



# BIM Expert

BIM EXCHANGE SOFTWARE



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**BuildSoft**  
structurally *loved* by engineers



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BIM Expert by BuildSoft



# BIM Expert

## Sharing BIM models

BIM Expert is an easy-to-use program for sharing analysis&design and drawing models between different software packages. It can be linked both to the BuildSoft product range and to external software like Tekla Structures, Idea Statica, etc. BIM Expert is the ideal tool to synchronise model geometry, cross-sections, materials, boundary conditions and loads effortlessly between your different software products. We guarantee a short learning curve so you can start using BIM Expert in no time.

## More user-friendly

BIM Expert guarantees transparent management of models and keeps adapting to your needs and desires. The result is a clearly structured work environment where you can share your models without any hassle.

## Always on standby

The BIM Expert program is installed as a Windows service, which makes it directly accessible from your modelling or analysis software. This ensures a fast response to your transfer requests.

## Comprehensive solution

Every plug-in offers a complete solution to convert models from and to the universal BuildSoft file format. To share models with other parties, you only need the plug-in that goes with your application, as long as the other parties use BIM Expert with the plug-ins that go with their applications.

## Flexible product structure

With its well-conceived license structure, BIM Expert always has the right solution for you, at a clear-cut price. The unique plug-in system can easily be extended so that you can gradually communicate with more and more software products.

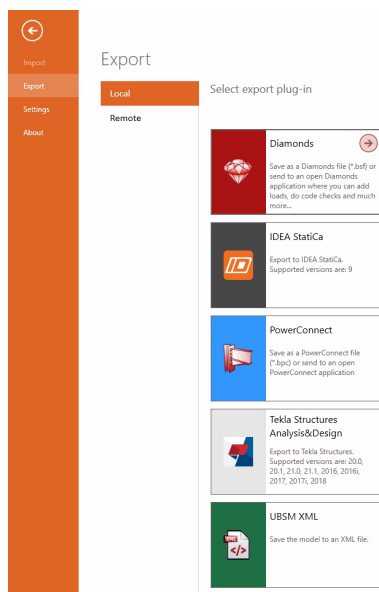
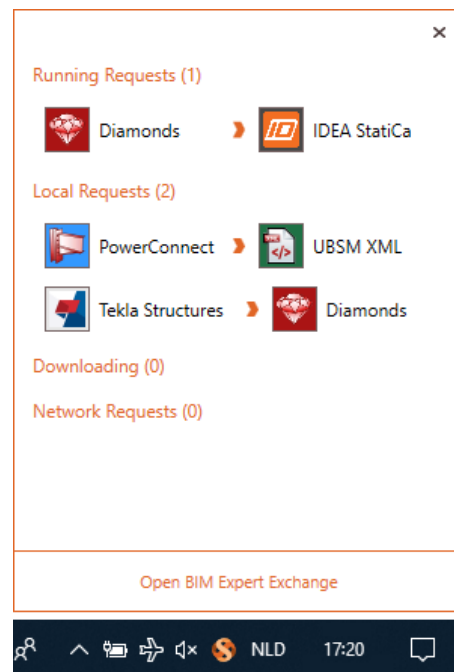
# BIM Expert

## At your service

Once you've started up BIM Expert, it works as a Windows service, which means that requests can be received from different programs. Even when you don't use BIM Expert, it will still be there running in the background, so you don't need to worry about it.

As a Window service, BIM Expert is always on standby, picking up every transfer request immediately. Different requests are placed in a clear waiting list and processed automatically when the current transfer is completed.

Should the service unexpectedly stop working, there are advanced repair options to ensure that you can always count on BIM Expert's synchronisation capacity.



## Plug-ins streamline communication

BIM Expert gives you access to a wide range of plug-ins to communicate between various software products. Start with a model in one of the BuildSoft programs or in a modelling software program like Tekla Structures. Then send your model to BIM Expert via the relevant plug-in that is installed on your device.

## One shared library

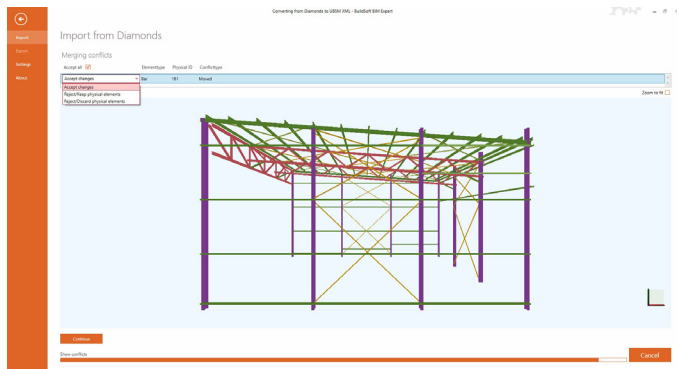
All BuildSoft applications and plug-ins share a database with materials, cross-sections, nuts and bolts without requiring any conversion. External software plug-ins contain mapping files to match cross-sections and materials, to ensure a flawless conversion. Model geometry and any loads that may be present are neatly translated into the universal BIM Expert format.

## One language for all plug-ins

BIM Expert provides a shared model definition, called Unified BuildSoft Model (UBSM). This format is a language shared between all plug-ins with which BIM Expert communicates. The UBSM file format is based on an Extensible Markup Language (XML), which ensures that files are readable to machines as well as humans.

```
<?xml version="1.0" encoding="utf-8"?>
<Model Version="1.1" ID="2b5b31f9-fab7-4d04-8f26-9c64e9d71d12">
  <Name Default="My new BIM Expert model" />
  <PhysicalModel ID="62b5b1b1-6c7e-4632-a8f1-dc4c723c27dd">
    <Name Default="My new BIM Expert model" />
    <Materials>
      <Material ID="26b3a195-f405-4ef1-b458-9ba568c6858e">
        <Name Default="C25/30" />
        <MaterialType>Concrete</MaterialType>
        <LastChanged>2018-08-02T08:00:00</LastChanged>
        <ReadOnly>true</ReadOnly>
      </Material>
      <Material ID="f441852e-31aa-4708-9a1f-6e9591e03e9">
        <Name Default="S235" />
        <MaterialType>Steel</MaterialType>
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        <ReadOnly>true</ReadOnly>
      </Material>
    </Materials>
    <ParametricSections>
      <ParametricSection ID="85b45c2b-7707-418c-8164-7fbeeab940d4">
        <Name Default="300*500" />
        <SectionType>SolidRectangle</SectionType>
        <MaterialID>26b3a195-f405-4ef1-b458-9ba568c6858e</MaterialID>
        <Measurements>
          <Measurement ID="1" Name="H" Value="0.3" />
          <Measurement ID="2" Name="B" Value="0.5" />
        </Measurements>
        <LastChanged>2019-01-14T14:59:00.9089485Z</LastChanged>
      </ParametricSection>
    </ParametricSections>
  </PhysicalModel>
</Model>
```

# BIM Expert



## Inspection tools

BIM Expert gives you a preview of the incoming structure from a plug-in. You can then simply superimpose the physical model and the analysis model and compare them. The BIM Expert tools allow you to inspect the model for flaws and adjust it before sending it to the next plug-in. This guarantees an effective transfer of the model at all times.

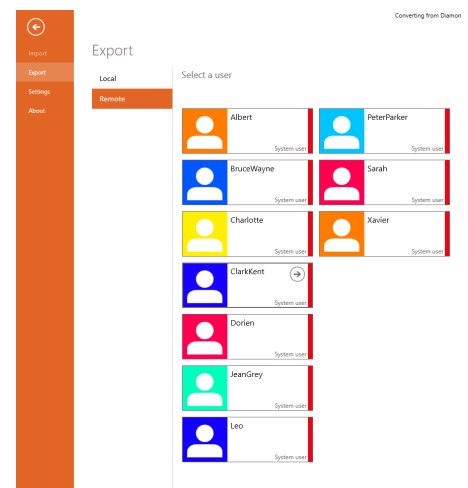
When you make a round-trip, BIM Expert will inform you of position changes in the model. BIM Expert will list these for you and automatically select the relevant bars when running through each item on the list. This way you can study and assess each change in detail. You can choose to accept or deny each change one by one.

## Synchronise locally and via the network

As easily as you can synchronise your models locally on your own device, you can also send them to colleagues, in your company or even elsewhere. Simply choose the user and see if they are logged on. If you are sending your models to a colleague who is absent, the BIM Expert Service will ensure that they remain available until the colleague logs on again. Once your colleague has received the model, he or she can decide to which software to transfer it, by selecting the relevant target plug-in.

Thanks to the well-designed structure for the local as well as network use of BIM Expert, it is not necessary for all users in your company to have all of the BIM Expert plug-in licenses, or for all users to have all of the target software licenses themselves.

This new way of sharing analysis and drawing models is a revolution in co-working between designers and draftsmen. The two parties can be in the same office, or on opposite sides of the globe. With the BIM Expert Server edition, all drawing and analysis models are just 1 click away, no matter where in the world you are.



## Your own plug-in via the BIM Expert API

The Application Programming Interface (API) enables you to create your own plug-ins, allowing BIM Expert to link and communicate with your applications or data sources, e.g. spreadsheets.

For the purpose of the API, a collection of definitions and libraries are provided in BIM Expert. You can request the BIM Expert API manual.

