SOFiSTiK

FINITE ELEMENT SOFTWARE

Bridge Design
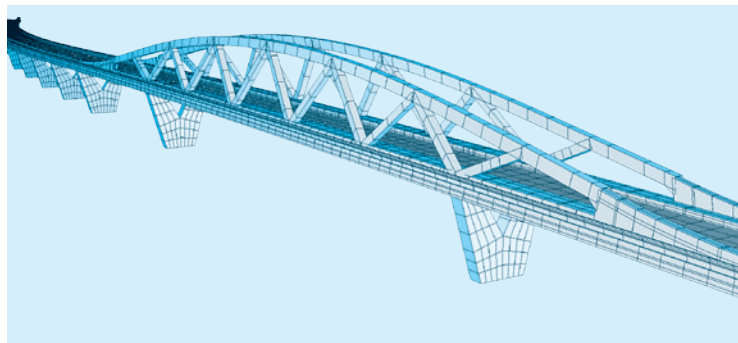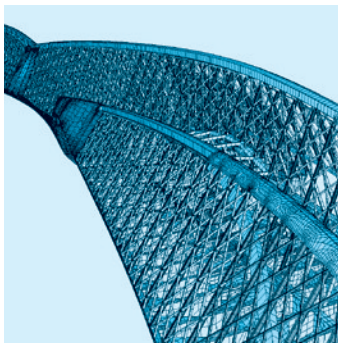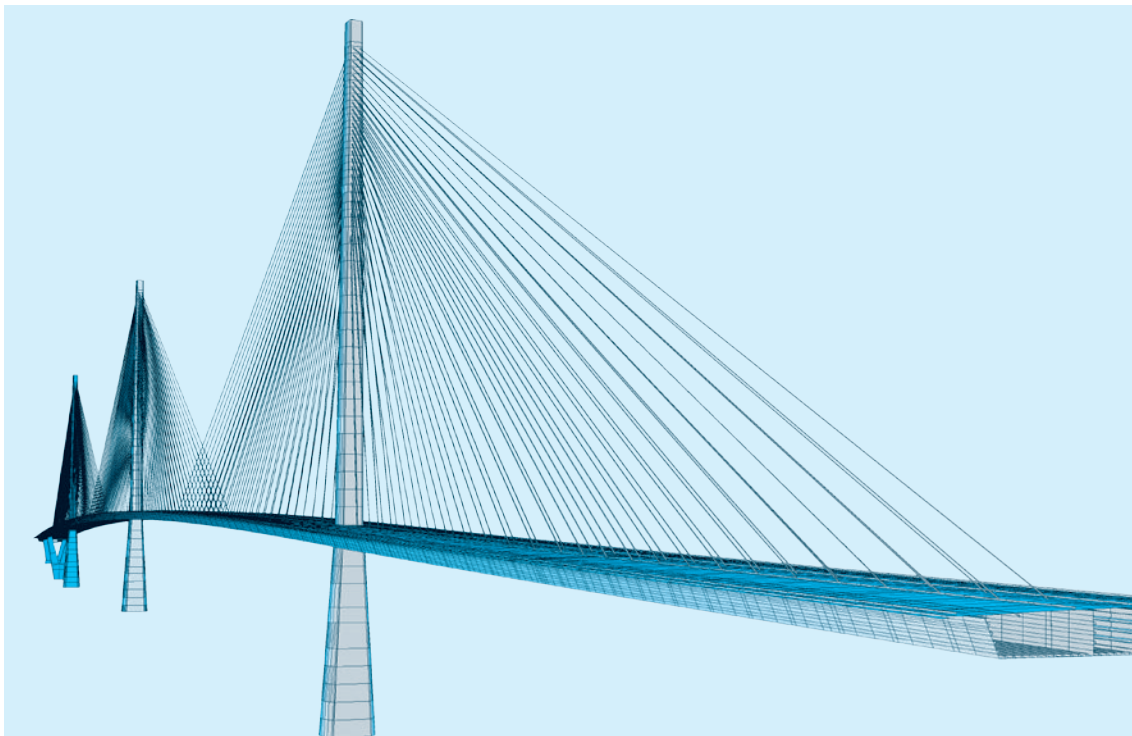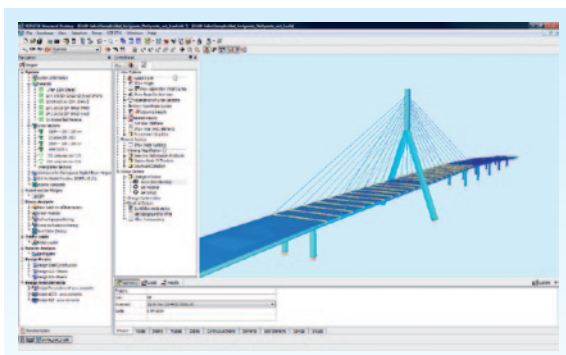
Bridge Design

