8460.28	16690.82
3.92	C 220/82/30	220	82	75	30	4.00	4.00	12.65	1596.83	106.18	22.67	1143.91	134.50	107.73	8179.18	13821.48
3.92	C 220/82/45	220	82	75	45	4.00	4.00	13.57	1714.43	106.31	26.23	1205.98	164.15	113.44	8781.54	21054.60

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.92	C 400/145/42	1028.60	3524.54	300.72	198.50	198.58	49.69	89.47	177.56	177.48	60.51	33.61	185.11	54.07	9.52	1.38	2277.31	128331
2.92	C 400/145/70	1132.03	3808.41	372.30	198.26	198.82	57.71	81.45	192.09	191.55	64.52	45.71	183.42	57.35	10.58	1.52	2535.06	179799
2.92	C 400/155/45	1032.63	3531.22	350.75	198.40	198.68	52.91	96.25	177.99	177.73	66.28	36.44	184.92	58.28	8.21	1.43	2254.46	152326
2.92	C 400/155/75	1132.40	3807.25	429.77	198.19	198.89	61.14	88.02	192.10	191.43	70.29	48.83	183.36	61.61	8.86	1.54	2490.89	209171
3.92	C 200/67/24	1162.02	770.19	63.72	95.72	100.36	19.47	39.69	80.46	76.75	32.72	16.06	81.41	23.42	2.76	0.33	5952.03	5615.08
3.92	C 200/67/36	1256.10	816.45	77.84	95.90	100.18	22.48	36.68	85.14	81.50	34.63	21.22	80.62	24.89	2.98	0.28	6433.92	8335.81
3.92	C 200/72/26	1216.69	816.55	79.49	95.84	100.24	22.02	42.14	85.19	81.46	36.10	18.86	81.92	25.56	2.99	0.29	6229.96	7208.29
3.92	C 200/72/39	1318.82	863.34	96.68	96.00	100.08	25.31	38.85	89.93	86.27	38.19	24.89	80.91	27.07	3.21	0.26	6755.18	10897
3.92	C 200/77/28	1269.35	860.78	97.13	96.10	99.98	24.56	44.60	89.57	86.09	39.55	21.78	82.35	27.66	3.16	0.10	6477.27	9079.48
3.92	C 200/77/42	1381.54	909.37	118.05	96.09	99.99	28.20	40.96	94.64	90.95	41.86	28.82	81.13	29.23	3.44	0.24	7076.44	14020
3.92	C 200/82/30	1321.76	904.37	116.95	96.35	99.73	27.15	47.01	93.87	90.68	43.08	24.88	82.72	29.75	3.30	0.08	6721.48	11276
3.92	C 200/82/45	1444.26	954.59	142.08	96.18	99.90	31.14	43.02	99.25	95.55	45.62	33.03	81.30	31.36	3.65	0.22	7397.70	17793
3.92	C 220/72/26	1228.45	1019.70	79.86	105.82	110.26	21.71	42.45	96.36	92.48	36.79	18.81	91.11	25.50	3.69	0.23	6269.39	8745.18
3.92	C 220/72/39	1332.65	1083.42	97.55	105.82	110.26	25.05	39.11	102.39	98.26	38.94	24.94	90.17	27.06	4.04	0.36	6825.99	12936
3.92	C 220/77/28	1280.92	1073.86	97.61	106.10	109.98	24.23	44.93	101.21	97.64	40.28	21.72	91.56	27.60	3.91	0.02	6514.49	10976
3.92	C 220/77/42	1395.37	1140.57	119.14	105.92	110.16	27.92	41.24	107.69	103.53	42.67	28.89	90.41	29.22	4.33	0.33	7147.26	16549
3.92	C 220/82/30	1331.73	1125.76	117.36	106.27	109.81	26.76	47.40	105.94	102.52	43.86	24.76	91.94	29.69	4.08	0.09	6735.06	13555
3.92	C 220/82/45	1458.09	1196.76	143.41	106.01	110.07	30.85	43.31	112.89	108.72	46.49	33.11	90.60	31.36	4.61	0.30	7468.52	20885

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																		
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	C 400/145/42	1	4542.86	510.72	189.09	207.99	37.06	102.10	240.25	218.41	137.82	50.02	154.44	51.78	3.12	10.79	5107.32	166829
2.92	C 400/145/42	2	4387.32	509.15	169.47	227.61	39.56	99.60	258.89	192.75	128.71	51.12	154.94	52.78	0.62	27.74	4894.32	162062
2.92	C 400/145/70	1	4837.66	634.89	187.60	209.48	43.43	95.73	257.87	230.94	146.18	66.32	154.11	55.83	3.70	12.18	5481.26	240065
2.92	C 400/145/70	2	4684.14	631.26	169.55	227.53	46.32	92.84	276.27	205.87	136.27	68.00	154.68	56.78	0.81	27.75	5270.61	233567
2.92	C 400/155/45	1	4679.97	610.81	185.47	211.61	40.55	108.61	252.33	221.16	150.64	56.24	154.74	55.90	4.16	14.36	5226.80	202068
2.92	C 400/155/45	2	4486.03	605.75	166.08	231.00	43.61	105.55	270.11	194.20	138.90	57.39	155.28	57.06	1.10	31.17	4964.45	195412
2.92	C 400/155/75	1	4967.43	754.20	183.83	213.25	47.29	101.87	270.23	232.93	159.49	74.03	154.15	60.07	5.00	15.91	5607.71	290000
2.92	C 400/155/75	2	4774.60	745.96	165.99	231.09	50.83	98.33	287.64	206.61	146.74	75.87	154.75	61.17	1.45	31.35	5344.50	280868
3.92	C 200/67/24	1	768.79	69.53	95.38	100.70	16.91	42.25	80.60	76.35	41.13	16.46	75.79	22.79	0.19	0.67	6855.92	5604
3.92	C 200/67/24	2	774.10	69.96	96.05	100.03	16.71	42.45	80.59	77.39	41.86	16.48	75.62	22.73	0.00	0.00	6934.30	5646
3.92	C 200/67/36	1	815.40	85.69	95.60	100.48	19.69	39.47	85.29	81.15	43.51	21.71	75.42	24.45	0.19	0.58	7342.90	8324
3.92	C 200/67/36	2	820.35	86.24	96.18	99.90	19.50	39.66	85.29	82.12	44.23	21.74	75.27	24.41	0.00	0.00	7416.19	8379
3.92	C 200/72/26	1	815.52	87.02	95.51	100.57	19.23	44.93	85.38	81.09	45.26	19.37	76.49	24.98	0.20	0.62	7140.08	7198
3.92	C 200/72/26	2	820.62	87.55	96.13	99.95	19.03	45.13	85.37	82.10	46.02	19.40	76.32	24.93	0.00	0.00	7215.40	7249
3.92	C 200/72/39	1	862.50	106.73	95.72	100.36	22.30	41.86	90.10	85.94	47.86	25.50	75.91	26.70	0.20	0.54	7667.21	10885
3.92	C 200/72/39	2	867.24	107.40	96.26	99.82	22.10	42.06	90.09	86.88	48.60	25.54	75.77	26.66	0.00	0.00	7737.45	10950
3.92	C 200/77/28	1	861.78	106.96	95.63	100.45	21.61	47.55	90.12	85.79	49.49	22.50	77.11	27.17	0.21	0.57	7424.00	9093
3.92	C 200/77/28	2	866.68	107.62	96.20	99.88	21.40	47.76	90.09	86.77	50.28	22.53	76.95	27.12	0.00	0.00	7496.50	9153
3.92	C 200/77/42	1	908.72	130.63	95.84	100.24	24.97	44.19	94.82	90.65	52.31	29.56	76.32	28.94	0.21	0.49	7991.27	14008
3.92	C 200/77/42	2	913.26	131.45	96.33	99.75	24.77	44.39	94.81	91.56	53.08	29.61	76.19	28.90	0.00	0.00	8058.71	14084
3.92	C 200/82/30	1	907.56	129.47	95.74	100.34	24.06	50.10	94.80	90.45	53.81	25.84	77.66	29.33	0.22	0.53	7707.73	11327
3.92	C 200/82/30	2	912.28	130.26	96.27	99.81	23.84	50.32	94.76	91.40	54.63	25.89	77.51	29.29	0.00	0.00	7777.61	11396
3.92	C 200/82/45	1	954.11	157.53	95.94	100.14	27.71	46.45	99.45	95.28	56.86	33.91	76.66	31.15	0.21	0.46	8315.11	17783
3.92	C 200/82/45	2	958.47	158.50	96.40	99.68	27.49	46.67	99.43	96.15	57.65	33.96	76.54	31.13	0.00	0.00	8379.97	17870
3.92	C 220/72/26	1	1024.78	89.74	105.37	110.71	18.21	45.95	97.25	92.57	49.28	19.53	83.45	24.69	0.19	0.67	7538.21	8795
3.92	C 220/72/26	2	1031.26	90.24	106.05	110.03	18.02	46.14	97.25	93.72	50.07	19.56	83.28	24.63	0.00	0.00	7616.98	8856
3.92	C 220/72/39	1	1086.61	110.40	105.58	110.50	21.20	42.96	102.91	98.34	52.07	25.70	83.07	26.48	0.19	0.59	8065.31	12975
3.92	C 220/72/39	2	1092.66	111.04	106.17	109.91	21.01	43.15	102.91	99.42	52.86	25.73	82.92	26.44	0.00	0.00	8139.02	13053
3.92	C 220/77/28	1	1081.60	110.41	105.49	110.59	20.51	48.65	102.53	97.80	53.82	22.70	84.16	26.89	0.20	0.63	7822.12	11071
3.92	C 220/77/28	2	1087.84	111.02	106.12	109.96	20.32	48.84	102.51	98.93	54.65	22.73	83.99	26.83	0.00	0.00	7898.08	11142
3.92	C 220/77/42	1	1143.99	135.25	105.70	110.38	23.79	45.37	108.23	103.64	56.85	29.81	83.57	28.74	0.20	0.55	8389.37	16600
3.92	C 220/77/42	2	1149.80	136.03	106.25	109.83	23.59	45.57	108.22	104.68	57.66	29.85	83.43	28.70	0.00	0.00	8460.28	16691
3.92	C 220/82/30	1	1137.89	133.75	105.60	110.48	22.88	51.28	107.76	102.99	58.46	26.08	84.80	29.07	0.21	0.58	8105.83	13738
3.92	C 220/82/30	2	1143.91	134.50	106.18	109.90	22.67	51.49	107.73	104.09	59.32	26.12	84.64	29.02	0.00	0.00	8179.18	13821
3.92	C 220/82/45	1	1200.39	163.23	105.81	110.27	26.44	47.72	113.45	108.85	61.74	34.20	84.00	30.98	0.21	0.51	8713.23	20949
3.92	C 220/82/45	2	1205.98	164.15	106.31	109.77	26.23	47.93	113.44	109.87	62.57	34.25	83.87	30.94	0.00	0.00	8781.54	21055

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
3.92	C 220/87/32	220	87	80	32	4.00	4.00	13.08	1651.71	106.25	25.09	1199.47	160.77	112.90	8460.28	16937.05
3.92	C 220/87/48	220	87	80	48	4.00	4.00	14.07	1777.15	106.37	28.93	1261.24	195.55	118.57	9102.80	26248.10
3.92	C 250/82/22.5	250	82	75	23	4.00	4.00	13.11	1655.63	121.00	19.22	1494.34	122.65	123.50	8480.36	14579.43
3.92	C 250/82/37.5	250	82	75	38	4.00	4.00	14.03	1773.23	121.14	22.89	1600.74	156.45	132.14	9082.73	21982.63
3.92	C 250/87/24	250	87	80	24	4.00	4.00	13.51	1706.59	121.06	21.36	1565.88	147.10	129.35	8741.39	17681.46
3.92	C 250/87/40	250	87	80	40	4.00	4.00	14.50	1832.03	121.20	25.34	1674.68	186.86	138.18	9383.91	27010.26
3.92	C 250/92/25.5	250	92	85	26	4.00	4.00	13.91	1757.55	121.12	23.55	1637.06	174.32	135.16	9002.41	21208.34
3.92	C 250/92/42.5	250	92	85	43	4.00	4.00	14.96	1890.83	121.25	27.85	1747.79	220.63	144.14	9685.09	32843.16
3.92	C 250/97/27	250	97	90	27	4.00	4.00	14.31	1808.51	121.17	25.79	1707.89	204.43	140.95	9263.43	25194.47
3.92	C 250/97/45	250	97	90	45	4.00	4.00	15.42	1949.63	121.31	30.41	1820.10	257.88	150.04	9986.27	39571.17
3.92	C 250/102/28.5	250	102	95	29	4.00	4.00	14.71	1859.47	121.22	28.08	1778.37	237.53	146.70	9524.46	29676.05
3.92	C 250/102/47.5	250	102	95	48	4.00	4.00	15.88	2008.43	121.36	33.01	1891.61	298.71	155.87	10287.45	47291.49
3.92	C 300/97/27	300	97	90	27	4.00	4.00	15.85	2004.51	146.01	23.27	2628.52	216.19	180.02	10267.37	37488.46
3.92	C 300/97/45	300	97	90	45	4.00	4.00	16.96	2145.63	146.15	27.63	2812.35	274.34	192.43	10990.21	56155.14
3.92	C 300/102/28.5	300	102	95	29	4.00	4.00	16.25	2055.47	146.06	25.40	2732.02	251.51	187.04	10528.40	43999.73
3.92	C 300/102/47.5	300	102	95	48	4.00	4.00	17.42	2204.43	146.20	30.07	2919.38	318.17	199.69	11291.39	66647.17
3.92	C 300/107/30	300	107	100	30	4.00	4.00	16.65	2106.43	146.11	27.57	2835.10	290.16	194.04	10789.42	51247.21
3.92	C 300/107/50	300	107	100	50	4.00	4.00	17.88	2263.23	146.25	32.56	3025.40	366.02	206.87	11592.57	78524.58

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 220/87/32	1381.12	1175.72	139.20	106.35	109.73	29.29	49.87	110.55	107.15	47.52	27.91	92.26	31.75	4.20	0.11	6935.34	16517
3.92	C 220/87/48	1520.81	1252.02	170.47	106.09	109.99	33.81	45.35	118.01	113.83	50.42	37.59	90.73	33.48	4.88	0.28	7789.78	26047
3.92	C 250/82/22.5	1253.82	1406.60	98.53	121.08	125.00	23.18	50.98	116.17	112.53	42.51	19.33	105.92	28.03	3.96	0.08	6037.74	13417
3.92	C 250/82/37.5	1415.75	1575.80	132.99	120.66	125.42	28.67	45.49	130.60	125.64	46.38	29.23	105.50	30.65	5.78	0.48	7251.66	21618
3.92	C 250/87/24	1296.72	1467.00	117.02	121.18	124.90	25.42	53.74	121.06	117.45	46.03	21.78	106.36	30.04	4.07	0.11	6195.19	16162
3.92	C 250/87/40	1472.93	1647.73	158.05	120.87	125.21	31.44	47.72	136.32	131.60	50.27	33.12	105.77	32.76	6.10	0.32	7528.09	26535
3.92	C 250/92/25.5	1339.15	1526.46	137.42	121.26	124.82	27.69	56.47	125.88	122.30	49.63	24.34	106.76	32.03	4.14	0.14	6348.23	19258
3.92	C 250/92/42.5	1529.06	1717.53	185.60	121.15	124.93	34.22	49.94	141.77	137.48	54.23	37.17	105.98	34.84	6.38	0.11	7789.01	32207
3.92	C 250/97/27	1381.11	1585.02	159.79	121.34	124.74	29.98	59.18	130.62	127.07	53.30	27.00	107.13	34.01	4.19	0.17	6497.16	22730
3.92	C 250/97/45	1584.01	1785.04	215.73	121.35	124.73	37.01	52.15	147.10	143.11	58.28	41.37	106.16	36.90	6.61	0.04	8032.49	38695
3.92	C 250/102/28.5	1422.64	1642.72	184.19	121.42	124.66	32.29	61.87	135.30	131.77	57.05	29.77	107.46	35.98	4.21	0.19	6642.23	26601
3.92	C 250/102/47.5	1636.84	1849.12	248.32	121.42	124.66	39.78	54.38	152.29	148.34	62.42	45.67	106.29	38.95	6.77	0.06	8244.78	46033
3.92	C 300/97/27	1388.54	2376.58	158.71	146.06	150.02	29.15	60.01	162.71	158.42	54.45	26.45	130.83	33.81	5.88	0.05	6459.20	32673
3.92	C 300/97/45	1591.34	2690.70	215.99	146.06	150.02	36.23	52.93	184.22	179.35	59.62	40.80	130.03	36.84	8.60	0.09	7949.24	53368
3.92	C 300/102/28.5	1429.22	2459.60	182.93	146.15	149.93	31.40	62.76	168.30	164.05	58.25	29.15	131.18	35.78	6.01	0.08	6598.16	38103
3.92	C 300/102/47.5	1643.33	2785.22	248.61	146.14	149.94	38.95	55.21	190.59	185.76	63.82	45.03	130.19	38.90	8.88	0.06	8152.35	63063
3.92	C 300/107/30	1469.46	2541.45	209.20	146.23	149.85	33.67	65.49	173.80	169.59	62.12	31.94	131.51	37.73	6.10	0.11	6733.76	44100
3.92	C 300/107/50	1694.89	2878.12	284.02	146.22	149.86	41.70	57.46	196.84	192.05	68.12	49.43	130.31	40.94	9.13	0.03	8350.50	73982

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 220/87/32	1	1193.06	159.75	105.76	110.32	25.27	53.89	112.81	108.14	63.21	29.65	85.36	31.23	0.19	0.49	8379.63	16830
3.92		2	1199.47	160.77	106.25	109.83	25.09	54.07	112.90	109.21	64.09	29.73	85.22	31.20	0.00	0.00	8460.28	16937
3.92	C 220/87/48	1	1255.86	194.46	105.90	110.18	29.14	50.02	118.59	113.98	66.72	38.88	84.37	33.20	0.21	0.47	9036.90	26128
3.92		2	1261.24	195.55	106.37	109.71	28.93	50.23	118.57	114.96	67.58	38.93	84.24	33.17	0.00	0.00	9102.80	26248
3.92	C 250/82/22.5	1	1467.72	118.70	121.89	124.19	18.84	55.32	120.41	118.18	63.01	21.46	94.82	26.97	0.38	0.89	8210.70	14231
3.92		2	1482.87	121.30	120.43	125.65	19.03	55.13	123.13	118.02	63.74	22.00	94.86	27.13	0.19	0.57	8365.57	14395
3.92	C 250/82/37.5	1	1592.71	155.67	120.52	125.56	23.08	51.08	132.15	126.85	67.44	30.48	95.17	29.75	0.19	0.62	9007.35	21863
3.92		2	1600.74	156.45	121.14	124.94	22.89	51.27	132.14	128.12	68.34	30.52	95.01	29.70	0.00	0.00	9082.73	21983
3.92	C 250/87/24	1	1535.77	142.00	122.24	123.84	20.86	58.30	125.64	124.01	68.09	24.35	95.55	29.05	0.50	1.18	8437.35	17223
3.92		2	1549.97	145.01	120.29	125.79	21.09	58.07	128.85	123.22	68.76	24.97	95.60	29.24	0.27	0.77	8583.30	17393
3.92	C 250/87/40	1	1666.92	185.94	120.62	125.46	25.54	53.62	138.19	132.87	72.80	34.68	95.76	31.98	0.20	0.58	9310.95	26872
3.92		2	1674.68	186.86	121.20	124.88	25.34	53.82	138.18	134.10	73.74	34.72	95.61	31.94	0.00	0.00	9383.91	27010
3.92	C 250/92/25.5	1	1603.15	167.88	122.58	123.50	22.92	61.24	130.78	129.81	73.26	27.41	96.22	31.14	0.63	1.46	8661.57	20616
3.92		2	1616.38	171.31	120.15	125.93	23.19	60.97	134.54	128.35	73.87	28.10	96.29	31.35	0.36	0.97	8798.40	20788
3.92	C 250/92/42.5	1	1740.28	219.55	120.71	125.37	28.05	56.11	144.17	138.82	78.26	39.13	96.29	34.20	0.20	0.54	9614.40	32686
3.92		2	1747.79	220.63	121.25	124.83	27.85	56.31	144.14	140.02	79.22	39.18	96.14	34.16	0.00	0.00	9685.09	32843
3.92	C 250/97/27	1	1669.88	196.44	122.92	123.16	25.01	64.15	135.85	135.59	78.54	30.62	96.84	33.21	0.77	1.75	8883.47	24439
3.92		2	1682.13	200.31	119.99	126.09	25.34	63.82	140.19	133.41	79.06	31.38	96.92	33.44	0.45	1.18	9011.07	24609
3.92	C 250/97/45	1	1812.82	256.63	120.80	125.28	30.62	58.54	150.07	144.70	83.82	43.84	96.76	36.41	0.21	0.51	9917.72	39394
3.92		2	1820.10	257.88	121.31	124.77	30.41	58.75	150.04	145.87	84.81	43.89	96.62	36.37	0.00	0.00	9986.27	39571
3.92	C 250/102/28.5	1	1735.96	227.78	122.82	123.26	27.15	67.01	141.34	140.84	83.91	33.99	97.41	35.28	0.93	2.03	9103.19	28723
3.92		2	1747.23	232.08	119.83	126.25	27.52	66.64	145.81	138.40	84.34	34.82	97.50	35.53	0.56	1.39	9221.43	28888
3.92	C 250/102/47.5	1	1884.56	297.29	120.88	125.20	33.22	60.94	155.90	150.52	89.48	48.79	97.18	38.60	0.21	0.48	10220.90	47094
3.92		2	1891.61	298.71	121.36	124.72	33.01	61.15	155.87	151.67	90.50	48.85	97.05	38.57	0.00	0.00	10287.45	47291
3.92	C 300/97/27	1	2563.84	205.88	147.62	148.46	22.35	66.81	173.68	172.69	92.13	30.81	113.96	32.29	0.92	2.45	9837.17	36154
3.92		2	2579.95	210.32	144.35	151.73	22.71	66.45	178.73	170.03	92.61	31.65	114.10	32.58	0.56	1.66	9948.85	36341
3.92	C 300/97/45	1	2799.18	272.93	145.63	150.45	27.78	61.38	192.21	186.05	98.23	44.47	114.63	35.79	0.16	0.52	10901.16	55863
3.92		2	2812.35	274.34	146.15	149.93	27.63	61.53	192.43	187.57	99.30	44.59	114.49	35.76	0.00	0.00	10990.21	56155
3.92	C 300/102/28.5	1	2660.38	238.99	147.23	148.85	24.32	69.84	180.70	178.73	98.29	34.22	114.67	34.37	1.08	2.79	10055.76	42338
3.92		2	2674.83	243.94	144.15	151.93	24.73	69.43	185.56	176.06	98.64	35.13	114.83	34.68	0.67	1.91	10156.24	42506
3.92	C 300/102/47.5	1	2902.63	315.81	145.92	150.16	30.15	64.01	198.92	193.31	104.75	49.34	115.17	37.99	0.08	0.27	11170.29	66199
3.92		2	2919.38	318.17	146.20	149.88	30.07	64.09	199.69	194.78	105.80	49.65	115.08	37.99	0.00	0.00	11291.39	66647
3.92	C 300/107/30	1	2756.06	275.15	146.84	149.24	26.32	72.84	187.69	184.68	104.54	37.77	115.33	36.44	1.26	3.13	10272.43	49201
3.92		2	2768.85	280.61	143.94	152.14	26.79	72.37	192.36	182.00	104.76	38.77	115.51	36.77	0.79	2.17	10361.60	49339
3.92	C 300/107/50	1	3004.74	362.54	146.21	149.87	32.55	66.61	205.50	200.49	111.37	54.43	115.67	40.18	0.01	0.03	11436.79	77874
3.92		2	3025.40	366.02	146.25	149.83	32.56	66.60	206.87	201.92	112.40	54.96	115.62	40.21	0.00	0.00	11592.57	78525

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
3.92	C 300/117/33	300	117	110	33	4.00	4.00	17.45	2208.35	146.20	32.05	3039.98	377.89	207.93	11311.47	68150.58
3.92	C 300/117/55	300	117	110	55	4.00	4.00	18.80	2380.83	146.33	37.67	3234.53	474.26	221.04	12194.93	106955.93
3.92	C 300/122/34.5	300	122	115	35	4.00	4.00	17.85	2259.31	146.24	34.35	3141.80	427.18	214.84	11572.49	77911.79
3.92	C 300/122/575	300	122	115	58	4.00	4.00	19.27	2439.63	146.37	40.28	3337.69	534.89	228.02	12496.12	123792.21
3.92	C 330/107/30	330	107	100	30	4.00	4.00	17.57	2224.03	161.03	26.12	3551.86	298.63	220.57	11391.78	63104.75
3.92	C 330/107/50	330	107	100	50	4.00	4.00	18.80	2380.83	161.16	30.96	3797.44	377.87	235.63	12194.93	94445.17
3.92	C 330/117/33	330	117	110	33	4.00	4.00	18.37	2325.95	161.12	30.43	3802.22	389.36	235.99	11913.83	83651.46
3.92	C 330/117/55	330	117	110	55	4.00	4.00	19.73	2498.43	161.25	35.90	4055.51	490.16	251.51	12797.30	127838.16
3.92	C 330/127/36	330	127	120	36	4.00	4.00	19.17	2427.87	161.20	34.90	4050.72	495.28	251.29	12435.88	108412.81
3.92	C 330/127/60	330	127	120	60	4.00	4.00	20.65	2616.03	161.33	40.99	4309.26	620.72	267.11	13399.66	169345.40
3.92	C 350/107/30	350	107	100	30	4.00	4.00	18.19	2302.43	170.98	25.23	4084.98	303.80	238.92	11793.36	71840.47
3.92	C 350/107/50	350	107	100	50	4.00	4.00	19.42	2459.23	171.11	29.97	4371.33	385.14	255.47	12596.51	106126.48
3.92	C 350/117/33	350	117	110	33	4.00	4.00	18.99	2404.35	171.07	29.44	4368.21	396.39	255.35	12315.41	95066.97
3.92	C 350/117/55	350	117	110	55	4.00	4.00	20.34	2576.83	171.20	34.80	4664.96	499.96	272.49	13198.87	143145.91
3.92	C 350/127/36	350	127	120	36	4.00	4.00	19.79	2506.27	171.15	33.81	4649.43	504.53	271.67	12837.45	122981.49
3.92	C 350/127/60	350	127	120	60	4.00	4.00	21.27	2694.43	171.28	39.80	4953.88	633.51	289.23	13801.23	188946.88
3.92	C 350/137/39	350	137	130	39	4.00	4.00	20.59	2608.19	171.22	38.32	4928.68	629.08	287.86	13359.50	156131.11
3.92	C 350/137/65	350	137	130	65	4.00	4.00	22.19	2812.03	171.35	44.94	5238.28	786.79	305.70	14403.60	244952.33

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 300/117/33	1548.70	2701.77	268.10	146.37	149.71	38.25	70.91	184.59	180.47	70.09	37.81	132.08	41.61	6.19	0.17	6995.74	57922
3.92	C 300/117/55	1796.72	3059.24	363.49	146.36	149.72	47.23	61.93	209.03	204.33	76.97	58.69	130.49	44.98	9.56	0.02	8732.90	99911
3.92	C 300/122/34.5	1587.71	2780.32	300.83	146.43	149.65	40.55	73.61	189.87	185.79	74.19	40.87	132.33	43.53	6.20	0.19	7122.48	65811
3.92	C 300/122/575	1847.03	3147.59	407.70	146.42	149.66	50.01	64.15	214.97	210.31	81.53	63.55	130.54	46.98	9.73	0.04	8917.59	115145
3.92	C 330/107/30	1470.65	3130.90	208.06	161.07	165.01	33.21	65.95	194.38	189.74	62.66	31.55	145.91	37.61	7.09	0.05	6700.00	53138
3.92	C 330/107/50	1696.02	3555.89	283.76	161.06	165.02	41.27	57.89	220.78	215.48	68.76	49.01	144.80	40.90	10.31	0.10	8288.12	87394
3.92	C 330/117/33	1548.94	3324.48	266.60	161.23	164.85	37.73	71.43	206.20	201.67	70.67	37.32	146.50	41.49	7.29	0.11	6956.23	69572
3.92	C 330/117/55	1796.92	3777.49	363.13	161.21	164.87	46.75	62.41	234.32	229.12	77.67	58.19	144.99	44.95	10.86	0.04	8661.30	117322
3.92	C 330/127/36	1625.62	3512.95	333.85	161.36	164.72	42.28	76.88	217.70	213.27	78.96	43.42	147.00	45.32	7.38	0.17	7201.84	89074
3.92	C 330/127/60	1896.19	3992.15	454.51	161.34	164.74	52.28	66.88	247.44	242.33	86.93	67.96	145.10	48.96	11.29	0.01	9017.87	154147
3.92	C 350/107/30	1470.82	3558.87	207.25	170.97	175.11	32.92	66.24	208.15	203.24	62.95	31.29	155.55	37.54	7.69	0.00	6676.95	59616
3.92	C 350/107/50	1696.16	4048.48	283.46	170.95	175.13	41.01	58.15	236.82	231.17	69.12	48.75	154.49	40.88	11.04	0.16	8246.79	97006
3.92	C 350/117/33	1548.51	3776.17	265.52	171.14	174.94	37.41	71.75	220.65	215.85	70.98	37.01	156.16	41.41	7.97	0.07	6929.63	77915
3.92	C 350/117/55	1796.45	4299.22	362.74	171.11	174.97	46.47	62.69	251.25	245.71	78.06	57.86	154.70	44.94	11.66	0.09	8614.22	129786
3.92	C 350/127/36	1624.59	3987.77	332.45	171.28	174.80	41.93	77.23	232.82	228.13	79.29	43.05	156.67	45.24	8.12	0.13	7172.01	99574
3.92	C 350/127/60	1895.12	4542.23	453.99	171.25	174.83	51.97	67.19	265.24	259.80	87.35	67.57	154.82	48.94	12.17	0.03	8965.33	169951
3.92	C 350/137/39	1690.36	4168.05	408.07	172.16	173.92	46.37	82.79	242.10	239.66	88.00	49.29	157.03	49.13	8.05	0.94	7360.35	124884
3.92	C 350/137/65	1973.43	4729.19	553.78	172.24	173.84	57.18	71.98	274.57	272.05	96.85	76.93	154.80	52.97	12.24	0.89	9148.98	216384

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 300/117/33	1	2944.93	357.00	146.08	150.00	30.42	78.74	201.59	196.33	117.36	45.34	116.53	40.57	1.63	3.80	10700.34	65127
3.92		2	2954.39	363.45	143.52	152.56	31.00	78.16	205.85	193.65	117.24	46.50	116.74	40.94	1.05	2.68	10766.70	65178
3.92	C 300/117/55	1	3205.06	467.99	146.78	149.30	37.46	71.70	218.35	214.68	124.94	65.27	116.53	44.53	0.21	0.45	11962.24	105724
3.92		2	3227.24	472.99	146.11	149.97	37.58	71.58	220.87	215.20	125.86	66.08	116.52	44.61	0.09	0.22	12136.04	106614
3.92	C 300/122/34.5	1	3038.15	402.85	145.71	150.37	32.51	81.65	208.50	202.05	123.91	49.34	117.07	42.63	1.84	4.13	10911.76	74279
3.92		2	3045.95	409.78	143.30	152.78	33.15	81.01	212.56	199.37	123.61	50.58	117.29	43.02	1.20	2.94	10966.65	74270
3.92	C 300/122/57.5	1	3303.34	526.92	147.06	149.02	39.95	74.21	224.62	221.68	131.88	71.01	116.90	46.69	0.33	0.69	12221.40	122158
3.92		2	3324.39	532.39	145.98	150.10	40.11	74.05	227.73	221.48	132.72	71.90	116.90	46.78	0.17	0.40	12388.69	123093
3.92	C 330/107/30	1	3448.84	281.65	161.43	164.65	24.79	74.37	213.64	209.47	113.63	37.87	125.54	35.87	1.33	3.62	10848.38	60365
3.92		2	3462.78	287.55	158.53	167.55	25.27	73.89	218.44	206.67	113.80	38.92	125.75	36.24	0.85	2.50	10925.54	60480
3.92	C 330/107/50	1	3765.46	373.22	161.40	164.68	30.83	68.33	233.30	228.65	121.05	54.62	126.29	39.76	0.12	0.24	11994.39	93458
3.92		2	3794.51	377.49	161.08	165.00	30.93	68.23	235.57	229.97	122.06	55.32	126.28	39.83	0.03	0.08	12175.79	94339
3.92	C 330/117/33	1	3678.96	365.80	160.61	165.47	28.71	80.45	229.06	222.33	127.39	45.47	126.88	40.01	1.72	4.36	11275.61	79648
3.92		2	3688.51	372.80	158.05	168.03	29.31	79.85	233.37	219.52	127.19	46.69	127.14	40.42	1.12	3.06	11327.78	79638
3.92	C 330/117/55	1	4012.03	482.26	162.02	164.06	35.56	73.60	247.63	244.54	135.61	65.53	127.31	44.14	0.34	0.77	12517.13	126081
3.92		2	4038.12	487.54	160.79	165.29	35.73	73.43	251.14	244.31	136.46	66.39	127.32	44.24	0.17	0.45	12684.32	127051
3.92	C 330/127/36	1	3905.27	463.67	159.80	166.28	32.76	86.40	244.39	234.86	141.56	53.66	128.06	44.13	2.15	5.08	11696.48	102731
3.92		2	3910.45	471.70	157.56	168.52	33.48	85.68	248.18	232.05	140.90	55.05	128.36	44.58	1.43	3.63	11723.45	102536
3.92	C 330/127/60	1	4252.80	608.64	162.62	163.46	40.41	78.75	261.51	260.18	150.61	77.29	128.16	48.49	0.58	1.29	13030.75	166439
3.92		2	4275.89	614.91	160.49	165.59	40.66	78.50	266.42	258.22	151.24	78.33	128.20	48.62	0.34	0.84	13183.28	167475
3.92	C 350/107/30	1	3963.86	285.50	171.15	174.93	23.85	75.31	231.59	226.60	119.69	37.91	132.25	35.49	1.37	3.95	11234.05	68553
3.92		2	3978.36	291.70	168.26	177.82	24.35	74.81	236.45	223.72	119.82	38.99	132.50	35.88	0.88	2.72	11303.18	68647
3.92	C 350/107/50	1	4330.32	379.67	171.54	174.54	29.78	69.38	252.44	248.10	127.51	54.72	133.27	39.46	0.19	0.43	12368.49	104871
3.92		2	4362.50	384.11	170.89	175.19	29.90	69.26	255.28	249.02	128.48	55.46	133.28	39.55	0.07	0.22	12546.11	105809
3.92	C 350/117/33	1	4223.69	371.04	170.29	175.79	27.67	81.49	248.04	240.26	134.08	45.53	133.69	39.63	1.77	4.73	11660.91	90291
3.92		2	4233.01	378.41	167.75	178.33	28.28	80.88	252.34	237.37	133.81	46.79	133.98	40.06	1.16	3.32	11703.62	90230
3.92	C 350/117/55	1	4610.43	490.92	172.19	173.89	34.39	74.77	267.75	265.13	142.73	65.66	134.40	43.86	0.41	0.99	12889.56	140976
3.92		2	4639.11	496.41	170.58	175.50	34.59	74.57	271.96	264.34	143.53	66.56	134.43	43.97	0.22	0.62	13051.96	141994
3.92	C 350/127/36	1	4479.31	470.58	169.43	176.65	31.61	87.55	264.37	253.57	148.88	53.75	134.96	43.75	2.20	5.50	12081.58	116243
3.92		2	4483.44	479.05	167.23	178.85	32.34	86.82	268.10	250.68	148.13	55.18	135.30	44.23	1.47	3.92	12097.65	115959
3.92	C 350/127/60	1	4884.12	619.91	172.82	173.26	39.14	80.02	282.61	281.90	158.39	77.47	135.35	48.22	0.66	1.55	13401.70	185436
3.92		2	4909.27	626.43	170.26	175.82	39.41	79.75	288.35	279.22	158.95	78.55	135.41	48.37	0.39	1.02	13548.38	186503
3.92	C 350/137/39	1	4709.79	584.65	167.85	178.23	35.49	93.67	280.59	264.26	164.75	62.41	135.89	47.88	2.83	7.01	12477.61	146994
3.92		2	4727.77	594.25	166.65	179.43	36.50	92.66	283.70	263.49	162.79	64.13	136.46	48.38	1.82	4.57	12482.67	146260
3.92	C 350/137/65	1	5111.21	762.30	171.20	174.88	43.50	85.66	298.56	292.26	175.26	88.99	135.90	52.48	1.44	3.53	13818.85	236646
3.92		2	5158.05	770.99	169.54	176.54	44.16	85.00	304.24	292.17	174.59	90.71	136.23	52.67	0.78	1.81	13971.56	238007

