SOFiSTiK vs RMBridge

- a comparision

SOFiSTiK

Agenda

- Who am I
- Fields of application – project applications
- Technical details - general
- Technical details - ILM
- Examples incl Panama crossing

Agenda

- Georg Pircher, M.Eng
- 1991- 1996 EPFL and project-engineer at Monod Ing. Conseils, Switzerland
- 1996 – 2005 Project support with RMBridge at TDV Heinz Pircher + Partner
  Specification of GP pre-processor
  International sales
- 2005 – 2012 CEO and owner of ABES, distribution partner for SOFiSTiK
- 2012 – date International sales manager SOFiSTiK, share holder

The two companies – economical view over the last 10 years

SOFiSTiK: The company

- 40 employees in 2006, 71 employees today of which 40+ are in R&D
- 40 international competence partners.
- FE and CAD since 1974, ongoing development, fully BIM since 2010.
- 11mio € turnover / year
- One of 4 industry partners of Autodesk
- Releases of SOFiSTiK 2008, 10, 12, 14, 16 and 2018 now in Aug2017.
- 90% of home market (=Central Europe).

RMBridge team at Bentley

- 24 employees in 2005, down to 8 until being closed in 2016
- 5 international partners, lots of Bentley resellers.
- Almost no development since 2008
- Home market dead (3 users in Austria left)
- 500k turnover / year (???)
- 2 engineers for global support.

Fields of application

SOFiSTiK: analyses and design of

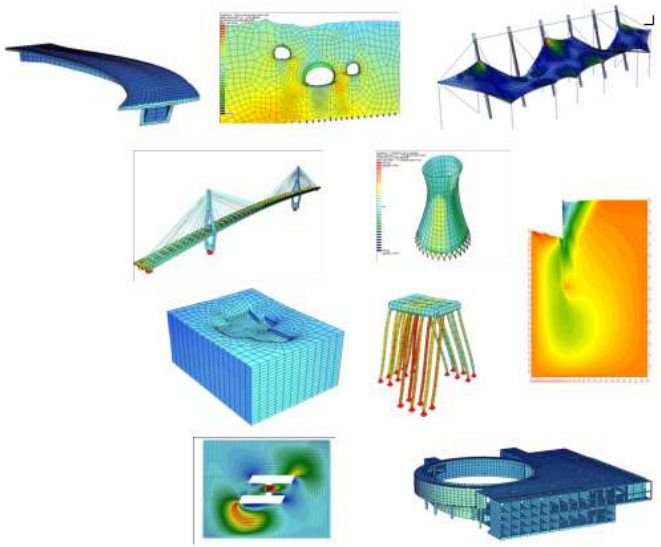
- Bridges
- Foundations
- Buildings (BIM!)
- Steel
- Light weight
- Tunnelling + Geotechnic
- Soil

RMBridge: analyses and design of

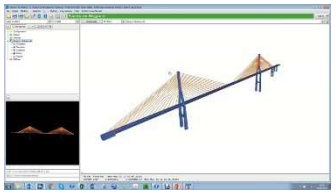
- Bridges

Fields of application

SOFiSTiK: analyses and design of



RMBridge: analyses and design of



SOFiSTiK

Fields of application

SOFiSTiK for Bridges

- Long span bridges
- Short span bridges
- Slab and shell bridges
- Design for shells and beams
- Design of supports and foundations
- Bridge repair and rehabilitation
- Global and local design

RMBridge for Bridges

- Long span bridges
- Short span bridges – not really.
- Global design

Fields of application

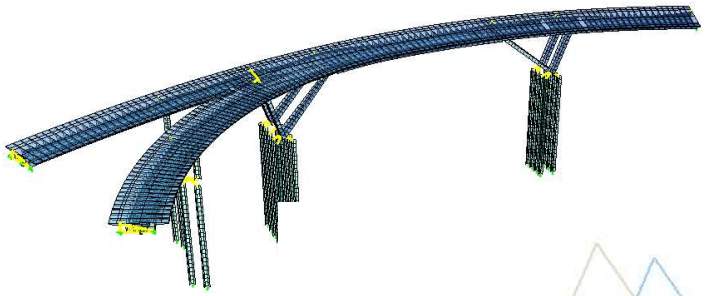
Where RMBridge is specifically good at:

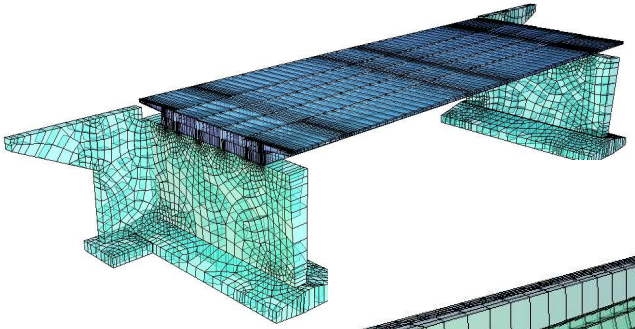
- Global design of Cable stayed bridges, …
- Suspension bridge and …
- Balanced cantilever bridges.
- Train-structure interaction (Rolling Stock)
- Wind dynamics

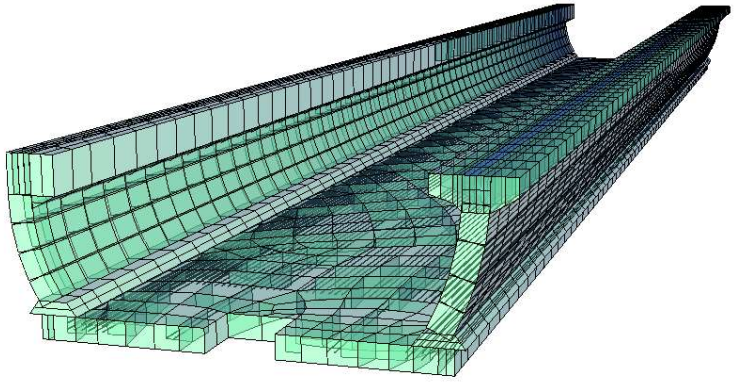
... but all can be done with SOFiSTiK as well.

Fields of application

Bridges RMBridge can not deal with:







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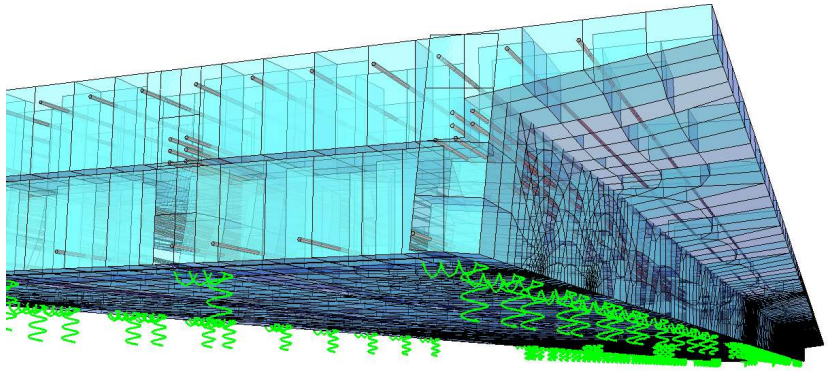

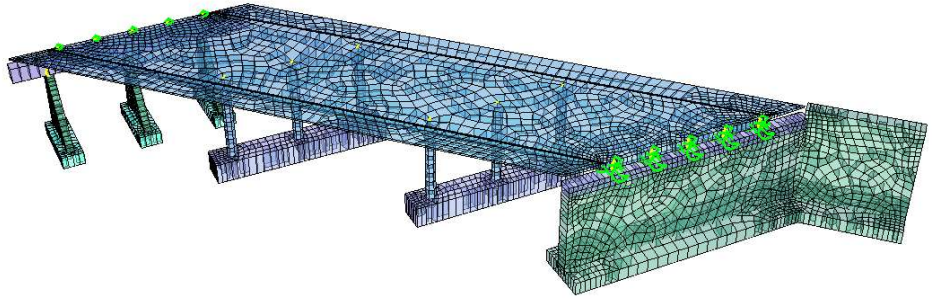

SOFiSTiK

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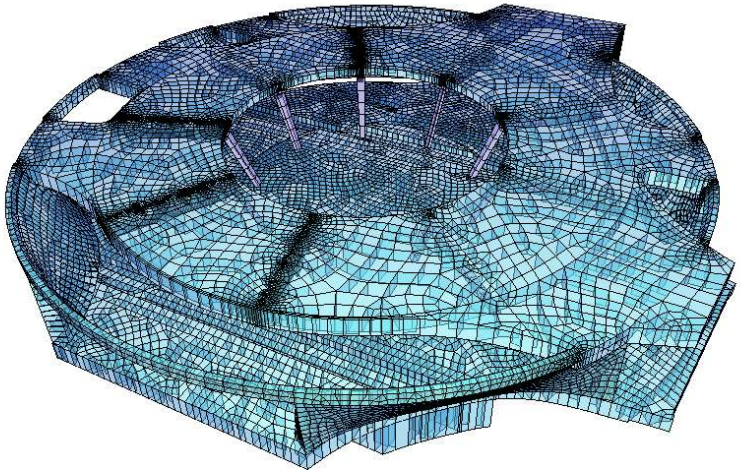

