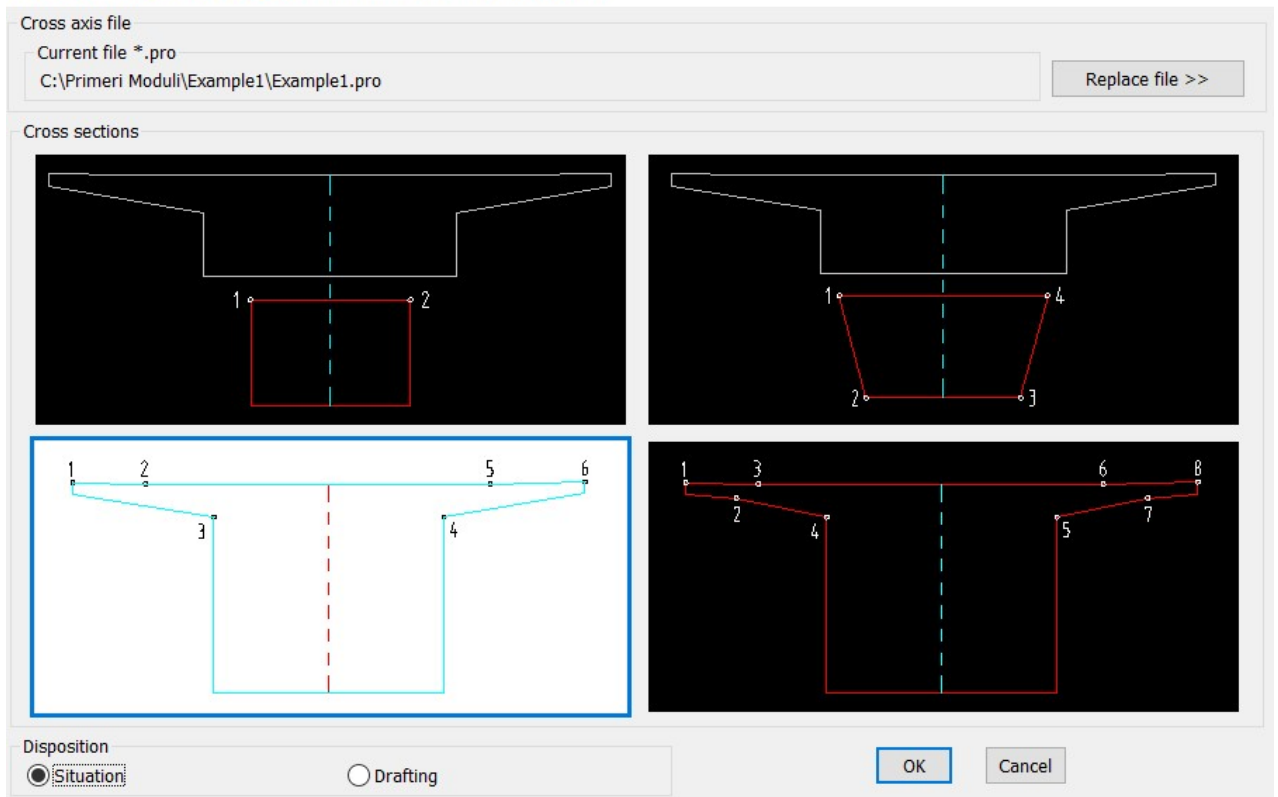# Module BRIDGE

3D CONSTRUCTION

1. Define file of monolith sections widths in ground floor   creating file **Example1.smk**
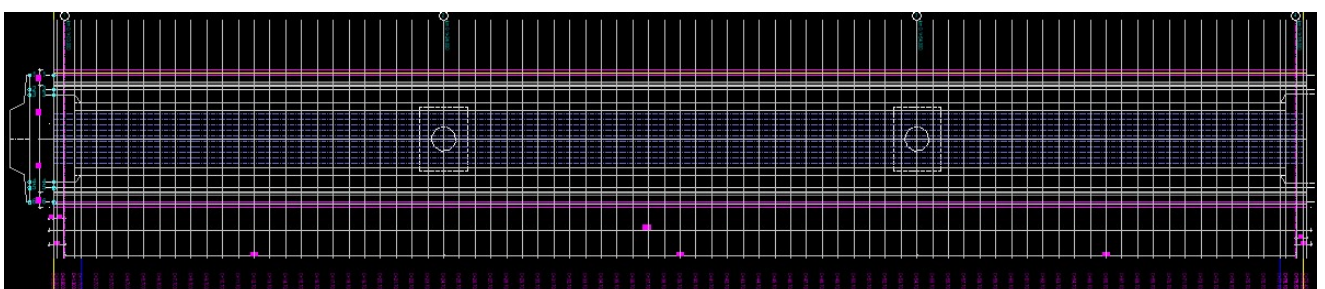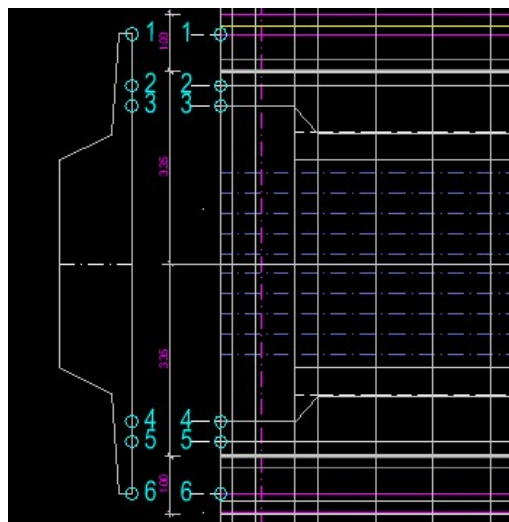
    While roadway has widening we define widths from situation.

Polylines 1 to 6 must be drawn from left to right (in station direction)!

2. Define file of monolith sections heights in longitudinal section   creating file **Example1.vmk**
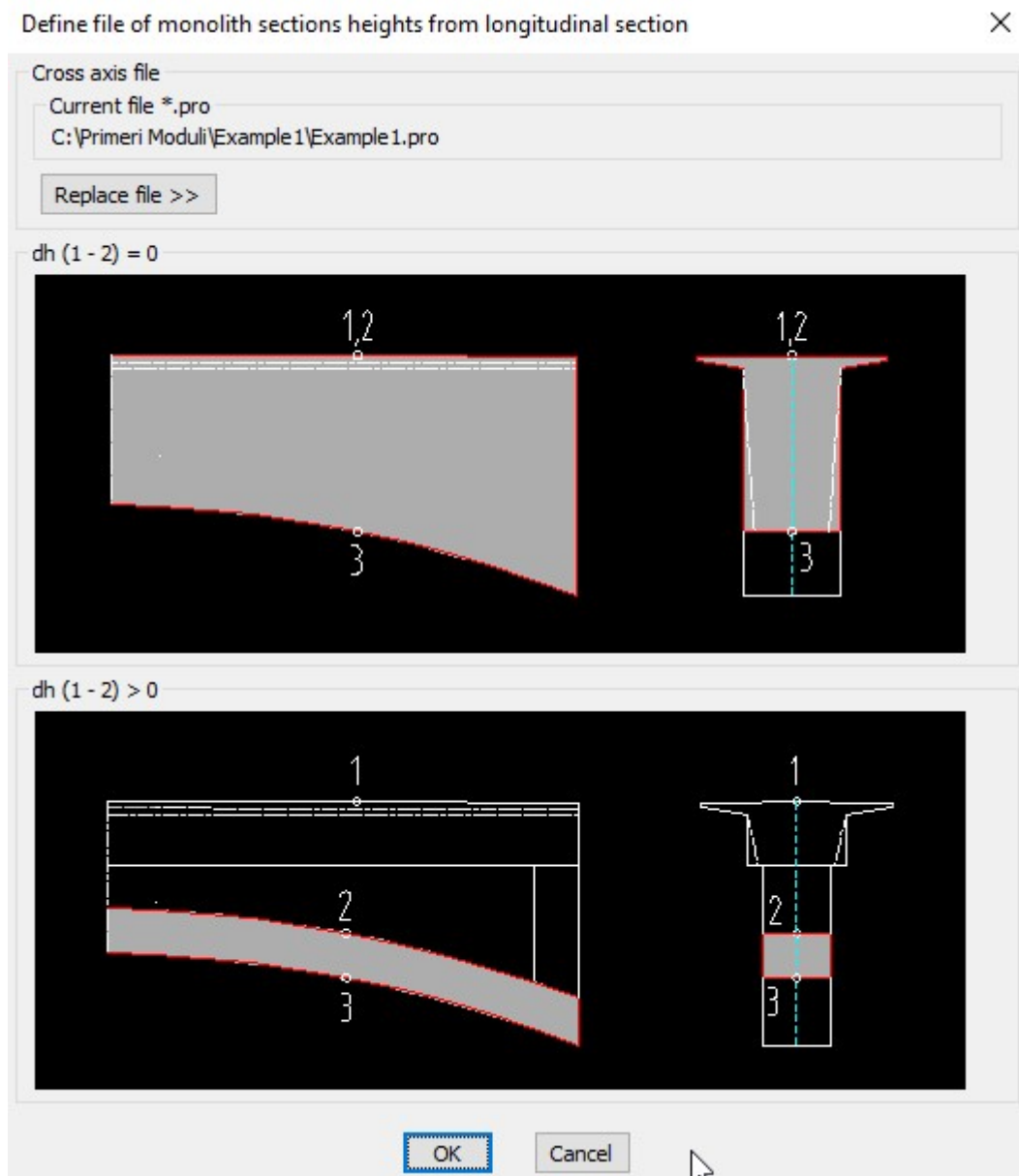
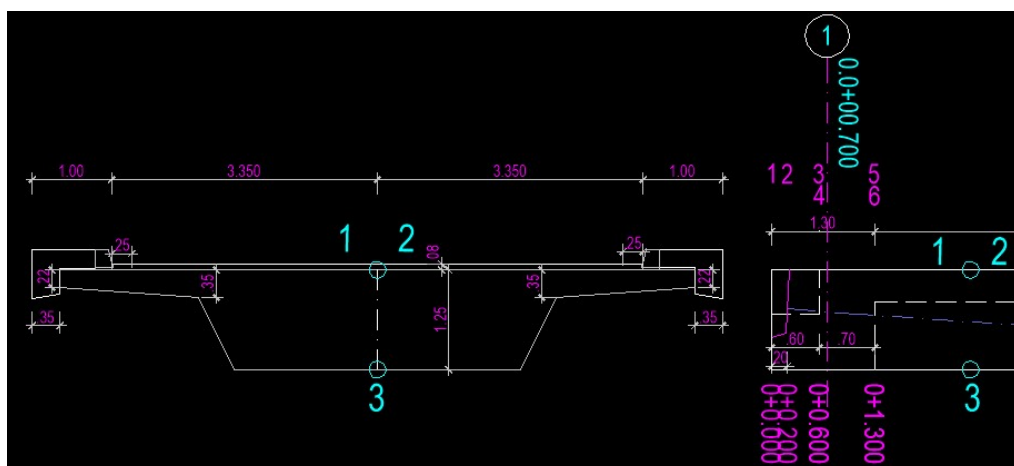**Polylines 1 to 3 must be drawn from left to right (in station direction)!** Recommendet is drawing in **horizontal** direction, which will be used as template for pressstressed cable lines drawing in longitudinal profile.
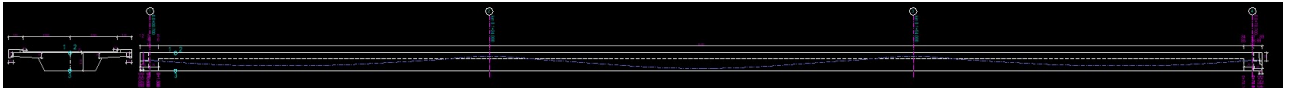
3. Draw 3D cross sections and model of deck construction
Drawing cross axis in longitudinal section
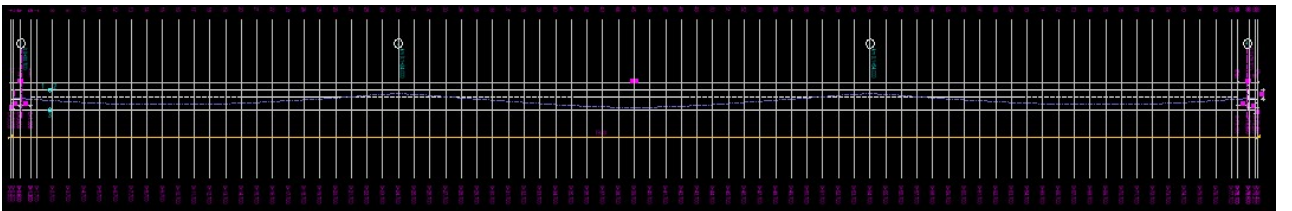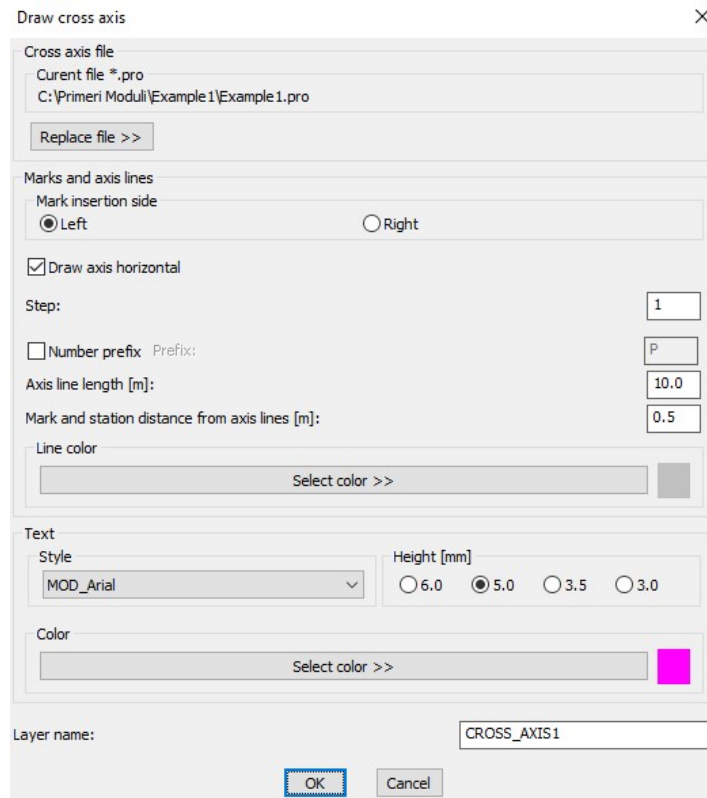
3d drawing will be performed per segments according to cross section type: sections from 1 - 3 and 87-89, sections 4-5 and 85-86, and sections 6-84.

3.1 Draw in WCS coordinate system:

According to upper drawing we insert dates per particular sections.
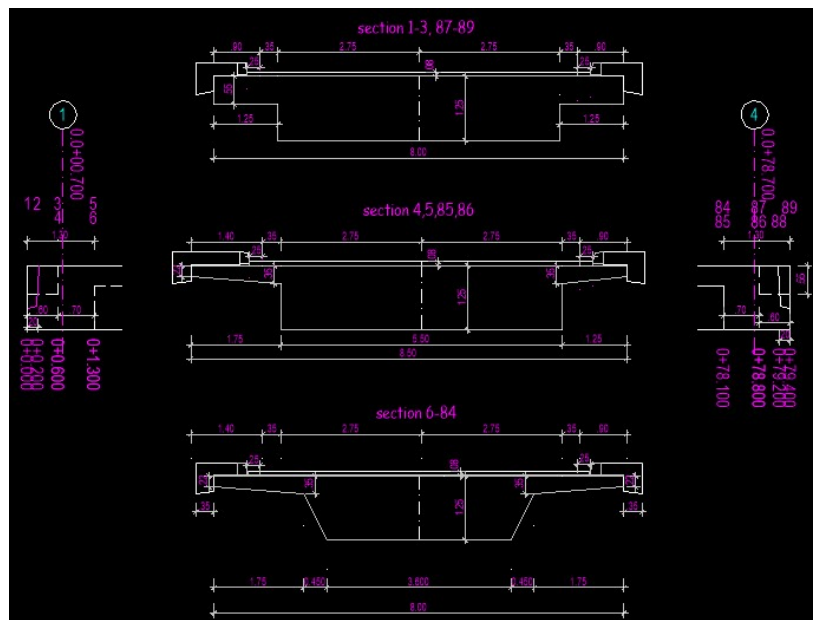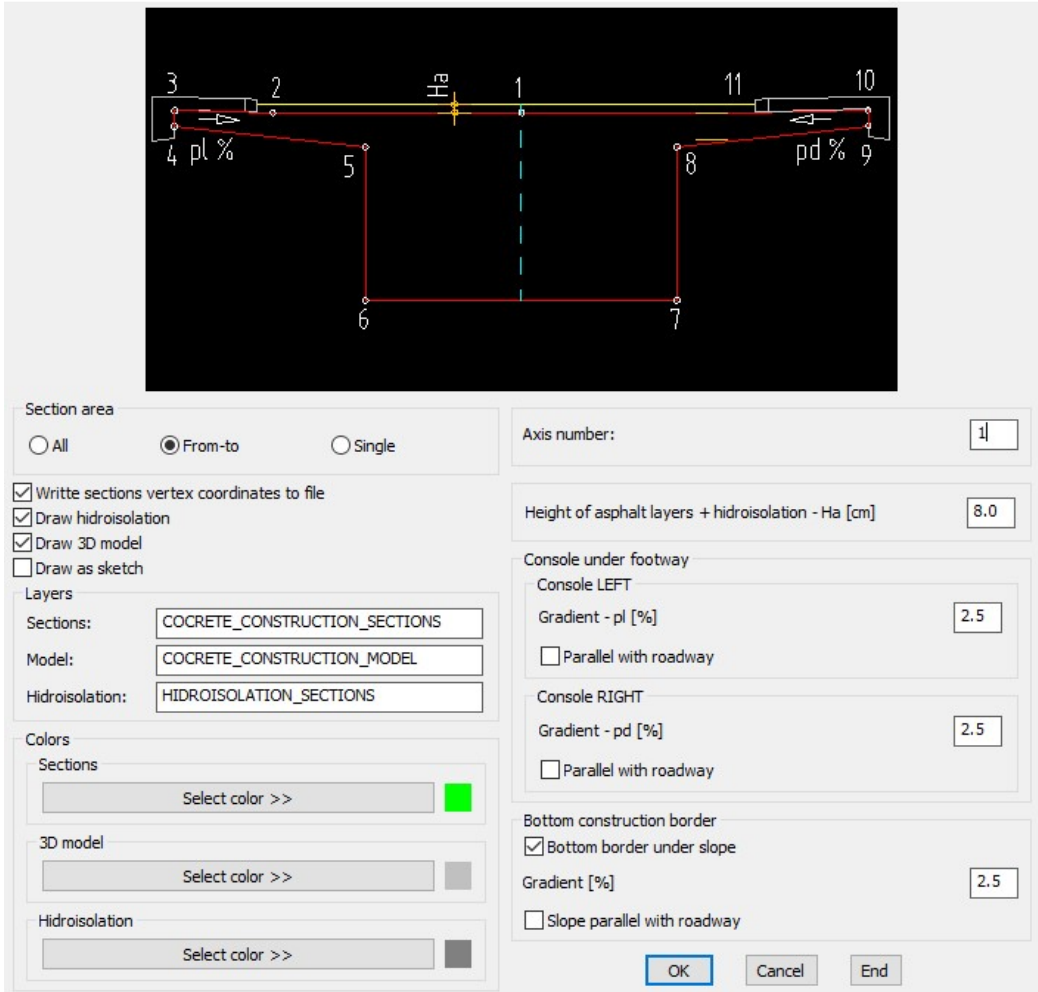At the same time are creating files of setting out points in sections **Example1_1.m3d, Example1_2.m3d and Example1_3.m3d** and files of console cross sections **Example1_1.ppk, Example1_2.ppk** and **Example1_3.ppk.**
Polyline (points 1 to 11) must be drawn in contraclockwise and closed (see picture on side 13)!

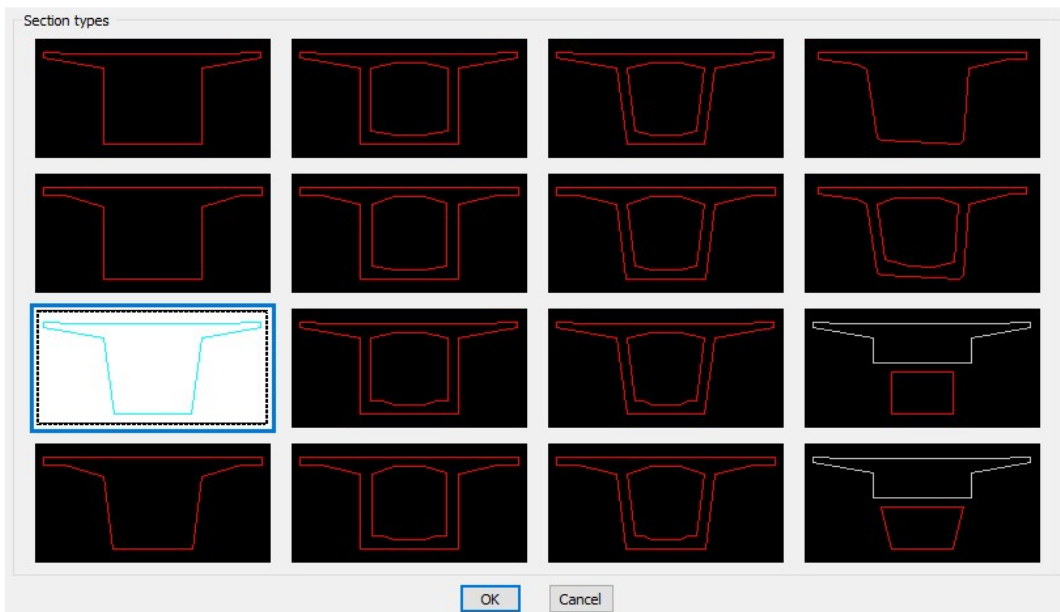### 3.1.1 Drawing from section 1 to 3 and 87 to 89

Draw 3D cross sections and model of monolite deck construction

Section area
○ All ◉ From-to ○ Single

Axis number: 1

☑ Writte sections vertex coordinates to file
☑ Draw hidroisolation
☑ Draw 3D model
☐ Draw as sketch

Height of asphalt layers + hidroisolation - Ha [cm] 8.0

Layers
Sections: COCRETE_CONSTRUCTION_SECTIONS
Model: COCRETE_CONSTRUCTION_MODEL
Hidroisolation: HIDROISOLATION_SECTIONS

Console under footway

Console LEFT
Gradient - pl [%] 2.5
☐ Parallel with roadway

Console RIGHT
Gradient - pd [%] 2.5
☐ Parallel with roadway

Colors

Sections
Select color >>

3D model
Select color >>

Hidroisolation
Select color >>

Bottom construction border
☑ Bottom border under slope
Gradient [%] 2.5
☐ Slope parallel with roadway

OK   Cancel   End

3.1.2 Drawing from section 4 to 5 and 85 to 86 – equal as 3.1.1

3.1.3 Drawing from section 6 to 84

Draw 3D cross sections and model of deck construction

Section types

OK   Cancel

Files

3d roadway level file

Current file *.o3d

C:\Primeri Moduli\Example1\Example1.o3d
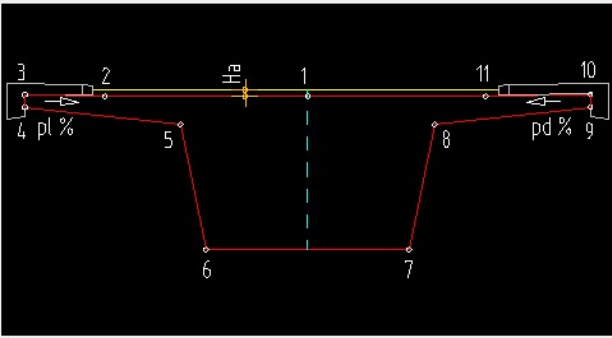
Replace file >>

Roadway file

Current file *.voz

C:\Primeri Moduli\Example1\Example1.voz

Replace file >>

Monolith construction sections height file

Current file *.vmk

C:\Primeri Moduli\Example1\Example1.vmk

Replace file >>

Monolith construction sections width file

Current file *.smk

C:\Primeri Moduli\Example1\Example1.smk

Replace file >>

OK   Cancel

Draw 3D cross sections and model of monolite deck construction   ✕

Section area

○ All   ● From-to   ○ Single

☑ Writte sections vertex coordinates to file
☑ Draw hidroisolation
☑ Draw 3D model
☐ Draw as sketch

