Alhambra s.r.l.

NEWS of release 3.6.1

New example

Verification of a Continuous Girder – Focus on Shrinkage and Thermal Effects

Verification of a Continuous Girder – Shrinkage and Thermal Effects

For LUSAS version:	22.0 or above
For software product(s):	LUSAS Bridge or LUSAS Bridge plus
With product option(s):	Steel and Composite Deck Designer (PontiEC4 – v3.6.1 or above)
With additional software	Microsoft Excel installed

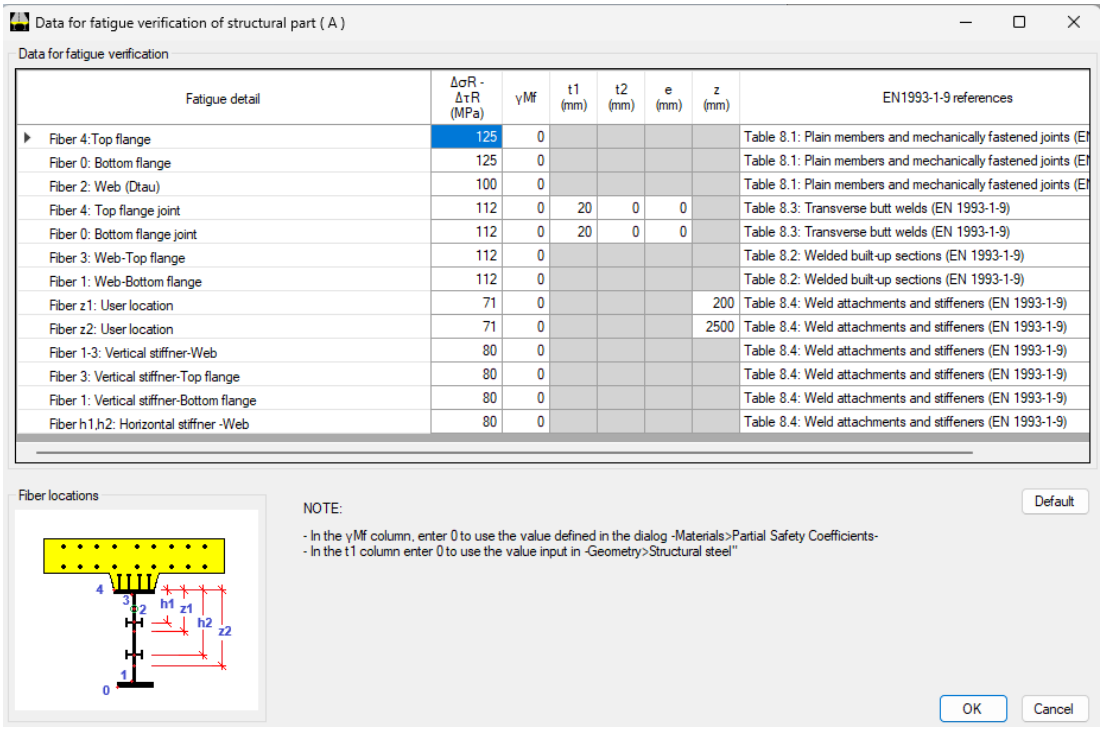
Bug fixing release

See Error fix notes.

NEWS of release 3.6.0

Fatigue Checks

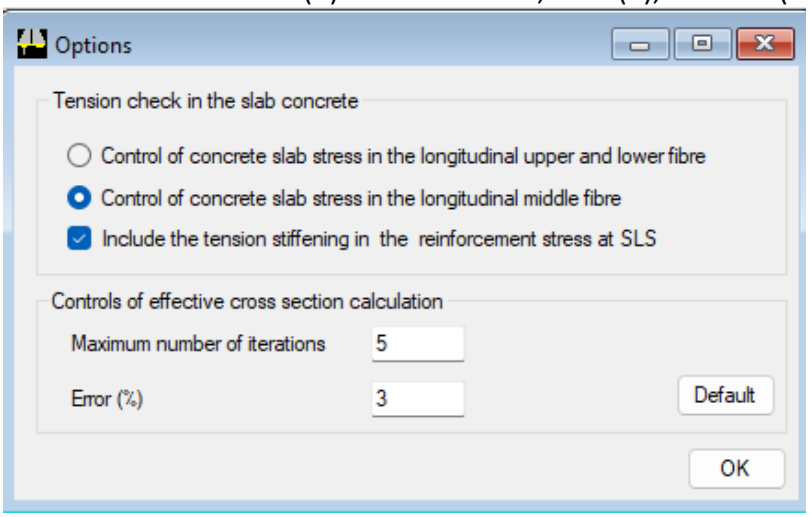
Completely redesigned interface for inputting fatigue structural details



The interface for fatigue structural details has been significantly improved, both visually and textually, to better specify the locations of fibres where stress variations are calculated.
Introduced the ability to define a partial safety factor for fatigue γMf, which can be set differently for each individual check. The user can also input a null value to continue using the factor specified in the Materials dialog.
Added two new verification positions along the web, at generic distances from the girder extrados, z1 and z2, defined by the user.
Included in the Graphs section the stress variation diagrams for the fibres located at z1 and z2, as well as for the fibres at the connections of longitudinal stiffeners.

Tension stiffening

Introduced the option to include “tension stiffening” for reinforcements in the tensioned zone, in accordance with EN 1994-2 clause 5.4.2.8(b) and EN 1994-2, 7.4.3(3), formula (7.5).



Bug fixing release

See Error fix notes.

Installation Package

It is now possible to install multiple versions of PontiEC4 on the same machine.

NEWS of release 3.5.2

Export of geometric properties to LUSAS

The export of geometric properties is now consistent with LUSAS 21.1

Bug fixing release

See Error fix notes.

NEWS of release 3.5.1

Implementation of a new protection system

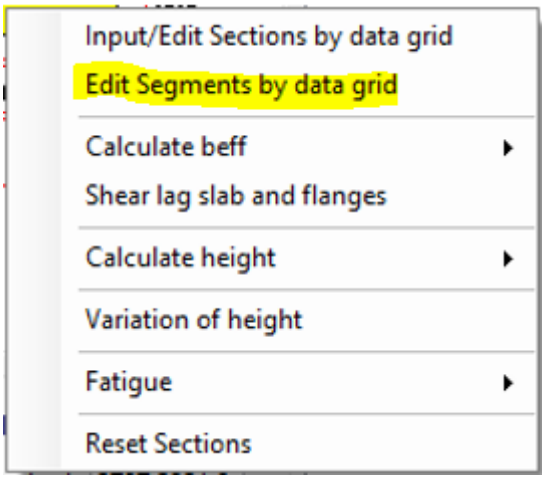
Safety system updates for the Italian version.

Bug fixing release

See Error fix notes.

NEWS of release 3.5.0

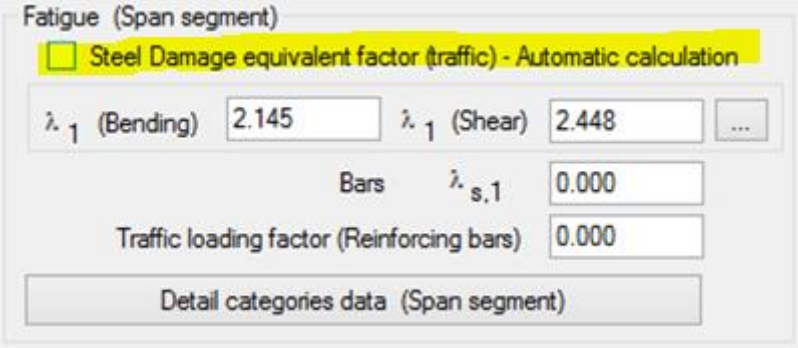
Edit Segments by data grid.



This menu item opens a sub-dialog that allows the more relevant data of all segments to be edited in a data grid view.
Copy and paste makes it easy to quickly change the parameters of all segments, or groups of segments at the same time.
The View menu allows for filtering of individual groups of variables.

Automatic calculation of λ_1.

