

# Design of aluminium structures - EN1999-1-1

## esaad.01.01 Design of aluminium structures - EN1999-1-1

Design of aluminium structures according to EN1999-1-1, including the design of transverse welds, aluminium slenderness, local and bow imperfections.



Datasheet Scia Engineer

esaad.01.01



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The design of aluminium structures according to EN1999 is providing Aluminium designers with a powerful integrated tool to check and (auto) design 2D and 3D structure as per EN1999.

It is possible to design any graphical cross-section as it can be drawn by the user himself in Scia Engineer or imported from DXF, DWG or IFC or it can be a typical cross-section as delivered by the well-known Scia Engineer library.

The user can define the section, (bow) imperfections, transverse welds, HAZ data and the existing tools as provided by the steel design modules. The design of aluminium is easy to learn and understand for existing as well as new customers as it is done in a similar approach as the steel design module. Any output can be handled in a typical Scia style.

For the use of this module, new materials have been added to the material database.

## Main Features

### General environment

The aluminium code check is implemented similarly to the steel code routines as implemented in Scia Engineer ( EC3, DIN18800,AISC ASD, AISC LRFD ...).

Included are:

- Standard definition of buckling data and LTB data;
- Standard warping check, performed as an elastic stress check;
- Standard setup;
- Aluminium member data (equivalent for actual steel member data);
- Standard definition of LTB restraints;
- Standard definition of stiffeners;
- Standard definition of diaphragms;
- Standard output facilities;
- Optimisation.

### General cross-sections design (module 'graphical section')

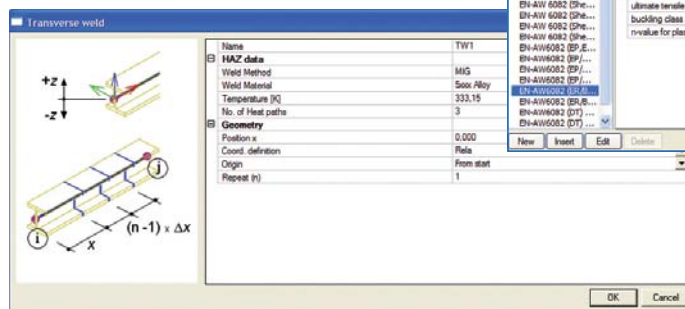
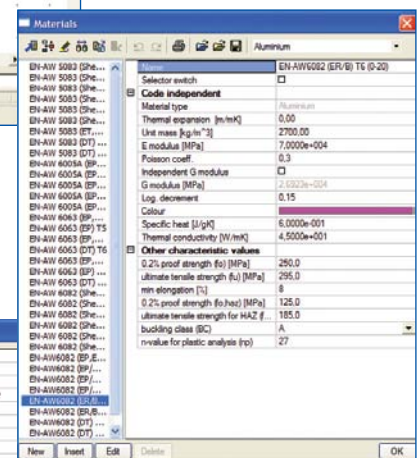
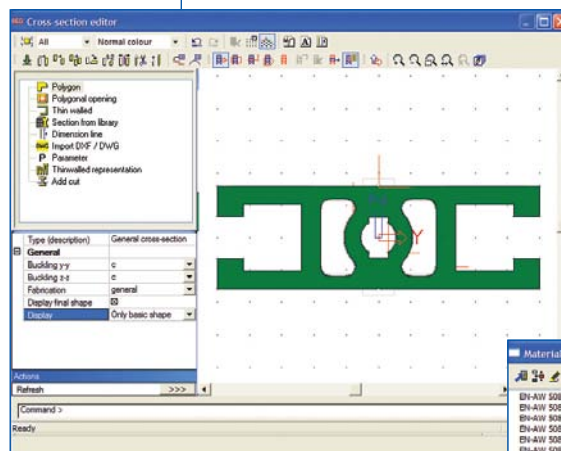
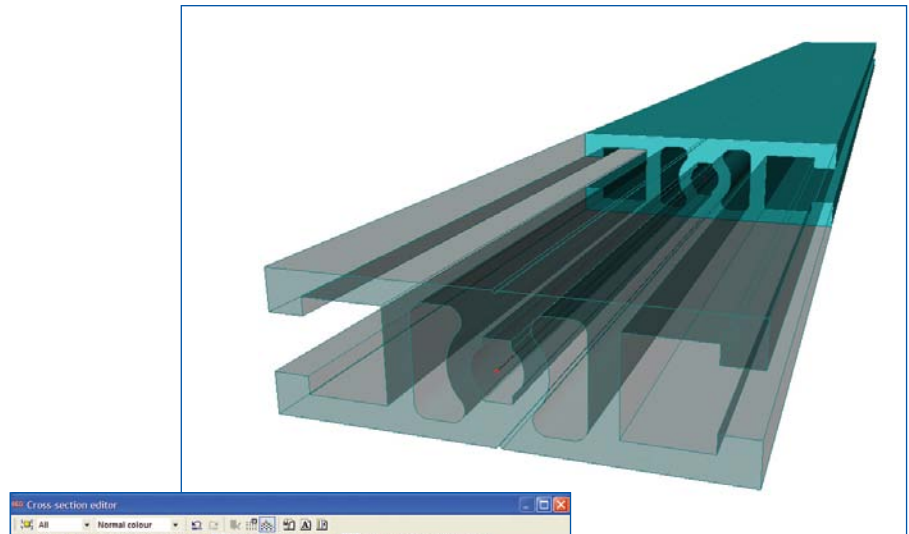
With thin-walled representation overlay for general cross-sections, showing the analytical section, any shape of the cross-section can be defined by the user.

### Aluminium material list from EN1999

Own user material input is allowed

### Aluminium setup

The setup menu can be implemented equal to the steel setup and contains the following tabs:



- Member check;
- Buckling defaults;
- Relative deformation;
- Alternative values;
- National annex.

