

Presentation | February 2021

SOFiSTiK **B**ridge + **I**nfrastructure **M**odeler

Dr.-Ing. Martin Siffling



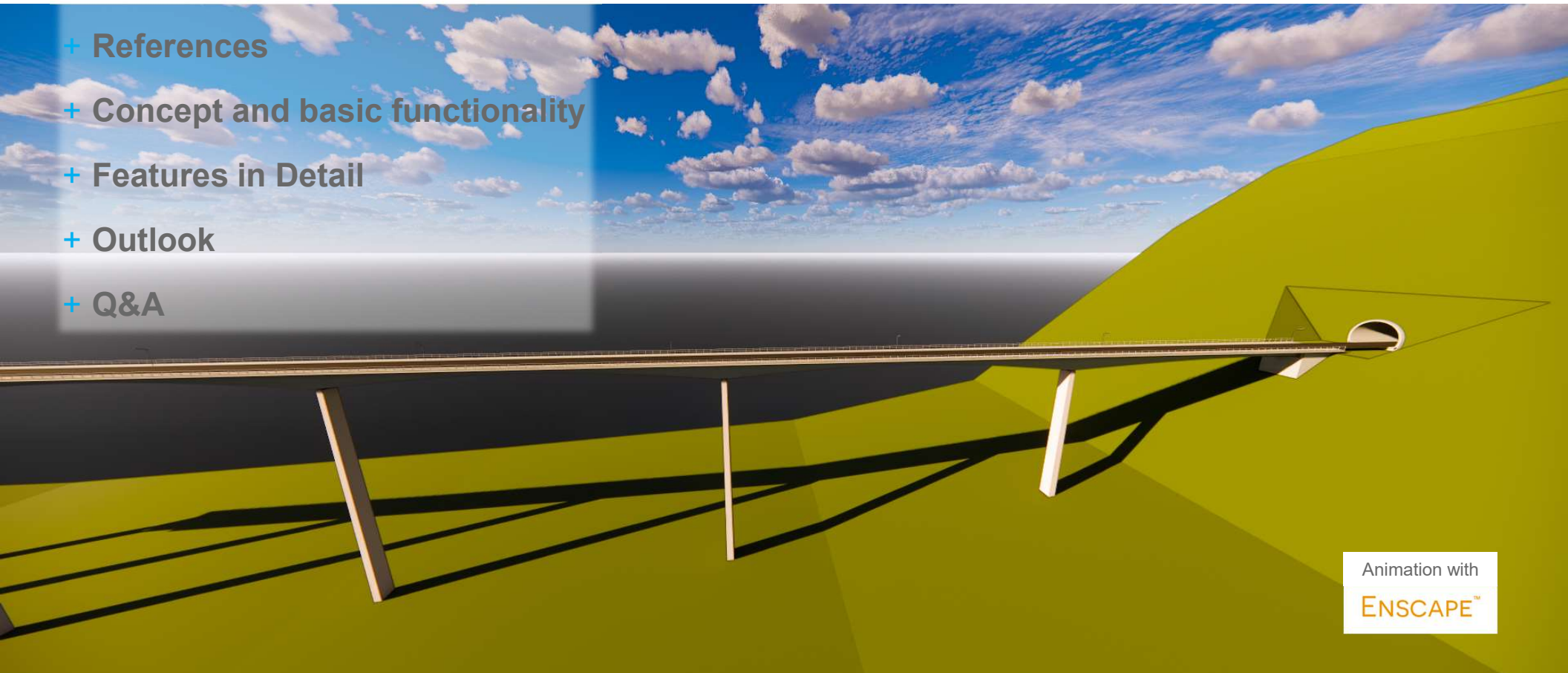
BIM Strategy - Vision

The SOFiSTiK Bridge + Infrastructure Modeler is part of the BIM Infrastructure Process with focus on detailing and design of bridges, tunnels and all kind of axes defined infrastructure projects based on Autodesk® Revit®.

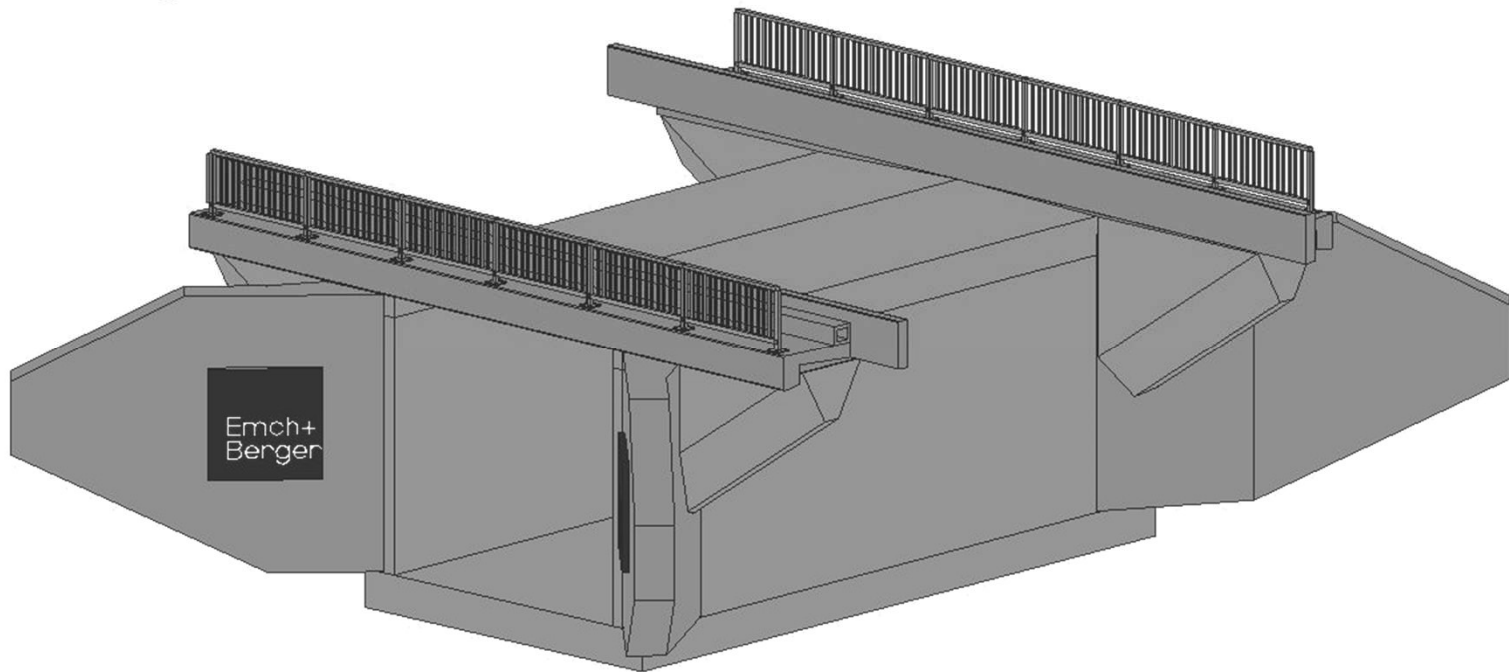


Agenda

- + References
- + Concept and basic functionality
- + Features in Detail
- + Outlook
- + Q&A

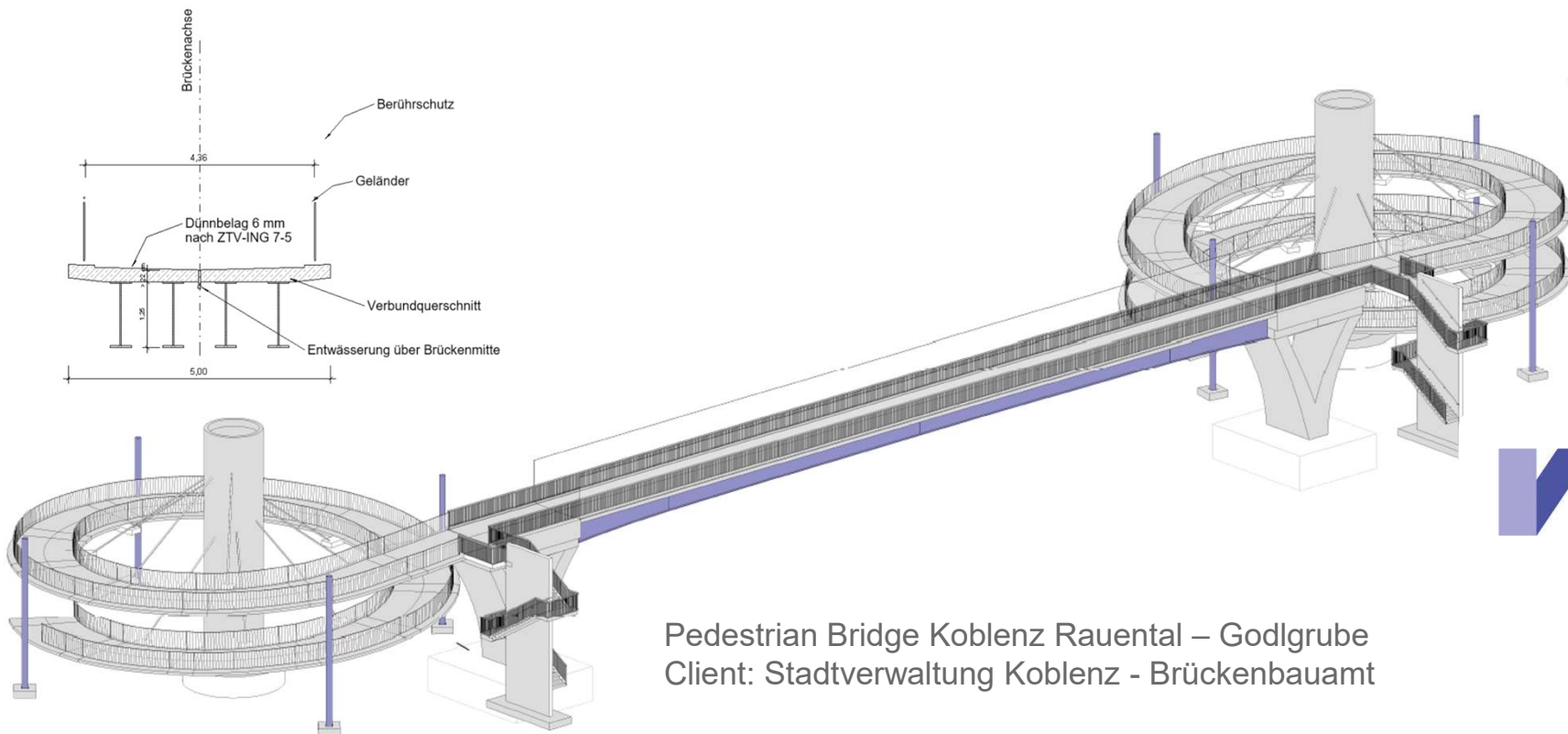


Emch + Berger

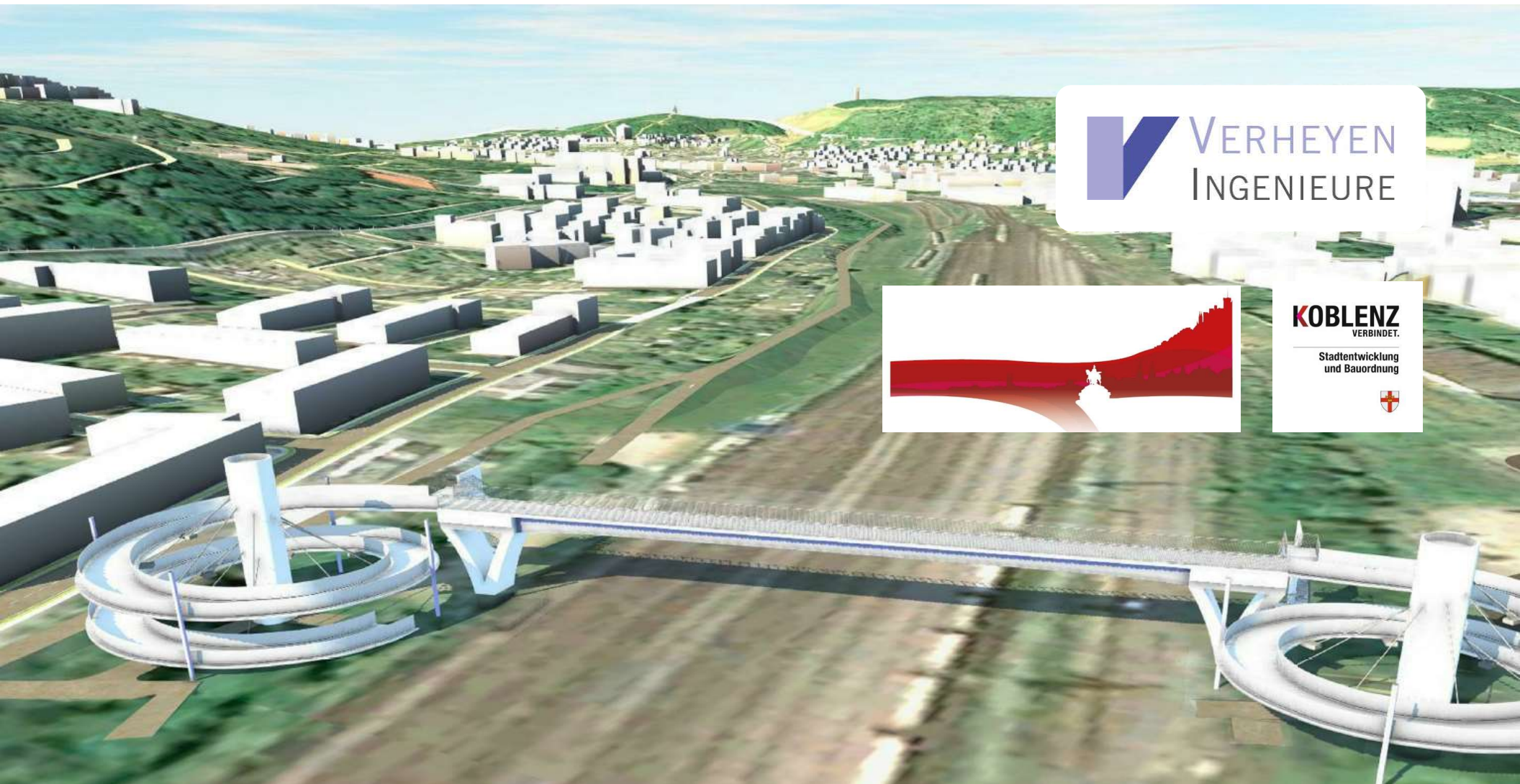


Railway Bridge
Client: DB Netz AG

Verheyen Ingenieure



Pedestrian Bridge Koblenz Rauental – Godlgrube
Client: Stadtverwaltung Koblenz - Brückenbauamt



 VERHEYEN
INGENIEURE



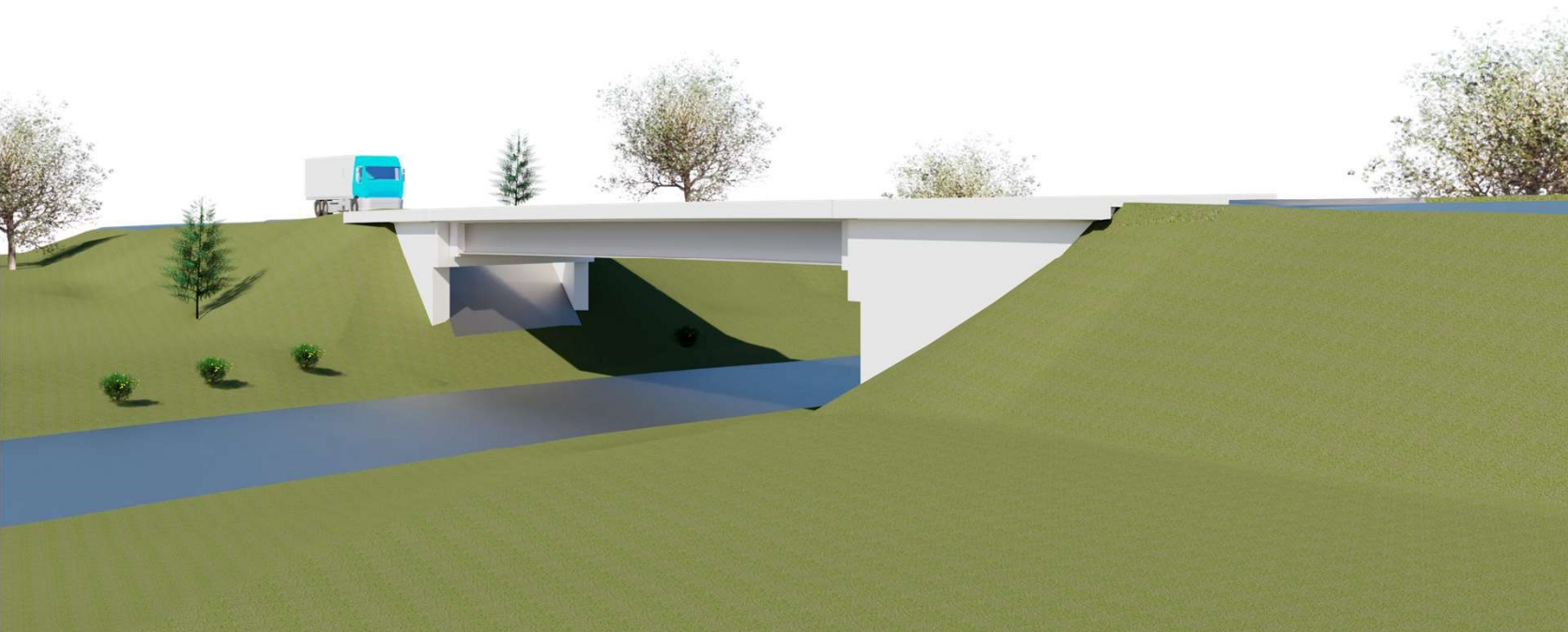
KOBLENZ
VERBINDET.
Stadtentwicklung
und Bauordnung


Pedestrian Bridge Koblenz Rauental – Godlgrube
Client: Stadtverwaltung Koblenz - Brückenbauamt

Verheyen Ingenieure



2021



BIM-Pilot Project – Bridge near Minden

KEDMOR Engineers Ltd.



2021

The KEDMOR logo, consisting of a red square with the word "KEDMOR" in white, bold, sans-serif capital letters.

KEDMOR

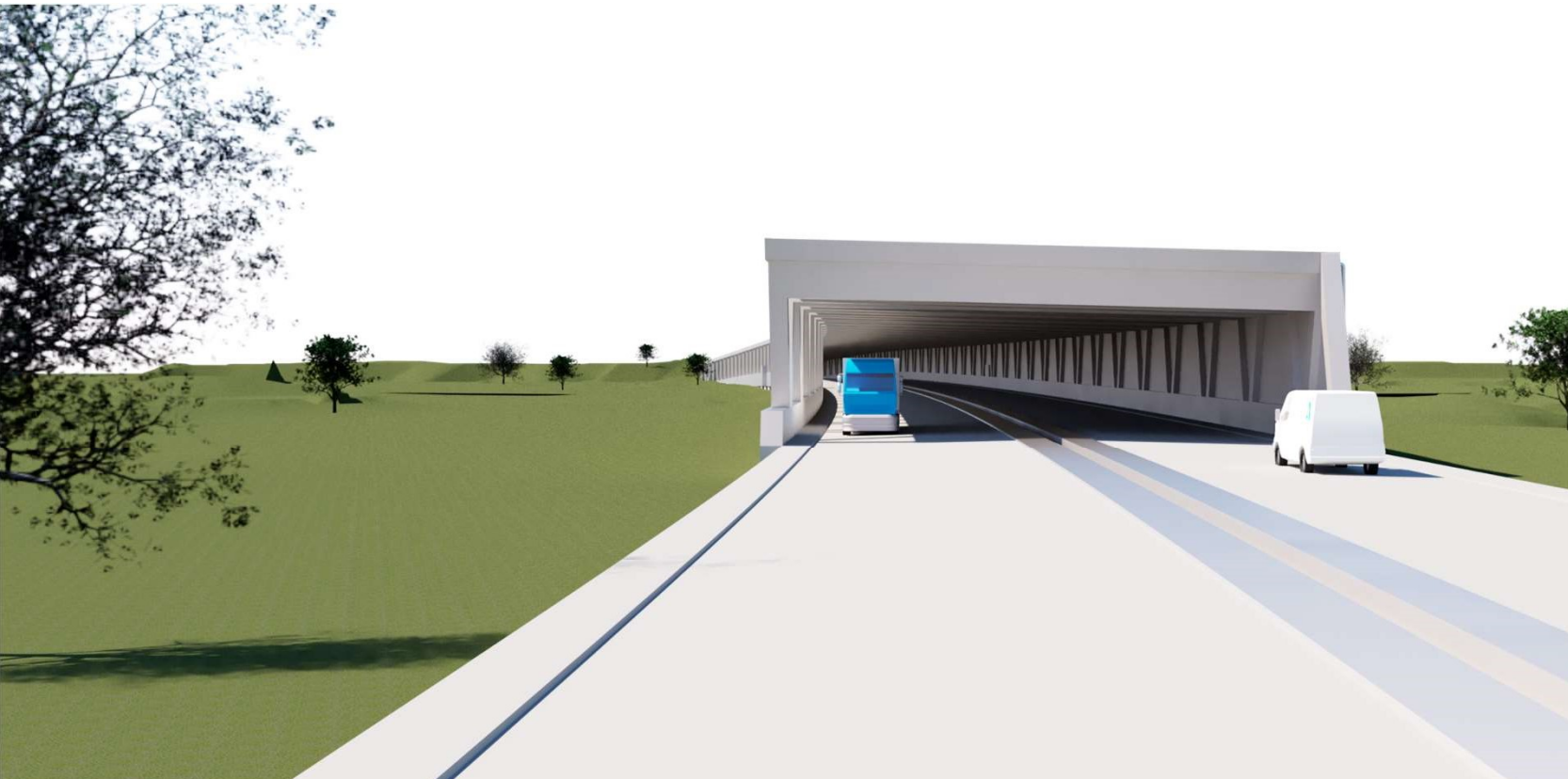


The American Road, Ramps #2,3, Israel

WTM ENGINEERS



2021



New Highway Tunnel between Bremen-Gröpelingen and AS Bremen-Strom
Client: DEGES

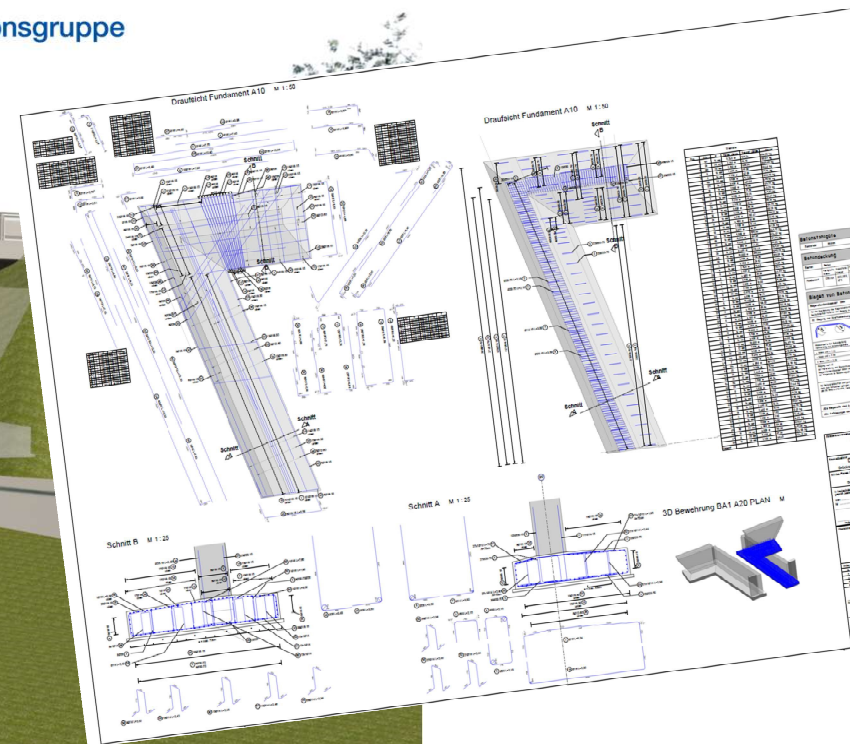
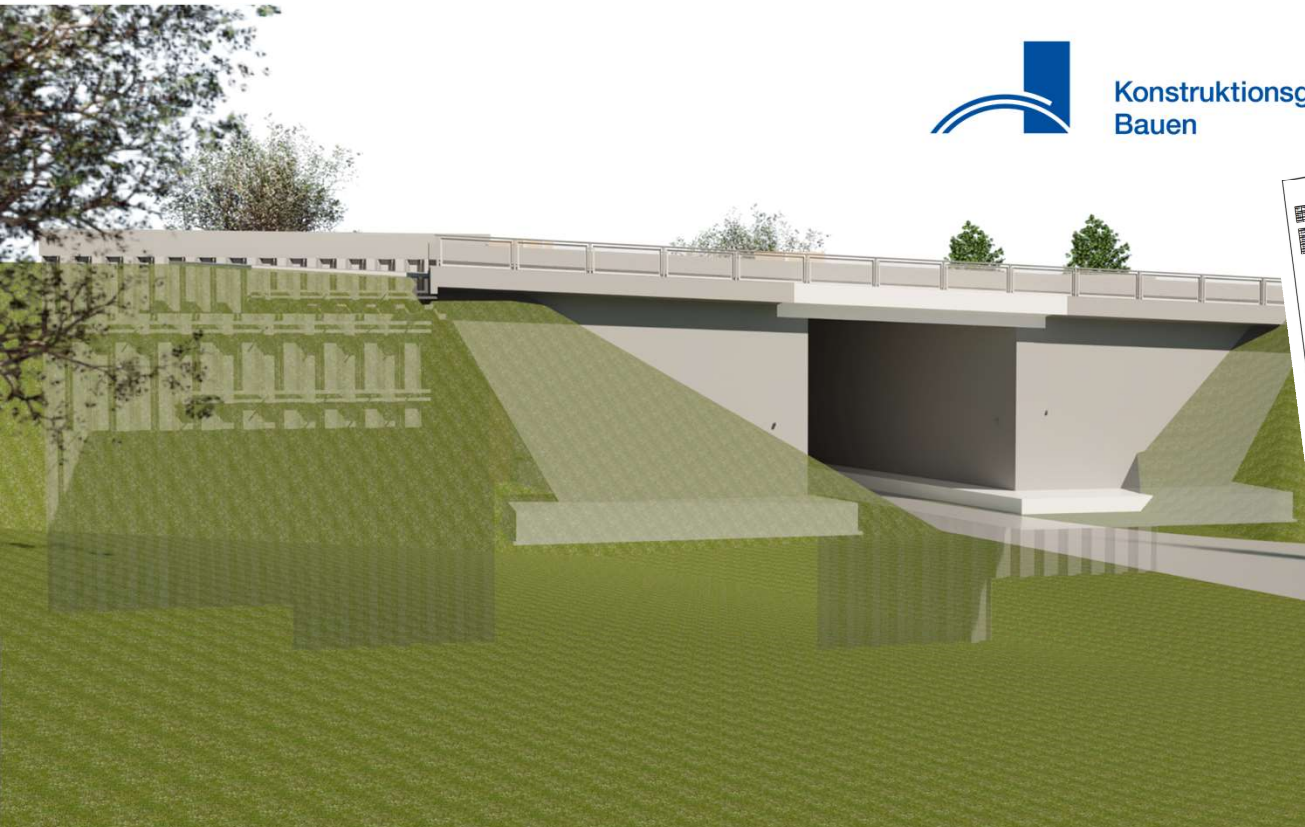
Konstruktionsgruppe Bauen AG



