

Truss design guide

14 May 2013

Vertex BD

Contents

1	Project requirements and limitations.....	3
2	Quick steps of truss design process.....	3
3	Complete truss design process.....	3
3.1	Needed program options	3
3.2	Modeling supports for trusses.....	3
3.2.1	Supports and bearers	3
3.2.2	Physical contact or joints is required.....	7
3.3	Modeling trusses	10
3.4	Modeling loads for trusses	15
3.4.1	Automatically defined wind loads	19
3.5	Concentrated load on roof	22
3.6	Setting active load combinations	23
3.7	Running design	23
3.8	Checking design results	26
3.9	Building code specific issues.....	28
3.9.1	Used design formulas	28
3.9.2	Cross section definitions.....	29
3.9.3	Earth quake design	32
3.9.4	Bearing nodes	32
3.10	Check list to avoid problems in engineering	33
4	How to engineer trusses with roof panels	34
4.1	Case 1:	34
4.2	Case 2:	35
4.3	Case 3:	36
4.4	Case 4:	37
4.5	Case 5:	38
4.6	Case 6:	39

14 May 2013

1 Project requirements and limitations

- Truss Engineering allows only one building within the project.
- Buildings with dynamic wind behavior cant' be engineered
- Floor should not be used as ceiling, wind load generation in case like this is not sustained
- User should run engineering for ceiling drawing-model pair before roof to generate ceiling dead load and engineering messages, which may tell errors or warnings in modeling
- Twisting and bending out of truss plane of truss member should be prevented by structural details like bracing. Trusses are engineered only for forces affecting in truss plane.
- Shear lag in cross sections is not taken into account.
- Local transverse loads are not engineered. Qualified engineer should check if local transverse loads rules in engineering.
- If cross section maximum width to thickness ratios are out of limits stated in building code, qualified engineer should check that engineering properties of cross section are valid.

2 Quick steps of truss design process

- Model bearing walls, beams, roofs, ceilings, floors into layout
- Generate truss areas and trusses
- Generate truss members
- Check connections between members
- Check supporting contacts and connections to bearing parts
- Generate truss elevation drawing
- Generate wind loads
- Add point / area / line loads if needed
- Run design
- Check design results

3 Complete truss design process

3.1 Needed program options

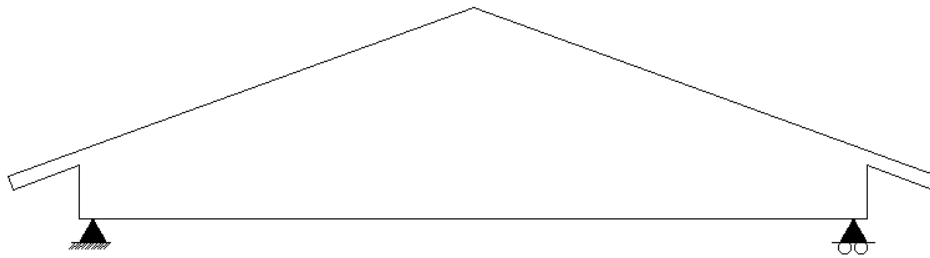
Vertex BD Truss Design option have to be set on to allow design of truss structures. Span table option use with Truss Design or Beam Design option is not possible.

3.2 Modeling supports for trusses

3.2.1 Supports and bearers

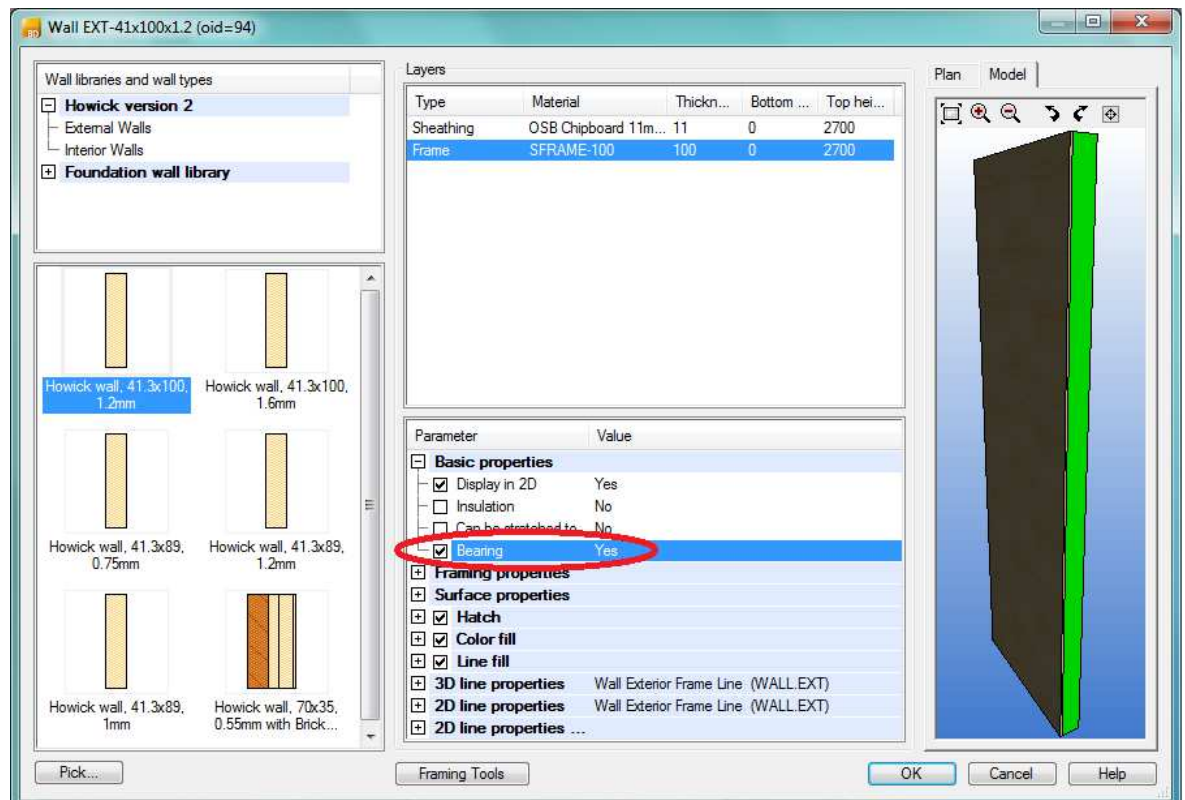
Truss supports are supposed to be either the pin or roller supports. Pinned support software is added automatically to the lowest part of truss on left hand side from viewing direction. All the rest are roller ones.

14 May 2013



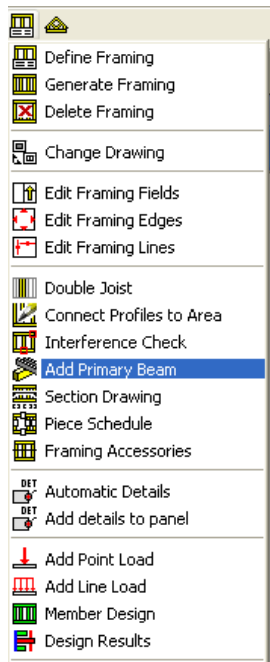
Viewing direction can be changed using function “Set Truss View Direction” in “Advanced menu” of “Truss” .

Use ordinary Vertex BD modeling tools to define bearing walls and primary beams. Usually exterior walls and foundation walls are defined to be load bearing by default, but user can switch this behavior on or off using wall properties dialog. Interior walls are most often defined as non-bearing by default in Vertex BD environment.



Beams added using Profile menu are non-bearing, but beams added using Framing menu functionality **Add primary beam** are load bearing.

14 May 2013



Columns are load bearing by default.

Hip roofs and load transfer

Rafters are often transferring loads from roof to truss. Typical case is hip end and drop down to leave space for rafters. When using framing tools, typically those profile types are correct. If user is adding single profiles manually, profile types must be checked. Load transfer requires some specific types of members. Profile types to use are as follows:

- Profiles transferring load must be “Rafters” or “Joists” (load transfer from other members is not allowed)

Function	Rafter	208
Function	Joist	200

- Profiles carrying loads from other members must be “Hip Rafters”

Function	Hip Rafter	212
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Valley trusses and support

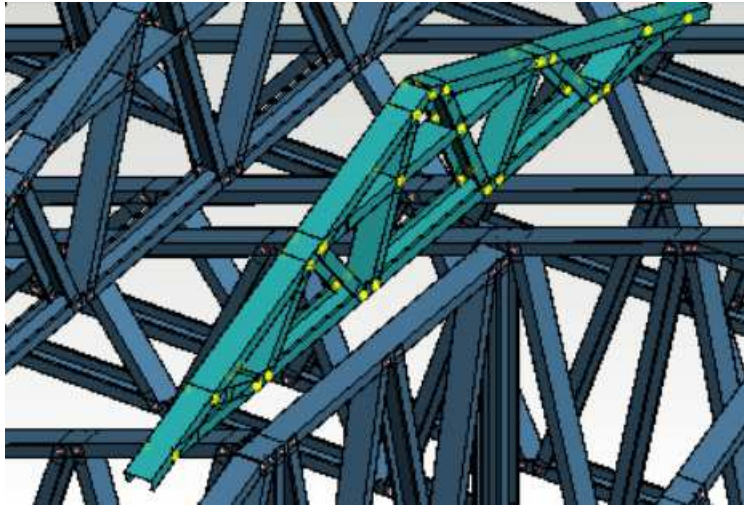
If there is short valley trusses and extra support is needed between trusses to carry loads, profile type must be “Main Beam”. Construction should be made as it is, if proper cutting lengths and profile feature are needed for production. If bearing member is made only to create support for truss engineering, easiest way to make a support add parallel support below the valley truss.

Function	Main beam	500
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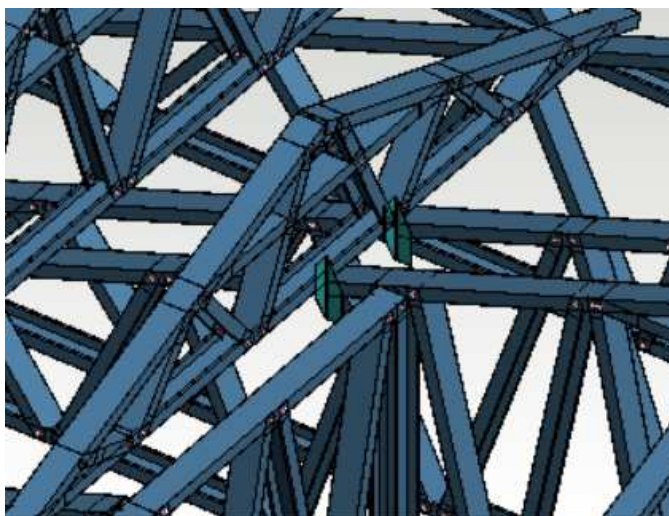
Valley/saddle truss vertical web members

14 May 2013

First time when valley truss members are generated, web verticals are not generated to main truss locations, because bearings are not recognized and valley truss can slide along main truss.

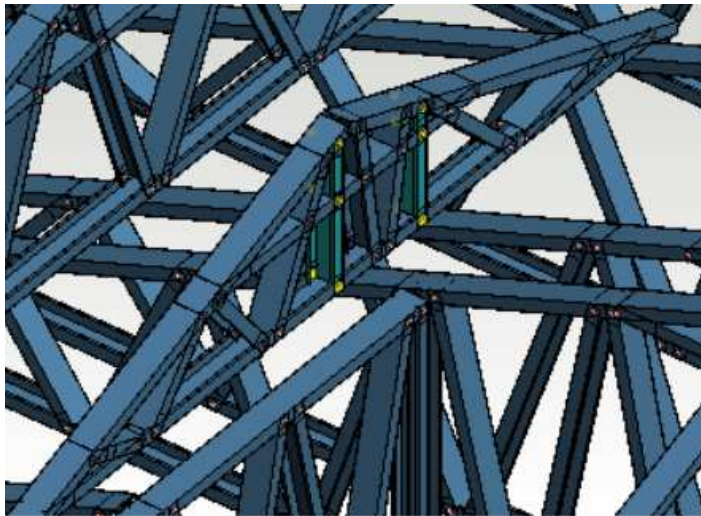


After member generation user can add connection tie joints between main truss and valley truss and after that regenerate valley truss members.



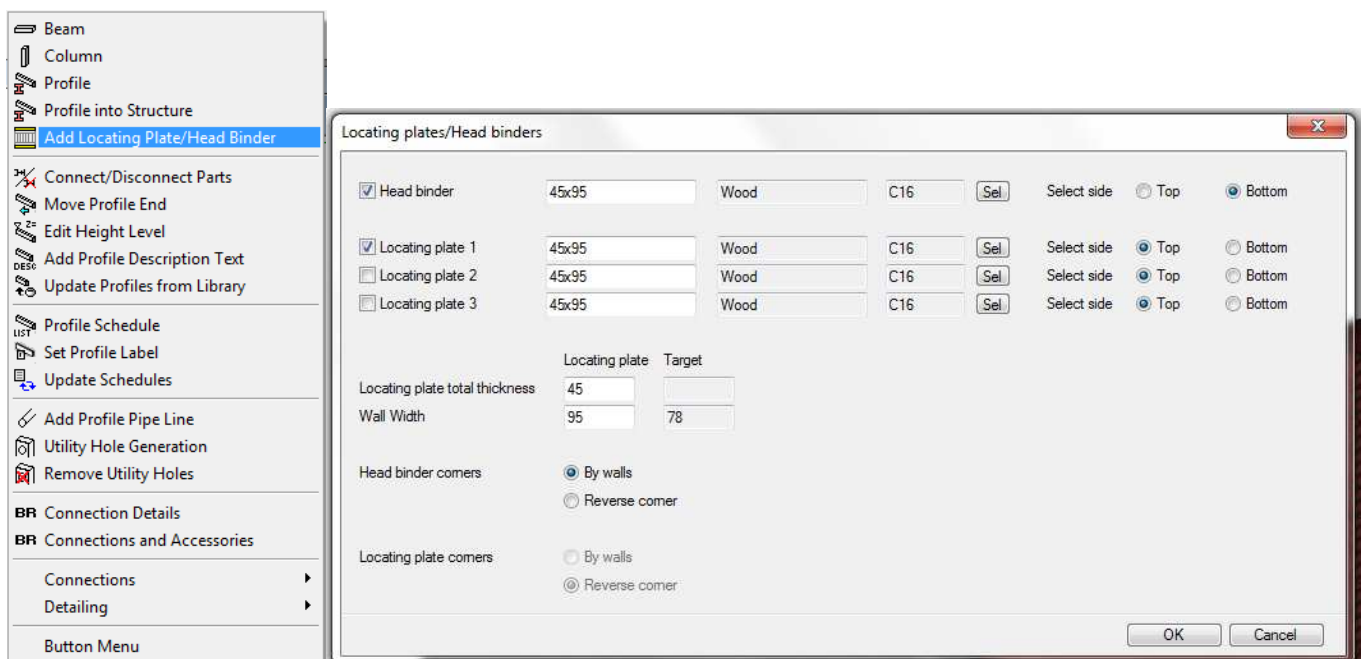
Now bearings are recognized and vertical web members are generated.