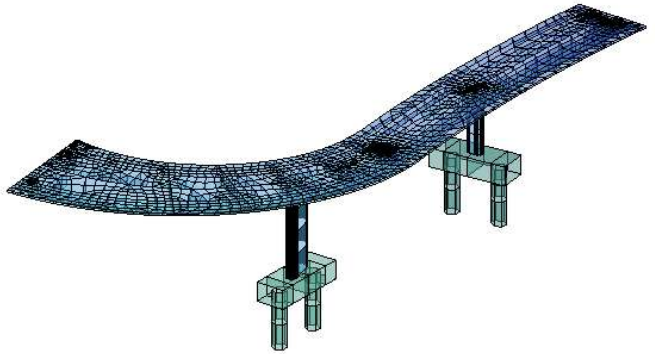

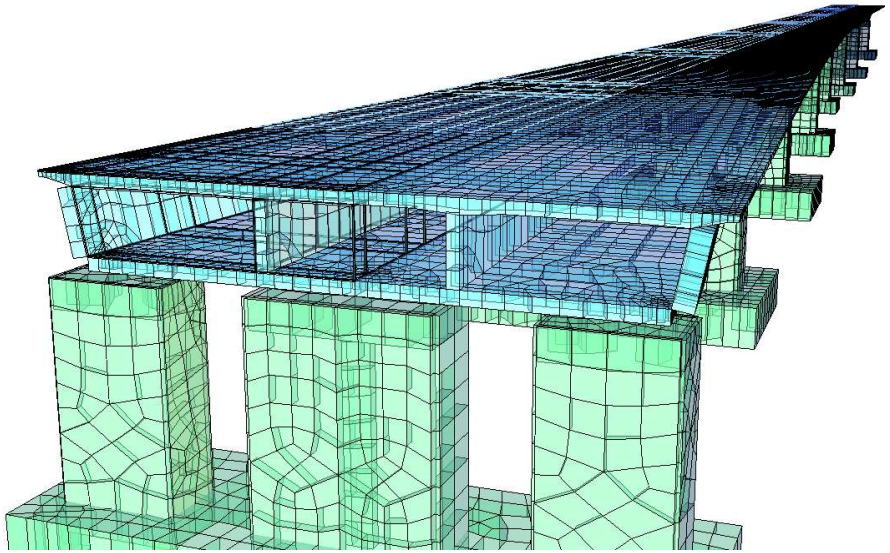

SOFiSTiK

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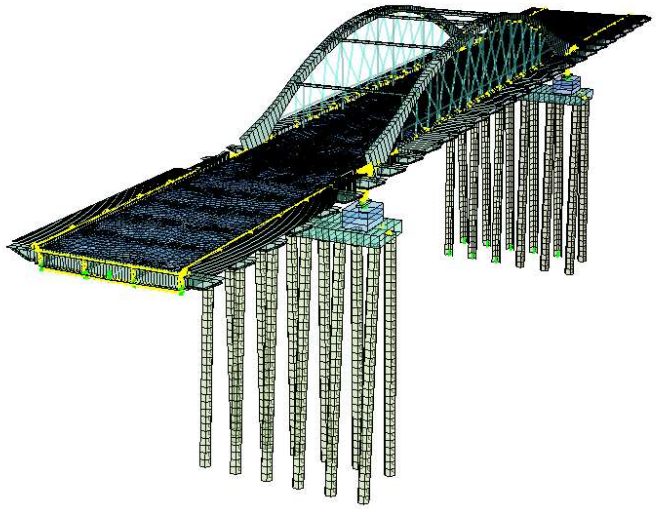

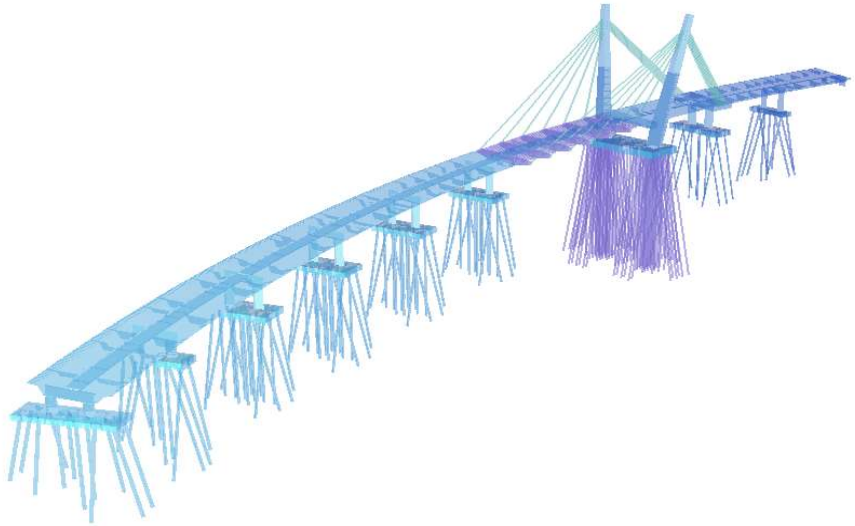

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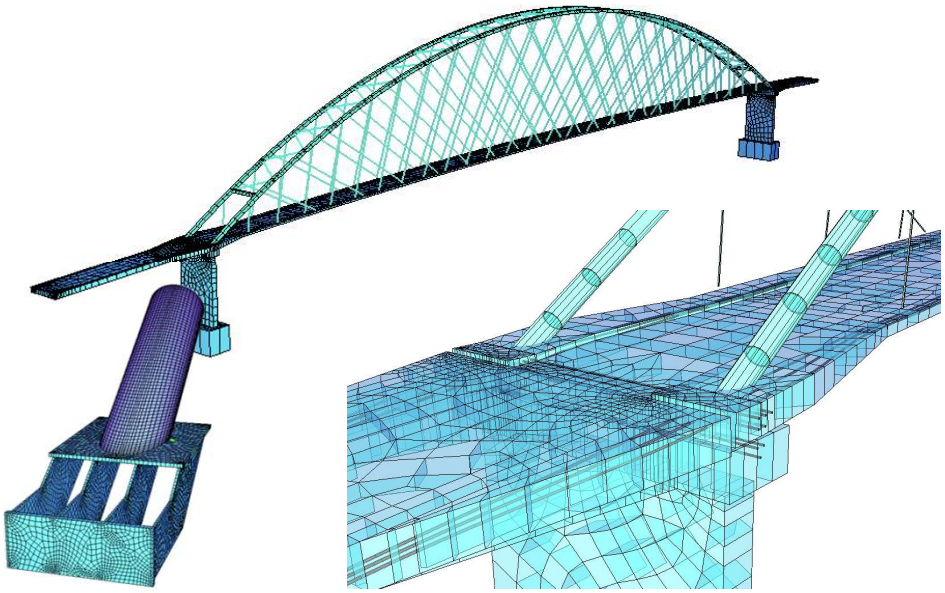

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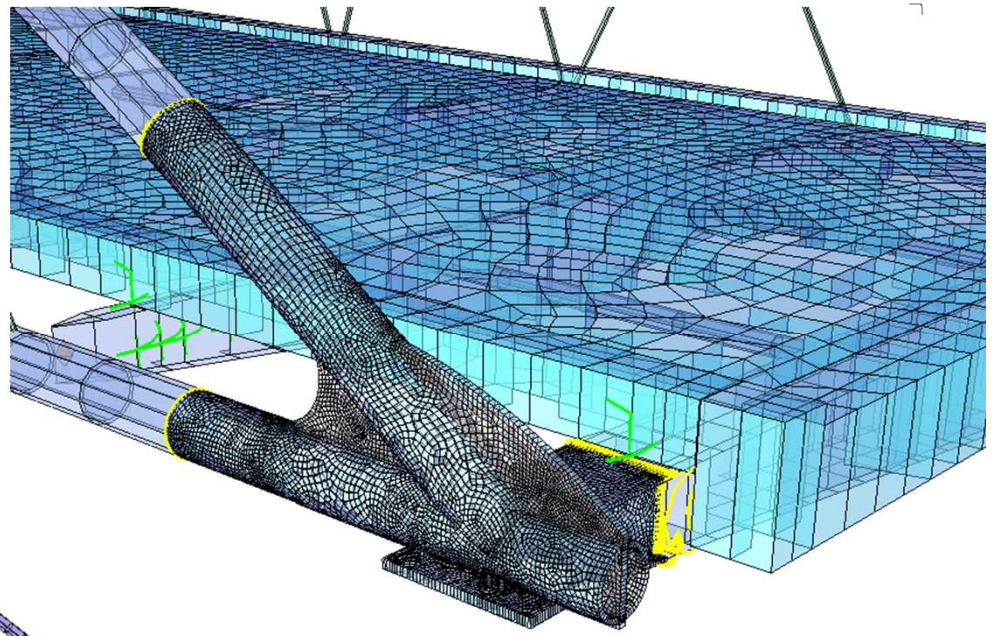

