crosssectionanalyzer

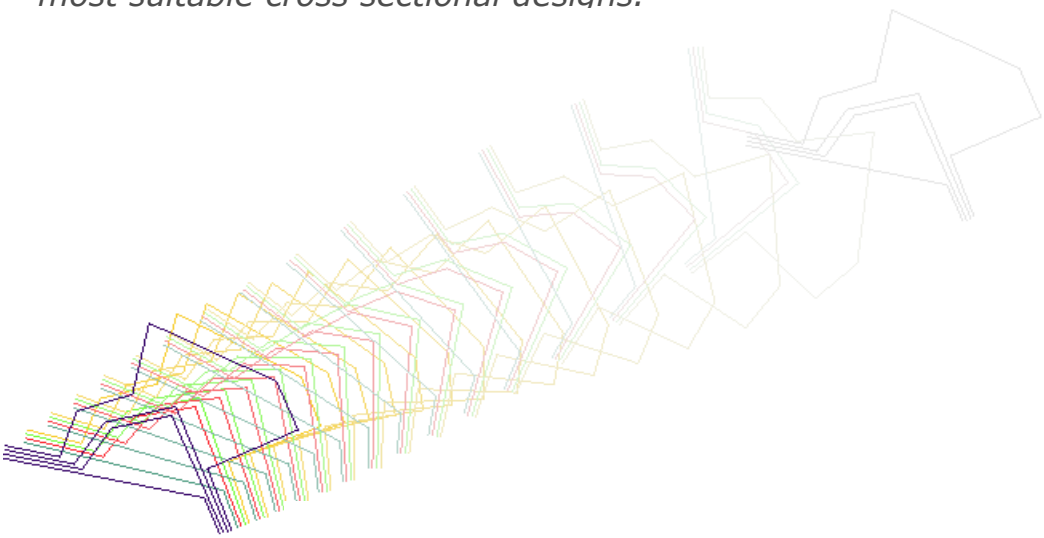
The fastest way in Pre Design

Cross Section Analyzer is a tool for automatic creation and calculation of various cross sectional design concepts

Cross sections are generated basing on user-defined design variables. The software enables the definition of material, thickness and length design variables.

One of the greatest advantages of the Cross Section Analyzer is the speed of calculations.
Now it is possible to calculate thousands of design variants in seconds !

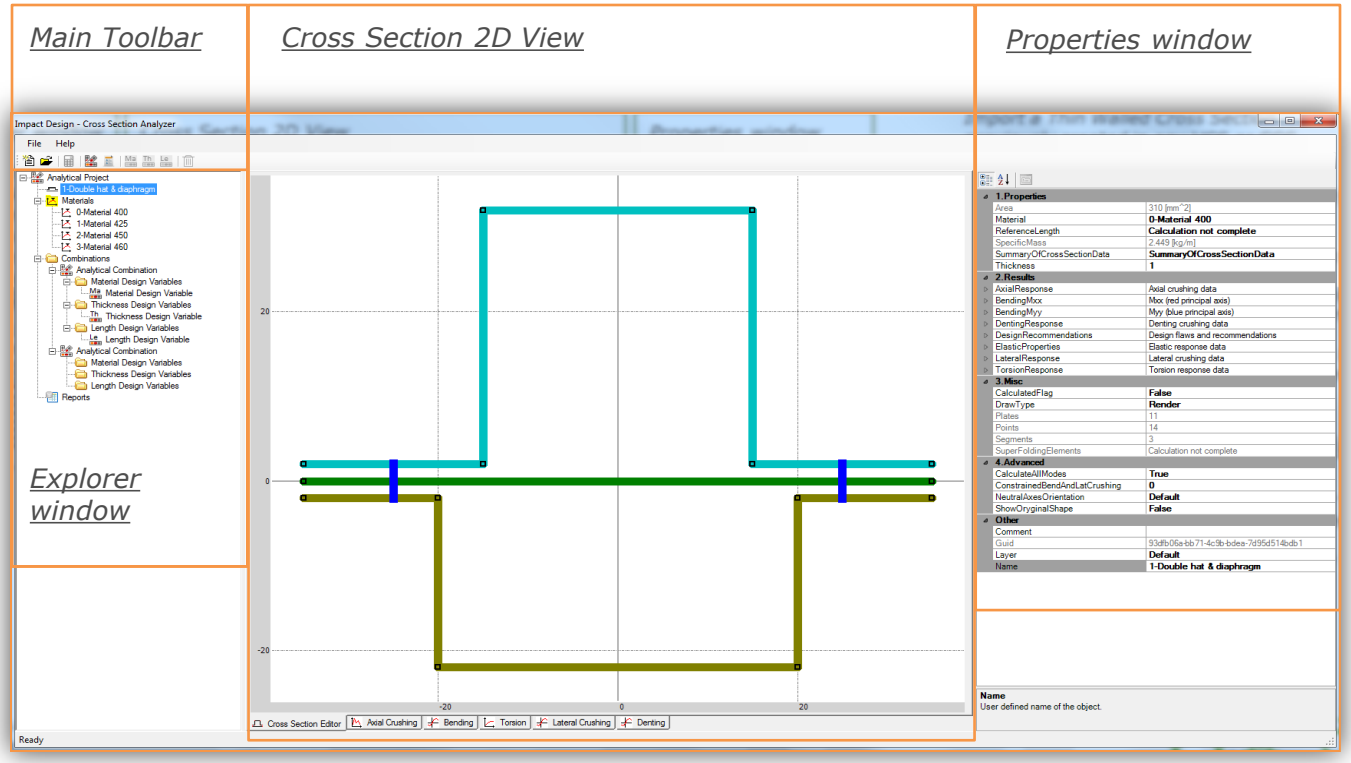
Search for the optimal solution with the usage of results filtering functionality. Set the range of acceptable results values and find the most suitable cross sectional designs.



CSA – WORKFLOW

Cross Section Analyzer – MAIN VIEW

CSA main view is divder into 3 mail areas: Explorer window, cross section 2D view and Properties widnow.



Explorer window

The Explorer window includes the basic cross section, list of imported materials, all defined design variables and results reports. All elements of a CSA solution are grouped in appropriate folders in the explorer tree.

Cross Section 2D View

In the cross section 2D view the geometry of an analyzed cross section is presented. It is equipped with the selection and area selection tools which enable the user to select specific elements of the cross section and assign them to chosen design variables.
Moreover, charts for axial response, bending response, torsion response etc. are available after clicking on an appropriate bookmark at the bottom of the 2D view window.

Properties window

In the Properties window the user can view properties of any selected object od the Analyzer's solution. Results of the basic cross section can be checked as well as detailed parameters of any plate or segment.
In case of materials, detailed characteristic of a selected material can be viewed
In case of a selected design variable the user can view, define and edit desired parameters.

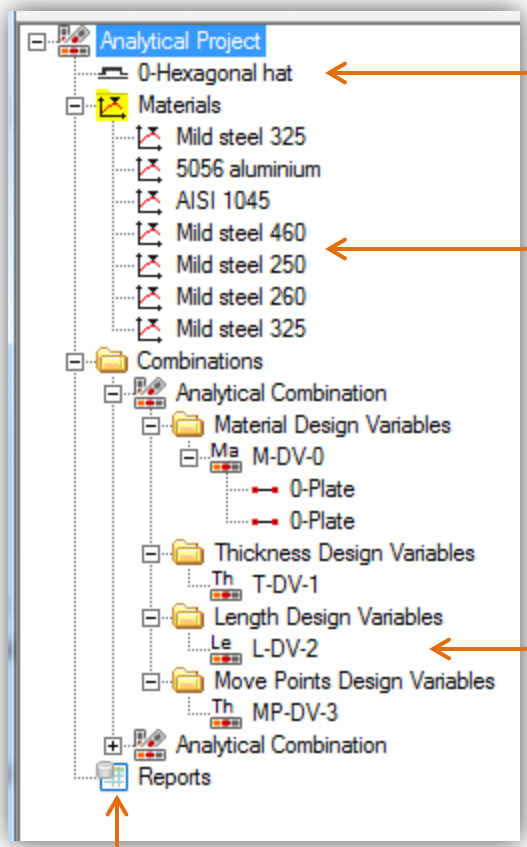
Main Toolbar

Main toolbar located above the Explorer window guaranties easy access to main functionalities of the CSA. Detailed description of CSA tools and functionalities will be given in later parts of this manual,

cross section analyzer

MAIN VIEW – Explorer Window

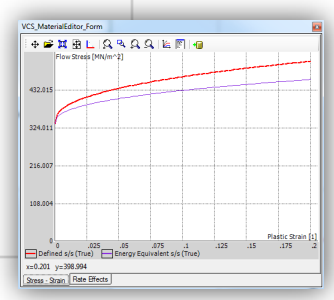
The Explorer tree enables easy access to all elements of an analytical project.
All objects can be found in appropriate expandable folders.



Cross Section – base for the analytical project

Imported materials

Double click on a chosen material to open the Material Editor window.
Detailed definition of a selected material can be viewed in the properties window.



Analytical Combination – set of design variables.

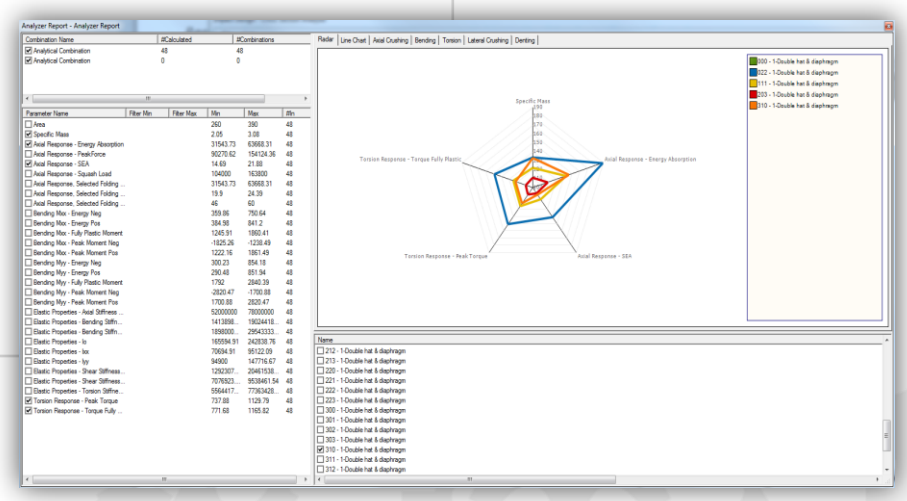
Within the "Analytical Combinations folder the user can find separate folders for each available design variable. All elements of a cross section assigned to a design variable will be listed in the explorer tree.

Material DV | *Thickness DV* | *Length DV* | *Move Point DV*

Results Report

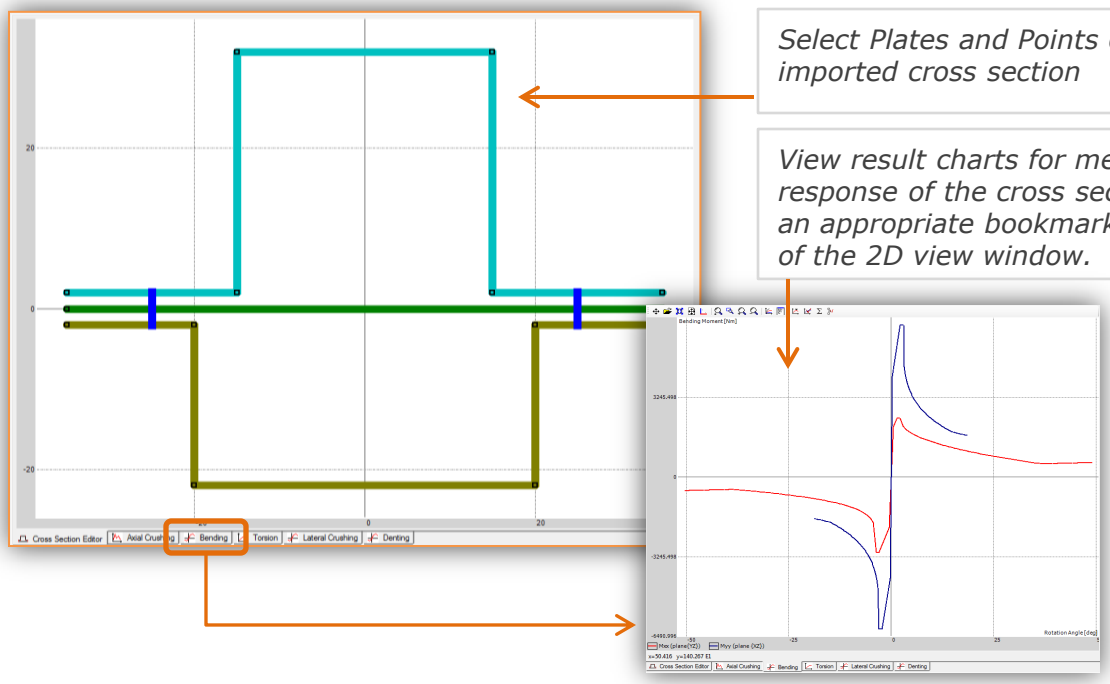
At the vary bottom of the Explorer tree the analysis Results Report can be found.

