

Release notes Advance Design Connection 10.1

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Introduction

We are proud to publish the version 10.1 of Advance Design Connection (ADC), the exclusive GRAITEC branded version of IDEA Statica Connection of our partner Idea Statica.

This version brings an exceptional volume of new features and improvements. All that with our focus to enable engineers to work faster, evaluate the requirements of the national code thoroughly and use the optimal amount of material.

To speed up the design process, our new **batch analysis** helps the structural engineer to code-check all connections in the project in one swing. We have implemented a long-desired manufacturing operation “**Negative volume (NVOL)**” and improved the meshing of the hollow sections. We have finally figured out geometrical nonlinearity (**GNMA**) for steel connections.

BIM workflows are crucial in everyday work of structural engineers and fabricators. We have updated the BIM links and re-worked the **IOM** interface. This public API can be used for creating a link between ADC and any FEA or CAD software.

Have you ever needed your colleague to export a connection from **Advance Steel**, but the license was not on his machine? Now he can get a **FREE plugin to export from Tekla Structures, Advance Steel and Revit**. Also, very helpful in coordinating engineering work with detailers.

We hope you will enjoy all our new features and improvements and would love to hear your feedback anytime.

Calculate yesterday’s estimates!

Installation and licensing

ADC Version **10.1 will not overwrite 10.0 installation**. You will have both on your PC. All future versions of ADC will behave the same way to ensure a smooth transition between versions.

From September 2019, our partner IDEA StatiCa no longer supports installation on Windows 7.

Version **10.1 does not require license update** or any other action from the end-users, just download the latest setup.

Single licenses – ADC 10.1 can be downloaded on all PCs of the one user (sharing the license with other users is forbidden according to EULA – no change from previous versions)

Network licenses – ADC 10.1 has to be deployed on all end-machines and multiple users can access it based on purchased number of seats

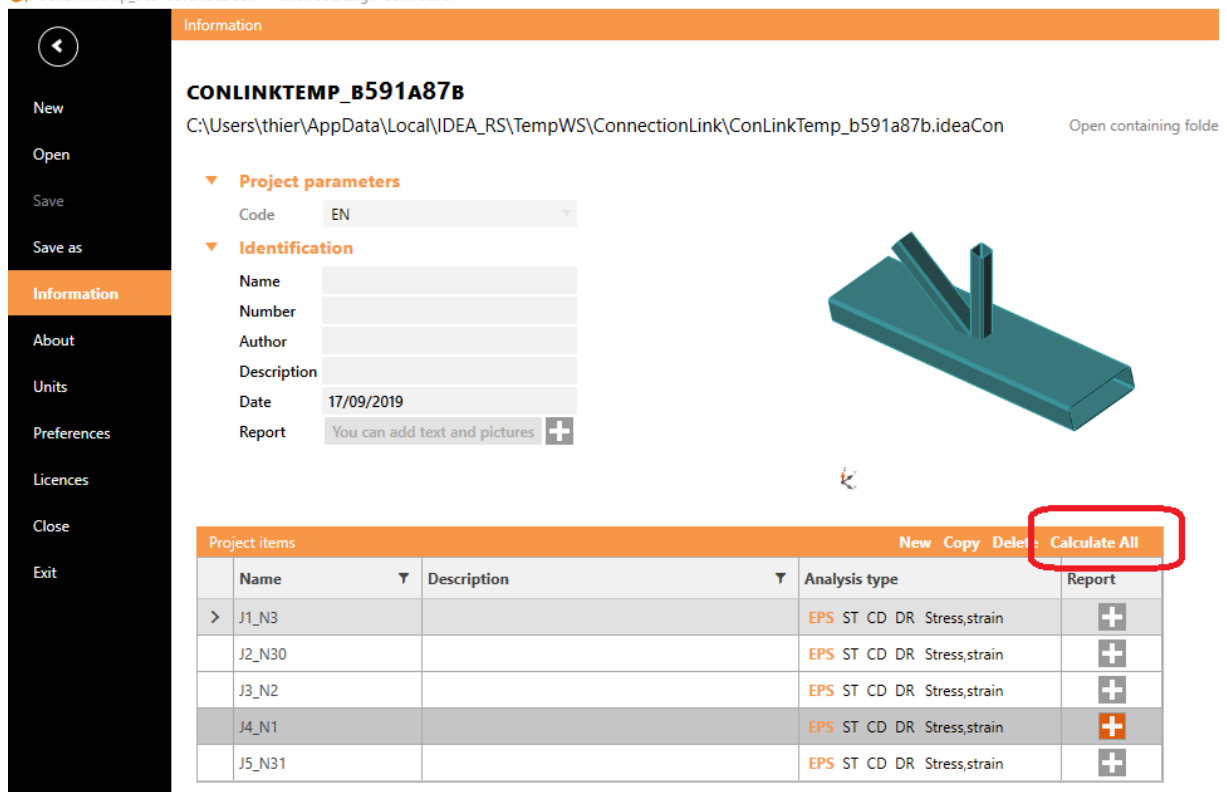
Advance Design Connection

Batch analysis process

The new batch feature for analysis of multiple-item projects is now available to calculate all the items at once.

