



HRVATSKA KOMORA INŽENJERA GRAĐEVINARSTVA

Dani Hrvatske komore inženjera građevinarstva

Opatija, 2019.

Allplan Bridge 2019

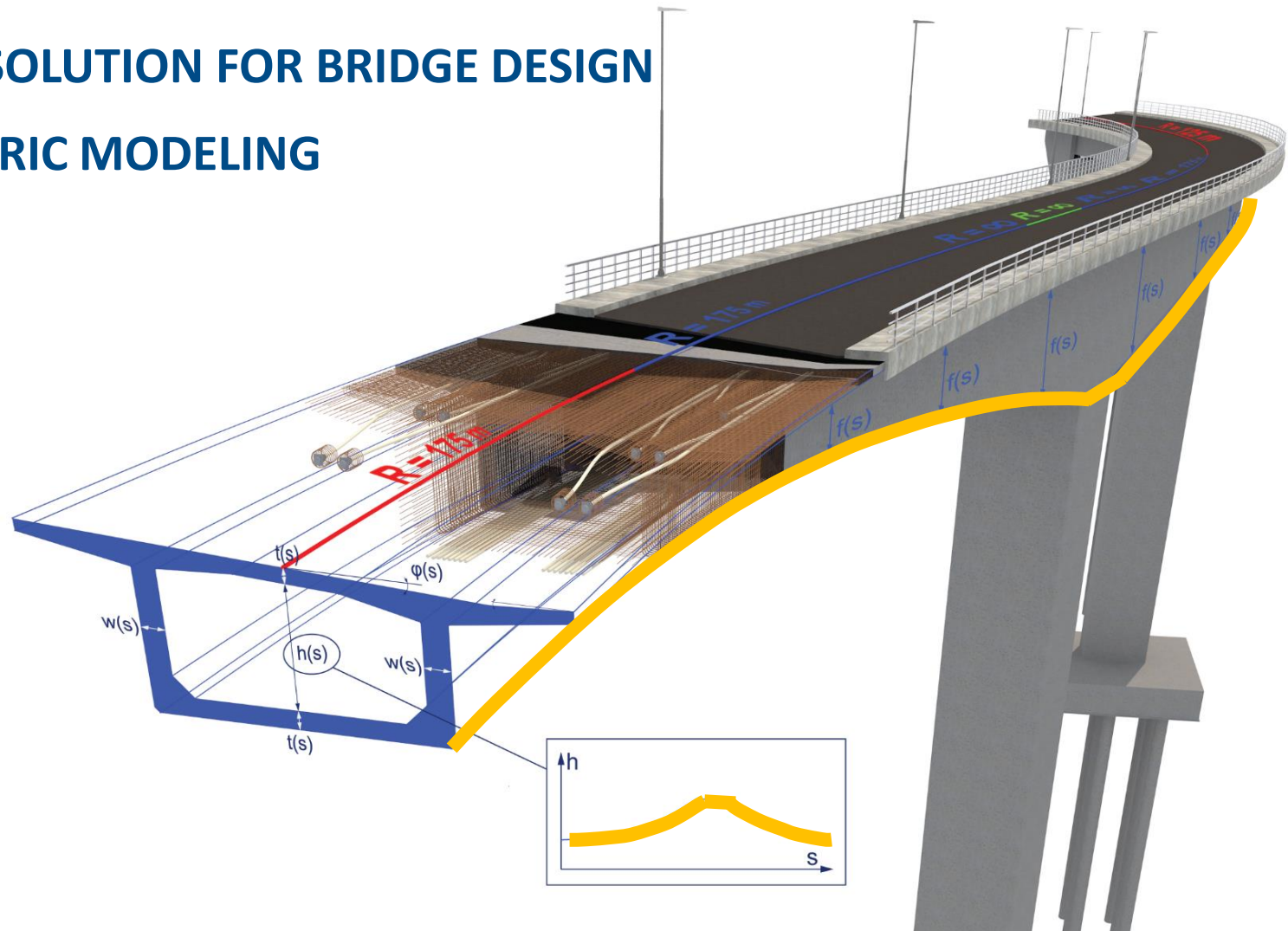
Gianmarco Čurčić Baldini

Gianmarco Čurčić Baldini, dipl.ing.arh., Baldinistudio, Zagreb

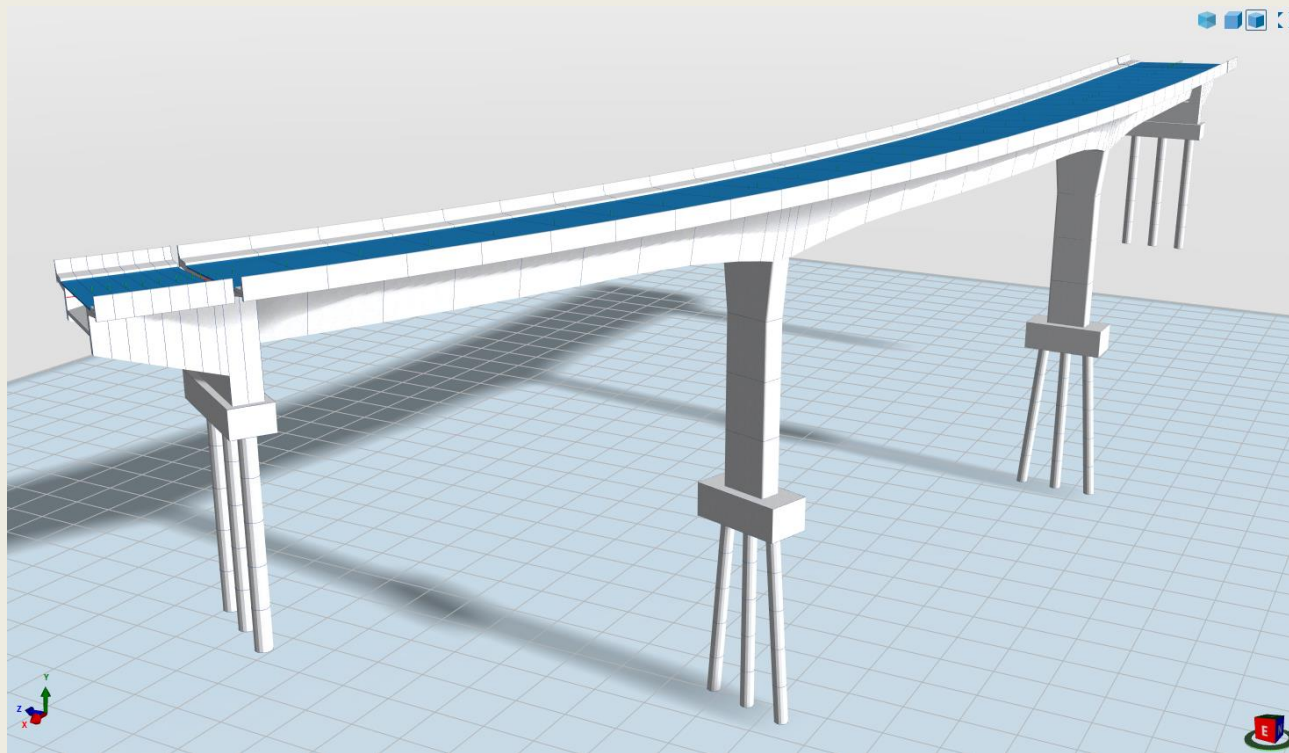
\ ALLPLAN BRIDGE

THE BIM SOLUTION FOR BRIDGE DESIGN

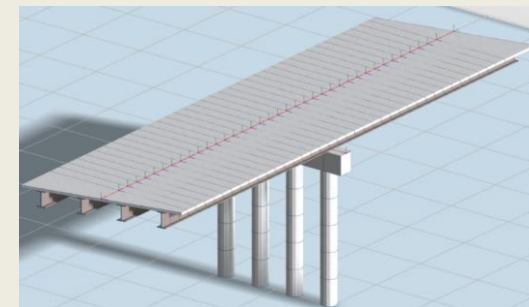
PARAMETRIC MODELING



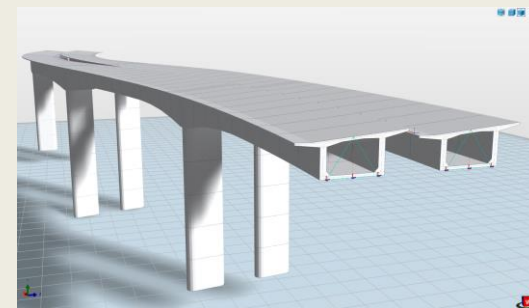
\ EXAMPLES



Superstructure and complete substructure



Composite bridges



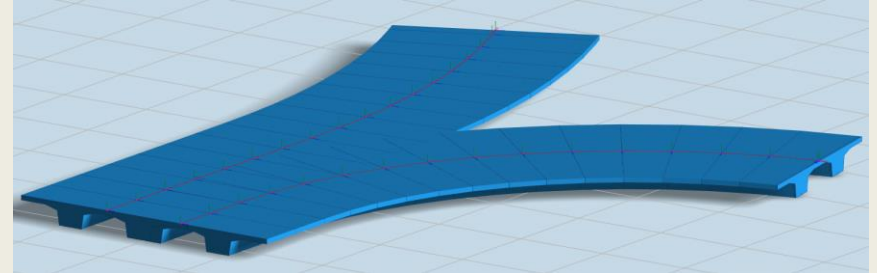
Double curved bridge with a double hollow box



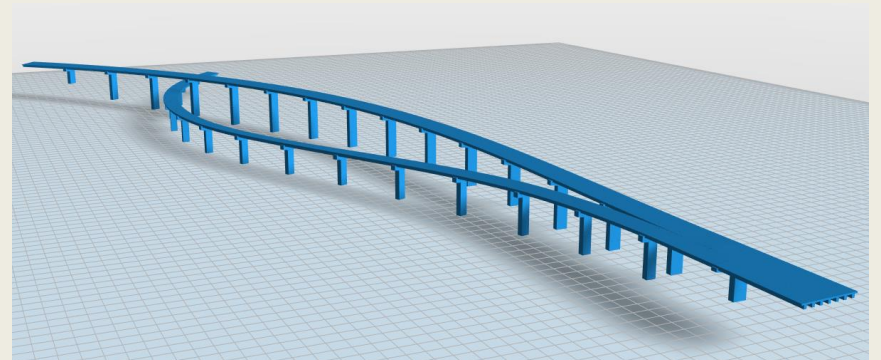
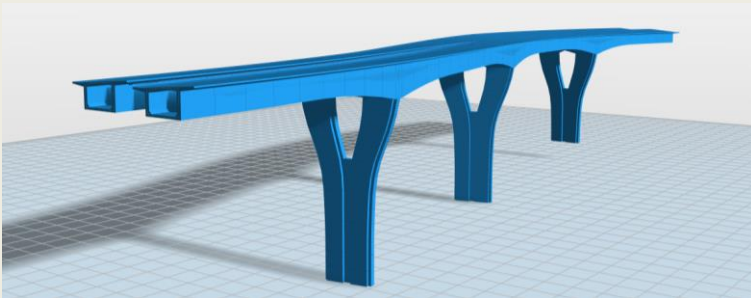
\ EXAMPLES