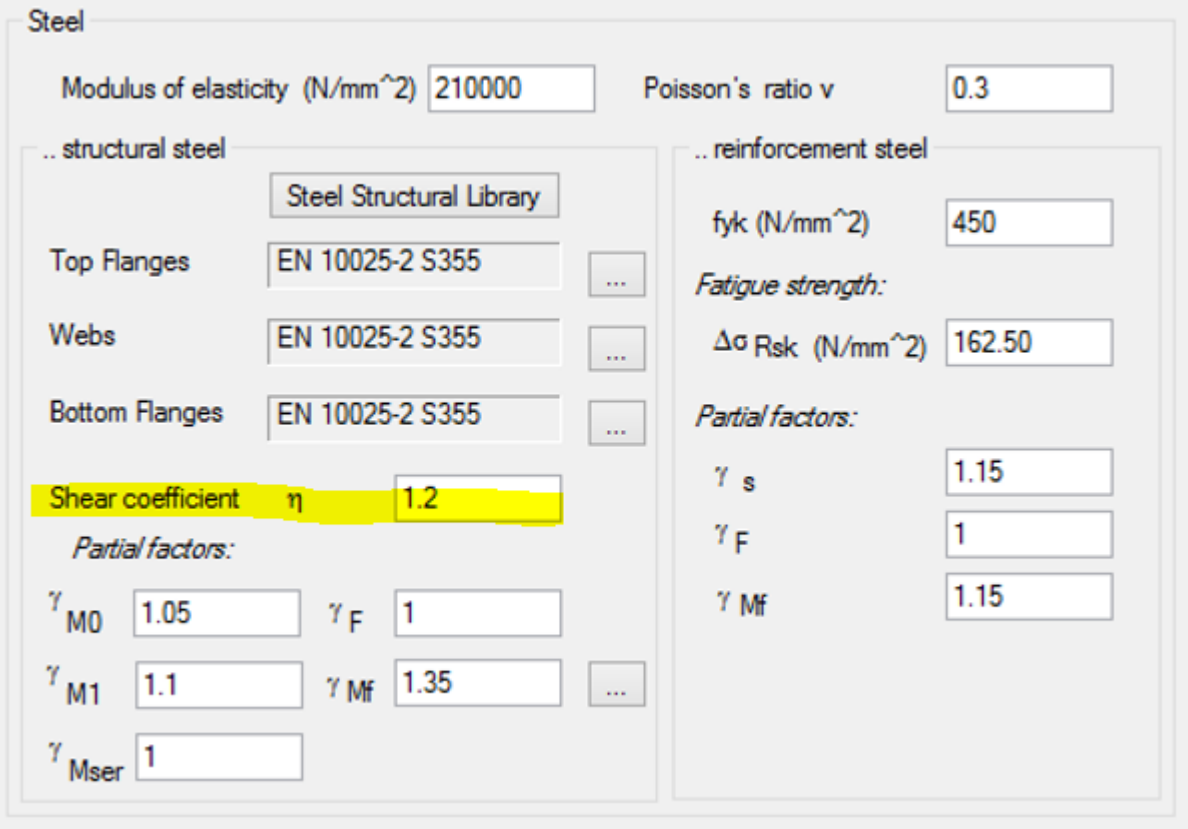
The factor corresponding to the damage effect of traffic on structural steel ($\lambda 1$) for road bridges can be now calculated automatically according to EN1993-2 clause 9.5.2, if the related check box is ticked.



Primary and secondary thermal effect

With regard to the effects of thermal variation, in the presence of primary effects ($\gamma^*\psi><0$), since the secondary and primary bending moments have a different sign, **the software now calculates their sum and evaluates whether to insert it among the maximum or minimum moments.**

Shear coefficient η.



The coefficient defined in EN 1993-1-5 Cl 5.1 Note 2 is used in the shear assessment. This value can now be input directly in the Material dialog. The value to be used is defined in the National Annex. Recommended values are 1.2 for steels with a grade between S235 and S460, and 1.0 for steels with a grade higher than S460.

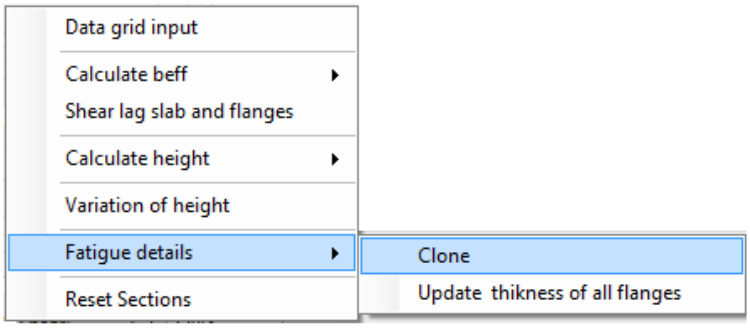
Bug fixing release

See Error fix notes.

NEWS of release 3.4.4

Clone Fatigue details

Fatigue details can be copied from one (source) segment to one or more (destination) segments.



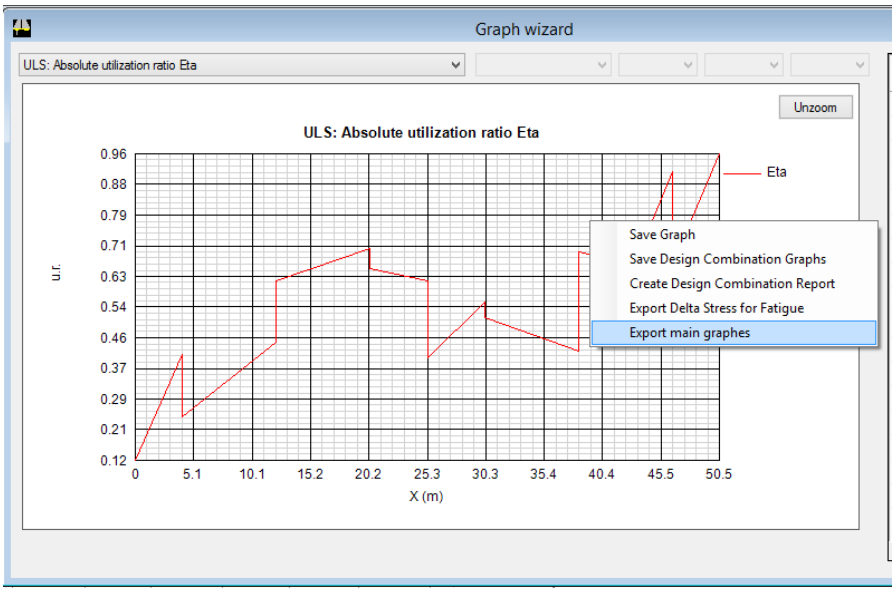
It is also possible to automatically update the thickness of all flanges (t1) from values input in the main geometry dialog.

NEWS of release 3.4.3

New graphs

The fatigue Delta Tau graph was limited to the barycentric fiber only (Delta Tau 2). The graphics of Delta Tau 1 and Delta Tau 3 have been implemented too, relating to the lower and upper connection of the web to the flange. These graphs allow you to easily carry out fatigue check of web-flange welds.
Added new graph of Stresses in reinforcement bars for Characteristic SLS (Mmax) combination.

Tool for exporting the main graphs



Graph view

It is possible to export simultaneously as images all the main graphs of a project (*Utilization coefficients for the various limit states, stresses in the plates, fatigue stress variations, etc.*).
The tool can be accessed from the "Graph view" using the context menu item ***Export main graphs***.

NEWS of release 3.4.2

Bug fixing release

See Error fix notes.

NEWS of release 3.4.1

Report in French

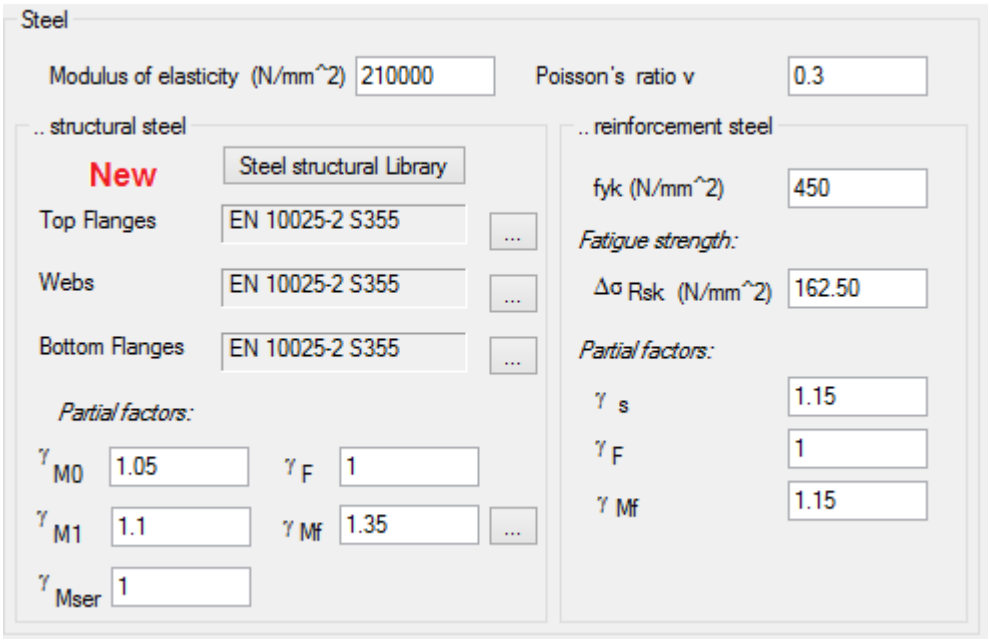
The main report and the concrete report are available in French

Steel structural Library

The EN1993-1-1 clause 3.2.1 (1) states that the values of yield strength f_y and ultimate strength f_u for structural steel should be obtained:

- either by adopting the values $f_y=R_{eh}$ and $f_u=R_m$ direct from product standard
- or by using the simplification given in Table 3.1.