All previously prepared project items can be analysed in one batch by using the “Calculate all” command in the Project items table.

ConLinkTemp_b591a87b.ideaCon - Advance Design Connection



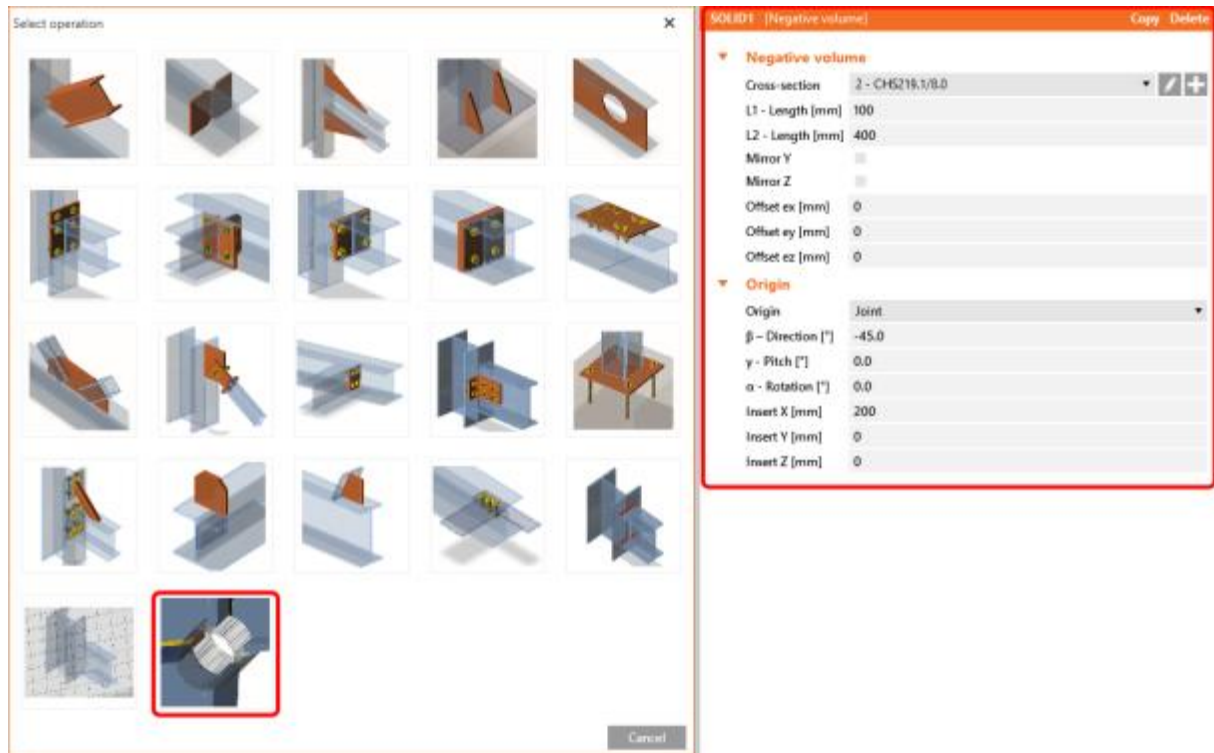
The screenshot shows the software interface for "Advance Design Connection". On the left is a dark sidebar with navigation options: New, Open, Save, Save as, Information (highlighted), About, Units, Preferences, Licences, Close, and Exit. The main area has an orange header "Information" and displays project details for "CONLINKTEMP_B591A87B". The file path is "C:\Users\thier\AppData\Local\IDEA_RS\TempWS\ConnectionLink\ConLinkTemp_b591a87b.ideaCon". There are sections for "Project parameters" (Code: EN) and "Identification" (Name, Number, Author, Description, Date: 17/09/2019, Report). A 3D model of a mechanical part is shown. At the bottom, a "Project items" table is visible, with the "Calculate All" button circled in red.