All possible pier types and shapes



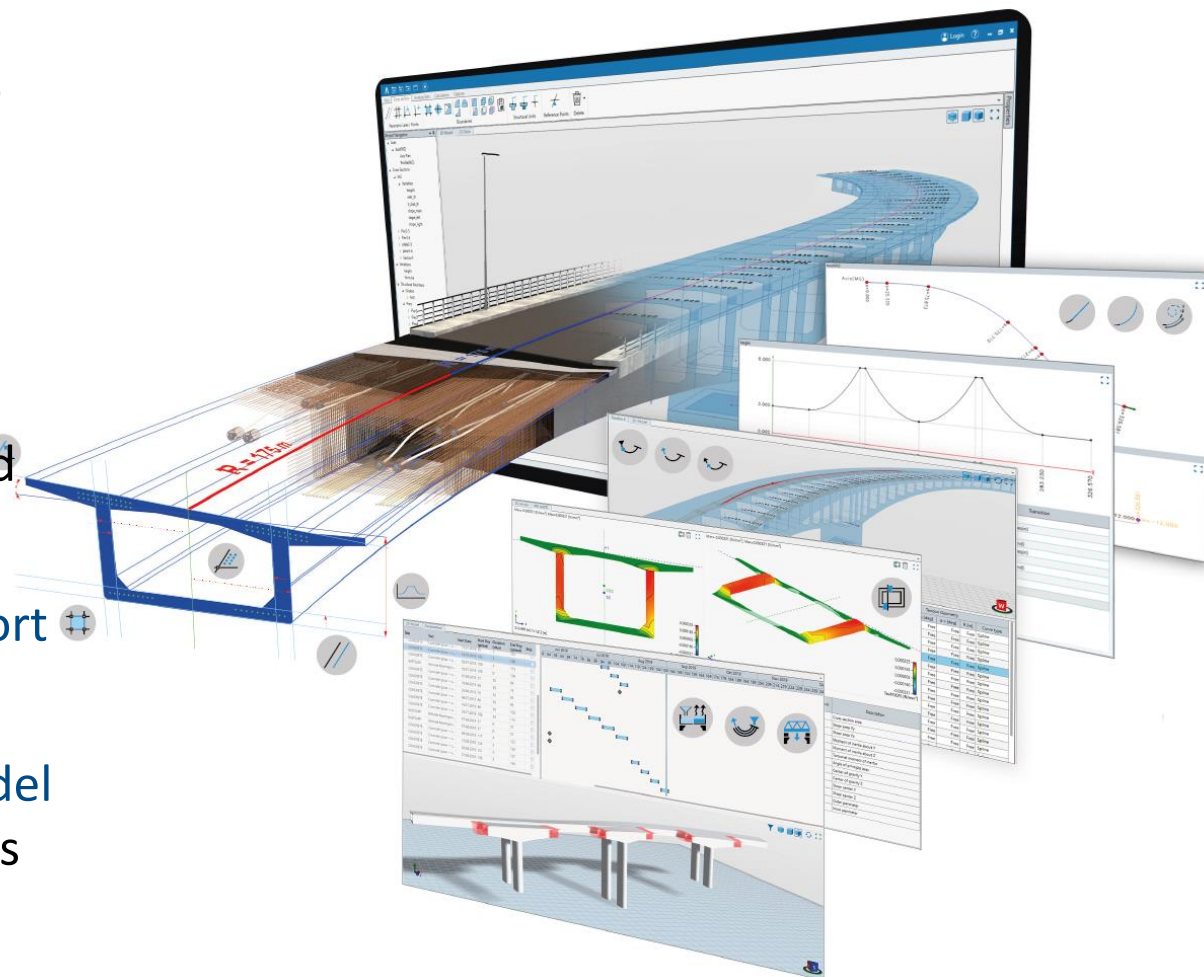
Stack interchanges and overpasses



\ EXAMPLES

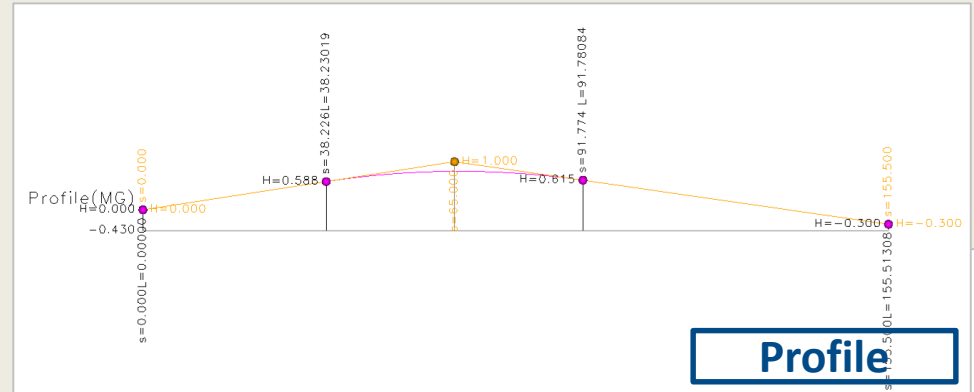
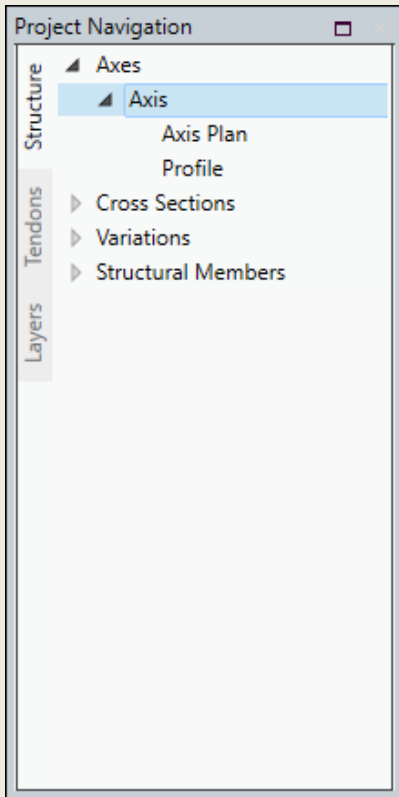
OUTSTANDING FEATURES

- Flexible and direct **modifications** anytime also at finished model state
- Full-featured **data import in Allplan**
- **One common data model** for drafting and analysis

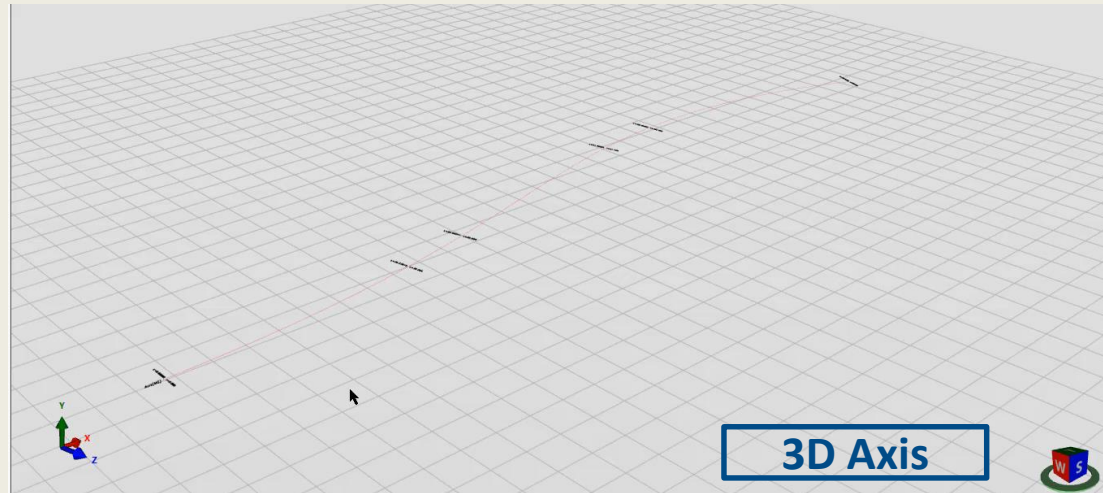


ALLPLAN BRIDGE

DEFINE PARAMETRIC AXIS

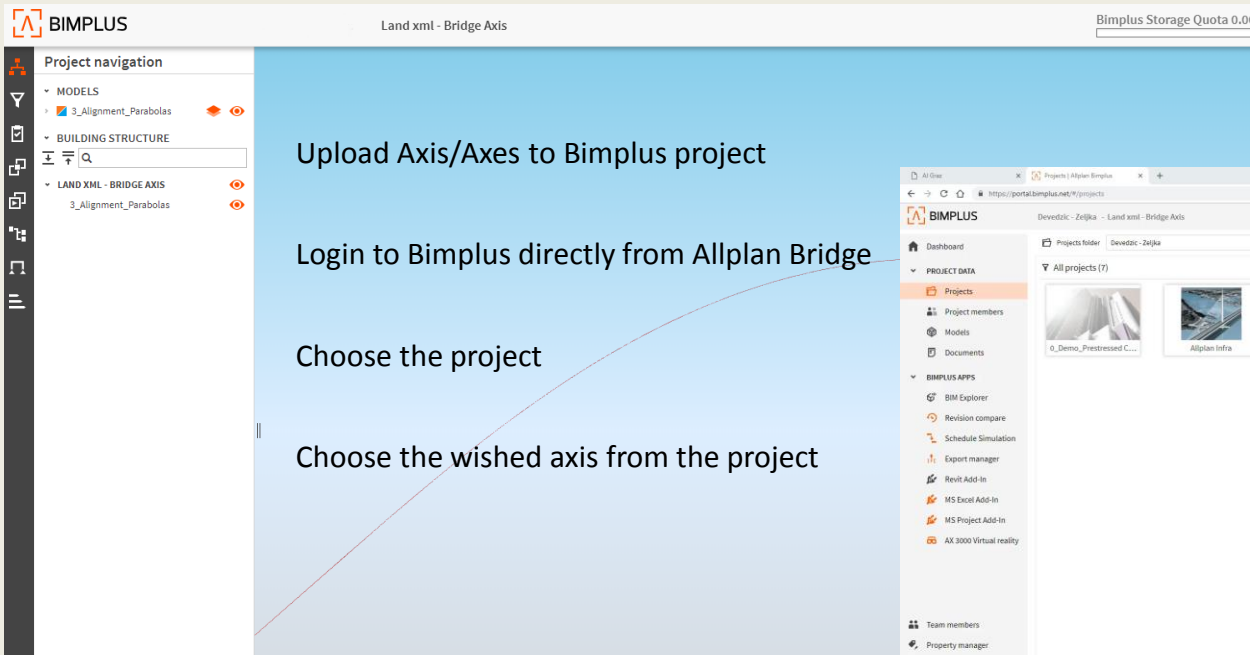


PLAN + ELEVATION -> 3D



\ ALLPLAN BRIDGE

IMPORT THE AXIS IN LAND XML FORMAT DIRECTLY FROM BIMPLUS



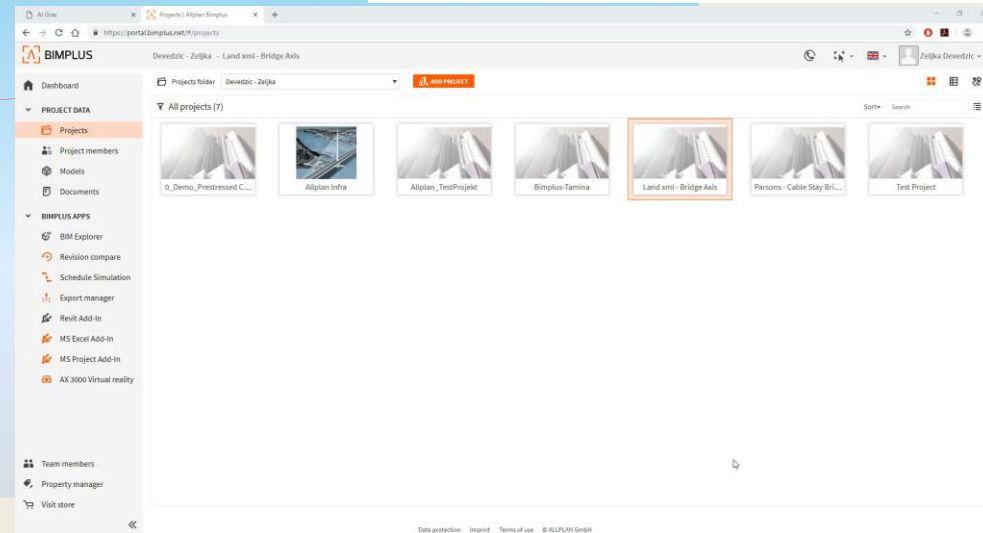
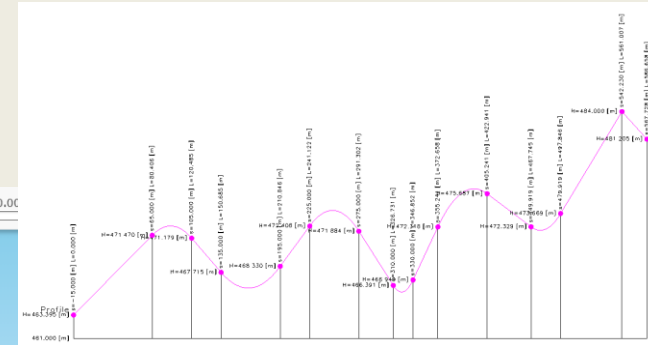
The screenshot shows the BIMPLUS web interface. On the left, there is a 'Project navigation' sidebar with a tree view containing 'MODELS', 'BUILDING STRUCTURE', and 'LAND XML - BRIDGE AXIS'. The main workspace is a light blue area with the text 'Land xml - Bridge Axis' at the top. A red line representing an axis is visible in the workspace.