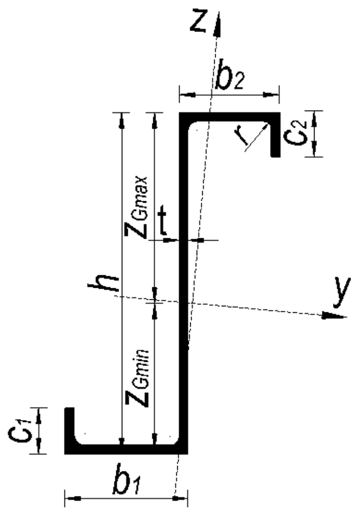
t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
3.92	C 400/127/36	400	127	120	36	4.00	4.00	21.33	2702.27	196.03	31.36	6368.91	525.31	324.90	13841.39	164370.73
3.92	C 400/127/60	400	127	120	60	4.00	4.00	22.80	2890.43	196.16	37.10	6804.61	662.45	346.89	14805.17	244306.67
3.92	C 400/137/39	400	137	130	39	4.00	4.00	22.13	2804.19	196.10	35.64	6738.55	655.86	343.62	14363.44	207897.05
3.92	C 400/137/65	400	137	130	65	4.00	4.00	23.73	3008.03	196.23	42.01	7186.26	823.79	366.21	15407.54	314408.31
3.92	C 400/147/42	400	147	140	42	4.00	4.00	22.93	2906.11	196.17	40.06	7105.90	804.60	362.23	14885.49	258780.99
3.92	C 400/147/70	400	147	140	70	4.00	4.00	24.65	3125.63	196.30	47.05	7562.61	1007.02	385.25	16009.90	398481.33
3.92	C 400/157/45	400	157	150	45	4.00	4.00	23.73	3008.03	196.23	44.59	7471.03	972.39	380.72	15407.54	317757.43
3.92	C 400/157/75	400	157	150	75	4.00	4.00	25.57	3243.23	196.36	52.21	7933.86	1213.13	404.04	16612.26	498459.07

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 400/127/36	1620.63	5307.13	328.75	196.07	200.01	41.14	78.02	270.67	265.34	79.91	42.14	180.96	45.04	9.78	0.04	7099.09	128255
3.92	C 400/127/60	1891.08	6073.94	452.24	196.02	200.06	51.28	67.88	309.86	303.61	88.18	66.63	179.22	48.90	14.18	0.14	8838.71	213138
3.92	C 400/137/39	1684.96	5540.77	403.34	197.08	199.00	45.50	83.66	281.14	278.44	88.65	48.21	181.34	48.93	9.85	0.98	7280.84	160242
3.92	C 400/137/65	1969.02	6322.48	552.11	197.10	198.98	56.46	72.70	320.78	317.74	97.78	75.95	179.19	52.95	14.45	0.87	9016.66	270330
3.92	C 400/147/42	1733.92	5712.90	486.69	197.26	198.82	49.74	89.42	289.61	287.35	97.84	54.43	181.52	52.98	9.68	1.09	7383.91	197040
3.92	C 400/147/70	2002.99	6436.54	651.77	197.83	198.25	60.81	78.35	325.36	324.67	107.18	83.19	179.26	57.04	13.76	1.53	8985.49	323956
3.92	C 400/157/45	1777.78	5864.26	579.66	197.59	198.49	54.00	95.16	296.79	295.44	107.34	60.92	181.62	57.10	9.41	1.36	7467.22	239150
3.92	C 400/157/75	2022.57	6499.36	758.94	197.96	198.12	64.98	84.18	328.31	328.06	116.79	90.16	179.26	61.26	12.78	1.60	8901.24	381690

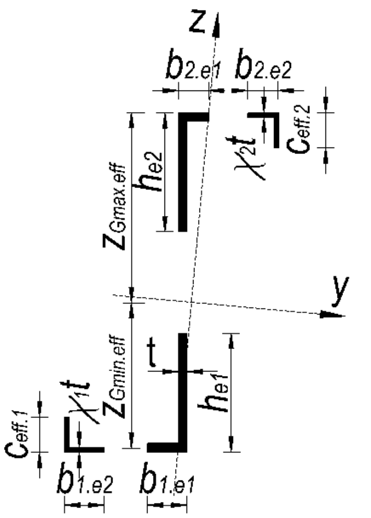
Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																	
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	C 400/127/36	1	6087.76	483.03	194.79	201.29	29.37	89.79	312.53	302.44	164.46	53.80	152.30	42.90	1.99	5.26	12899.97	153332
3.92		2	6063.86	491.28	189.44	206.64	30.28	88.88	320.10	293.45	162.25	55.27	152.81	43.50	1.08	6.59	12821.01	152291
3.92	C 400/127/60	1	6671.60	642.72	197.70	198.38	36.47	82.69	337.46	336.30	176.25	77.72	153.20	47.55	0.63	1.54	14253.26	238068
3.92		2	6682.12	648.12	193.44	202.64	36.96	82.20	345.43	329.76	175.35	78.85	153.44	47.79	0.14	2.72	14318.29	238500
3.92	C 400/137/39	1	6385.01	599.96	193.22	202.86	33.11	96.05	330.44	314.76	181.21	62.46	153.47	47.04	2.53	6.75	13269.23	192925
3.92		2	6380.59	609.60	188.71	207.37	34.28	94.88	338.12	307.69	177.81	64.25	154.20	47.66	1.36	7.39	13188.77	191277
3.92	C 400/137/65	1	6970.80	790.43	196.47	199.61	40.75	88.41	354.81	349.22	193.96	89.41	154.01	51.86	1.26	3.38	14642.17	302104
3.92		2	7010.34	798.48	192.58	203.50	41.58	87.58	364.03	344.49	192.03	91.17	154.49	52.14	0.43	3.66	14724.98	302861
3.92	C 400/147/42	1	6662.38	732.60	191.40	204.68	36.90	102.26	348.09	325.50	198.56	71.64	154.42	51.21	3.16	8.51	13619.64	238946
3.92		2	6643.47	742.26	187.08	209.00	38.33	100.83	355.12	317.86	193.64	73.62	155.27	51.90	1.73	9.09	13483.49	236256
3.92	C 400/147/70	1	7208.86	950.26	193.46	202.62	44.75	94.41	372.63	355.78	212.36	100.65	154.49	56.09	2.30	6.32	14961.97	372440
3.92		2	7238.48	958.33	190.01	206.07	46.01	93.15	380.95	351.27	208.30	102.88	155.21	56.47	1.04	6.29	14965.70	371437
3.92	C 400/157/45	1	6906.76	882.45	189.08	207.00	40.69	108.47	365.28	333.66	216.86	81.36	155.10	55.44	3.90	10.77	13961.55	292418
3.92		2	6882.56	890.75	185.16	210.92	42.48	106.68	371.70	326.32	209.70	83.49	156.15	56.17	2.12	11.07	13758.16	288004
3.92	C 400/157/75	1	7429.32	1127.85	190.45	205.63	48.77	100.39	390.10	361.29	231.26	112.35	154.83	60.33	3.44	9.27	15271.82	452812
3.92		2	7431.62	1134.40	187.11	208.97	50.49	98.67	397.18	355.63	224.67	114.97	155.72	60.84	1.71	9.26	15172.47	449369

B.2. Effective sectional characteristics for parameterized " Z " sections

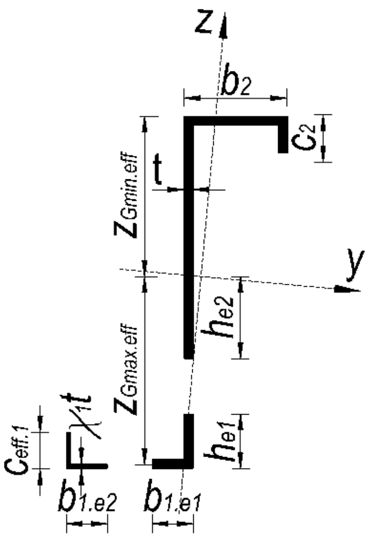
The dimensions were noted, according to the below figures:



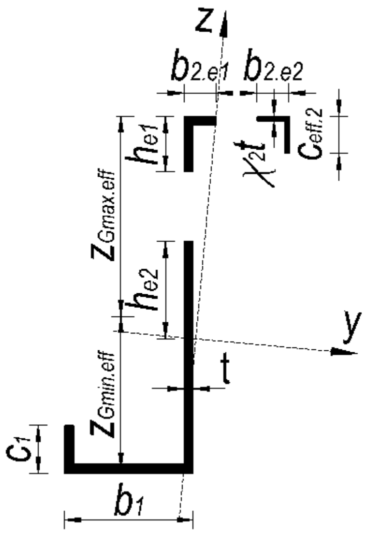
Gross section



Effective section subjected to centric compression



Bending of the Effective section
Flange 1 compression



Bending of the Effective section
Flange 2 compression

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
0.92	Z 100/35/12	100	35	30	12	1.00	3.00	1.30	163.04	48.14	1.16	23.97	3.71	4.98	46.00	65.43
0.92	Z 100/35/18	100	35	30	18	1.00	3.00	1.38	174.08	48.23	1.24	25.32	4.81	5.25	49.11	89.93
0.92	Z 100/40/14	100	40	35	18	1.00	3.00	1.40	179.60	48.97	0.53	27.18	6.32	5.55	50.67	114.12
0.92	Z 100/40/21	100	40	35	21	1.00	3.00	1.50	188.80	48.33	1.34	28.10	7.60	5.81	53.27	142.20
0.92	Z 120/40/14	120	40	35	14	1.00	3.00	1.54	194.32	58.13	1.14	41.12	5.87	7.07	54.82	151.61
0.92	Z 120/40/21	120	40	35	21	1.00	3.00	1.64	207.20	58.22	1.22	43.46	7.60	7.46	58.46	206.96
0.92	Z 120/45/16	120	45	40	16	1.00	3.00	1.64	207.20	58.22	1.22	45.13	8.75	7.75	58.46	222.79
0.92	Z 120/45/24	120	45	40	24	1.00	3.00	1.76	221.92	58.31	1.31	47.50	11.30	8.15	62.61	307.15
0.92	Z 150/50/18	150	50	45	18	1.00	4.00	1.95	245.52	73.14	1.15	81.72	12.21	11.17	69.27	498.29
0.92	Z 150/50/27	150	50	45	27	1.00	4.00	2.08	262.08	73.23	1.24	86.30	15.81	11.78	73.94	681.51
0.92	Z 150/55/20	150	55	50	20	1.00	4.00	2.05	258.40	73.21	1.22	87.99	16.76	12.02	72.90	675.56
0.92	Z 150/55/30	150	55	50	30	1.00	4.00	2.19	276.80	73.30	1.30	92.61	21.66	12.63	78.09	931.38
1.12	Z 100/35/12	100	35	30	12	1.20	3.00	1.57	197.32	48.04	1.16	28.83	4.41	6.00	82.51	77.52
1.12	Z 100/35/18	100	35	30	18	1.20	3.00	1.67	210.76	48.13	1.24	30.49	5.73	6.33	88.13	106.82
1.12	Z 100/40/14	100	40	35	14	1.20	3.00	1.69	213.00	48.14	1.25	32.19	7.00	6.69	89.06	121.55
1.12	Z 100/40/21	100	40	35	21	1.20	3.00	1.81	228.68	48.23	1.34	33.85	9.08	7.02	95.62	169.40
1.12	Z 120/40/14	120	40	35	14	1.20	3.00	1.87	235.40	58.03	1.14	49.57	7.01	8.54	98.43	180.35
1.12	Z 120/40/21	120	40	35	21	1.20	3.00	1.99	251.08	58.11	1.22	52.41	9.08	9.02	####	246.74

t [mm]	Profile type	Subjected to compression																
		Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
0.92	Z 100/35/12	106.96	21.92	3.63	48.09	50.99	1.56	31.60	4.56	4.30	23.27	1.15	45.26	18.42	0.40	0.05	29.99	47.95
0.92	Z 100/35/18	115.27	23.02	4.45	48.49	50.59	1.40	31.76	4.75	4.55	31.84	1.40	44.69	19.64	0.15	0.26	32.52	60.55
0.92	Z 100/40/14	113.34	23.22	5.39	48.65	50.43	1.43	36.73	4.77	4.60	37.66	1.47	45.26	21.82	0.17	0.41	31.25	72.12
0.92	Z 100/40/21	120.61	24.18	6.35	48.96	50.12	1.32	36.84	4.94	4.83	48.18	1.72	44.78	22.94	0.02	0.62	33.83	86.58
0.92	Z 120/40/14	113.39	34.43	5.33	58.47	60.61	1.44	36.72	5.89	5.68	37.13	1.45	55.10	21.68	0.30	0.34	30.87	100.67
0.92	Z 120/40/21	121.00	36.10	6.32	58.73	60.35	1.38	36.78	6.15	5.98	45.80	1.72	54.62	22.86	0.16	0.51	33.73	120.04
0.92	Z 120/45/16	116.14	35.27	7.16	58.36	60.72	1.61	41.55	6.04	5.81	44.58	1.72	55.11	24.82	0.38	0.15	30.95	137.15
0.92	Z 120/45/24	123.71	36.92	8.43	58.49	60.59	1.64	41.52	6.31	6.09	51.29	2.03	54.63	26.11	0.34	0.18	33.79	162.05
0.92	Z 150/50/18	116.95	56.98	8.88	73.22	75.86	1.60	46.56	7.78	7.51	55.39	1.91	69.80	27.55	0.45	0.08	29.65	266.74
0.92	Z 150/50/27	124.97	60.04	10.56	73.10	75.98	1.81	46.35	8.21	7.90	58.39	2.28	69.31	29.07	0.57	0.13	32.80	313.21
0.92	Z 150/55/20	118.40	57.65	11.12	72.81	76.27	2.00	51.16	7.92	7.56	55.66	2.17	69.78	30.65	0.78	0.40	29.52	338.73
0.92	Z 150/55/30	126.15	60.58	13.12	72.78	76.30	2.14	51.02	8.32	7.94	61.39	2.57	69.30	32.25	0.83	0.52	32.48	394.72
1.12	Z 100/35/12	140.06	27.57	4.40	47.46	51.42	1.63	31.13	5.81	5.36	27.00	1.41	44.37	17.72	0.47	0.57	58.56	60.75
1.12	Z 100/35/18	153.50	29.22	5.72	47.64	51.24	1.70	31.06	6.13	5.70	33.56	1.84	43.63	19.31	0.46	0.49	64.18	82.75
1.12	Z 100/40/14	154.56	30.66	6.95	48.03	50.85	1.58	36.18	6.38	6.03	43.98	1.92	44.54	21.21	0.33	0.11	64.63	94.72
1.12	Z 100/40/21	166.99	32.04	8.60	48.26	50.62	1.50	36.26	6.64	6.33	57.27	2.37	43.80	22.69	0.16	0.03	69.83	123.19
1.12	Z 120/40/14	155.35	45.81	6.92	57.61	61.27	1.64	36.12	7.95	7.48	42.11	1.92	54.30	21.10	0.51	0.41	64.65	132.96
1.12	Z 120/40/21	168.16	48.28	8.60	58.04	60.84	1.49	36.27	8.32	7.94	57.67	2.37	53.58	22.61	0.27	0.07	70.31	170.34

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
0.92	(*) Z 100/35/12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.92		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.92	Z 100/35/18	1	24.32	4.53	48.58	50.50	0.67	32.49	5.01	4.82	67.68	1.39	38.21	16.49	0.58	0.35	46.65	84.57
0.92		2	24.51	4.63	46.85	52.23	1.65	31.51	5.23	4.69	28.13	1.47	38.31	16.65	0.40	1.38	46.54	83.64
0.92	Z 100/40/14	1	24.85	5.37	49.26	49.82	0.21	37.95	5.04	4.99	259.38	1.42	38.70	17.99	1.05	1.57	45.60	96.76
0.92		2	25.03	5.48	45.84	53.24	2.09	36.07	5.46	4.70	26.16	1.52	38.90	18.20	0.84	2.40	45.03	93.77
0.92	Z 100/40/21	1	26.14	6.73	48.93	50.15	0.16	38.32	5.34	5.21	433.16	1.76	38.46	19.51	1.50	1.81	49.15	127.80
0.92		2	26.27	6.89	45.75	53.33	2.59	35.75	5.74	4.93	26.63	1.93	38.64	19.79	1.25	2.58	48.36	122.63
0.92	Z 120/40/14	1	37.19	5.28	58.58	60.50	0.05	38.11	6.35	6.15	1119.32	1.38	46.00	17.33	1.09	0.45	47.95	138.13
0.92		2	37.30	5.42	53.61	65.47	2.07	36.09	6.96	5.70	26.22	1.50	46.20	17.62	0.93	4.52	47.48	133.30
0.92	Z 120/40/21	1	39.35	6.63	59.09	59.99	0.28	38.44	6.66	6.56	233.59	1.73	45.92	18.85	1.51	0.87	51.44	180.51
0.92		2	39.37	6.85	53.55	65.53	2.53	35.69	7.35	6.01	27.12	1.92	46.09	19.22	1.30	4.67	50.76	172.33
0.92	Z 120/45/16	1	39.65	7.44	58.65	60.43	0.79	43.95	6.76	6.56	94.05	1.69	46.35	20.08	2.01	2.21	50.11	196.00
0.92		2	39.23	7.69	52.11	66.97	3.02	41.18	7.53	5.86	25.47	1.87	46.50	20.59	1.80	6.11	48.79	187.14
0.92	Z 120/45/24	1	41.78	9.32	58.16	60.92	1.29	44.45	7.18	6.86	72.17	2.10	46.12	21.79	2.60	2.61	53.82	256.67
0.92		2	41.15	9.58	51.91	67.17	3.77	41.93	7.93	6.13	25.41	2.28	46.25	22.31	2.46	6.40	52.11	237.87
0.92	Z 150/50/18	1	67.97	9.72	73.75	75.33	1.79	49.95	9.22	9.02	54.19	1.95	57.42	21.71	2.95	2.19	55.51	405.47
0.92		2	65.50	10.11	61.36	87.72	4.00	47.16	10.68	7.47	25.28	2.14	57.31	22.51	2.85	11.79	53.29	377.64
0.92	Z 150/50/27	1	71.89	12.24	72.93	76.15	2.43	50.59	9.86	9.44	50.42	2.42	57.29	23.64	3.67	2.91	59.38	528.58
0.92		2	68.89	12.62	61.09	87.99	4.92	48.08	11.28	7.83	25.64	2.62	57.13	24.45	3.68	12.14	56.66	474.93
0.92	Z 150/55/20	1	71.44	12.80	71.72	77.36	2.83	55.99	9.96	9.23	45.16	2.29	57.68	24.42	4.05	4.15	57.68	533.93
0.92		2	67.43	13.11	59.41	89.67	5.39	53.55	11.35	7.52	24.31	2.45	57.41	25.32	4.17	13.81	54.37	481.46
0.92	Z 150/55/30	1	75.20	16.00	70.88	78.20	3.71	56.87	10.61	9.62	43.08	2.81	57.38	26.47	5.02	4.90	61.69	694.10
0.92		2	70.74	16.34	59.19	89.89	6.54	54.70	11.95	7.87	24.99	2.99	57.08	27.44	5.23	14.11	57.90	607.01
1.12	(*) Z 100/35/12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12	Z 100/35/18	1	30.23	5.73	47.72	51.16	1.26	31.50	6.34	5.91	45.54	1.82	38.13	16.61	0.02	0.41	86.92	105.72
1.12		2	30.49	5.73	48.13	50.75	1.24	31.52	6.33	6.01	46.18	1.82	38.03	16.49	0.00	0.00	88.13	106.82
1.12	Z 100/40/14	1	31.54	6.84	48.38	50.50	0.99	36.77	6.52	6.25	69.04	1.86	38.85	18.09	0.26	0.24	86.39	119.48
1.12		2	31.60	6.76	47.56	51.32	1.62	36.14	6.64	6.16	41.74	1.87	38.75	17.92	0.36	0.58	86.11	117.54
1.12	Z 100/40/21	1	33.27	8.76	48.53	50.35	0.93	36.83	6.86	6.61	94.71	2.38	38.54	19.78	0.42	0.30	93.65	162.81
1.12		2	33.64	8.88	47.97	50.91	1.59	36.17	7.01	6.61	55.87	2.46	38.49	19.78	0.25	0.26	94.54	164.16
1.12	(*) Z 120/40/14	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.12	Z 120/40/21	1	51.04	8.73	58.08	60.80	0.82	36.94	8.79	8.40	106.95	2.36	45.83	18.96	0.40	0.04	101.32	235.40
1.12		2	51.09	8.83	56.80	62.08	1.55	36.21	8.99	8.23	56.88	2.44	45.87	19.07	0.33	1.31	100.62	234.07

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.12	Z 120/45/16	120	45	40	16	1.20	4.00	1.98	248.46	58.10	1.22	53.52	10.24	9.21	103.89	261.13
1.12	Z 120/45/24	120	45	40	24	1.20	4.00	2.12	266.38	58.19	1.31	56.40	13.31	9.69	111.38	362.68
1.12	Z 150/50/18	150	50	45	18	1.20	4.00	2.36	297.74	73.04	1.15	98.71	14.63	13.51	124.49	595.76
1.12	Z 150/50/27	150	50	45	27	1.20	4.00	2.52	317.90	73.13	1.24	104.28	18.97	14.26	132.92	816.21
1.12	Z 150/55/20	150	55	50	20	1.20	4.00	2.49	313.42	73.11	1.22	106.32	20.11	14.54	131.05	808.95
1.12	Z 150/55/30	150	55	50	30	1.20	4.00	2.66	335.82	73.20	1.30	111.95	26.03	15.29	140.42	1116.99
1.12	Z 150/60/22	150	60	55	22	1.20	4.00	2.61	329.10	73.17	1.28	113.84	26.82	15.56	137.61	1067.20
1.12	Z 150/60/33	150	60	55	33	1.20	4.00	2.80	353.74	73.26	1.36	119.43	34.65	16.30	147.91	1486.44
1.12	Z 180/60/22	180	60	55	22	1.20	4.00	2.87	362.70	88.06	1.16	174.82	26.82	19.85	151.66	1579.25
1.12	Z 180/60/33	180	60	55	33	1.20	4.00	3.07	387.34	88.15	1.25	184.48	34.66	20.93	161.96	2157.49
1.12	Z 180/65/24	180	65	60	24	1.20	4.00	3.00	378.38	88.12	1.22	185.80	34.88	21.09	158.21	2031.21
1.12	Z 180/65/36	180	65	60	36	1.20	4.00	3.21	405.26	88.20	1.30	195.51	45.01	22.17	169.45	2794.27
1.42	Z 120/45/16	120	45	40	16	1.50	4.00	2.49	312.80	57.94	1.22	66.91	12.64	11.55	210.25	320.83
1.42	Z 120/45/24	120	45	40	24	1.50	4.00	2.67	335.52	58.04	1.30	70.56	16.48	12.16	225.52	446.95
1.42	Z 150/50/18	150	50	45	18	1.50	4.00	2.98	375.28	72.88	1.15	123.68	18.11	16.97	252.24	735.04
1.42	Z 150/50/27	150	50	45	27	1.50	4.00	3.18	400.84	72.97	1.23	130.75	23.54	17.92	269.42	1009.65
1.42	Z 150/55/20	150	55	50	20	1.50	4.00	3.13	395.16	72.96	1.21	133.30	24.96	18.27	265.60	1000.39
1.42	Z 150/55/30	150	55	50	30	1.50	4.00	3.36	423.56	73.04	1.30	140.43	32.37	19.23	284.69	1384.54

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.12	Z 120/45/16	164.08	48.22	9.80	58.32	60.56	1.56	41.20	8.27	7.96	62.82	2.38	54.21	24.44	0.34	0.22	67.50	188.99
1.12	Z 120/45/24	175.70	50.42	11.74	58.84	60.04	1.28	41.48	8.57	8.40	91.80	2.83	53.57	25.85	0.03	0.65	73.47	232.41
1.12	Z 150/50/18	169.52	80.61	12.84	73.16	75.72	1.55	46.21	11.02	10.65	82.91	2.78	68.96	27.52	0.40	0.12	67.83	382.57
1.12	Z 150/50/27	180.75	84.47	15.20	73.38	75.50	1.55	46.21	11.51	11.19	98.14	3.29	68.36	29.00	0.31	0.25	73.98	453.99
1.12	Z 150/55/20	172.74	82.14	16.26	72.88	76.00	1.85	50.91	11.27	10.81	87.72	3.20	68.96	30.69	0.64	0.23	68.02	489.15
1.12	Z 150/55/30	183.80	85.91	19.11	73.09	75.79	1.84	50.92	11.75	11.34	103.98	3.75	68.37	32.24	0.53	0.11	74.02	575.95
1.12	Z 150/60/22	175.21	83.29	20.07	72.53	76.35	2.24	55.52	11.48	10.91	89.42	3.61	68.95	33.84	0.97	0.64	68.11	609.42
1.12	Z 150/60/33	186.06	86.96	23.42	72.76	76.12	2.19	55.57	11.95	11.43	107.17	4.21	68.37	35.48	0.82	0.50	73.82	713.20
1.12	Z 180/60/22	173.93	122.03	19.49	87.61	91.27	1.94	55.82	13.93	13.37	100.40	3.49	83.76	33.48	0.78	0.45	65.44	846.68
1.12	Z 180/60/33	185.42	128.33	23.03	87.60	91.28	2.07	55.69	14.65	14.06	111.36	4.14	83.19	35.25	0.82	0.55	72.17	987.96
1.12	Z 180/65/24	175.54	123.11	23.46	87.23	91.65	2.31	60.45	14.11	13.43	101.35	3.88	83.74	36.55	1.10	0.88	65.12	1030.17
1.12	Z 180/65/36	186.83	129.28	27.58	87.27	91.61	2.40	60.36	14.81	14.11	114.75	4.57	83.18	38.42	1.10	0.93	71.60	1196.86
1.42	Z 120/45/16	229.91	64.53	12.62	57.46	61.12	1.66	40.50	11.23	10.56	76.24	3.12	52.98	23.43	0.44	0.49	154.53	254.67
1.42	Z 120/45/24	252.31	68.15	16.40	57.67	60.91	1.68	40.48	11.82	11.19	97.66	4.05	51.97	25.50	0.38	0.37	169.59	350.20
1.42	Z 150/50/18	250.04	114.81	17.88	72.30	76.28	1.73	45.43	15.88	15.05	103.19	3.94	67.76	26.74	0.59	0.59	166.89	542.65
1.42	Z 150/50/27	270.85	121.01	22.24	72.84	75.74	1.51	45.65	16.61	15.98	146.99	4.87	66.84	28.66	0.28	0.13	182.05	695.78
1.42	Z 150/55/20	263.05	120.86	23.99	72.99	75.59	1.68	50.48	16.56	15.99	143.07	4.75	67.78	30.20	0.46	0.04	173.77	727.63
1.42	Z 150/55/30	281.68	126.39	28.75	73.68	74.90	1.28	50.88	17.16	16.87	223.87	5.65	66.99	31.95	0.02	0.63	189.32	893.33

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																	
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.12	Z 120/45/16	1	50.93	9.69	59.08	59.80	0.50	42.26	8.62	8.52	195.55	2.29	46.24	20.17	0.72	0.97	97.53	251.92
1.12		2	50.99	9.68	55.94	62.94	1.93	40.83	9.12	8.10	50.15	2.37	46.40	20.21	0.71	2.16	95.98	242.94
1.12	Z 120/45/24	1	53.70	12.23	59.43	59.45	0.16	42.60	9.04	9.03	741.94	2.87	46.00	21.95	1.14	1.24	105.25	334.29
1.12		2	54.02	12.43	56.10	62.78	2.25	40.51	9.63	8.60	55.34	3.07	46.17	22.15	0.94	2.09	103.88	325.79
1.12	Z 150/50/18	1	88.51	12.96	73.87	75.01	0.44	48.20	11.98	11.80	291.89	2.69	57.55	22.02	1.59	0.83	107.93	534.09
1.12		2	87.96	13.28	66.51	82.37	2.58	45.34	13.22	10.68	51.47	2.93	57.72	22.43	1.43	6.53	105.85	517.21
1.12	Z 150/50/27	1	93.64	16.33	74.39	74.49	0.91	48.67	12.59	12.57	178.77	3.35	57.42	23.98	2.15	1.37	115.88	699.08
1.12		2	92.63	16.68	66.29	82.59	3.28	46.04	13.97	11.22	50.90	3.62	57.55	24.42	2.04	6.84	113.00	661.60
1.12	Z 150/55/20	1	93.21	17.13	73.22	75.66	1.26	54.02	12.73	12.32	135.41	3.17	57.89	24.82	2.48	2.55	111.94	707.31
1.12		2	91.37	17.45	64.87	84.01	3.62	51.38	14.08	10.88	48.23	3.40	58.01	25.35	2.40	8.24	108.04	671.45
1.12	Z 150/55/30	1	98.16	21.42	72.55	76.33	1.96	54.72	13.53	12.86	109.12	3.91	57.60	26.91	3.27	3.14	120.13	923.08
1.12		2	95.86	21.77	64.59	84.29	4.56	52.32	14.84	11.37	47.72	4.16	57.69	27.49	3.26	8.61	115.37	854.10
1.12	Z 150/60/22	1	97.51	22.00	71.48	77.40	2.22	59.98	13.64	12.60	98.97	3.67	58.12	27.61	3.50	4.22	115.83	909.73
1.12		2	94.21	22.19	63.15	85.73	4.88	57.64	14.92	10.99	45.52	3.85	58.18	28.24	3.60	10.02	110.07	843.04
1.12	Z 150/60/33	1	102.28	27.37	70.81	78.07	3.15	60.91	14.44	13.10	86.86	4.49	57.69	29.84	4.51	4.81	124.31	1185.93
1.12		2	98.58	27.61	62.92	85.96	6.04	58.80	15.67	11.47	45.75	4.70	57.73	30.55	4.67	10.34	117.68	1074.31
1.12	Z 180/60/22	1	146.19	21.57	88.10	90.78	2.34	60.10	16.59	16.10	92.25	3.59	69.09	26.53	3.50	2.72	122.35	1293.18
1.12		2	139.78	21.98	73.79	105.09	4.75	57.51	18.94	13.30	46.30	3.82	68.88	27.32	3.59	14.27	116.50	1196.28
1.12	Z 180/60/33	1	154.25	26.93	87.05	91.83	3.20	60.96	17.72	16.80	84.11	4.42	68.87	28.78	4.45	3.68	130.72	1671.11
1.12		2	146.96	27.42	73.48	105.40	5.86	58.62	20.00	13.94	46.82	4.68	68.64	29.65	4.61	14.67	123.92	1505.01
1.12	Z 180/65/24	1	152.18	27.03	86.07	92.81	3.40	66.16	17.68	16.40	79.55	4.09	69.33	29.22	4.61	4.69	126.18	1619.71
1.12		2	143.14	27.28	71.84	107.04	6.13	63.89	19.93	13.37	44.48	4.27	68.99	30.12	4.92	16.28	118.44	1463.02
1.12	Z 180/65/36	1	160.01	33.64	85.03	93.85	4.48	67.24	18.82	17.05	75.04	5.00	68.96	31.62	5.78	5.64	134.87	2093.02
1.12		2	150.20	33.98	71.58	107.30	7.46	65.22	20.99	14.00	45.56	5.21	68.60	32.63	6.16	16.63	126.15	1844.90
1.42	Z 120/45/16	1	66.26	12.54	57.69	60.89	1.15	41.01	11.49	10.88	109.44	3.06	46.33	20.16	0.07	0.26	206.52	317.09
1.42		2	66.10	12.34	57.50	61.08	1.48	40.68	11.50	10.82	83.15	3.03	46.15	19.94	0.27	0.45	205.58	313.85
1.42	Z 120/45/24	1	70.09	16.42	57.71	60.87	1.28	40.88	12.15	11.52	128.56	4.02	45.96	22.25	0.03	0.33	223.03	441.85
1.42		2	70.56	16.48	58.04	60.54	1.30	40.86	12.16	11.65	126.38	4.03	45.86	22.16	0.00	0.00	225.52	446.95
1.42	Z 150/50/18	1	120.49	17.49	72.96	75.62	0.74	46.42	16.51	15.93	234.83	3.77	57.43	21.88	0.40	0.08	241.30	713.51
1.42		2	119.19	17.31	70.81	77.77	1.73	45.43	16.83	15.33	100.29	3.81	57.43	21.88	0.58	2.07	236.95	694.04
1.42	Z 150/50/27	1	128.15	22.73	72.93	75.65	0.78	46.38	17.57	16.94	291.15	4.90	57.30	24.13	0.45	0.04	262.32	965.75
1.42		2	127.69	22.81	71.48	77.10	1.69	45.47	17.87	16.56	134.74	5.02	57.30	24.21	0.46	1.50	258.88	957.74
1.42	Z 150/55/20	1	127.90	23.81	74.02	74.56	0.45	51.71	17.28	17.15	527.09	4.60	57.88	24.97	0.76	1.06	251.79	969.96
1.42		2	127.38	23.55	70.45	78.13	2.08	50.08	18.08	16.30	113.07	4.70	58.03	24.95	0.87	2.50	246.44	935.38
1.42	Z 150/55/30	1	134.81	30.00	74.16	74.42	0.05	52.11	18.18	18.11	6540.72	5.76	57.59	27.16	1.26	1.38	271.67	1282.95
1.42		2	134.94	30.22	70.65	77.93	2.44	49.72	19.10	17.32	124.08	6.08	57.74	27.32	1.13	2.39	266.78	1252.55