Project items		New	Copy	Delete	Calculate All
Name	Description	Analysis type	Report		
> J1_N3		EPS ST CD DR Stress,strain	+		
J2_N30		EPS ST CD DR Stress,strain	+		
J3_N2		EPS ST CD DR Stress,strain	+		
J4_N1		EPS ST CD DR Stress,strain	+		
J5_N31		EPS ST CD DR Stress,strain	+		

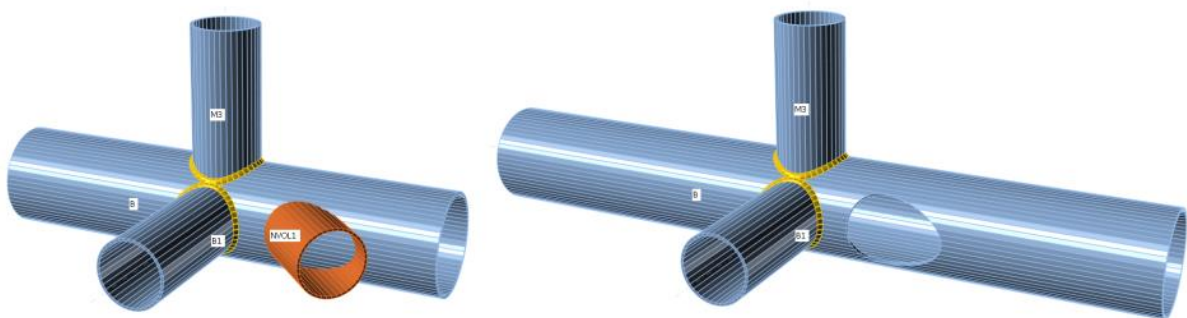
New manufacturing operation: Negative volume

The “Negative volume” operation has been added to define an auxiliary member that enables some subsequent advanced manufacturing operations.

The negative volume can be used to subtract some intersecting parts of members. This comes in handy in case of special openings of irregular shapes.



See an example of the “Negative volume” manufacturing operation used together with “Cut of member” to create an opening in the pipe.

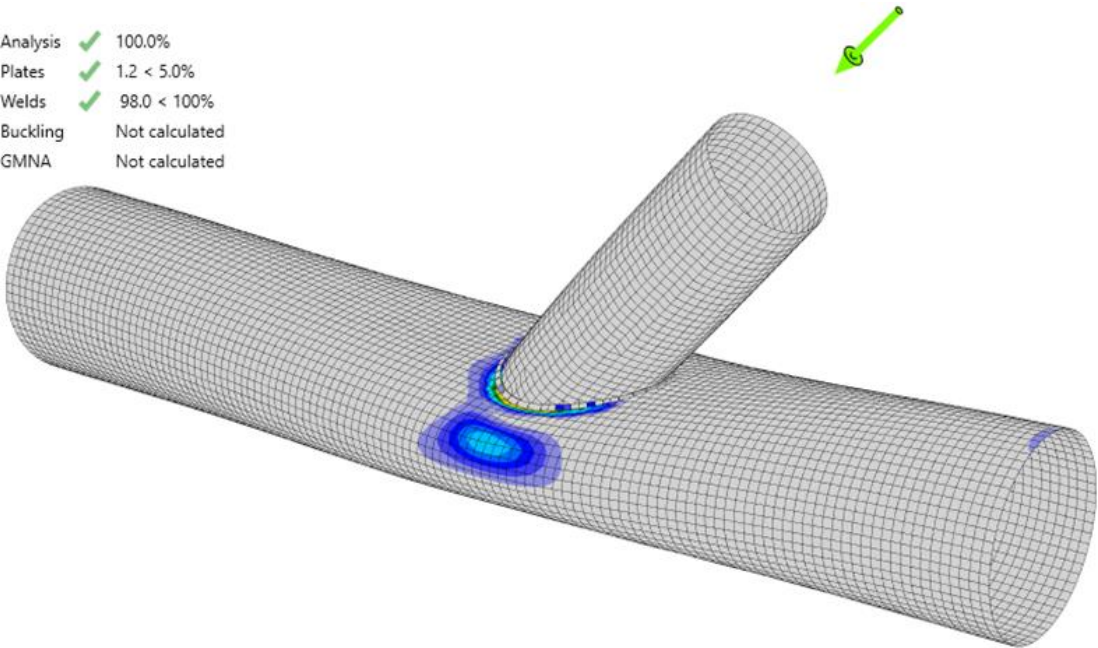


Auxiliary member (negative volume) and modelling of an opening in the pipe

Geometrically and materially nonlinear analysis (GMNA)