Side angels of construction

● Equal   ○ Different

Layers

Sections: COCRETE_CONSTRUCTION_SECTIONS

Model: COCRETE_CONSTRUCTION_MODEL

Hidroisolation: HIDROISOLATION_SECTIONS

Colors

Sections

Select color >>

3D model

Select color >>

Hidroisolation

Select color >>

Axis number: 1

Height of asphalt layers + hidroisolation - Ha [cm]   8.0

Console under footway

Console LEFT

Gradient - pl [%]   2.5

☐ Parallel with roadway

Console RIGHT

Gradient - pd [%]   2.5

☐ Parallel with roadway

Bottom construction border

☑ Bottom border under slope

Gradient [%]   2.5

☐ Slope parallel with roadway
☐ Constant bottom border width

OK   Cancel   End

```
Selected file .o3d: C:\Primeri Moduli\Example1\Example1.o3d
Selected file .voz:C:\Primeri Moduli\Example1\Example1.voz
Selected file .vmk: C:\Primeri Moduli\Example1\Example1.vmk
Selected file .smk: C:\Primeri Moduli\Example1\Example1.smk
Checking files ... finished.
Select cross section CONTOUR:
STARTING section number <85>: 6
ENDING section number <86>: 84
```
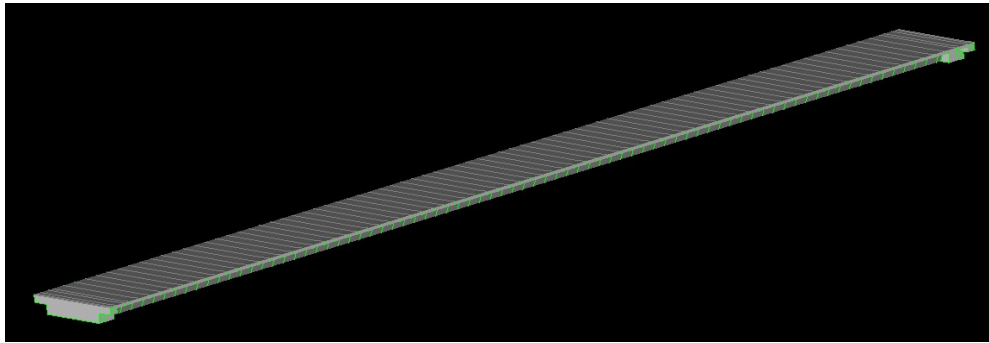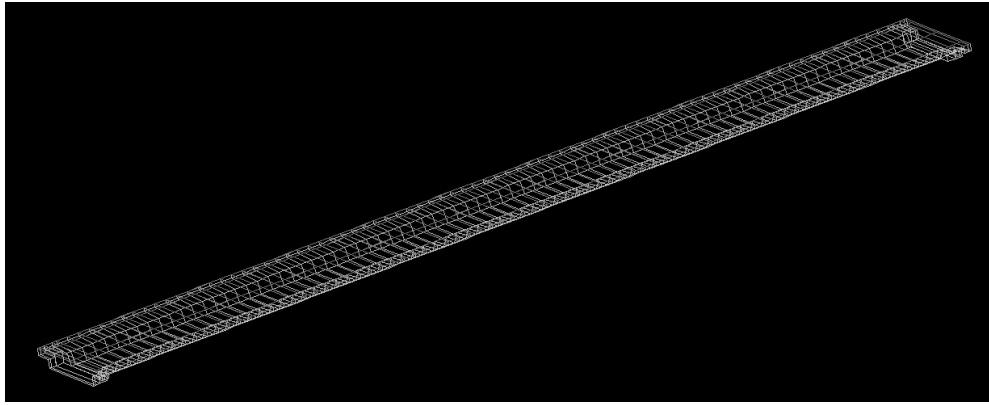
3.2 Draw as draft/sketch (horizontal) in local coordinate system

According to drawing on side 10 we insert dates for drawing per particular segments, simillar as in chapter 3.1, without drawing of model, defining axis number 2 and in name of layer adding 2.
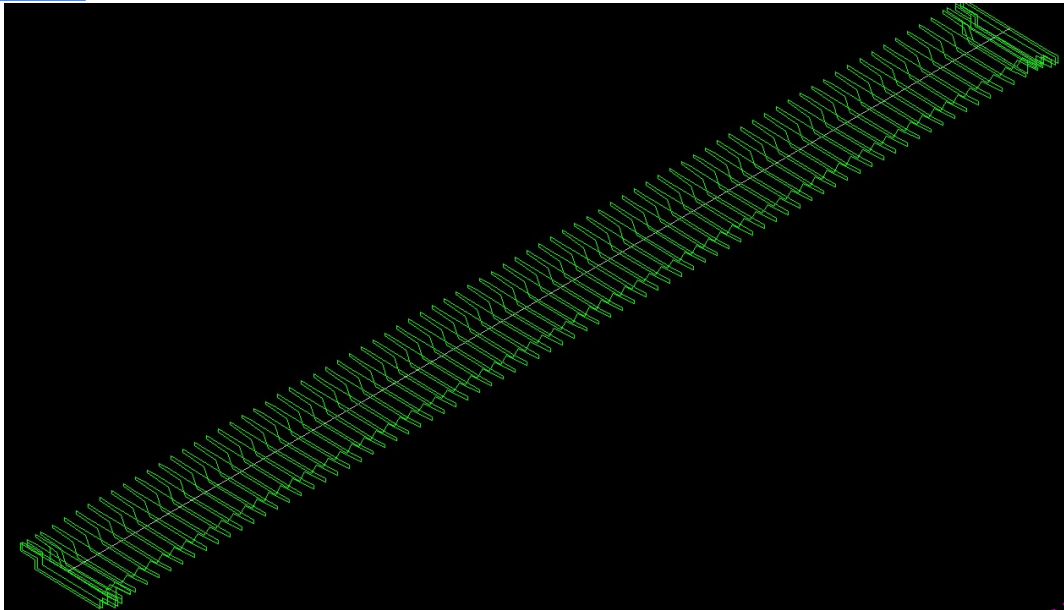At the same time files of marking points in sections **Example1_1_sketch.m3d,** **Example1_2_sketch.m3d** and **Example1_3_sketch.m3d** are creating.

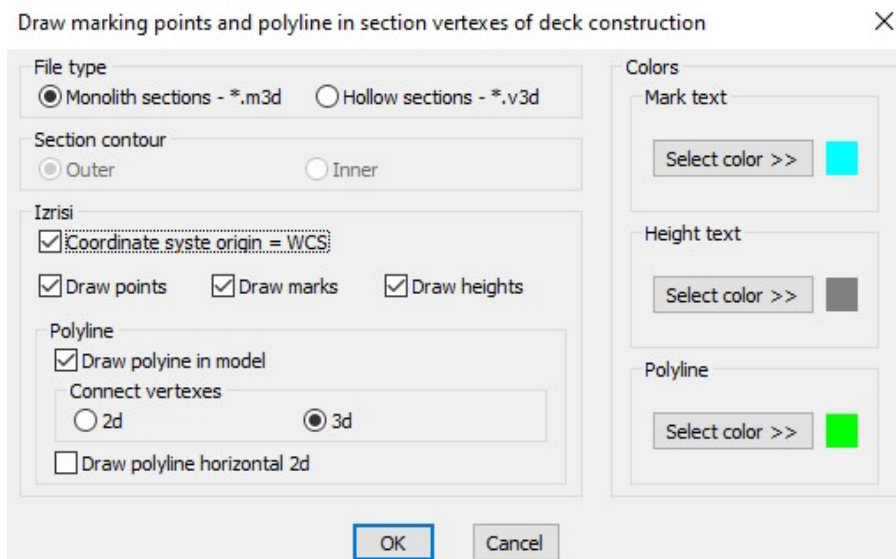Example for sections 1 - 3 and 87-89:
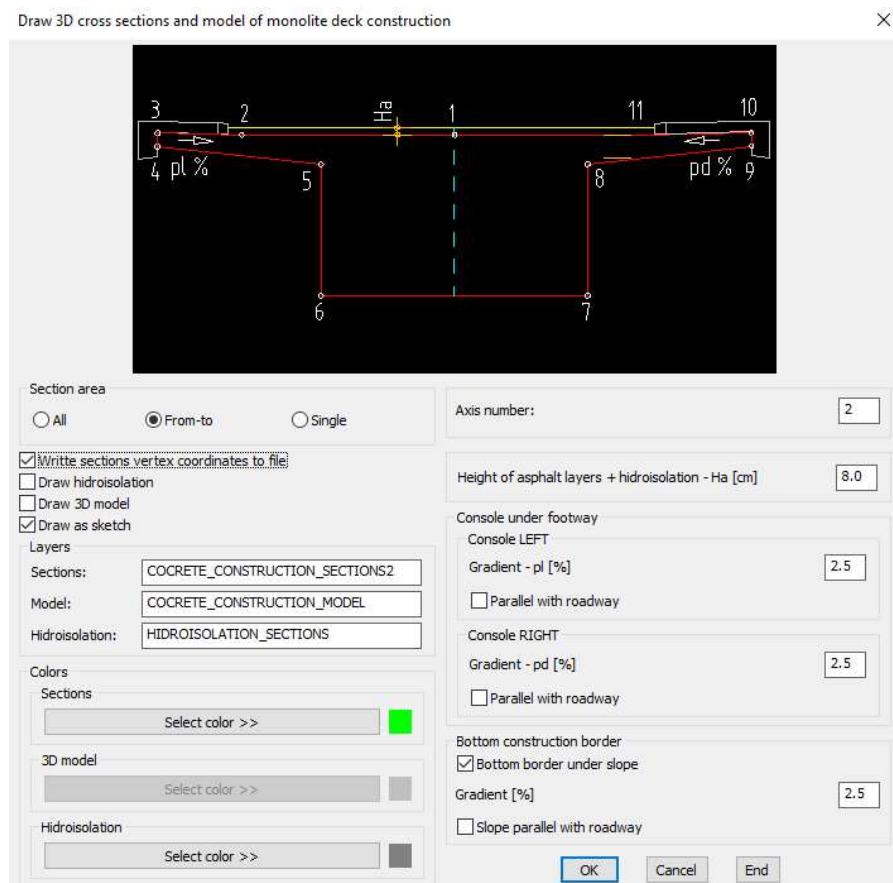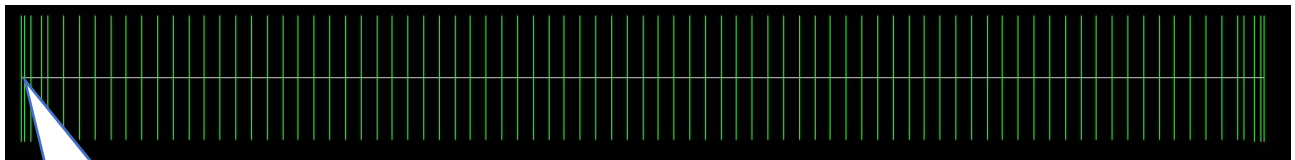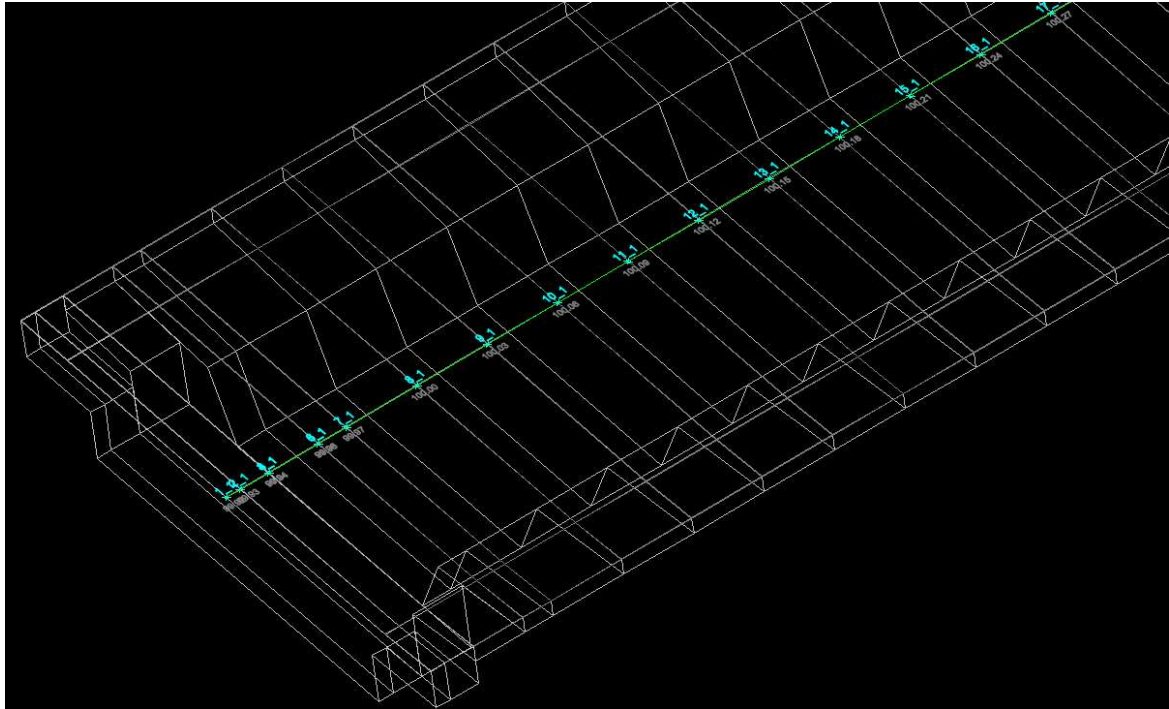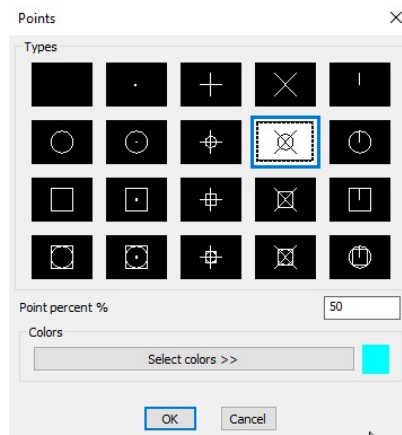
Position of 1. cross axis

4. Draw marking points and polyline in section vertexes of deck construction

4.1 Draw in WCS coordinate system

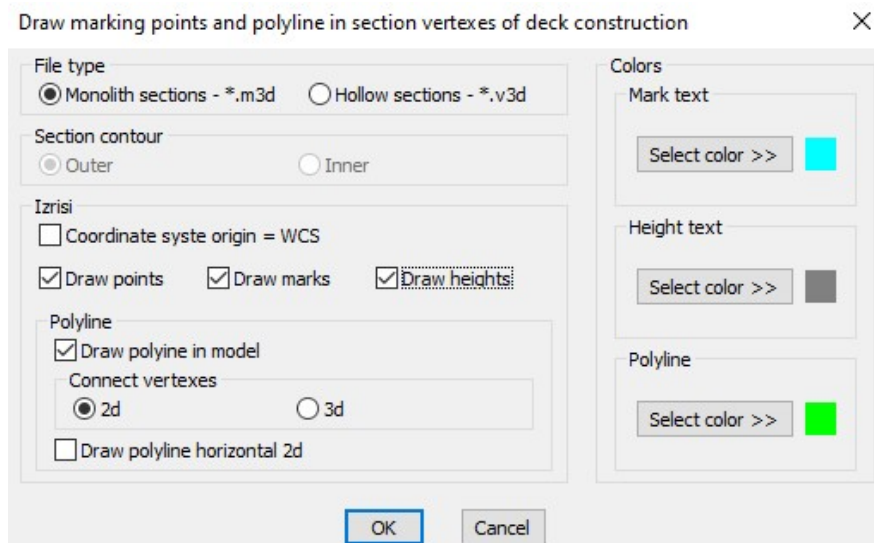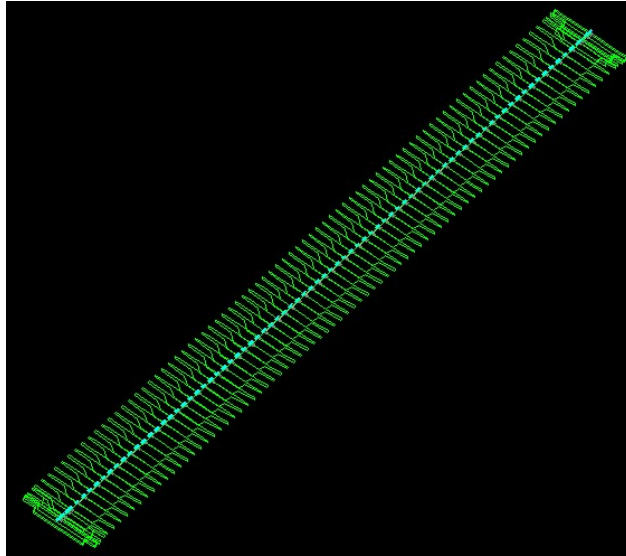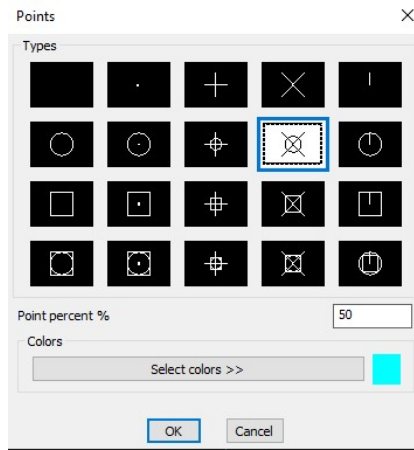From file Example1.m3d - added files Example1_1.m3d to Example1_3.m3d:

4.2 Draw in local coordinate system and in 2d:

From file Example1_sketch.m3d – added Example1_1_sketch.m3d to Example1_3_sketch.m3d

We can use drawing of longitudinal connection 2d points 1, 2, 3, 5, 6, 7, 8, 10, 11 in local coordinate system as ground floor sketch, that can be used by drawing of presstressed cable lines, especially in **examples**, **where objects are not linear, or roadways with expansions …**.
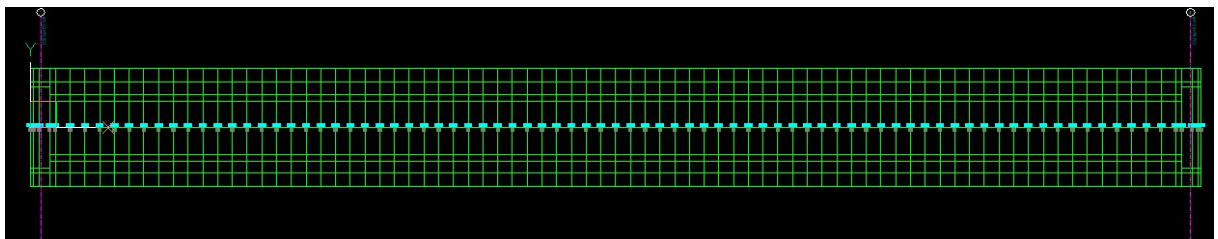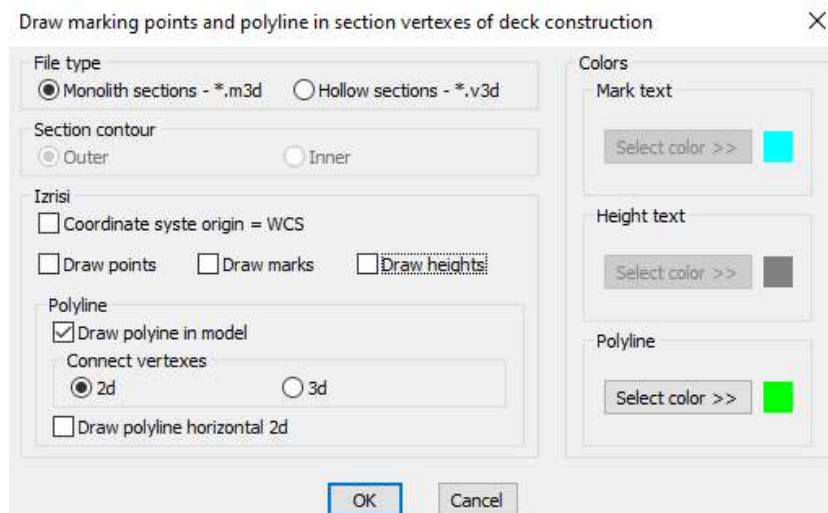
5. Draw sections vertexes marking points table of deck construction

5.1 Drawing in WCS coordinate system (from files Example1_1.m3d to Example1_3.m3d):

Draw sections vertexes marking points table of deck construction ✕

File type
● Monolith sections - *.m3d　　　　　○ Hollow sections - *.v3d

Columns

Coloumn number of marks: [1]

Coloumn number of Y-coordinates: [3]

Coloumn number of elevation marks: [5]

Colors

Title text
[　　　　　　　Select color >>　　　　　　　] ■ (magenta)

Text in rows
[　　　　　　　Select color >>　　　　　　　] ■ (cyan)

Vertical lines
[　　　　　　　Select color >>　　　　　　　] □ (white)

Horizontal lines
[　　　　　　　Select color >>　　　　　　　] ■ (gray)

[OK]　[Cancel]

Marking points			
point	Y	X	H
1_1	587789.003	140962.804	99.920
1_2	587789.003	140965.904	99.998
1_3	587789.003	140966.804	100.020
1_4	587789.003	140966.804	99.470
1_5	587789.003	140965.554	99.439
1_6	587789.003	140965.554	98.739
1_7	587789.003	140960.054	98.601
1_8	587789.003	140960.054	99.301
1_9	587789.003	140958.804	99.315
1_10	587789.003	140958.804	99.865
1_11	587789.003	140959.704	99.843
2_1	587789.203	140962.804	99.926
2_2	587789.203	140965.904	100.004
2_3	587789.203	140966.804	100.026
2_4	587789.203	140966.804	99.476
2_5	587789.203	140965.554	99.445
2_6	587789.203	140965.554	98.745
2_7	587789.203	140960.054	98.607
2_8	587789.203	140960.054	99.307
2_9	587789.203	140958.804	99.321
2_10	587789.203	140958.804	99.871
2_11	587789.203	140959.704	99.849

5.2 Drawing in local coordinate system (from files Example1_1_sketch.m3d to Example1_3_sketch.m3d):

Draw sections vertexes marking points table of deck construction ✕

File type
● Monolith sections - *.m3d　　　　　○ Hollow sections - *.v3d

Columns

Coloumn number of marks: [1]

Coloumn number of Y-coordinates: [3]

Coloumn number of elevation marks: [5]

Colors

Title text
[　　　　　　　Select color >>　　　　　　　] ■ (magenta)

Text in rows
[　　　　　　　Select color >>　　　　　　　] ■ (cyan)

Vertical lines
[　　　　　　　Select color >>　　　　　　　] □ (white)

Horizontal lines
[　　　　　　　Select color >>　　　　　　　] ■ (gray)

[OK]　[Cancel]

Marking points			
point	Y	X	H
1_1	0.000	0.000	0.000
1_2	0.000	3.100	0.078
1_3	0.000	4.000	0.100
1_4	0.000	4.000	-0.450
1_5	0.000	2.750	-0.481
1_6	0.000	2.750	-1.181
1_7	0.000	-2.750	-1.319
1_8	0.000	-2.750	-0.619
1_9	0.000	-4.000	-0.605
1_10	0.000	-4.000	-0.055
1_11	0.000	-3.100	-0.078
2_1	0.200	0.000	0.000
2_2	0.200	3.100	0.078
2_3	0.200	4.000	0.100
2_4	0.200	4.000	-0.450
2_5	0.200	2.750	-0.481
2_6	0.200	2.750	-1.181
2_7	0.200	-2.750	-1.319
2_8	0.200	-2.750	-0.619
2_9	0.200	-4.000	-0.605
2_10	0.200	000	-0.055
2_11	0.200	-3.100	-0.078

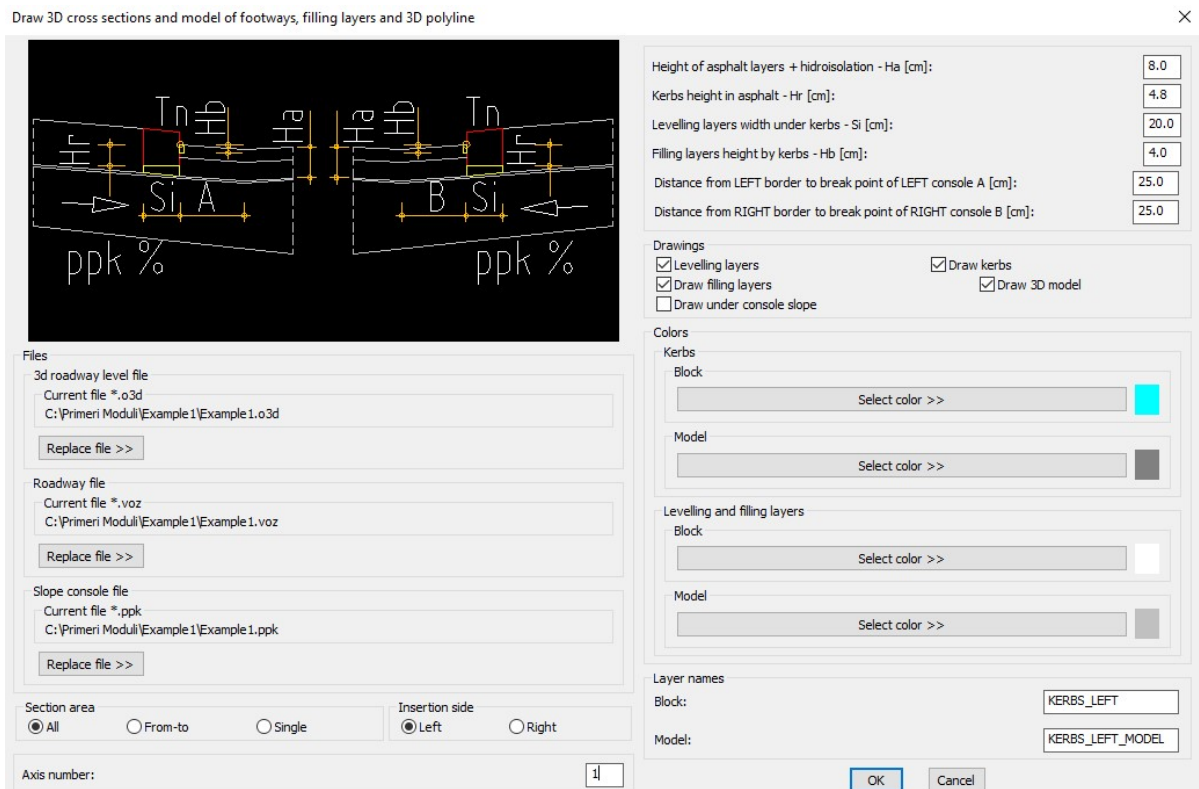6. Define file of border wreaths in ground floor   creating file **Example1.srv**
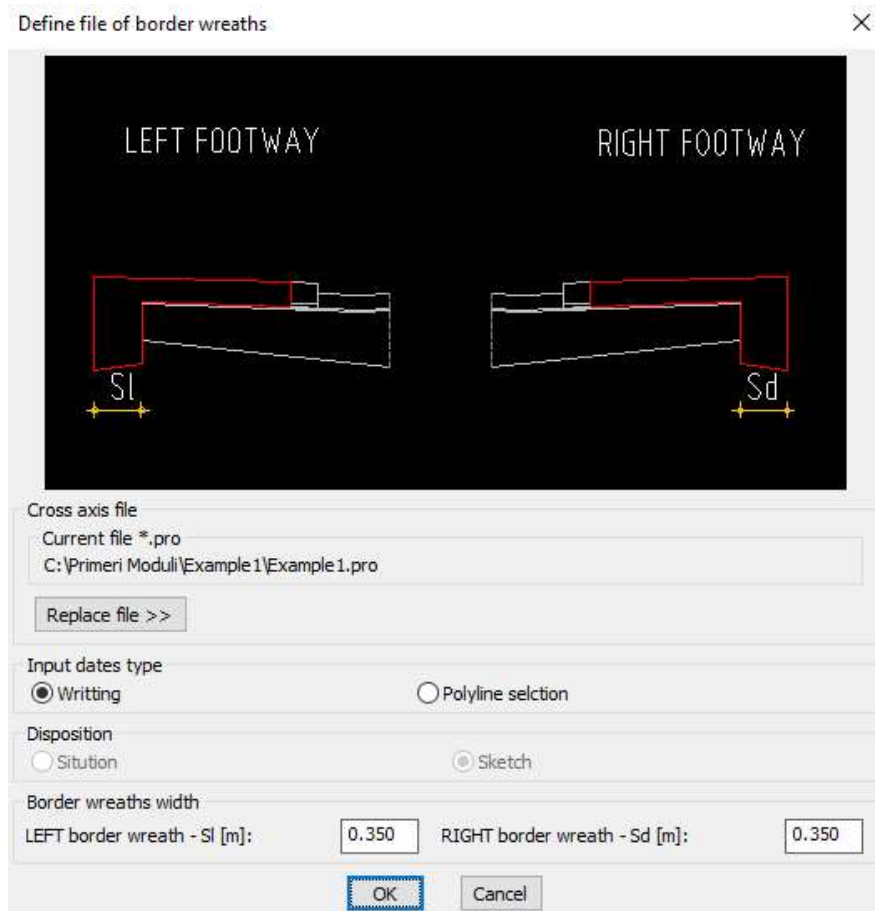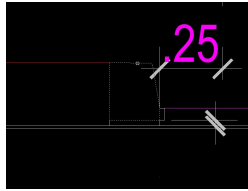