14 May 2013



3.2.2 Physical contact or joints is required

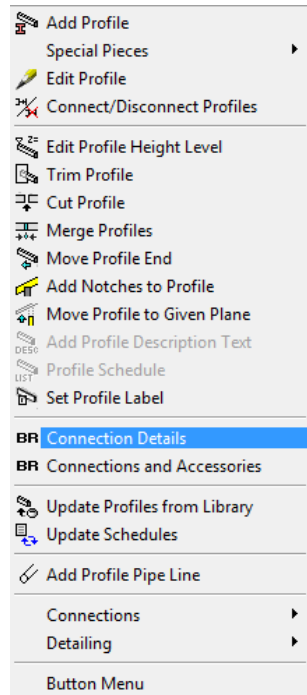
Physical contact or joint between parts is required for support condition between truss member and other bearing object. Contact should cover the total width of supported member otherwise the contact is not working as load transferring contact. If there is space between top of the wall and bottom of the truss, something is needed in between. One typical structure is binder plate above walls and structural beams. Plates can be added one by one manually. There is also more automated tool to add those in profile menu:



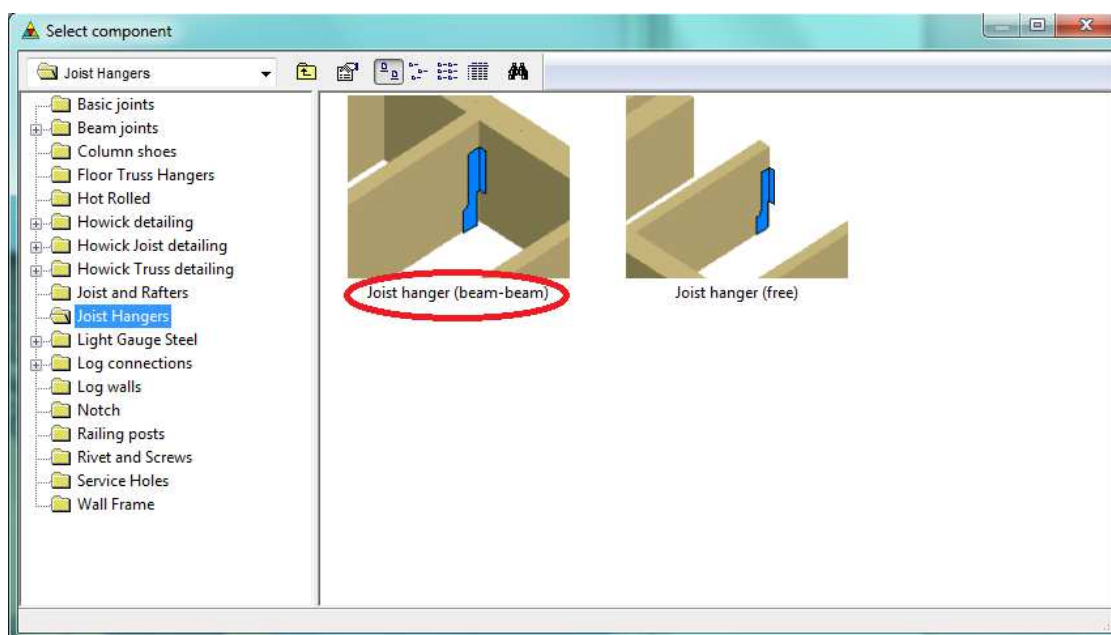
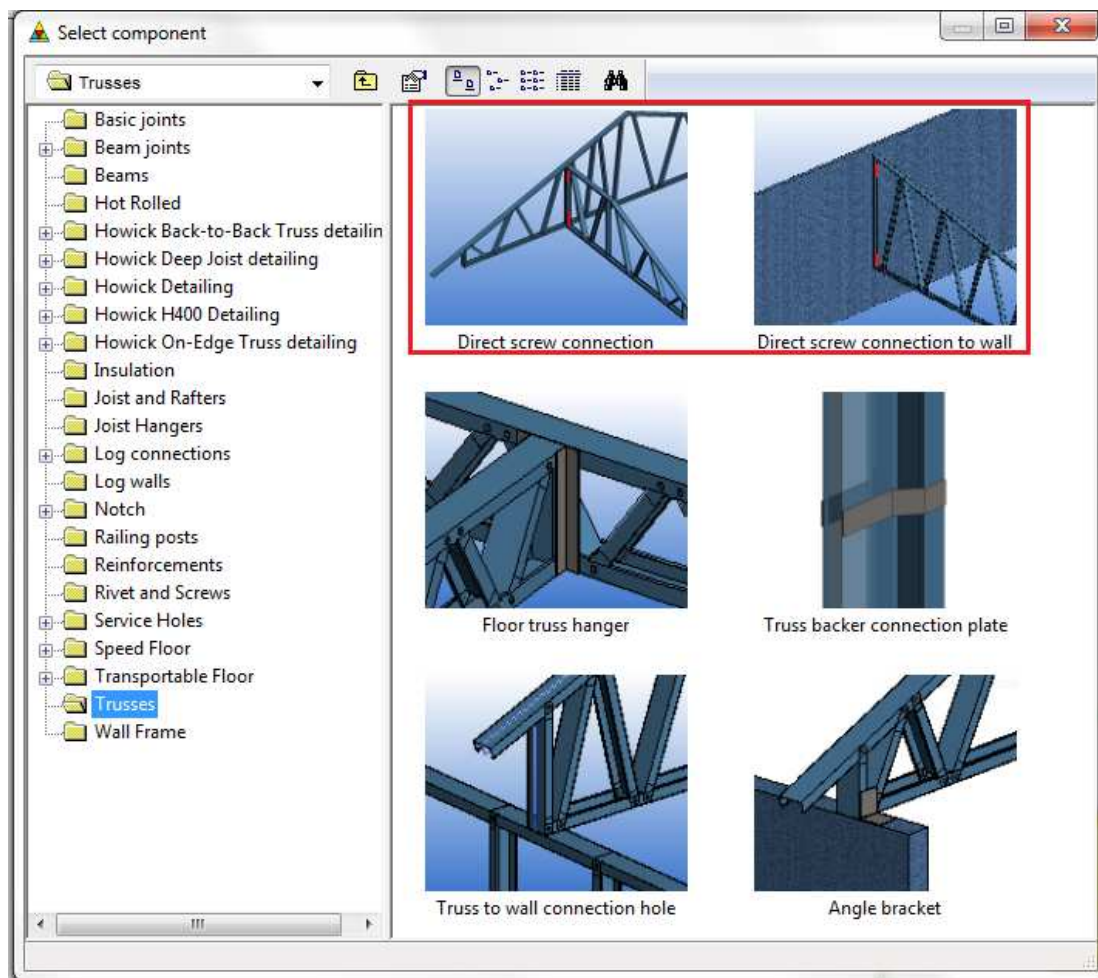
Joints may work as load transferring even if there is no any physical contact between supporting and supported object. Then there have to be a load bearing connector in a joint and a load receiving object. The connector itself does not work as a support. For example a free hanger connected to member end without connection to a header member is not working as a support. Uncheck "Free" selection box for hanger joints to get load transferred from member to another.

14 May 2013

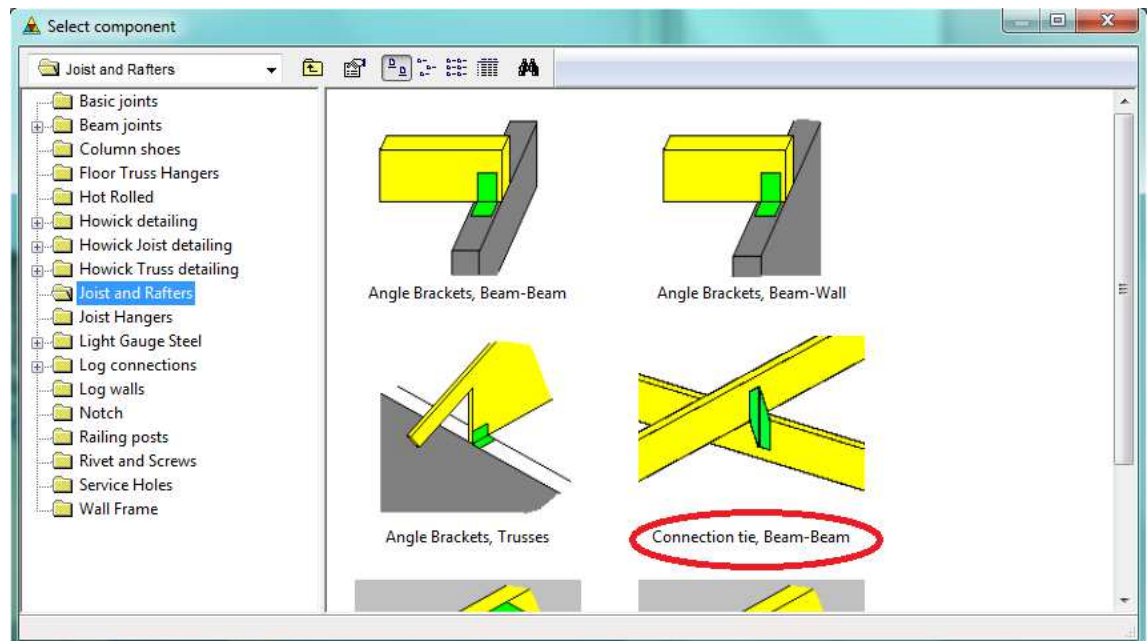
Trusses may be connected to other trusses using joints. Direct screw connections are most effective tool to connect trusses to other structures. Most of the connections in library are single connection and they need to be added one by one. Direct screw connections are made for mass selection. User selects connecting members (trusses/walls) and defines properties of connectors. System adds connection automatically between verticals if they are parallel and close enough each other. Girder truss may work as supporting object for hip end truss. In this case joints are always between truss members not between trusses.



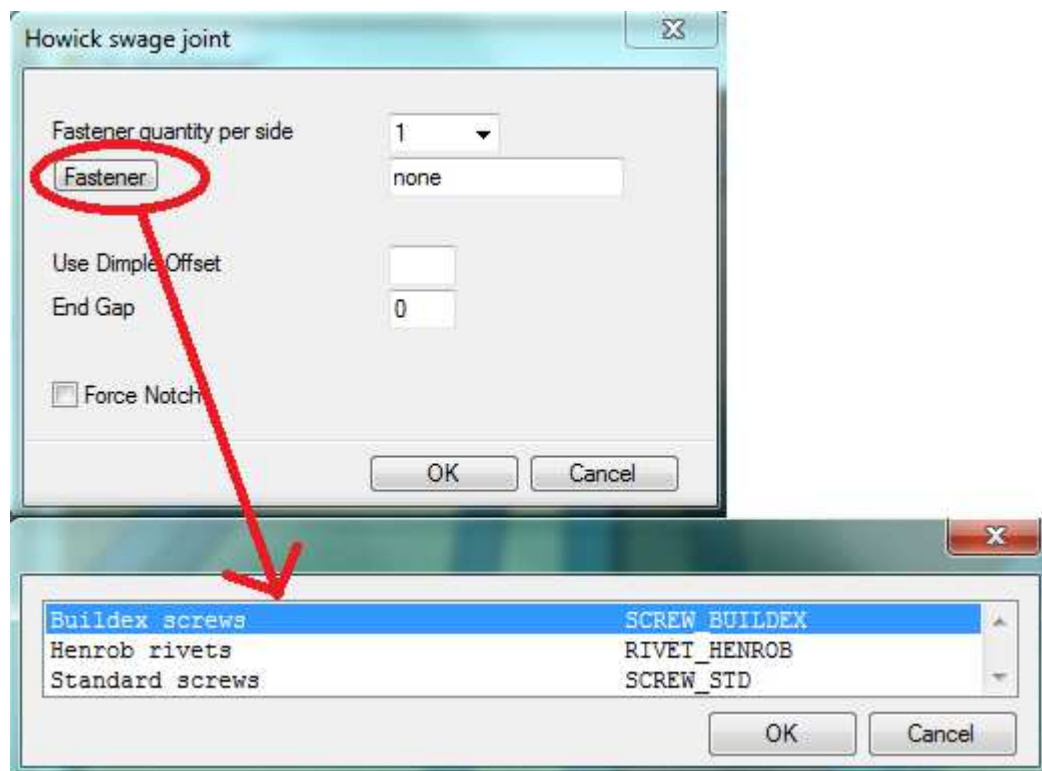
14 May 2013



14 May 2013



Some joints may have faster selection. By selecting a faster user can affect to strength of joint.



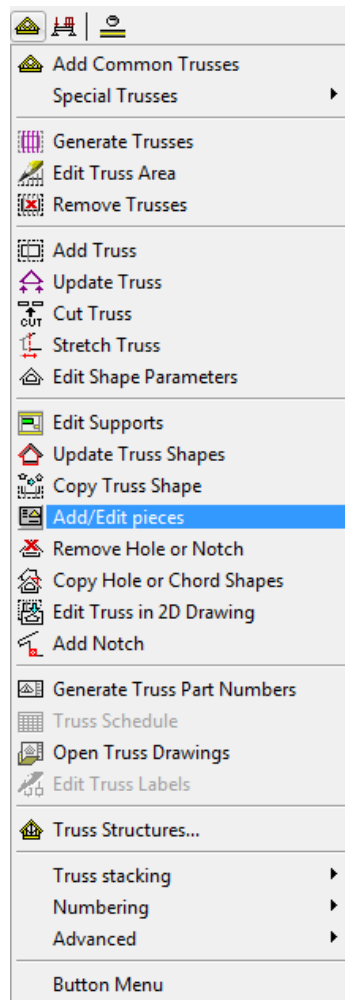
3.3 Modeling trusses

Use ordinary Vertex BD modeling tools to define truss areas and truss shapes. Before defining truss areas user has to model ceilings and roofs. Ceiling areas and roof slopes are also used to distribute acting uniform loads to load bearing members.

When truss shapes are defined, modify truss shapes giving tolerances and offsets that are required for connectors or rafters. Truss members are generated inside and flush with truss shape edges.