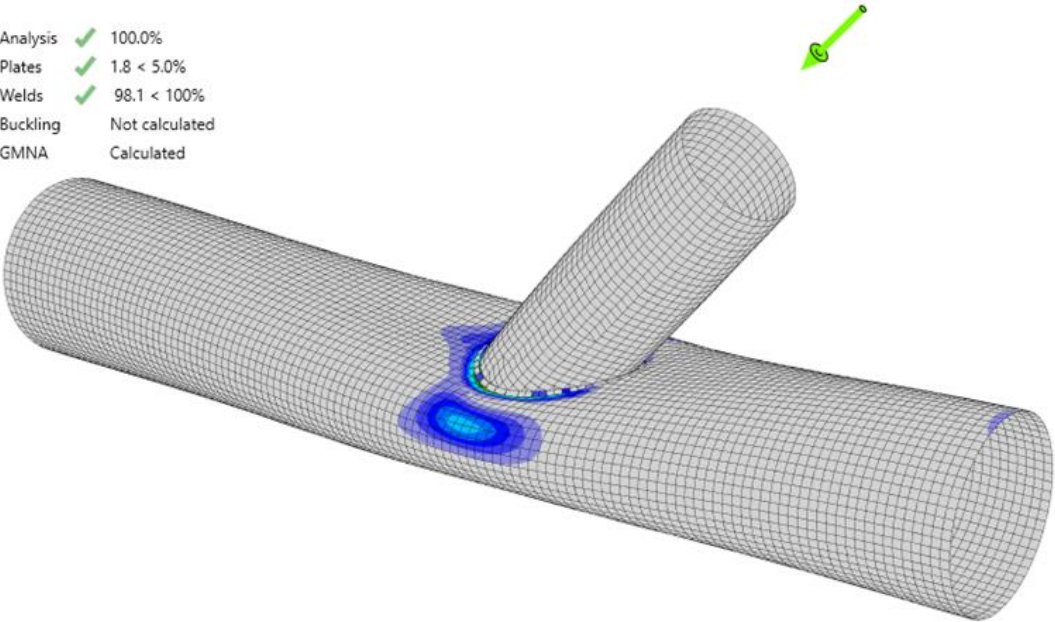
A brand new type of analysis for the hollow section members was implemented. Geometrically nonlinear analysis (GMNA) is an important part of the code-check for the hollow section members with significant influence on the calculated resistance of the whole connection. GMNA feature is turned on by default in all new projects where a bearing member has hollow cross-section assigned to it. Projects from previous versions keep their original settings. Users can switch into GMNA in the code setup dialog.

Analysis	✓	100.0%
Plates	✓	1.2 < 5.0%
Welds	✓	98.0 < 100%
Buckling		Not calculated
GMNA		Not calculated



Geometrically linear analysis of the hollow section joint

Analysis	✓	100.0%
Plates	✓	1.8 < 5.0%
Welds	✓	98.1 < 100%
Buckling		Not calculated
GMNA		Calculated



Geometrically nonlinear analysis of the hollow section joint

Until 10.0, CBFEM method has used the materially nonlinear analysis (MNA method, elastic-plastic working diagram). This solution is sufficient for the vast majority of connection cases. For specific hollow section members and/or members with extremely slender walls, point loading can cause high local deformations (especially of cross-sections) which influences the overall stability of the member. That is why we have developed a new and more advanced analysis based on the geometrically nonlinear solution which takes these effects into account. The new analysis is called GMNA – geometrically and materially nonlinear analysis. We have verified this approach using models from ANSYS and ABAQUS.

GMNA calculation brings results of the analysis closer to real behaviour (but not necessarily to the code requirements). This might result in a scenario when a connection created in 10.0 and recalculated in 10.1 using GMNA gives different results. In general, results are less conservative for members in tension and more conservative for members in pressure.

