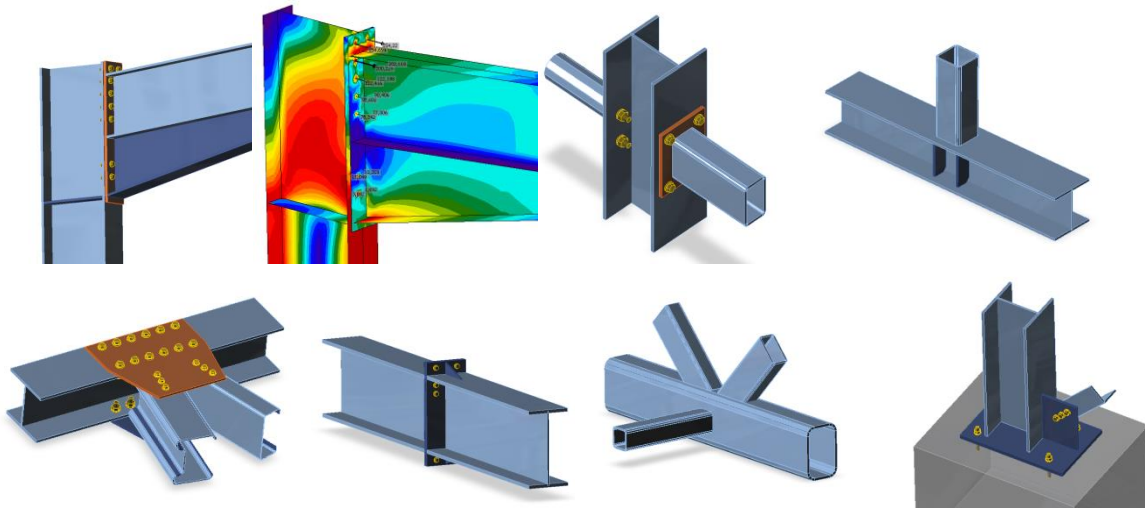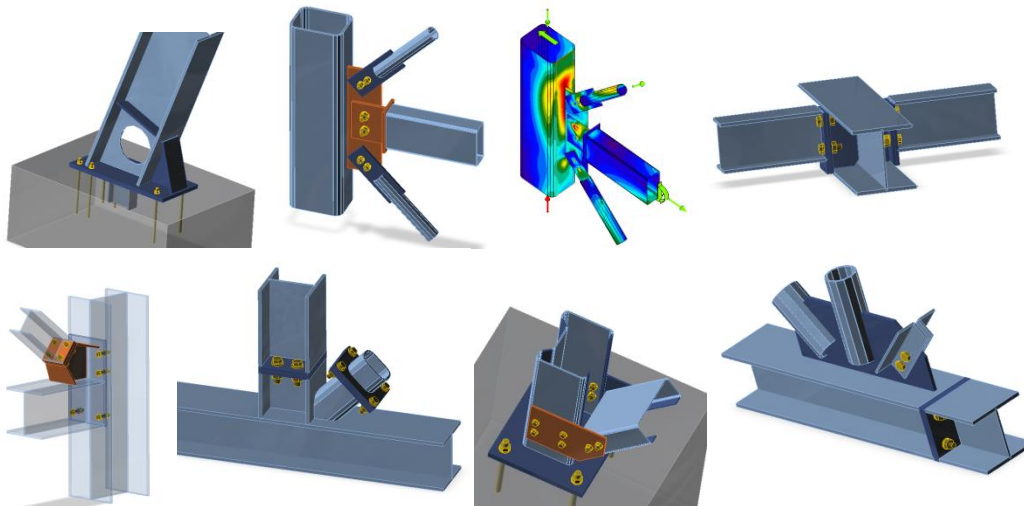# IDEA StatiCa Steel - Connection

IDEA Connection enables engineers to design steel joints of general shape, connections and base plates with no limitation in shape and loading. It is based on a unique design and analysis method called CBFEM. It delivers precise checks of each component of the joint.