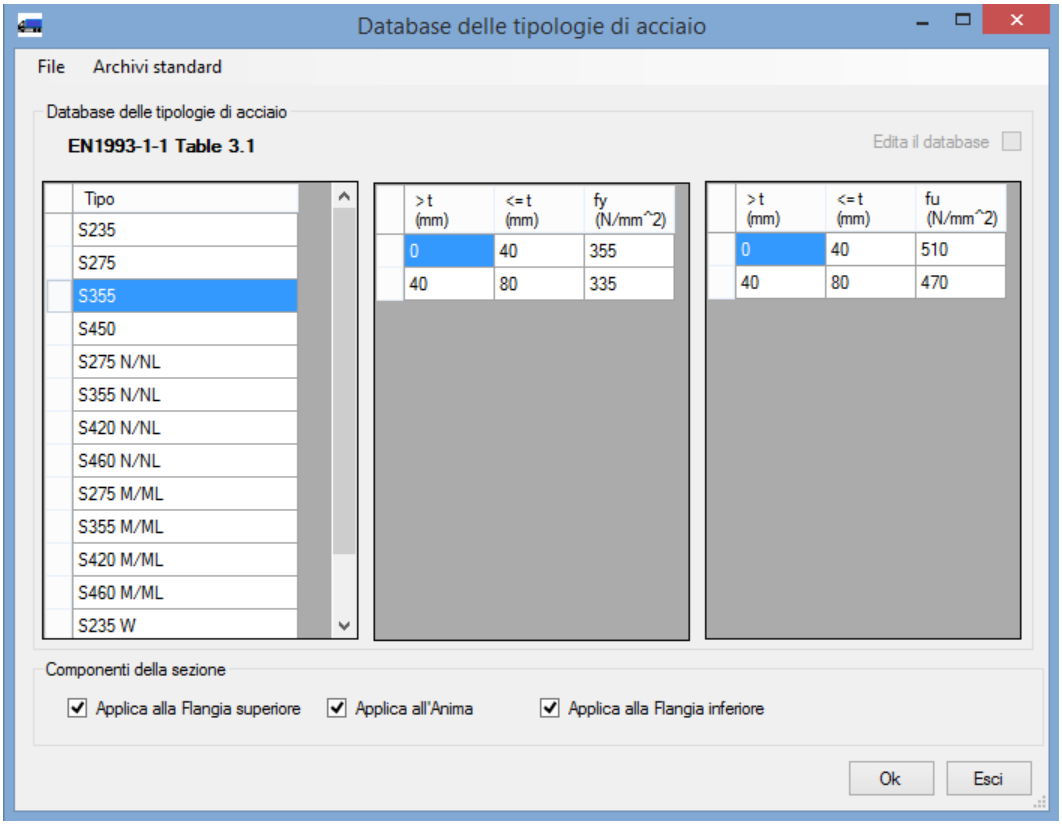
The National Annex may give the choice.



Steel (region of Materials Dialog)

For this reason a ***Database*** dialog has been added, which allows you to choose the steel grade from the following **Standard Libraries**, or create one or more customized libraries, and save them in * .xml format.

- EN1993-1-1 Table 3.1
- 10025-2 Table 6
- 10025-3 Table 4
- 10025-4 Table 4
- 10025-5 Table 4
- 10025-6 Table 4

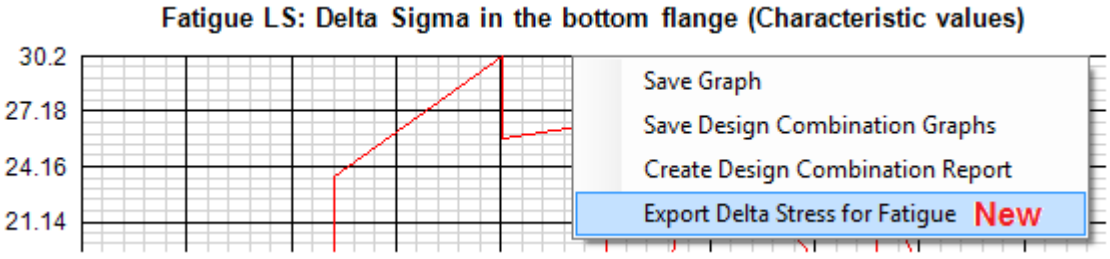


Database of Structural Steel

By selecting the steel grade and clicking "Ok", the related tables, which define the characteristic values of yield stress f_y and ultimate strength f_u as function of steel thickness t range, are loaded into the project. The user can now apply different steel grade for upper flanges, webs, and lower flanges by tick the checkbox in the Section component region.

Export $\Delta\sigma/\Delta\tau$ for fatigue

By right-clicking in the graph dialog, a context menu can be accessed, from which it is now possible to export a table of variation in fatigue stress.



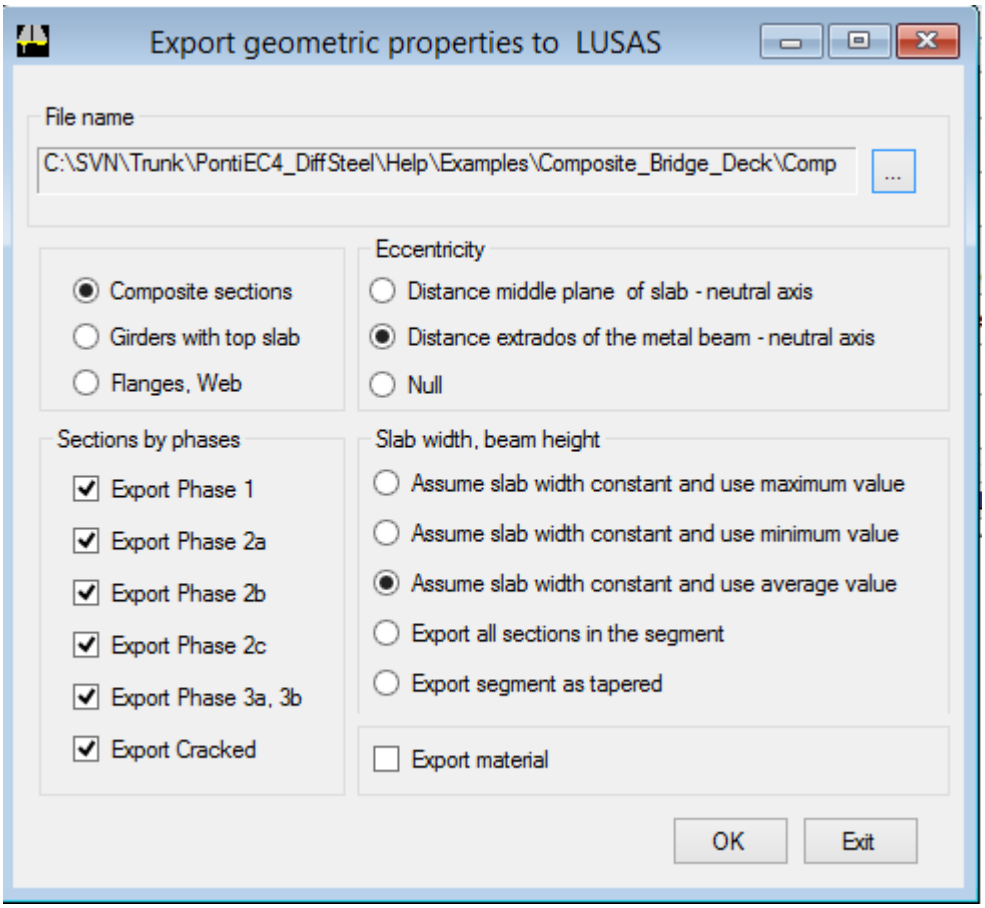
Geometric properties for LUSAS

A new option to export “Bridge wizard Section” to LUSAS is now available.