The SOFiSTiK module portfolio is especially powerful and versatile for the advanced analysis and design in all fields of bridge engineering.

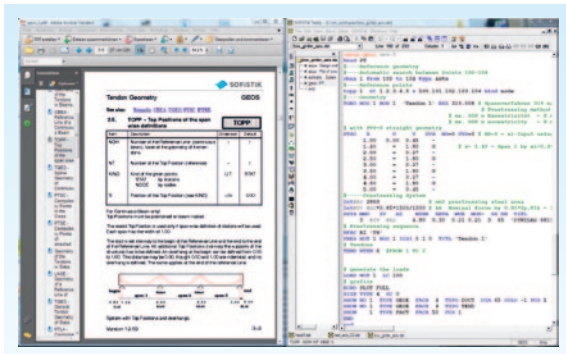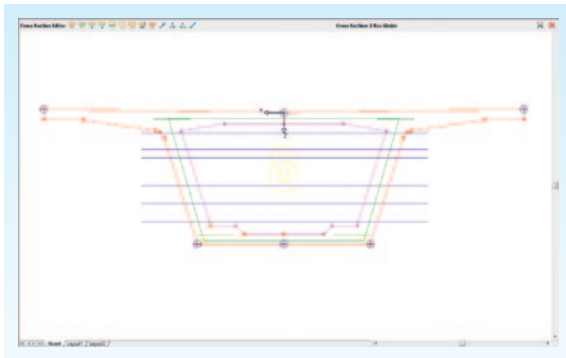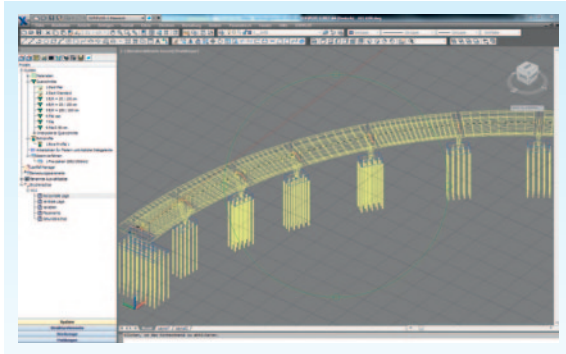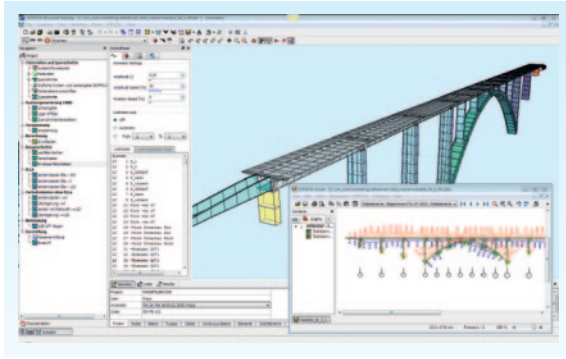Powerful graphical AutoCAD®-based 3D pre-processing and interactive parametric input enable the user to control and adjust the model and the calculation to any demand. Analysis with nonlinear effects as well as economical influence line evaluation is possible. Seamless integration of construction stage analysis, precamber determination and automated force optimization are available. Design code specific tasks are supported ranging from a library of standard load models (road and railway) to special design and serviceability checks and assessments. Interactive graphical and numerical post-processing as well as open interfaces for individual result treatment are part of this package which is used by many leading bridge design offices world wide.

