



Tekla Structures to FEM-Design

Using the Tekla Structures to FEM-Design link

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Introduction

This document is explaining the operation of the Tekla – FEM-Design analysis model link functionalities. The intended audience is the professional users of both Tekla Structures and FEM-Design, those who perform structural design and analysis tasks in the two systems.

This documentation is following the notions of the Tekla Structures 16; however, the fundamental operations are the same since the Tekla Structures 13.1. It means that despite the Tekla Structures user interface and process changes the functionality of the link is identical to all prior versions from Tekla Structures 13.1 to Tekla Structures 16. For the related changes between Tekla versions please refer to the Tekla documentations.

This manual is for both FEM-Design 8.0 and 9.0 versions. The differences between the versions lie only in inevitable changes made to follow Windows Vista and Window 7 modifications in the FEM-Design 9.0 (location of user files had to be changed); all the functionalities are fundamentally the same in the two FEM-Design versions.

The Tekla – FEM-Design link is only available in English language.

1. Basics

Beginning with the FEM-Design 8.0 version there is the possibility to take over partial analysis models from Tekla Structures. The purpose of the link is to transfer the Tekla generated analysis model geometry and some other model attributes into the FEM-Design for structural analysis purposes.

Users of the link should be aware of that the link provides partial support and substantial amount of model preparations might still be required in the FEM-Design environment after the transfer. Users should also be aware that change management is not implemented for the connection currently; each transfer creates completely new FEM-Design model and therefore the design alterations should be handled in alternate ways.

1.1 Installation

There is no need to install the Tekla – FEM-Design link separately. During the installation or upgrade of the FEM-Design the link sets up automatically.

It is required to have the two applications installed on the same computer, i.e. transfer between computers is not supported.

2. Usage

The main steps of operation are the followings:

- Prepare the structural model in Tekla Structures
- Create analysis model for FEM-Design
- Set up conversion parameters
- Activate the transfer
- Complete the analysis model and perform the analysis

2.1 Prepare the structural model in Tekla Structures

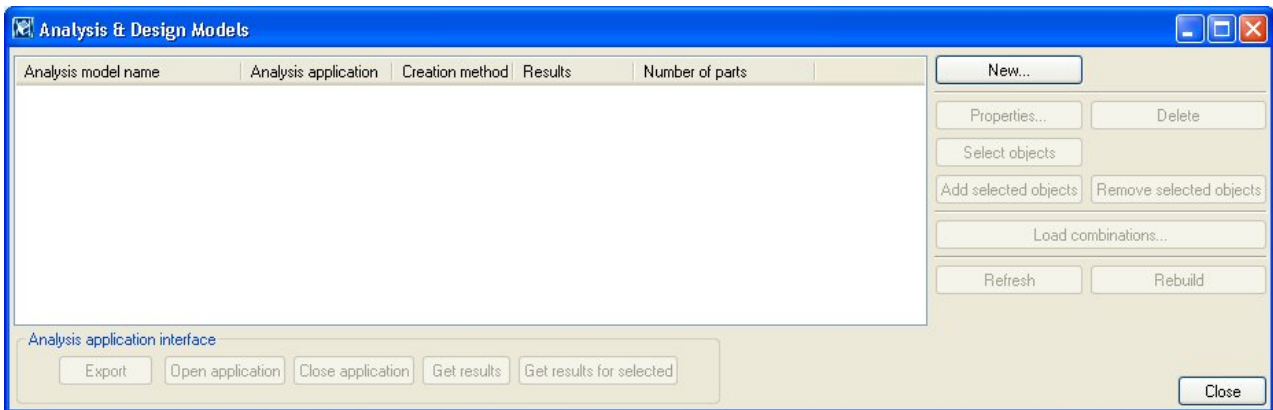
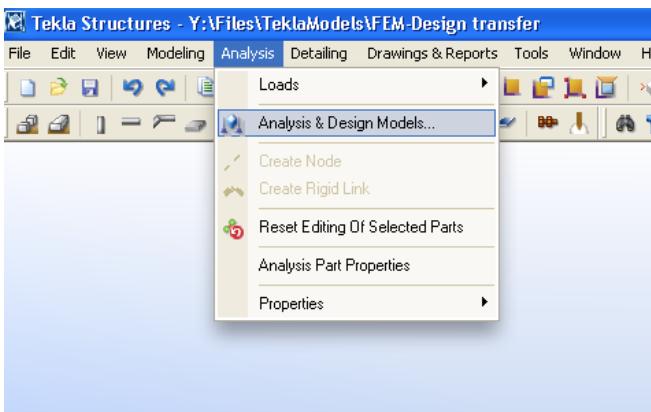
The structural model in Tekla Structures should be adequately prepared for analysis model creation. Connectivity of members, material parameters, positioning and relationship of members and other parameters should be prepared appropriately for the automated analysis model creation of the Tekla Structures.