Double click on the report to open the "Analyzer Report" in which you can view and filter results.



MAIN VIEW – Cross Section 2D view

In the cross section 2D view the geometry of the base cross section is displayed.
The window is equipped with selection tool – the user can easily select plates and points of the cross section, view their definition in the properties window and assign them to a chosen design variable.

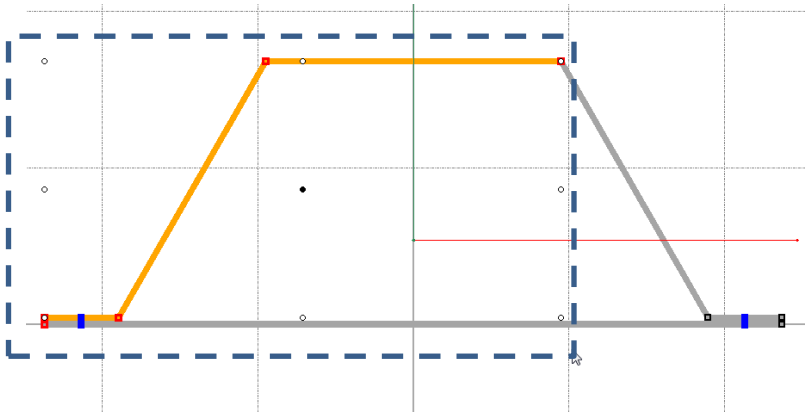


Select Plates and Points of the imported cross section

View result charts for mechanical response of the cross section. Click on an appropriate bookmark at the bottom of the 2D view window.

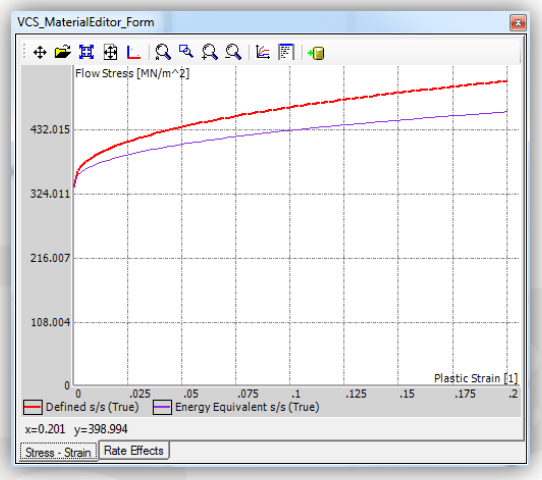
Area Selection

The user can select several plates and points of a cross section simultaneously by means of the area selection tool.
Please note that all selected plates will be marked by orange color, all selected points will be marked by red color.



Material Editor

Double click on a chosen material in the Explorer window to open the Material Editor window.
In the Material Editor the stress-strain curve is displayed
Additionally, after selecting the appropriate bookmark, you can view the strain rate characteristic.
All information about detailed material definition are available in the Properties window



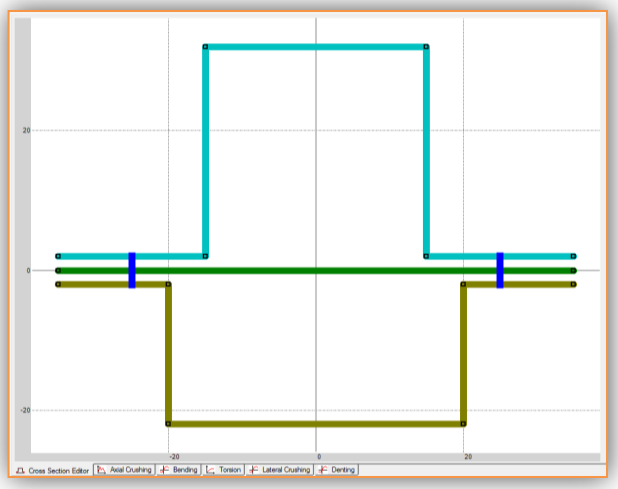
cross section analyzer

2D VIEW – Cross Section in Macro Element Method

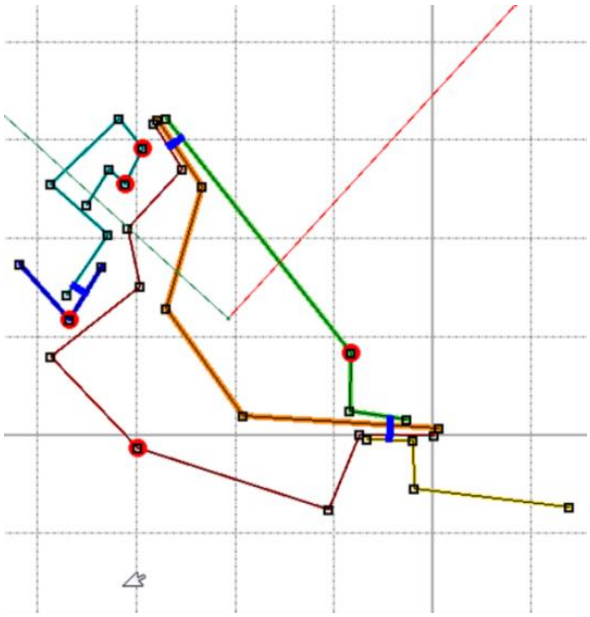
Accordingly to the Macro Element Method (MEM) the VCS software enables the creation of a simplified cross section model build of plates and segments based on Points.

All Cross Sections created in MEM consist of :

- *Points*
- *Plates – created by connecting two Points*
- *Segments – build of Plates*
- *Super Folding Elements and possibly*
- *Connections*



IMPORTANT NOTICE
Please note that a cross section purposed for analysis in the CSA needs to be defined with accordance to the Macro Element Method.
Incorrect or too dense discretization of a cross section can affect the overall results.

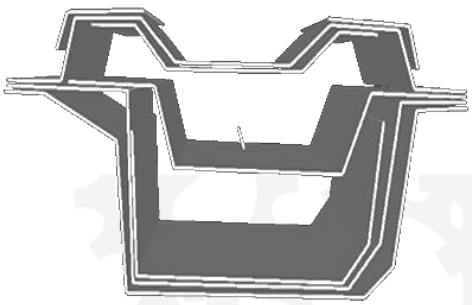


In the picture on the left you can see an example of a Cross Section modelled in MEM. Please note that each segment has been marked in different color.

*A Macro Element model is a **simplified model**, where details of the cross sectional geometry should be neglected.*

The problem of radius modelling at the Cross Section level is related to the definition of Super Folding Element (SFE) and corresponding modelling methodology (quite different then in FE programs). The energy absorption in corner area can be significantly increased only for radii that guarantee development of full plastic folds like in the case of circular or hexagonal column.

In the picture on the right you can see the comparison of a simplified MEM model (gray) and a typical model created in accordance to the FE methodology.

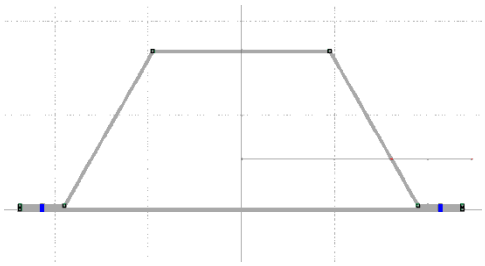


cross section analyzer

MAIN VIEW – Properties Window

In the Properties window the user can view detailed definition of any selected object from a current CSA solution.

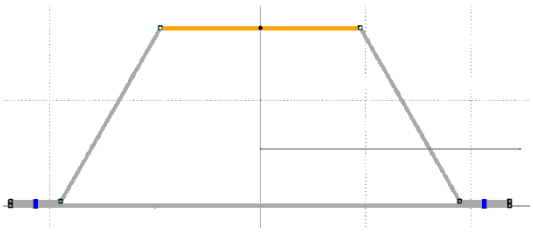
After selecting an object in the Explorer window all its properties will be automatically displayed.
In case of a cross section the Properties window includes not only information about the geometry and assigned material but also detailed results.

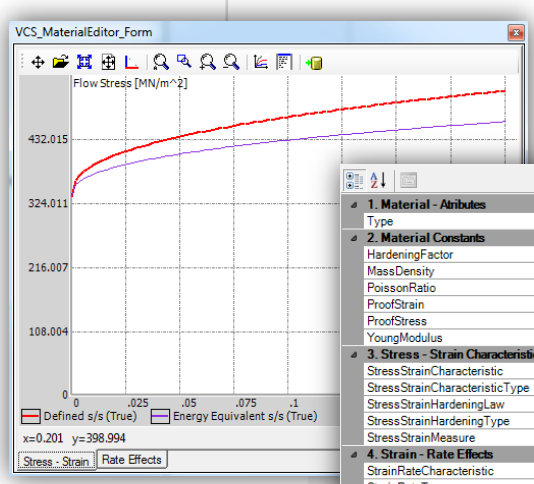


1.Properties	
Area	498 [mm^2]
Material	Mild steel 325
ReferenceLength	201.07
SpecificMass	3.9342 [kg/m]
SummaryOfCrossSectionData	SummaryOfCrossSectionData
Thickness	Multiple thicknesses
2.Results	
AxialResponse	Axial crushing data
BendingMxx	Mxx (red principal axis)
BendingMyy	Myy (blue principal axis)
DentingResponse	Denting crushing data
DesignRecommendations	Design flaws and recommendations
ElasticProperties	Elastic response data
LateralResponse	Lateral crushing data
TorsionResponse	Torsion response data
3.Misc	
CalculatedFlag	True
DrawType	Render
Plates	6
Points	8
Segments	2
SuperFoldingElements	5
4.Advanced	
CalculateAllModes	True
ConstrainedBendAndLatCrushing	0
NeutralAxesOrientation	Default
ShowOryginalShape	False
Other	
Comment	
Guid	33964684-4a25-4b43-ba4d-2bd3cec6ca96
Layer	Default
Name	0-Hexagonal hat

0. Basic Properties	
Material	Mild steel 325
Thickness	1.3
1. Apperance	
Color	165, 165, 165
Visible	True
2.Properties	
DirectionVector	(1 E0, 0 E0, 0 E0)
End	(30, 53.3615242270663)
Start	(-30, 53.3615242270663)
Width	60
WidthEffective	61.26
3.Design Recommendations	
MaximalWidth	61.26 [mm] (OK)
RequiredWidth	13 [mm]
4.Misc	
Name	0-Plate
PlateType	Web
Other	
Comment	
Guid	7fb8f2c7-4668-4cb2-9181-478f32f4ab12
Layer	Default

For any selected plate information concerning thickness, assigned material and length are available. Those data can be treated as reference when defining design variables.





1. Material - Atributes	
Type	DuctileIsotropic
2. Material Constants	
HardeningFactor	1
MassDensity	2700
PoissonRatio	0.33
ProofStrain	0.002
ProofStress	337
YoungModulus	200000
3. Stress - Strain Characteristic	
StressStrainCharacteristic	A=343, n=0.41, epsf=0.2, A0=ProofStress
StressStrainCharacteristicType	PowerLaw
StressStrainHardeningLaw	100 [%] isotropic
StressStrainHardeningType	Isotropic
StressStrainMeasure	True
4. Strain - Rate Effects	
StrainRateCharacteristic	C=1 E-2 , eps_0=1
StrainRateType	JohnsonCook
5. Fracture Indicator	
AreaReduction	0
D	1
FractureModel	CL
Other	
Comment	
Guid	707e6044-bae0-4db0-a19d-9627ac9a0331
Layer	Default
Name	7039 aluminium

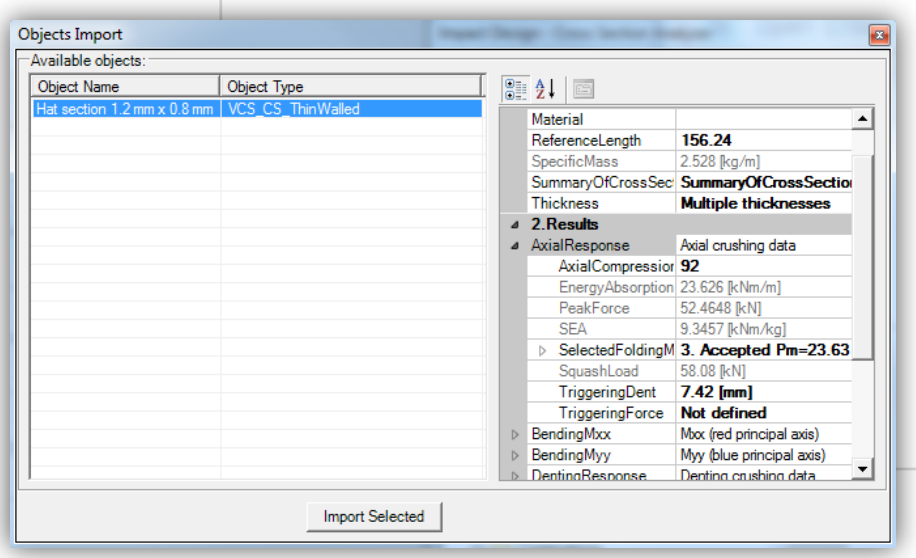
In CSA it is possible to work with ductile isotropic materials which can be defined in form of elastic-plastic piecewise characteristic .
The Material is described by five groups of data in Available the Properties window:

- *Material Constants*
- *Stress Strain Characteristic*
- *Strain Rate Characteristic*
- *Hardening Factor*
- *Fracture Indicator*

cross section analyzer

1. Open cross section for analysis

Import a Thin Walled Cross Section previously created in any VCS or CCC solution.
All materials assigned to plates of the imported cross section will be automatically added to the Analyzer Project.

