Import/Export of tendons in module StatiCa Tendon

by using formats DXF, TXT and table format

Contents

1. Terminology

Reference curve – it is defined as a union of basic geometrical entities of parts of members. Reference curve goes through nodes of structural model. If the basic geometrical entity is a straight line, the reference curve is defined as a connecting line of the nodes, see the user guide IDEA Tendon - chap. 3.1. [1].

Uncoiled view (of member, tendon, design member) – is obtained by uncoiling of the reference curve/polygon. For more details see the user guide IDEA Tendon - chap. 3.1. [1].
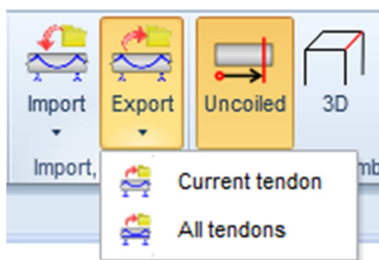
2. Import

It is possible to import the tendons into IDEA Tendon from DXF file, see chap. 2.1, TXT file, see chap. 2.3, and from the table, see chap. 2.2. Tendons, which will be created in IDEA Tendon, can be exported to TXT file, see chap. 3.2. It is also possible to export content of the main window to DXF file, see chap. 3.1.

Export and import of tendons is performed by commands in ribbon group **Import, Export**.
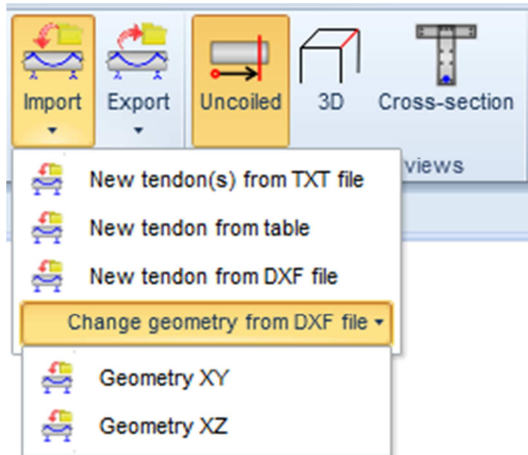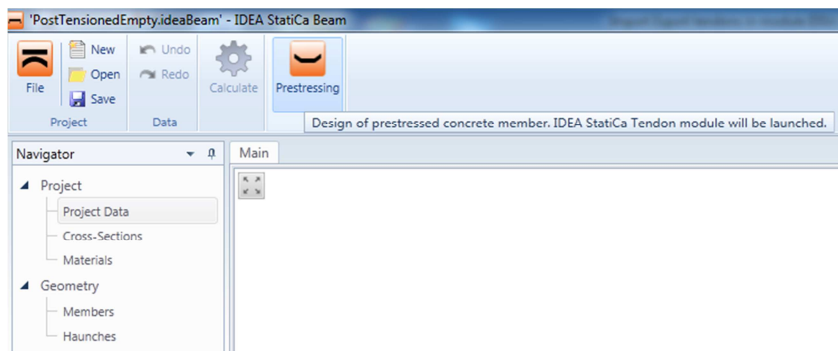

Import of tendons

Export of tendons

- **Import > New tendon(s) from TXT file** – create new tendons importing geometry from text file. If the imported tendon is longer than target design member, the imported tendon is shortened automatically.
- **Import > New tendon from table** – create new tendon using the table editor to define tendon polygon vertexes.
- **Import > New tendon(s) from DXF file** – create new polygonal tendons importing the tendon geometry from DXF file
- **Import > Change geometry from DXF file > Geometry XY** –import tendon geometry into the uncoiled view XY of the current tendon from DXF file.
- **Import > Change geometry from DXF file > Geometry XZ** – import tendon geometry into the uncoiled view XZ of the current tendon from DXF file.

- **Export > Current tendon** – save geometry definition of current tendon to text file.
- **Export > All tendons** –save geometry definition of all tendons in current design member to text file.
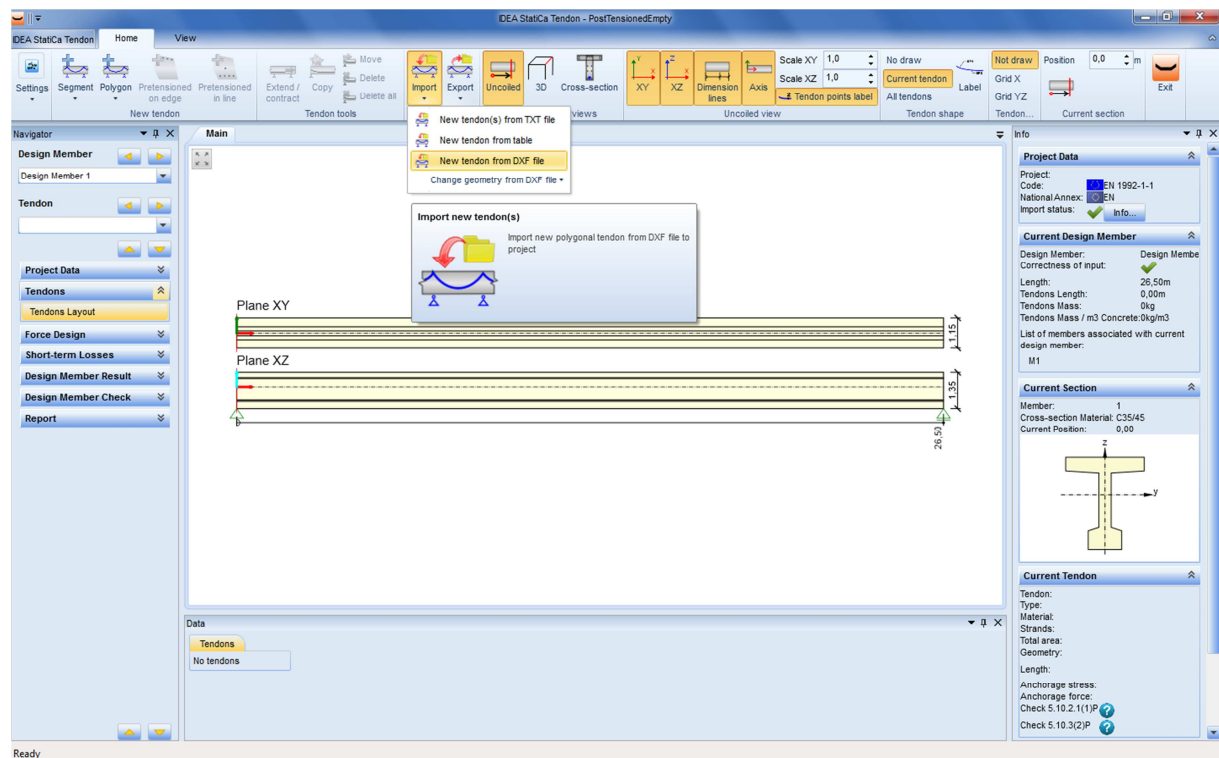
2.1. Import from DXF file

After opening the file "PostTensionedEmpty.ideaBeam" in IDEA StatiCa Beam application and after recalculation, it is possible to start the module IDEA StatiCa Tendon.

Design member named "Design member1" is created automatically. Tendons will be imported from DXF file to this new design member.

2.1.1. Import of the first tendon

Import of new tendon from DXF

Click navigator command **Tendons > Tendons Layout** to enable input and modification of tendons.

To import the first tendon click **New tendon from DXF file** in ribbon group **Import**. Dialog **Open** appears. Select file to import the tendons from – 'TendonsTwo.dfx'.

A dialog **Tendon geometry** appears where the entities to define the polygon can be selected. The polygon can be inserted to individual projections of the geometry of tendon than.
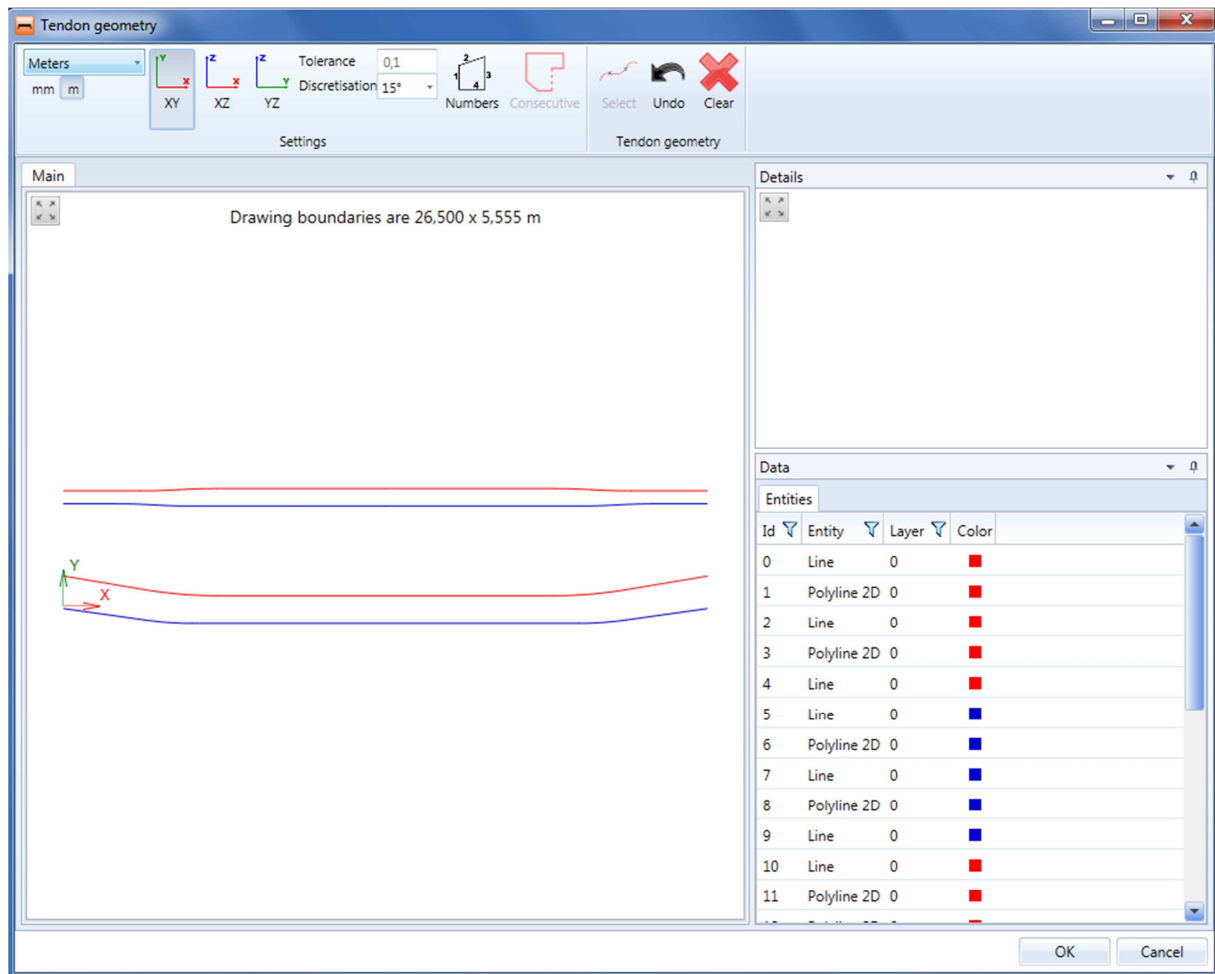
Imported DXF entities