Upload Axis/Axes to Bimplus project

Login to Bimplus directly from Allplan Bridge

Choose the project

Choose the wished axis from the project

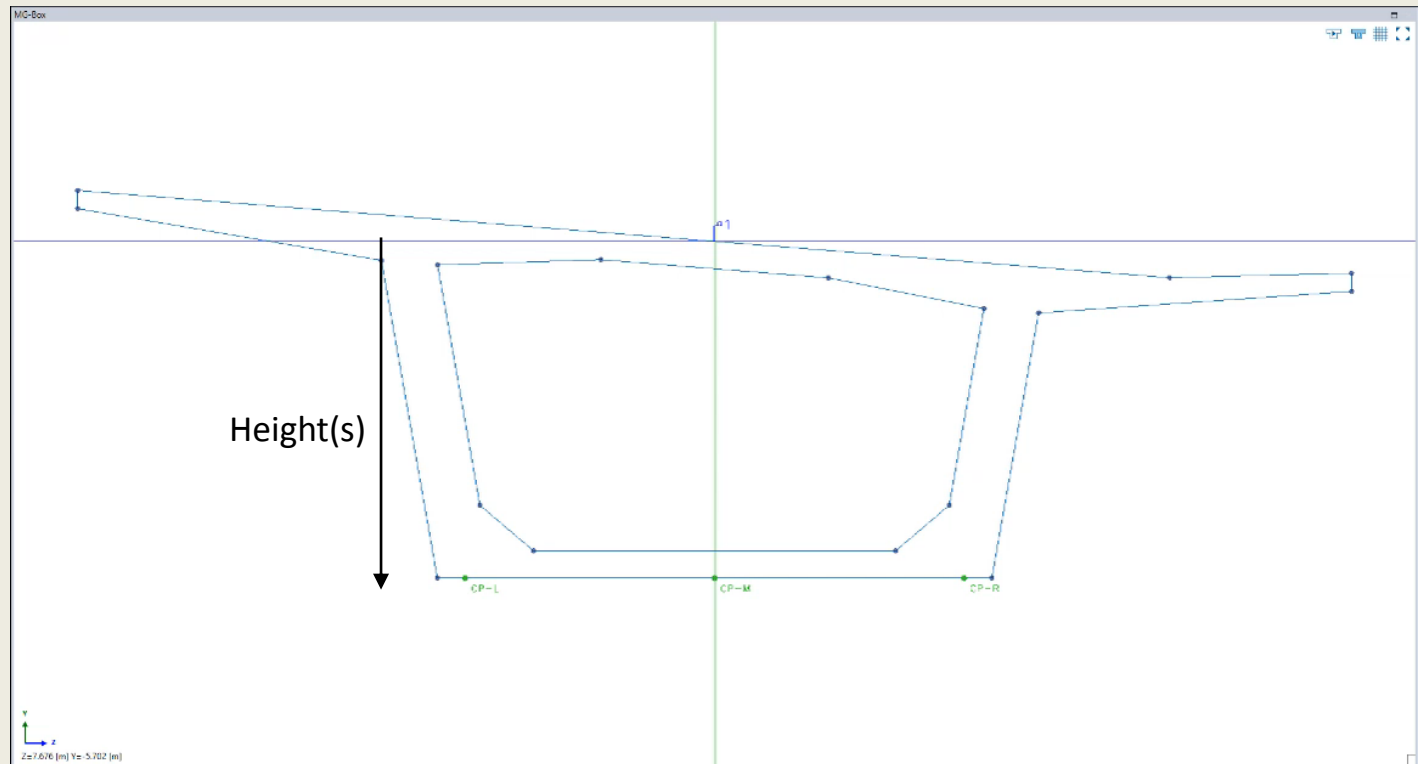
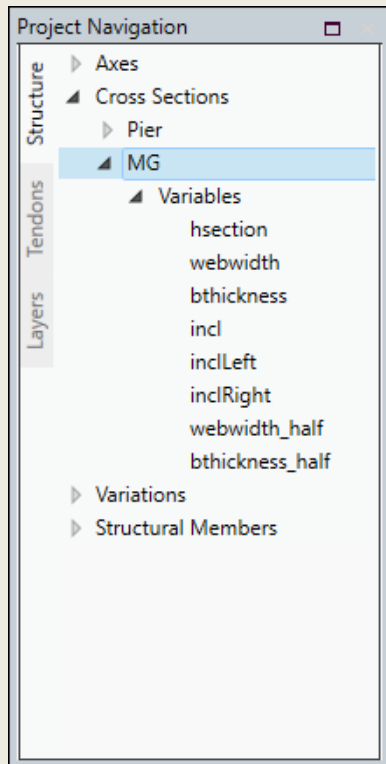


The screenshot shows the BIMPLUS dashboard. The top navigation bar includes 'Dashboard', 'Projects', 'Project members', 'Models', and 'Documents'. The main content area displays a list of projects under the heading 'All projects (7)'. The projects are represented by small thumbnail images. The project 'Land xml - Bridge Axis' is highlighted with a red border. Other projects include 'O_Demo_Prestressed C...', 'Allplan Infra', 'Allplan_TestProject', 'Bimplus-Tamilia', 'Parsons - Cable Stay Br...', and 'Test Project'.



\ ALLPLAN BRIDGE

DEFINE ONLY ONE ARBITRARY CROSS-SECTION USING VARIABLES

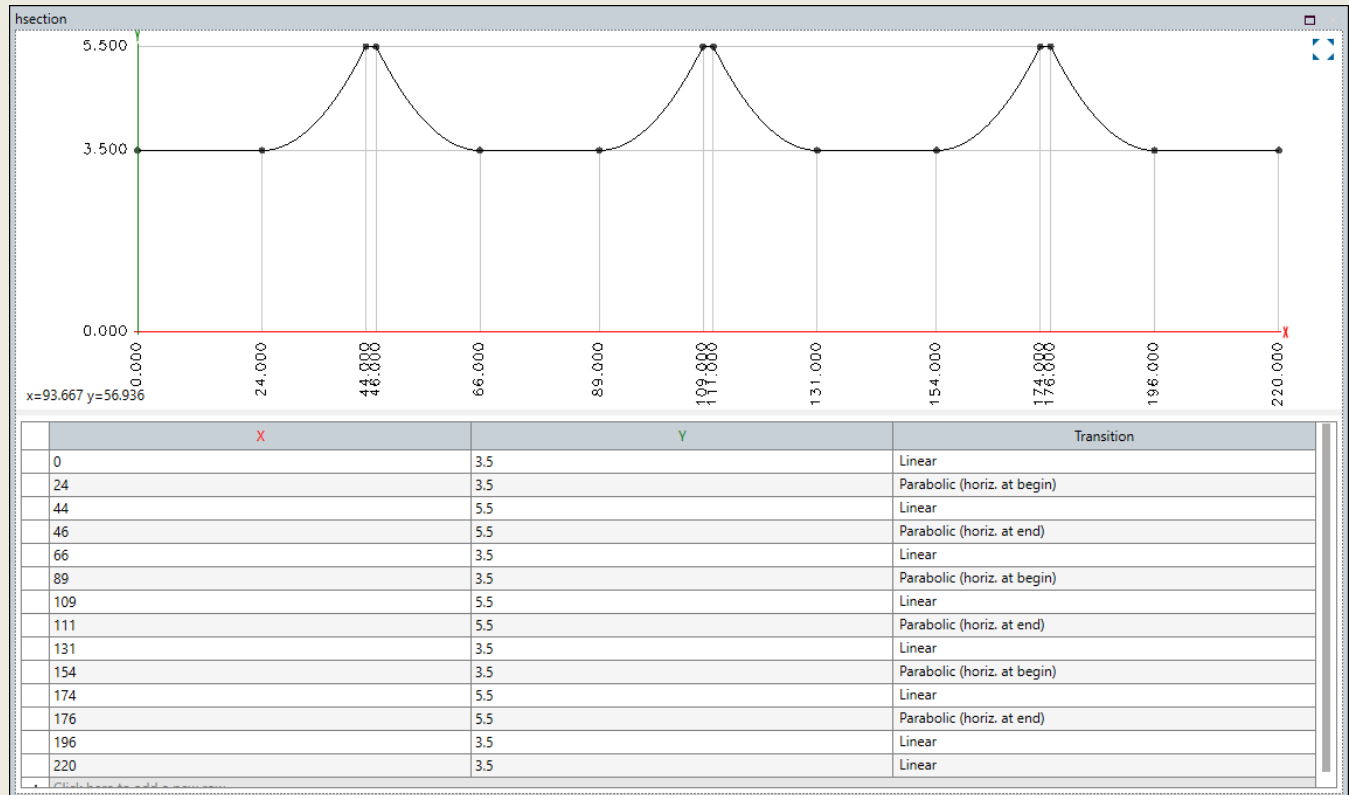


ALLPLAN BRIDGE

DEFINE VARIATIONS BY TABLES...