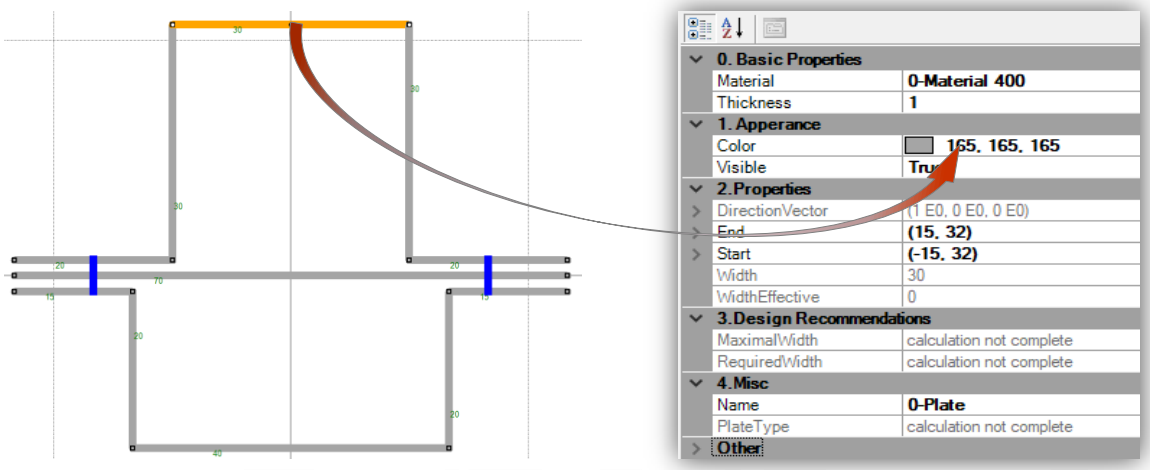


In the "Object Import" window select one thin walled cross section for further analysis.

On the right hand side of the window a complete set of cross sectional properties is displayed.

You can import one cross section for each analytical project.

After the import is completed the cross section is added to the Explorer tree and is displayed in the main 2D view.
In the Properties window you can find detailed information about the cross section.
After selecting a plate in the 2D view you will be able to view its Properties (along with the information about assigned material and thickness).
All materials assigned to plates of the imported cross section will be automatically added to the CSA solution and placed in appropriate folder in the Explorer window.



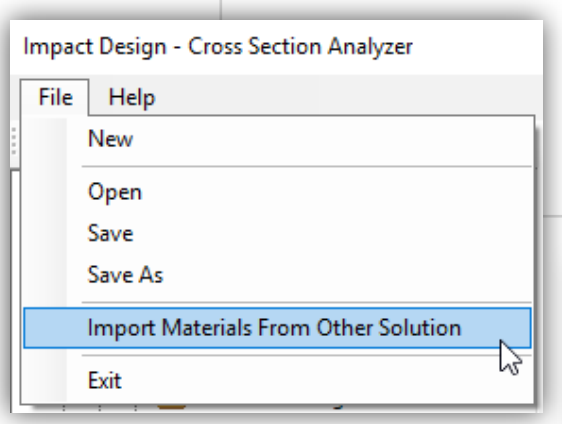
Important Notice:

Imported cross section needs to be defined accordingly to the Macro Element Method requirements.

cross section analyzer

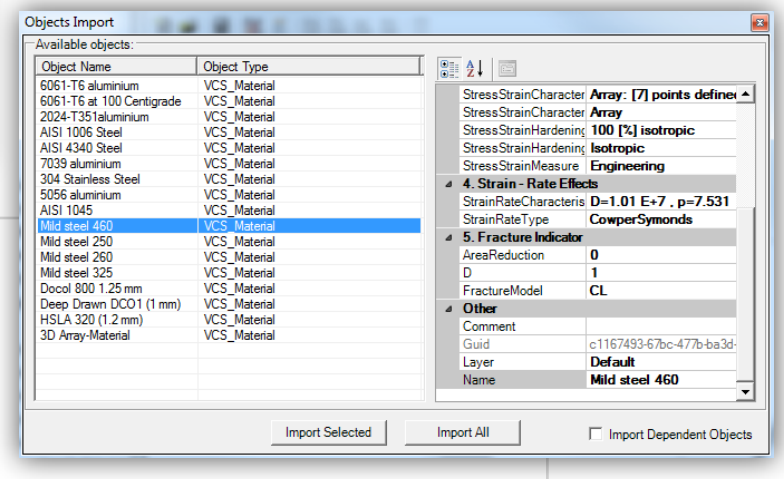
2) Import Materials from other solutions

You can import materials from any VCS or CCC solution – afterwards they can be used to define Material design variable.
All imported materials can be found in the Explorer window. Their definition can be viewed in the Properties window.



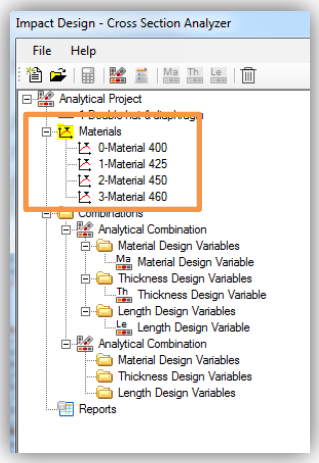
In order to import a material click on File; from the drop down list select the "Import Material From Other Solution" option.

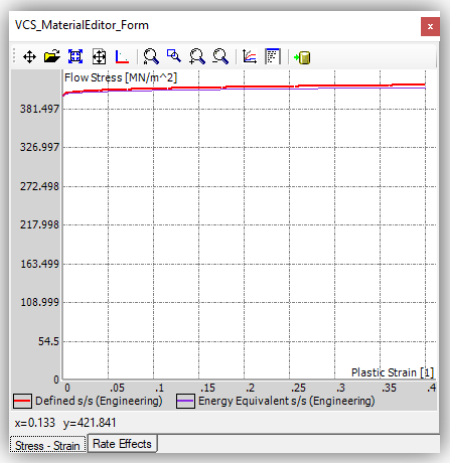
Select a VCS or CCC file from which you wish to import materials and press Open.

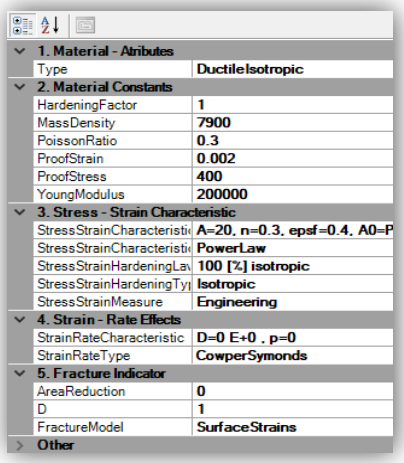


In the "Object Import" list of all materials included in the selected file is displayed.
On the right hand side of the window material properties can be viewed.

Select all materials you wish to import and click on the "Import Selected" button.







All imported materials can be found in the Explorer window.

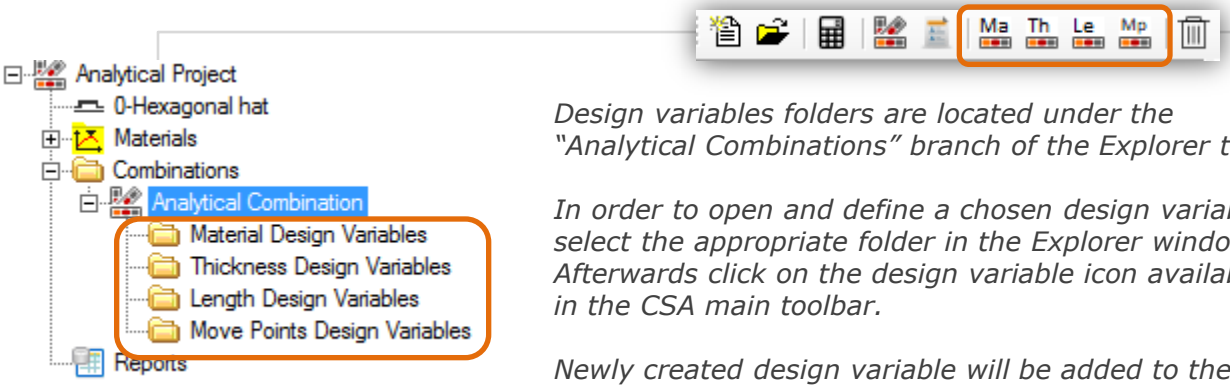
Detailed definition of a material can be viewed in the Properties window.

Double click on a selected material to open the Material Editor window in which stress-strain and strain rate characteristics are displayed.

cross section analyzer

Define set of design variables for an analytical combination

For each "Analytical Combination" you can define four types of design variables: material, thickness, length and move point design variables.



Design variables folders are located under the "Analytical Combinations" branch of the Explorer tree.

In order to open and define a chosen design variable select the appropriate folder in the Explorer window. Afterwards click on the design variable icon available in the CSA main toolbar.

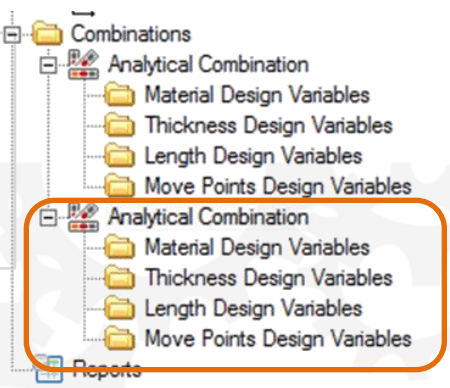
Newly created design variable will be added to the fitting folder in the Explorer window.

Material Design Variable	*Assign various materials to a selected plate or a group of plates*
Thickness Design Variable	*Assign various thickness values within the defined range to a selected plate or a group of plates.*
Length Design Variable	*Assign various length values within the defined range to a selected plate or a group of plates. Additionally define moving and/or restricted points of the cross section*
Move Point Design Variable	*Change coordinates of selected points along a predefined vector. Analyze various geometry variants*

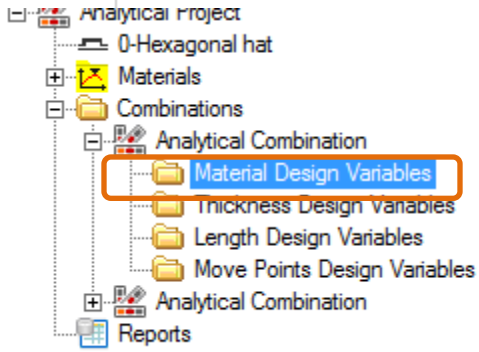
Create additional Analytical Projects

You can create number of analytical combinations within a single Analyzer Project. This enables you to analyze even more design option within one Analyzer Project.

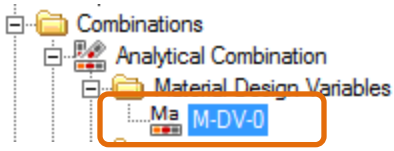
In order to create additional Analytical Combination simply click on the icon in CSA main menu.
New Analytical Combination branch will be added to the Explorer tree together with a set of folders for four types of design variables.



In order to open and define a chosen design variable select the appropriate folder in the Explorer window. Afterwards click on the design variable icon available in the CSA main toolbar.

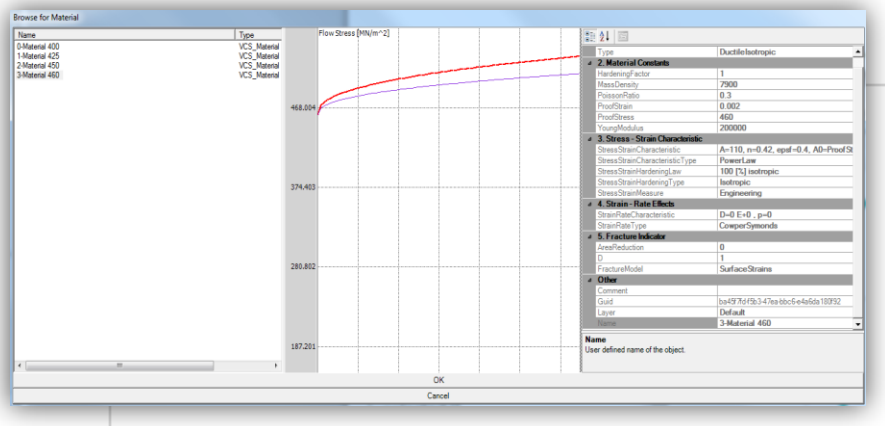


In order to create a Material Design Variable click on its folder in the Explorer window.
Afterwards click on the appropriate icon in the main toolbar.
Automatically a new Material Design Variable will appear in the explorer tree.



After selecting the Material Design Variable (double click in the Explorer tree) a "Browse for Material" window will appear on the screen.