Explaining the analysis model creation of the Tekla Structures is out of the scope of this documentation, please refer to the manuals of the Tekla Structures (for a sample issue highlights the importance of settings please refer to the section 3.4 in this manual).

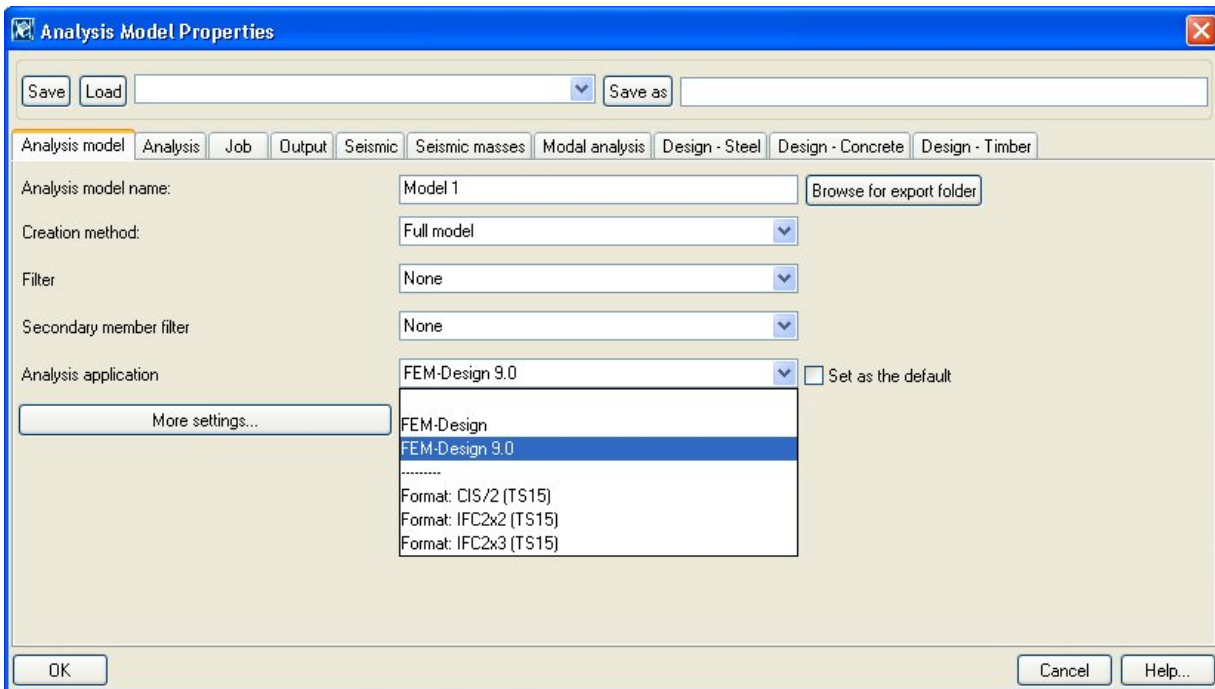
The Tekla Structures - FEM-Design link transfers the analysis model without alteration. The quality of the analysis model in the Tekla Structures determines the quality of the transferred analysis model in FEM-Design. In case of need the alteration of the automatically created analysis model can be performed manually in FEM-Design by its numerous model-editing facilities.

2.2 Create analysis model for FEM-Design

Before activating the transfer an analysis model dedicated for the FEM-Design should exist in the 'Analysis & Design Models' dialog of the Tekla Structures. The dialog can be shown from the 'Analysis / Analysis & Design Models...' menu point.



A new analysis model can be created by pressing the 'New...' button and then selecting 'FEM-Design' or 'FEM-Design 9.0' in the appearing 'Analysis Model Properties' dialog as 'Analysis Application'.



2.3 Set up conversion parameters

The definition and the implementation of the material and section catalogs in Tekla Structures and FEM-Design are different. Also the modifications, improvements and corrections to the catalogs in the two programs take place independently, which makes a fully automated material and cross-section data conversion complicated for practical usage.

