

Presentation - composite beam

Demonstration example


Internal document – training of distributors, 06/2014

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1. Wizard

Beam wizard



Type of beam

☐ Cast-in-situ concrete beam

☒ Pre-fabricated concrete beam Composite pre/post-tensioned

☐ Steel beam

☒ Single span beam

Beam alignment Top surface

Supports position Bottom surface

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Beam wizard



Pre-fabricated single span beam

☒ Straight beam loaded in vertical plane

☐ Straight or polygonal beam loaded in 3D

Length of beam [m] :

Note : Detailed support conditions can be set when defining the construction

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Beam wizard



Code, cross-section, loads

Design code: EN

National annex: EN

Design working life: 50 years

Cross-section General

☒ Self weight according cross-section

Permanent load [kN/m]:

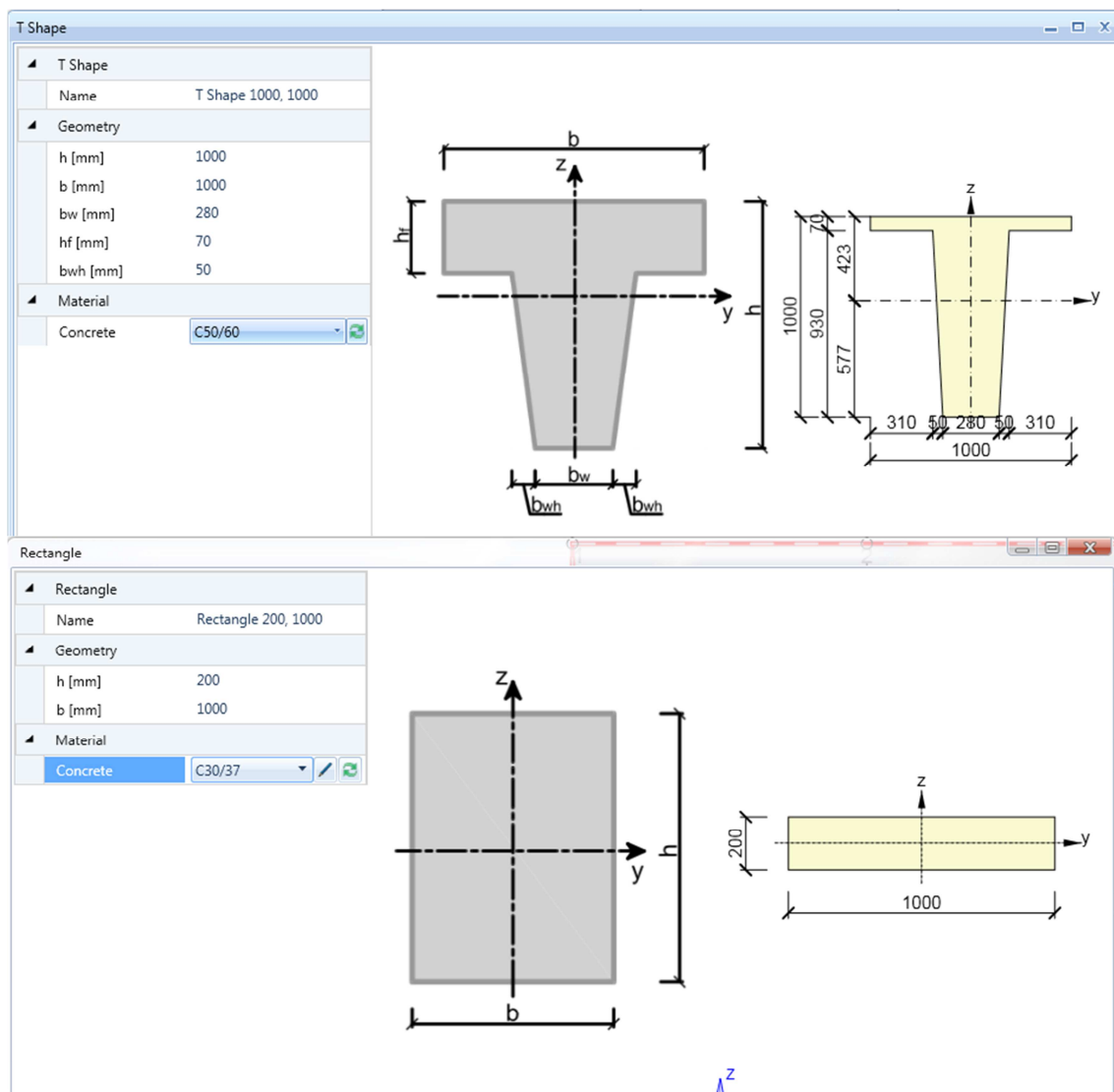
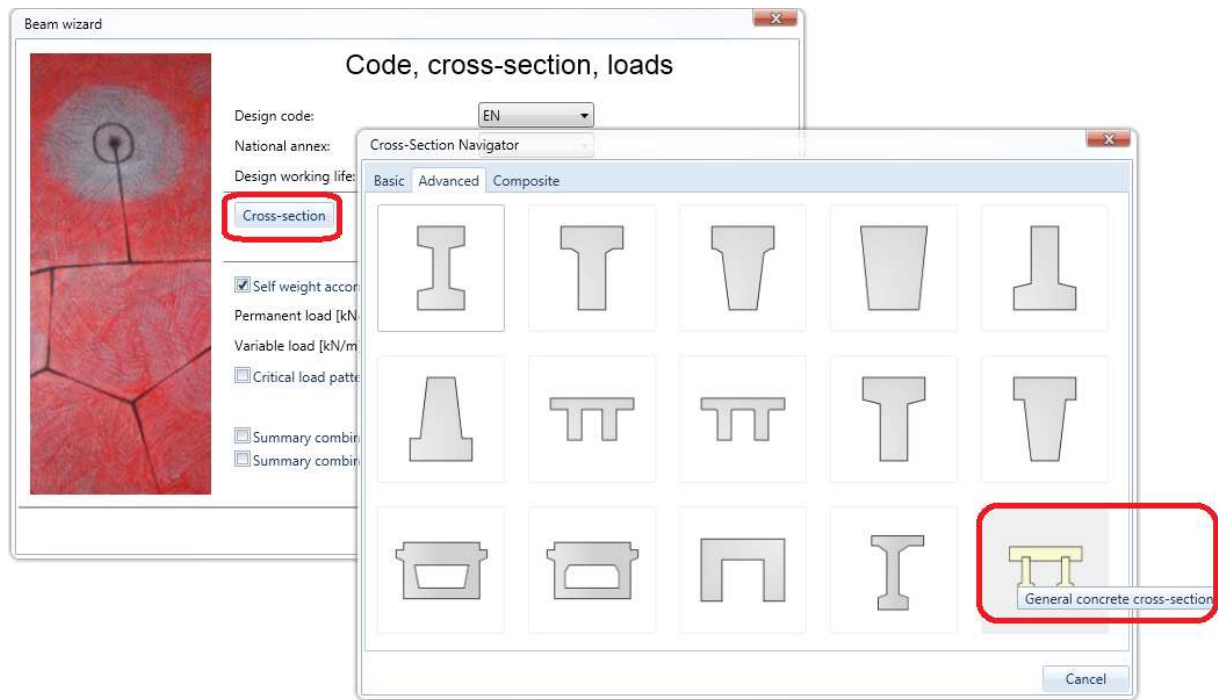
Variable load [kN/m]:

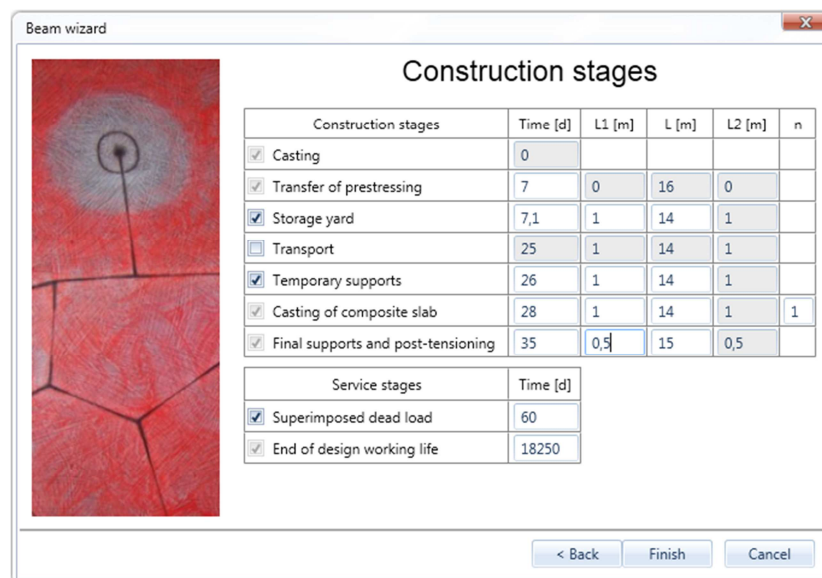
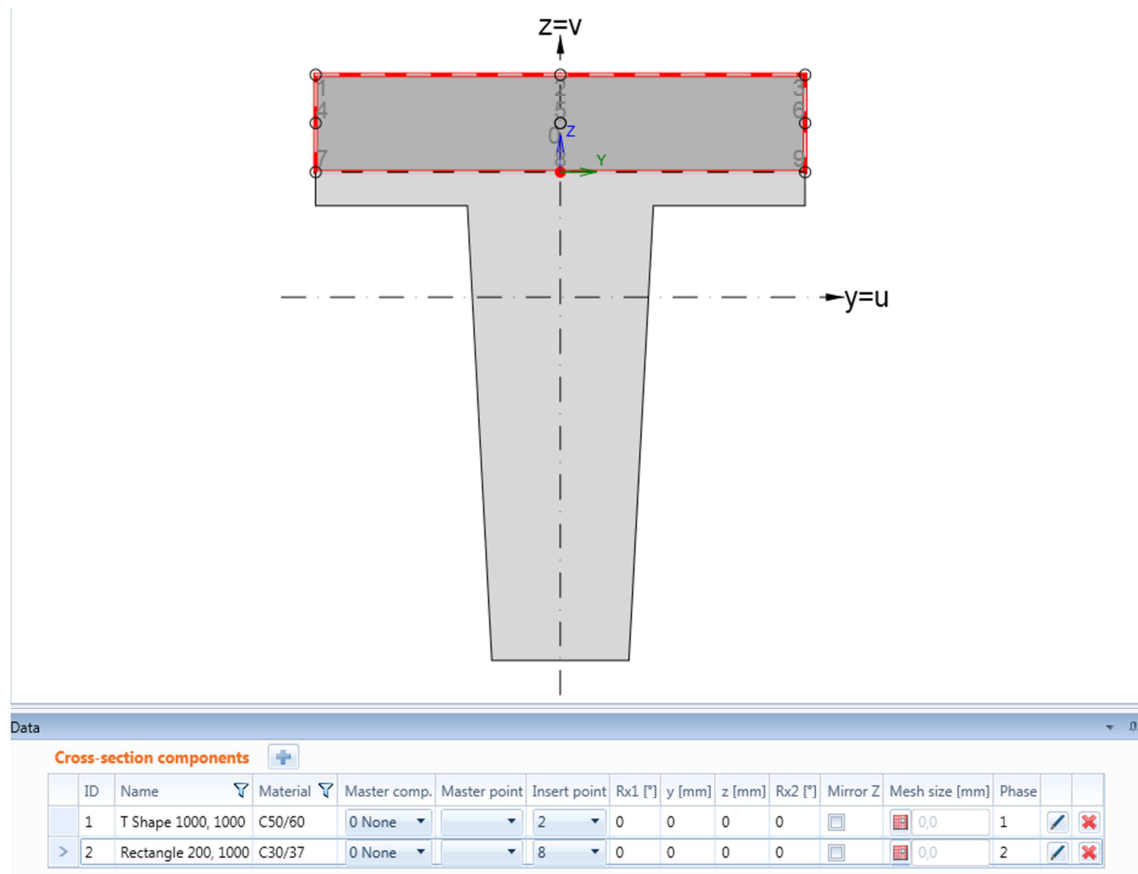
☐ Critical load patterns