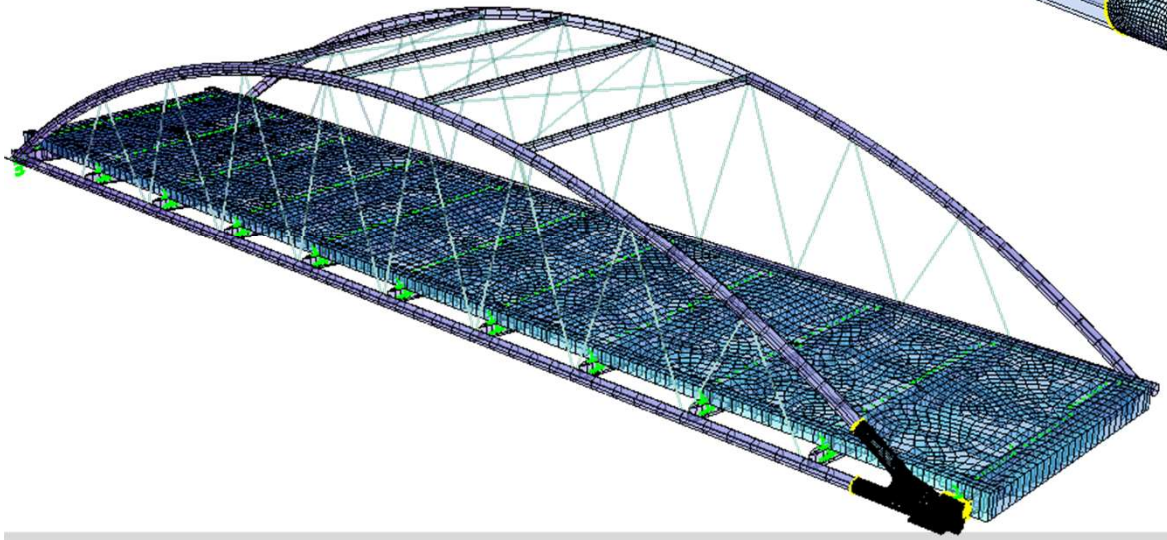

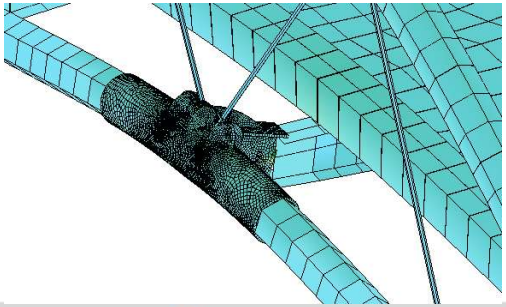

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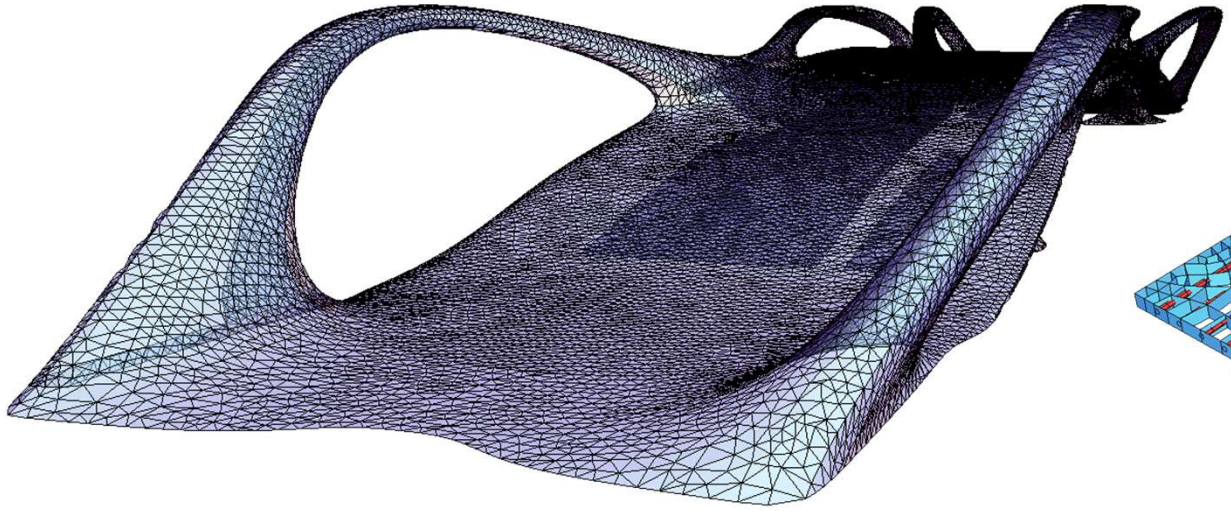

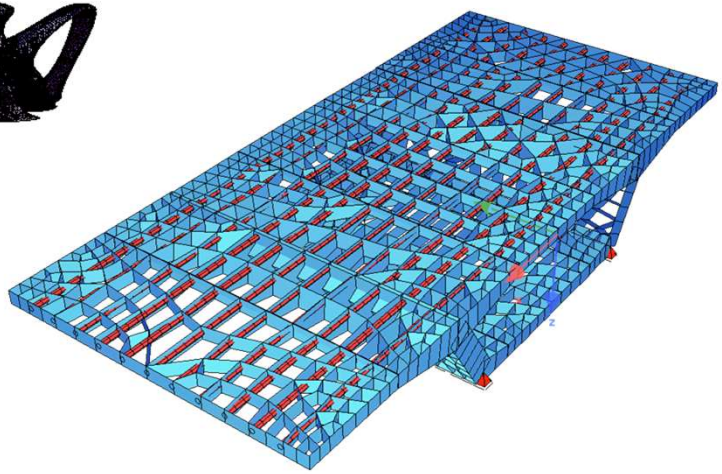

Fields of application

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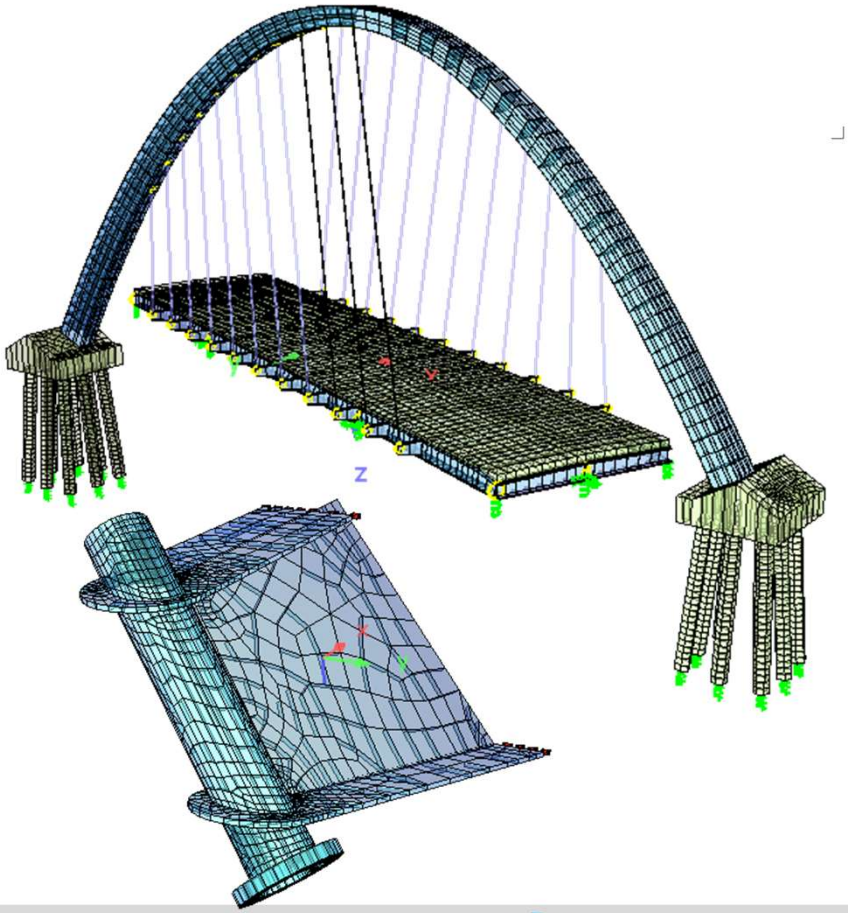

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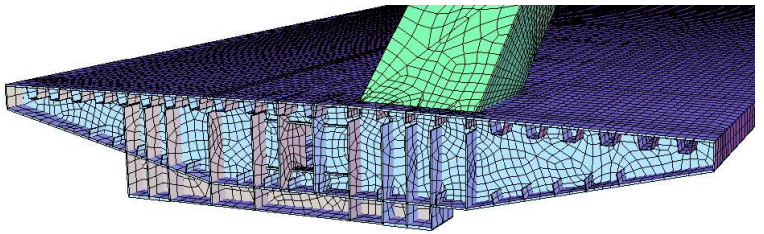
Fields of application



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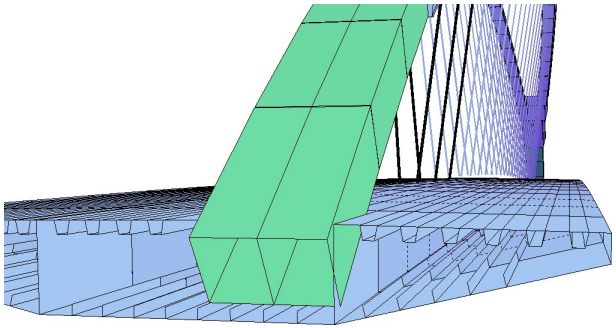

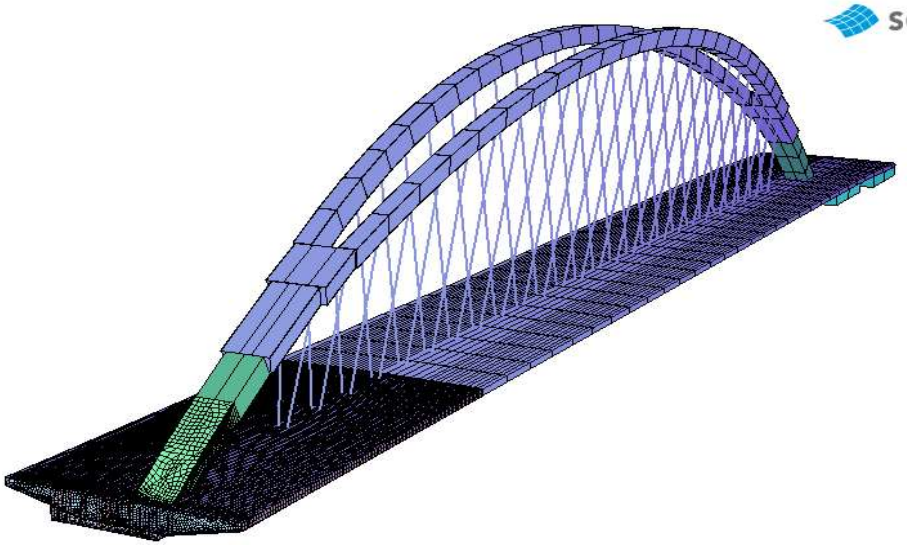

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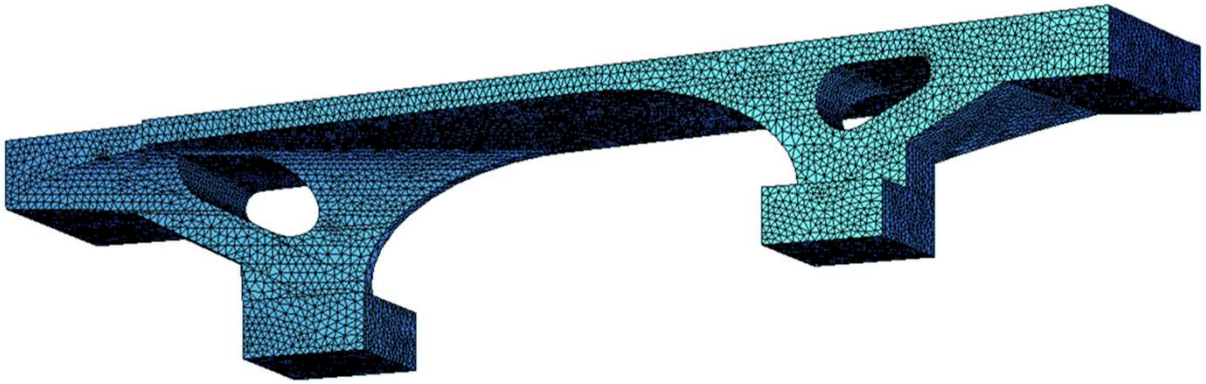