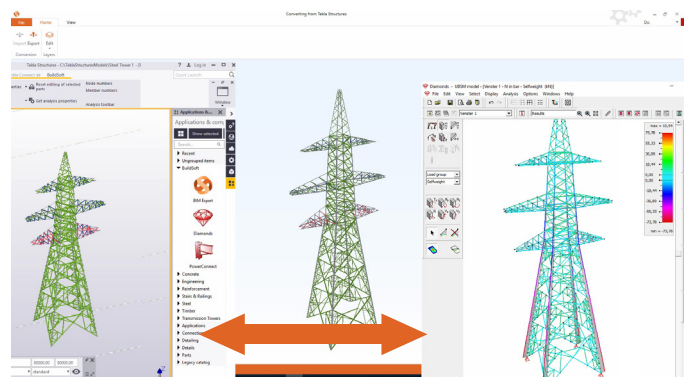
# Examples of exchanging

## Endless possibilities for exchanging

With each new plug-in, the well-designed BIM Expert plug-in system opens up a world of communication possibilities. Each time you add a plug-in to those you already have, you double the number of sharing possibilities. If you have  $n$  plug-ins, you will have  $2^n$  possible exchange paths. This is what makes the BIM Expert solution so unique in its kind and its possibilities. Synchronising models and making round-trips has never been this easy.

## Tekla Structures < > Diamonds

In Tekla Structures, you can make an analysis model of the entire or part of the structure. You can then immediately send the model to Diamonds via BIM Expert, the Tekla plug-in and the Diamonds plug-in. You can choose to write the model to file or to an open Diamonds session.



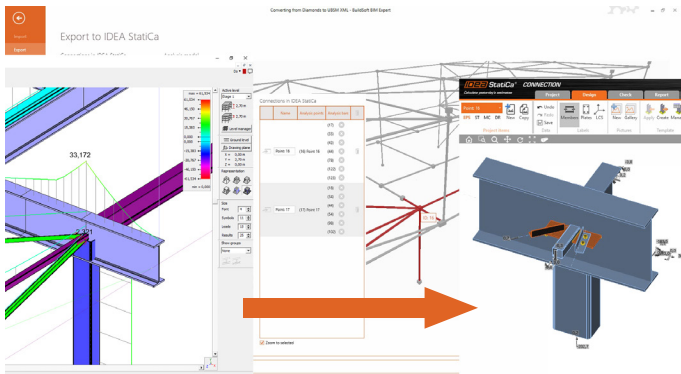
Thanks to mapping files for cross-sections and materials, all Tekla Structures cross-sections and materials are compared and matched with those in Diamonds, and converted. Non-existent cross-sections or materials will be newly created in Diamonds.

Extra Diamonds parameters such as supports, hinges and loads, remain linked to the BIM Expert model. When you go back to Diamonds with an adjusted Tekla Structures model, you will already have the allocated conditions and loads. You can complete the model with supports (rigid, flexible, soil profile...) and loads (point, line, wind, snow, fire and seismic loads). You can then execute a 1<sup>st</sup> or 2<sup>nd</sup> order analysis and quickly obtain the optimal dimensioning.

After the analysis, steel, concrete and timber design, and adjustment of cross-sections if necessary, you can synchronise the Diamonds model via the BIM Expert with the one in Tekla Structures. You also have the option of copying the model a new analysis model.

The Tekla Structures model may also have been adjusted by a colleague in the meantime. BIM Expert will create a preview and a clear summary of the changes that were made to the start model in Tekla Structures on the one hand, and brought about by Diamonds on the other hand. As user, you have full control over which elements are kept, removed or adjusted.

# Examples of exchanging



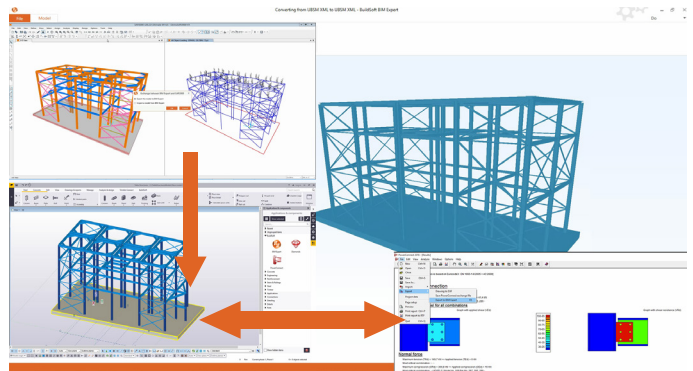
## Diamonds > Idea Statica Connection

Use the F8 short-cut key or the menu, you send the complete Diamonds calculation model with results to BIM Expert via the Diamonds plug-in. In BIM Expert, you choose from the 3D model 1 or more nodes that you want to check with Idea Statica Connection. The Idea Statica plug-in will then translate the geometry, cross-sections, materials, loads and standard information to an Idea Statica Connection file and automatically

open it for further detailing of the chosen connections.

## SAP2000 > Tekla Structures < > PowerConnect

Send the calculation model with loads and results from SAP2000 to BIM Expert via the SAP 2000 plug-in. You can then send this model with BIM Expert to Tekla Structures via the Tekla plug-in. In Tekla Structures, you complete the model with connection components like end plate, fin plate or column base connections. You can choose between different connection components (14, 24, 29, 40, 41, 77, etc.). From here, you can send the adjusted model back to BIM Expert via the Tekla plug-in and check the connections with PowerConnect using the PowerConnect plug-in. You load each connection separately in PowerConnect. PowerConnect will recognise the geometry so that the connection can be optimised. The present loads are those calculated from SAP2000, with detailing attributed by the Tekla Structures connection component. PowerConnect calculates the connection and compares the strength with the related loads. If the connection is insufficient, you can make changes in the bolt configuration and add extra stiffening components such as haunches, web plates and stiffeners etc. You send all adjustments back to Tekla Structures via BIM Expert, with recognition and retention of Tekla components. If another connection component is a better match for the adjusted component from PowerConnect, for example with the addition of a haunch, the connection component will automatically be updated to the best match.



## Tekla Structures 20.1 < > Tekla Structures 2018i

You send the complete or a part of the structure from Tekla Structures 2018i to BIM Expert via the Tekla plug-in. Cross-sections and materials will be matched according to the mapping file that goes with Tekla Structures 2018i. You can now easily send the BIM Expert model to an earlier version of Tekla Structures, e.g. 20.1. As this version also has its own mapping files, cross-sections and materials are neatly converted so you can work further in Tekla Structures 20.1.

# BIM Expert licenses

## Advantageous

BIM Expert is a modular exchange software. You only pay for what you really need. Thanks to the well-designed bundling of features, you can easily use the Packs to choose a sharing solution that is ideally suited to your needs.

## Flexible

The ingenious BIM Expert license structure allows you to work out a solution at all times that is tailored to you. Every solution can also be extended so that you can gradually link up to more programs and synchronise more models.

- ✓: standard function
- €: in option
- °: future development

BIM EXPERT
Local use
Network <= 5 users
Network 5 < users <= 15
Network 15 < users
PLUG-INS*
Diamonds
PowerConnect
Tekla Structures
Idea Statica
SAP 2000
IFC °
Revit °

BIM Expert Design Packs		
Complex Connections	Modeling & Analysis	Modeling & Analysis Plus
✓	✓	✓
€	€	€
€	€	€
€	€	€
✓	✓	✓
✓	€	✓
€	✓	✓
✓	€	€
€	€	€
€	€	€
€	€	€

\* : Plug-ins only contain the link to the relevant software. The software itself must still be purchased separately.



# BIM Expert licenses

BIM Expert Unlimited Packs		
1 Work station All plug-ins	15 Work stations All plug-ins	Unlimited # Work stations All plug-ins
✓	✓	✓
€	€	€
€	✓	€
€	€	✓
✓	✓	✓
✓	✓	✓
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✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓

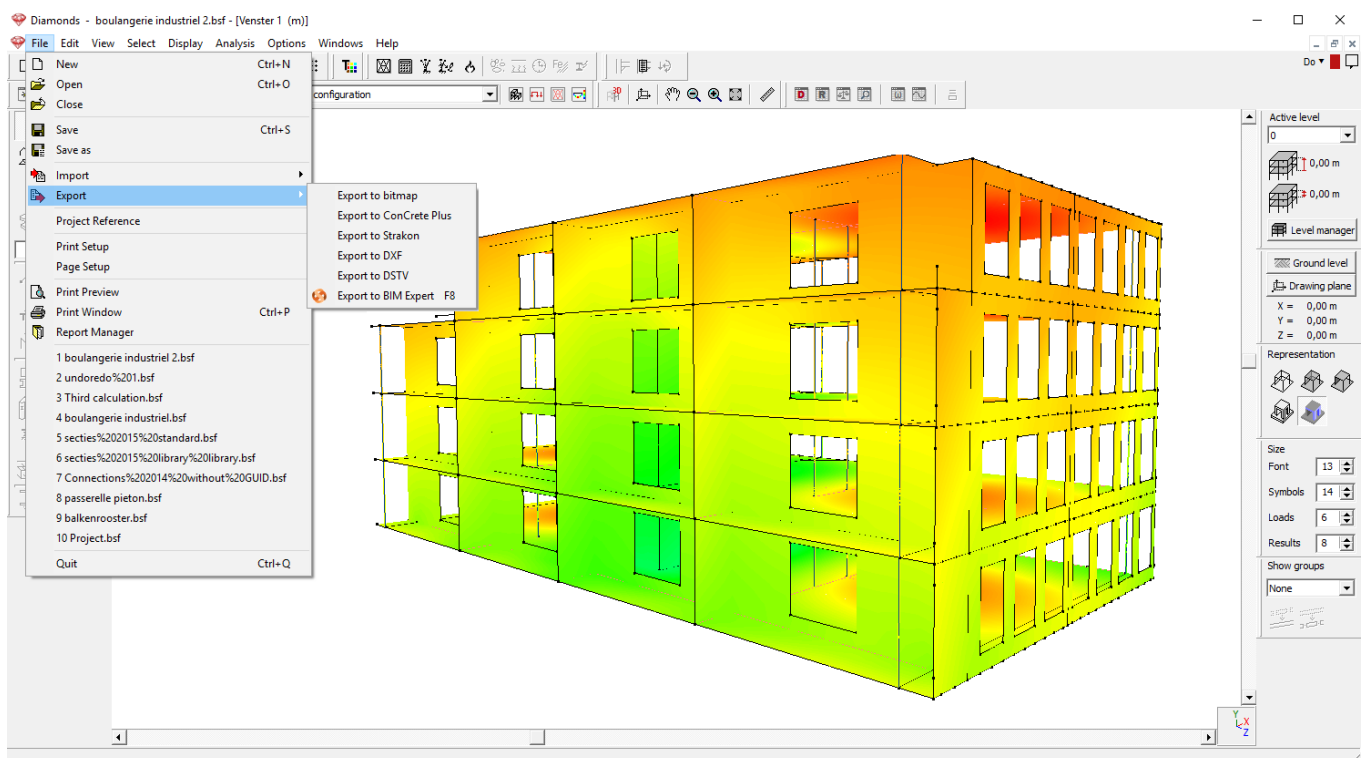
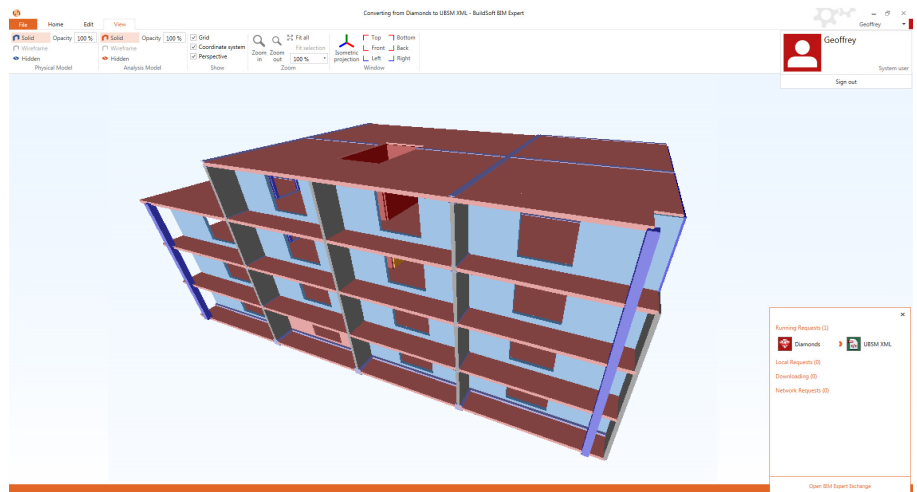
# Diamonds plug-in

MODELING – GLOBAL ANALYSIS – DETAILING – OTHER



## About Diamonds

Diamonds is an easy-to-use finite element software for the analysis and design of frames, beam grids, slabs, plates, rafts and complete 3D structures in steel, concrete and timber. Its highly intuitive and versatile working environment enables you to do your job in the shortest possible time frame. Your learning curve is short – guaranteed.



# FEATURES

Two-way link between BIM Expert and Diamonds

## Import in BIM Expert

Import Diamonds models in BIM Expert

- Directly from an open Diamonds session
- From a Diamonds file

## Export from BIM Expert

Export BIM Expert models to Diamonds

- Directly to an open Diamonds session
- To a Diamonds file

Conversion of geometry, orientations, conditions (hinges, rigidity diagram), support (rigid, flexible, soil layers), eccentricities and groups (physical, sections, loads or buckling).

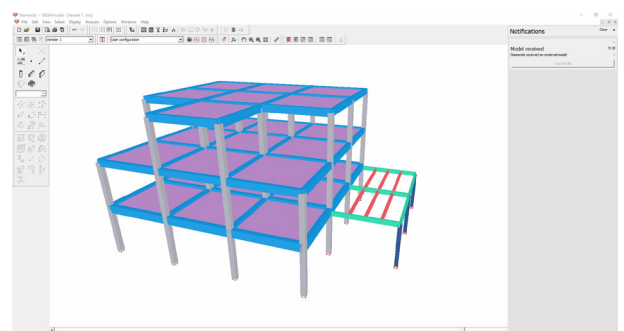
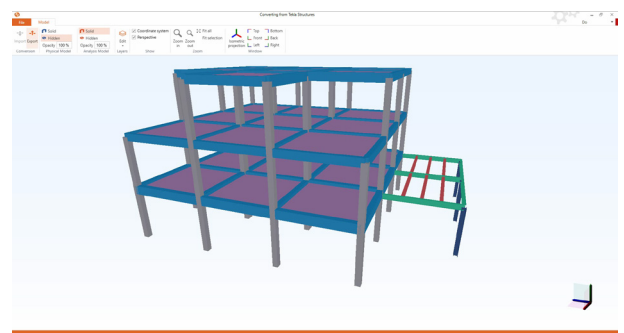
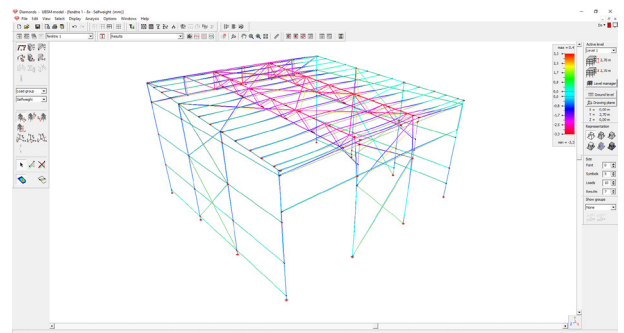
Automatic recognition of materials, cross-sections, nuts and bolts by using 1 shared BuildSoft database with libraries.

Conversion of loads, load groups and load combinations.

Conversion of mesh, analysis settings and results.

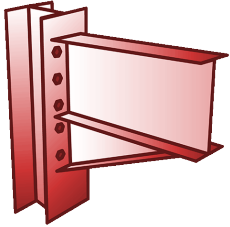
Conversion of connections.

Supporting Diamonds versions: 2017, 2018 and 2019.



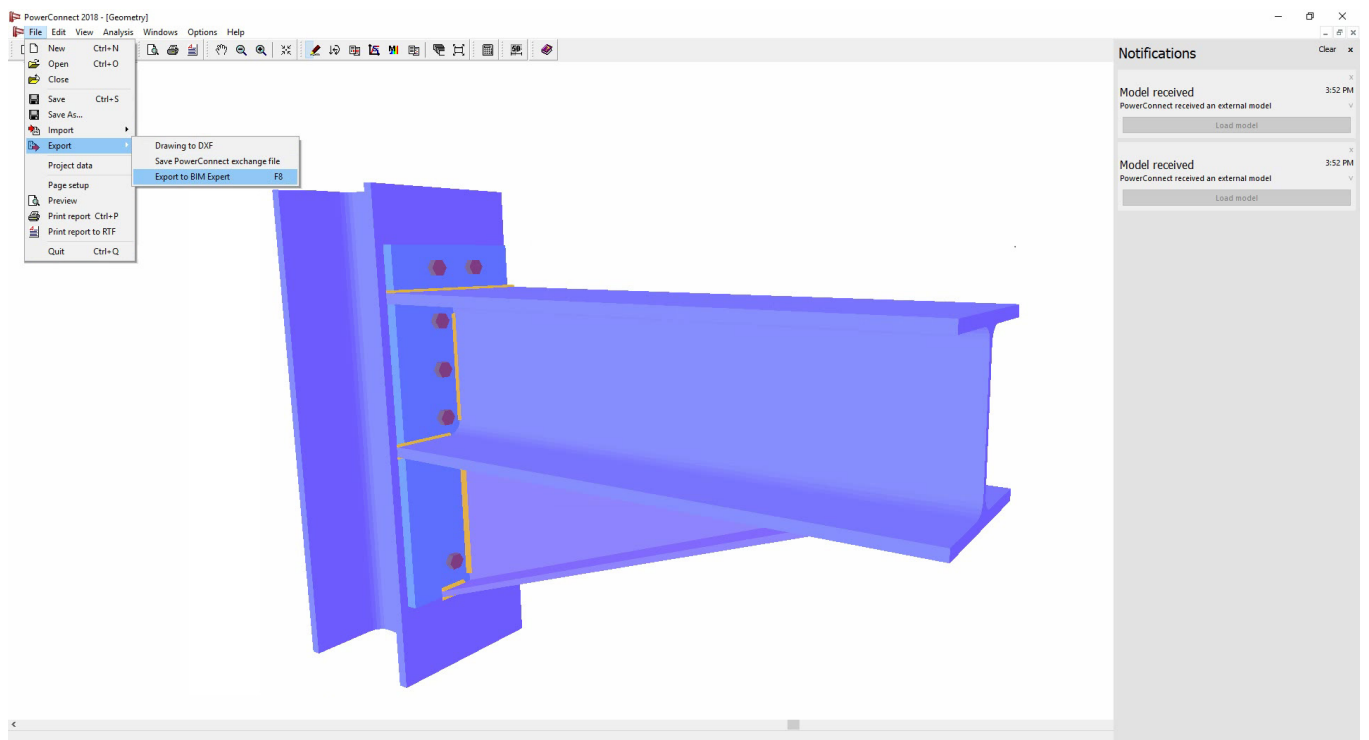
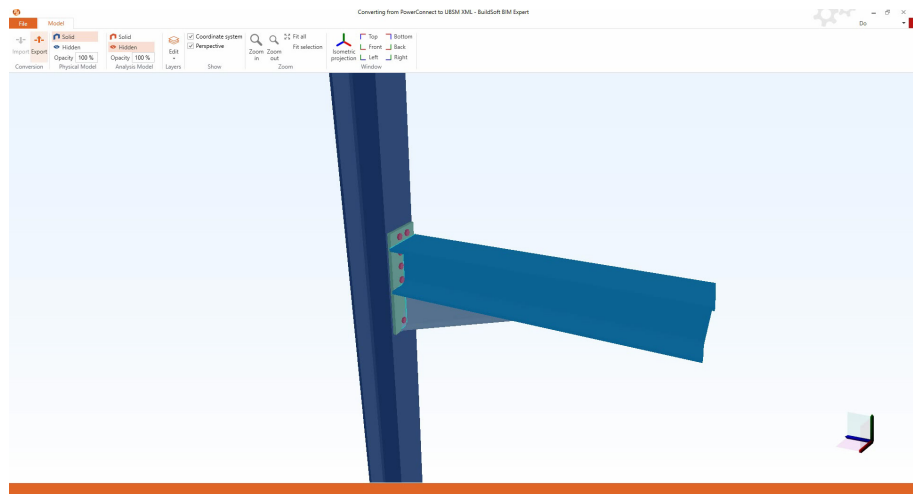
# PowerConnect plug-in