14 May 2013

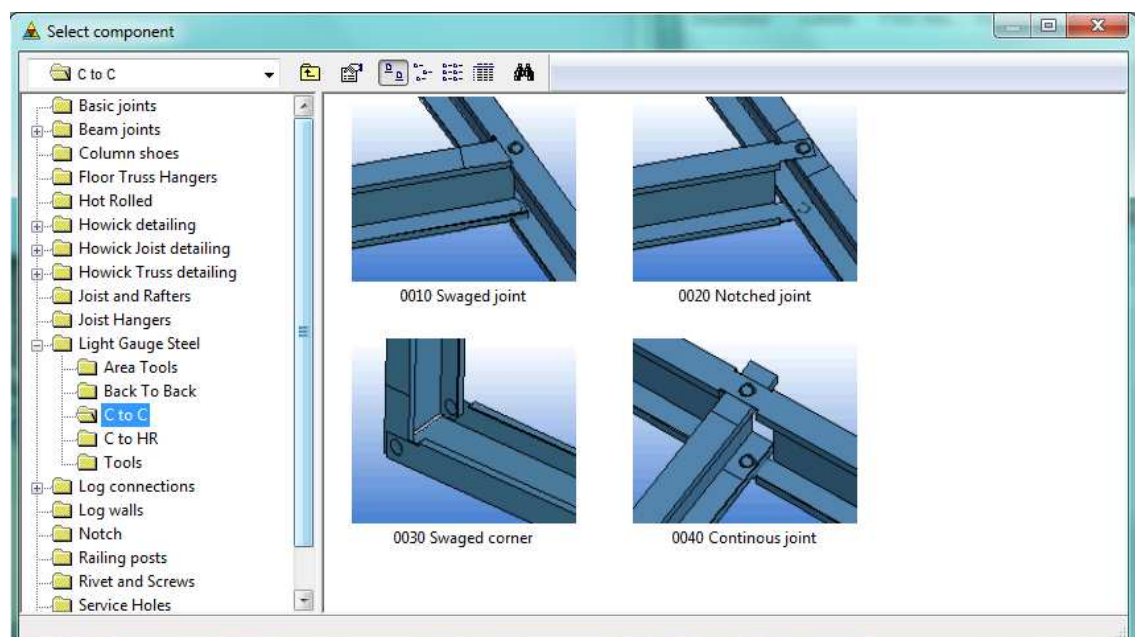
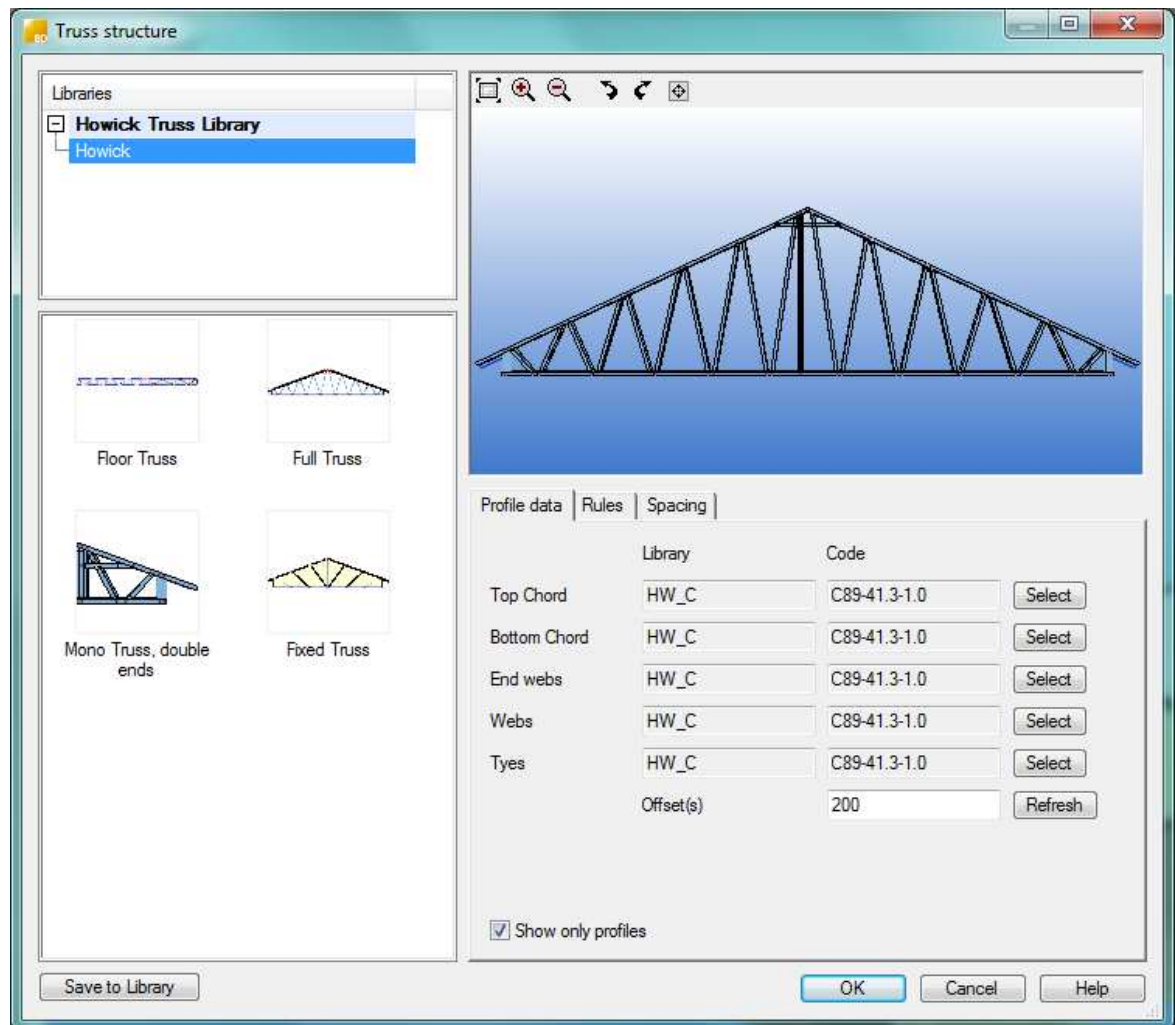
After defining truss shapes use **Add/Edit Pieces** functionality in Trusses menu to generate truss members. Back to back configuration of truss members is not included in Vertex BD software. Also design of back to back trusses is not possible. All neutral axis of truss members should locate in one plane. This kind of configuration is called in-plane truss.



Select appropriate cross sections for chords, webs (diagonals) and end webs (end verticals) in Truss structure dialog. Cross sections with design data proper for Australian building code can be checked under Vertex BD installation system or custom\setup\AS_4600_2005\AS\CS folder. Other building codes may be available too.

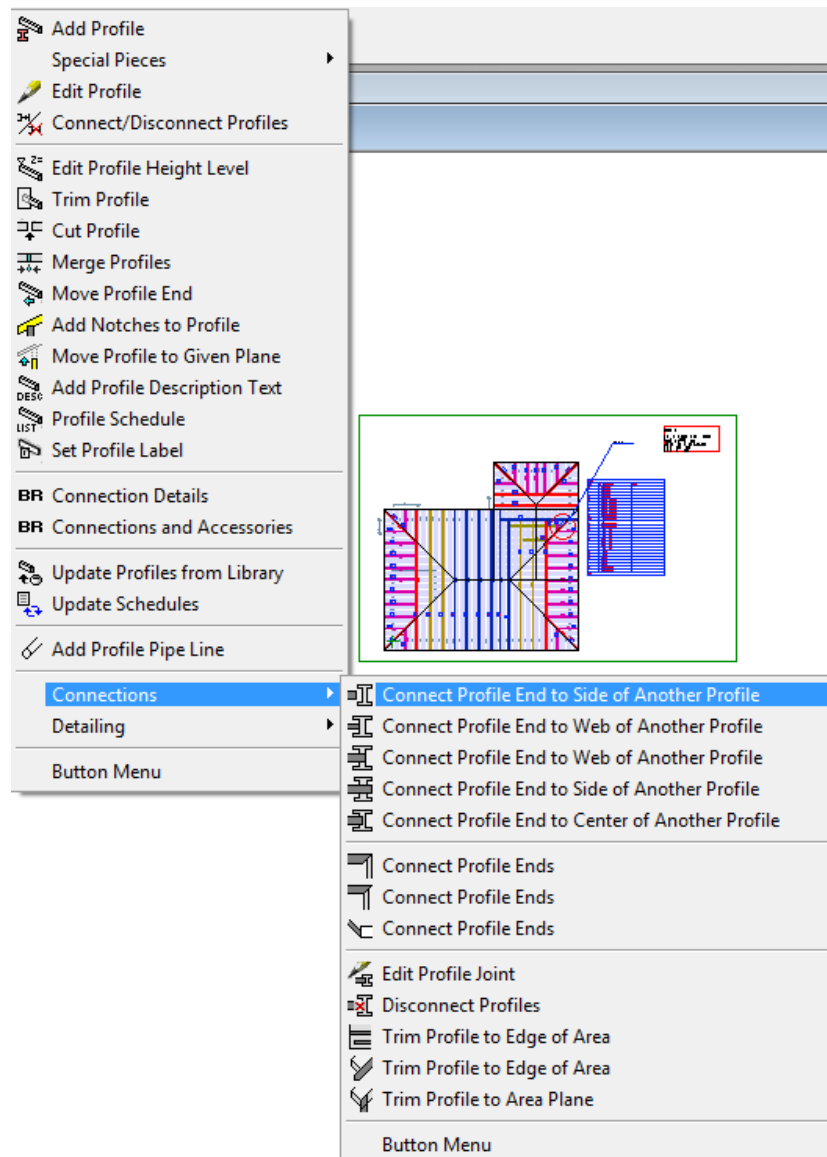
Select appropriate framing rules for truss and finally select appropriate joints between truss members. Use light gauge steel joints between truss members or tick joints as welded. Truss member joints could have design capacity or not depending on program setup. All joints in truss design are understood as pinned connection nodes. If there are no joints between truss members then there won't be any pinned connections in design model and truss members may work like mechanism that can't be solved during design.

14 May 2013



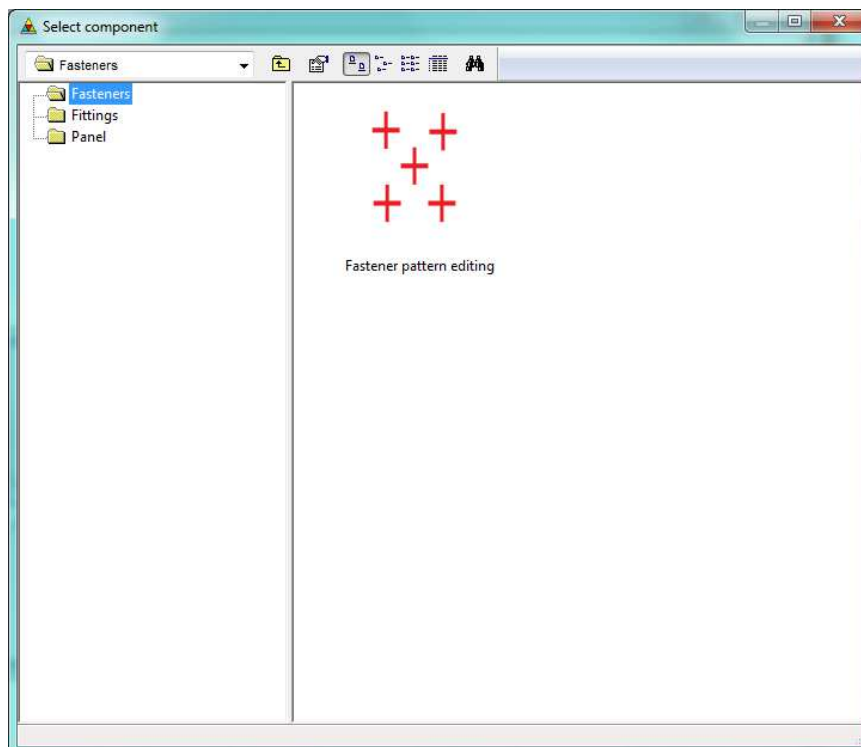
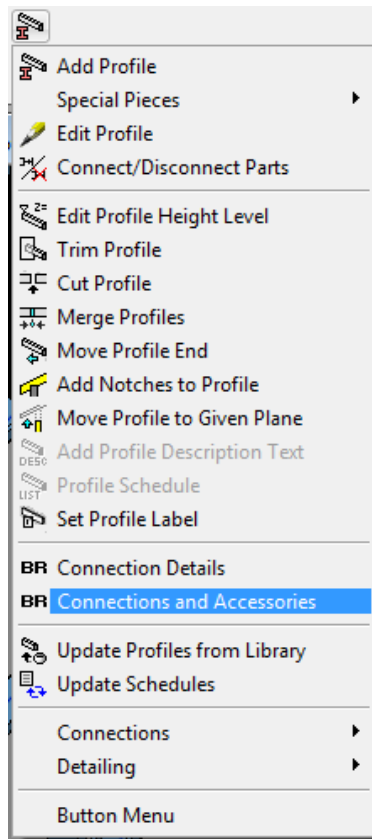
14 May 2013

Welded joints can be created also later using ordinary profile connection tools.



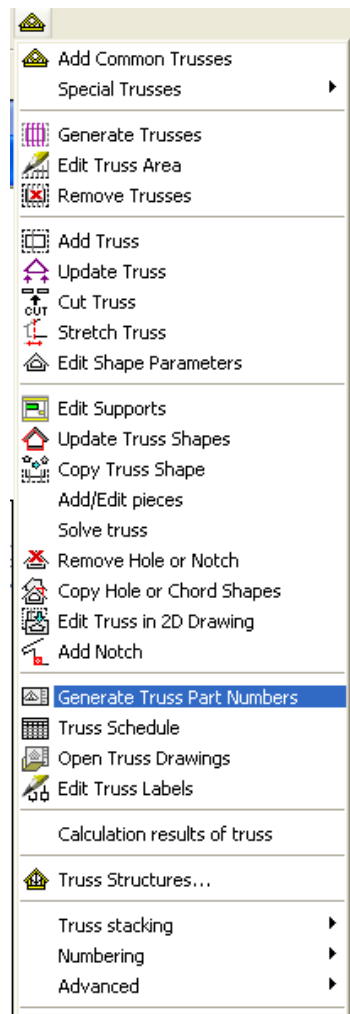
Modifying connection fasteners is achieved by Connections and Accessories. Using Fastener pattern editing the number of fasteners or fastener type can be changed. Fastener selection affects to load bearing capacity of joint.

14 May 2013



14 May 2013

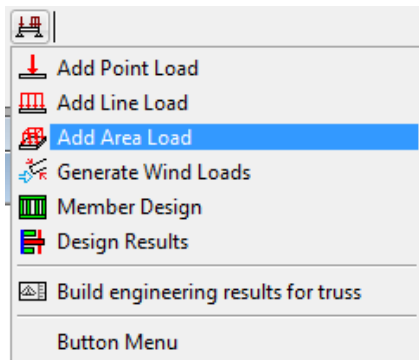
There have to be truss members in all trusses and truss elevation drawings should be generated before truss design. This is needed because trusses should have labels where design results can refer to. Truss labels will be updated during design process.