7. Draw 3D cross sections and model of kerbs, levelling layers and filling layers

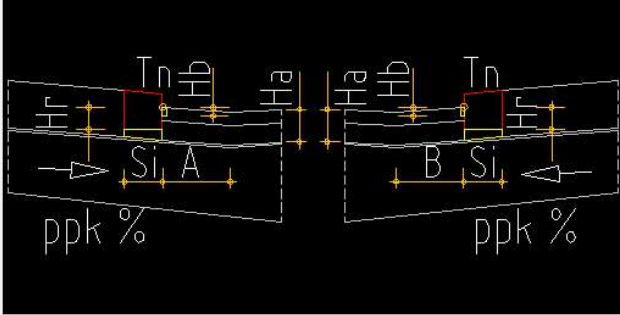   Kerb is equal on whole object, so we can create all segments at once.
   7.1 Draw on left side

7.2 Draw on right side

Draw 3D cross sections and model of footways, filling layers and 3D polyline

Height of asphalt layers + hidroisolation - Ha [cm]: `8.0`

Kerbs height in asphalt - Hr [cm]: `4.8`

Levelling layers width under kerbs - Si [cm]: `20.0`

Filling layers height by kerbs - Hb [cm]: `4.0`

Distance from LEFT border to break point of LEFT console A [cm]: `25.0`

Distance from RIGHT border to break point of RIGHT console B [cm]: `25.0`

Drawings
- ☑ Levelling layers
- ☑ Draw filling layers
- ☐ Draw under console slope
- ☑ Draw kerbs
- ☑ Draw 3D model

Colors

Kerbs

Block — Select color >>

Model — Select color >>

Levelling and filling layers

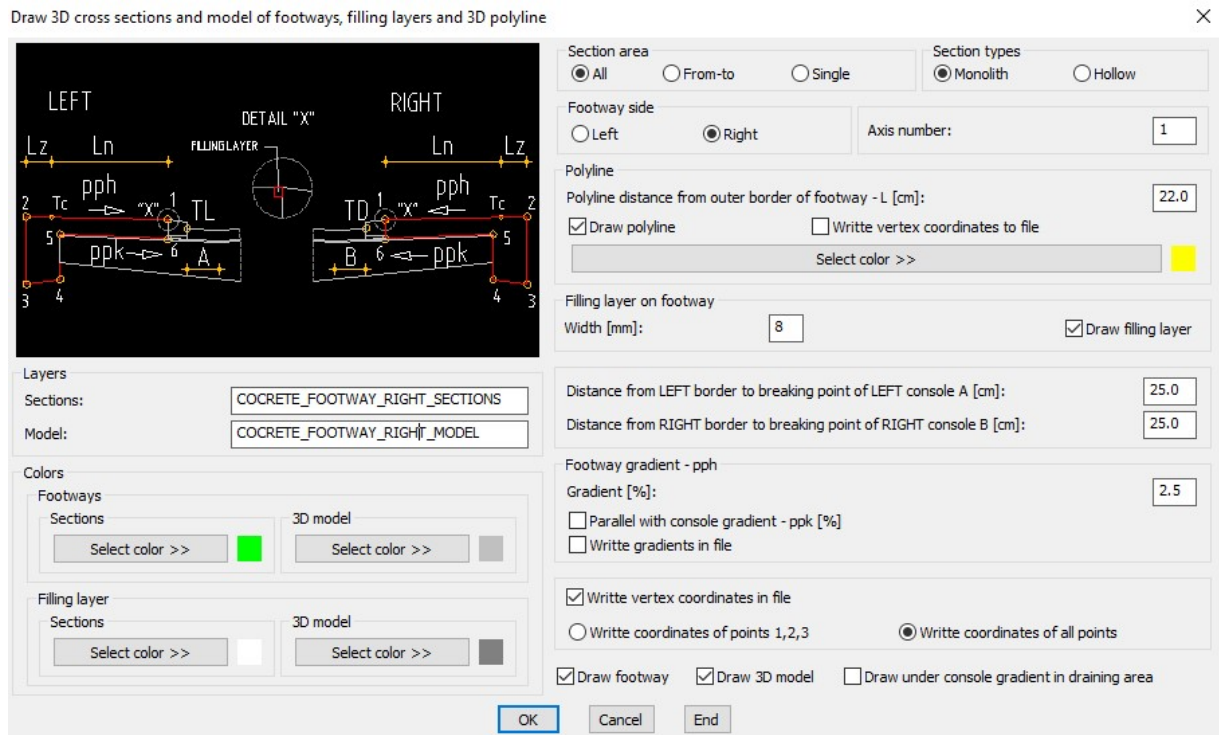Block — Select color >>

Model — Select color >>

Files

3d roadway level file

Current file *.o3d
C:\Primeri Moduli\Example1\Example1.o3d

Replace file >>

Roadway file

Current file *.voz
C:\Primeri Moduli\Example1\Example1.voz

Replace file >>

Slope console file

Current file *.ppk
C:\Primeri Moduli\Example1\Example1.ppk

Replace file >>

Section area
- ◉ All
- ○ From-to
- ○ Single

Insertion side
- ○ Left
- ◉ Right

Axis number: `1`

Layer names

Block: `KERBS_RIGHT`

Model: `KERBS_RIGHT_MODEL`

OK   Cancel
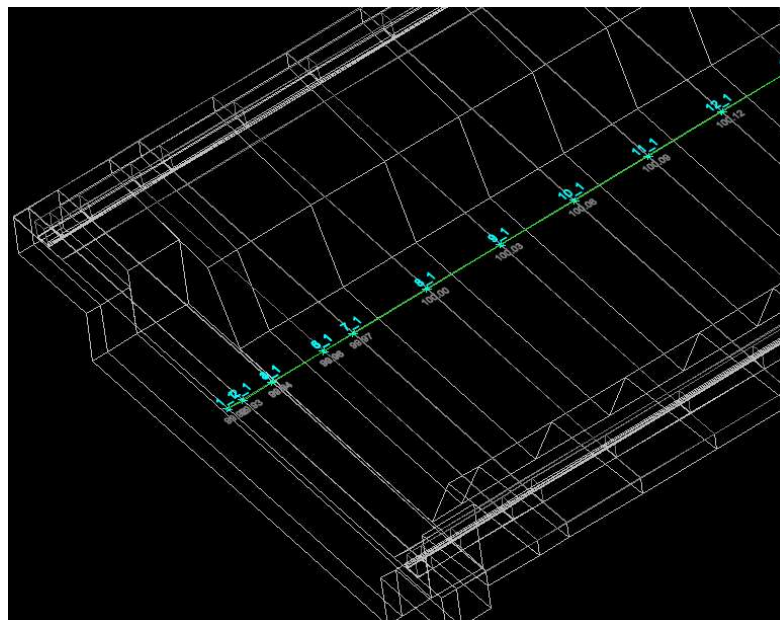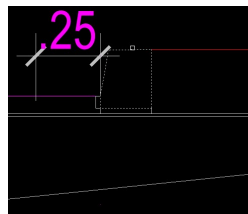
8. Draw 3D cross sections and model of footways, filling layers and 3D polyline

Footways are equall on whole object, so we can create all segments at once.
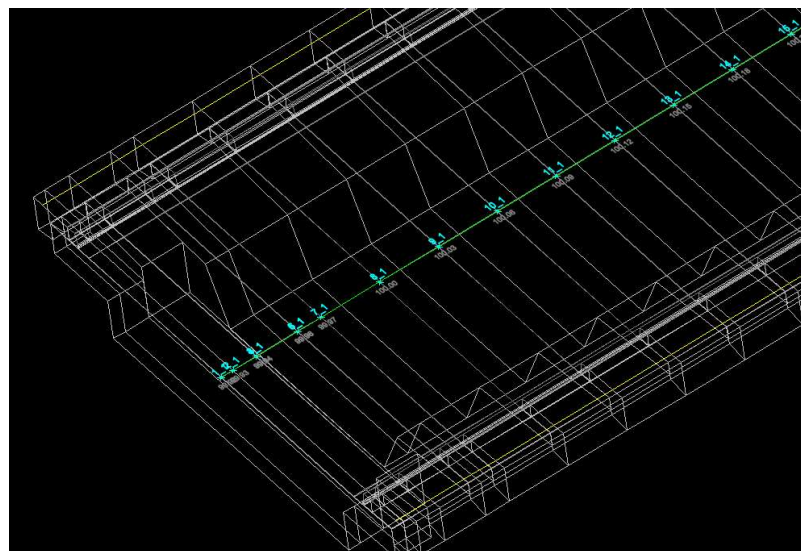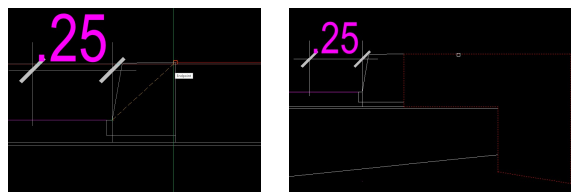
8.1 Draw on left side:

File of footways coordinate vertexes is created - **Example1_footway_left.m3d**
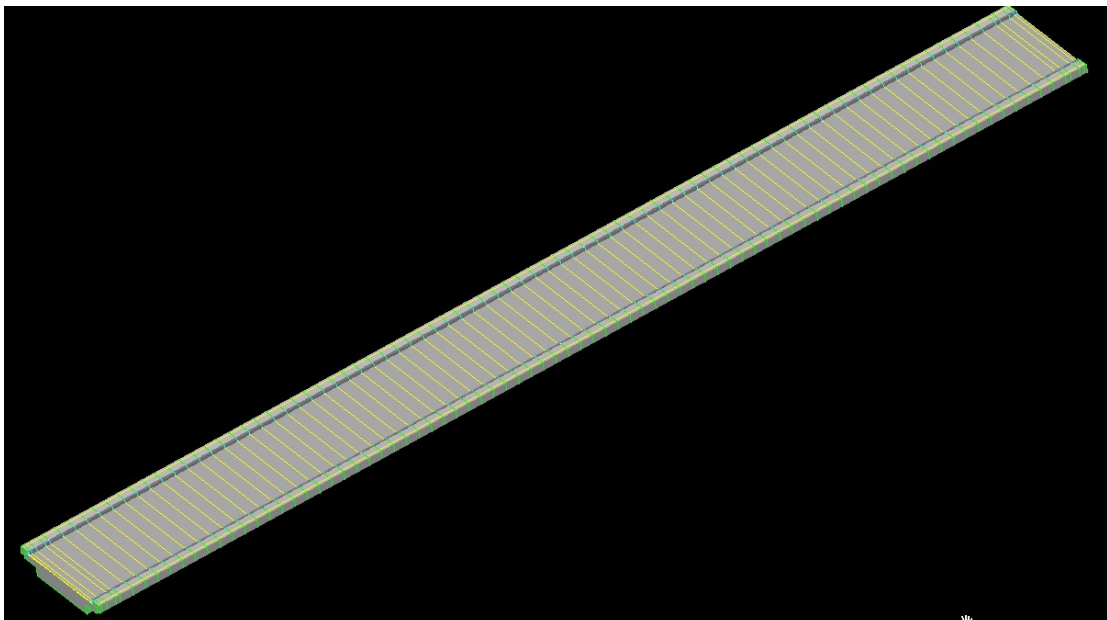
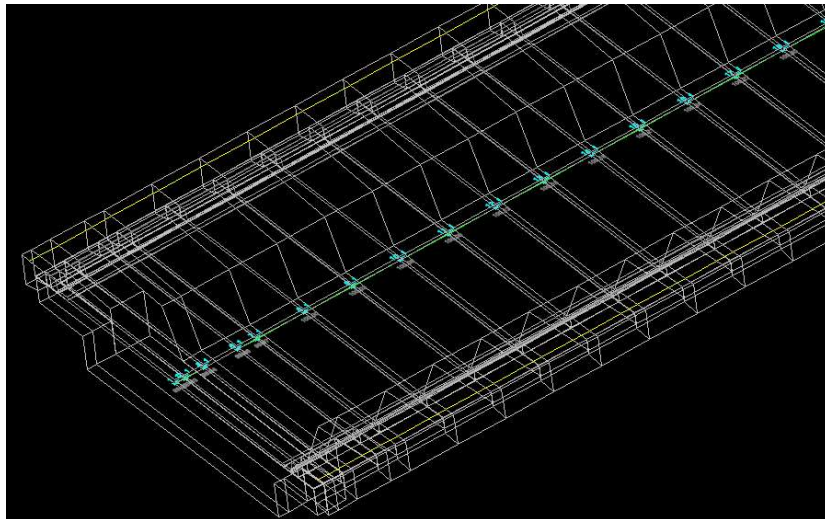

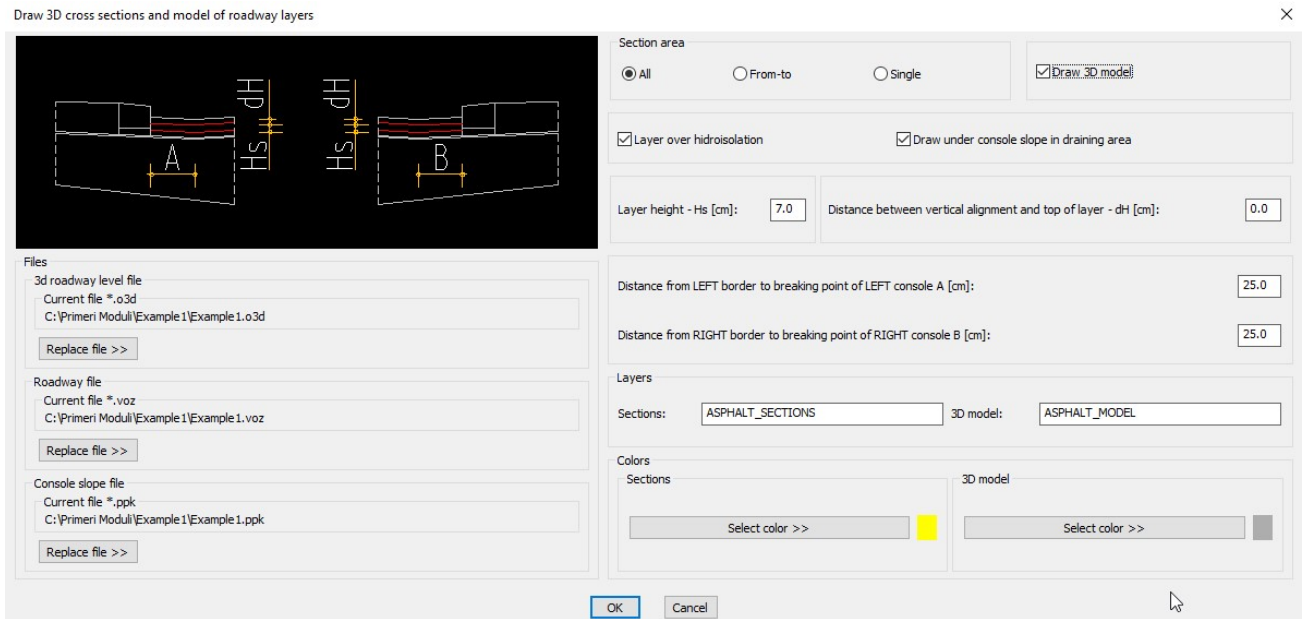8.2 Draw on right side:

File of footways coordinate vertexes is created – **Example1_footway_right.m3d**

9. Draw 3D cross sections and model of roadway layers

Layers are equall on whole object, so we can create all segments at once.

2D CONSTRUCTION

1. Draw 2D cross sections of deck construction

2. Insert blocks in 2D cross sections of deck construction

2.1 Insert hidroisolation
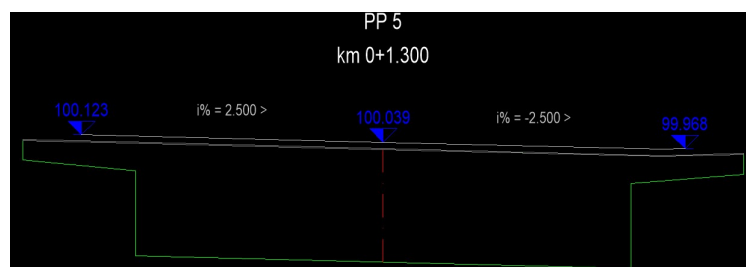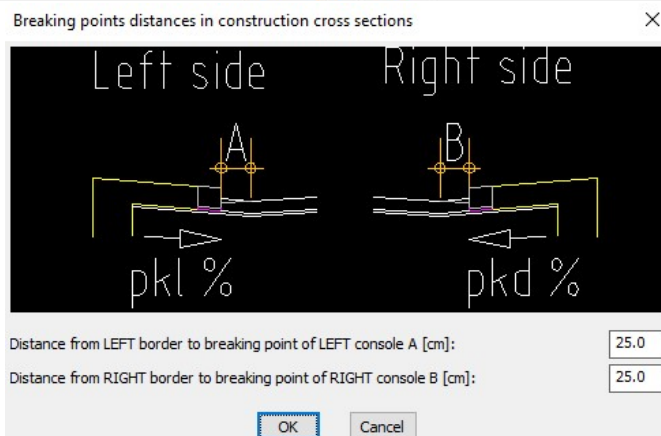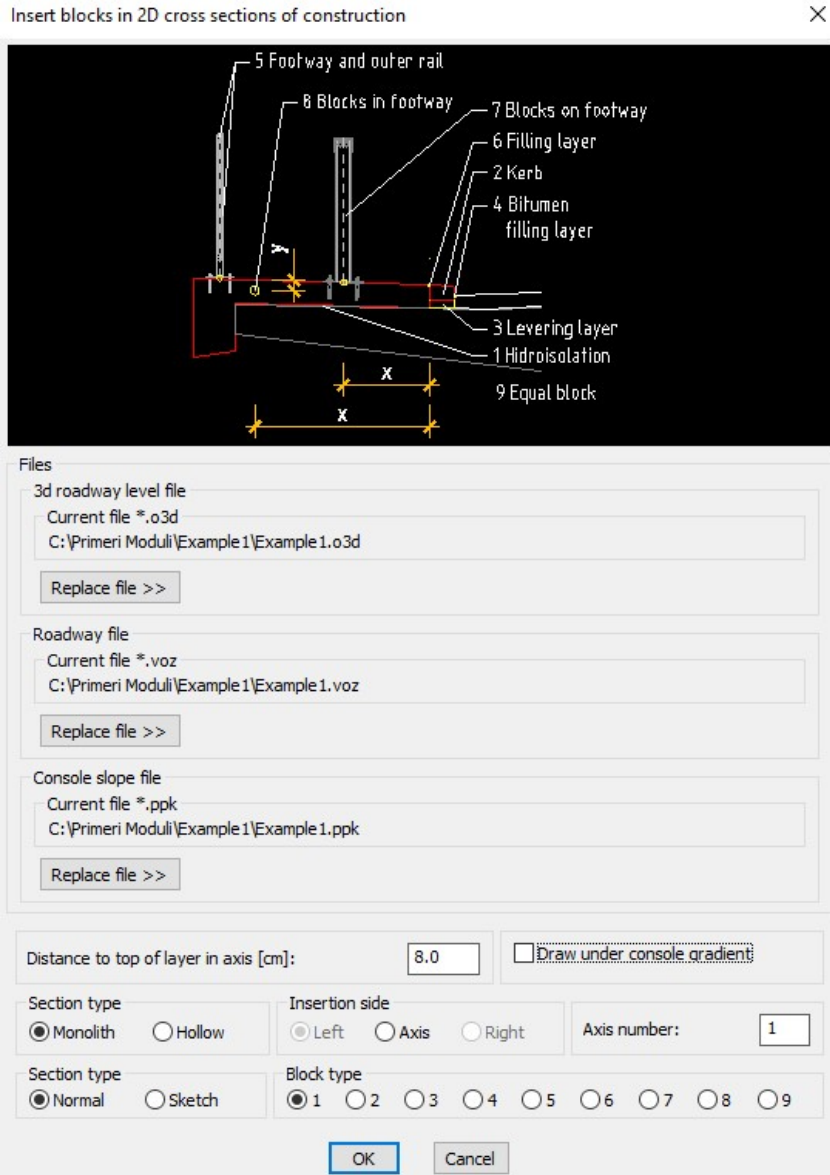
2.2 Insert equal block – first on left side and then on the right side.
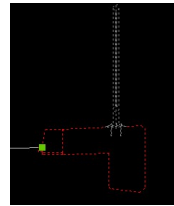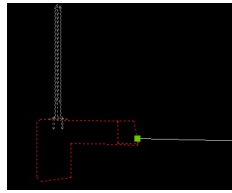
Insert blocks in 2D cross sections of construction
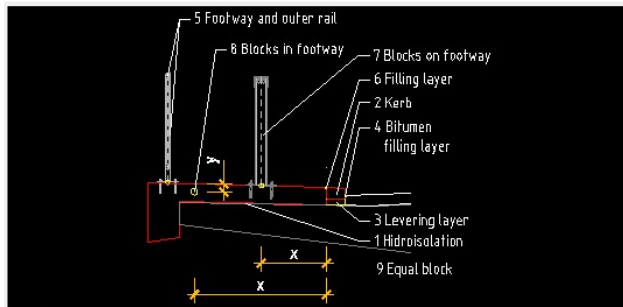
Files

3d roadway level file
Current file *.o3d
C:\Primeri Moduli\Example1\Example1.o3d
[Replace file >>]

Roadway file
Current file *.voz
C:\Primeri Moduli\Example1\Example1.voz
[Replace file >>]

Console slope file
Current file *.ppk
C:\Primeri Moduli\Example1\Example1.ppk
[Replace file >>]

Distance to top of layer in axis [cm]: 8.0   ☐ Draw under console gradient

Section type: ◉ Monolith ○ Hollow
Insertion side: ◉ Left ○ Axis ○ Right
Axis number: 1

Section type: ◉ Normal ○ Sketch
Block type: ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ◉9

[OK] [Cancel]

Insert blocks in 2D cross sections of construction
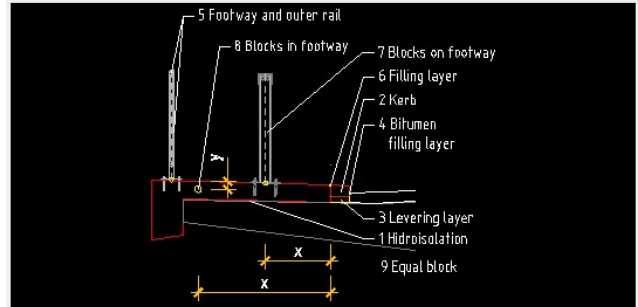
Files

3d roadway level file
Current file *.o3d
C:\Primeri Moduli\Example1\Example1.o3d
[Replace file >>]

Roadway file
Current file *.voz
C:\Primeri Moduli\Example1\Example1.voz
[Replace file >>]

Console slope file
Current file *.ppk
C:\Primeri Moduli\Example1\Example1.ppk
[Replace file >>]

Distance to top of layer in axis [cm]: 8.0   ☑ Draw under console gradient

Section type: ◉ Monolith ○ Hollow
Insertion side: ○ Left ○ Axis ◉ Right
Axis number: 1

Section type: ◉ Normal ○ Sketch
Block type: ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ◉9

[OK] [Cancel]

Breaking points distances in construction cross sections
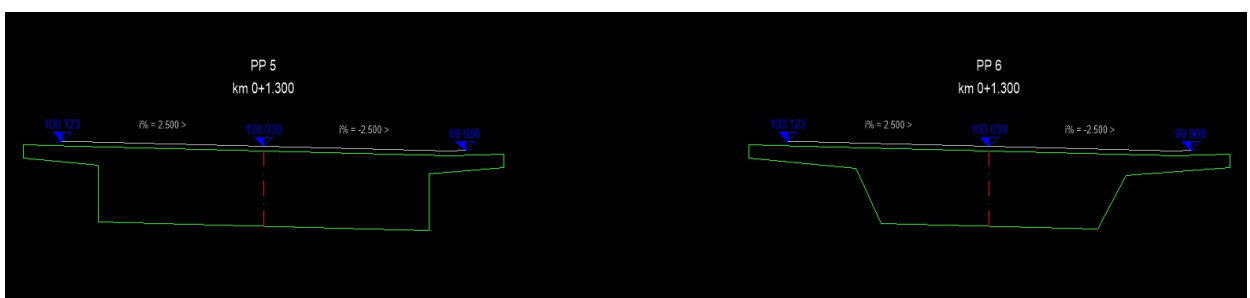

Distance from LEFT border to breaking point of LEFT console A [cm]: 25.0
Distance from RIGHT border to breaking point of RIGHT console B [cm]: 25.0

[OK] [Cancel]

PP 5
km 0+1.300
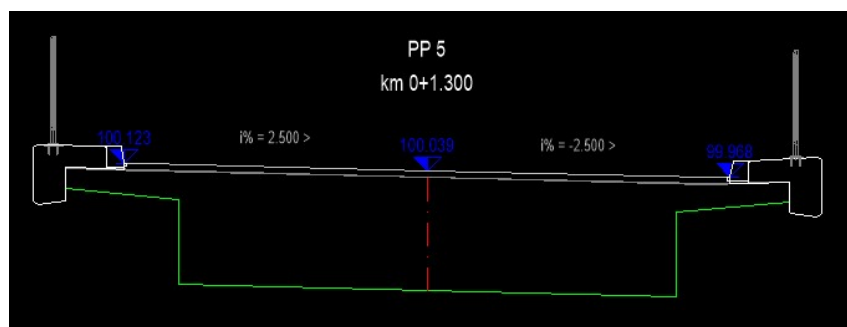
3. Draw longitudinal section in axis of monolite construction