2021



Konstruktionsgruppe
Bauen

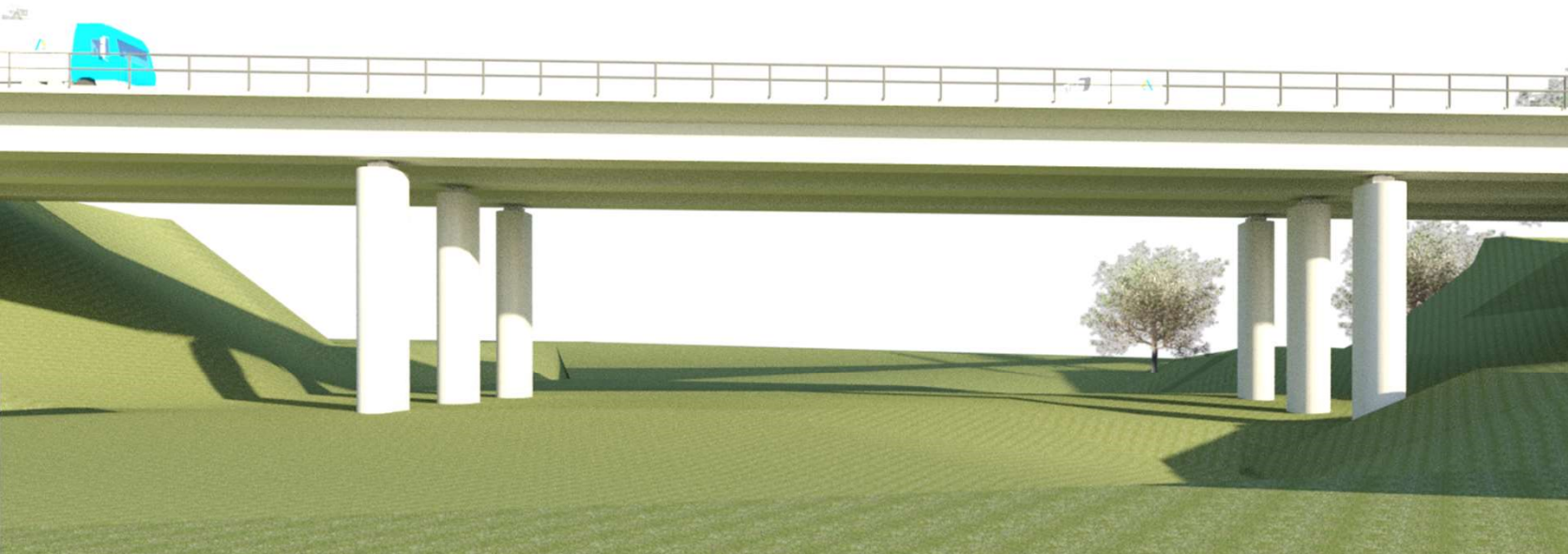


General Maintenance of Highway 9 between Nuremberg and Munich
Client: Josef Rädlinger Ingenieurbau GmbH

Präsentation
5/3/2021 / 10

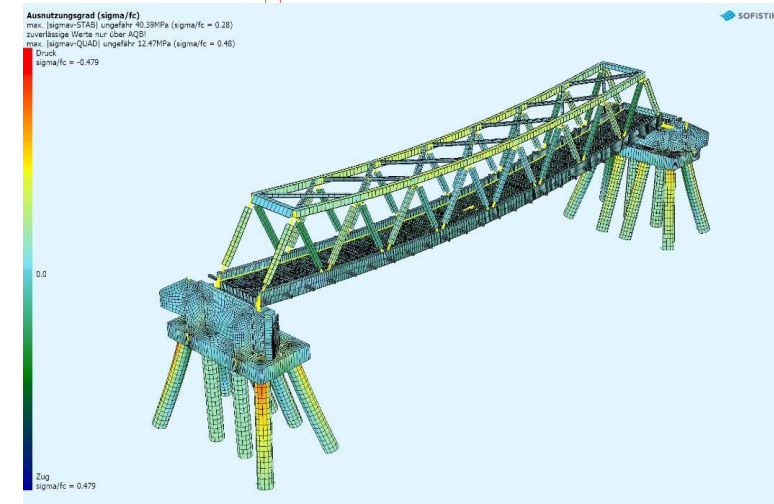
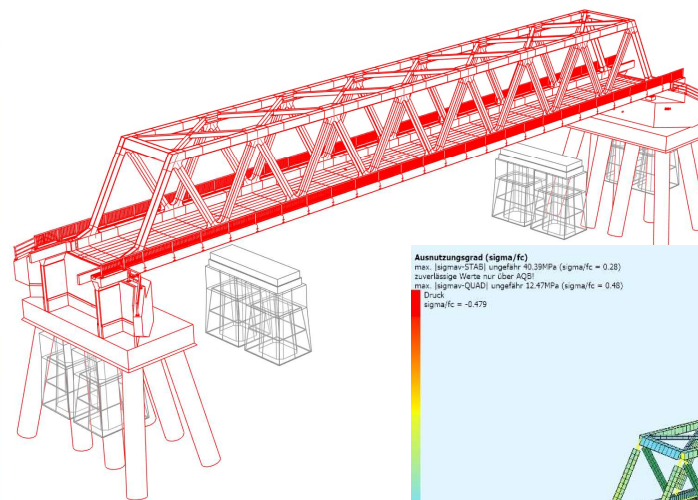
SSF Ingenieure

2021



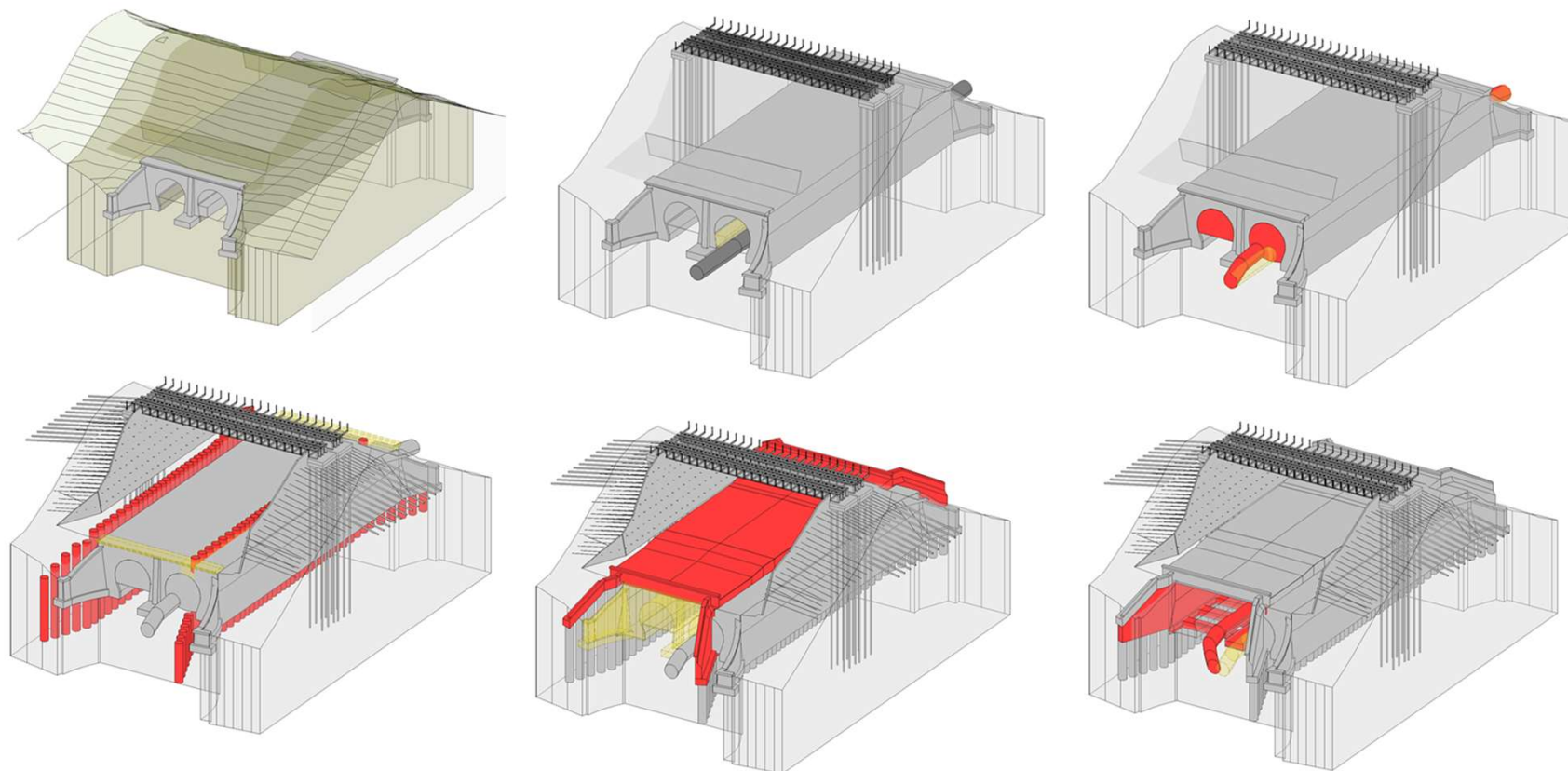
Replacement of Highway Bridge between Hannover and Kassel
Client: Niedersächsische Landesbehörde für Straße

Emch + Berger



<https://info.sofistik.de/en/user-report-emch-and-berger>

Replacement of Railwaybridge in Thuringia
 Client: DB Regional

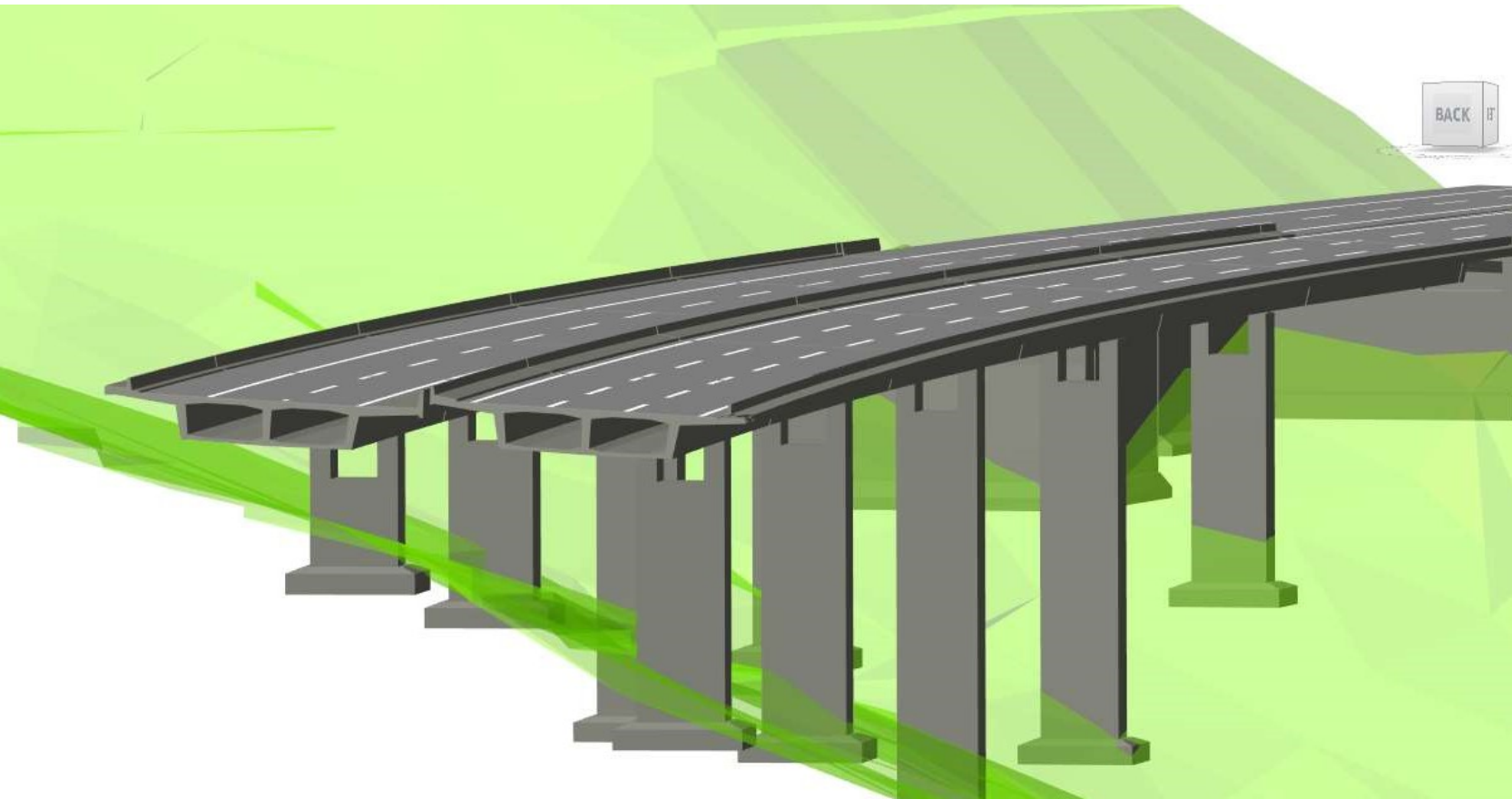


Tunnel Project in Vienna

WTM ENGINEERS - Germany



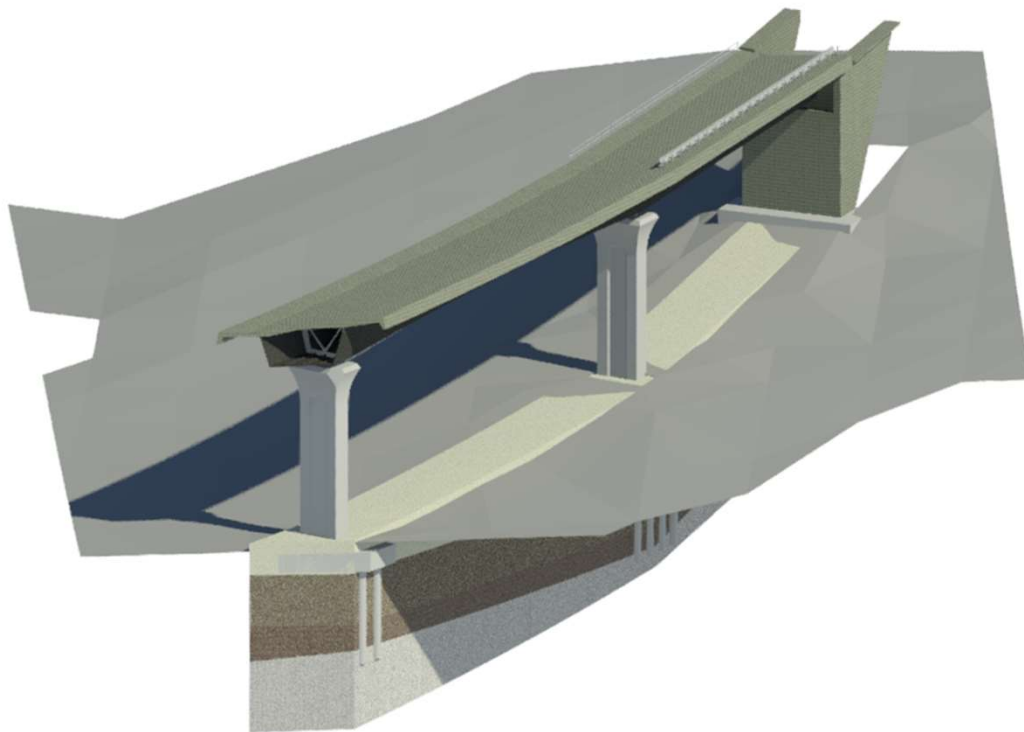
2021



Highway Bridge Sürenhagen between Hagen and Lüdenscheid
Client: Straßen NRW

SOFISTIK Bridge Modeler
03.05.2021 / 14

VÖSSING INGENIEURE - Germany

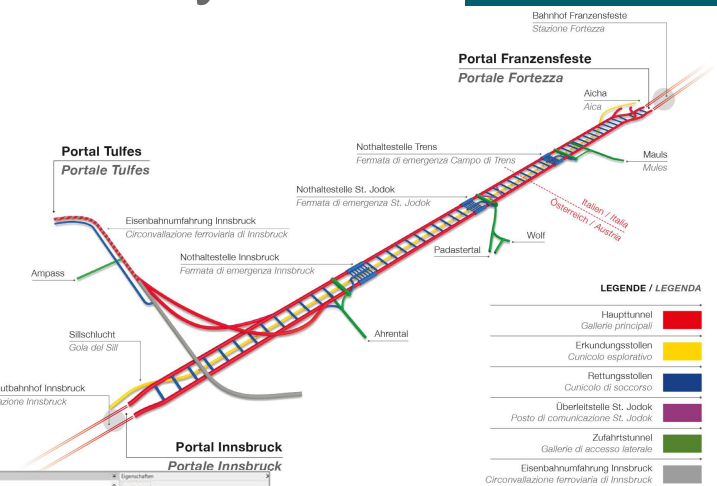
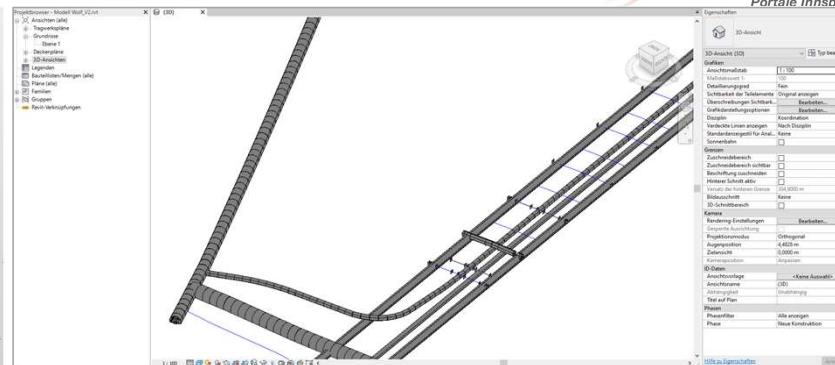
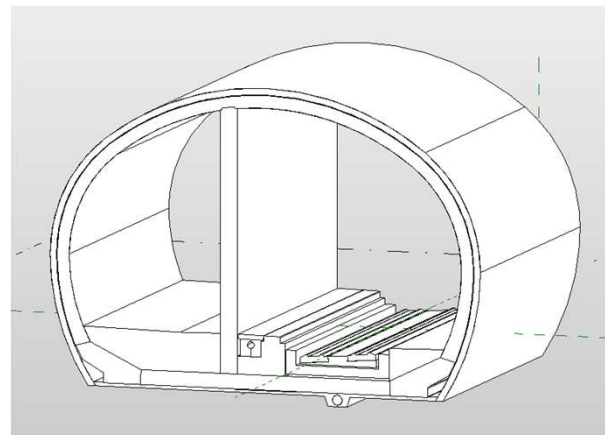
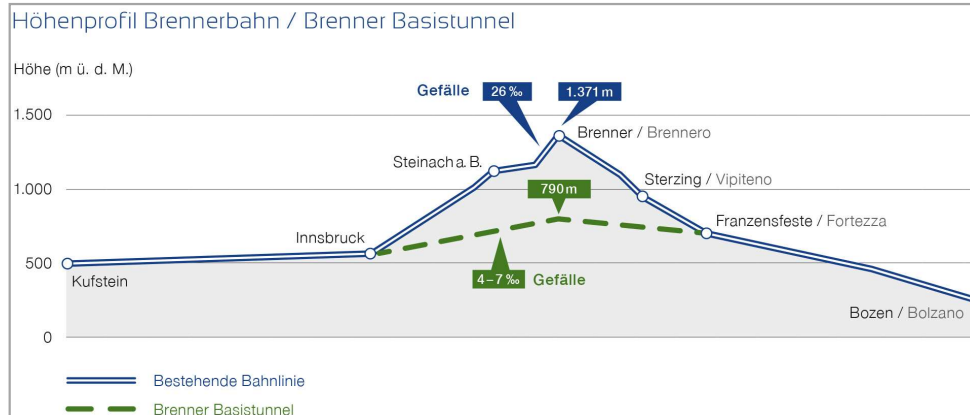


VÖSSING
INGENIEURE

Composite Bridge, Master Thesis from Jonas Kahle

[illegible]

BBT SE - Brenner Basistunnel – Austria / Italy



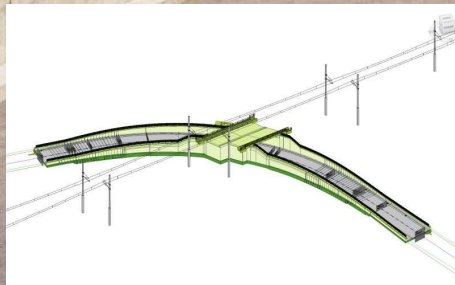
Projektconsulting – Men and Machine Salzburg

menschenmaschine
CAD as CAD can

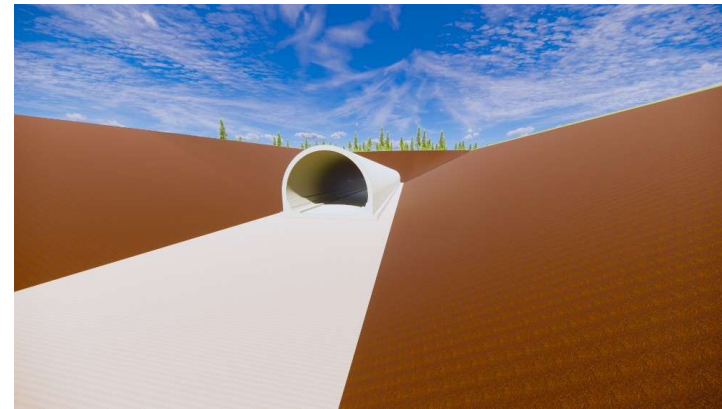
ibbs ZT-GMBH - Austria

WIB bridge for Austrian railways

NORDBAHN NIV - L6 Dt. Wagram



SOFiSTiK Beispielprojekte



Download Current Program Version 2020



2021

SOFISTIK

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Current Downloads

With Version 2020 you can download all SOFISTIK products via the SOFISTIK Application Manager. Additionally the SOFISTIK BIM apps are available via the [Autodesk App Store](#).