The units conversion can be set on the top left. One length unit of DXF file than corresponds to one unit of selected type in IDEA application

The plane (XY, XZ, YZ) of loaded DXF file can be selected also. The projection of loaded DXF entities to the selected plane is drawn in the Main window.

Individual geometrical entities to be imported can be selected either by mouse or in the table **Entities** in the Data window (on the bottom right).

It is possible to import just one plane of tendon geometry. The target plane of tendon geometry will be selected later.

Let`s start with lower red line. Because the curve in the DXF file is composed of many entities, the entities to be converted to the tendon curve must be selected.

There are more possibilities how to select the entities. Entities of the curve can be either selected by mouse in the **Main window**, or can be selected in the **Entities** table at the bottom right.

It is also possible to select only part of the curve and after clicking **Consecutive** in the ribbon group **Settings** (which becomes active after selecting the first entity) the program it will automatically find 'the whole curve' – all preceding and following entities to the current entity are searched.

After selecting the entities, rows with indexes 0-4 should be selected in the **Entities** window. Those will be converted to the tendon geometry.

Click **Select** in ribbon group **Tendon geometry** to convert the selected entities to the final curve. The curve is shown in the upper right window **Details**.

Click **OK** to confirm the selection.
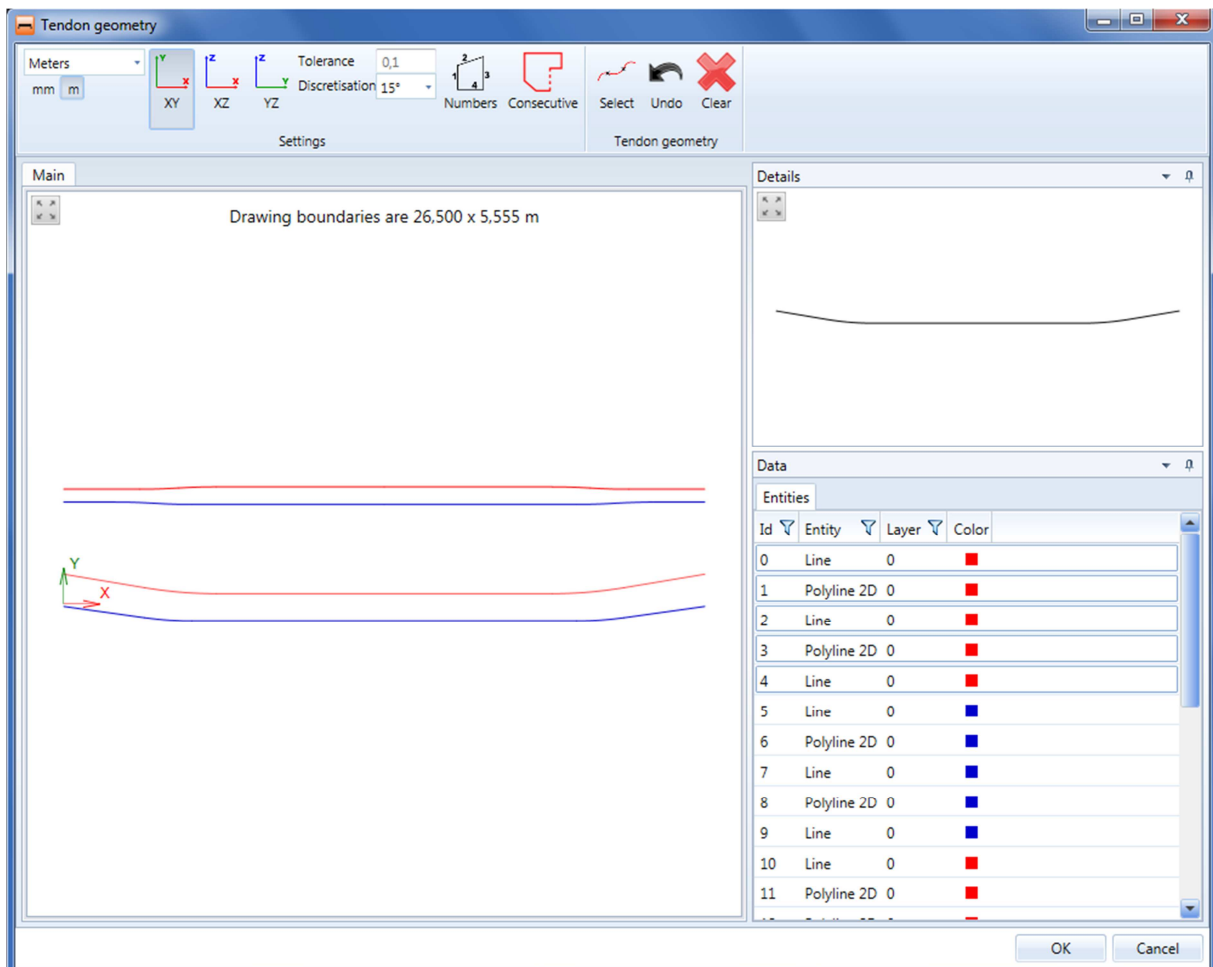
Selected entites and generated curve

A dialog **Setting the insertion position** appears to define the positioning of selected polygon into uncoiled view of design member.

The polygon must be a function f(x). It means that there is exactly one y-value for one argument x. Therefore it is not possible to import for example vertical parts of the curve.

Local coordinate system is assigned to the selected polygon. This system is used for the positioning of polygon into uncoiled view of design member.

The origin of the coordinate system [0;0] is placed to the beginning of the polygon - to the most left point.
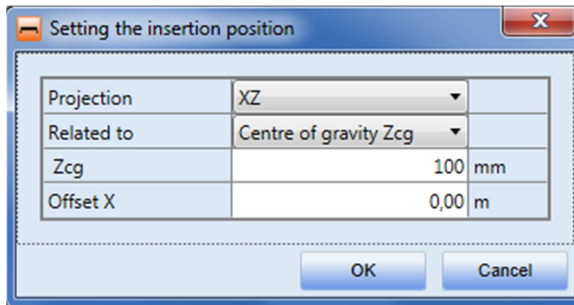
Insertion parameters

Individual options of **Setting the insertion position**:

- **Projection –** select the target uncoiled view plane XY or XZ, into which the polygonal tendon will be inserted.
- **Related to** – choose the reference point, to which the offset of the tendon origin is defined.
- **v (Y-, Y+,Ycg**, resp. **Z-, Z+, Zcg)** – the distance between the beginning point of the tendon and the '**Related to**' point.
- **Offset X** – the distance between the beginning point of the tendon and the beginning of the design member.

Set the parameters according to the picture above and click **OK**.

The tendon shape projection XZ is generated from the selected entities respecting the defined parameters.