The conversion of materials and sections between the two software are based on names of the materials and sections, and are done through conversion files set up by the user. The conversion files contain pairs of matching material and cross-section names of the two programs. There is one conversion file for materials and there is one for cross-sections. The default common locations of the conversion files are:

- FEM-Design 8.0:

'[FEM-Design install directory]\FORMATS', where the *[FEM-Design install directory]* is typically *'C:\Program Files\STRUSOFT\FEM-Design 8.0'*.

- FEM-Design 9.0:

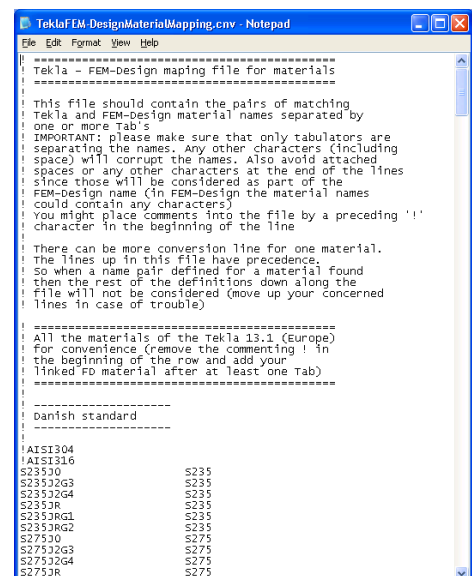
'[Program Data Folder]\StruSoft\FEM-Design 9.0\Formats\Tekla' where the *[Program Data Folder]* is typically *'C:\Documents and Settings\All Users\Application Data'* for Windows XP and *'C:\Documents and Settings\All Users\ProgramData'* for Windows Vista and Windows 7.

The name of the conversion files are:

TeklaFEM-DesignMaterialMapping.cnv

TeklaFEM-DesignProfileMapping.cnv

(The name of the files should not be changed)



Note: Before the very first usage of the link - after initial installation - the mentioned conversion files do not exist. The user might want to do an initial test transfer, which creates the conversion files from the factory template files found in the same directory (*TeklaFEM-DesignMaterialMapping_factory.cnv*; *TeklaFEM-*

DesignProfileMapping_factory.cnv) or the user can rename the factory template files manually by removing the *'_factory'* tail from the name of the files. This is to supply suggested conversion files with the installation for the most typical cases but at the same time not overwriting the user's conversion files on subsequent installations (software update).

Before using the link in projects the users have to edit these files to their own requirements with the help of their favorite text editor (e.g.: Notepad.exe). This step should be done once before the first usage and thereafter only when changes in the practice occur.

Instructions on the formatting of the file can be found in the header of the files. Refer to the section *Additional information* below for more details on the conversion files.

2.2 Activate the transfer

The transfer can be activated in the *'Analysis & Design Models'* dialog of the Tekla Structures by pressing the *'Export'* button.

The transfer process locates the FEM-Design and starts up a new instance of the program then delivers the analytical information to it.

Please note that each and every initiation starts a new FEM-Design, so an update of the previously transferred model is not available.

2.3 Complete the analysis model and perform analysis

After having the transferred model in the FEM-Design the user needs to overview and complete the analytical model in FEM-Design (e.g. defining the loads, review and probably edit positioning, define line or surface supports, overview default reinforcement parameters where necessary, etc.) and execute the desired analysis and calculations.

The results of the analysis and calculation are available only in FEM-Design.

3. Additional information

In this chapter we give some more details about the functionality of the link.

3.1 Transferred data

The link transfers the geometry of the analysis model together with some fundamental parameters (like material information). The detailed list of the transferred data is as follows:

- geometry of analytical model
- cross-section name of linear member (cross-section in start node)
- end releases of linear members (semi rigid releases are becoming fix)
- material name
- rigid links (become connection elements)
- supports (only point supports are available in Tekla)

Loads are not transferred. It is advised not to create these analytical information in Tekla Structures but in FEM-Design instead.

3.2 Conversion files

Apart from the default conversion files (see 2.3) it is possible to define model specific conversion files. If the link finds a conversion file in the *'Attributes'* folder of the actual model (e.g. *'C:\TeklaStructures\Models\MyModel\Attributes'*) then that conversion file will be used for pairing Tekla material or cross-section with FEM-Design ones in place of the default conversion files.