☐ Summary combination for permanent and superimposed dead load

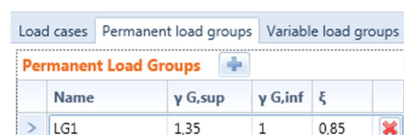
☐ Summary combination for prestressing and rheological load cases

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2. Adaptation of beam input



Load cases Permanent load groups Variable load groups

Variable Load Groups

| Name | Type | γ_q | ψ_0 | ψ_1 | ψ_2 |
|------|----------------------|------------|----------|----------|----------|
| LG2 | Standard - Exclusive | 1,5 | 0,7 | 0,5 | 0,3 |
| LG3 | Standard | 1,5 | 0,7 | 0,5 | 0,3 |

IDEA StatiCa Tendon - Presentation - composite beam

Units Application Code Project data Material

Uncoiled 3D XY XZ Dimension lines Axis

Scale XY 1,0 Scale XZ 2,0 Number of members

Calculate FEM

Brief Standard Detailed Settings

Print report Export report

Settings

Design member...

Uncoiled view

Navigator

Design Member

DM1

Tendon

Project Data

Construction Stages

Design Members

Tendons

Force Design

Short-term Losses

Design Member Result

Report

Main

Plane XZ

M1 M2

0.50

Data

| Name | Description | Members | Type | Stressing bed | Void | Print |
|-------|-------------|---------|--------------------|-----------------|------|-------|
| 1 DM1 | | 1-3 | Pre/Post-tensioned | Stressing bed 1 | | |

Edit

3. Tendon design

Stressing bed

| | |
|---|---|
| Length of prestressing units | 50,00 m |
| Stressing procedure | Pretensioned - correction of relaxation |
| Duration of keeping stress constant | 300 s |
| Duration of short-term relaxation | 57600 s |
| Loss due to deformation of end abutments | <input checked="" type="checkbox"/> |
| Defining of number of prestressing units | By the groups |
| Shortening of stressing bed | 1 mm |
| Anchorage set | 2 mm |
| Loss due to the difference in temperature | <input checked="" type="checkbox"/> |
| Code coefficient | 0,50 - |
| Tmax | 50,00 °C |
| T0 | 20,00 °C |
| Tendon releasing | Gradual releasing |

OK Cancel

Pretensioned on edge, Y1860S7-12,5

Group1 + 2:

Data

Tendons Pretensioned group

Group 1

| | | |
|------------------|---|---------------------|
| Cross-section | | |
| Position | | 0,00 - |
| Relative | <input checked="" type="radio"/> Yes <input type="radio"/> No | |
| Edge | 1 / 4 | |
| n | | 2 |
| Cover | | |
| Selected edge | | 40 mm |
| Previous edges | | 40 mm |
| Next edges | | 40 mm |
| Diameter | | 13 mm |
| As | | 186 mm ² |
| Blanketed length | | |
| Begin | | 3,00 m |
| End | | 3,00 m |

Data

Tendons Pretensioned group

Group 2

| | | |
|------------------|---|---------------------|
| Cross-section | | |
| Position | | 0,00 - |
| Relative | <input checked="" type="radio"/> Yes <input type="radio"/> No | |
| Edge | 1 / 4 | |
| n | | 2 |
| Cover | | |
| Selected edge | | 90 mm |
| Previous edges | | 40 mm |
| Next edges | | 40 mm |
| Diameter | | 13 mm |
| As | | 186 mm ² |
| Blanketed length | | |
| Begin | | 0,00 m |
| End | | 0,00 m |

New Post-tensioned, segment, do NOT take supports into account

Data

Tendons Tendon geometry XY Tendon geometry XZ Pretensioned group

Post-tensioned tendons

| | Tendon name | Load case | Material | Strands | Duct diameter [mm] | Duct material | Stressing from | Stressing procedure | Detail | Geometry | Locked | Tendon stress check |
|---|-------------|---------------------|--------------|---------|----------------------|---------------|----------------|---------------------|--------|----------|--------|---------------------|
| 1 | Tendon 1 | Post-tensioning (7) | Y1860S7-12.5 | 5 | 65 | Metal | beginning | No correction | | | | |

Pre-tensioned tendon groups

| | Group name | Load case | Material | Initial stress [MPa] | Geometry | Limiting value of stress [MPa] | Tendon stress check |
|---|------------|--------------------|--------------|------------------------|----------|----------------------------------|---------------------|
| 2 | Group 1 | Pre-tensioning (2) | Y1860S7-12.5 | 1431,00 | | 1476,00 | |
| 3 | Group 2 | Pre-tensioning (2) | Y1860S7-12.5 | 1431,00 | | 1476,00 | |

Detail (Tendon):

| Tendon | |
|---|---------------|
| Name | Tendon 1 |
| Material | Y1860S7-12.5 |
| Number of strands | 5 |
| Friction coefficient | 0,20 |
| Unintended angular change per unit length | 0,001 |
| Stressing from | beginning |
| Stressing procedure | No correction |
| Anchorage set (beginning) | 5 mm |
| Anchorage set (end) | |
| Duration of keeping stress constant | |
| Anchorage stress (beginning) | 1475,00 MPa |
| Anchorage stress (end) | |
| Maximum stress applied to the tendon | 1476,00 MPa |

OK Cancel

Plane XZ

Data

Tendons Tendon geometry XY Tendon geometry XZ Pretensioned group

Tendon 1

☐ Locked tendon geometry ☐ Primary geometry

Tendon segments

| Beginning X [m] | End X [m] | Merge with next | Split | Segment geometry | |
|-----------------|-----------|-----------------|-------|------------------|-------------------------------------|
| 1 | 0,00 | 16,00 | - | + | Stand-alone, parabolic and straight |

Tendon points

| X [m] | v [mm] |
|-------|--------|
| 1 | 0,00 |
| 2 | 6,40 |
| 3 | 16,00 |

Intermediate point Straight - Parabola (S-P)

