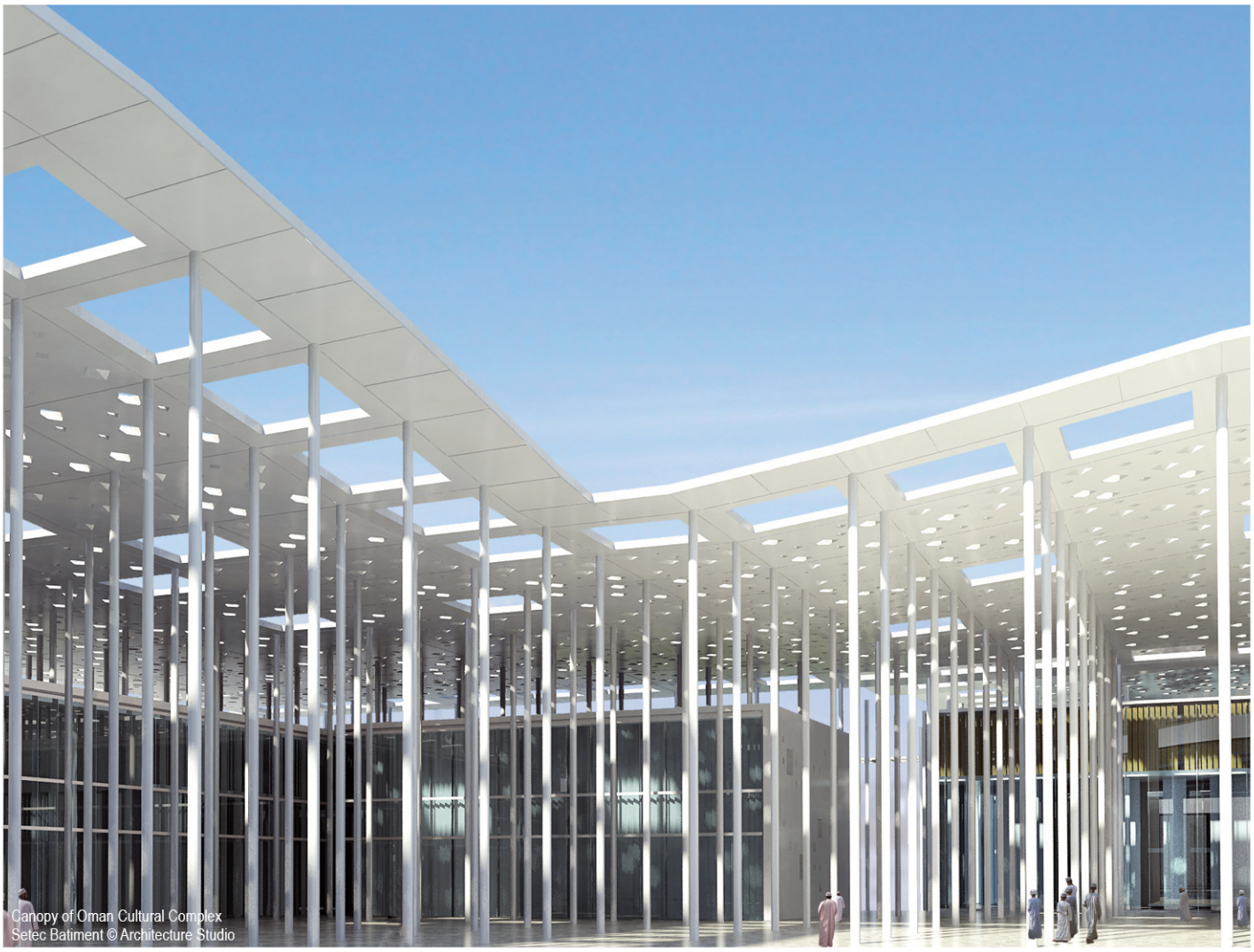
NEMETSCHEK Scia



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Manual

Profile Library Editor

Scia Engineer

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Version & Protection Information

Welcome to the Manual for the Profile Library Editor.

This document illustrates the usage of the Profile Library Editor which is used to modify the Profile Library of steel cross-sections within Scia Engineer.

Version info

Document Title	Manual – Profile Library Editor
Release	2013.1
Revision	06/2013

Protection info

In order to use the Profile Library Editor, the **Productivity Toolbox** module (**ESA.06**) needs to be activated in the License.

Introduction

This document illustrates the usage of the Profile Library Editor which is used to modify the Profile Library of steel cross-sections within Scia Engineer.

In the first chapter the folder structure of the Profile Library as well as the naming and ordering of different libraries is explained.

The second chapter discusses the Profile Library Editor which allows to add new sections to the library or edit and remove existing ones. Both main functions (editing and adding) are illustrated using a practical example.

At the end of this document, several annexes are provided which give additional information.
Annex A gives an overview of the Formcodes used within Scia Engineer, including all parameters which describe the shapes.

Annex B provides a list of all Cross-section characteristics which can be inputted in the Profile Library.

Annex C contains information regarding filters, which allow an easy filtering of the Profile Library section Types.

The final annex, Annex D lists the different files located in the folder of the Scia Engineer Profile Library.

Within Chapter 2 an example MS Excel file is used named Example_Profile_Library.xlsx. This file is supplied with this manual

1. Profile Library Folders

In this chapter the folder structure of the Profile Library as well as the naming and ordering of different libraries is explained.

Default folders

The first part of this chapter will focus on the structure of the Profile Library. Therefore, the directory settings of Scia Engineer are examined:

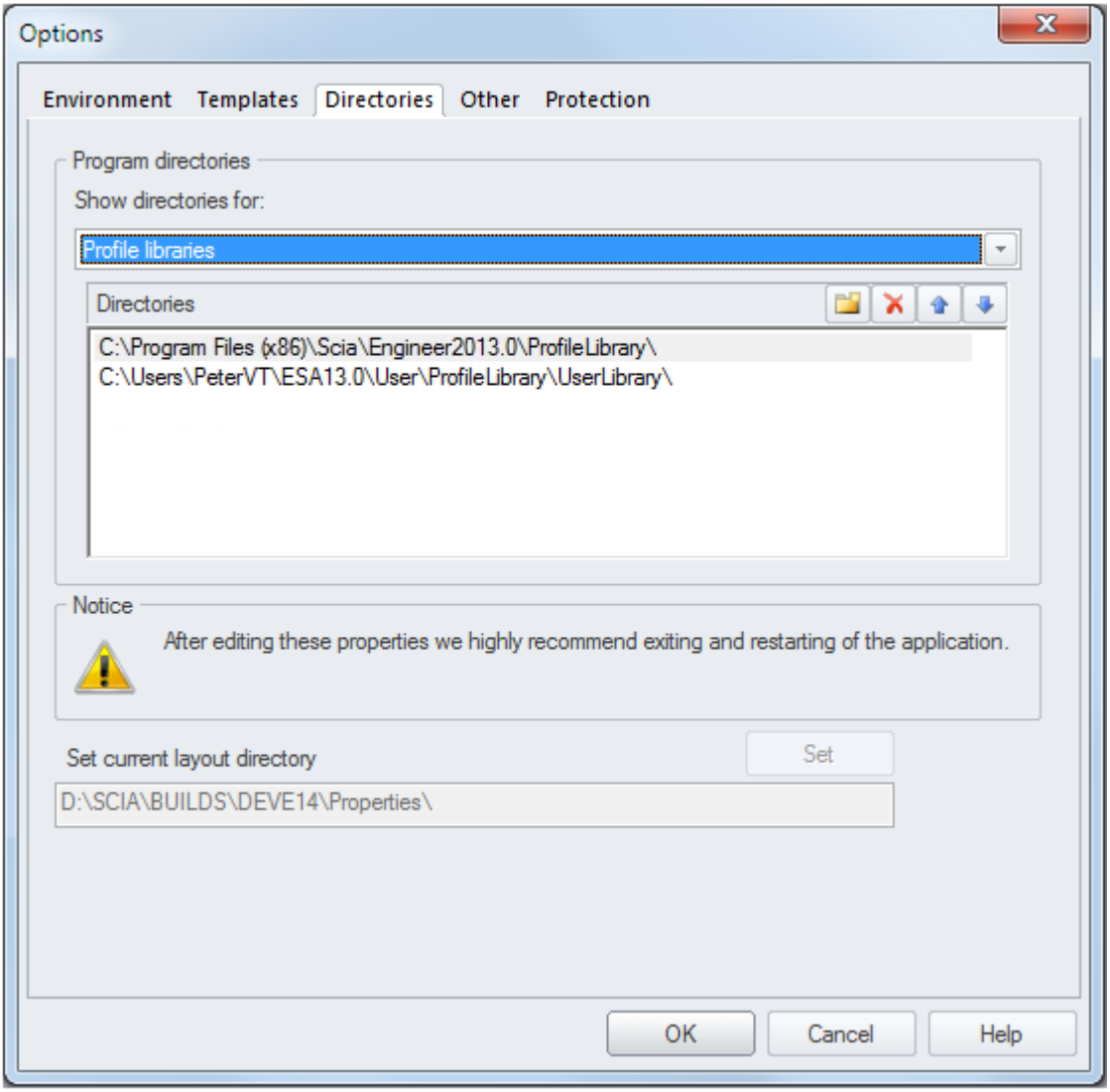
- Launch Scia Engineer.

- When the **Open project** dialog appears, press Cancel.

- Go to **Setup** > **Options**

- Go to the tab **Directories**

- Set the **'Show directories for:'** combo-box to **Profile Libraries**



The actual numbers in the folders (ESA13.0, ESA13.1, ...) can differ depending on the version of Scia Engineer which is installed.

By default two directories are listed in this dialog, one referring to the installation folder and one referring to the user folder. In general they can be written as follows:

Folder 1: "C:\Program Files (x86)\Scia\EngineerXXXX.X\ProfileLibrary\"

The first directory refers to the installation folder of Scia Engineer. The ProfileLibrary subfolder contains the so-called System library i.e. the Profile Library which is supplied with Scia Engineer.

Folder 2: "C:\Users\#USER#\ESAXX.X\User\ProfileLibrary\UserLibrary\"

The second folder refers to the user folder of Scia Engineer. This specific path refers to the UserLibrary i.e. the default location where any new Library sections added by the user will be stored.

Using the **New** and **Delete** buttons folders can be added or removed. In this way it is for example possible to set a Profile Library folder located on a network location.

When installing a patch of Scia Engineer, the ProfileLibrary will be updated. The UserLibrary will not be modified, so no data is lost/overwritten when applying a patch. It is therefore recommended to always use the UserLibrary when adding new sections!

Library naming and order

Each folder entry is seen as a separate library. Each library receives a name equal to the last subfolder of the path. The number (or order) of these libraries depends on the order in which they are listed in the dialog.

For the two default folders specified above this means that the first folder will be labeled **ProfileLibrary** and seen as the first library while the second folder is labeled as **UserLibrary** and is seen as the second library.

If for example a third folder would have been added labeled **"D:\Test\Scia"** then this folder would represent the 3rd library (by its order in the list) and would be labeled **Scia** (the name taken from the last subfolder of the path).

Using the **Move Item Up/Down** buttons the order of folders (Libraries) can be changed but this is not required.

Scia Engineer always takes the first folder as being the System library.

Folder Content

A rundown of the content of the ProfileLibrary folder can be found in Annex D.

The UserLibrary folder will be empty initially. Files are generated in the UserLibrary folder when sections are added into this library. This is illustrated in Chapter 2.

2. Profile Library Editor

In this chapter the Profile Library Editor is discussed which allows the user to add new sections to the library or edit and remove existing ones.

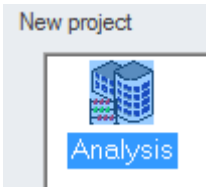
Edit Profile Library

In order to open the Profile Library Editor a new project needs to be created (or an existing one opened).

- Launch Scia Engineer.

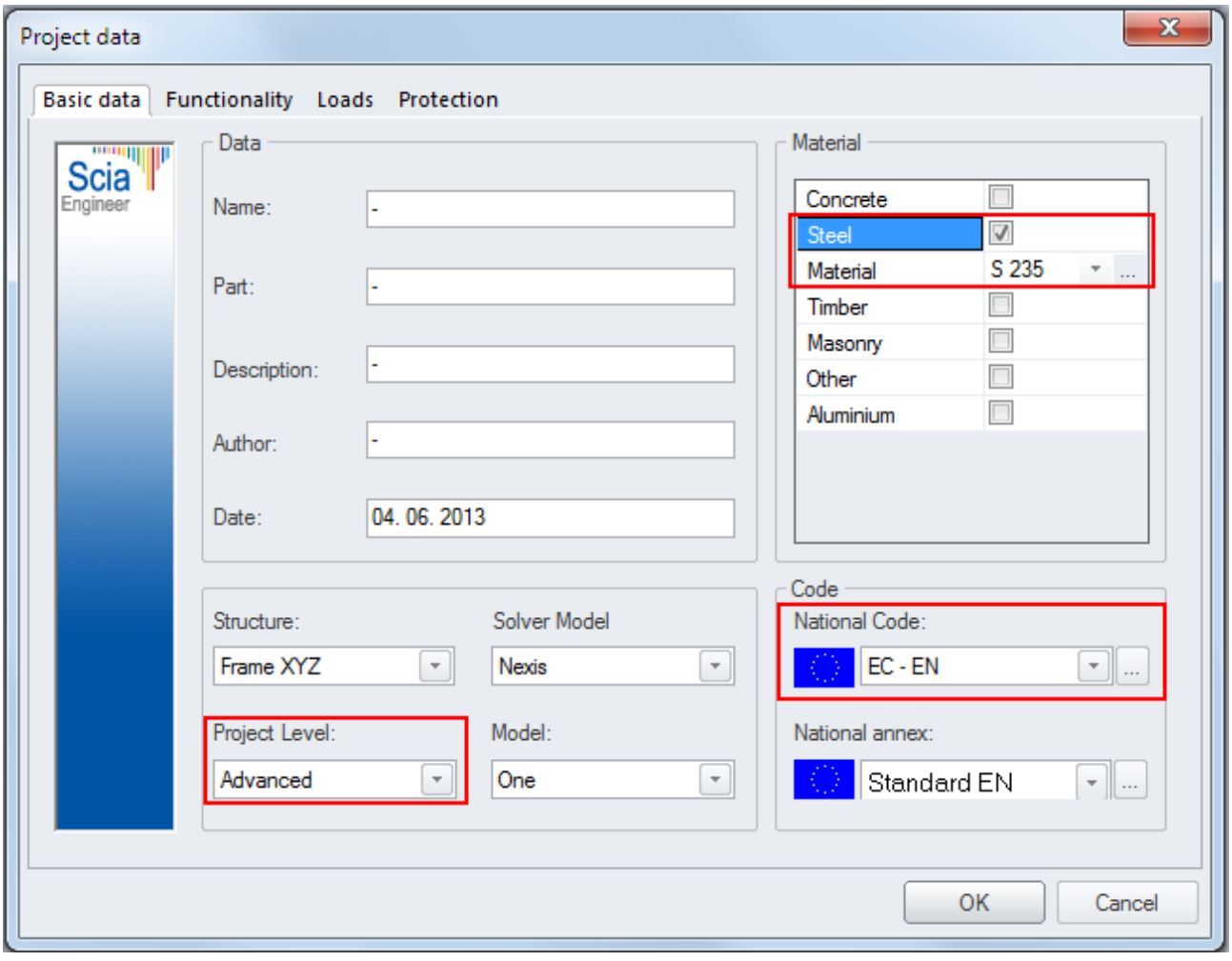
- When the **Open project** dialog appears, press Cancel.

- Go to **File** > **New**

- Select a new **Analysis** project 

- Confirm the selection with OK.

The **Project data** dialog opens:

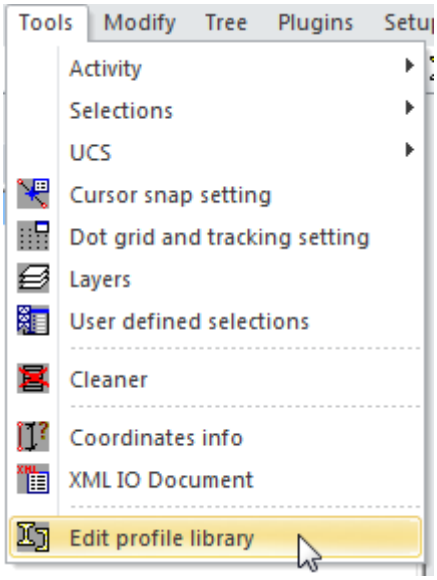


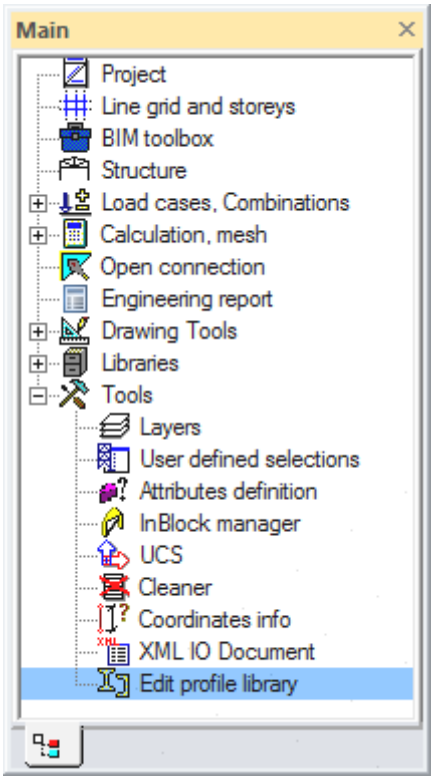
- In this dialog, set the **National Code** to for example **EC-EN**, activate **Steel** material and set the **Project Level** to **Advanced**.