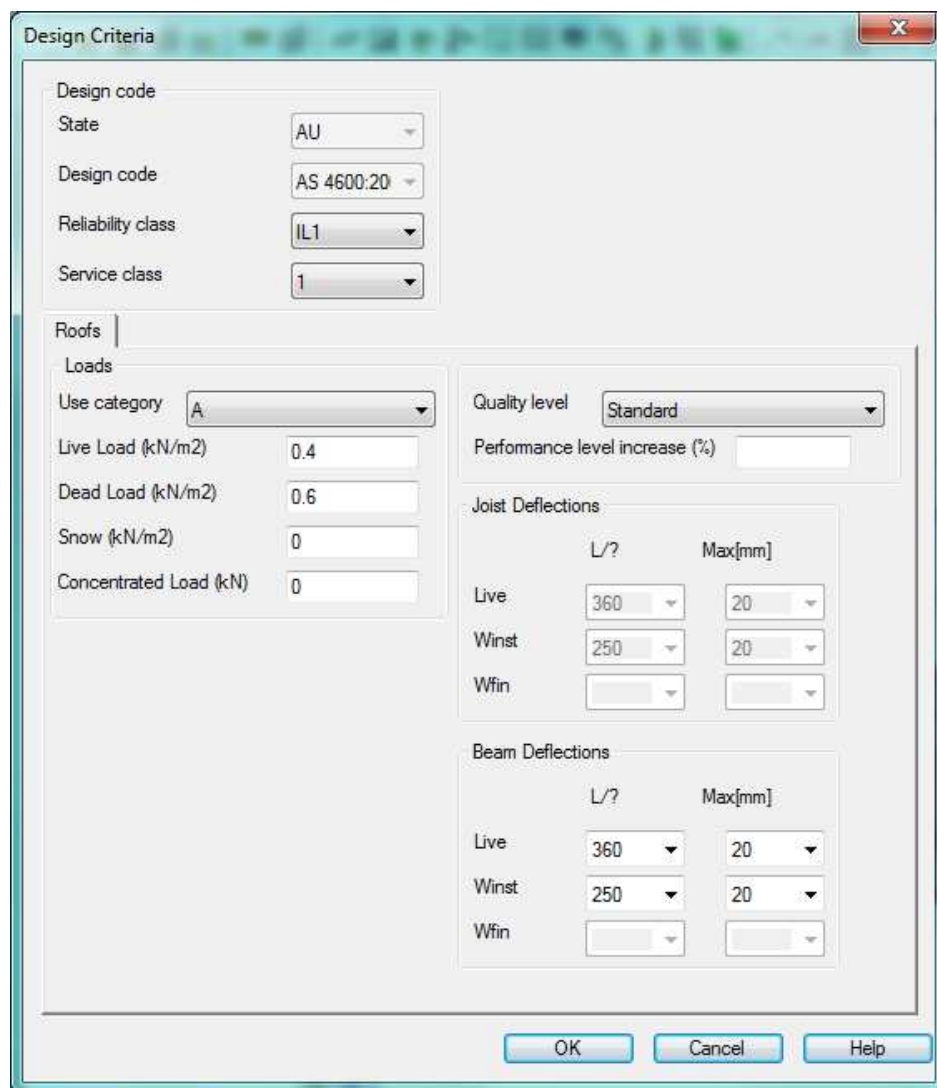
3.4 Modeling loads for trusses

Point, line and area loads can be added into layout using **Add point Load**, **Add Line Load** or **Add Area Load** functionality in Engineering menu when 2D is active. Point and line loads are connected to selected roof or ceiling areas or to selected member if area is not found. Area loads are connected to roof or ceiling area. All loads should be modeled into same drawing-model pair where bearing object is. Point or line loads located between bearing objects is divided to nearest bearing objects with multipliers reversed comparable to distance from load to objects.

14 May 2013



Uniform loads are defined when running **Member design** functionality. Live, dead, or snow loads can be added. Selected magnitudes affect in active 2D layout only. These horizontal loads are projected to sloped areas and then load magnitude is reduced compared to area declination. Load magnitudes can be set different for roofs, ceilings and floors and proper tab is shown in dialog only if given type of area exist in active layout. The beam deflection limits applies for truss bottom chords.



Design code	
State	AU
Design code	AS 4600:20
Reliability class	IL1
Service class	1

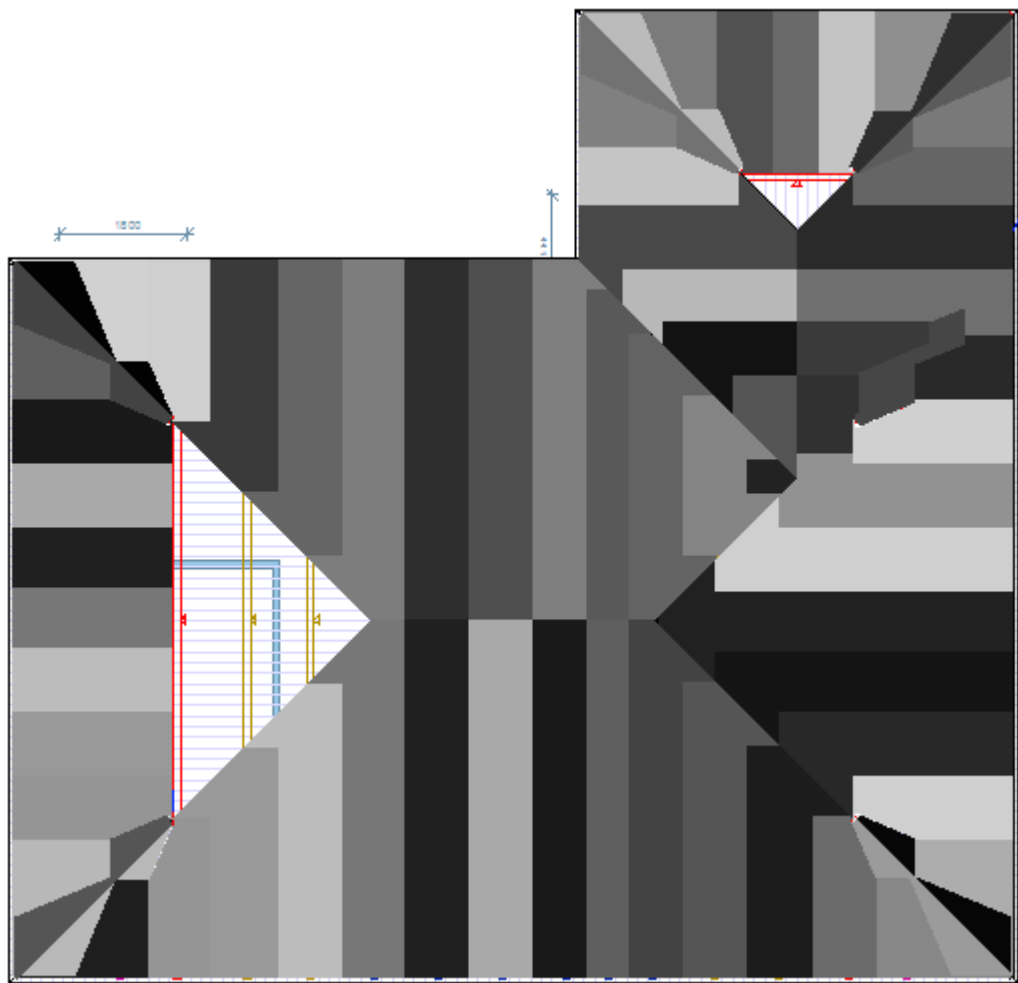
Roofs	
Loads	
Use category	A
Live Load (kN/m2)	0.4
Dead Load (kN/m2)	0.6
Snow (kN/m2)	0
Concentrated Load (kN)	0
Quality level	Standard
Performance level increase (%)	
Joist Deflections	
	L/? Max[mm]
Live	360 20
Winst	250 20
Wfin	
Beam Deflections	
	L/? Max[mm]
Live	360 20
Winst	250 20
Wfin	

OK Cancel Help

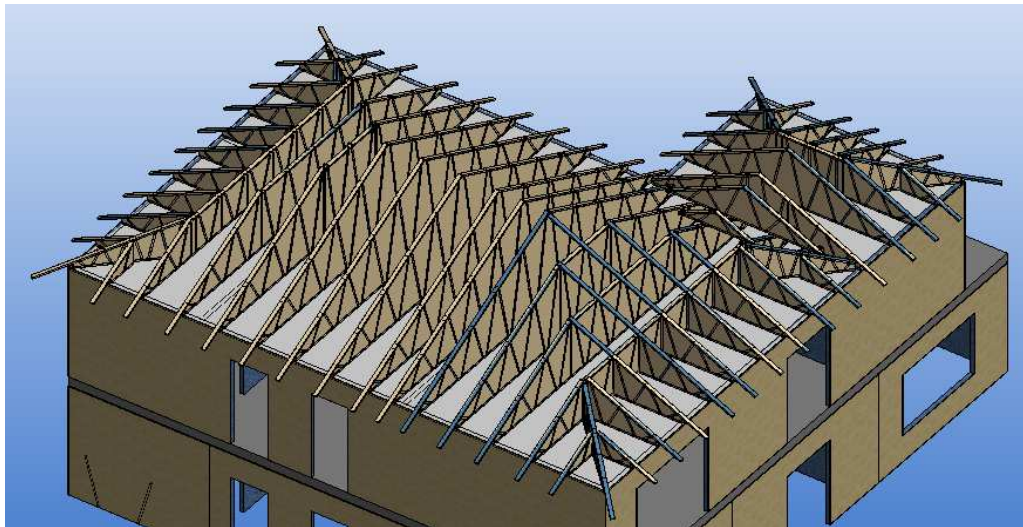
14 May 2013

Uniform loads are divided to members based on loading tributary area solving which is done during design. Greyed areas seen below shows tributary areas and areas without grey color (with background color) are unsupported areas. Trusses with hip drop should have rafters or jack truss extended top chords above them and connected to them to get load from roof slope.

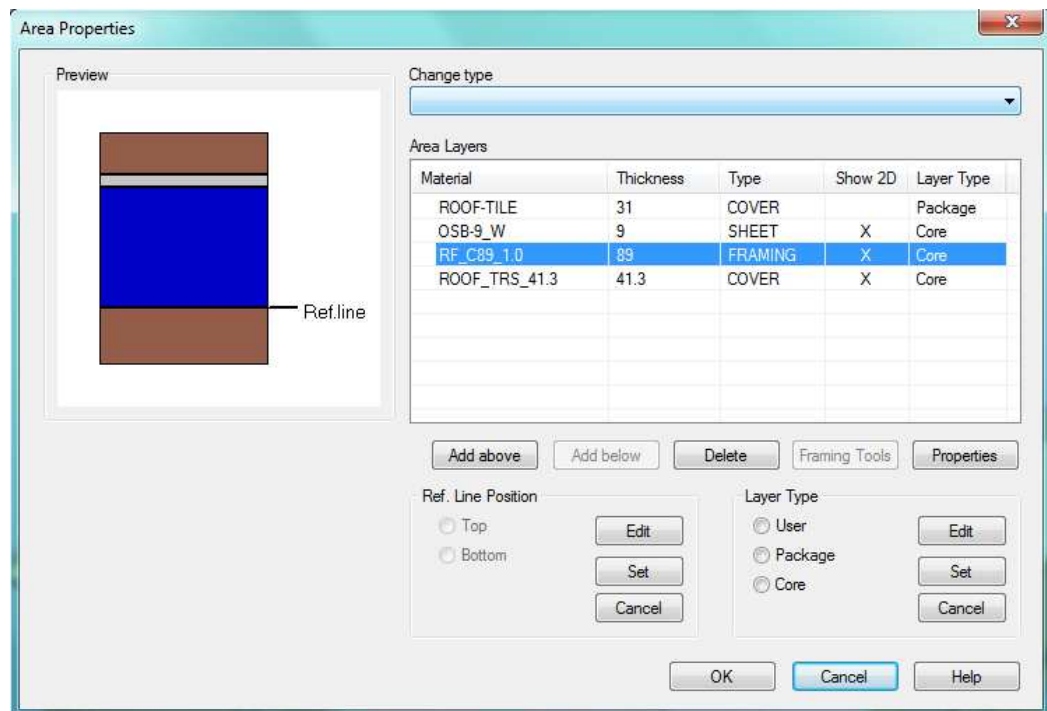
Only vertical transferred loads from supported structures in same drawing model pair or connected trusses are added to truss loading model. Loads from upper floor levels are not transferred. Truss engineering doesn't take care of horizontal load components affecting perpendicular to truss side plane. Engineer should design these horizontal loads and structures carrying them independently.



14 May 2013



Geometry of area main framing layer is used when solving loading tributary and members getting load from area should be located top flush with main framing layer top face. Truss bottom chord if bottom flush with ceiling main framing layer may also get wind load from ceiling.



After the design uniform load values are shown in layout rounded with red or green box indicating a validity state of design.

14 May 2013

Roof Loadings

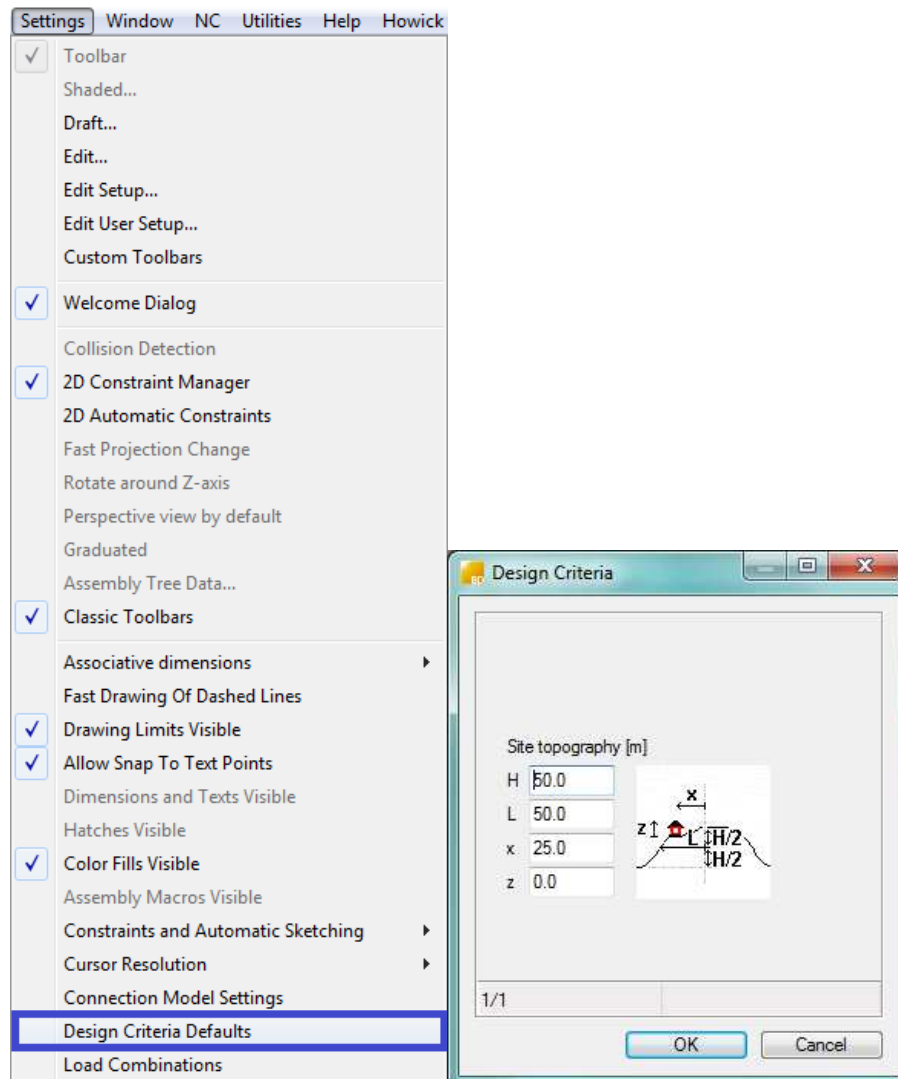
Imposed load H, roof maintenance =0.4 kN/m²
Dead load =0.6 kN/m²
Snow load <= 1000 m =0 kN/m²
Concentrated load check NOT CHECKED
Wind load down =0.6 kN/m²
Wind load up =-0.6 kN/m²

3.4.1 Automatically defined wind loads

Building code may offer automatic wind load generation option. Before wind loads are generated, internal load pressure are should be defined. There is specific function for that purpose in engineering menu. This functions tries to find closed exterior wall change ad add automatically area using frame exterior line as a reference. It's also possible manually add or modify area.