Cross Sections and Geometry

- CABD-Technology: Parametric axis-based geometry input. Variables and formulas enable complex parametric modeling.
- SOFiPLUS: 3D General AutoCAD-based pre-processing with automatic meshing
- Rhinoceros® Interface: FE meshing for NURBS surfaces (freeform areas)
- Parametric master cross sections
- Cross Section Editor: AutoCAD-based cross section input
- High-End sectional analysis for R/C, steel and composite sections (Warping, FE cross sections)
- Consideration of sectional construction stages (In-situ concreting, composite shear etc.)
- Open and closed sections
- Non-effective areas (shear lag)
- Steel and composite class 4 sections with automatic determination of effective widths acc. t. EN 1993-1-5
- General stress output points (automatic and user defined)
- Dedicated input wizard for standard bridge types (Beam, Slab and Arch-Bridges)

General Features and Bridge Types

- 3D Finite Elements: Beam, shell, volume, cable, truss, spring and dampers with nonlinear material and geometric capabilities
- Elastic bedding, nonlinear bedding, pile elements, analytical halfspace model for soil-structure interaction (also for dynamic effects)
- BIM/IFC 2x3 structural view interface (e. g. Dlubal RFEM/RSTAB)
- Single or multi-web beam systems
- Grillages
- Cable stayed bridges
- Suspension bridges
- Slab/Frame/Integral systems
- Moving and foldable systems
- Hybrid systems (beam and orthotropic shell deck)
- Extradosed bridges
- Composite systems
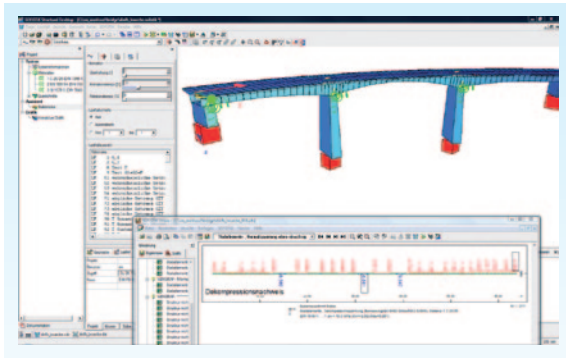
Pre- / Post-Tensioning

- TENDON: Prestressing of beam and shell structures
- Cubic 3D spline tendon geometry
- Full 3D geometry definition in plan, elevation and cross sectional views
- Jacking and construction sequences
- Immediate bond
- Unbonded tendons
- Internal and external tendons
- Library of prestressing systems
- Tendon stress diagram
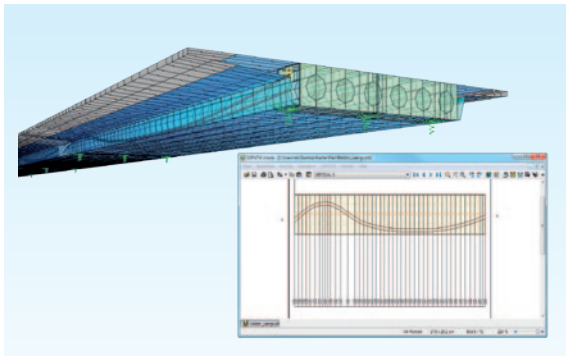
Loading