> **A different National Code may also be selected but it should contain Steel material.**

- Confirm these settings with OK.

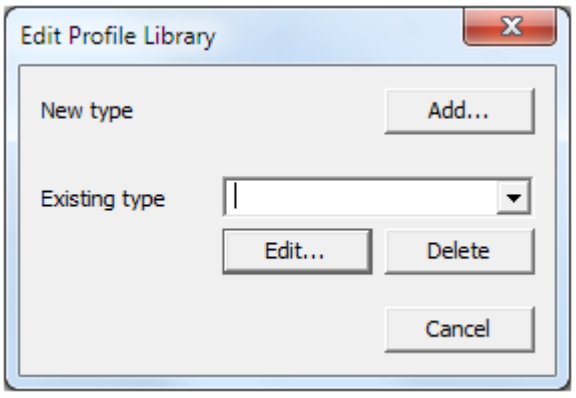
When the project environment is loaded the Profile Library Editor can be opened either through the Menu toolbar at the top or through the tree in the Main dialog.

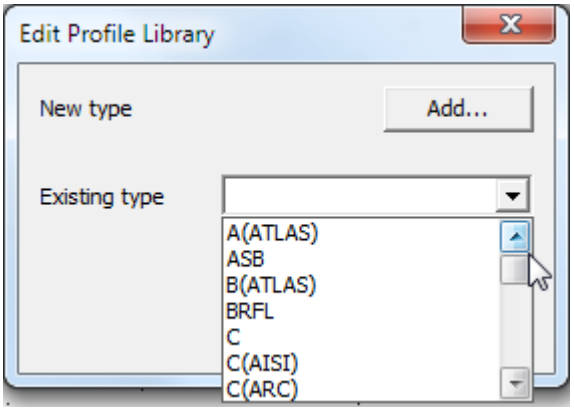




- Go to **Tools** > **Edit profile library**

The **Edit Profile Library** dialog appears:





Using the Add... button a New section type can be added to a library (either system or user).

The **Existing type** combo-box shows an alphabetical list of all sections found in the different Libraries. This list shows the content of all Libraries set in the Profile Library Folders (see Chapter 1).

When an Existing type is selected this can either be edited using the Edit... button or removed using the Delete button.

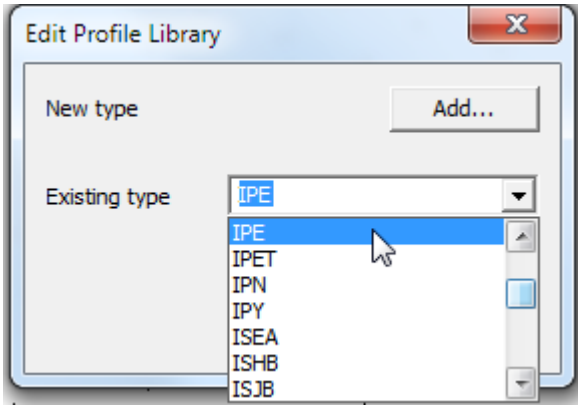
In the following paragraphs the different options of this dialog are further elaborated.

Editing an existing section type

In this paragraph, the editing of an existing section type is illustrated by means of an example.

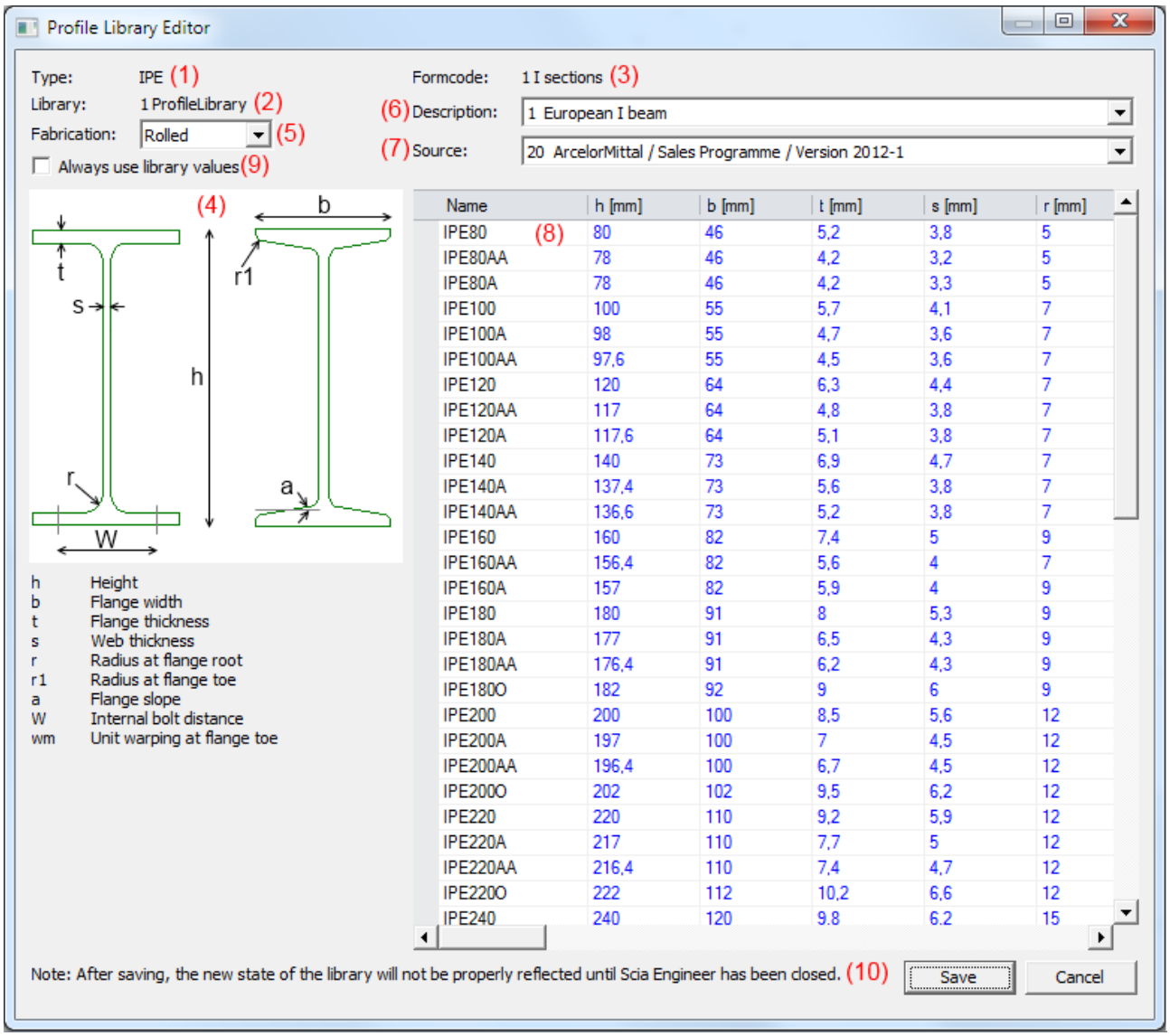
- Follow the steps of the previous paragraph to get to the **Edit Profile Library** dialog.

- In the **Existing type** combo-box either select **IPE** from the drop-down list or type **IPE** into the input field.



- Now press the Edit... button.

The **Profile Library Editor** will open, showing the data for the selected type (IPE).



On the previous picture the different items of the dialog have been marked by red numbers (X). These items will now be discussed one by one in the following paragraphs.

1. Type

The **Type**, marked with number (1) on the Profile Library Editor picture shows the type of the selected section, in this case "IPE".

The Type may only contain letters i.e. no numbers.

Additional information regarding the Name of a section is given in Paragraph 8.

2. Library

The **Library**, marked with number (2) on the Profile Library Editor picture shows the Library in which this Type is located.
As specified in Chapter 1 the naming and ordering of the libraries depends on the folder name and order in the directory settings.

In this example, the IPE type is located in the **ProfileLibrary** which is the 1st library (denoted by the 1).

3. & 4. Formcode and picture

Within Scia Engineer, each shape within the Profile Library is uniquely identified by a so called Formcode. The Formcode defines the shape, the parameters which describe the shape and in some cases also additional parameters like distance between bolt holes, unit warping ordinates etc.

Annex A of this manual gives a complete overview of all Formcodes used within the Profile Library including pictures of the shapes and descriptions of the different parameters.

Within the Profile Library Editor picture the **Formcode** is marked with number (3). Number (4) shows the corresponding picture which details the shape of this Formcode and all parameters which define this shape.

In this example, the IPE Type has Formcode **1** i.e. **I-sections**. The picture shows the I-section shape including an overview of all geometrical parameters which define this shape.

5. Fabrication

The **Fabrication**, marked with number (5) on the Profile Library Editor picture provides the default fabrication for this Type.
When any section of this Type is inputted in the Scia Engineer Cross-Section Manager it will get this fabrication by default.

The drop-down list allows a selection between **Rolled**, **Welded** and **Cold-formed** which represent the main fabrications for steel library sections.

In this example, the IPE Type concerns hot-rolled I-sections and thus the Fabrication is shown as **Rolled**.

6. Description

The **Description** combo-box is marked with number (6) on the Profile Library Editor picture.

The **Description** field shows a description of the Type as given by the manufacturer. For example "European standard beam", "Cold formed C section", "British parallel flange channel"...

The content of the **Description** drop-down list is defined in the file **Descrip_ID.txt** located in the folder of the selected Library. This file can be edited using a default text editor.

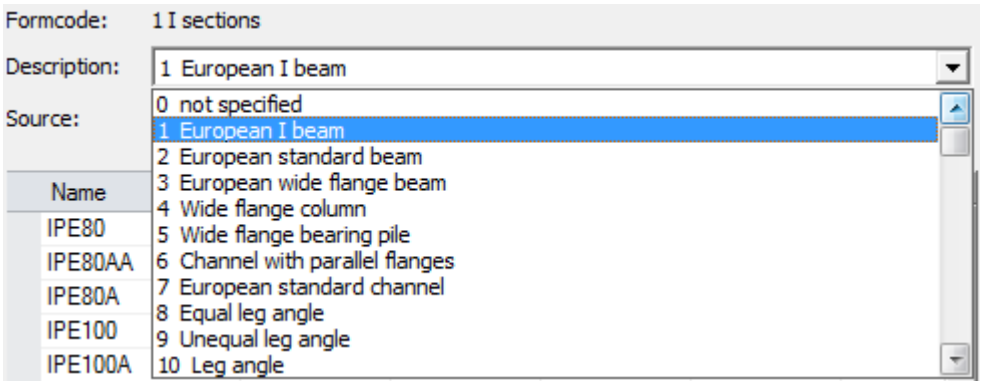
Descrip_ID.TXT

```
0       ; not specified
1       ; European I beam
2       ; European standard beam
3       ; European wide flange beam
4       ; Wide flange column
5       ; Wide flange bearing pile
6       ; Channel with parallel flanges
7       ; European standard channel
8       ; Equal leg angle
9       ; Unequal leg angle
```

On each line within this file, two fields are defined which are separated by a semicolon.

The first field gives a number while the second field concerns the actual Description string.

Within the Profile Library Editor the respective item can then be selected from the drop-down list.



The number is only shown in this dialog, in order to make it convenient for the user to select the proper string. Within Scia Engineer, for example in the Cross-Section Manager, only the Description string is shown, not the number.

In this example the IPE Type is set as "**1 European I beam**".

Each library (folder) has its own Descrip_ID.TXT file. When editing a type, make sure to edit the corresponding Descrip_ID.TXT file of that library since else the changes will not be visible.

Extension: Translations

The content of the **Descrip_ID.txt** file is used by default for any interface language of Scia Engineer.

Within the standard ProfileLibrary folder, additional Descrip_ID files can be found i.e. **Descrip_ID_05**, **Descrip_ID_07**, **Descrip_ID_0c**...

These files have the same content as the standard **Descrip_ID.txt** file but contain strings for specific languages. The number used to identify a certain language concerns the Locale ID (LCID) as provided by Microsoft. More specifically the last two digits of the LCID are used. The following table illustrates this principle:

Language	LCID	Number used in filename
Czech	0405	05
German	0407	07
English	0809	09
French	040c	0c
Dutch	0813	13
Slovak	041b	1b

A list of all LCID's as provided by Microsoft can be found on the MSDN website.

Thus when the interface of Scia Engineer is for example set to German, the Description strings will be read from the file **Descrip_ID_07.txt**. In case this file does not exist, the content of **Descrip_ID.txt** is used.

These Translations are only used by the standard ProfileLibrary, not the UserLibraries.

7. Source

The **Source** combo-box is marked with number (7) on the Profile Library Editor picture.

The **Source** field gives a reference to the source documentation from which the data of this Type was gathered. Typically it refers to the catalogue of a manufacturer or a book in which the data was published.

The content of the **Source** drop-down list is defined in the file **Source_ID.txt** located in the folder of the selected Library. This file can be edited using a default text editor.

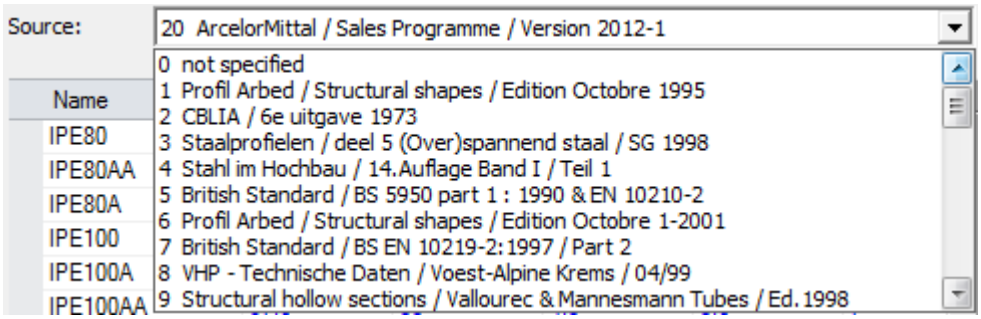
Source_ID.TXT

```
0       ; not specified ;
1       ; Profil Arbed / Structural shapes / Edition October 1995 ;
2       ; CBLIA / 6e uitgave 1973;
3       ; Staalprofielen / deel 5 (Over)spannend staal / SG 1998;
4       ; Stahl im Hochbau / 14.Auflage Band I / Teil 1;
5       ; British Standard / BS 5950 part 1 : 1990 & EN 10210-2;
6       ; Profil Arbed / Structural shapes / Edition Octobre 1-2001;
7       ; British Standard / BS EN 10219-2:1997 / Part 2;
8       ; VHP - Technische Daten / Voest-Alpine Krems / 04/99;
9       ; Structural hollow sections / Vallourec & Mannesmann Tubes / Ed.1998;
10      ; Section properties and Member Capacities to BS 5950 part 1:1990;
```

On each line within this file, three fields are defined which are separated by a semicolon.

The first field gives a number while the second field concerns the actual Source string. The third field is currently not used thus remains empty.

Within the Profile Library Editor the respective item can then be selected from the drop-down list.



The number is only shown in this dialog, in order to make it convenient for the user to select the proper string. Within Scia Engineer, for example in the Cross-Section Manager, only the Source string is shown, not the number.

In this example the IPE Type is set as "**20 ArcelorMittal / Sales Programme / Version 2012-1**".

Each library (folder) has its own Source_ID.TXT file. When editing a type, make sure to edit the corresponding Source_ID.TXT file of that library since else the changes will not be visible.

Extension: Translations

The content of the **Source_ID.txt** file is used by default for any interface language of Scia Engineer.

Within the standard ProfileLibrary folder, additional Source_ID files can be found i.e. **Source _ID_05**, **Source _ID_07**, **Source _ID_0c**,...

These files follow the same logic as explained for the Description strings.

8. Name, Parameters & Properties

The grid marked with number (8) on the Profile Library Editor picture concerns the core of the Editor.

On each line of this grid the following data for one section of the given Type can be set:

- **Name**: The first column in the grid contains the section Name.

  A section Name is defined by a 'Type' and a 'Code'. For example an IPE200 has Type "IPE" and Code "200". The first number in the Name defines the start of the 'Code'.

  The following conditions apply for the naming:
  - The Type may only contain letters i.e. no numbers
  - The Code has to start by a number and may also contain letters

  So an IPE180A is fully valid and has Type "IPE" and Code "180A".

  The Name always starts with the Type, so in this specific example, all sections start with "IPE" in their name.

The Type can also contain a part between brackets. This can be used to differentiate between sections which have the same Type, for example L(ARC), L(ARCI), L(CSN). Within the Cross-Section manager, when a cross-section is added to the project, the part between the brackets is automatically omitted from the Type, so all three L-Types given above will be listed as L once inputted.