IDEA Connection enables engineers to understand and minimize risk of construction defects. It removes uncertainty in connection design to decrease material costs by up to 30%.

IDEA Connection is a module of IDEA StatiCa Steel, a thorough solution for steel engineers around the world.

Key features of IDEA Connection

➢ Structural design and check of joints, connections and details of steel structures
➢ Joints with various numbers of beams in multiple directions and loads
➢ Analysis model created according to manufacturing operations used – cuts, plates, stiffeners, ribs, openings
➢ Calculation of internal stress/forces in joints based on elastic/plastic FEA analysis
➢ Automatic creation of joint's FEA model
➢ Efficient FEA solver delivers result faster than current methods
➢ National-code-independent solution; design checks according to EN 1993-1-1
➢ Checks of bolts and welds using standard component method
➢ Graphical presentation of shape of the joint to check member collisions
➢ Clear information about behavior of the joint/connection
➢ Both simple (1 connection = 1 A4) and detailed result reports
➢ Wide range of predefined joint/connection templates; user defined templates
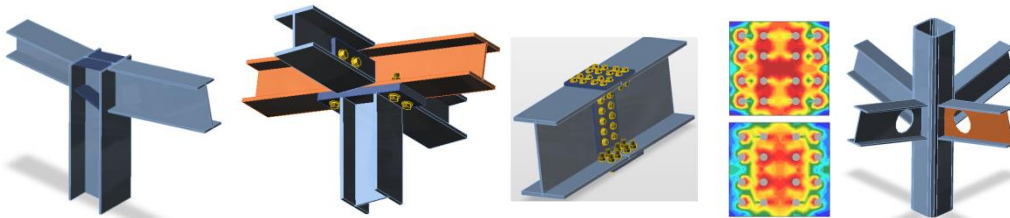
BIM – link with the structural software

IDEA Connection can be used as a standalone program - input of geometry, loads and all operations is done manually. But IDEA Connection also supports BIM - steel joins including loads (internal forces) can be imported from several FEA programs, for example MIDAS Civil and GEN, AxisVM, SCIA Engineer and Nexis (Esa Prima Win).
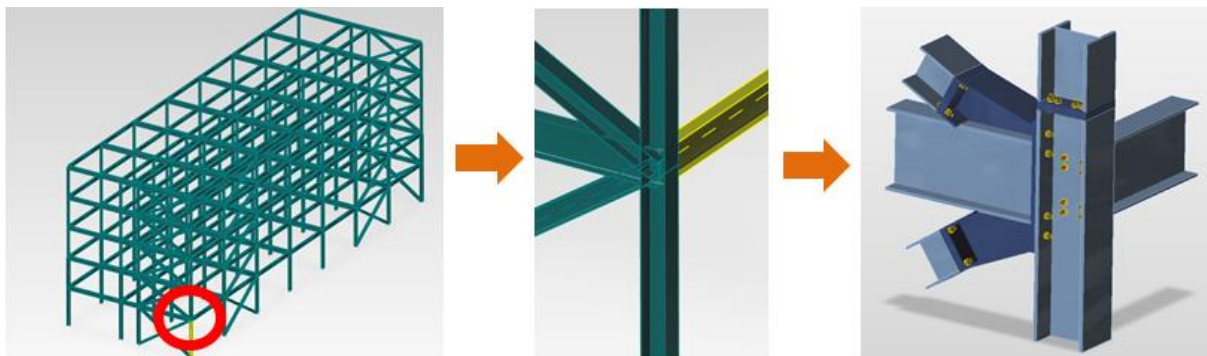
Imported structure in IDEA BIM   Selected node   Precise model of steel joint