In this window you can browse for all materials you wish to be automatically assigned to chosen plates during the analysis procedure.

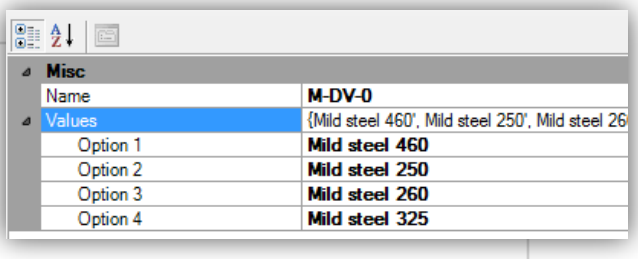


"Browse for Material" window includes a list of all imported materials.
For each selected material the user can view its stress-strain chart and properties.

Select number of required materials and click on "OK"

The Material Design Variable is now successfully defined.

After selecting a material design variable in the explorer the its definition will be available in the Properties window.
In the "Values" section of the Properties window all defined material options are listed.

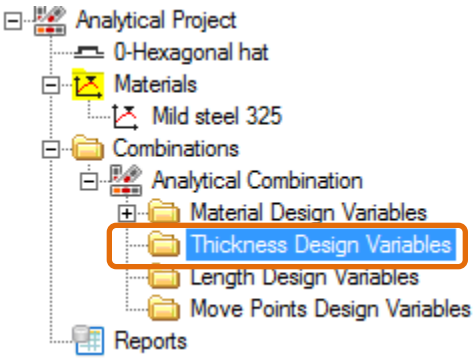


After the definition of Material Design Variable is completed a plate or a number of plates needs to be assign to it.
The procedure of assigning plates to a design variable is described in later part of this manual.

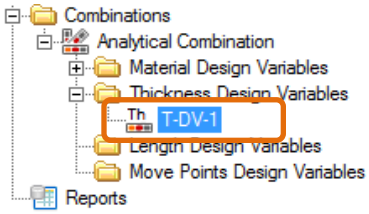
Each design variable can be removed from the CSA project after clicking on the "delete" icon in the main toolbar.

Thickness Design Variable

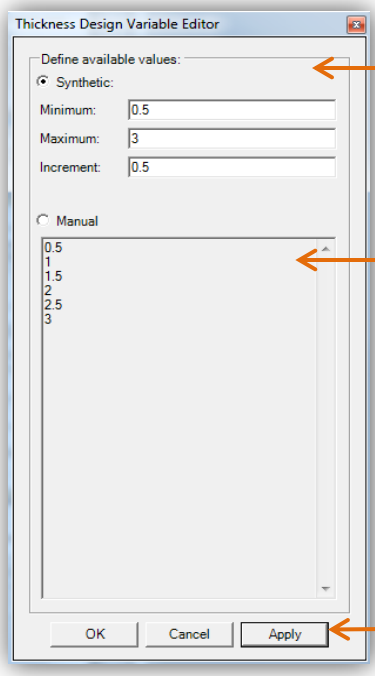
The Thickness Design Variable enables the user to assign various thickness values within the defined range to a selected plate or a group of plates.



In order to create a Thickness Design Variable click on its folder in the Explorer window.
Afterwards click on the appropriate icon in the main toolbar.
Automatically a new Thickness Design Variable will appear in the explorer tree.



After selecting the Thickness Design Variable (double click in the Explorer tree) a "Thickness Design Variable Editor" window will appear on the screen.



In the "Thickness Design Variable Editor" you can set the minimum and maximum value of plate thickness. Additionally the increment needs to be defined.

Alternatively, after checking the "Manual" option, it is possible to enter set of user defined thickness values.

In case the "Synthetic" option was selected, a list of all thickness variants will be automatically displayed.

The design variable definition procedure end by clicking on the "Apply" button

Basing on the design variables definition the software will automatically create cross sectional design variants, where prior selected plates will be given various thickness values.

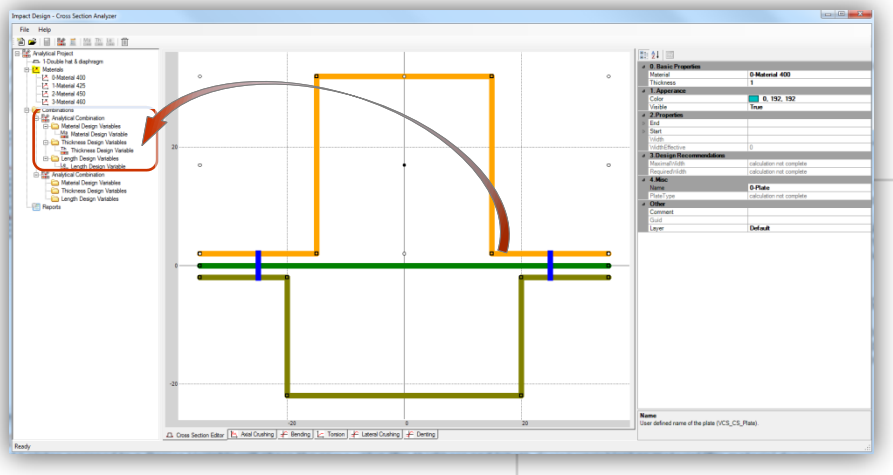
In the Properties window you can view and edit the design variable.
In the "Values" section a list of all thickness variants is given.

Misc	
Increment	0.5
Manual	(Collection)
Maximum	3
Minimum	0.5
Name	T-DV-1
Synthetic	True
Values	{0.5', 1', 1.5', 2', 2.5', 3'}
Option 1	0.5
Option 2	1
Option 3	1.5
Option 4	2
Option 5	2.5
Option 6	3

Each design variable can be removed from the CSA project after clicking on the "delete" icon in the main toolbar.

Assign Plates to previously defined design variables

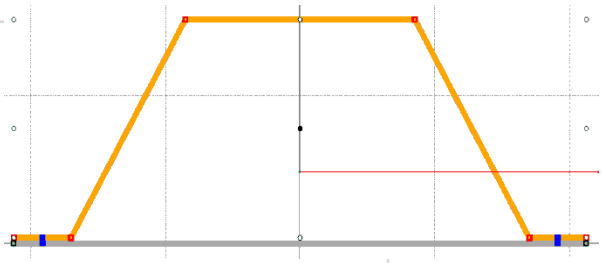
Select plates and assign them to a selected design variable

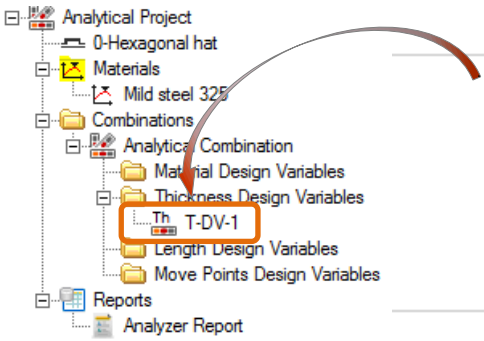


Firstly select required plate or number of plates and afterwards drag and drop them in the appropriate design variable (in the Explorer window)

The procedure of assigning plates to a design variable done by means od a simple drag-and-drop tool. The three steps of this activity are given below.

1) *Select the required plate od number of plate in the 2D view. You can use the area selection option.*
   All selected elements of a cross section will be marked in orange
   (*) Please note that points are also automatically selected when using the area selection. They will however not be assigned to material nor thickness design variable

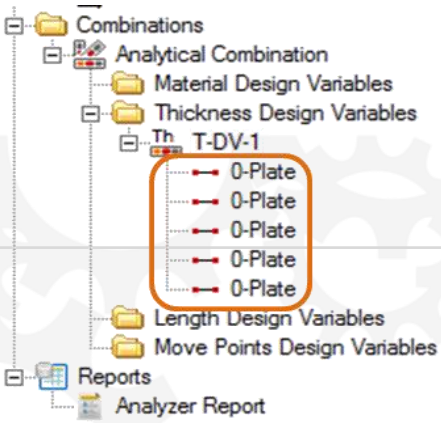




2) *After selecting the required plates in the 2D view drag and drop them in the appropriate design variable in the Explorer tree.*

3) *All assigned plates will be automatically added to the chosen design variable in the Explorer tree.*

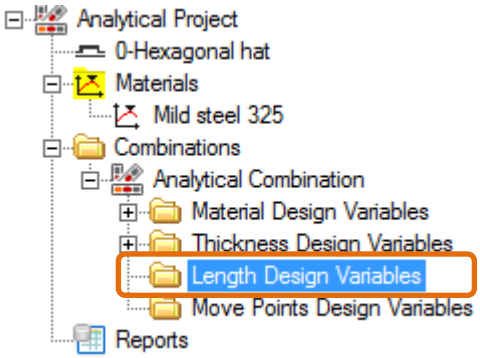
   After selecting a design variable in the Explorer window all assigned to it plates will be highlighted in orange in the 2D view window.



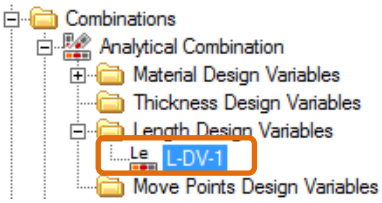
cross section analyzer

Length Design Variable

The Length Design Variable enables the user to assign various length values within the defined range to a selected plate or a group of plates.

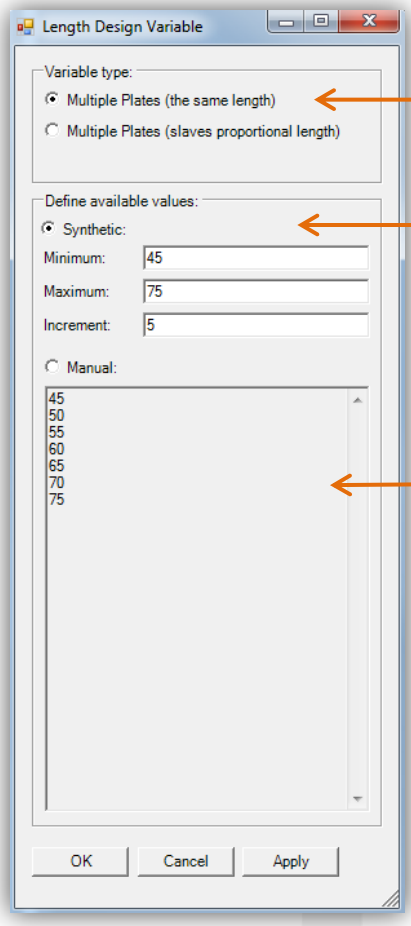


In order to create a Thickness Design Variable click on its folder in the Explorer window.
Afterwards click on the appropriate icon in the main toolbar.
Automatically a new Thickness Design Variable will appear in the explorer tree.



Useful keyboard shortcuts:
*Key: **L** – show lengths*
*Key: **T** – show thickness*

Click on the cross section 2D view and use one of the presented keyboard shortcuts in order to display plates length thicknesses and / or lengths.



The Length Design Variable offers two definition options:
- *Multiple Plates (the same length)*
- *Multiple Plates (slaves proportional length)*

In the "Length Design Variable" window you can set the minimum and maximum length value for chosen plate or number of plates.
Additionally the increment needs to be defined.

Alternatively, after checking the "Manual" option, it is possible to enter set of user defined thickness values.

In case the "Synthetic" option was selected, a list of all thickness variants will be automatically displayed.

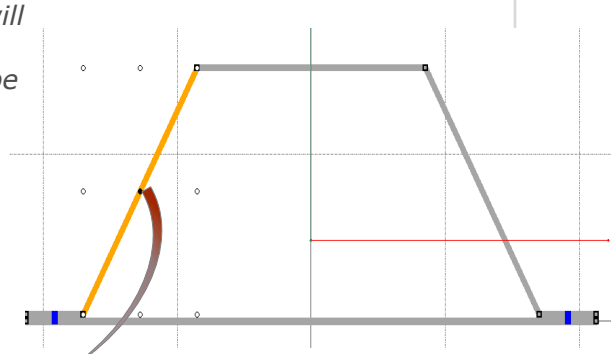
Each design variable can be removed from the CSA project after clicking on the "delete" icon in the main toolbar.

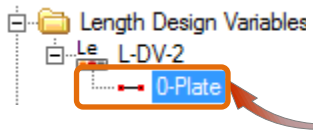
Length Design Variable

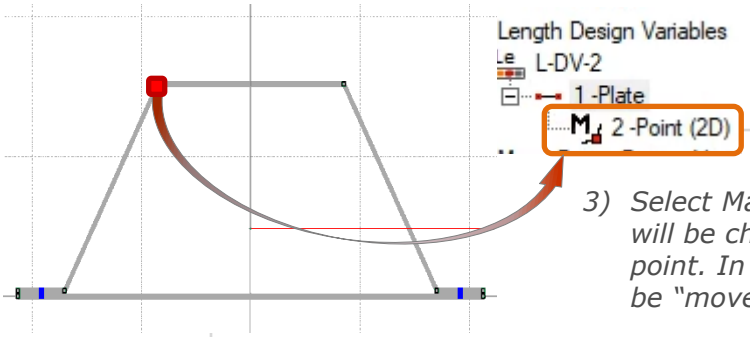
After the definition of Length Design Variable is completed a plate or a number of plates needs to be assign to it, as well as a set of master and slave points.
The procedure of assigning plates to a design variable is described below.