- **Parameters**: Next to the Name different columns are shown for the Parameters which describe the shape for the selected Formcode.

  As specified in Paragraph 3. & 4. the Parameters depend on the Formcode and are shown on the picture of the shape.

  The Parameters can be easily recognized due to their blue font.

  All standard Parameters which are required for the shape definition need to have values different from zero. In addition, when the dialog is closed additional tests are done to verify if the inputted data is sensible (An I-section cannot have a web thickness which is larger than its height etc).

  Parameters which are not required for the shape can remain zero in case they are not used. Examples include the flange slope in case of a section with parallel flanges, the internal bolt distance etc.

  In the example, when the first section in the grid is examined the following can be seen:

Name	h [mm]	b [mm]	t [mm]	s [mm]	r [mm]
IPE80	80	46	5,2	3,8	5

  These Parameters define the shape of the IPE80 I-section. The remaining parameters r1, a, W and wm1 are not used in this case and remain zero.

The units used for these Parameters concern the standard Scia Engineer Cross-Section units. These units can be modified in **Setup > Units > Cross-section > Length**.

- **Properties**: The remainder of the grid concern columns which contain the different Properties.

  A list of all Properties which can be set in the grid can be found in Annex B.

  In essence it is not required to input any Property. Each Property value which remains zero will later on, when the cross-section is used, be calculated automatically by Scia Engineer. It is thus possible to define only Parameters and no Properties.

  In the example, when the first section in the grid is examined the following can be seen:

A [m^2]	Ay [m^2]	Az [m^2]	AL [m^2/m]	AD [m^2/m]	IYLCS [m^4]	IZLCS [m^4]
0,000764	0	0	328	0	8,01e-007	8,49e-008

  For the IPE80 this shows that A, AL, IYLCS and IZLCS have been inputted according to the documentation given in the Source field while the Ay, Az and AD properties are not defined and will thus be calculated automatically by Scia Engineer.

  The units used for these Properties concern the standard Scia Engineer Cross-Section units. These units can be modified in **Setup > Units > Cross-section > Properties**.

The grid fully supports the Copy and Paste functionality from MS Excel. It is thus possible to Paste data obtained from MS Excel, or first Copy data from the Editor to MS Excel, modify the data and Paste it back into the Editor etc. This functionality will be further illustrated in the subsequent Paragraph for adding a new section Type.

9. Always use library values

Number (9) on the Profile Library Editor picture concerns a specific checkbox labeled **Always use library values**.

For the functionality of this checkbox reference is also made to [1] regarding the calculation of Cross-section properties.

Within Scia Engineer, by default, all cross-section properties are calculated. After the properties have been calculated, the values are compared with the values defined in the Profile Library. In case the difference between the calculated and the inputted value is less than **10%** the inputted value from the Library is used.

This so-called **10%** rule is intended specifically to avoid errors in the input of the Library values. In typical cases, the values within the Library (provided by manufacturer tables) are rounded off values and fall within this **10%** range.

In the actual example, the Library contains a value for the area A of an IPE80 of 764 mm² coming from the manufacturer's table. The calculated area A for an IPE80 is 764,74 mm². Since the values differ less than **10%**, within the Cross-Section Manager the Library value of 764 mm² is used.

For very special applications it is possible to activate the checkbox **Always use library values**. As this checkbox indicates, in this case the library values will ALWAYS be used, even if they differ more than **10%**.
A typical example could be a Pair section (Formcode 127 or 128) in which the manufacturer indicates to use the inertia Iz around the weak axis as the sum of the inertias of the different parts.

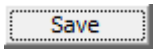
In this case the Iz value in the Library will be much lower than the calculated one, thus by using the **Always use library values** checkbox it can be forced to always use the inputted values.

Any values which are inputted as zero will still be calculated by Scia Engineer, independent if the Always use library values checkbox is activated or not.

The Always use library values checkbox should be used with care since the safety rule of 10% is in fact skipped. The user should double check the inputted values to make sure there are no errors in the input.

10. Note, Save & Cancel

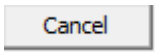
The final items, noted by number (10) on the Profile Library Editor picture are located at the bottom.

- **Save**: The 

button is used to store changes made to the library after which a confirmation dialog will be shown.

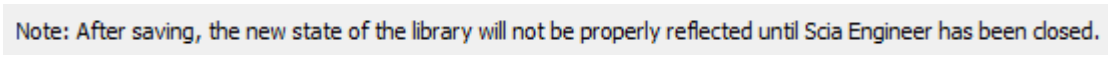
  In case the **Always use library values** checkbox was activated an additional warning will be given to make sure the user activated this checkbox intentionally.

  In case there is an error in any of the input fields a message will be given to explain what the error is (for example h > b) and the cell which contains the incorrect value will be highlighted.

- **Cancel**: Using the 

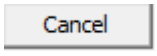
button the dialog can be closed without storing any changes.

- **Note**: The note shown at the bottom of the dialog is quite important:

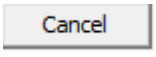


When Scia Engineer is open, data from the Library is already loaded in memory. In order to reflect the changes Scia Engineer should be closed and re-opened.

Closing and re-opening Scia Engineer applies specifically in case new sections are added into the Library. When data of an existing section has been edited it is not imperative to close and re-open Scia Engineer.

- To finalize this example press the 

button in order to avoid making any changes to the standard IPE Type.

- The Edit Profile Library dialog can then also be closed by pressing 

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Adding a new section type

The previous paragraph illustrated how an existing Type can be edited and explained the different parts of the Profile Library Editor.

In this paragraph, the adding of a new section Type is illustrated by means of an example.

Example Section Type

The following table shows typical manufacturer data for a hot-rolled section Type "UI":

	A	B	C	D	E	F	G	H	I	J
1		h	b	tf	tw	r	A	Iy	Iz	It
2		[mm]	[mm]	[mm]	[mm]	[mm]	[mm^2]	[mm^4]	[mm^4]	[mm^4]
3	UI100	100	55	5,7	4,1	7	1030	1710000	159000	12000
4	UI200	200	100	8,5	5,6	12	2850	19430000	1420000	69800
5	UI300	300	150	10,7	7,1	15	5380	83560000	6040000	201000

The data was obtained from a fictive reference "**Treatise on UI-sections / 1st Edition / 2013**" and describes the parameters and properties of a "**Universal I-section**".

In order to follow this example, either use the MS Excel file Example_Profile_Library.xlsx provided with this manual or create a new MS Excel sheet with the same data.

Step 1: Create a new project / Open an existing project

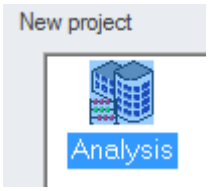
In order to add new sections into the profile Library, first of all a project is needed. Either an existing project can be opened or a new project can be created.

For this example a new project will be created.

- Launch Scia Engineer.

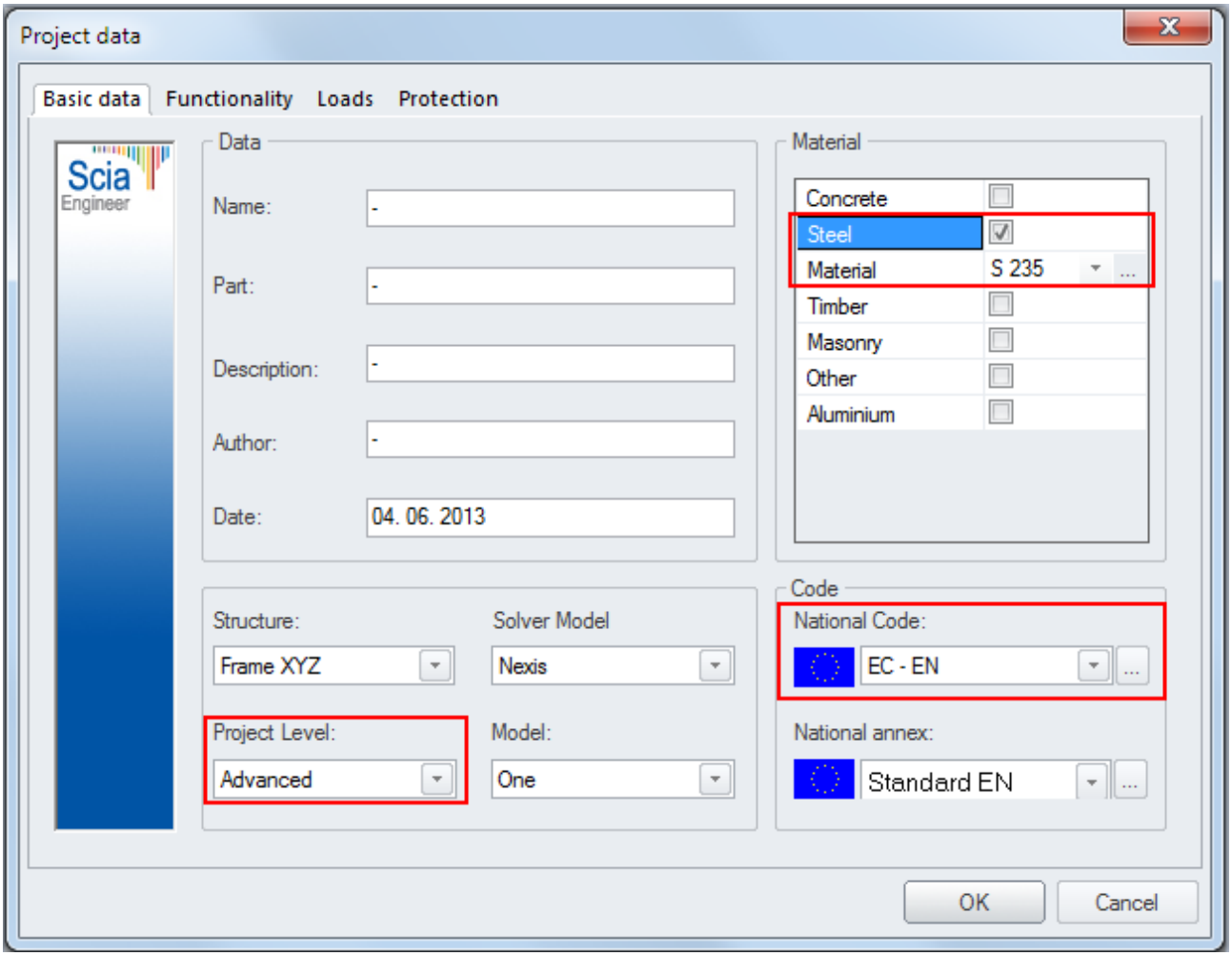
- When the **Open project** dialog appears, press Cancel.

- Go to **File** > **New**

- Select a new **Analysis** project 

- Confirm the selection with OK.

The **Project data** dialog opens:



- In this dialog, set the **National Code** to for example **EC-EN**, activate **Steel** material and set the **Project Level** to **Advanced**.

A different National Code may also be selected but it should contain Steel material.

- Confirm these settings with OK.

The project will now be created with the selected settings.

Step 2: Set correct units

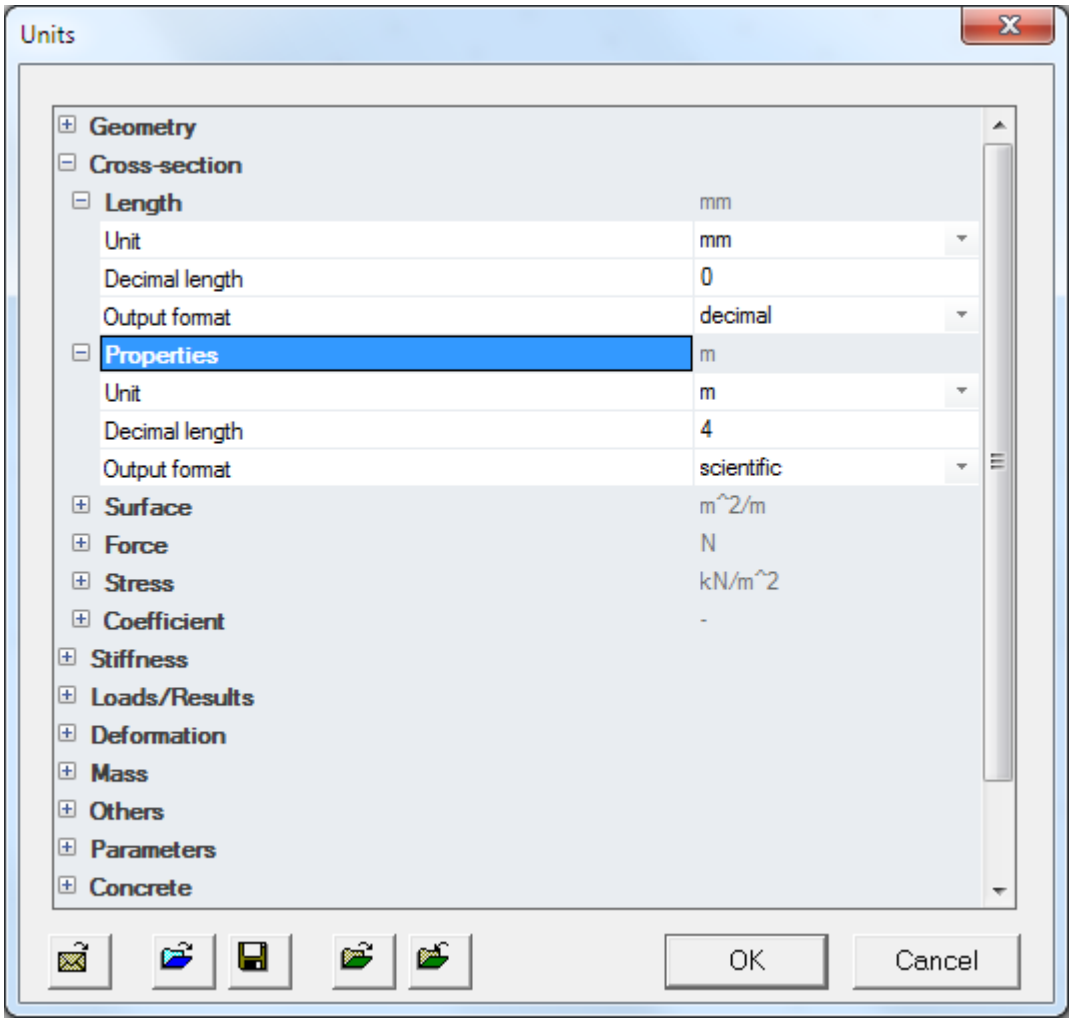
Data provided by a manufacturer will have manufacturer specific units. For example some manufacturers show all units in [mm], others use [cm], others use Imperial units etc.

In order to have a smooth copy/paste operation later on, the units within Scia Engineer are modified to match those used in the MS Excel sheet.

In this specific case, both the Parameters and Properties are given in [mm]. The units within Scia Engineer can be changed as follows:

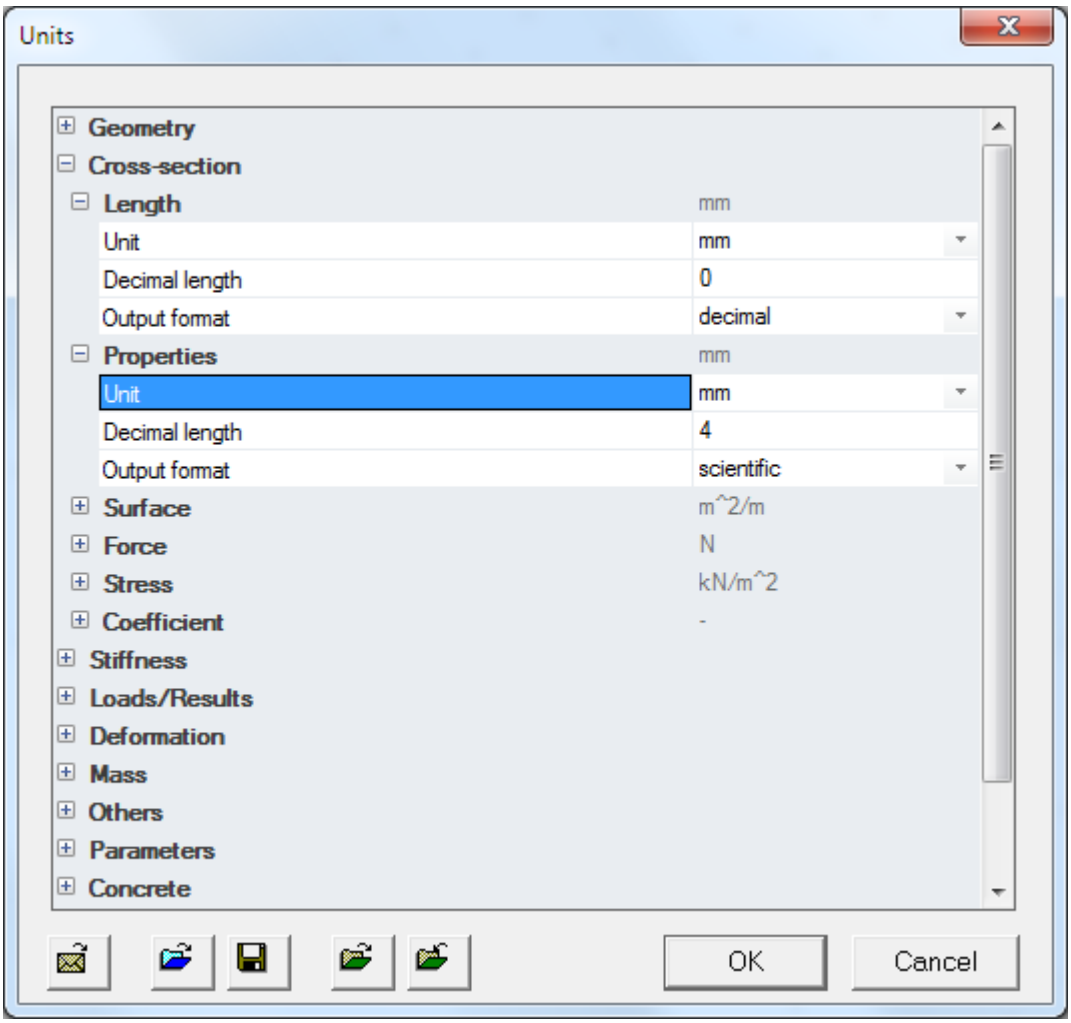
- Go to **Setup** > **Units**

- Open up the tree nodes for **Cross-section Length** and **Cross-section Properties**



In this dialog it can be seen that the unit for **Cross-section Length** is already set to [mm]. The unit for **Cross-section Properties** however is by default set to [m].