If you have any questions regarding our products, please contact us at support@sofistik.com.

SOFISTIK Application Manager

SOFISTIK Application Manager

SOFISTIK

BIM Apps 2020

Product	Version	Action
SOFISTIK Analysis + Design for Revit 2020	1.0.348	Release Notes Uninstall
SOFISTIK Bridge Modeler 2020	1.0.261	Release Notes Uninstall
SOFISTIK Reinforcement Detailing 2020	0.0.160	Release Notes Uninstall
SOFISTIK Reinforcement Generation 2020	0.0.123	Release Notes Uninstall
SOFISTIK BiMTOOLS 2020	0.0.141	Release Notes Uninstall

Next

<https://www.sofistik.com/downloads/current-downloads/>

Description

SOFiSTiK Bridge Modeler supports BIM in Bridge Design and Detailing. The application allows users to create parametrized 3D bridge models using alignment parameters and generic families in Autodesk® Revit® 2020.

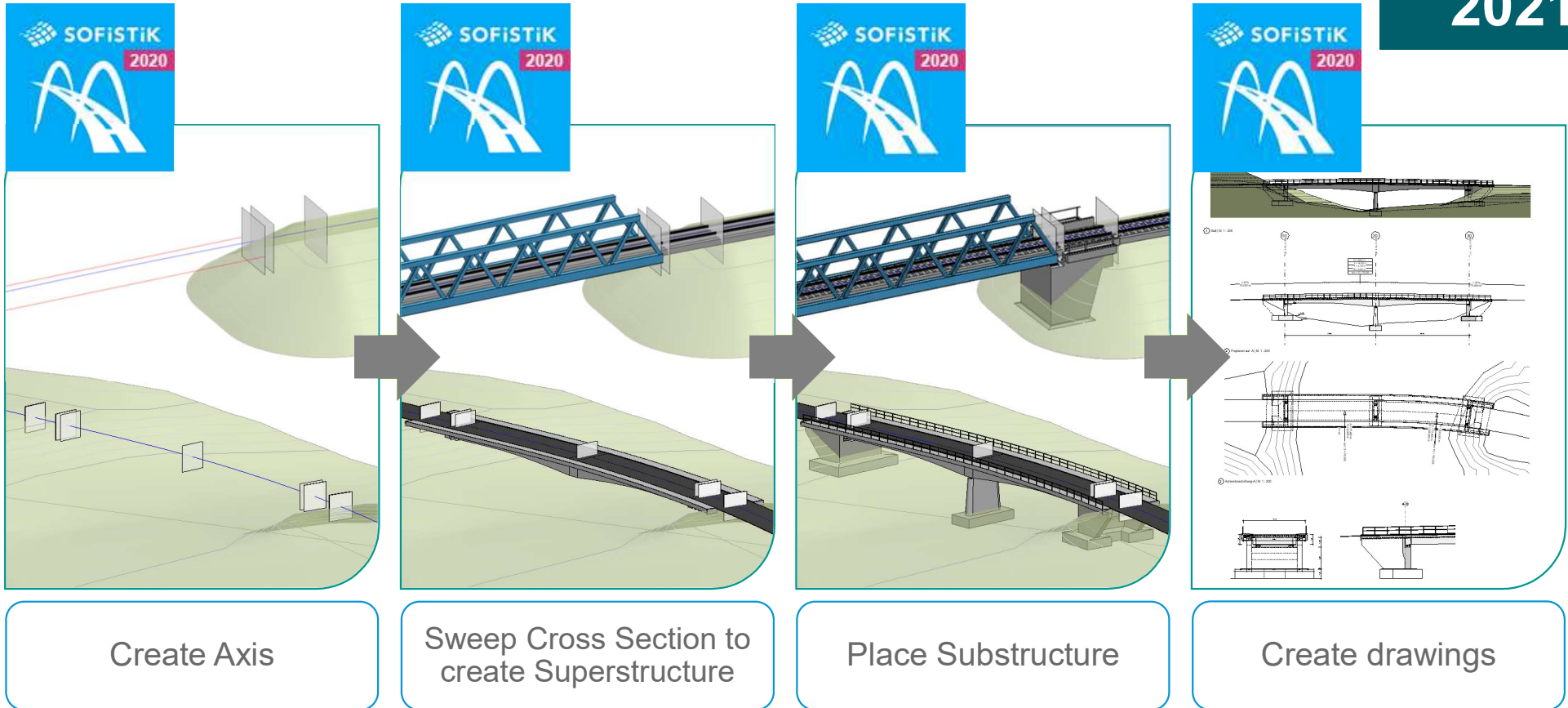
The parametric modeling allows case studies and reduces planning time and cost. The parameterization stays consistent for the whole processing period.

The product consists of the software itself and content including generic families for super- and substructure creation. These families can easily be modified or created from scratch to meet local and company standards.

Additional bridge equipment elements such as parapets and railings can also be created. Automatic generation of section views, top views, longitudinal sections and elevation points assists users in detailing and documenting their structures.

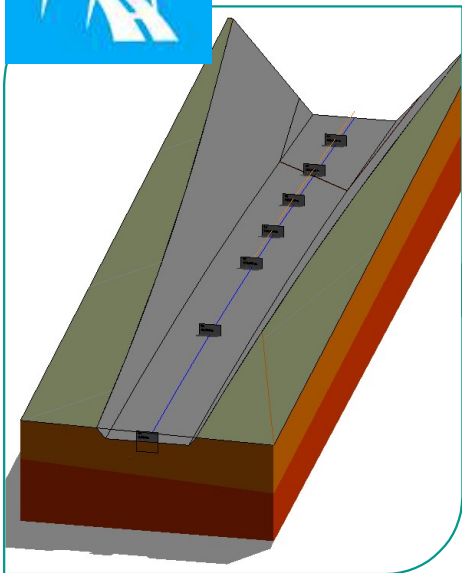
Parametric Modelling of Bridges in Revit

2021

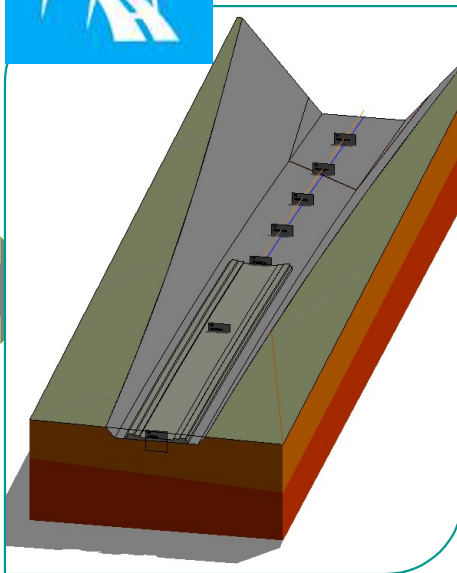


Parametrische Modellierung of Tunnels in Revit

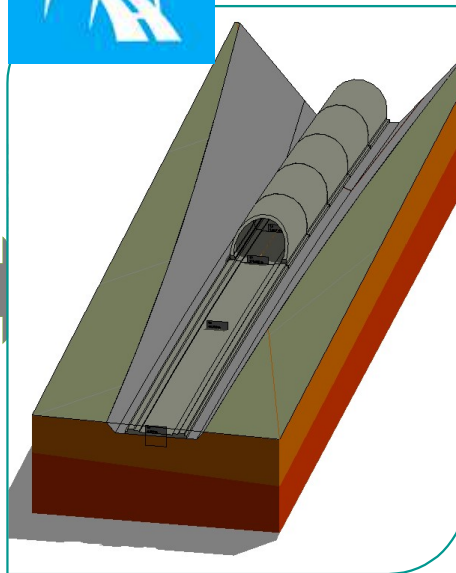
2021



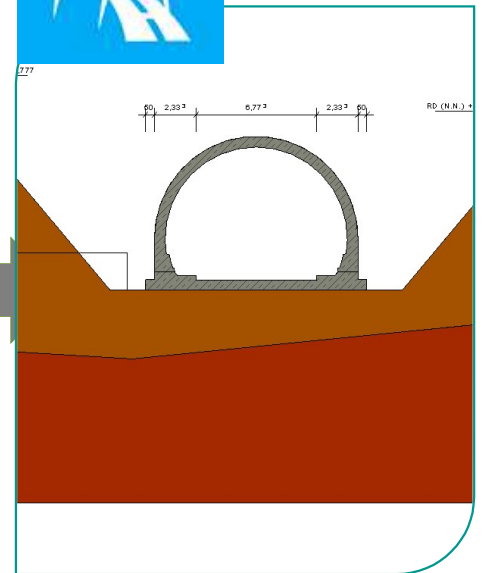
Create Axis



Sweep base plate



Create tunnel
segments



Create drawings

Workflows



+ Workflow 1.1: Create Bridge (update automatically)

- + Create Axis
- + Create Superstructure along Axis
- + Create Substructure at Axis-Placements
- + Create Bridge Equipment, e.g. Parapet, Railing

+ Workflow 1.2: Shop Drawings (update manually)

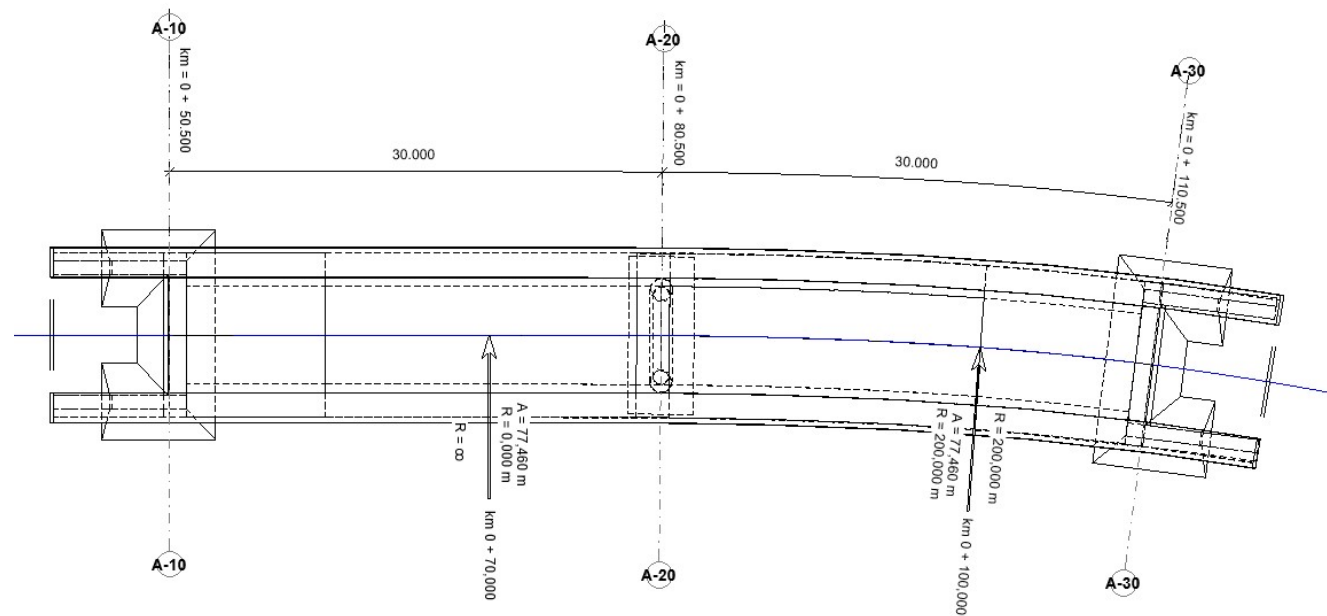
- + Create Section Views
- + Create Longitudinal Section View
- + Create Elevation Points and Table of Coordinates

The diagram illustrates the design process for a hollow box beam through several stages:

- Basis-Familien (Basic Family):** Shows two 2D cross-sections of a basic beam. The top one has a total width of 6.32 and a height of 5.78. The bottom one has a total width of 6.32 and a height of 5.78. Both are labeled 'Basis-Familien'.
- Einstegiger Plattenbalken (Single-slab beam):** Shows a 3D perspective view of a beam with a single slab. Dimensions include a total width of 6.32, a height of 5.78, and a bottom flange width of 5.32.
- Hohlkasten (Hollow box):** Shows a 3D perspective view of a beam with a hollow box cross-section. Dimensions include a total width of 6.32, a height of 5.78, and a bottom flange width of 5.32.

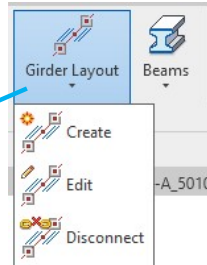
+ Station Annotation on Axis and/or Grids

- + Curved Dimension
- + Cross Member Layout
- + Multi-Girder Bridges
- + Visibility of Placements
- + Placement Annotation
- + Performance Improvement

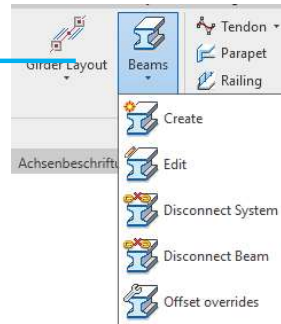


Multi-Girder-Bridges

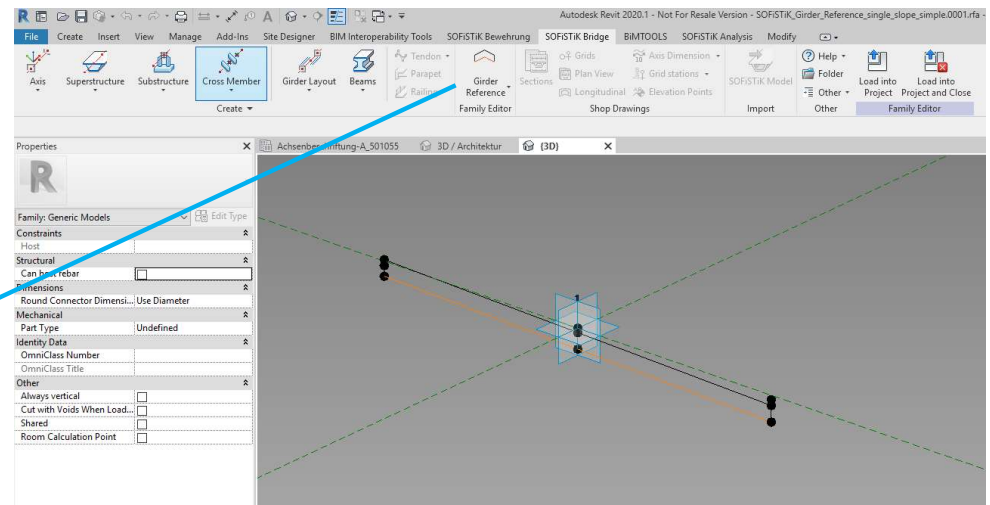
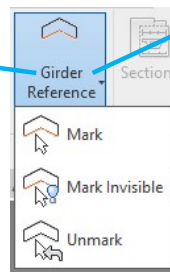
+ Create Girder Layout



+ Create Beams

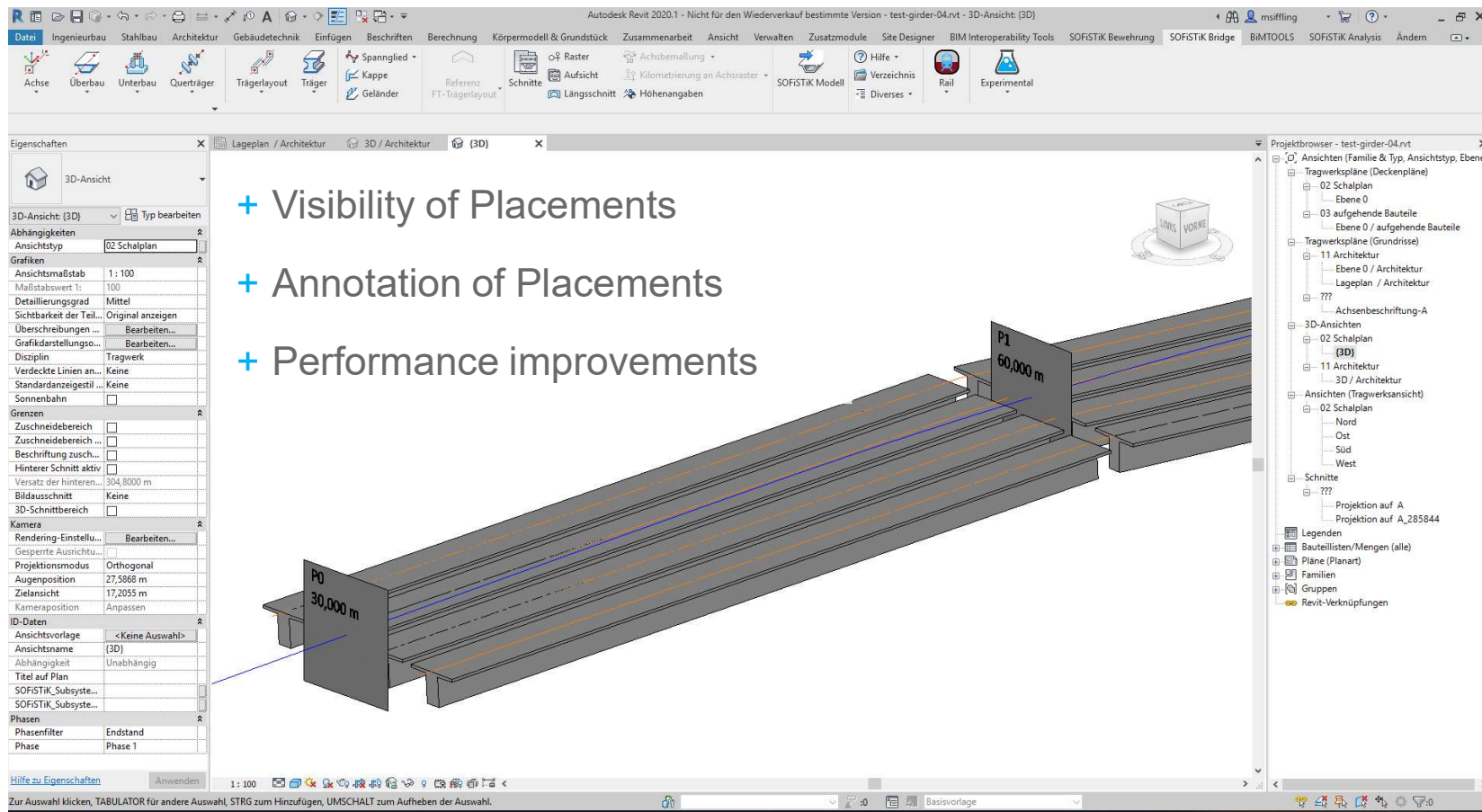


+ Girder Reference



New Features in Version 2020-1

- + Visibility of Placements
- + Annotation of Placements
- + Performance improvements



Visualisation of Placements

Autodesk Revit 2020.1 - Not For Resale Version - Pfeimdbücke-01.rvt - 3D View: (3D)

File Structure Steel Architecture Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Site Designer BIM Interoperability Tools SOFISTIK Bewehrung SOFISTIK Bridge BiMTOOLS SOFISTIK Analysis Modify

Axis Superstructure Substructure Cross Member Girder Layout Beams Tendon Parapet Railing Girder Reference Sections Plan View Longitudinal Elevation Points Shop Drawings SOFISTIK Model Import Other Help Folder Other

Properties 3D View 3D-Ansicht

3D View: (3D) Edit Type

Constraints Ansichtstyp 02 Schalplan

Graphics View Scale 1 : 100 Scale Value 1: 100 Detail Level Medium Parts Visibility Show Original Visibility/Graphics Overrides Edit... Graphic Display Options Edit... Discipline Structural Show Hidden Lines None Default Analysis Display... None Sun Path ☐

Extents Crop View ☐ Crop Region Visible ☐ Annotation Crop ☐ Far Clip Active ☐ Far Clip Offset 304,8000 m Scope Box None Section Box ☐

Camera Rendering Settings Edit... Locked Orientation ☐ Projection Mode Orthographic

Achsenbeschriftung-A_501055 3D / Architektur {3D} {3D}

20 164,500 m 30 190,500 m 40 216,500 m 10 142,500 m

Visibility/Graphic Overrides for 3D View: (3D)

Model Categories Annotation Categories Analytical Model Categories Imported Categories Filters

☒ Show model categories in this view If a category is unchecked, it will not be visible.

Filter list: <multiple>

Visibility	Projection/Surface			Cut		Halftone
	Lines	Patterns	Transparency	Lines	Patterns	
☐ Furniture Systems						☐
☒ Generic Models						☐
☒ Einfügepunkt						☐
☒ Hidden Lines						☐
☒ Mittellinie						☐
☐ SOFISTIK Reference Point						☐
☒ SOFISTIK-Axis-Main						☐
☒ SOFISTIK-Axis-Secondary						☐
☒ SOFISTIK-Placement						☐
☒ SOFISTIK-Placement-Annotation						☐
☒ Virtueller Schnittkörper						☐
☐ Lighting Fixtures						☐
☒ Lines						☐
☐ Mass						☐

All None Invert Expand All

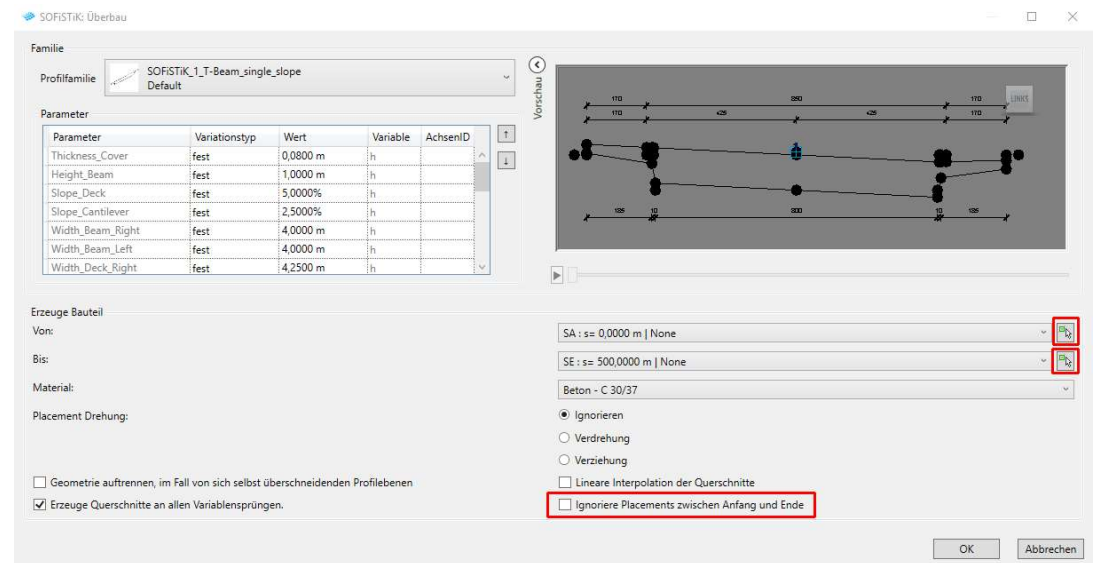
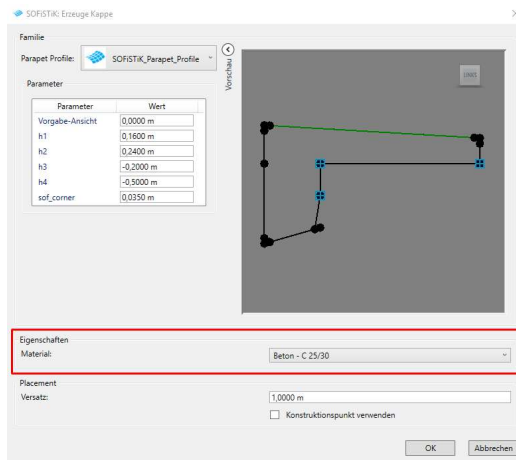
Override Host Layers ☐ Cut Line Styles Edit...

Categories that are not overridden are drawn according to Object Style settings. Object Styles...