1) *Select Plate – during the analysis process CSA will automatically create number of cross-sectional design concepts in which this plates length will be changed accordingly to the design variable's definition.*

2) *Drag and drop to previously defined* ***Length Design Variable*** *in the Explorer window*





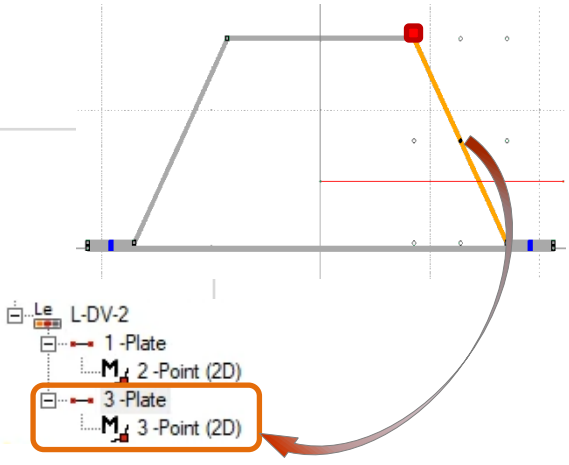


3) *Select Master Point (moving point) – plates length will be changed in the direction of the selected point. In other words, only this selected point will be "moved".*

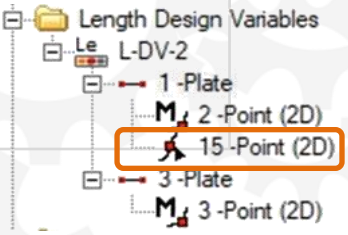
4) *Drag and drop to* ***Plate*** *in the Explorer tree*

5) *To one Length Design Variable several plates can be assigned.*

6) *To each plate a moving point needs to be selected.*

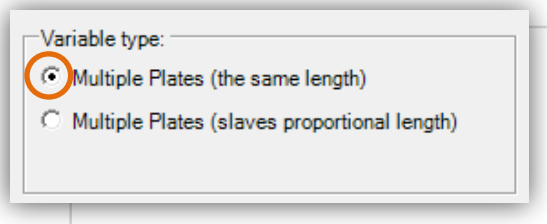


7) *To each plate within a length design variable a slave point can be assigned. This point will be moved proportionally to the movement of the master point.*
The slave point will be moved along a vector parallel to the master point's plate.



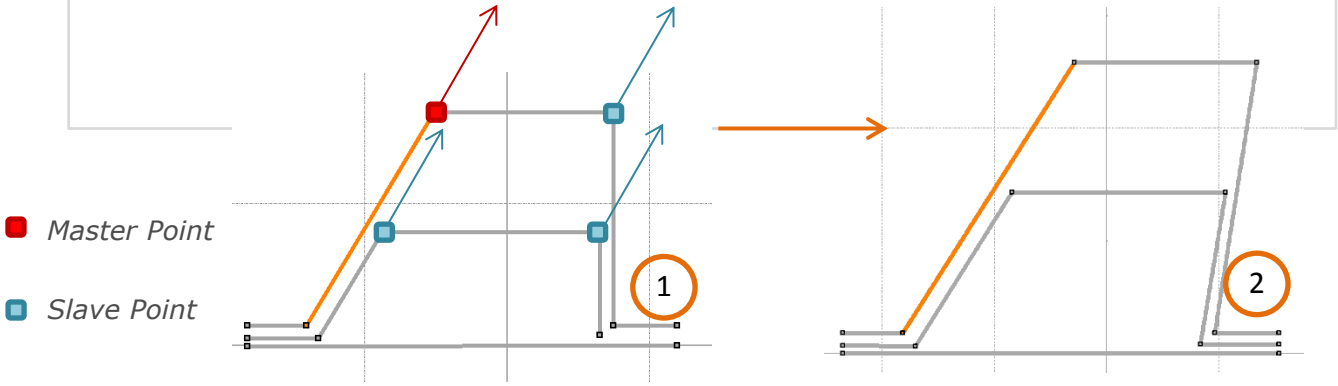
The Length Design Variable offers two options of multiple plate movement definition:

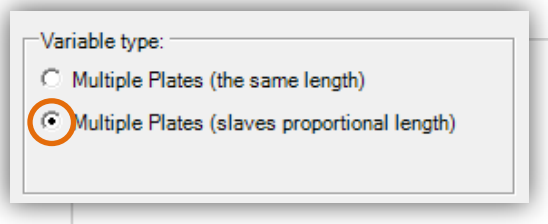
1. *Multiple plates – the same length*
2. *Multiple plates – slaves proportional length*



In case of the "the same length" option all plates assigned to the design variable will share the same length value.
You can assign several slave points to a selected plate (here marked in blue).

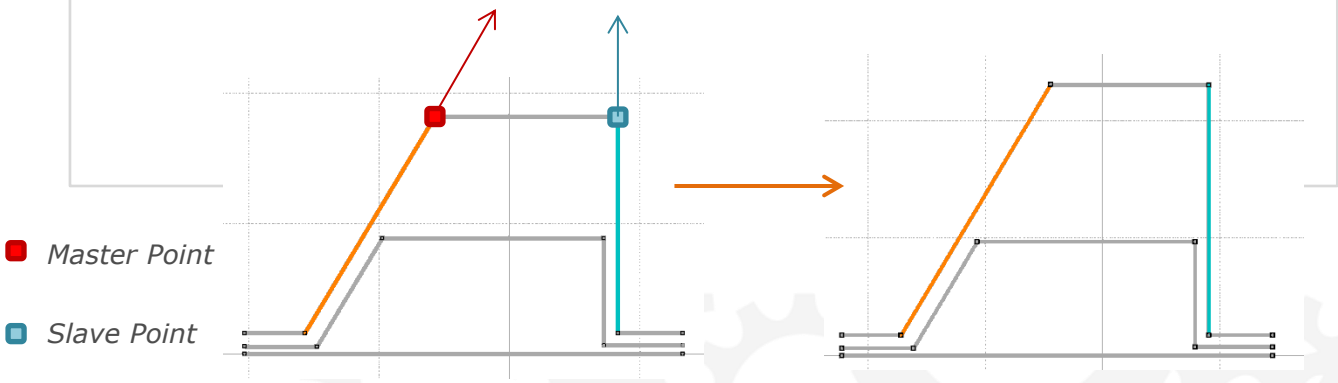
Slave points will change their position along a vector parallel to the master point's plate (see below).





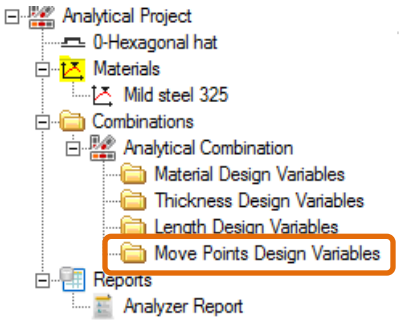
In case of the "slaves proportional length" the plate "attached" to a slave plate will change its length proportionally to the master plate.

The slave point (marked below in blue) will change its position along a line tangent to its original plate (see below).
Please note that in consequence of such plate-length change the angles between plates of the cross section will remain the same.

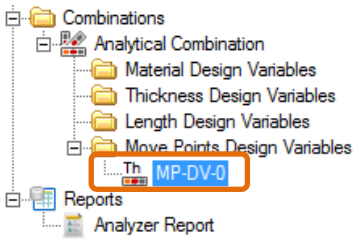


Move Point Design Variable

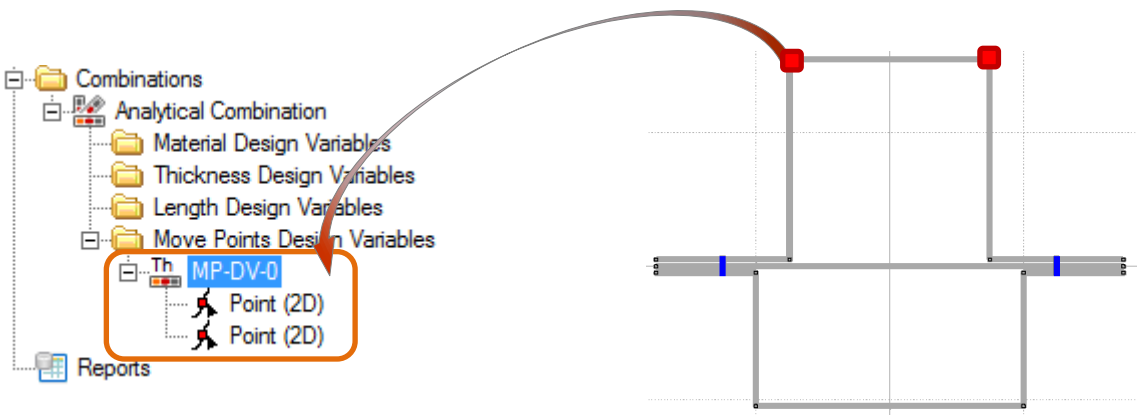
The Move Point Design Variable enables you to change coordinates of selected points along a user-defined vector. This allows to analyze various geometry variants.



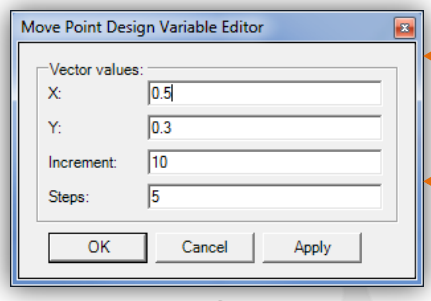
In order to create a Thickness Design Variable click on its folder in the Explorer window.
Afterwards click on the appropriate icon in the main toolbar.
Automatically a new Thickness Design Variable will appear in the explorer tree.



After the Move Point Design Variable is created select required points in the 2D view (use the area selection tool) and drag and drop them to the Explorer window.
All points added to the design variable will be automatically listed in the explorer tree.



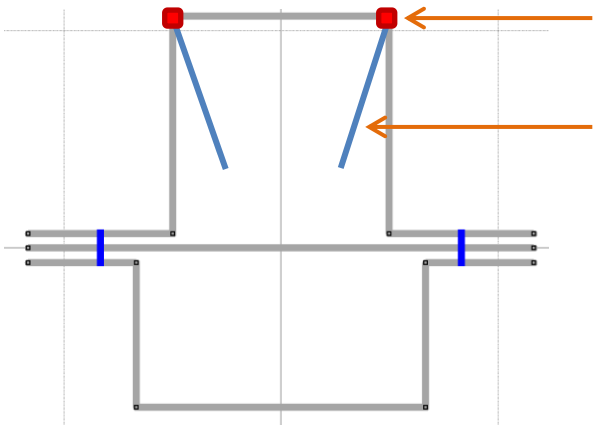
Thanks to the "Move Point" design variable it is possible to define the change of selected points coordinates.
Position of chosen points will change along a user-defined vector.
For each point an individual vector can be defined. Double click on a point in the explorer window to open the "Move Point Design Variable Editor" (see below).



Define the vector values (X and Y coordinates)

Define increment and number of steps

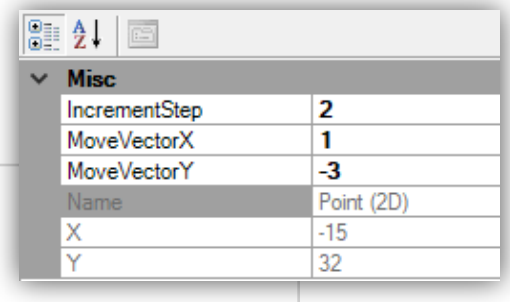
Vectors defined in the editor window are displayed in the main 2D view as blue lines.
After clicking on a Move Point Design Variable in the explorer tree all assigned to it points will be marked (red) and all defined vectors displayed (see below)

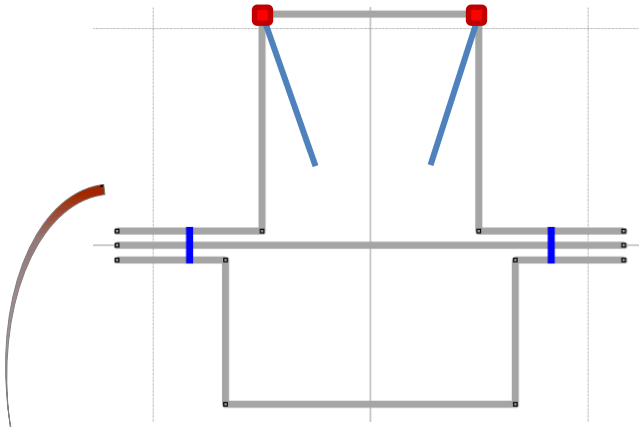


Point assigned to a Move Point Design Variable

User defined vector

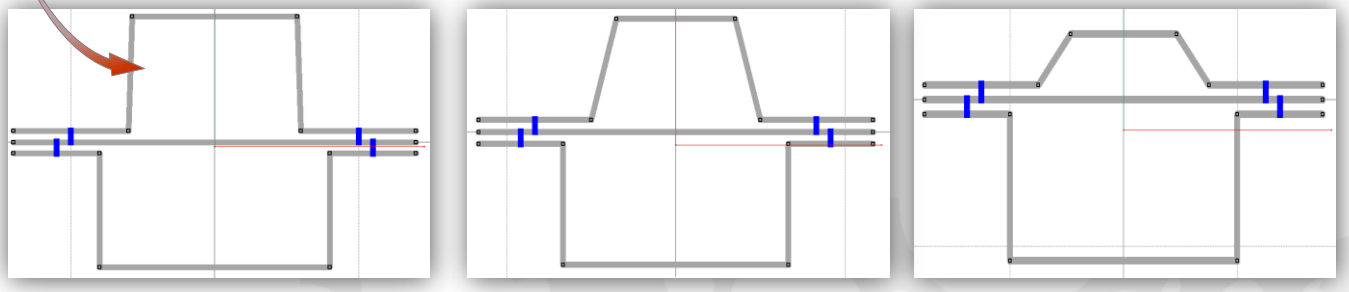
Additionally a Move Point Design Variable settings can be viewed and edited any time in the Properties window.