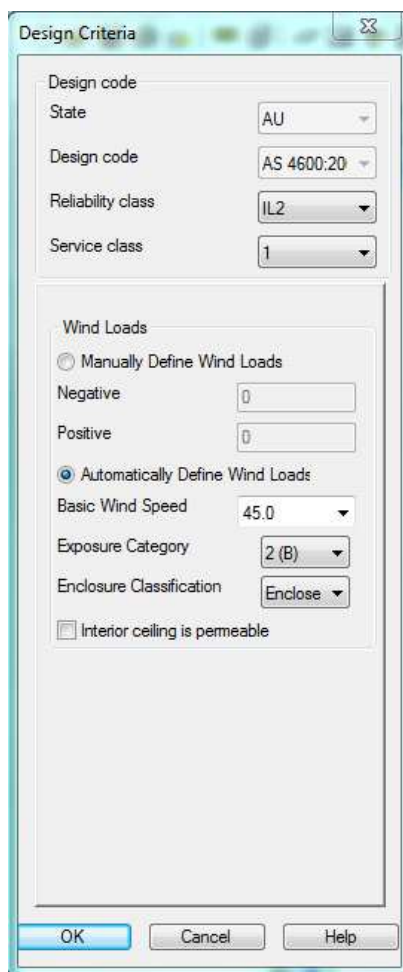
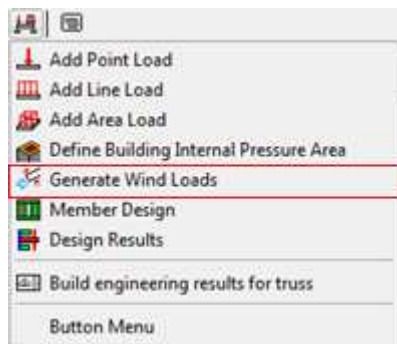
Automatic wind loads are generated based on wind speed, exposure of building site and building enclosure classification. Design criteria defaults should be checked before generating wind loads. Parameters in site topology dialog affects to generated wind loads. Hill height (H), hill width at half height (L), site location from top of hill (x) and building height (z) should be given. Wind load generation may fail if building height is not defined.

14 May 2013

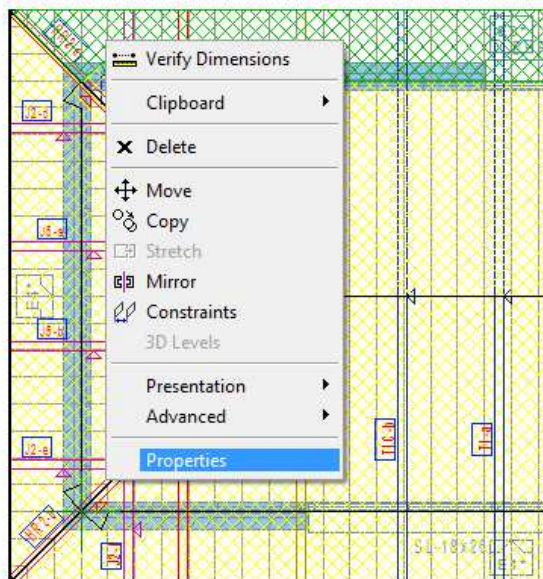
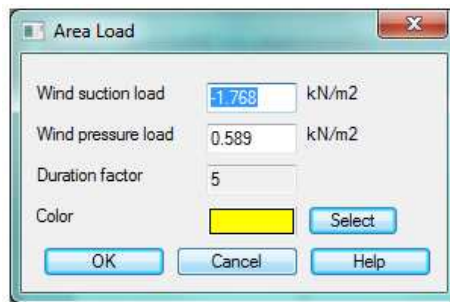


Generation of wind loads creates additional area loads into active building model. Edges of these area loads, magnitude of wind loads and presentation color are then available for user editing. Wind internal pressure is assumed to affect to bottom chord via ceiling area if building type is not defined as "Open" and interior ceiling is not checked as permeable in Design criteria dialog. Ceiling structure 0-layer bottom surface should match to truss bottom chord bottom surface and there should be another layer below ceiling 0-layer to get generated wind loads correct. If ceiling is in wrong height level then "Unsupported object found" errors will arise during engineering indicating that ceiling wind loads are not set to trusses. Otherwise wind internal pressure affects to top chords. Enclosed exterior wall chain should exist in building model, because system detects exterior overhang areas and interior areas of chords based on exterior wall chain. Remark: User should generate wind load to ceiling too. Wind positive external is affecting to top chord via roof slopes. Wind loads are not affecting to end verticals of trusses.

14 May 2013



14 May 2013

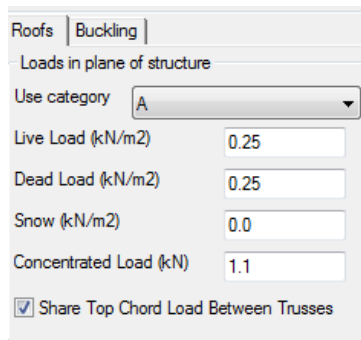


Wind is assumed to blow from any direction and user should select the most open terrain exposure category for building site. The user selected building enclosure classification should base on interpretation of selected building code. Wind frictional drag load is not taken into account. Automatic generation of wind loads may fail if building width depth ratio or building mean height does not meet the requirements of selected building code. Then user should define manually all wind loads using uniform load values or point and line loads.

3.5 Concentrated load on roof

Concentrated load value depends on load category (This may vary depending on building code. For example load category A = 1,1 kN, Australian building code, residential case). Program uses building code specific value by default. Value can be change in roof tab of engineering dialog. If value is changed, it may be not fulfil anymore requirements of building code. Load is applied as a half of this value to top chord by default and full for bottom chord (This may vary depending on selected building code). Load dialog allows user to select if load is shared between top chords or not. See picture below:

14 May 2013



Roofs | Buckling |

Loads in plane of structure

Use category A

Live Load (kN/m2) 0.25

Dead Load (kN/m2) 0.25

Snow (kN/m2) 0.0

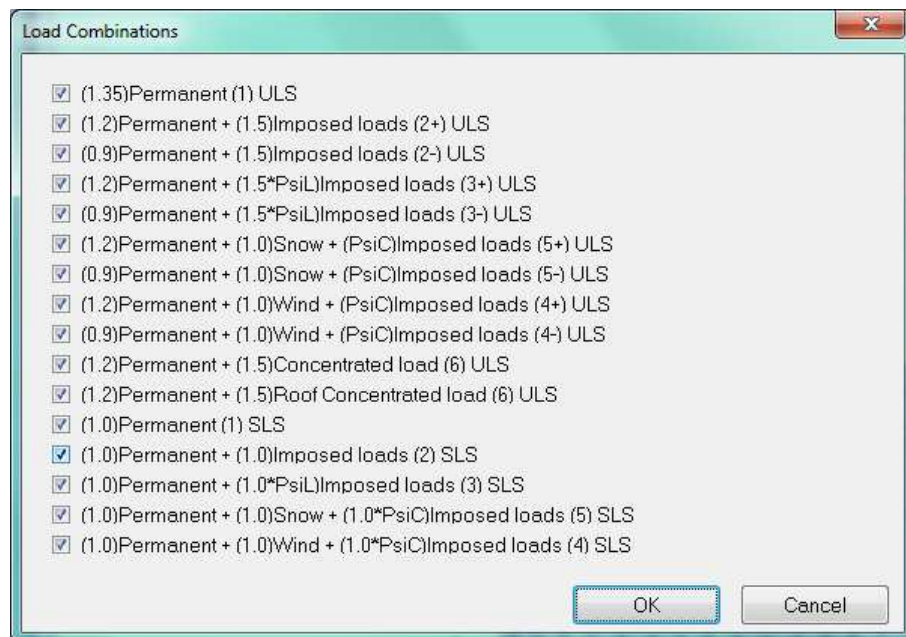
Concentrated Load (kN) 1.1

☒ Share Top Chord Load Between Trusses

3.6 Setting active load combinations

Use **Load combinations** functionality from Settings menu to set active load combinations. A set of load patterns are generated during the design and all these load patterns are run through selected load combinations to create number of load cases. While generating truss load patterns all variable loads are set on or off for each top chord truss member depending on current location of separating folding point.

If concentrated load value is given in design criteria dialog during engineering truss bottom chord get loaded by moveable concentrated load. This concentrated load is placed just next to bearings and into middle of span or to end of cantilever and it acts only with dead load.



Load Combinations

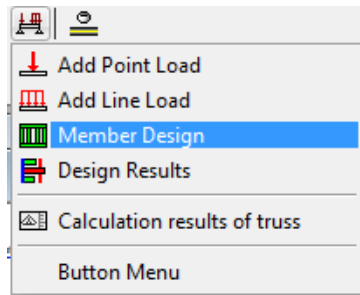
- ☒ (1.35)Permanent (1) ULS
- ☒ (1.2)Permanent + (1.5)Imposed loads (2+) ULS
- ☒ (0.9)Permanent + (1.5)Imposed loads (2-) ULS
- ☒ (1.2)Permanent + (1.5*PsiL)Imposed loads (3+) ULS
- ☒ (0.9)Permanent + (1.5*PsiL)Imposed loads (3-) ULS
- ☒ (1.2)Permanent + (1.0)Snow + (PsiC)Imposed loads (5+) ULS
- ☒ (0.9)Permanent + (1.0)Snow + (PsiC)Imposed loads (5-) ULS
- ☒ (1.2)Permanent + (1.0)Wind + (PsiC)Imposed loads (4+) ULS
- ☒ (0.9)Permanent + (1.0)Wind + (PsiC)Imposed loads (4-) ULS
- ☒ (1.2)Permanent + (1.5)Concentrated load (6) ULS
- ☒ (1.2)Permanent + (1.5)Roof Concentrated load (6) ULS
- ☒ (1.0)Permanent (1) SLS
- ☒ (1.0)Permanent + (1.0)Imposed loads (2) SLS
- ☒ (1.0)Permanent + (1.0*PsiL)Imposed loads (3) SLS
- ☒ (1.0)Permanent + (1.0)Snow + (1.0*PsiC)Imposed loads (5) SLS
- ☒ (1.0)Permanent + (1.0)Wind + (1.0*PsiC)Imposed loads (4) SLS

OK Cancel

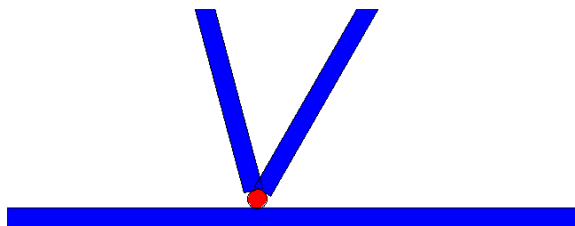
3.7 Running design

Use **Member design** functionality in Engineering menu to run truss design. 2D layout should be active while running design. Set design criteria in Design Criteria dialog and then select trusses to design.

14 May 2013



Truss analysis model is created during design. Truss bottom and top chords are continuous and webs are connected to chords with pinned connection nodes. Number of design points along design element between nodes can be set in building code setup.



Linear first order analysis is used to solve truss structure statistics and Euler-Bernoulli beam element is used. Shear deformation can be taken into account by defining (A_y and A_z) effective areas of design cross sections under building code resisting shear deformation to local direction of main principal axis coordinate system. Ends of beam elements are supposed to be free of any restraint in torsion.

Only in-plane trusses (weak axis) can be engineered. Main principal axis of all truss members should locate in middle plane of truss. Needed out of plane buckling restraint spacing is solved member by member and in plane buckling is checked.

14 May 2013

Design Criteria
✕

Design code

State AU

Design code AS 4600:20

Reliability class L2

Service class 1

☒ Optimize Connections between Truss Members

Floors
Roofs
Buckling

Effective length for torsional buckling, top chord (A) 900.0


Effective length for torsional buckling, bottom chord (B) 600.0

Effective length for torsional buckling, web (C) 5000.0

Effective length for side-way buckling, top chord (D) 900.0

Effective length for side-way buckling, bottom chord (E) 600.0

Effective length for side-way buckling, web (F) 5000.0



OK
Cancel
Help

Length for torsional buckling = distance between torsional supports (prevents rotation).