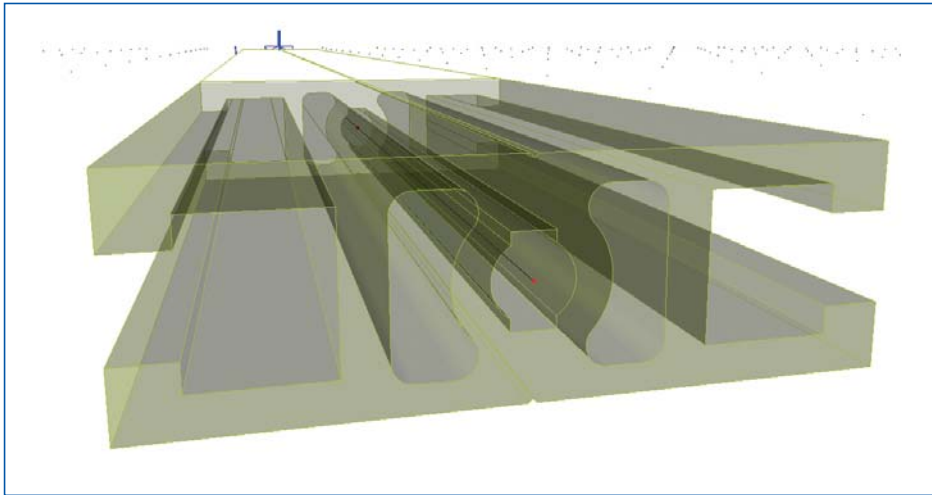
### Transverse Welds

Transverse welds locally weaken a member and can thus have a large impact on the combined section/stability check. They can be defined as additional data.

## Highlights

NEW

- ▶ Integrated solution.
- ▶ Conforms to the general application user interface.
- ▶ Latest EN standard.
- ▶ Transverse and HAZ data possible.
- ▶ General cross-sections from dxf/dwg/IFC.
- ▶ Initial and reduced shapes, including integrated cross-section classification tool.



## Support for slender sections and HAZ data

The support for slender sections (class 4 sections) and HAZ data, is realized by the definition of the initial shape and reduced section properties.

## Classification of Cross-Sections

Classification of the cross-section is realized by the definition of the initial shape. Classification is performed for each loading components separately.

## Setup parameters

- Code settings: In those cases where the code allows for different methods, the user can choose between the default and alternative method.
- National Annexes: The Aluminium setup is prepared for the National annexes.

## Other functionalities working with Aluminium

### LTBII

- LTBII is supported in the same way as for Steel.
- Eigenvalue analysis for determination of  $M_{cr}$
- 2nd order analysis according to code - elastic/plastic
- 2nd order analysis - general

### Aluminium Slenderness

In addition to the result values of Steel, the values of the applied bow imperfections  $e_{0,y}$  and  $e_{0,z}$  are available.

### Local Imperfections according to EC9

In the buckling data, the introduction of bow imperfections according to EC9 is supported.

### Manual input of $M_{cr}$

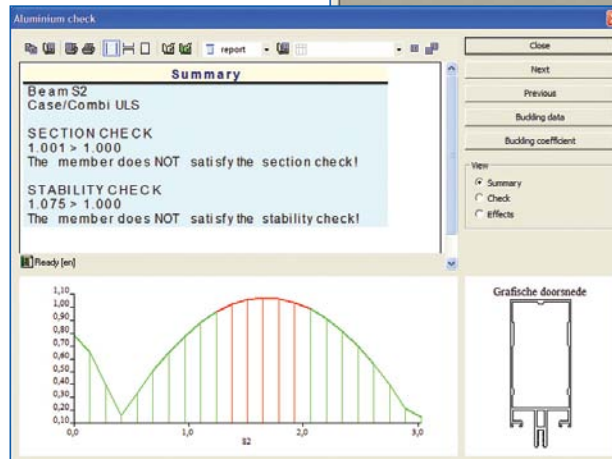
Moreover, the user can input the  $M_{cr}$  manually for a member.

Initial shape and HAZ data

	Yc [mm]	Zc [mm]	A [mm <sup>2</sup> ]	Ybkg [mm]	Zbkg [mm]	Yend [mm]	Zend [mm]	t [mm]	Plate type	Reinf type	Reinf ID
1	83.10	319.30	22.33	76.90	317.80	89.30	320.80	1.75	UO	RUCO	0
2	89.30	334.95	49.53	89.30	320.80	89.30	349.10	1.75	I	none	0
3	45.15	349.10	154.53	89.30	349.10	1.00	349.10	1.75	I	none	0
4	1.00	324.75	88.22	1.00	349.10	1.00	300.40	1.75	I	none	0
5	14.25	293.65	52.05	1.00	300.40	27.50	286.90	1.75	I	none	0
6	27.50	174.85	391.83	27.50	286.90	27.50	63.00	1.75	I	none	0
7	14.25	56.25	52.05	27.50	63.00	1.00	49.50	1.75	I	none	0
8	0.95	25.20	85.05	1.00	49.50	0.90	0.90	1.75	I	none	0
9	45.05	0.85	154.52	0.90	0.90	89.20	0.80	1.75	I	none	0
10	89.20	14.95	49.53	89.20	0.80	89.20	29.10	1.75	I	none	0
11	83.05	30.60	22.16	89.20	29.10	76.90	32.10	1.75	UO	RUCO	0

HAZ data

Drawing



## Optimisation

The optimization routine is supported in the same way as for Steel.

## Re-factored single check

Single check now supports the Scia Engineer-document style (table composer) and gives the user a direct access to buckling data and buckling coefficients of a member.