The curve entities are transformed into a polygon. The second tendon geometry (XY in this case) is generated automatically as straight line and it is placed into the reference curve of the design member.
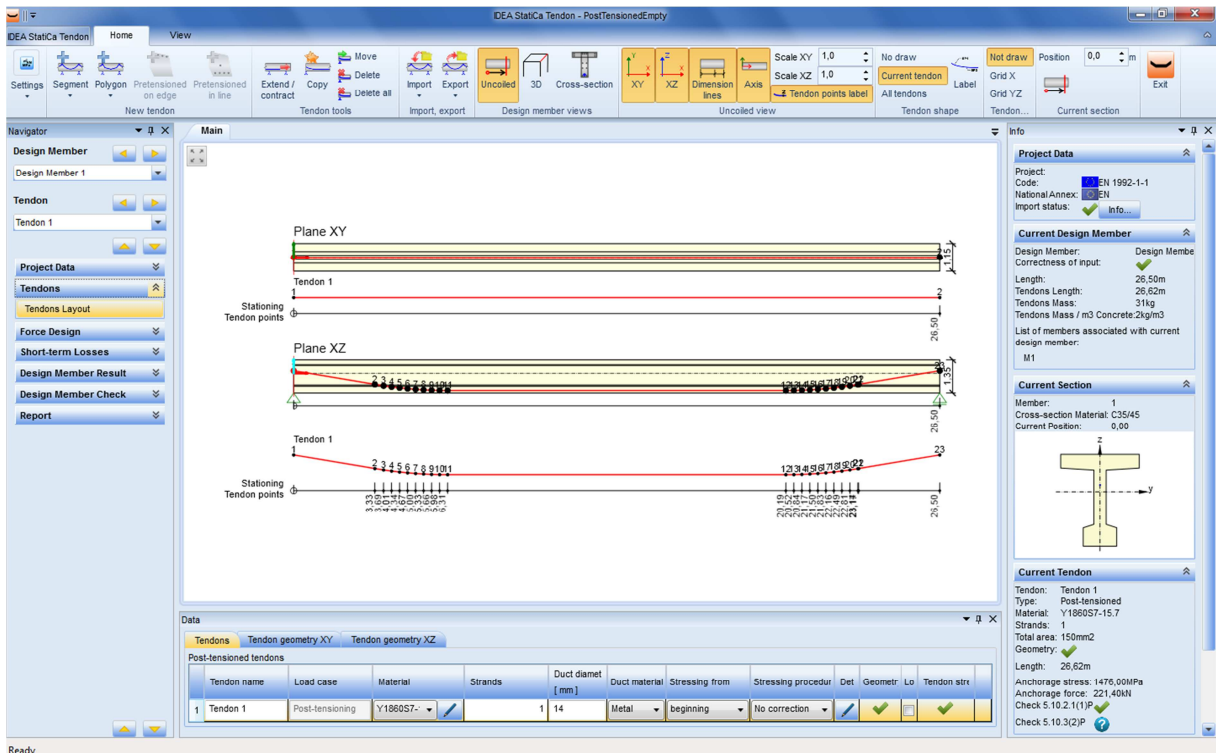

Imported first tendon

The import of the second projection (XY) is done in similar way. As far as the XY geometry of the tendon exists, not a new tendon will be imported, but the existing tendon geometry will be changed using import from the DXF file.
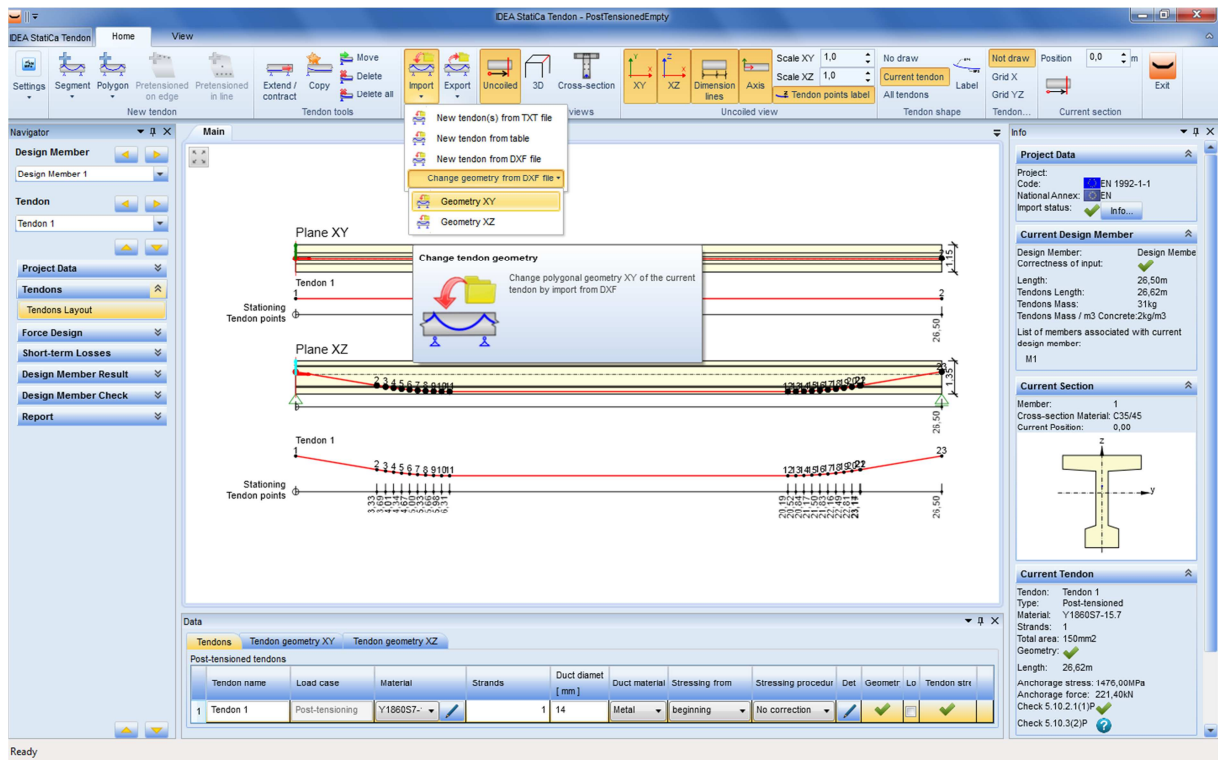
**Starting modification of XY projection**

Click **Import > Change geometry from DXF file > Geometry XY** in ribbon group **Import, export** to modify the XY projection of the tendon.

The entities for the XY projection are imported from the same DXF file and are selected in similar way as for the initial import. Select entities of the top red curve is for the XY projection. Rows of indexes 10-17 should be selected in the **Entities** table in the Data window.
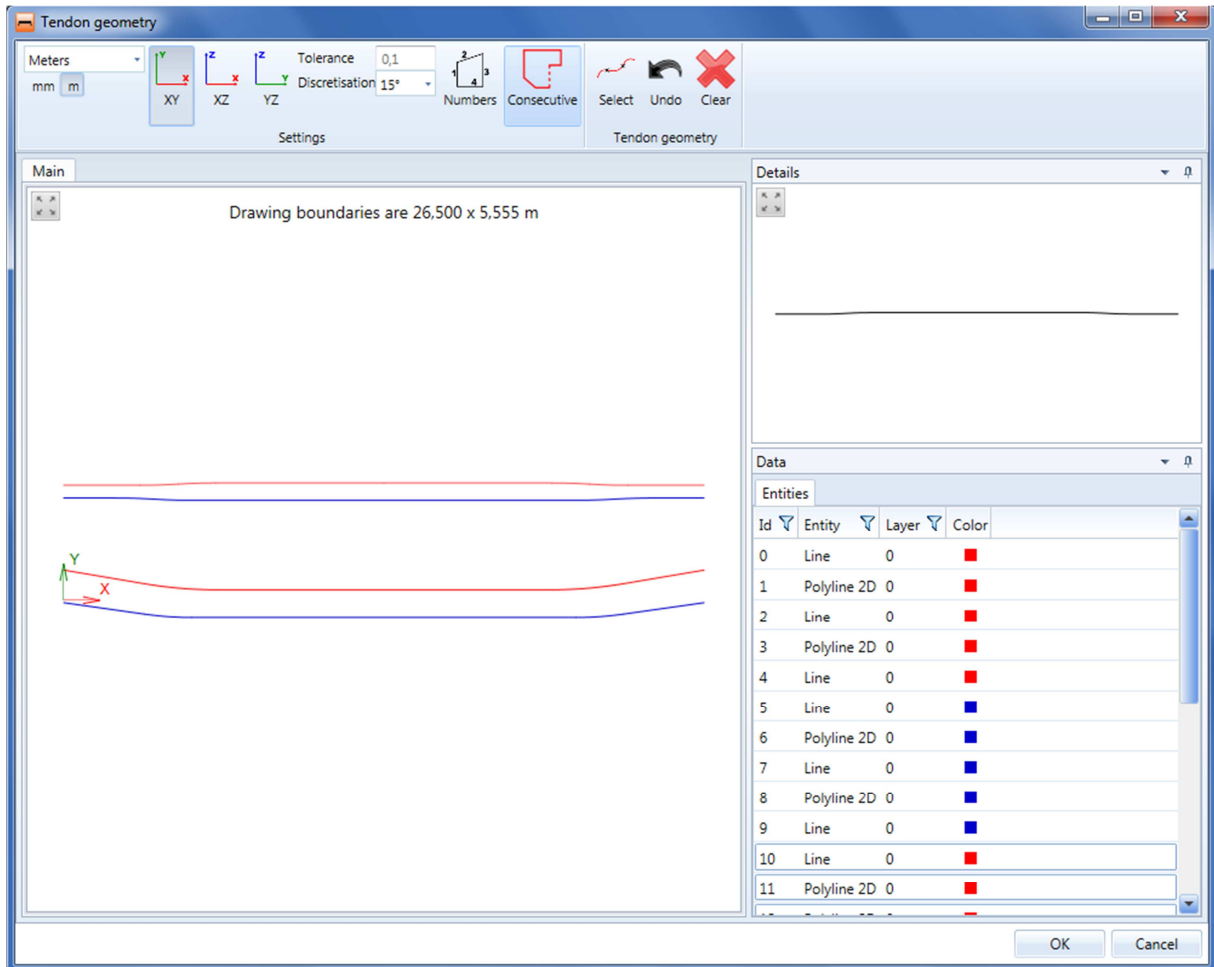
Selected entities and generated curve for modification of XY projection

After selecting the entities click **OK** to close the dialog **Tendon geometry.** The dialog **Setting the insertion position** appears. The **Projection** cannot be changed, because it was determined using the command **Geometry XY** at the launch of import and **Offset X** cannot be changed - it is set automatically to the beginning of the opposite projection. Set the parameters according to the picture below and click **OK**.
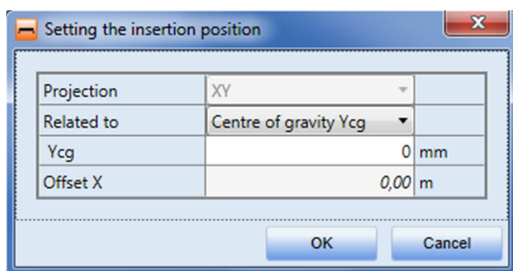
Insertion parameters for modification

If the length of imported geometry is not identical with the length of the second projection, a point is added at the end of the shorter of both geometries to get two identical geometries. A last point of the shorter projection is taken and its copy is created. The copy has the same y-coordinate (or z-, depending on the projection) and is moved to the x coordinate that corresponds to the end point coordinate of the longer projection.