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.42	Z 150/60/22	150	60	55	22	1.50	4.00	3.29	415.04	73.02	1.28	142.80	33.34	19.56	278.96	1322.23
1.42	Z 150/60/33	150	60	55	33	1.50	4.00	3.54	446.28	73.11	1.36	149.88	43.17	20.50	299.96	1845.56
1.42	Z 180/60/22	180	60	55	22	1.50	4.00	3.63	457.64	87.90	1.16	219.51	33.35	24.97	307.60	1958.27
1.42	Z 180/60/33	180	60	55	33	1.50	4.00	3.87	488.88	87.99	1.24	231.75	43.18	26.34	328.59	2680.82
1.42	Z 180/65/24	180	65	60	24	1.50	4.00	3.78	477.52	87.96	1.21	233.38	43.43	26.53	320.96	2522.64
1.42	Z 180/65/36	180	65	60	36	1.50	4.00	4.05	511.60	88.05	1.30	245.70	56.15	27.90	343.87	3476.85
1.42	Z 180/70/26	180	70	65	26	1.50	4.00	3.94	497.40	88.02	1.26	247.11	55.37	28.08	334.32	3185.17
1.42	Z 180/70/39	180	70	65	39	1.50	4.00	4.23	534.32	88.10	1.35	259.37	71.50	29.44	359.14	4422.29
1.42	Z 200/65/24	200	65	60	24	1.50	4.00	4.00	505.92	97.90	1.15	299.34	43.44	30.58	340.05	3166.22
1.42	Z 200/65/36	200	65	60	36	1.50	4.00	4.27	540.00	97.98	1.23	316.09	56.16	32.26	362.95	4319.21
1.42	Z 200/70/26	200	70	65	26	1.50	4.00	4.16	525.80	97.95	1.20	316.54	55.37	32.32	353.41	3994.50
1.42	Z 200/70/39	200	70	65	39	1.50	4.00	4.45	562.72	98.04	1.28	333.42	71.50	34.01	378.22	5482.55
1.42	Z 200/75/28	200	75	70	28	1.50	4.00	4.32	545.68	98.00	1.24	333.57	69.32	34.04	366.77	4954.37
1.42	Z 200/75/42	200	75	70	42	1.50	4.00	4.63	585.44	98.09	1.33	350.44	89.41	35.73	393.50	6844.87
1.42	Z 200/80/30	200	80	75	30	1.50	4.00	4.47	565.56	98.04	1.29	350.44	85.43	35.74	380.13	6056.30
1.42	Z 200/80/45	200	80	75	45	1.50	4.00	4.81	608.16	98.13	1.37	367.16	110.09	37.42	408.77	8425.70
1.42	Z 220/70/26	220	70	65	26	1.50	4.00	4.38	554.20	107.89	1.14	396.49	55.38	36.75	372.50	4906.00
1.42	Z 220/70/39	220	70	65	39	1.50	4.00	4.67	591.12	107.98	1.22	418.72	71.51	38.78	397.31	6673.20

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	Z 150/60/22	270.58	124.20	30.45	73.12	75.46	1.64	55.52	16.99	16.46	185.27	5.48	67.75	33.55	0.37	0.10	176.81	932.08
1.42	Z 150/60/33	287.54	129.15	35.68	73.55	75.03	1.45	55.71	17.56	17.21	246.84	6.40	67.02	35.22	0.08	0.44	191.17	1113.95
1.42	Z 180/60/22	271.49	184.80	30.28	87.68	90.90	1.76	55.40	21.08	20.33	172.27	5.47	82.50	33.40	0.60	0.22	176.39	1305.03
1.42	Z 180/60/33	288.47	192.89	35.51	88.22	90.36	1.55	55.61	21.86	21.35	229.08	6.39	81.77	35.09	0.31	0.23	190.60	1542.72
1.42	Z 180/65/24	276.14	188.00	36.92	87.38	91.20	2.07	60.09	21.52	20.61	178.18	6.14	82.51	36.57	0.86	0.58	177.27	1601.28
1.42	Z 180/65/36	292.82	195.86	43.02	87.94	90.64	1.82	60.34	22.27	21.61	236.37	7.13	81.78	38.33	0.52	0.12	190.95	1881.18
1.42	Z 180/70/26	279.82	190.48	44.15	87.05	91.53	2.43	64.73	21.88	20.81	181.35	6.82	82.51	39.72	1.17	0.96	177.62	1929.07
1.42	Z 180/70/39	296.24	198.17	51.19	87.62	90.96	2.14	65.02	22.62	21.79	239.66	7.87	81.79	41.57	0.79	0.48	190.82	2255.30
1.42	Z 200/65/24	275.41	235.02	36.45	97.38	101.20	1.94	60.22	24.13	23.22	187.76	6.05	92.38	36.38	0.80	0.52	174.39	1938.93
1.42	Z 200/65/36	293.18	246.29	42.89	97.65	100.93	1.90	60.26	25.22	24.40	226.25	7.12	91.66	38.25	0.66	0.33	190.48	2275.81
1.42	Z 200/70/26	278.81	237.90	43.50	97.09	101.49	2.25	64.91	24.50	23.44	193.74	6.70	92.37	39.50	1.05	0.86	174.26	2332.50
1.42	Z 200/70/39	296.59	249.17	51.03	97.30	101.28	2.22	64.94	25.61	24.60	229.74	7.86	91.66	41.48	0.94	0.74	190.37	2727.40
1.42	Z 200/75/28	281.50	240.15	51.12	96.76	101.82	2.60	69.76	24.82	23.59	196.31	7.33	92.36	42.61	1.36	1.24	174.00	2763.59
1.42	Z 200/75/42	299.29	251.41	59.82	96.93	101.65	2.59	69.75	25.94	24.73	230.65	8.58	91.65	44.71	1.26	1.15	189.93	3221.89
1.42	Z 200/80/30	283.72	241.97	59.33	96.36	102.22	3.04	75.20	25.11	23.67	195.10	7.89	92.35	45.73	1.75	1.68	173.84	3233.02
1.42	Z 200/80/45	301.42	253.13	69.23	96.55	102.03	3.01	75.17	26.22	24.81	229.78	9.21	91.64	47.92	1.64	1.58	189.27	3759.01
1.42	Z 220/70/26	277.91	290.58	42.92	107.10	111.48	2.10	65.06	27.13	26.07	204.57	6.60	102.25	39.30	0.96	0.79	171.03	2773.18
1.42	Z 220/70/39	296.32	305.58	50.70	107.12	111.46	2.21	64.95	28.53	27.42	229.80	7.81	101.55	41.36	0.99	0.86	188.90	3238.51

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	Z 150/60/22	1	134.26	30.86	73.18	75.40	0.17	57.33	18.35	17.81	1802.02	5.38	58.21	27.91	1.45	2.38	260.43	1259.86
1.42		2	133.54	30.84	69.47	79.11	2.70	54.86	19.22	16.88	114.45	5.62	58.40	28.07	1.42	3.55	253.41	1220.44
1.42	Z 150/60/33	1	140.88	38.51	72.70	75.88	0.83	57.99	19.38	18.57	461.43	6.64	57.77	30.21	2.20	2.77	280.68	1656.89
1.42		2	139.90	38.66	69.23	79.35	3.50	55.66	20.21	17.63	110.32	6.95	57.96	30.47	2.14	3.88	272.18	1591.79
1.42	Z 180/60/22	1	200.92	30.37	88.69	89.89	0.38	57.54	22.65	22.35	803.03	5.28	69.24	26.92	1.54	0.78	273.33	1799.45
1.42		2	199.09	30.53	81.24	97.34	2.70	54.86	24.51	20.45	113.26	5.57	69.40	27.18	1.54	6.66	266.96	1735.80
1.42	Z 180/60/33	1	212.09	38.01	89.13	89.45	0.99	58.15	23.80	23.71	383.56	6.54	69.03	29.22	2.23	1.46	293.31	2341.19
1.42		2	209.76	38.41	81.02	97.56	3.44	55.60	25.89	21.50	111.61	6.91	69.17	29.60	2.20	6.98	285.45	2236.56
1.42	Z 180/65/24	1	209.62	38.27	88.18	90.40	1.16	63.32	23.77	23.19	330.33	6.04	69.58	29.73	2.37	2.44	281.45	2268.77
1.42		2	205.89	38.49	79.72	98.86	3.61	60.77	25.83	20.83	106.62	6.33	69.72	30.14	2.40	8.24	271.72	2171.50
1.42	Z 180/65/36	1	220.54	47.66	87.38	91.20	1.98	64.14	25.24	24.18	240.40	7.43	69.22	32.18	3.28	3.15	302.01	2948.09
1.42		2	216.02	47.98	79.37	99.21	4.64	61.80	27.22	21.77	103.32	7.76	69.35	32.68	3.34	8.68	290.37	2769.52
1.42	Z 180/70/26	1	217.74	47.27	86.50	92.08	2.05	69.21	25.17	23.65	230.61	6.83	69.83	32.53	3.31	4.07	289.39	2804.01
1.42		2	211.59	47.22	78.05	100.53	4.76	66.92	27.11	21.05	99.28	7.06	69.94	33.04	3.49	9.97	275.92	2637.19
1.42	Z 180/70/39	1	228.35	58.66	85.70	92.88	3.09	70.25	26.64	24.59	189.80	8.35	69.34	35.14	4.44	4.77	310.57	3642.36
1.42		2	221.51	58.75	77.73	100.85	6.00	68.16	28.50	21.96	97.87	8.62	69.44	35.76	4.65	10.37	295.14	3367.40
1.42	Z 200/65/24	1	264.73	37.89	99.17	99.41	1.26	63.42	26.70	26.63	300.80	5.97	76.87	29.08	2.40	1.27	290.18	2786.79
1.42		2	259.08	38.29	87.21	111.37	3.58	60.74	29.71	23.26	107.07	6.30	76.93	29.57	2.43	10.68	280.62	2664.98
1.42	Z 200/65/36	1	279.43	47.28	98.40	100.18	2.05	64.21	28.40	27.89	230.78	7.36	76.67	31.54	3.28	2.19	310.59	3601.96
1.42		2	272.56	47.79	86.83	111.75	4.58	61.74	31.39	24.39	104.35	7.74	76.71	32.12	3.35	11.15	299.02	3373.44
1.42	Z 200/70/26	1	274.99	46.77	97.53	101.05	2.14	69.30	28.19	27.21	218.28	6.75	77.19	31.83	3.34	3.10	298.10	3439.97
1.42		2	266.03	46.97	85.42	113.16	4.70	66.86	31.14	23.51	99.90	7.02	77.19	32.43	3.50	12.53	284.75	3231.54
1.42	Z 200/70/39	1	289.40	58.16	96.51	102.07	3.14	70.30	29.99	28.35	185.10	8.27	76.84	34.45	4.42	4.04	319.14	4444.09
1.42		2	279.29	58.50	85.05	113.53	5.91	68.07	32.84	24.60	98.94	8.59	76.82	35.16	4.63	12.99	303.69	4093.20
1.42	Z 200/75/28	1	284.60	56.80	95.71	102.87	3.13	75.29	29.74	27.67	181.70	7.54	77.42	34.59	4.37	4.88	305.91	4175.87
1.42		2	272.16	56.62	83.62	114.96	5.97	73.13	32.55	23.67	94.86	7.74	77.35	35.28	4.73	14.38	288.78	3854.36
1.42	Z 200/75/42	1	298.66	70.41	94.69	103.89	4.34	76.50	31.54	28.75	162.22	9.20	76.92	37.35	5.67	5.80	327.59	5395.82
1.42		2	285.19	70.43	83.29	115.29	7.39	74.55	34.24	24.74	95.25	9.45	76.84	38.19	6.07	14.79	308.32	4890.09
1.42	Z 200/80/30	1	293.63	68.00	93.94	104.64	4.20	81.36	31.26	28.06	161.92	8.36	77.59	37.34	5.49	6.60	313.64	4997.80
1.42		2	277.56	67.24	81.82	116.76	7.37	79.53	33.92	23.77	91.20	8.45	77.43	38.11	6.09	16.23	292.79	4532.55
1.42	Z 200/80/45	1	307.27	84.09	92.97	105.61	5.64	82.80	33.05	29.09	149.22	10.16	76.95	40.25	7.01	7.48	335.99	6462.26
1.42		2	290.36	83.56	81.57	117.01	9.02	81.18	35.60	24.82	92.69	10.29	76.79	41.19	7.64	16.56	312.96	5764.88
1.42	Z 220/70/26	1	339.76	46.33	108.79	109.79	2.22	69.38	31.23	30.95	208.98	6.68	84.45	31.18	3.35	1.90	306.94	4140.10
1.42		2	327.13	46.73	92.62	125.96	4.65	66.81	35.32	25.97	100.56	6.99	84.29	31.86	3.51	15.27	293.54	3886.33
1.42	Z 220/70/39	1	358.59	57.71	107.53	111.05	3.18	70.34	33.35	32.29	181.55	8.21	84.25	33.80	4.40	3.07	327.84	5325.42
1.42		2	344.23	58.28	92.21	126.37	5.83	67.99	37.33	27.24	100.02	8.57	84.07	34.59	4.61	15.77	312.23	4892.34

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.42	Z 220/75/28	220	75	70	28	1.50	4.00	4.54	574.08	107.94	1.18	417.37	69.32	38.67	385.86	6081.06
1.42	Z 220/75/42	220	75	70	42	1.50	4.00	4.85	613.84	108.03	1.27	439.81	89.42	40.71	412.58	8317.90
1.42	Z 220/80/30	220	80	75	30	1.50	4.00	4.70	593.96	107.98	1.23	438.06	85.43	40.57	399.22	7427.94
1.42	Z 220/80/45	220	80	75	45	1.50	4.00	5.03	636.56	108.07	1.31	460.54	110.10	42.61	427.86	10221.03
1.42	Z 220/85/32	220	85	80	32	1.50	4.00	4.85	613.84	108.03	1.27	458.57	103.87	42.45	412.58	8959.20
1.42	Z 220/85/48	220	85	80	48	1.50	4.00	5.21	659.28	108.11	1.35	480.94	133.74	44.48	443.13	12405.81
1.42	Z 250/80/22.5	250	80	75	23	1.50	4.00	4.86	615.26	122.86	1.10	571.16	73.11	46.49	413.54	8182.14
1.42	Z 250/80/37.5	250	80	75	38	1.50	4.00	5.20	657.86	122.95	1.19	609.69	97.77	49.59	442.17	11481.28
1.42	Z 250/85/24	250	85	80	24	1.50	4.00	5.01	633.72	122.90	1.14	597.51	88.93	48.62	425.95	9840.18
1.42	Z 250/85/40	250	85	80	40	1.50	4.00	5.36	679.16	122.99	1.23	636.92	118.81	51.79	456.49	13870.76
1.92	Z 150/50/18	150	50	45	18	2.00	4.00	3.99	502.46	72.63	1.14	163.94	23.51	22.57	617.42	949.30
1.92	Z 150/50/27	150	50	45	27	2.00	4.00	4.26	537.02	72.72	1.23	173.49	30.70	23.86	659.89	1309.78
1.92	Z 150/55/20	150	55	50	20	2.00	4.00	4.20	529.34	72.70	1.21	176.87	32.54	24.33	650.45	1297.12
1.92	Z 150/55/30	150	55	50	30	2.00	4.00	4.50	567.74	72.79	1.30	186.51	42.37	25.62	697.64	1802.36
1.92	Z 150/60/22	150	60	55	22	2.00	4.00	4.41	556.22	72.76	1.27	189.64	43.62	26.06	683.48	1719.92
1.92	Z 150/60/33	150	60	55	33	2.00	4.00	4.74	598.46	72.85	1.36	199.22	56.67	27.35	735.39	2409.29
1.92	Z 180/60/22	180	60	55	22	2.00	4.00	4.87	613.82	87.65	1.15	292.01	43.63	33.32	754.26	2550.79
1.92	Z 180/60/33	180	60	55	33	2.00	4.00	5.20	656.06	87.74	1.24	308.56	56.68	35.17	806.17	3504.24

t [mm]	Profile type	Subjected to compression – Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	Z 220/75/28	280.47	293.19	50.38	106.77	111.81	2.43	69.73	27.46	26.22	207.57	7.22	102.24	42.38	1.24	1.17	170.44	3283.40
1.42	Z 220/75/42	298.64	307.94	59.27	106.82	111.76	2.51	69.67	28.83	27.55	236.59	8.51	101.55	44.55	1.24	1.20	187.77	3820.04
1.42	Z 220/80/30	282.47	295.19	58.36	106.39	112.19	2.81	74.97	27.75	26.31	207.80	7.78	102.23	45.46	1.58	1.59	169.82	3837.08
1.42	Z 220/80/45	300.56	309.85	68.50	106.46	112.12	2.88	75.04	29.11	27.63	237.97	9.13	101.53	47.74	1.57	1.61	186.74	4452.95
1.42	Z 220/85/32	283.98	296.68	66.85	106.00	112.58	3.24	80.40	27.99	26.35	206.33	8.31	102.21	48.52	1.97	2.02	169.25	4433.06
1.42	Z 220/85/48	302.20	311.43	78.39	106.01	112.57	3.34	80.50	29.38	27.67	234.76	9.74	101.52	50.93	1.99	2.10	185.93	5137.96
1.42	Z 250/80/22.5	271.02	373.23	51.68	120.87	127.71	2.85	75.01	30.88	29.22	181.40	6.89	117.35	43.67	1.75	1.98	156.40	4416.93
1.42	Z 250/80/37.5	291.34	396.73	63.00	121.43	127.15	2.61	74.77	32.67	31.20	241.30	8.43	116.69	46.50	1.42	1.52	174.51	5275.81
1.42	Z 250/85/24	272.45	375.04	59.18	120.44	128.14	3.27	80.43	31.14	29.27	180.94	7.36	117.33	46.61	2.13	2.45	155.66	5104.51
1.42	Z 250/85/40	292.63	398.37	71.97	121.04	127.54	2.98	80.14	32.91	31.23	241.27	8.98	116.68	49.59	1.75	1.95	173.25	6082.81
1.92	Z 150/50/18	371.18	158.79	23.49	72.13	75.95	1.54	44.62	22.02	20.91	152.08	5.26	65.41	25.16	0.40	0.50	456.10	773.98
1.92	Z 150/50/27	405.74	168.35	30.67	72.29	75.79	1.63	44.53	23.29	22.21	188.65	6.89	64.41	27.49	0.40	0.43	498.57	1056.16
1.92	Z 150/55/20	398.06	171.73	32.51	72.25	75.83	1.61	49.55	23.77	22.65	202.06	6.56	65.68	28.58	0.40	0.44	489.13	1052.99
1.92	Z 150/55/30	436.46	181.37	42.34	72.41	75.67	1.69	49.47	25.05	23.97	250.91	8.56	64.46	31.15	0.39	0.38	536.32	1449.94
1.92	Z 150/60/22	424.94	184.50	43.59	72.37	75.71	1.67	54.49	25.50	24.37	261.76	8.00	65.89	32.03	0.39	0.39	522.17	1392.39
1.92	Z 150/60/33	465.54	193.81	56.13	72.62	75.46	1.60	54.56	26.69	25.68	351.82	10.29	64.52	34.72	0.24	0.23	572.06	1915.23
1.92	Z 180/60/22	428.86	277.65	43.59	87.05	91.03	1.65	54.51	31.90	30.50	264.19	8.00	80.46	31.88	0.50	0.60	526.99	1963.59
1.92	Z 180/60/33	469.46	293.70	56.13	87.37	90.71	1.58	54.58	33.62	32.38	354.79	10.28	79.10	34.58	0.34	0.37	576.88	2637.37

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.42	Z 220/75/28	1	351.66	56.23	106.77	111.81	3.19	75.35	32.94	31.45	176.25	7.46	84.74	33.89	4.37	3.87	314.76	5019.83
1.42		2	334.41	56.32	90.69	127.89	5.89	73.05	36.87	26.15	95.59	7.71	84.48	34.67	4.71	17.25	297.51	4628.93
1.42	Z 220/75/42	1	370.16	69.85	105.51	113.07	4.36	76.52	35.08	32.74	160.13	9.13	84.39	36.66	5.63	5.04	336.31	6457.56
1.42		2	351.29	70.15	90.31	128.27	7.28	74.44	38.90	27.39	96.33	9.42	84.11	37.59	6.01	17.72	316.77	5834.47
1.42	Z 220/80/30	1	362.85	67.29	104.82	113.76	4.25	81.41	34.62	31.90	158.16	8.26	84.96	36.58	5.48	5.78	322.50	6000.40
1.42		2	340.80	66.89	88.76	129.82	7.27	79.43	38.40	26.25	91.96	8.42	84.58	37.47	6.05	19.22	301.45	5435.27
1.42	Z 220/80/45	1	380.94	83.39	103.58	115.00	5.64	82.80	36.78	33.12	147.82	10.07	84.45	39.51	6.95	6.93	344.72	7723.60
1.42		2	357.46	83.23	88.44	130.14	8.88	81.04	40.42	27.47	93.76	10.27	84.07	40.57	7.57	19.63	321.33	6865.53
1.42	Z 220/85/32	1	373.39	79.55	102.93	115.65	5.40	87.56	36.28	32.29	147.27	9.08	85.11	39.28	6.67	7.62	330.19	7085.22
1.42		2	346.40	78.40	86.85	131.73	8.79	85.95	39.89	26.30	89.24	9.12	84.60	40.25	7.52	21.18	305.42	6303.21
1.42	Z 220/85/48	1	391.00	98.38	101.74	116.84	7.01	89.17	38.43	33.46	140.38	11.03	84.45	42.36	8.36	8.73	353.09	9129.03
1.42		2	362.82	97.51	86.62	131.96	10.61	87.77	41.89	27.50	91.94	11.11	83.95	43.52	9.25	21.49	325.94	7985.35
1.42	Z 250/80/22.5	1	466.78	58.38	122.70	125.88	3.55	80.71	38.04	37.08	164.60	7.23	95.77	33.87	4.64	3.02	325.07	6668.55
1.42		2	431.68	56.98	98.84	149.74	6.58	78.74	43.67	28.83	86.65	7.24	94.83	34.45	5.48	24.01	303.96	5901.49
1.42	Z 250/80/37.5	1	497.02	74.95	120.79	127.79	4.87	82.03	41.15	38.89	154.05	9.14	95.81	37.20	6.05	4.84	347.56	8793.05
1.42		2	462.11	75.04	98.83	149.75	7.81	79.97	46.76	30.86	96.03	9.38	95.01	38.29	6.63	24.12	324.68	7880.54
1.42	Z 250/85/24	1	480.91	69.02	120.56	128.02	4.56	86.72	39.89	37.56	151.22	7.96	96.07	36.39	5.70	5.13	332.41	7859.02
1.42		2	439.23	67.20	96.87	151.71	7.86	85.02	45.34	28.95	85.50	7.90	94.95	37.14	6.72	26.03	307.82	6899.82
1.42	Z 250/85/40	1	510.96	88.44	118.63	129.95	6.10	88.26	43.07	39.32	144.95	10.02	95.95	39.92	7.33	6.96	355.62	10368
1.42		2	469.01	87.94	96.76	151.82	9.39	86.55	48.47	30.89	93.62	10.16	94.97	41.12	8.16	26.23	328.84	9133.93
1.92	Z 150/50/18	1	162.89	23.51	72.15	75.93	1.15	45.01	22.58	21.45	203.88	5.22	57.24	21.75	0.01	0.47	610.88	943.09
1.92		2	163.28	23.32	72.44	75.64	1.24	44.92	22.54	21.59	188.63	5.19	57.08	21.57	0.10	0.18	612.83	942.32
1.92	Z 150/50/27	1	172.51	30.70	72.30	75.78	1.24	44.92	23.86	22.77	247.58	6.83	56.94	24.02	0.01	0.41	653.77	1301.26
1.92		2	173.49	30.70	72.72	75.36	1.23	44.93	23.86	23.02	249.90	6.83	56.84	23.91	0.00	0.00	659.89	1309.78
1.92	Z 150/55/20	1	175.88	32.54	72.27	75.81	1.22	49.94	24.34	23.20	266.34	6.52	57.92	24.91	0.01	0.43	644.24	1288.92
1.92		2	175.43	32.01	72.31	75.77	1.44	49.72	24.26	23.15	222.72	6.44	57.72	24.66	0.23	0.38	640.36	1278.55
1.92	Z 150/55/30	1	185.59	42.37	72.42	75.66	1.31	49.85	25.63	24.53	323.89	8.50	57.41	27.43	0.01	0.37	691.85	1791.18
1.92		2	186.51	42.37	72.79	75.29	1.30	49.86	25.62	24.77	326.61	8.50	57.32	27.32	0.00	0.00	697.64	1802.36
1.92	Z 150/60/22	1	188.70	43.62	72.38	75.70	1.28	54.88	26.07	24.93	339.88	7.95	58.50	28.13	0.01	0.38	677.57	1709.44
1.92		2	187.31	42.57	72.17	75.91	1.66	54.50	25.95	24.68	256.09	7.81	58.27	27.78	0.39	0.59	667.32	1684.47
1.92	Z 150/60/33	1	198.18	56.22	72.65	75.43	1.23	54.93	27.28	26.27	456.01	10.23	57.81	30.79	0.13	0.21	728.60	2373.57
1.92		2	199.18	56.61	72.84	75.24	1.38	54.78	27.35	26.47	410.50	10.33	57.70	30.76	0.02	0.02	735.12	2405.08
1.92	Z 180/60/22	1	289.05	42.98	87.67	90.41	0.95	55.21	32.97	31.97	453.03	7.79	68.99	26.61	0.20	0.02	739.91	2517.73
1.92		2	287.34	42.21	86.76	91.32	1.63	54.53	33.12	31.47	258.64	7.74	68.77	26.36	0.48	0.88	732.77	2476.35
1.92	Z 180/60/33	1	306.85	56.22	87.49	90.59	1.12	55.04	35.07	33.87	500.10	10.22	68.70	29.41	0.12	0.24	798.94	3456.93
1.92		2	308.48	56.62	87.72	90.36	1.26	54.90	35.17	34.14	450.11	10.31	68.58	29.38	0.02	0.02	805.90	3498.47

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	Z 180/65/24	180	65	60	24	2.00	4.00	5.08	640.70	87.71	1.21	310.68	56.98	35.42	787.29	3294.63
1.92	Z 180/65/36	180	65	60	36	2.00	4.00	5.44	686.78	87.80	1.30	327.34	73.90	37.28	843.92	4555.41
1.92	Z 180/70/26	180	70	65	26	2.00	4.00	5.29	667.58	87.76	1.26	329.16	72.81	37.51	820.32	4169.15
1.92	Z 180/70/39	180	70	65	39	2.00	4.00	5.68	717.50	87.85	1.35	345.74	94.29	39.36	881.66	5805.55
1.92	Z 200/65/24	200	65	60	24	2.00	4.00	5.38	679.10	97.64	1.14	398.83	56.99	40.85	834.48	4137.98
1.92	Z 200/65/36	200	65	60	36	2.00	4.00	5.74	725.18	97.73	1.23	421.47	73.90	43.13	891.10	5662.73
1.92	Z 200/70/26	200	70	65	26	2.00	4.00	5.59	705.98	97.69	1.19	421.99	72.82	43.20	867.51	5232.11
1.92	Z 200/70/39	200	70	65	39	2.00	4.00	5.98	755.90	97.78	1.28	444.81	94.30	45.49	928.85	7202.12
1.92	Z 200/75/28	200	75	70	28	2.00	4.00	5.80	732.86	97.74	1.24	444.92	91.34	45.52	900.54	6501.66
1.92	Z 200/75/42	200	75	70	42	2.00	4.00	6.22	786.62	97.83	1.33	467.73	118.13	47.81	966.60	9006.85
1.92	Z 200/80/30	200	80	75	30	2.00	4.00	6.01	759.74	97.79	1.29	467.63	112.77	47.82	933.57	7960.66
1.92	Z 200/80/45	200	80	75	45	2.00	4.00	6.46	817.34	97.88	1.37	490.24	145.68	50.09	1004.35	11103.09
1.92	Z 220/70/26	220	70	65	26	2.00	4.00	5.89	744.38	107.63	1.13	528.94	72.82	49.14	914.69	6429.58
1.92	Z 220/70/39	220	70	65	39	2.00	4.00	6.28	794.30	107.72	1.22	559.00	94.30	51.89	976.04	8770.81
1.92	Z 220/75/28	220	75	70	28	2.00	4.00	6.10	771.26	107.68	1.18	557.06	91.35	51.73	947.72	7984.70
1.92	Z 220/75/42	220	75	70	42	2.00	4.00	6.52	825.02	107.77	1.27	587.40	118.14	54.50	1013.78	10950.92
1.92	Z 220/80/30	220	80	75	30	2.00	4.00	6.31	798.14	107.73	1.22	584.94	112.77	54.30	980.75	9769.15
1.92	Z 220/80/45	220	80	75	45	2.00	4.00	6.76	855.74	107.82	1.31	615.33	145.69	57.07	1051.53	13476.06

t [mm]	Profile type	Subjected to compression – Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	Z 180/65/24	454.04	295.07	56.56	87.01	91.07	1.81	59.35	33.91	32.40	311.90	9.53	80.61	35.29	0.60	0.69	554.90	2516.88
1.92	Z 180/65/36	491.67	309.71	70.24	87.52	90.56	1.59	59.57	35.39	34.20	442.68	11.79	79.37	37.80	0.29	0.28	604.17	3254.68
1.92	Z 180/70/26	473.42	307.88	71.12	87.72	90.36	1.74	64.42	35.10	34.07	409.20	11.04	80.64	38.76	0.48	0.04	574.28	3160.51
1.92	Z 180/70/39	507.97	321.34	85.68	88.42	89.66	1.30	64.86	36.34	35.84	658.20	13.21	79.54	41.07	0.05	0.58	624.19	3942.92
1.92	Z 200/65/24	455.23	371.95	56.35	96.63	101.45	1.89	59.27	38.49	36.66	297.93	9.51	90.39	35.18	0.75	1.01	554.58	3061.40
1.92	Z 200/65/36	493.62	392.35	70.24	97.36	100.72	1.58	59.58	40.30	38.96	444.44	11.79	89.15	37.72	0.35	0.37	606.56	3926.65
1.92	Z 200/70/26	474.52	388.03	70.86	97.41	100.67	1.83	64.33	39.83	38.54	387.22	11.01	90.43	38.64	0.64	0.28	573.77	3836.72
1.92	Z 200/70/39	509.91	406.88	85.68	98.37	99.71	1.30	64.86	41.36	40.80	660.72	13.21	89.33	40.99	0.02	0.58	626.58	4754.51
1.92	Z 200/75/28	487.57	398.23	86.36	97.53	100.55	1.86	69.30	40.83	39.61	464.76	12.46	90.38	42.09	0.62	0.21	585.49	4698.96
1.92	Z 200/75/42	519.44	414.93	101.91	98.34	99.74	1.37	69.79	42.19	41.60	742.50	14.60	89.38	44.29	0.05	0.51	635.41	5661.15
1.92	Z 200/80/30	496.19	405.13	102.06	97.47	100.61	1.96	74.20	41.57	40.27	521.14	13.76	90.36	45.35	0.67	0.32	590.57	5585.84
1.92	Z 200/80/45	526.49	420.78	119.03	98.10	99.98	1.60	74.56	42.89	42.09	742.54	15.97	89.40	47.55	0.23	0.22	637.49	6641.40
1.92	Z 220/70/26	475.30	477.64	70.60	107.07	111.01	1.92	64.24	44.61	43.03	368.07	10.99	100.25	38.54	0.79	0.57	573.00	4577.44
1.92	Z 220/70/39	511.50	502.89	85.68	108.31	109.77	1.29	64.87	46.43	45.81	662.77	13.21	99.16	40.93	0.08	0.59	628.53	5643.37
1.92	Z 220/75/28	488.40	490.35	86.04	107.23	110.85	1.95	69.21	45.73	44.23	440.93	12.43	100.20	41.97	0.77	0.46	584.69	5598.37
1.92	Z 220/75/42	520.43	512.10	101.66	108.16	109.92	1.44	69.72	47.35	46.59	705.49	14.58	99.20	44.20	0.18	0.39	634.54	6709.28
1.92	Z 220/80/30	497.14	498.94	101.76	107.18	110.90	2.04	74.12	46.55	44.99	498.77	13.73	100.18	45.24	0.82	0.55	589.95	6656.44
1.92	Z 220/80/45	527.46	519.26	118.74	107.89	110.19	1.68	74.48	48.13	47.12	707.43	15.94	99.22	47.45	0.37	0.07	636.63	7868.06