MODELING - GLOBAL ANALYSIS - **DETAILING** - OTHER



## About PowerConnect

PowerConnect is the perfect software for steel connection design, according to Eurocode and AISC, fast and easy: moment connections with stiffeners (haunches, web plates, backing plates, ...), shear connections, column base connections and tubular connections.



# FEATURES

Two-way link between BIM Expert and PowerConnect.

## Import in BIM Expert

Import PowerConnect models in BIM Expert

- Directly from an open PowerConnect session
- From a PowerConnect file

## Export from BIM Expert

Export BIM Expert models to PowerConnect

- Directly to an open PowerConnect session
- To a PowerConnect file

Conversion of geometry, eccentricities, orientations and loads.

Automatic recognition of materials, cross-sections, nuts and bolts by using 1 shared BuildSoft database with libraries.

Conversion of loads, connection components (end plate, fin plate, angle profile and haunch) and stiffeners (web plates, backing plate, etc.)

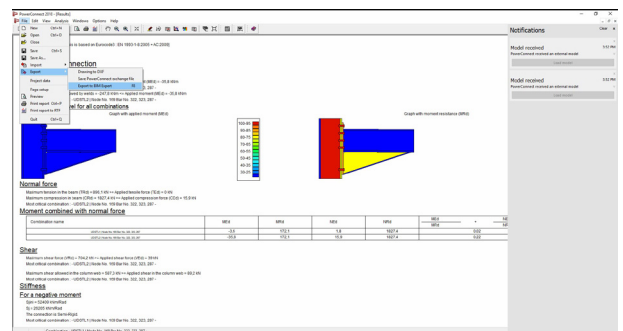
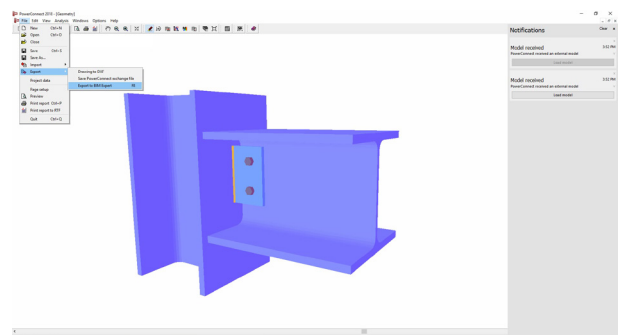
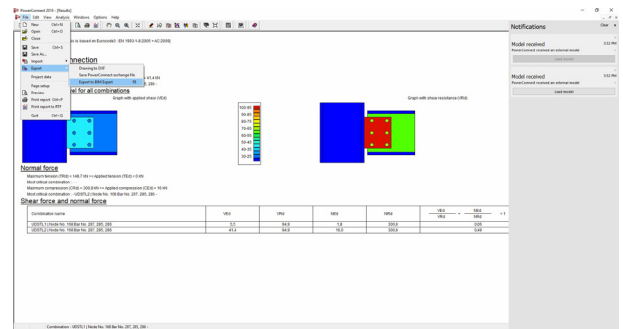
Supported PowerConnect versions: 2018 and 2019.

Conversion of calculated strength and rigidity diagrams when importing in BIM Expert.

Possible to group identical connections together.

Option to reuse earlier identified connections when converting to BIM Expert.

Automatic reassembly of connections when converting to PowerConnect: splitting, grouping or splitting and grouping connections.



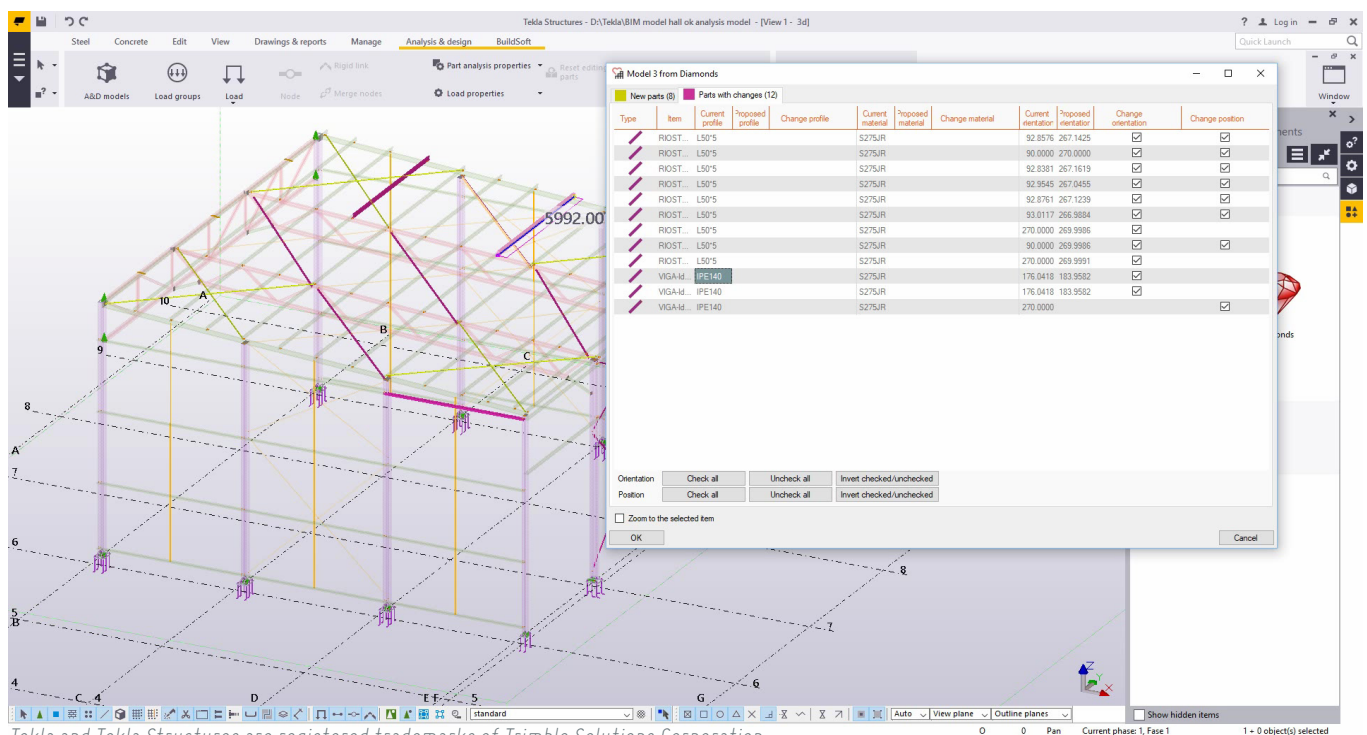
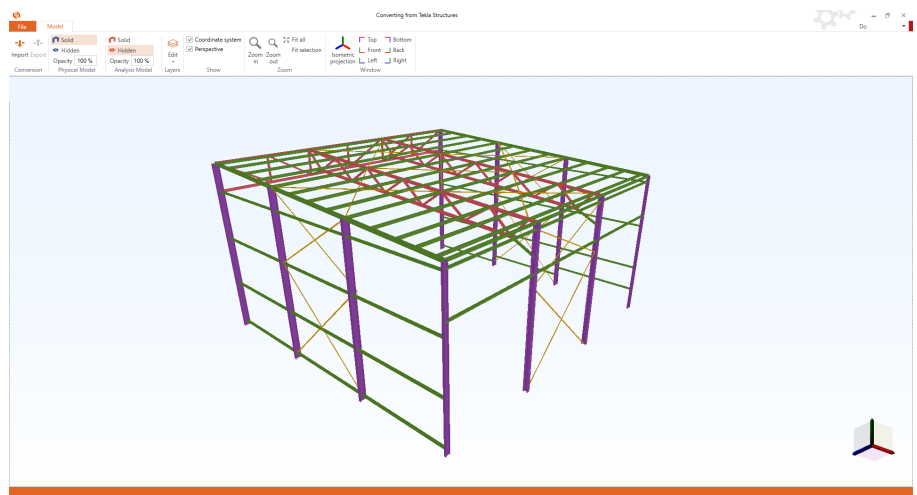
# Tekla Structures plug-in

MODELING – GLOBAL ANALYSIS – DETAILING – OTHER



## About Tekla Structures

Tekla Structures is the most advanced structural software for BIM. With it, you can create, combine, manage and distribute accurate multi-material models full of construction information, and manage and communicate the design.