- Change the Unit combo-box from **Cross-section Properties** to [mm].



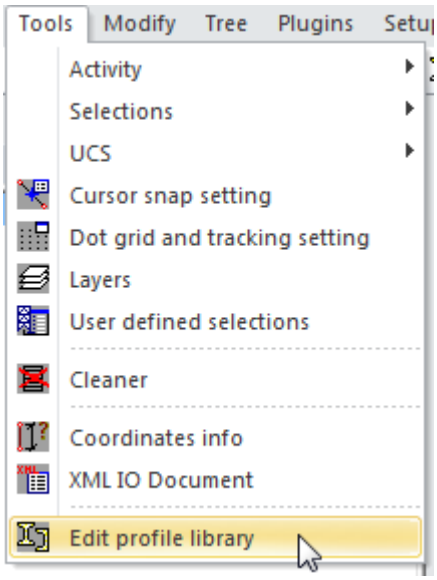
- Confirm the changes with OK.

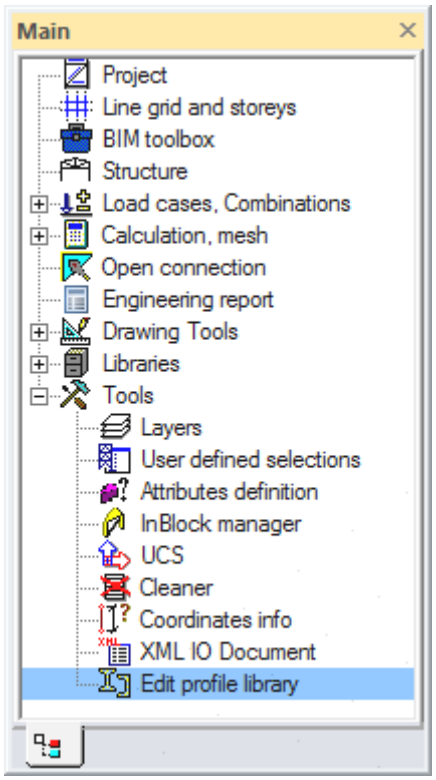
The units within Scia Engineer now match with the units used in the MS Excel sheet. This will make the Copy/Paste from the data much easier.

In some cases it can be required to modify the data in the MS Excel file in order to have equal units between MS Excel and Scia Engineer.

Step 3: Open the Profile Library Editor

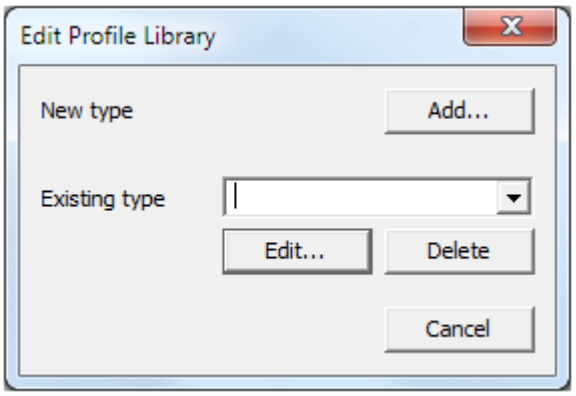
The Profile Library Editor can now be opened either through the Menu toolbar at the top or through the tree in the Main dialog.

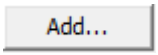




- Go to **Tools** > **Edit profile library**

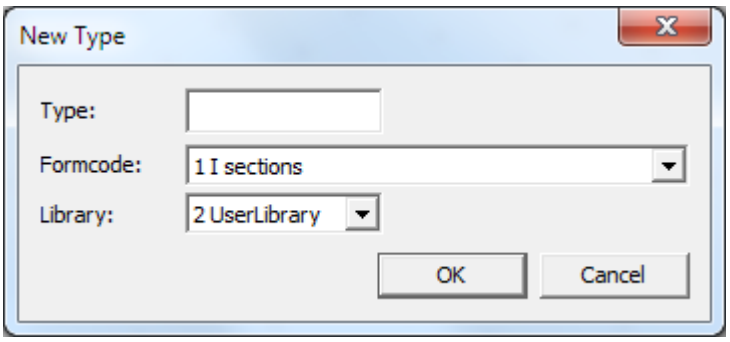
The **Edit Profile Library** dialog appears:



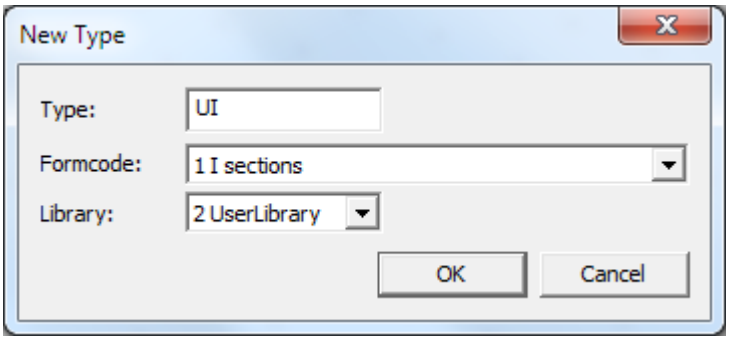
- Use the 

button to indicate that a New section type will be defined.

The **New Type** dialog appears in which the basic information for the new type can now be defined.



- Within the **Type** input field the string for the Type can be defined, in this case **UI**.



The **Formcode** combo-box can now be used to set the proper Formcode. As detailed in Chapter 2 and Annex A, the Formcode defines the shape and all related shape parameters.

- Since the new **UI** Type concerns an I-section shape the **Formcode** is left on the default **1 I sections**.

The **Library** combo-box is used to specify in which Library the new section type will be created. By default, this combo-box will always point to the UserLibrary (the second entry in the Folder settings as explained in Chapter 1).

When installing a patch of Scia Engineer, the UserLibrary will not be modified, so no data is lost/overwritten when applying a patch. It is therefore at all times recommended to use the UserLibrary when adding new section types.

- Following the above logic, the **Library** is left on the default **2 UserLibrary**.

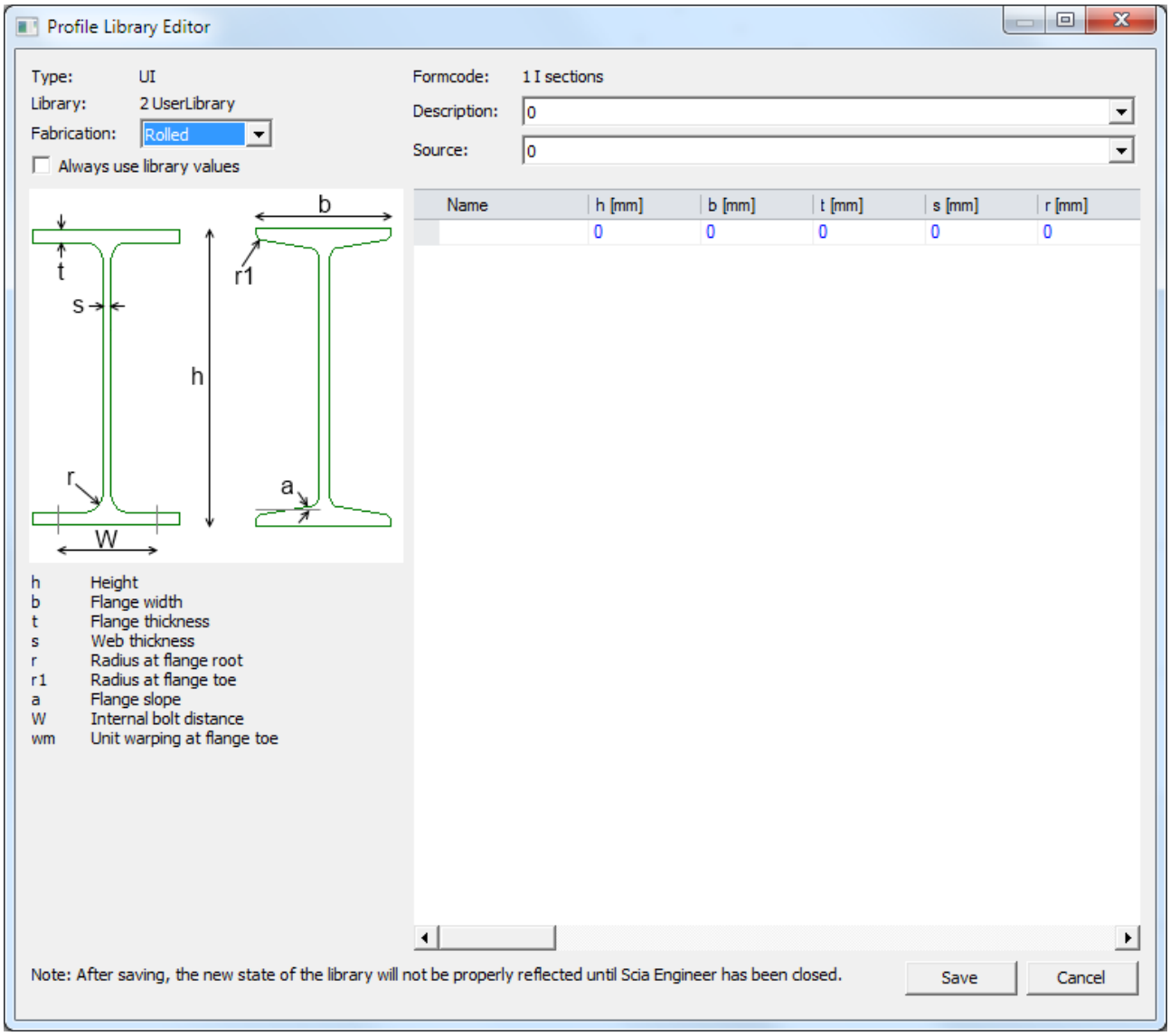
- Confirm the changes with

.

The Profile Library Editor will now open.

Step 4: Copy data from MS Excel

The Profile Library Editor shows an empty grid at this point. All the information from the previous dialog is visible here and the Formcode is illustrated by a picture and parameter description.



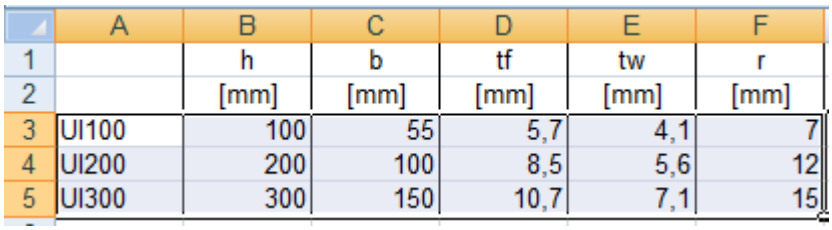
- The **Fabrication** combo-box is by default set to **Rolled**. Since the **UI** Type concerns hot-rolled I-sections this setting is left on the default.

- The **Description** and **Source** combo-boxes at this time are empty since this is the very first entry ever made in this UserLibrary. Therefore, the **Source_ID.txt** and **Descrip_ID.txt** files as specified in Chapter 2 are not yet generated. In a subsequent step they will be defined.

Name and Parameters

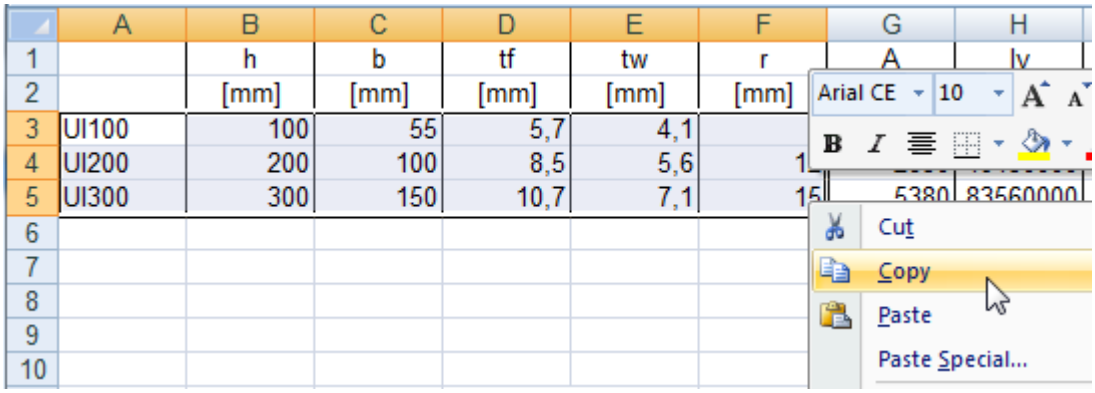
The first data which will be copied from the MS Excel sheet will be the name and parameters. Before starting it is always advised to check if the data in Excel is shown in the same order as in the Editor. The columns in the MS Excel sheet should be repositioned accordingly.
In this example, the order of the property columns matches.

- Within the MS Excel sheet, select the name and parameter values (**h, b, tf, tw, r**) as shown on the following screenshot:

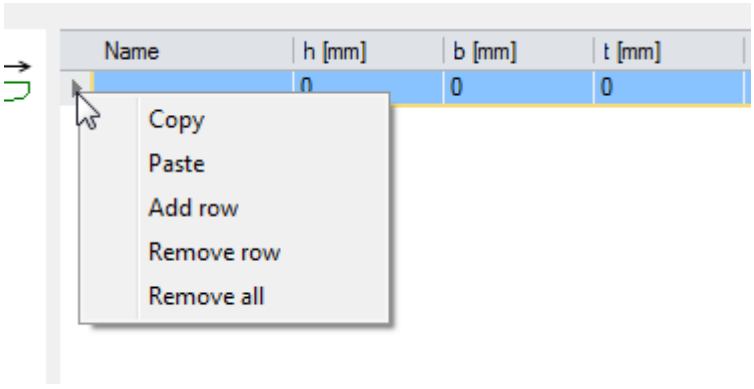


	A	B	C	D	E	F
1		h	b	tf	tw	r
2		[mm]	[mm]	[mm]	[mm]	[mm]
3	UI100	100	55	5,7	4,1	7
4	UI200	200	100	8,5	5,6	12
5	UI300	300	150	10,7	7,1	15

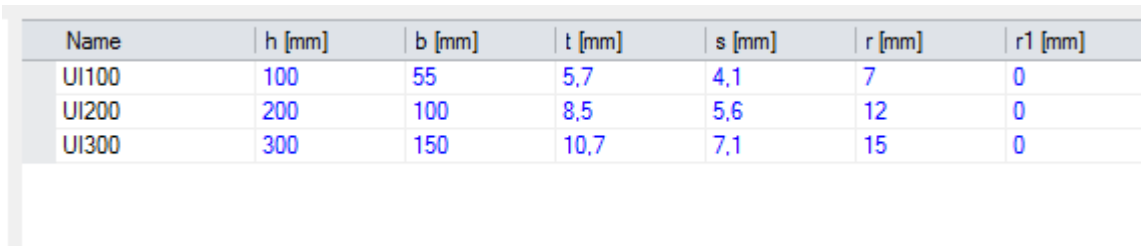
- Within the MS Excel sheet, right-click the selection and select **Copy** from the context menu.



- Within Scia Engineer, put the mouse cursor just before the first line of the grid, right-click and select **Paste** from the context menu.



The data has been copied into the grid. The parameters receive the blue color code.