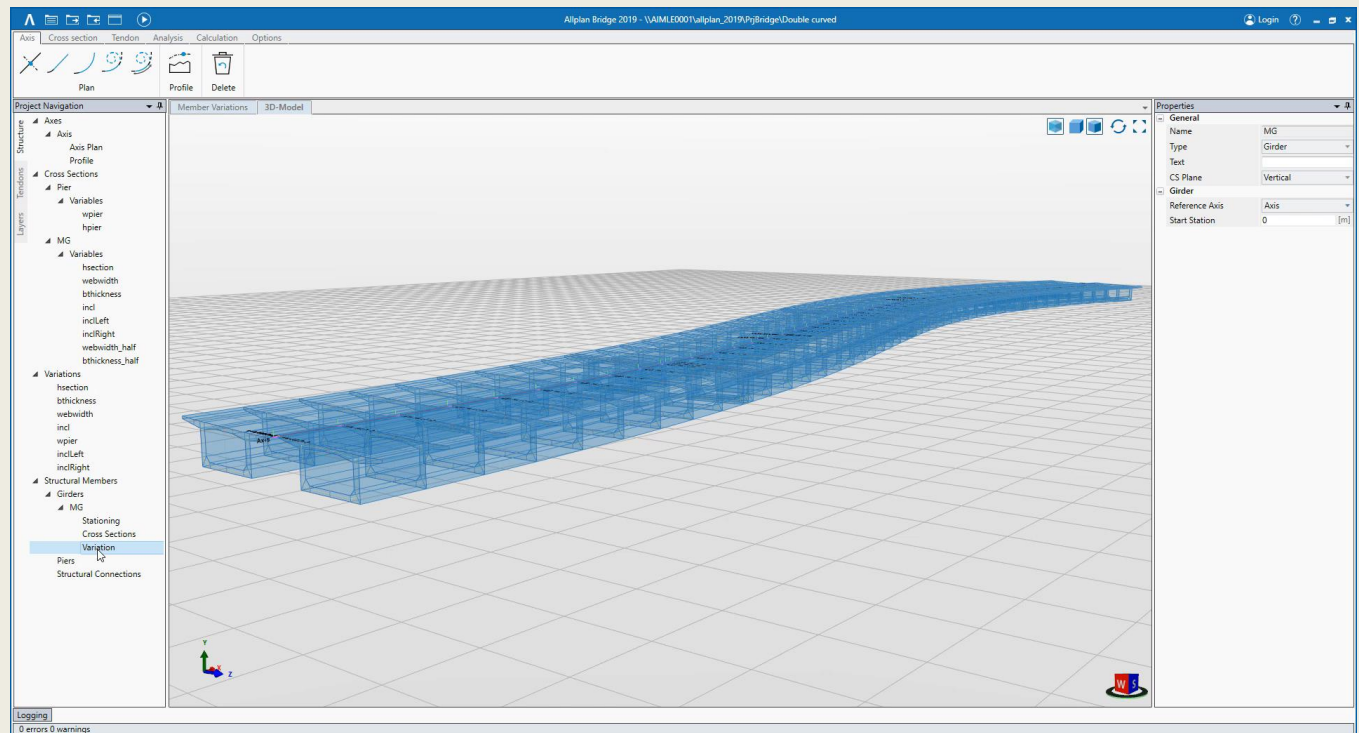
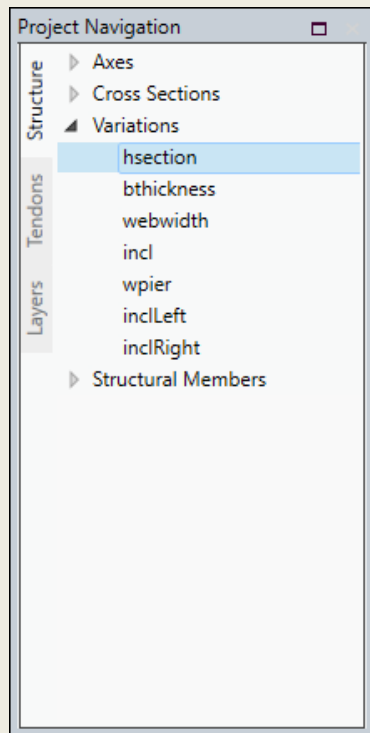
Project Navigation

- Structure
 - ▶ Axes
 - ▶ Cross Sections
 - ▶ Variations
 - hsection
 - bthickness
 - webwidth
 - incl
 - wpier
 - inclLeft
 - inclRight
 - ▶ Structural Members
- Tendons
- Layers



\ ALLPLAN BRIDGE

...AND ASSIGN THE TABLES TO THE GIRDER ALONG ITS STATIONS



ALLPLAN BRIDGE

EASY MANAGE CHANGES IN GEOMETRY – CROSS SECTION

The screenshot displays the Allplan Bridge 2019 software interface. The main window shows a 3D model of a bridge structure. Below the 3D model, there is a 2D cross-section plot labeled 'hsection' with a coordinate system (x, y) and a table of data points. The table has columns for X, Y, and Transition. The Y-axis represents section height, ranging from 0.000 to 3.500. The X-axis represents the horizontal position, ranging from 0.000 to 220.000. The table data is as follows:

X	Y	Transition
0	3.5	Linear
24	3.5	Parabolic (horiz. at begin)
44	3.5	Linear
46	3.5	Parabolic (horiz. at end)
66	3.5	Linear
89	3.5	Parabolic (horiz. at begin)
109	3.5	Linear
111	3.5	Parabolic (horiz. at end)

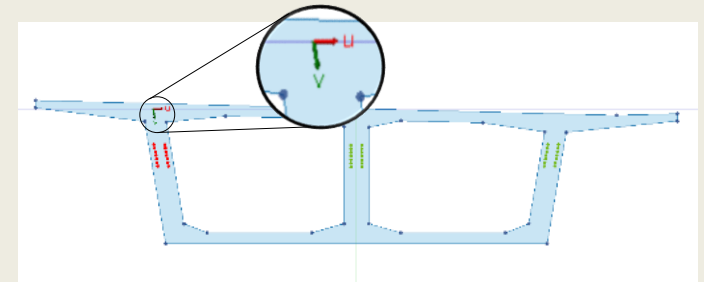
The interface also includes a Project Navigation tree on the left, a Properties panel on the right, and a status bar at the bottom showing '0 errors 0 warnings'.



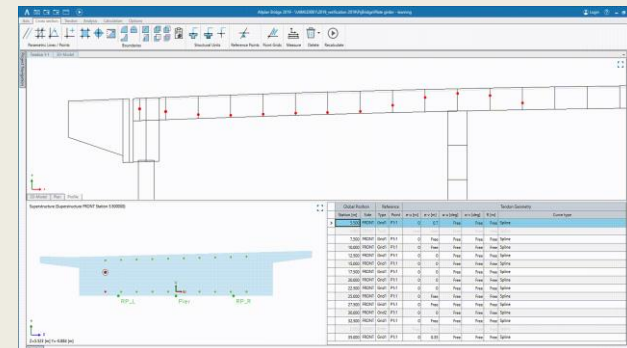
\ ALLPLAN BRIDGE

PRE-TENSIONING, POST-TENSIONING, INTERNAL, EXTERNAL, VERTICAL & TRANSVERSE

- › **PARAMETRIC MODELING OF TENDONS**
- › Additional points in the CS define tendon positions
 - › Set distance between points as variable
 - › Uses a local coordinate system
- › Accurate and flexible definition of tendon layout



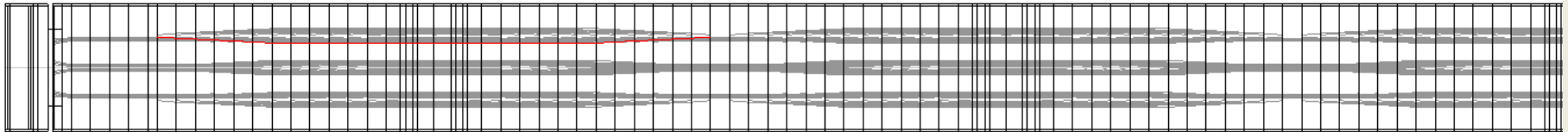
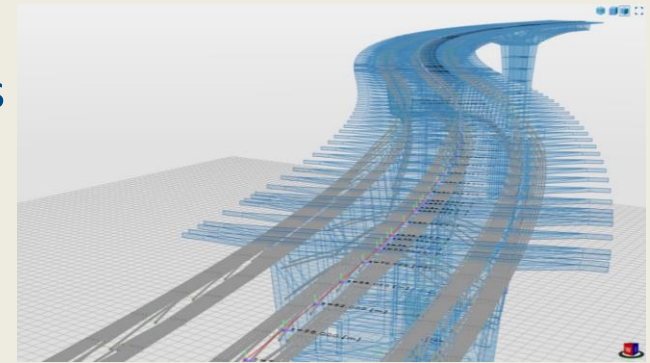
- › **Interactive definition:**
- › **3D Tendon Point = Station + In-Plane Position (Cross Section)**
- › Tendon geometry is AUTOMATICALLY generated between 3D Tendon points
- › Keeps friction losses to a minimal
- › Uses 'Hermite spline' curves



\ ALLPLAN BRIDGE

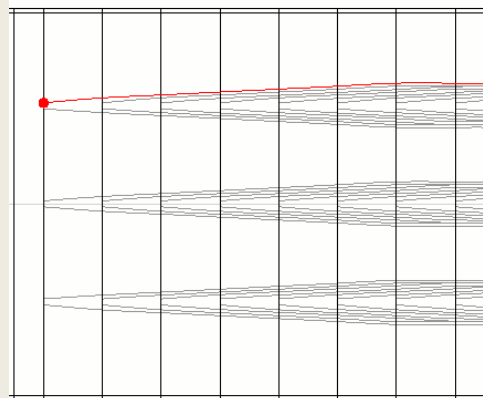
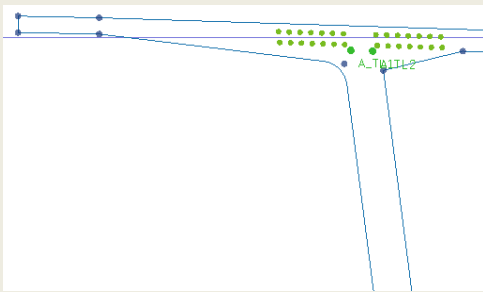
MULTIPLE ADDITIONAL FUNCTIONS FOR TENDONS AND TENDON GROUPS

- › Developed view of the corresponding girder available in plan and elevation
- › Intelligent COPY, MOVE and MIRROR functionality for tendon point, one tendon and for a complete tendon group
- › Possible setting of additional boundary conditions
- › Quick definition of the tendon straight parts



ALLPLAN BRIDGE

EXAMPLE: TENDON DEFINITION FOR A BRIDGE BUILT WITH THE CANTILEVER METHOD



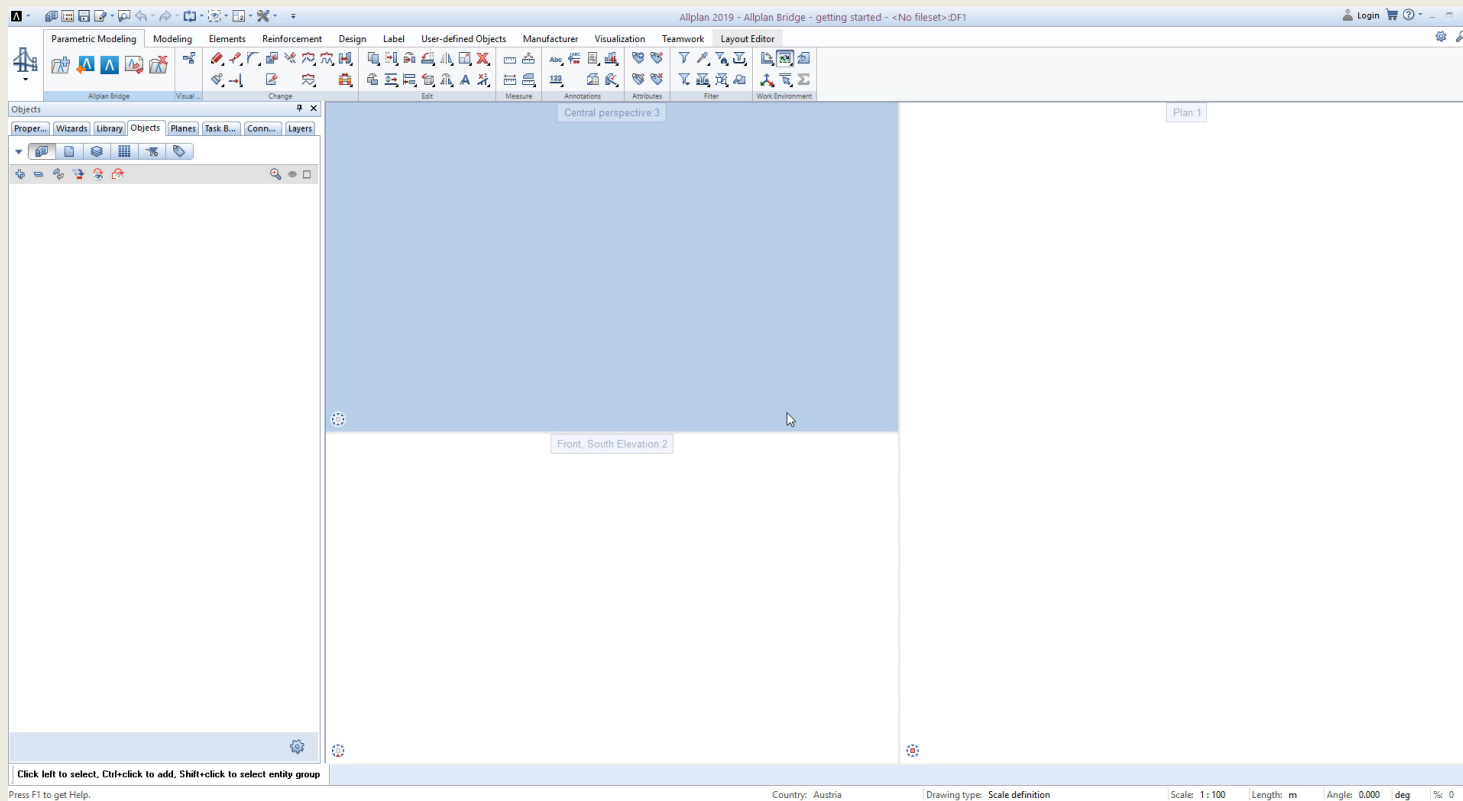
Box (BoxGirder FRONT Station 148.000000)