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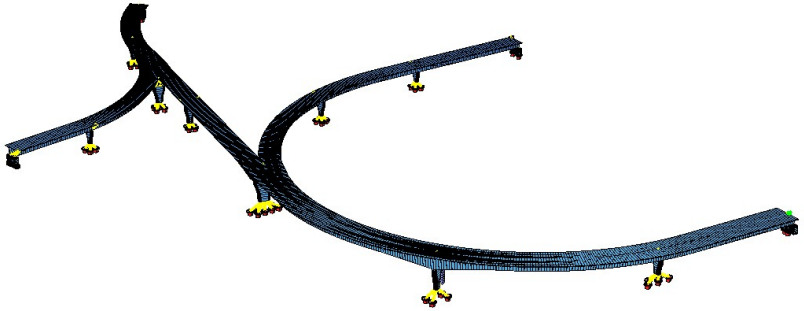

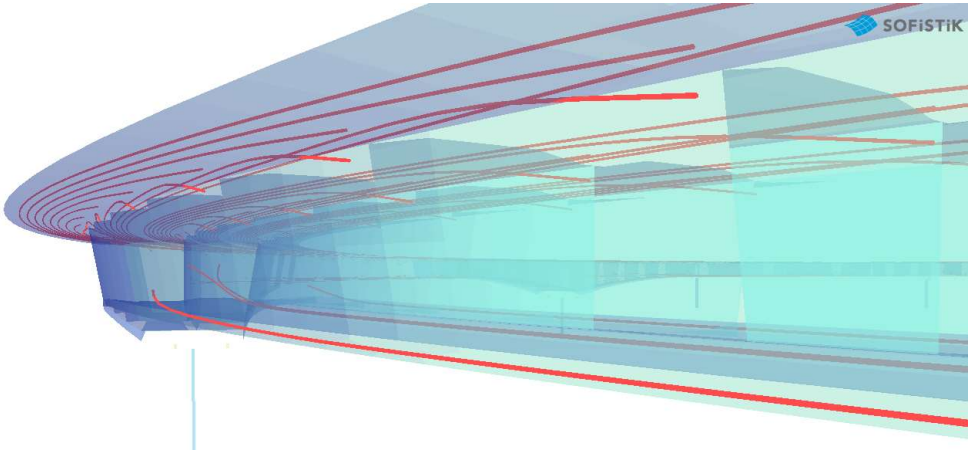

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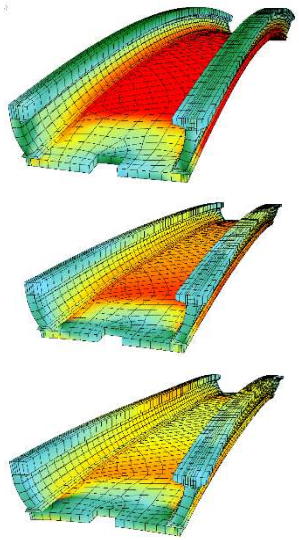

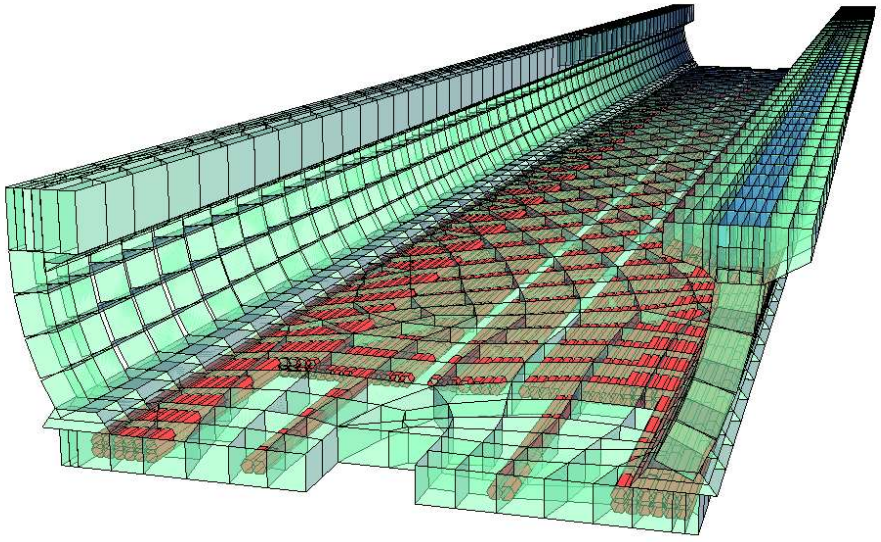

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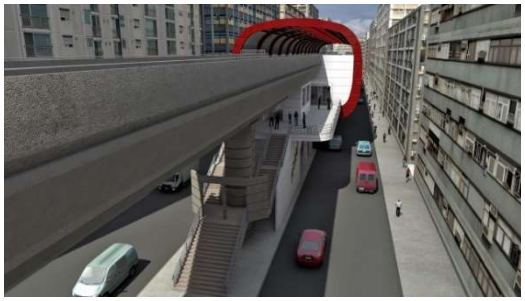

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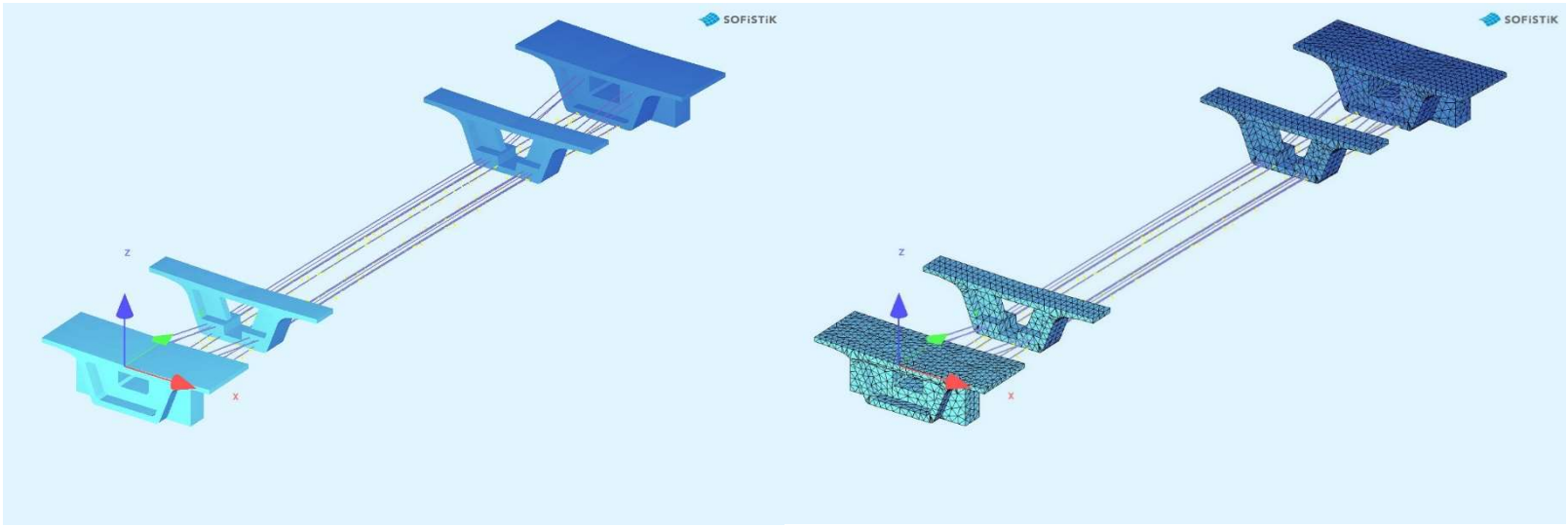

SOFiSTiK

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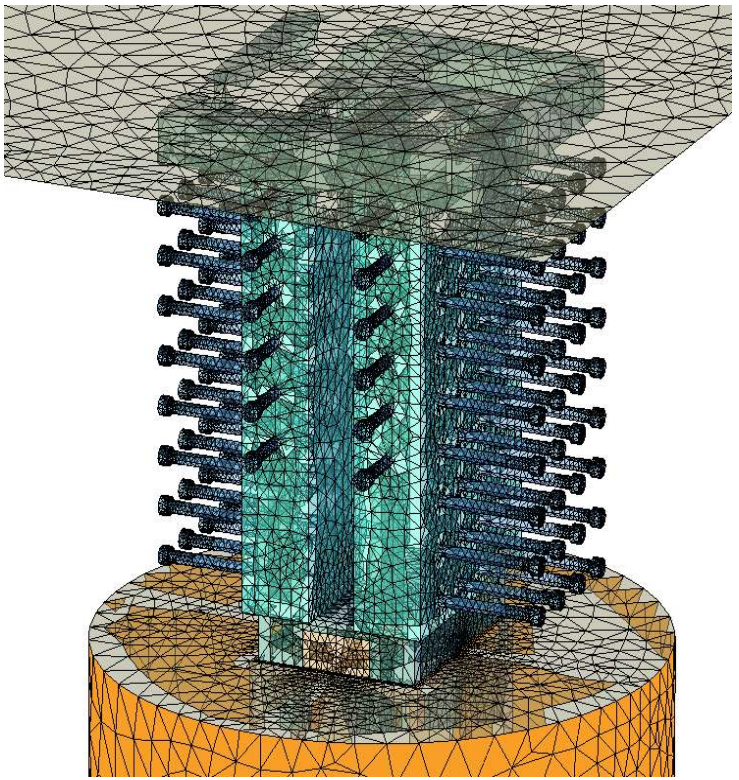


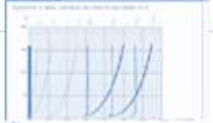
Technical details - general

Bridge Engineering					
	Geometry	3D geometry based on AutoCAD, road alignment in plan and elevation.	also for interactive load definitions.	o	seperate Pre-processor, Bentley based graphics
	Cross-sections	any shape, steel, concrete, composite, thin- and thick-walled, parametric variation.	AutoCAD based or individual pre-processor.	~	seperate Pre-processor
	Tendons	3D tendons, internal, external.	bonded / unbonded	~	only beam pt
	Loads	no limitation. For traffic - load stepping or influence lines/surface.	Automatic patch loader for some standards.	~	no influence surfaces, no load stepping, no auto-loader
	Stages	Built in Construction stage manager.	Forward, Backward.	o	only forward stages
	Superposition	All relevant combinations and envelopes.	Either using code dependent macros, or individual combinations.	o	no automatic combinations
	Design	SLS and ULS design for several codes (concrete, PT, reinf., steel), precamber.	Automatised code dependent macros, or individual checks.	~	only basic steel design
	Results/Report	Standard graphics set up, automatically set up general report, individual adjustments and comments possible.	Full Excel/Word/PDF interface.	~	report facililty limited, difficult creation of graphical results and reports