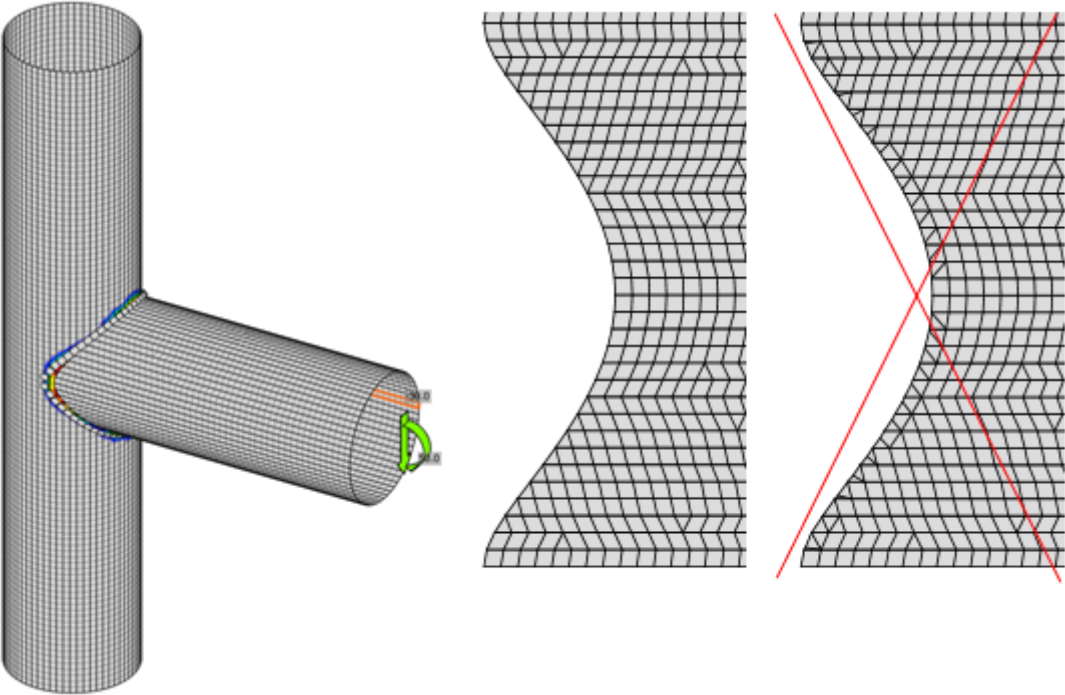
GMNA analysis was developed because CBFEM gives different results than code-procedures for K, X, T, etc. joints. With GMNA the results will be closer to the code ones.

You can calculate the GMNA for all kind of connections, but it will not make the results so different in the case of hot rolled I sections.

It is possible that some connections designed in the previous version, especially those designed very aggressively and/or with border-line code-check values, will no longer pass the code-check in version 10.1. We recommend of recalculating them in version 10.1 and investigate the differences with the previous version together with GRAITEC or directly with IDEA StatiCa.

Updated meshing of hollow section members

In the last versions, mapping the finite elements to the intersection of the hollow section members was a complicated task which often led to the uneven size of finite elements around the intersection edge. That concluded into high average maximum values and local extremes generated on the small triangular elements. The improved mesh generator can create more regular mesh around the edge at the intersection of the hollow members which will provide better results.



Russian design code – check of concrete block resistance

Code check of the concrete block resistance according to the SP 63.13330.2012, Cl. 8.1.44 has been implemented.

Analysis Plates Welds Anchors **Concrete block**

Check of contact stress in concrete for extreme load effect

Status	Item	Loads	N [kN]	R _{b,loc} [MPa]	A _{b,loc} [mm ²]	Ut [%]
<input checked="" type="checkbox"/>	CB 1	LE1	384.6	30.7	85227	19.6

Concrete block bearing resistance check (SP 63.13330.2012, Cl. 8.1.44)

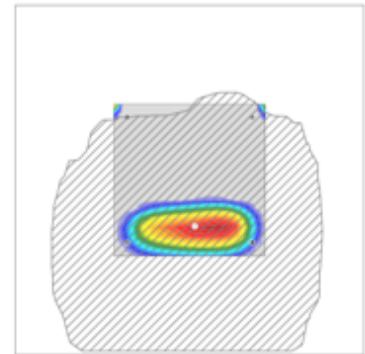
$$\varphi \cdot R_{b,loc} \cdot A_{b,loc} = 1961.5 \text{ kN} \geq N = 384.6 \text{ kN}$$

Where:

- $N = 384.6 \text{ kN}$ – local compressive force from an external load
- $\varphi = 0.75$ – factor for non-uniform distribution of the local load across the bearing surface
- $R_{b,loc} = \varphi_b \cdot R_b = 30.7 \text{ MPa}$ – design compressive resistance of concrete in case of the local impact of compressive force
- $R_b = 14.2 \text{ MPa}$ – design value of concrete axial compressive resistance:

- $R_b = \frac{R_{bc}}{\gamma_b}$, where:
 - $R_{bc} = 18.5 \text{ MPa}$ – concrete compressive strength
 - $\gamma_b = 1.30$ – concentration factor taking into account the triaxial stress in concrete
- $\varphi_b = 2.16$ – concentration factor

- $\varphi_b = 0.8 \cdot \sqrt{\frac{A_{b,max}}{A_{b,loc}}}$; $1.0 \leq \varphi_b \leq 2.5$, where:
 - $A_{b,loc} = 85227 \text{ mm}^2$ – application area of the compressive force
 - $A_{b,max} = 619231 \text{ mm}^2$ – maximum design area



Concrete block check in SP code

Chinese design code (GB)

The Chinese steel design code (CHN) for steel-to-steel joints is now available besides five other standards. Component bolts, preloaded bolts, and welds are checked according to GB 50017 including detailing. Detailing check for bolts and concrete block resistance check has been implemented too.