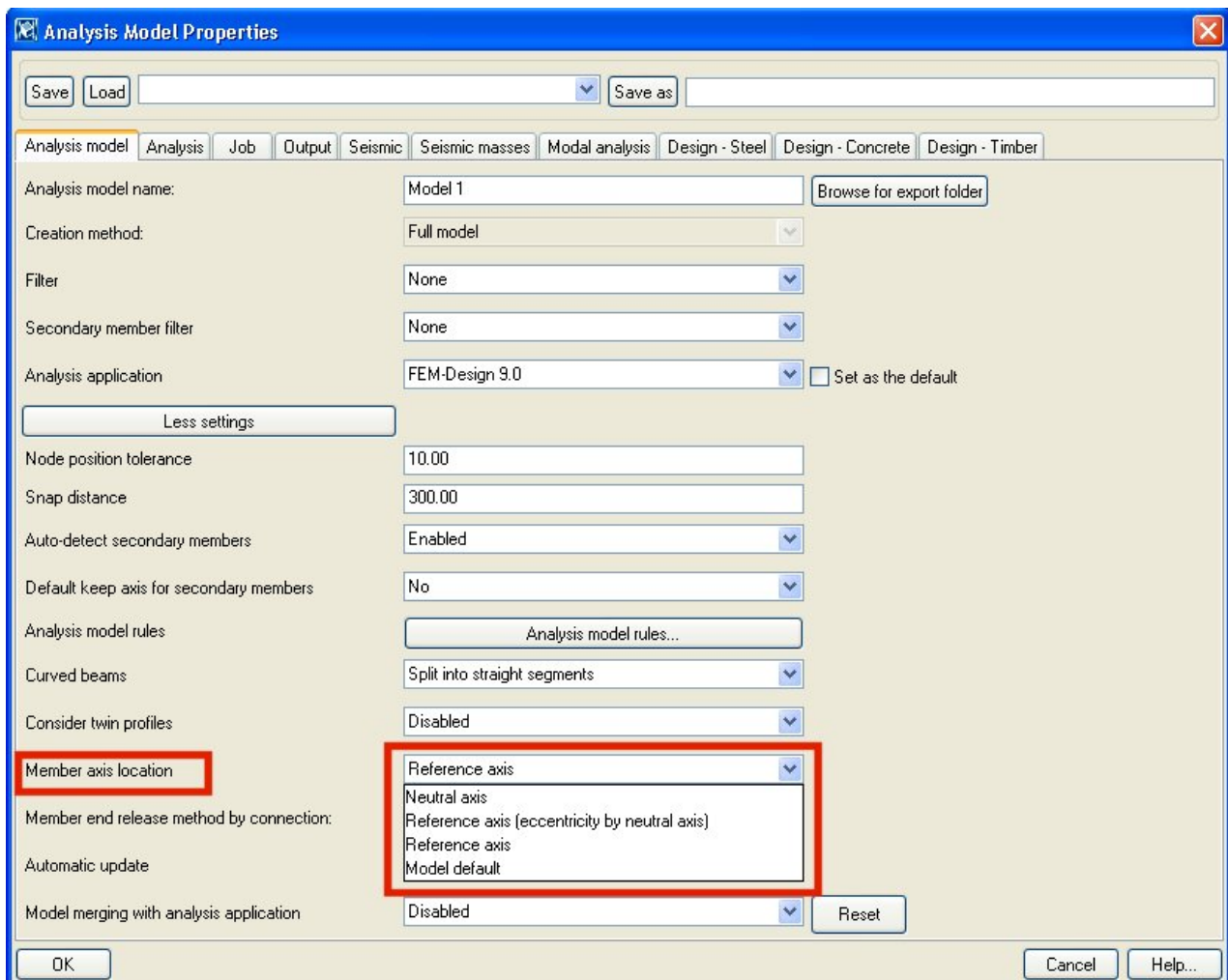
Please note that there could be default cross-section parameters defined in the cross-section conversion file. For cross-sections that have no explicitly defined conversion pair the default cross-section will be used (in FEM-Design the linear members must have cross-section defined, this information cannot be left undefined). For the syntax of default cross-sections please see the header of the conversion file.

Please also note that the contents of the default Tekla profile catalog and the default FEM-Design section library are highly different. You could easily find situations where a cross-section in Tekla has no matching pair in FEM-Design. This is true especially for hollow core profiles. The configuration of cross-section profiles will likely involve the prior creation of the cross-sections in the Section Editor module of the FEM-Design.