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
1.92	Z 180/65/24	1	307.22	55.98	87.91	90.17	0.92	60.24	34.95	34.07	607.52	9.29	69.62	29.72	0.29	0.21	770.79	3248.45
1.92		2	304.45	54.70	86.57	91.51	1.89	59.27	35.17	33.27	289.73	9.23	69.39	29.41	0.68	1.14	758.83	3178.69
1.92	Z 180/65/36	1	324.58	71.76	88.06	90.02	0.79	60.37	36.86	36.06	913.55	11.89	69.19	32.53	0.51	0.27	833.18	4393.91
1.92		2	324.54	71.87	87.20	90.88	1.81	59.35	37.22	35.71	397.06	12.11	69.05	32.50	0.51	0.59	830.79	4399.68
1.92	Z 180/70/26	1	322.33	70.93	88.90	89.18	0.67	65.49	36.26	36.14	1060.97	10.83	69.98	32.83	0.59	1.14	799.63	4115.16
1.92		2	321.05	69.33	86.34	91.74	2.18	63.98	37.19	34.99	317.94	10.84	69.93	32.50	0.92	1.42	784.20	3998.79
1.92	Z 180/70/39	1	338.71	89.23	88.70	89.38	0.15	66.01	38.18	37.90	5932.30	13.52	69.42	35.63	1.20	1.53	863.77	5483.11
1.92		2	339.63	89.24	86.62	91.46	2.49	63.67	39.21	37.13	359.12	14.02	69.44	35.60	1.14	1.23	853.11	5423.01
1.92	Z 200/65/24	1	391.16	55.42	97.70	100.38	0.72	60.44	40.04	38.97	767.81	9.17	76.67	28.86	0.42	0.06	805.55	4037.43
1.92		2	385.47	54.40	95.14	102.94	1.90	59.26	40.51	37.45	286.08	9.18	76.60	28.77	0.76	2.50	787.25	3924.56
1.92	Z 200/65/36	1	415.91	71.76	97.59	100.49	0.75	60.41	42.62	41.39	957.97	11.88	76.48	31.77	0.48	0.14	873.67	5443.16
1.92		2	412.89	71.61	96.01	102.07	1.81	59.35	43.00	40.45	395.47	12.07	76.43	31.83	0.58	1.72	860.35	5400.28
1.92	Z 200/70/26	1	409.75	70.21	98.61	99.47	0.47	65.69	41.55	41.19	1488.20	10.69	77.15	31.94	0.72	0.91	832.09	5098.51
1.92		2	405.97	68.94	94.87	103.21	2.20	63.96	42.79	39.34	313.19	10.78	77.23	31.83	1.01	2.82	811.75	4928.83
1.92	Z 200/70/39	1	432.69	89.03	98.94	99.14	0.10	66.06	43.73	43.64	8885.35	13.48	76.80	34.84	1.18	1.16	899.54	6763.66
1.92		2	431.27	88.92	95.28	102.80	2.48	63.68	45.27	41.95	358.78	13.96	76.91	34.92	1.20	2.51	880.91	6636.14
1.92	Z 200/75/28	1	426.59	87.03	98.37	99.71	0.09	71.07	43.37	42.78	10059.51	12.24	77.52	35.01	1.15	1.97	856.47	6316.68
1.92		2	422.71	85.43	94.10	103.98	2.68	68.84	44.92	40.65	319.00	12.41	77.69	34.92	1.44	3.64	831.53	6077.04
1.92	Z 200/75/42	1	447.90	108.32	97.71	100.37	0.71	71.87	45.84	44.62	1529.97	15.07	77.03	37.88	2.03	2.54	922.07	8255.57
1.92		2	444.54	108.02	93.94	104.14	3.42	69.58	47.32	42.69	315.63	15.52	77.19	38.05	2.10	3.89	895.38	8014.13
1.92	Z 200/80/30	1	441.32	104.75	96.97	101.11	0.62	76.78	45.51	43.65	1700.94	13.64	77.81	37.91	1.90	3.32	876.99	7605.59
1.92		2	435.88	103.58	92.91	105.17	3.38	74.54	46.92	41.44	306.50	13.90	77.99	38.02	2.09	4.88	846.10	7354.47
1.92	Z 200/80/45	1	462.11	129.94	96.31	101.77	1.62	77.78	47.98	45.41	802.52	16.71	77.18	40.93	2.99	3.90	944.07	9934.58
1.92		2	455.98	129.18	92.51	105.57	4.52	75.68	49.29	43.19	285.56	17.07	77.37	41.18	3.15	5.37	908.33	9543.46
1.92	Z 220/70/26	1	505.58	69.57	107.37	110.71	0.31	65.85	47.09	45.67	2230.83	10.57	84.45	31.33	0.82	0.26	853.32	6143.19
1.92		2	500.41	68.57	102.89	115.19	2.23	63.93	48.63	43.44	307.74	10.73	84.51	31.29	1.10	4.74	834.38	5938.38
1.92	Z 220/70/39	1	535.64	88.50	107.80	110.28	0.01	66.17	49.69	48.57	61307.48	13.37	84.27	34.25	1.23	0.08	920.45	8115.43
1.92		2	533.32	88.60	103.41	114.67	2.48	63.68	51.57	46.51	356.77	13.91	84.37	34.39	1.27	4.31	903.12	7946.25
1.92	Z 220/75/28	1	526.44	86.31	108.58	109.50	0.06	71.22	48.49	48.08	13956.29	12.12	84.89	34.37	1.24	0.89	877.59	7611.26
1.92		2	520.99	84.97	102.13	115.95	2.70	68.86	51.01	44.93	314.85	12.34	85.04	34.34	1.52	5.56	854.05	7313.68
1.92	Z 220/75/42	1	554.52	107.65	108.68	109.40	0.82	71.98	51.03	50.69	1320.31	14.96	84.54	37.25	2.08	1.63	942.82	9896.41
1.92		2	549.64	107.65	102.01	116.07	3.41	69.57	53.88	47.35	316.04	15.47	84.70	37.48	2.14	5.76	917.53	9581.39
1.92	Z 220/80/30	1	544.64	103.91	107.96	110.12	0.75	76.91	50.45	49.46	1380.21	13.51	85.23	37.23	1.98	2.39	898.01	9162.34
1.92		2	537.02	103.03	100.87	117.21	3.39	74.55	53.24	45.82	303.53	13.82	85.40	37.41	2.17	6.86	868.46	8839.42
1.92	Z 220/80/45	1	572.18	129.09	107.10	110.98	1.72	77.88	53.43	51.56	751.20	16.58	84.75	40.25	3.03	3.16	964.67	11898
1.92		2	563.52	128.73	100.46	117.62	4.49	75.65	56.09	47.91	286.70	17.02	84.92	40.59	3.18	7.35	930.24	11391

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	Z 220/85/32	220	85	80	32	2.00	4.00	6.52	825.02	107.77	1.27	612.56	137.31	56.84	1013.78	11799.76
1.92	Z 220/85/48	220	85	80	48	2.00	4.00	7.01	886.46	107.86	1.35	642.81	177.22	59.60	1089.28	16377.35
1.92	Z 250/80/22.5	250	80	75	23	2.00	4.00	6.54	826.94	122.60	1.09	762.96	96.33	62.23	1016.14	10748.37
1.92	Z 250/80/37.5	250	80	75	38	2.00	4.00	6.99	884.54	122.69	1.19	815.07	129.24	66.43	1086.92	15131.01
1.92	Z 250/85/24	250	85	80	24	2.00	4.00	6.73	851.90	122.64	1.13	798.47	117.37	65.11	1046.81	12946.52
1.92	Z 250/85/40	250	85	80	40	2.00	4.00	7.22	913.34	122.74	1.23	851.76	157.28	69.40	1122.31	18304.51
1.92	Z 250/90/25.5	250	90	85	26	2.00	4.00	6.93	876.86	122.68	1.17	833.81	141.28	67.96	1077.49	15415.66
1.92	Z 250/90/42.5	250	90	85	43	2.00	4.00	7.44	942.14	122.78	1.27	888.03	189.10	72.33	1157.70	21897.98
1.92	Z 250/95/27	250	95	90	27	2.00	4.00	7.13	901.82	122.72	1.21	868.97	168.23	70.81	1108.16	18171.05
1.92	Z 250/95/45	250	95	90	45	2.00	4.00	7.67	970.94	122.81	1.30	923.92	224.95	75.23	1193.09	25941.54
1.92	Z 250/100/28.5	250	100	95	29	2.00	4.00	7.32	926.78	122.76	1.25	903.96	198.41	73.64	1138.83	21228.23
1.92	Z 250/100/47.5	250	100	95	48	2.00	4.00	7.89	999.74	122.85	1.34	959.42	265.07	78.10	1228.48	30466.55
1.92	Z 300/95/27	300	95	90	27	2.00	4.00	7.88	997.82	147.61	1.09	1332.42	168.24	90.27	1226.12	27135.94
1.92	Z 300/95/45	300	95	90	45	2.00	4.00	8.42	1066.94	147.70	1.19	1422.45	224.97	96.31	1311.06	38048.89
1.92	Z 300/100/28.5	300	100	95	29	2.00	4.00	8.08	1022.78	147.64	1.13	1383.68	198.42	93.72	1256.79	31691.61
1.92	Z 300/100/47.5	300	100	95	48	2.00	4.00	8.65	1095.74	147.73	1.22	1475.44	265.09	99.87	1346.45	44605.60
1.92	Z 300/105/30	300	105	100	30	2.00	4.00	8.27	1047.74	147.67	1.16	1434.74	232.01	97.16	1287.46	36713.94
1.92	Z 300/105/50	300	105	100	50	2.00	4.00	8.87	1124.54	147.77	1.25	1527.93	309.71	103.40	1381.83	51882.92

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	Z 220/85/32	503.35	505.26	117.96	106.89	111.19	2.35	78.81	47.27	45.44	501.50	14.97	100.19	48.41	1.09	0.88	592.03	7752.50
1.92	Z 220/85/48	533.34	525.19	137.06	107.61	110.47	1.95	79.21	48.81	47.54	703.01	17.30	99.23	50.69	0.60	0.25	637.50	9125.86
1.92	Z 250/80/22.5	465.86	622.28	83.68	120.72	127.36	2.70	73.86	51.55	48.86	309.74	11.33	115.58	42.38	1.61	1.88	530.15	7000.22
1.92	Z 250/80/37.5	515.56	675.18	111.08	122.19	125.89	1.95	74.21	55.25	53.63	569.40	14.97	114.44	46.42	0.77	0.50	615.30	9270.27
1.92	Z 250/85/24	476.23	635.61	99.91	120.38	127.70	3.11	79.27	52.80	49.77	320.92	12.60	115.53	45.80	1.98	2.27	540.47	8376.59
1.92	Z 250/85/40	521.57	683.16	128.43	121.86	126.22	2.25	78.91	56.06	54.13	571.16	16.27	114.45	49.62	1.02	0.87	616.73	10766
1.92	Z 250/90/25.5	485.99	647.79	117.99	119.99	128.09	3.58	84.74	53.99	50.57	329.17	13.92	115.45	49.27	2.41	2.69	550.60	9921.72
1.92	Z 250/90/42.5	526.62	689.78	146.94	121.52	126.56	2.58	83.74	56.76	54.50	569.23	17.55	114.45	52.82	1.32	1.26	617.21	12380
1.92	Z 250/95/27	493.27	656.90	136.57	119.93	128.15	3.82	89.98	54.77	51.26	357.50	15.18	115.40	52.62	2.61	2.79	556.47	11548
1.92	Z 250/95/45	530.86	695.28	166.58	121.16	126.92	2.95	89.11	57.38	54.78	564.82	18.69	114.44	56.02	1.65	1.65	616.98	14112
1.92	Z 250/100/28.5	497.96	662.70	155.12	119.87	128.21	4.00	95.16	55.29	51.69	387.70	16.30	115.36	55.81	2.76	2.88	558.30	13219
1.92	Z 250/100/47.5	534.43	699.83	187.33	120.79	127.29	3.35	94.51	57.94	54.98	558.76	19.82	114.43	59.21	2.02	2.06	616.21	15962
1.92	Z 300/95/27	489.75	961.22	132.40	144.72	153.36	3.42	89.58	66.42	62.68	387.32	14.78	140.10	52.00	2.32	2.88	536.20	16082
1.92	Z 300/95/45	529.19	1024.71	163.81	145.80	152.28	2.81	88.97	70.28	67.29	583.98	18.41	139.15	55.64	1.62	1.89	604.18	19624
1.92	Z 300/100/28.5	494.02	969.01	150.07	144.67	153.41	3.57	94.73	66.98	63.16	420.51	15.84	140.05	55.12	2.44	2.97	536.10	18372
1.92	Z 300/100/47.5	532.20	1030.40	183.83	145.48	152.60	3.13	94.29	70.83	67.52	587.45	19.50	139.14	58.77	1.91	2.26	601.69	22166
1.92	Z 300/105/30	497.24	974.78	168.31	144.46	153.62	3.84	100.00	67.48	63.45	438.63	16.83	140.01	58.18	2.68	3.22	535.30	20763
1.92	Z 300/105/50	534.69	1035.03	204.87	145.12	152.96	3.49	99.65	71.32	67.67	587.04	20.56	139.13	61.90	2.24	2.64	599.22	24866

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	Z 220/85/32	1	561.81	123.44	106.43	111.65	1.54	82.70	52.79	50.32	800.78	14.93	85.50	40.08	2.81	3.88	917.96	10884
1.92		2	550.40	122.15	99.36	118.72	4.35	80.51	55.39	46.36	280.72	15.17	85.68	40.36	3.09	8.41	879.83	10418
1.92	Z 220/85/48	1	588.76	152.90	105.56	112.52	2.72	83.88	55.77	52.33	562.99	18.23	84.88	43.26	4.07	4.66	986.15	14130
1.92		2	576.10	151.97	98.92	119.16	5.70	81.86	58.24	48.35	266.70	18.56	85.06	43.69	4.35	8.94	942.48	13381
1.92	Z 250/80/22.5	1	690.53	85.50	123.73	124.35	1.22	77.38	55.81	55.53	700.70	11.05	95.92	33.75	2.31	1.13	886.77	9671.37
1.92		2	672.35	83.91	111.04	137.04	3.84	75.00	60.55	49.06	218.67	11.19	95.93	33.89	2.74	11.56	854.27	9032.08
1.92	Z 250/80/37.5	1	744.89	116.22	123.74	124.34	1.26	77.42	60.20	59.91	924.32	15.01	96.18	37.99	2.44	1.05	965.27	13542
1.92		2	732.25	116.08	112.47	135.61	3.79	74.95	65.11	54.00	306.36	15.49	96.28	38.33	2.60	10.23	934.65	13016
1.92	Z 250/85/24	1	715.44	103.26	123.00	125.08	1.71	82.87	58.17	57.20	603.96	12.46	96.40	36.62	2.84	2.44	908.85	11633
1.92		2	692.11	100.65	109.78	138.30	4.57	80.73	63.05	50.04	220.27	12.47	96.39	36.76	3.43	12.86	868.68	10767
1.92	Z 250/85/40	1	767.50	137.75	122.55	125.53	2.14	83.30	62.63	61.14	644.22	16.54	96.46	40.87	3.37	2.79	985.82	16062
1.92		2	748.79	137.13	110.75	137.33	4.87	81.03	67.61	54.53	281.85	16.92	96.54	41.31	3.64	11.98	945.86	15258
1.92	Z 250/90/25.5	1	739.48	123.25	121.66	126.42	2.24	88.40	60.78	58.49	549.54	13.94	96.81	39.52	3.42	3.74	930.69	13840
1.92		2	710.76	119.31	108.49	139.59	5.37	86.53	65.51	50.92	222.24	13.79	96.77	39.65	4.19	14.19	882.70	12697
1.92	Z 250/90/42.5	1	788.87	161.50	120.80	127.28	3.10	89.26	65.31	61.98	520.37	18.09	96.68	43.74	4.37	4.51	1006.08	18847
1.92		2	763.84	160.15	109.03	139.05	6.06	87.22	70.06	54.93	264.44	18.36	96.73	44.29	4.79	13.75	956.76	17696
1.92	Z 250/95/27	1	762.47	145.47	120.32	127.76	2.83	93.99	63.37	59.68	513.32	15.48	97.16	42.44	4.04	5.04	951.96	16298
1.92		2	728.42	139.98	107.20	140.88	6.23	92.39	67.95	51.70	224.60	15.15	97.10	42.57	5.02	15.52	896.42	14830
1.92	Z 250/95/45	1	809.13	187.54	119.09	128.99	4.15	95.31	67.94	62.73	452.17	19.68	96.83	46.62	5.45	6.17	1026.14	21905
1.92		2	777.54	185.16	107.31	140.77	7.36	93.52	72.45	55.24	251.66	19.80	96.85	47.26	6.06	15.50	967.50	20332
1.92	Z 250/100/28.5	1	783.17	169.24	118.82	129.26	3.58	99.74	65.91	60.59	472.53	16.97	97.41	45.28	4.83	6.50	970.83	18957
1.92		2	742.33	161.59	105.62	142.46	7.32	98.48	70.28	52.11	220.75	16.41	97.30	45.40	6.08	17.13	906.94	17045
1.92	Z 250/100/47.5	1	828.37	215.95	117.43	130.65	5.27	101.43	70.54	63.41	410.16	21.29	96.94	49.49	6.60	7.80	1046.05	25247
1.92		2	790.02	212.16	105.61	142.47	8.77	99.93	74.80	55.45	242.04	21.23	96.92	50.23	7.43	17.24	978.17	23168
1.92	Z 300/95/27	1	1138.73	141.95	148.29	149.79	3.11	94.27	76.79	76.02	455.86	15.06	115.24	40.69	4.21	2.18	1006.71	23208
1.92		2	1077.48	137.93	125.04	173.04	6.17	92.33	86.17	62.27	223.62	14.94	114.71	41.04	5.07	22.57	951.00	21105
1.92	Z 300/95/45	1	1215.44	184.58	146.60	151.48	4.27	95.43	82.91	80.24	432.51	19.34	115.34	44.95	5.45	3.78	1079.86	31076
1.92		2	1156.86	183.54	125.33	172.75	7.19	93.35	92.31	66.97	255.35	19.66	114.96	45.79	6.00	22.37	1020.83	28740
1.92	Z 300/100/28.5	1	1169.53	164.98	146.47	151.61	3.87	100.03	79.85	77.14	426.02	16.49	115.60	43.42	5.00	3.97	1025.44	26933
1.92		2	1097.34	159.29	123.31	174.77	7.22	98.38	88.99	62.79	220.74	16.19	114.98	43.81	6.09	24.33	961.54	24225
1.92	Z 300/100/47.5	1	1244.66	212.42	144.57	153.51	5.36	101.52	86.09	81.08	396.12	20.92	115.54	47.73	6.58	5.78	1099.78	35752
1.92		2	1174.34	210.29	123.38	174.70	8.55	99.71	95.18	67.22	245.91	21.09	115.06	48.69	7.33	24.36	1031.13	32669
1.92	Z 300/105/30	1	1198.46	189.52	144.60	153.48	4.75	105.91	82.88	78.09	399.07	17.89	115.90	46.09	5.91	5.80	1043.77	30889
1.92		2	1114.65	182.10	121.48	176.60	8.39	104.55	91.75	63.12	217.14	17.42	115.16	46.54	7.23	26.19	971.34	27531
1.92	Z 300/105/50	1	1272.48	242.61	142.60	155.48	6.53	107.69	89.23	81.84	371.77	22.53	115.68	50.51	7.78	7.71	1119.60	40824
1.92		2	1190.19	239.01	121.44	176.64	10.02	106.18	98.01	67.38	238.60	22.51	115.09	51.58	8.76	26.33	1041.46	36858

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
1.92	Z 300/115/33	300	115	110	33	2.00	4.00	8.66	1097.66	147.74	1.22	1536.22	310.14	103.98	1348.80	48246.82
1.92	Z 300/115/55	300	115	110	55	2.00	4.00	9.33	1182.14	147.83	1.31	1631.50	413.45	110.36	1452.61	68773.33
1.92	Z 330/105/30	330	105	100	30	2.00	4.00	8.72	1105.34	162.62	1.10	1794.40	232.02	110.35	1358.24	45270.08
1.92	Z 330/105/50	330	105	100	50	2.00	4.00	9.33	1182.14	162.71	1.19	1914.67	309.72	117.68	1452.61	63407.31
1.92	Z 330/115/33	330	115	110	33	2.00	4.00	9.12	1155.26	162.68	1.16	1918.27	310.15	117.92	1419.58	59475.49
1.92	Z 330/115/55	330	115	110	55	2.00	4.00	9.78	1239.74	162.77	1.25	2042.31	413.46	125.47	1523.39	83914.95
1.92	Z 350/105/30	350	105	100	30	2.00	4.00	9.03	1143.74	172.58	1.06	2061.65	232.02	119.46	1405.43	51518.33
1.92	Z 350/105/50	350	105	100	50	2.00	4.00	9.63	1220.54	172.67	1.15	2201.89	309.73	127.52	1499.80	71807.88
1.92	Z 350/115/33	350	115	110	33	2.00	4.00	9.42	1193.66	172.64	1.12	2201.69	310.15	127.53	1466.77	67681.04
1.92	Z 350/115/55	350	115	110	55	2.00	4.00	10.08	1278.14	172.73	1.21	2347.03	413.47	135.88	1570.58	94955.92
2.42	Z 150/50/18	150	50	45	18	2.50	4.00	4.98	627.05	72.37	1.13	202.52	28.44	27.99	1224.09	1142.18
2.42	Z 150/50/27	150	50	45	27	2.50	4.00	5.33	670.61	72.46	1.22	214.56	37.30	29.61	1309.12	1583.18
2.42	Z 150/55/20	150	55	50	20	2.50	4.00	5.25	660.93	72.44	1.20	218.74	39.53	30.20	1290.23	1567.07
2.42	Z 150/55/30	150	55	50	30	2.50	4.00	5.63	709.33	72.53	1.29	230.89	51.67	31.83	1384.71	2186.37
2.42	Z 150/60/22	150	60	55	22	2.50	4.00	5.52	694.81	72.50	1.27	234.74	53.17	32.38	1356.36	2084.68
2.42	Z 150/60/33	150	60	55	33	2.50	4.00	5.93	748.05	72.60	1.36	246.82	69.33	34.00	1460.30	2931.03
2.42	Z 180/60/22	180	60	55	22	2.50	4.00	6.09	767.41	87.39	1.15	362.06	53.19	41.43	1498.09	3096.06
2.42	Z 180/60/33	180	60	55	33	2.50	4.00	6.50	820.65	87.48	1.24	382.92	69.35	43.77	1602.02	4268.67

t [mm]	Profile type	Subjected to compression																
		Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	Z 300/115/33	501.19	981.93	206.01	143.64	154.44	4.77	110.93	68.36	63.58	431.86	18.57	139.97	64.11	3.55	4.10	533.20	25745
1.92	Z 300/115/55	538.61	1042.10	250.12	144.30	153.78	4.37	110.53	72.22	67.77	572.88	22.63	139.10	68.15	3.05	3.53	595.13	30745
1.92	Z 330/105/30	494.97	1187.03	165.38	159.38	168.70	3.59	99.75	74.48	70.36	460.83	16.58	154.86	57.80	2.49	3.24	524.53	24685
1.92	Z 330/105/50	532.59	1262.74	202.03	160.08	168.00	3.27	99.43	78.88	75.16	618.56	20.32	153.98	61.59	2.07	2.63	586.71	29525
1.92	Z 330/115/33	498.64	1195.09	202.09	158.51	169.57	4.47	110.63	75.40	70.48	452.39	18.27	154.81	63.66	3.31	4.17	521.02	30575
1.92	Z 330/115/55	535.94	1270.08	246.08	159.30	168.78	4.04	110.20	79.73	75.25	609.19	22.33	153.94	67.76	2.79	3.47	580.62	36458
1.92	Z 350/105/30	493.51	1339.86	163.57	169.33	178.75	3.45	99.61	79.13	74.96	474.75	16.42	164.77	57.57	2.38	3.25	518.28	27471
1.92	Z 350/105/50	531.24	1426.89	200.28	170.06	178.02	3.14	99.30	83.91	80.15	638.41	20.17	163.89	61.40	1.98	2.61	579.42	32840
1.92	Z 350/115/33	496.99	1348.46	199.66	168.43	179.65	4.29	110.45	80.06	75.06	465.44	18.08	164.72	63.38	3.17	4.21	514.11	34002
1.92	Z 350/115/55	534.41	1434.69	243.73	169.25	178.83	3.88	110.04	84.77	80.23	628.30	22.15	163.85	67.53	2.66	3.48	572.54	40531
2.42	Z 150/50/18	501.86	199.70	28.42	72.01	75.57	1.42	43.74	27.73	26.43	200.40	6.50	63.08	23.80	0.28	0.36	979.71	994.90
2.42	Z 150/50/27	545.42	211.74	37.28	72.15	75.43	1.50	43.66	29.35	28.07	247.76	8.54	62.31	26.14	0.28	0.31	1064.74	1367.37
2.42	Z 150/55/20	535.74	215.92	39.50	72.12	75.46	1.49	48.67	29.94	28.61	265.74	8.12	63.48	27.15	0.28	0.32	1045.84	1359.82
2.42	Z 150/55/30	584.14	228.07	51.65	72.26	75.32	1.57	48.59	31.56	30.28	328.86	10.63	62.48	29.73	0.28	0.27	1140.33	1883.62
2.42	Z 150/60/22	569.62	231.93	53.15	72.22	75.36	1.55	53.61	32.11	30.78	343.61	9.91	63.81	30.55	0.28	0.28	1111.98	1804.19
2.42	Z 150/60/33	622.86	244.00	69.31	72.36	75.22	1.63	53.53	33.72	32.44	425.64	12.95	62.59	33.36	0.27	0.24	1215.91	2521.90
2.42	Z 180/60/22	577.54	352.27	53.15	86.93	90.65	1.53	53.63	40.52	38.86	348.40	9.91	78.10	30.34	0.38	0.46	1127.44	2557.00
2.42	Z 180/60/33	630.78	373.14	69.31	87.09	90.49	1.61	53.55	42.85	41.23	431.07	12.94	76.91	33.15	0.37	0.39	1231.37	3489.06

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																		
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
1.92	Z 300/115/33	1	1251.56	243.12	140.82	157.26	6.82	117.98	88.88	79.59	356.54	20.61	116.33	51.27	8.04	9.52	1079.70	39442
1.92		2	1143.56	231.72	117.70	180.38	11.08	117.24	97.16	63.40	209.09	19.76	115.32	51.91	9.86	30.03	990.36	34540
1.92	Z 300/115/55	1	1324.33	310.29	138.83	159.25	9.04	120.20	95.39	83.16	343.17	25.81	115.82	56.06	10.36	11.42	1159.02	52198
1.92		2	1217.47	302.34	117.63	180.45	13.24	119.40	103.50	67.47	228.32	25.32	114.99	57.30	11.93	30.20	1062.41	45997
1.92	Z 330/105/30	1	1479.39	187.27	161.50	166.58	4.83	105.99	91.60	88.81	387.43	17.67	126.67	45.07	5.93	3.96	1077.38	37162
1.92		2	1365.89	180.60	131.61	196.47	8.30	104.46	103.78	69.52	217.48	17.29	125.47	45.62	7.20	31.00	1003.93	33032
1.92	Z 330/105/50	1	1574.98	240.42	159.13	168.95	6.54	107.70	98.98	93.22	367.64	22.32	126.70	49.50	7.73	6.25	1152.63	48956
1.92		2	1462.39	237.82	131.62	196.46	9.87	106.03	111.11	74.44	241.04	22.43	125.69	50.69	8.67	31.09	1073.11	44133
1.92	Z 330/115/33	1	1545.06	240.05	157.34	170.74	6.89	118.05	98.20	90.49	348.56	20.33	127.21	50.14	8.05	8.07	1113.48	47359
1.92		2	1400.08	230.01	127.61	200.47	10.94	117.10	109.71	69.84	210.31	19.64	125.66	50.93	9.78	35.06	1022.78	41439
1.92	Z 330/115/55	1	1639.70	307.32	154.95	173.13	9.03	120.19	105.82	94.71	340.49	25.57	126.94	54.96	10.28	10.37	1192.22	62467
1.92		2	1494.49	300.79	127.51	200.57	13.04	119.20	117.20	74.51	230.72	25.23	125.60	56.35	11.78	35.26	1093.69	54937
1.92	Z 350/105/30	1	1685.03	185.81	172.93	175.15	4.88	106.04	97.44	96.21	380.42	17.52	133.77	44.42	5.95	2.57	1099.98	41627
1.92		2	1548.24	179.64	138.24	209.84	8.25	104.41	112.00	73.78	217.80	17.21	132.22	45.04	7.18	34.34	1025.68	36956
1.92	Z 350/105/50	1	1796.77	239.07	170.32	177.76	6.54	107.70	105.49	101.08	365.55	22.20	133.97	48.87	7.69	5.09	1174.87	54773
1.92		2	1660.22	237.05	138.29	209.79	9.77	105.93	120.05	79.14	242.69	22.38	132.64	50.12	8.61	34.38	1094.26	49345
1.92	Z 350/115/33	1	1760.06	238.15	168.53	179.55	6.92	118.08	104.44	98.02	344.23	20.17	134.39	49.43	8.04	6.91	1136.23	53008
1.92		2	1586.08	228.91	134.10	213.98	10.84	117.00	118.28	74.12	211.15	19.56	132.42	50.31	9.72	38.54	1044.44	46360
1.92	Z 350/115/55	1	1871.06	305.49	165.87	182.21	9.01	120.17	112.80	102.69	339.22	25.42	134.28	54.26	10.22	9.48	1214.62	69800
1.92		2	1695.61	299.80	133.99	214.09	12.90	119.06	126.54	79.20	232.34	25.18	132.56	55.74	11.69	38.74	1114.62	61334
2.42	Z 150/50/18	1	201.20	28.44	71.89	75.69	1.15	44.01	27.99	26.58	247.86	6.46	56.95	21.41	0.01	0.48	1210.91	1134.66
2.42		2	202.52	28.44	72.37	75.21	1.13	44.03	27.99	26.93	250.57	6.46	56.83	21.30	0.00	0.00	1224.09	1142.18
2.42	Z 150/50/27	1	213.33	37.30	72.04	75.54	1.24	43.92	29.61	28.24	301.94	8.49	56.67	23.70	0.01	0.42	1296.80	1572.80
2.42		2	214.56	37.30	72.46	75.12	1.22	43.94	29.61	28.56	304.82	8.49	56.56	23.58	0.00	0.00	1309.12	1583.18
2.42	Z 150/55/20	1	217.49	39.53	72.01	75.57	1.22	48.94	30.20	28.78	324.84	8.08	57.64	24.57	0.01	0.43	1277.73	1557.08
2.42		2	218.74	39.53	72.44	75.14	1.20	48.96	30.20	29.11	328.03	8.07	57.53	24.45	0.00	0.00	1290.23	1567.07
2.42	Z 150/55/30	1	229.73	51.67	72.16	75.42	1.30	48.86	31.84	30.46	396.16	10.58	57.15	27.10	0.01	0.37	1373.06	2172.68
2.42		2	230.89	51.67	72.53	75.05	1.29	48.87	31.83	30.76	399.53	10.57	57.05	26.99	0.00	0.00	1384.71	2186.37
2.42	Z 150/60/22	1	233.56	53.17	72.12	75.46	1.28	53.88	32.39	30.95	415.64	9.87	58.23	27.79	0.01	0.39	1344.47	2071.86
2.42		2	234.74	53.17	72.50	75.08	1.27	53.89	32.38	31.27	419.32	9.87	58.13	27.66	0.00	0.00	1356.36	2084.68
2.42	Z 150/60/33	1	245.72	69.33	72.26	75.32	1.37	53.79	34.00	32.62	507.52	12.89	57.53	30.56	0.01	0.33	1449.25	2913.55
2.42		2	246.82	69.33	72.60	74.98	1.36	53.80	34.00	32.92	511.39	12.89	57.44	30.44	0.00	0.00	1460.30	2931.03
2.42	Z 180/60/22	1	360.18	53.18	86.93	90.65	1.16	54.00	41.43	39.73	459.20	9.85	68.81	26.44	0.01	0.46	1485.09	3079.72
2.42		2	361.14	52.91	87.25	90.33	1.22	53.94	41.39	39.98	432.56	9.81	68.66	26.28	0.08	0.14	1490.84	3082.01
2.42	Z 180/60/33	1	381.17	69.35	87.08	90.50	1.25	53.91	43.77	42.12	556.86	12.86	68.41	29.18	0.01	0.40	1589.86	4246.27
2.42		2	382.92	69.35	87.48	90.10	1.24	53.92	43.77	42.50	561.12	12.86	68.31	29.07	0.00	0.00	1602.02	4268.67

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	Z 180/65/24	180	65	60	24	2.50	4.00	6.35	801.29	87.45	1.21	385.49	69.66	44.08	1564.23	4009.77
2.42	Z 180/65/36	180	65	60	36	2.50	4.00	6.81	859.37	87.54	1.29	406.48	90.64	46.43	1677.61	5562.41
2.42	Z 180/70/26	180	70	65	26	2.50	4.00	6.62	835.17	87.50	1.26	408.67	89.23	46.70	1630.37	5085.61
2.42	Z 180/70/39	180	70	65	39	2.50	4.00	7.11	898.09	87.59	1.34	429.57	115.89	49.04	1753.19	7103.12
2.42	Z 200/65/24	200	65	60	24	2.50	4.00	6.73	849.69	97.38	1.14	495.29	69.67	50.86	1658.71	5039.61
2.42	Z 200/65/36	200	65	60	36	2.50	4.00	7.19	907.77	97.47	1.22	523.83	90.64	53.74	1772.09	6918.98
2.42	Z 200/70/26	200	70	65	26	2.50	4.00	7.00	883.57	97.44	1.19	524.36	89.24	53.81	1724.85	6386.67
2.42	Z 200/70/39	200	70	65	39	2.50	4.00	7.49	946.49	97.53	1.28	553.12	115.90	56.71	1847.68	8817.57
2.42	Z 200/75/28	200	75	70	28	2.50	4.00	7.26	917.45	97.49	1.24	553.14	112.17	56.74	1790.99	7951.68
2.42	Z 200/75/42	200	75	70	42	2.50	4.00	7.80	985.21	97.58	1.32	581.89	145.46	59.63	1923.26	11045.96
2.42	Z 200/80/30	200	80	75	30	2.50	4.00	7.53	951.33	97.53	1.28	581.64	138.73	59.64	1857.13	9752.19
2.42	Z 200/80/45	200	80	75	45	2.50	4.00	8.10	1023.93	97.62	1.37	610.15	179.67	62.50	1998.85	13636.86
2.42	Z 220/70/26	220	70	65	26	2.50	4.00	7.38	931.97	107.38	1.13	657.72	89.25	61.25	1819.33	7852.72
2.42	Z 220/70/39	220	70	65	39	2.50	4.00	7.87	994.89	107.47	1.21	695.61	115.91	64.73	1942.16	10743.78
2.42	Z 220/75/28	220	75	70	28	2.50	4.00	7.64	965.85	107.43	1.18	693.04	112.18	64.51	1885.47	9770.98
2.42	Z 220/75/42	220	75	70	42	2.50	4.00	8.18	1033.61	107.52	1.26	731.27	145.47	68.01	2017.75	13437.29
2.42	Z 220/80/30	220	80	75	30	2.50	4.00	7.91	999.73	107.47	1.22	728.03	138.74	67.74	1951.61	11974.51
2.42	Z 220/80/45	220	80	75	45	2.50	4.00	8.48	1072.33	107.56	1.31	766.34	179.68	71.25	2093.33	16560.14