- SOFiLOAD-V: Library for traffic loads (road and railway) e.g.: EN 1991-2 TS/UDL/Special vehicle bridge loading, BS 5400 HA/HB vehicles, AS M1600/S1600, US AASHTO, High-Speed Trains (ICE3, TGV etc.)
- Traffic-Loader Task: Graphical traffic load input
- Free or element/node related general load definition
- Settlement, temperature, wind, collision and support jacking loading
- Load combinations according to selected standard
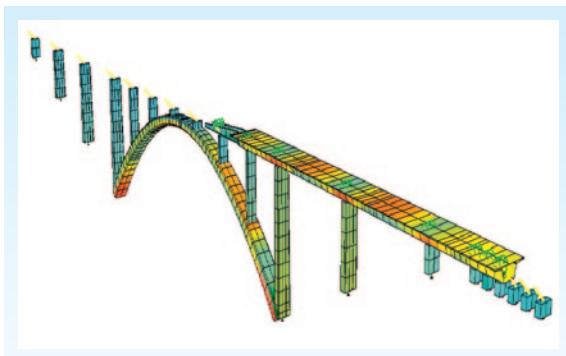
Analysis

- ASE: 1st, 2nd and 3rd order 3D FE analysis (Linear, P-Delta and fully geometric nonlinear analysis)
- ELLA: Influence lines and influence surfaces
- HISOLV: High-End parallel sparse and iterative solvers (Windows and LINUX)
- Eigenvalues
- Earthquake and response spectra analysis
- Nonlinear material models for R/C and steel
- Nonlinear spring and damper elements
- Contact elements for ILM
- Primary states for deformation and stress ("construction memory")
- Time-step integration
- Influence lines
- Hydration of concrete
- Buckling analysis
- Dynamic wind analysis
- Moving loads (rolling stock)
- Vehicle–Structure Interaction
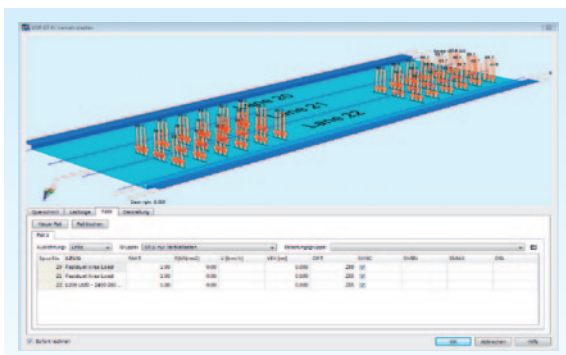
Construction Stage Simulation

- CSM: Tabular graphical supported construction stage simulation with all time-dependant effects (automatic determination of all CSR parameters)
- Span-by-span erection with precamber
- Free and balanced cantilever method (FCM/BCM)
- Nonlinear construction methods (Suspension Bridges)
- Integrated force optimization and iterative shop forms
- Incremental launching with special contact bearing elements (ILM)
- Retrofitting, collapse and forensic analysis

