

Imposed classes in Section Utility

During an elastic analysis the internal forces M, V, N , the elastic stresses σ and elastic deformations δ, φ of a steel structure are determined.

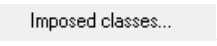
During design it's verified if the chosen sections (HEA, IPE, ...) are capable of taking the internal forces M, V, N .

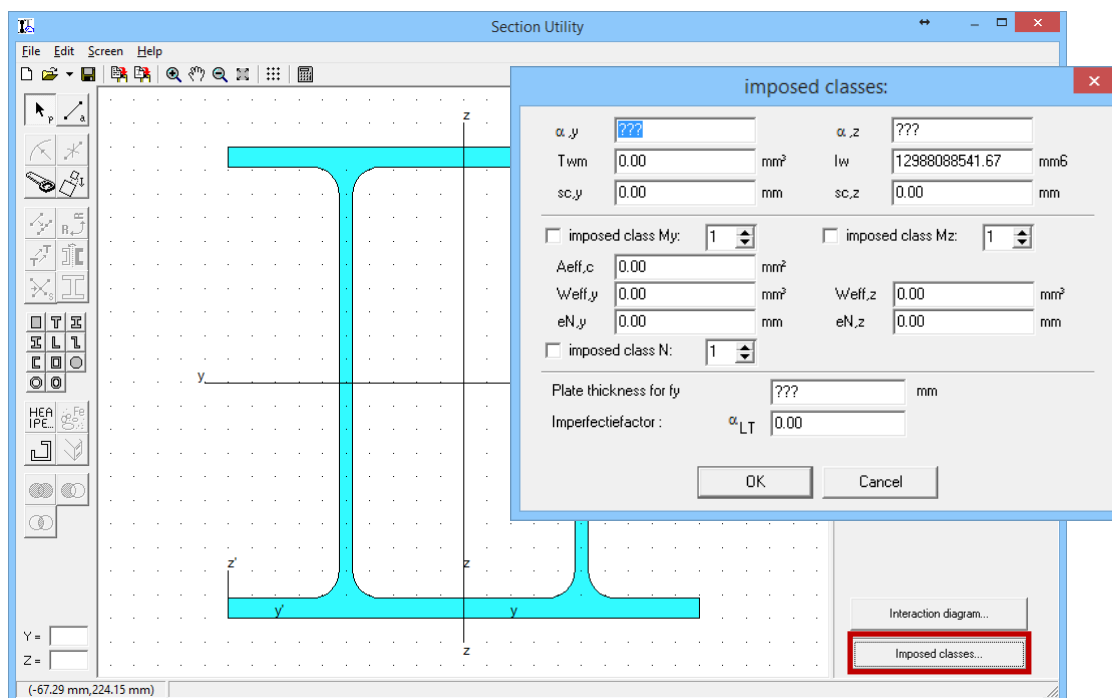
Design is usually done according to EN 1993-1-1 (Eurocode 3).

To perform these calculations additional parameters ($\alpha_y, \alpha_z, \alpha_{LT}$, section classes, ...) are needed next to the elastic/plastic properties ($A, I_{yI}, I_{zI}, I_u, I_v, W_{el,yI}, W_{pl,yI}, \dots$) of the cross sections.

For standard profiles (I, H, T, L, O, □) EN 1993-1-1 gives rules to determine these additional parameters. But for other cross sections (✚, △, double H, combinations of standard profiles) EN 1993-1-1 doesn't provide rules.

By consequence it's up to the user to give the additional parameters a meaningful value. If he doesn't, Diamonds will not be able to perform a steelcheck on these cross section (in other words no results will be available).

You can do this by clicking on the button .



The table on the next page contains an overview of all the parameters that must be entered, including a reference where additional info can be found. The last column indicated for which check the relevant parameter is needed. Entering an incorrect parameter, will lead to incorrect results for that check.