OK Cancel Apply Help

New Features in Version 2020-1

- + Graphical selection of placement while creating superstructure
- + New function, ignore placements between start and end
- + Material selection in parapet dialogue



New Features in Version 2020-2

- + Constrain axis
- + Create axis between placements
- + Superstructure – Duplicate
- + Superstructure – Repeater with Offset options

Stationing

☒ Between Placements

☐ Apply layout rule

Layout

Rule: Maximum Spacing

Justification: Center

Quantity: 1

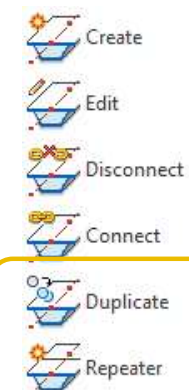
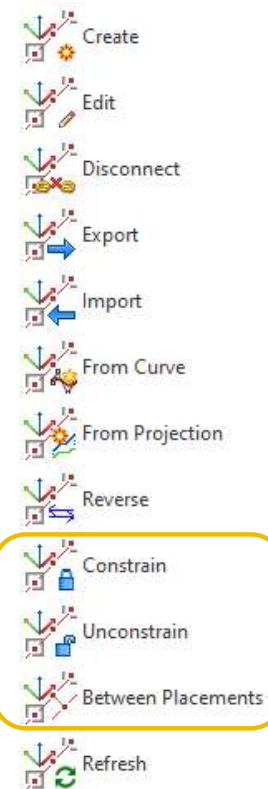
Spacing: 2,5000 m

Offsets

At Start : 0,0000 m

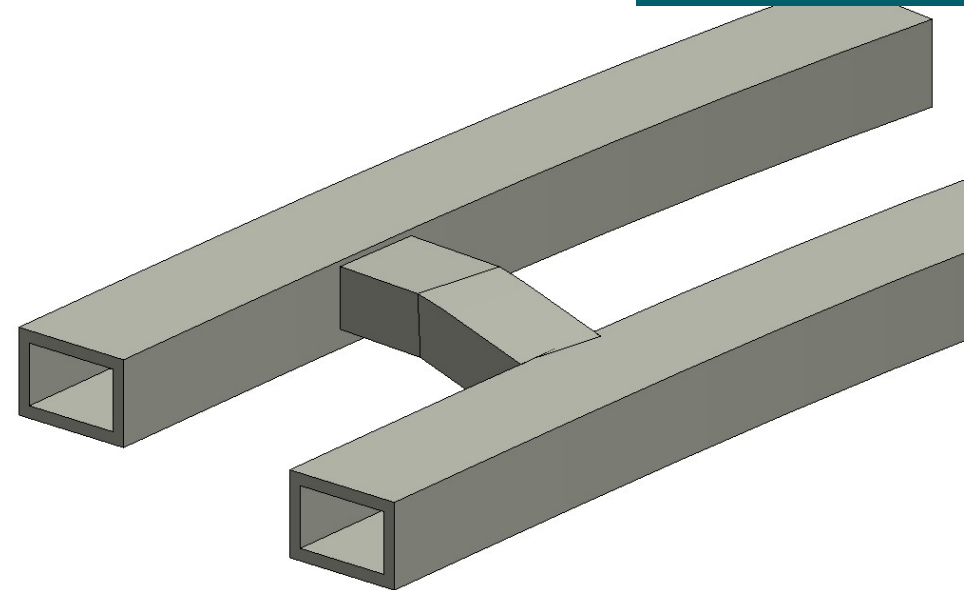
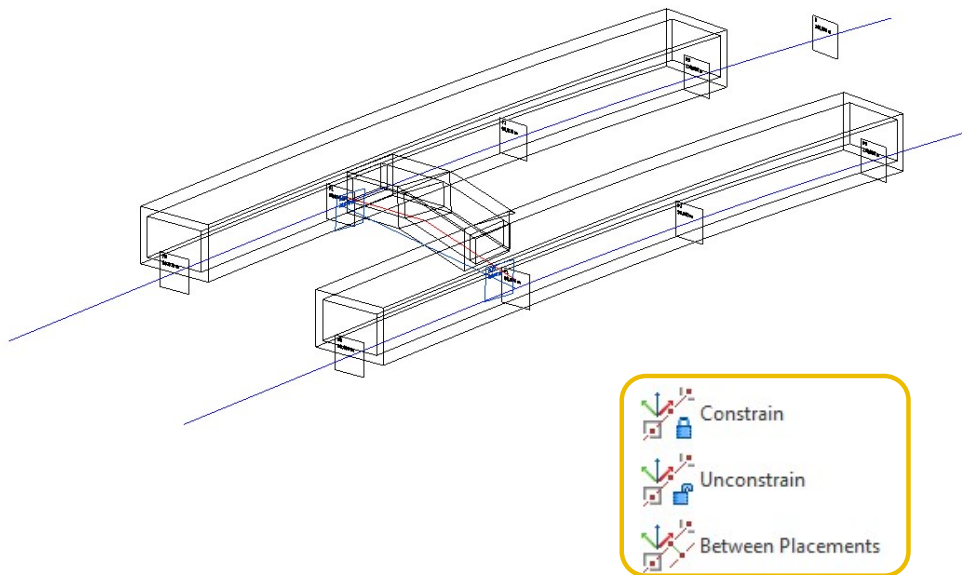
At End : 0,0000 m

Gap between : 0,0000 m



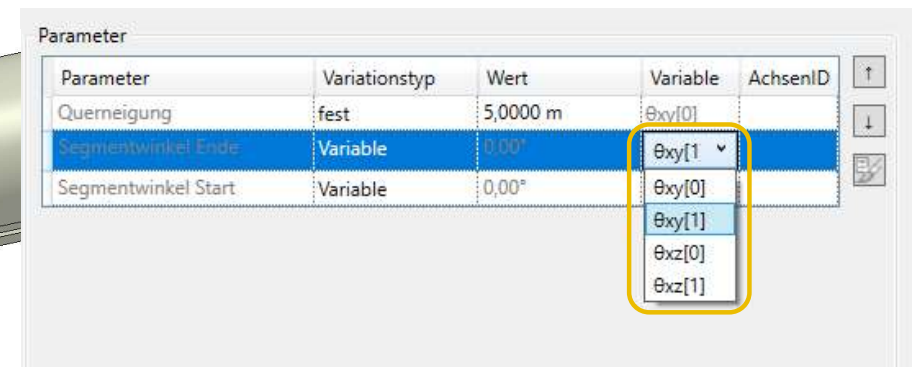
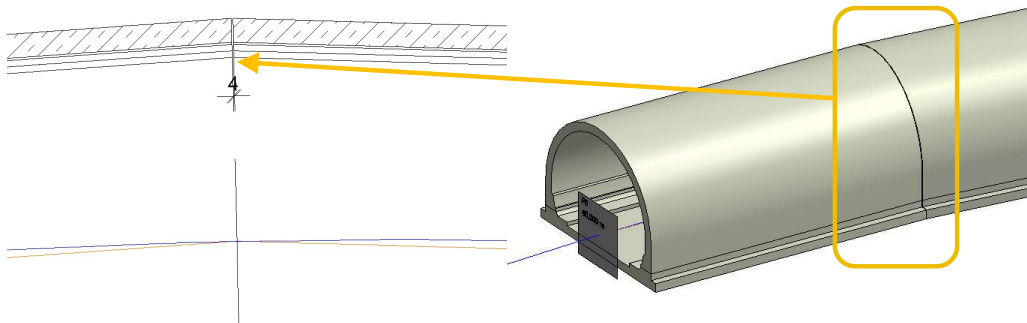
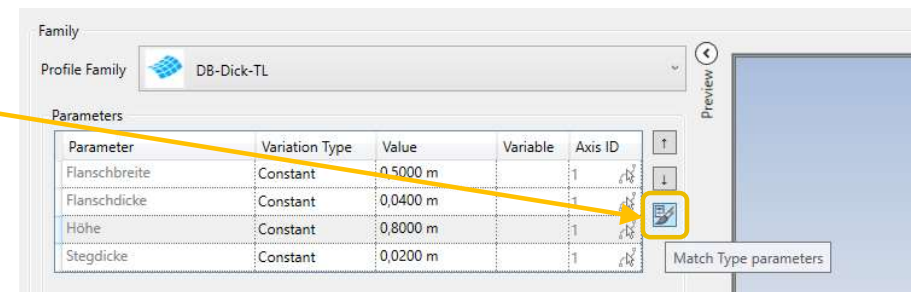
New Features in Version 2020-2

+ Connecting axis between two tunnels



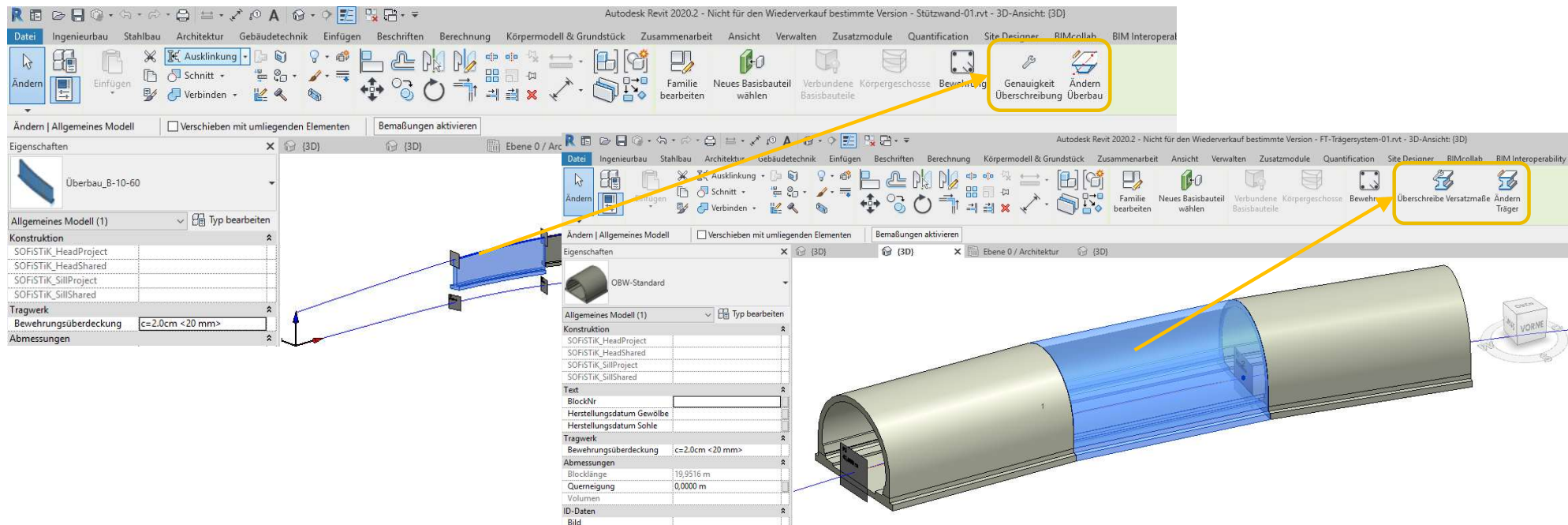
New Features in Version 2020-2

- + Match Type parameters between two types of one family
- + New variable for rotation in xy and xz plane. The used family needs a rotational variable as well.



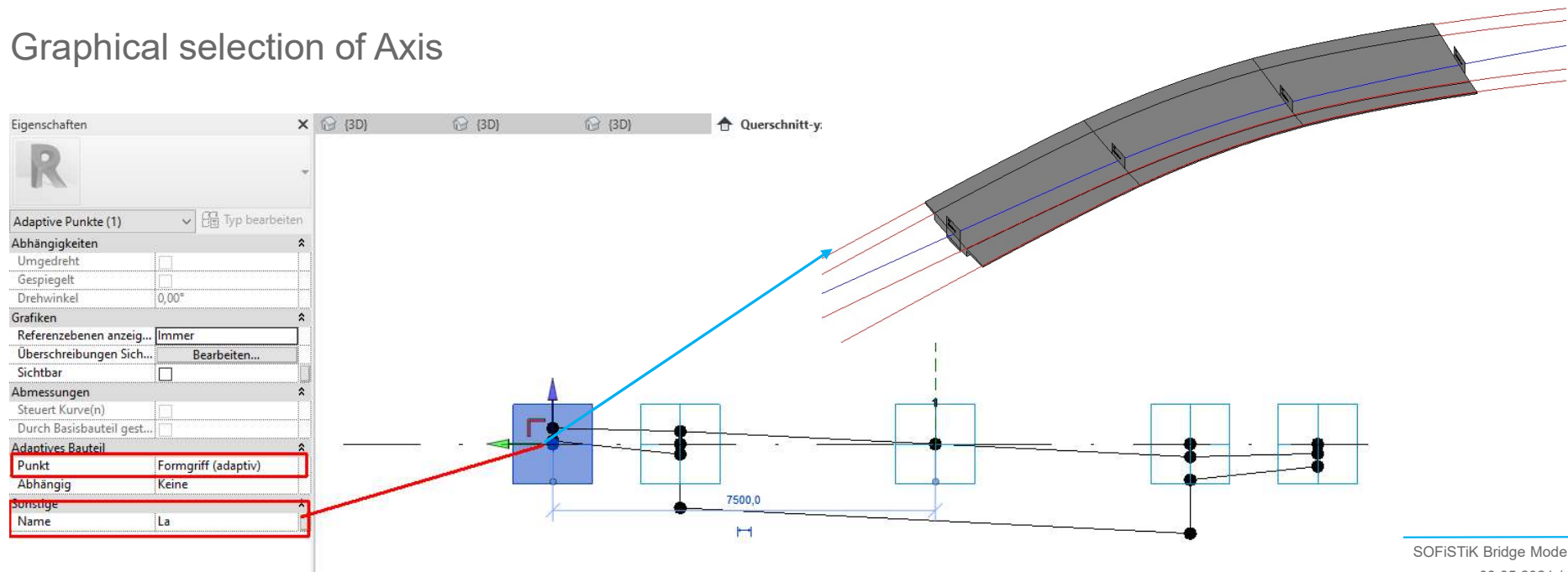
New Features in Version 2020-2

+ Direct access to the modify buttons in the toolbar.



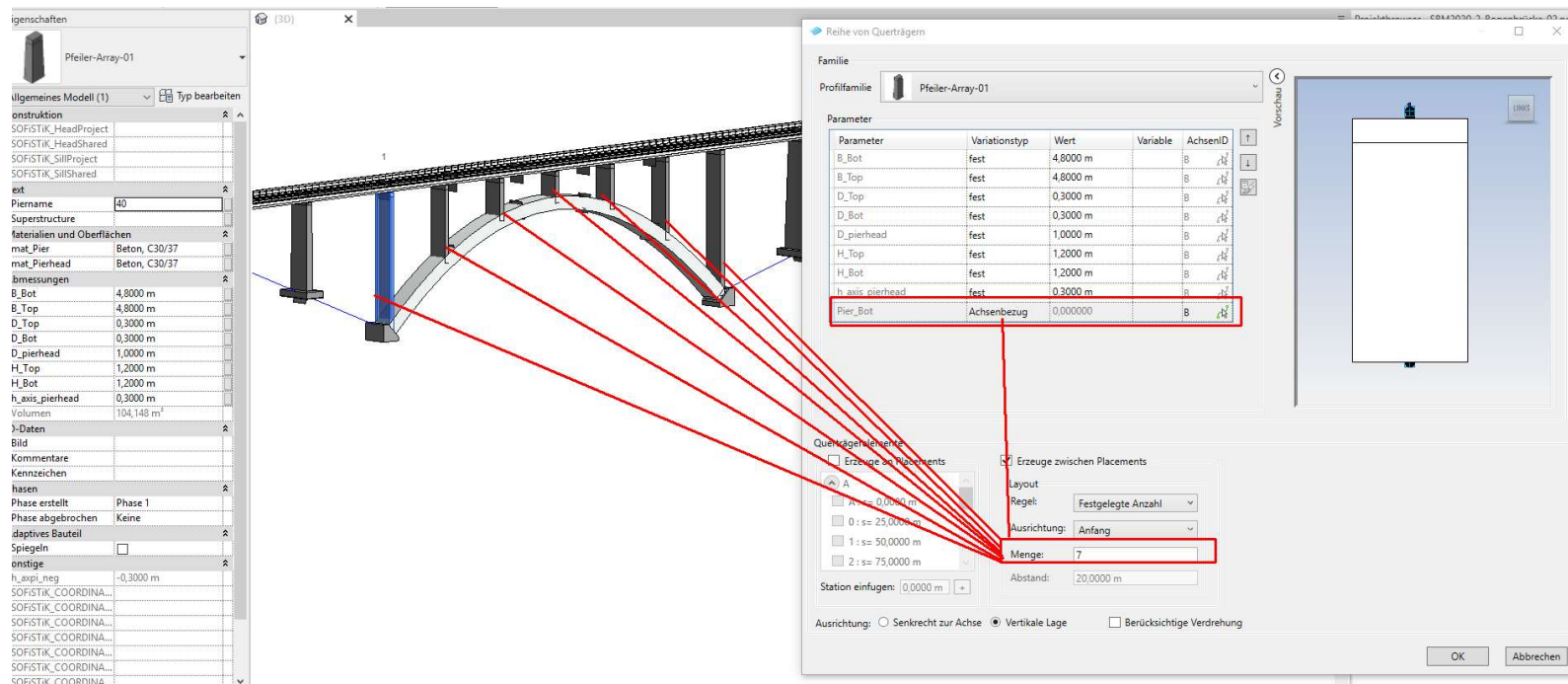
New Features in Version 2020-3

- + Creating cross section profiles with shape handlers. This option enables you to connect cross section points with property “shape handler” to variable secondary axis.
- + Graphical selection of Axis



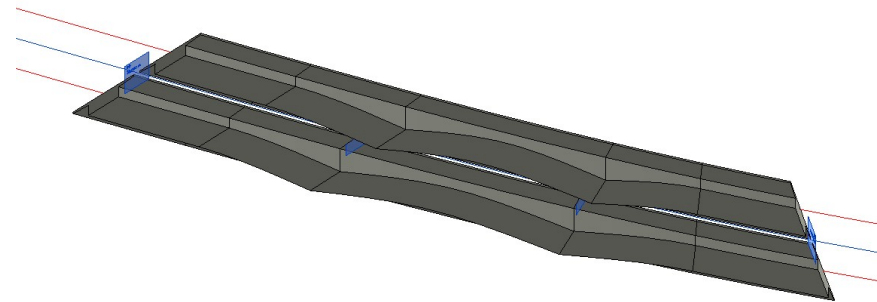
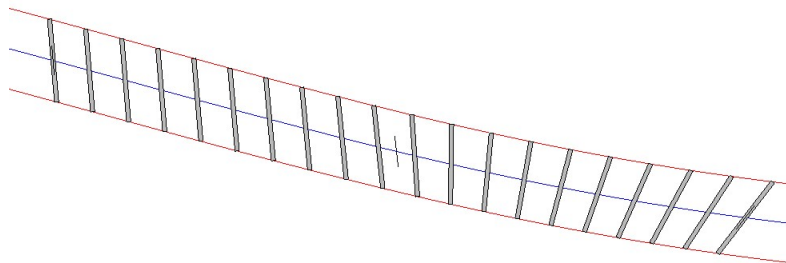
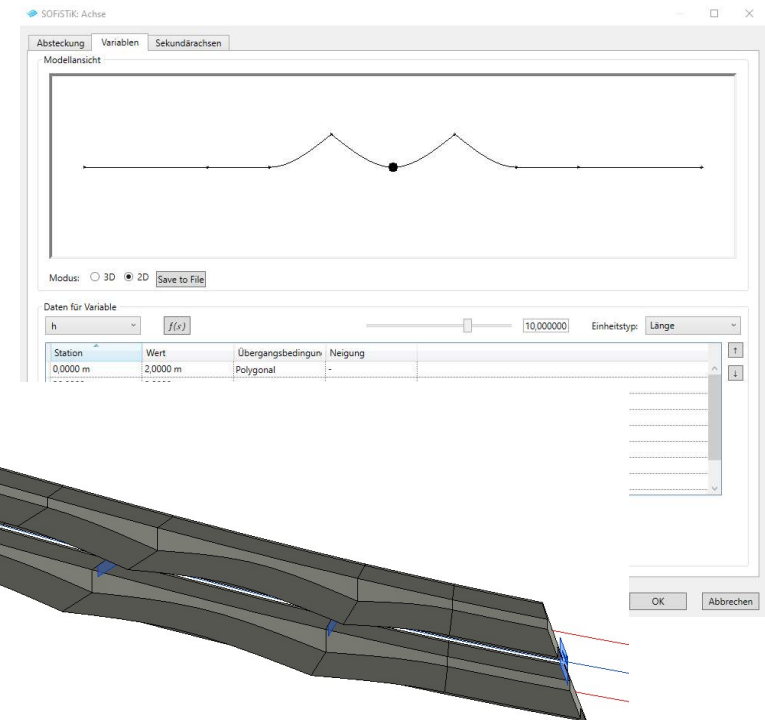
New Features in Version 2020-3

- + You may use the property shape handler also for cross beams, e.g. to connect piers to an arch.



New Features in Version 2020-4

- + Placement rotation will effect also secondary axis.
- + Scaled parametrisation for secondary axis with rotated placements



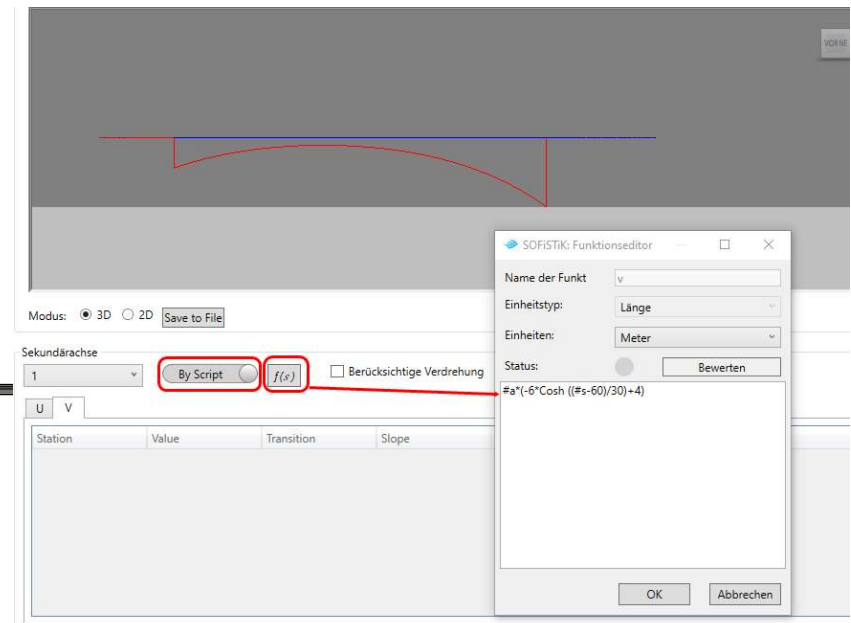
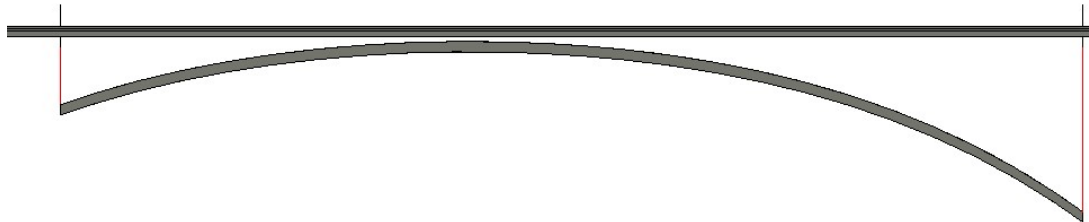
New Features in Version 2020-4