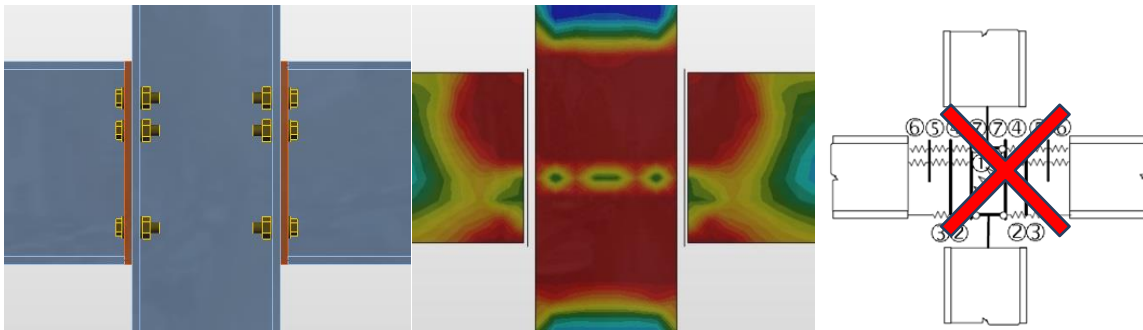## Steel joint - Component Based Finite Element Model

Joint is divided into components
All steel plates are modeled by Finite Element method
Bolts and welds are modelled as nonlinear springs
FE Model is used for investigating of internal forces in each component
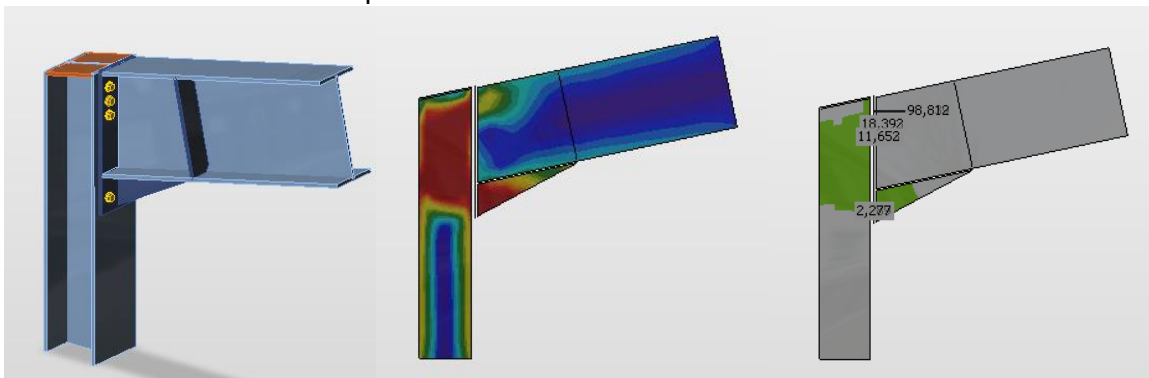Each component is checked according to specific formulas like in Component Method

CBFEM workflow

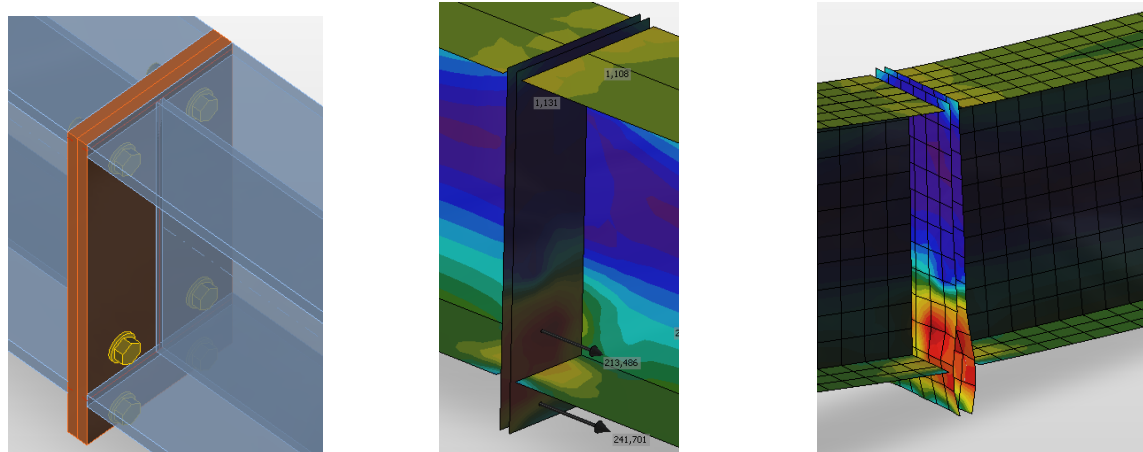All plates are modeled from ideal elastic-plastic material
Plates are checked for limit plastic strain – 5% acc. to EC3