Both imported geometries are of the same length in this example.
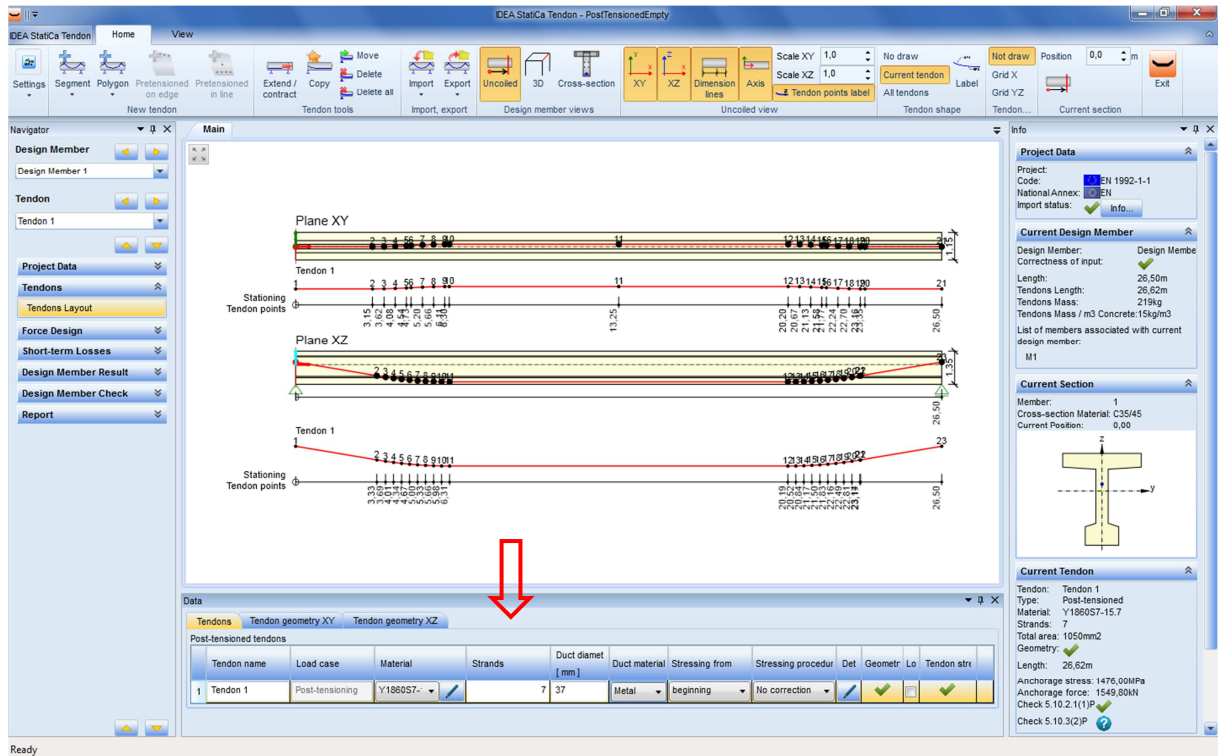
Both projections of the imported tendon

Only the tendon geometry is imported, other tendon parameters are set to default values.

The final tendon geometry is created by composition of both projections and geometry of the reference curve of the design member. In this case the design member geometry is a straight line, thus it does not affect the final geometry.
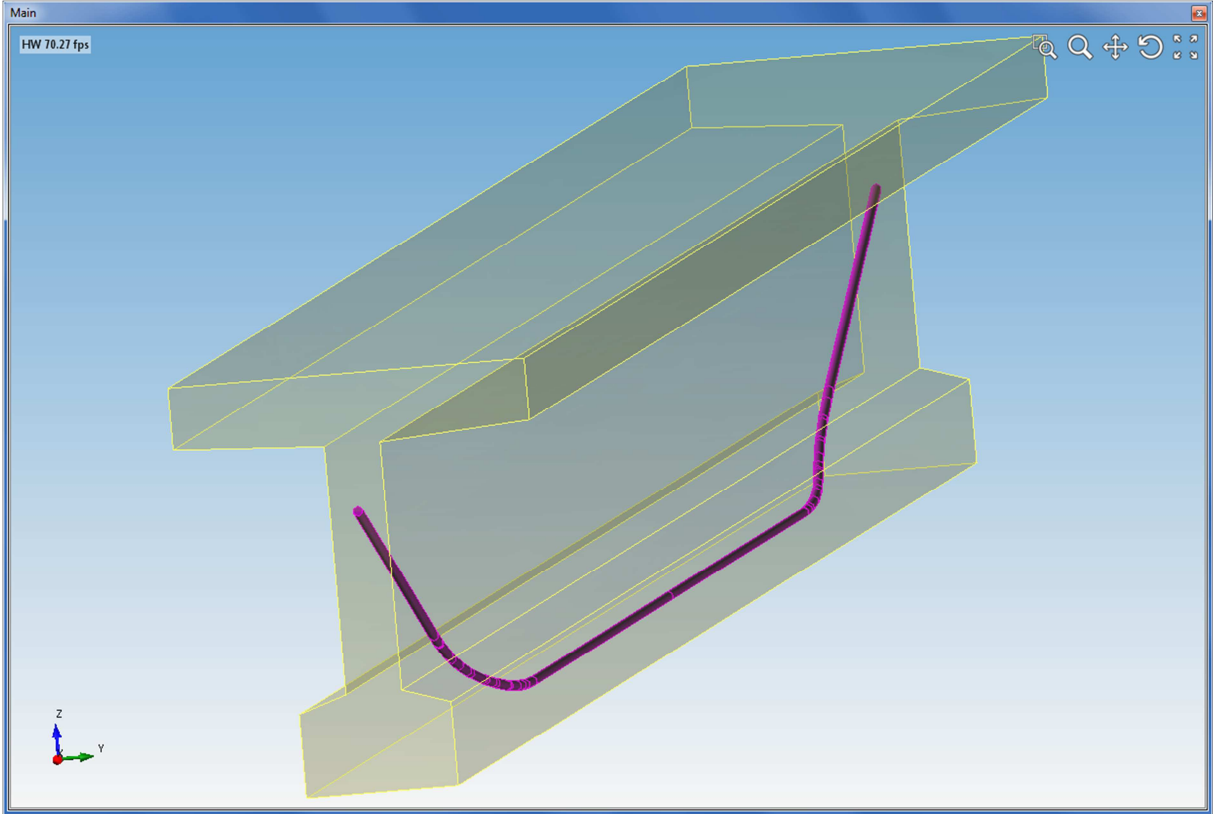
**Final 3D tendon geometry of the first tendon**