	Name or meaning	Reference	Affected checks
α_y, α_z	Imperfection factor for buckling around the y' -axis and z' -axis	EN 1993-1-1 Table 6.1	Stability <ul style="list-style-type: none"> All checks
I_w	warping constant ¹	<ul style="list-style-type: none"> Torsional Section Properties Of Steel Shapes, Canadian Institute of Steel Construction, 2002 Warping Constant of Open Section with Arbitrary Profile Geometry, John Fong & Bill Vanni, 2010 Structural Members and Frames, T. Galambos, 1968 Bleich, 1952 	Stability <ul style="list-style-type: none"> Lateral torsional buckling Buckling + bending
T_{wm}	torsional module ²	<ul style="list-style-type: none"> Krachtswerking, Deel 4 Spanning, Prof. Ir. W.J. Beranek, 2001 Design of steel beams in torsion, Annex B, SCI, 2011 	Resistance <ul style="list-style-type: none"> Torsion
sc_y en sc_z	Coordinates of the shear centre with respect to the origin of the xy coordinate system	R. C. Hibbler, Sterkteleer, Chapter 7	Stability <ul style="list-style-type: none"> Lateral torsional buckling Buckling + bending
Imposed class N, M_y and M_z	Imposed class N, M_y and M_z	EN 1993-1-1 Table 5.2	Resistance <ul style="list-style-type: none"> Axial compression Bending Stability <ul style="list-style-type: none"> All checks
$A_{eff,c}$ $W_{eff,y}$ $W_{eff,z}$ $e_{N,y}$ en $e_{N,z}$	effective area of a cross section effective section modulus against bending around the y' -axis effective section modulus against bending around the z' -axis displacement of the centre of gravity of the effective section A_{eff} in relation of the centre of gravity of the gross section.	EN 1993-1-5 §5.2.2.	Resistance <ul style="list-style-type: none"> Axial compression Bending Y, bending Z Bending + shear Double bending + axial force

¹ NL: welf constante, FR: l'inertie de gauchissement

² NL: torsieweerstandsmoment, FR: module de torsion

			<ul style="list-style-type: none"> • Double bending + shear and axial force Stability <ul style="list-style-type: none"> • All checks
α_{LT}	Imperfection factor for lateral torsional buckling	EN 1993-1-1 Table 6.3	Stability <ul style="list-style-type: none"> • Lateral torsional buckling • Buckling + bending
Plate thickness for f_y	Plate thickness for the determination of the yield stress f_y of steel	EN 1993-1-1 Table 3.1	Resistance and stability <ul style="list-style-type: none"> • All checks

Practical tips:

- Berekening van constructies, Van de Pitte is a Dutch series of books that used to have an online version. But that's no longer the case. The relevant pages can be downloaded using this WeTransfer link: <https://we.tl/t-M5paj2gQty>
If you have an English source for this information, please let us know support@buildsoft.eu.
- If you are only interested in for example the resistance check, then enter only the parameters that affect this check (T_{wm} , f_y and imposed class). All the other parameters can be set to '1'.
- If the beam/column is not loaded with torsion, T_{wm} can be set to zero.
- If a section appears to be of class 4, then strengthen the profile (make the web and/or flange thicker) so it fits class 3. This saves you the effort of calculating the effective properties.
- If the section is of class 1, 2 or 3, then enter '1' for all effective properties.
- The plate thickness is the thickness of the largest element (web or flange) of the section.
- If a profile is composed out of multiple profiles (I, H, T, L, O, \square -profiles), try to deduce the value of for example the torsion module T_{wm} from the section separately:
 - o 2 IPE500 sections on top of each other: take $T_{wm} = T_{wm,1 IPE500}$
 - o 2 IPE500 sections next to each other: take $T_{wm} = \max(T_{wm,1 IPE500}; T_{wm,koker})$
 If 2 I-sections are next to each other, a box section will be formed in the middle.

Corrections or supplements are always welcome at info@buildsoft.eu.