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 180/65/24	611.42	375.71	69.63	87.03	90.55	1.58	58.58	43.17	41.49	440.79	11.89	78.39	33.75	0.37	0.42	1193.58	3300.31
2.42	Z 180/65/36	669.50	396.70	90.60	87.19	90.39	1.66	58.50	45.50	43.89	545.94	15.49	76.98	36.79	0.37	0.35	1306.96	4537.91
2.42	Z 180/70/26	645.30	398.89	89.20	87.13	90.45	1.63	63.53	45.78	44.10	547.91	14.04	78.62	37.18	0.37	0.38	1259.72	4175.83
2.42	Z 180/70/39	708.22	419.79	115.85	87.27	90.31	1.71	63.45	48.10	46.49	679.31	18.26	76.99	40.44	0.36	0.32	1382.55	5790.05
2.42	Z 200/65/24	615.35	476.91	69.63	96.85	100.73	1.57	58.59	49.24	47.34	443.62	11.88	88.04	33.64	0.43	0.54	1201.24	4035.01
2.42	Z 200/65/36	673.43	505.46	90.60	97.01	100.57	1.65	58.51	52.10	50.26	549.15	15.48	86.64	36.68	0.43	0.46	1314.62	5474.93
2.42	Z 200/70/26	649.23	505.99	89.20	96.95	100.63	1.62	63.54	52.19	50.28	551.25	14.04	88.28	37.07	0.43	0.49	1267.38	5096.20
2.42	Z 200/70/39	712.15	534.76	115.85	97.11	100.47	1.70	63.46	55.07	53.23	683.08	18.25	86.66	40.33	0.42	0.42	1390.21	6964.77
2.42	Z 200/75/28	683.11	534.77	112.13	97.04	100.54	1.66	68.50	55.11	53.19	674.72	16.37	88.48	40.51	0.42	0.45	1333.52	6329.75
2.42	Z 200/75/42	746.26	561.98	143.13	97.31	100.27	1.59	68.57	57.75	56.05	899.78	20.87	86.78	43.79	0.27	0.27	1456.79	8547.86
2.42	Z 200/80/30	715.92	562.33	138.23	96.98	100.60	1.80	73.36	57.98	55.90	769.50	18.84	88.63	43.94	0.51	0.55	1393.45	7733.51
2.42	Z 200/80/45	774.73	587.06	171.22	97.36	100.22	1.62	73.54	60.30	58.58	1059.82	23.28	87.05	47.01	0.25	0.26	1512.37	10112
2.42	Z 220/70/26	652.42	626.55	89.20	106.77	110.81	1.61	63.55	58.68	56.54	553.96	14.04	98.00	36.98	0.48	0.61	1273.61	6108.66
2.42	Z 220/70/39	715.34	664.45	115.85	106.95	110.63	1.69	63.47	62.13	60.06	686.15	18.25	96.38	40.24	0.47	0.52	1396.44	8249.91
2.42	Z 220/75/28	686.18	661.74	112.08	106.85	110.73	1.66	68.50	61.93	59.76	673.41	16.36	98.20	40.42	0.49	0.57	1339.05	7573.82
2.42	Z 220/75/42	749.45	697.99	143.13	107.17	110.41	1.58	68.58	65.13	63.22	903.64	20.87	96.51	43.70	0.32	0.34	1463.02	10109
2.42	Z 220/80/30	718.07	694.58	137.80	106.66	110.92	1.88	73.28	65.12	62.62	732.59	18.80	98.35	43.81	0.66	0.82	1393.70	9221.46
2.42	Z 220/80/45	777.92	728.65	171.22	107.23	110.35	1.61	73.55	67.95	66.03	1064.19	23.28	96.78	46.91	0.30	0.33	1518.60	11952

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 180/65/24	1	383.69	69.66	87.02	90.56	1.21	58.95	44.09	42.37	573.36	11.82	69.48	29.60	0.01	0.42	1551.78	3989.14
2.42		2	383.24	68.85	87.12	90.46	1.40	58.76	43.99	42.37	491.52	11.72	69.29	29.37	0.20	0.33	1546.53	3969.55
2.42	Z 180/65/36	1	404.81	90.64	87.17	90.41	1.30	58.86	46.44	44.78	696.22	15.40	68.87	32.59	0.01	0.37	1666.00	5534.26
2.42		2	406.48	90.64	87.54	90.04	1.29	58.87	46.43	45.14	701.08	15.40	68.77	32.48	0.00	0.00	1677.61	5562.41
2.42	Z 180/70/26	1	406.94	89.23	87.11	90.47	1.27	63.89	46.71	44.98	704.23	13.97	70.06	32.81	0.01	0.39	1618.42	5060.19
2.42		2	404.94	87.63	86.98	90.60	1.60	63.56	46.56	44.69	548.29	13.79	69.85	32.49	0.34	0.53	1601.29	5008.87
2.42	Z 180/70/39	1	427.97	115.89	87.26	90.32	1.35	63.81	49.05	47.38	856.28	18.16	69.25	36.04	0.01	0.34	1742.09	7068.54
2.42		2	429.57	115.89	87.59	89.99	1.34	63.82	49.04	47.74	861.75	18.16	69.16	35.92	0.00	0.00	1753.19	7103.12
2.42	Z 200/65/24	1	492.94	69.67	96.91	100.67	1.15	59.01	50.86	48.97	608.09	11.81	76.47	28.75	0.01	0.47	1645.62	5015.98
2.42		2	491.33	68.53	96.90	100.68	1.39	58.77	50.71	48.80	491.29	11.66	76.24	28.47	0.26	0.49	1634.18	4967.01
2.42	Z 200/65/36	1	521.63	90.64	97.06	100.52	1.23	58.93	53.74	51.90	735.50	15.38	76.07	31.71	0.01	0.41	1759.84	6886.62
2.42		2	523.83	90.64	97.47	100.11	1.22	58.94	53.74	52.33	740.63	15.38	75.96	31.60	0.00	0.00	1772.09	6918.98
2.42	Z 200/70/26	1	522.05	89.21	97.02	100.56	1.19	63.97	53.81	51.91	748.23	13.95	77.15	31.89	0.00	0.42	1711.86	6356.35
2.42		2	518.44	87.21	96.73	100.85	1.60	63.56	53.60	51.41	546.39	13.72	76.89	31.53	0.41	0.70	1688.44	6261.66
2.42	Z 200/70/39	1	551.02	115.90	97.15	100.43	1.28	63.88	56.72	54.87	902.47	18.14	76.54	35.10	0.01	0.38	1835.93	8777.60
2.42		2	553.12	115.90	97.53	100.05	1.28	63.88	56.71	55.28	908.26	18.14	76.45	34.99	0.00	0.00	1847.68	8817.57
2.42	Z 200/75/28	1	550.51	111.92	97.17	100.41	1.20	68.96	56.65	54.83	932.36	16.23	77.74	35.05	0.04	0.31	1775.54	7906.63
2.42		2	545.11	108.92	96.56	101.02	1.82	68.34	56.45	53.96	599.21	15.94	77.46	34.63	0.58	0.92	1741.86	7757.75
2.42	Z 200/75/42	1	579.17	143.90	97.46	100.12	1.11	69.05	59.43	57.85	1299.26	20.84	76.98	38.37	0.22	0.12	1907.67	10865
2.42		2	581.34	144.73	97.48	100.10	1.43	68.73	59.64	58.08	1010.16	21.06	76.88	38.36	0.11	0.09	1920.24	10965
2.42	Z 200/80/30	1	578.70	138.18	97.32	100.26	1.20	73.96	59.46	57.72	1148.86	18.68	78.27	38.25	0.08	0.21	1839.20	9689.73
2.42		2	571.34	133.88	96.38	101.20	2.06	73.10	59.28	56.46	649.78	18.32	77.97	37.74	0.78	1.15	1794.51	9470.15
2.42	Z 200/80/45	1	606.42	174.88	97.87	99.71	0.76	74.40	61.96	60.82	2308.55	23.50	77.40	41.56	0.61	0.25	1976.18	13156
2.42		2	606.73	175.44	97.12	100.46	1.94	73.22	62.47	60.40	906.12	23.96	77.28	41.56	0.57	0.50	1977.12	13201
2.42	Z 220/70/26	1	653.00	88.50	107.24	110.34	1.00	64.16	60.89	59.18	888.52	13.79	84.06	30.95	0.13	0.14	1795.43	7783.94
2.42		2	649.05	86.82	106.49	111.09	1.59	63.57	60.95	58.43	546.20	13.66	83.81	30.65	0.46	0.89	1776.17	7664.45
2.42	Z 220/70/39	1	692.93	115.91	107.05	110.53	1.22	63.94	64.73	62.69	948.70	18.13	83.72	34.24	0.01	0.41	1929.84	10699
2.42		2	695.61	115.91	107.47	110.11	1.21	63.95	64.73	63.17	954.76	18.13	83.62	34.13	0.00	0.00	1942.16	10744
2.42	Z 220/75/28	1	687.69	110.99	107.42	110.16	0.98	69.18	64.02	62.43	1128.61	16.04	84.74	34.04	0.19	0.00	1857.88	9674.39
2.42		2	681.64	108.42	106.30	111.28	1.81	68.35	64.12	61.25	597.72	15.86	84.46	33.69	0.64	1.13	1829.16	9488.72
2.42	Z 220/75/42	1	727.72	143.91	107.39	110.19	1.06	69.10	67.76	66.04	1363.41	20.82	84.24	37.46	0.21	0.12	2001.77	13227
2.42		2	730.52	144.74	107.41	110.17	1.37	68.79	68.01	66.31	1059.93	21.04	84.13	37.45	0.10	0.10	2014.72	13342
2.42	Z 220/80/30	1	722.05	136.98	107.60	109.98	0.96	74.20	67.11	65.65	1422.15	18.46	85.34	37.17	0.26	0.12	1920.21	11845
2.42		2	713.72	133.25	106.10	111.48	2.06	73.10	67.27	64.02	647.10	18.23	85.05	36.75	0.84	1.37	1881.41	11573
2.42	Z 220/80/45	1	761.36	174.88	107.85	109.73	0.72	74.44	70.59	69.39	2418.90	23.49	84.72	40.60	0.58	0.29	2070.62	16000
2.42		2	760.34	174.90	106.88	110.70	1.93	73.23	71.14	68.68	907.48	23.88	84.57	40.56	0.62	0.68	2062.99	16015

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
2.42	Z 220/85/32	220	85	80	32	2.50	4.00	8.18	1033.61	107.52	1.26	762.72	169.19	70.94	2017.75	14484.38
2.42	Z 220/85/48	220	85	80	48	2.50	4.00	8.78	1111.05	107.61	1.35	800.84	218.87	74.42	2168.92	20151.29
2.42	Z 250/80/22.5	250	80	75	23	2.50	4.00	8.19	1036.03	122.34	1.09	949.99	118.28	77.65	2022.47	13158.67
2.42	Z 250/80/37.5	250	80	75	38	2.50	4.00	8.76	1108.63	122.44	1.18	1015.66	159.22	82.95	2164.20	18585.38
2.42	Z 250/85/24	250	85	80	24	2.50	4.00	8.44	1067.49	122.39	1.13	994.60	144.37	81.27	2083.89	15874.88
2.42	Z 250/85/40	250	85	80	40	2.50	4.00	9.05	1144.93	122.48	1.22	1061.75	194.04	86.69	2235.06	22513.92
2.42	Z 250/90/25.5	250	90	85	26	2.50	4.00	8.69	1098.95	122.43	1.17	1038.98	174.03	84.87	2145.30	18928.66
2.42	Z 250/90/42.5	250	90	85	43	2.50	4.00	9.33	1181.23	122.52	1.26	1107.33	233.60	90.38	2305.92	26965.82
2.42	Z 250/95/27	250	95	90	27	2.50	4.00	8.94	1130.41	122.46	1.21	1083.15	207.50	88.45	2206.71	22339.16
2.42	Z 250/95/45	250	95	90	45	2.50	4.00	9.62	1217.53	122.56	1.30	1152.41	278.21	94.03	2376.78	31978.82
2.42	Z 250/100/28.5	250	100	95	29	2.50	4.00	9.18	1161.87	122.50	1.24	1127.11	245.01	92.01	2268.13	26125.84
2.42	Z 250/100/47.5	250	100	95	48	2.50	4.00	9.90	1253.83	122.60	1.33	1197.00	328.16	97.64	2447.65	37592.16
2.42	Z 300/95/27	300	95	90	27	2.50	4.00	9.89	1251.41	147.35	1.09	1662.52	207.52	112.83	2442.92	33388.38
2.42	Z 300/95/45	300	95	90	45	2.50	4.00	10.57	1338.53	147.44	1.18	1775.99	278.23	120.45	2612.99	46941.15
2.42	Z 300/100/28.5	300	100	95	29	2.50	4.00	10.13	1282.87	147.39	1.13	1726.95	245.03	117.17	2504.34	39036.42
2.42	Z 300/100/47.5	300	100	95	48	2.50	4.00	10.85	1374.83	147.48	1.22	1842.60	328.18	124.94	2683.85	55082.12
2.42	Z 300/105/30	300	105	100	30	2.50	4.00	10.38	1314.33	147.42	1.16	1791.12	286.81	121.50	2565.75	45266.90
2.42	Z 300/105/50	300	105	100	50	2.50	4.00	11.14	1411.13	147.51	1.25	1908.58	383.78	129.38	2754.72	64122.81

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.42	Z 220/85/32	744.07	720.42	166.14	107.22	110.36	1.84	78.32	67.19	65.28	902.21	21.21	98.40	47.25	0.58	0.29	1435.89	11089
2.42	Z 220/85/48	800.29	752.57	201.44	108.02	109.56	1.36	78.80	69.67	68.69	1483.45	25.56	96.97	50.17	0.01	0.42	1562.27	13963
2.42	Z 250/80/22.5	675.15	870.85	113.11	119.57	128.01	2.68	72.84	72.83	68.03	421.64	15.53	113.57	40.93	1.59	2.78	1275.16	9585.25
2.42	Z 250/80/37.5	760.29	955.42	159.15	121.82	125.76	1.72	73.44	78.43	75.97	923.20	21.67	112.10	45.75	0.54	0.62	1484.18	13774
2.42	Z 250/85/24	698.59	903.72	136.47	120.06	127.52	2.79	77.95	75.27	70.87	488.62	17.51	113.74	44.20	1.66	2.32	1314.10	11473
2.42	Z 250/85/40	785.12	988.90	189.27	122.91	124.67	1.33	78.83	80.46	79.32	1423.28	24.01	112.23	49.10	0.11	0.43	1532.66	16277
2.42	Z 250/90/25.5	716.79	928.37	161.59	120.36	127.22	2.94	83.10	77.13	72.98	549.07	19.44	113.81	47.48	1.77	2.06	1340.11	13567
2.42	Z 250/90/42.5	797.83	1005.83	218.35	122.82	124.76	1.49	83.67	81.89	80.62	1470.24	26.10	112.28	52.31	0.22	0.30	1544.71	18800
2.42	Z 250/95/27	731.76	947.69	189.00	120.28	127.30	3.22	88.38	78.79	74.44	586.95	21.38	113.80	50.82	2.01	2.19	1361.57	15905
2.42	Z 250/95/45	807.97	1019.07	249.22	122.57	125.01	1.72	88.44	83.14	81.52	1452.60	28.18	112.31	55.54	0.42	0.01	1551.89	21519
2.42	Z 250/100/28.5	745.34	964.65	218.96	120.12	127.46	3.54	93.70	80.31	75.68	618.52	23.37	113.76	54.20	2.30	2.38	1380.84	18498
2.42	Z 250/100/47.5	816.75	1030.45	282.01	122.31	125.27	1.97	93.19	84.25	82.26	1428.95	30.26	112.32	58.76	0.64	0.28	1556.63	24435
2.42	Z 300/95/27	729.87	1397.18	184.57	144.87	152.71	3.00	88.16	96.44	91.49	614.33	20.93	138.36	50.29	1.91	2.48	1332.02	22266
2.42	Z 300/95/45	810.68	1519.18	247.93	147.00	150.58	1.90	88.26	103.35	100.89	1305.05	28.09	136.89	55.30	0.72	0.45	1547.50	29962
2.42	Z 300/100/28.5	743.87	1423.38	214.31	144.55	153.03	3.39	93.55	98.47	93.01	632.29	22.91	138.33	53.68	2.26	2.83	1354.43	25886
2.42	Z 300/100/47.5	769.63	1433.90	115.89	148.78	148.80	40.54	54.62	96.38	96.37	28.59	21.22	136.50	38.80	10.14	1.30	1261.96	31395
2.42	Z 300/105/30	685.85	1305.39	99.57	148.68	148.90	35.48	64.68	87.80	87.67	28.06	15.39	137.96	38.10	7.54	1.26	1074.18	23200
2.42	Z 300/105/50	773.65	1441.15	129.52	148.73	148.85	42.51	57.65	96.90	96.82	30.47	22.47	136.48	40.92	9.62	1.34	1250.64	35340

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.42	Z 220/85/32	1	751.70	166.08	108.38	109.20	0.76	79.40	69.35	68.84	2182.08	20.92	85.73	40.30	0.50	0.87	1978.98	14333
2.42		2	745.32	161.51	105.90	111.68	2.33	77.83	70.38	66.73	694.45	20.75	85.58	39.84	1.06	1.62	1932.95	13936
2.42	Z 220/85/48	1	789.03	208.87	108.59	108.99	0.14	80.02	72.66	72.40	15358.35	26.10	84.98	43.72	1.21	1.38	2133.02	19132
2.42		2	789.11	208.49	106.33	111.25	2.57	77.73	74.22	70.93	810.04	26.82	84.96	43.67	1.23	1.28	2108.31	18980
2.42	Z 250/80/22.5	1	922.32	111.32	123.68	123.90	0.07	75.09	74.57	74.44	15591.42	14.83	95.48	33.17	1.02	1.33	1921.85	12570
2.42		2	902.86	108.70	118.01	129.57	2.58	72.74	76.51	69.68	420.51	14.94	95.38	33.09	1.50	4.34	1868.34	12034
2.42	Z 250/80/37.5	1	1007.96	158.78	121.75	125.83	1.14	74.02	82.79	80.10	1397.12	21.45	95.90	38.06	0.05	0.69	2135.62	18429
2.42		2	995.30	155.38	120.49	127.09	1.73	73.43	82.60	78.32	900.41	21.16	95.78	37.84	0.54	1.95	2085.96	18061
2.42	Z 250/85/24	1	960.73	135.11	123.28	124.30	0.15	80.31	77.93	77.29	8996.73	16.82	96.13	36.05	1.28	1.91	1971.12	15135
2.42		2	941.46	131.66	117.68	129.90	2.93	78.09	80.00	72.48	449.64	16.86	96.10	35.94	1.80	4.71	1912.12	14425
2.42	Z 250/85/40	1	1042.88	189.58	122.96	124.62	0.64	79.52	84.82	83.68	2968.28	23.84	96.31	41.06	0.59	0.48	2184.07	21997
2.42		2	1036.03	187.75	120.17	127.41	2.02	78.14	86.22	81.31	927.96	24.03	96.32	41.00	0.80	2.32	2136.36	21710
2.42	Z 250/90/25.5	1	994.92	161.70	122.33	125.25	0.49	85.65	81.33	79.44	3323.71	18.88	96.62	38.95	1.66	2.82	2018.39	18025
2.42		2	974.41	156.99	116.95	130.63	3.42	83.58	83.32	74.59	459.53	18.78	96.67	38.80	2.25	5.48	1948.38	17065
2.42	Z 250/90/42.5	1	1074.02	223.10	123.23	124.35	0.02	85.18	87.16	86.37	92859.14	26.19	96.62	44.04	1.29	1.83	2227.69	25904
2.42		2	1066.42	220.96	119.06	128.52	2.75	82.91	89.57	82.98	804.33	26.65	96.74	44.03	1.48	3.46	2168.21	253767
2.42	Z 250/95/27	1	1027.35	191.41	121.31	126.27	0.88	91.04	84.69	81.36	2178.26	21.02	97.04	41.89	2.09	3.81	2064.89	21260
2.42		2	1005.31	185.10	116.11	131.47	3.97	89.13	86.58	76.47	465.96	20.77	97.17	41.70	2.76	6.35	1982.24	19984
2.42	Z 250/95/45	1	1103.67	259.95	121.83	125.75	0.77	90.93	90.59	87.77	3377.70	28.59	96.87	47.01	2.07	3.19	2270.62	30210
2.42		2	1090.75	256.83	117.62	129.96	3.66	88.82	92.74	83.93	701.64	28.92	97.03	47.08	2.36	4.94	2193.32	29354
2.42	Z 250/100/28.5	1	1058.71	224.46	120.28	127.30	1.31	96.47	88.02	83.17	1713.90	23.27	97.41	44.85	2.55	4.80	2110.88	24860
2.42		2	1032.18	215.90	115.04	132.54	4.64	94.80	89.72	77.88	465.23	22.77	97.57	44.63	3.40	7.46	2013.13	23199
2.42	Z 250/100/47.5	1	1131.88	300.22	120.44	127.14	1.59	96.75	93.98	89.03	1885.12	31.03	97.08	50.00	2.93	4.54	2312.78	34926
2.42		2	1113.29	295.77	116.16	131.42	4.67	94.83	95.84	84.71	632.75	31.19	97.27	50.14	3.34	6.44	2217.34	33666
2.42	Z 300/95/27	1	1531.54	187.27	148.45	149.13	1.24	91.40	103.17	102.70	1508.84	20.49	115.14	40.26	2.33	1.10	2173.86	30466
2.42		2	1492.00	182.67	135.47	162.11	4.02	89.18	110.13	92.04	454.07	20.48	115.12	40.28	2.93	11.88	2095.48	28630
2.42	Z 300/95/45	1	1655.23	256.58	148.03	149.55	1.04	91.20	111.82	110.68	2465.38	28.13	115.48	45.47	2.22	0.58	2375.47	42987
2.42		2	1631.61	254.88	137.60	159.98	3.66	88.82	118.58	101.99	696.00	28.70	115.59	45.68	2.48	9.85	2304.66	41657
2.42	Z 300/100/28.5	1	1577.83	219.49	147.86	149.72	1.69	96.85	106.71	105.38	1298.14	22.66	115.64	43.13	2.82	2.33	2218.71	35571
2.42		2	1532.10	213.13	134.39	163.19	4.66	94.82	114.00	93.89	457.19	22.48	115.65	43.13	3.54	12.99	2126.32	33194
2.42	Z 300/100/47.5	1	1673.27	179.70	146.22	151.36	29.16	66.00	114.44	110.55	61.63	27.23	115.37	37.81	1.24	3.88	2351.48	37804
2.42		2	1663.97	181.40	135.94	161.64	30.44	64.72	122.40	102.94	59.60	28.03	115.89	38.26	0.04	11.54	2327.88	37397
2.42	Z 300/105/30	1	1589.64	159.99	144.25	153.33	25.98	74.18	110.20	103.68	61.58	21.57	115.47	36.63	1.96	5.91	2204.19	29179
2.42		2	1568.01	161.96	133.15	164.43	27.47	72.69	117.76	95.36	58.95	22.28	116.07	37.30	0.47	14.27	2155.29	28626
2.42	Z 300/105/50	1	1710.66	204.13	144.39	153.19	31.09	69.07	118.48	111.67	65.66	29.55	115.56	39.92	1.80	5.68	2388.06	43569
2.42		2	1693.96	205.58	134.27	163.31	32.63	67.53	126.16	103.73	63.00	30.44	116.13	40.46	0.26	13.25	2350.36	42930

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	Z 300/115/33	300	115	110	33	2.50	4.00	10.87	1377.25	147.48	1.22	1918.67	384.09	130.09	2688.58	59585.98
2.42	Z 300/115/55	300	115	110	55	2.50	4.00	11.71	1483.73	147.58	1.31	2038.76	513.13	138.15	2896.44	85121.32
2.42	Z 300/120/34.5	300	120	115	35	2.50	4.00	11.12	1408.71	147.51	1.25	1982.06	440.05	134.37	2749.99	67730.91
2.42	Z 300/120/57.5	300	120	115	58	2.50	4.00	11.99	1520.03	147.61	1.34	2102.97	587.49	142.47	2967.30	97192.73
2.42	Z 330/105/30	330	105	100	30	2.50	4.00	10.95	1386.93	162.36	1.10	2241.17	286.82	138.04	2707.48	55837.25
2.42	Z 330/105/50	330	105	100	50	2.50	4.00	11.71	1483.73	162.45	1.19	2392.76	383.79	147.29	2896.44	78394.05
2.42	Z 330/115/33	330	115	110	33	2.50	4.00	11.44	1449.85	162.42	1.16	2396.90	384.10	147.57	2830.30	73481.98
2.42	Z 330/115/55	330	115	110	55	2.50	4.00	12.28	1556.33	162.52	1.25	2553.25	513.14	157.11	3038.17	103899.94
2.42	Z 330/125/36	330	125	120	36	2.50	4.00	11.94	1512.77	162.48	1.21	2551.49	501.21	157.03	2953.13	94386.49
2.42	Z 330/125/60	330	125	120	60	2.50	4.00	12.85	1628.93	162.57	1.31	2711.07	668.72	166.76	3179.89	134500.74
2.42	Z 350/105/30	350	105	100	30	2.50	4.00	11.33	1435.33	172.32	1.06	2575.67	286.82	149.47	2801.96	63557.26
2.42	Z 350/105/50	350	105	100	50	2.50	4.00	12.09	1532.13	172.42	1.15	2752.43	383.80	159.64	2990.93	88798.04
2.42	Z 350/115/33	350	115	110	33	2.50	4.00	11.82	1498.25	172.39	1.12	2751.77	384.10	159.63	2924.79	83637.94
2.42	Z 350/115/55	350	115	110	55	2.50	4.00	12.66	1604.73	172.48	1.21	2934.95	513.15	170.16	3132.65	117594.53
2.42	Z 350/125/36	350	125	120	36	2.50	4.00	12.32	1561.17	172.44	1.18	2926.63	501.22	169.72	3047.62	107414.59
2.42	Z 350/125/60	350	125	120	60	2.50	4.00	13.23	1677.33	172.54	1.27	3114.56	668.73	180.52	3274.37	152086.81
2.42	Z 350/135/39	350	135	130	39	2.50	4.00	12.81	1624.09	172.50	1.23	3100.27	640.00	179.73	3170.44	135189.71
2.42	Z 350/135/65	350	135	130	65	2.50	4.00	13.80	1749.93	172.59	1.32	3291.38	852.95	190.71	3416.10	192869.63

t [mm]	Profile type	Subjected to compression																
		Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 300/115/33	702.36	1335.53	126.78	148.78	148.80	39.60	70.56	89.77	89.75	32.02	17.97	137.89	42.49	7.18	1.32	1083.74	30292
2.42	Z 300/115/55	839.31	1573.44	389.40	145.66	151.92	3.15	108.31	108.02	103.57	1235.10	35.95	136.92	68.11	1.84	1.92	1556.56	47758
2.42	Z 300/120/34.5	788.10	1503.25	356.32	143.57	154.01	4.83	114.99	104.71	97.61	738.09	30.99	138.11	67.24	3.58	3.94	1423.05	43585
2.42	Z 300/120/57.5	844.31	1582.67	429.31	145.30	152.28	3.54	113.70	108.92	103.93	1214.36	37.76	136.91	71.31	2.20	2.30	1555.64	52889
2.42	Z 330/105/30	754.35	1767.59	242.67	159.12	168.46	3.56	98.72	111.08	104.93	682.04	24.58	153.08	56.72	2.46	3.24	1351.66	35503
2.42	Z 330/105/50	827.93	1905.87	313.99	160.88	166.70	2.59	97.75	118.46	114.33	1211.12	32.12	151.72	61.58	1.40	1.57	1551.90	45616
2.42	Z 330/115/33	777.53	1818.42	314.32	158.48	169.10	4.38	109.54	114.74	107.53	717.91	28.69	152.93	63.58	3.22	3.95	1386.31	46218
2.42	Z 330/115/55	840.20	1934.08	388.12	160.12	167.46	3.29	108.45	120.79	115.49	1179.02	35.79	151.72	67.97	2.04	2.40	1553.44	56834
2.42	Z 330/125/36	789.68	1845.12	386.24	158.44	169.14	4.67	119.83	116.46	109.09	826.20	32.23	152.86	69.94	3.46	4.04	1392.48	57465
2.42	Z 330/125/60	849.51	1955.01	469.35	159.32	168.26	4.10	119.26	122.71	116.19	1143.72	39.35	151.70	74.33	2.80	3.25	1550.98	69343
2.42	Z 350/105/30	752.58	1998.48	240.10	169.07	178.51	3.41	98.57	118.20	111.95	704.09	24.36	162.96	56.48	2.35	3.26	1337.24	39504
2.42	Z 350/105/50	828.38	2163.50	313.35	170.56	177.02	2.67	97.83	126.85	122.22	1173.11	32.03	161.61	61.50	1.52	1.86	1549.57	50835
2.42	Z 350/115/33	775.66	2056.01	311.08	168.39	179.19	4.21	109.37	122.10	114.74	738.18	28.44	162.81	63.33	3.09	4.00	1369.97	51416
2.42	Z 350/115/55	840.62	2195.37	387.29	169.74	177.84	3.38	108.54	129.34	123.44	1145.10	35.68	161.60	67.88	2.17	2.74	1551.19	63318
2.42	Z 350/125/36	787.67	2085.85	382.14	168.35	179.23	4.50	119.66	123.90	116.38	848.46	31.93	162.73	69.65	3.33	4.09	1374.10	63904
2.42	Z 350/125/60	849.47	2217.90	467.80	168.97	178.61	4.15	119.31	131.26	124.17	1126.49	39.21	161.58	74.21	2.88	3.57	1546.34	77194
2.42	Z 350/135/39	794.64	2103.04	455.50	167.69	179.89	5.30	130.46	125.41	116.91	858.99	34.91	162.68	75.71	4.07	4.80	1372.49	76985
2.42	Z 350/135/65	856.45	2235.11	555.47	168.09	179.49	5.09	130.25	132.97	124.53	1092.13	42.65	161.55	80.53	3.77	4.50	1541.33	92519

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																		
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 300/115/33	1	1668.61	206.91	141.41	156.17	29.72	80.44	118.00	106.85	69.62	25.72	116.10	40.88	2.70	8.68	2282.04	38495
2.42		2	1635.12	208.04	130.62	166.96	31.64	78.52	125.18	97.94	65.75	26.50	116.78	41.66	0.78	16.86	2211.47	37591
2.42	Z 300/115/55	1	1813.95	436.01	142.87	154.71	4.70	114.86	126.96	117.25	927.52	37.96	116.38	57.06	6.01	7.13	2538.97	73161
2.42		2	1747.66	427.99	130.92	166.66	8.15	113.31	133.49	104.87	524.99	37.77	116.46	57.63	6.84	16.65	2394.00	68463
2.42	Z 300/120/34.5	1	1747.66	382.46	142.71	154.87	3.93	119.09	122.46	112.85	972.00	32.11	117.07	54.76	5.18	7.36	2390.01	61453
2.42		2	1664.06	363.89	129.22	168.36	7.96	118.12	128.78	98.84	456.96	30.81	117.04	54.73	6.72	18.29	2235.81	55758
2.42	Z 300/120/57.5	1	1849.48	489.93	141.28	156.30	5.78	120.94	130.91	118.33	848.22	40.51	116.49	59.96	7.12	8.69	2578.92	82262
2.42		2	1771.69	479.10	129.26	168.32	9.50	119.66	137.06	105.26	504.40	40.04	116.55	60.61	8.16	18.34	2415.50	76317
2.42	Z 330/105/30	1	2000.35	252.02	163.42	164.16	2.36	102.52	122.40	121.86	1067.35	24.58	126.89	45.04	3.46	1.80	2328.57	49662
2.42		2	1926.49	244.61	144.30	183.28	5.39	100.55	133.51	105.11	454.23	24.33	126.72	45.16	4.29	18.07	2222.00	46014
2.42	Z 330/105/50	1	2149.08	336.72	162.83	164.75	2.85	103.01	131.98	130.45	1183.23	32.69	127.14	50.32	4.03	2.29	2521.90	68372
2.42		2	2088.00	333.75	145.64	181.94	5.68	100.84	143.37	114.76	587.25	33.10	127.12	50.82	4.49	16.81	2415.53	64994
2.42	Z 330/115/33	1	2106.04	332.88	160.64	166.94	3.45	113.61	131.10	126.15	964.23	29.30	127.76	50.79	4.61	4.52	2415.27	65224
2.42		2	2007.29	319.80	141.64	185.94	6.98	112.14	141.72	107.95	457.96	28.52	127.52	50.90	5.82	20.78	2277.42	59616
2.42	Z 330/115/55	1	2243.15	432.57	159.18	168.40	4.79	114.95	140.92	133.20	902.63	37.63	127.59	56.03	6.04	5.88	2602.52	87840
2.42		2	2152.43	426.08	142.05	185.53	8.07	113.23	151.52	116.02	527.82	37.63	127.49	56.72	6.82	20.46	2458.38	82014
2.42	Z 330/125/36	1	2199.32	425.06	157.54	170.04	4.91	125.07	139.60	129.34	865.23	33.99	128.34	56.42	6.13	7.56	2491.98	83125
2.42		2	2071.62	404.29	138.51	189.07	9.03	124.19	149.57	109.57	447.56	32.55	128.01	56.55	7.82	23.97	2322.04	74763
2.42	Z 330/125/60	1	2329.66	543.07	155.68	171.90	6.98	127.14	149.65	135.52	777.99	42.71	127.86	61.73	8.29	9.33	2682.04	110324
2.42		2	2207.90	530.96	138.49	189.09	10.81	125.97	159.42	116.77	491.35	42.15	127.66	62.61	9.50	24.08	2500.58	101174
2.42	Z 350/105/30	1	2276.66	250.11	172.77	174.81	2.47	102.63	131.77	130.24	1014.16	24.37	134.03	44.42	3.53	0.45	2372.65	55720
2.42		2	2187.44	243.47	151.58	196.00	5.38	100.54	144.31	111.60	452.54	24.22	133.72	44.61	4.32	20.75	2266.31	51618
2.42	Z 350/105/50	1	2450.05	335.16	173.47	174.11	2.91	103.07	141.24	140.72	1152.59	32.52	134.47	49.74	4.06	1.06	2564.86	76637
2.42		2	2375.30	332.81	153.08	194.50	5.66	100.82	155.17	122.12	588.45	33.01	134.34	50.29	4.50	19.34	2458.85	72788
2.42	Z 350/115/33	1	2396.70	330.26	171.84	175.74	3.57	113.73	139.48	136.37	926.33	29.04	134.99	50.11	4.69	3.36	2458.86	73120
2.42		2	2277.95	318.27	148.84	198.74	6.97	112.13	153.05	114.62	456.75	28.38	134.58	50.30	5.85	23.55	2321.25	66830
2.42	Z 350/115/55	1	2557.63	430.44	170.22	177.36	4.84	115.00	150.26	144.20	889.17	37.43	134.99	55.38	6.05	4.88	2645.45	98373
2.42		2	2447.28	424.86	149.34	198.24	8.02	113.18	163.87	123.45	529.80	37.54	134.75	56.15	6.81	23.14	2501.21	91744
2.42	Z 350/125/36	1	2503.23	421.94	168.56	179.02	5.01	125.17	148.50	139.83	842.29	33.71	135.64	55.69	6.19	6.57	2535.72	93186
2.42		2	2349.99	402.38	145.60	201.98	9.00	124.16	161.40	116.35	447.20	32.41	135.11	55.91	7.82	26.84	2365.73	83747
2.42	Z 350/125/60	1	2656.62	540.24	166.48	181.10	7.01	127.17	159.58	146.69	770.13	42.48	135.32	61.02	8.28	8.57	2724.96	123439
2.42		2	2509.14	529.41	145.62	201.96	10.72	125.88	172.30	124.24	493.62	42.05	134.95	61.99	9.46	26.91	2542.93	113037
2.42	Z 350/135/39	1	2597.13	521.28	165.00	182.58	6.94	137.10	157.40	142.25	750.59	38.02	136.09	60.97	8.17	10.08	2607.87	114724
2.42		2	2407.94	495.68	142.10	205.48	11.43	136.59	169.46	117.18	433.83	36.29	135.39	61.43	10.20	30.40	2405.08	102332
2.42	Z 350/135/65	1	2748.10	665.20	162.91	184.67	9.41	139.57	168.69	148.81	707.20	47.66	135.49	66.66	10.73	12.08	2803.83	152005
2.42		2	2562.20	646.45	141.96	205.62	13.76	138.92	180.48	124.61	469.95	46.54	134.95	67.79	12.44	30.63	2584.87	136656