2.1.2. Import of the second tendon

The import is analogous to the import of the first tendon, now the blue entities of the DXF file are used.
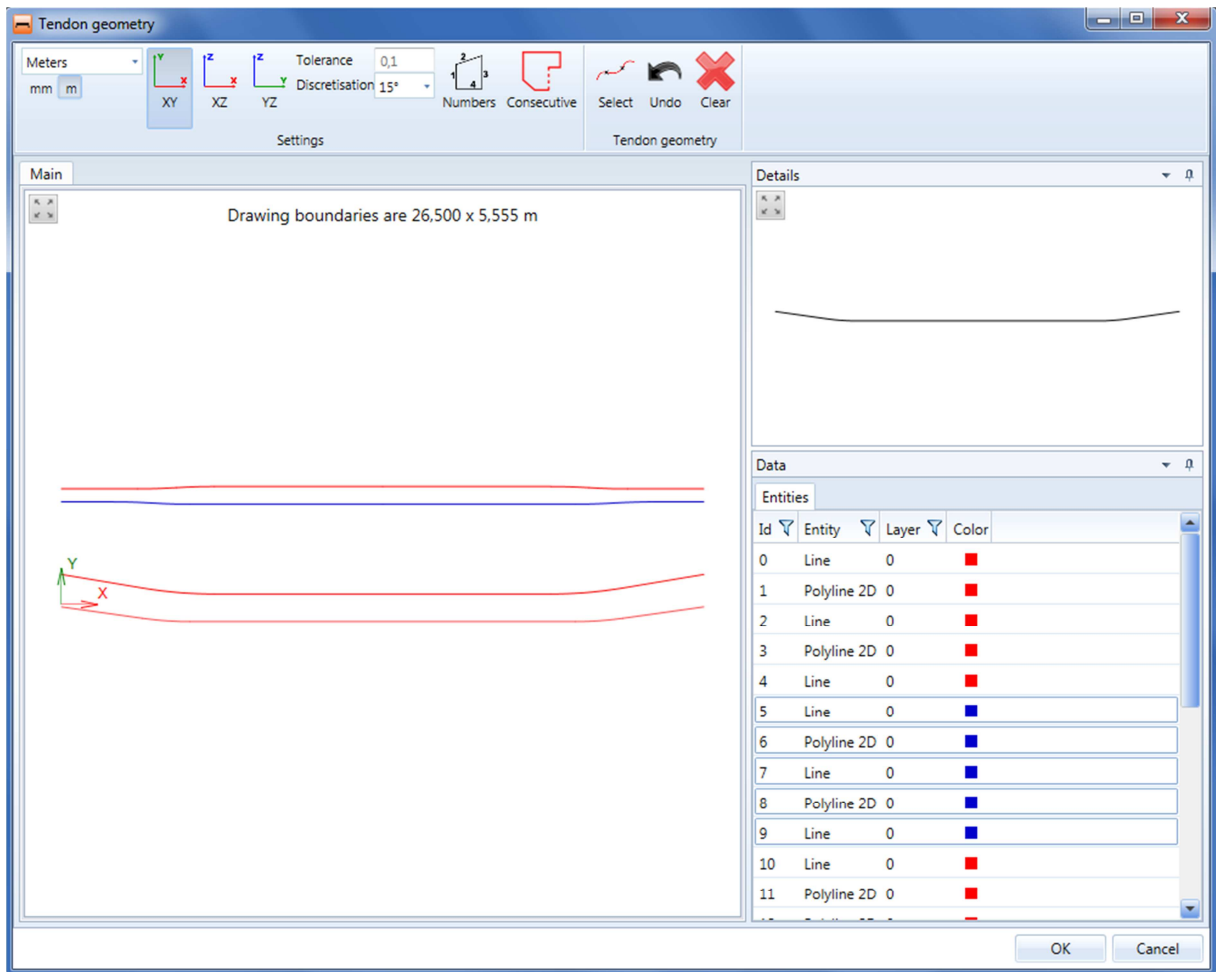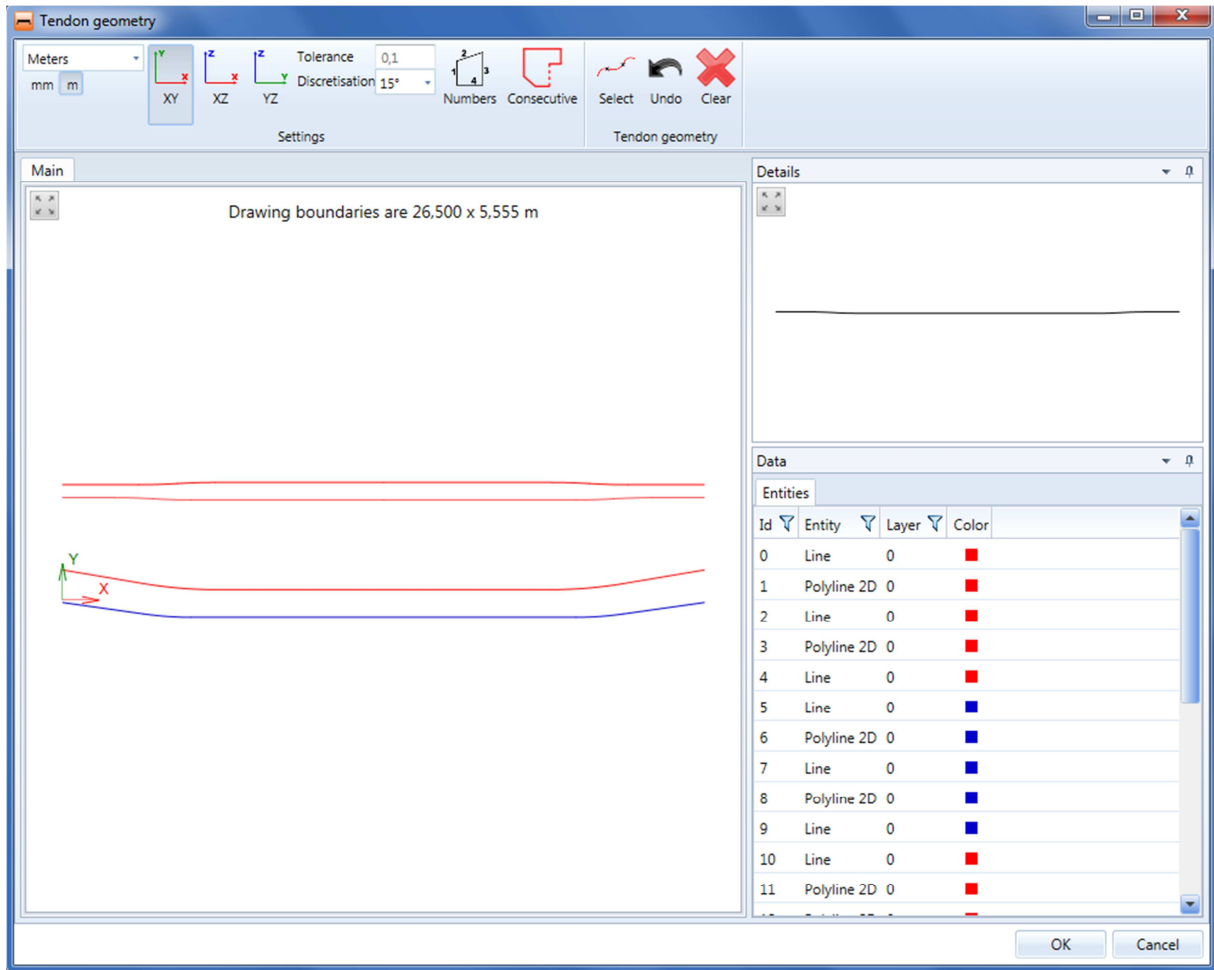

Selected entities and generated curve for XZ projection of second tendon

Entities in rows with indexes 5-9 should be selected for the XZ projection of second tendon.

Set the insertion parameters according to the picture below.
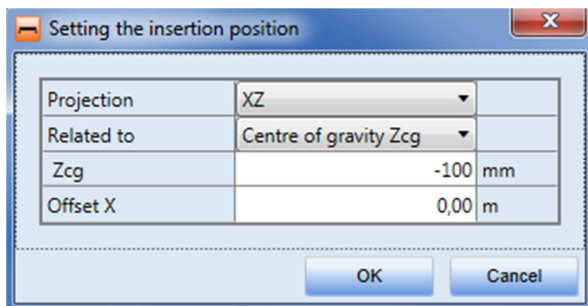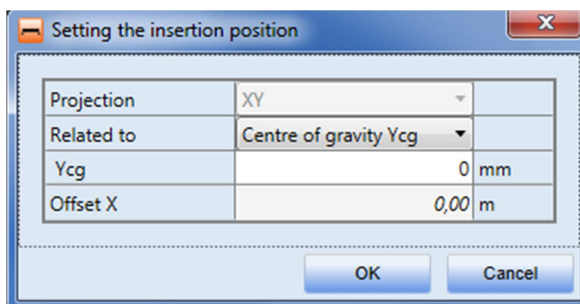

Insertion parameters of XZ projection

After XZ projection is imported the XY projection can be modified.
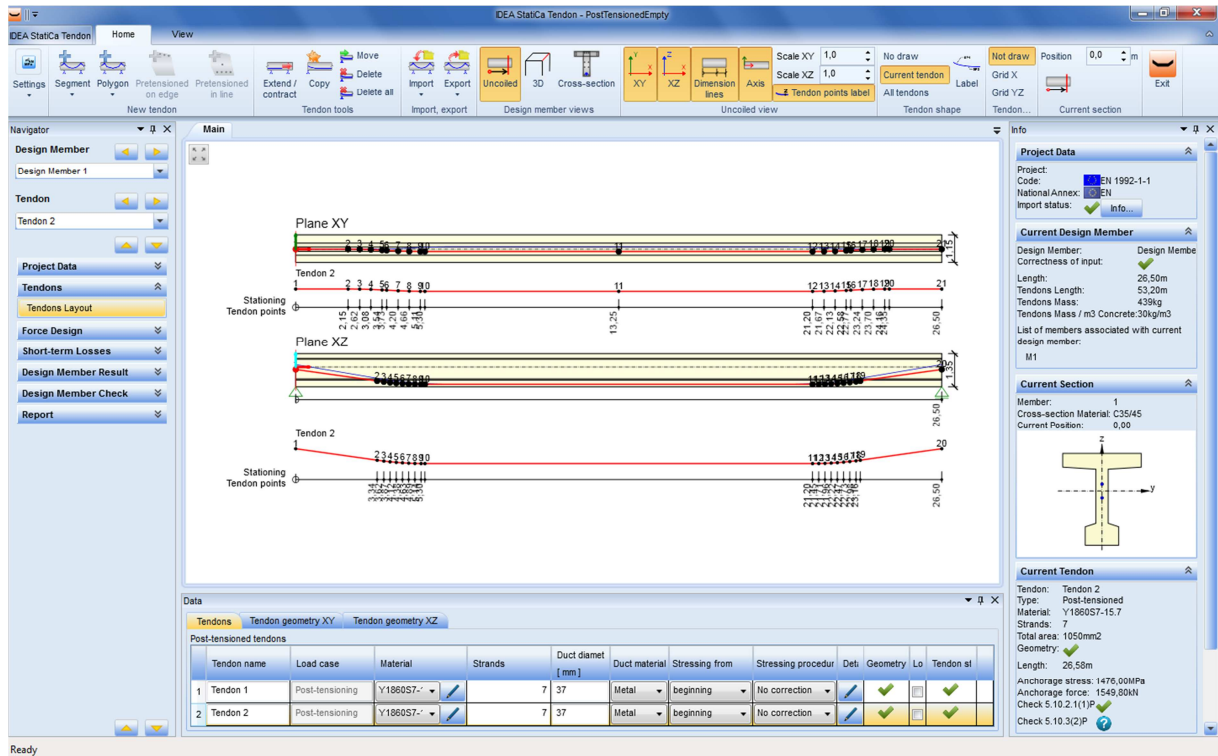
Selected entities and generated curve for modification of XY projection