Welds and bolts

Bolts and welds are modeled as special members with predefined diagram
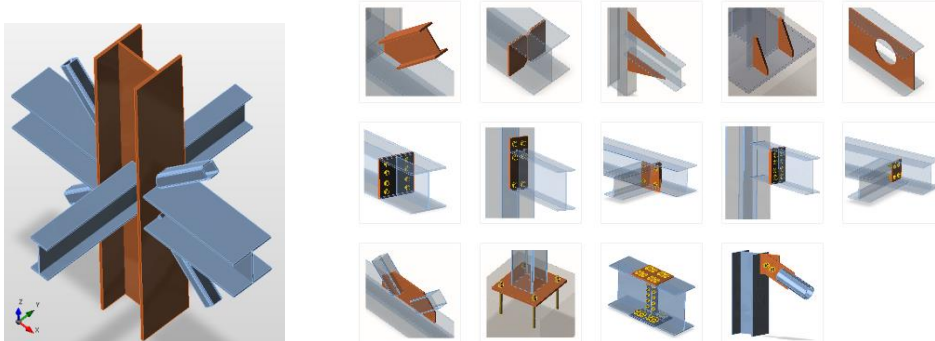Connecting components use unique interpolation constrains

Geometry of joint, manufacturing operations

3D geometry, rolled, welded or cold formed cross-sections

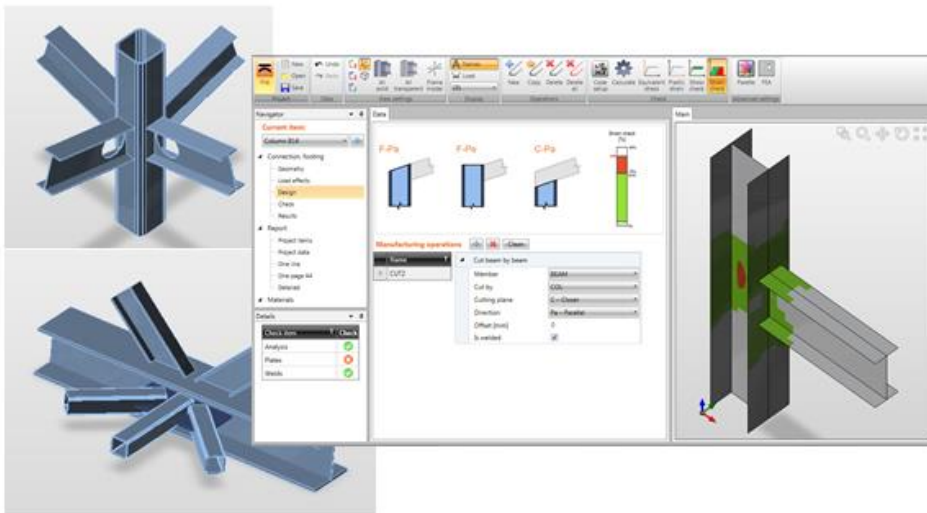Joint is engineered by manufacturing operations

All steel plates have precise shapes which can be used for drawings or in CAD/CAM

Welded joints

Frame or truss joints, all welds are modeled as components and properly checked

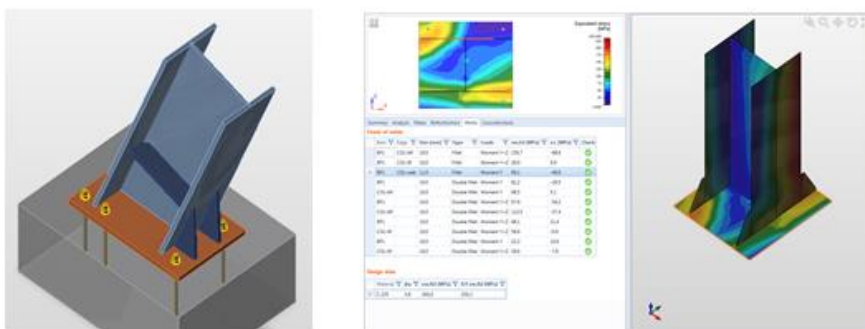Optimization of stiffener positions can be done