NEWS of release 3.3.1

Geometric properties for LUSAS

Three new options have been introduced for exporting geometric properties to LUSAS 19.0

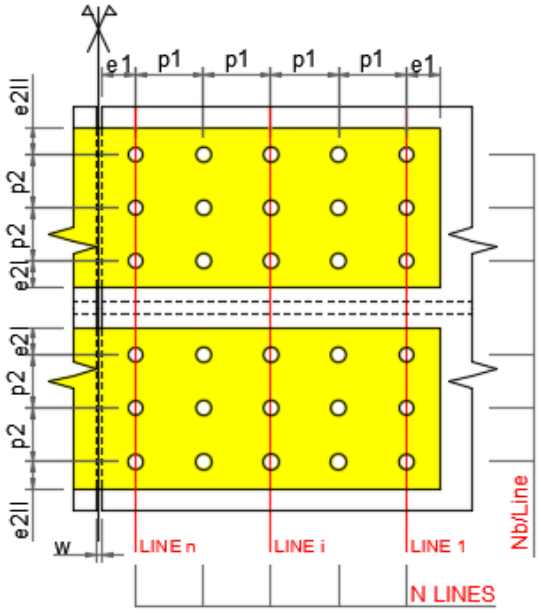


- **Girders with top slab** for grillage modelling and for managing the export of forces and moments from USAS to PontiEC4
- **Flanges, Web** for shell modelling of slabs and webs, and beam modelling of flanges
- **Distance extrados of the metal beam – neutral axis** for the positioning of the mesh plane on the extrados of metal beams.

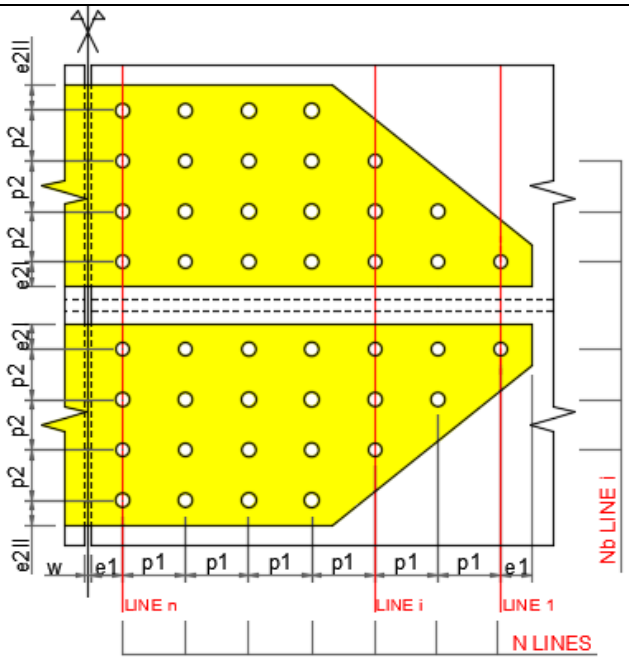
NEWS of release 3.3

New types of bolted joints

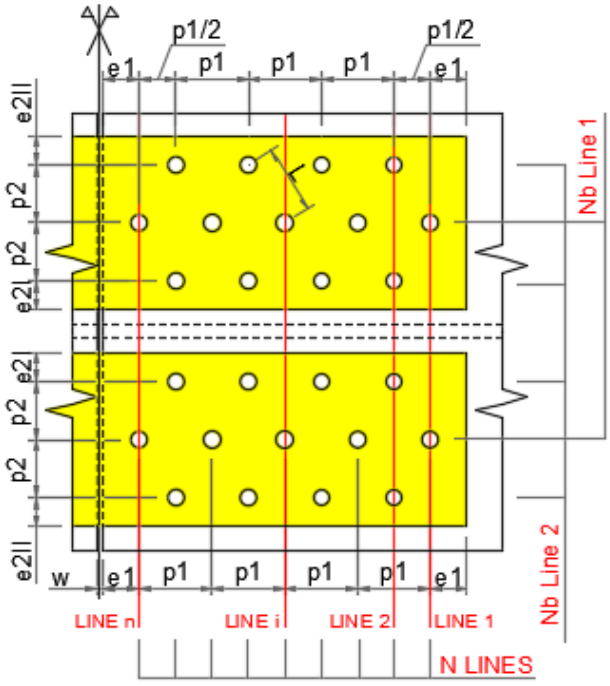
The ***regular distribution*** of bolts, already available in PontiEC4, has been extended to include ***staggered distribution***, according to two possible schemes: with different numbers of bolts on the even and odd rows (***type 1***) or with an equal number of bolts on different rows (***type 2***).
Furthermore, for flanges, the use of trapezoidal-shaped plates has been introduced. These allow a more gradual migration of normal force from the profile flanges to the joint plates, reducing the force in the more perforated sections of the profile.
The new options for flanges are shown below.



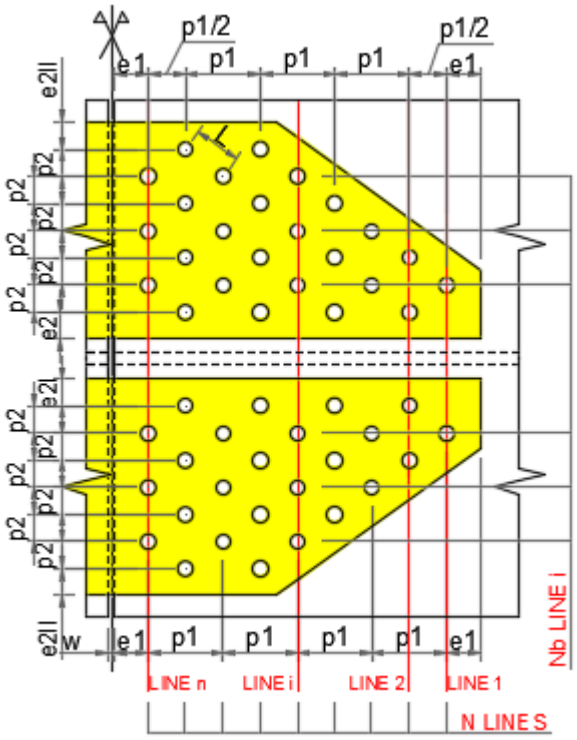
Rectangular plates, regular distribution of bolts



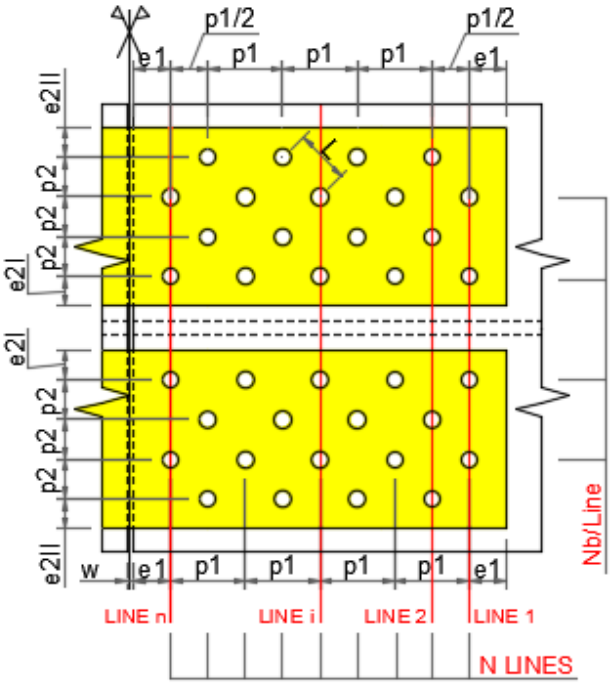
Trapezoidal plates, regular distribution of bolts



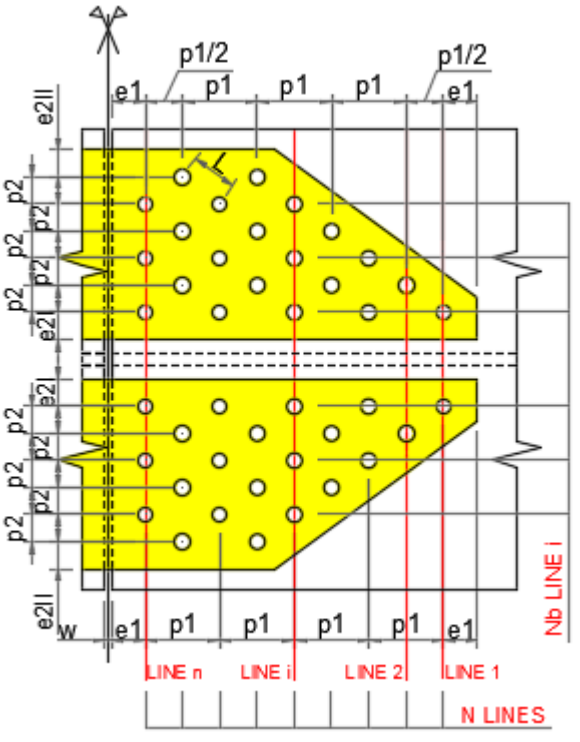
Rectangular plates, distribution type 1 of bolts with staggered lines



