www.consteelsoftware.com

What's new in Consteel 14

20.05.2020

version 14.0

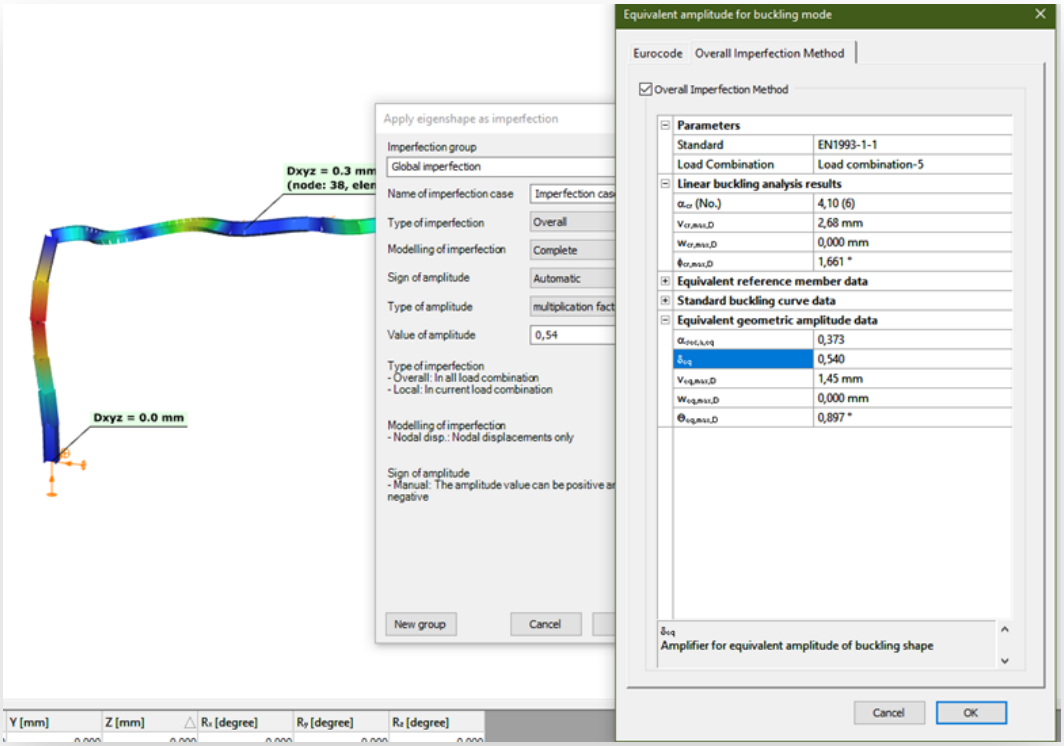
Content

1. Overall Imperfection Method 3
2. Smart link 4
3. Linearly variable distributed surface load 5
4. Critical temperature 6
5. Pangolin plugin in Grasshopper 7
6. Steelspace 8
7. Online user account and licensing system 9
8. Design improvements 10
9. Converting previous models 11

1. Overall Imperfection Method

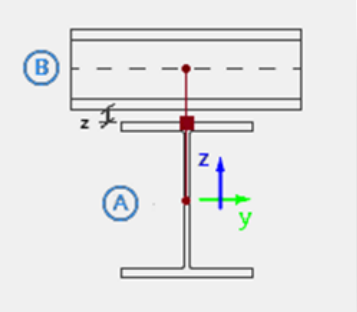
Stability design based on imperfections is becoming more prevalent as modern architecture poses an increasing challenge to structural designers with its unusual, innovative, and non-conventional solutions. Global buckling shapes of the structure can be used as starting data to geometric imperfections. However, in addition to imperfection shapes, it is also necessary to determine their amplitudes, but the design standards do not provide much help for this, as it yields a solution for only simple column buckling problems. In the case of real, complex structures, the value of the imperfection amplitude cannot be calculated in this way. The new method we have developed, the Overall Imperfection Method, provides a solution to this.

We introduced a new sensitivity test called the Imperfection Sensitivity test. Using the results from this new test, we also automatically obtain the value of the required amplitude multiplier for the application of the buckling shapes as imperfection. Thus, even the imperfection based stability design can already be performed automatically and quickly in Consteel as the design based on strength reduction factors in the general method.