Point location in uncoiled view in vertical direction

Related to Minimum Z-

Distance Z- 70 mm

Point location in uncoiled view in horizontal direction

Related to Left

Relative Yes

Distance - h_{S-P} 0,40

Straight length - l_{S-P} 0,20

4. Sectional design

Deformations
Internal Forces

Concrete Design 1D

Data

Reinforcement

Deflection

Redistribution and reduction

Results

Report

Standard

Detailed

Data

Ultimate limit state

Capacity N-M-M ☒

Shear ☒

Torsion ☒

Interaction ☒

Serviceability limit state

Stress limitation ☒

Crack width ☒

Detailing

Detailing ☒

Deflections

Deflections Do not calculate

Exposure class

No corrosion (X0) ☒

Carbonation XC3 - Moderate humidity

Chlorides XD1 - Moderate humidity

Chlorides from sea No risk of chlorides from sea

Freeze/Thaw Attack No risk of freeze/thaw attack

Chemical Attack No risk of chemical attack

Member Data

Relative humidity [%] 65

Creep coefficient Calculated

Member type Beam

Structural member import Major

Deflection requirement Standard

Deformations
Internal Forces
Concrete Design 1D
Data
Reinforcement
Deflection
Redistribution and reduction
Results
Report
Standard
Detailed

Data

Reinforcement zones

| Reference point | Begin [m] | End [m] | Reinforcement | Check | Division |
|-----------------|-----------|---------|---------------|-------|----------|
| > 1 | 0 | 16 | A-A | | 2 |

Check position

| Name | Reference point | Position [m] | Total position | Check |
|-----------|-----------------|--------------|----------------|-------|
| support | 2 | 1 | 1,5 | |
| > midspan | 1 | 8 | 8 | |

RCS (Detailed)

Check all, it is satisfactory with prestressing reinforcement only

Set cover ... 30 mm

Stirrups – new from points ... closed stirrup in the web

Stirrups 10 mm, cover 30, distance 250 mm

General stirrup

Stirrup

Stirrups diameter d_s 10 mm

Stirrups material B 500B

Shear check

Torsion check

Stirrups distance 250 mm

Diameter of mandrel 4,00

| | Y [mm] | Z [mm] |
|---|--------|--------|
| 1 | 200 | -50 |
| 2 | 100 | -50 |
| 3 | 100 | -230 |
| 4 | 900 | -230 |
| 5 | 900 | -50 |
| 6 | 800 | -50 |

Import stirrup

Origin of coordinate system
Cross-section vertex
Component 2, vertex 4

OK Cancel

Reinforcement – new on edge:

Reinforcement Layers On Edge

☒ Label cross-section component number / component edge number
☐ Draw dimension lines of current layer

| Component / Edge | n | Ø [mm] | As [mm ²] | Material | Cover | Edge cover [mm] | Left cover [mm] | Right cover [mm] |
|------------------|---|--------|-----------------------|----------|-----------------------------|-----------------|-----------------|------------------|
| 1 2 / 3 | 2 | 12 | 226 | B 500B | As defined in cross-section | 30 | 30 | 30 |
| 2 1 / 3 | 4 | 12 | 452 | B 500B | As defined in cross-section | 30 | 30 | 30 |
| 3 1 / 5 | 4 | 12 | 452 | B 500B | As defined in cross-section | 30 | 30 | 30 |

Import layers

OK Cancel

Reinforcement – new in line

General Reinforcement Bar or Layer

☒ Label cross-section component number / component vertex number
☐ Draw dimension lines of current layer

| n | Ø [mm] | Origin | Begin Δ Y [mm] | Begin Δ Z [mm] | Origin | End Δ Y [mm] | End Δ Z [mm] | As [mm ²] | Material |
|-----|--------|----------------------|----------------|----------------|----------------------|--------------|--------------|-----------------------|----------|
| 1 4 | 12 | Component 2/vertex 4 | 120 | -218 | Component 2/vertex 4 | 880 | -218 | 452 | B 500B |

Import bars

OK Cancel

Export, import of reinforcement

5. Literature, references

1. IDEA StatiCa Prestressing, *IDEA Tendon 4, User guide*, IDEA RS s.r.o., U Vodárny 2a, 616 00 BRNO, www.idea-rs.com
2. IDEA StatiCa Prestressing, *IDEA Beam, IDEA Tendon, IDEA RCS, Tutorial*, IDEA RS s.r.o., U Vodárny 2a, 616 00 BRNO, www.idea-rs.com
3. IDEA StatiCa Prestressing, *Import/Export of tendons in module StatiCa Tendon, Tutorial*, IDEA RS s.r.o., U Vodárny 2a, 616 00 BRNO