Trapezoidal plates, distribution type 1 of bolts with staggered lines

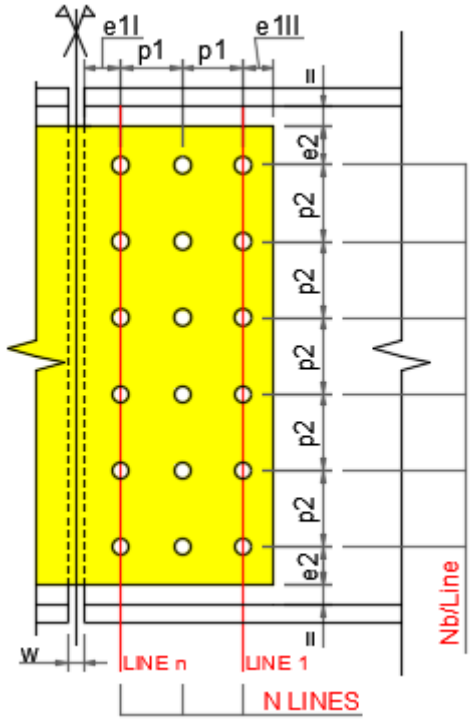


Rectangular plates and distribution type 2 of bolts with staggered lines

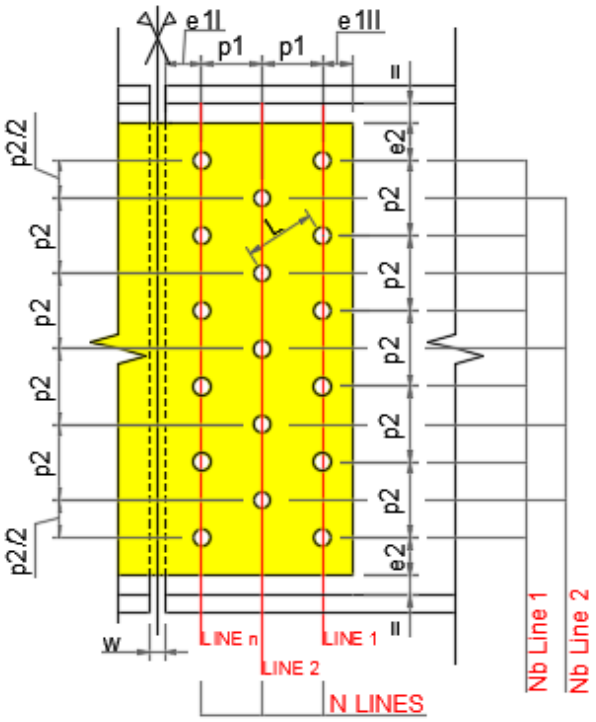


Trapezoidal plates, distribution type 2 of bolts with staggered lines

For web connections it is possible to choose either regular or staggered distribution type 1 as shown in the following pictures.



Regular distribution



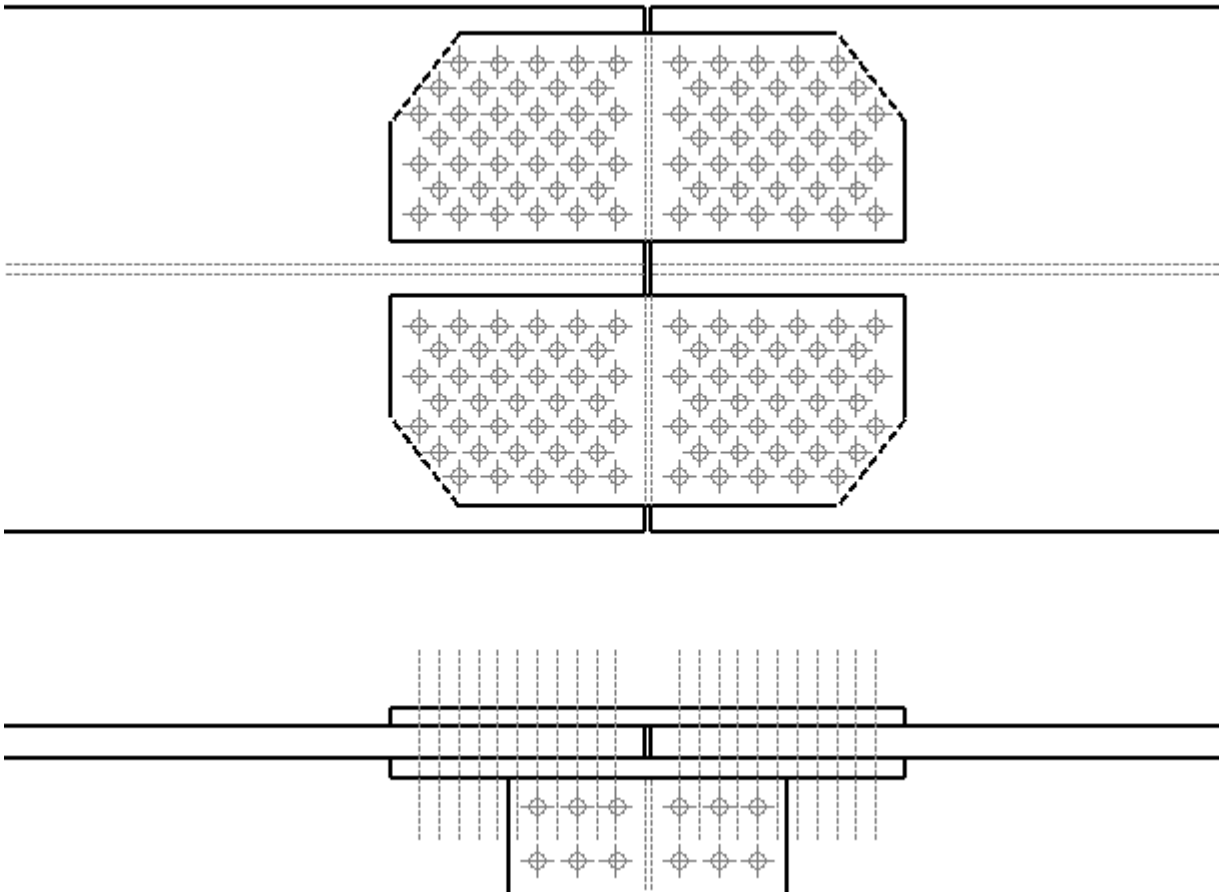
Distribution type 1 of bolts with staggered lines

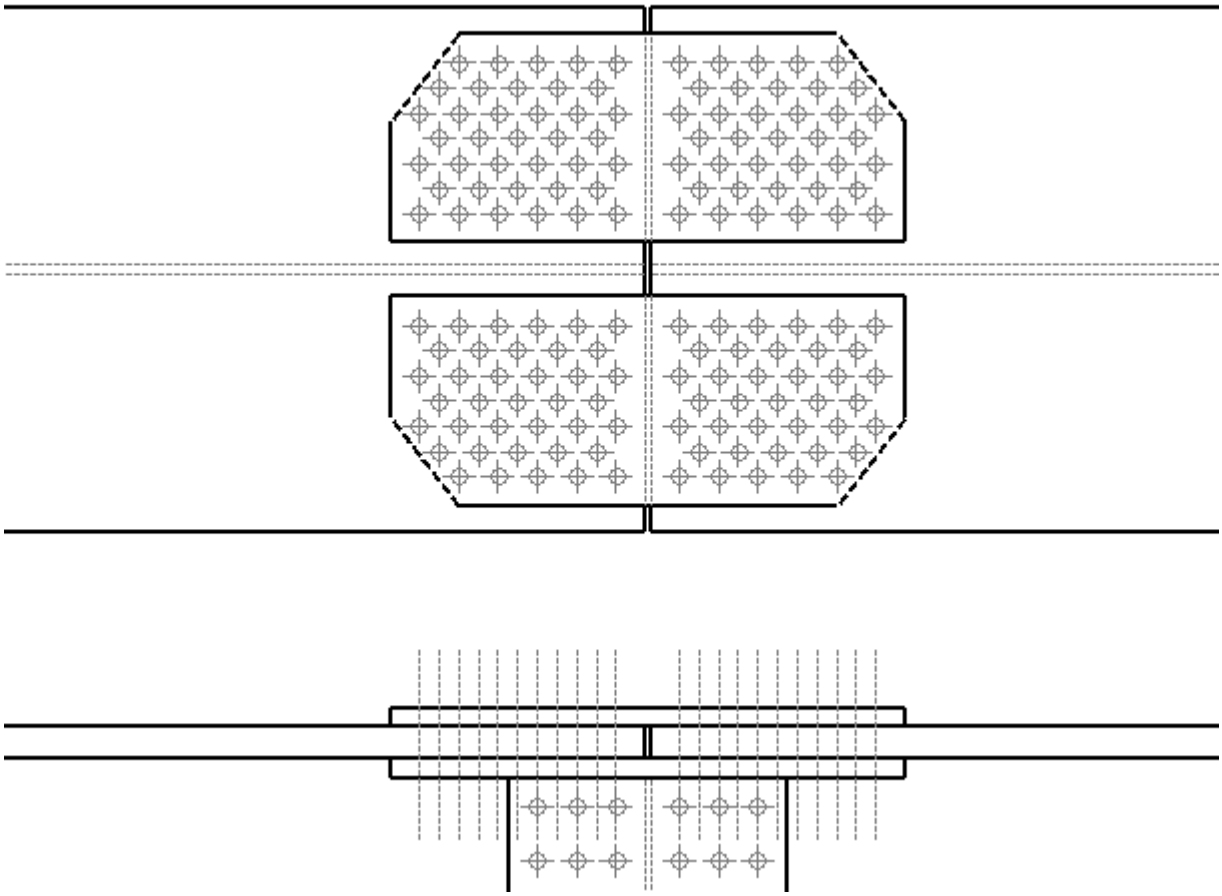
Fatigue checks

For all types of joints, fatigue verification of the profile and plates has been introduced, with reference to the net or gross cross sections, and the verification of the tangential tensions in the bolts.