+ Formeleditor e.g. for describing the height of an arch

$\#a * (-6 * \text{Cosh} ((\#s - 60) / 30) + 4)$

$\#a \dots$ Variable mit Werten 0 und 1

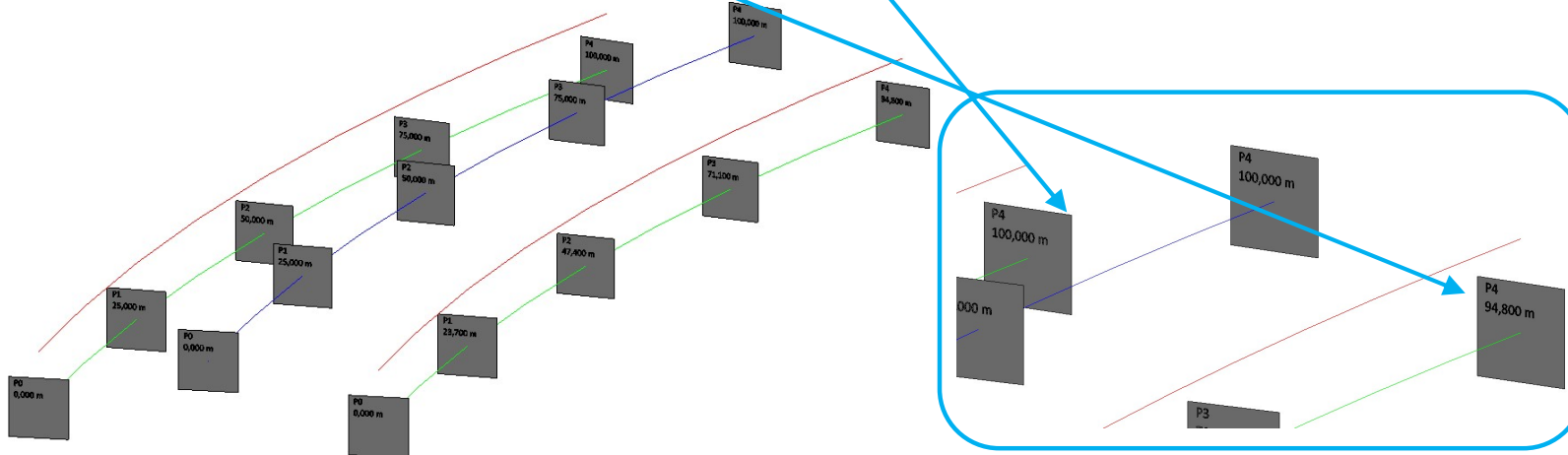
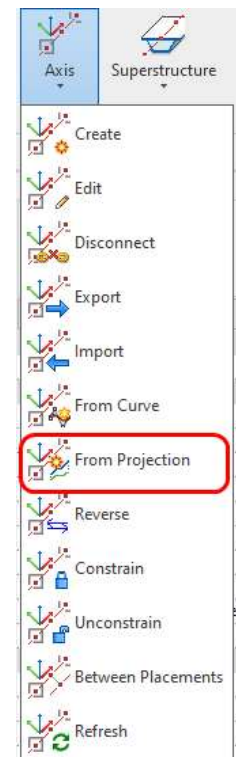
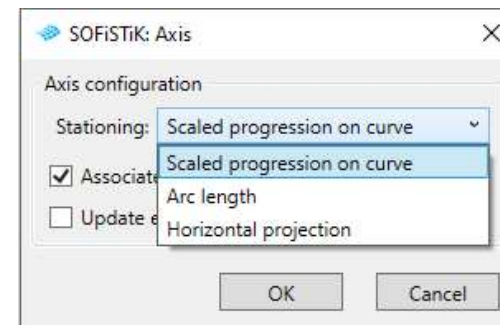
$\#s \dots$ Stationierung



Examples of math. functions can be found here:
<https://docs.microsoft.com/en-us/dotnet/api/system.math?view=netframework-4.8#methods>

New Features in Version 2020-4

- + New axis from projection: Creates an Axis from the horizontal projection of a Revit curve
- + Option 1: Scaled progression on curve
- + Option 2: Arc length
- + Option 3: Horizontal projection

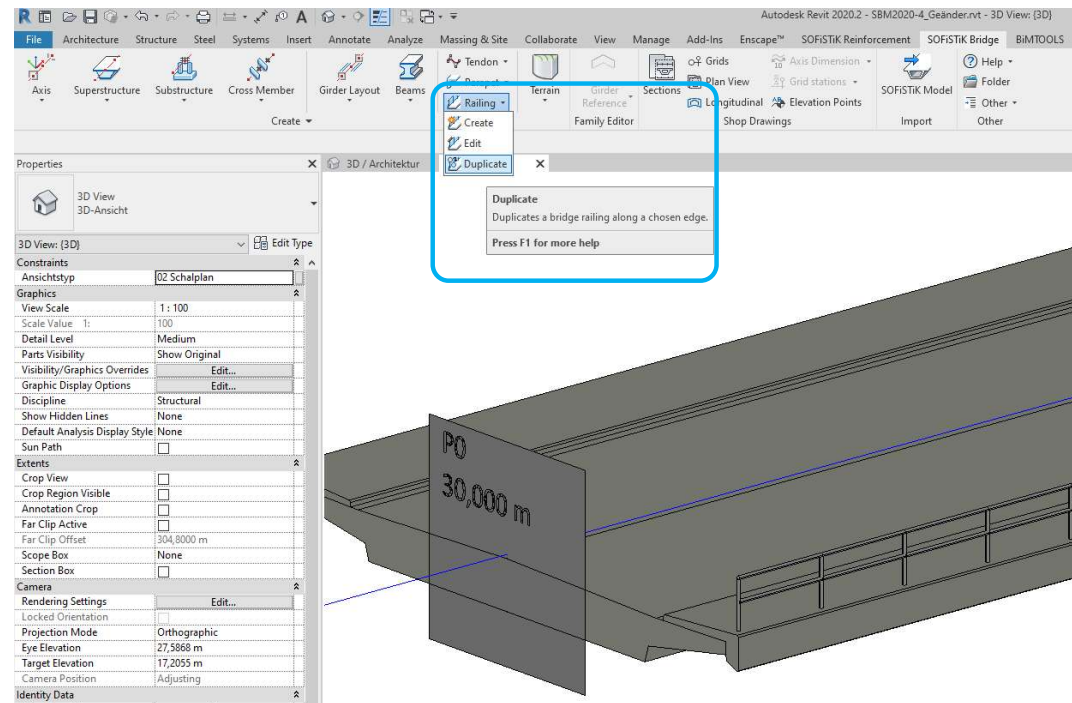


New Features in Version 2020-4

+ New functions for railings and parapets

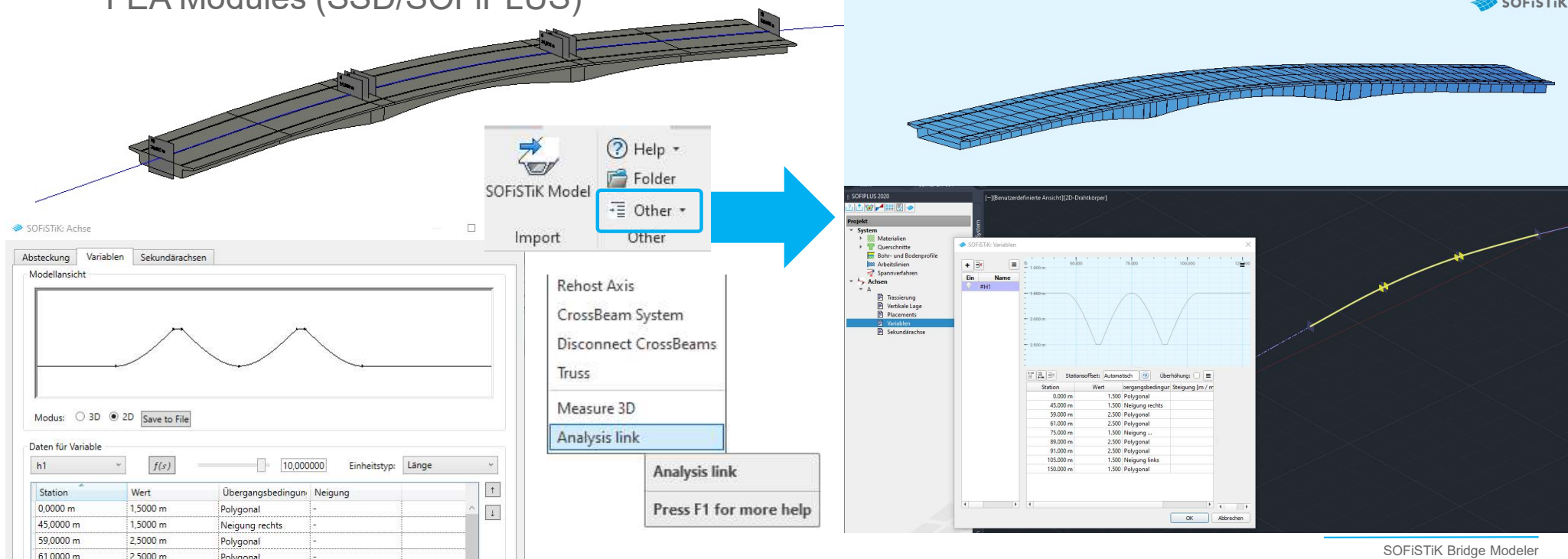
+ Edit

+ Duplicate



New Features in Version 2020-4.1

- + Interface from Revit to SOFiSTiK FEA Modules (SSD/SOFiPLUS)



The screenshot illustrates the workflow for importing a Revit model into SOFiSTiK FEA Modules. It shows the SOFiSTiK Modeler interface with a 3D model of a bridge structure. A blue arrow points from the Revit model to the SOFiSTiK Modeler, indicating the import process. The SOFiSTiK Modeler interface includes a menu with options like 'Import', 'Other', and 'Analysis link'. A 'Rehost Axis' dialog box is also visible, showing options for 'CrossBeam System', 'Disconnect CrossBeams', and 'Truss'. The 'Analysis link' button is highlighted, and a message 'Press F1 for more help' is displayed.

SOFiSTiK Achse

Absteckung Variablen Sekundärachsen

Modellansicht

Modus: ☐ 3D ☒ 2D Save to File

Daten für Variable

Station	Wert	Übergangsbedingung	Neigung
0,0000 m	1,5000 m	Polygonal	-
45,0000 m	1,5000 m	Neigung rechts	-
59,0000 m	2,5000 m	Polygonal	-
61,0000 m	2,5000 m	Polygonal	-

SOFiSTiK Model

Import Other

Rehost Axis
CrossBeam System
Disconnect CrossBeams
Truss
Measure 3D
Analysis link

Analysis link
Press F1 for more help

SOFiPLUS 2020

Projekt

System

- Querschnitte
- Bohr- und Bodenprofile
- Arbeitslinien
- Spannverfahren
- Achsen
- Tessierung
- Vertikale Lage
- Placements
- Verfahren
- Sekundärachse

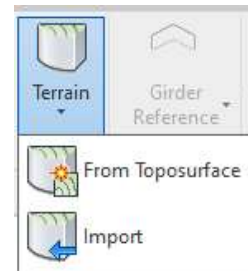
SOFiSTiK Variablen

Station	Wert	Übergangsbedingung	Steigung [m / m]
0,000 m	1,500	Polygonal	
45,000 m	1,500	Neigung rechts	
59,000 m	2,500	Polygonal	
61,000 m	2,500	Polygonal	
75,000 m	1,500	Neigung ...	
89,000 m	2,500	Polygonal	
91,000 m	2,500	Polygonal	
105,000 m	1,500	Neigung links	
150,000 m	1,500	Polygonal	

OK Abbrechen

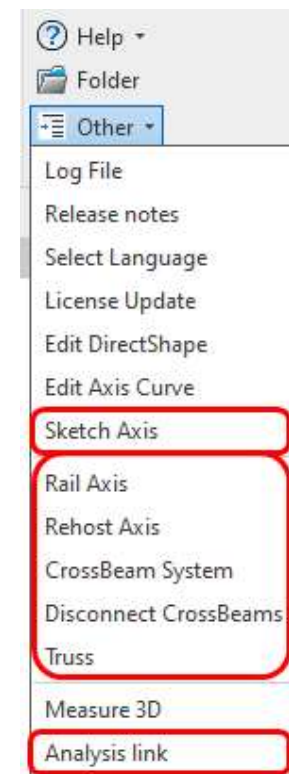
New Features in Version 2020-5

+ Terrain modeler



+ Neue function „Sketch axis“

+ Include of SBM Rail functionality in menu „Other“



New Features in Version 2020-5

+ Command „Rail Axis“

→ creates a new straight axis between two placements including two secondary axis




Rail Axis
✕

Axis

From (A) : P1 : s= 60,0000 m | SupportAxis ▼ 

To (A) : P2 : s= 90,0000 m | SupportAxis ▼ 

ID:

☐ Find best-fit line

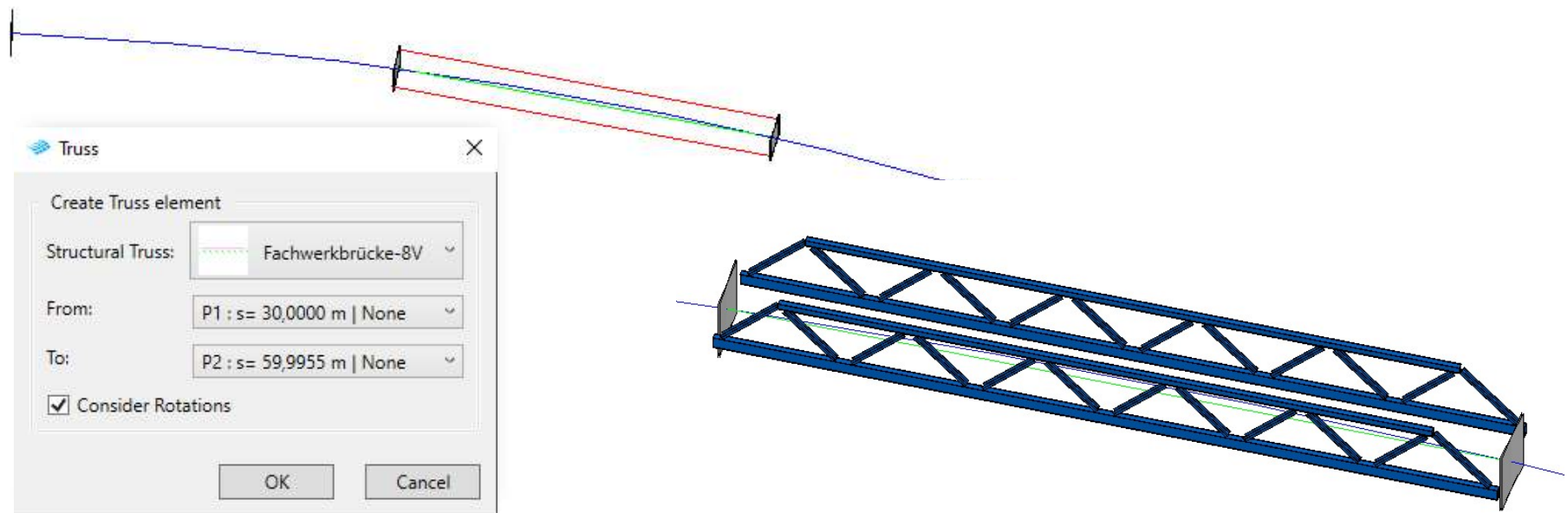
☒ Create Parallel Axes

Offset:

OK Cancel

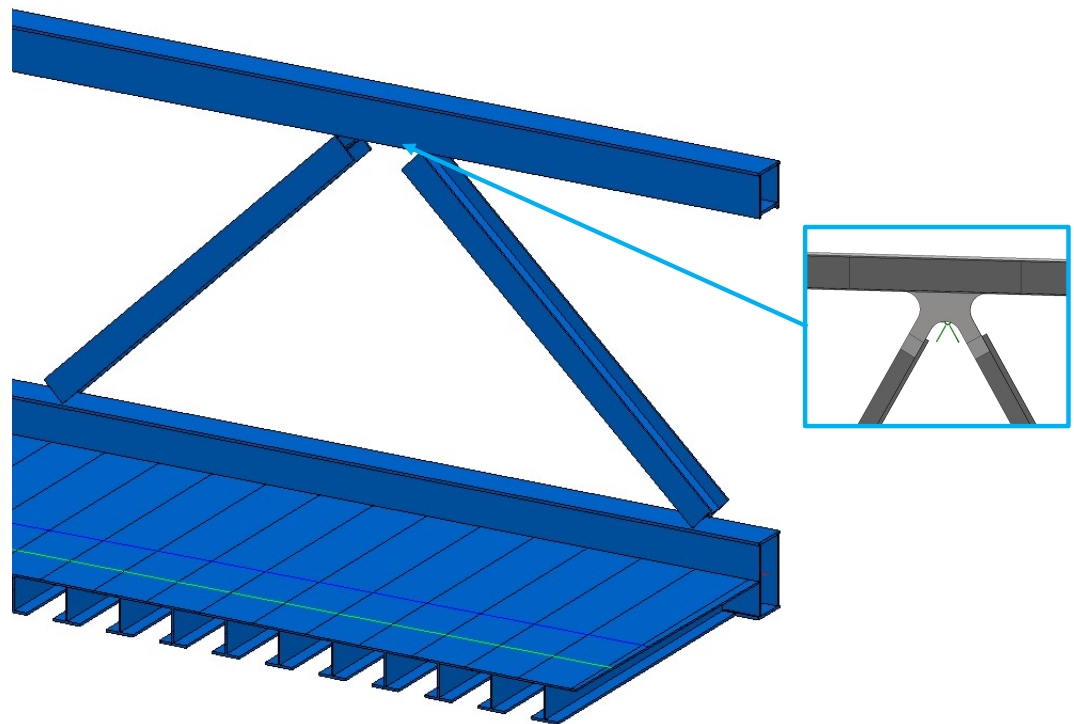
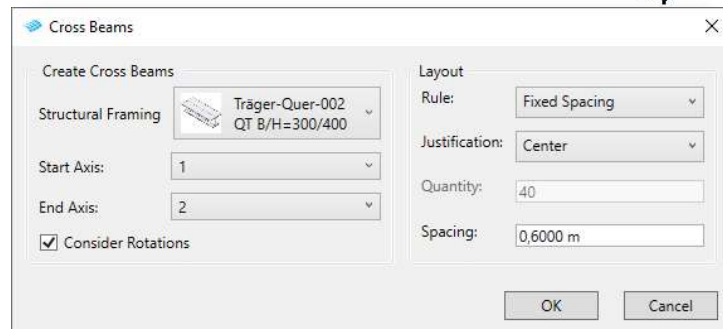
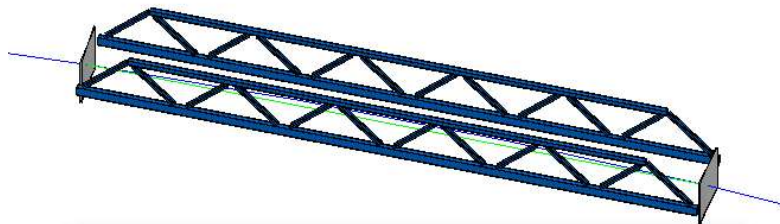
New Features in Version 2020-5

+ Command „Truss“

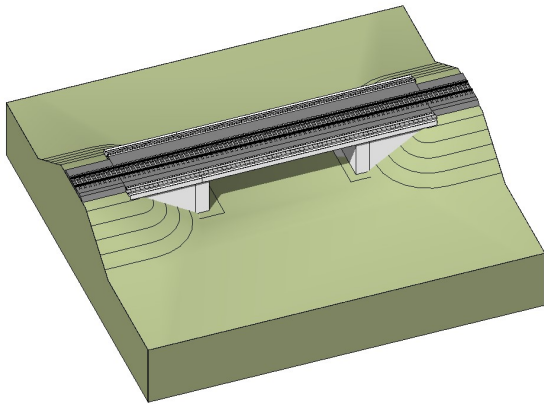


New Features in Version 2020-5

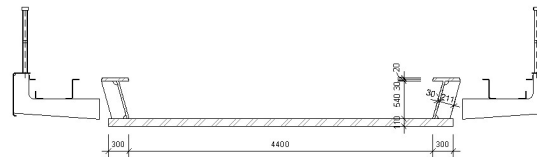
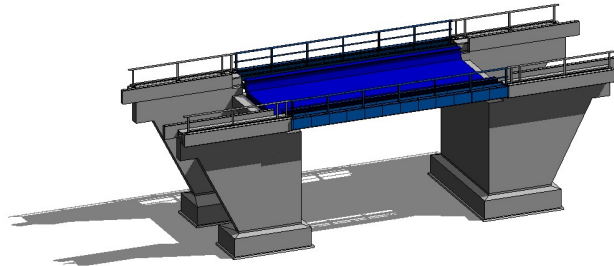
+ Command „CrossBeam System“



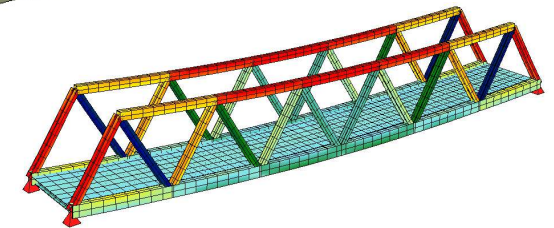
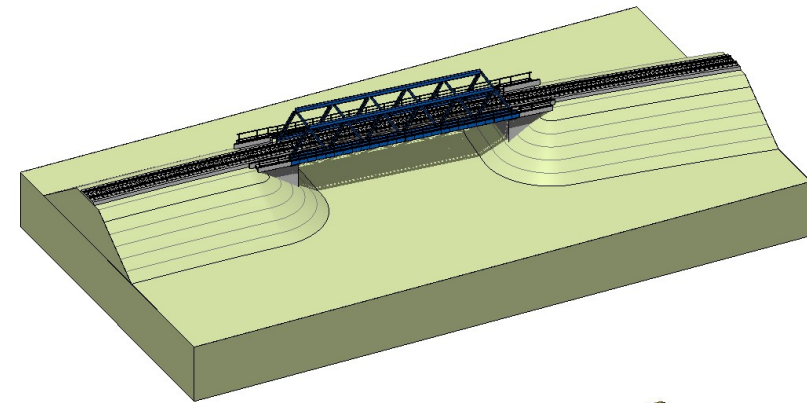
Examples of Railway Bridges



Reinforced Concrete
Frame Bridge



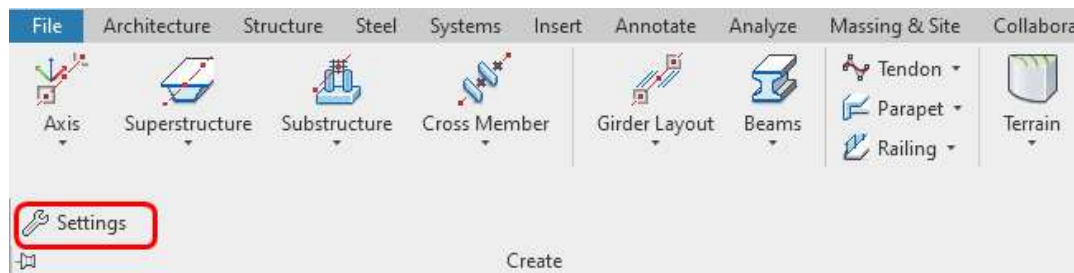
Steel Plate Bridge



Steel Truss Bridge

New Features in Version 2020-5

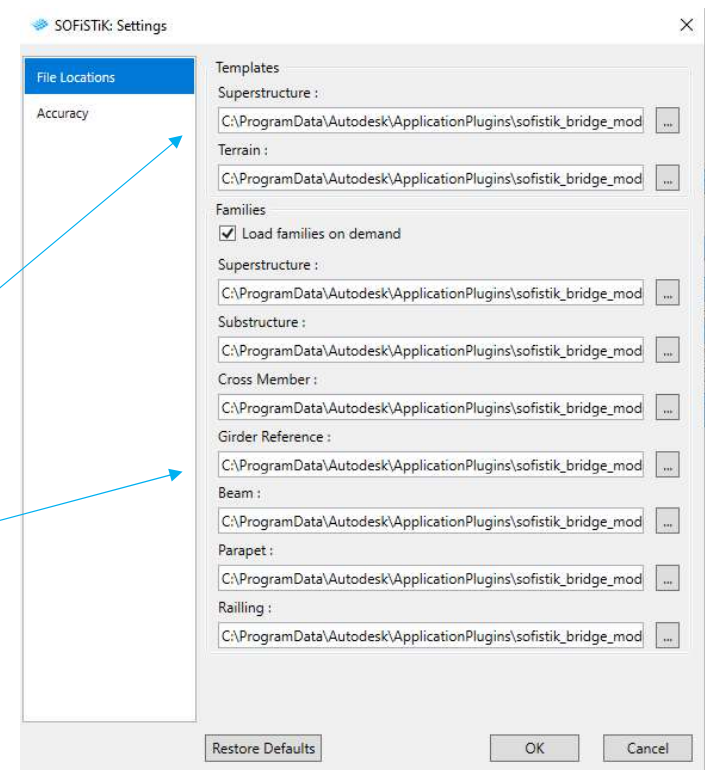
+ New „Settings“ dialogue



+ Use individual family templates for superstructure components

+ Load your own families from specific directories

+ SBIM available now for Revit 2021



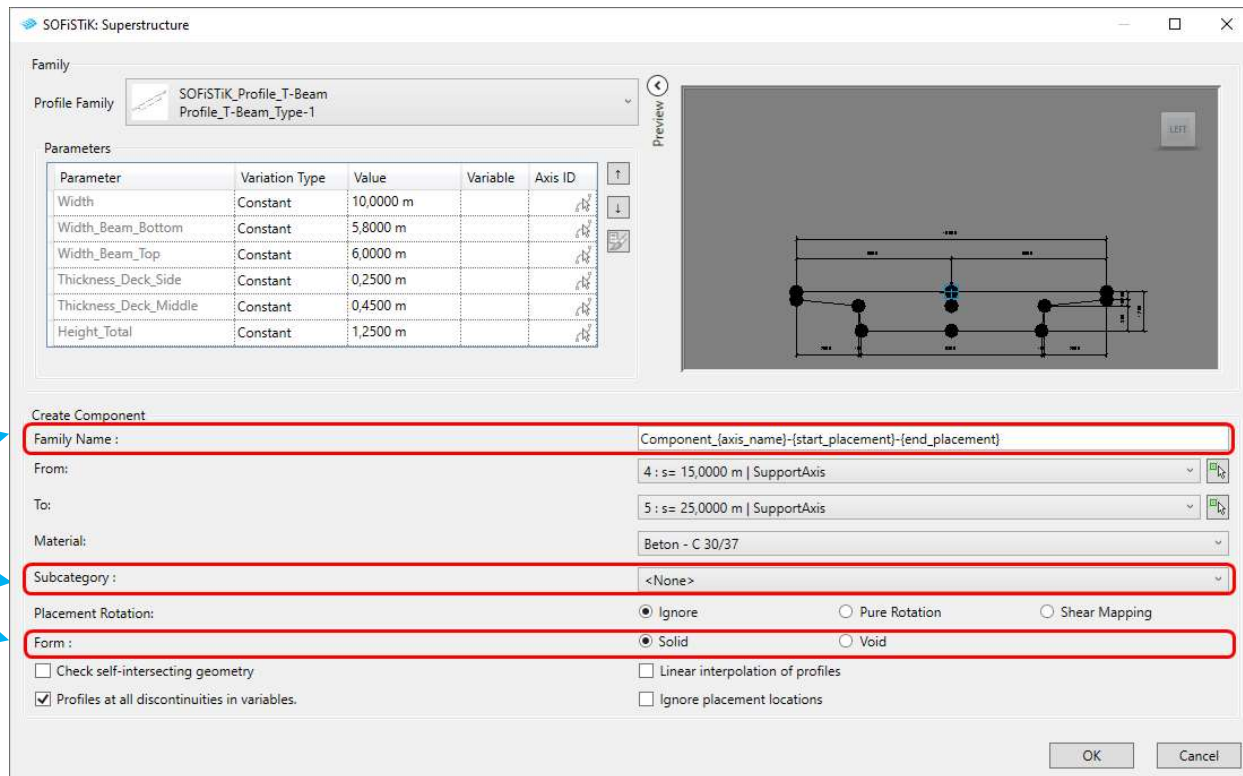
New Features in Version 2020-5

+ Extensions for superstructure command

+ Create individual family name

+ Assign subcategory

+ Create solid or void component



Family: SOFISTIK_Profile_T-Beam
Profile_T-Beam_Type-1

Parameter	Variation Type	Value	Variable	Axis ID
Width	Constant	10,0000 m		
Width_Beam_Bottom	Constant	5,8000 m		
Width_Beam_Top	Constant	6,0000 m		
Thickness_Deck_Side	Constant	0,2500 m		
Thickness_Deck_Middle	Constant	0,4500 m		
Height_Total	Constant	1,2500 m		

Create Component

Family Name : Component_{axis_name}-{start_placement}-{end_placement}

From: 4 : s= 15,0000 m | SupportAxis

To: 5 : s= 25,0000 m | SupportAxis

Material: Beton - C 30/37

Subcategory : <None>

Placement Rotation: ☒ Ignore ☐ Pure Rotation ☐ Shear Mapping

Form : ☒ Solid ☐ Void

☐ Check self-intersecting geometry

☒ Profiles at all discontinuities in variables.