Technical details - general

Erection methods					
	Span-by-span	Level by level, layer per layer.	In general applicable for any type of structure.	~	only for bridge structures
	Incremental Launching	Temp. supports and temp. pre-stressing.	Specific pre-processor available.	o	seperate Pre-processor
	Balanced cantilevers	Pre-camber, stability, int.+ext. pre-stressing.	Creep&shinkage, relaxation, elastic shortening	o	
	Pre-cast pre- and post-tensioning	Slab + beam, concrete + concrete, steel + concrete.	Specific pre-processor available.	~	difficult modelling, only beams
	Composite	All materials, any combination		o	composite as indiv. Beam elements (3 beams = one composite member)
	Suspension	Non-lin stages, stress-free lengths,	Form finding feature.	~	very complicated for non-lin stages
	Cable Stayed	Forward, backward calculation	Stressing force and geometry optimistation.	~	no backward calculation

Technical details - general

Dynamic & Seismic Analysis	Modal analysis and time-step method	Linear/non-lin dynamics and seismic analysis & design.	Eigenvalue Solver: concurrent.	o	
	Damping elements (linear and non-linear)	3D-shell elements.	3D-continuum elements.	x	
	Response Spectra	According to EC8, DIN 4149B 4015, SIA 160, UBC,	Indian Standard 1893, Chinesische GBJ 11.89, SNIP, AASHTO, BS5400.	~	no standard spectras available
	Damping elements (linear and non-linear)	Groups with variable damping characteristics.	Integration of the motion equation through superpositioning of the Eigenforms (even for 3D continua).	o	
	Vehicle-Structure-Integration	Moving loads, High-Speed trains.	3D-continuum elements, Time-history.	o	
	Push-over analysis	2nd order, plastic hinges, stability.		~	
	Non-Lin Wind analysis	Wind spectra according to Karmann, Davenport, Harris, EC 1, Fichtl/McVehil, Simiu/Scanlan	Indian Standard 1893, Chinesische GBJ 11.89, SNIP, AASHTO, BS5400	o	buffetting available, no flutter or galopping

Technical details - ILM

Bridges erected by ILM - SOFiSTiK

- Beams, shells, brics, springs can be launched
- No specific pre-processor required, no separate module, fully compatible with all other definitions / analysis needs.
- Moving deck or complete sub-structure, from any side
- No restriction regarding PT, element numbers etc.
- Biggest moment at supports available (ex. 10mm before contact at support)
- Longitudinal and transvere PT, intern and extern
- Super- and Substructure

Bridges erected by ILM - RMBridge

- Beams, springs can be launched
- Launching of partial models not possible.
- Specific pre-processor dividing the model into launching step – elements. Two models to deal with.
- Moving deck only, no sub-structure model possible
- PT related to element/node numbers – problems when handling two models.
- Biggest moment at supports not available.
- Longitudinal PT, intern and extern
- Only Superstructure

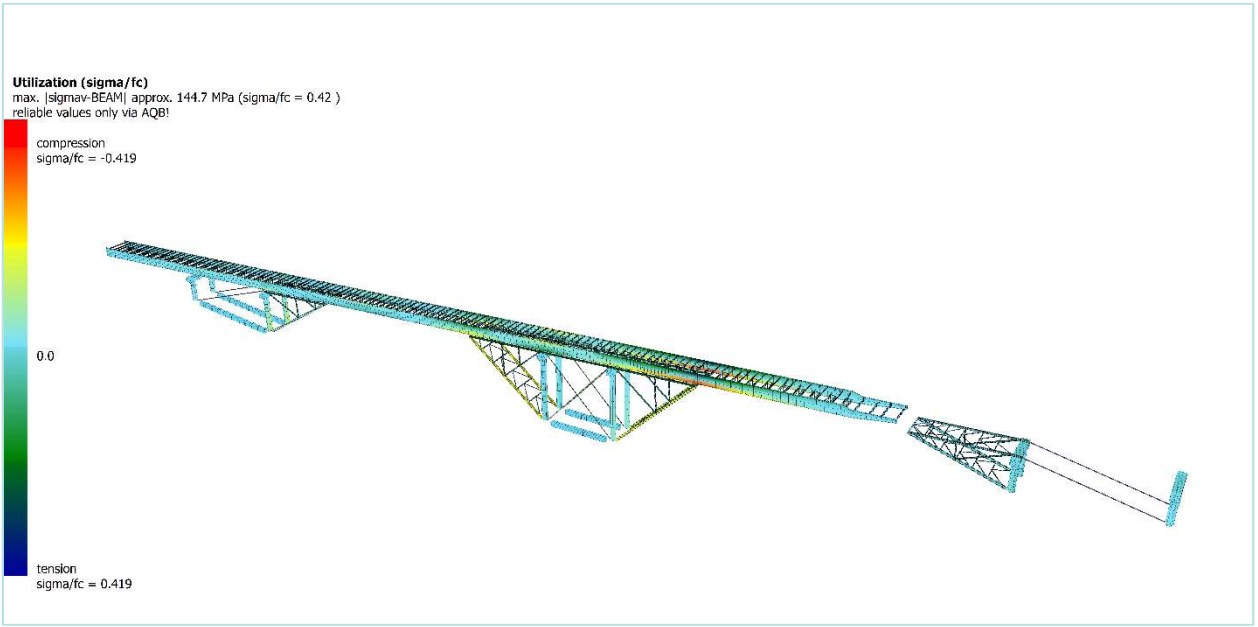
ILM examples

Bridges erected by ILM – SOFiSTiK: DORSTFONTEIN ILM/CABLE STAY RIVER BRIDGE, SOUTH AFRICA

- Beams, shells, cables, springs launched, cables as temporarily supports
- Steel girder as beams, deck as 3D shell with variable thickness

ILM examples

Bridges erected by ILM – SOFiSTiK: DORSTFONTEIN ILM/CABLE STAY RIVER BRIDGE, SOUTH AFRICA



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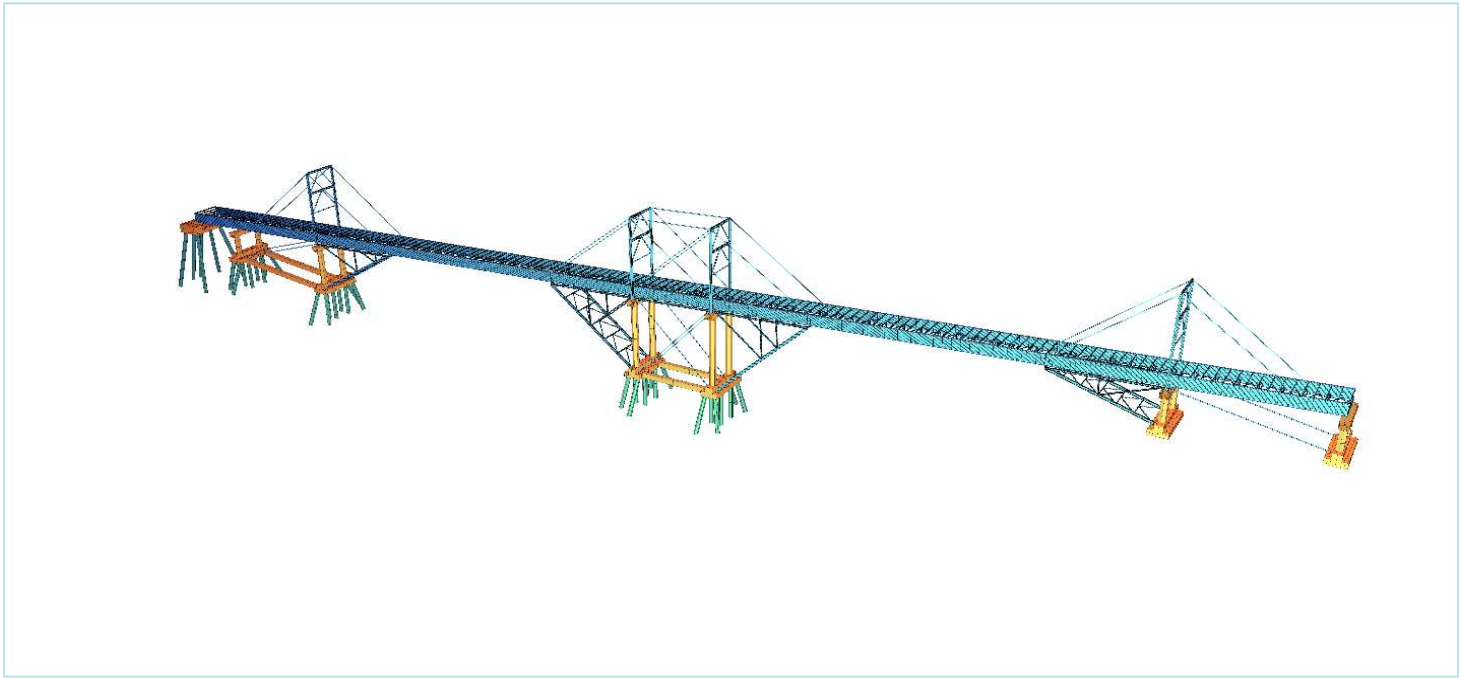
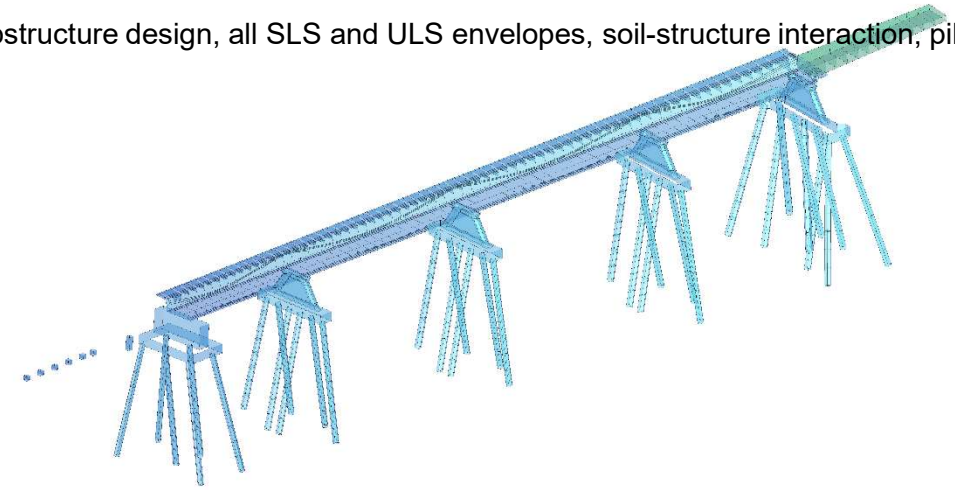