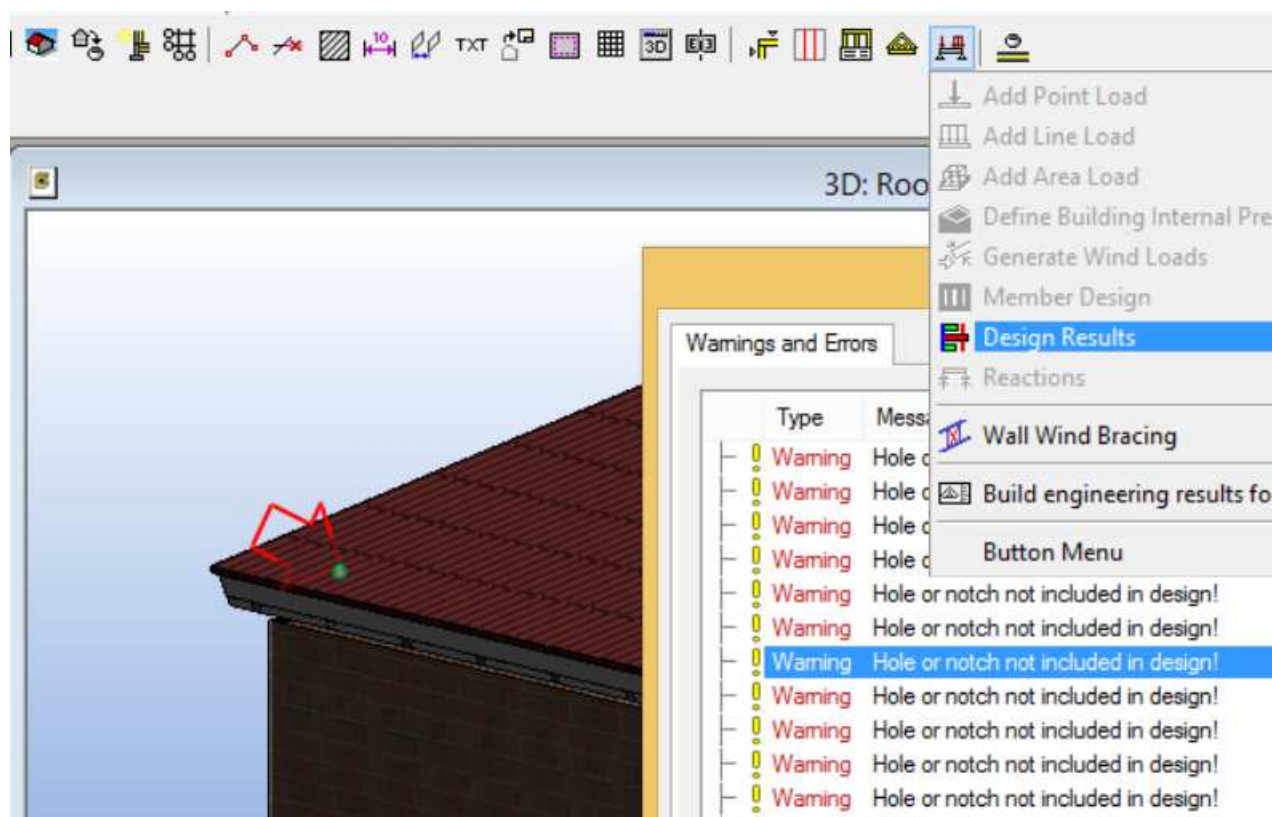
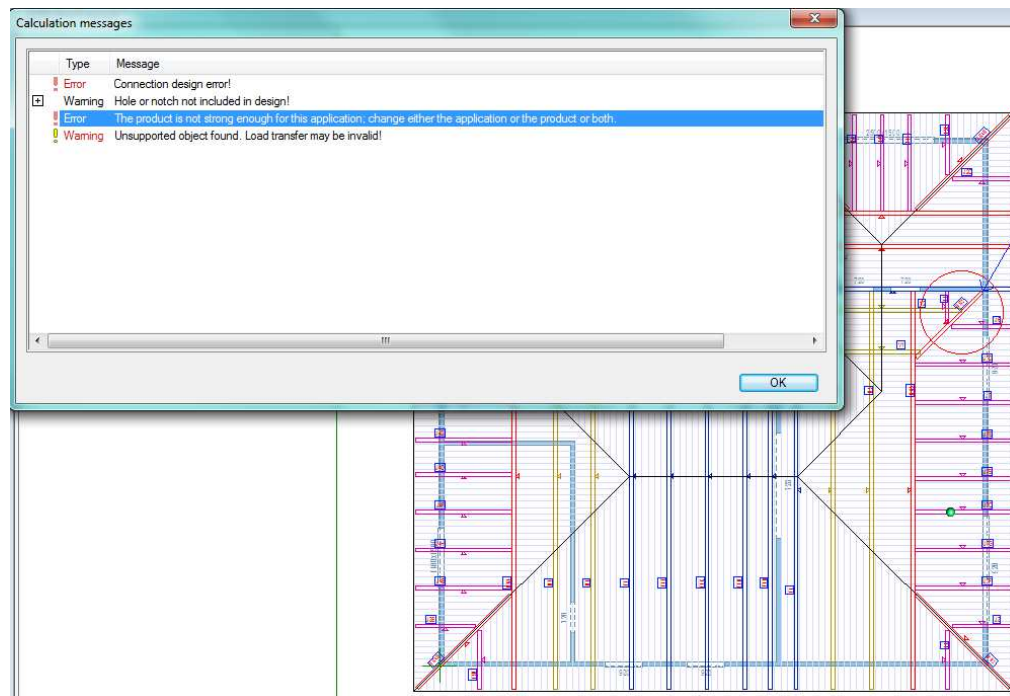
Length for side-way buckling = distance between lateral supports (prevents side-way translation).

Effective length depends on the type of the supports.

14 May 2013

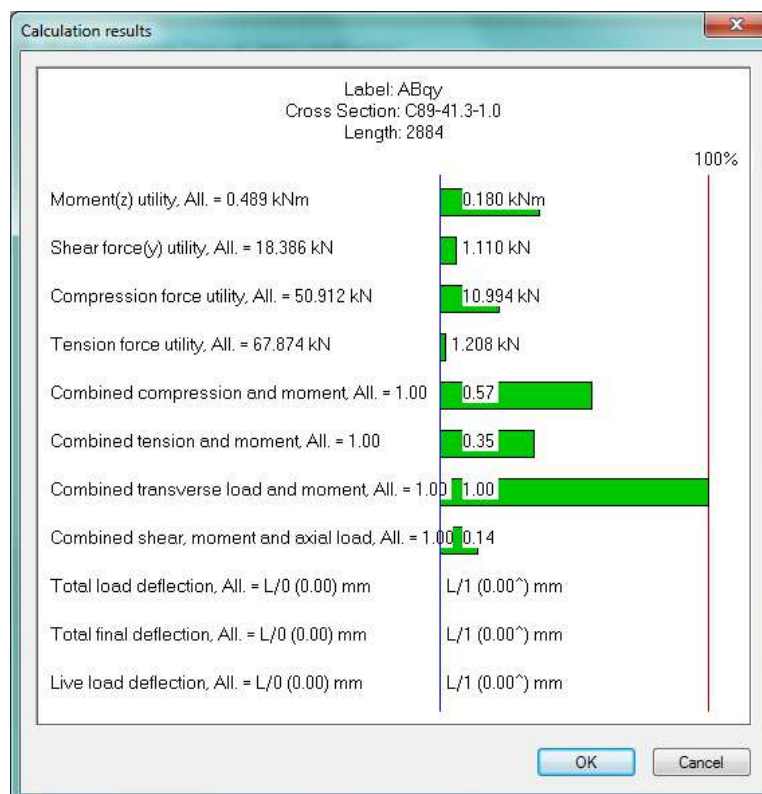
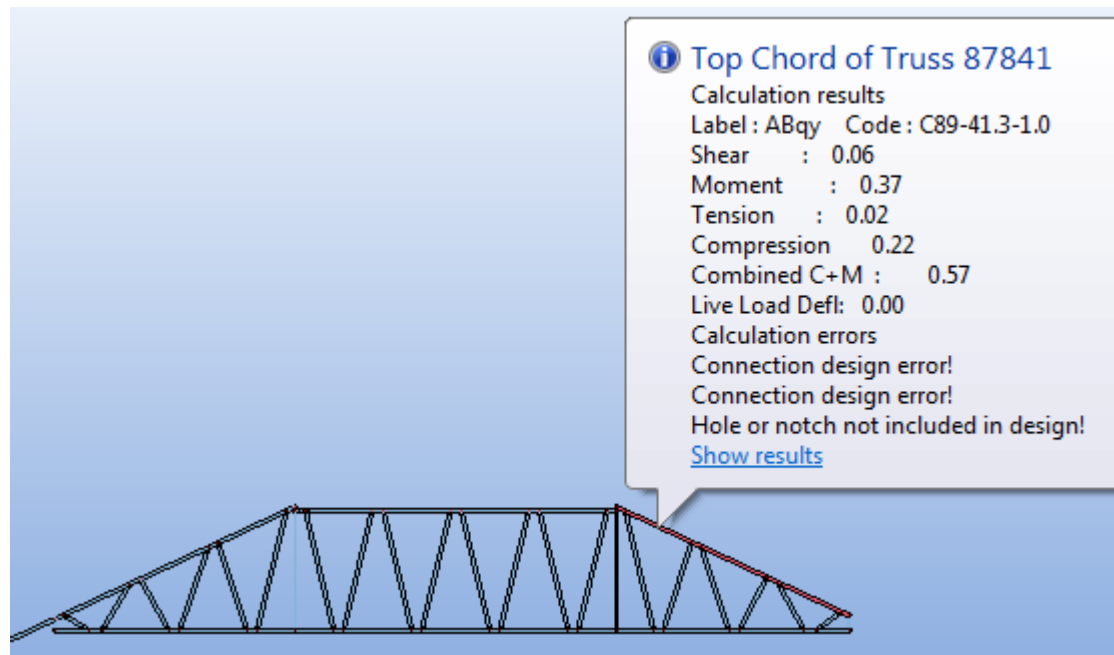
3.8 Checking design results

Design errors may occur during design. These errors or warnings are shown after running design and user can high light the source point of error by selecting error from Calculation messages dialog. This can be done also in 3D.



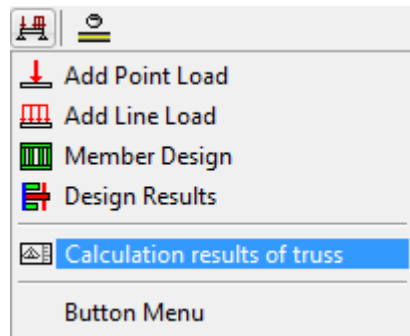
14 May 2013

To see results select truss in 3D model and pick functionality **Open Truss Calculation results** from pop up menu. This functionality hides other element in model and shows selected truss in face view. Failing truss members are shown red in color. When mouse is located to top of member tip text tells more about member design results. Clicking Show results link text in tip area utility bars of truss member are shown. To return back to model pick **Close Truss Calculation results** from pop up menu.



14 May 2013

Truss specific design results sheet can be opened by Engineering menu **Calculation results of truss** functionality. Design results sheet shows utilization of each truss member and connector, if connectors have design capacity defined. It also shows design error messages, bearing reaction information and spacing list of needed out of plane buckling restraint.

[illegible]

3.9 Building code specific issues

3.9.1 Used design formulas

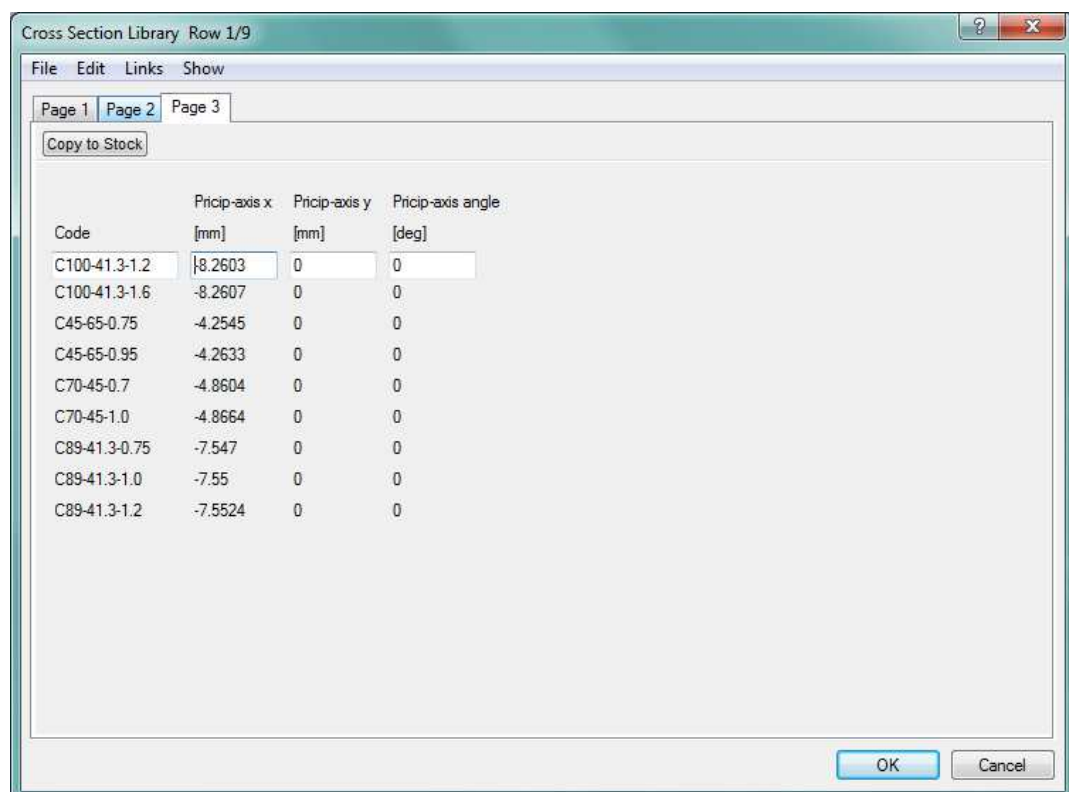
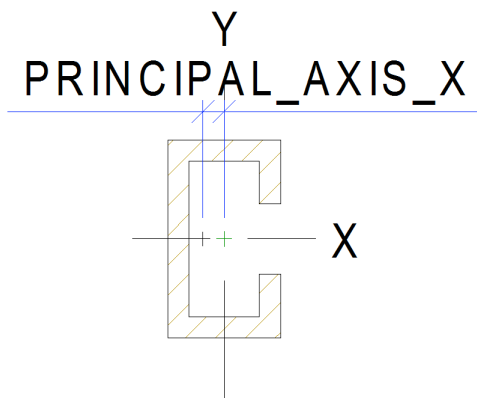
Design equations are based on building code where name of design criteria building code refers. If further information is needed, implemented equation can be found under building code setup.

14 May 2013

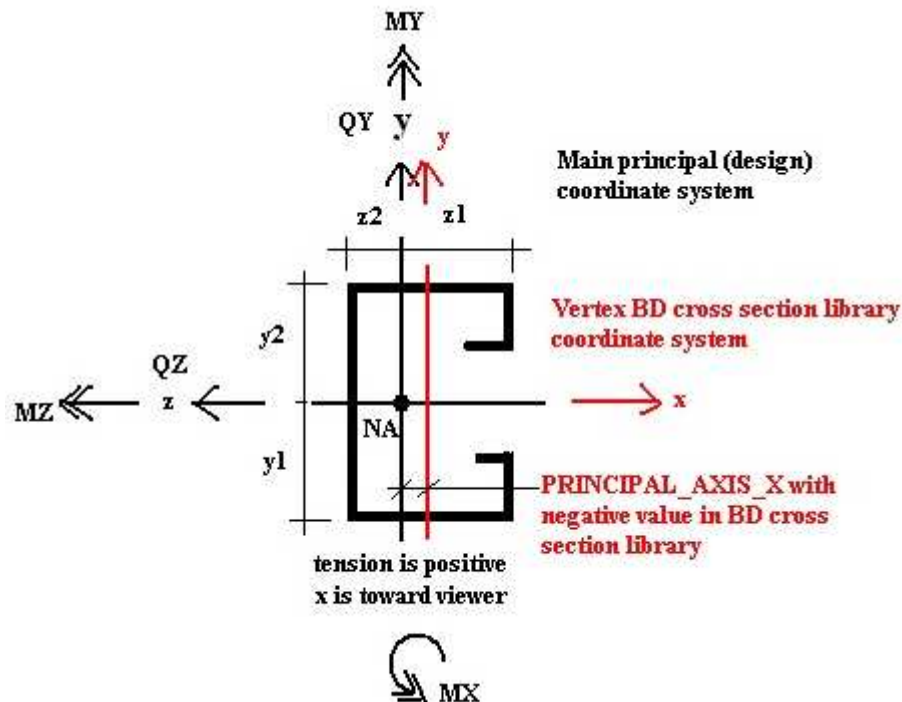
Depending on building code, buckling design may be done by solving required spacing for restraints or engineering member buckling.