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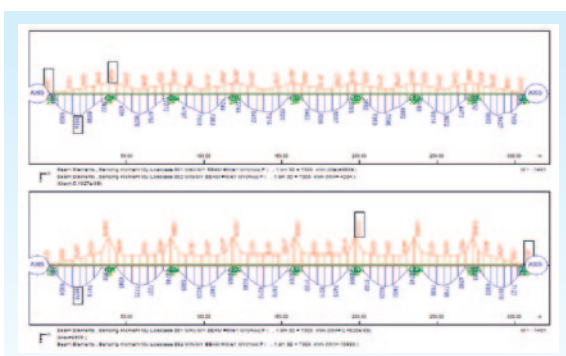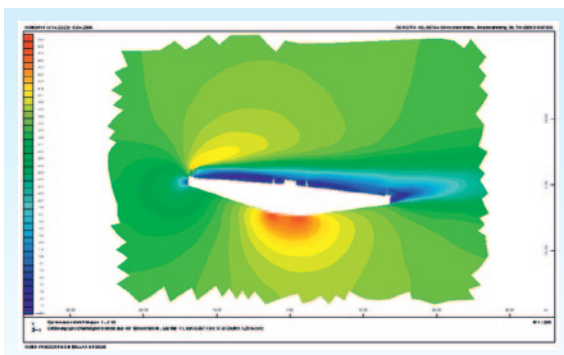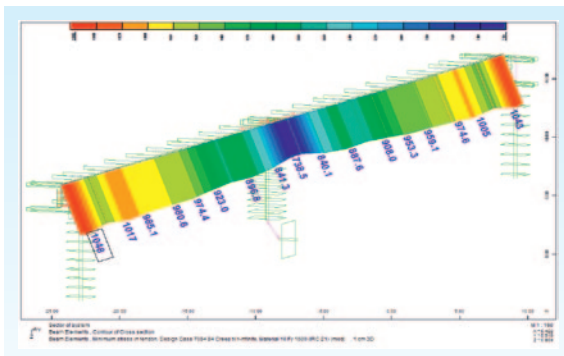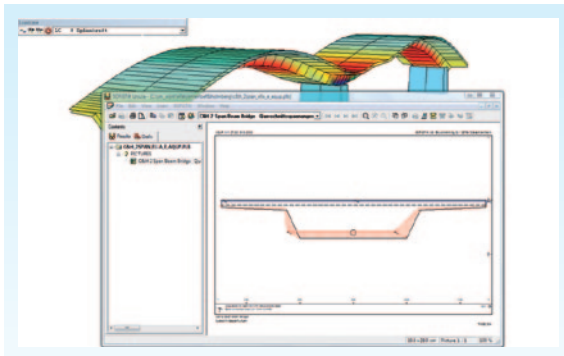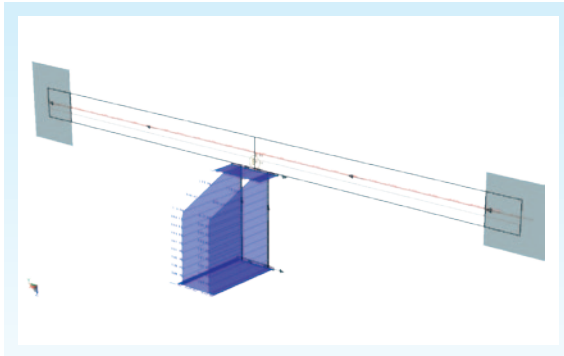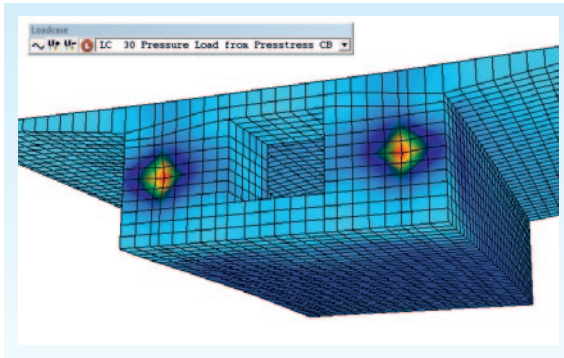
Design Code Checks

- SLS and ULS in general with reinforcement design, stress checks, decompression, crack widths, robustness, fatigue
- Integrated design of all elements
- Eurocodes EN 1992, 1993, 1994 and 1999
- National Annexes of Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, UK
- DIN-FB 101, 102-104
- BS 5400 (opt. Hong Kong concrete model)
- SIA 262
- AASHTO 2004, 2010 (LRFD), ACI 318-08, AISC 2005
- AS 5100 (Australia)
- EHE (Spain)
- IRC (India)
- S-BRO 2004 (Sweden)
- SNIP 52.101-2003, II 01.03-89 (GOST Certificate)
- Please contact us for latest code support information

Post-Processing

- WinGRAF: Graphical interactive post-processing for all results
- SIR: Integration of FE shell results
- Numerical post-processing (copy-and-paste to Excel or similar)
- Programming interfaces (VBA, C, C++, FORTRAN)
- Excel interface /.pdf export

Additional Features

- Pre-camber and shop forms
- Push-Over analysis
- Optimization of structural answers (cable forces, max. moment, min. displacement, etc.)
- Geometry finding for cable structures
- Soil Structure Interaction
- Vehicle-Structure interaction
- Hydration
- Fire-Design
- Nonlinear Timestep Analysis
- Dynamic wind properties for cross sections (incl. Scanlan-Derivatives)
- Dynamic wind for bridge aerodynamics (SOFiLOAD-DW)
- CFD Analysis
- On-demand support with academy and individual expert trainings
- Worldwide expert network