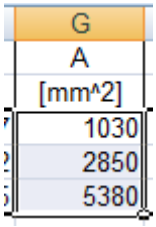


Name	h [mm]	b [mm]	t [mm]	s [mm]	r [mm]	r1 [mm]
UI100	100	55	5,7	4,1	7	0
UI200	200	100	8,5	5,6	12	0
UI300	300	150	10,7	7,1	15	0

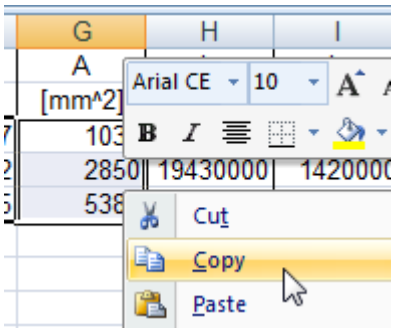
Properties

In the same way the properties can now be copied. The MS Excel sheet provides data for four different properties which are located on different places in the grid. Therefore these properties will be copied separately.

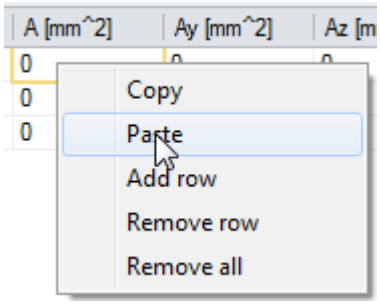
- Within the MS Excel sheet, select the area **A** values as shown on the following screenshot:



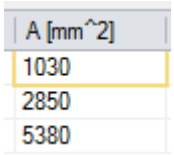
- Within the MS Excel sheet, right-click the selection and select **Copy** from the context menu.



- Within Scia Engineer, put the mouse cursor on the first cell of the area **A,** right-click and select **Paste** from the context menu.

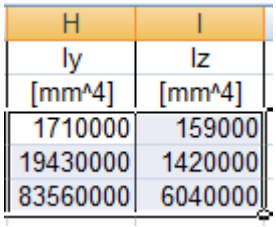


The values of the area **A** are now copied into the grid.

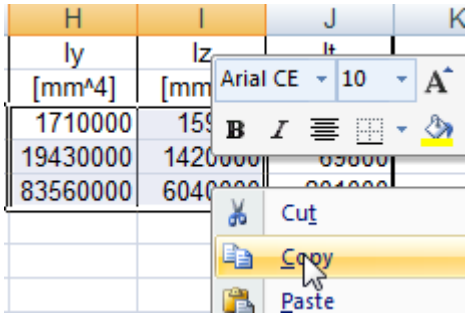


When performing grid operations note that, both in MS Excel and in the Scia Engineer grid, the context menu which is shown on a right-click differs in case a cell is selected or in case the content of a cell is being edited. In the above example at all times the cell is being selected, not edited.

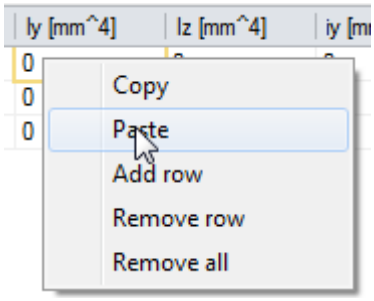
- Within the MS Excel sheet, select the inertia **Iy** and **Iz** values as shown on the following screenshot:



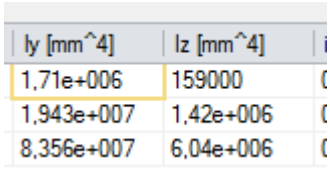
- Within the MS Excel sheet, right-click the selection and select **Copy** from the context menu.



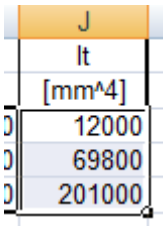
- Within Scia Engineer, put the mouse cursor on the first cell of the inertia **Iy,** right-click and select **Paste** from the context menu.



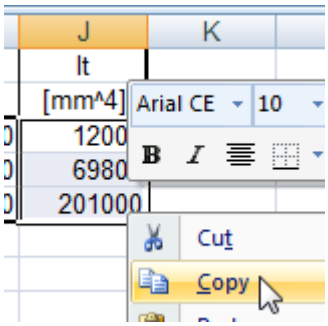
The values of the inertia **Iy** and **Iz** are now copied into the grid.



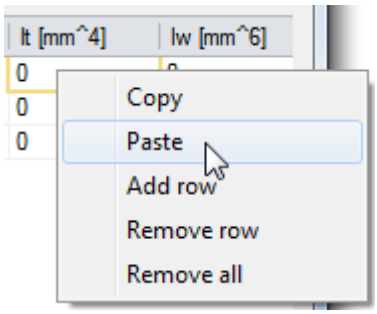
- Within the MS Excel sheet, select the torsional constant **It** values as shown on the following screenshot:



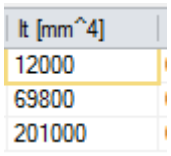
- Within the MS Excel sheet, right-click the selection and select **Copy** from the context menu.



- Within Scia Engineer, put the mouse cursor on the first cell of the torsional constant **It,** right-click and select **Paste** from the context menu.



The values of the torsional constant **It** are now copied into the grid.



All data from the MS Excel file has now been transferred into the Profile Library.

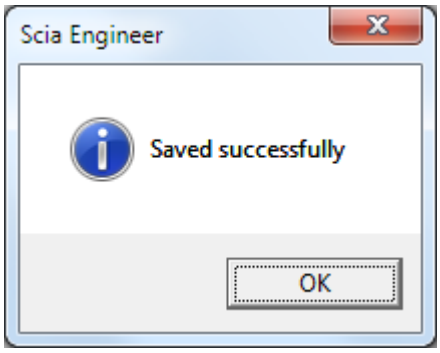
In this Step the copy/paste functionality from MS Excel to the Profile Editor grid was illustrated. In the same way, data can be copied from the grid and pasted into MS Excel.

Step 5: Save the data and close Scia Engineer

The modifications can now be saved into the database.

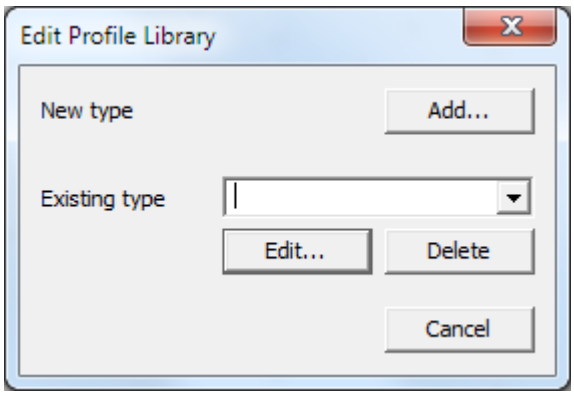
- Press the Save button

A confirmation is given that the data was successfully saved.



- Confirm this message by pressing the OK button.

The **Edit Profile Library** dialog re-appears.



This provides the possibility to add another section type etc.

- For this example no more new type is added so the dialog is closed by pressing Cancel.

As indicated in Chapter 2, the new changes made to the Profile Library will only be visible after Scia Engineer has been closed and re-opened.

- To finalize this step, close Scia Engineer.

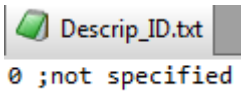
The project may be saved so it can be re-opened in a next step or the project may be closed without saving. The data has been saved in the Profile Library, not the project, so by discarding the project the data within the Profile Library is not lost.

Step 6: Source & Description

When the data was saved in the previous step, Scia Engineer detected that there were no Source and Description files within the UserLibrary folder and created those files automatically.

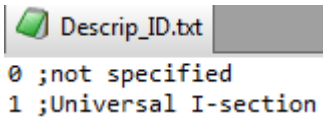
- Using Windows Explorer, navigate to the UserLibrary folder (see Chapter 1).

- Open the **Descrip_ID.txt** file using any default text editor.



Since the file is newly created it shows only one line, which has the **not specified** description.

- For this example, a new line is added with the number **1** and description **Universal I-section**. As specified in Chapter 2 both fields (number and description string) are separated by a semicolon.



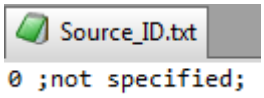
- Save the changes made to the **Descrip_ID.txt** file.

- Close the text editor.

In the same way the Source will now be added.

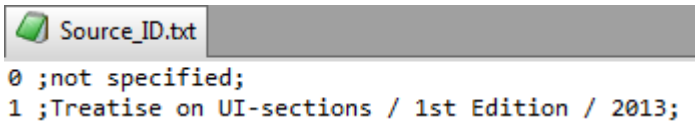
- Using Windows Explorer, navigate to the UserLibrary folder (see Chapter 1).

- Open the **Source_ID.txt** file using any default text editor.



Since the file is newly created it shows only one line, which has the **not specified** description.

- For this example, a new line is added with the number **1** and source **Treatise on UI-sections / 1st Edition / 2013**. As specified in Chapter 2, the source definition consists of three fields which are separated by semicolons and of which only the first two are used.



- Save the changes made to the **Source_ID.txt** file.

- Close the text editor.

Both files now contain the required data and thus this information can now be assigned to the Profile Library.

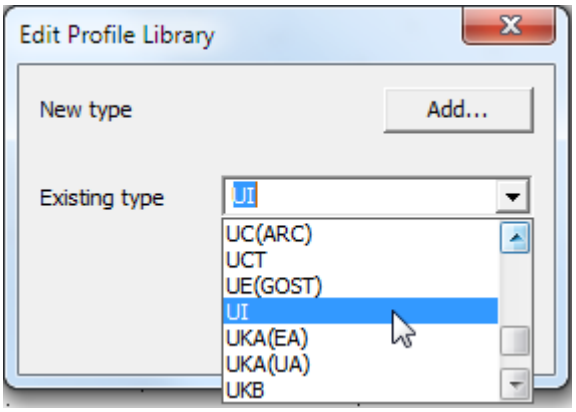
- Launch Scia Engineer.

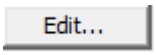
- When the Open project dialog appears, either re-open the project saved in Step 5 or, if the project was discarded, Cancel the dialog and create a new project as outlined in Step 1.

- Go to **Tools** > **Edit profile library**

The **Edit Profile Library** dialog appears:

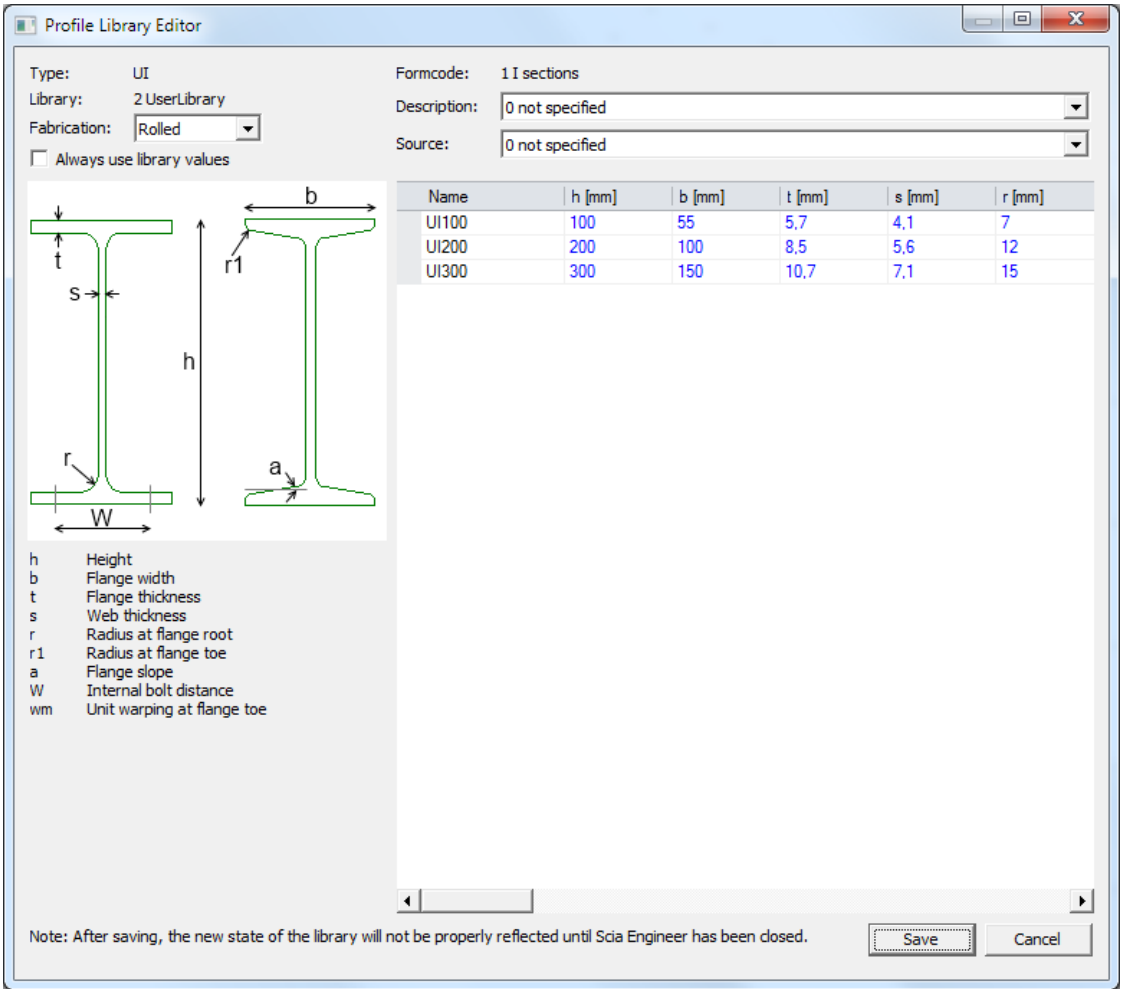
- In the **Existing type** combo-box either select **UI** from the drop-down list or type **UI** into the input field.



- Now press the 

button.

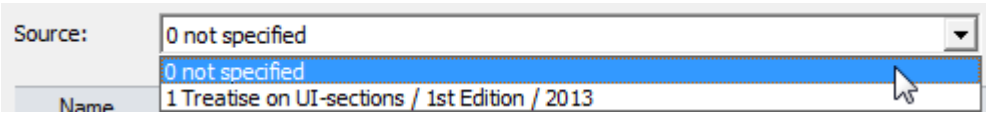
The **Profile Library Editor** will open, showing the data for the selected type (UI).



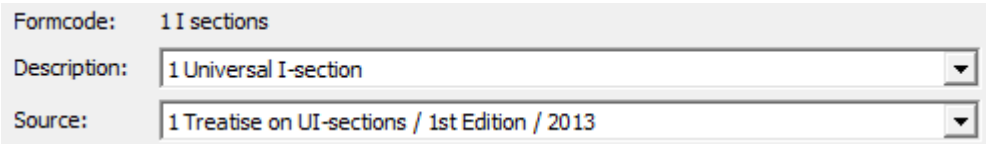
The drop-down list of the **Description** combo-box now shows the modified content of the **Descrip_ID.txt** file:

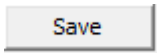
- Change the **Description** combo-box to **1 Universal I-section**.

The drop-down list of the **Source** combo-box now shows the modified content of the **Source_ID.txt** file:



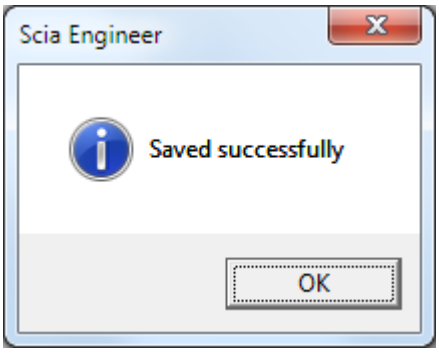
- Change the **Source** combo-box to **1 Treatise on UI-sections / 1st Edition / 2013**.

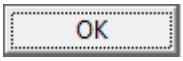


- Press the 

button to store the changes.

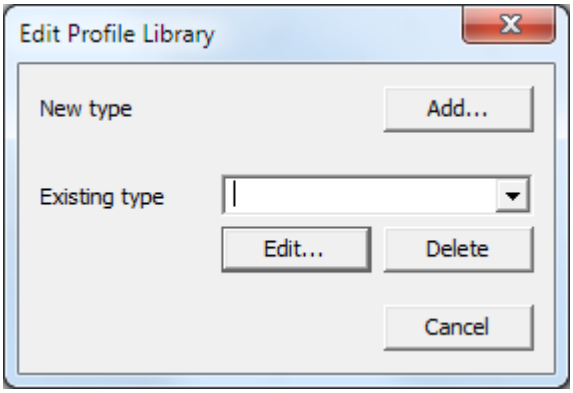
A confirmation is given that the data was successfully saved.



- Confirm this message by pressing the 

button.

The **Edit Profile Library** dialog re-appears.



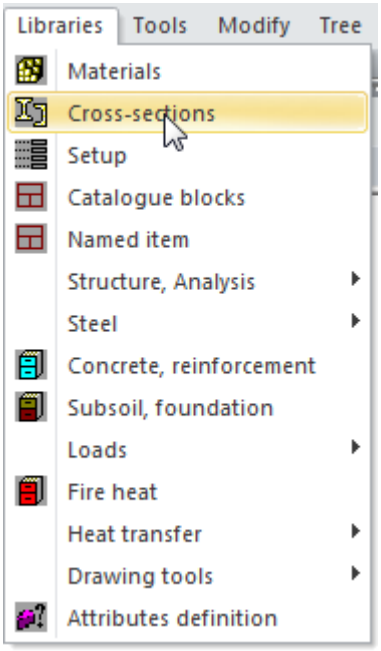
- Close this dialog by pressing Cancel.