ILM examples

Bridges erected by ILM – SOFiSTiK: OKAVANGO ILM RIVER BRIDGES, BOTSWANA

- Beams, shells, springs launched, launching nose as 3D Shells for detailed design and local buckling issues
- PT deck with internal and external PT
- Full substructure design, all SLS and ULS envelopes, soil-structure interaction, pile design



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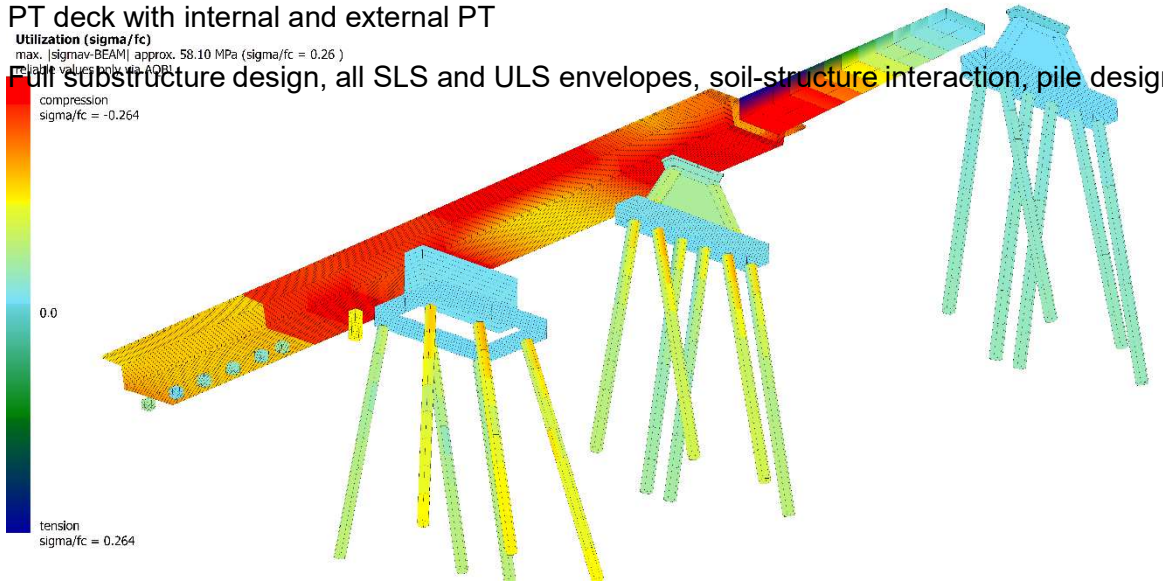


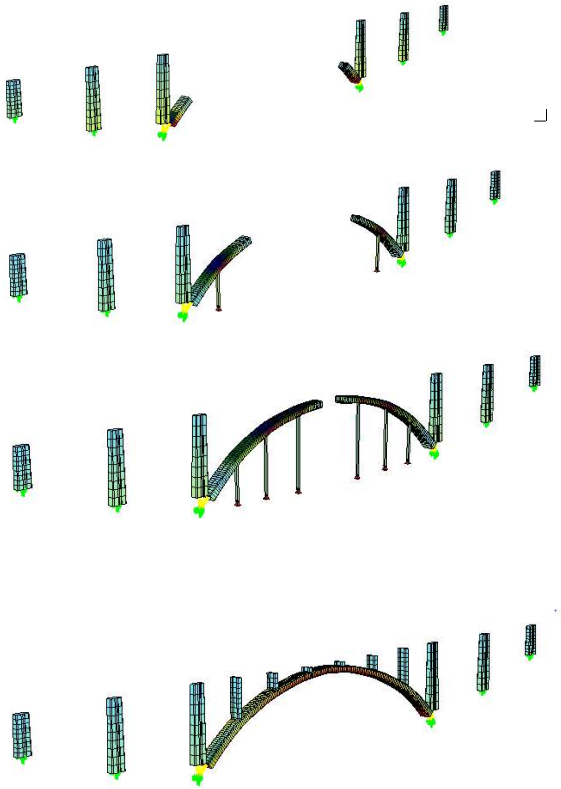
ILM examples

Bridges erected by ILM – SOFiSTiK: Trunkenthalbridge, Germany

- 300 stages for arch construction, 400 stages for ILM erection.

ILM examples

Bridges erected by ILM – SOFiSTiK: Trunkenthalbridge, Germany



ILM examples

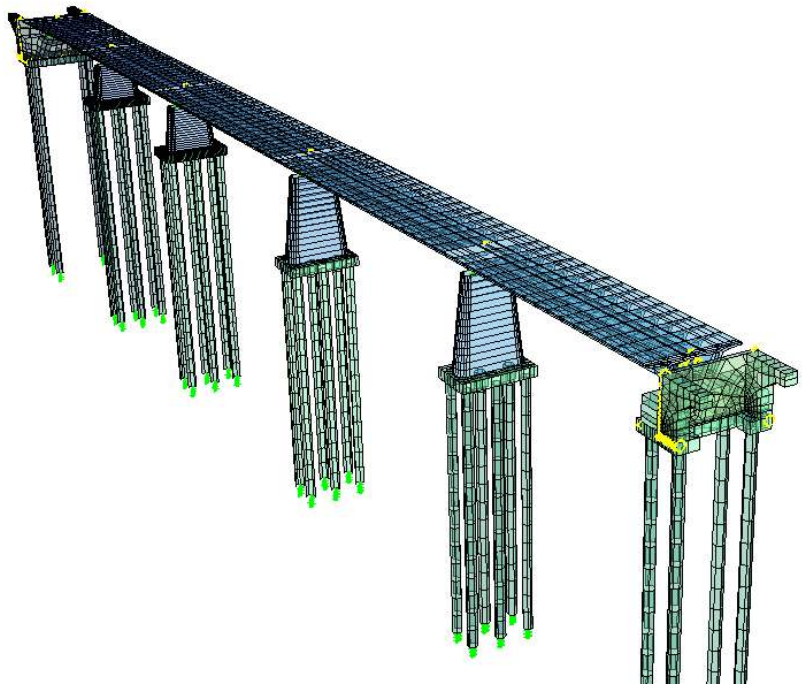
Bridges erected by ILM – SOFiSTiK

ILM examples

Bridges erected by ILM – SOFiSTiK:

Haspenbachbridge, Germany

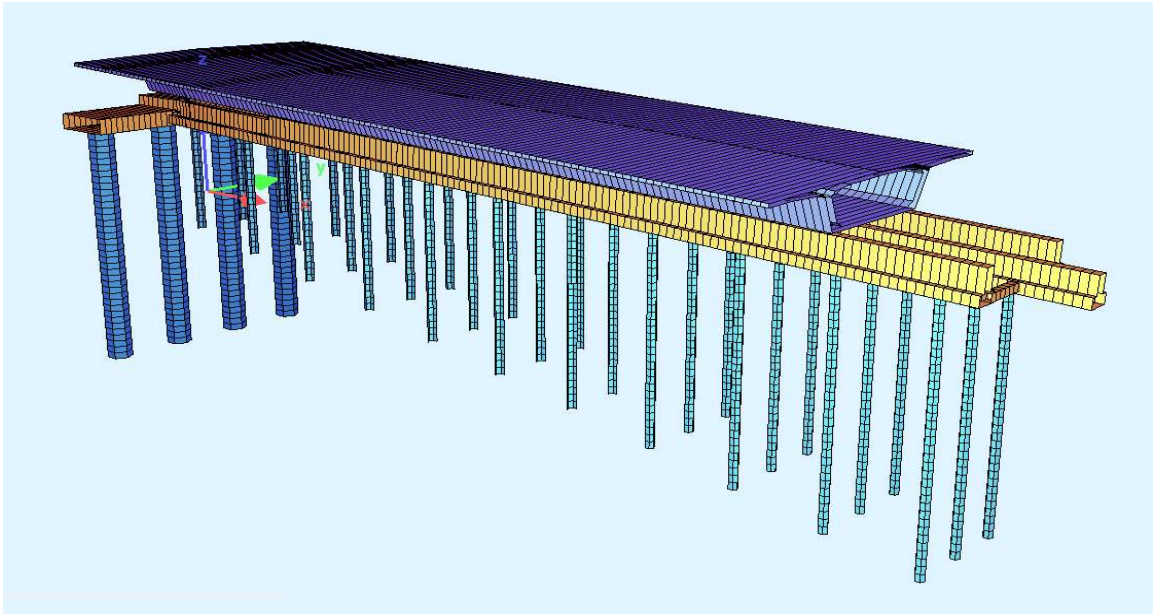
- Launching from both sides, connecting two decks with each other.