Original cross section

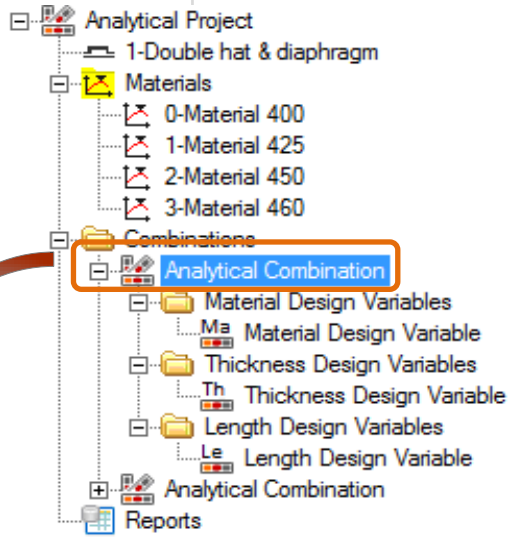
As a result of a fully defined move point design variable the CSA will automatically generate number of cross sectional design variants, where coordinates of assigned points will be changed along the defined vector. Please see the example below:



Examples of automatically generated variants of cross sectional geometry.

View the List of Combinations

After all design variables are defined and all required elements of the cross section are properly assigned the further steps of analysis procedure can be done.
Before conducting the CSA calculations it is recommended to check the list analytical combinations.



Double click on a selected "Analytical Combination" in the Explorer window. In the "Analytical Combination" window which will appear on the screen you will be able to view details of the design variants.

In appropriate columns values for thickness and length design variable are given. Materials used for each design variant are listed in the "Material Design Variable Column".

Analytical Combination

	Combination Id	Status	Thickness Design Variable	Thickness Design Variable	Material Design Variable
▶	000	Created	0.6	0.8	0-Material 400
	001	Created	0.6	0.8	1-Material 425
	002	Created	0.6	0.8	2-Material 450
	003	Created	0.6	0.8	3-Material 460
	010	Created	0.6	1.2	0-Material 400
	011	Created	0.6	1.2	1-Material 425
	012	Created	0.6	1.2	2-Material 450
	013	Created	0.6	1.2	3-Material 460
	020	Created	0.6	1.6	0-Material 400
	021	Created	0.6	1.6	1-Material 425
	022	Created	0.6	1.6	2-Material 450
	023	Created	0.6	1.6	3-Material 460
	100	Created	0.8	0.8	0-Material 400
	101	Created	0.8	0.8	1-Material 425
	102	Created	0.8	0.8	2-Material 450
	103	Created	0.8	0.8	3-Material 460
	110	Created	0.8	1.2	0-Material 400
	111	Created	0.8	1.2	1-Material 425
	112	Created	0.8	1.2	2-Material 450
	113	Created	0.8	1.2	3-Material 460
	120	Created	0.8	1.6	0-Material 400
	121	Created	0.8	1.6	1-Material 425
	122	Created	0.8	1.6	2-Material 450

Loaded 48 combinations based on 3 Design Variables.

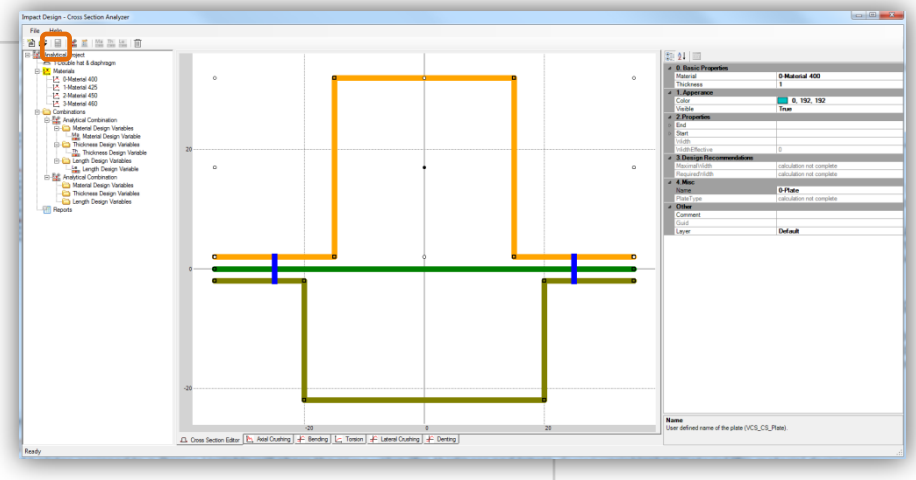
On the very bottom of the "Analytical Combinations" window you can find total number of combinations and design variables contained in the selected Analytical Combination

In the presented example 3 design variables were defined (two thickness design variables, one material design variable). Basing on those definitions the software created 43 combinations.

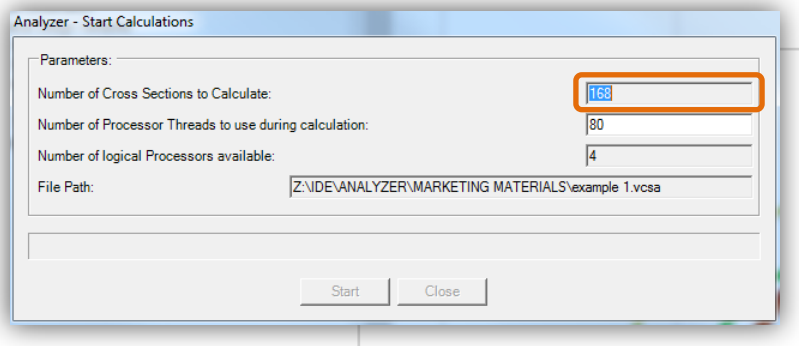
cross section analyzer

The Cross Section Analyzer automatically creates and calculates cross sectional design variants (combinations) basing on the previously defined design variables.

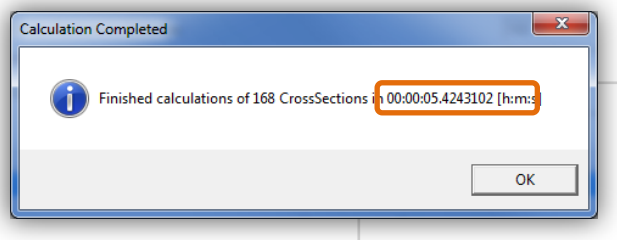
In order to start the calculation routine you need to select an Analytical Combination from the Explorer window and click on the "Calculate icon in the main toolbar.



Important notice:
You need to save the CSA project before the calculations.

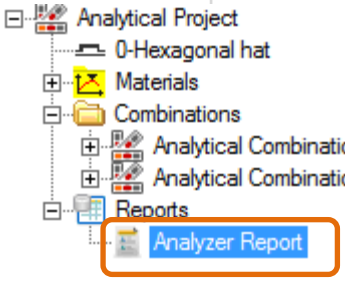


In the "Analyzer – Start Calculations" window you can see the number of cross sections that are to be calculated. In the given example the software created 168 cross sections



One of the greatest advantages on the Analyzer software is the speed of calculations.
In the given example calculation of 168 cross sections took slightly over 5 seconds.

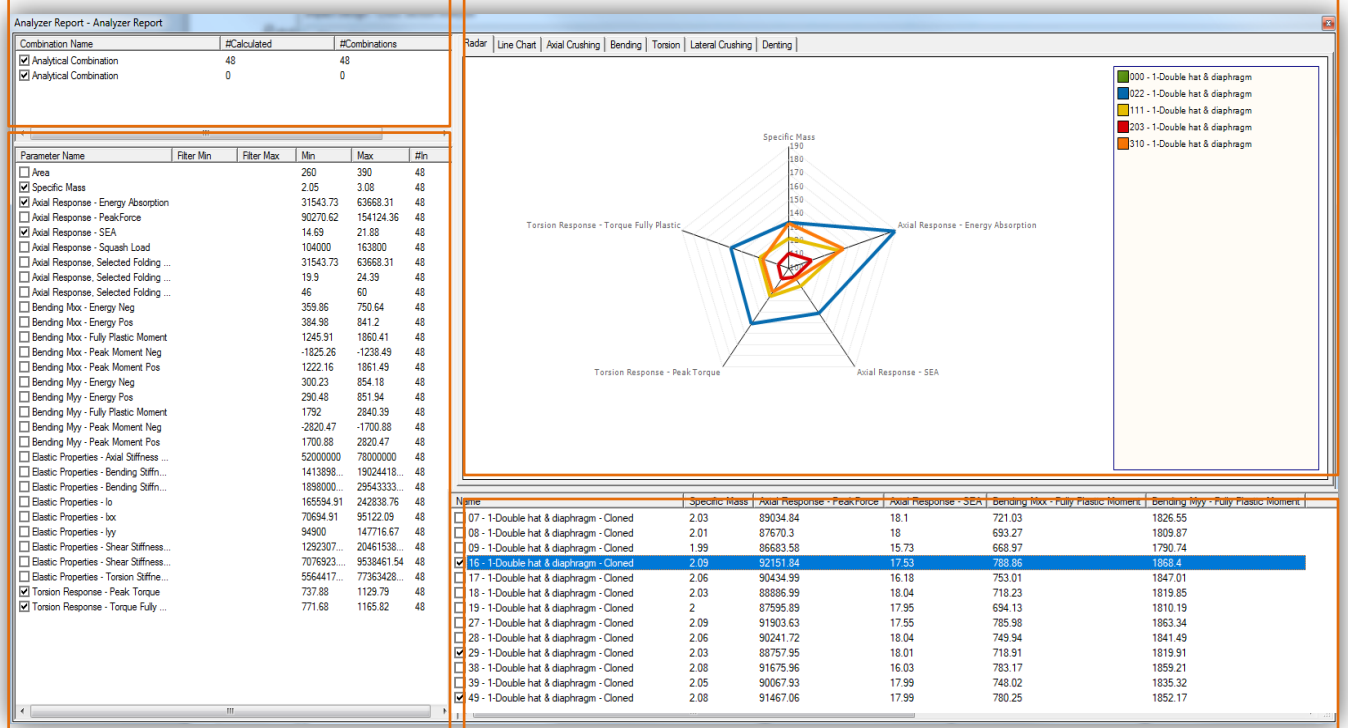
Results of the cross sectional analysis are available in the "Analyzer Report" window.



Click on the "Report" icon in CSA main toolbar after the calculations are done.
A new "Analyzer Report" will be automatically added to the explorer tree.
Double click on it to view calculation results in the Analyzer Report window.

List of calculated Analytical Combinations
You can view results for all calculated Analytical Combinations or only for a chosen one

The "Radar" window.
In this window a radar graph is displayed illustrating the comparison of selected cross sections (only chosen results are taken into account).



List of all available results.
In columns you can find the minimum and maximum values detected within the group of calculated combinations
In this are you can also define filters.