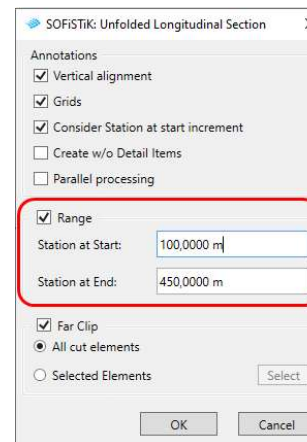
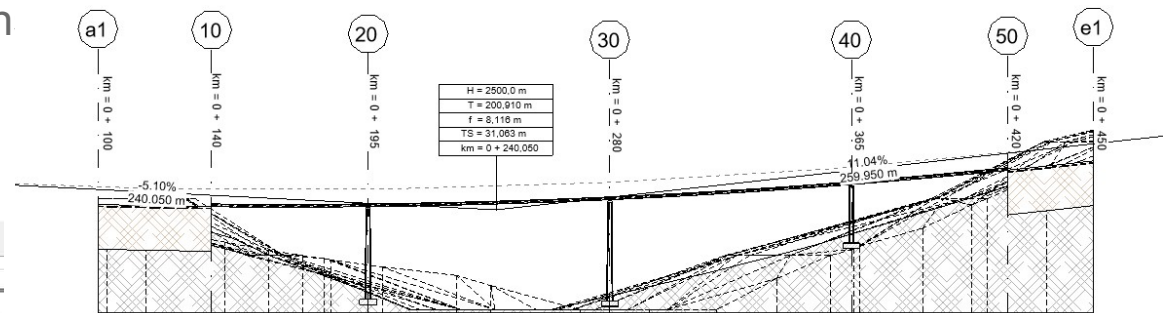
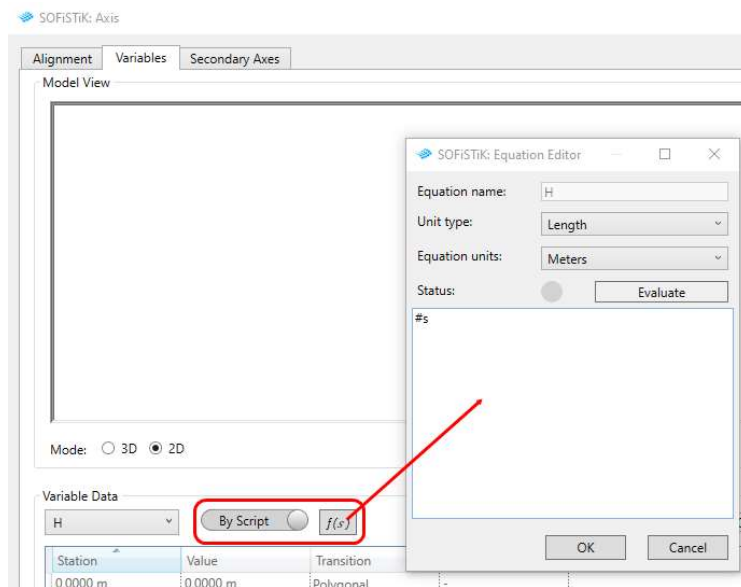
☐ Linear interpolation of profiles

☐ Ignore placement locations

OK Cancel

New Features in Version 2020-5

- + Define a range for longitudinal section
- + New UI for variable



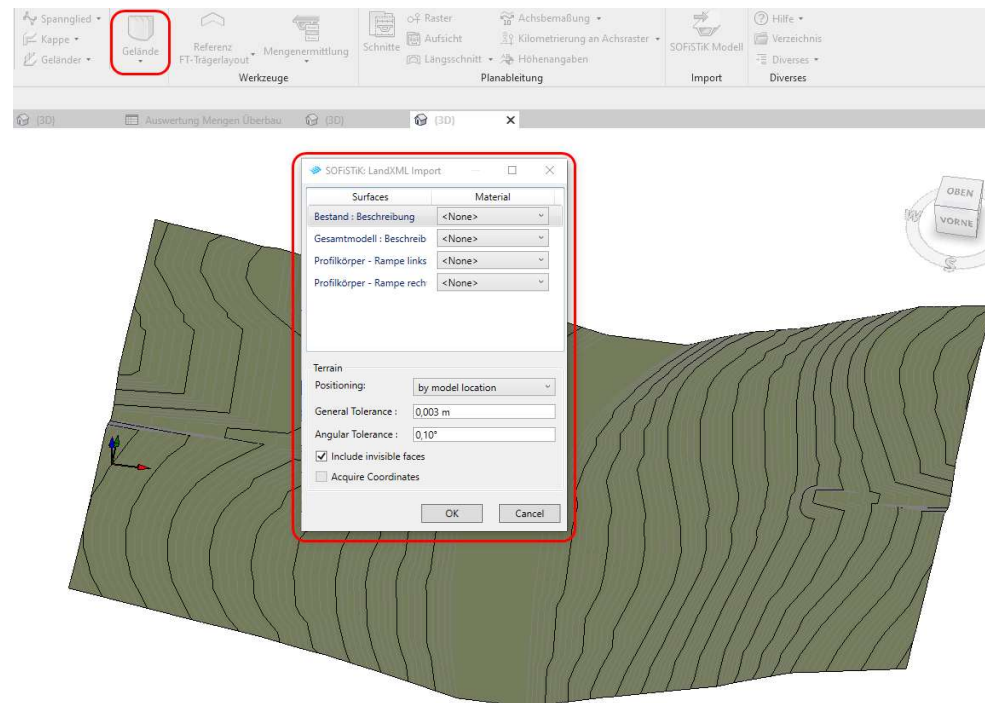
New Features in Version 2021-6 / 2020-6

- + Import DGM surface from Land.XML file
- + Shop Drawing – update longitudinal section
- + Quantification for super- and substructures
- + Assign materials via global parameters, sub-categories and shared parameter

New Features in Version 2021-6 / 2020-6

Import Surface from LandXML file

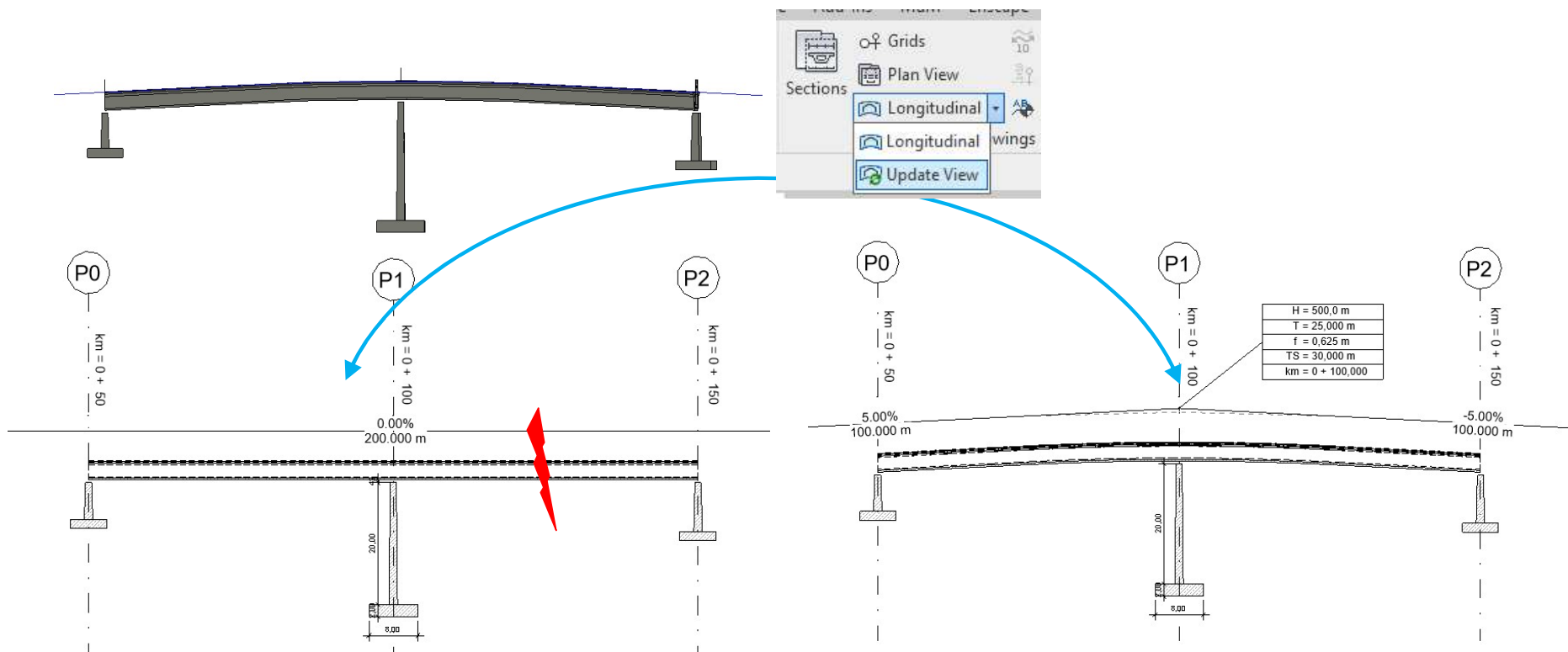
- + Create a REVIT surface from a LandXML file.
- + BIM 360 as a workaround is no longer necessary
- + General LandXML files e.g. created from Civil 3D may be used.



New Features in Version 2021-6 / 2020-6

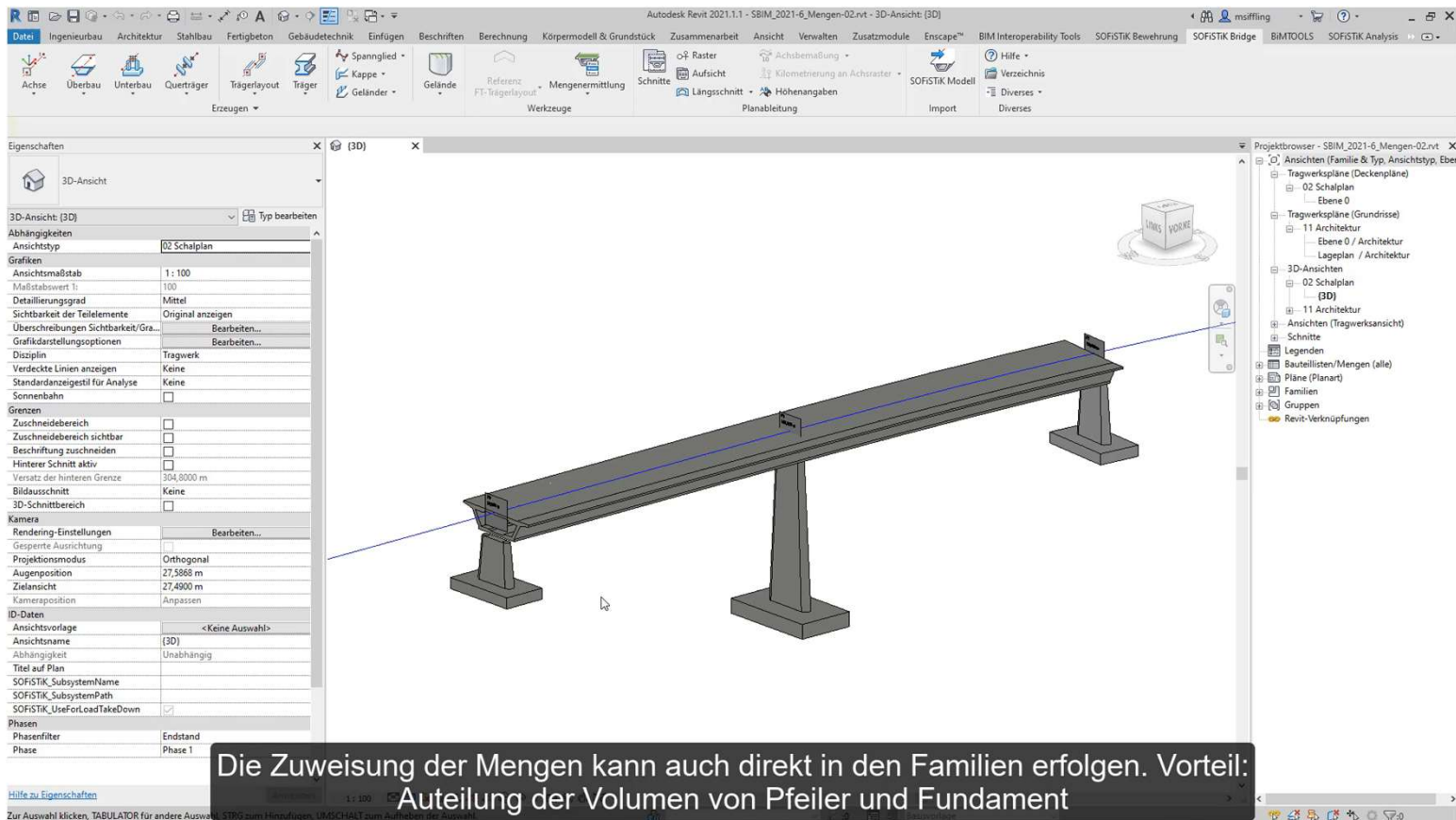
Update Longitudinal Section

2021



New Features in Version 2021-6 / 2020-6

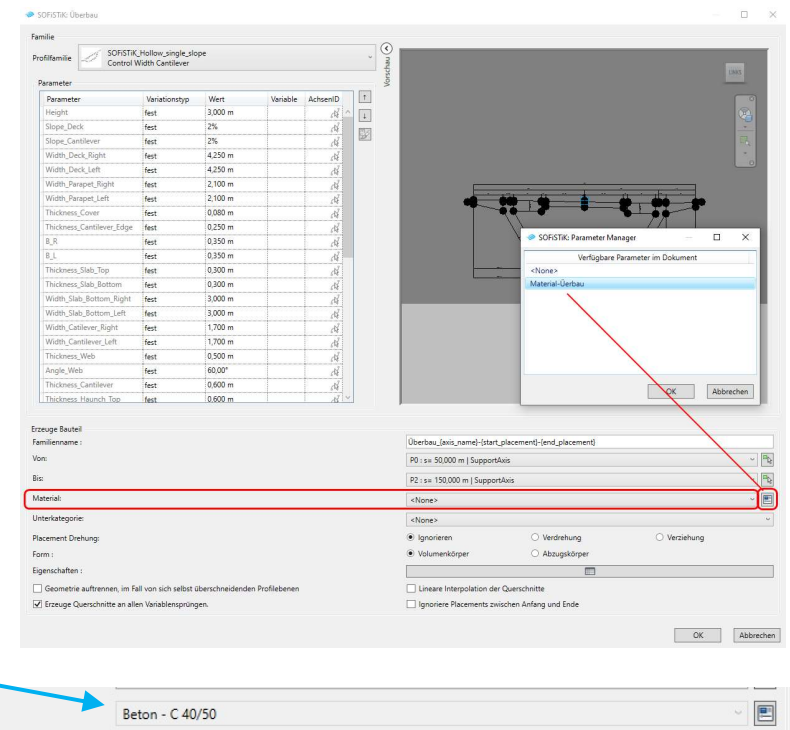
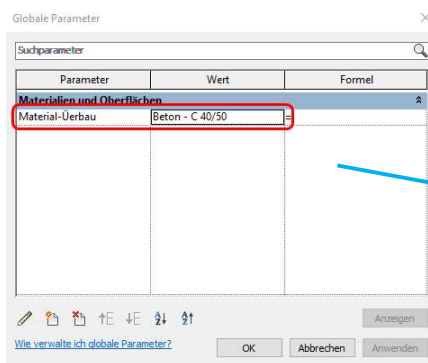
Quantification - Substructures



New Features in Version 2021-6 / 2020-6

Assign materials via global parameters

- + The material for a superstructure is assigned via a global parameter.
- + In case the material needs to be changed, simple change the global parameter without regenerating the existing superstructure family components
→ simplification and speed up

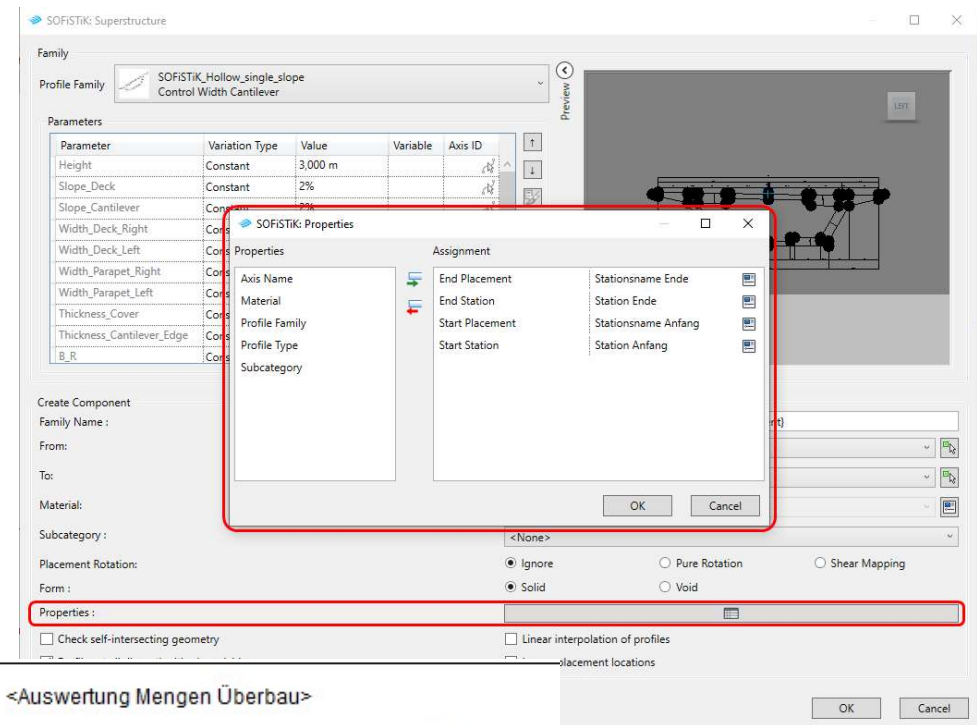


New Features in Version 2021-6 / 2020-6

Component Properties

2021

- + You may assign Superstructure component properties to shared parameters for additional evaluation of the components.
- + This enables you to evaluate these parameters in different.