> **In case the Source_ID.txt and Descrip_ID.txt files already exist, they can directly be used in Step 4 so Step 6 would not be required.**

Step 7: Review the Cross-section

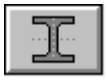
The new UI section Type is now defined into the Profile Library with its proper Source and Description strings. The cross-section can now be used in the Cross-section Manager.

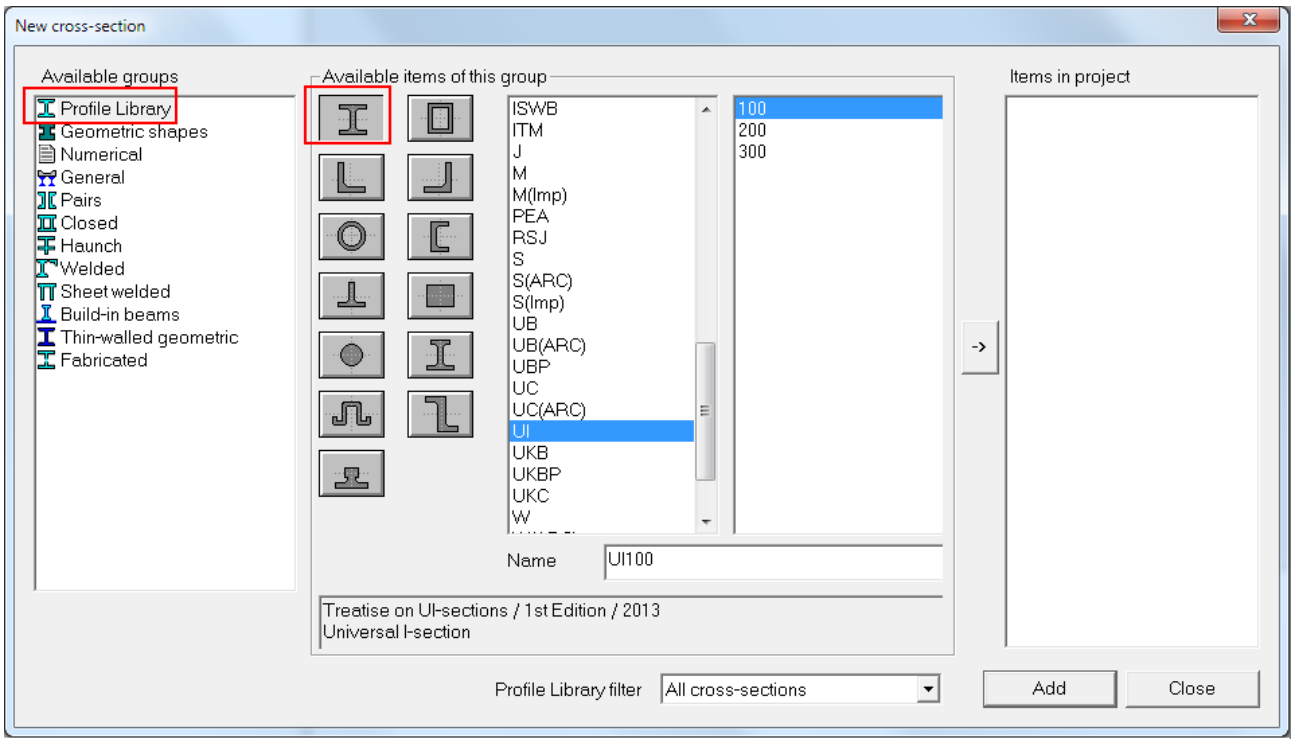
- Go to **Libraries** > **Cross-sections**



The Cross-section Manager as well as the **New cross-section** dialog will open. In case in Step 6 an existing project was opened which already contained cross-sections then press the New button to open the **New cross-section** dialog.

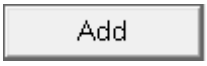
- In the **Available groups** select **Profile Library**.

- In the **Available items of this group** select the  icon.



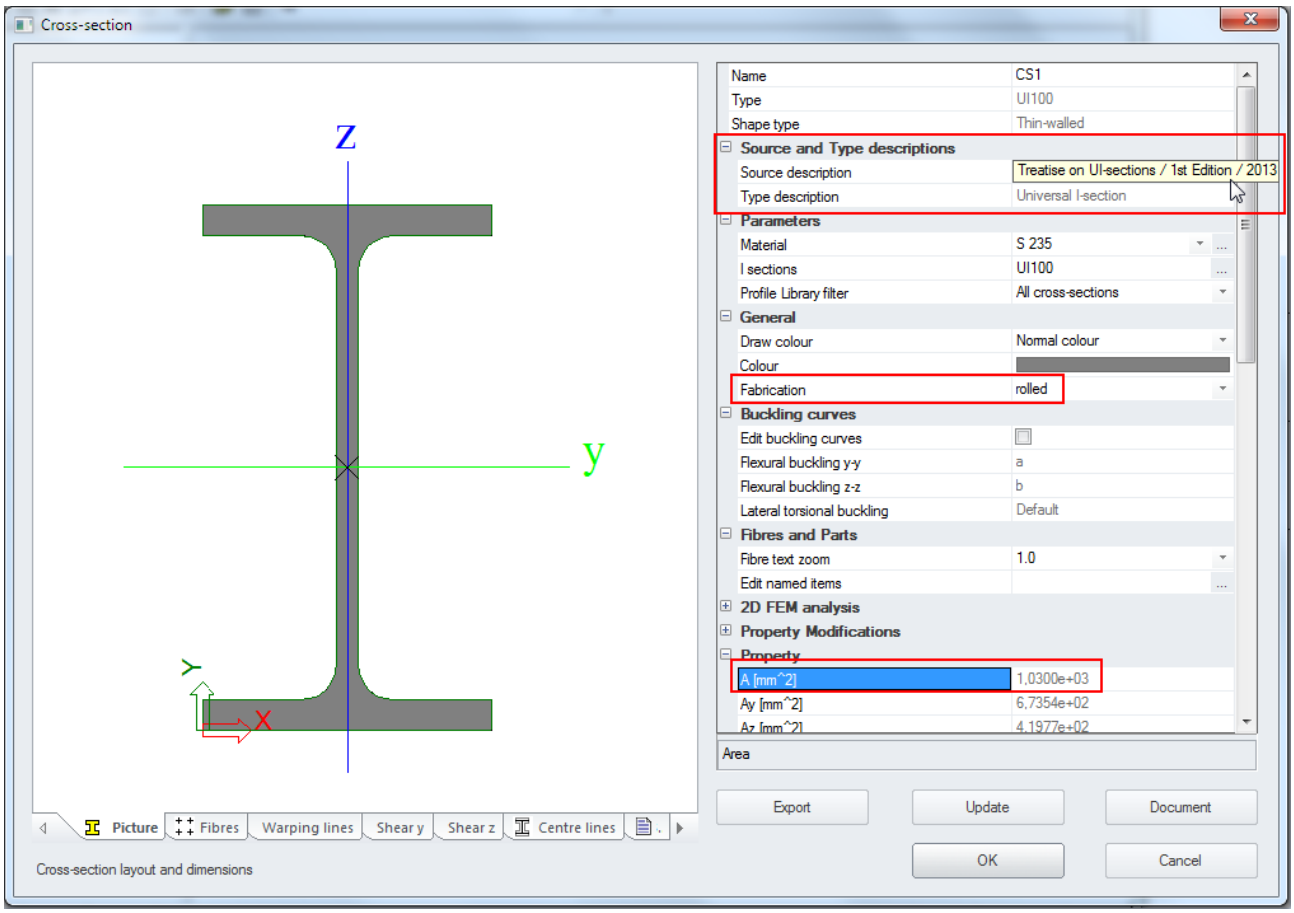
The new **UI** Type will now be visible. As can be seen, Scia Engineer automatically shows the cross-sections of all the defined libraries: ProfileLibrary, UserLibrary and any others as set in the library folders (see Chapter 1).

At the bottom the Source and Description strings will be visible:

- Select Type **UI** and code **100** and press the 

button.

The Cross-section dialog will open, showing the properties of the inputted cross-section.

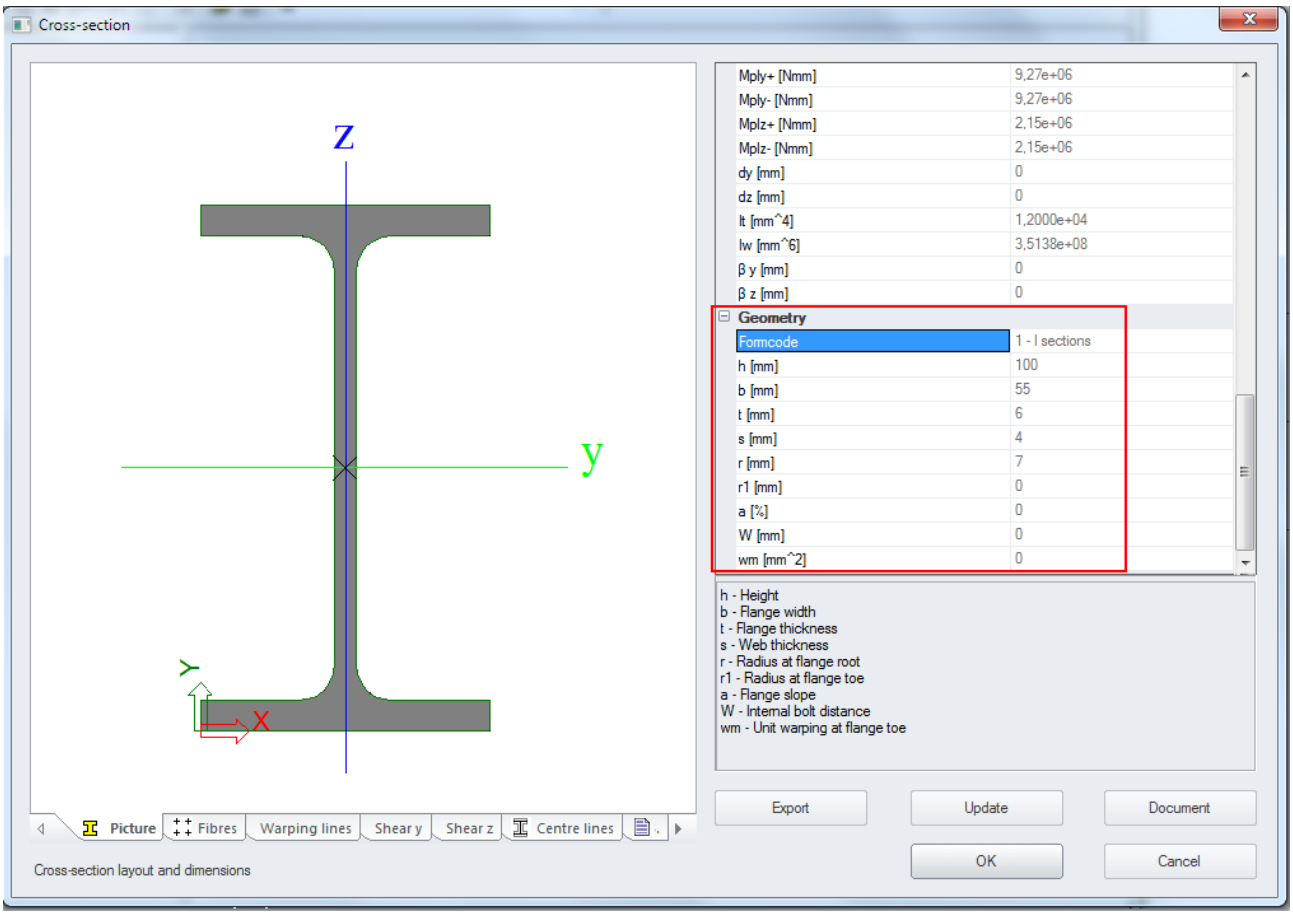


The **Source and Type descriptions subgroup** will show the Source and Description.

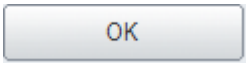
The Fabrication is set to **rolled**, as defined in the Profile Library Editor.

The value of the Area **A** concerns the nicely rounded value which was inputted in the Profile Library Editor (the exact value for this shape would be 1032 mm^2)

Scrolling to the bottom of the dialog shows the parameters of this section (**h, b, tf, tw, r**) and the Formcode.



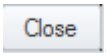
This cross-section can now be used within the Scia Engineer model, checks...

- Close the Cross-section dialog by pressing 

.

- Close the New cross-section dialog by pressing

.

- Close the Cross-section manager by pressing 

.

- Scia Engineer can now be closed, the project changes can be discarded.

This concludes the example for defining a new Section Type in the Profile Library Editor.

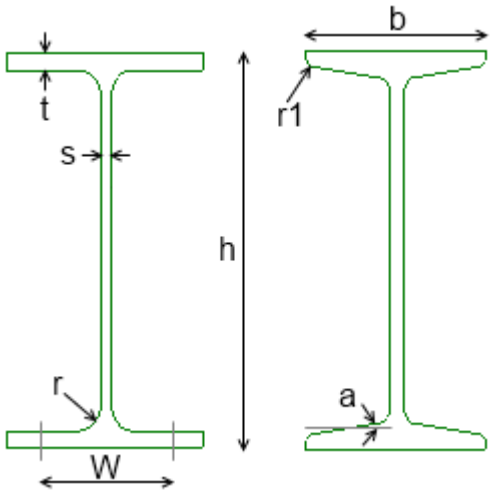
Annex C illustrates the creation of a Profile Library filter with which the new section Type can be filtered.

Annex A: Profile Library Formcodes

Within Scia Engineer, each shape within the Profile Library is uniquely identified by a so called Formcode. The Formcode defines the shape, the parameters which describe the shape and in some cases also additional parameters like distance between bolt holes, unit warping ordinates etc.

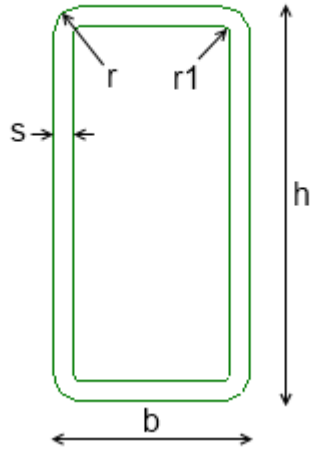
In this Annex the different Formcodes and their parameters are described.

Formcode 1: I-Section



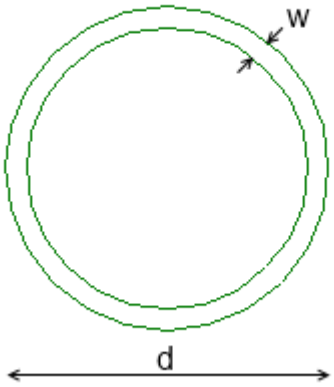
Parameters	Description
h	Height
b	Flange width
t	Flange thickness
s	Web thickness
r	Radius at flange root
r1	Radius at flange toe
a	Flange slope
W	Internal bolt distance
wm	Unit warping at flange toe

Formcode 2: Rectangular Hollow Section



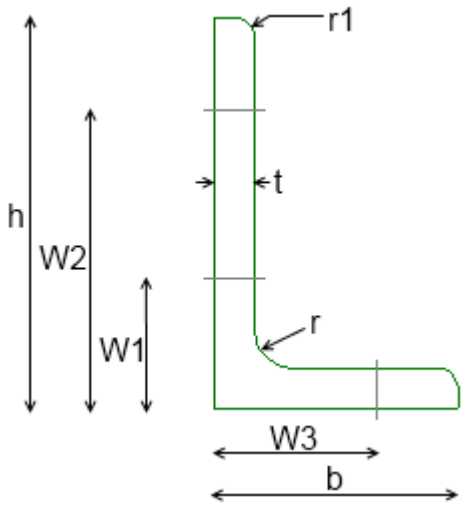
Parameters	Description
h	Height
b	Width
s	Thickness
r	Outer radius
r1	Inner radius

Formcode 3: Circular Hollow Section



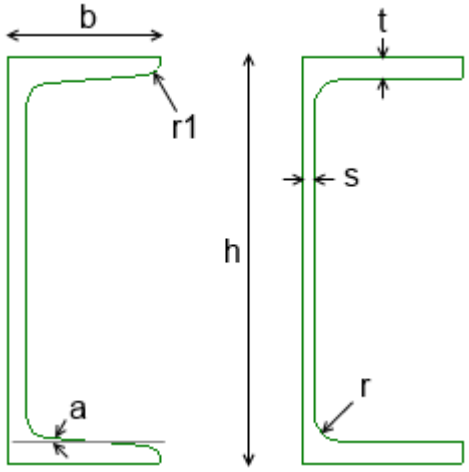
Parameters	Description
d	Diameter
w	Thickness