Entities in rows with indexes 18-25 should be selected for the modification of XY projection of the second tendon.
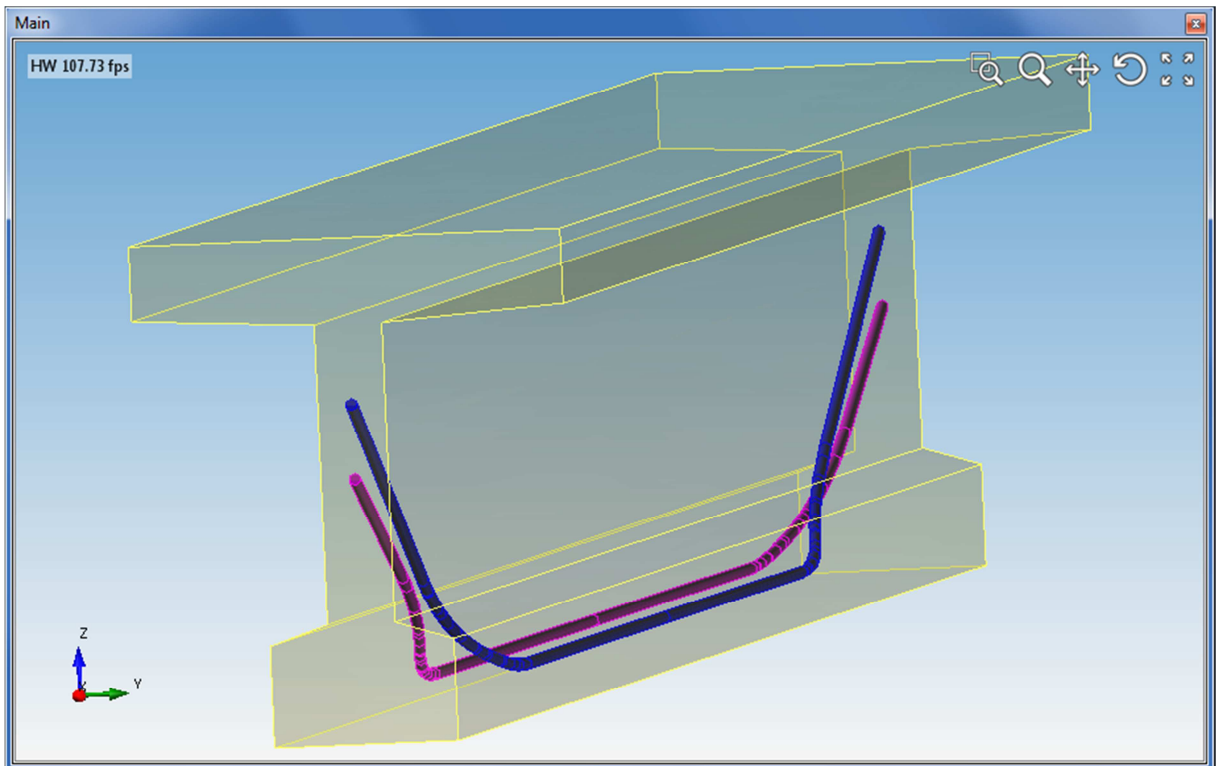
Set the insertion parameters according to the picture below.

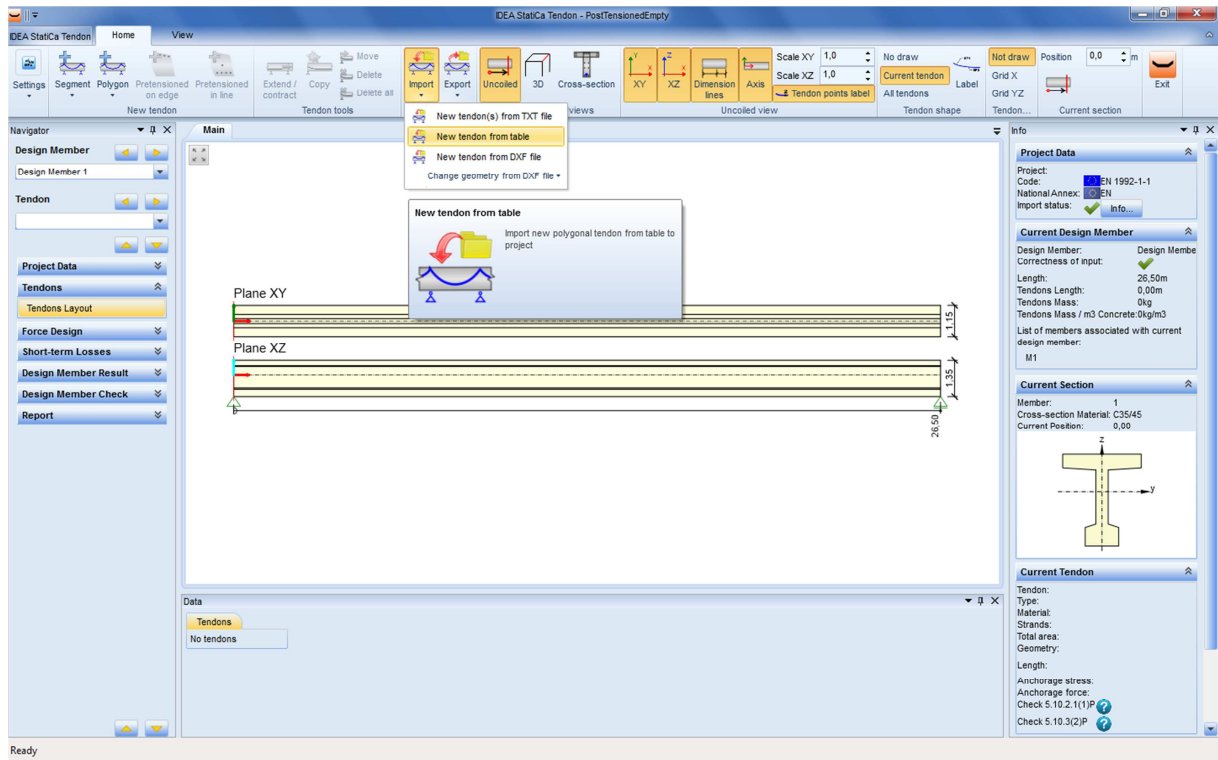**Insertion parameters for modification of the second tendon**

Both projections of the second imported tendon

3D view of both imported tendons

2.2.New tendon by table

New tendon can be created by defining the coordinates of individual vertexes of the polygon in the table.
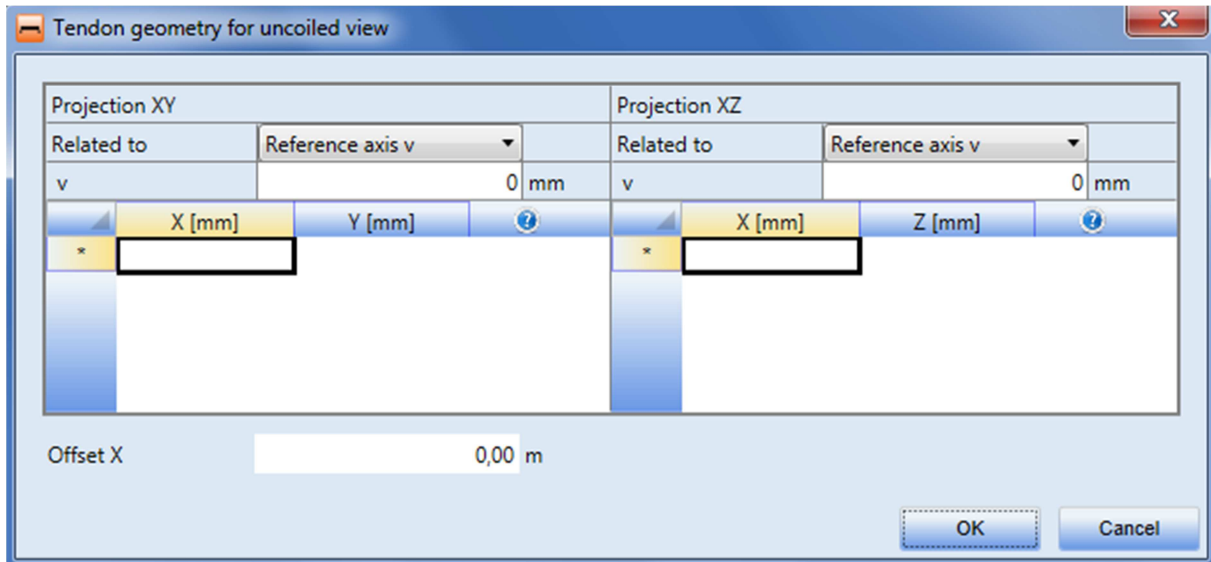