Automatic joint design

A graphical representation of the bolted connection has been added, providing an immediate visual means of checking the consistency of the data entered, and the proportions and dimensions of the various components. In addition, it is possible to analyze the drawing in detail by means of zoom and pan operations, and export it in DXF format.



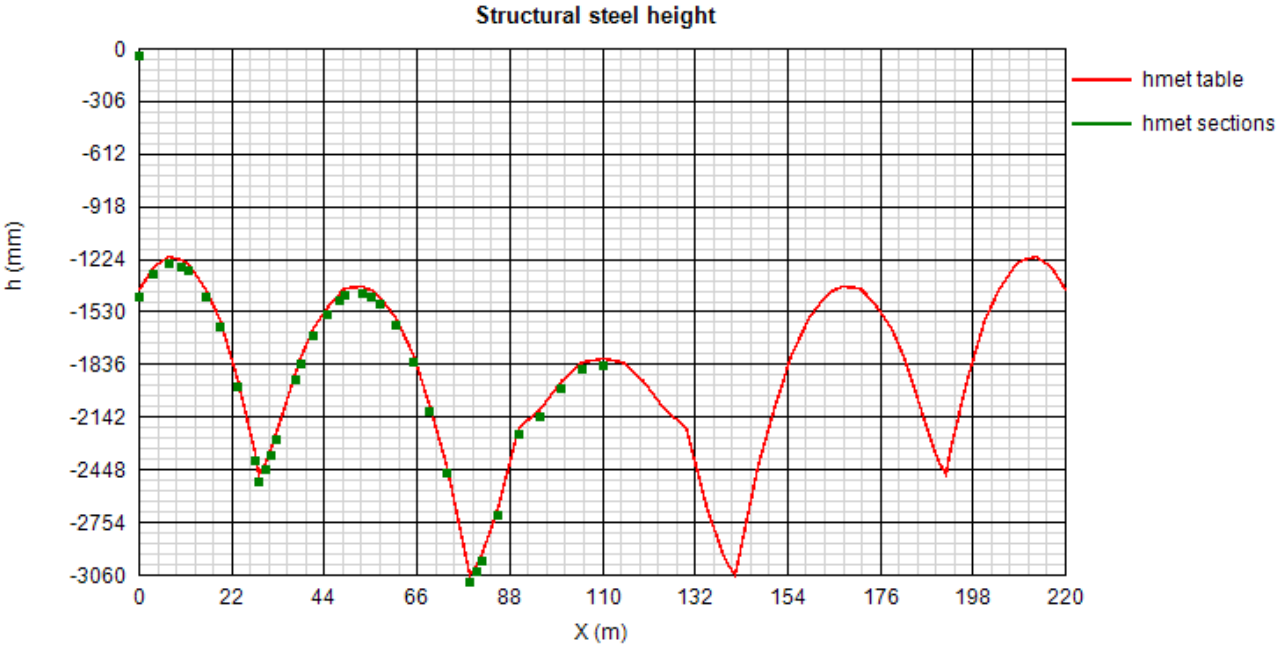


Detail of the design of a joint

NEWS of release 3.2

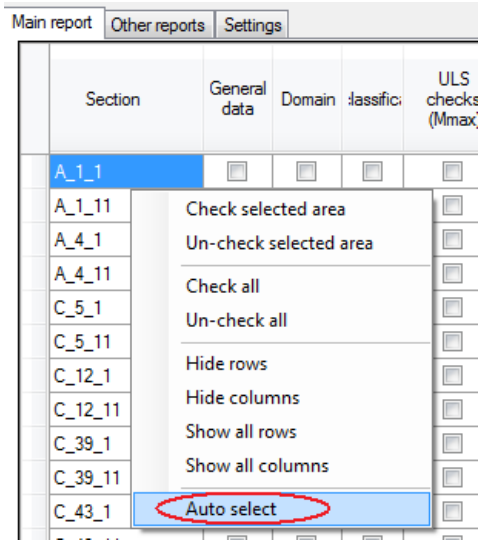
Auto calculation of steel section height

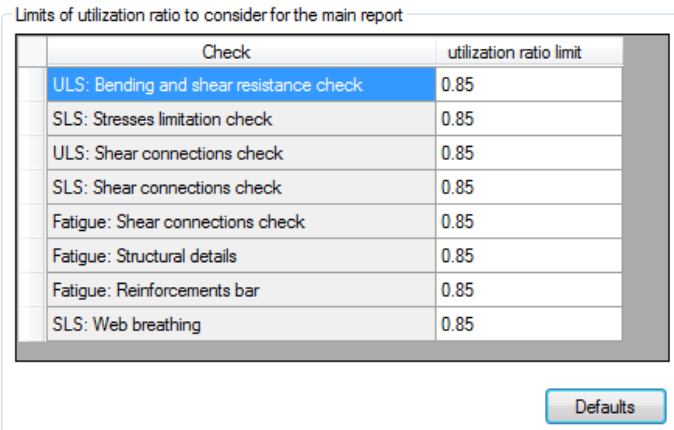
It is now possible to define a line variation by a series of X distances and the heights, to be interpolated between those distances.
This line variation is used also to define the height of new sections detected when importing Force and Moments from xls file.
A new item in the graphs list allows plotting of the variation of the height along the bridge.



Automatic selection of paragraphs to include in the Report

It is now possible to automatically include all checks in the report for utilization ratios that exceed predefined values.





Reinforcement bars fatigue assessment

It is now possible to apply a traffic loading factor, depending on the segment position, to the maximum and minimum Phase 3b forces and moments of the Fatigue combination. This allows you to apply EN1992-2 Annex NN.2.1 (101) that requires you to scale force and moments arising from a fatigue loading model FLM3 for the equivalent stress range calculation in the reinforcement bars.
Furthermore the fatigue reinforcement bars assessment can be included in the rtf report.

Influence of Shrinkage and thermal action on the studs design at deck ends

The calculation of the minimum number of studs in the deck ends region has been reviewed and now it is performed according to EN1994-2, 6.6.2.4(3). The utilization ratio arising from the check is included in the ULS summary and a paragraph about this check can be included in the rtf report.

Web breathing check

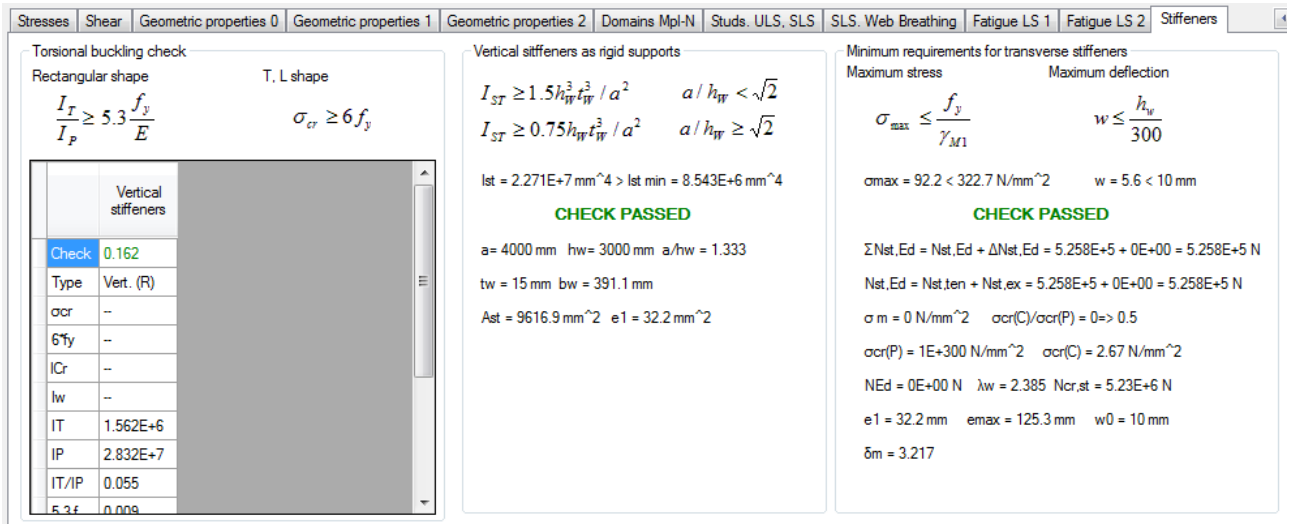
It is now possible to add into the rtf report a paragraph about the web breathing check. It includes a summary of the force and moments from the SLS frequent combination and a table of the stresses in the section.