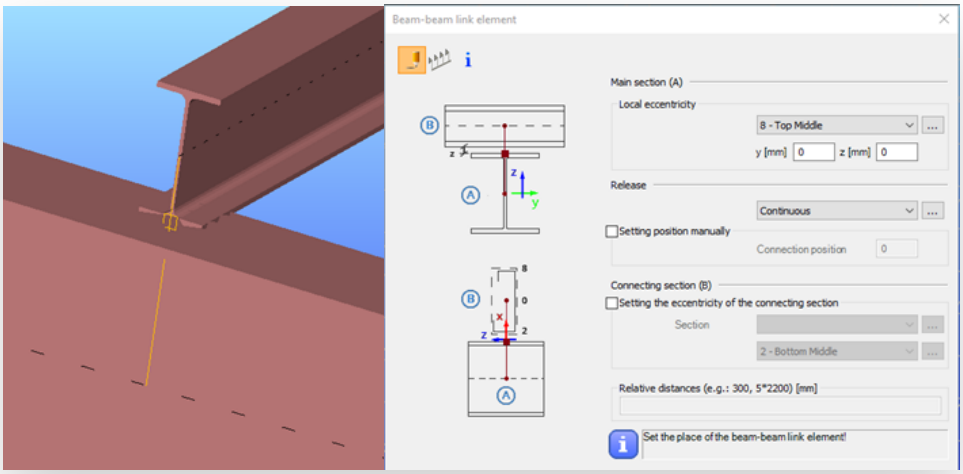


2. Smart link

A new type of link element has been implemented into Consteel, the smart beam-beam link element, which simplifies the modelling of the eccentric connection of two bypassing members. The connection between the main beam and purlins is a typical example for this. With this new object, we can place link elements at specific points in the main beam, and we can easily connect other beams to their other endpoint, based on the predefined parameters of the eccentricity. In case of any changes in geometry or profile, the link element follows the modification of the main beam, together with the purlin attached to it.

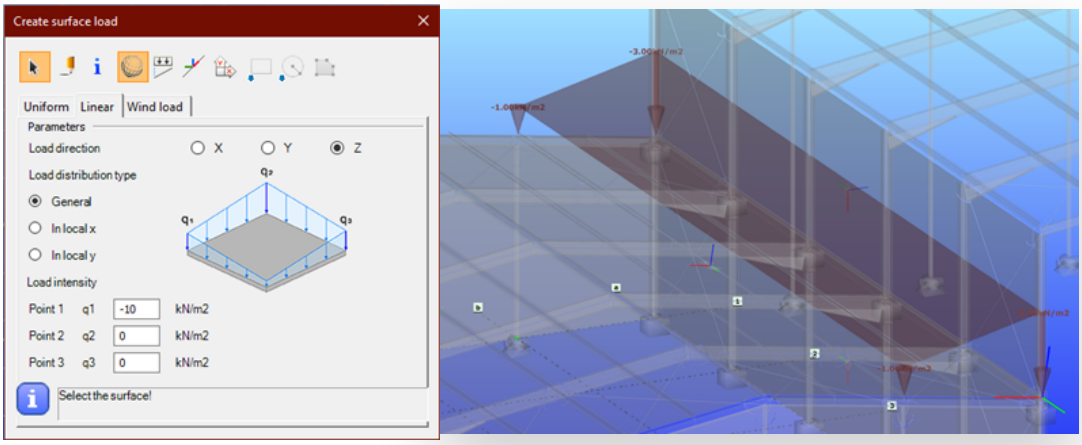


The link elements can be placed individually or in groups with a predetermined arrangement along the main beam.



3. Linearly variable distributed surface load

The available types of surface loads have been expanded with a linearly variable type of distributed load. From now on, the definition of snow accumulation loads will be much easier than before. In this case, also, the load can be applied over the entire surface or only on a delimited part of it. The desired load pattern of a roof can be assembled with several surface loads of different intensities linked to a single load-transfer surface spanning over the entire roof.