ILM examples

Bridges erected by ILM – SOFiSTiK: Panama bridge, VINCI data

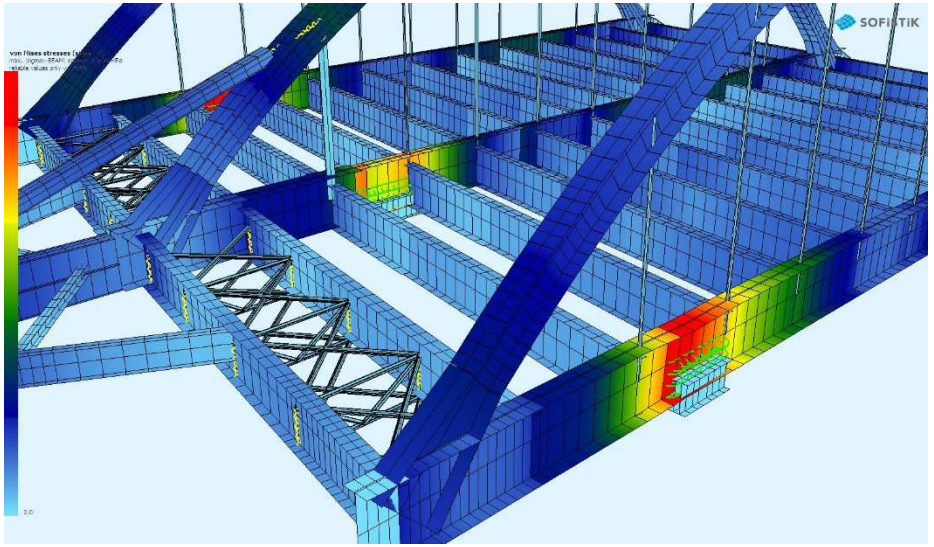
- Detailed modelling of casting mould incl sub structure, sliding of deck incl friction.