3.9.2 Cross section definitions

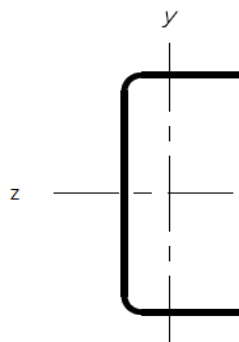
In Vertex BD cross sections for modeling are defined under System settings menu **Cross section Libraries** functionality. Profile libraries used for design should have proper information about main principal axis (neutral axis) location and rotation compared to modeling cross section center. All other cross section design properties are defined under building codes setup files.



14 May 2013



Design cross section parameter may vary between building code implementation, because building code specific design equations may require specific parameters. Below is shown one set of needed cross section parameters. Parameter names may refer to local coordinates. Because design cross section local coordinate system differ from modeling cross section local coordinate system, setup builder should check from design equations what is actual meaning of design cross section parameter.



Value	Example	Unit	Description of the value
CODE	C75x32x1.0		Cross section code
GRADE	S350GD		Material grade
d	75	mm	Overall height of cross section to y-direction
b	32	mm	Overall width of cross section to z-direction
b_f1	32	mm	Overall width of flange in negative y side
b_f2	32	mm	Overall width of flange in positive y side
d2	9	mm	First edge fold dimension
b2	9	mm	Second edge fold dimension

14 May 2013

r	2	mm	Folding radius
gauge	1	mm	Design thickness of material
t _{mc}	0	mm	Thickness of metallic coatings
A	153	mm ²	Area of gross cross section
effA	148,7	mm ²	Area of effective cross section
IX	49,57	mm ⁴	The torsion constant of the gross cross-section
I _w	25170000	mm ⁴	The warping constant of the gross cross-section
IZ	130900	mm ⁴	Second moment of gross cross section area around z-z
IY	20480	mm ⁴	Second moment of gross cross section area around y-y
effIZ	130900	mm ⁴	Second moment of effective cross section area around z-z
effIY	20480	mm ⁴	Second moment of effective cross section area around y-y
y ₀	0	mm	Distance between shear centre and gravity centre, negative value means to negative y direction
z ₀	-24,51	mm	Distance between shear centre and gravity centre, negative value means to negative y direction
y ₁	-37,5	mm	Extreme fiber distance in negative y side (<0)
y ₂	37,5	mm	Extreme fiber distance in positive y side (>0)
z ₁	-9,73	mm	Extreme fiber distance in negative z side (<0)
z ₂	22,27	mm	Extreme fiber distance in positive z side (>0)
E	200000	MPa	Elastic modulus
G _v	80000	MPa	Shear modulus
CSWeight	2,0837825	kN/m = N/mm	Cross section weight
Ply	1	non-dimensional	Number of cross sections in ply cross section
R _{rminBrgE}	30	mm	Allowed minimum bearing length at end support
b _w	1	mm	Width of web = gauge
d _f	1	mm	Depth of flange = gauge
Poisson	0,3	non-dimensional	Poisson constant
SG	0	non-dimensional	Special gravity
f _{od}	500	N/mm ² MPa ==	Elastic distortional buckling stress
f _u	550	N/mm ² MPa ==	Tensile strength
f _y	550	N/mm ²	Yield stress
effZz	600000	mm ³	The effective section modulus calculated with the extreme compression or tension fibre about the local z axis
effZy	400000	mm ³	The effective section modulus calculated with the extreme compression or tension fibre about the local y axis

14 May 2013

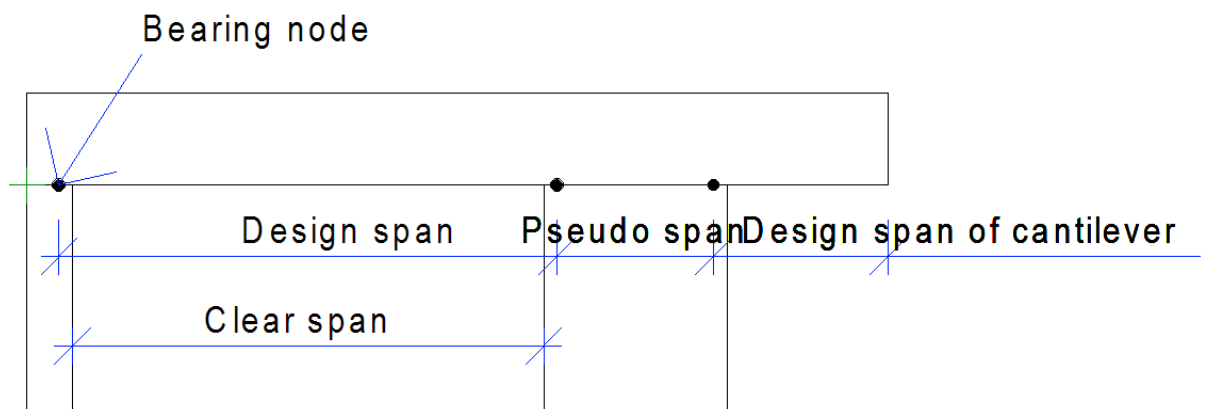
Zy	434000	mm ³	Full unreduced section modulus for the extreme compression fibre about the local y axis
Zz	660000	mm ³	Full unreduced section modulus for the extreme compression fibre about the local z axis
Zty	434000	mm ³	Full unreduced section modulus for the extreme tension fibre about the local y axis
Ztz	660000	mm ³	Full unreduced section modulus for the extreme tension fibre about the local z axis
Beta_y	0	non-dimensional	Monosymmetry section constant about the y-axis
Beta_z	0	non-dimensional	Monosymmetry section constant about the z-axis
ry	16	mm	Radii of gyration of the cross-section about the local y-axis
rz	37	mm	Radii of gyration of the cross-section about the local z-axis

3.9.3 Earth quake design

Building code setups delivered by Vertex neither include earth quake specific loads nor earth quake design.

3.9.4 Bearing nodes

Continuous bearing is modeled as two separate discrete bearings at continuous bearing ends and pseudo span between discrete bearings or with one discrete bearing during design depending on building code setup. The location of bearing nodes in discrete or in continuous bearings also depends on building code setup. Usually design span is supposed to be a little more than clear span between bearings. Bearing node at end support is located small distance from end bearings inside face toward end of member and bearing node at internal discrete support is located in middle of bearing.



14 May 2013

3.10 Check list to avoid problems in engineering

- Rafters should be supported by wall and hip rafter. No tolerance is allowed between wall top and rafter. Adjust architectural wall height to meet rafters.
- Hip rafter Function value should be "Hip Rafter", use member properties to check and change that.
- Hip drop truss/girder sloping top chords should not extend inside hip rafter, otherwise bad support relation is found during engineering.
- Beams should be supported by vertical bearing element, meaning column or bearing wall, check wall bearing by wall properties
- Saddle truss verticals should be in line with top chord of truss below, at least middle of red fastener pattern macro should be between top chord sides below
- Use joist hangers or direct screw connection between trusses to generate support relation between girder truss and trusses supported by it
- Use exterior walls only for building envelope not for interior walls, exterior wall chain should be closed that system can recognize building inside area for wind generation
- Don't add loose walls into model, because outside of building they affect into solving of building dimensions for wind load generation
- Don't use old project as template for new project because problems in old project are also problems in new project

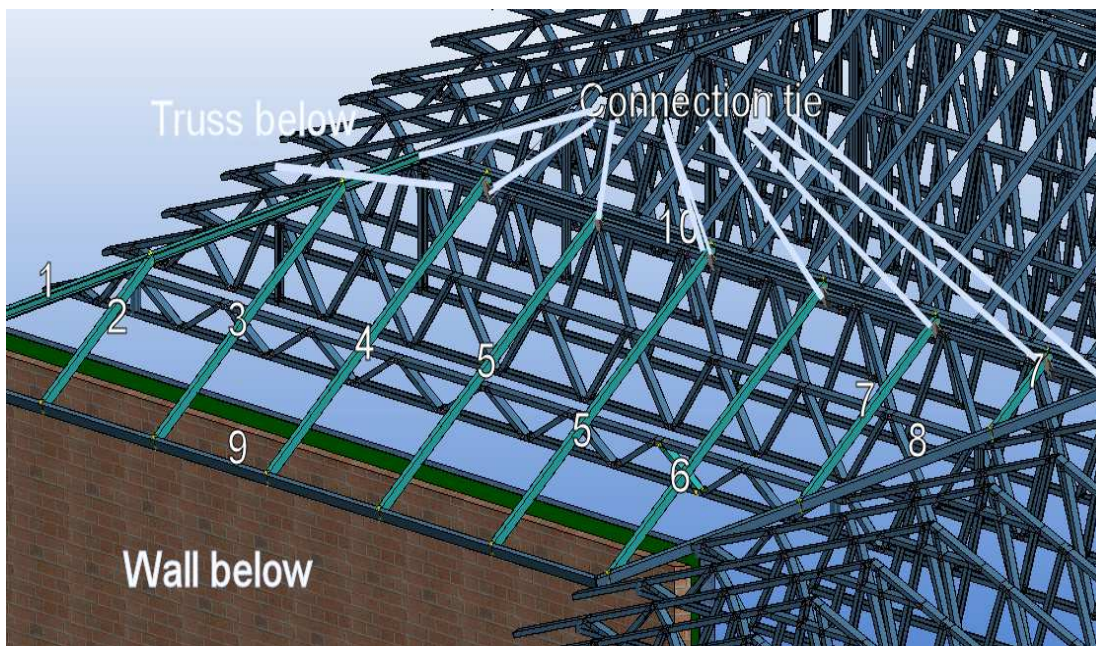
14 May 2013

4 How to engineer trusses with roof panels

The idea to pass engineering of trusses with roof panels above is to define panel members and connections so that each member has at least two bearings or member function property is set so that member is ignored in engineering. Bearing span direction of panel is selected based on surrounding trusses and other bearing objects. Member function property can be used to define load path, support relations and to ignore some panel members in engineering.

4.1 Case 1:

Make sure that members 1-6 and valley rafter 8 touch exterior wall bearing frame below. Set function property of members like in table below. Rake members 9-10 are ignored in engineering. Connect upper end of rafters 4-7, hip rafter 1 and valley rafter 8 to truss top cord below with connection tie.

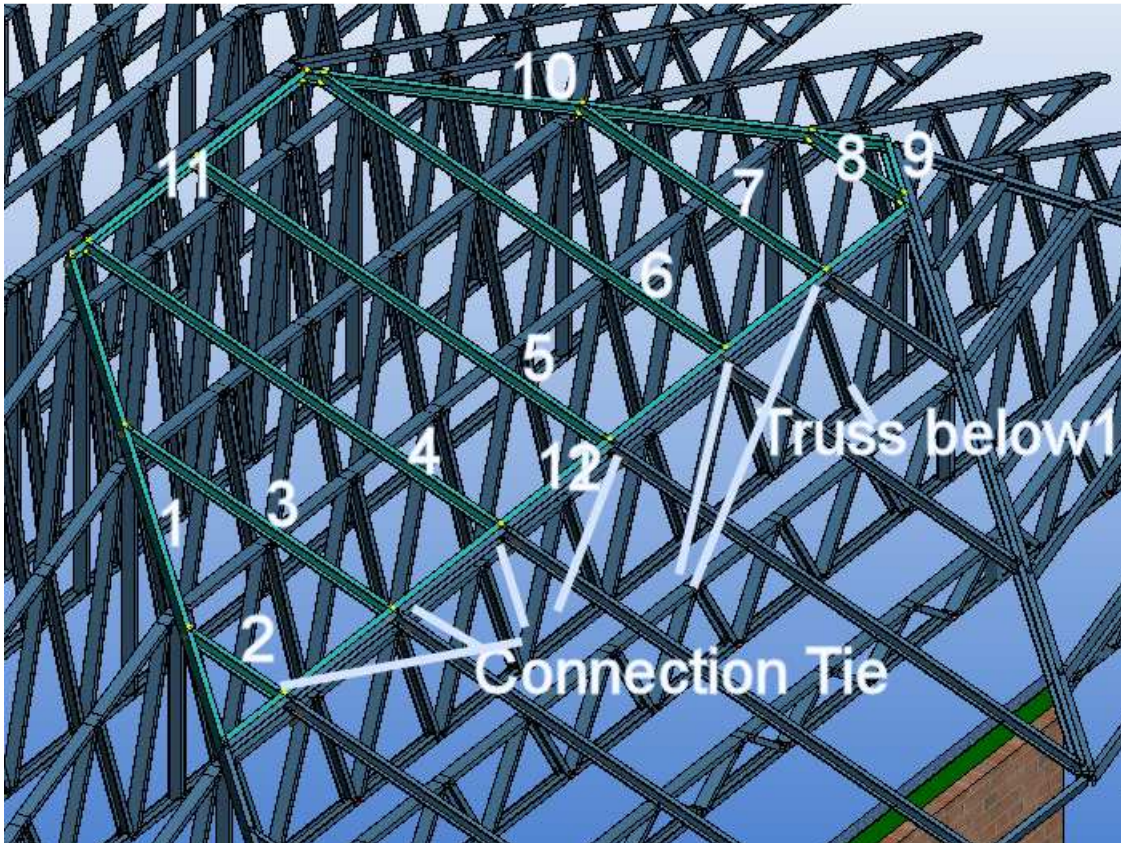


Member	Function
1	Hip Rafter
2	Rafter
3	Rafter
4	Rafter
5	Rafter
6	Rafter
7	Rafter
8	Valley Rafter
9	Rake
10	Rake

14 May 2013

4.2 Case 2:

Make sure that members 1, 3 - 7 touch trusses below. Set function property of members like in table below. Rake members 9, 11 and 12 are ignored in engineering. Connect lower end of rafters 2-7 to top cord of truss below 1 with connection tie. Connect rafter 8 lower end with connection tie to valley rafter of the other roof panel.