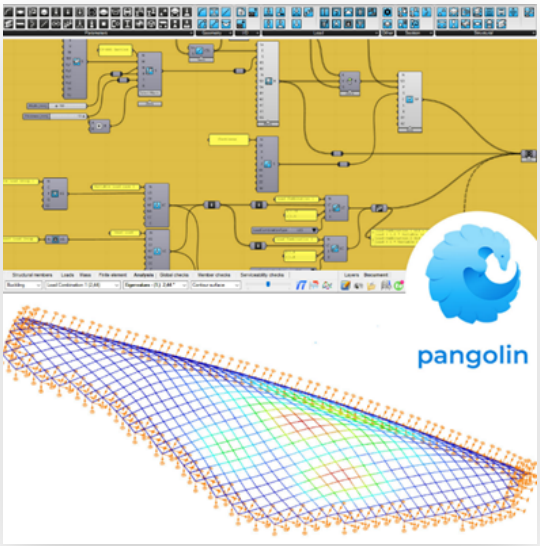
4. Critical temperature

In response to the request of our users, we have implemented the calculation of the critical temperature, which is an important parameter of the design in the fire situation. The critical temperature is the temperature at which, due to that heating, the material properties are reduced to such an extent that the load-bearing capacity of the element is exhausted at a given load. It means that the value of utilization is just 100%. If fire protection is to be achieved with fire-protection intumescent painting, this value is the basis for specifying the appropriate material and layer thickness.

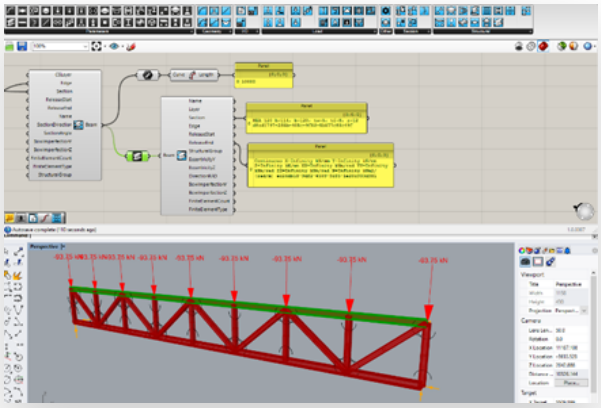
The critical temperature must be calculated differently for the strength and stability analysis. Consteel can perform both calculations and the result will be the lower of the two calculations, i.e. the design value.

5. Pangolin plugin in Grasshopper

In the intuitive and revolutionary parametric geometric modelling environment of Grasshopper, it has already been possible to create any spatial model that can be described by mathematical functions. The new plugin we have developed for this environment allows us to develop the geometric model directly into the Consteel model right in the Grasshopper, endowing it with gauges, supports, loads, and all the elements and features available in the Consteel. This model can then be uploaded to Steelspace (see more at page 6) or even directly to Consteel. The model thus adopted only needs to be run in Consteel, because the modelling can be carried out in a parametric way in Grasshopper.



If you need to change somewhere in the geometry or loads, you can do so by changing a few parameters and then passing the model that has changed in this way to Consteel, you can run the analysis again immediately. The live connection between Grasshopper and Consteel also makes it possible to supplement the model built in Consteel with additional elements and loads in Grasshopper, of course also in a parametric way.



6. Steelspace

We believe that cloud-based services are the future! Just think of things like Netflix, Spotify, or Google Drive, whose explosive proliferation is completely transforming our world. Just a few of the many benefits of moving services and data to the cloud:

- the user saves time and resources,
- their work is more secure,
- and collaboration between multiple users is much smoother and easier.

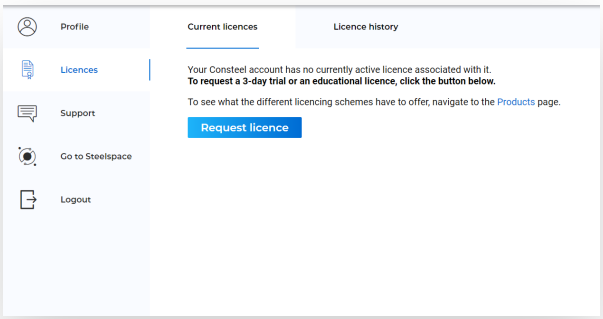
We are confident that engineering work is facing a similar transformation and we want to be one of the inducers of this process with our latest development.