Base plates

Columns can be loaded in 2D or 3D (all 6 internal forces)

Contact stress under base plate is analyzed and average stress in effective area is calculated

Check of anchors bolts, break out cones, shear check (iron, friction, bolts), mortar joint

Bolted joints

Frame joints, truss joints. Can be combined with all welded joints
Interaction of more connections in one joint
End plates, splice plates, gusset plates, L profiles
Unique models of bolts in tension and shear
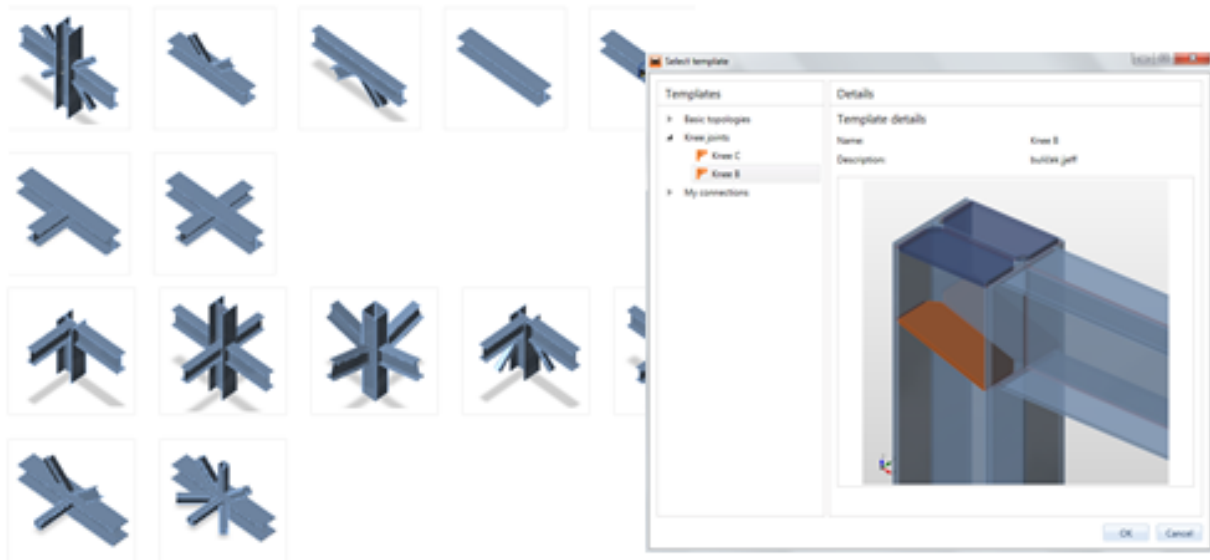Check of each bolt according to component method
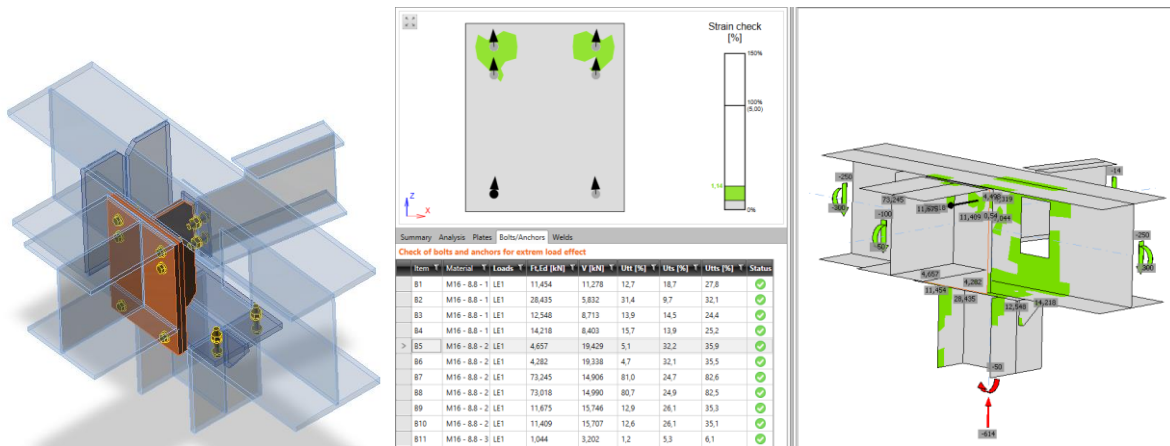
Steel joint templates