   If we do with upper procedure, **we don't need to draw object longitudinal section in object axis**, because this command is doing that.
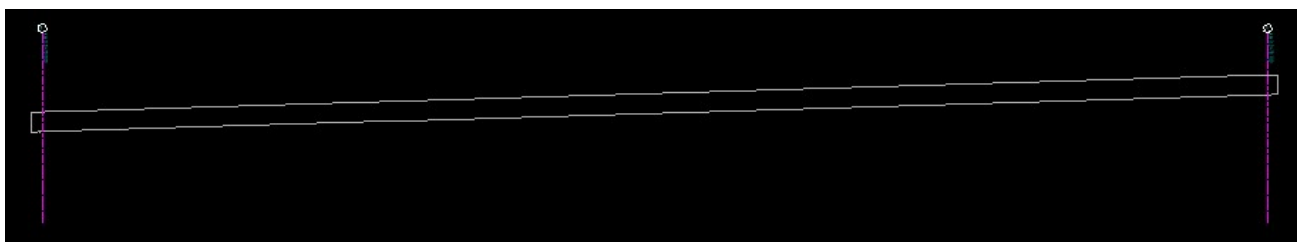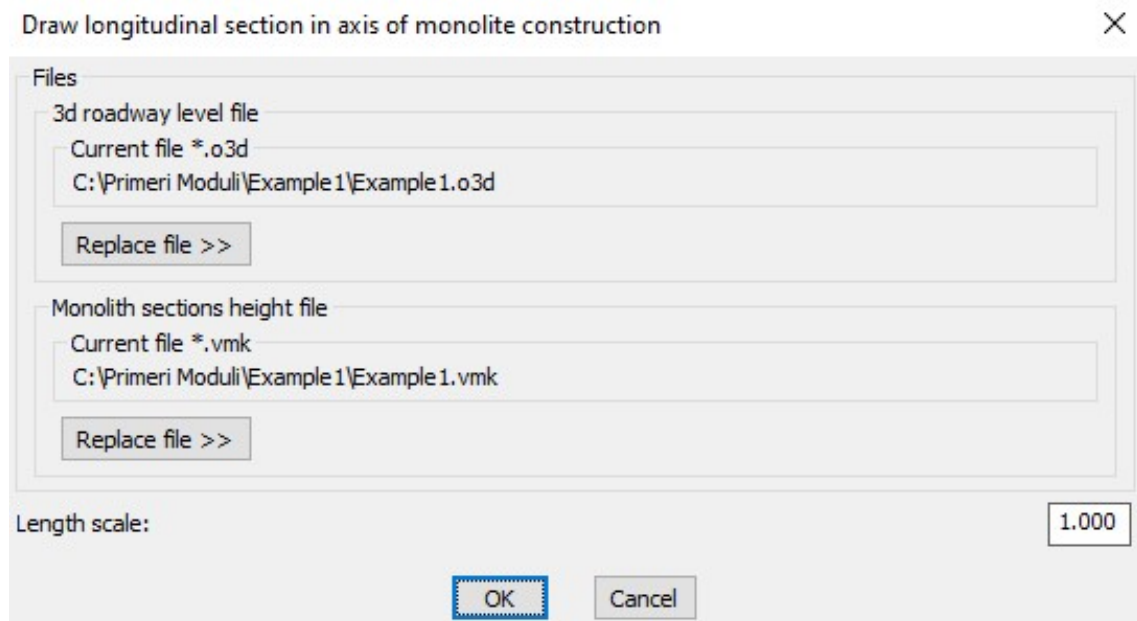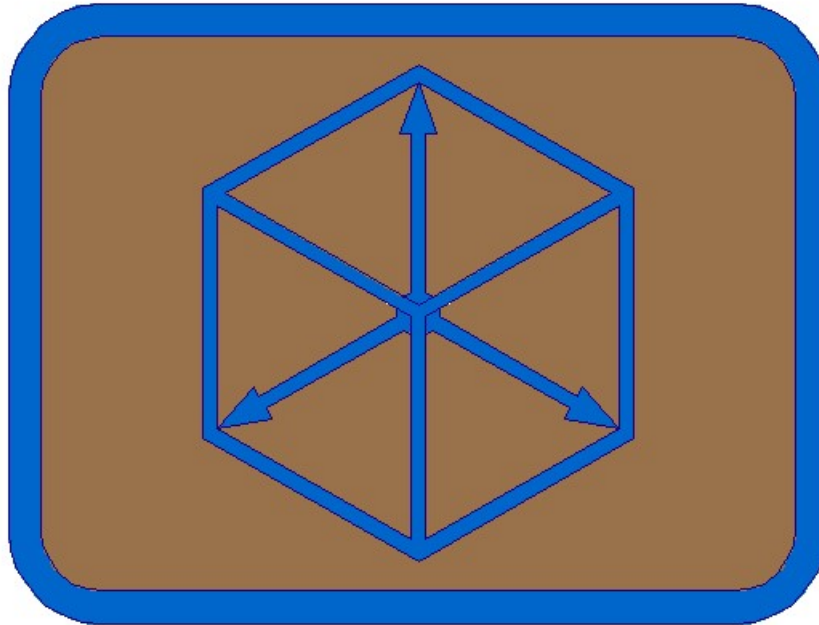
Module BRIDGE

BRIDGE FENCES

1. Draw longitudinal section from 3d polyline and calculating positions of segments

3d polyline – axis of left fence

3d polyline – axis of right fence
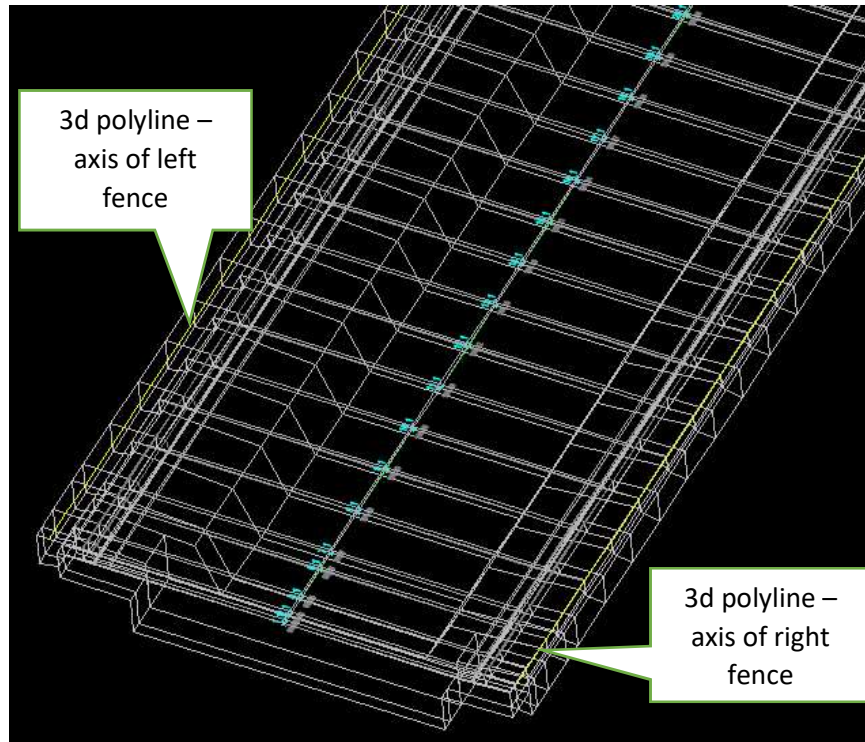
Example for left footway fence:

Calculating segments positions ✕

Segments lengths [m]:   6.00

OK   Cancel
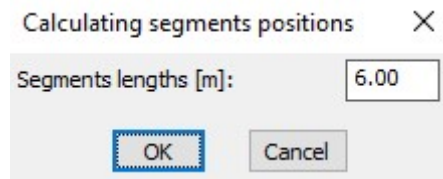
2d longitudinal profile from 3d polyline is drawing:

100.280

In command line appears claculation:

```
Select 3D polyline - rail axis:
Drawing ground floor 3d polyline projection ... finished.
Pick starting point position of rail longitudinal section:
Drawing longitudinal rail section ... finished.
Rail length = 79.400 m. Layout Left -> Right: 0.700 m + 13 x 6.000 m + 0.700 m; <- Middle ->: 0.700 m + 13 x 6.000 m + 0.700 m
```

2. Segments positioning and polyline drawing in X-direction of longitudinal section

We divide fence in 3 parts:

1. section: 0.70 + 2.00 m
2.70 m

2. section 36 x 2.00 m

72.00 m

3. section: 4.00 + 0.70 m

4.70 m
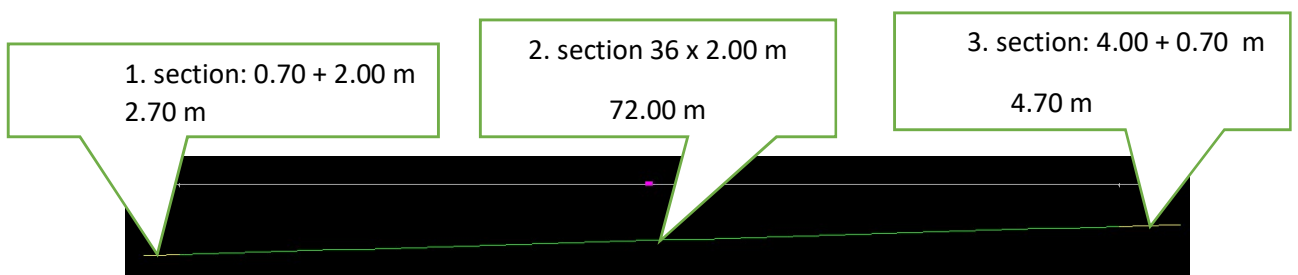
3. Longitudinal draw of pipe vertical profiles

3.1 In 1. segment we define in single option position of dilatation position to right side:
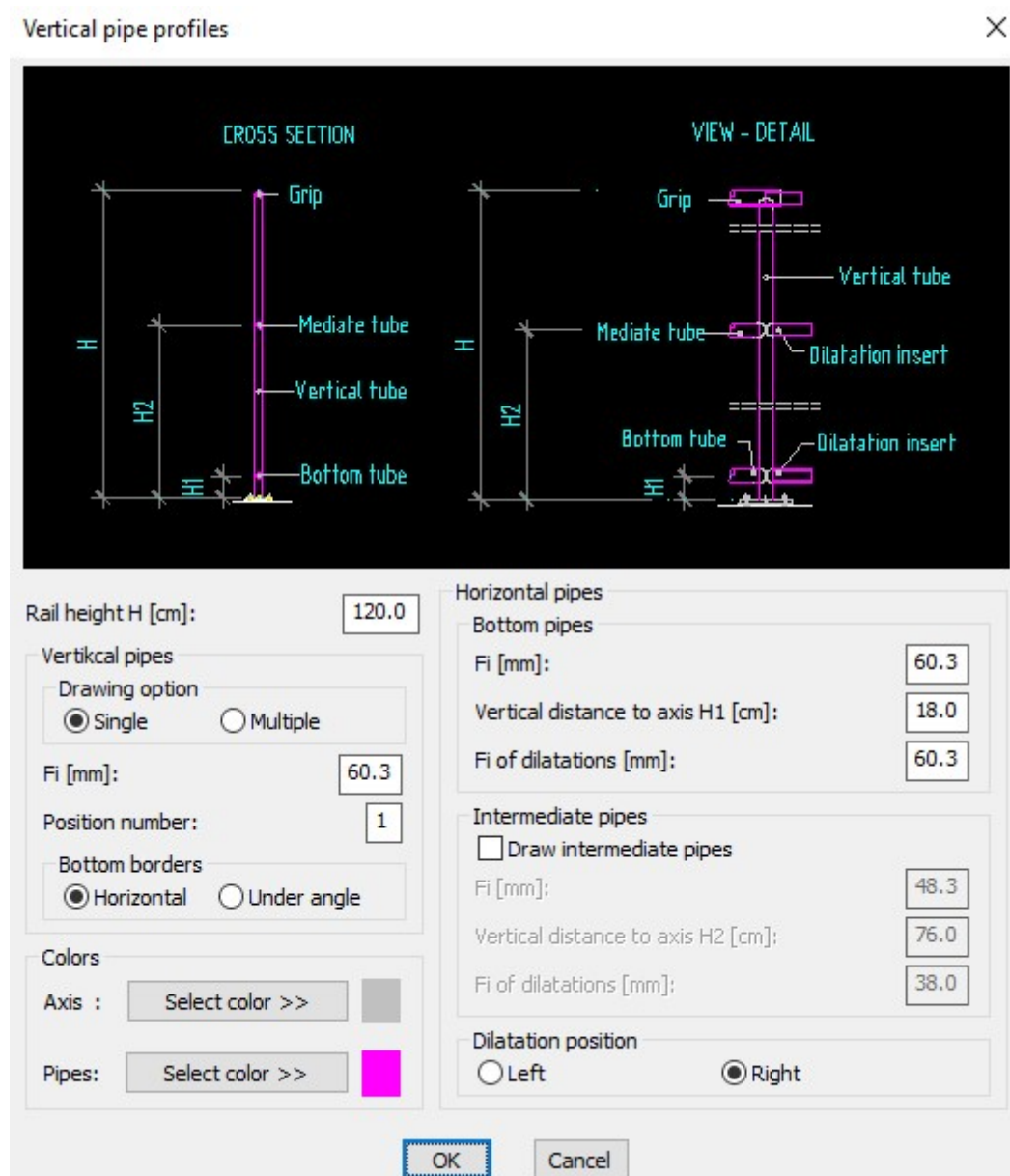
In command line we define side of utorov drawing Left+Right for two first vertical profiles on 1. section:

```
Dilatation darwing side: Right
Pick BOTTOM point in axis of LEFT profile/Side of dilatation/End: S
Dilatation darwing side  Left/Right/LeftRight: <R>LR

Dilatation darwing side: Left+Right
```
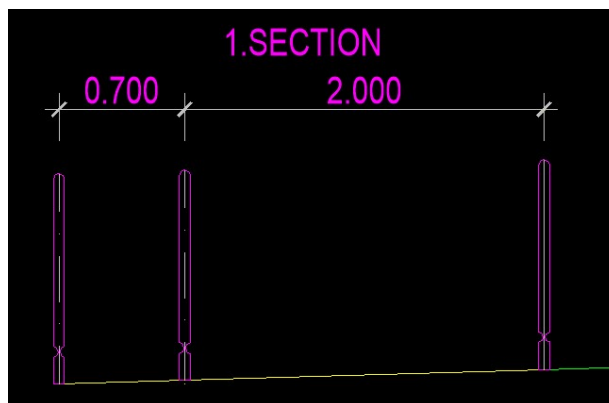
1.SECTION
0.700   2.000

3.2 Drawing multiple profiles - 2. section; first profile is with dilatation , next two are without dilatation and so on to next to last:

Vertical pipe profiles

CROSS SECTION   VIEW - DETAIL

Grip   Grip
                                           Vertical tube
Mediate tube   Mediate tube
                                           Dilatation insert
Vertical tube
                                           Bottom tube   Dilatation insert
Bottom tube

Rail height H [cm]:   120.0

Horizontal pipes
Bottom pipes

Vertikcal pipes

Drawing option

○ Single   ◉ Multiple

Fi [mm]:   60.3

Vertical distance to axis H1 [cm]:   18.0

Position number: 1

Fi of dilatations [mm]:   51

Bottom borders

◉ Horizontal   ○ Under angle

Fi [mm]:   60.3

Intermediate pipes
☐ Draw intermediate pipes

Fi [mm]:   48.3

Vertical distance to axis H2 [cm]:   76.0

Fi of dilatations [mm]:   38.0

Colors

Axis :   Select color >>

Pipes: Select color >>

Dilatation position
○ Left   ◉ Right

OK   Cancel

2.SECTION

2.000   2.000   2.000

3.3 Drawing multiple profiles - 3. section; first profile is with dilatation , next is without dilatation:

Vertical pipe profiles

CROSS SECTION   VIEW – DETAIL

Grip
Mediate tube
Vertical tube
Bottom tube

Grip
Vertical tube
Mediate tube
Dilatation insert
Bottom tube
Dilatation insert

Rail height H [cm]:   120.0

Vertikcal pipes
  Drawing option
  ○ Single   ● Multiple

Fi [mm]:   60.3

Position number: 1

Bottom borders
  ● Horizontal   ○ Under angle

Colors
  Axis :   Select color >>

  Pipes: Select color >>

Horizontal pipes
  Bottom pipes
    Fi [mm]:   60.3
    Vertical distance to axis H1 [cm]:   18.0
    Fi of dilatations [mm]:   51.0

  Intermediate pipes
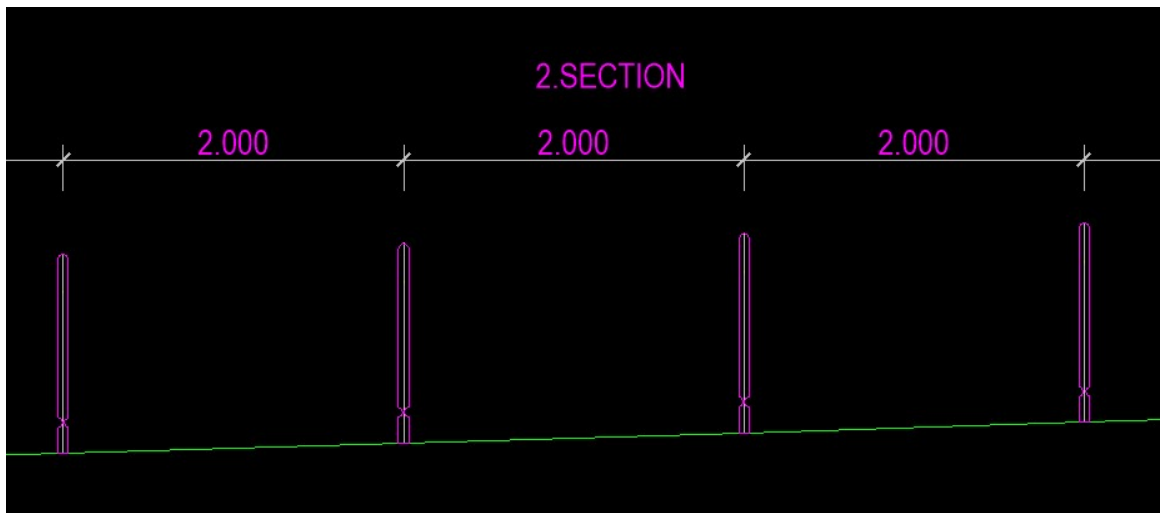   ☐ Draw intermediate pipes
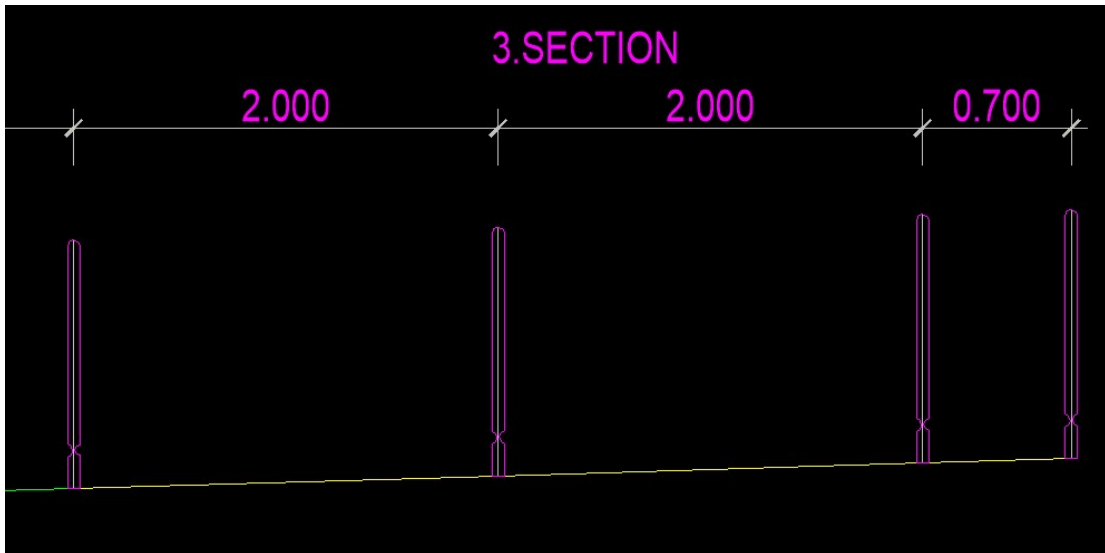   Fi [mm]:   48.3
    Vertical distance to axis H2 [cm]:   76.0
    Fi of dilatations [mm]:   38.0

  Dilatation position
    ○ Left   ● Right

OK   Cancel

After that we copy last profile in last poyline vertex.

3.SECTION

2.000   2.000   0.700

4. Longitudinal draw of grips

4.1 In 1. section are grips without dilatations:

Grips   ×

Vertical profiles
A = D/Fi [mm]:   60.3

Grips
  Drawing option
  ⦿ Single   ○ Multiple

B = D/Fi [mm]:   60.3

Vertical distance H [cm]:   120.0

Position number: 2

☐ Grips with dilatations

Colors
  Axis:
    [Select color >>]   ▢

  Grips:
    [Select color >>]   ■

  Dilatations:
    [Select color >>]   ■

CROSS SECTION   VIEW - DEATIL

DETAIL "A"

Dilatations
C = D/Fi [mm]:   51.0
Dilatation length L [mm]:   150.0
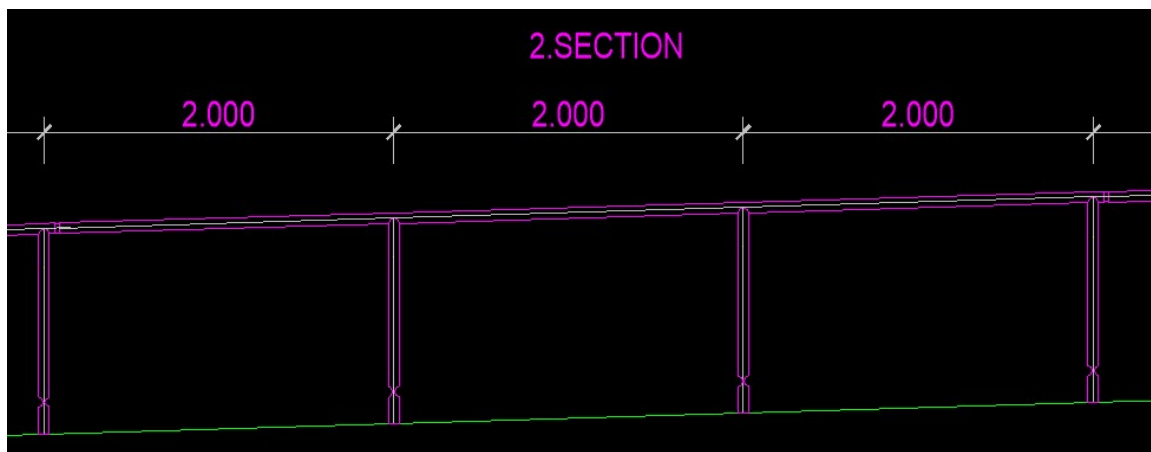Length L1 [mm]:   60.0
Dilatation opening L2 [mm]:   30.0
Position number: 4

[OK]   [Cancel]

```
Draw dilatation LEFT: NO
Pick segment LEFT point/Dilatation/None dilatation/Position number/End:
Draw dilatation RIGHT: NO
Pick segment RIGHT point/Dilatation/None dilatation:
Draw dilatation LEFT: NO
Pick segment LEFT point/Dilatation/None dilatation/Position number/End: p
Position number of HORIZONTAL profiles <2>: 3

Draw dilatation LEFT: NO
Pick segment LEFT point/Dilatation/None dilatation/Position number/End:
Draw dilatation RIGHT: NO
Pick segment RIGHT point/Dilatation/None dilatation:
Draw dilatation LEFT: NO
Pick segment LEFT point/Dilatation/None dilatation/Position number/End: e
```

1.SECTION

0.700   2.000
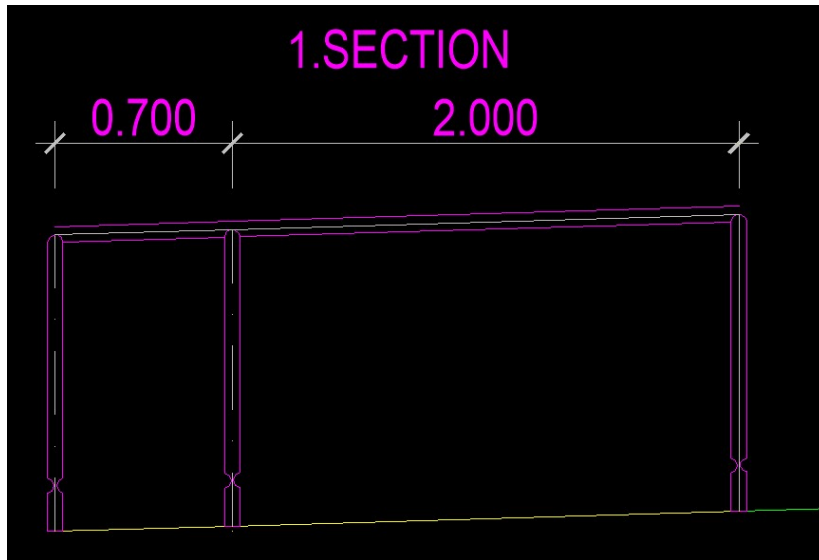
4.2 In 2. and 3. section are grip dilatations on right side at every 6.00 m, first dilatation is in first profile:

Grips   ✕

Vertical profiles
A = D/Fi [mm]:   60.3

Grips
Drawing option
⊙ Single   ○ Multiple

B = D/Fi [mm]:   60.3

Vertical distance H [cm]:   120.0

Position number: 3

☑ Grips with dilatations

Colors
Axis:
Select color >>

Grips:
Select color >>

Dilatations:
Select color >>

CROSS SECTION   VIEW - DEATIL

DETAIL "A"

