# Cellular beams

## esasd.12.01 Cellular beams 'ENV 1993-1-1, 1992/A2

Integrated input and check of cellular beams as per ENV 1993-1-1. Cellular beams are defined through a library of cellular beams and are checked in a similar way as via the steel code checks. The design of the cellular beam is done via the ArcelorMittal ACB solver application.

## Datasheet Scia Engineer

esasd.12.01

Scia Group nv • Industrieweg 1007 • B-3540 Herk-de-Stad • Tel: +32 13 55 17 75 • Fax: +32 13 55 41 75 • info@scia-online.com

# Cellular beams

The purpose of this software tool is to facilitate the design of cellular beams according to the principles of theEurocodes. Thanks to the integrated 3D graphical interface, its use requires little extra familiarisation time. However, due to the complexity of the design methods, it is essential that the user has the required knowledge in the field of steel constructions. The design of the cellular beam is done by using the ArcelorMittal ACB solver.

The application range is limited to simply supported beams within any 3D steel building. The beams are fabricated from I-shape hot-rolled profiles with circular openings. The upper chord and the lower chord may be from different base profiles and of different steel grades. Scia Engineer is provided with a library of fabricated cross-sections delivered by ArcelorMittal.
The internal forces from any cellular beam are generated by the Scia Engineer solver in predefined sections of the beam. They are generated on different posts along the web openings.

These internal forces are used for the check of the Arcelor beam by the ArcelorMittal solver according to EC3 - Annex N : ENV 1993-1-1 : 1992/A2.

## Main Features

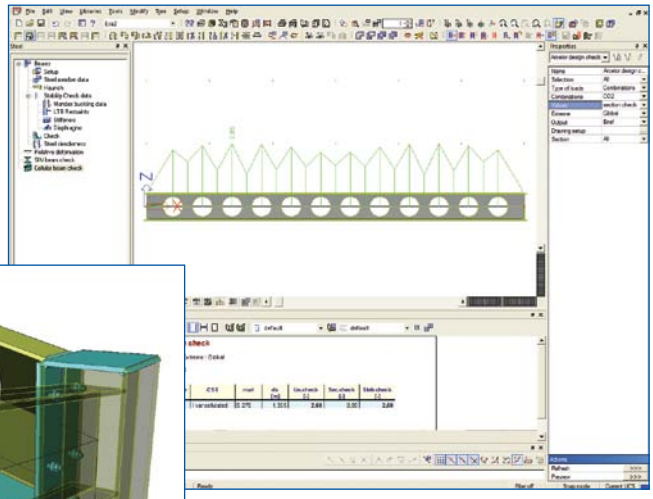
The program performs resistance checks at the Ultimate Limit States (cross-section resistance, plate or local buckling, lateral torsional buckling) according to the principles of Eurocodes 3 (Eurocode 3 : Design of steel structures - Annex N: Openings in webs. ENV 1993-1-1 : 1992/A2.)

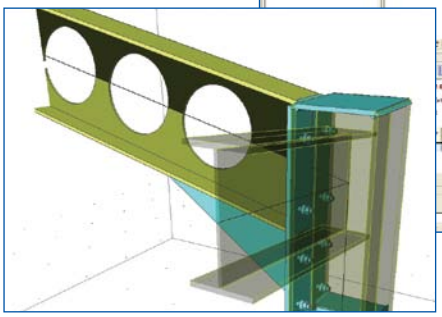
The program calculates the maximum deflection for any combination defined by the user at the Serviceability Limit State. The user has to check himself whether the calculated deflection meets the appropriate criteria for the project and, if necessary, whether pre-cambering is needed.

Before commencing the detailed calculations, the program first performs preliminary checks, ignoring completely the presence of web openings. Should any design criterion be exceeded, a warning is displayed: it is assumed that the configuration to be solved is out of the program scope. As a consequence, the user should modify the dimensions of the beam.

## Definition of the openings

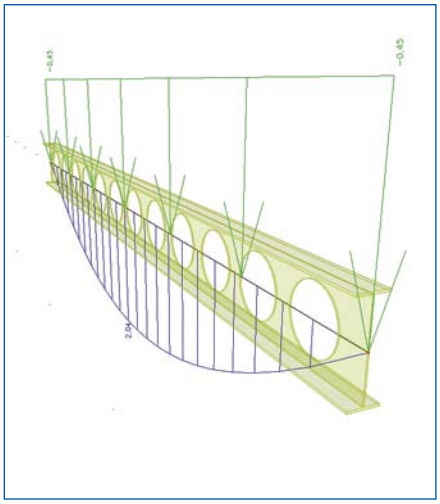
The following dimensions are relevant:
- Opening diameter;
- Distance between openings from centre to centre (or intermediate posts width);
- Left (and / or right) end post width.





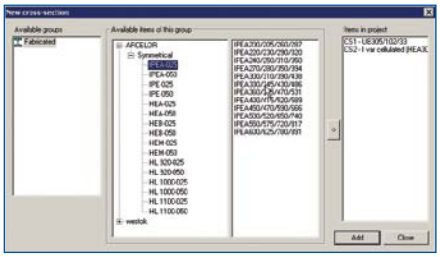
Those dimensions have to be consistent with geometric requirements resulting from the cutting process of the base sections and are thus dependent on the base sections dimensions:
- Depth;
- Flange thickness;
- Web-flange transition radius.

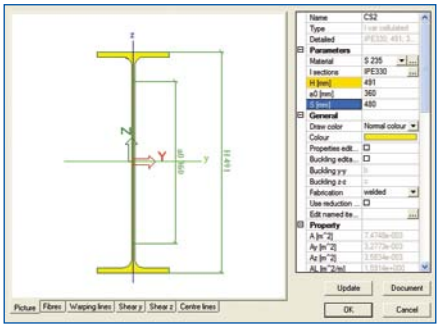
In order to make the input easier and error free, the program provides a library of fabricated cross-sections delivered by ArcelorMittal. The number of openings, as well as the final depth of the cellular beam (once welded), are derived from the beam but can also be modified by the user.



## Ultimate Limit State

For each ULS combination, the program will check in succession the resistance at each web opening location, then the resistance at each post location, and finally, the lateral torsional buckling resistance.
The following ultimate limit states are considered:
- Cross-section resistance at post locations (taking account of the class of the section);
- Shear buckling (transverse shear force);
- Weld resistance to longitudinal shear;
- Flexural buckling of posts;
- Cross-section resistance at opening locations;
- Lateral torsional buckling.





## Highlights

NEW

- Integrated in Scia Engineer for a complete building analysis.
- Cooperation with ArcelorMittal design institute.
- Fast overview of (non) satisfying members.
- Choice of Scia Engineer steel section library: Arcelor catalogue available.