Tekla and Tekla Structures are registered trademarks of Trimble Solutions Corporation.



# FEATURES

Two-way link between BIM Expert and Tekla Structures.

## Import in BIM Expert

Import Tekla Structures models in BIM Expert

- Directly from an open Tekla Structures session

## Export from BIM Expert

Export BIM Expert models to Tekla Structures

- Directly to an open Tekla Structures session

Conversion of geometry, eccentricities, orientations, supports and boundary conditions. Conversion of cross-sections, materials via mapping files between Tekla Structures catalogues and BIM Expert libraries. Conversion of footings, polybeams and panels.

Unmatched materials and cross-sections will automatically be added to the Tekla Structures material and cross-sections catalogue respectively. Add extra mapping items yourself between the Tekla Structures catalogues and BIM Expert libraries.

Supported Tekla Structures versions: 20.0, 20.1, 21.0, 21.1, 2016, 2016i, 2017, 2017i, 2018, 2018i and Learning. Each version has its own mapping files for cross-sections and materials. Possibility to copy mapping files.

Automatic recognition of installed Tekla Structures versions.

Tekla Structures models shared between different Tekla Structures versions, both up- and down-grading.

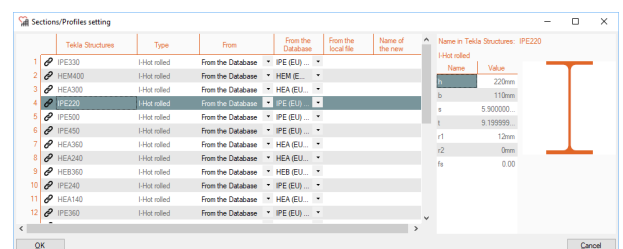
Choice between created analysis models when converting from Tekla Structures. Choice between overwriting or copying an existing analysis model or to create one when converting to Tekla Structures.

Choice of insertion point when converting to Tekla Structures.

Additional analysis information, e.g. boundary conditions and results, is kept in the BIM Expert map with the Tekla Structures model, and when necessary, requested again. Analysis information from the previous conversion can be sent through again.

Summary of changes from incoming BIM Expert model regarding initial model: new elements, changed elements and unmatched elements. Possibility to accept or reject these elements.

Recognition and storage of different connection components (14, 24, 29, 40, 41, 77, 106, 128, 141, 142, 142, 144, 146, 1004, 10014, 1029, 1042). Automatic update to another connection component when it is a better match for the incoming BIM Expert connection. Choice of order and connection component preference to be taken into account.



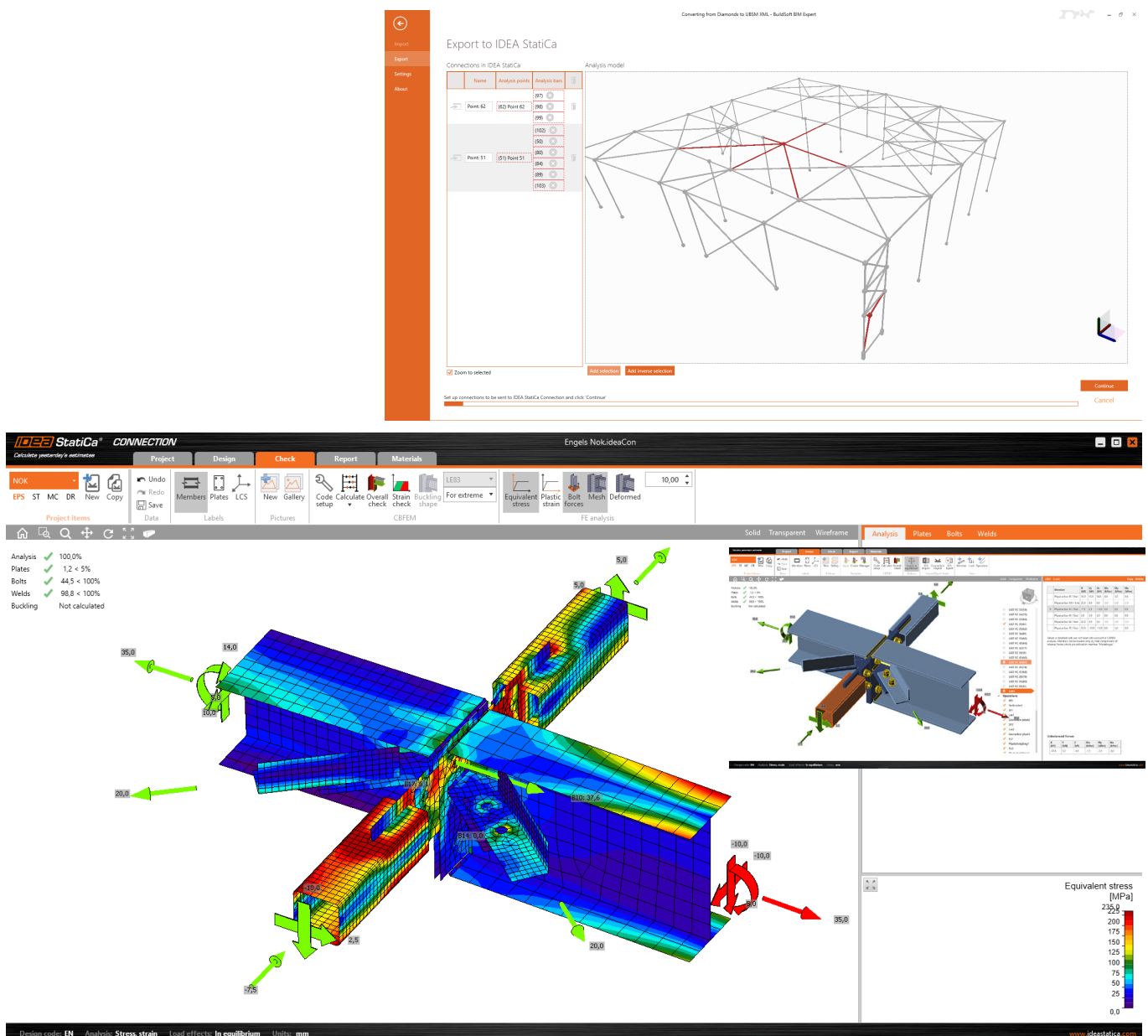
# Idea Statica plug-in

MODELING – GLOBAL ANALYSIS – **DETAILING** – OTHER



## About Idea Statica Connection

IDEA StatiCa Connection can design all types of welded or bolted connections, base plates, footings and anchoring. It provides precise checks, results of strength, stiffness and buckling analysis of a steel joint. Bolts, welds and concrete blocks are checked according to EC/AISC.



IDEA STATICA is a registered trademark of IDEA RS s.r.o.

# FEATURES

One-way link between BIM Expert and Idea Statica.

## Export from BIM Expert

Export BIM Expert models to Idea Statica

- To an Idea Statica Connection file
- To an Idea Statica Beam file
- To an IOM file

Conversion of geometry, materials, eccentricities, orientations, loads and standard choice (if available).

Conversion of cross-sections via mapping files between Idea Statica catalogues and BIM Expert libraries. Possibility to add extra mapping items yourself.

Supported Idea Statica versions: 9.

Idea Statica file opens automatically after conversion.

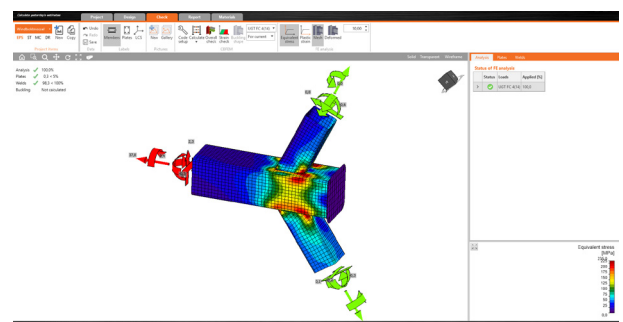
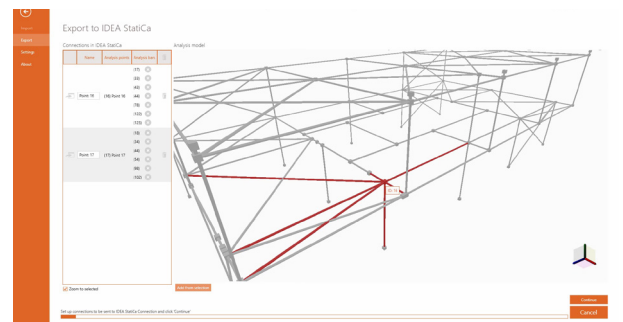
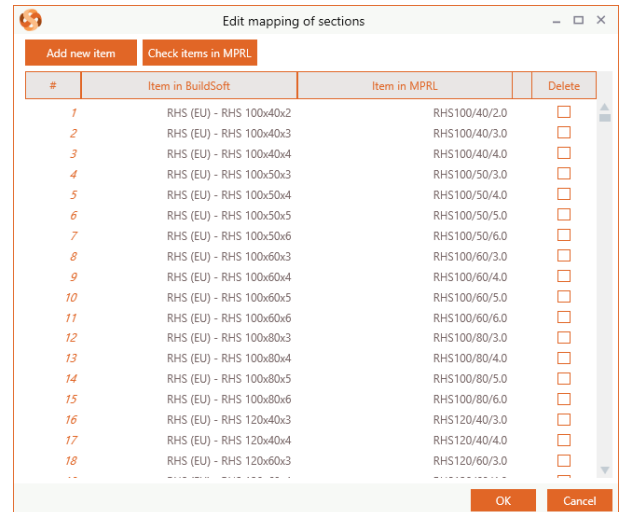
Configurable rate for bug incident reporting during conversion.