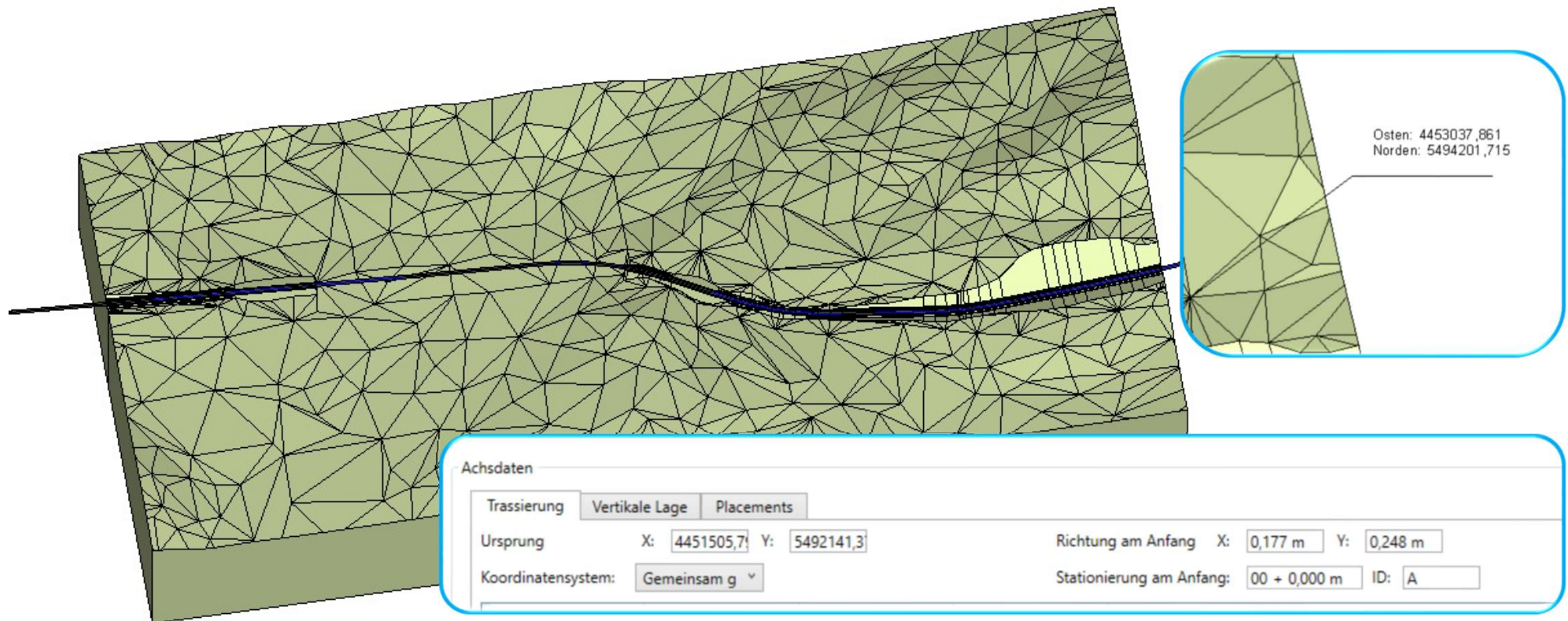
<Auswertung Mengen Überbau>

A	B	C	D	E	F
Familie	Schalfläche - Bodenplatte	Schalfläche - Fahrbahnplatte	Schalfläche - Kappe links	Schalfläche - Kappe rechts	Schalfläche - Steg links
Überbau_A-30-50	746,05 m²	841,43 m²	201,77 m²	196,80 m²	486,05 m²
Überbau_A-10-30	746,10 m²	841,43 m²	200,28 m²	198,29 m²	483,62 m²

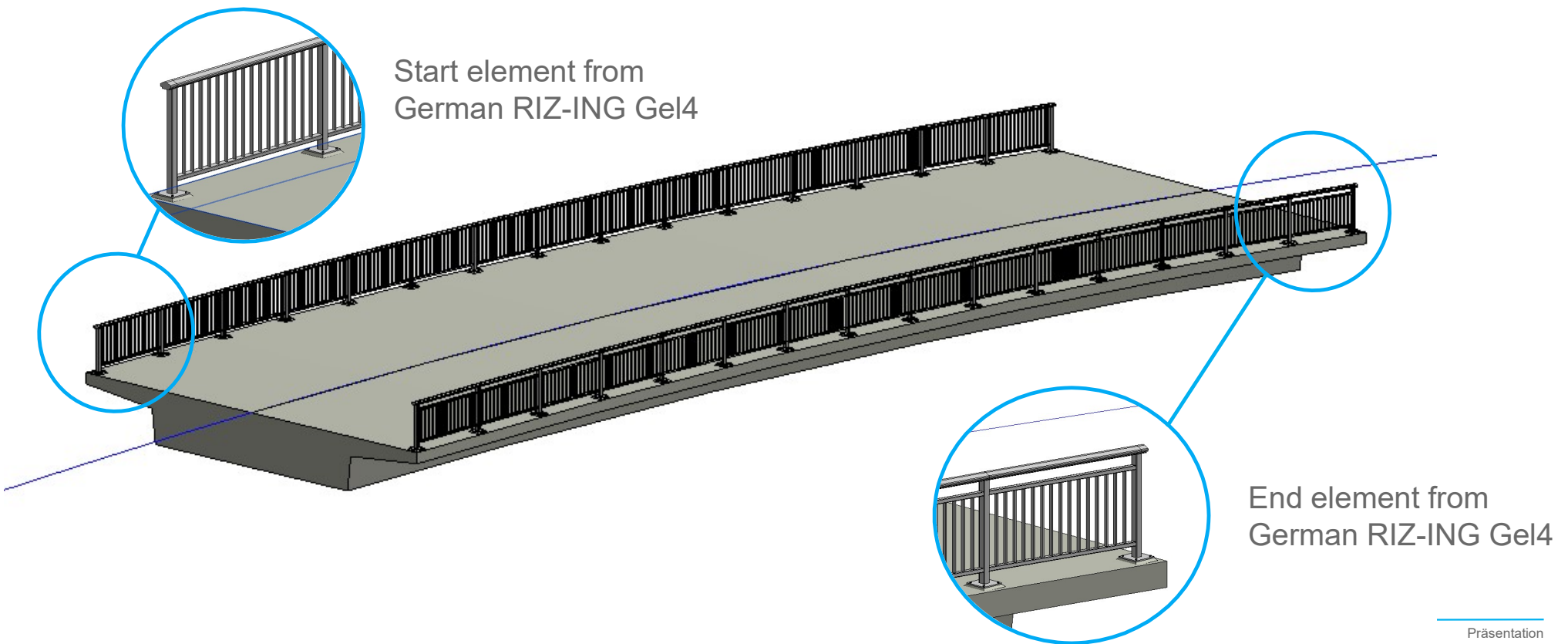
New Features in Version 2021-7 / 2020-7

- + Extension Import DGM surface from Land.XML file: new option „positioning by project base point“ → project base point and survey point will be set automatically.
- + Extension import of axis from Land.XML file: new option „positioning by project base point“ → project base point and survey point will be set automatically.
- + Extension Railing command: new options for start and end element with 2 adaptive points
- + Extension Cross-Member command: family components with 2 or 3 adaptive points may be placed along an axis, e.g. for tunnels

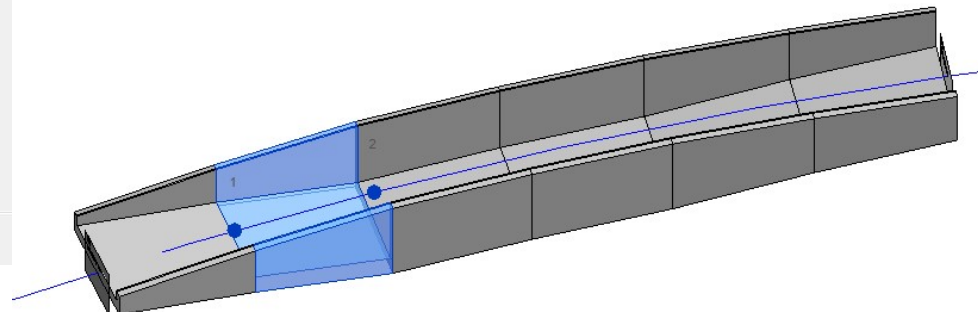
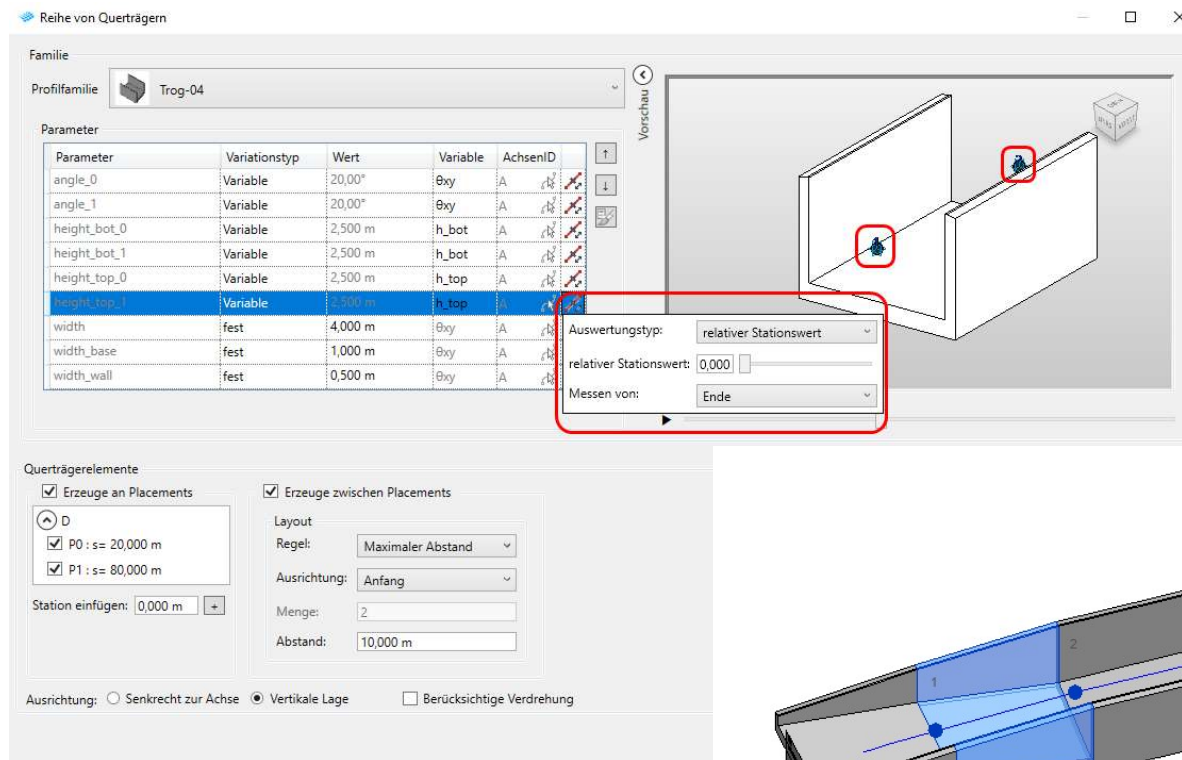
Import Achse + DGM from Land-XML



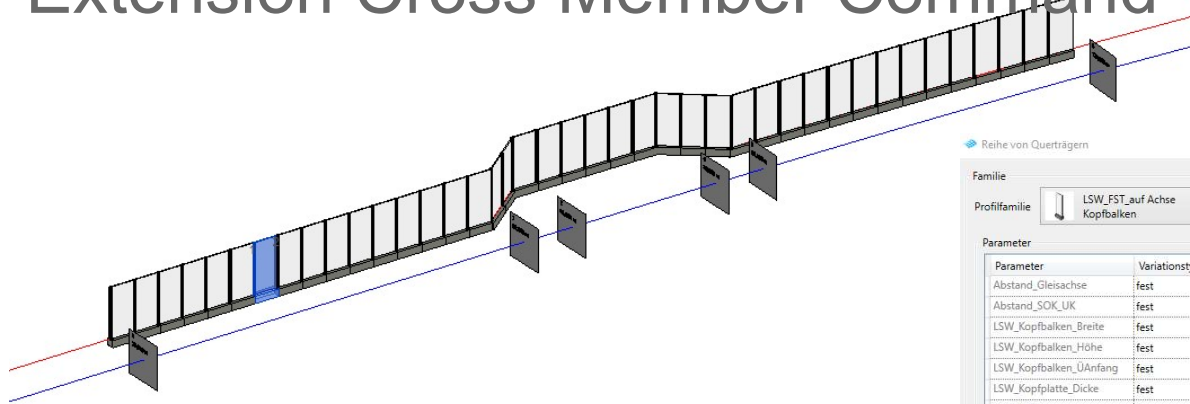
Extension Railing Commands



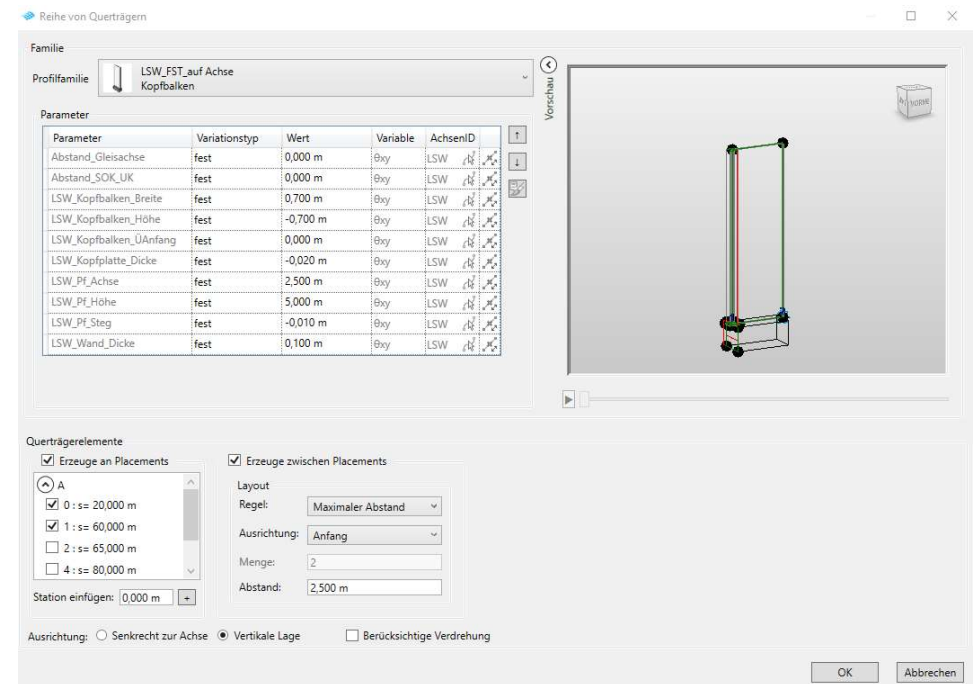
Extension Cross Member Command



Extension Cross Member Command



Example noise barrier wall
modelling with cross member command

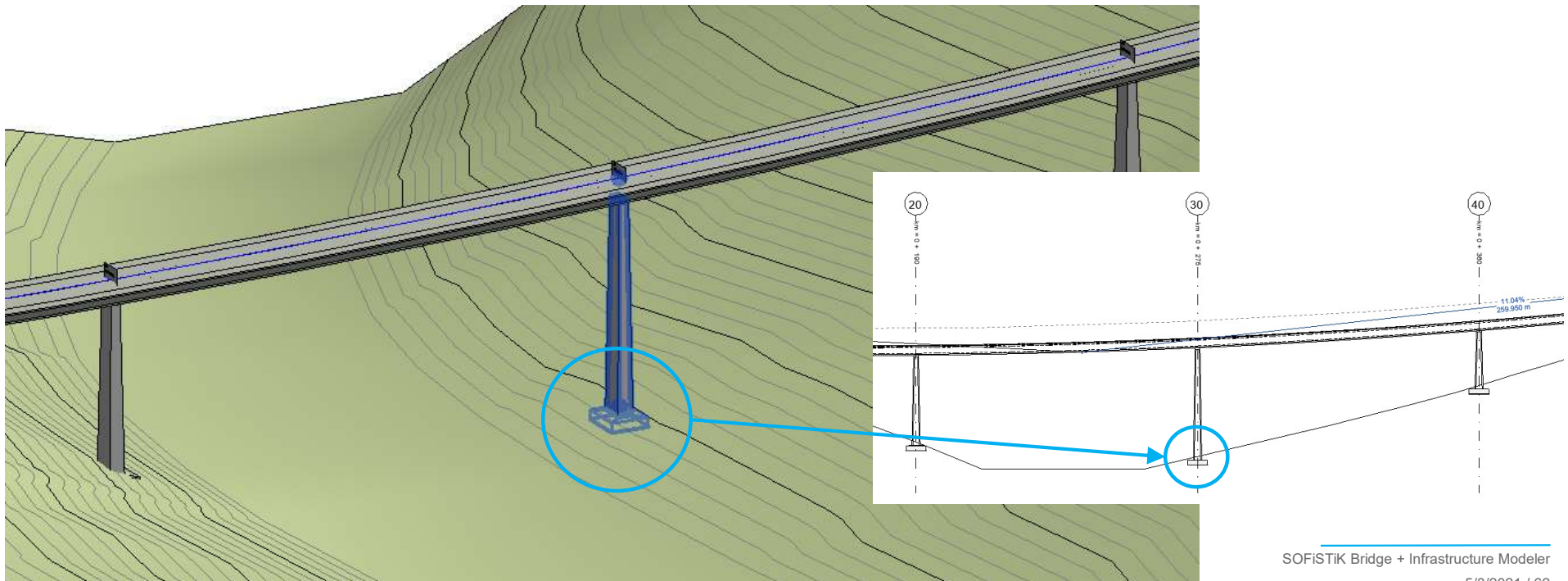


New Features in Version 2021-8 / 2020-8

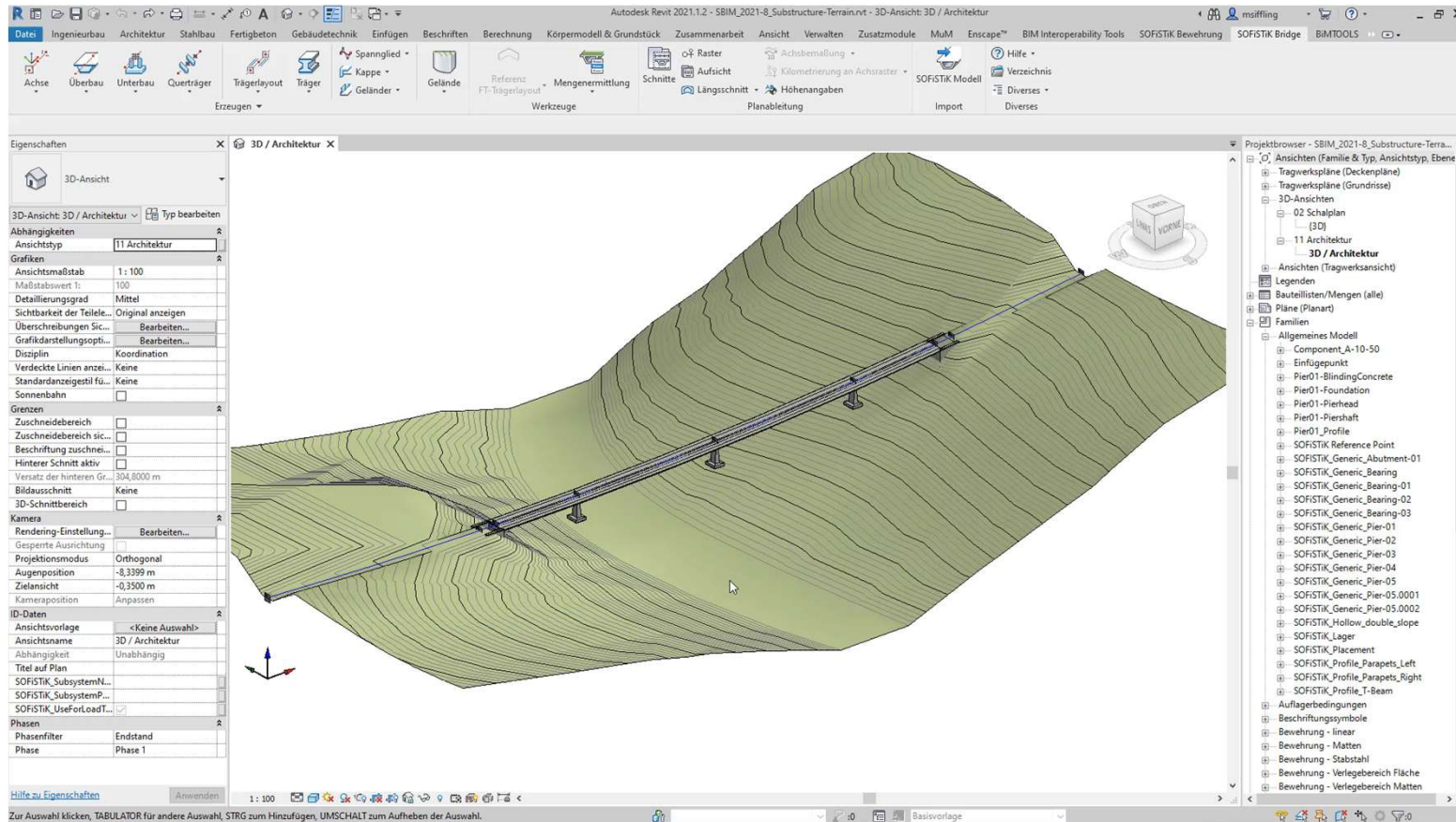
- + Adaptiven Formgriffe von Unterbaufamilien können mit einer Topographie oder mit einer Achse verknüpft werden.
- + Unterbauelemente können an beliebigen Stationen abgesetzt werden
- + Eine Funktion zur Übertragung von Parametern von Überbau- und Querträgerfamilien wurde ergänzt.
- + Beim Import von Geländedaten werden nun auch die Datenformate ACIS(.sat), STL(.stl) und Rhino(.3dm) unterstützt.

New Features in Version 2021-8 / 2020-8

+ Align substructure to toposurface

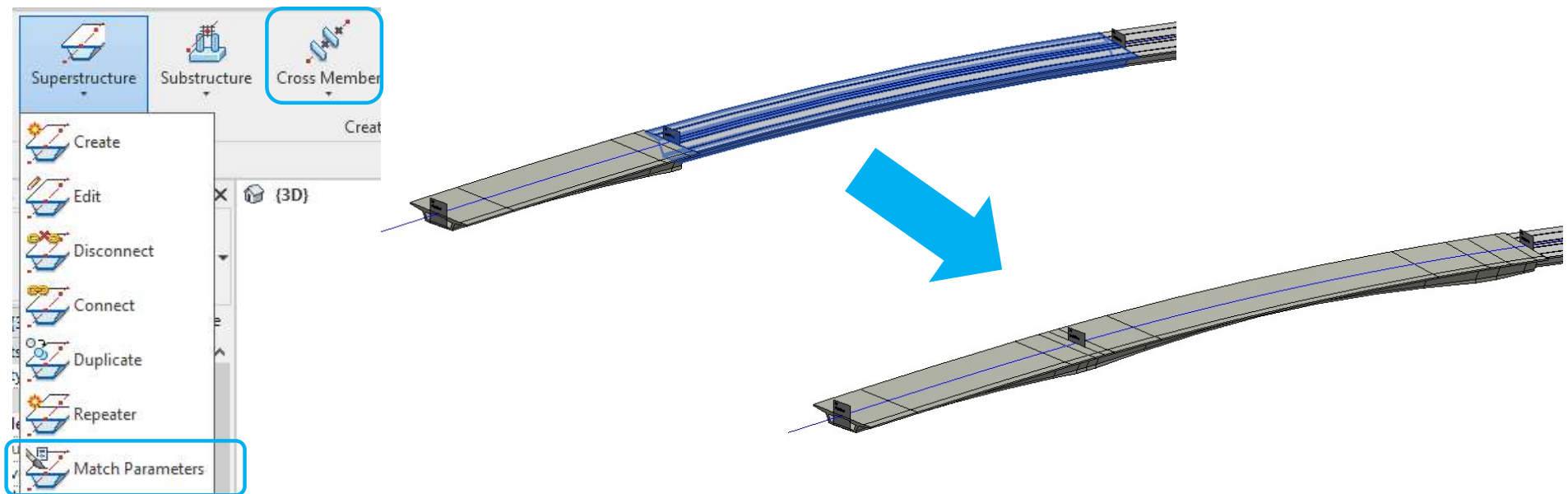


Align Substructure to Toposurface



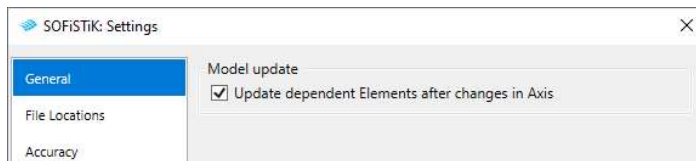
New Features in Version 2021-8 / 2020-8

- + Adjust one or more components with the parameters of a source component along axis



New Features in Version 2021-9 / 2020-9

- + New Command: Split Axis
- + New option inside SOFiSTiK: Settings

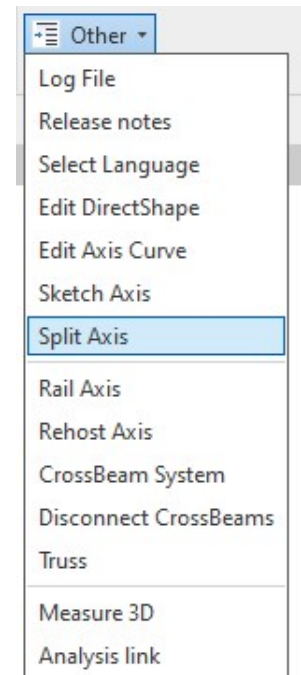
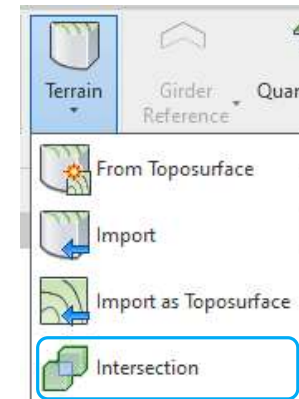
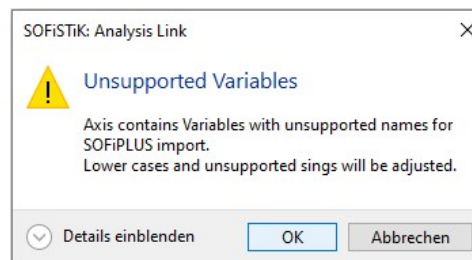


- + New command: Terrain Intersection
- + Check variables within Analysis Link

Variable Data

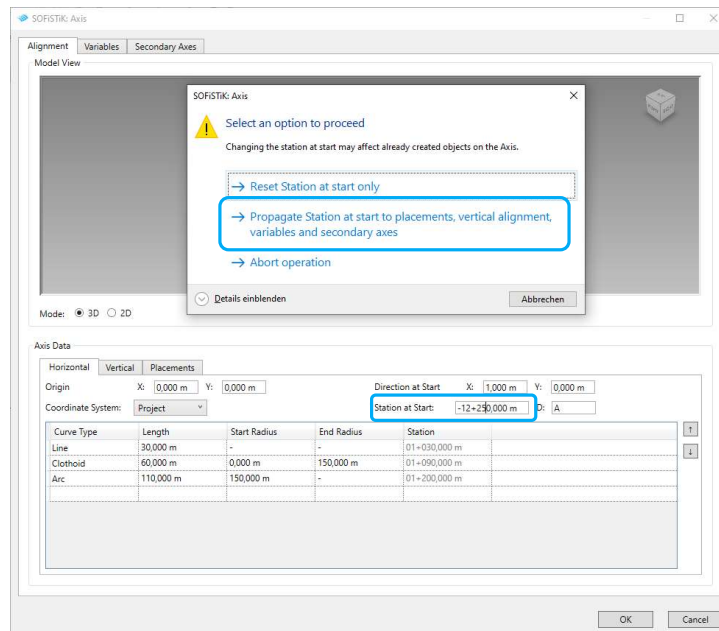
h By Points $f(s)$

Station	Value	Transition	S
00+000,000 m	0,000 m	Polygonal	-
01+000,000 m	1,000 m	Polygonal	-
01+075,000 m	1,000 m	Transition right	-



New Features in Version 2021-9 / 2020-9

- + Negative stations are possible now. After editing the stationing, you may propagate the station at start to placements, variables and secondary axis.