Dilatations
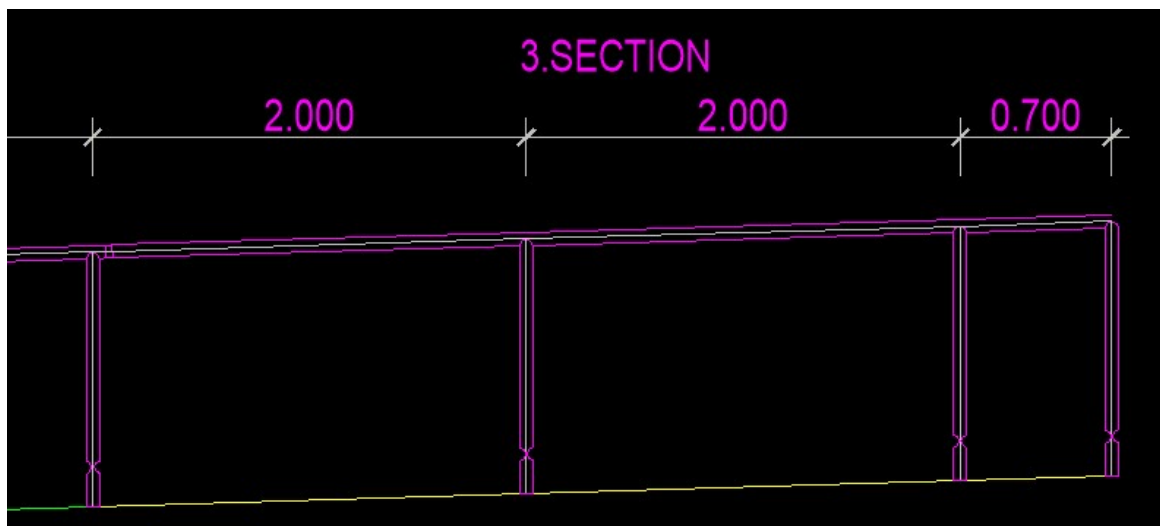C = D/Fi [mm]:   51.0
Dilatation length L [mm]:   150.0
Length L1 [mm]:   60.0
Dilatation opening L2 [mm]:   30.0
Position number LEFT: 4   Position number: 5   Position number RIGHT: 6

OK   Cancel

2.SECTION

2.000   2.000   2.000

3.SECTION

| 2.000 | 2.000 | 0.700 |

5. Longitudinal draw of horizontal profiles

   5.1 In 1. section are profiles without dilatations:

Horizontal profiles

Vertical profiles
A = D/Fi [mm]: 60.3

Horizontal profiles
B = D/Fi [mm]: 60.3

Drawing option
◉ Single ○ Multiple

Position number: 2
☐ Profiles with dilatations

Colors
Axis
[Select colors >>]

Profiles
[Select colors >>]

Dilatations
[Select colors >>]

Dilatations
C = D/Fi [mm]: 51.0
Dilatation length L [mm]: 190.0
Distance L1 [mm]: 60.0
Position number of dilatations: 5   Position number by dilatations: 3

☑ Round profiles and dilatations

CROSS SECTION   VIEW – DETAIL
DETAIL "A"
A
L
Vertical profile "A"
B
C
Vertical profile
L1
"A"

[OK] [Cancel]

```
Pick segment LEFT point/Position number/End: p
Position number of HORIZONTAL profiles <8>: 6
Pick segment LEFT point/Position number/End:
Pick segment RIGHT point:
Vertical distance from 1. AXIS of  HORIZONTAL profile in cm <18.000>/eXit:
Vertical distance from 2. AXIS of  HORIZONTAL profile in cm <18.000>/eXit: x
Pick segment LEFT point/Position number/End: p
Position number of HORIZONTAL profiles <6>: 7
Pick segment LEFT point/Position number/End:
Pick segment RIGHT point:
Vertical distance from 2. AXIS of  HORIZONTAL profile in cm <18.000>/eXit:
Vertical distance from 3. AXIS of  HORIZONTAL profile in cm <18.000>/eXit: x
Pick segment LEFT point/Position number/End: e
```

1.SECTION

0.700 | 2.000
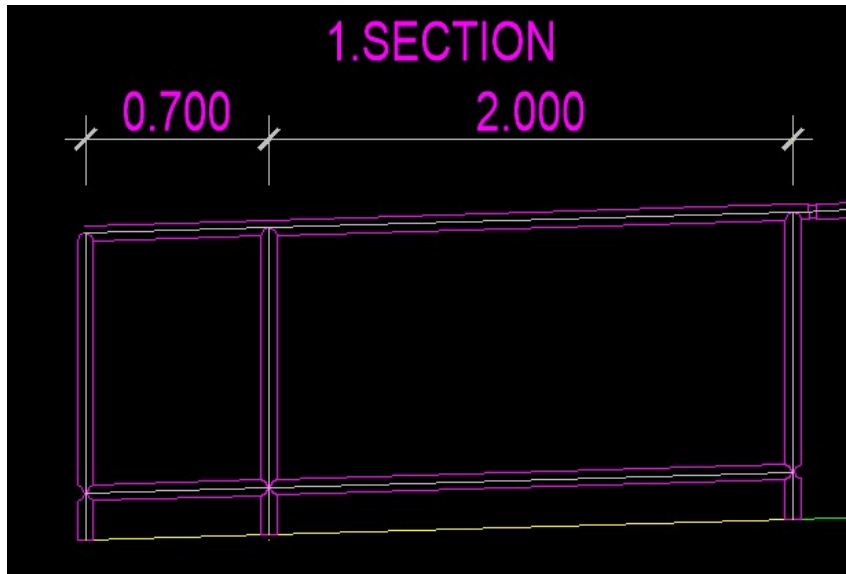
5.2 In 2. section profile dilatations will be on right side at every 6.00 m, first dilatation is in first profile:

Horizontal profiles

Vertical profiles
A = D/Fi [mm]: 60.3

Horizontal profiles
B = D/Fi [mm]: 60.3

Drawing option
○ Single ● Multiple

Position number: 7
☑ Profiles with dilatations

Colors
Axis
[Select colors >>]

Profiles
[Select colors >>]

Dilatations
[Select colors >>]

Dilatations
C = D/Fi [mm]: 51.0
Dilatation length L [mm]: 190.0
Distance L1 [mm]: 60.0
Position number of dilatations: 8   Position number by dilatations: 9
☑ Round profiles and dilatations

CROSS SECTION   VIEW - DETAIL
DETAIL "A"
Vertical profile "A"
Vertical profile

[OK] [Cancel]

2.SECTION

2.000 | 2.000 | 2.000
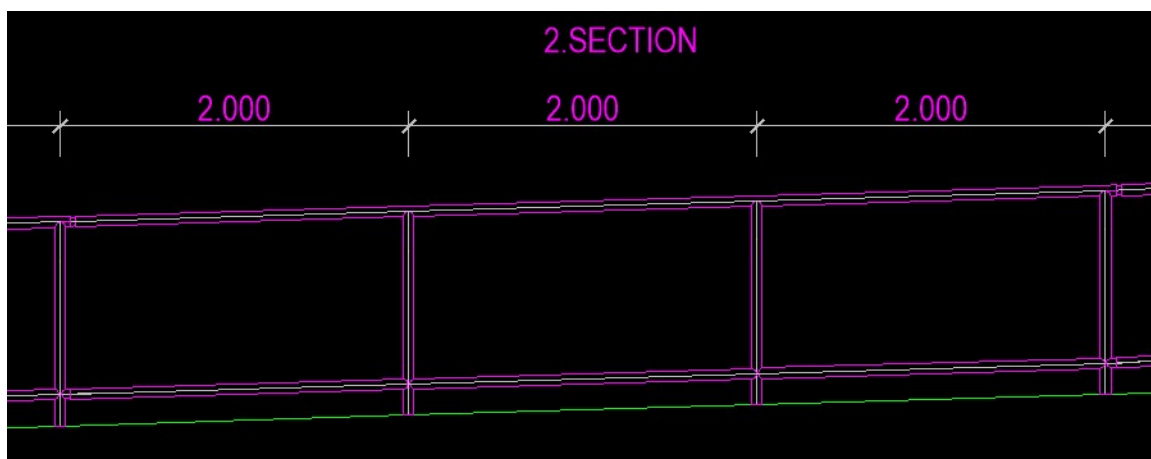
5.3 In 3. section profile dilatation will be on right side in first profile.
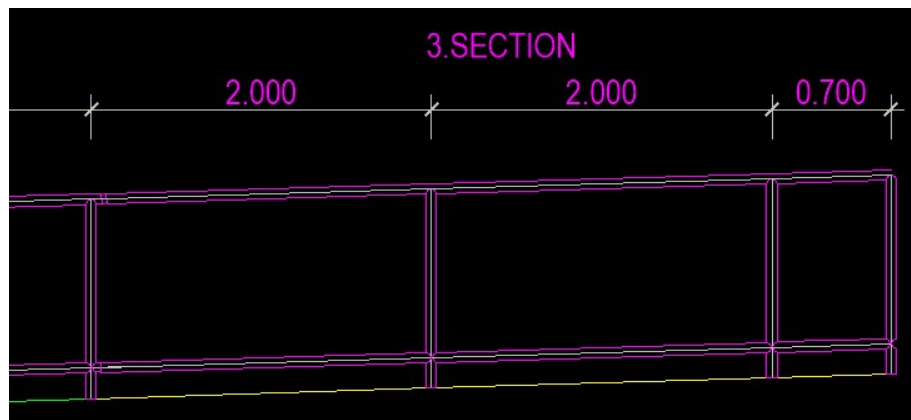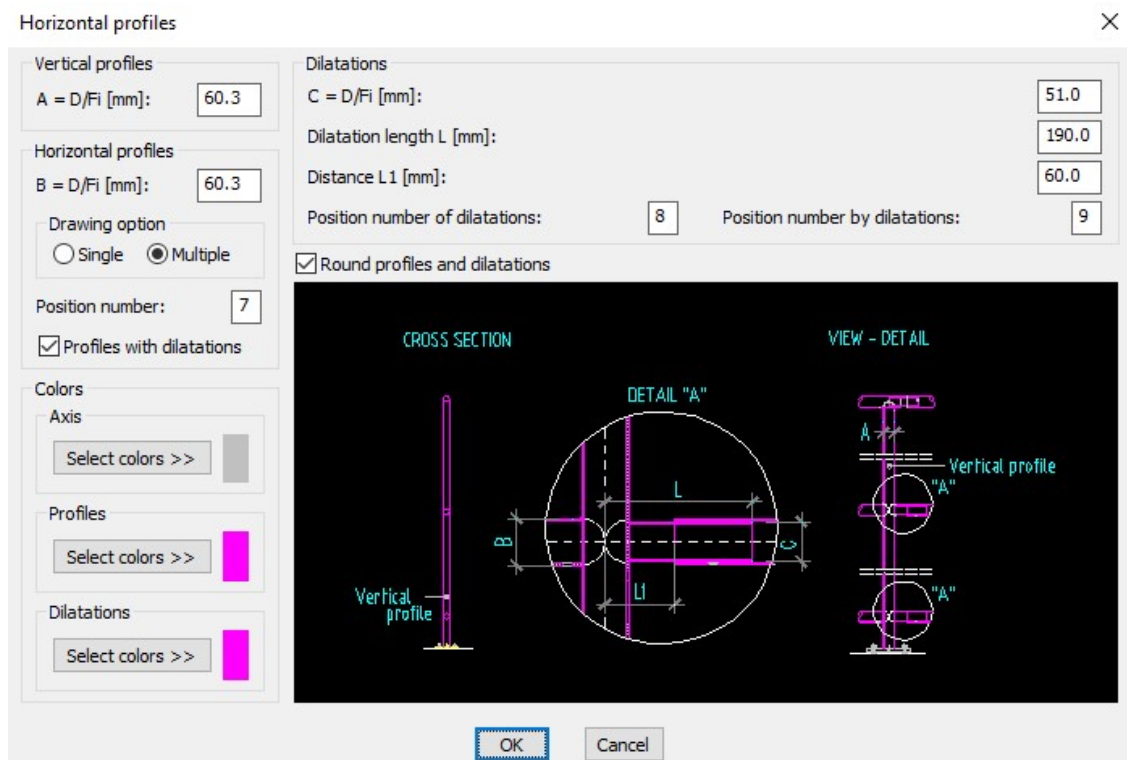
6. Longitudinal draw of ending profiles fillets
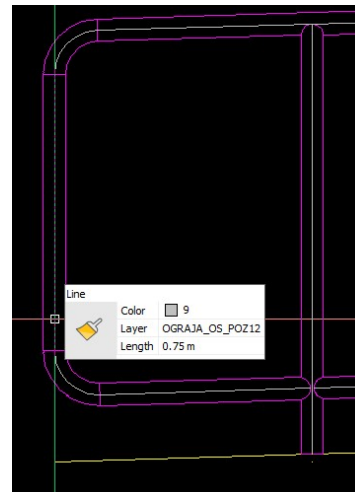   Explode first vertical and horizontal profile in 1. section:

```
<Select 1. OUTER profile>/End:
Select 2. OUTER profile:
Select 1. INNER profile:
Select 2. INNER profile:
Select AXIS of 1. profile:
Select AXIS of 2. profile: 0.15
<Select 1. OUTER profile>/End:
Select 2. OUTER profile:
Select 1. INNER profile:
Select 2. INNER profile:
Select AXIS of 1. profile:
Select AXIS of 2. profile: 0.15
<Select 1. OUTER profile>/End:e
```
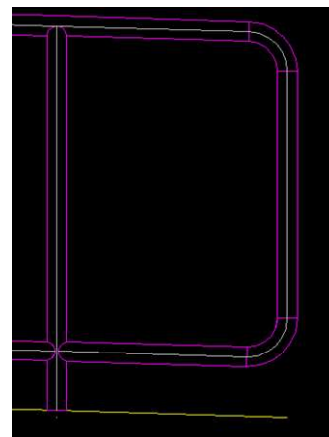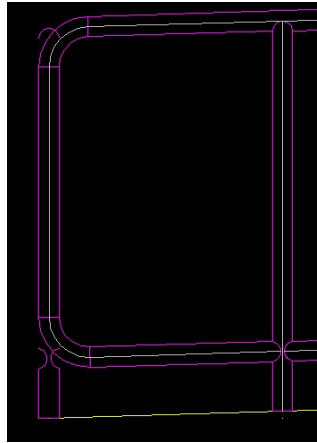
Change layer nameame of first vertical axis with command **Define layers of bridge fences profiles axis**:


```
Select LINES or ARCS:
Select entities:
Entities in set: 1
Select entities:
AXIS number < 1 >: 12
```

Repeat the same procedure in 3. section.- explode last vertical and horizontal profile, fillet ending profiles, erase excessive objects and cahange layer name of last vertical axis.

7. Longitudinal draw of intermediate vertical profiles
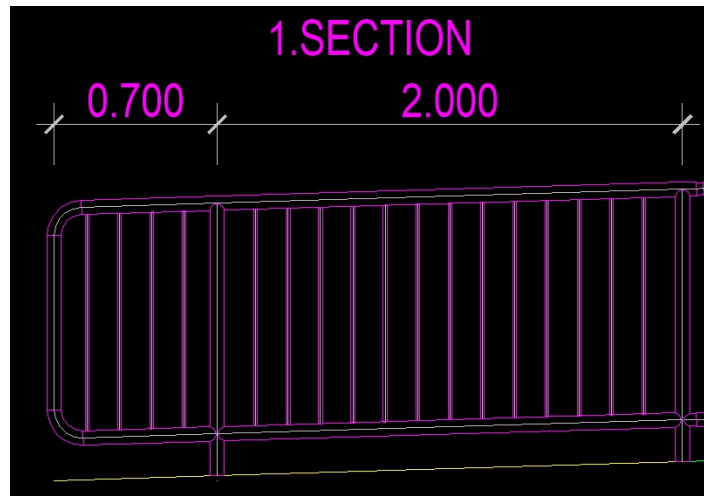
Draw profiles in 1. section:
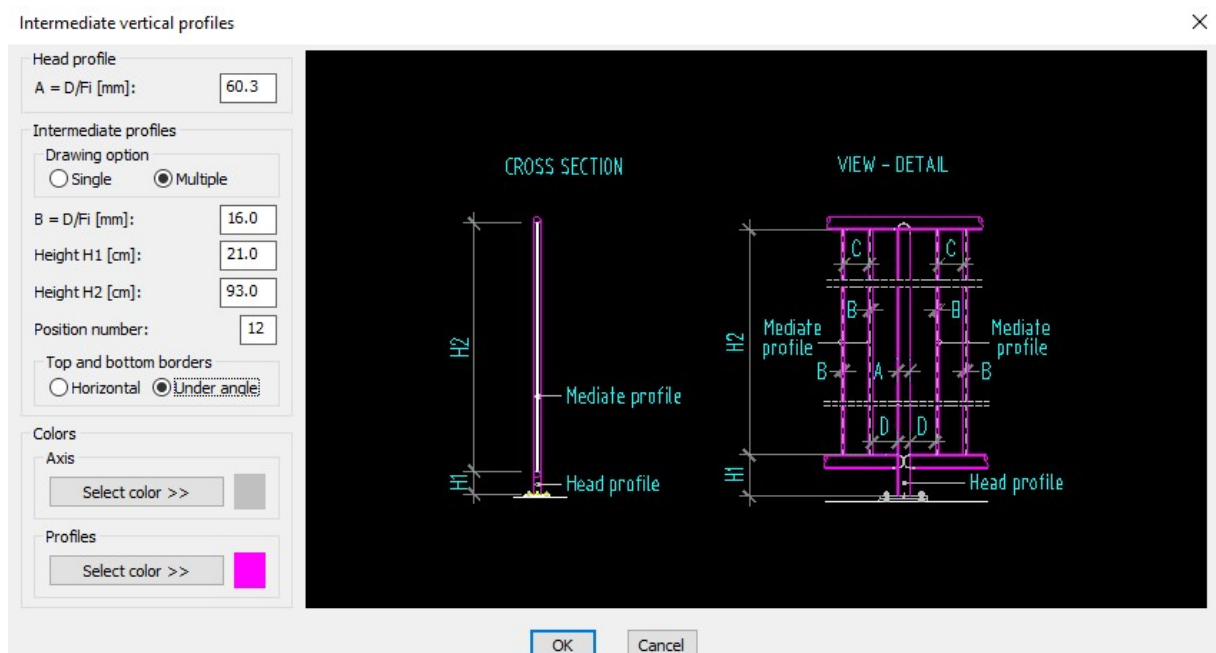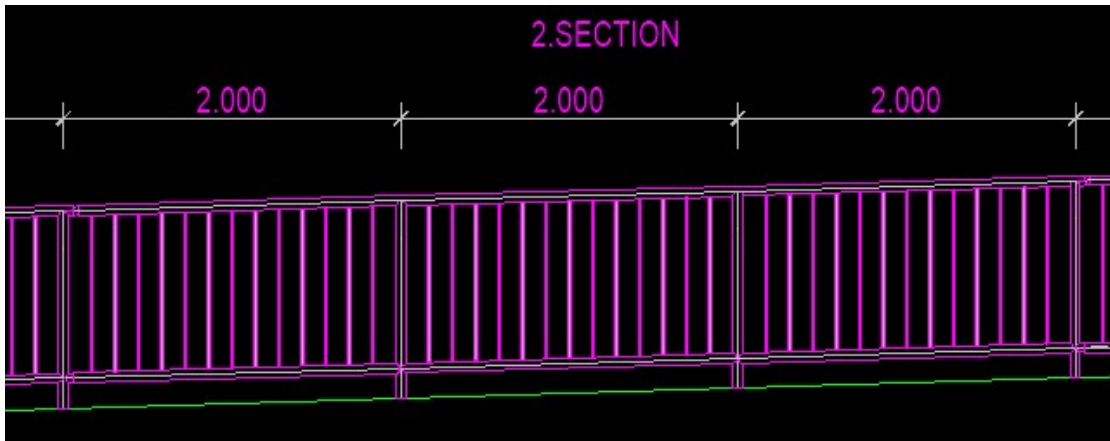
```
Profiles will be drawn between current polyline vertexes.
Select polyline:
Bright openeing between INTERMEDIATE profiles in mm = <123.000>:
Bright openeing on start and end of segment = 103.3 mm.
Bright openeing on start and end of segment = 103.3 mm. Continue Yes/No/eXit <N>:y

Bright openeing on start and end of segment = 127.9 mm.
Bright openeing on start and end of segment = 127.9 mm. Continue Yes/No/eXit <Y>:
```


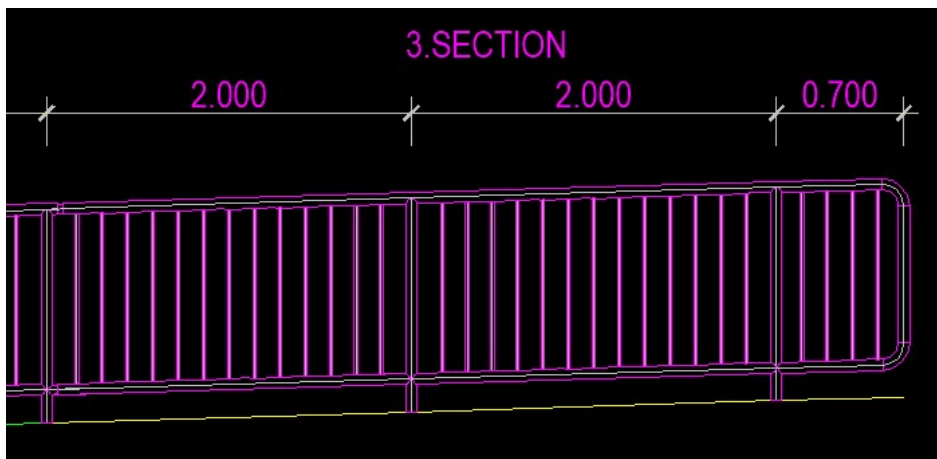Draw profiles in 2. section:


```
Profiles will be drawn between current polyline vertexes.
Select polyline:
Bright openeing between INTERMEDIATE profiles in mm = <123.000>:
Bright openeing on start and end of segment = 127.9 mm.
Bright openeing on start and end of segment = 127.9 mm. Continue Yes/No/eXit <Y>:
Bright openeing on start and end of segment = 127.9 mm.
Bright openeing on start and end of segment = 127.9 mm. Continue Yes/No/eXit <Y>:
```

2.SECTION

2.000   2.000   2.000

Draw profiles in 3. section:

Intermediate vertical profiles

Head profile
A = D/Fi [mm]: 60.3

Intermediate profiles
Drawing option
○ Single ● Multiple

B = D/Fi [mm]: 16.0
Height H1 [cm]: 21.0
Height H2 [cm]: 93.0
Position number: 12

Top and bottom borders
○ Horizontal ● Under angle

Colors
Axis
[Select color >>]

Profiles
[Select color >>]

CROSS SECTION   VIEW – DETAIL

[OK]   [Cancel]


```
Profiles will be drawn between current polyline vertexes.
Select polyline:
Bright openeing between INTERMEDIATE profiles in mm = <123.000>:
Bright openeing on start and end of segment = 127.9 mm.
Bright openeing on start and end of segment = 127.9 mm. Continue Yes/No/eXit <Y>:
Bright openeing on start and end of segment = 127.9 mm.
Bright openeing on start and end of segment = 127.9 mm. Continue Yes/No/eXit <Y>:
Bright openeing on start and end of segment = 103.3 mm.
Bright openeing on start and end of segment = 103.3 mm. Continue Yes/No/eXit <Y>:
```
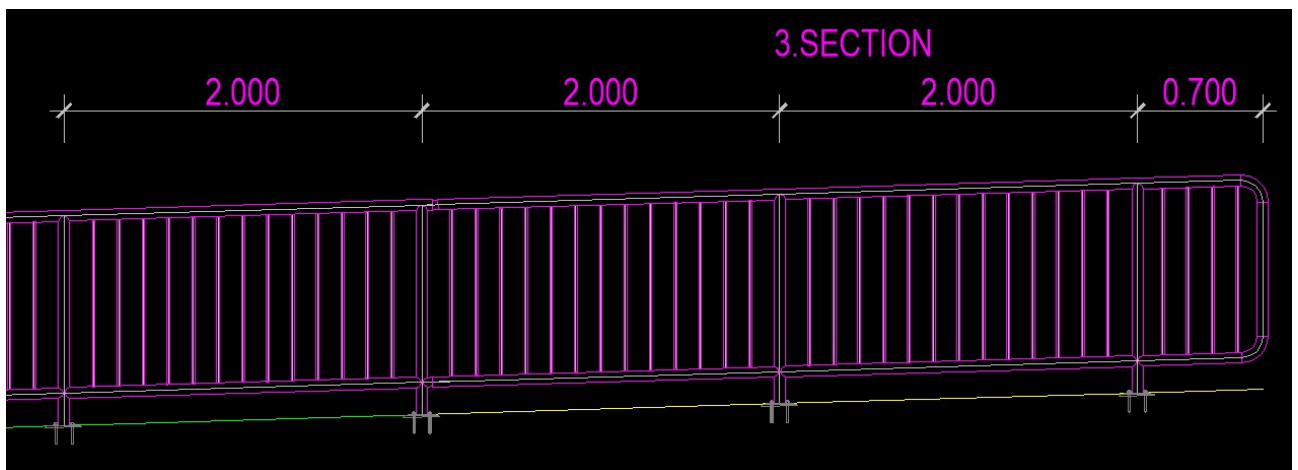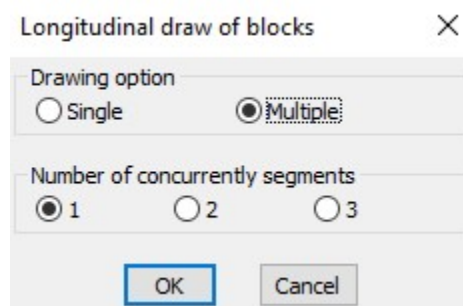