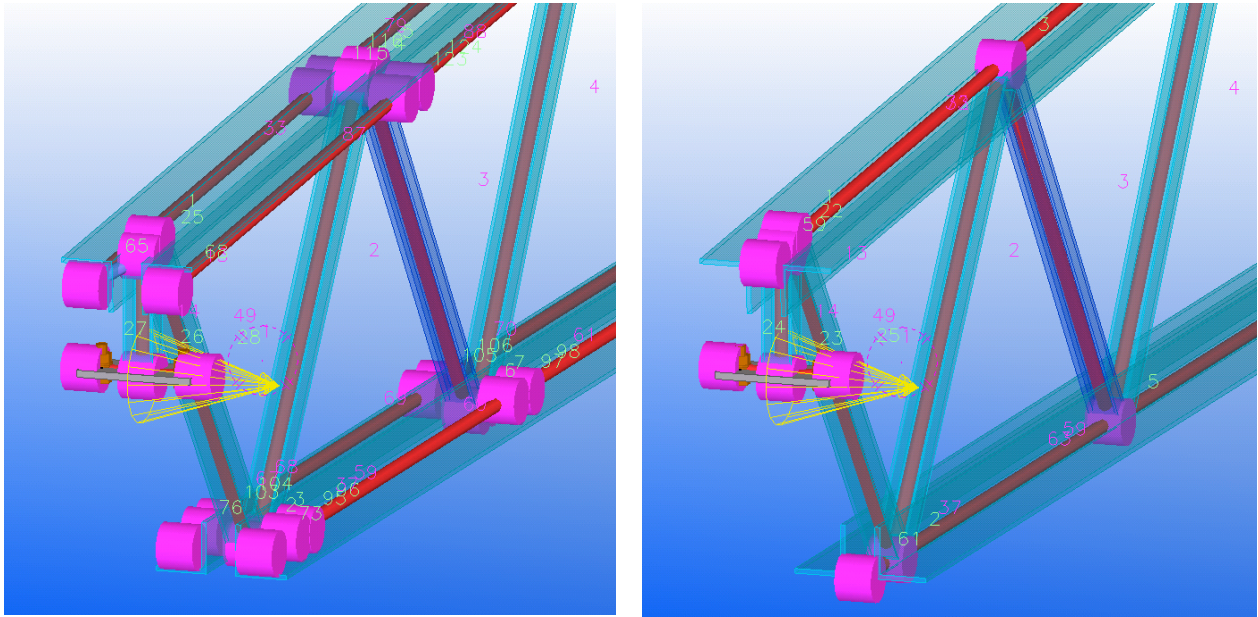
3.3 Analysis model generation settings in Tekla

It is not our intention to explain all the aspects of analysis model creation in Tekla – please study carefully the relevant Tekla manual – but let us show an example of how important the selection of right settings is for correct analysis model creation in Tekla.

The *'Member axis location'* setting of the analysis model has notable effect on the geometry of the analysis model.



Please see the bellow example on how this setting affects the positioning of nodes and members. Switching the *'Member axis location'* setting between *'Neutral axis'* and *'Reference axis'* will change the positioning of members and nodes:



Using 'Reference axis' will result in duplicated beams in the very same position in the above example (the picture to the right has duplicated flanges). Please be aware that the visualization of the model might not indicate the duplications. In FEM-Design this might cause unexpected model configuration and strange results without noticing.

It is not the scope of this manual to discuss tips and tricks of the Tekla model generation but we hope that the above example gives a hint on how important is to study the usage of Tekla possibilities carefully. When the user finds the generated model incorrect for the actual purposes it is our recommendation to overview and correct the settings of the analysis model in Tekla.

3.4 Others

As mentioned earlier the analysis model transfer can be initiated with the 'Export' button in the 'Analysis & Design Models' dialog. In the 'Analysis application interface' section of the dialog only the 'Execute' button has functionality for FEM-Design. The other buttons have no effect at this point.

It is possible to initiate the transfer a second time from the FEM-Design while the Tekla Structures is still active. Typing the command 'CXL FEM COMIMPORT' (FEM-Design 8.0) or 'CXL SFRAME COMIMPORT' (FEM-Design 9.0) into the command line of the FEM-Design will initiate the transfer again.