Axis Data

Horizontal

Vertical

Placements

Origin

X: 0,000 m

Y: 0,000 m

Direction at Start

X: 1,000 m

Y: 0,000 m

Coordinate System:

Project

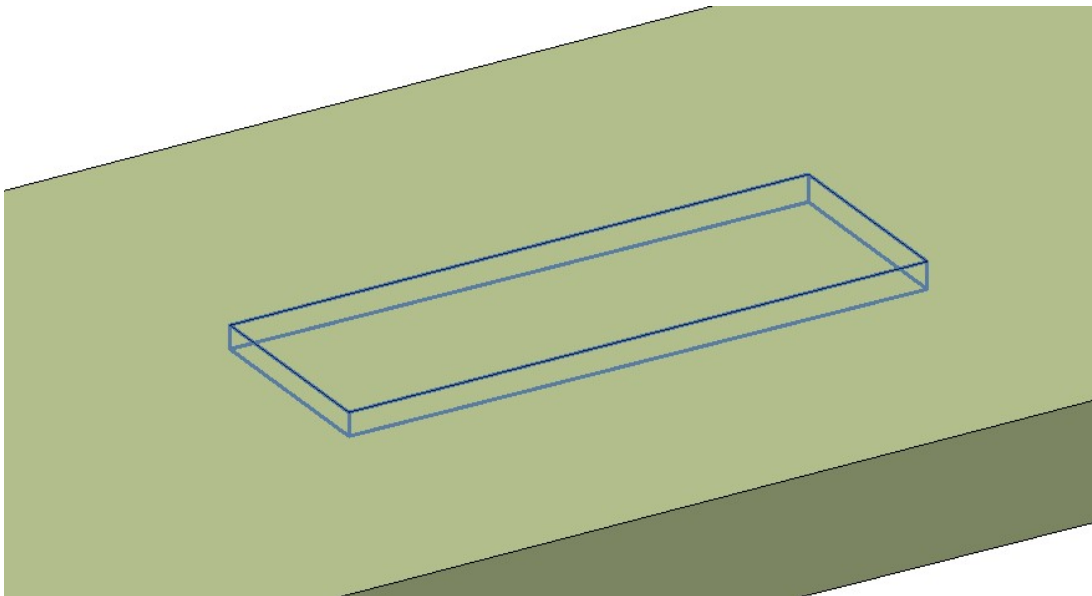
Station at Start: -12+250,000 m

ID: A

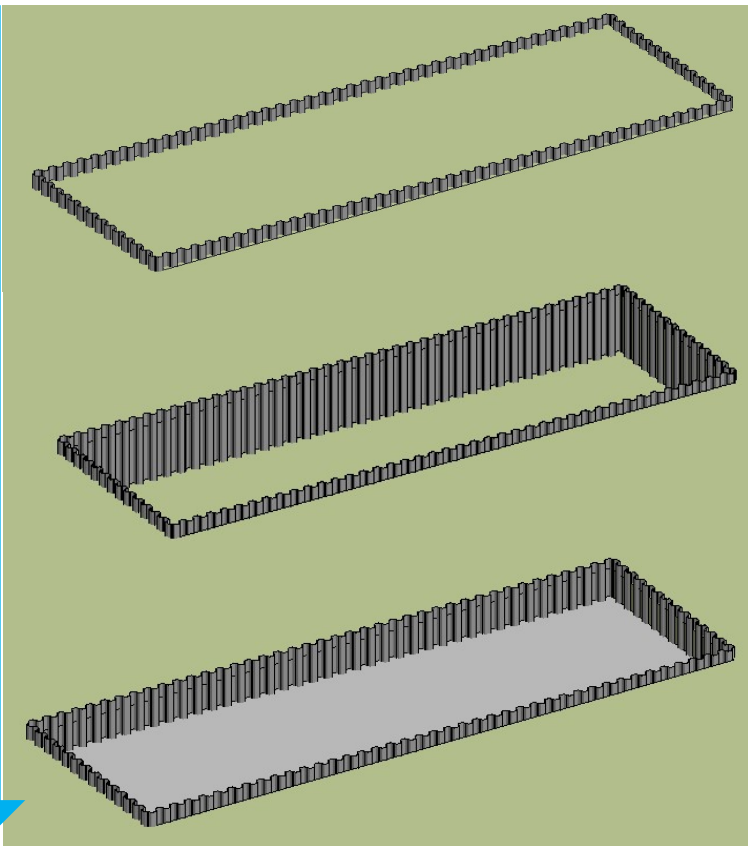
Curve Type	Length	Start Radius	End Radius	Station
Line	30,000 m	-	-	-12+220,000 m
Clothoid	60,000 m	0,000 m	150,000 m	-12+160,000 m
Arc	110,000 m	150,000 m	-	-12+050,000 m

New Features in Version 2021-9 / 2020-9

+ New command: Terrain Intersection

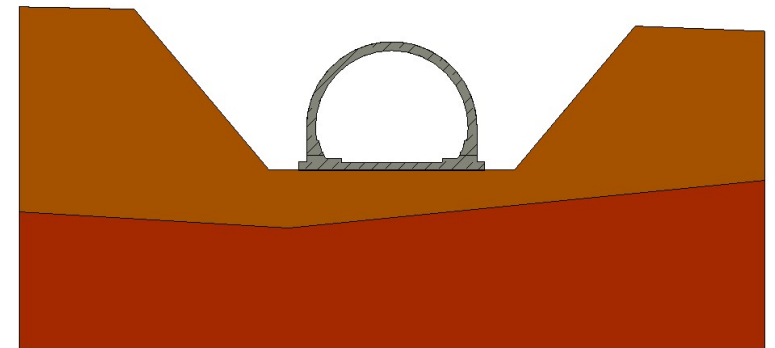
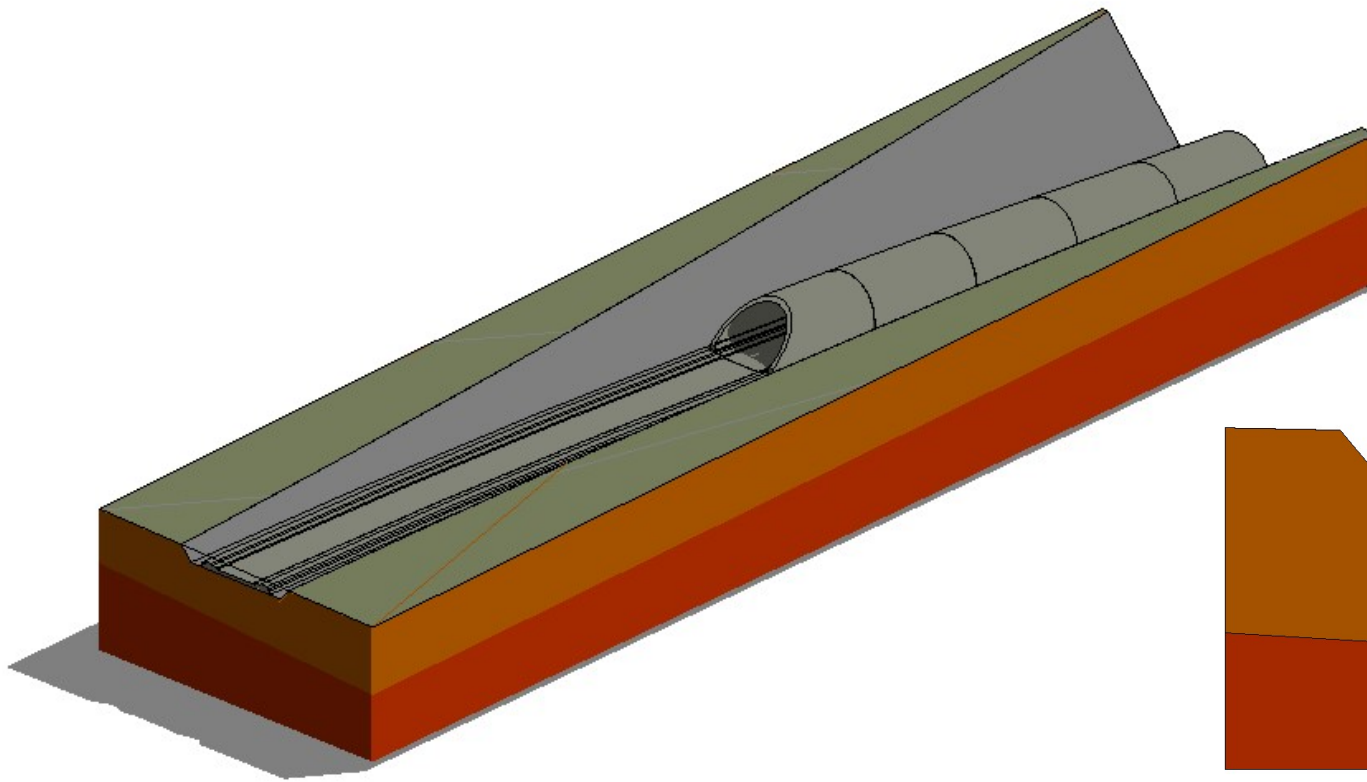


Baugrubenaushub mit Spundwand



Tunnel

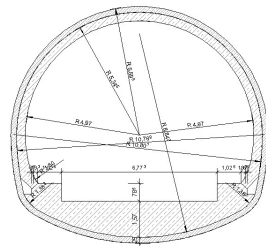
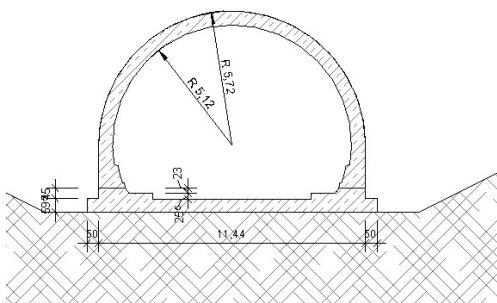
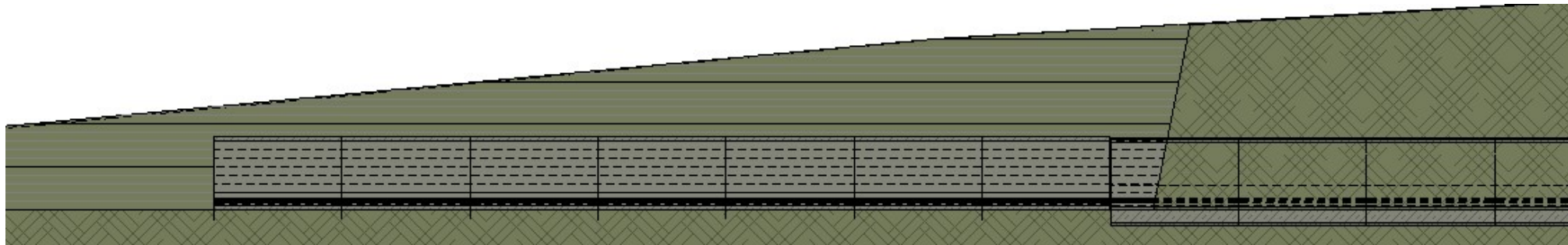
including terrain imported from Civil 3D



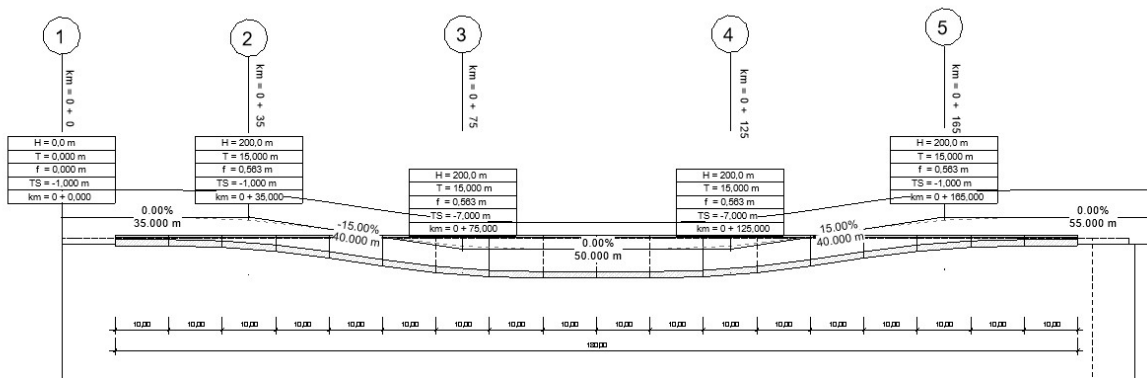
Tunnel

Modelling with girder layout functionality

2021

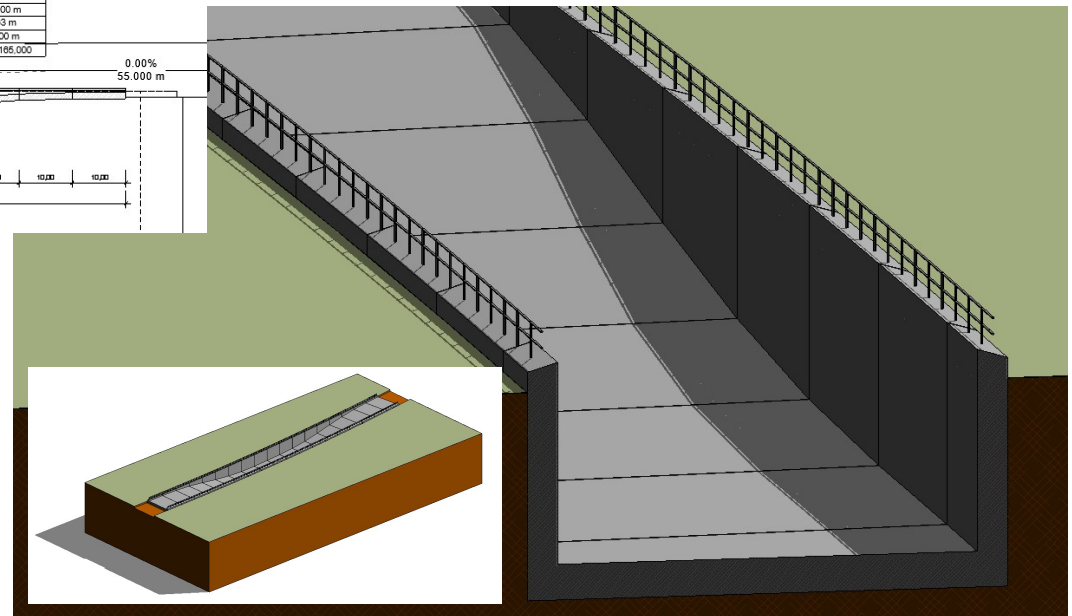


Trough Structures



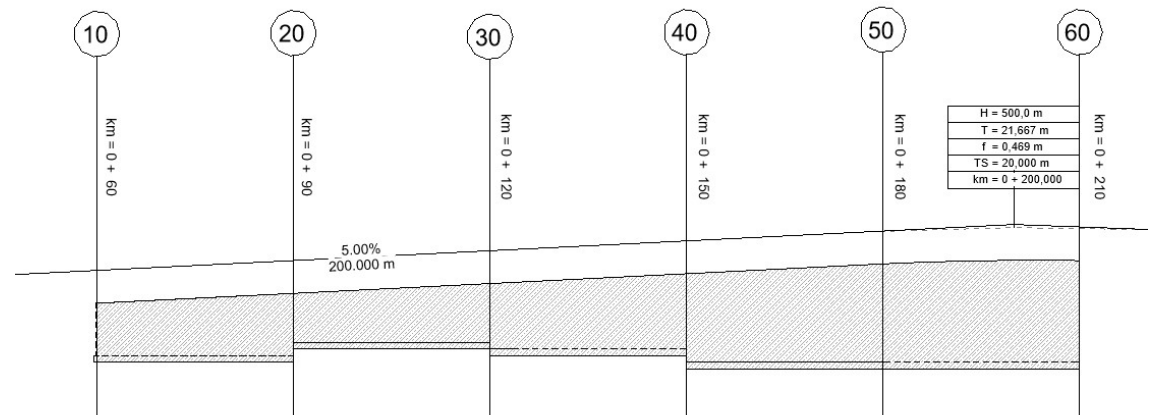
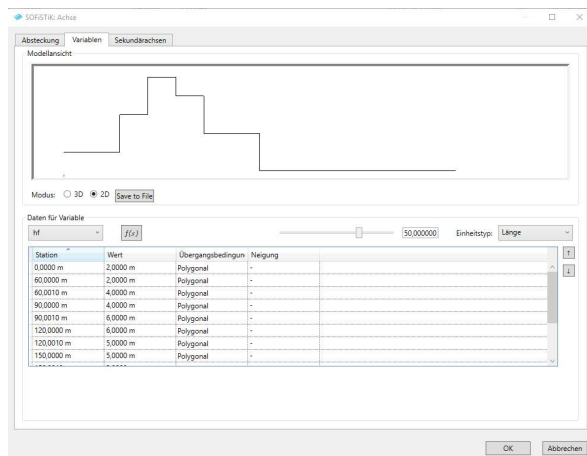
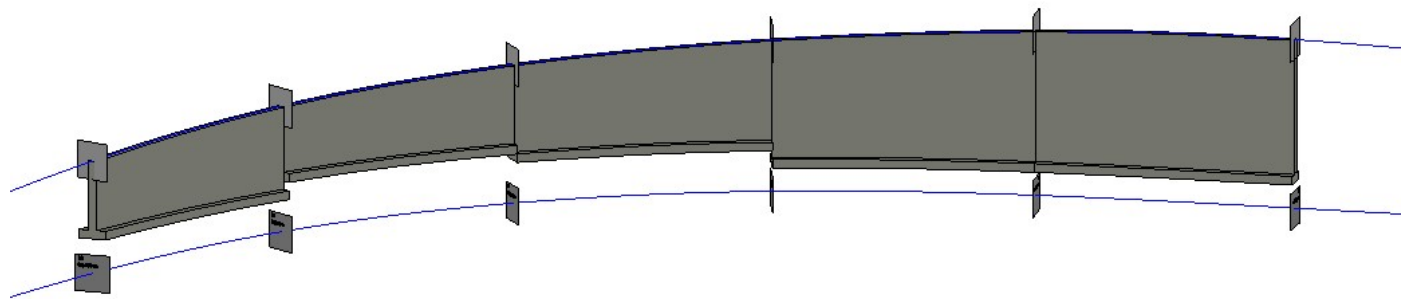
Modelling with standard Bridge Modeler functionalities:

- + Create a superstructure as void element
- + Generate intersection with soil volume
- + Create trough structure



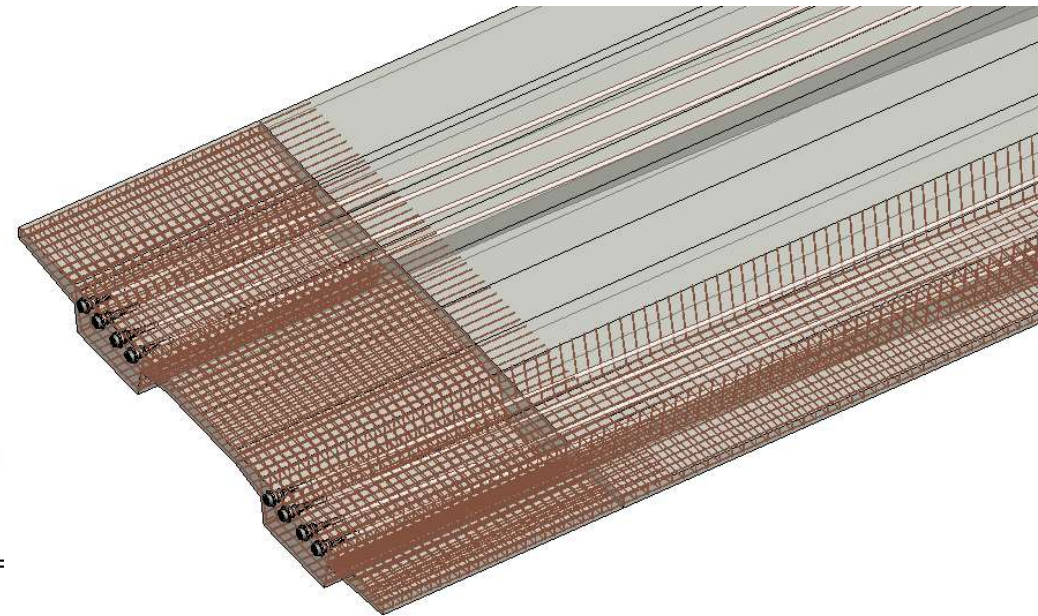
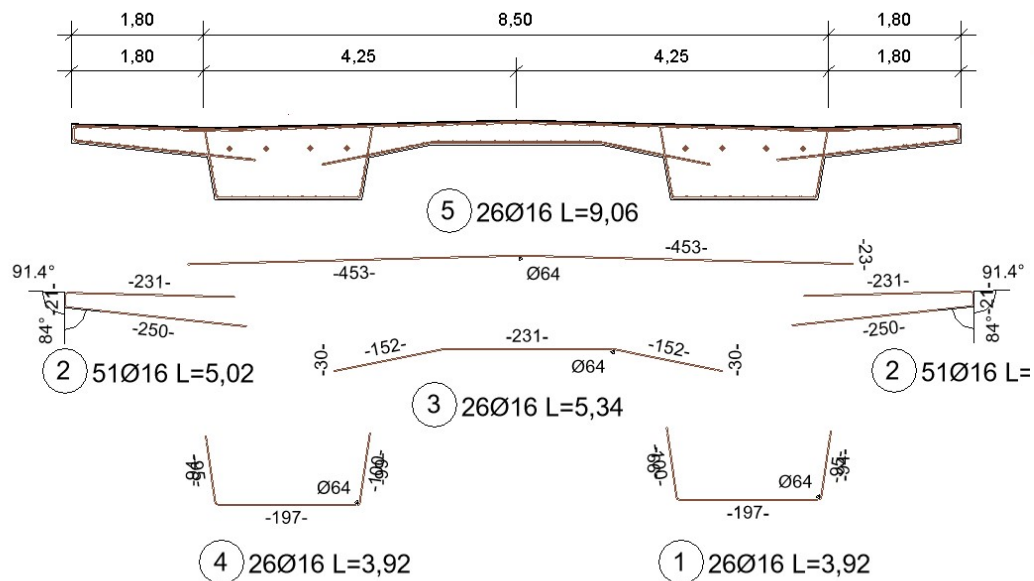
Retaining Walls

Modelling with 2 axis and axis related variables



Reinforcement in REVIT

- + Create and modify reinforcement
- + Create shop drawing with RCD



Additional Information

- + Program Information <https://www.sofistik.com/produkte/bim-cad/bridge-modeler>
- + Webinar Recordings <https://www.sofistik.com/infocenter/webinare>
- + Playlist of SBIM Videos <https://vimeo.com/showcase/7741733>

SOFISTIK Bridge + Infrastructure Modeler



Mitglieder ▾
Martin
Siffling





Martin Siffling
Brücken sind meine Leidenschaft Bridges are my passion
Deutschland · 164 Kontakte




Zum Vernetzen anmelden

Juni 2020 | Deutsch

BIM Brückenbau: Planen - Modellieren - Berechnen

Revit Modelle direkt in den SOFISTIK Structural Desktop importieren und hier die erforderlichen Berechnungen und Bemessungen durchführen.

Oktober 2019 | Deutsch

SOFISTIK Bridge Modeler: Neue Funktionalitäten für FT-Träger Brücken, gekrümmte Bemaßungen und vieles mehr

Parametrisches Modellieren von Brücken mit Autodesk® Revit®

Juli 2019 | Deutsch

SOFISTIK Bridge Modeler: Erweiterter Workflow für die Modellierung von Brückenstrukturen

Parametrisches Modellieren von Brücken mit Autodesk® Revit®

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Lernen Sie den SOFISTIK Bridge Modeler kennen

Parametrisches Modellieren von Brücken mit Autodesk® Revit®

Juli 2020 | Deutsch

Neue Features im SOFISTIK Bridge + Infrastructure Modeler

Parametrisches Modellieren von Brücken & Infrastruktur-Bauwerken mit Autodesk® Revit®

„The SOFiSTiK Bridge + Infrastructure Modeler supports your creativity“

2021

Questions ?

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www.bimotion.de