Steelspace is a cloud-based storing, sharing and service providing open platform for structural models and their analysis or design results. It provides additional services complementing the existing software package functionalities and calculations of the users. As a basic service Steelspace offers a cloud-based model store and viewer function: users having a Steelspace account are able to upload, store and view structural models and their analysis and design results and share them with colleagues having also Steelspace account. Additionally, on the models in Steelspace several structural analysis and design calculation packages can be executed which are available for and compatible with the uploaded model.

The system is still under development and is expected to be launched shortly after the release of Consteel 14 at the webpage of steelspace.io. Initially, you will be able to upload, view, share and comment models from Consteel and their analysis and design results, and models from Grasshopper made and saved by our Pangolin plugin.

7. Online user account and licensing system

Along with the release of Consteel 14, we are also launching our new website which will offer a continuously growing personal space for registered users so there will be an opportunity to track your licenses, to send error messages to our support team and even upload your own csPI codes. We provide a continuously expanding set of materials, including different tutorials and learning materials, some of which will be available for registered users exclusively. Our aim is to create a centralized user experience therefore the registration on our website will be valid also to log in to the Steelspace site as well. It is important to note that uploading csPI codes will only be available later in time.



Regarding our self-developed online license management system, the main advantage in this development is that from now on there is no need to differentiate between a local and a network license, as the user can use the purchased license on any computer where an internet connection is available. For larger companies where multiple licenses are used, a user with administrative rights can control the allocation of licenses to each engineer. This will make the use of licenses much more flexible within the company. It is important to note that this option will only be available to students and trial users for the time being. However, in addition to continuous improvement, we will gradually make it available to other users in the future. The hardware keys used so far remain usable. It is up to the user to decide whether they want to switch to the new licensing mode and return their dongle or stay with the previous protection system.

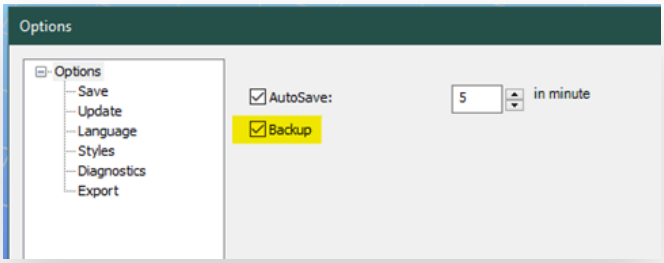
8. Design improvements

The actual edition of EN 1993-1-1 unfortunately does not consistently include the bimoment type of internal forces in the linearized interaction formula (6.2). Bimoment is only considered in torsion verification (6.2.7(4)). In ConSteel 13 we have already added a plastic bimoment resistance value (B Rd.pl) to this interaction formula only for I sections of class 1 or 2, to comply with the result a ConSteel user would get when he performs an imperfection based stability verification.
With the introduction of Overall Imperfection Method (OIM) special cross-section plastic resistance values have been introduced for further cross-section types of Class 1 or 2. For the rest of the cross-sections the elastic bimoment resistance value is calculated and used in the extended form of the linearized interaction formula (6.2). These developments generally improve the resistance of every cross-section subject to a mix of normal forces, biaxial bending, and torsion.

Additionally, to keep the developments in sync with the above-mentioned improvements of linearized interaction formulas, the global elastic buckling check based on the General Method has also been further enhanced. The bimoment component has been added to the formulation, carefully fine-tuned to the results obtained when the OIM is used with compatible sections.

9. Converting previous models

As the consequence of new developments in Consteel 14 the model database has substantially changed. This new format is not compatible with earlier versions. When a model made in an earlier version of Consteel is saved in Consteel 14, an automatic backup of the original model is made (model_file_name - Consteel XX.bak, where XX = the number of that version), if the backup file creation is enabled in the Options menu.



Interested in Consteel 14?

Contact us or download our free trial from www.consteelsoftware.com.

ConSteel Solutions Kft.
Mester utca. 87., Budapest 1095 (Hungary)
+36 30 835 6426
info@consteelsoftware.com

For a complete list of all our international resellers and partners, please visit our website.