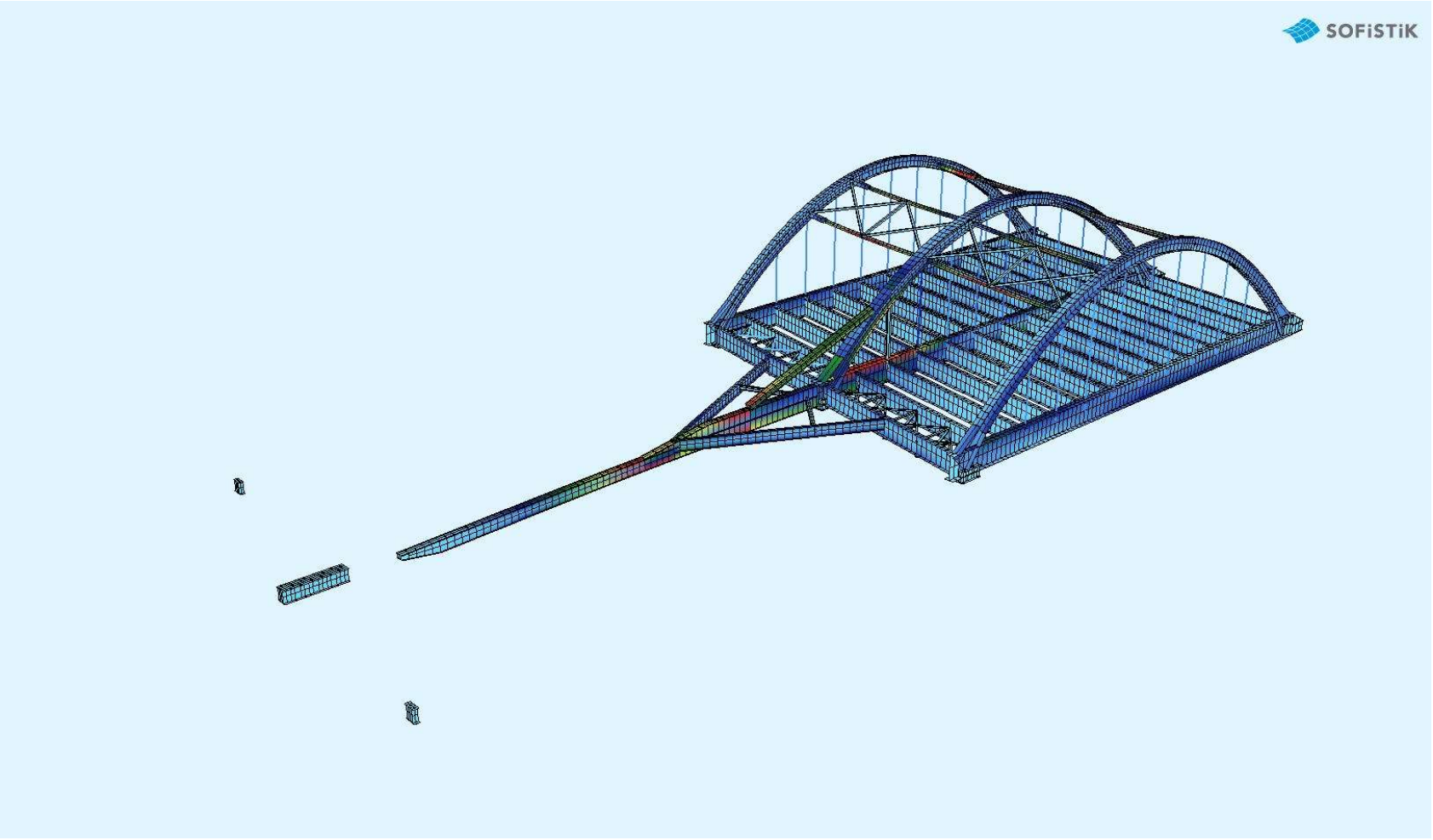


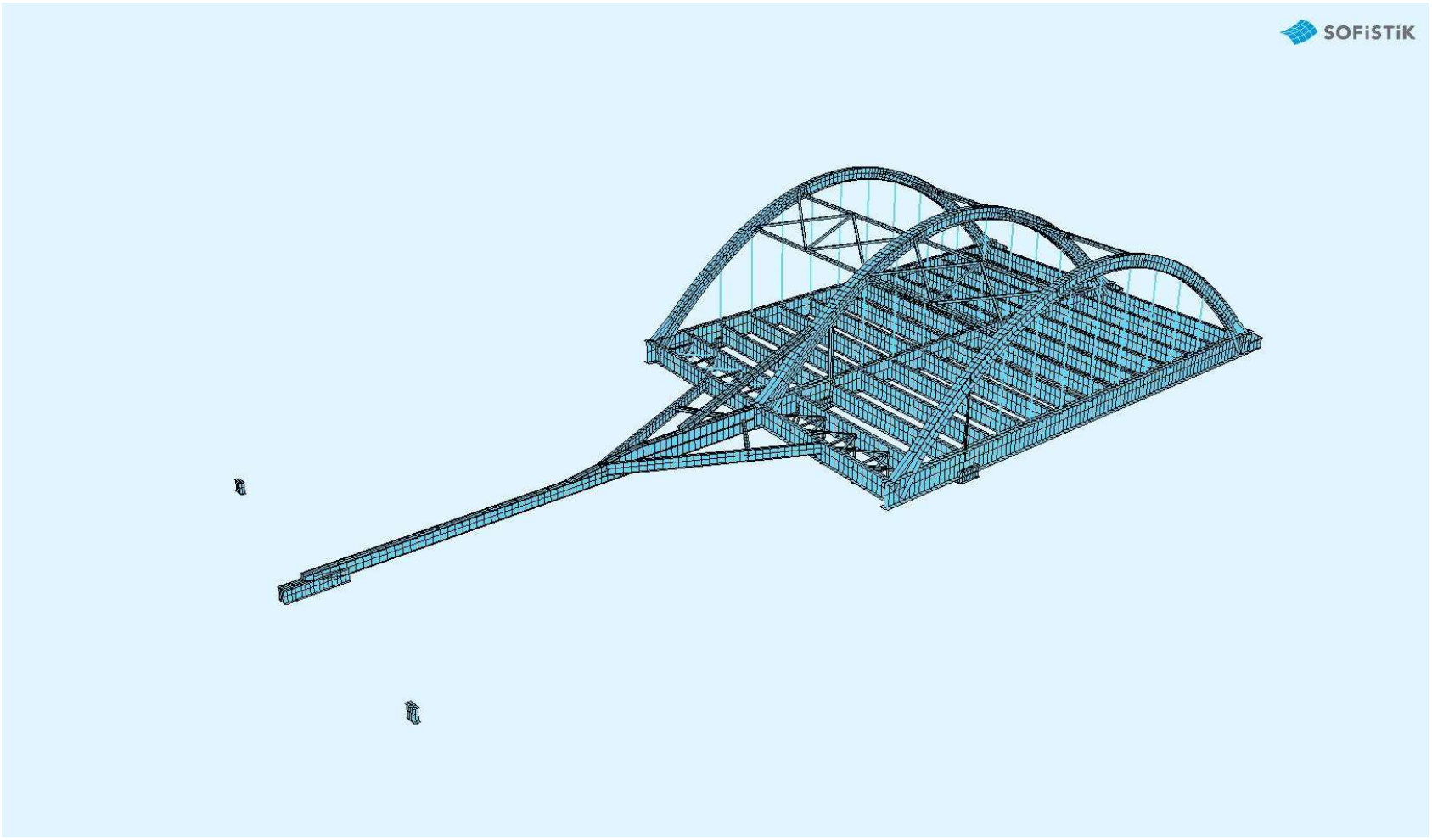
ILM examples

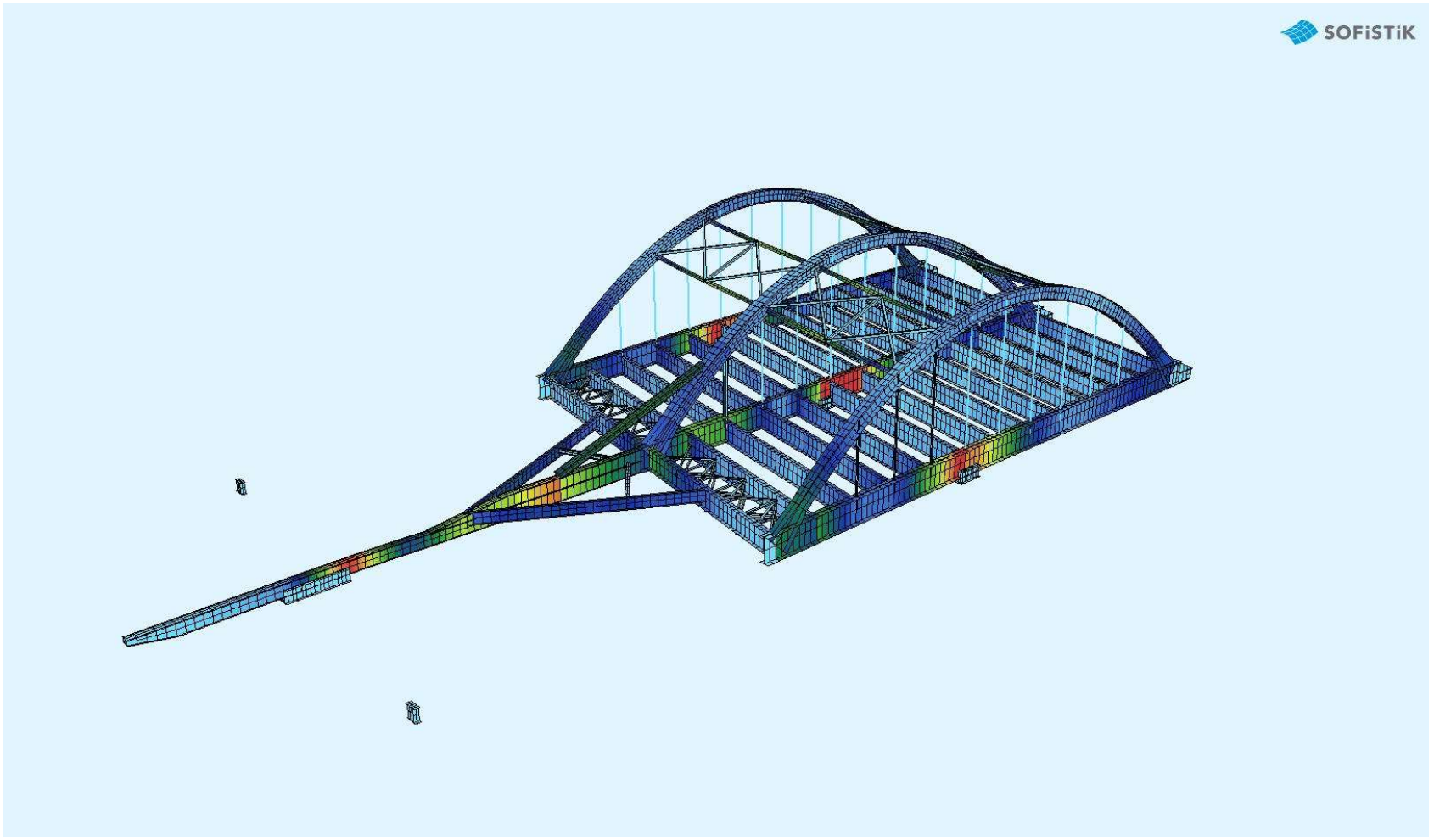
Bridges erected by ILM – SOFiSTiK: new parking over the railway station in Rome

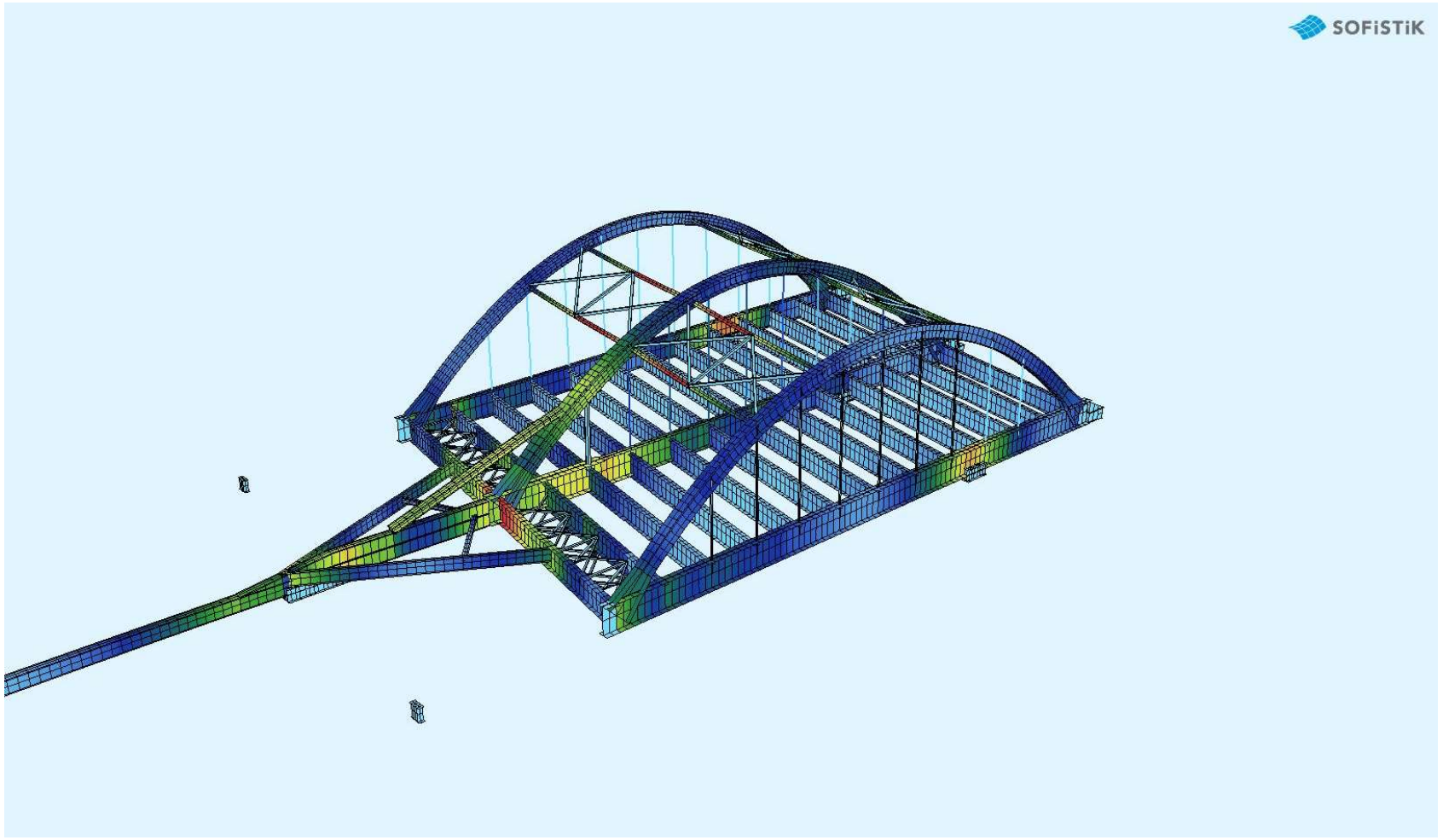
- Beams, shells, springs launched, full steel design, full foundation design
- Precamber and fabrication shapes

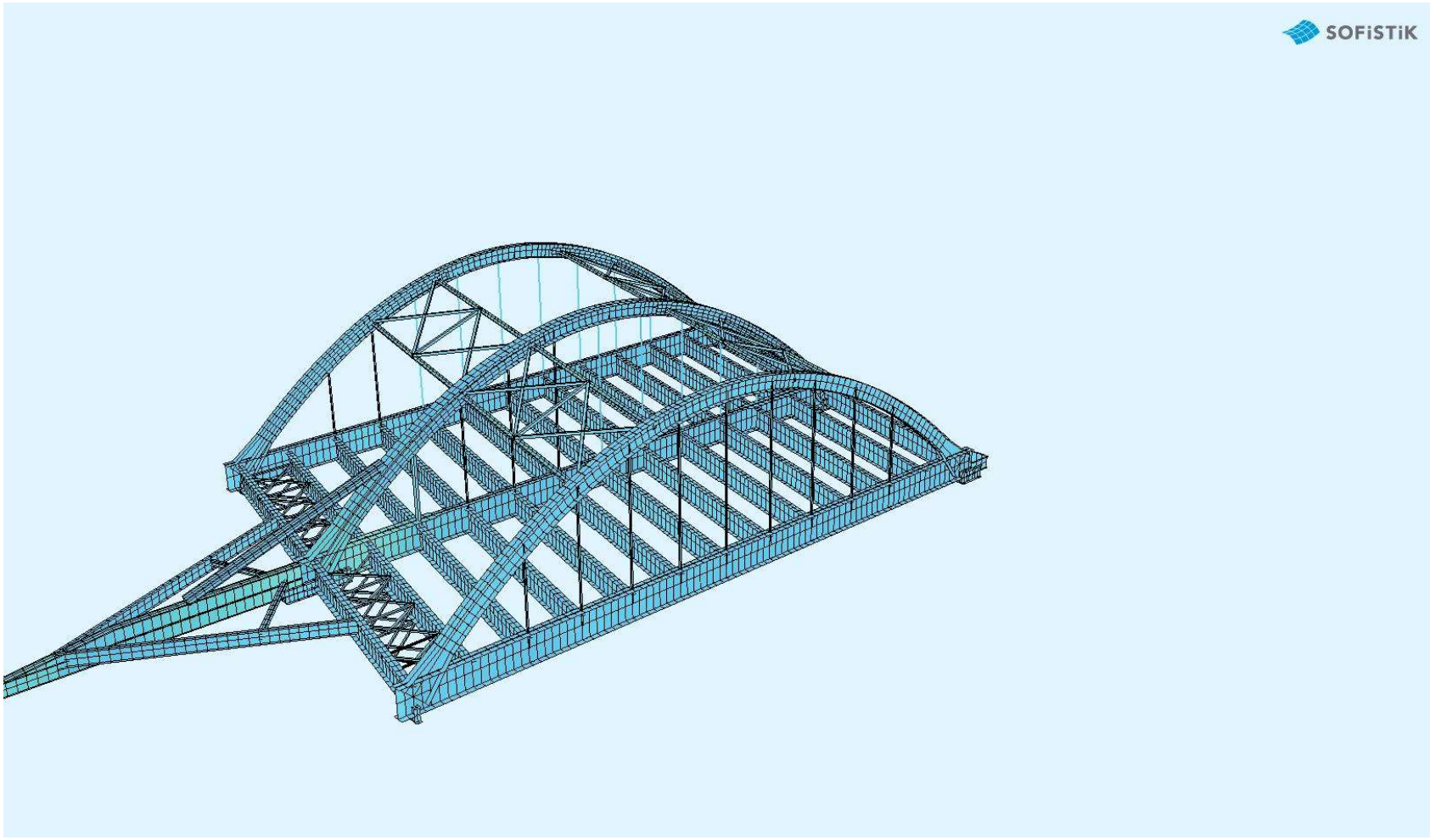









SOFiSTiK



Thank you