Formcode 4: L-Section



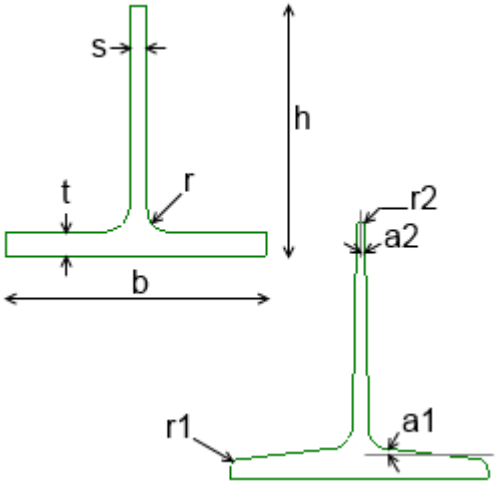
Parameters	Description
h	Height
b	Width
t	Thickness
r	Radius at flange root
r1	Radius at flange toe
W1	Bolt distance
W2	Bolt distance
W3	Bolt distance

Formcode 5: Channel Section



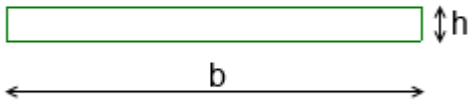
Parameters	Description
h	Height
b	Flange width
t	Flange thickness
s	Web thickness
r	Radius at flange root
r1	Radius at flange toe
a	Flange slope
wm1	Unit warping at flange root
wm2	Unit warping at flange toe

Formcode 6: T-Section



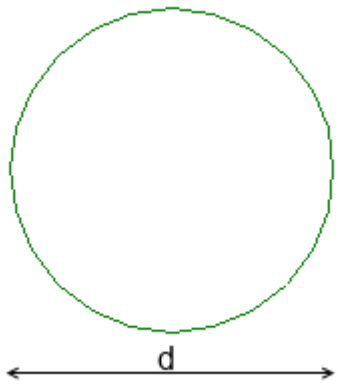
Parameters	Description
h	Height
b	Flange width
t	Flange thickness
s	Web thickness
r	Radius at flange root
r1	Radius at flange toe
r2	Radius at web root
a1	Flange slope
a2	Web slope

Formcode 7: Full Rectangular Section



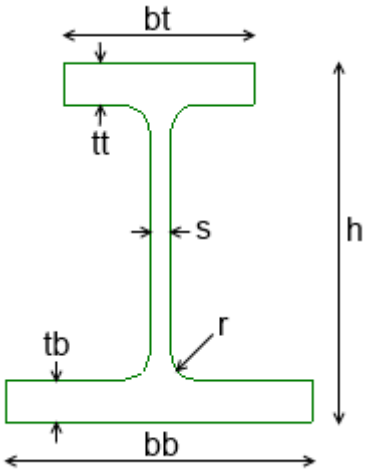
Parameters	Description
h	Height
b	Width

Formcode 11: Full Circular Section



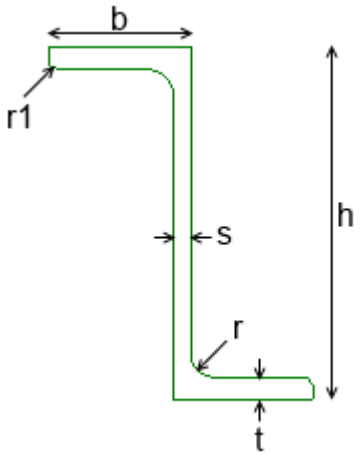
Parameters	Description
d	Diameter

Formcode 101: Asymmetric I-Section



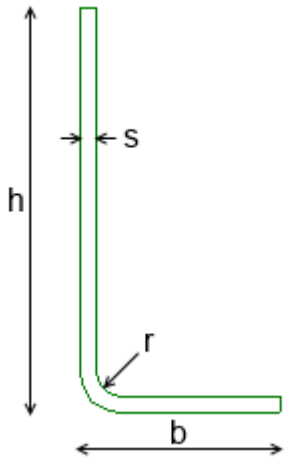
Parameters	Description
h	Height
s	Web thickness
bt	Flange width top
bb	Flange width bottom
tt	Flange thickness top
tb	Flange thickness bottom
r	Radius at flange root

Formcode 102: Rolled Z-Section



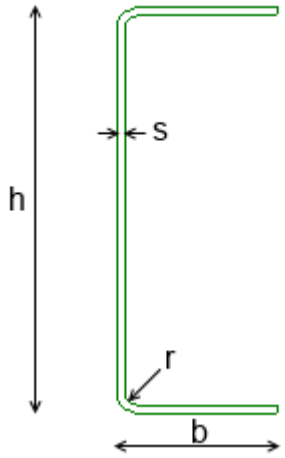
Parameters	Description
h	Height
b	Flange width
t	Flange thickness
s	Web thickness
r	Radius at flange root
r1	Radius at flange toe

Formcode 111: Cold-Formed Angle Section



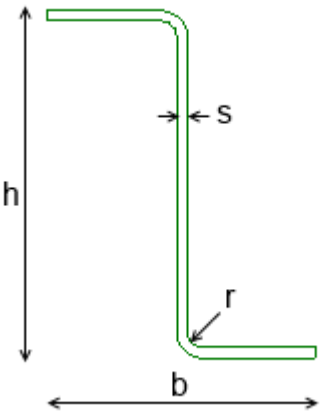
Parameters	Description
s	Thickness
r	Inner radius
b	Width
h	Height

Formcode 112: Cold-Formed Channel Section



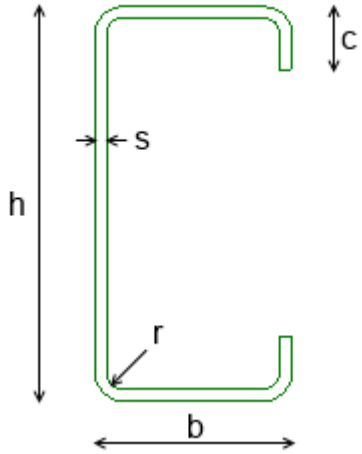
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height

Formcode 113: Cold-Formed Z-Section



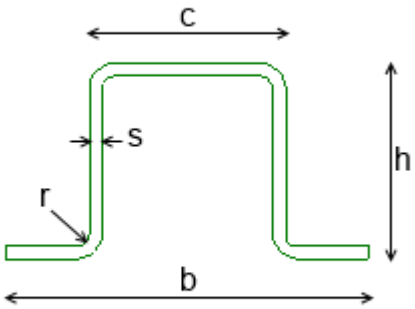
Parameters	Description
s	Thickness
r	Inner radius
b	Total width
h	Height

Formcode 114: Cold-Formed C-Section



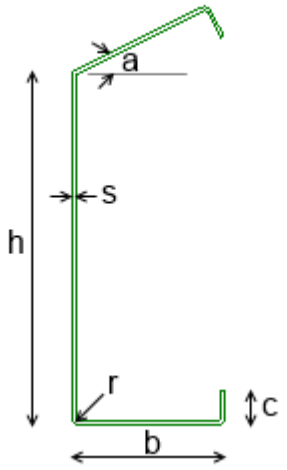
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
c	Lip

Formcode 115: Cold-Formed Omega Section



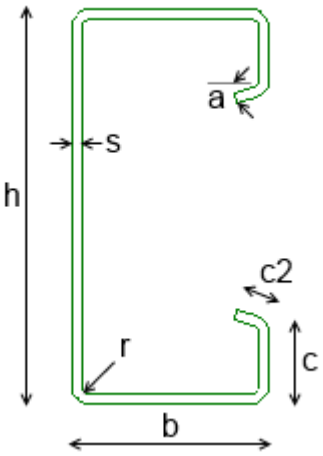
Parameters	Description
s	Thickness
r	Inner radius
b	Total width
h	Height
c	Inner length

Formcode 116: Cold-Formed C-Section Eaves Beam



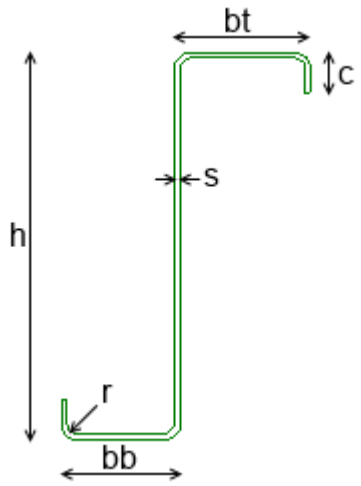
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
c	Lip
a	Flange angle

Formcode 117: Cold-Formed C-Plus Section



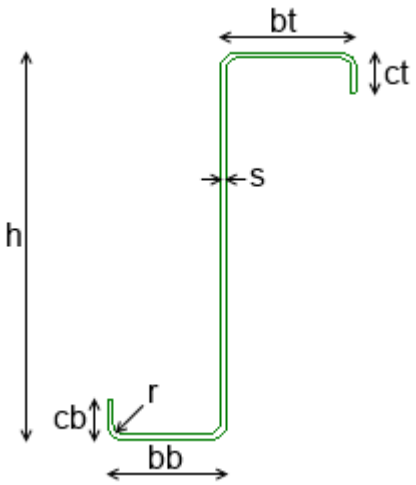
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
c	Lip
c2	Pluslip
a	Pluslip angle

Formcode 118: Cold-Formed ZED-Section



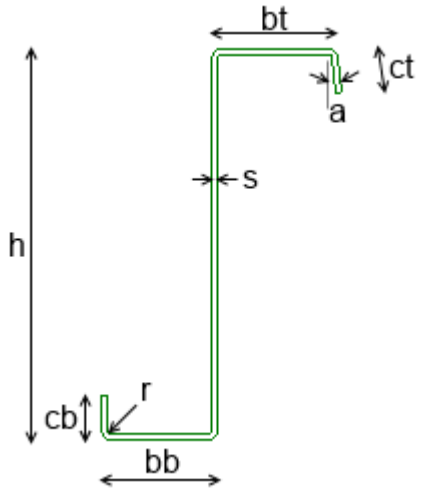
Parameters	Description
s	Thickness
r	Inner radius
bt	Flange width top
bb	Flange width bottom
h	Height
c	Lip

Formcode 119: Cold-Formed ZED-Section Asymmetric Lips



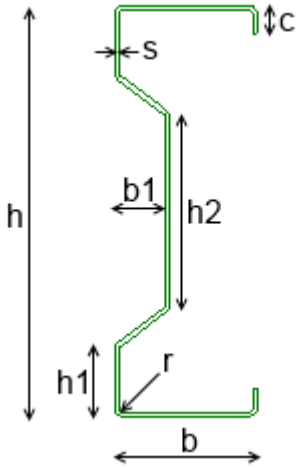
Parameters	Description
s	Thickness
r	Inner radius
bt	Flange width top
bb	Flange width bottom
h	Height
ct	Lip top
cb	Lip bottom

Formcode 120: Cold-Formed ZED-Section Inclined Lip



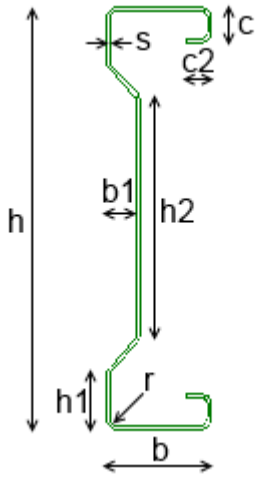
Parameters	Description
s	Thickness
r	Inner radius
bt	Flange width top
bb	Flange width bottom
h	Height
ct	Lip top
cb	Lip bottom
a	Lip angle

Formcode 121: Cold-Formed Sigma Section



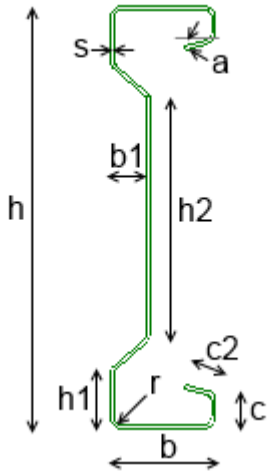
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
b1	Web depression

Formcode 122: Cold-Formed Sigma Section Stiffened



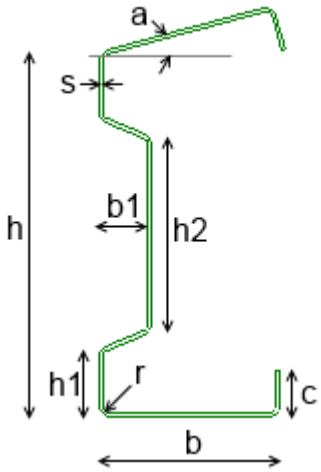
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
c2	Pluslip
b1	Web depression

Formcode 123: Cold-Formed Sigma-Plus Section



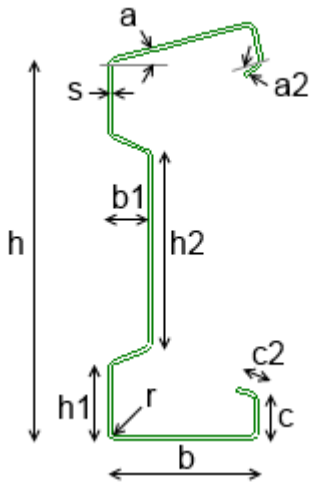
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
c2	Pluslip
b1	Web depression
a	Pluslip angle

Formcode 124: Cold-Formed Sigma Section Eaves Beam



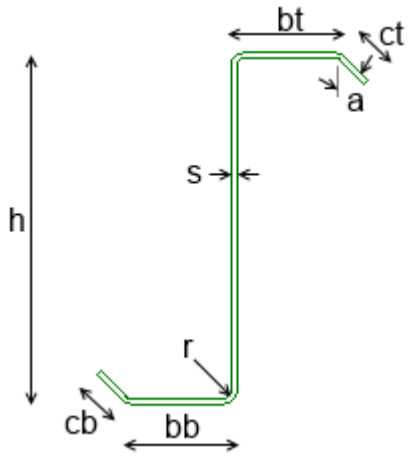
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
b1	Web depression
a	Flange angle

Formcode 125: Cold-Formed Sigma-Plus Section Eaves Beam



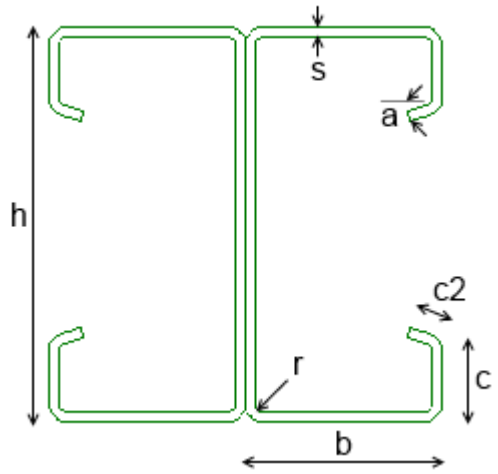
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
c2	Pluslip
b1	Web depression
a	Flange angle
a2	Pluslip angle

Formcode 126: Cold-Formed ZED-Section Both Lips Inclined



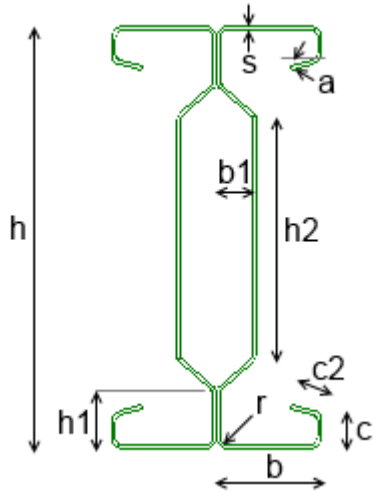
Parameters	Description
s	Thickness
r	Inner radius
bt	Flange width top
bb	Flange width bottom
h	Height
ct	Lip top
cb	Lip bottom
a	Lip angle

Formcode 127: Cold-Formed I-Plus Section



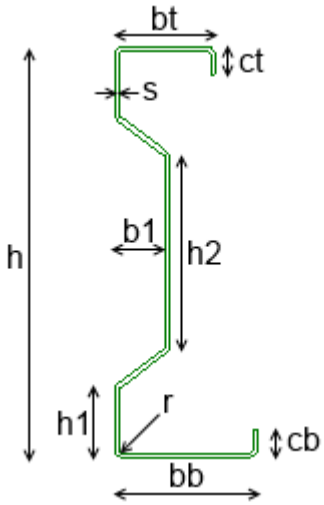
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
c	Lip
c2	Pluslip
a	Pluslip angle

Formcode 128: Cold-Formed IS-Plus Section



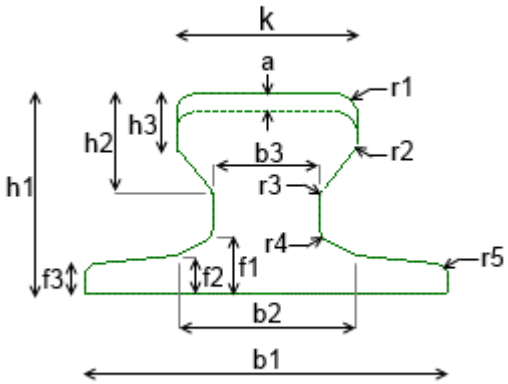
Parameters	Description
s	Thickness
r	Inner radius
b	Flange width
h	Height
h1	Web height near flange
h2	Inner web height
c	Lip
c2	Pluslip
b1	Web depression
a	Pluslip angle