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.42	Z 400/125/36	400	125	120	36	2.50	4.00	13.27	1682.17	197.36	1.09	4003.19	501.23	202.84	3283.82	144063.63
2.42	Z 400/125/60	400	125	120	60	2.50	4.00	14.18	1798.33	197.45	1.18	4272.15	668.75	216.36	3510.58	201420.79
2.42	Z 400/135/39	400	135	130	39	2.50	4.00	13.76	1745.09	197.41	1.14	4232.81	640.01	214.42	3406.65	181260.67
2.42	Z 400/135/65	400	135	130	65	2.50	4.00	14.75	1870.93	197.50	1.23	4509.19	852.97	228.31	3652.31	254950.25
2.42	Z 400/145/42	400	145	140	42	2.50	4.00	14.25	1808.01	197.46	1.19	4461.03	802.30	225.92	3529.48	224166.61
2.42	Z 400/145/70	400	145	140	70	2.50	4.00	15.32	1943.53	197.55	1.28	4742.95	1068.25	240.09	3794.03	317339.47
2.92	Z 150/50/18	150	50	45	18	3.00	4.00	5.96	749.06	72.11	1.13	239.45	32.91	33.21	2128.92	1314.78
2.92	Z 150/50/27	150	50	45	27	3.00	4.00	6.37	801.62	72.20	1.22	253.98	43.37	35.18	2278.30	1831.14
2.92	Z 150/55/20	150	55	50	20	3.00	4.00	6.28	789.94	72.18	1.20	258.92	45.94	35.87	2245.11	1811.49
2.92	Z 150/55/30	150	55	50	30	3.00	4.00	6.74	848.34	72.27	1.29	273.57	60.31	37.85	2411.09	2538.04
2.92	Z 150/60/22	150	60	55	22	3.00	4.00	6.60	830.82	72.25	1.26	278.12	62.03	38.50	2361.29	2417.95
2.92	Z 150/60/33	150	60	55	33	3.00	4.00	7.10	895.06	72.34	1.35	292.69	81.18	40.46	2543.87	3412.50
2.92	Z 180/60/22	180	60	55	22	3.00	4.00	7.29	918.42	87.13	1.14	429.70	62.04	49.32	2610.26	3596.05
2.92	Z 180/60/33	180	60	55	33	3.00	4.00	7.79	982.66	87.22	1.23	454.87	81.19	52.15	2792.84	4976.41
2.92	Z 180/65/24	180	65	60	24	3.00	4.00	7.61	959.30	87.19	1.20	457.84	81.50	52.51	2726.45	4670.26
2.92	Z 180/65/36	180	65	60	36	3.00	4.00	8.16	1029.38	87.28	1.29	483.16	106.39	55.36	2925.63	6500.44
2.92	Z 180/70/26	180	70	65	26	3.00	4.00	7.93	1000.18	87.25	1.25	485.67	104.66	55.67	2842.64	5937.03
2.92	Z 180/70/39	180	70	65	39	3.00	4.00	8.53	1076.10	87.34	1.34	510.89	136.34	58.50	3058.41	8317.91

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 400/125/36	782.86	2751.15	372.90	193.12	204.46	4.16	119.32	142.46	134.56	896.94	31.25	187.46	69.02	3.07	4.24	1336.02	81369
2.42	Z 400/125/60	843.94	2929.94	458.01	194.13	203.45	3.64	118.80	150.93	144.01	1259.14	38.55	186.33	73.67	2.45	3.32	1500.05	98013
2.42	Z 400/135/39	789.53	2772.70	444.17	192.50	205.08	4.83	129.99	144.04	135.20	920.29	34.17	187.40	75.01	3.68	4.91	1330.35	98040
2.42	Z 400/135/65	849.44	2948.05	541.93	193.39	204.19	4.36	129.52	152.44	144.38	1243.10	41.84	186.30	79.87	3.13	4.12	1488.15	117224
2.42	Z 400/145/42	793.63	2785.65	518.91	191.63	205.95	5.77	140.93	145.37	135.26	899.65	36.82	187.35	80.86	4.58	5.83	1324.26	115759
2.42	Z 400/145/70	853.22	2960.04	631.76	192.61	204.97	5.19	140.35	153.68	144.41	1217.87	45.01	186.26	86.05	3.91	4.95	1477.20	138123
2.92	Z 150/50/18	641.65	238.22	32.90	71.87	75.21	1.32	42.84	33.15	31.67	249.61	7.68	60.93	22.64	0.19	0.24	1823.67	1202.17
2.92	Z 150/50/27	694.21	252.75	43.35	71.99	75.09	1.41	42.75	35.11	33.66	308.00	10.14	60.34	24.99	0.19	0.21	1973.05	1664.17
2.92	Z 150/55/20	682.53	257.68	45.93	71.97	75.11	1.39	47.77	35.81	34.31	330.71	9.61	61.44	25.94	0.19	0.21	1939.85	1651.49
2.92	Z 150/55/30	740.93	272.34	60.29	72.09	74.99	1.48	47.68	37.78	36.32	408.38	12.64	60.63	28.53	0.19	0.18	2105.84	2301.78
2.92	Z 150/60/22	723.41	276.89	62.01	72.06	75.02	1.45	52.71	38.43	36.91	427.21	11.76	61.87	29.28	0.19	0.19	2056.04	2199.68
2.92	Z 150/60/33	787.65	291.46	81.15	72.18	74.90	1.54	52.62	40.38	38.91	527.99	15.42	60.83	32.10	0.18	0.16	2238.62	3090.94
2.92	Z 180/60/22	737.44	423.86	62.01	86.79	90.29	1.42	52.74	48.84	46.94	435.52	11.76	75.81	29.00	0.28	0.35	2095.91	3132.33
2.92	Z 180/60/33	801.68	449.04	81.16	86.93	90.15	1.51	52.65	51.66	49.81	537.42	15.41	74.84	31.82	0.28	0.30	2278.49	4298.81
2.92	Z 180/65/24	778.32	452.01	81.47	86.88	90.20	1.48	57.68	52.03	50.11	550.33	14.13	76.21	32.35	0.28	0.31	2212.09	4055.67
2.92	Z 180/65/36	848.40	477.34	106.36	87.02	90.06	1.56	57.60	54.86	53.00	679.74	18.47	75.01	35.41	0.28	0.27	2411.27	5604.33
2.92	Z 180/70/26	819.20	479.84	104.63	86.96	90.12	1.53	62.63	55.18	53.25	683.25	16.71	76.53	35.74	0.28	0.29	2328.28	5144.14
2.92	Z 180/70/39	895.12	505.07	136.30	87.10	89.98	1.61	62.55	57.99	56.13	844.74	21.79	75.12	39.02	0.27	0.24	2544.06	7163.09

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.42	Z 400/125/36	1	3359.20	414.13	196.61	200.97	5.23	125.39	170.85	167.15	791.16	33.03	153.66	53.95	6.33	3.61	2646.53	120499
2.42		2	3127.16	397.88	162.92	234.66	8.90	124.06	191.94	133.26	446.98	32.07	152.49	54.39	7.81	34.44	2474.88	108311
2.42	Z 400/125/60	1	3579.99	533.81	194.02	203.56	7.07	127.23	184.52	175.87	755.47	41.96	153.76	59.37	8.25	6.11	2834.02	159400
2.42		2	3351.66	525.74	163.05	234.53	10.53	125.69	205.56	142.91	499.49	41.83	152.81	60.52	9.34	34.41	2648.92	145616
2.42	Z 400/135/39	1	3486.87	512.68	192.62	204.96	7.09	137.25	181.02	170.12	723.29	37.35	154.27	59.15	8.23	7.55	2719.30	148567
2.42		2	3200.02	489.83	159.08	238.50	11.29	136.45	201.16	134.17	433.84	35.90	152.82	59.79	10.15	38.33	2513.36	131958
2.42	Z 400/135/65	1	3704.56	656.86	189.88	207.70	9.42	139.58	195.10	178.37	697.38	47.06	154.06	64.87	10.65	10.19	2913.19	195855
2.42		2	3418.88	641.89	158.99	238.59	13.49	138.65	215.04	143.30	475.96	46.30	152.84	66.23	12.25	38.51	2689.82	175554
2.42	Z 400/145/42	1	3604.88	622.03	188.66	208.92	9.20	149.36	191.08	172.55	676.02	41.65	154.71	64.26	10.39	11.46	2791.13	179406
2.42		2	3258.66	589.26	155.07	242.51	14.09	149.25	210.15	134.37	418.34	39.48	152.93	65.03	12.90	42.39	2550.58	156567
2.42	Z 400/145/70	1	3820.21	795.32	185.94	211.64	11.97	152.13	205.46	180.50	664.47	52.28	154.21	70.36	13.25	14.09	2992.00	236842
2.42		2	3475.83	770.32	155.01	242.57	16.75	151.91	224.24	143.29	459.76	50.71	152.69	71.88	15.47	42.54	2731.45	208222
2.92	Z 150/50/18	1	237.87	32.91	71.62	75.46	1.14	43.02	33.21	31.52	288.33	7.65	56.66	21.08	0.01	0.48	2105.65	1306.05
2.92		2	239.45	32.91	72.11	74.97	1.13	43.03	33.21	31.94	291.53	7.65	56.54	20.96	0.00	0.00	2128.92	1314.78
2.92	Z 150/50/27	1	252.51	43.37	71.78	75.30	1.23	42.93	35.18	33.53	352.40	10.10	56.39	23.37	0.01	0.42	2256.55	1819.02
2.92		2	253.98	43.37	72.20	74.88	1.22	42.94	35.18	33.92	355.80	10.10	56.29	23.26	0.00	0.00	2278.30	1831.14
2.92	Z 150/55/20	1	257.42	45.94	71.75	75.33	1.21	47.95	35.88	34.17	379.13	9.58	57.37	24.24	0.01	0.43	2223.04	1799.84
2.92		2	258.92	45.94	72.18	74.90	1.20	47.96	35.87	34.57	382.90	9.58	57.25	24.12	0.00	0.00	2245.11	1811.49
2.92	Z 150/55/30	1	272.18	60.31	71.90	75.18	1.30	47.86	37.86	36.20	463.74	12.60	56.89	26.78	0.01	0.38	2390.54	2521.99
2.92		2	273.57	60.31	72.27	74.81	1.29	47.87	37.85	36.57	467.73	12.60	56.79	26.66	0.00	0.00	2411.09	2538.04
2.92	Z 150/60/22	1	276.70	62.03	71.86	75.22	1.28	52.88	38.51	36.78	486.42	11.73	57.97	27.45	0.01	0.39	2340.31	2402.95
2.92		2	278.12	62.03	72.25	74.83	1.26	52.90	38.50	37.17	490.79	11.73	57.86	27.32	0.00	0.00	2361.29	2417.95
2.92	Z 150/60/33	1	291.37	81.18	72.00	75.08	1.36	52.80	40.47	38.81	595.55	15.38	57.28	30.23	0.01	0.34	2524.39	3391.97
2.92		2	292.69	81.18	72.34	74.74	1.35	52.81	40.46	39.16	600.15	15.37	57.18	30.12	0.00	0.00	2543.87	3412.50
2.92	Z 180/60/22	1	427.43	62.04	86.66	90.42	1.15	53.01	49.32	47.27	537.88	11.70	68.52	26.11	0.01	0.47	2587.32	3576.94
2.92		2	429.70	62.04	87.13	89.95	1.14	53.02	49.32	47.77	542.65	11.70	68.40	25.99	0.00	0.00	2610.26	3596.05
2.92	Z 180/60/33	1	452.75	81.19	86.82	90.26	1.24	52.92	52.15	50.16	653.94	15.34	68.14	28.86	0.01	0.41	2771.40	4950.10
2.92		2	454.87	81.19	87.22	89.86	1.23	52.93	52.15	50.62	659.01	15.34	68.04	28.74	0.00	0.00	2792.84	4976.41
2.92	Z 180/65/24	1	455.67	81.50	86.76	90.32	1.21	57.95	52.52	50.45	673.08	14.06	69.20	29.27	0.01	0.43	2704.49	4646.07
2.92		2	457.84	81.50	87.19	89.89	1.20	57.96	52.51	50.93	678.56	14.06	69.08	29.15	0.00	0.00	2726.45	4670.26
2.92	Z 180/65/36	1	481.15	106.39	86.91	90.17	1.30	57.86	55.36	53.36	819.24	18.39	68.61	32.26	0.01	0.37	2905.16	6467.30
2.92		2	483.16	106.39	87.28	89.80	1.29	57.87	55.36	53.81	825.02	18.38	68.51	32.15	0.00	0.00	2925.63	6500.44
2.92	Z 180/70/26	1	483.60	104.66	86.85	90.23	1.26	62.90	55.68	53.60	828.28	16.64	69.79	32.47	0.01	0.39	2821.57	5907.14
2.92		2	485.67	104.66	87.25	89.83	1.25	62.91	55.67	54.06	834.47	16.64	69.68	32.35	0.00	0.00	2842.64	5937.03
2.92	Z 180/70/39	1	508.97	136.33	87.00	90.08	1.35	62.81	58.50	56.50	1009.31	21.71	68.99	35.71	0.01	0.34	3038.83	8277.12
2.92		2	510.89	136.34	87.34	89.74	1.34	62.82	58.50	56.93	1015.82	21.70	68.90	35.59	0.00	0.00	3058.41	8317.91

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.92	Z 200/65/24	200	65	60	24	3.00	4.00	8.07	1017.70	97.13	1.13	588.75	81.51	60.62	2892.43	5873.76
2.92	Z 200/65/36	200	65	60	36	3.00	4.00	8.62	1087.78	97.22	1.22	623.19	106.40	64.10	3091.61	8091.04
2.92	Z 200/70/26	200	70	65	26	3.00	4.00	8.39	1058.58	97.18	1.19	623.68	104.67	64.18	3008.62	7461.11
2.92	Z 200/70/39	200	70	65	39	3.00	4.00	8.98	1134.50	97.27	1.27	658.39	136.35	67.69	3224.39	10332.33
2.92	Z 200/75/28	200	75	70	28	3.00	4.00	8.71	1099.46	97.23	1.23	658.27	131.85	67.70	3124.80	9307.69
2.92	Z 200/75/42	200	75	70	42	3.00	4.00	9.35	1181.22	97.32	1.32	692.96	171.44	71.20	3357.18	12966.04
2.92	Z 200/80/30	200	80	75	30	3.00	4.00	9.03	1140.34	97.28	1.28	692.52	163.36	71.19	3240.99	11434.50
2.92	Z 200/80/45	200	80	75	45	3.00	4.00	9.72	1227.94	97.37	1.37	726.91	212.10	74.66	3489.96	16031.28
2.92	Z 220/70/26	220	70	65	26	3.00	4.00	8.85	1116.98	107.12	1.12	782.86	104.68	73.08	3174.60	9178.90
2.92	Z 220/70/39	220	70	65	39	3.00	4.00	9.44	1192.90	107.21	1.21	828.58	136.35	77.28	3390.37	12596.11
2.92	Z 220/75/28	220	75	70	28	3.00	4.00	9.17	1157.86	107.17	1.17	825.32	131.85	77.01	3290.78	11443.71
2.92	Z 220/75/42	220	75	70	42	3.00	4.00	9.81	1239.62	107.26	1.26	871.46	171.45	81.25	3523.16	15781.45
2.92	Z 220/80/30	220	80	75	30	3.00	4.00	9.49	1198.74	107.22	1.22	867.39	163.37	80.90	3406.97	14048.24
2.92	Z 220/80/45	220	80	75	45	3.00	4.00	10.18	1286.34	107.31	1.30	913.61	212.11	85.14	3655.94	19478.24
2.92	Z 220/85/32	220	85	80	32	3.00	4.00	9.81	1239.62	107.26	1.26	909.09	199.54	84.75	3523.16	17017.70
2.92	Z 220/85/48	220	85	80	48	3.00	4.00	10.54	1333.06	107.35	1.35	955.09	258.73	88.97	3788.73	23733.11
2.92	Z 250/80/22.5	250	80	75	23	3.00	4.00	9.83	1242.54	122.09	1.09	1132.28	139.01	92.74	3531.46	15417.92
2.92	Z 250/80/37.5	250	80	75	38	3.00	4.00	10.52	1330.14	122.18	1.18	1211.52	187.75	99.16	3780.43	21850.04

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 200/65/24	785.26	576.42	81.47	96.71	100.37	1.47	57.69	59.60	57.43	555.25	14.12	85.68	32.21	0.34	0.42	2231.82	4970.25
2.92	Z 200/65/36	855.34	610.86	106.36	96.86	100.22	1.55	57.61	63.07	60.95	685.31	18.46	84.51	35.26	0.33	0.36	2431.00	6779.49
2.92	Z 200/70/26	826.14	611.35	104.63	96.80	100.28	1.52	62.64	63.16	60.96	689.05	16.70	86.02	35.59	0.33	0.38	2348.01	6293.33
2.92	Z 200/70/39	902.06	646.07	136.30	96.95	100.13	1.60	62.56	66.64	64.52	851.30	21.79	84.63	38.87	0.33	0.33	2563.78	8640.11
2.92	Z 200/75/28	867.02	645.94	131.80	96.88	100.20	1.56	67.60	66.67	64.47	842.32	19.50	86.31	38.99	0.33	0.35	2464.19	7832.07
2.92	Z 200/75/42	948.78	680.64	171.39	97.02	100.06	1.65	67.51	70.15	68.03	1041.68	25.39	84.70	42.50	0.32	0.30	2696.56	10830
2.92	Z 200/80/30	907.90	680.20	163.31	96.96	100.12	1.61	72.55	70.16	67.94	1016.34	22.51	86.56	42.41	0.33	0.32	2580.38	9605.12
2.92	Z 200/80/45	995.50	714.60	212.04	97.09	99.99	1.69	72.47	73.60	71.47	1258.08	29.26	84.72	46.15	0.32	0.27	2829.35	13383
2.92	Z 220/70/26	831.78	760.12	104.63	106.63	110.45	1.51	62.65	71.28	68.82	693.76	16.70	95.59	35.47	0.39	0.49	2364.04	7558.43
2.92	Z 220/70/39	907.70	805.85	136.30	106.79	110.29	1.59	62.57	75.46	73.07	856.63	21.78	94.22	38.75	0.38	0.42	2579.81	10257
2.92	Z 220/75/28	872.66	802.58	131.80	106.72	110.36	1.55	67.61	75.20	72.73	847.81	19.50	95.90	38.86	0.38	0.45	2480.23	9393.01
2.92	Z 220/75/42	954.42	848.73	171.39	106.88	110.20	1.64	67.52	79.41	77.02	1047.88	25.38	94.30	42.38	0.38	0.38	2712.60	12826
2.92	Z 220/80/30	913.54	844.65	163.31	106.81	110.27	1.60	72.56	79.08	76.60	1022.67	22.51	96.16	42.28	0.38	0.41	2596.41	11502
2.92	Z 220/80/45	1001.14	890.89	212.04	106.96	110.12	1.68	72.48	83.29	80.90	1265.22	29.25	94.33	46.02	0.37	0.35	2845.38	15811
2.92	Z 220/85/32	954.42	886.36	199.48	106.88	110.20	1.64	77.52	82.93	80.43	1219.62	25.73	96.37	45.72	0.38	0.38	2712.60	13909
2.92	Z 220/85/48	1047.86	932.36	258.66	107.03	110.05	1.71	77.45	87.11	84.72	1510.28	33.40	94.33	49.68	0.37	0.32	2978.17	19256
2.92	Z 250/80/22.5	870.35	1075.09	136.52	120.63	126.45	1.97	72.19	89.13	85.02	691.95	18.91	111.14	39.61	0.89	1.46	2440.83	12127
2.92	Z 250/80/37.5	964.07	1163.48	187.68	121.67	125.41	1.63	72.53	95.63	92.77	1153.67	25.87	109.86	44.12	0.45	0.51	2740.02	17185

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 200/65/24	1	585.92	81.51	96.65	100.43	1.14	58.02	60.62	58.34	714.18	14.05	76.18	28.41	0.01	0.47	2869.35	5846.05
2.92		2	588.75	81.51	97.13	99.95	1.13	58.03	60.62	58.90	719.94	14.05	76.06	28.30	0.00	0.00	2892.43	5873.76
2.92	Z 200/65/36	1	620.55	106.40	96.80	100.28	1.23	57.93	64.10	61.88	865.80	18.37	75.79	31.39	0.01	0.41	3070.01	8052.96
2.92		2	623.19	106.40	97.22	99.86	1.22	57.94	64.10	62.40	871.90	18.36	75.69	31.28	0.00	0.00	3091.61	8091.04
2.92	Z 200/70/26	1	620.97	104.67	96.74	100.34	1.19	62.97	64.19	61.89	876.74	16.62	76.87	31.56	0.01	0.44	2986.43	7426.66
2.92		2	623.33	104.55	97.15	99.93	1.21	62.95	64.16	62.37	867.57	16.61	76.75	31.43	0.02	0.03	3005.28	7453.95
2.92	Z 200/70/39	1	655.87	136.34	96.89	100.19	1.28	62.88	67.69	65.46	1064.14	21.68	76.28	34.78	0.01	0.38	3203.69	10285
2.92		2	658.39	136.35	97.27	99.81	1.27	62.89	67.69	65.97	1071.03	21.68	76.18	34.67	0.00	0.00	3224.39	10332
2.92	Z 200/75/28	1	655.66	131.84	96.83	100.25	1.24	67.92	67.71	65.40	1061.18	19.41	77.49	34.75	0.01	0.40	3103.44	9265.73
2.92		2	656.10	130.98	97.02	100.06	1.36	67.80	67.62	65.57	959.95	19.32	77.34	34.55	0.13	0.21	3104.23	9257.02
2.92	Z 200/75/42	1	690.54	171.44	96.97	100.11	1.33	67.83	71.21	68.98	1289.56	25.27	76.69	38.21	0.01	0.35	3337.29	12909
2.92		2	692.96	171.44	97.32	99.76	1.32	67.84	71.20	69.46	1297.25	25.27	76.59	38.10	0.00	0.00	3357.18	12966
2.92	Z 200/80/30	1	690.00	163.36	96.90	100.18	1.29	72.87	71.21	68.88	1268.79	22.42	78.04	37.97	0.01	0.38	3220.39	11384
2.92		2	688.36	161.42	96.89	100.19	1.54	72.62	71.04	68.71	1047.66	22.23	77.86	37.70	0.26	0.39	3201.73	11324
2.92	Z 200/80/45	1	724.58	212.09	97.05	100.03	1.37	72.79	74.66	72.43	1543.70	29.14	77.03	41.67	0.01	0.32	3470.83	15963
2.92		2	726.91	212.10	97.37	99.71	1.37	72.79	74.66	72.90	1552.22	29.14	76.94	41.56	0.00	0.00	3489.96	16031
2.92	Z 220/70/26	1	779.42	104.68	106.64	110.44	1.13	63.03	73.09	70.58	925.24	16.61	83.84	30.73	0.01	0.48	3151.40	9139.99
2.92		2	780.90	104.13	106.95	110.13	1.21	62.95	73.01	70.91	860.51	16.54	83.68	30.56	0.09	0.17	3159.46	9137.66
2.92	Z 220/70/39	1	825.36	136.35	106.79	110.29	1.22	62.94	77.29	74.84	1119.01	21.66	83.45	33.92	0.01	0.42	3368.65	12543
2.92		2	828.58	136.35	107.21	109.87	1.21	62.95	77.28	75.42	1126.24	21.66	83.34	33.81	0.00	0.00	3390.37	12596
2.92	Z 220/75/28	1	822.00	131.85	106.73	110.35	1.18	67.98	77.02	74.49	1117.66	19.40	84.55	33.86	0.01	0.44	3268.40	11396
2.92		2	820.98	130.44	106.81	110.27	1.37	67.79	76.86	74.45	949.72	19.24	84.35	33.62	0.20	0.36	3257.60	11340
2.92	Z 220/75/42	1	868.36	171.45	106.88	110.20	1.27	67.89	81.25	78.80	1353.38	25.25	83.95	37.30	0.01	0.39	3502.25	15716
2.92		2	871.46	171.45	107.26	109.82	1.26	67.90	81.25	79.35	1361.47	25.25	83.85	37.19	0.00	0.00	3523.16	15781
2.92	Z 220/80/30	1	864.18	163.37	106.80	110.28	1.22	72.94	80.91	78.37	1333.86	22.40	85.18	37.03	0.01	0.41	3385.35	13991
2.92		2	860.48	160.74	106.66	110.42	1.55	72.61	80.67	77.93	1034.56	22.14	84.95	36.72	0.34	0.55	3354.33	13861
2.92	Z 220/80/45	1	910.63	212.10	106.95	110.13	1.31	72.85	85.15	82.69	1617.15	29.12	84.37	40.72	0.01	0.36	3635.80	19400
2.92		2	913.61	212.11	107.31	109.77	1.30	72.86	85.14	83.23	1626.12	29.11	84.28	40.61	0.00	0.00	3655.94	19478
2.92	Z 220/85/32	1	905.99	199.54	106.88	110.20	1.27	77.89	84.77	82.21	1575.12	25.62	85.75	40.24	0.01	0.39	3502.25	16950
2.92		2	899.40	195.30	106.51	110.57	1.75	77.41	84.44	81.34	1115.12	25.23	85.49	39.84	0.49	0.75	3449.75	16723
2.92	Z 220/85/48	1	952.21	258.73	107.02	110.06	1.35	77.81	88.98	86.52	1911.95	33.25	84.73	44.17	0.01	0.33	3769.29	23641
2.92		2	955.09	258.73	107.35	109.73	1.35	77.81	88.97	87.04	1921.82	33.25	84.64	44.06	0.00	0.00	3788.73	23733
2.92	Z 250/80/22.5	1	1115.65	134.50	122.99	124.09	0.53	73.63	90.71	89.91	2524.86	18.27	95.26	33.08	0.55	0.90	3438.10	15065
2.92		2	1104.06	131.54	120.22	126.86	2.03	72.13	91.84	87.03	647.04	18.24	94.99	32.79	0.95	1.87	3388.54	14661
2.92	Z 250/80/37.5	1	1207.24	187.75	121.75	125.33	1.19	72.97	99.16	96.32	1582.96	25.73	95.55	37.68	0.01	0.44	3758.21	21770
2.92		2	1210.34	187.38	122.11	124.97	1.22	72.94	99.12	96.85	1534.82	25.69	95.42	37.55	0.04	0.08	3773.04	21815

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
2.92	Z 250/85/24	250	85	80	24	3.00	4.00	10.13	1280.50	122.13	1.13	1185.92	169.96	97.10	3639.34	18630.53
2.92	Z 250/85/40	250	85	80	40	3.00	4.00	10.86	1373.94	122.23	1.22	1266.95	229.15	103.66	3904.91	26505.15
2.92	Z 250/90/25.5	250	90	85	23	3.00	4.00	10.29	1300.94	122.15	1.15	1221.42	192.65	99.99	3697.44	20706.34
2.92	Z 250/90/42.5	250	90	85	43	3.00	4.00	11.21	1417.74	122.27	1.26	1321.76	276.23	108.10	4029.40	31784.62
2.92	Z 250/95/27	250	95	90	27	3.00	4.00	10.73	1356.42	122.21	1.20	1292.41	244.98	105.75	3855.12	26286.43
2.92	Z 250/95/45	250	95	90	45	3.00	4.00	11.55	1461.54	122.31	1.30	1375.98	329.35	112.50	4153.88	37733.66
2.92	Z 250/100/28.5	250	100	95	29	3.00	4.00	11.02	1394.38	122.25	1.24	1345.27	289.61	110.05	3963.01	30776.01
2.92	Z 250/100/47.5	250	100	95	48	3.00	4.00	11.90	1505.34	122.34	1.33	1429.60	388.88	116.85	4278.37	44399.31
2.92	Z 300/95/27	300	95	90	27	3.00	4.00	11.87	1502.42	147.10	1.09	1985.74	245.00	135.00	4270.07	39321.04
2.92	Z 300/95/45	300	95	90	45	3.00	4.00	12.70	1607.54	147.19	1.18	2122.66	329.37	144.21	4568.83	55432.75
2.92	Z 300/100/28.5	300	100	95	29	3.00	4.00	12.17	1540.38	147.13	1.12	2063.26	289.63	140.23	4377.96	46023.78
2.92	Z 300/100/47.5	300	100	95	48	3.00	4.00	13.04	1651.34	147.23	1.21	2202.81	388.90	149.62	4693.32	65108.58
2.92	Z 300/105/30	300	105	100	30	3.00	4.00	12.47	1578.34	147.17	1.16	2140.47	339.37	145.45	4485.84	53422.47
2.92	Z 300/105/50	300	105	100	50	3.00	4.00	13.39	1695.14	147.26	1.25	2282.21	455.21	154.98	4817.81	75859.76
2.92	Z 300/115/33	300	115	110	33	3.00	4.00	13.06	1654.26	147.23	1.22	2293.94	455.31	155.81	4701.62	70440.63
2.92	Z 300/115/55	300	115	110	55	3.00	4.00	14.07	1782.74	147.32	1.31	2438.84	609.61	165.54	5066.78	100849.69
2.92	Z 300/120/34.5	300	120	115	35	3.00	4.00	13.36	1692.22	147.26	1.25	2370.22	522.06	160.96	4809.51	80127.73
2.92	Z 300/120/57.5	300	120	115	58	3.00	4.00	14.42	1826.54	147.35	1.34	2516.11	698.43	170.75	5191.26	115224.72

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.92	Z 250/85/24	905.63	1124.79	165.89	120.39	126.69	2.22	76.94	93.43	88.78	747.50	21.56	111.44	42.80	1.09	1.74	2527.74	14540
2.92	Z 250/85/40	1007.87	1218.92	229.07	121.75	125.33	1.66	77.50	100.12	97.26	1376.03	29.56	109.97	47.67	0.44	0.48	2864.51	20802
2.92	Z 250/90/25.5	940.70	1173.93	199.08	120.15	126.93	2.49	81.67	97.71	92.48	800.41	24.38	111.71	46.00	1.32	2.03	2613.46	17240
2.92	Z 250/90/42.5	1051.67	1273.74	276.15	121.82	125.26	1.70	82.46	104.56	101.69	1624.85	33.49	110.05	51.24	0.44	0.44	2988.99	24910
2.92	Z 250/95/27	975.57	1222.52	236.29	119.89	127.19	2.78	86.94	101.97	96.12	850.91	27.18	111.94	49.22	1.57	2.32	2698.09	20245
2.92	Z 250/95/45	1095.47	1327.96	329.27	121.89	125.19	1.73	87.43	108.94	106.08	1901.58	37.66	110.10	54.82	0.43	0.41	3113.48	29548
2.92	Z 250/100/28.5	1005.39	1263.61	276.66	120.18	126.90	2.89	92.05	105.14	99.58	958.43	30.06	112.11	52.46	1.65	2.07	2767.36	23562
2.92	Z 250/100/47.5	1128.39	1370.83	382.20	122.58	124.50	1.42	92.74	111.84	110.10	2694.50	41.21	110.22	58.20	0.09	0.23	3207.04	34135
2.92	Z 300/95/27	980.64	1821.74	234.47	143.71	153.37	2.99	87.15	126.76	118.78	783.77	26.90	136.30	48.90	1.90	3.39	2699.23	28701
2.92	Z 300/95/45	1103.63	1997.47	329.27	146.57	150.51	1.72	87.44	136.28	132.72	1915.76	37.66	134.53	54.62	0.54	0.62	3136.67	41136
2.92	Z 300/100/28.5	1010.26	1881.75	274.49	144.03	153.05	3.12	92.28	130.65	122.95	878.71	29.74	136.48	52.12	2.00	3.10	2767.65	33349
2.92	Z 300/100/47.5	1136.55	2060.95	382.20	147.40	149.68	1.41	92.75	139.82	137.69	2714.00	41.21	134.66	57.99	0.19	0.18	3230.23	47447
2.92	Z 300/105/30	1033.61	1927.81	317.13	144.45	152.63	3.23	97.39	133.46	126.30	981.43	32.56	136.57	55.39	2.08	2.72	2817.54	38440
2.92	Z 300/105/50	1154.76	2096.55	432.53	147.59	149.49	1.46	97.70	142.06	140.24	2971.55	44.27	134.74	61.20	0.21	0.32	3262.95	53653
2.92	Z 300/115/33	1070.76	1997.23	412.31	144.36	152.72	3.76	107.92	138.36	130.77	1097.69	38.21	136.57	62.05	2.54	2.87	2894.90	50125
2.92	Z 300/115/55	1179.54	2143.21	539.75	147.06	150.02	1.92	107.24	145.74	142.86	2810.26	50.33	134.80	67.65	0.61	0.27	3289.11	67255
2.92	Z 300/120/34.5	1086.98	2026.27	465.45	144.18	152.90	4.08	113.24	140.54	132.52	1140.51	41.10	136.53	65.44	2.84	3.08	2928.47	56764
2.92	Z 300/120/57.5	1189.87	2162.47	597.54	146.78	150.30	2.19	111.97	147.32	143.88	2732.53	53.36	134.81	70.87	0.85	0.57	3296.83	74675