Any joint designed in IDEA Connection can be saved **„as template"**
Any template can be reused for joint of similar topology.

- Different angles of members
- Different cross-section dimensions
- Different cross-sections type

Fast work with typical connections

Design and check

IDEA Connection runs proper checks according to EN 1993-1-8.

Steel plates are check against the requirement of maximal equivalent strain

Bolts and fasteners are checked both on normal and shear force like separate components

Stress in each weld is properly evaluated and weld is checked

Interaction of base plate and concrete block is analyzed – effective stress is checked.
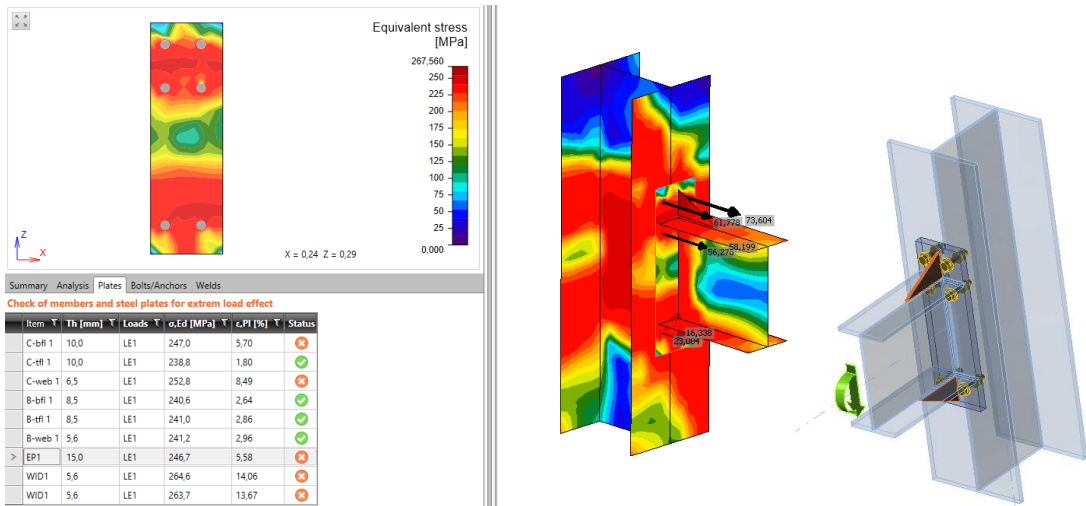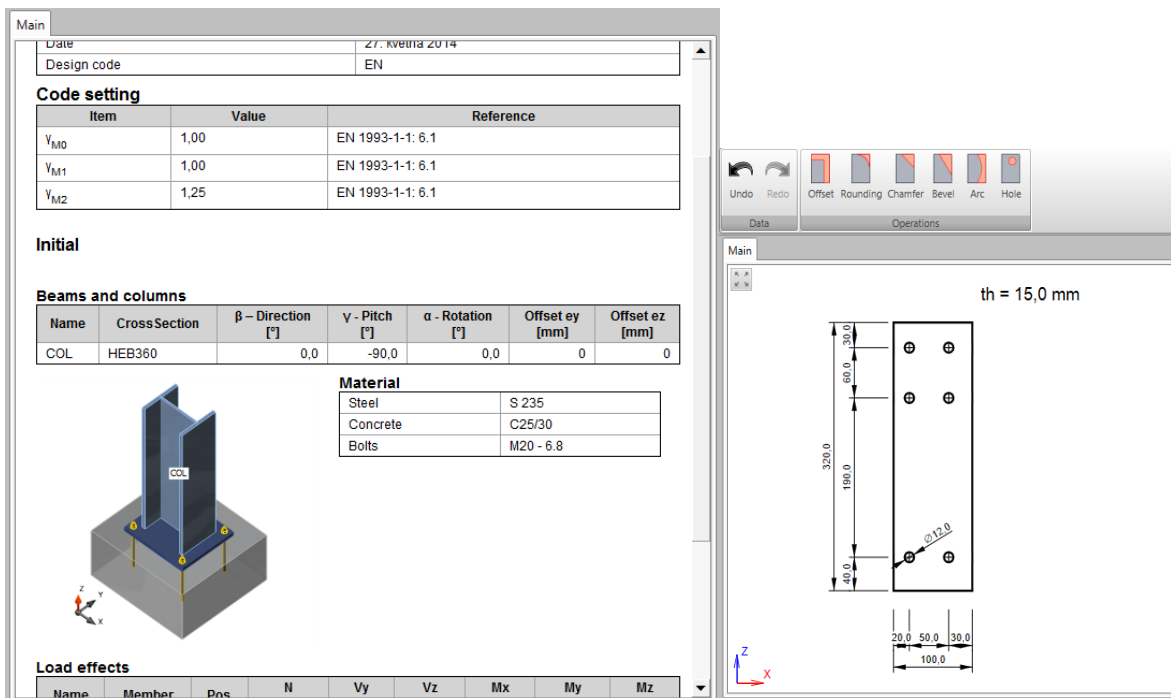