Steel grades, bolt grades, and typical Chinese steel cross-sections are listed in the library

The image shows a software interface for creating a project. On the left, there is a form with the following fields:

- Name: [Empty]
- Description: [Empty]
- Steel grade: Q345
- Bolt assembly: M16 8.8 A, B
- Weld grade: E43
- Concrete grade: C25
- Design code: [China]

Below the form is a 3D model of a steel joint. At the bottom of the form is an orange button labeled "Create project".

On the right, there is a "Cross-section" dialog box with a list of steel profiles. The list includes:

- HP (CISC TSS 9.2)
- M (CISC TSS 9.2)
- S (CISC TSS 9.2)
- W (CISC TSS 9.2)
- WWF (CISC TSS 9.2)
- HP (AISC 14.1)
- M (AISC 14.1)
- S (AISC 14.1)
- W (AISC 14.1)
- FOCT 8239-89
- FOCT 26020-83
- FOCT P 57837-2017
- CTO AC4M 20-93
- UB
- TFB (AUS)
- UB, UC (AUS)
- UBP (AUS)
- HM (China)
- GB-I (China)
- HN (China)
- HT (China)
- HW (China)

The "HM (China)" entry is highlighted in the list. The dialog box also has "OK" and "Cancel" buttons at the bottom.

Chinese standard and cross-sections

BIM

A lot of effort has been put to improve BIM procedures and workflows. In version 10.1, several new BIM links has been integrated. You can now use the link with:

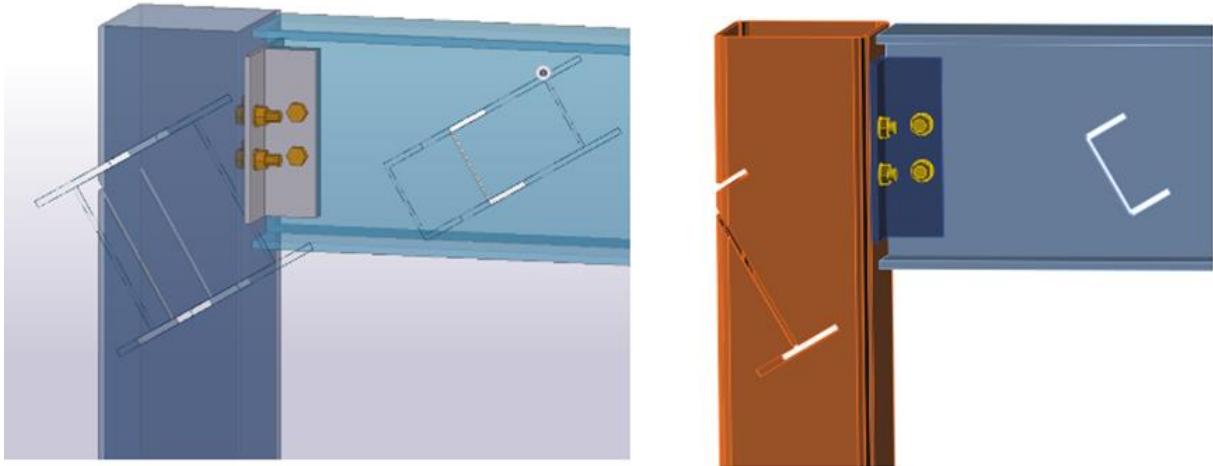
Advance Design Connection	
Application	Supported version
Advance Design	2018, 2019, 2020
AxisVM	X5 2c
ETABS	17.0.1, 18.0.2
Midas Civil + Gen	2018, 2019
Revit	2019, 2020
RFEM	5.19. 5.20
Robot Structural Analysis	2019, 2020
RSTAB	8.19, 8.20
SAP2000	20.2.0, 21.0.2, 21.1.0
SCIA Engineer	18.1, 19.0
STAAD.Pro V8i	20.07.11.70
Tekla Structural Designer	2018i, 2019
Consteel	12, 13
SCADAPro	17
Modest	8
Advance Steel	2019, 2020
Tekla Structures	2018, 2018i, 2019

*For Robot Structural Analysis, SAP2000 and ETABS, version 10.1 supports only the direct export of connection/beam through the Code-check manager. The export of the whole model to IDEA StatiCa BIM is discontinued.