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 250/85/24	1	1167.70	164.12	123.19	123.89	0.48	78.68	94.79	94.26	3453.25	20.86	96.01	36.00	0.65	1.06	3536.94	18186
2.92		2	1152.49	159.78	119.97	127.11	2.30	76.86	96.06	90.67	695.18	20.79	95.72	35.64	1.17	2.16	3471.80	17628
2.92	Z 250/85/40	1	1262.82	229.15	121.82	125.26	1.23	77.93	103.66	100.81	1866.08	29.40	96.14	40.95	0.01	0.41	3883.40	26410
2.92		2	1262.72	227.62	121.96	125.12	1.38	77.78	103.53	100.92	1650.84	29.26	95.98	40.75	0.16	0.27	3878.32	26364
2.92	Z 250/90/25.5	1	1219.45	197.79	123.38	123.70	0.41	83.75	98.83	98.59	4813.45	23.62	96.71	38.95	0.76	1.21	3635.61	21697
2.92		2	1200.37	191.68	119.73	127.35	2.58	81.74	100.26	94.25	741.66	23.45	96.38	38.51	1.42	2.45	3554.12	20947
2.92	Z 250/90/42.5	1	1317.76	276.23	121.88	125.20	1.27	82.89	108.12	105.26	2179.70	33.32	96.66	44.25	0.01	0.38	4008.55	31673
2.92		2	1314.25	273.12	121.81	125.27	1.55	82.61	107.89	104.91	1759.20	33.06	96.47	43.98	0.29	0.46	3982.24	31503
2.92	Z 250/95/27	1	1270.93	235.78	123.52	123.56	0.34	88.82	102.89	102.86	6918.41	26.55	97.35	41.93	0.86	1.35	3734.19	25621
2.92		2	1247.71	227.43	119.47	127.61	2.89	87.05	104.43	97.78	786.63	26.13	97.00	41.41	1.69	2.74	3635.57	24638
2.92	Z 250/95/45	1	1372.10	329.35	121.95	125.13	1.30	87.86	112.52	109.65	2525.30	37.49	97.13	47.59	0.01	0.36	4133.66	37604
2.92		2	1364.96	324.17	121.65	125.43	1.74	87.42	112.20	108.82	1860.65	37.08	96.92	47.23	0.44	0.65	4084.87	37272
2.92	Z 250/95/28.5	1	1319.19	277.82	123.08	124.00	0.18	93.98	107.18	106.39	15090.97	29.56	97.87	44.91	1.06	1.75	3829.54	29984
2.92		2	1294.53	267.23	119.22	127.86	3.22	92.38	108.58	101.24	830.21	28.93	97.57	44.33	1.98	3.03	3716.22	28716
2.92	Z 250/100/47.5	1	1418.27	384.19	122.76	124.32	0.93	93.23	115.54	114.08	4112.26	41.21	97.46	50.72	0.40	0.41	4243.78	43816
2.92		2	1413.61	380.25	121.41	125.67	2.01	92.15	116.43	112.49	1890.02	41.26	97.31	50.47	0.68	0.93	4179.09	43621
2.92	Z 300/95/27	1	1931.59	231.19	148.31	148.77	0.08	89.24	130.24	129.84	28209.96	25.91	114.61	39.65	1.17	1.67	4070.86	37636
2.92		2	1889.26	224.89	142.04	155.04	2.88	87.04	133.01	121.86	779.65	25.84	114.47	39.49	1.80	5.05	3950.60	36026
2.92	Z 300/95/45	1	2110.04	328.95	146.44	150.64	1.16	88.00	144.09	140.08	2839.01	37.38	115.11	45.45	0.02	0.75	4522.30	55080
2.92		2	2082.49	321.40	145.02	152.06	1.82	87.34	143.60	136.95	1761.96	36.80	114.95	45.16	0.64	2.17	4411.66	53953
2.92	Z 300/100/28.5	1	2000.37	272.22	147.82	149.26	0.27	94.43	135.33	134.02	9955.50	28.83	115.28	42.53	1.40	2.13	4159.52	43982
2.92		2	1956.42	264.18	141.71	155.37	3.22	92.38	138.06	125.92	821.08	28.60	115.19	42.33	2.10	5.42	4027.58	41945
2.92	Z 300/100/47.5	1	2174.95	382.66	147.42	149.66	0.75	93.41	147.54	145.32	5118.16	40.96	115.56	48.47	0.47	0.19	4612.83	63957
2.92		2	2154.16	377.16	144.72	152.36	2.08	92.08	148.85	141.39	1809.16	40.96	115.49	48.33	0.87	2.51	4502.66	63047
2.92	Z 300/105/30	1	2062.74	317.21	147.02	150.06	0.57	99.73	140.30	137.46	5606.69	31.81	115.83	45.42	1.72	2.90	4243.60	50984
2.92		2	2016.61	307.01	141.08	156.00	3.65	97.81	142.94	129.27	840.13	31.39	115.81	45.19	2.50	6.08	4095.14	48389
2.92	Z 300/105/50	1	2229.97	439.47	148.30	148.78	0.11	99.05	150.37	149.88	38705.68	44.37	115.89	51.45	1.13	1.52	4689.98	73459
2.92		2	2212.12	433.99	143.81	153.27	2.70	96.86	153.82	144.33	1604.96	44.80	115.96	51.36	1.46	3.45	4565.50	72123
2.92	Z 300/115/33	1	2175.76	420.43	145.01	152.07	1.34	110.50	150.04	143.07	3126.96	38.05	116.67	51.29	2.56	4.84	4407.10	67148
2.92		2	2123.21	404.23	139.36	157.72	4.76	108.92	152.35	134.62	849.26	37.11	116.81	50.97	3.54	7.87	4213.52	62995
2.92	Z 300/115/55	1	2333.34	567.53	145.53	151.55	1.36	110.52	160.33	153.96	4165.36	51.35	116.40	57.40	2.67	4.23	4840.82	94942
2.92		2	2298.13	558.26	140.97	156.11	4.49	108.65	163.02	147.21	1243.02	51.38	116.56	57.45	3.18	6.35	4655.08	92043
2.92	Z 300/120/34.5	1	2229.95	479.31	143.99	153.09	1.78	115.94	154.86	145.67	2689.65	41.34	117.02	54.25	3.03	5.83	4487.73	76372
2.92		2	2168.45	458.76	138.24	158.84	5.44	114.60	156.86	136.52	842.58	40.03	117.18	53.90	4.20	9.02	4266.72	71227
2.92	Z 300/120/57.5	1	2381.89	639.03	144.16	152.92	2.20	116.36	165.23	155.76	2908.76	54.92	116.59	60.39	3.54	5.57	4914.51	106972
2.92		2	2336.72	627.02	139.50	157.58	5.52	114.68	167.50	148.29	1136.44	54.68	116.79	60.50	4.18	7.85	4696.79	103050

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.92	Z 330/105/30	330	105	100	30	3.00	4.00	13.16	1665.94	162.11	1.09	2679.56	339.38	165.30	4734.82	65922.03
2.92	Z 330/105/50	330	105	100	50	3.00	4.00	14.07	1782.74	162.20	1.19	2862.47	455.22	176.48	5066.78	92776.51
2.92	Z 330/115/33	330	115	110	33	3.00	4.00	13.75	1741.86	162.17	1.16	2867.00	455.32	176.79	4950.59	86901.63
2.92	Z 330/115/55	330	115	110	55	3.00	4.00	14.76	1870.34	162.26	1.25	3055.64	609.62	188.31	5315.75	123142.97
2.92	Z 330/125/36	330	125	120	36	3.00	4.00	14.35	1817.78	162.23	1.21	3053.04	595.05	188.20	5166.37	111780.45
2.92	Z 330/125/60	330	125	120	60	3.00	4.00	15.45	1957.94	162.32	1.30	3245.60	795.50	199.95	5564.72	159605.42
2.92	Z 350/105/30	350	105	100	30	3.00	4.00	13.61	1724.34	172.07	1.06	3080.36	339.39	179.02	4900.80	75052.04
2.92	Z 350/105/50	350	105	100	50	3.00	4.00	14.53	1841.14	172.16	1.15	3293.64	455.23	191.31	5232.76	105110.47
2.92	Z 350/115/33	350	115	110	33	3.00	4.00	14.21	1800.26	172.13	1.12	3292.33	455.33	191.27	5116.57	98933.65
2.92	Z 350/115/55	350	115	110	55	3.00	4.00	15.22	1928.74	172.23	1.21	3513.36	609.63	204.00	5481.73	139402.55
2.92	Z 350/125/36	350	125	120	36	3.00	4.00	14.81	1876.18	172.19	1.17	3502.81	595.06	203.43	5332.35	127237.54
2.92	Z 350/125/60	350	125	120	60	3.00	4.00	15.91	2016.34	172.28	1.27	3729.57	795.50	216.48	5730.70	180511.47
2.92	Z 350/135/39	350	135	130	39	3.00	4.00	15.40	1952.10	172.24	1.23	3711.83	760.80	215.50	5548.12	160327.14
2.92	Z 350/135/65	350	135	130	65	3.00	4.00	16.59	2103.94	172.34	1.32	3942.43	1015.78	228.76	5979.67	229151.37
2.92	Z 400/125/36	400	125	120	36	3.00	4.00	15.95	2022.18	197.11	1.09	4793.96	595.08	243.22	5747.30	170725.58
2.92	Z 400/125/60	400	125	120	60	3.00	4.00	17.05	2162.34	197.20	1.18	5118.49	795.53	259.56	6145.65	239166.92
2.92	Z 400/135/39	400	135	130	39	3.00	4.00	16.55	2098.10	197.16	1.14	5070.45	760.82	257.18	5963.07	215061.99
2.92	Z 400/135/65	400	135	130	65	3.00	4.00	17.74	2249.94	197.25	1.23	5403.92	1015.80	273.96	6394.62	303039.73

Solicitare de compresiune																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 330/105/30	1033.09	2363.99	313.87	159.07	168.01	3.18	97.34	148.62	140.70	986.40	32.24	151.27	55.12	2.09	3.04	2793.54	45933
2.92	Z 330/105/50	1157.06	2585.17	431.41	162.31	164.77	1.56	97.60	159.28	156.89	2768.45	44.20	149.47	61.06	0.37	0.11	3258.77	63783
2.92	Z 330/115/33	1071.76	2453.05	409.68	158.77	168.31	3.85	108.01	154.50	145.75	1065.40	37.93	151.29	61.83	2.69	3.40	2885.08	59937
2.92	Z 330/115/55	1181.78	2642.26	538.29	161.72	165.36	2.04	107.12	163.38	159.79	2642.34	50.25	149.53	67.49	0.79	0.54	3284.93	79904
2.92	Z 330/125/36	1104.08	2523.88	520.05	158.25	168.83	4.61	118.77	159.49	149.49	1128.53	43.79	151.19	68.63	3.40	3.98	2956.89	76435
2.92	Z 330/125/60	1201.24	2686.66	656.24	161.10	165.98	2.61	116.77	166.76	161.87	2518.01	56.20	149.55	73.91	1.30	1.22	3297.70	97977
2.92	Z 350/105/30	1031.51	2676.89	310.95	168.97	178.11	3.06	97.22	158.42	150.30	1016.02	31.98	161.09	54.90	2.00	3.10	2768.34	51197
2.92	Z 350/105/50	1158.27	2939.95	430.69	172.11	174.97	1.62	97.54	170.82	168.02	2650.99	44.16	159.32	60.98	0.48	0.06	3255.42	71021
2.92	Z 350/115/33	1069.84	2777.33	405.60	168.73	178.35	3.68	107.84	164.60	155.72	1102.99	37.61	161.12	61.57	2.56	3.41	2855.24	66721
2.92	Z 350/115/55	1182.95	3004.57	537.35	171.48	175.60	2.11	107.05	175.21	171.10	2543.57	50.20	159.37	67.40	0.90	0.75	3281.57	88939
2.92	Z 350/125/36	1102.85	2859.74	516.17	168.03	179.05	4.53	118.69	170.19	159.72	1139.57	43.49	161.03	68.41	3.36	4.16	2935.89	85147
2.92	Z 350/125/60	1202.37	3054.81	655.04	170.82	176.26	2.69	116.85	178.83	173.32	2434.11	56.06	159.39	73.81	1.42	1.46	3294.42	109023
2.92	Z 350/135/39	1132.81	2932.04	642.92	167.31	179.77	5.47	129.63	175.25	163.10	1175.38	49.60	160.88	75.34	4.24	4.93	3009.59	106519
2.92	Z 350/135/65	1217.76	3094.10	783.52	170.14	176.94	3.36	127.52	181.85	174.87	2331.70	61.44	159.40	80.21	2.04	2.19	3298.02	131285
2.92	Z 400/125/36	1097.25	3783.34	503.87	192.89	204.19	4.09	118.25	196.14	185.28	1230.69	42.61	185.69	67.77	3.00	4.22	2862.03	108423
2.92	Z 400/125/60	1204.36	4080.24	652.17	195.06	202.02	2.90	117.06	209.18	201.97	2252.12	55.71	184.06	73.59	1.71	2.14	3284.92	139196
2.92	Z 400/135/39	1126.37	3877.59	627.55	192.13	204.95	4.97	129.13	201.82	189.20	1262.84	48.60	185.54	74.64	3.83	5.03	2927.71	135490
2.92	Z 400/135/65	1219.67	4132.14	779.94	194.27	202.81	3.59	127.75	212.70	203.75	2172.80	61.05	184.06	79.97	2.36	2.98	3288.84	167527

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
2.92	Z 330/105/30	1	2541.38	313.82	163.33	163.75	0.78	99.94	155.60	155.19	4042.26	31.40	126.65	44.50	1.87	1.22	4359.60	61612
2.92		2	2480.90	304.99	152.93	174.15	3.69	97.85	162.23	142.45	825.55	31.17	126.56	44.38	2.60	9.18	4216.53	58466
2.92	Z 330/105/50	1	2755.72	436.71	162.04	165.04	0.06	99.22	170.06	166.97	69988.47	44.01	127.03	50.57	1.25	0.16	4800.75	88395
2.92		2	2731.33	432.23	156.07	171.01	2.75	96.91	175.01	159.72	1573.08	44.60	127.09	50.56	1.56	6.13	4683.61	86701
2.92	Z 330/115/33	1	2679.76	415.74	161.50	165.58	1.58	110.74	165.93	161.84	2638.82	37.54	127.62	50.27	2.73	3.41	4520.88	81037.
2.92		2	2610.61	401.53	151.17	175.91	4.79	108.95	172.69	148.41	838.17	36.85	127.69	50.08	3.63	11.00	4333.84	76027.
2.92	Z 330/115/55	1	2883.55	563.71	161.95	165.13	1.53	110.69	178.05	174.63	3686.84	50.93	127.64	56.44	2.78	2.86	4950.43	114114
2.92		2	2836.52	556.05	153.08	174.00	4.50	108.66	185.30	163.02	1236.75	51.18	127.78	56.58	3.25	9.19	4772.77	110447
2.92	Z 330/125/36	1	2810.89	536.98	159.23	167.85	2.50	121.66	176.53	167.47	2146.10	44.14	128.41	56.12	3.71	5.62	4679.20	104134
2.92		2	2718.11	514.16	148.81	178.27	6.19	120.35	182.66	152.47	830.06	42.72	128.50	55.89	4.98	13.42	4437.98	96572
2.92	Z 330/125/60	1	3001.40	710.55	158.91	168.17	3.25	122.41	188.87	178.48	2188.48	58.05	128.08	62.32	4.55	5.85	5095.82	143932
2.92		2	2927.04	697.48	149.94	177.14	6.60	120.76	195.22	165.23	1057.41	57.76	128.26	62.61	5.29	12.38	4853.73	137448
2.92	Z 350/105/30	1	2891.61	311.72	172.01	175.07	0.90	100.06	168.11	165.17	3466.45	31.15	133.79	43.93	1.96	0.06	4437.42	69249
2.92		2	2819.53	303.70	160.66	186.42	3.72	97.88	175.50	151.25	817.18	31.03	133.65	43.86	2.66	11.41	4296.71	65699
2.92	Z 350/105/50	1	3140.67	434.99	170.73	176.35	0.17	99.33	183.96	178.09	26141.49	43.79	134.39	50.02	1.32	1.44	4875.18	99141
2.92		2	3110.68	431.11	164.08	183.00	2.77	96.93	189.58	169.98	1554.69	44.47	134.43	50.05	1.62	8.08	4761.64	97184
2.92	Z 350/115/33	1	3048.45	412.84	172.65	174.43	1.71	110.87	176.56	174.77	2415.36	37.24	134.86	49.63	2.83	2.29	4597.51	91013
2.92		2	2964.98	399.76	158.86	188.22	4.81	108.97	186.64	157.53	830.38	36.68	134.85	49.52	3.70	13.27	4412.90	85377
2.92	Z 350/115/55	1	3286.46	561.35	173.06	174.02	1.63	110.79	189.90	188.85	3452.90	50.67	135.08	55.83	2.84	1.80	5024.31	127899
2.92		2	3229.66	554.64	161.00	186.08	4.50	108.66	200.60	173.57	1233.30	51.05	135.18	56.02	3.29	11.22	4850.54	123677
2.92	Z 350/125/36	1	3197.16	533.09	170.23	176.85	2.65	121.81	187.82	180.78	2013.58	43.76	135.72	55.42	3.82	4.66	4754.60	116860
2.92		2	3086.76	511.94	156.46	190.62	6.20	120.36	197.28	161.94	825.41	42.53	135.73	55.28	5.03	15.73	4516.73	108377
2.92	Z 350/125/60	1	3420.96	707.39	169.81	177.27	3.34	122.50	201.46	192.98	2121.03	57.75	135.58	61.65	4.60	4.99	5169.20	161203
2.92		2	3331.28	695.67	157.73	189.35	6.58	120.74	211.20	175.93	1057.84	57.62	135.70	62.01	5.31	14.56	4930.61	153742
2.92	Z 350/135/39	1	3338.79	674.01	167.83	179.25	3.70	132.86	198.94	186.26	1821.34	50.73	136.43	61.30	4.93	7.01	4909.38	147163
2.92		2	3198.30	641.70	153.97	193.11	7.78	131.94	207.72	165.62	824.65	48.64	136.44	61.11	6.56	18.27	4616.20	134933
2.92	Z 350/135/65	1	3545.67	874.04	166.64	180.44	5.27	134.43	212.78	196.50	1658.28	65.02	135.91	67.48	6.59	8.11	5311.33	199307
2.92		2	3421.12	854.79	154.44	192.64	8.96	133.12	221.51	177.60	953.66	64.21	136.03	68.00	7.65	17.89	5007.69	187477
2.92	Z 400/125/36	1	4285.35	524.26	198.22	198.86	2.95	122.11	216.19	215.50	1778.26	42.93	153.79	53.79	4.04	1.75	4945.95	151809
2.92		2	4118.93	506.67	175.12	221.96	6.21	120.37	235.20	185.57	815.83	42.09	153.52	53.84	5.12	21.98	4712.17	140761
2.92	Z 400/125/60	1	4604.72	700.20	197.54	199.54	3.51	122.67	233.10	230.77	1992.28	57.08	154.12	60.10	4.70	2.34	5355.52	208725
2.92		2	4465.61	691.39	176.76	220.32	6.52	120.68	252.63	202.69	1059.92	57.29	154.04	60.61	5.34	20.44	5121.55	198589
2.92	Z 400/135/39	1	4474.20	662.45	195.43	201.65	4.02	133.18	228.94	221.88	1646.12	49.74	154.68	59.52	5.16	4.49	5098.33	190851
2.92		2	4263.64	634.99	172.45	224.63	7.77	131.93	247.23	189.81	817.26	48.13	154.35	59.57	6.63	24.70	4809.76	175002
2.92	Z 400/135/65	1	4773.49	864.66	193.87	203.21	5.42	134.58	246.23	234.90	1593.96	64.25	154.60	65.80	6.66	5.96	5497.09	257633
2.92		2	4581.65	849.43	173.15	223.93	8.86	133.02	264.61	204.60	959.25	63.86	154.45	66.50	7.62	24.10	5196.67	241588

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
2.92	Z 400/145/42	400	145	140	42	3.00	4.00	17.14	2174.02	197.21	1.19	5345.23	954.78	271.05	6178.85	266237.17
2.92	Z 400/145/70	400	145	140	70	3.00	4.00	18.43	2337.54	197.30	1.28	5685.40	1273.39	288.16	6643.59	377528.12
2.92	Z 400/155/45	400	155	150	45	3.00	4.00	17.74	2249.94	197.25	1.23	5618.36	1179.19	284.83	6394.62	324730.62
2.92	Z 400/155/75	400	155	150	75	3.00	4.00	19.12	2425.14	197.34	1.32	5963.09	1571.22	302.17	6892.56	463584.13
3.92	Z 200/67/24	200	67	60	24	4.00	4.00	10.74	1353.79	96.05	1.58	774.10	107.44	80.59	6934.30	7585.26
3.92	Z 200/67/36	200	67	60	36	4.00	4.00	11.48	1447.87	96.18	1.71	820.35	140.87	85.29	7416.19	10508.28
3.92	Z 200/72/26	200	72	65	26	4.00	4.00	11.17	1408.67	96.13	1.66	820.62	138.16	85.37	7215.40	9660.74
3.92	Z 200/72/39	200	72	65	39	4.00	4.00	11.97	1510.59	96.26	1.78	867.24	180.70	90.09	7737.45	13448.46
3.92	Z 200/77/28	200	77	70	28	4.00	4.00	11.60	1463.55	96.20	1.73	866.68	174.23	90.09	7496.50	12077.91
3.92	Z 200/77/42	200	77	70	42	4.00	4.00	12.47	1573.31	96.33	1.85	913.26	227.40	94.81	8058.71	16906.80
3.92	Z 200/82/30	200	82	75	30	4.00	4.00	12.03	1518.43	96.27	1.79	912.28	216.10	94.76	7777.61	14864.57
3.92	Z 200/82/45	200	82	75	45	4.00	4.00	12.96	1636.03	96.40	1.91	958.47	281.54	99.43	8379.97	20935.16
3.92	Z 220/72/26	220	72	65	26	4.00	4.00	11.79	1487.07	106.05	1.57	1031.26	138.18	97.25	7616.98	11899.89
3.92	Z 220/72/39	220	72	65	39	4.00	4.00	12.59	1588.99	106.17	1.69	1092.66	180.72	102.91	8139.02	16413.62
3.92	Z 220/77/28	220	77	70	28	4.00	4.00	12.22	1541.95	106.12	1.64	1087.84	174.25	102.51	7898.08	14868.40
3.92	Z 220/77/42	220	77	70	42	4.00	4.00	13.08	1651.71	106.25	1.76	1149.80	227.43	108.22	8460.28	20601.10
3.92	Z 220/82/30	220	82	75	30	4.00	4.00	12.65	1596.83	106.18	1.70	1143.91	216.12	107.73	8179.18	18285.40
3.92	Z 220/82/45	220	82	75	45	4.00	4.00	13.57	1714.43	106.31	1.83	1205.98	281.57	113.44	8781.54	25464.90

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 400/145/42	1143.46	3933.30	751.48	192.17	204.91	5.24	139.40	204.68	191.95	1434.10	53.91	185.47	81.07	4.05	5.04	2945.14	163678
2.92	Z 400/145/70	1231.83	4172.66	918.10	193.46	203.62	4.38	138.54	215.69	204.92	2097.98	66.27	184.05	86.33	3.10	3.84	3286.40	198616
2.92	Z 400/155/45	1154.21	3967.36	878.90	191.73	205.35	5.85	150.01	206.92	193.20	1503.18	58.59	185.40	87.26	4.61	5.52	2947.03	193276
2.92	Z 400/155/75	1241.49	4204.08	1066.31	192.63	204.45	5.26	149.42	218.24	205.63	2028.29	71.36	184.02	92.68	3.93	4.71	3279.54	232442
3.92	Z 200/67/24	1162.02	770.19	107.39	95.72	100.36	1.84	57.32	80.46	76.75	582.06	18.74	81.41	30.40	0.26	0.33	5952.03	6940
3.92	Z 200/67/36	1256.10	816.45	140.81	95.90	100.18	1.97	57.19	85.14	81.50	715.16	24.62	80.62	33.48	0.26	0.28	6433.92	9557
3.92	Z 200/72/26	1216.90	816.72	138.10	95.83	100.25	1.92	62.24	85.23	81.47	719.41	22.19	81.92	33.69	0.26	0.30	6233.13	8819
3.92	Z 200/72/39	1318.82	863.34	180.63	96.00	100.08	2.04	62.12	89.93	86.27	884.68	29.08	80.91	37.01	0.26	0.26	6755.18	12212
3.92	Z 200/77/28	1271.78	862.78	174.17	95.92	100.16	1.99	67.17	89.94	86.14	876.19	25.93	82.37	37.01	0.26	0.28	6514.23	11006
3.92	Z 200/77/42	1381.54	909.37	227.33	96.09	99.99	2.11	67.05	94.64	90.95	1078.45	33.90	81.13	40.56	0.26	0.24	7076.44	15335
3.92	Z 200/82/30	1326.66	908.38	216.03	96.01	100.07	2.05	72.11	94.61	90.78	1053.63	29.96	82.75	40.35	0.26	0.26	6795.34	13527
3.92	Z 200/82/45	1444.26	954.59	281.46	96.18	99.90	2.17	71.99	99.25	95.55	1298.04	39.10	81.30	44.15	0.25	0.22	7397.70	18975
3.92	Z 220/72/26	1230.73	1022.01	138.10	105.63	110.45	1.90	62.26	96.75	92.53	727.61	22.18	91.13	33.50	0.33	0.42	6303.95	10632
3.92	Z 220/72/39	1332.65	1083.42	180.63	105.82	110.26	2.02	62.14	102.39	98.26	893.98	29.07	90.17	36.82	0.33	0.36	6825.99	14558
3.92	Z 220/77/28	1285.61	1078.60	174.17	105.73	110.35	1.97	67.19	102.01	97.75	885.74	25.92	91.60	36.81	0.33	0.38	6585.05	13252
3.92	Z 220/77/42	1395.37	1140.57	227.33	105.92	110.16	2.09	67.07	107.69	103.53	1089.27	33.89	90.41	40.36	0.32	0.33	7147.26	18239
3.92	Z 220/82/30	1340.49	1134.67	216.03	105.83	110.25	2.03	72.13	107.22	102.92	1064.64	29.95	92.00	40.14	0.33	0.36	6866.15	16265
3.92	Z 220/82/45	1458.09	1196.76	281.47	106.01	110.07	2.15	72.01	112.89	108.72	1310.49	39.09	90.60	43.94	0.32	0.30	7468.52	22517

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
2.92	Z 400/145/42	1	4646.07	818.11	192.41	204.67	5.37	144.53	241.46	227.01	1523.95	56.61	155.34	65.19	6.56	7.46	5237.48	235103
2.92		2	4387.32	778.09	169.47	227.61	9.65	143.81	258.89	192.75	806.16	54.10	154.94	65.25	8.46	27.74	4894.32	212933
2.92	Z 400/145/70	1	4930.76	1050.20	190.31	206.77	7.54	146.70	259.10	238.46	1392.92	71.59	154.92	71.50	8.82	9.47	5636.90	312878
2.92		2	4684.14	1025.60	169.55	227.53	11.48	145.64	276.27	205.87	893.67	70.42	154.68	72.38	10.20	27.75	5270.61	289143
2.92	Z 400/155/45	1	4799.07	985.44	189.09	207.99	7.14	156.30	253.80	230.74	1380.02	63.05	155.81	70.60	8.37	10.74	5365.69	282517
2.92		2	4486.03	933.02	166.08	231.00	11.95	156.11	270.11	194.20	780.86	59.77	155.28	70.82	10.72	31.17	4964.45	253676
2.92	Z 400/155/75	1	5077.81	1257.63	186.88	210.20	9.84	159.00	271.72	241.57	1277.81	79.09	155.11	77.19	11.17	12.86	5775.58	374744
2.92		2	4774.60	1219.98	165.99	231.09	14.37	158.53	287.64	206.61	848.73	76.95	154.75	78.22	13.05	31.35	5344.50	341259
3.92	Z 200/67/24	1	768.79	107.44	95.38	100.70	1.60	57.56	80.60	76.35	670.78	18.67	75.79	28.33	0.02	0.67	6855.92	7532
3.92		2	774.10	107.44	96.05	100.03	1.58	57.58	80.59	77.39	678.48	18.66	75.62	28.17	0.00	0.00	6934.30	7585
3.92	Z 200/67/36	1	815.40	140.87	95.60	100.48	1.73	57.43	85.29	81.15	816.54	24.53	75.42	31.35	0.02	0.58	7342.90	10435
3.92		2	820.35	140.87	96.18	99.90	1.71	57.45	85.29	82.12	824.72	24.52	75.27	31.19	0.00	0.00	7416.19	10508
3.92	Z 200/72/26	1	815.52	138.15	95.51	100.57	1.68	62.48	85.38	81.09	824.43	22.11	76.49	31.48	0.02	0.62	7140.08	9595
3.92		2	820.62	138.16	96.13	99.95	1.66	62.50	85.37	82.10	833.15	22.10	76.32	31.32	0.00	0.00	7215.40	9661
3.92	Z 200/72/39	1	862.50	180.69	95.72	100.36	1.80	62.36	90.10	85.94	1004.48	28.97	75.91	34.74	0.02	0.54	7667.21	13358
3.92		2	867.24	180.70	96.26	99.82	1.78	62.38	90.09	86.88	1013.71	28.97	75.77	34.59	0.00	0.00	7737.45	13448
3.92	Z 200/77/28	1	861.78	174.23	95.63	100.45	1.74	67.42	90.12	85.79	998.91	25.84	77.11	34.67	0.02	0.57	7424.00	11998
3.92		2	866.68	174.23	96.20	99.88	1.73	67.43	90.09	86.77	1008.69	25.84	76.95	34.50	0.00	0.00	7496.50	12078
3.92	Z 200/77/42	1	908.72	227.40	95.84	100.24	1.87	67.29	94.82	90.65	1218.25	33.79	76.32	38.18	0.02	0.49	7991.27	16798
3.92		2	913.26	227.40	96.33	99.75	1.85	67.31	94.81	91.56	1228.55	33.78	76.19	38.02	0.00	0.00	8058.71	16907
3.92	Z 200/82/30	1	907.56	216.09	95.74	100.34	1.81	72.35	94.80	90.45	1195.46	29.87	77.66	37.90	0.02	0.53	7707.73	14769
3.92		2	912.28	216.10	96.27	99.81	1.79	72.37	94.76	91.40	1206.32	29.86	77.51	37.72	0.00	0.00	7777.61	14865
3.92	Z 200/82/45	1	954.11	281.54	95.94	100.14	1.93	72.23	99.45	95.28	1459.40	38.98	76.66	41.64	0.01	0.46	8315.11	20805
3.92		2	958.47	281.54	96.40	99.68	1.91	72.25	99.43	96.15	1470.81	38.97	76.54	41.48	0.00	0.00	8379.97	20935
3.92	Z 220/72/26	1	1024.78	138.17	105.37	110.71	1.59	62.57	97.25	92.57	870.53	22.08	83.45	30.64	0.02	0.67	7538.21	11826
3.92		2	1031.26	138.18	106.05	110.03	1.57	62.59	97.25	93.72	879.65	22.08	83.28	30.48	0.00	0.00	7616.98	11900
3.92	Z 220/72/39	1	1086.61	180.72	105.58	110.50	1.71	62.45	102.91	98.34	1056.78	28.94	83.07	33.88	0.02	0.59	8065.31	16311
3.92		2	1092.66	180.72	106.17	109.91	1.69	62.47	102.91	99.42	1066.46	28.93	82.92	33.72	0.00	0.00	8139.02	16414
3.92	Z 220/77/28	1	1081.60	174.25	105.49	110.59	1.66	67.50	102.53	97.80	1052.61	25.81	84.16	33.78	0.02	0.63	7822.12	14778
3.92		2	1087.84	174.25	106.12	109.96	1.64	67.52	102.51	98.93	1062.86	25.81	83.99	33.62	0.00	0.00	7898.08	14868
3.92	Z 220/77/42	1	1143.99	227.42	105.70	110.38	1.78	67.38	108.23	103.64	1279.08	33.75	83.57	37.26	0.01	0.55	8389.37	20477
3.92		2	1149.80	227.43	106.25	109.83	1.76	67.40	108.22	104.68	1289.92	33.74	83.43	37.11	0.00	0.00	8460.28	20601
3.92	Z 220/82/30	1	1137.89	216.12	105.60	110.48	1.72	72.44	107.76	102.99	1257.35	29.83	84.80	36.95	0.02	0.58	8105.83	18176
3.92		2	1143.91	216.12	106.18	109.90	1.70	72.46	107.73	104.09	1268.75	29.83	84.64	36.79	0.00	0.00	8179.18	18285
3.92	Z 220/82/45	1	1200.39	281.57	105.81	110.27	1.84	72.32	113.45	108.85	1529.42	38.93	84.00	40.68	0.01	0.51	8713.23	25316
3.92		2	1205.98	281.57	106.31	109.77	1.83	72.33	113.44	109.87	1541.44	38.93	83.87	40.53	0.00	0.00	8781.54	25465