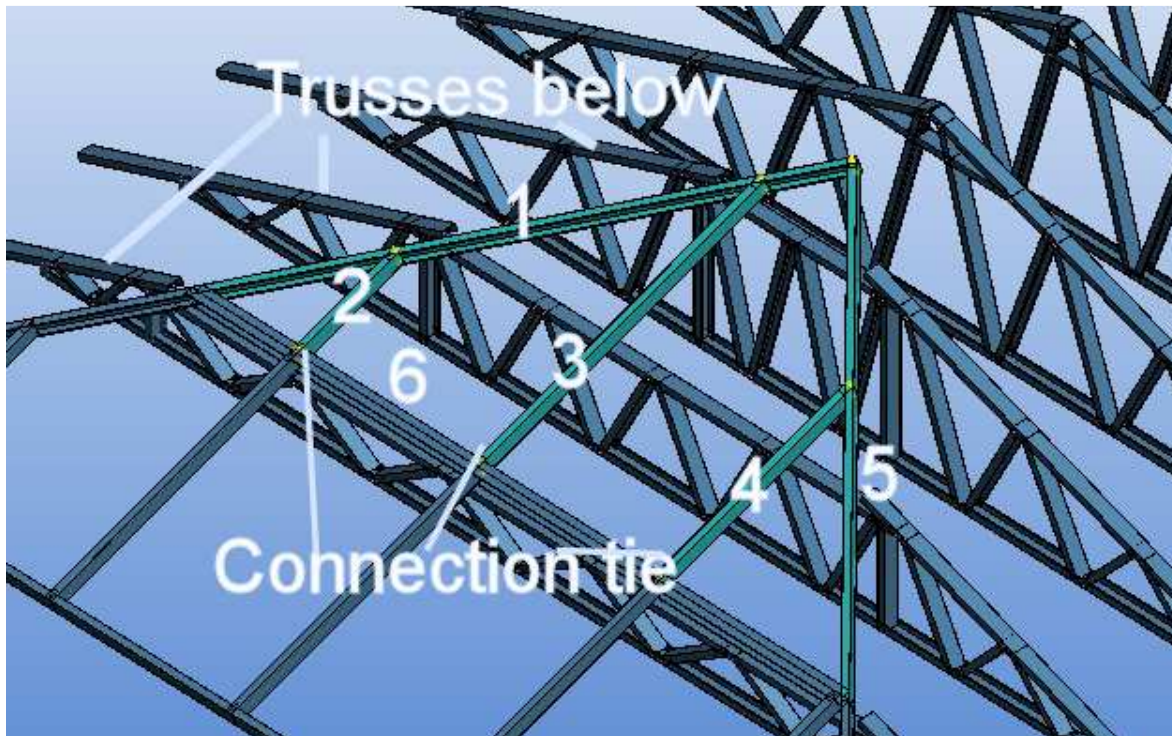


Member	Function
1	Hip Rafter
2	Rafter
3	Rafter
4	Rafter
5	Rafter
6	Rafter
7	Rafter
8	Rafter
9	Rake
10	Hip Rafter
11	Rake
12	Rake

14 May 2013

4.3 Case 3:

Make sure that members 1, 3-5 touch trusses below. Set function property of members like in table below. Rake member 6 is ignored in engineering. Connect lower end of rafters 2-4, hip rafter 1 and 5 to top cord of truss below with connection tie.

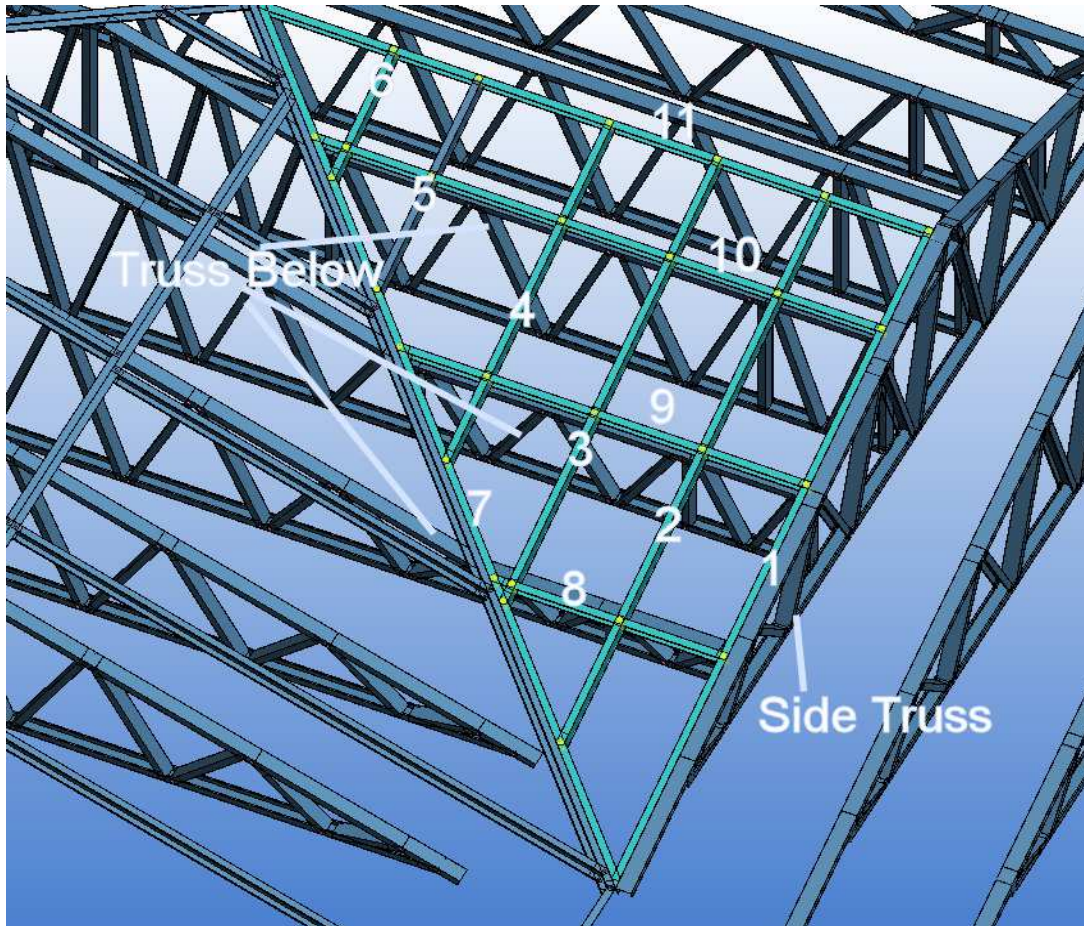


Member	Function
1	Hip Rafter
2	Rafter
3	Rafter
4	Rafter
5	Hip Rafter
6	Rake

14 May 2013

4.4 Case 4:

Make sure that members 1 and 7 touch exterior corner walls bearing frame below. Set function property of members like in table below. Rake members 8-11 are ignored in engineering. Upper end of rafters 2-6 and upper end of valley rafter 6 lie on truss below, there is no need of connection tie now. Make sure that rafter overhang is not more than allowed. Use truss backer connection plates to connect rafter 1 to side truss.

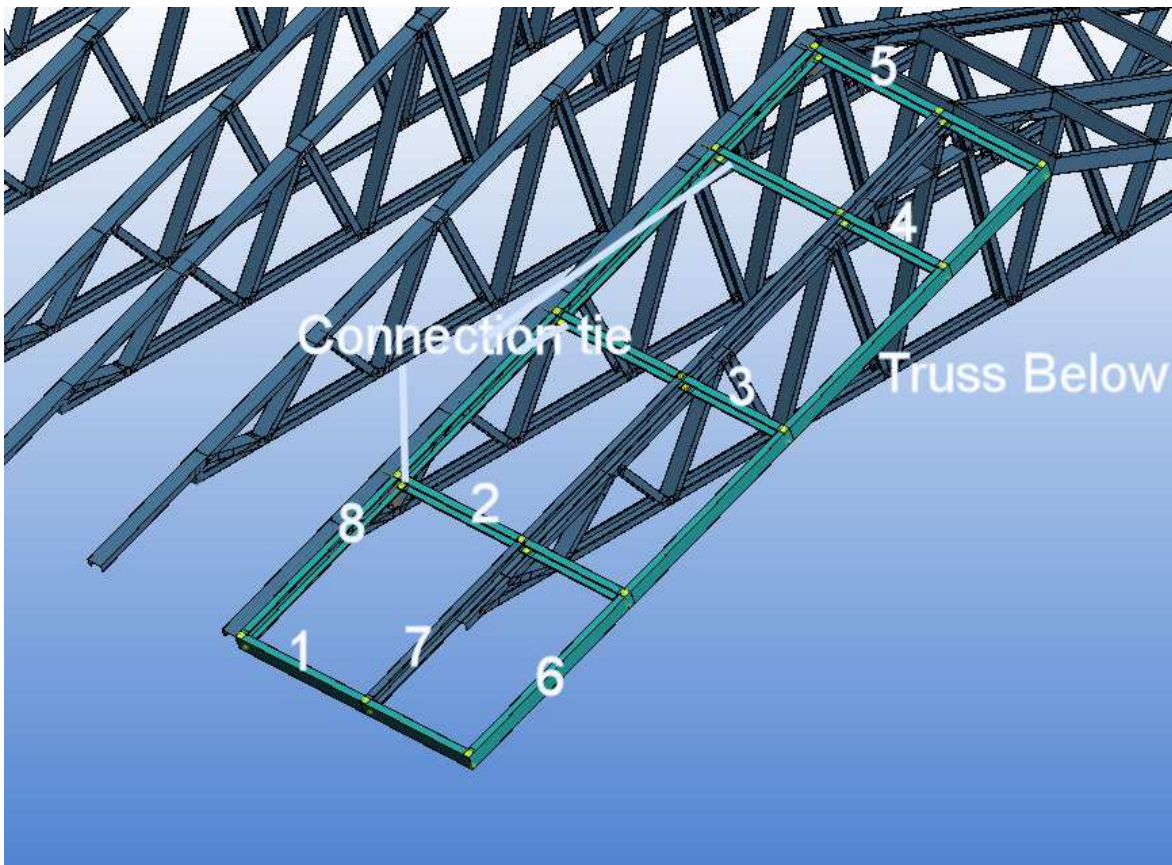


Member	Function
1	Rafter
2	Rafter
3	Rafter
4	Rafter
5	Rafter
6	Rafter
7	Valley Rafter
8	Rake
9	Rake
10	Rake
11	Rake

14 May 2013

4.5 Case 5:

Make sure that members 2-5 touch truss below. Set function property of members like in table below. Rake members 1, 6-8 are ignored in engineering. Use connection tie to connect rafters 2-5 ends to side truss top chord.

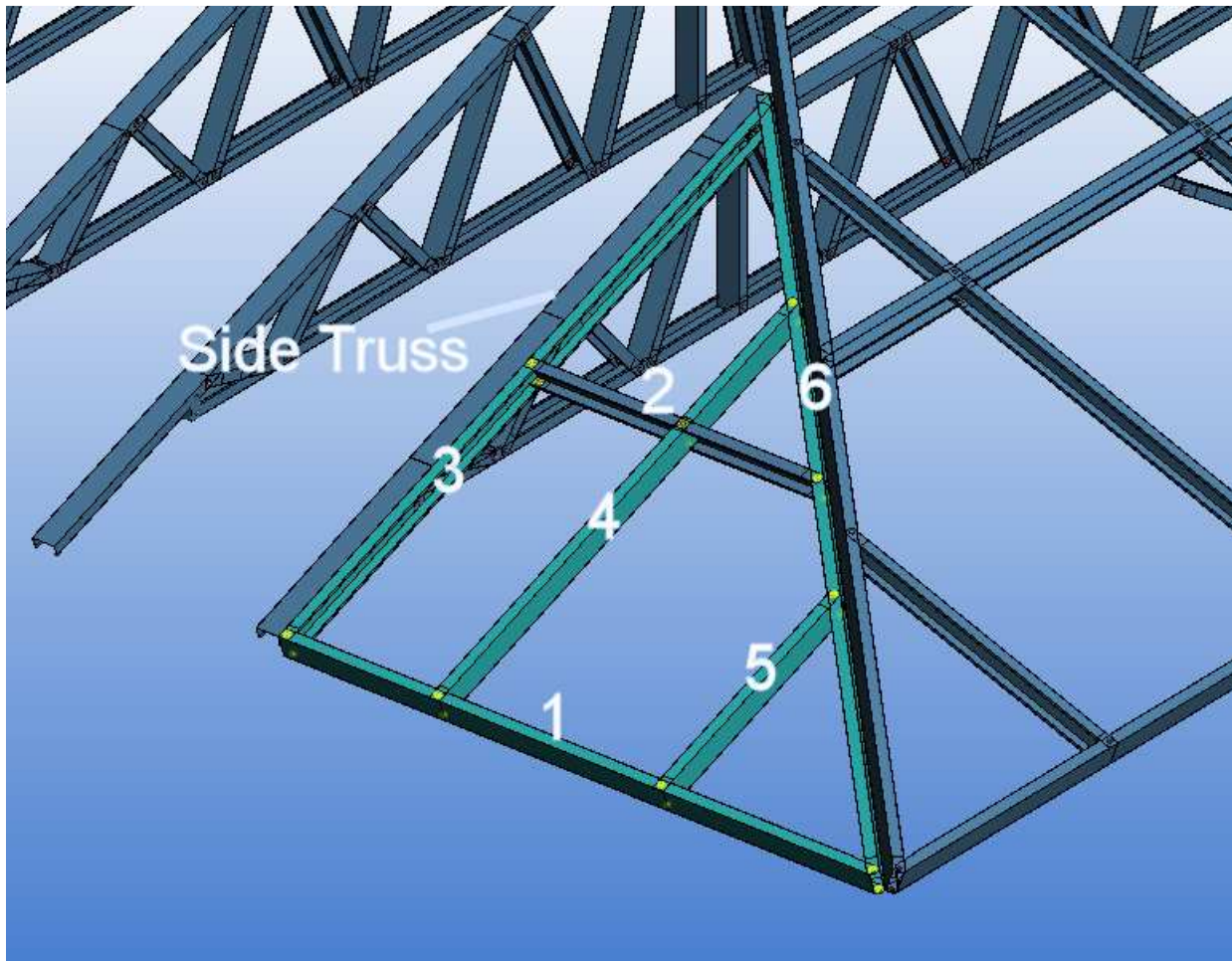


Member	Function
1	Rake
2	Rafter
3	Rafter
4	Rafter
5	Rafter
6	Rake
7	Rake
8	Rake

14 May 2013

4.6 Case 6:

Make sure that hip rafter 6 touch exterior corner wall bearing frame below. Set function property of members like in table below. Rake members 3 - 5 are ignored in engineering. Use connection tie to connect rafters 1 and 2 ends to side truss top chord. Use connection tie to connect upper end of hip rafter 6 to side truss top chord.



Member	Function
1	Rafter
2	Rafter
3	Rake
4	Rake
5	Rake
6	Hip Rafter