3.SECTION

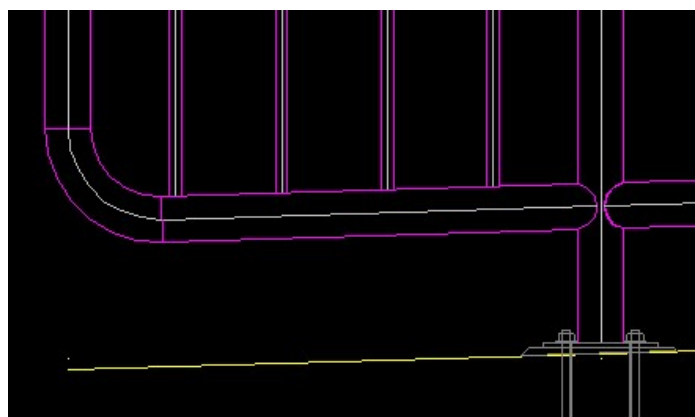2.000   2.000   0.700

8. Longitudinal draw of blocks

Draw block for anchor plate of vertical profiles in 1. section with horizontal insertion:
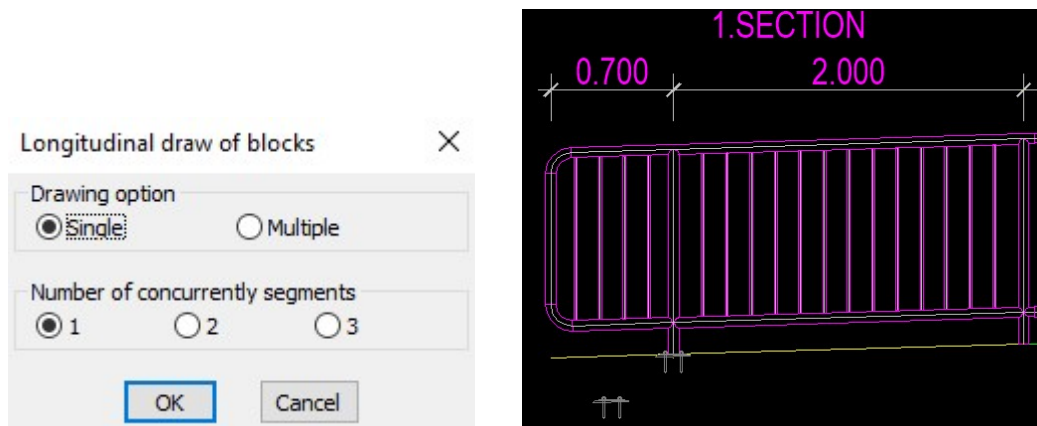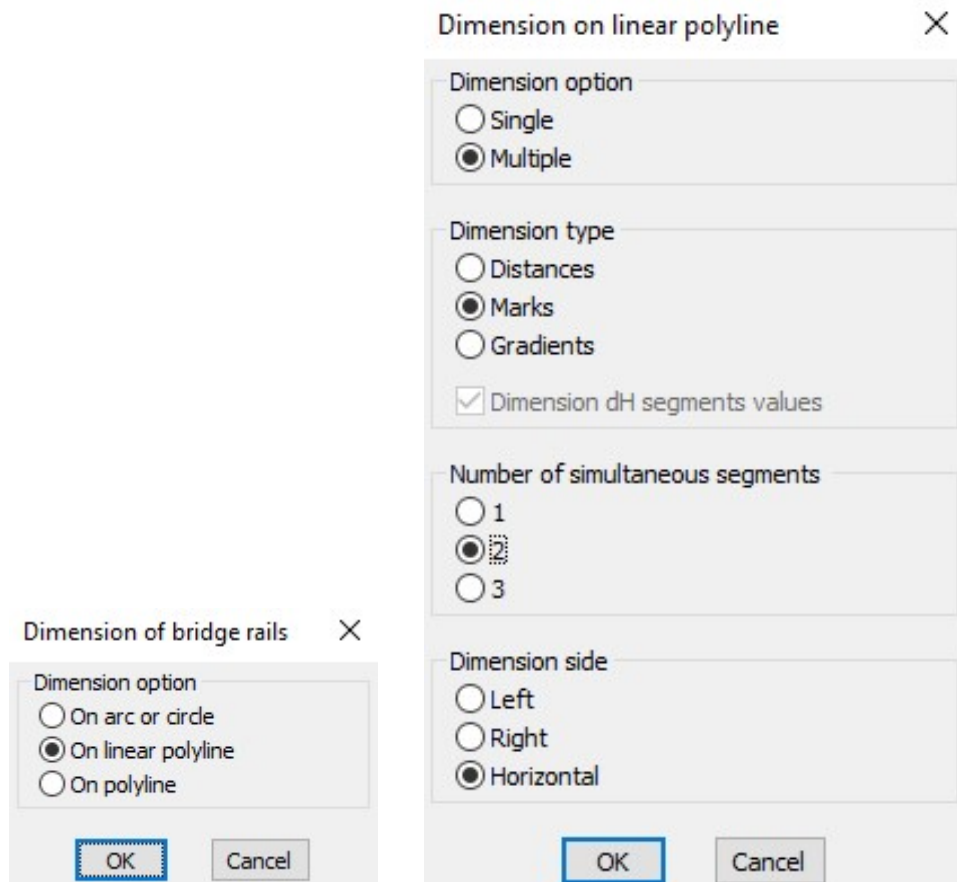

And 2. and 3. section:

Move subsidiary lines – polylines to bottom border of filling layer:

9. Bridge fences dimension

   9.1 Mark dimension

Dimension marks in 1. segment:

Dimension on linear polyline ✕

Dimension option
- ○ Single
- ◉ Multiple

Dimension type
- ○ Distances
- ◉ Marks
- ○ Gradients
- ☑ Dimension dH segments values

Number of simultaneous segments
- ○ 1
- ◉ 2
- ○ 3

Dimension side
- ○ Left
- ○ Right
- ◉ Horizontal

[OK] [Cancel]

Dimension of bridge rails ✕

Dimension option
- ○ On arc or circle
- ◉ On linear polyline
- ○ On polyline
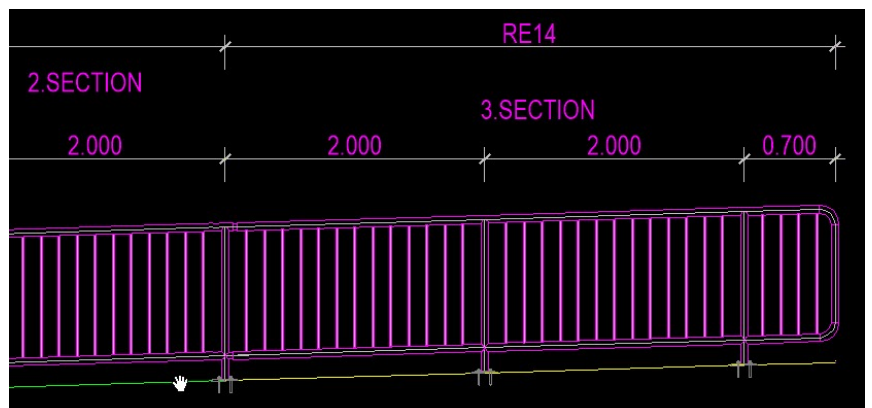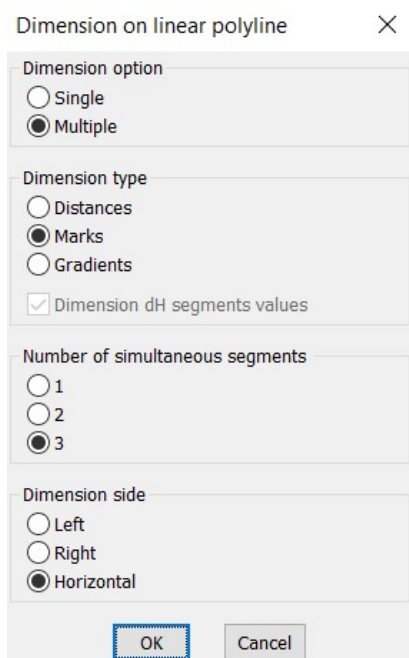
[OK] [Cancel]

```
Dimension is between existing polyline vertexes!
Select starting side of polyline:
Pick dimension line position:
Rail segments mark < RE >:
Number of 1. segment < 1 >:
Dimension between rail segments finished.
```
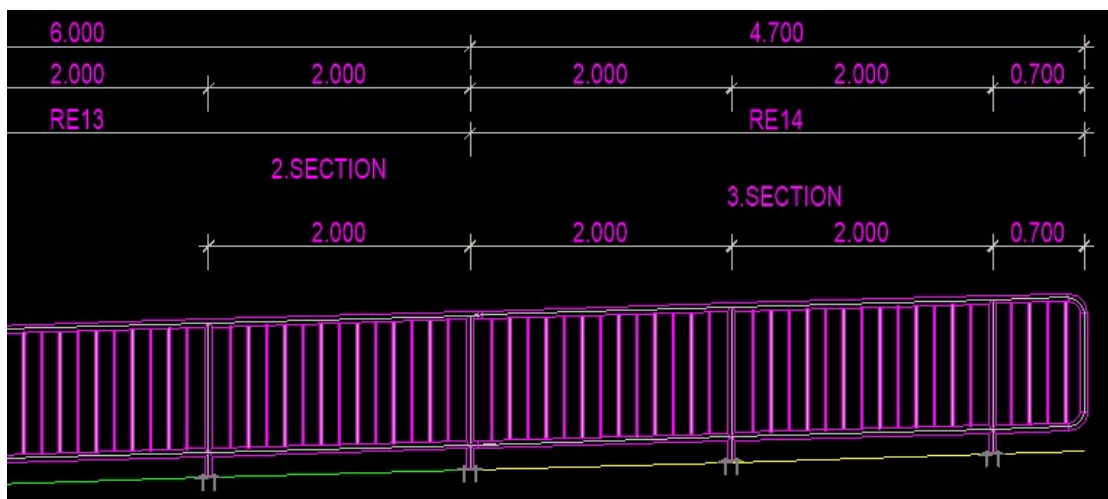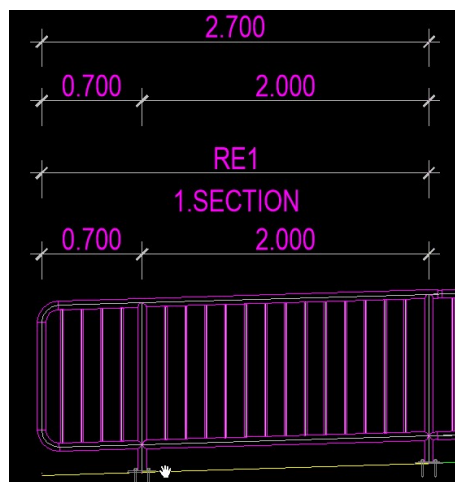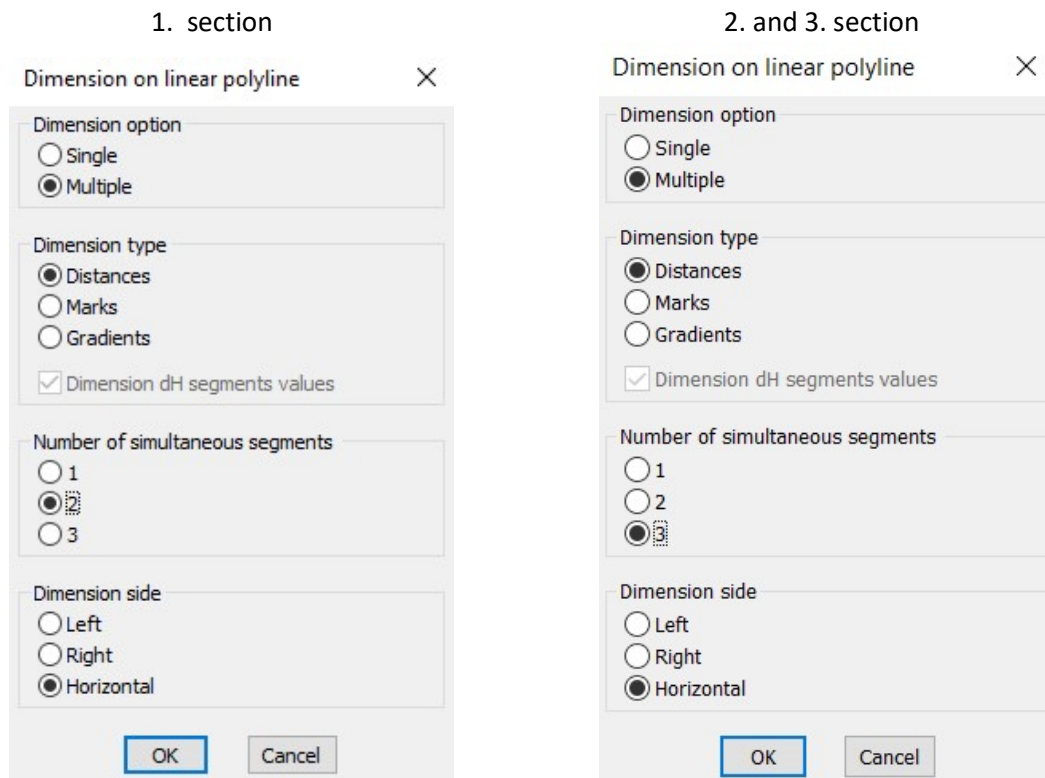
RE1
1.SECTION
0.700   2.000
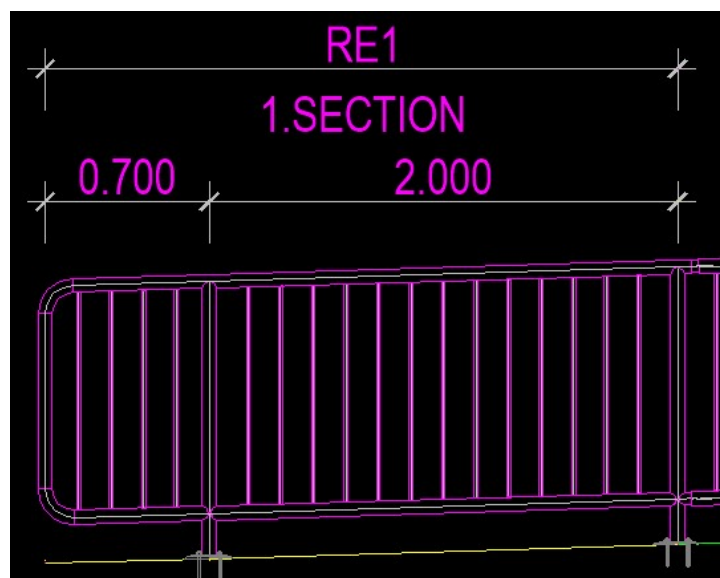
Dimension in 2. section:
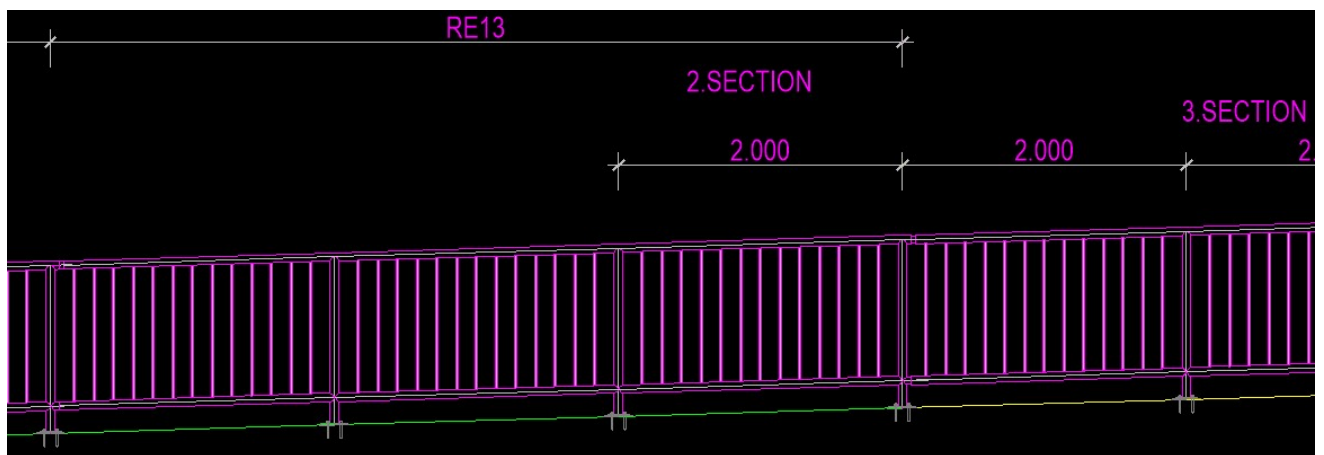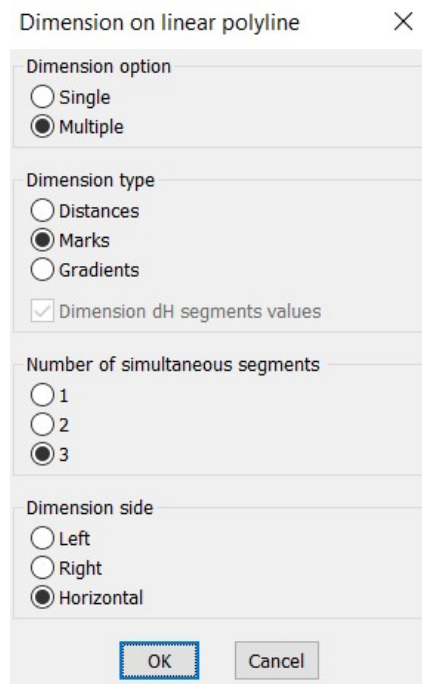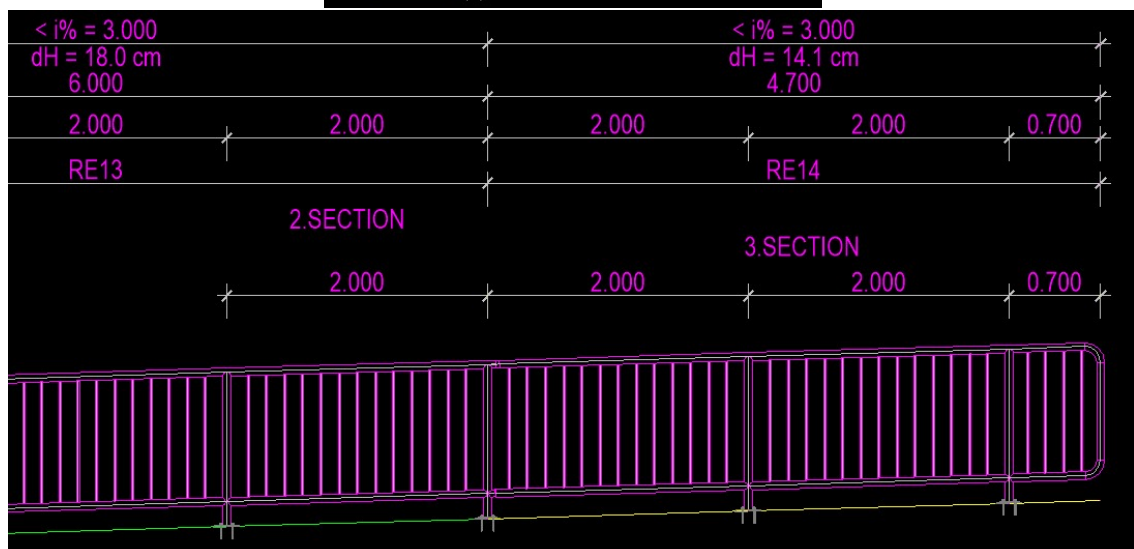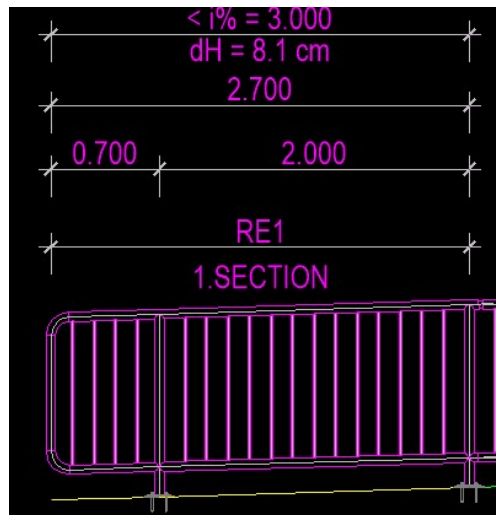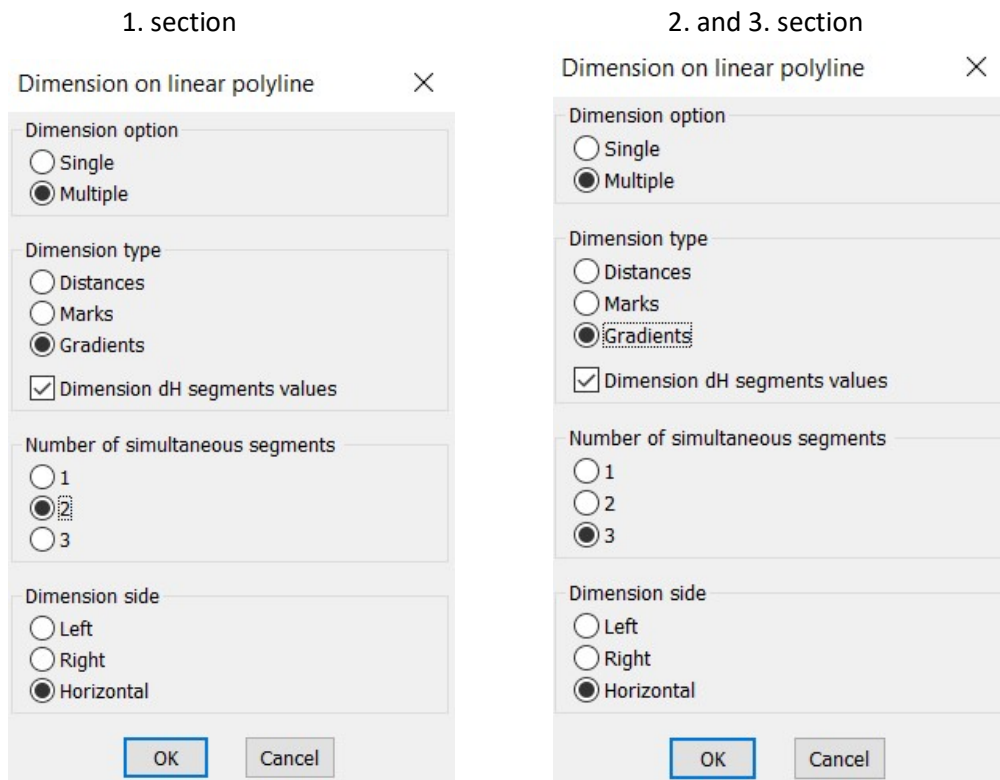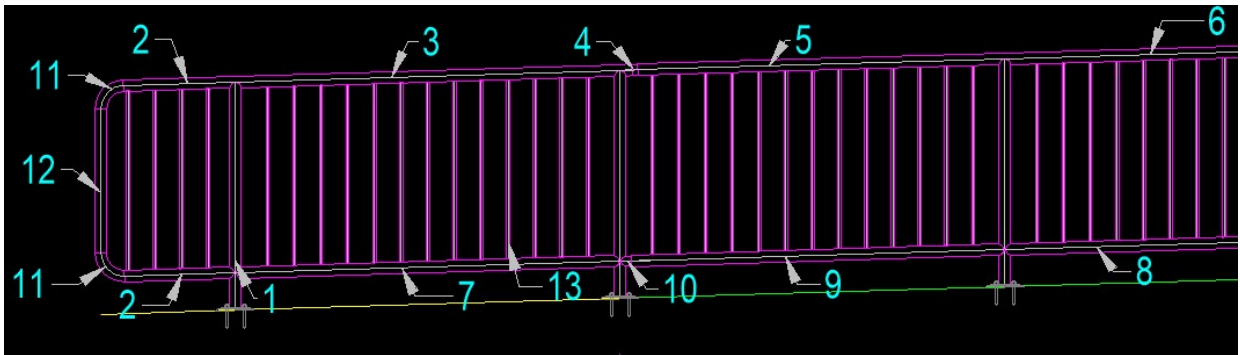

Dimension in 3. section:

9.2 Distance dimension

Dimension distances between separate vertical profiles and than on the same sections as dimensions of marks:

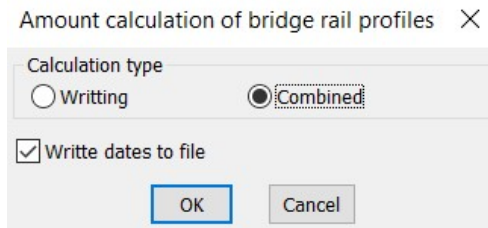| 1. section	2. and 3. section

9.3 Gradient and dH values dimension

Dimension gradients and dH values between fence segments :

1. section

2. and 3. section

Select every position separate:


```
< Select POSITION AXIS - line or arc for calculation >/select Length/select Blok/Writte dates/End:
Position number < 1 >:
SElect LINES on corresponding axis.
Select entities:
Opposite Corner:
Entities in set: 40
Select entities:
Weight g [kg/m1]: 1 = 6.819; 2 = 5.554; 3 = 4.636; 4 = 1.578; 5 = writte value
Weight  g [kg/m1] = < 1 >:

Position 1: Length = 1.170 m; g = 6.819; G = 7.977; Pcs. number = 40; Weight = 319.088 kg; Total weight = 319.129 kg.
< Select POSITION AXIS - line or arc for calculation >/select Length/select Blok/Writte dates/End:
Position number < 2 >:
SElect LINES on corresponding axis.
Select entities:
Opposite Corner:
Entities in set: 2
Select entities:
Weight g [kg/m1]: 1 = 6.819; 2 = 5.554; 3 = 4.636; 4 = 1.578; 5 = writte value
Weight  g [kg/m1] = < 1 >: 2

Position 2: Length = 0.583 m; g = 5.554; G = 3.239; Pcs. number = 2; Weight = 6.442 kg; Total weight = 325.605 kg.
< Select POSITION AXIS - line or arc for calculation >/select Length/select Blok/Writte dates/End:'._osnap
```
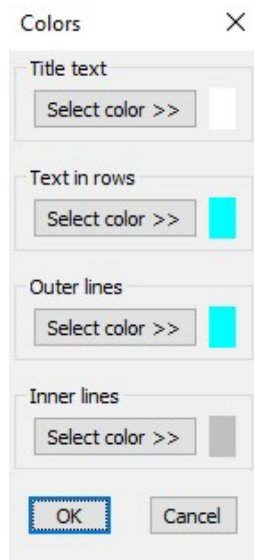
11. Draw table of bridge fence profiles Example1.ogr