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] $x10^4$	I_z [mm^4] $x10^4$	W_Y [mm^3] $x10^3$	I_t [mm^4]	I_w [mm^6] $x10^6$
3.92	Z 220/87/32	220	87	80	32	4.00	4.00	13.08	1651.71	106.25	1.76	1199.47	264.22	112.90	8460.28	22184.32
3.92	Z 220/87/48	220	87	80	48	4.00	4.00	14.07	1777.15	106.37	1.89	1261.24	343.69	118.57	9102.80	31066.87
3.92	Z 250/82/22.5	250	82	75	23	4.00	4.00	13.11	1655.63	121.00	1.52	1494.34	183.43	123.50	8480.36	20035.37
3.92	Z 250/82/37.5	250	82	75	38	4.00	4.00	14.03	1773.23	121.14	1.65	1600.74	248.88	132.14	9082.73	28550.94
3.92	Z 250/87/24	250	87	80	24	4.00	4.00	13.51	1706.59	121.06	1.58	1565.88	224.51	129.35	8741.39	24252.79
3.92	Z 250/87/40	250	87	80	40	4.00	4.00	14.50	1832.03	121.20	1.71	1674.68	303.99	138.18	9383.91	34681.14
3.92	Z 250/92/25.5	250	92	85	26	4.00	4.00	13.91	1757.55	121.12	1.63	1637.06	271.30	135.16	9002.41	29002.40
3.92	Z 250/92/42.5	250	92	85	43	4.00	4.00	14.96	1890.83	121.25	1.77	1747.79	366.69	144.14	9685.09	41637.91
3.92	Z 250/97/27	250	97	90	27	4.00	4.00	14.31	1808.51	121.17	1.69	1707.89	324.19	140.95	9263.43	34314.64
3.92	Z 250/97/45	250	97	90	45	4.00	4.00	15.42	1949.63	121.31	1.82	1820.10	437.48	150.04	9986.27	49481.31
3.92	Z 250/102/28.5	250	102	95	29	4.00	4.00	14.71	1859.47	121.22	1.74	1778.37	383.54	146.70	9524.46	40220.47
3.92	Z 250/102/47.5	250	102	95	48	4.00	4.00	15.88	2008.43	121.36	1.87	1891.61	516.83	155.87	10287.45	58273.83
3.92	Z 300/97/27	300	97	90	27	4.00	4.00	15.85	2004.51	146.01	1.52	2628.52	324.24	180.02	10267.37	51427.96
3.92	Z 300/97/45	300	97	90	45	4.00	4.00	16.96	2145.63	146.15	1.65	2812.35	437.54	192.43	10990.21	72817.51
3.92	Z 300/102/28.5	300	102	95	29	4.00	4.00	16.25	2055.47	146.06	1.57	2732.02	383.59	187.04	10528.40	60262.55
3.92	Z 300/102/47.5	300	102	95	48	4.00	4.00	17.42	2204.43	146.20	1.70	2919.38	516.89	199.69	11291.39	85603.18
3.92	Z 300/107/30	300	107	100	30	4.00	4.00	16.65	2106.43	146.11	1.62	2835.10	449.78	194.04	10789.42	70019.50
3.92	Z 300/107/50	300	107	100	50	4.00	4.00	17.88	2263.23	146.25	1.75	3025.40	605.32	206.87	11592.57	99815.80

t [mm]	Profile type	Subjected to compression — Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
3.92	Z 220/87/32	1395.37	1190.24	264.12	105.92	110.16	2.09	77.07	112.38	108.04	1265.54	34.27	92.36	43.51	0.32	0.33	7147.26	19702
3.92	Z 220/87/48	1520.81	1252.02	343.58	106.09	109.99	2.20	76.96	118.01	113.83	1559.22	44.65	90.73	47.53	0.32	0.28	7789.78	27448
3.92	Z 250/82/22.5	1298.15	1469.37	183.32	120.44	125.64	1.94	72.22	122.00	116.95	946.51	25.38	106.39	37.58	0.42	0.56	6649.30	17370
3.92	Z 250/82/37.5	1415.75	1575.80	248.76	120.66	125.42	2.07	72.09	130.60	125.64	1203.67	34.51	105.50	41.92	0.42	0.48	7251.66	24517
3.92	Z 250/87/24	1349.11	1540.92	224.39	120.54	125.54	2.00	77.16	127.84	122.74	1124.29	29.08	106.87	40.78	0.42	0.52	6910.32	20967
3.92	Z 250/87/40	1474.55	1649.76	303.86	120.75	125.33	2.12	77.04	136.63	131.63	1430.72	39.44	105.77	45.39	0.41	0.45	7552.84	29720
3.92	Z 250/92/25.5	1400.07	1612.12	271.18	120.63	125.45	2.05	82.11	133.64	128.51	1322.45	33.03	107.31	44.01	0.42	0.49	7171.35	25014
3.92	Z 250/92/42.5	1533.35	1722.88	366.55	120.84	125.24	2.18	81.98	142.58	137.56	1684.07	44.71	106.00	48.89	0.41	0.42	7854.03	35626
3.92	Z 250/97/27	1451.03	1682.96	324.06	120.71	125.37	2.10	87.06	139.42	134.24	1542.04	37.22	107.70	47.26	0.42	0.46	7432.37	29537
3.92	Z 250/97/45	1592.15	1795.19	437.33	120.92	125.16	2.23	86.93	148.46	143.43	1965.12	50.31	106.19	52.41	0.41	0.39	8155.21	42289
3.92	Z 250/102/28.5	1500.00	1750.56	382.14	120.63	125.45	2.25	91.91	145.11	139.55	1696.43	41.58	108.03	50.47	0.52	0.59	7663.04	34477
3.92	Z 250/102/47.5	1650.95	1866.72	516.68	120.99	125.09	2.27	91.89	154.28	149.24	2275.26	56.23	106.33	55.94	0.40	0.36	8456.39	49765
3.92	Z 300/97/27	1468.29	2540.12	322.56	145.01	151.07	2.21	86.95	175.17	168.14	1461.11	37.10	131.53	46.87	0.69	1.00	7493.81	42199
3.92	Z 300/97/45	1612.09	2729.73	437.34	145.52	150.56	2.20	86.96	187.58	181.31	1989.77	50.29	130.13	52.09	0.55	0.63	8257.33	59252
3.92	Z 300/102/28.5	1516.28	2637.31	379.82	144.83	151.25	2.41	91.75	182.10	174.37	1574.80	41.40	131.88	50.05	0.84	1.24	7710.50	49137
3.92	Z 300/102/47.5	1670.89	2836.77	516.69	145.61	150.47	2.24	91.92	194.82	188.53	2302.78	56.21	130.30	55.61	0.54	0.59	8558.51	69529
3.92	Z 300/107/30	1564.04	2733.63	443.33	144.64	151.44	2.63	96.53	189.00	180.50	1684.57	45.93	132.20	53.24	1.01	1.48	7924.71	56767
3.92	Z 300/107/50	1729.69	2942.81	605.10	145.69	150.39	2.29	96.87	201.99	195.68	2646.44	62.46	130.44	59.15	0.54	0.55	8859.69	80959

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																			
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	Z 220/87/32	1	1193.66	264.21	105.70	110.38	1.78	77.38	112.93	108.14	1485.98	34.14	85.37	40.16	0.01	0.55	8389.37	22055
3.92		2	1199.47	264.22	106.25	109.83	1.76	77.40	112.90	109.21	1498.56	34.14	85.22	40.00	0.00	0.00	8460.28	22184
3.92	Z 220/87/48	1	1255.86	343.69	105.90	110.18	1.90	77.26	118.59	113.98	1809.38	44.48	84.37	44.14	0.01	0.47	9036.90	30891
3.92		2	1261.24	343.69	106.37	109.71	1.89	77.27	118.57	114.96	1822.60	44.48	84.24	43.98	0.00	0.00	9102.80	31067
3.92	Z 250/82/22.5	1	1485.71	183.42	120.29	125.79	1.53	72.63	123.51	118.11	1196.32	25.26	95.18	33.44	0.01	0.71	8399.63	19929
3.92		2	1482.87	180.45	120.43	125.65	1.80	72.36	123.13	118.02	1000.28	24.94	94.86	33.09	0.29	0.57	8365.57	19733
3.92	Z 250/82/37.5	1	1592.71	248.88	120.52	125.56	1.66	72.50	132.15	126.85	1495.80	34.33	95.17	37.62	0.01	0.62	9007.35	28399
3.92		2	1600.74	248.88	121.14	124.94	1.65	72.51	132.14	128.12	1508.34	34.32	95.01	37.46	0.00	0.00	9082.73	28551
3.92	Z 250/87/24	1	1556.81	224.19	120.46	125.62	1.57	77.59	129.24	123.93	1432.12	28.89	95.95	36.41	0.01	0.60	8654.73	24108
3.92		2	1549.97	219.75	120.29	125.79	1.99	77.17	128.85	123.22	1103.53	28.48	95.60	36.00	0.41	0.77	8583.30	23785
3.92	Z 250/87/40	1	1666.92	303.99	120.62	125.46	1.72	77.44	138.19	132.87	1764.49	39.26	95.76	40.89	0.01	0.58	9310.95	34500
3.92		2	1674.68	303.99	121.20	124.88	1.71	77.45	138.18	134.10	1778.34	39.25	95.61	40.73	0.00	0.00	9383.91	34681
3.92	Z 250/92/25.5	1	1627.47	270.57	120.61	125.47	1.59	82.57	134.93	129.71	1700.88	32.77	96.66	39.41	0.04	0.51	8909.06	28812
3.92		2	1616.38	264.25	120.15	125.93	2.19	81.97	134.54	128.35	1205.04	32.24	96.29	38.93	0.56	0.97	8798.40	28328
3.92	Z 250/92/42.5	1	1740.28	366.69	120.71	125.37	1.78	82.38	144.17	138.82	2062.28	44.51	96.29	44.20	0.01	0.54	9614.40	41425
3.92		2	1747.79	366.69	121.25	124.83	1.77	82.39	144.14	140.02	2077.47	44.50	96.14	44.04	0.00	0.00	9685.09	41638
3.92	Z 250/97/27	1	1697.77	322.96	120.76	125.32	1.61	87.55	140.59	135.47	2003.93	36.89	97.31	42.44	0.07	0.42	9163.28	34072
3.92		2	1682.13	314.23	119.99	126.09	2.41	86.75	140.19	133.41	1304.48	36.22	96.92	41.89	0.72	1.18	9011.07	33387
3.92	Z 250/97/45	1	1812.82	437.47	120.80	125.28	1.83	87.33	150.07	144.70	2390.58	50.09	96.76	47.53	0.01	0.51	9917.72	49235
3.92		2	1820.10	437.48	121.31	124.77	1.82	87.34	150.04	145.87	2407.13	50.09	96.62	47.37	0.00	0.00	9986.27	49481
3.92	Z 250/102/28.5	1	1767.73	381.71	120.89	125.19	1.63	92.53	146.22	141.20	2343.38	41.25	97.91	45.50	0.11	0.33	9417.54	39920
3.92		2	1747.23	369.98	119.83	126.25	2.64	91.52	145.81	138.40	1401.67	40.43	97.50	44.86	0.90	1.39	9221.43	38989
3.92	Z 250/102/47.5	1	1884.56	516.83	120.88	125.20	1.88	92.28	155.90	150.52	2750.80	56.01	97.18	50.89	0.01	0.48	10220.90	57991
3.92		2	1891.61	516.83	121.36	124.72	1.87	92.29	155.87	151.67	2768.73	56.00	97.05	50.73	0.00	0.00	10287.45	58274
3.92	Z 300/97/27	1	2598.81	317.65	146.36	149.72	1.11	88.05	177.56	173.58	2861.73	36.08	114.45	40.01	0.41	0.35	10056.04	50615
3.92		2	2579.95	311.44	144.35	151.73	2.36	86.80	178.73	170.03	1319.21	35.88	114.10	39.64	0.84	1.66	9948.85	49560
3.92	Z 300/97/45	1	2800.77	437.53	145.54	150.54	1.66	87.50	192.44	186.04	2631.35	50.01	114.64	45.31	0.01	0.61	10915.08	72503
3.92		2	2812.35	437.54	146.15	149.93	1.65	87.51	192.43	187.57	2649.48	50.00	114.49	45.16	0.00	0.00	10990.21	72818
3.92	Z 300/102/28.5	1	2700.18	375.26	146.55	149.53	1.09	93.07	184.25	180.58	3450.32	40.32	115.21	42.95	0.48	0.49	10300.91	59268
3.92		2	2674.83	366.64	144.15	151.93	2.59	91.57	185.56	176.06	1412.91	40.04	114.83	42.51	1.02	1.91	10156.24	57849
3.92	Z 300/102/47.5	1	2908.12	516.89	145.62	150.46	1.71	92.45	199.71	193.28	3019.58	55.91	115.23	48.58	0.01	0.58	11218.26	85239
3.92		2	2919.38	516.89	146.20	149.88	1.70	92.46	199.69	194.78	3039.29	55.91	115.08	48.42	0.00	0.00	11291.39	85603
3.92	Z 300/107/30	1	2801.08	439.44	146.73	149.35	1.06	98.10	190.90	187.55	4146.19	44.79	115.91	45.91	0.56	0.62	10545.46	68822
3.92		2	2768.85	427.83	143.94	152.14	2.84	96.32	192.36	182.00	1504.35	44.42	115.51	45.40	1.23	2.17	10361.60	66966
3.92	Z 300/107/50	1	3014.44	605.31	145.70	150.38	1.76	97.40	206.90	200.45	3442.69	62.15	115.77	51.88	0.01	0.55	11521.34	99399
3.92		2	3025.40	605.32	146.25	149.83	1.75	97.41	206.87	201.92	3463.99	62.14	115.62	51.72	0.00	0.00	11592.57	99816

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
3.92	Z 300/117/33	300	117	110	33	4.00	4.00	17.45	2208.35	146.20	1.70	3039.98	604.15	207.93	11311.47	92477.22
3.92	Z 300/117/55	300	117	110	55	4.00	4.00	18.80	2380.83	146.33	1.83	3234.53	811.31	221.04	12194.93	132869.85
3.92	Z 300/122/34.5	300	122	115	35	4.00	4.00	17.85	2259.31	146.24	1.74	3141.80	693.07	214.84	11572.49	105267.89
3.92	Z 300/122/57.5	300	122	115	58	4.00	4.00	19.27	2439.63	146.37	1.87	3337.69	929.86	228.02	12496.12	151892.66
3.92	Z 330/107/30	330	107	100	30	4.00	4.00	17.57	2224.03	161.03	1.53	3551.86	449.81	220.57	11391.78	86476.51
3.92	Z 330/107/50	330	107	100	50	4.00	4.00	18.80	2380.83	161.16	1.66	3797.44	605.35	235.63	12194.93	122171.51
3.92	Z 330/117/33	330	117	110	33	4.00	4.00	18.37	2325.95	161.12	1.62	3802.22	604.18	235.99	11913.83	114186.64
3.92	Z 330/117/55	330	117	110	55	4.00	4.00	19.73	2498.43	161.25	1.75	4055.51	811.35	251.51	12797.30	162369.20
3.92	Z 330/127/36	330	127	120	36	4.00	4.00	19.17	2427.87	161.20	1.70	4050.72	790.36	251.29	12435.88	147071.29
3.92	Z 330/127/60	330	127	120	60	4.00	4.00	20.65	2616.03	161.33	1.83	4309.26	1059.47	267.11	13399.66	210665.81
3.92	Z 350/107/30	350	107	100	30	4.00	4.00	18.19	2302.43	170.98	1.48	4084.98	449.83	238.92	11793.36	98500.96
3.92	Z 350/107/50	350	107	100	50	4.00	4.00	19.42	2459.23	171.11	1.61	4371.33	605.37	255.47	12596.51	138475.99
3.92	Z 350/117/33	350	117	110	33	4.00	4.00	18.99	2404.35	171.07	1.57	4368.21	604.20	255.35	12315.41	130060.13
3.92	Z 350/117/55	350	117	110	55	4.00	4.00	20.34	2576.83	171.20	1.69	4664.96	811.37	272.49	13198.87	183891.23
3.92	Z 350/127/36	350	127	120	36	4.00	4.00	19.79	2506.27	171.15	1.64	4649.43	790.38	271.67	12837.45	167491.08
3.92	Z 350/127/60	350	127	120	60	4.00	4.00	21.27	2694.43	171.28	1.77	4953.88	1059.50	289.23	13801.23	238367.14
3.92	Z 350/137/39	350	137	130	39	4.00	4.00	20.59	2608.19	171.22	1.72	4928.68	1011.35	287.86	13359.50	211277.59
3.92	Z 350/137/65	350	137	130	65	4.00	4.00	22.19	2812.03	171.35	1.85	5238.28	1353.67	305.70	14403.60	302855.20

Subjected to compression																		
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section																
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	Z 300/117/33	1658.90	2923.69	590.17	144.23	151.85	3.12	106.04	202.71	192.54	1892.52	55.65	132.76	59.65	1.41	1.97	8346.20	74225
3.92	Z 300/117/55	1847.29	3151.96	811.08	145.84	150.24	2.36	106.80	216.12	209.80	3431.34	75.95	130.62	66.26	0.53	0.49	9462.05	107588
3.92	Z 300/122/34.5	1706.01	3017.49	674.09	144.02	152.06	3.39	110.77	209.52	198.44	1990.98	60.85	132.99	62.86	1.64	2.23	8553.73	84120
3.92	Z 300/122/57.5	1906.09	3255.13	929.62	145.91	150.17	2.40	111.76	223.09	216.76	3875.37	83.18	130.68	69.84	0.52	0.47	9763.23	122947
3.92	Z 330/107/30	1570.85	3379.20	441.77	159.08	167.00	2.73	96.43	212.42	202.35	1617.12	45.81	146.67	53.03	1.20	1.94	7939.51	68283
3.92	Z 330/107/50	1738.68	3653.53	605.11	160.47	165.61	2.27	96.89	227.68	220.61	2660.23	62.46	144.96	58.99	0.61	0.69	8905.77	96502
3.92	Z 330/117/33	1665.46	3610.80	588.05	158.62	167.46	3.24	105.92	227.63	215.63	1817.27	55.52	147.24	59.42	1.62	2.49	8358.78	89164
3.92	Z 330/117/55	1856.28	3911.63	811.08	160.63	165.45	2.35	106.81	243.52	236.42	3448.07	75.94	145.16	66.10	0.60	0.62	9508.13	127903
3.92	Z 330/127/36	1759.23	3838.53	762.54	158.14	167.94	3.80	115.96	242.73	228.56	2004.60	65.76	147.71	65.84	2.11	3.06	8769.82	113768
3.92	Z 330/127/60	1973.88	4165.41	1059.19	160.77	165.31	2.42	116.74	259.09	251.98	4375.62	90.73	145.27	73.25	0.59	0.56	10110.49	165727
3.92	Z 350/107/30	1574.56	3849.35	440.78	168.70	177.38	2.80	96.36	228.18	217.01	1575.94	45.74	156.36	52.91	1.32	2.28	7945.91	76536
3.92	Z 350/107/50	1743.80	4172.37	605.11	170.32	175.76	2.27	96.89	244.98	237.39	2668.08	62.45	154.68	58.91	0.66	0.79	8932.00	107628
3.92	Z 350/117/33	1669.01	4110.88	586.68	168.20	177.88	3.31	105.85	244.40	231.11	1771.25	55.43	156.94	59.29	1.75	2.86	8363.76	99865
3.92	Z 350/117/55	1861.40	4466.04	811.08	170.49	175.59	2.35	106.81	261.95	254.34	3457.60	75.93	154.90	66.01	0.65	0.71	9534.36	142435
3.92	Z 350/127/36	1762.62	4368.11	760.72	167.68	178.40	3.89	116.05	260.50	244.85	1954.66	65.55	157.42	65.70	2.25	3.47	8773.51	127322
3.92	Z 350/127/60	1979.00	4754.99	1059.19	170.64	175.44	2.41	116.75	278.66	271.03	4386.99	90.73	155.01	73.16	0.64	0.64	10136.73	184272
3.92	Z 350/137/39	1838.05	4571.97	957.87	168.51	177.57	4.04	126.20	271.32	257.48	2370.73	75.90	157.72	72.19	2.32	2.71	9083.38	159119
3.92	Z 350/137/65	2058.97	4962.93	1312.19	172.17	173.91	1.80	127.36	288.26	285.37	7297.23	103.03	155.25	79.83	0.05	0.82	10546.30	226670

Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression

t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] $x10^4$	$I_{z,eff}$ [mm^4] $x10^4$	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] $x10^3$	$W_{Ymin,eff}$ [mm^3] $x10^3$	$W_{Zmax,eff}$ [mm^3] $x10^3$	$W_{Zmin,eff}$ [mm^3] $x10^3$	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] $x10^6$
3.92	Z 300/117/33	1	3001.56	588.95	147.05	149.03	0.99	108.17	204.11	201.41	5941.32	54.45	117.19	51.91	0.71	0.85	11034.12	90807
3.92		2	2954.39	569.29	143.52	152.56	3.39	105.77	205.85	193.65	1680.59	53.82	116.74	51.24	1.68	2.68	10766.70	87820
3.92	Z 300/117/55	1	3224.13	811.30	145.84	150.24	1.84	107.32	221.07	214.60	4399.08	75.60	116.69	58.54	0.01	0.49	12127.22	132337
3.92		2	3227.24	807.75	146.11	149.97	1.99	107.17	220.87	215.20	4064.34	75.37	116.52	58.29	0.15	0.22	12136.04	132417
3.92	Z 300/122/34.5	1	3101.19	675.02	147.20	148.88	0.95	113.21	210.68	208.30	7090.99	59.63	117.77	54.95	0.79	0.96	11278.46	103329
3.92		2	3045.95	650.10	143.30	152.78	3.68	110.84	212.56	199.37	1765.56	58.65	117.29	54.19	1.94	2.94	10966.65	99629
3.92	Z 300/122/57.5	1	3327.54	929.85	145.90	150.18	1.88	112.28	228.06	221.58	4935.17	82.82	117.10	61.90	0.01	0.47	12430.04	151295
3.92		2	3324.39	922.69	145.98	150.10	2.16	112.00	227.73	221.48	4266.84	82.38	116.90	61.59	0.29	0.40	12388.69	150992
3.92	Z 330/107/30	1	3499.50	435.39	162.18	163.90	0.79	98.37	215.78	213.52	5488.34	44.26	126.13	44.49	0.74	1.15	11087.28	84521
3.92		2	3462.78	425.64	158.53	167.55	2.81	96.35	218.44	206.67	1513.51	44.18	125.75	44.09	1.28	2.50	10925.54	82224
3.92	Z 330/107/50	1	3783.49	605.35	160.56	165.52	1.67	97.49	235.64	228.58	3621.86	62.09	126.45	50.58	0.01	0.60	12120.28	121699
3.92		2	3794.51	604.41	161.08	165.00	1.71	97.45	235.57	229.97	3542.97	62.02	126.28	50.40	0.04	0.08	12175.79	122017
3.92	Z 330/117/33	1	3742.66	583.24	162.57	163.51	0.68	108.48	230.21	228.90	8532.72	53.77	127.57	50.36	0.93	1.46	11566.74	111461
3.92		2	3688.51	566.28	158.05	168.03	3.36	105.80	233.37	219.52	1686.76	53.52	127.14	49.82	1.74	3.06	11327.78	107784
3.92	Z 330/117/55	1	4042.23	811.34	160.70	165.38	1.76	107.40	251.53	244.43	4616.55	75.54	127.55	57.15	0.01	0.55	12726.16	161761
3.92		2	4038.12	804.47	160.79	165.29	2.03	107.13	251.14	244.31	3961.41	75.09	127.32	56.83	0.28	0.45	12684.32	161274
3.92	Z 330/127/36	1	3983.84	761.27	162.92	163.16	0.56	118.60	244.52	244.17	13701.91	64.19	128.84	56.32	1.14	1.73	12045.43	143423
3.92		2	3910.45	733.96	157.56	168.52	3.96	116.12	248.18	232.05	1851.93	63.21	128.36	55.61	2.27	3.63	11723.45	137873
3.92	Z 330/127/60	1	4296.59	1059.47	160.83	165.25	1.84	117.32	267.15	260.01	5771.23	90.30	128.48	63.80	0.01	0.50	13331.72	209903
3.92		2	4275.89	1043.44	160.49	165.59	2.40	116.76	266.42	258.22	4343.02	89.37	128.20	63.33	0.58	0.84	13183.28	208183
3.92	Z 350/107/30	1	4018.33	432.90	172.49	173.59	0.64	98.52	232.96	231.48	6751.05	43.94	132.86	43.61	0.84	1.51	11453.81	95917
3.92		2	3978.36	424.25	168.26	177.82	2.79	96.37	236.45	223.72	1520.95	44.02	132.50	43.27	1.31	2.72	11303.18	93299
3.92	Z 350/107/50	1	4355.16	605.37	170.47	175.61	1.62	97.54	255.47	248.01	3741.36	62.06	133.48	49.77	0.01	0.63	12519.76	137967
3.92		2	4362.50	602.88	170.89	175.19	1.72	97.44	255.28	249.02	3498.92	61.87	133.28	49.55	0.11	0.22	12546.11	138005
3.92	Z 350/117/33	1	4292.18	579.73	172.92	173.16	0.51	108.65	248.21	247.88	11401.42	53.36	134.39	49.39	1.06	1.86	11928.21	126458
3.92		2	4233.01	564.37	167.75	178.33	3.33	105.83	252.34	237.37	1692.50	53.33	133.98	48.92	1.77	3.32	11703.62	122281
3.92	Z 350/117/55	1	4649.54	811.37	170.62	175.46	1.70	107.46	272.51	264.99	4761.60	75.51	134.70	56.27	0.01	0.58	13125.62	183233
3.92		2	4639.11	802.37	170.58	175.50	2.05	107.11	271.96	264.34	3907.19	74.91	134.43	55.91	0.36	0.62	13051.96	182247
3.92	Z 350/127/36	1	4563.79	756.45	172.76	173.32	0.35	118.81	264.17	263.32	21340.83	63.67	135.76	55.27	1.29	2.17	12401.35	162664
3.92		2	4483.44	731.41	167.23	178.85	3.94	116.10	268.10	250.68	1856.07	63.00	135.30	54.65	2.30	3.92	12097.65	156373
3.92	Z 350/127/60	1	4939.15	1059.49	170.75	175.33	1.78	117.38	289.26	281.71	5944.30	90.26	135.74	62.87	0.01	0.53	13731.18	237539
3.92		2	4909.27	1040.65	170.26	175.82	2.43	116.73	288.35	279.22	4280.83	89.15	135.41	62.35	0.66	1.02	13548.38	235020
3.92	Z 350/137/39	1	4809.97	962.04	171.57	174.51	0.05	129.21	280.35	275.63	182406.86	74.45	136.77	61.17	1.77	3.29	12854.11	205090
3.92		2	4727.77	927.14	166.65	179.43	4.63	126.79	283.70	263.49	2004.48	73.13	136.46	60.43	2.91	4.57	12482.67	195917
3.92	Z 350/137/65	1	5174.04	1326.55	172.75	173.33	0.92	128.24	299.52	298.50	14435.79	103.44	136.37	69.05	0.93	1.39	14251.55	297186
3.92		2	5158.05	1310.19	169.54	176.54	3.17	125.99	304.24	292.17	4128.51	103.99	136.23	68.66	1.33	1.81	13971.56	294409

t [mm]	Profile type	Sectional dimensions							Geometric characteristics of the gross section							
		h [mm]	b_1 [mm]	b_2 [mm]	c [mm]	t_{nom} [mm]	r [mm]	G [kg/m]	A [mm^2]	z_G [mm]	y_G [mm]	I_y [mm^4] x10^4	I_z [mm^4] x10^4	W_Y [mm^3] x10^3	I_t [mm^4]	I_w [mm^6] x10^6
3.92	Z 400/127/36	400	127	120	36	4.00	4.00	21.33	2702.27	196.03	1.52	6368.91	790.43	324.90	13841.39	224963.58
3.92	Z 400/127/60	400	127	120	60	4.00	4.00	22.80	2890.43	196.16	1.65	6804.61	1059.55	346.89	14805.17	316116.39
3.92	Z 400/137/39	400	137	130	39	4.00	4.00	22.13	2804.19	196.10	1.60	6738.55	1011.40	343.62	14363.44	283694.20
3.92	Z 400/137/65	400	137	130	65	4.00	4.00	23.73	3008.03	196.23	1.73	7186.26	1353.74	366.21	15407.54	400880.14
3.92	Z 400/147/42	400	147	140	42	4.00	4.00	22.93	2906.11	196.17	1.66	7105.90	1270.14	362.23	14885.49	351518.33
3.92	Z 400/147/70	400	147	140	70	4.00	4.00	24.65	3125.63	196.30	1.79	7562.61	1697.89	385.25	16009.90	499772.48
3.92	Z 400/157/45	400	157	150	45	4.00	4.00	23.73	3008.03	196.23	1.73	7471.03	1569.63	380.72	15407.54	429074.95
3.92	Z 400/157/75	400	157	150	75	4.00	4.00	25.57	3243.23	196.36	1.85	7933.86	2095.93	404.04	16612.26	614063.22

Subjected to compression																	
t [mm]	Profile type	Geometric characteristics of the transversal effective cross section															
		A_{eff} [mm^2]	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	Z 400/127/36	1768.83	5846.19	756.19	191.48	204.60	4.09	116.25	305.31	285.74	1846.93	65.05	181.80	65.38	2.57	4.54	8771.79	164432
3.92	Z 400/127/60	1989.53	6407.61	1059.20	195.31	200.77	2.40	116.76	328.08	319.15	4410.34	90.72	179.46	72.96	0.75	0.85	10190.62	235005
3.92	Z 400/137/39	1844.02	6115.87	952.22	192.38	203.70	4.29	126.45	317.90	300.24	2220.84	75.31	182.12	71.86	2.69	3.72	9081.39	205168
3.92	Z 400/137/65	2067.90	6678.56	1310.03	196.91	199.17	1.88	127.28	339.16	335.33	6975.44	102.92	179.71	79.59	0.15	0.68	10569.27	288442
3.92	Z 400/147/42	1899.10	6303.69	1168.77	192.63	203.45	4.70	136.86	327.24	309.84	2488.99	85.40	182.19	78.45	3.03	3.54	9286.72	251814
3.92	Z 400/147/70	2104.32	6800.88	1557.82	196.41	199.67	2.31	136.85	346.27	340.60	6751.18	113.83	179.77	86.04	0.52	0.10	10647.35	343953
3.92	Z 400/157/45	1944.68	6451.08	1410.73	192.30	203.78	5.31	147.47	335.47	316.57	2654.77	95.66	182.13	85.17	3.59	3.93	9458.76	305161
3.92	Z 400/157/75	2134.67	6901.94	1825.84	195.87	200.21	2.80	146.36	352.37	344.74	6510.86	124.75	179.81	92.48	0.95	0.49	10696.25	404726

Y Subjected to Bending by Y-Y axis - flange 1 and 2 subjected to compression																		
t [mm]	Profile type	TC	$I_{y,eff}$ [mm^4] x10^4	$I_{z,eff}$ [mm^4] x10^4	$z_{Gmin,eff}$ [mm]	$z_{Gmax,eff}$ [mm]	$y_{Gmin,eff}$ [mm]	$y_{Gmax,eff}$ [mm]	$W_{Ymax,eff}$ [mm^3] x10^3	$W_{Ymin,eff}$ [mm^3] x10^3	$W_{Zmax,eff}$ [mm^3] x10^3	$W_{Zmin,eff}$ [mm^3] x10^3	$i_{y,eff}$ [mm]	$i_{z,eff}$ [mm]	e_y [mm]	e_z [mm]	$I_{t,eff}$ [mm^4]	$I_{w,eff}$ [mm^6] x10^6
3.92	Z 400/127/36	1	6200.15	745.57	197.61	198.47	0.05	119.21	313.76	312.39	135649.22	62.54	152.99	53.05	1.58	2.45	13212.52	215491
3.92		2	6063.86	725.34	189.44	206.64	3.94	116.10	320.10	293.45	1841.06	62.48	152.81	52.85	2.42	6.59	12821.01	206160
3.92	Z 400/127/60	1	6769.59	1058.03	195.35	200.73	1.62	117.54	346.54	337.24	6542.86	90.01	153.65	60.74	0.04	0.81	14673.74	314353
3.92		2	6682.12	1034.07	193.44	202.64	2.51	116.65	345.43	329.76	4122.91	88.65	153.44	60.36	0.86	2.72	14318.29	307971
3.92	Z 400/137/39	1	6521.48	947.85	196.49	199.59	0.48	129.64	331.90	326.74	19722.96	73.11	154.27	58.81	2.08	3.49	13635.03	271127
3.92		2	6380.59	919.22	188.71	207.37	4.63	126.79	338.12	307.69	1983.41	72.50	154.20	58.53	3.04	7.39	13188.77	257936
3.92	Z 400/137/65	1	7062.37	1318.95	197.58	198.50	0.65	128.51	357.45	355.78	20281.43	102.63	154.46	66.75	1.07	1.34	15087.71	391311
3.92		2	7010.34	1303.30	192.58	203.50	3.21	125.95	364.03	344.49	4063.21	103.48	154.49	66.61	1.48	3.66	14724.98	385412
3.92	Z 400/147/42	1	6798.43	1179.51	194.54	201.54	1.20	140.36	349.46	337.33	9869.06	84.04	155.18	64.64	2.86	5.37	14034.35	335548
3.92		2	6643.47	1138.31	187.08	209.00	5.67	137.83	355.12	317.86	2008.63	82.59	155.27	64.27	4.00	9.09	13483.49	316505
3.92	Z 400/147/70	1	7316.94	1609.09	195.75	200.33	0.72	139.88	373.79	365.24	22445.69	115.04	155.03	72.70	2.51	4.03	15457.77	477679
3.92		2	7238.48	1587.45	190.01	206.07	4.80	136.96	380.95	351.27	3310.27	115.91	155.21	72.68	3.00	6.29	14965.70	466167
3.92	Z 400/157/45	1	7062.45	1444.95	192.53	203.55	2.02	151.18	366.82	346.97	7163.51	95.58	155.94	70.53	3.74	7.31	14427.31	409399
3.92		2	6882.56	1386.68	185.16	210.92	6.88	149.04	371.70	326.32	2015.27	93.04	156.15	70.09	5.16	11.07	13758.16	382815
3.92	Z 400/157/75	1	7555.85	1934.45	193.01	203.07	2.28	151.44	391.48	372.08	8473.65	127.73	155.46	78.66	4.14	6.71	15818.22	574796
3.92		2	7431.62	1901.87	187.11	208.97	6.72	148.88	397.18	355.63	2831.17	127.75	155.72	78.78	4.86	9.26	15172.47	555613

References

1. A.G.J. Way, S.O. Popo-Ola, A.R. Biddle, R.M. Lawson : „Durability of Light Steel Framing in Residential Building”, Second Edition, , SCI Publication P262, The Steel Construction Institute, ISBN 978-1-85942-193-2

2. Britvec, S. J.; Chajes, Alexander; Warren, K. W.; Uribe, Jairo; and Winter, George : "Effects of cold work in cold-formed steel structural members" (1970). Center for Cold-Formed Steel Structures Library. 170.

3. D.Dubină, V.Ungureanu, R. Zaharia, Z.Nagy : „Calculul și proiectarea construcțiilor din profile metalice cu pereți subțiri formate la rece”. Volumul I. Editura AMM, 2004, ISBN : 973-86509-4-1.

4. D.Dubină, V.Ungureanu, Raffaele Landolfo : „Design of Cold-formed Steel Structures: Eurocode 3: Design of Steel Structures. Part 1-3 - Design of Cold-formed Steel Structures” First Edition, ECCS Eurocode Design Manuals, ISBN 978-343-302-979-4

5. Daniel-Viorel Ungureanu : „Construcții metalice ușoare din profile de oțel formate la rece. Probleme speciale de calcul” , Editura Orizonturi Universitare, 2006, ISBN (10)973-638-279- 6; ISBN (13)978-973-638-279-6

6. E.C.C.S „Worked examples according to EN 1993-1-3”, ECCS Technical Committee 7 Cold-formed Steel, Practical Improvement of Design Procedures, 2008

7. ENV 1993-1-1 EUROCODE 3 – „ Design of Steel Structures, Part 1 - 1: General Rules and rules for buildings”,European Committee for Standardisation, Brussels, July, 1994.

8. ENV 1993-1-3 EUROCODE 3 „Design of Steel Structures, Part 1 - 3: General Rules,Supplementary Rules for Cold-Formed Thin-Gauge Members and Sheeting”, CEN/TC 250/SC3 –European Committee for Standardisation, Brussels, 1996.

9. ENV 1993-1-5 EUROCODE 3 - „Design of steel structures, Part 1 - 5: - Plated structural elements”,European Committee for Standardisation, Brussels, 2005.

10. P.M. Pernes : „Studiul comportării îmbinărilor cu șuruburi ale structurilor în cadre realizate din profile de oțel formate la rece” teza de doctorat; coducător : V.Pacurar , Universitatea Tehnică din Cluj-Napoca și Conducător cotutelă : D. Dubină, Universitatea Politehnica Timisoara 2006

11. P.J. Grubb, R.M. Lawson : „Construction Detailing and Practice”, SCI Publication P165, The Steel Construction Institute, ISBN 1 85942 034 6

12. Raul Zaharia: „Analiza experimentală și numerică a fermelor din profile metalice formate la rece”, Teza de doctorat, Editura Orizonturi Universitare, 2006, ISBN (10)973-638-243-5; ISBN(13)978-973-638-243-7

13. R.M. Lawson, K.F. Chung, S.O. Popo-Ola : „Structural Design to BS 5950-5 :1998, Section Properties and Load Tables”, SCI Publication P276, The Steel Construction Institute, ISBN 1 85942 119 9

14. Zsolt Nagy – „Studiul soluțiilor constructive și performanțelor structurale ale halelor ușoare cu structura realizată din profile de oțel formate la rece” ; teza de doctorat; coducător : D. Dubină, Universitatea Politehnica Timisoara 2006, ISBN (10):973-625-389-9 , ISBN (13): 978-973-625-389-8