Global Position		Reference		Tendon Geometry					
Station	Side	Type	Point	e-u	e-v	a-u	a-v	R [m]	Curve type
128.000	FRONT	TG_TL1	P17	0	0	Free	Free	Free	Spline
112.000	FRONT	TG_TL1	P17	0	0	Free	Free	Free	Spline
116.000	FRONT	TG_TL1	P17	0	0	Free	Free	Free	Spline
120.000	FRONT	TG_TL1	P17	0	0	Free	Free	Free	Spline
124.000	FRONT	TG_TL1	P17	0	0	Free	Free	Free	Spline
128.000	FRONT	TG_TL1	P16	0	0	Free	Free	Free	Spline
132.000	FRONT	TG_TL1	P15	0	0	Free	Free	Free	Spline
136.000	FRONT	TG_TL1	P14	0	0	Free	Free	Free	Spline
140.000	FRONT	TG_TL1	P13	0	0	Free	Free	Free	Spline
144.000	FRONT	TG_TL1	P12	0	0	Free	Free	Free	Spline
148.000	FRONT	Point	A_TL1	0	0	Free	Free	Free	Spline



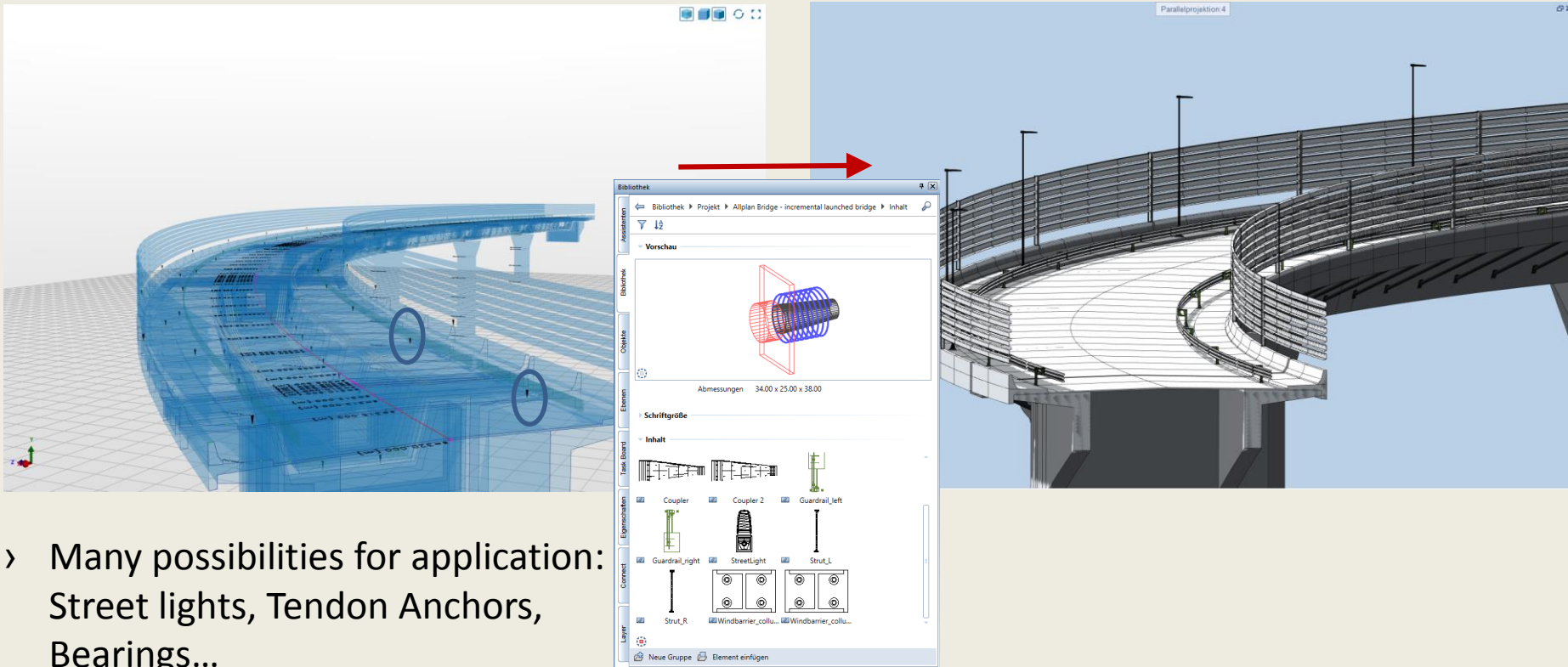
\ ALLPLAN BRIDGE

CONNECTION TO ALLPLAN – IMPORT ALLPLAN BRIDGE DATA



\ ALLPLAN BRIDGE

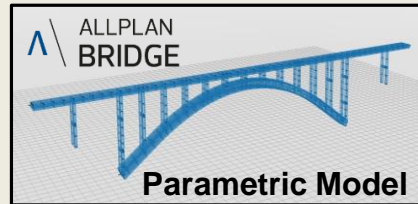
SMART PLACEMENTS: PARAMETRIC PLACEMENT OF ALLPLAN LIBRARY OBJECTS



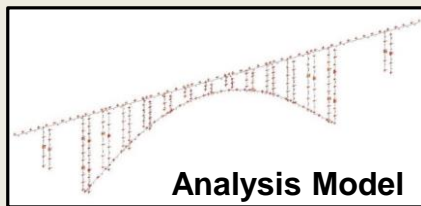
- › Many possibilities for application: Street lights, Tendon Anchors, Bearings...