Element RE1-RE14			
Position	Wgt. [kg]	Pieces	Sum [kg]
1	7.98	40	319.13
2	3.24	4	12.95
3	11.11	2	22.23
4	0.70	13	9.04
5	10.61	2	21.22
6	10.61	35	371.28
7	11.06	2	22.13
8	11.06	24	265.39
9	10.75	13	139.78
10	0.88	13	11.45
11	1.03	4	4.11
12	4.17	2	8.33
13	1.47	515	755.78
Sum for 1 element			1962.82
Sum for 1 elements			1962.82

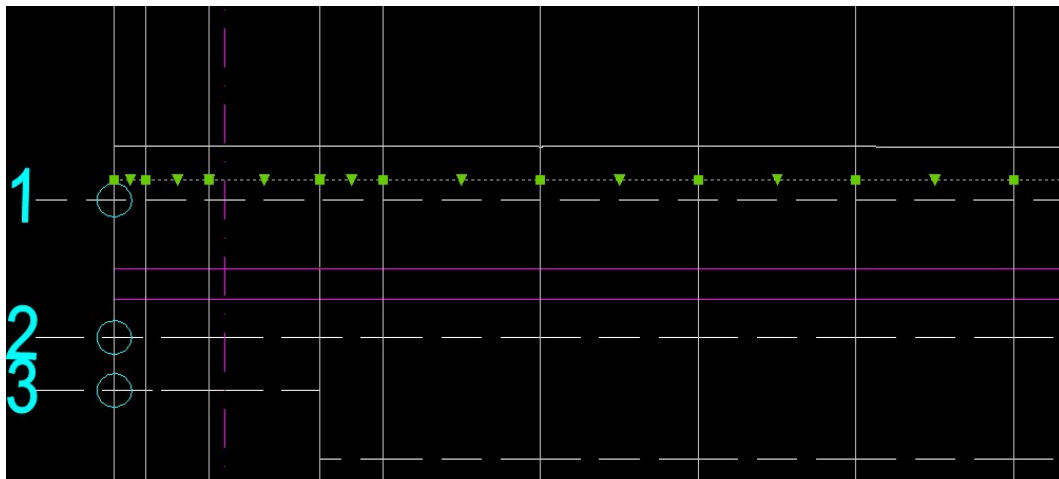12. Ground floor and 3d drawing of vertical profiles
    Copy and join longitudinal polyline between vertical profile distances. Copy axis of intermediate vertical profiles.
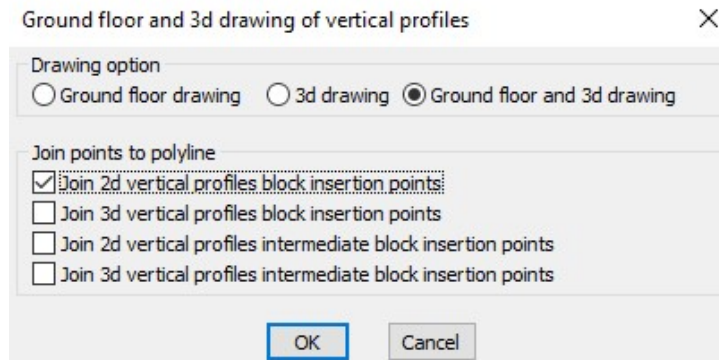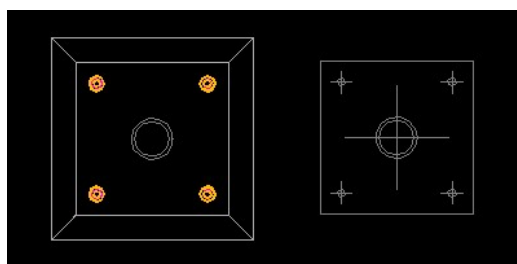

Select new polyline in longitudinal profile, with vertexes in vertical profiles distances:
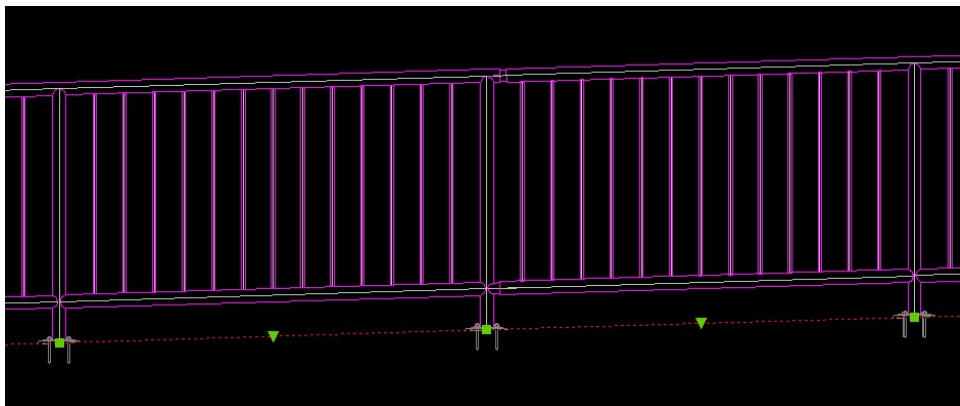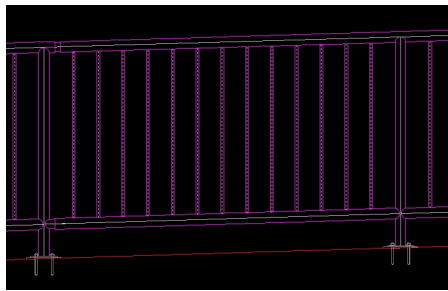

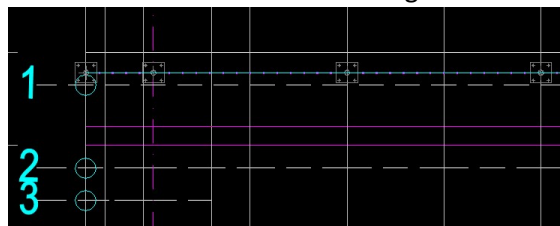Select polyline - 2d fence axis in ground floor:
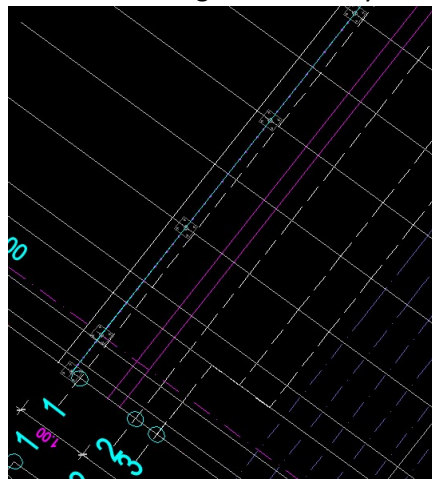

Select blocks for 2d and 3d vertical profiles:

Select axis of intermediate vertical profile in longitudinal profile for layer, and then select all intermediate vertical profiles, for distance definition to draw in ground floor and 3d model and select corresponding 2d and 3d block:
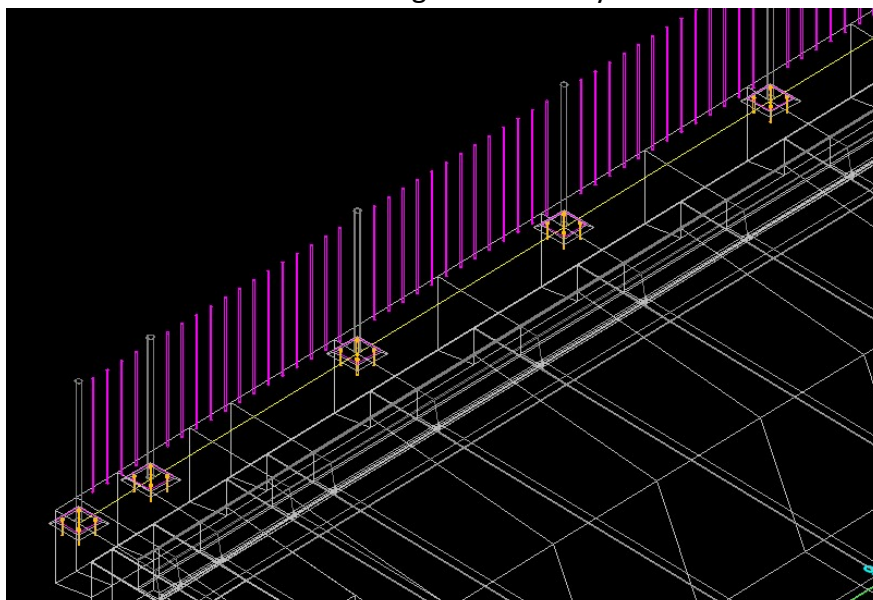

Ground floor drawing

2d drawing - axonometry

3d drawing - axonometry

Copy 3d line of fence in vertical direction for 19.3 and 99 cm, from longitudinal profila transfer ending axis with fillets:
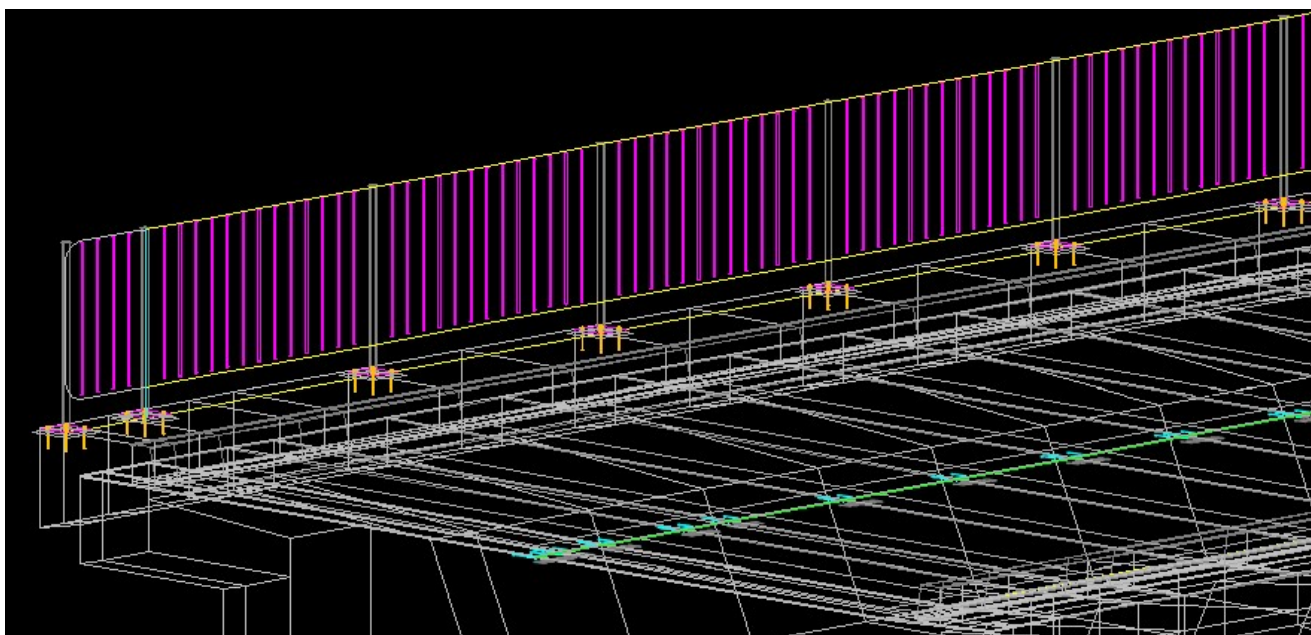
With command Utilitys -> Loft 2D polyline - profiles on 3D polyline, we draw 3d holle pipe profiles:
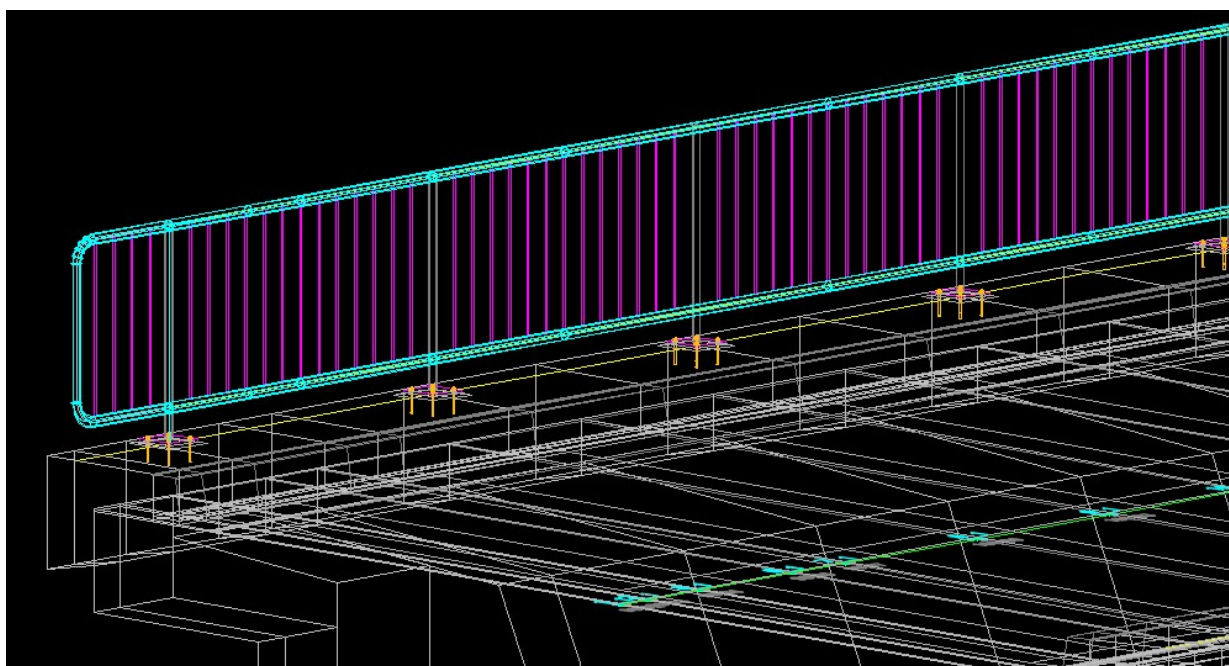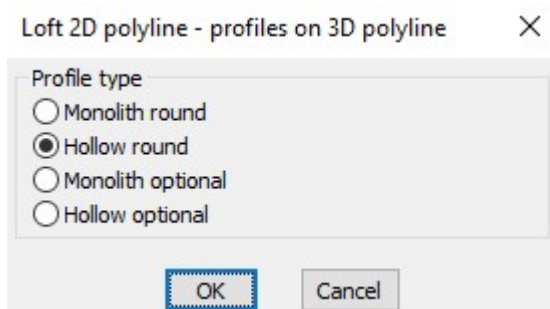
13. Bridge fences dimension in ground floor

Dimension fence elements in ground floor – distances and marks, in the same procedure as in longitudinal profile:
For single distances between segments:

In 1, 2. and 3. section
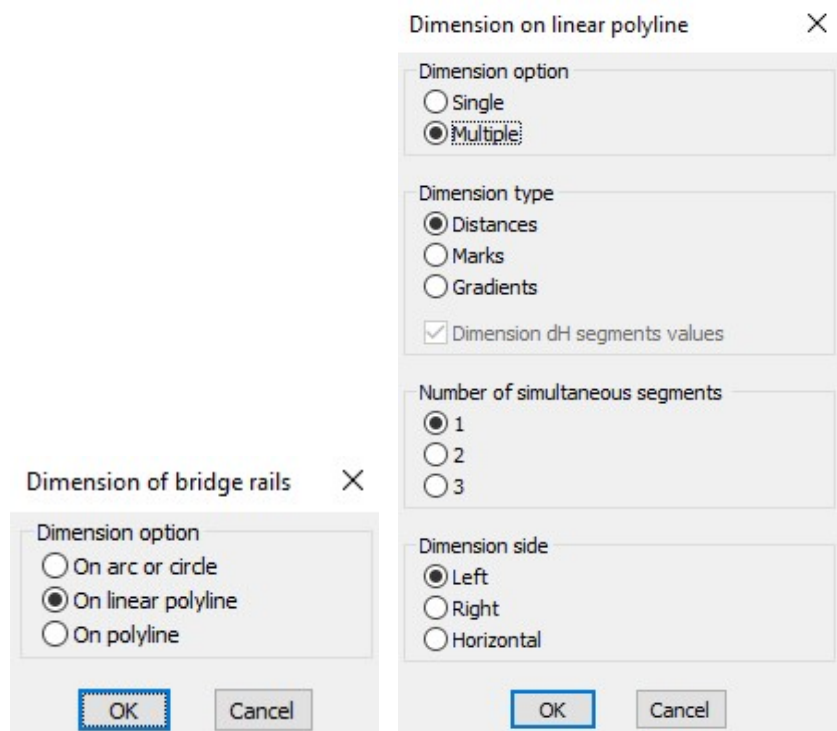
For 1. section 2 segments at once and in 2. and 3. section 3 segments at once.
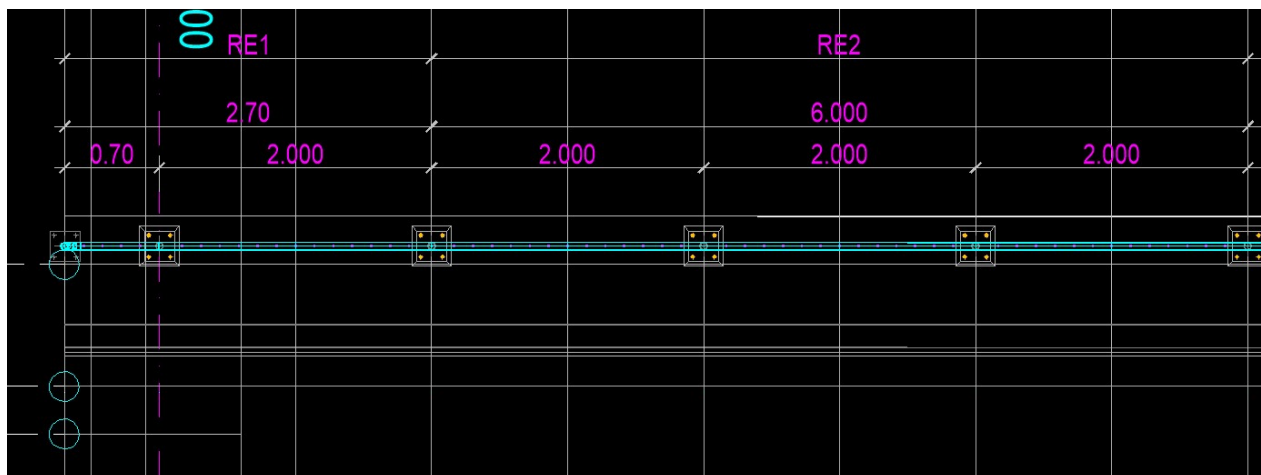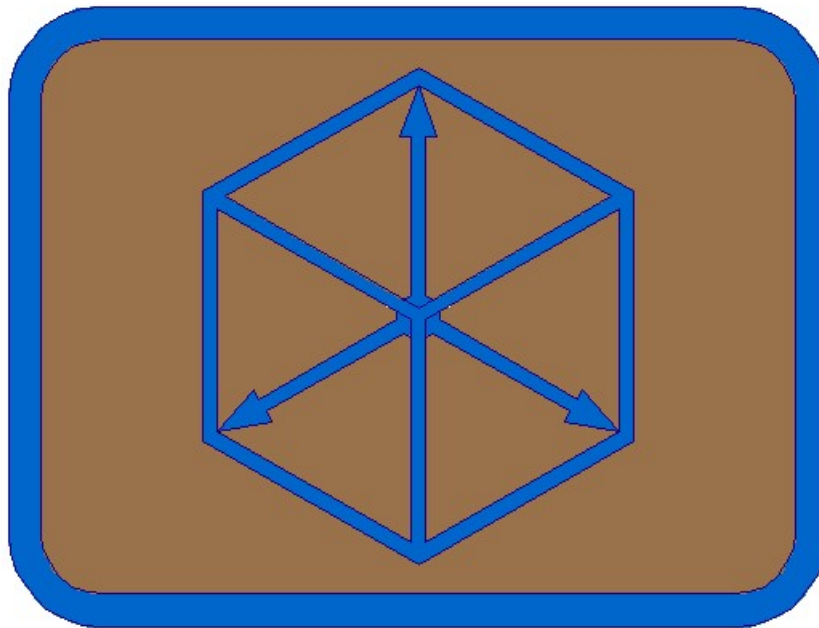
Modul BRIDGE

CABLE PRESSTRESSING

CABLE PRESSTRESSING

1. Define cable axis files in cross sections in draft/sketch ground floor and longitudinal section

1.1 Draw cross axis horizontal with command Civil -> Cross axis -> Draw cross axis.
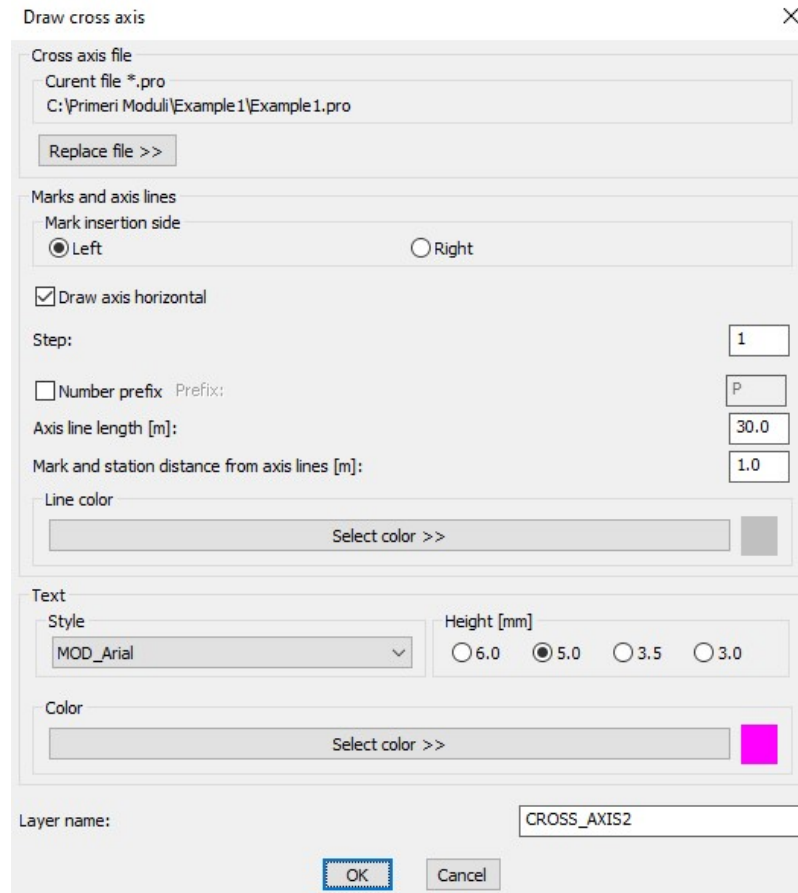
1.2 Draw cable axis in draft/sketch ground floor and longitudinal section. (see examples in appendix 12)

Longitudinal section and ground floor
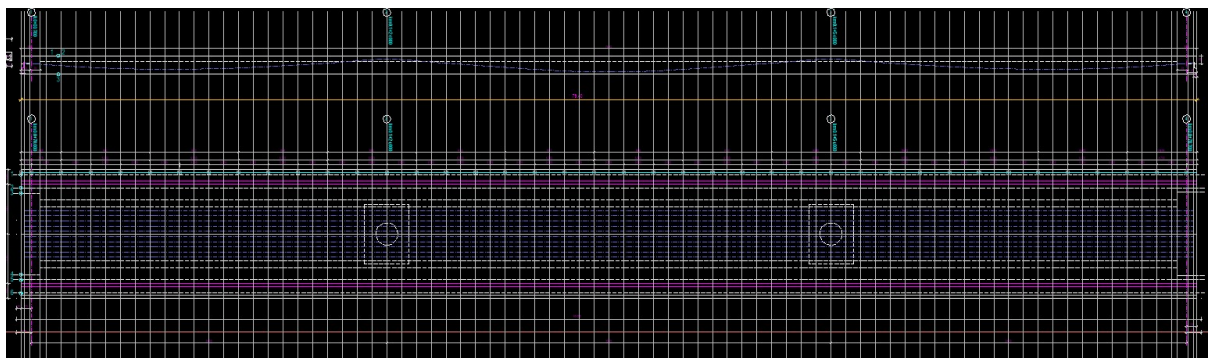
Longitudinal section   Ground floor
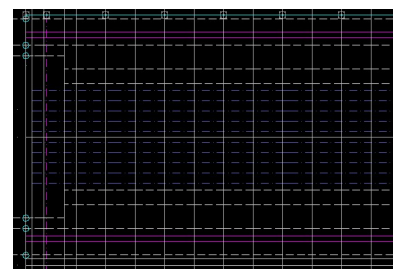
1.3 Define cable file Cable1.kal. **Multiple cable drawing files must have the same cahracters to cable numbers in names!** (Cable2.kal, Cable3.kal ...)
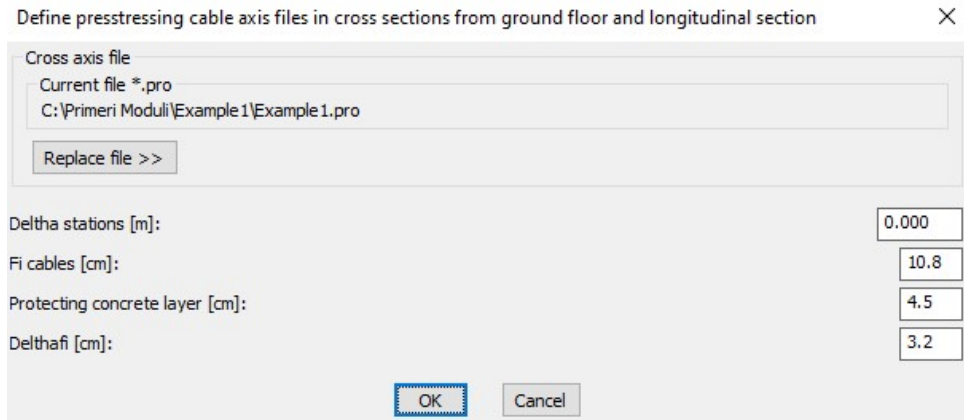
2. Draw cables in draft/sketch ground floor and longitudinal section