List of calculated cross sections.
Displays all cross sections which fulfill the filtering limitations, or all calculated cross sections if no filter has been defined.
For each cross section selected results are shown.

cross section analyzer

*Apart from the "Radar" functionality the Results report includes the **Line Chart** bookmark which enables more detailed analysis of selected cross sections.*

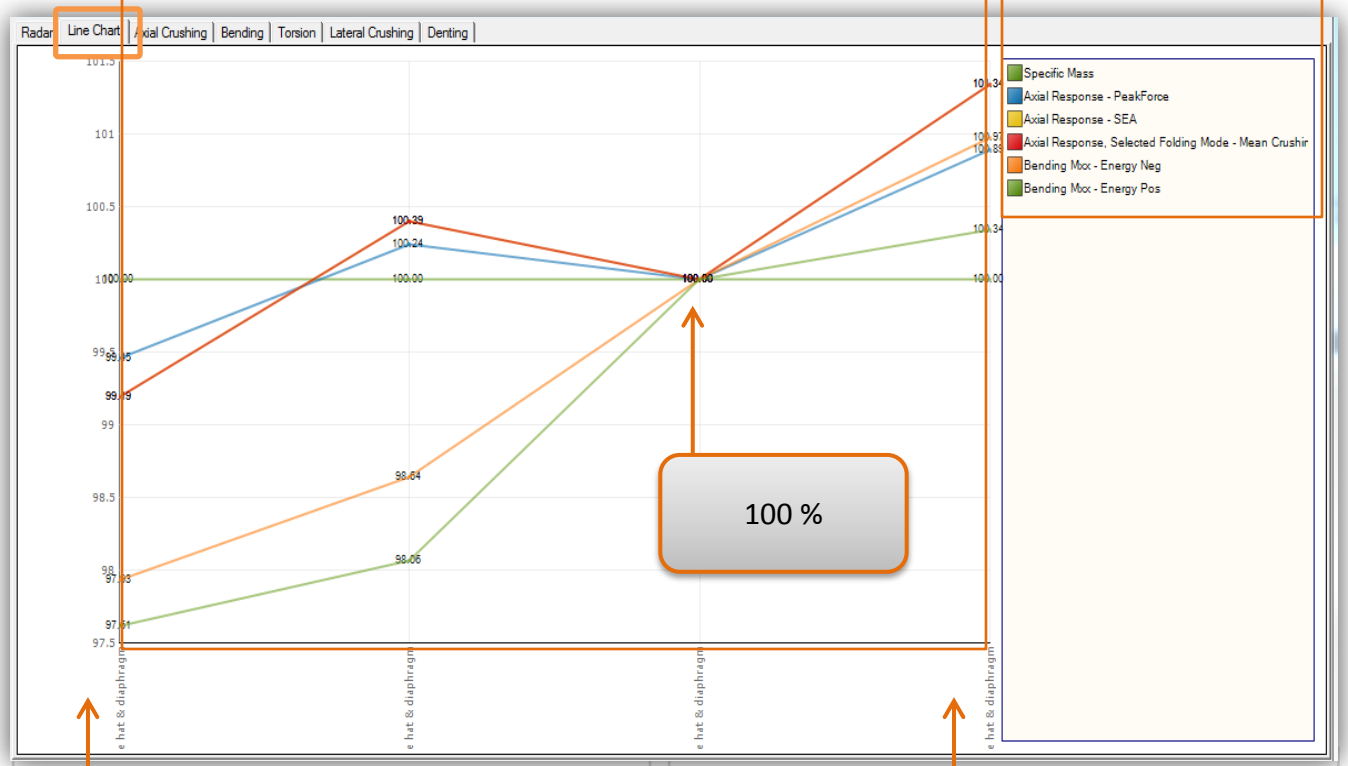
In the center of the "line chart" view lines representing results for number of selected cross sections are displayed.

In the example presented below:

- *Blue line represents results for axial response – peak force.*
- *Results are given for 4 selected cross sections.*
- *One selected cross section is treated as a reference point to which other values are compared (in percentage rate). In the given example the third cross section is selected for reference, and therefore its results are given 100% value.*

Colorful lines represent results for prior selected response.

In the given example lines for 6 results are displayed.

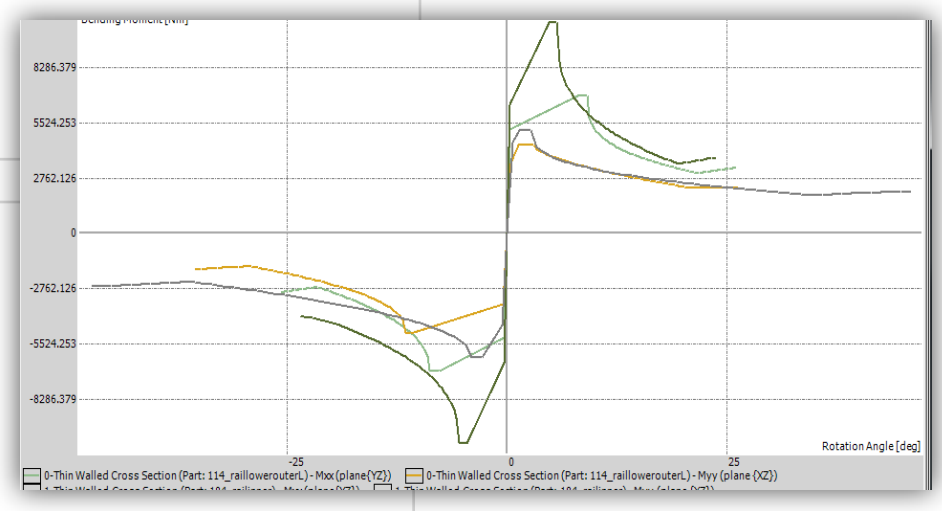


On the "Y" axis percentage values are given.

Chosen cross sections are listed on the "X" axis.
In order to add or remove a cross section simply check or uncheck it in the "List of calculated cross sections" window.

cross section analyzer

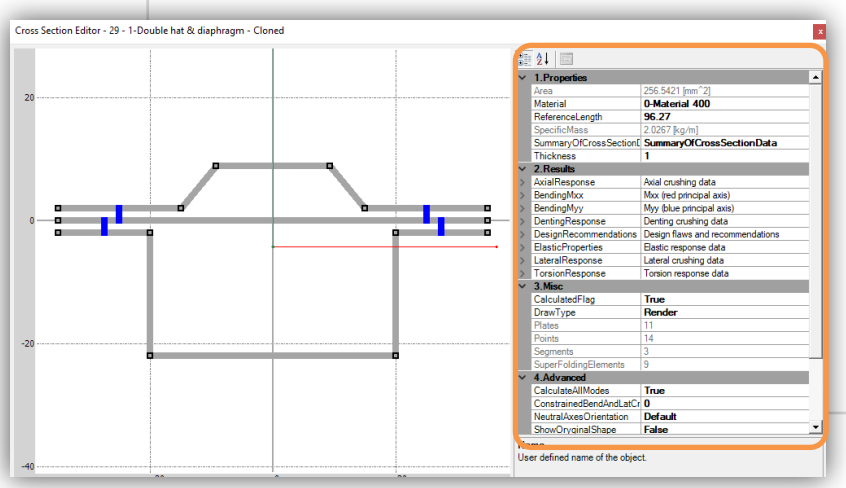
Additionally the results report is enhanced with the functionality of curve comparison
The user can compare charts for axial response, bending or torsion of number of selected cross sections



Each line represents response curve of one selected cross section.

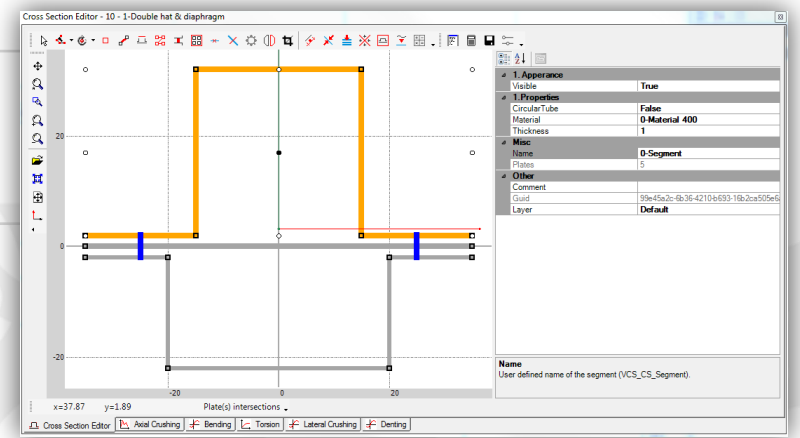
In order to add or remove a cross section simply check or uncheck it in the "List of calculated cross sections" window

Double click on a selected cross section from the list to open its individual window



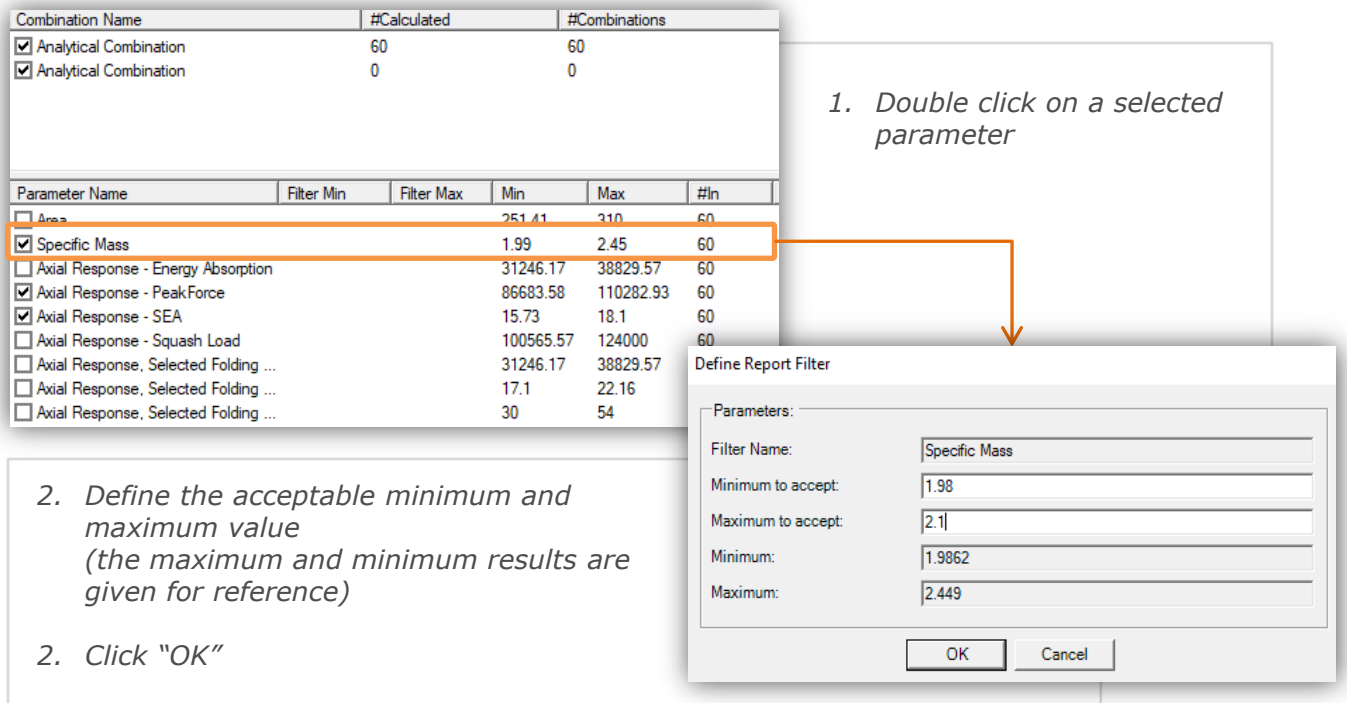
- *View the geometry of the selected design.*
- *All results are available in the Properties part of the window*
- *Additionally result charts are available under appropriate bookmarks.*

Moreover, you can view properties of any selected element of the cross section.



cross section analyzer

Double click on a selected parameter to define the results filter

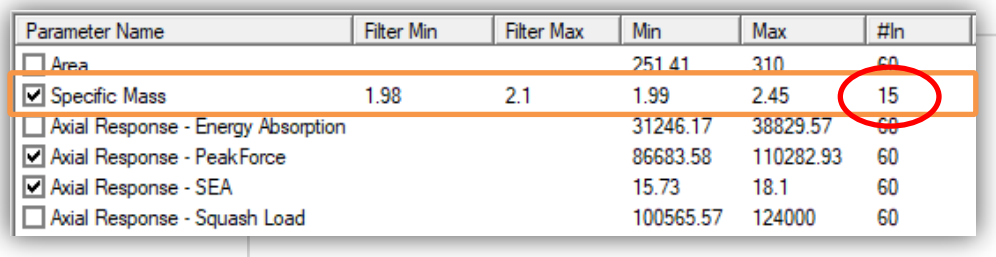


1. *Double click on a selected parameter*

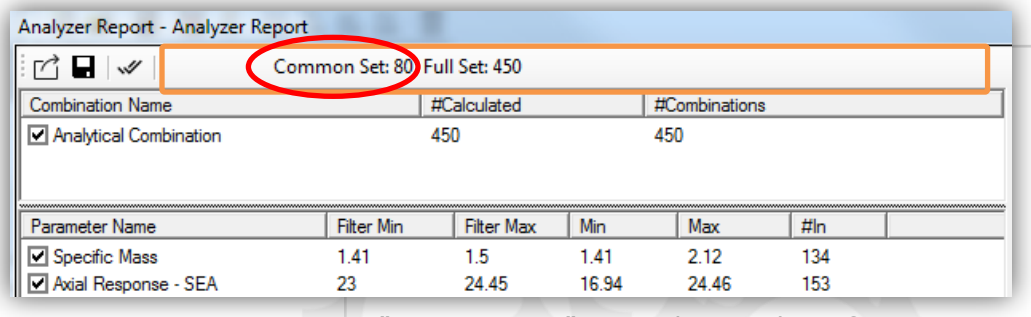
2. *Define the acceptable minimum and maximum value (the maximum and minimum results are given for reference)*

2. *Click "OK"*

The filter is now defined. You can see the number of cross sections within the filter's range in the "In#" column (see below).
In the "List of calculated cross sections" window only those cross sections which fulfill the filter's conditions will be listed (as long as the filtered parameter is checked).



Number of cross section which are contained within the filter's range.