Report, drawings, bill of material

Overall report is composed in several levels of detail:1 line / 1 page A4/ Detailed

Bill of all steel plates, bolts and welds is provided

Shop drawings of all plates are generated

R&D project IDEA Connection

R&D project has started in 2013 with a question: "Can we analyze steel joints in a more precise and general way?" We know the answer today: "YES, we can!"

Research and development team was created from core employees of IDEA RS and academic staff from two Czech universities:

- IDEA RS – Lubomír Šabatka & team
- FCE CTU Prague – prof. František Wald & team
- FCE BUT Brno – prof. Miroslav Bajer & team

Our technical background:

- Long-term experience with development of component method (CM)
- Practical experience with design of steel structures
- Proven professional experience with FEM and SW development

The goal was to develop a method and tools for analysis and check of steel joints of general Method has to be:

- ➢ **general** so that it is useable for most of joints, anchors, and details used in building practice
- ➢ **simple and fast** so that it provides results in time comparable with currently existing methods and tools
- ➢ **comprehensible** so that structural engineer gets clear information about joint behavior, stress, strain and reserves of individual components and about overall safety and reliability

Ideal elastic/plastic material diagram
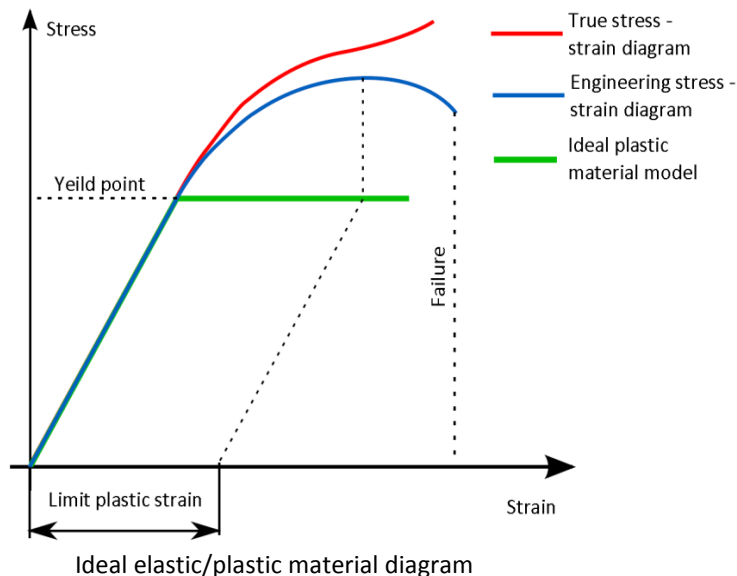