Formcode 129: Cold-Formed Sigma Section Asymmetric



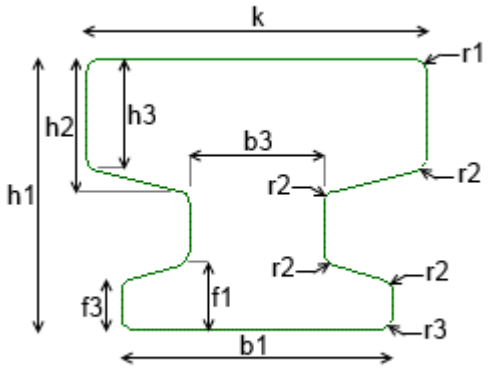
Parameters	Description
s	Thickness
r	Inner radius
bt	Flange width top
bb	Flange width bottom
h	Height
h1	Web height near flange
h2	Inner web height
ct	Lip top
cb	Lip bottom
b1	Web depression

Formcode 150: Rail Type KA



Parameters	Description
h1	Height
h2	Intermediate top height
h3	Intermediate top height
b1	Width bottom
b2	Intermediate width
b3	Intermediate width
k	Width top
f1	Intermediate bottom height
f2	Intermediate bottom height
f3	Intermediate bottom height
r1	Radius
r2	Radius
r3	Radius
r4	Radius
r5	Radius
a	Wear

Formcode 151: Rail Type KF



Parameters	Description
h1	Height
h2	Intermediate top height
h3	Intermediate top height
b1	Width bottom
b3	Intermediate width
k	Width top
f1	Intermediate bottom height
f3	Intermediate bottom height
r1	Radius
r2	Radius
r3	Radius

Annex B: Cross-section Characteristics

The following table provides an overview of all Cross-section Characteristics which can be inputted into the Profile Library:

Property	Description
A	Area
Ay	Shear Area in principal y-direction
Az	Shear Area in principal z-direction
AL	Circumference per unit length
AD	Drying Surface per unit length
cYUCS	Centroid coordinate in Y-direction of Input axis system
cZUCS	Centroid coordinate in Z-direction of Input axis system
IYLCS	Second moment of area about the YLCS axis
IZLCS	Second moment of area about the ZLCS axis
IYZLCS	Product moment of area in the LCS system
α	Rotation Angle of the principal axis system
Iy	Second moment of area about the principal y-axis
Iz	Second moment of area about the principal z-axis
iy	Radius of gyration about the principal y-axis
iz	Radius of gyration about the principal z-axis
Wely	Elastic section modulus about the principal y-axis
Welz	Elastic section modulus about the principal z-axis
Wply	Plastic section modulus about the principal y-axis
Wplz	Plastic section modulus about the principal z-axis
Mply+	Plastic moment about the principal y-axis for a positive My moment
Mply-	Plastic moment about the principal y-axis for a negative My moment
Mplz+	Plastic moment about the principal z-axis for a positive Mz moment
Mplz-	Plastic moment about the principal z-axis for a negative Mz moment
dy	Shear center coordinate in principal y-axis measured from the centroid
dz	Shear center coordinate in principal z-axis measured from the centroid
It	Torsional constant
Iw	Warping constant
βy	Mono-symmetry constant about the principal y-axis
βz	Mono-symmetry constant about the principal z-axis

For background information regarding these parameters reference is made to [1].

The centroid coordinates are not defined in the Profile Library since they refer to an arbitrary axis. These properties are always calculated by Scia Engineer and referenced to the Input Axis System (see [1]).

Annex C: Profile Library filters

The Profile Library filters in the New Cross-section dialog allow an easy selection of specific types. Any set of section types can be gathered in a filter. This can be used to create filters for often used section types, filters for country specific sections etc.

Within this Annex the creation of a filter is illustrated.

The content of a filter is defined by means of a filter file. This file concerns a simple text file which is located in the folder of a library and has extension **.FIL**.

The standard ProfileLibrary has several filter files provided by default, for example **European.FIL**, **German.FIL**, **American.FIL**, ...

The name of the file defines the name of the filter i.e. how it will be visible within Scia Engineer. A filter file can be edited using a default text editor. The following picture shows the partial content of the **European.FIL** file:

As can be seen from the screenshot, the content is a list of all the section Types which should be visible when this filter is selected.

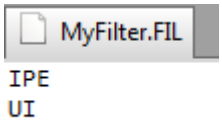
Filter files can be located in any Library folder, and can contain Types of different libraries.
This is illustrated by means of the example of Chapter 2: at the end of that Chapter the UserLibrary contained a new **UI** section Type.

- Using Windows Explorer, navigate to the UserLibrary folder (see Chapter 1).

- Within this folder, create a new text file using any default text editor.

- Save the file as **MyFilter.FIL** Make sure the **.FIL** extension is properly set (instead of .txt)

- As content, input the desired section Types. For this example, the **IPE** Type and the **UI** Type are used:



The IPE Type concerns a standard Type which is located in the ProfileLibrary while the UI Type is a user-defined Type located in the UserLibrary. As indicated above, the filter file itself can be located in any Library folder, and can contain Types of different libraries.

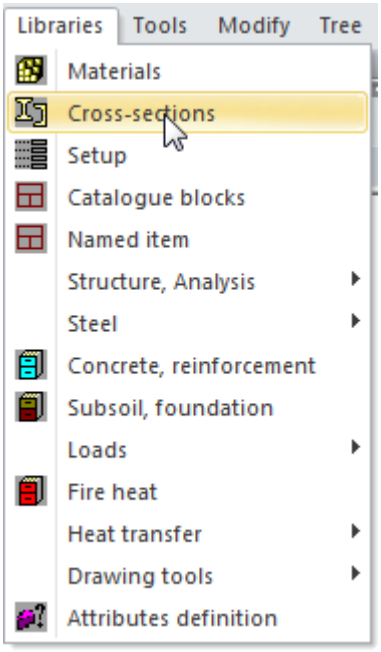
- Save and close the **MyFilter.FIL** file.

The filter file is now created and can be used within Scia Engineer.

- Launch Scia Engineer.

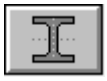
- When the **Open project** dialog appears, either re-open an existing project or Cancel the dialog and create a new project as outlined in Chapter 2.

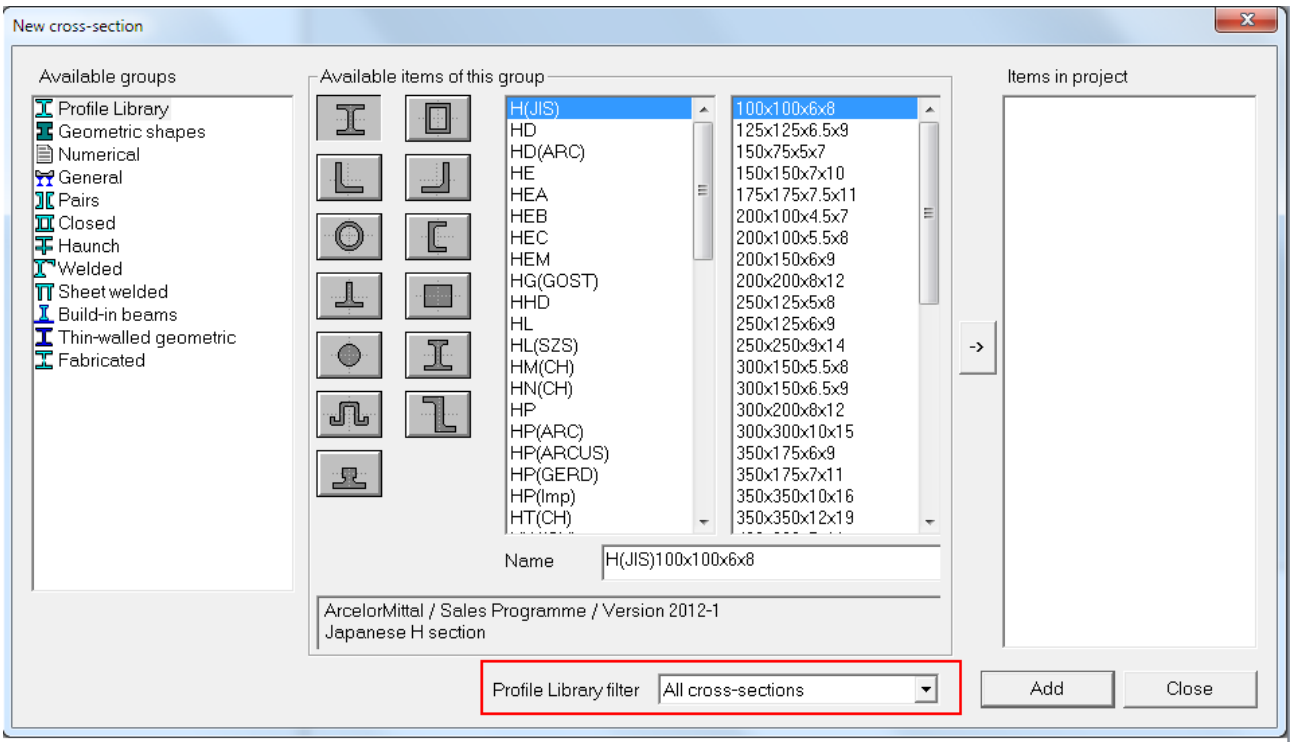
- Go to **Libraries** > **Cross-sections**



The Cross-section Manager as well as the **New cross-section** dialog will open. In case an existing project was opened which already contained cross-sections then press the New button to open the **New cross-section** dialog.

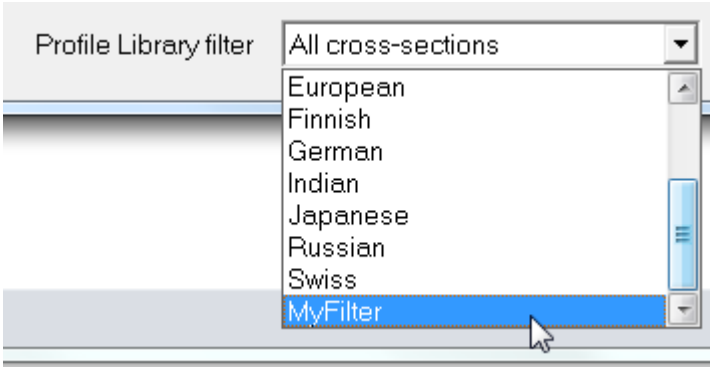
- In the **Available groups** select **Profile Library**.

- In the **Available items of this group** select the  icon.

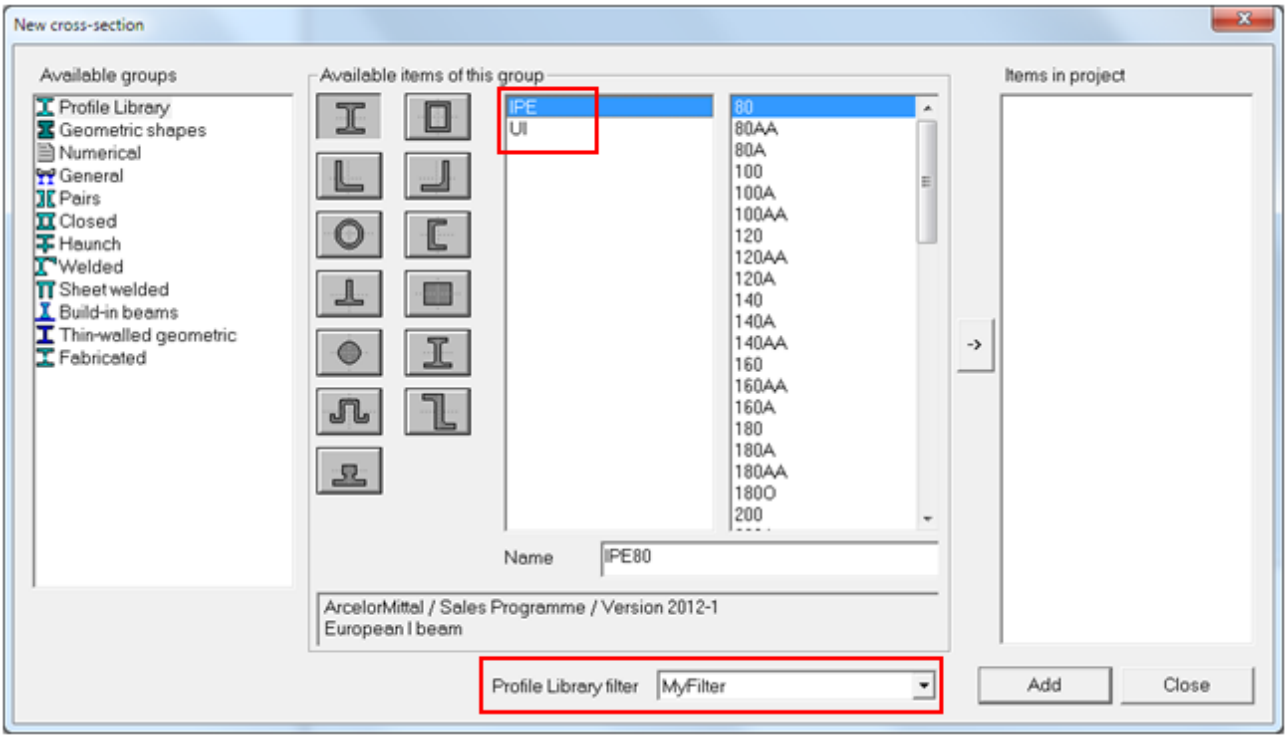


At the bottom of the dialog the **Profile Library filter** combo-box contains the filters of all Libraries.

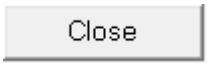
- Click on the **Profile Library filter** combo-box and select **MyFilter** from the list.



The **Available items of this group** now shows only the **IPE** and **UI** Types.



This example illustrated how filters for the Profile Library can be defined and used.

- Close the **New cross-section** dialog by pressing 

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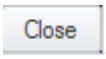
- Close the Cross-section manager by pressing 

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- Scia Engineer can now be closed, the project changes can be discarded.

Extension: Translations

Within the standard ProfileLibrary folder, additional files related to the filters can be found i.e. **Filter_Names_05.txt**, **Filter_Names_07.txt**, **Filter_Names_0c.txt**...

Each of these files contains a translation of the filter file names for specific languages. The naming follows the same logic as outlined in Chapter 2 for the Descrip_ID and Source_ID files.

The number used to identify a certain language concerns the Locale ID (LCID) as provided by Microsoft. More specifically the last two digits of the LCID are used. The following table illustrates this principle:

Language	LCID	Number used in filename
Czech	0405	05
German	0407	07
English	0809	09
French	040c	0c
Dutch	0813	13
Slovak	041b	1b

A list of all LCID's as provided by Microsoft can be found on the MSDN website.

Thus when the interface of Scia Engineer is for example set to German, the filter strings will be read from the file **Filter_Names_07.txt**. In case this file does not exist, the content of **Filter_Names.txt** is used.

These Translations are only used by the standard ProfileLibrary, not the UserLibraries.

Annex D: Folder Content

This Annex gives an overview of the relevant files located within the standard ProfileLibrary folder.

File	Description
dbgeo	Actual library file containing parameters and properties
American.fil	Filter file containing American sections
Brazilian.fil	Filter file containing Brazilian sections
British.fil	Filter file containing British sections
Chinese.fil	Filter file containing Chinese sections
European.fil	Filter file containing European sections
Finnish.fil	Filter file containing Finnish sections
German.fil	Filter file containing German sections
Indian.fil	Filter file containing Indian sections
Japanese.fil	Filter file containing Japanese sections
Russian.fil	Filter file containing Russian sections
Swiss.fil	Filter file containing Swiss sections
Descrip_ID.txt	File containing Description strings used in any language interface
Descrip_ID_05.txt	File containing Description strings used in the Czech language interface
Descrip_ID_07.txt	File containing Description strings used in the German language interface
Descrip_ID_09.txt	File containing Description strings used in the English language interface
Descrip_ID_0c.txt	File containing Description strings used in the French language interface
Descrip_ID_13.txt	File containing Description strings used in the Dutch language interface
Descrip_ID_1b.txt	File containing Description strings used in the Slovak language interface
Filter_Names.txt	File containing Filter name strings used in any language interface
Filter_Names _05.txt	File containing Filter name strings used in the Czech language interface
Filter_Names _07.txt	File containing Filter name strings used in the German language interface
Filter_Names _09.txt	File containing Filter name strings used in the English language interface
Filter_Names _0c.txt	File containing Filter name strings used in the French language interface
Filter_Names _13.txt	File containing Filter name strings used in the Dutch language interface
Filter_Names _1b.txt	File containing Filter name strings used in the Slovak language interface
Source_ID.txt	File containing Source strings used in any language interface
Source _ID_05.txt	File containing Source strings used in the Czech language interface
Source _ID_07.txt	File containing Source strings used in the German language interface
Source _ID_09.txt	File containing Source strings used in the English language interface
Source _ID_0c.txt	File containing Source strings used in the French language interface
Source _ID_13.txt	File containing Source strings used in the Dutch language interface
Source _ID_1b.txt	File containing Source strings used in the Slovak language interface

References

[1] Theoretical Background – Cross-Section Characteristics
Nemetschek Scia
2012