Improved export from Tekla Structures

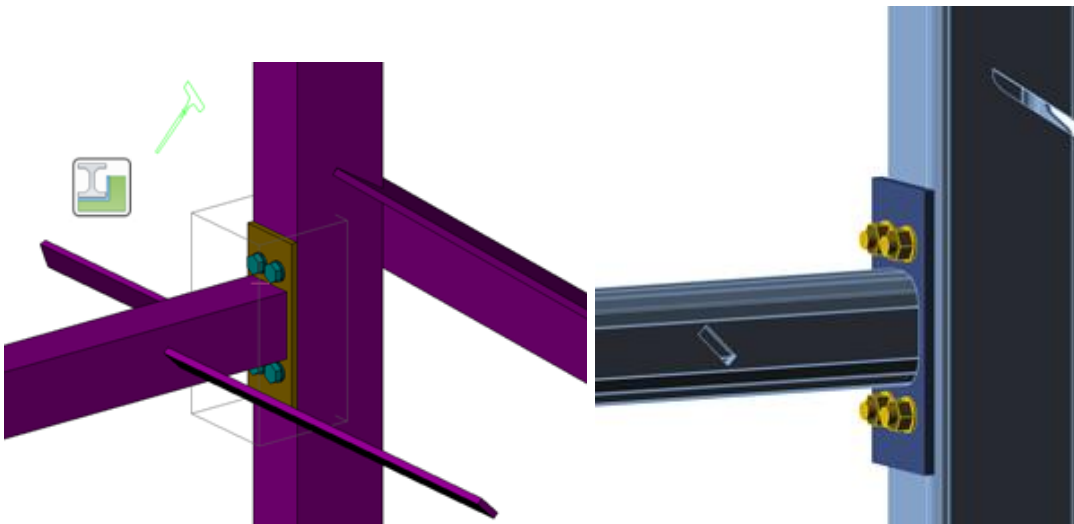
Negative volume manufacturing operation implemented in IDEA StatiCa Connection also improves the export process from Tekla Structures.

All properly modeled openings in Tekla Structures are now exported to IDEA StatiCa Connection.



Improved exports from Advance Steel

Negative volume manufacturing operation implemented in IDEA StatiCa Connection also improves the export process from Autodesk Advance Steel. All properly modeled openings using Element contour-UCS command are now imported to IDEA StatiCa Connection.



The viewer

New workflow for engineers and detailers without IDEA StatiCa license

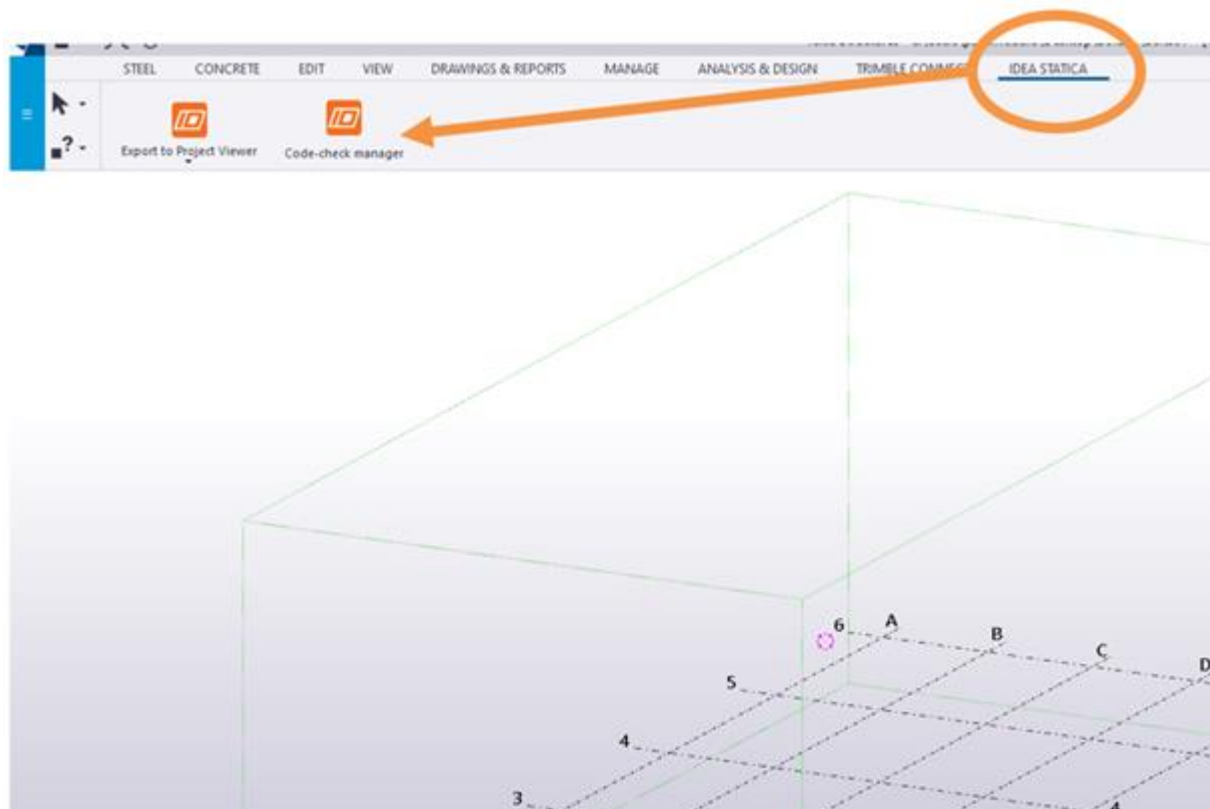
Have you ever needed your colleague to export a connection from Tekla Structures, but ADC license was not on his machine? Now he can get a FREE plugin to export from Tekla Structures, Advance Steel and Revit.