\ ALLPLAN BRIDGE

USE ONE COMMON DATA MODEL FOR DRAFTING AND ANALYSIS

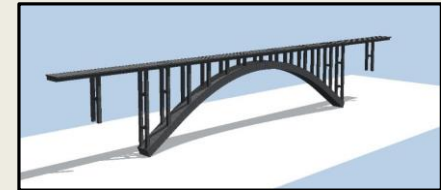


Analysis Software

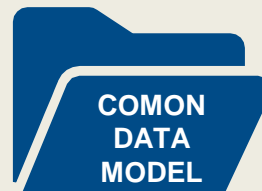


Structural Analysis

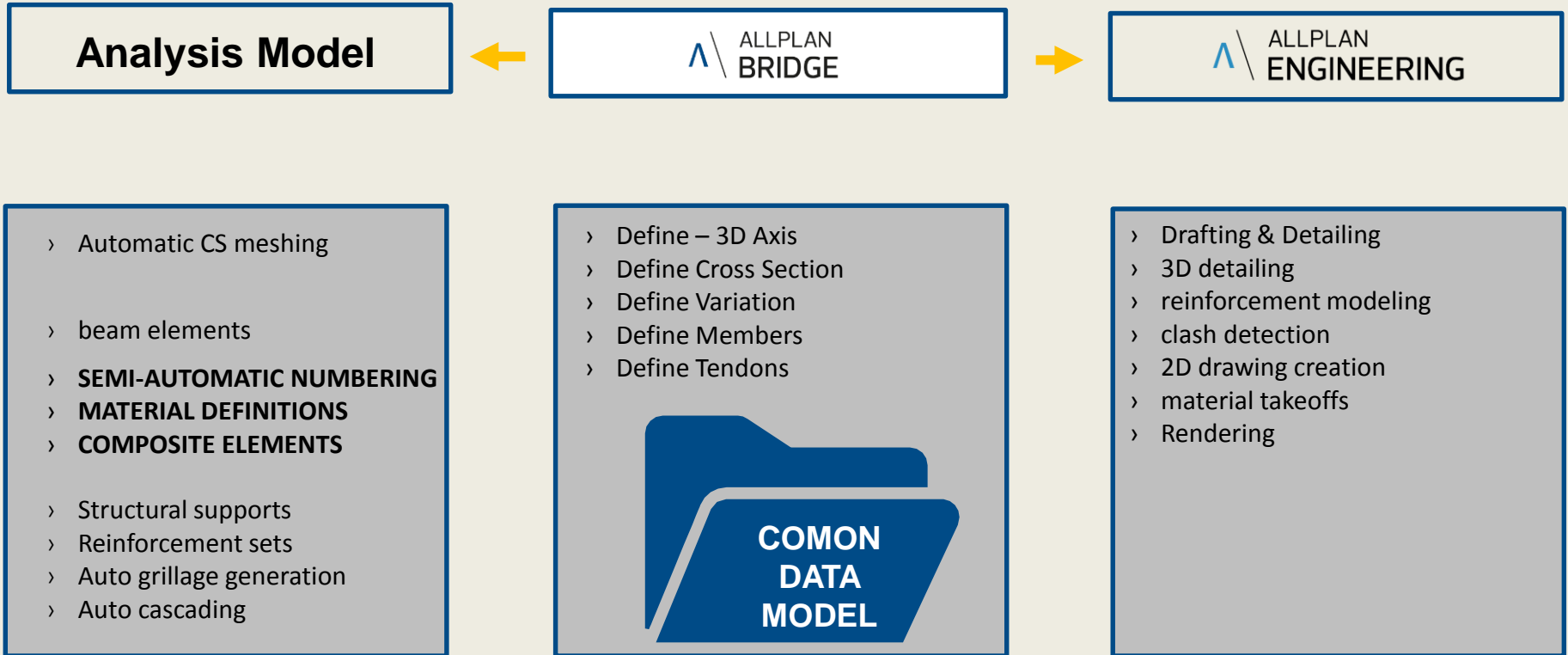
ALLPLAN
ENGINEERING



Detailing & Drawing
Production



\ ALLPLAN BRIDGE



ALLPLAN BRIDGE MARKET

Analytical Modeling

Preliminary Design

Parametric Modeling
Concept design

Final Design
Detailing



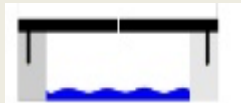
Project Manager



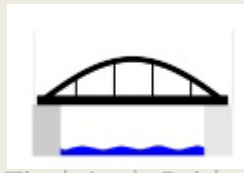
Bridge Engineer



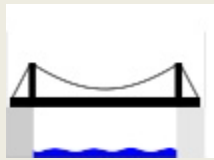
Bridge Designer



Cantilever Bridge



Tied-Arch Bridge



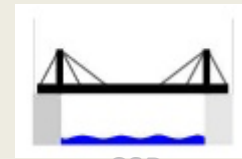
Suspension Bridge



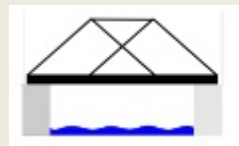
Arch Bridge



Girder Bridge



CSB



Truss-Bridge

CONCRETE
COMPOSITE
STEEL



Structural Engineer



Bridge Detailer



Bridge Drafter



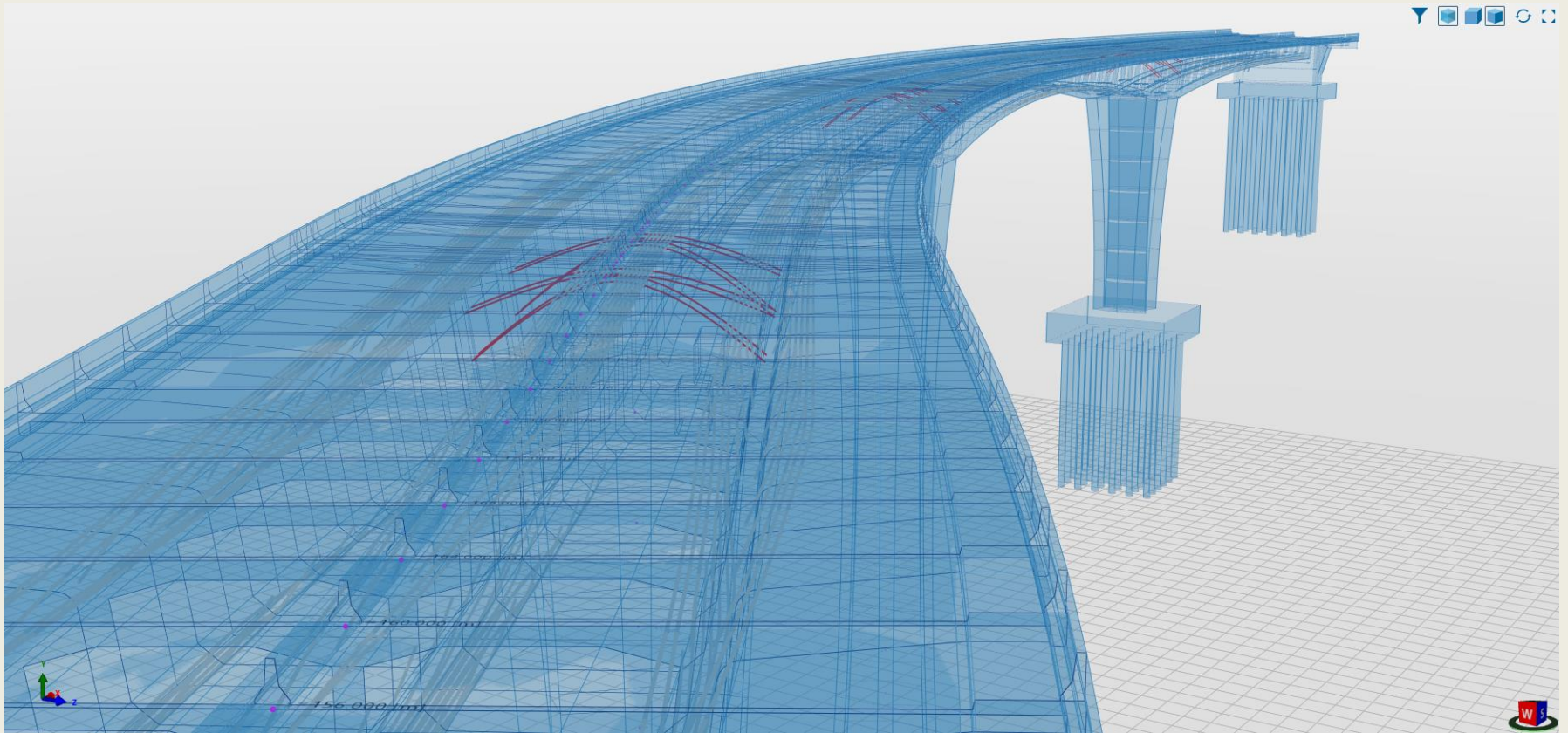
\ ALLPLAN BRIDGE MARKET

CASE STUDIES



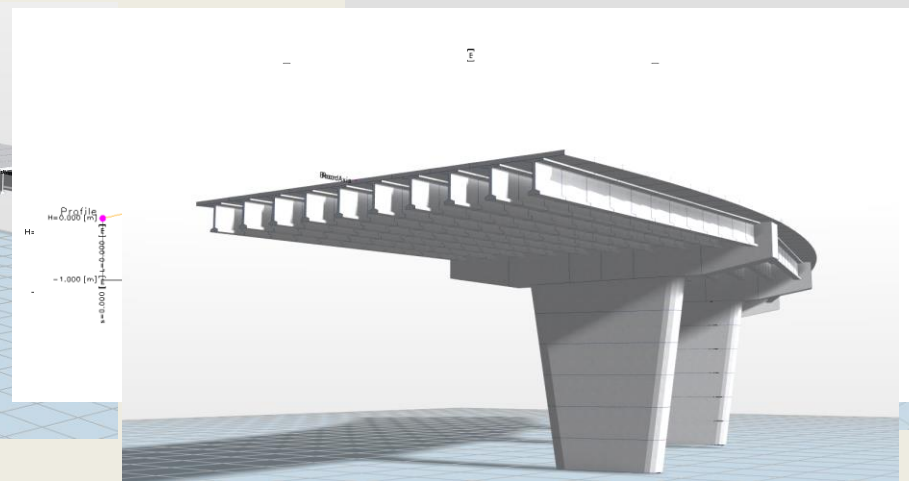
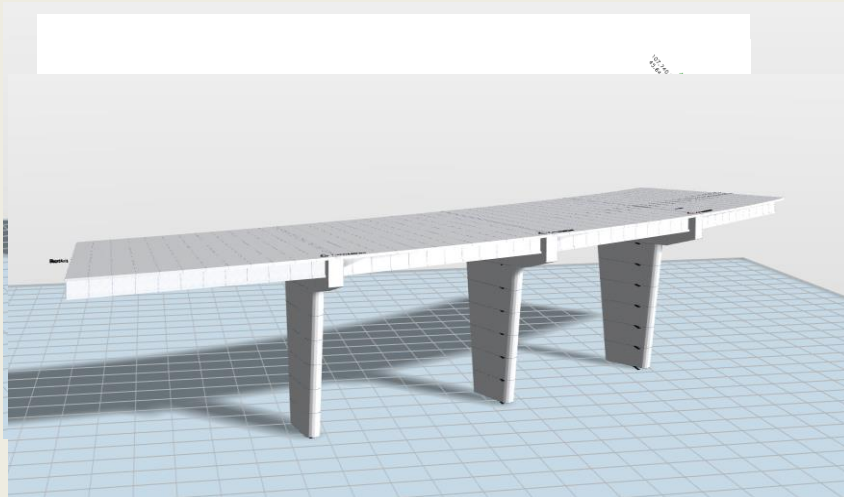
\ PROJECT EXAMPLE 3

Cantilever, continuous, transversal and vertical tendons



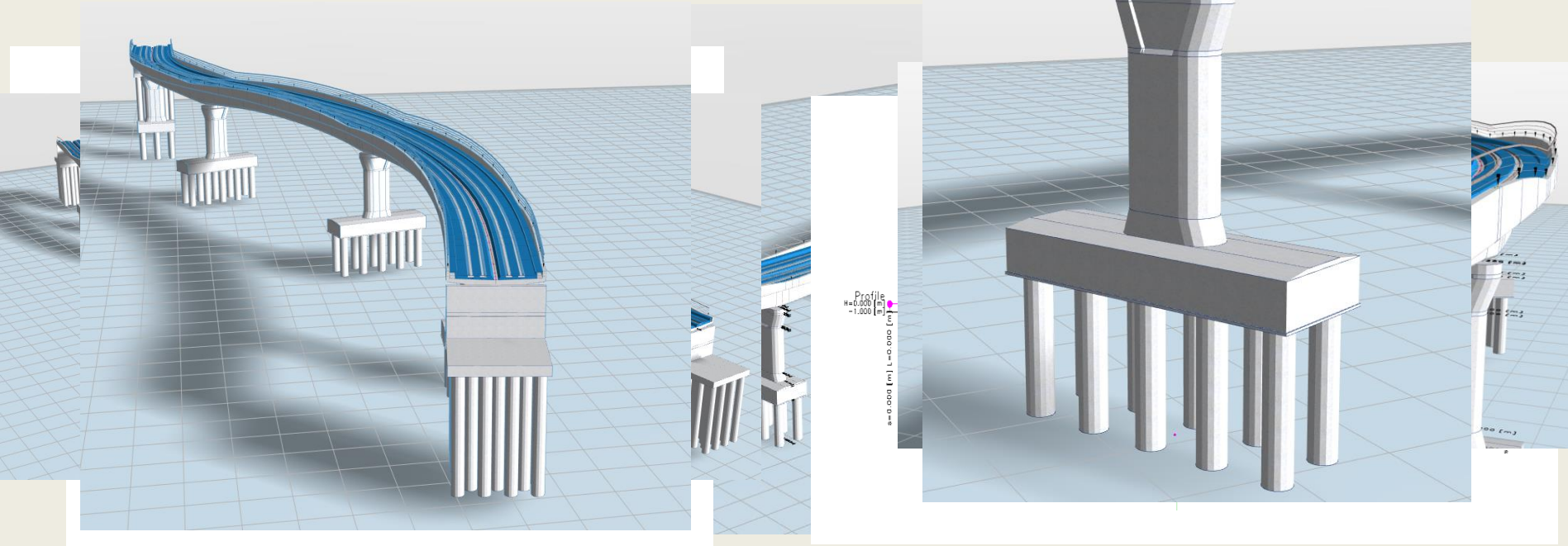
\ PROJECT EXAMPLE 4

Beach axis definition:

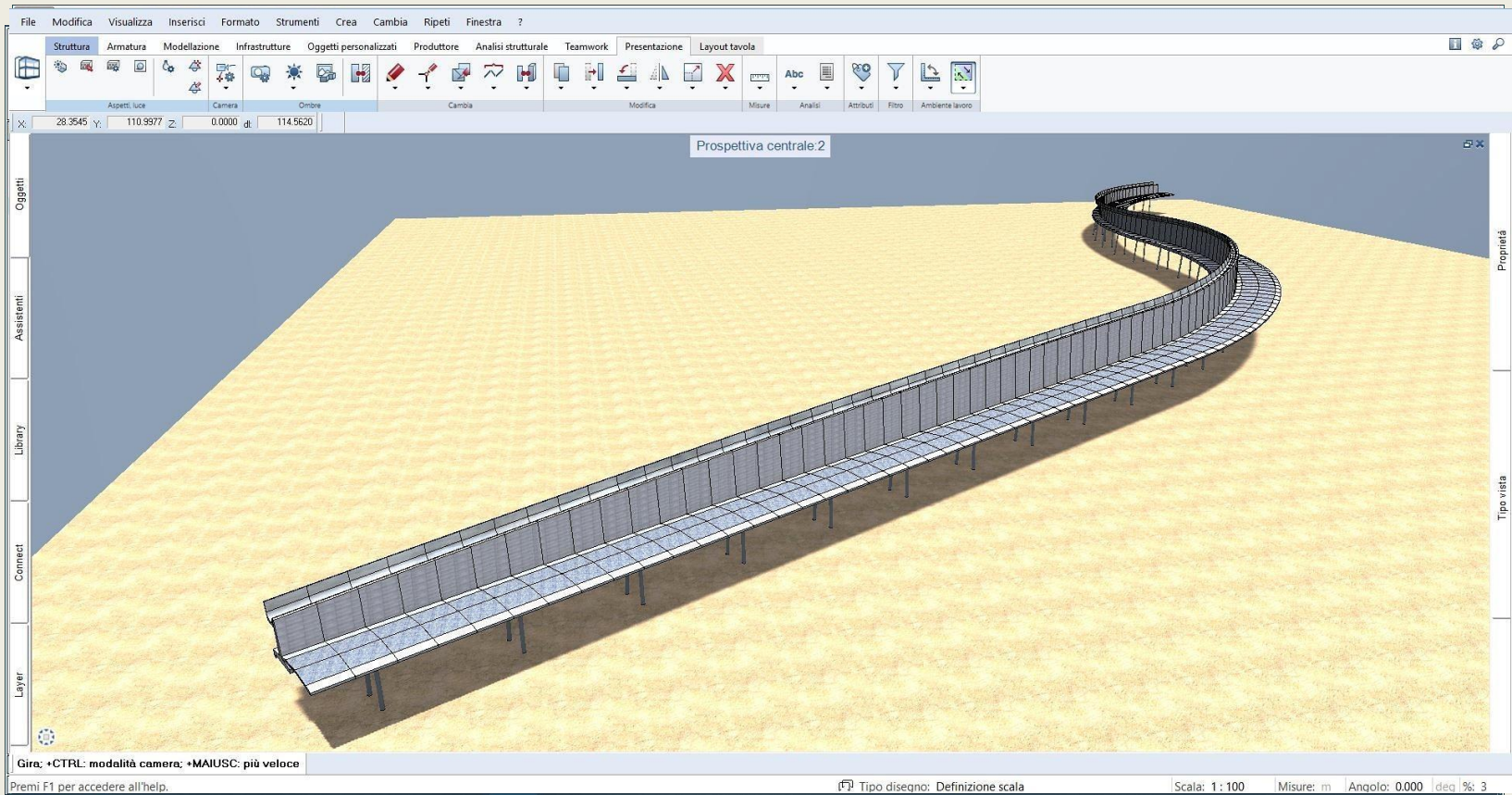


\ PROJECT EXAMPLE 5

Railway bridge definition:

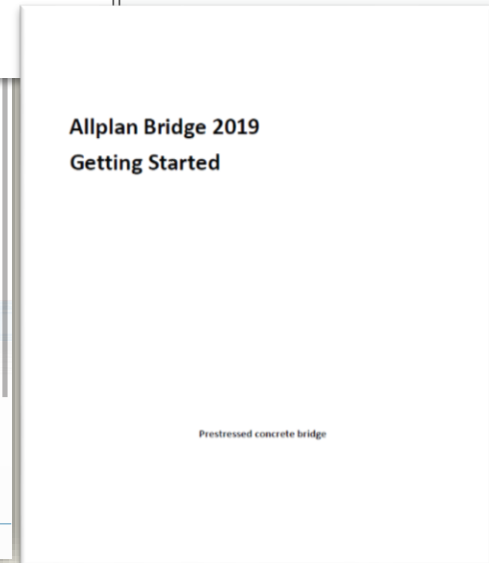
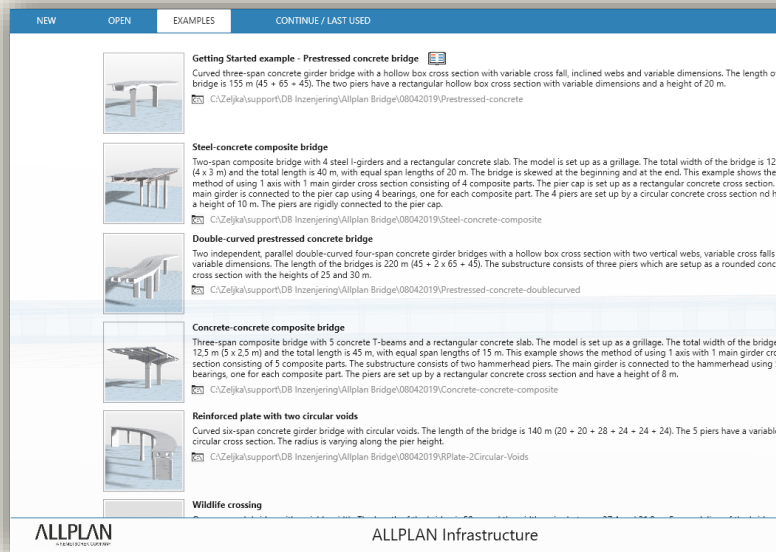
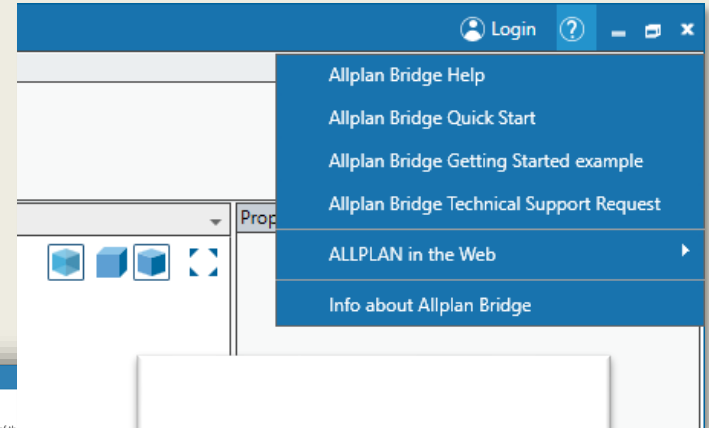


\ PROJECT EXAMPLE 7



\ WE ARE HERE TO HELP

TECHNICAL AND PROJECT SUPPORT



\ ALLPLAN BRIDGE

NEW IN VERSION 2019 - 1



\ VERSION 2019-1 NEWS



- › **Construction Sequence definition**
Implementation of 4th Dimension



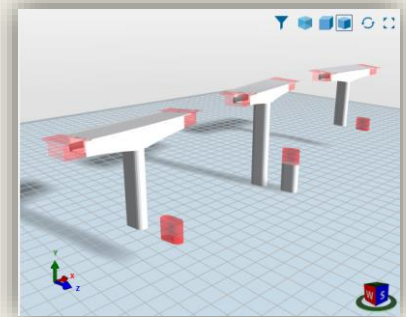
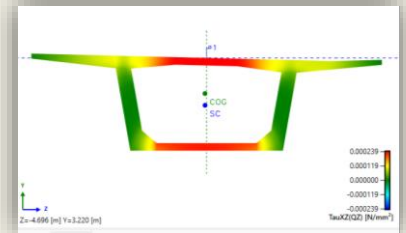
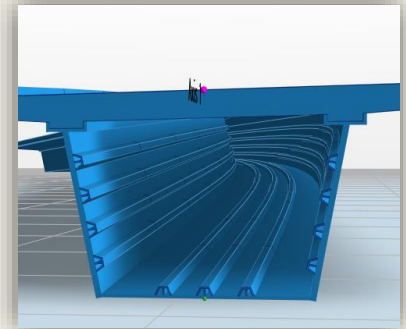
- › **Referencing standard profiles**
Definition of stiffeners optimized



- › **Calculation of cross-section values**
Area, Moment of Inertia, Shear stresses, COG, ...



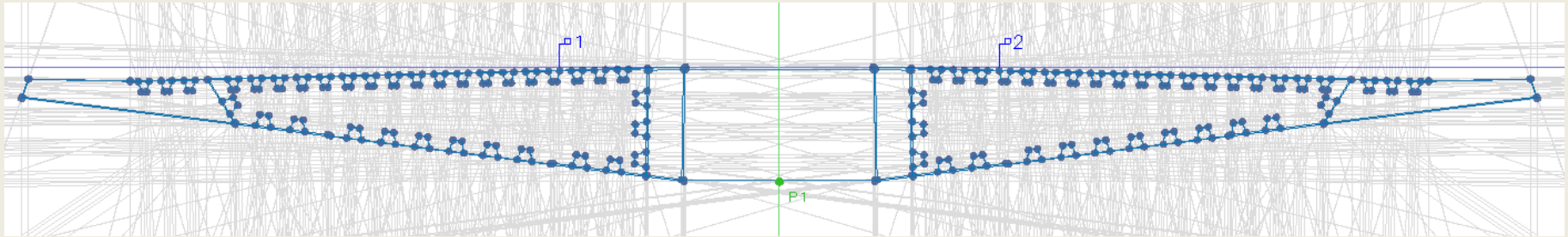
- › **Several other improvements**
New parametric lines, Angle as “%”, New chamfers, ...



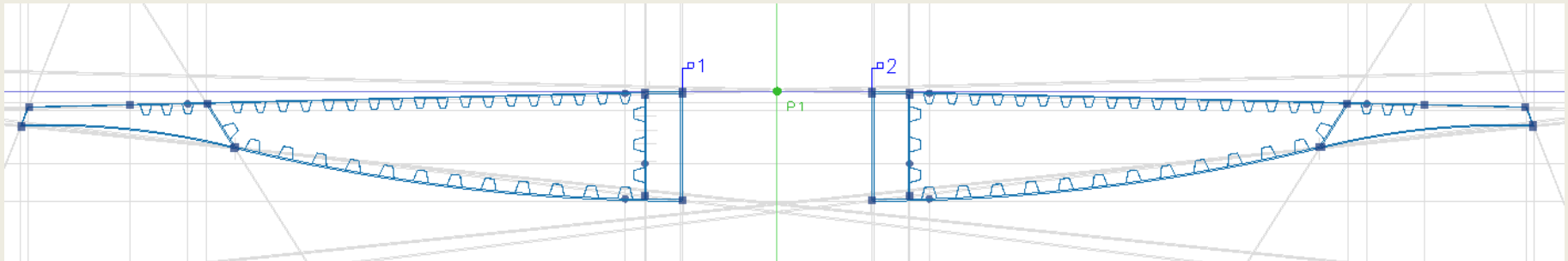
\ REFERENCING STANDARD PROFILES

MODELLING STIFFENERS

Previous workflow



Workflow with new functionality

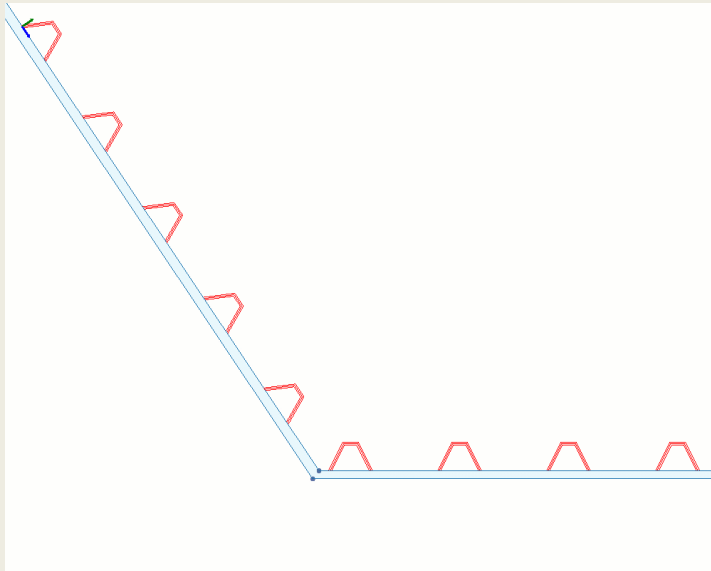


\ REFERENCING STANDARD PROFILES

MODELLING STIFFENERS

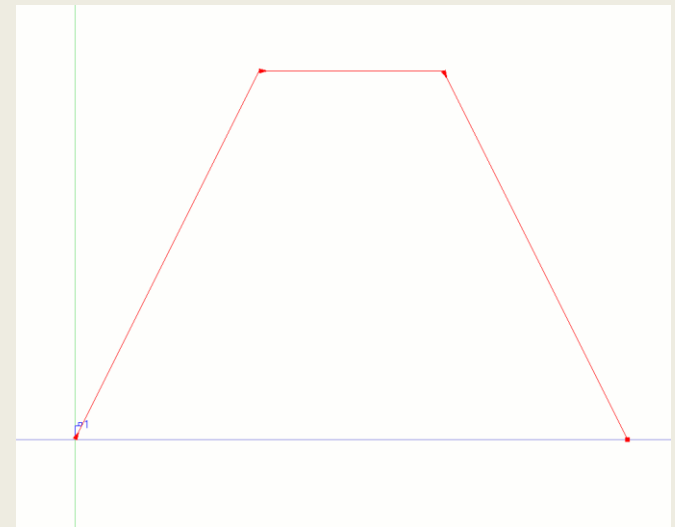
EXTERNAL BOUNDARY

Referencing an **arbitrary** boundary Orientation,
Quantity, Offset and Spacing
Variation and auto alignment.