NEWS of release 3.1

Longitudinal and vertical stiffeners checks

In the new release 3.1 of PontiEC4 the following checks have been added:

- The torsional buckling of vertical and longitudinal stiffeners with open cross-section according to EN 1993-1-5, 9.2.1, (8) , (9)
- The effective section of intermediate vertical stiffeners acting as rigid support for web panels according to EN 1993-1-5, 9.3.3 (3)
- The maximum stress and the additional deflection in the vertical stiffeners according to EN 1993-1-5, 9.2.1, (4)

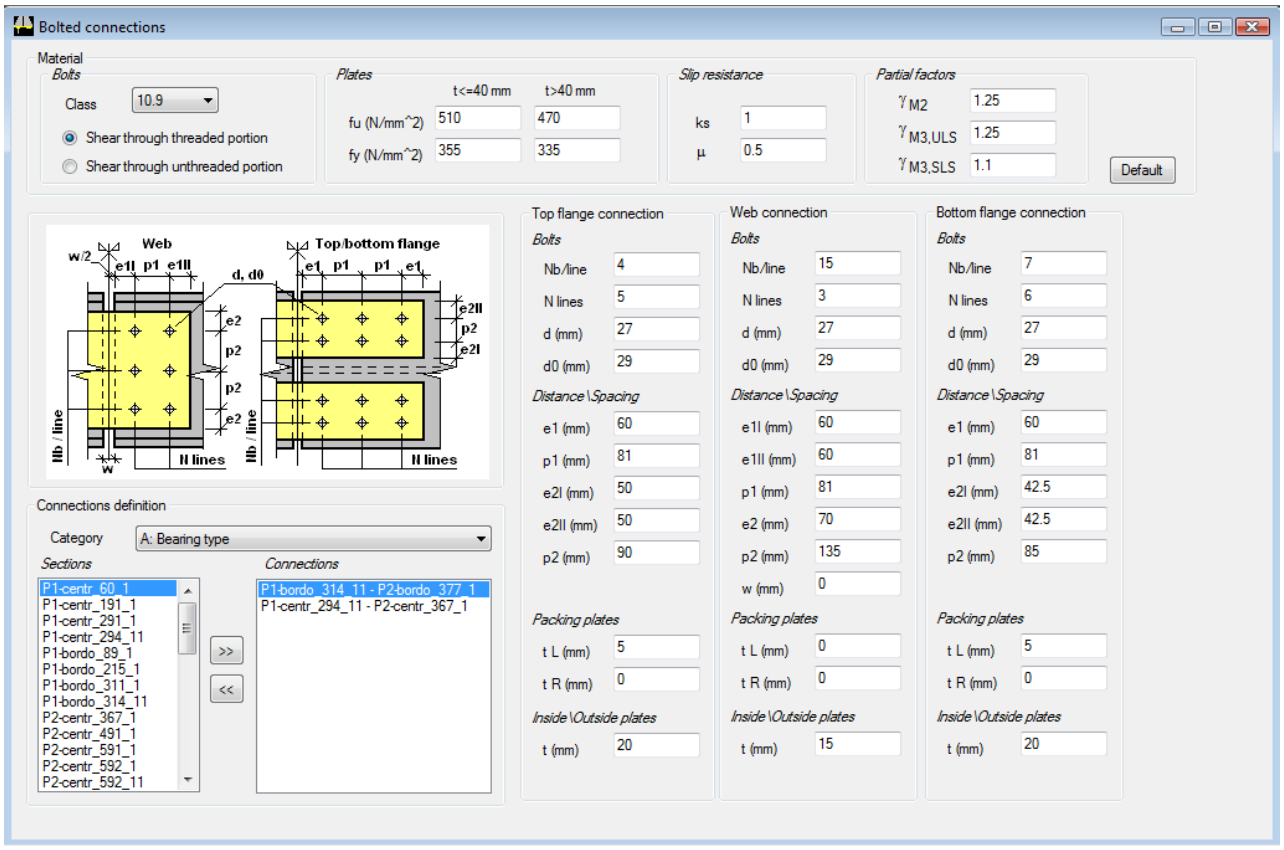


NEWS of release 3.0

Bolted connections

In the new release 3.0 of PontiEC4 it is possible to check bolted connections loaded in shear, standard or slip-resistant, starting from the sections geometric properties and force/moments already input in PontiEC4, according to EN 1993-1-8.

All geometric and material data specific for the bolted connections are input in the following window dialog.



In detail, according to the paragraph 3.4.1 adn table 3.2 of the EN 1993-1-8, the bolted connection loaded in shear, are designed in category A, B or C, following the scheme below:

Category A - Bearing type

Expected checks:

- Shear resistance of bolts (ULS)
- Bearing resistance of connected plates and members (ULS)

Bolt specifications:

- No preloading required
- Bolt classes from 4.6 to 10.9 may be used

Category B - Slip-resistant at serviceability limit state

Expected checks:

- Shear resistance of bolts (ULS)

- Bearing resistance of connected plates and members (ULS)
- Slip resistance at serviceability limit state (SLS)

Bolt specifications:

Only preloaded class 8.8 or 10.9 bolts should be used

Category C - Slip-resistant at ultimate limit state

Expected checks:

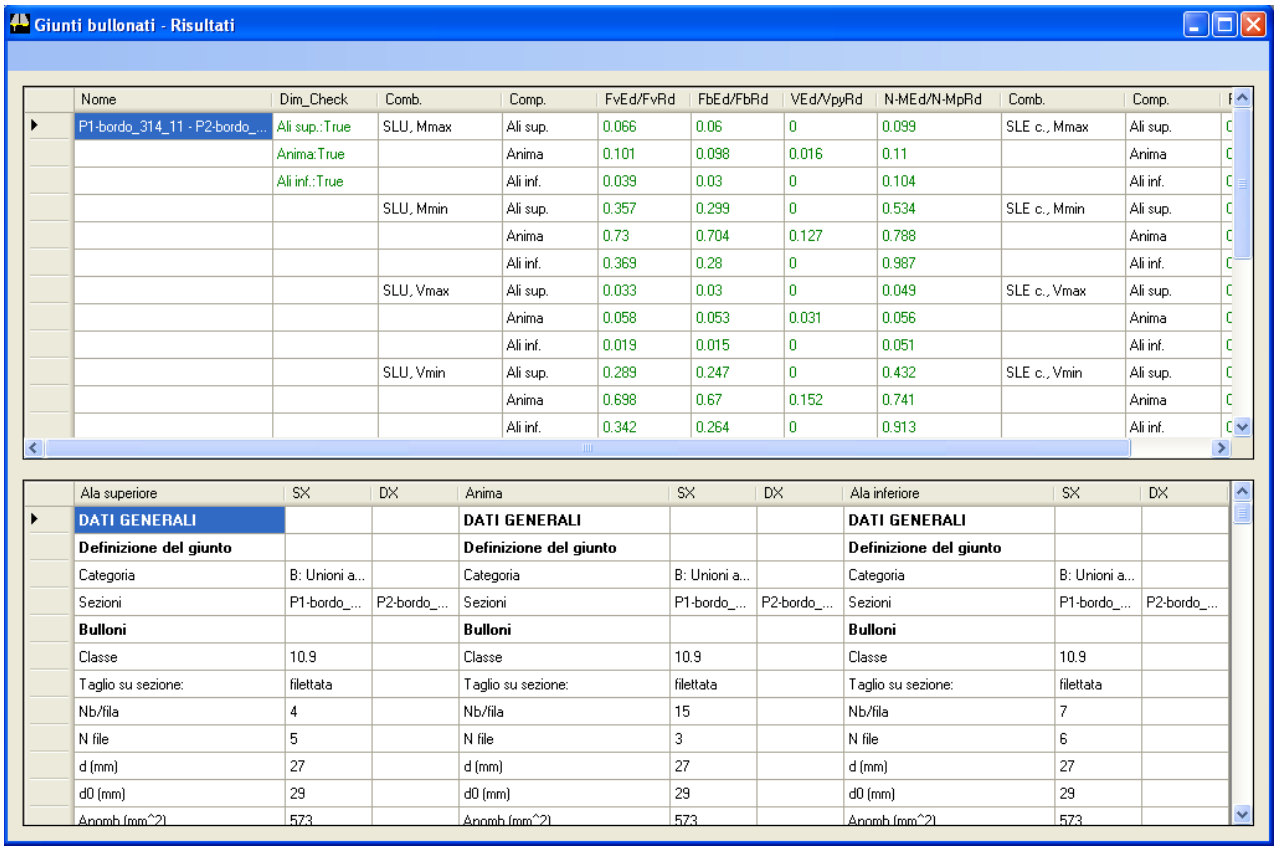
- Bearing resistance of connected plates and members (ULS)
- Slip resistance at ultimate limit state (ULS)
- Plastic resistance of the net cross-section at bolt holes for the connected members (ULS, only for tension forces)

Bolt specifications:

Only preloaded class 8.8 or 10.9 bolts should be used

For each connection category, distances and spacings of the bolts are checked with reference to the dimensional limits expected in table 3.3, EN 1993-1-8. Also the resistance at ultimate limit state of the connected plates is checked.