Multiple – longitudinal and ground floor cables
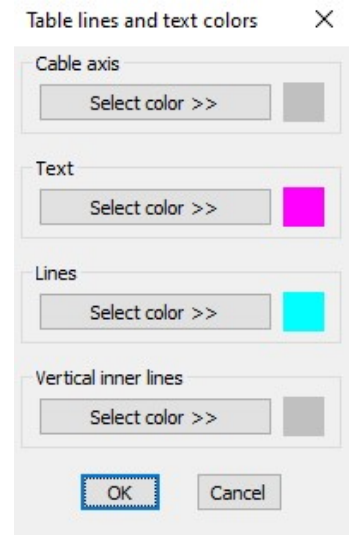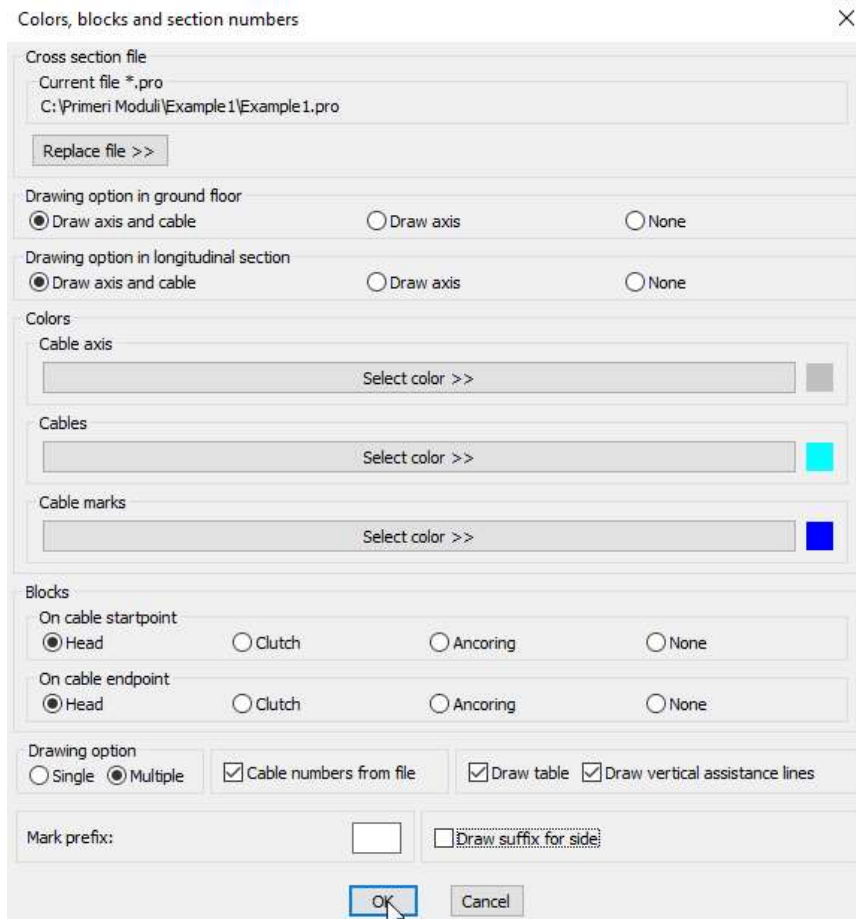
Block CABLE_HEAD_LEFT   Block CABLE_HEAD_RIGHT
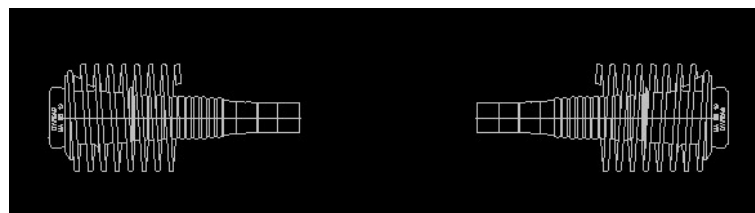
```
Selected cross section file: C:\Primeri Moduli\Example1\Example1.pro
Checking dates in file ... finished.
Select basic BLOCK for LEFT head:
Select basic BLOCK for RIGHT head:
Select polyline - TOP BORDER of construction longitudinal section:
Pick AXIS position in ground floor:
Starting cable files text <K>: Cable
STARTING cable number <1>:
ENDING cable number <1>: 10

File C:\Primeri Moduli\Example1\Cable1.kal not found.
Cable line file:
C:\Primeri Moduli\Example1\Cable1.kal.
Longitudinal section processing ...
Section processing in ground floor ...  finished.
Pick table X0Y origin point of cable. 1:
Draw table of 1. cable ...
```

Longitudinal section and ground floor draft/sketch
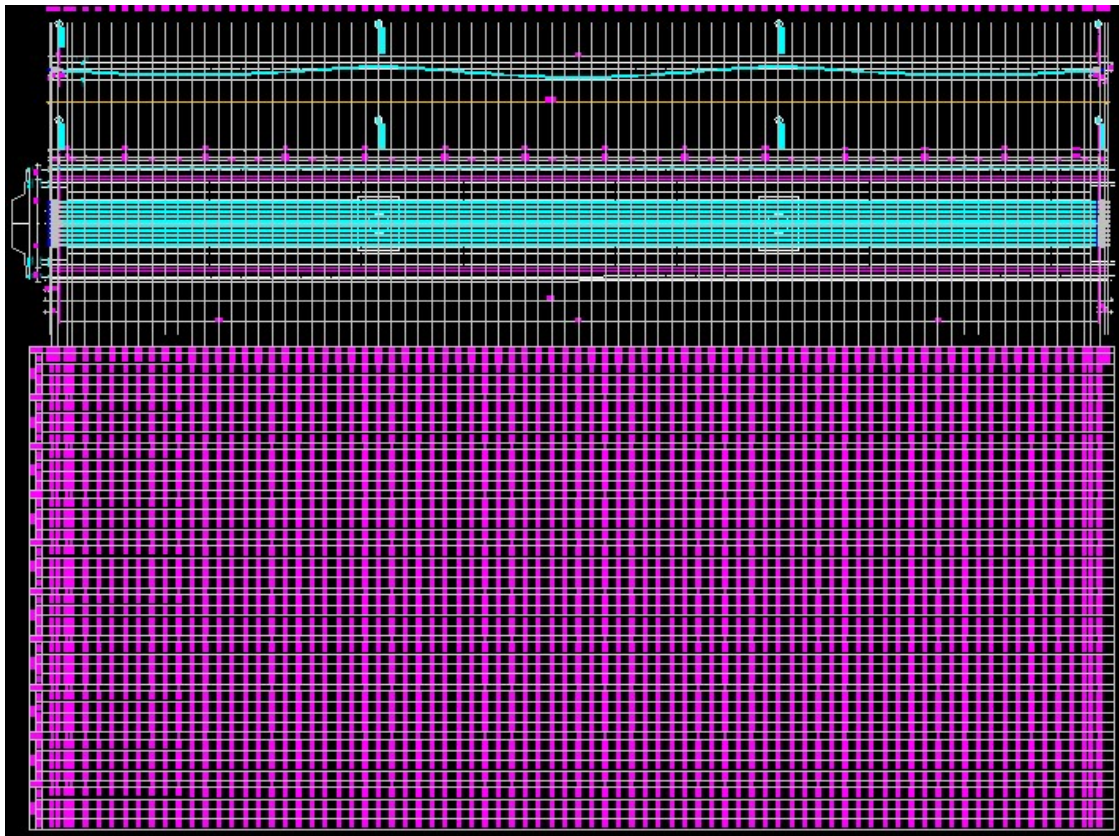
Longitudinal section draft/sketch   Ground floor draft/sketch

3. Draw cables in real ground floor 2d or 3d

2d draw

Draw cable in real ground floor ✕

Files
┌─ 3d roadway level file ────────────────────────────
│ Current file *.o3d
│ C:\Primeri Moduli\Example1\Example1.o3d
│
│ [Replace file >>]
└──

┌─ Roadway file ─────────────────────────────────────
│ Current file *.voz
│ C:\Primeri Moduli\Example1\Example1.voz
│
│ [Replace file >>]
└──

Drawing option
○ Single   ◉ Multiple   ◉ 2d   ○ 3d

☐ Draw 3d Y- coordinates horizontal   ☐ Draw as sketch

Mark prefix: [   ]   ☐ Writte suffix for side

[OK]   [Cancel]

Colors and blocks ✕

Drawing option in ground floor
◉ Draw axis and cable   ○ Draw axis   ○ None

Colors
┌─ Cable axis ───────────────────────────
│ [Select color >>]   ▨
└───

┌─ Cables ───────────────────────────────
│ [Select color >>]   ▨
└───

┌─ Cable marks ──────────────────────────
│ [Select color >>]   ▨
└───

Blocks
┌─ On cable startpoint ──────────────────────────
│ ◉ Head   ○ Clutch   ○ Ancoring   ○ None
└───

┌─ On cable endpoint ────────────────────────────
│ ◉ Head   ○ Clutch   ○ Ancoring   ○ None
└───

Mark prefix: [   ]   ☐ Draw suffix for side

[OK]   [Cancel]

```
Selected file *.o3d: C:\Primeri moduli\Example1\Example1.o3d
Selected file *.voz:C:\Primeri moduli\Example1\Example1.voz
Checking dates in files ... finished.
Section checking ... finished.
Select basic BLOCK for LEFT head:
Select basic BLOCK for RIGHT head:
Starting text of cable files <K>: CABLE
Number of STARTING cable <1>:
Number of ENDING cable <1>: 10

Cable line drawing file:C:\Primeri moduli\Example1\CABLE1.kal.
Section processing ...  finished.
Draw 1. cable ...  finished.
Cable line drawing file:C:\Primeri moduli\Example1\CABLE2.kal.
Section processing ...  finished.
Draw 2. cable ...  finished.
Cable line drawing file:C:\Primeri moduli\Example1\CABLE3.kal.
```
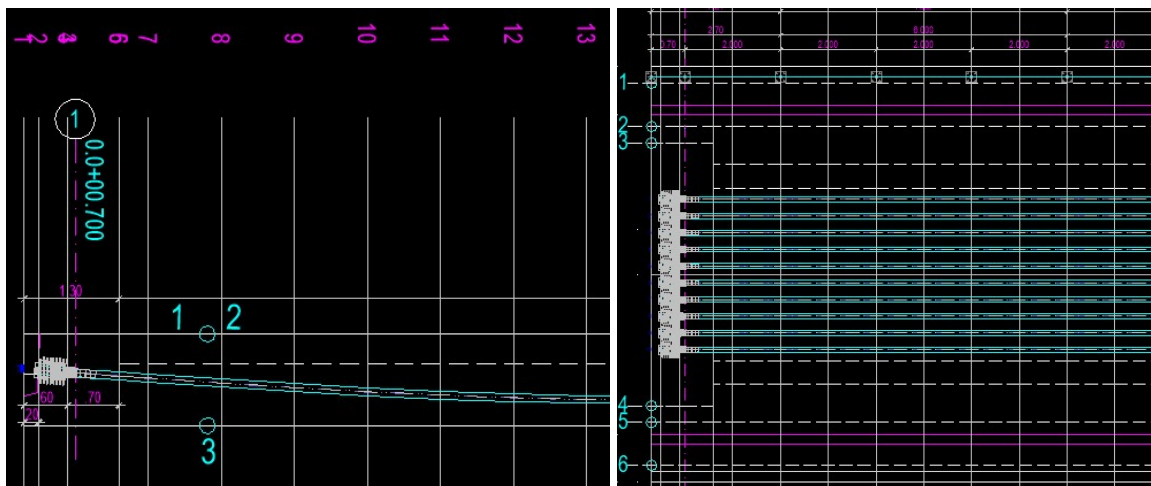

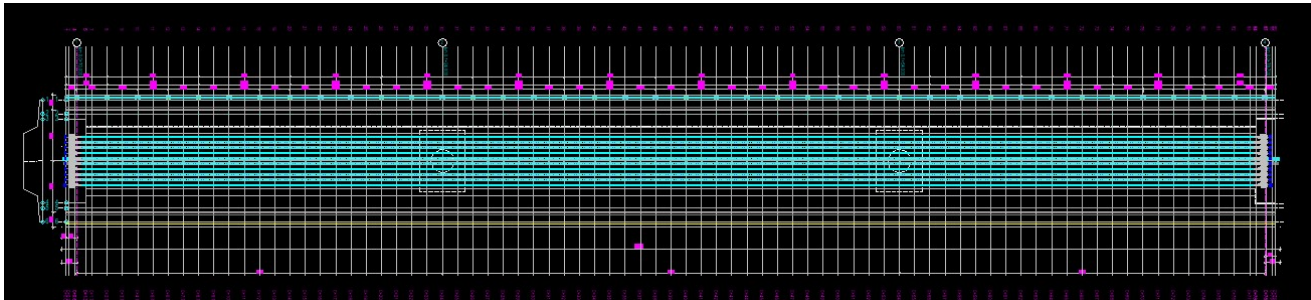**3d draw**


```
Selected file *.o3d: C:\Primeri moduli\Example1\Example1.o3d
Selected file *.voz:C:\Primeri moduli\Example1\Example1.voz
Checking dates in files ... finished.
Section checking ... finished.
Select basic BLOCK for LEFT head:
Select basic BLOCK for RIGHT head:
Starting text of cable files <cable>:
Number of STARTING cable <1>:
Number of ENDING cable <10>:
Cable line drawing file:C:\Primeri moduli\Example1\cable1.kal.
Section processing ...  finished.
Draw 1. cable ...  finished.
```

Block CABLE_HEAD_LEFT_3D   Block CABLE_HEAD_RIGHT_3D
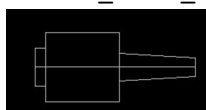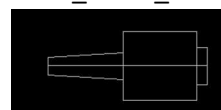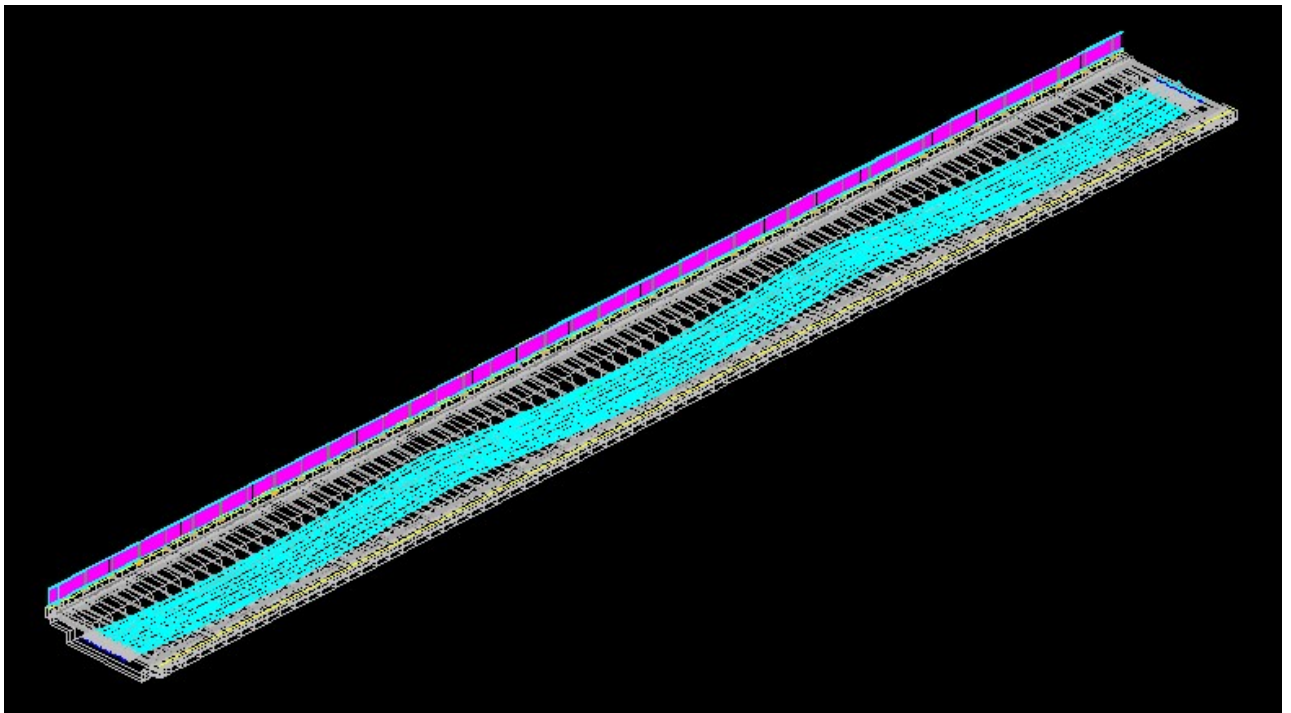
4. Draw cables in cross sections
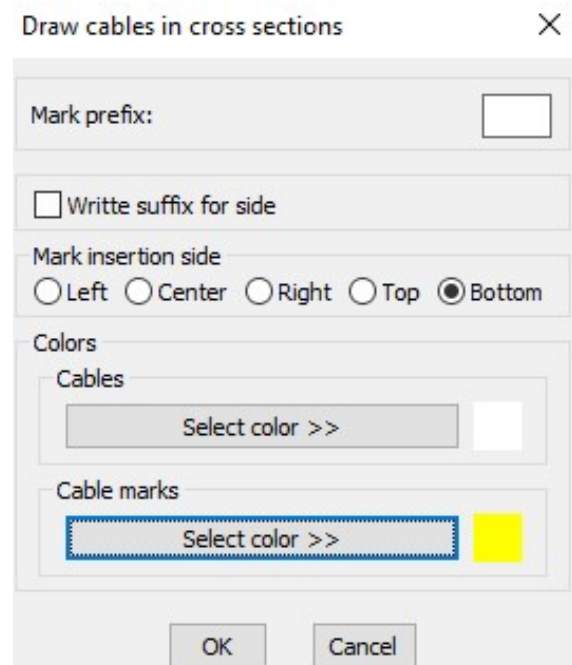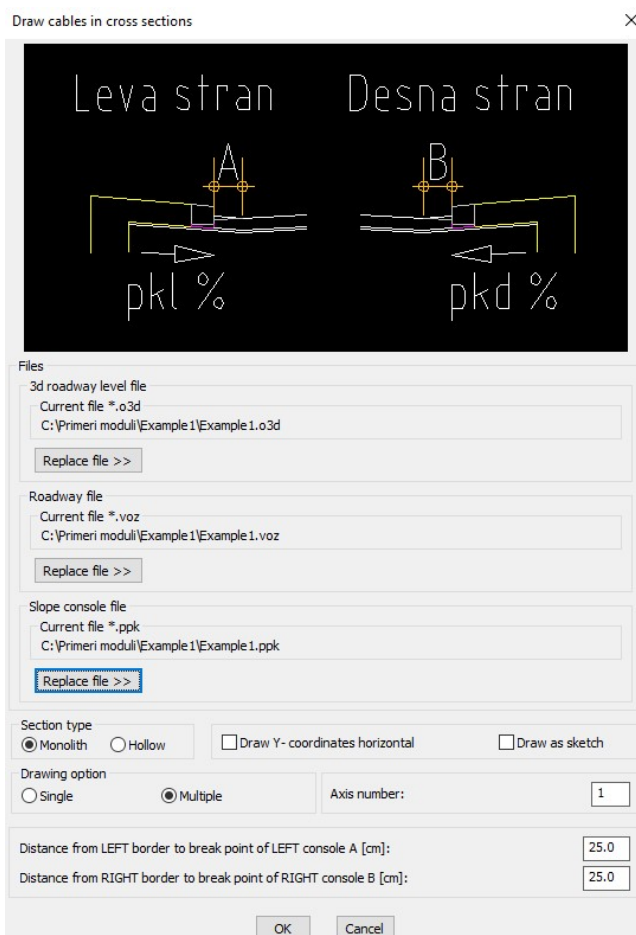

```
Selected file *.o3d: C:\Razno\!Projekti\Ponting\Nadvoz Ormož\OrmožENG.o3D
Selected file *.voz:C:\Razno\!Projekti\Ponting\Nadvoz Ormož\OrmožENG.voz
Selected file *.ppk: C:\Razno\!Projekti\Ponting\Nadvoz Ormož\OrmožENG.ppk
Preverjanje PREREZOV... finished.
Starting text of cable files <kabeleng>:
Number of STARTING cable <1>:
Number of ENDING cable <10>:
Cable line drawing file:C:\Razno\!Projekti\Ponting\Nadvoz Ormož\kabeleng1.kal.
Section processing ...
Draw cable ...  finished.
```

PP 5
km 0+1.300

100.123   i% = 2.500 >   100.039   i% = -2.500 >   99.968

1 2 3 4 5 6 7 8 9 10
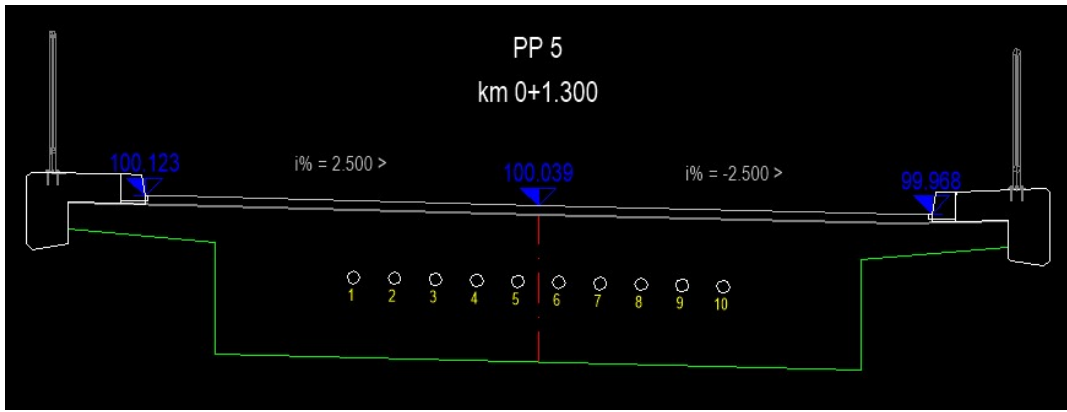
5. Insert Y0Z basis points in cross sections

6. Draw table of cable coordinates in cross sections

6.1 Left side

PP 5
km 0+1.300

Cross section 5		
Cable	Y [m]	Z [m]
1	0.719	-1.575
2	0.711	-1.225
3	0.702	-0.875
4	0.693	-0.525
5	0.684	-0.175

6.2 Right side

Draw table of cable coordinates in cross sections

Section type
● Monolith   ○ Hollow

Drawing type
○ Sketch   ● Normal

Coordinate system Y0Z origin
○ Top axis point   ● Bottom axis point

Cable position for draw
○ Left   ○ Axis   ● Right

Axis number: 1

Mark prefix:
☐ Writte suffix for side

Views
Width [m]: 10.0
Height [m]: 10.0

Colors
Title text
Select color >>

Text
Select color >>

Outer lines
Select color >>

Inner lines
Select color >>

OK   Cancel

PP 5
km 0+1.300

Cross section 5		
Cable	Y [m]	Z [m]
1	0.719	-1.575
2	0.711	-1.225
3	0.702	-0.875
4	0.693	-0.525
5	0.684	-0.175

Cross section 5		
Cable	Y [m]	Z [m]
10	0.641	1.575
6	0.676	0.175
7	0.667	0.525
8	0.658	0.875
9	0.649	1.225
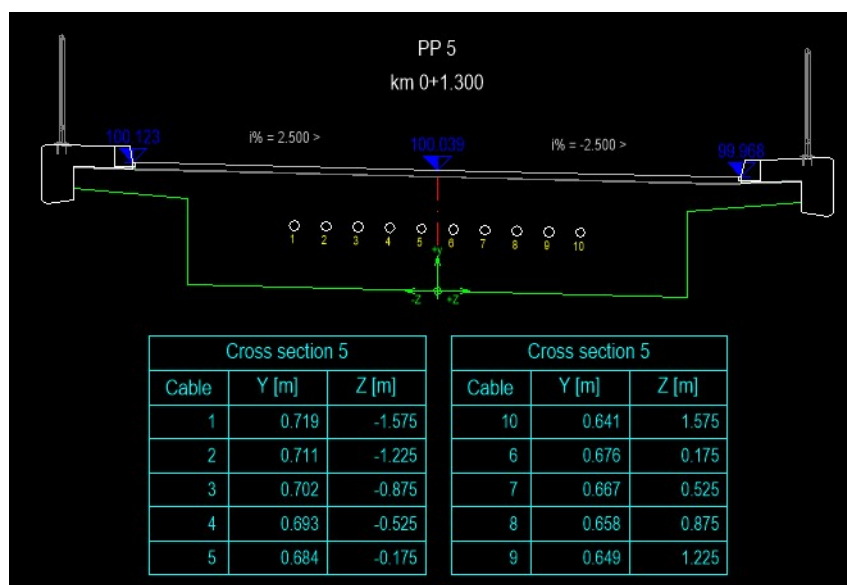
7. Draw table of cable specifications

7.1 Left side

Draw table of cable specifications

Drawing area
- ○ 2d
- ◉ 3d

Cable position
- ◉ Left
- ○ Axis
- ○ Right

Textual dates
- Titele text: Cable specification
- Mark prefix: [ ]
- ☐ Writte suffix for side

Cable type: 19 x 150 mm2

Cable weight [kg]: 22.700

Colors
- Title text — Select color >>
- Text in lines — Select color >>
- Outer table lines — Select color >>
- Inner table lines — Select color >>

[OK] [Cancel]

Cable specifikation				
Mark	pcs	TYPE	L [m]	Wght [kg]
1	1	19 x 150 mm2	79.2	1797.8
2	1	19 x 150 mm2	79.2	1797.8
3	1	19 x 150 mm2	79.2	1797.8
4	1	19 x 150 mm2	79.2	1797.8
5	1	19 x 150 mm2	79.2	1797.8
Sum			396.0	8989.0

7.2 Right side

Draw table of cable specifications

Drawing area
- ○ 2d
- ◉ 3d

Cable position
- ○ Left
- ○ Axis
- ◉ Right

Textual dates
- Titele text: Cable specifikation
- Mark prefix: [ ]
- ☐ Writte suffix for side

Cable type: 19 x 150 mm2

Cable weight [kg]: 22.700

Colors
- Title text — Select color >>
- Text in lines — Select color >>
- Outer table lines — Select color >>
- Inner table lines — Select color >>

[OK] [Cancel]

Cable specifikation				
Mark	pcs	TYPE	L [m]	Wght [kg]
1	1	19 x 150 mm2	79.2	1797.8
2	1	19 x 150 mm2	79.2	1797.8
3	1	19 x 150 mm2	79.2	1797.8
4	1	19 x 150 mm2	79.2	1797.8
5	1	19 x 150 mm2	79.2	1797.8
Sum			396.0	8989.0