Moreover, all detailers without IDEA StatiCa license can export a connection to the Project Viewer and send the .ideacon file to the structural engineer.

Export from Tekla Structures and Autodesk Revit

IDEA StatiCa ribbon inside Tekla Structures or Revit now has two buttons:

- **Code-check manager** – this is the standard desktop integration activated while installing IDEA StatiCa setup (and it is paid). It enables to work with multiple connections at a time, synchronize models, etc.
- **Viewer** – new button to export any connection to the online environment of the IDEA StatiCa Viewer. This is FREE. That means it does not require a license of IDEA StatiCa. It gets activated by downloading the plugin from IDEA StatiCa website or Tekla Warehouse (Autodesk AppStore).



Export from Advance Steel

IDEA StatiCa is called using commands in Advance Steel.

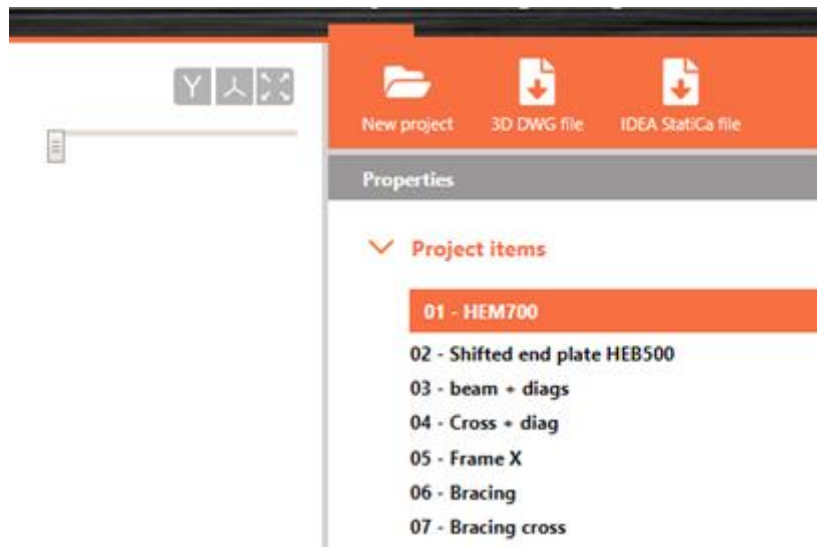
CONUI – launches the **Code-check manager**. This is the standard desktop integration activated while installing IDEA StatiCa setup (and it is paid). It enables to work with multiple connections at a time, synchronize models, etc.

There are now **six new commands** to export any connection to the online environment of the IDEA StatiCa Viewer. This is FREE. That means it does not require a license of IDEA StatiCa. It gets activated by downloading the plugin from IDEA StatiCa website or Autodesk App Store. They differ according to the desired design code:

- CONEXPORT-EN
- CONEXPORT-AISC
- CONEXPORT-CISC
- CONEXPORT-AS
- CONEXPORT-SP
- CONEXPORT-GB

Export options from Viewer

IDEA StatiCa Viewer has a new export option: download IDEA StatiCa project file (.ideaCon) that can be opened in the desktop version.



This is accessible right in the main ribbon, next to the export to 3D DWG.