All results are organized in tables, where it is possible to view either a summury **of the utilization factors** of the checks performed and **all details with step by step results**.



Nome	Dim_Check	Comb.	Comp.	FvEd/FvRd	FbEd/FbRd	VEd/VpyRd	N-MEd/N-MpRd	Comb.	Comp.
P1-bordo_314_11 - P2-bordo_...	Ali sup.:True	SLU, Mmax	Ali sup.	0.066	0.06	0	0.099	SLE c., Mmax	Ali sup.
	Anima:True		Anima	0.101	0.098	0.016	0.11		Anima
	Ali inf.:True		Ali inf.	0.039	0.03	0	0.104		Ali inf.
		SLU, Mmin	Ali sup.	0.357	0.299	0	0.534	SLE c., Mmin	Ali sup.
			Anima	0.73	0.704	0.127	0.788		Anima
			Ali inf.	0.369	0.28	0	0.987		Ali inf.
		SLU, Vmax	Ali sup.	0.033	0.03	0	0.049	SLE c., Vmax	Ali sup.
			Anima	0.058	0.053	0.031	0.056		Anima
			Ali inf.	0.019	0.015	0	0.051		Ali inf.
		SLU, Vmin	Ali sup.	0.289	0.247	0	0.432	SLE c., Vmin	Ali sup.
			Anima	0.698	0.67	0.152	0.741		Anima
			Ali inf.	0.342	0.264	0	0.913		Ali inf.

Ala superiore	SX	DX	Anima	SX	DX	Ala inferiore	SX	DX
DATI GENERALI			**DATI GENERALI**			**DATI GENERALI**		
Definizione del giunto			**Definizione del giunto**			**Definizione del giunto**		
Categoria	B: Unioni a...		Categoria	B: Unioni a...		Categoria	B: Unioni a...	
Sezioni	P1-bordo_...	P2-bordo_...	Sezioni	P1-bordo_...	P2-bordo_...	Sezioni	P1-bordo_...	P2-bordo_...
Bulloni			**Bulloni**			**Bulloni**		
Classe	10.9		Classe	10.9		Classe	10.9	
Taglio su sezione:	filettata		Taglio su sezione:	filettata		Taglio su sezione:	filettata	
Nb/fila	4		Nb/fila	15		Nb/fila	7	
N file	5		N file	3		N file	6	
d (mm)	27		d (mm)	27		d (mm)	27	
d0 (mm)	29		d0 (mm)	29		d0 (mm)	29	
Anomb (mm^2)	573		Anomb (mm^2)	573		Anomb (mm^2)	573	

Finally, it is possible to compile a **report in rtf format** containing all input data entered and checks carried out for all joints and all design combinations.

NEWS of release 2.0

Composite and Orthotropic box-girder

In the new version 2.0 of PONTIEC4 is possible an input of detail data that enable the management and calculation of the Shear lag and / or the buckling of the flanges longitudinally stiffened.
These options are particularly useful for the management of the flanges of the boxes in the orthotropic decks and in the composite steel-concrete box-girder.

The dialog box asks the user to indicate, separately for the flange of the right and the left:

- The type of flange: **Outstand / Internal**
- The width of the flange.
- The presence or absence and possibly the type of stiffener used ("V", "T", "L"). In the presence of stiffener are required geometric data indicated in the schematic figures proposals.

- A series of beta coefficients (as many as there are sections of ashlar) of shear lag for SLU and SLE, calculated automatically.

In the presence of stiffeners the user can choose the option "include in the calculation": This option allows to take into account the area of the stiffeners in the calculation of the geometric properties of the entire gross and effective section; anyway for the buckling and shear lag, the stiffening are taken into account, even if excluded from the calculation of effective properties.

For outstand stiffened flanges, no calculation is carried out automatically for Ksigma, that is asked to the user as input. For internal flange Ksigma is not required and is automatically calculated, assuming that there are at least 3 equally spaced over the entire stiffened flange (at least 1.5 stiffeners in half flange).

A series of automated checks verify the congruence of the geometric data entered.
The input file PontiEC4 compiled with versions prior to 2.0 are automatically interpreted in these latest hypotheses.

The Results dialog box contains the following new data sets:

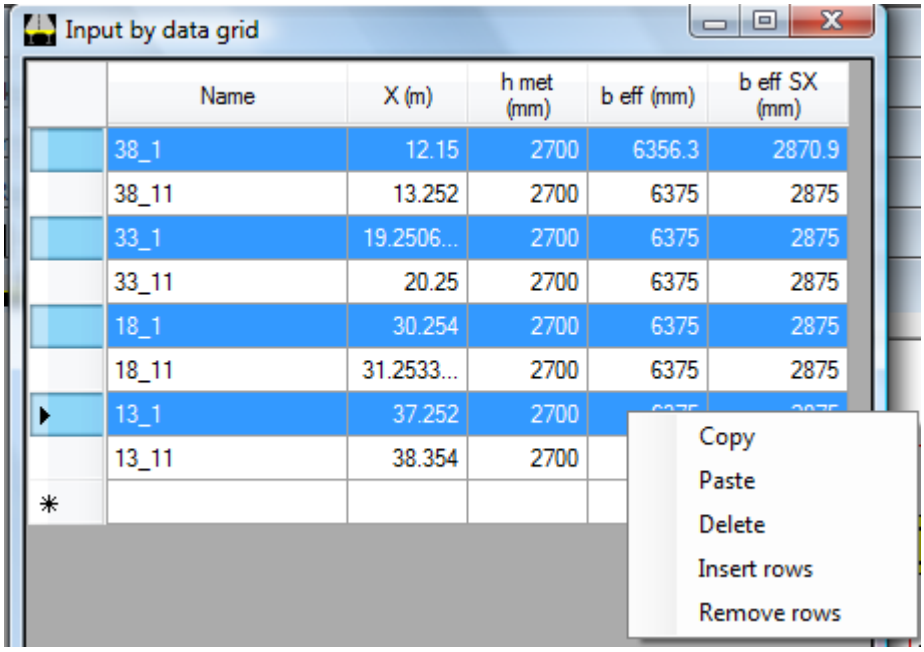
- **Reduction factors for buckling of the flanges and / or shear lag**
Are shown in tabular form the coefficients of reduction, and the effective area, for instability and / or shear lag for the flanges (separate into flange top, bottom, left and right).
- **Effective areas of subpanels**
In tabular form are given the reduction factors for instability, and the effective area of the sub-panels with stiffened flanges (separate into upper, lower, left and right flange).
- Stiffening flanges
In tabular form is reporting data relating to the geometry of the stiffened flanges

- Instability of stiffened flanges

In tabular form are given the reduction factors, and the effective area for instability of the whole stiffened flanges (separate for top, bottom, left and right)

Improvements to operations

- ✓ It has been enhanced athe bility to delete or add sections within a segment, during both the input and edit mode. For example in the following figure is shown the possibility of eliminating the sections using a multiple selection



- ✓ When you import the forces and moments using the menu **File> Import forces/moments**, are automatically identified for existing segment any sections not included in PontiEC4, you then have the ability to automatically insert them. The name of the sections and the segment must simply meet the following specification:

"Segment name" + "_" + "Section name"

For example, if in the Excel file there is a section called: "A_S5" and the segment "A" in PontiEC4 does not contain any section called "S5", then it will be added automatically.

This possibility makes the input of forces and moments much easier and eliminates the working phase which consists in defining within each segment the individual sections before proceeding to the import of forces/moments

- ✓ It was enhanced the ability to use the dual language English / Italian; the user interface will be in English or Italian depending on the system regional settings of your PC. The report will be written in either Italian, English or French

- ✓ **(Lusas USERS ONLY)** For users who use the finite element analysis system LUSAS, is provided in the setup package of PontiEC4, a wizard named **EXPPontiEC4** that allows fully automatic filling of the xls file containing sections and forces/moments. The user only needs to preselect the finit elements to chack and identify the Smart Combination / envelopes for the various design phases. The wizard recognizes the cracked areas and also automatically sets the column of coefficients ψ γ for the shrinkage and thermal actions.

- ✓ **(Lusas USERS ONLY)** The examples directory contains a new example "guided step by step" to use in combination with Lusas PontiEC4