## To Idea Statica Connection

Automatic recognition of nodes defined in physical model. Choice of 1 or more nodes directly from graphic representation of 3D analysis model.

Conversion of 1 or more nodes simultaneously.

Choice between considering either all load combinations or only the extreme load combinations.



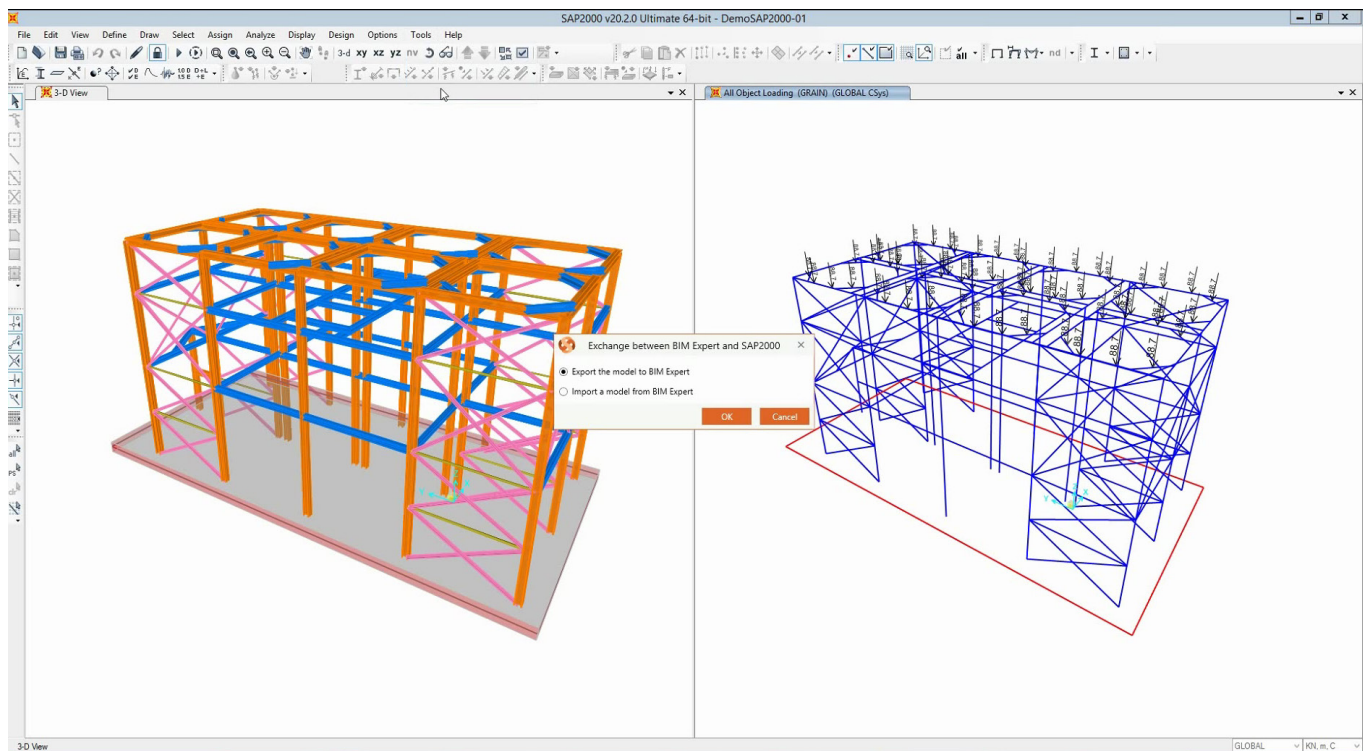
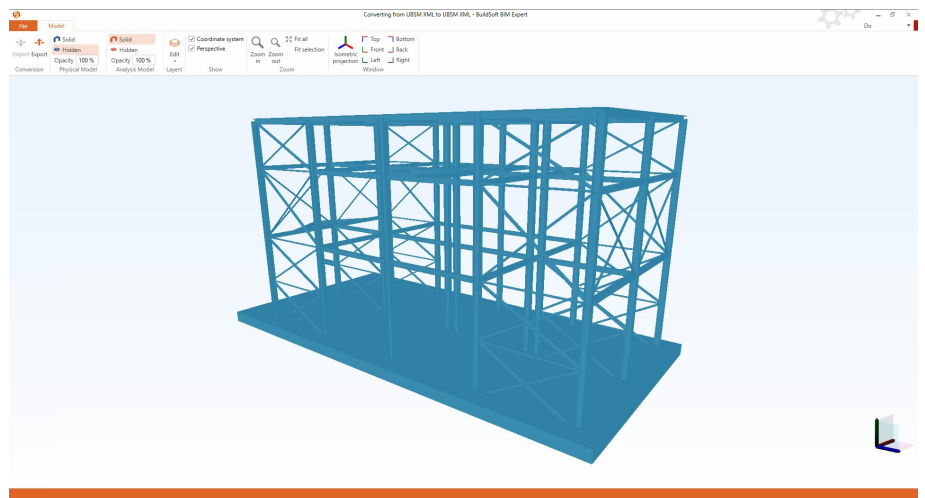
# SAP2000 plug-in

MODELING - GLOBAL ANALYSIS - DETAILING - OTHER



## About SAP 2000

SAP 2000 has a very sophisticated, intuitive and versatile user interface, powered by a never seen calculation core and design tools for engineers working in different departments like transportation, industrial, public works, sports, and other facilities.



The CSI Logo®, SAP2000®, CSiBridge®, ETABS®, and SAFE® are registered trademarks of Computers & Structures, Inc

# FEATURES

One-way link between BIM Expert and SAP 2000.

## Import in BIM Expert

Import SAP2000 models in BIM Expert

- Directly from an open SAP2000 session
- From a SAP2000 file

Conversion of geometry, eccentricities, orientations, insertion points, springs, material overrides, property modifiers, loads, load patterns, load cases, load combinations, modal cases, response spectra, etc.

Conversion of materials and cross-sections via mapping files between SAP2000 properties and BIM Expert libraries. Possibility to add extra mapping items. Support of complex sections done by Section Designer.

Supported SAP2000 versions: 20.

Import of curved beams, except those with parabolic shape.

Frame and area objects are imported as physical bars and plates in the physical model.

Line and area elements are imported as analysis bar and plates in the analysis model. These elements are created by SAP2000 according to the mesh settings from the frame and area objects.

Choice of results to be imported: points, bars and/or plates.

Configurable rate for bug incident reporting during conversion.

Options

☒ From running instance

☐ From existing model

Browse...

Consider the following elements during the conversion:

- ☒ Loads
- ☒ Results
- ☐ Points
- ☒ Bars
- ☐ Plates

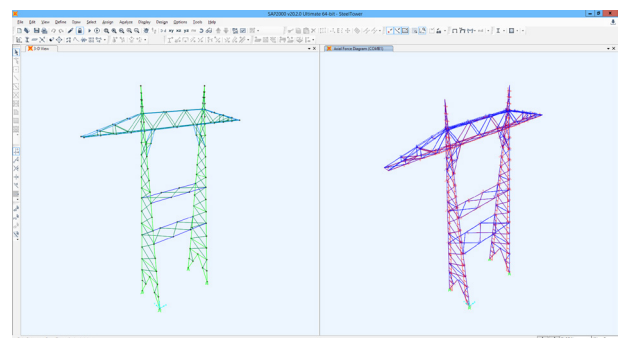
Combinations setting

Select the combinations you want to include and also define the category for each one.

☐ Use categories according to Limit States

Include	Name	Type	Strength	Service	Custom
<input checked="" type="checkbox"/>	1,4D	Linear Additive	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	1,2D+1,6L	Linear Additive	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	D	Linear Additive	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	D+L	Linear Additive	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	0,9D-0,33X-1,1Y-0,3Z	Linear Additive	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	0,9D-0,33X-1,1Y+0,3Z	Linear Additive	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<input checked="" type="checkbox"/>	0,9D+0,33X+1,1Y-0,3Z	Linear Additive	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OK Cancel



Options

After conversion, show incidences of type:

☒ Low severity

☐ Medium severity

☐ High severity

☒ Critical severity

Computers and Structures, Inc.

☒ SAP2000 v20

☐ SAP2000 v21

☐ ETABS v17

☐ ETABS v18

Edit mapping of materials

Edit mapping of sections

Add new item

Edit mapping of sections

OK Cancel

# Customer testimonial

## Borreman Consulting Engineers

Borreman Consulting Engineers, a Dutch consultancy office specialized in engineering construction, has an impressive track record in the structural analysis of both residential and non-residential buildings (including industrial buildings, office buildings, warehouses, and commercial buildings). As so many things require a close follow-up or can even be subject to change during building construction, BBorreman Consulting Engineers works very closely with both clients, architects and building contractors throughout the entire building process – from design to construction.