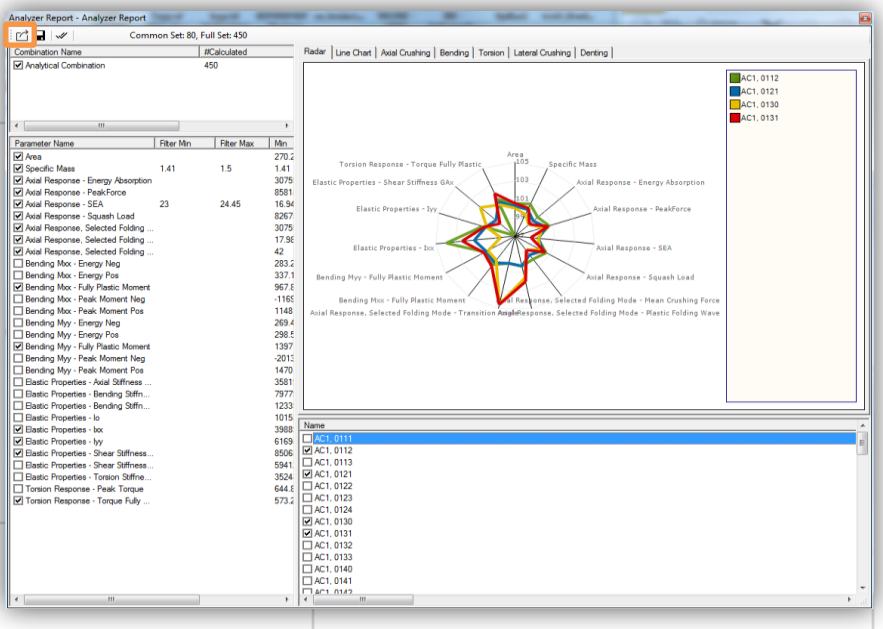
On the top of the report window additional information about common set of cross sections is displayed

"Common set" gives the number of cross sections which fulfil the requirements of all defined filters.
In the example presented above 2 filters were defined (for specific mass and SEA).
From the total number of 450 calculated cross sections 80 fit in the range of both filters.

Selected results of the Analyzer Report can by easily exported after clicking on the "Export" icon available in the report's main toolbar.

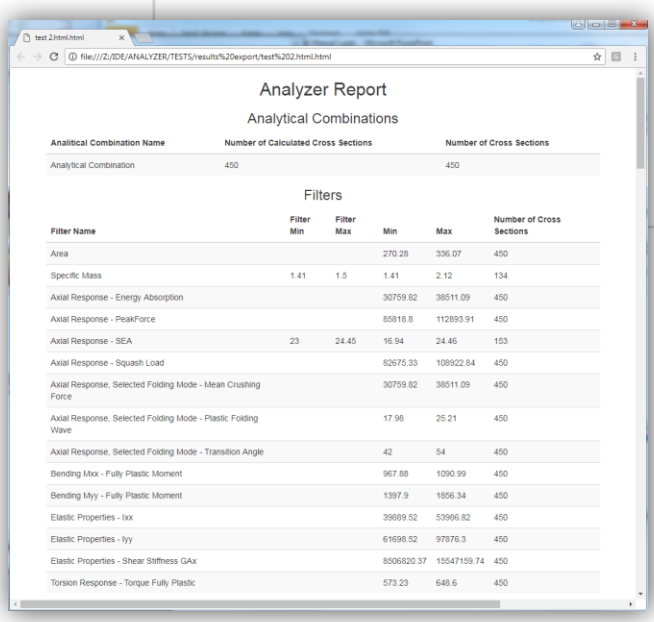
1. *Select results which are to be included in the exported report.*

Only the selected results will be visible in the exported document.



2. *Choose cross sections which are to be included in the exported report.*

3. *Click on the "Export" icon. The results of selected cross sections will be exported in a .html document.*



Analyzer Report

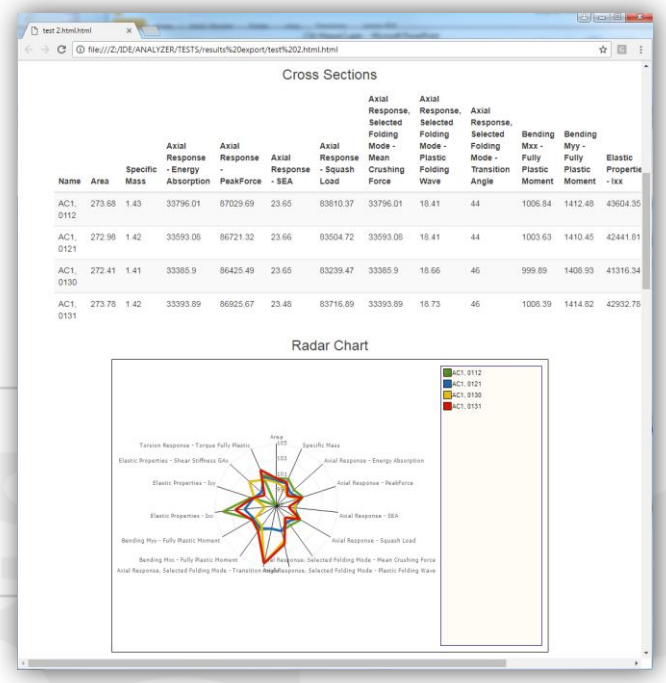
Analytical Combinations

Analitical Combination Name	Number of Calculated Cross Sections	Number of Cross Sections
Analytical Combination	450	450

Filters

Filter Name	Filter Min	Filter Max	Min	Max	Number of Cross Sections
Area			270.28	336.07	450
Specific Mass	1.41	1.5	1.41	2.12	134
Axial Response - Energy Absorption			30759.82	38511.09	450
Axial Response - PeakForce			85618.8	112893.91	450
Axial Response - SEA	23	24.45	16.94	24.46	153
Axial Response - Squash Load			82675.33	108922.84	450
Axial Response, Selected Folding Mode - Mean Crushing Force			30759.82	38511.09	450
Axial Response, Selected Folding Mode - Plastic Folding Wave			17.98	25.21	450
Axial Response, Selected Folding Mode - Transition Angle			42	54	450
Bending Mxx - Fully Plastic Moment			967.88	1090.99	450
Bending Myy - Fully Plastic Moment			1397.9	1856.34	450
Elastic Properties - Ixx			39689.52	53986.82	450
Elastic Properties - Iyy			61698.52	97876.3	450
Elastic Properties - Shear Stiffness GAx			8506820.37	15547159.74	450
Torsion Response - Torque Fully Plastic			573.23	648.6	450

The Exported document contains basic information about the calculated analytical combination.
The list of prior selected results is available together with information about filters definition.



Cross Sections

Name	Area	Specific Mass	Axial Response - Energy Absorption	Axial Response - PeakForce	Axial Response - SEA	Axial Response - Squash Load	Axial Response, Selected Folding Mode - Mean Crushing Force	Axial Response, Selected Folding Mode - Plastic Folding Wave	Axial Response, Selected Folding Mode - Transition Angle	Bending Mxx - Fully Plastic Moment	Bending Myy - Fully Plastic Moment	Elastic Properties - Ixx
AC1, 0112	273.68	1.43	33796.01	87029.69	23.65	83810.37	33796.01	18.41	44	1006.84	1412.48	43604.35
AC1, 0121	272.96	1.42	33593.08	86721.32	23.66	83504.72	33593.08	18.41	44	1003.63	1410.45	42441.61
AC1, 0130	272.41	1.41	33385.9	86425.49	23.65	83239.47	33385.9	18.66	46	999.89	1408.93	41316.34
AC1, 0131	273.78	1.42	33393.89	86925.67	23.48	83716.89	33393.89	18.73	46	1008.39	1414.82	42932.78

Radar Chart

Afterwards you can find in the document a table covering results for previously selected cross sections.
Additionally the report contains the Radar Chart, Line Chart and curve comparison view

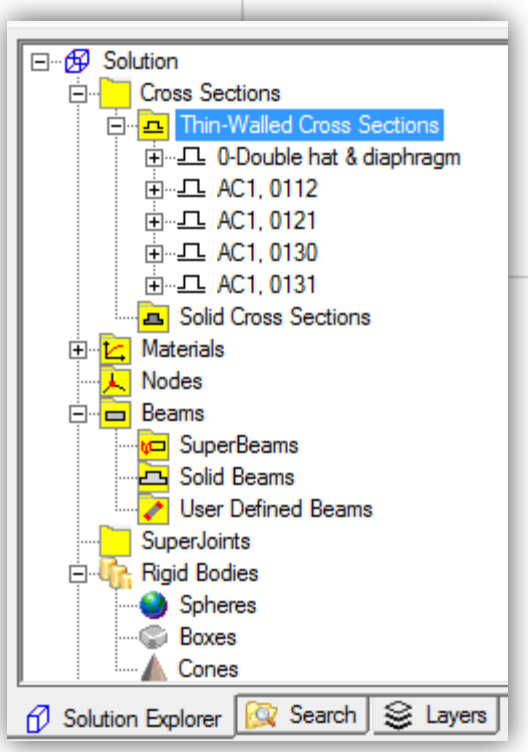
cross section analyzer

Export – CROSS SECTION

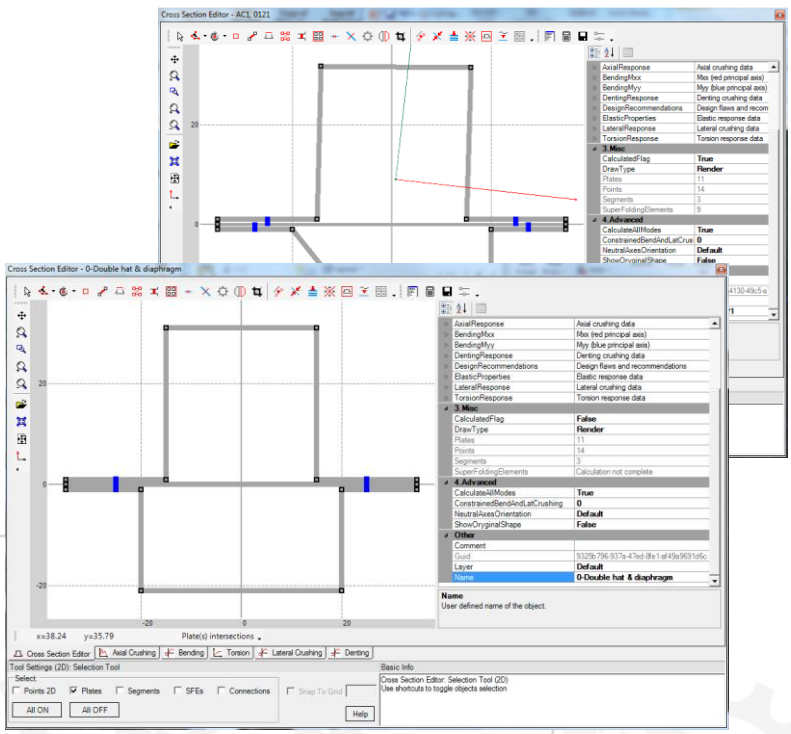
Each cross section generated during the analytical procedure can be saved and afterwards opened in VCS of CCC solution.
The "Save Selected Cross Sections" icon is available in the main toolbar of the Analyzer Report.

Name	Specific Mass	Axial Response - PeakForce	Axial Response - SEA	Bending Mxx - Fully Plastic Moment	Bending Myy - Fully Plastic Moment
☐ 07 - 1-Double hat & diaphragm - Cloned	2.03	89034.84	18.1	721.03	1826.55
☐ 08 - 1-Double hat & diaphragm - Cloned	2.01	87670.3	18	693.27	1809.87
☐ 09 - 1-Double hat & diaphragm - Cloned	1.99	86683.58	15.73	668.97	1790.74
☑ 16 - 1-Double hat & diaphragm - Cloned	2.09	92151.84	17.53	788.86	1868.4
☐ 17 - 1-Double hat & diaphragm - Cloned	2.06	90434.99	16.18	753.01	1847.01
☐ 18 - 1-Double hat & diaphragm - Cloned	2.03	88886.99	18.04	718.23	1819.85
☐ 19 - 1-Double hat & diaphragm - Cloned	2	87595.89	17.95	694.13	1810.19
☐ 27 - 1-Double hat & diaphragm - Cloned	2.09	91903.63	17.55	785.98	1863.34
☐ 28 - 1-Double hat & diaphragm - Cloned	2.06	90241.72	18.04	749.94	1841.49
☑ 29 - 1-Double hat & diaphragm - Cloned	2.03	88757.95	18.01	718.91	1819.91
☐ 38 - 1-Double hat & diaphragm - Cloned	2.08	91675.96	16.03	783.17	1859.21
☐ 39 - 1-Double hat & diaphragm - Cloned	2.05	90067.93	17.99	748.02	1835.32
☑ 49 - 1-Double hat & diaphragm - Cloned	2.08	91467.06	17.99	780.25	1852.17

Select all cross sections you wish to save. You can export several cross sections simultaneously.



After opening the saved file in VCS or CCC you will find all previously selected cross sections in the Solution Explorer tree.
Additionally all materials assigned to plates of saved cross sections will be automatically added to the solution.



Double click on a chosen cross section to open it in the Cross Section Editor and to view its definition in the properties window.