Input of new tendon by table

Click **New tendon from table** in ribbon group **Import** to start input of the coordinates of tendon polygon vertexes. It is possible to copy a table of coordinates from Microsoft Excel table too.
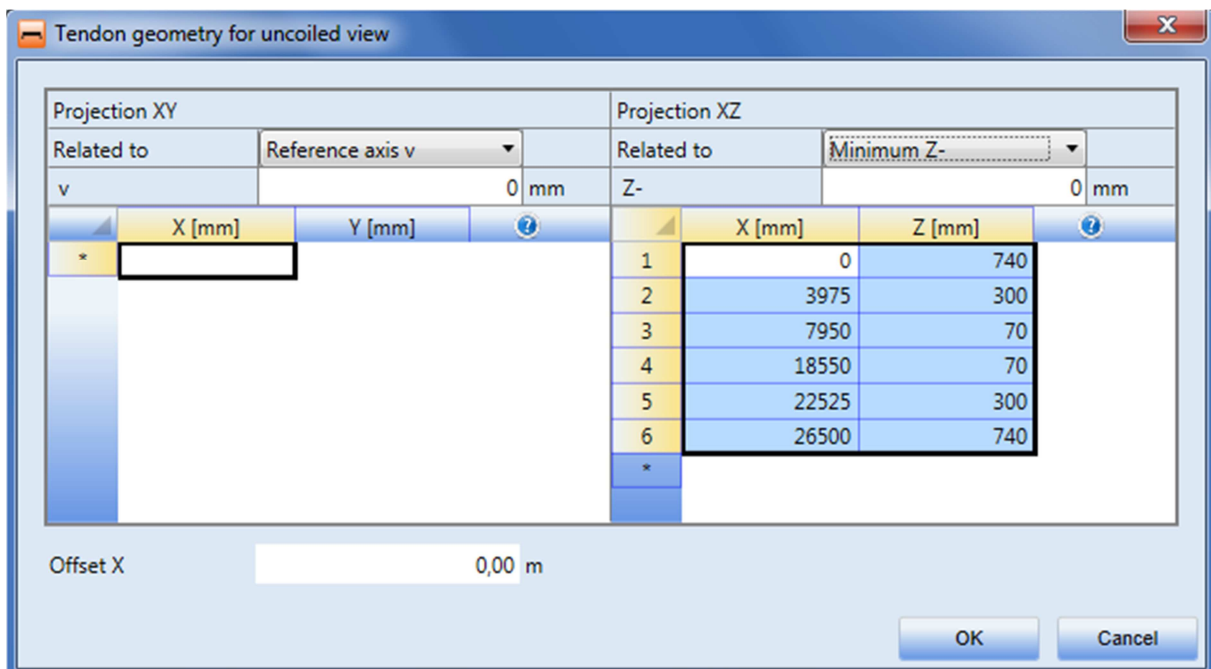
Example of imported coordinates table:

0	740
3975	300
7950	70
18550	70
22525	300
26500	740

Tables to define tendon polygon coordinates

The coordinates can be filled manually or inserted from the clipboard (eg. from Excel) to the required projection. In this example it is XZ projection.
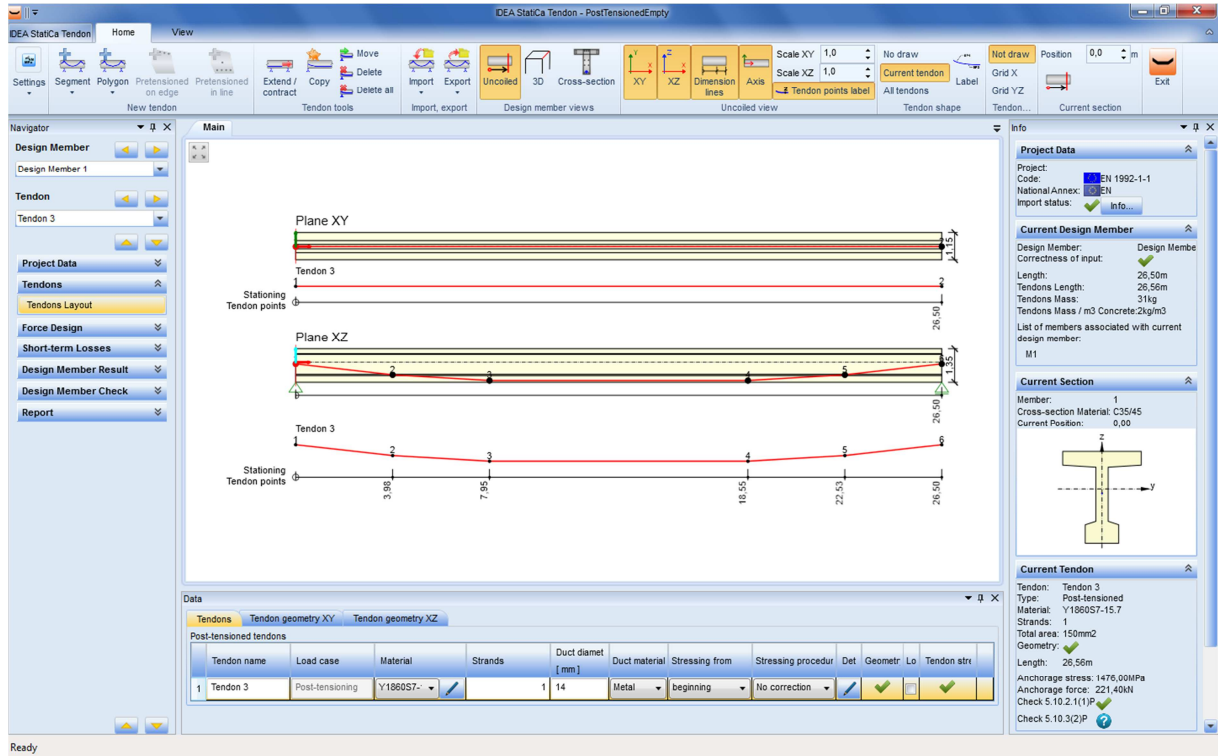

Defined coordinates for XZ projection

Enter the coordinates and set the insertion parameters according to the picture above.

Both projections are defined at once in one dialogue. The values **Relative to** and corresponding values „**v**" etc. have the similar meaning as for the import from DXF file.

But, in contrast with import from DXF, the first point of polygon is not moved to the point [0;0]. The value of **Offset X** is added to the entered values of X coordinates (eg. if the first point coordinate X is 700 mm and the Offset X is set to value 1 m, the beginning of tendon is placed in a distance of 1.7 m from the beginning of the design member).

If the second projection is not defined (XY in this example), it is automatically completed by two points with X coordinates corresponding to the X coordinates of the first and the last

point in the defined projection and the Y coordinates are set to zero (it means that the tendon is straight).

Tendon geometry created using the table

The coordinates can be also defined for both projections. In such case the X-coordinates of the first and the last points in both projections must match. If the coordinates do not match, an error message appears and the import is not performed.

2.3. Import from TXT

The complete cable including the geometry is imported from the TXT file. The TXT file can be created by exporting the existing tendon from IDEA Tendon or can be created manually. The TXT file with the extension "*.nav" has a special XML format.

All items are always imported from the file.

3. Export

3.1. Export to DXF

Click right mouse button on the **Main window** to display context menu with following commands:

Zoom All
Print
To Bitmap
To DXF
To Clipboard
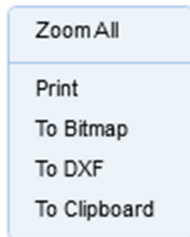
- **Zoom all** – show the whole structure.
- **Print** – start the print of the current view on selected printer.
- **Into bitmap** – start export of the current view to the raster graphics file.
- **To DXF** – start export of the current view to the DXF file.
- **To Clipboard -** copy the content of the current view to the clipboard as a bitmap.

The current content of the **Main window** is exported to the DXF file. The content of the **Main window** can be controlled using commands in ribbon groups.
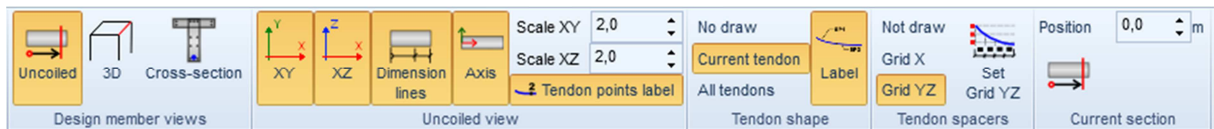

Ribbon groups to control the drawing content

Following options are set to be drawn: uncoiled view - projection XY and XZ, dimension lines, axes and tendon points label. Only the current tendon with labels and tendon spacers YZ is set to be drawn.

The setting of spacers drawing is described below. According to the settings in the YZ projection the stationing along design the member is calculated for tendon spacers with spacing of 200 mm from the bottom edge, in the XZ projection the stationing along the design member is calculated for tendon spacers of height 100 mm and 300 mm from the bottom edge.
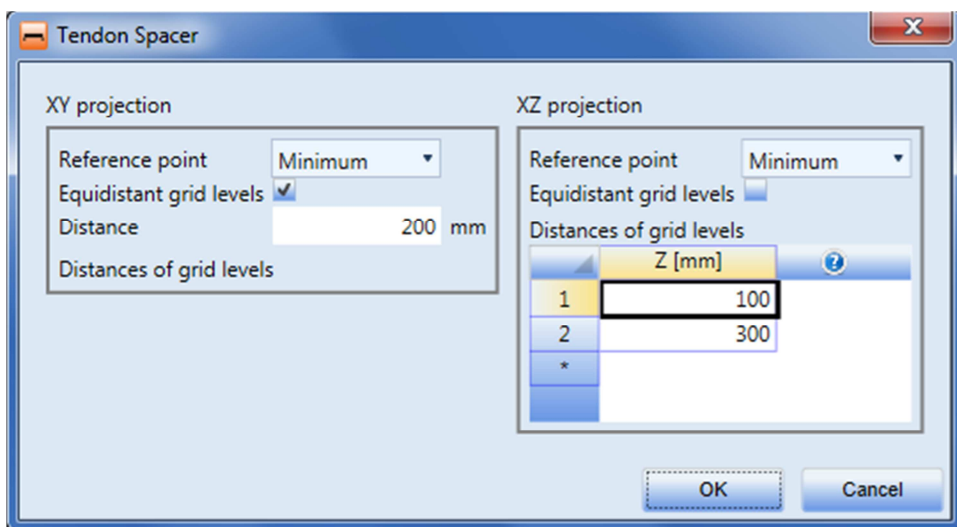