Borreman Consulting Engineers (or Borreman, in short) has been active in the market since 2006 and currently employs 6 engineers. Borreman's decision to further broaden its service portfolio and promote an integrated approach to structural analysis & design has been inspired by the tremendous opportunities that arise from working together on a Building Information Model.

### BuildSoft client since

2015

### BuildSoft software

- BIM Expert with Diamonds, PowerConnect and Tekla Structures plug-in
- PowerConnect
- Diamonds

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## Integrated structural analysis using BIM Expert

### AN INTEGRATED APPROACH MAKING EVERYBODY SUCCESSFUL

The BuildSoft BIM Expert plays a crucial role in Borreman's integrated approach to structural analysis & design. BIM Expert is a unique software that makes it possible to exchange model information between structural analysis software and BIM (Building Information Modeling) software. BIM Expert plugins for Diamonds, PowerConnect and Tekla Structures, enabled Borreman to put an integrated approach into practice, seamlessly linking their familiar Diamonds and PowerConnect software with Tekla Structures.

"An integrated approach with everybody collaborating around a BIM model simplifies the building process," Edwin Borreman comments "while saving a lot of time and money for our clients. The architect, the structural design engineer and the building contractor no longer work in isolation on separate models and drawings. Instead, we use Tekla Structures to build a BIM model starting from the IFC file that we receive from the architect. Then we use the BuildSoft BIM Expert to connect this BIM model to Diamonds (our 3D structural analysis software) and PowerConnect (the software that we use for steel connection design).

Any modifications proposed by the structural analysis can then be translated into BIM model adjustments. Once we have completed that process, we share the updated BIM model with the building contractor via an IFC file. That makes it so much easier for the contractor to deliver accurate construction drawings that are entirely in sync with the structural design, while we can inspect these drawings so much faster.

This kind of integrated approach implies a profound change in the structural design process. However, the extra time that we need to spend initially on building and sharing a BIM model is more than recouped afterward."

### A GLOBAL OVERVIEW THANKS TO THE BIM MODEL

"The best way to illustrate the benefits of an integrated approach to structural analysis & design is to explain our way of working through a typical project," says Jaap Wim Riphagen, project engineer at Borreman. "Let us therefore have a look at the expansion of an existing industrial building and adjoining offices for Van Dijk Transport (Kampen, the Netherlands).

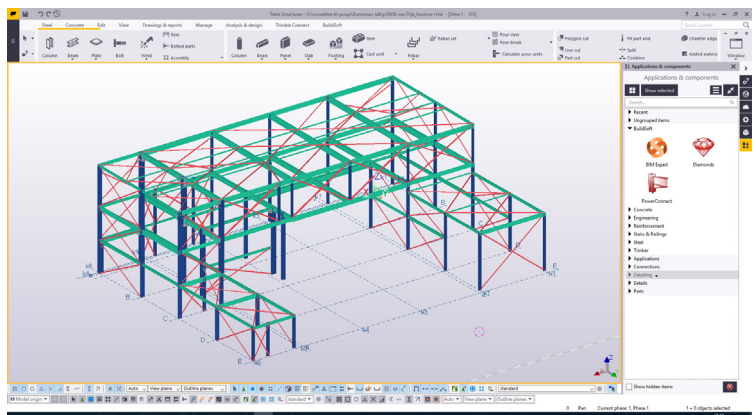
In particular, I'd like to discuss the new office floors that were planned on top of the existing office building. The existing building structure was unable to support any additional floors because it was just not designed to do that. That's why the steel structure of the new office building had to be designed independently from the existing building structure.

In a first step, we built a BIM model using Tekla Structures. We did this starting from an IFC file that was provided by the architect. This BIM model included the entire building structure, both the existing buildings and the new buildings to be constructed. The advantage of this model was that it offered a complete overview of the entire project, making it so much easier to discuss different designs with our client and to identify the best design for the new office building.

# Customer testimonial

Once our client had agreed to the design, we started working from the BIM model to further detail the steel structure design of the new office building through structural analyses using Diamonds.”

## TRANSLATING BIM INTO A SMART STRUCTURAL ANALYSIS MODEL

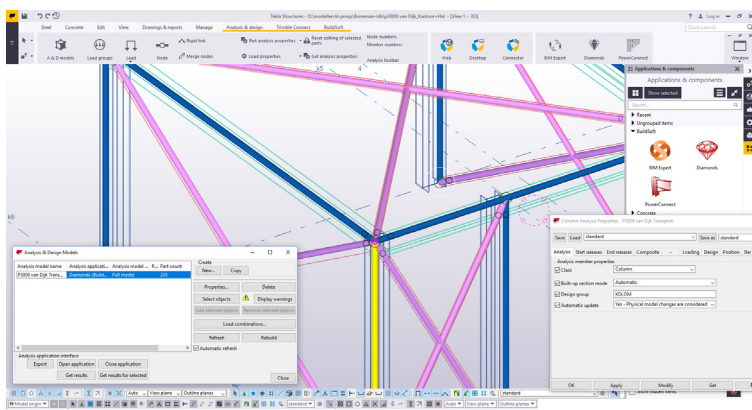


*The BIM model offers a global overview of the entire project, making it so much easier to provide the client with transparent information on the steel structure design of the new office floor.*

“Integrated structural analysis & design become all the easier as you consistently use a sound methodical approach,” says Jaap Wim. “We always start with a series of upfront model checks in Tekla Structures, before we use the BuildSoft BIM Expert to exchange model information with our Diamonds structural analysis software. Depending on the project, we perform these checks on the entire BIM model or a part of the BIM model. In Tekla Structures, it’s perfectly possible to select a part of the entire BIM model and build an integrated structural analysis model for that part only.

In this project too, model checks started with a visual inspection of the steel structure’s wireframe. Such a wireframe visualizes the steel structure’s beams, columns, tie rods, ... through their reference lines defined in the BIM model. To translate the BIM model correctly into a fully functional structural analysis model, all reference lines must necessarily connect at their ends. A visual inspection of the wireframe allows us to detect and correct any missing or faulty connections quickly.

Reference lines play a crucial role in an integrated structural analysis & design approach because any adjustments to structural members are to be interpreted with respect to these reference lines. Let’s take the example of the steel beams supporting a floor of the



*A visual inspection of the wireframe in Tekla Structures allows to detect and correct any missing or faulty connections between the BIM model’s reference lines and to translate this model into a fully functional structural analysis model.*

new office building. The reference line of any such beam is typically positioned in its upper surface. If the structural analysis requires that the height of one or more beams be adjusted, then this definition of the reference lines ensures that all height adjustments are translated correctly into BIM model adaptations: the top surface of each beam remains unaffected, while its bottom surface is shifted upward or downward.

A proper definition of the reference lines thus ensures that all adjustments to the structural analysis model are interpreted correctly by the BIM model. On the other

hand, the reference lines also allow for a smart translation of the BIM model into a fully functional structural analysis model, taking into account the eccentricity between the center line and the reference line of each bar element in the analysis model.”

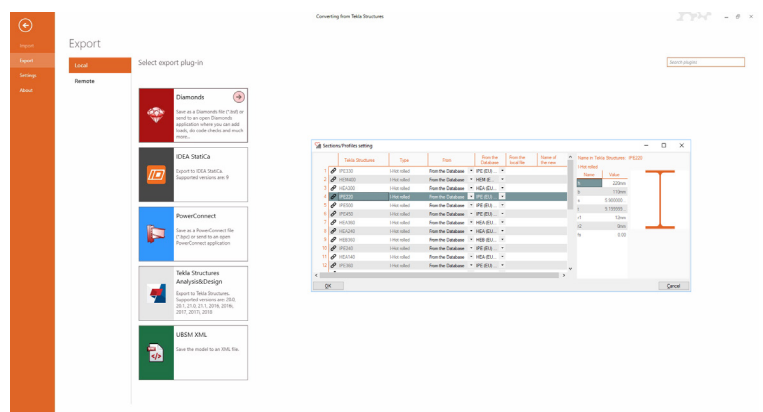
## A ROUND-TRIP BIM WORKFLOW

“In a next step, we inspected the Tekla Structures analysis model of the new office building” Jaap Wim continues. “We therefore completed the wireframe model with the information that is required by the structural analysis. For example, we defined hinged connections between beams wherever needed. Also, we specified the elements of the wind bracing system (which must be considered as tie rods during the structural analysis), and we defined the supports of the steel structure.

Once the Tekla Structures analysis model had been completed, we used the BuildSoft BIM Expert to convert that model into a Diamonds structural analysis model. During this conversion, the BIM Expert performs a range of vital checks – comparing and matching cross-section and material properties between the Tekla Structures analysis model and the Diamonds cross-section and material libraries.