Live testing of new CBFEM method

Impacts for daily work of engineers

Our motto is „Calculate yesterday's estimates" and IDEA Connection is a perfect example of this. We researched a new CBFEM method which can design steel joint of arbitrary topology and loaded in all directions. We put this functionality in a product with a powerful computing and graphic engine but kept it simple enough to make it accessible to the engineering public, not just a couple of academics. We kept the calculation time comparable to currently used (and simplified) methods because IDEA Connection creates CBFEM model automatically, you can work on your task right away. f

IDEA Connection enables engineers to design every new steel construction cheaper and safer by:

- **Minimizing risks of structural defects**
- **Decreasing material consumption of steel construction members/details by up to 30%**
- **Providing 100% "white box" results for engineers, general contractors, checkers and construction authorities.**

Our beta testing group and first users report that they can get results to sophisticated connection tasks in 20 seconds.
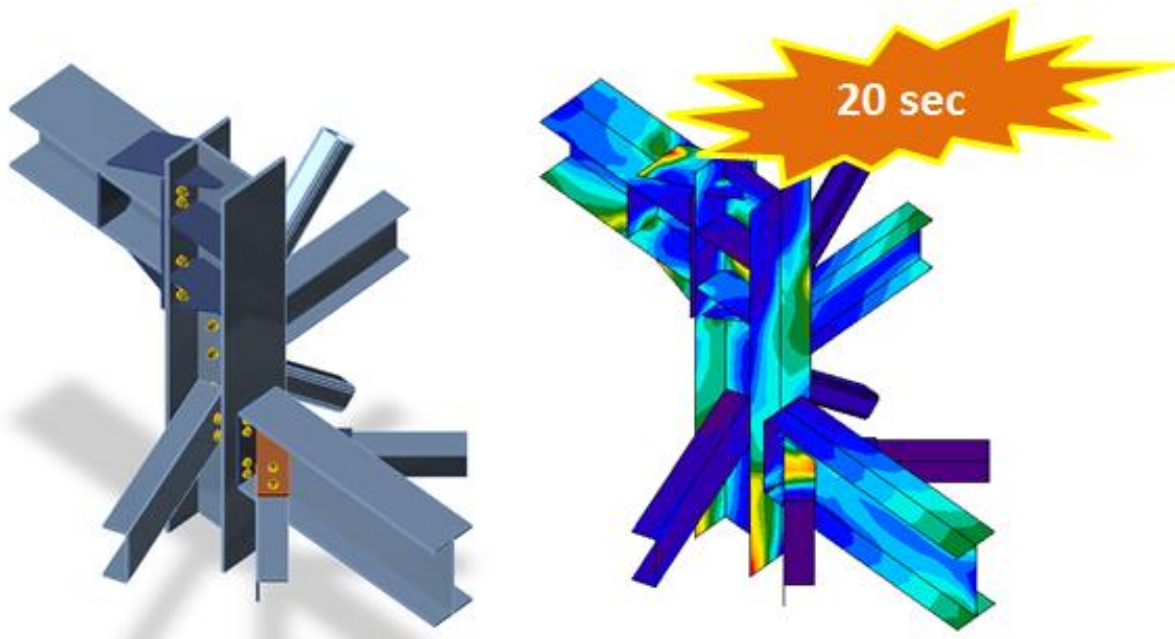
Get more information

Visit our website www.idea-rs.com to find out more the product, method and people who created it.
Request a FREE trial of IDEA Connection at info@idea-rs.com.
Drop us an email with question or schedule a Skype call with one of our consultants