BOUNDARY THICKNESS

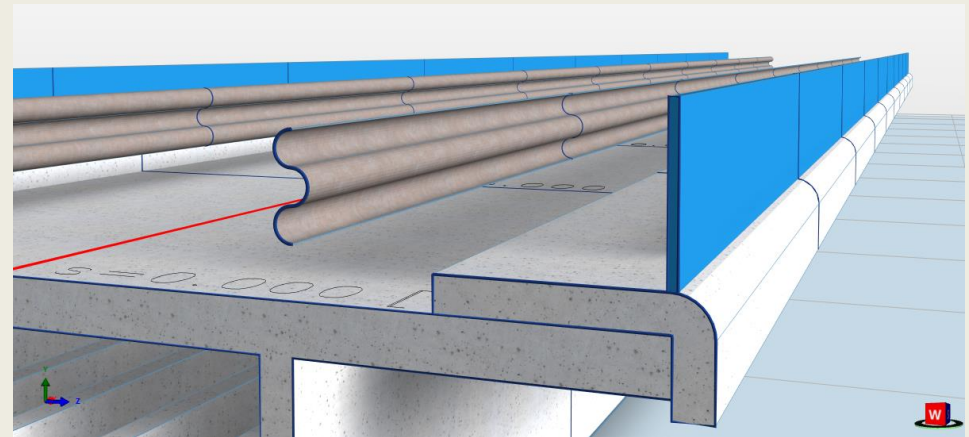
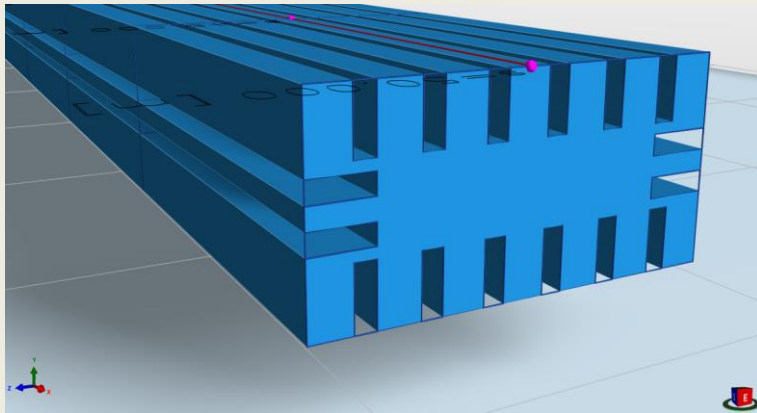
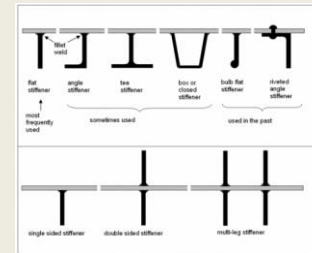
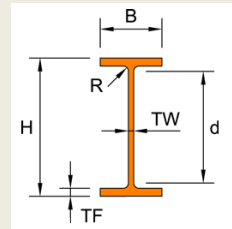
Input of thin walled structures simplified
Boundary line + Thickness + (Offset)
Thickness value can be **FIX** or **Variable**
Auto extrusion at begin and end.



\ EXPAND THE TECHNOLOGY

USAGE OF TECHNOLOGY FOR OTHER PURPOSES

I-,T-,H-beams
Metal sheet Structures
BRIDGE EQUIPMENT
Structures with cavities



\ MATERIAL

MATERIAL PROPERTIES

DB and GUI
Create and Store
Assign/Use

The screenshot displays a software interface for material management. At the top, a tree view under 'Geometry Reports Analysis' shows a hierarchy: EN > Concrete (C35/45, C40/50) > Prestressing steel (Strand 1640/1860) > Reinforcing steel (St500(A)). Below this is a '3D-Model' window with a 'Member Materials' table. The table has columns for 'Global Station' (Start [m], End [m]) and 'Structural Unit 1' (Beam, Material). A context menu is open over the table, with options 'Assign Material to Selection' and 'Apply Material to subsequent stations'. The 'Assign Material to Selection' option is expanded, showing a list of material types: Concrete (C35/45), Prestressing steel (C40/50), and Reinforcing steel. To the right, a 'Properties' window is open for the selected material, showing fields for Name, Text, Filter, Foreign name, and various material values (E, G, Poisson's ratio, α -T, γ , σ -pm0).

Global Station		Structural Unit 1	
Start [m]	End [m]	Beam	Material
0.000000	5.000000	101	EN:C40/50
5.000000	10.000000	102	EN:C40/50
10.000000	15.000000	103	EN:C40/50
15.000000	20.000000	104	EN:C40/50
20.000000	25.000000	105	EN:C40/50
25.000000	30.000000	106	EN:C40/50
30.000000	35.000000	107	EN:C40/50
35.000000	40.000000	108	EN:C40/50
40.000000	42.500000	109	EN:C40/50

Properties	
General	
Name	C35/45
Text	C35/45, EN 1992-1-1
Filter	Concrete
Foreign name	EN_Eurocode:C_35/45
Basic material values	
E	34,000,000 [N/mm ²]
G	14,166,670 [N/mm ²]
Poisson's ratio	0.2
α -T	0.00001 [1/°C]
γ	25.0 [kN/m ³]
σ -pm0	0 [N/mm ²]
User material values	



\ CROSS-SECTION CALCULATION

CALCULATION OF CROSS-SECTION PROPERTIES

Arbitrary sections

Composite

Basic properties

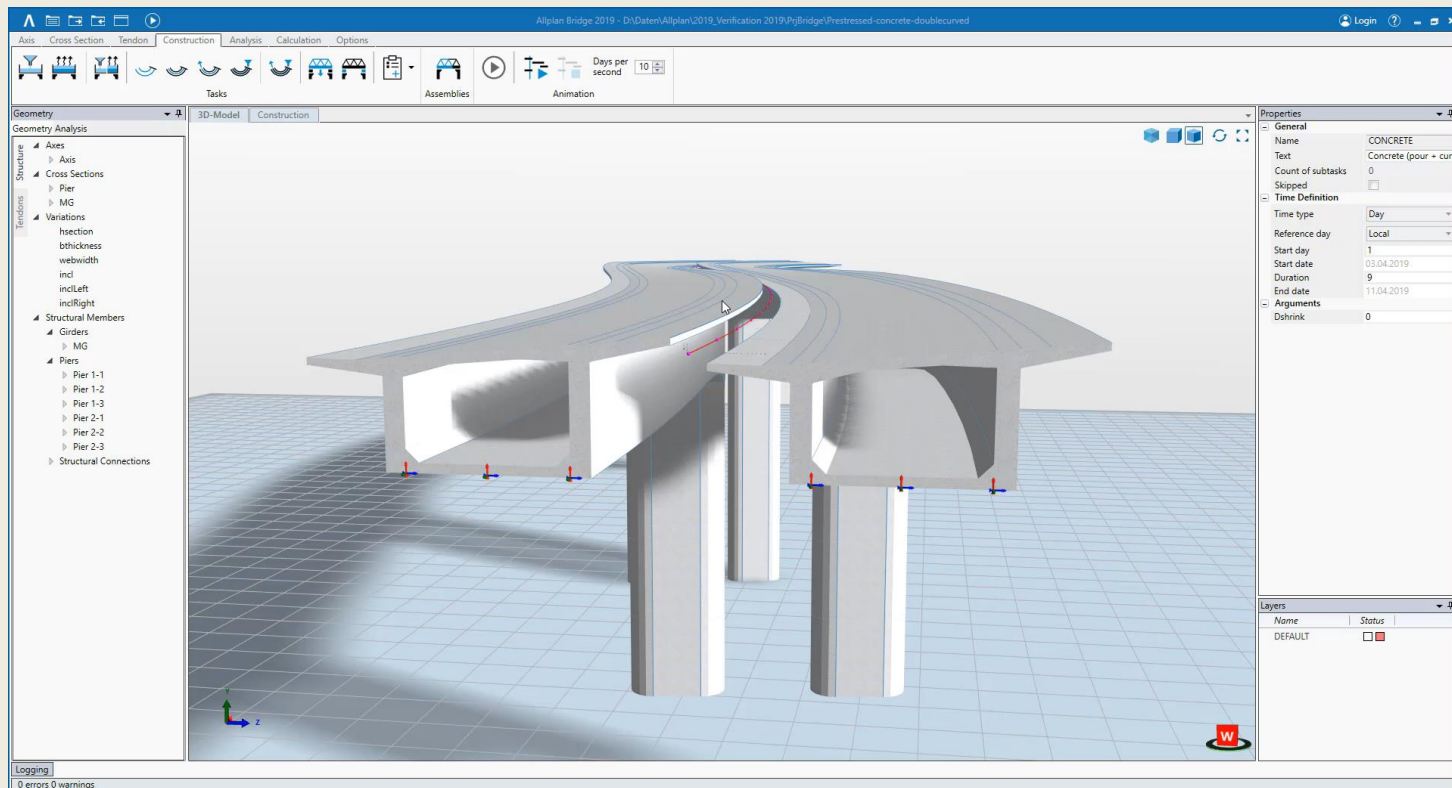
Shear unit stresses

Property	Struct. Unit 1 Value	Dim. unit	Description
Ax	10.6927	[m ²]	Cross-section area
Ay	3.3381	[m ²]	Shear area Vy
Az	5.9759	[m ²]	Shear area Vz
Iy	115.5569	[m ⁴]	Moment of inertia about Y
Iz	20.4647	[m ⁴]	Moment of inertia about Z
It	38.8365	[m ⁴]	Torsional moment of inertia
Alpha	-1.4727	[deg]	Angle of principle axes
ey	-1.4193	[m]	Center of gravity Y
ez	-0.0668	[m]	Center of gravity Z
ey,S	-1.8888	[m]	Shear center Y
ez,S	-0.06321	[m]	Shear center Z
U	33.8114	[m]	Outer perimeter
U,in	16.4306	[m]	Inner perimeter



\ CROSS-SECTION SEQUENCE DEFINITION

“CONSTRUCTION ORIENTED” TIME SCHEDULE



\ OTHER IMPROVEMENTS

VIEW OPTIONS, STATION HEIGHT