Tendon spacer settings

Click **To DXF** in the context menu to start the export.
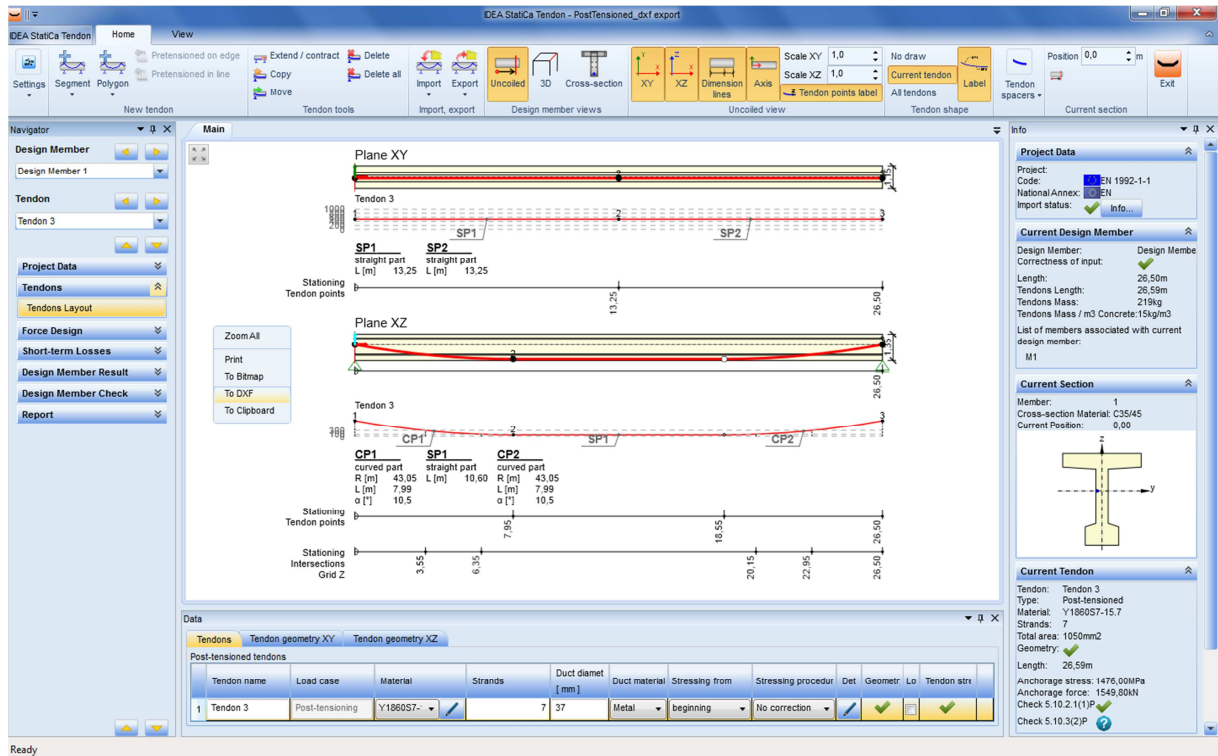
Context menu of the Main window

Dialog **Save the DXF file** appears. The different scale, unit of output and layers generation mode can be set. Also request to fill regions and export dimensions can be set.

In this example keep default settings except layers. Set the layers to be generated **By line type**.
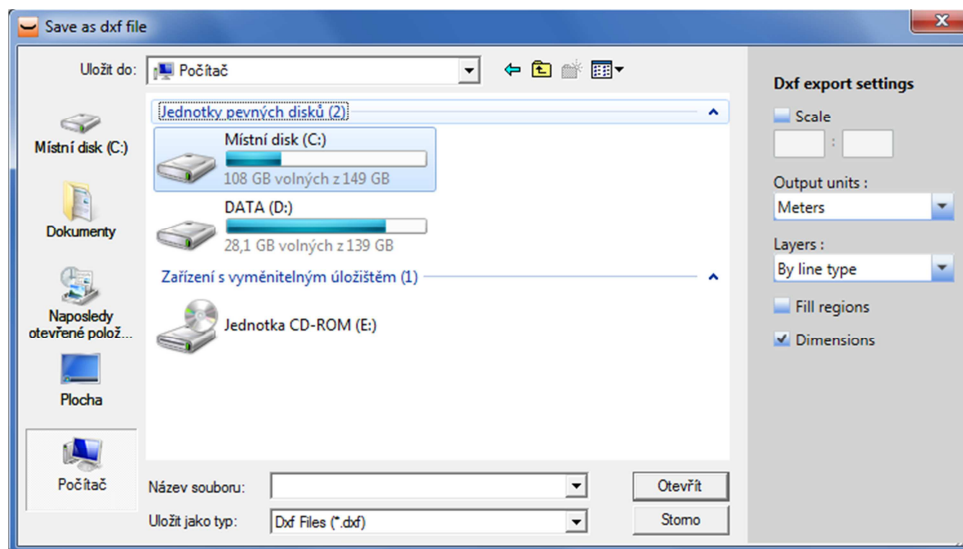
Save as DXF dialog with DXF export settings
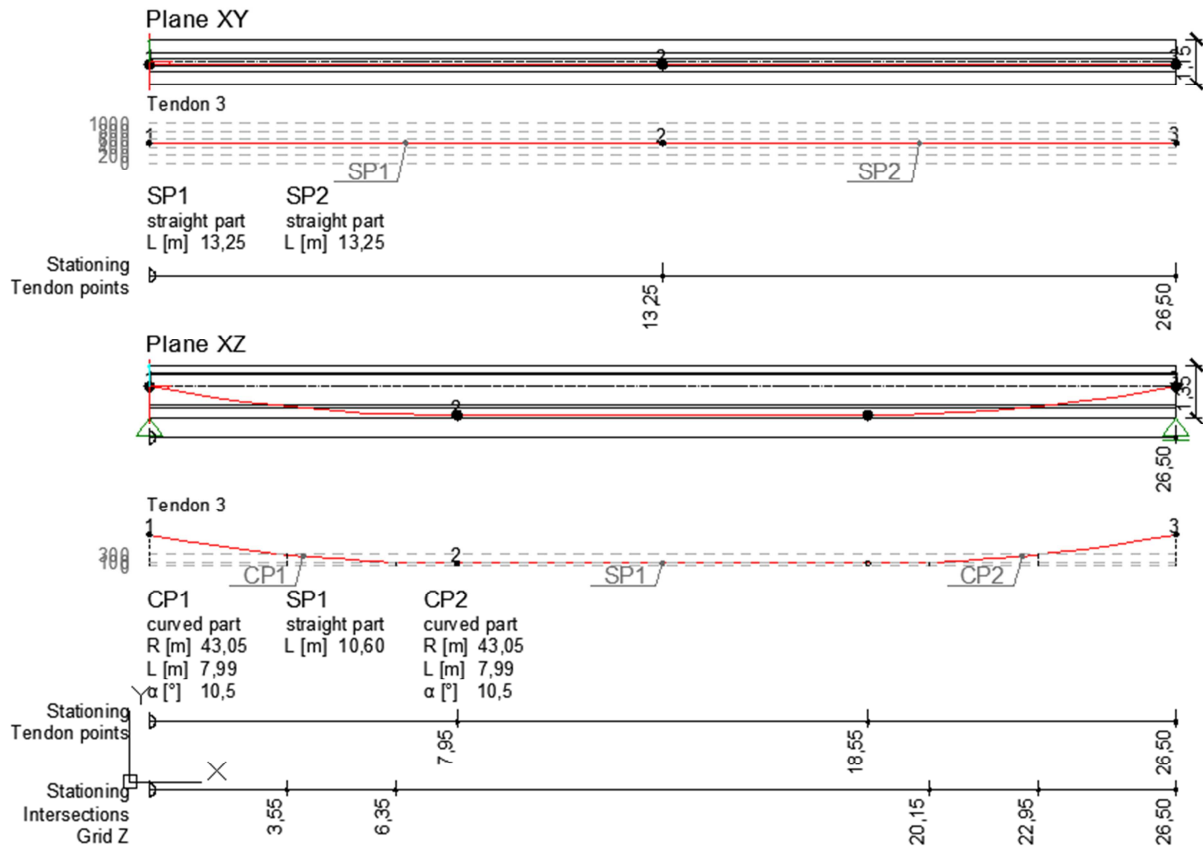
Content of exported DXF file

All text are placed to layer 0 in the exported file. Other lines are sorted to the layers according their line types - see the picture of layers from AutoCAD below.

All entities are exported in one block. The block can be exploded to enable the modifications.
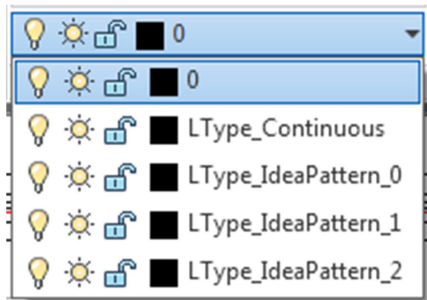
Drawing layers in AutoCAD

3.2. Export to TXT

All tendon properties including the geometry are exported when performing export to TXT file. To start the export to TXT file click **Export > Current tendon** or **Export > All tendons** in ribbon group **Import, export**. A file with the extension '*.NAV' is created, which has a special XML format.
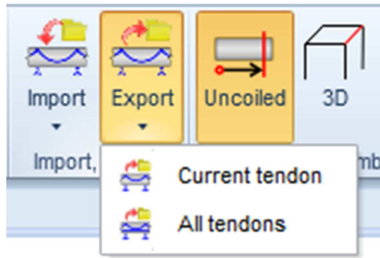
Export to TXT file

4. Literature and links

1.   IDEA StatiCa Tendon, *IDEA Tendon 4, User guide*, IDEA RS s.r.o., U Vodarny 2a, 616 00 BRNO, www.idea-rs.com