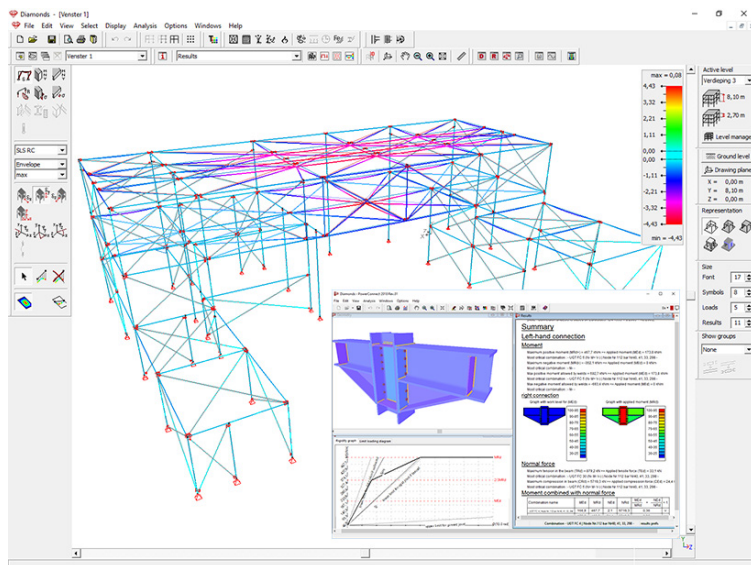
From this point onward, we could proceed in precisely the same way as we would for any structural analysis using Diamonds. In a first step, we completed the Diamonds model with the permanent loads, wind loads, snow loads, ... and we generated all load combinations according to Eurocode. After an initial 3D analysis and the related design verifications of all structural steel members, we started adjusting the Diamonds analysis model until the design verifications confirmed that the resistance of all cross-sections and the buckling stability of all compression and bending members complied with Eurocode 3 requirements.

During the final phase of our round-trip BIM workflow, we synchronized the Diamonds structural analysis model with the BIM model using BuildSoft's BIM Expert. The BIM Expert reported all geometry changes to existing members with respect to the original BIM model, asking us whether we wanted to incorporate these changes automatically into the BIM model. In addition, Tekla Structures recognized any newly added structural members and any updates related to cross-section properties, material properties or cross-section orientation. All in all, this is a very flexible way of working that saves us a lot of time."



*During the conversion of the Tekla Structures analysis model into a Diamonds structural analysis model, the BuildSoft BIM Expert performs a range of vital checks – comparing and matching cross-section and material properties between both models.*

# Customer testimonial



*In Borreman's round-trip BIM workflow, the BuildSoft BIM Expert ensures that the Diamonds structural analysis model remains in sync with the Tekla Structures BIM model and that any adjustments to the Diamonds model are incorporated into the BIM model.*

components such as end plates, stiffeners, welds, bolts, ...), and to calculate the corresponding rotational stiffness diagram as well. Thanks to the tight integration between Diamonds and PowerConnect, the stiffness of the corresponding node in the Diamonds model can automatically be updated based on the rotational stiffness diagram calculated by PowerConnect. That is an iterative process, since any such adjustment requires a new 3D analysis to account for the favorable redistribution of bending moments throughout the steel structure.

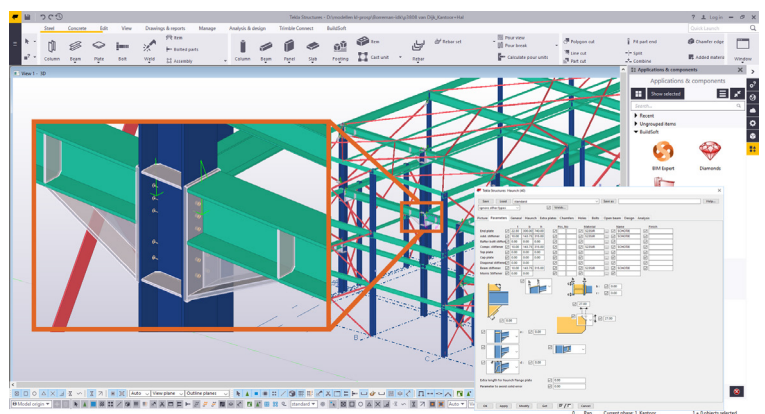
The real beauty of all this? Thanks to the BuildSoft BIM Expert, it is now possible to translate any steel connection design calculated by PowerConnect into the BIM model. Tekla Structures automatically recognizes these connections as components, smart tools that you can use to connect parts in the BIM model. Components automate tasks and group objects so that Tekla Structures treats them as a single unit and any adaptations can be implemented very quickly.

The result of all that is an accurate and complete BIM model that is entirely in sync with the structural analysis model. This BIM model can easily be shared with the building contractor, who can use it to deliver up-to-date construction drawings. It's hard to imagine an even more integrated approach to structural analysis and design."

## IT'S HARD TO IMAGINE AN EVEN MORE INTEGRATED APPROACH

"But this is not the end of our story about integrated structural analysis & design," Jaap Wim concludes. "The office building's steel structure, for example, includes quite a few beam-to-column connections which we have detailed using the PowerConnect software. We can do that directly from the Diamonds structural analysis model, selecting the corresponding structural node and automatically launching PowerConnect. PowerConnect not just recognizes the connection geometry, but also imports the loads calculated by Diamonds.

That makes it possible to detail the structural design of these beam-to-column connections (including all com-



*In Borreman's round-trip BIM workflow, the BuildSoft BIM Expert translates any steel connection design calculated by PowerConnect into the Tekla Structures BIM model.*

## MORE OPPORTUNITIES FOR BETTER COLLABORATION

“An integrated approach to structural analysis & design using Tekla Structures, BIM Expert, Diamonds and PowerConnect is very powerful indeed,” Edwin Borreman concludes “and offers us more opportunities to collaborate more closely with all partners involved in the building process. As all our work is organized around a central BIM model that we can share with all partners, it’s easier for us to get involved at an early stage. That makes it possible for us to guide the structural design from these early stages onwards, in close collaboration with the architect.

Moreover, the BIM model contains a wealth of information that can be shared with the building contractor. Material quantities can be derived from the model, considerably simplifying the cost estimation process, and construction drawings can be produced much faster. I’ve mentioned it before: using this kind of integrated approach, we do invest more time in building and sharing an initial BIM model, but we more than recoup that extra time afterward. In the end, that comes down to a better and more cost-effective result for our customer. And, by the way, that result is delivered in less time.”

# About BuildSoft

BuildSoft is a Belgian company specialized in software solutions for the structural design analysis of buildings and the calculation of structures in reinforced concrete, steel and timber. BuildSoft develops specialized calculation software according to the latest Eurocode, American and many local standards. We highly invest in the user-friendly and intuitive quality of our analysis software. The software is meant for structural engineers, architects, contractors and building companies.

## User-friendly

Started in 1989 with the software ConCrete for continuous beams in concrete, BuildSoft has developed several time-saving programs. From the beginning, the usability was a key feature. With the increased capacities of the computers, the BuildSoft products have evolved from a 1D program to the powerful and reliable 3D finite element software Diamonds.

## VIP support

“Our unique mix of power, usability and service, appeals to the customers. We give you answers to your questions. Because we have a wide technical expertise on structural analysis and Eurocodes”, says Geert Goossens, CEO of BuildSoft.

## Worldwide

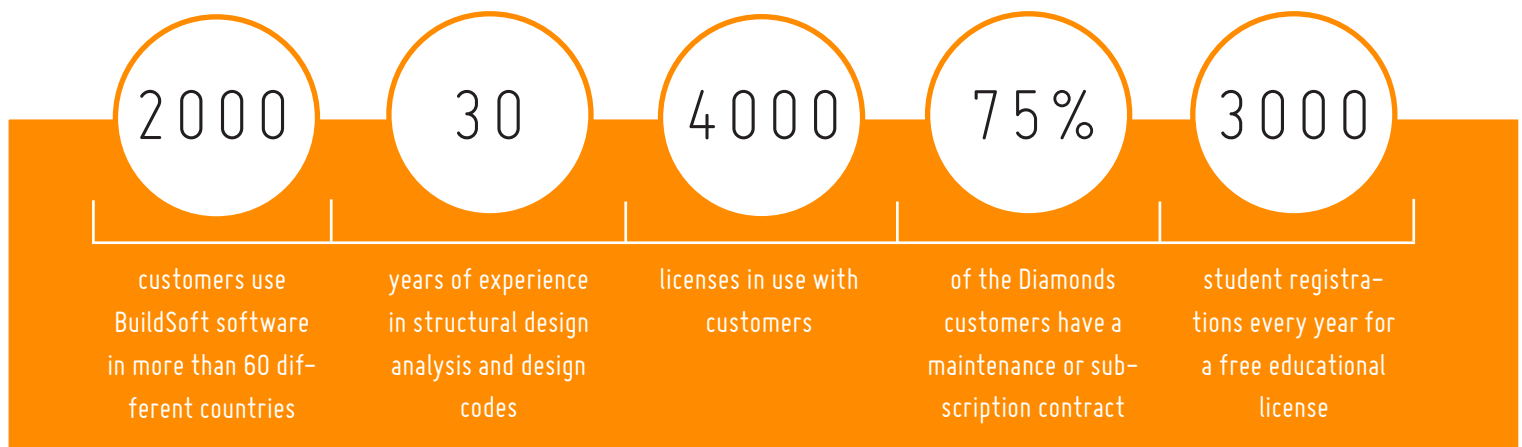
BuildSoft continues to innovate and invest in powerful user-friendly analysis software. The BuildSoft software is being used today in over 50 countries. With the help of resellers in Southern-Europe, Scandinavia, South America, India, Middle East and China, there are over 4000 BuildSoft licenses in use. For example, with a product like PowerConnect, for steel connection design, BuildSoft distinguishes itself from the market with both simplicity and performance and draws new customers worldwide.

## References

Examples of projects calculated with BuildSoft software and a complete list of our customers (engineering offices, contractors, governments and education) can be found on our website:

<http://www.buildsoft.eu/en/references>

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