Packages

- BRIDGE-BASIC: 3D linear analysis and design for R/C and composite systems
- BRIDGE-BEAM: 3D analysis and design for all beam bridge models (incl. cables)
- BRIDE-HYBRID: 3D analysis and design for all bridge models
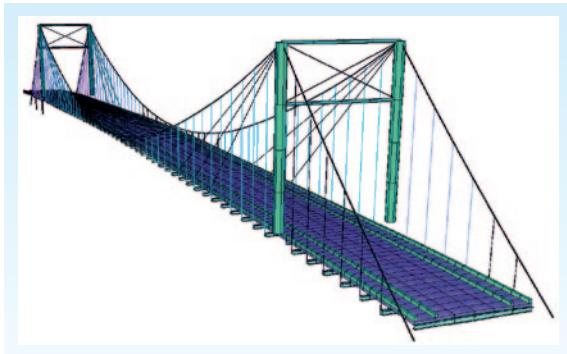- Ask us for individual module offers …

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References
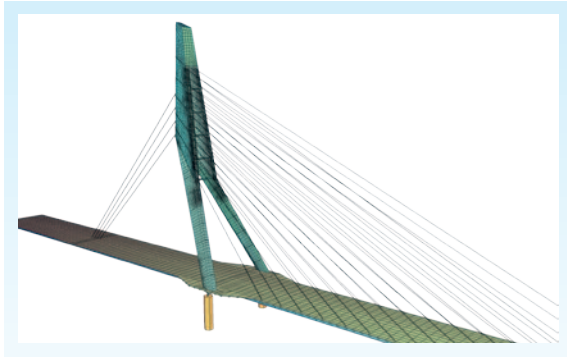
Project: Yamuna Bridge at Wazirabad, India
Architect: Ratan J. Batliboi, Mumbai
Engineering: schlaich bergermann und partner
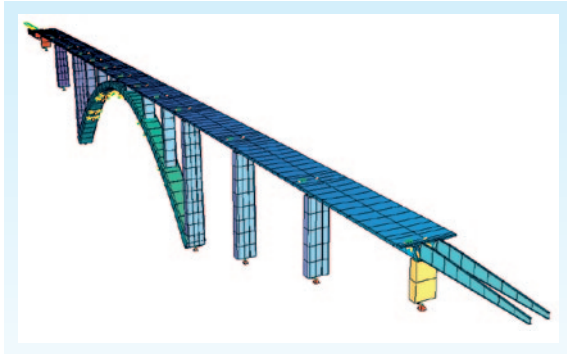
Project: Massetal Railway Bridge, Germany
Owner: DB Netz AG
Engineering: Obermeyer, SSF Engineers AG, Büchting + Streit AG

Project: Khor Al Batah Bridge, Sur, Sultanate of Oman
Owner: Ministry of Regional Municipalities, Environment and Water Resources Directorate General of Technical Affairs Muscat, Sultanate of Oman
Engineering: schlaich bergermann und partner
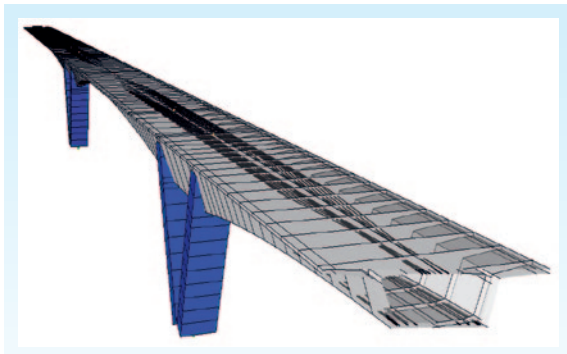
Project: Sheikh Khalifa Bridge, Abu Dhabi
Owner: TDIC Tourism Development & Investment Company Abu Dhabi
Contractor: ZÜBLIN / SAIF BIN DARWISH
Engineering: K+S Ingenieur-Consult
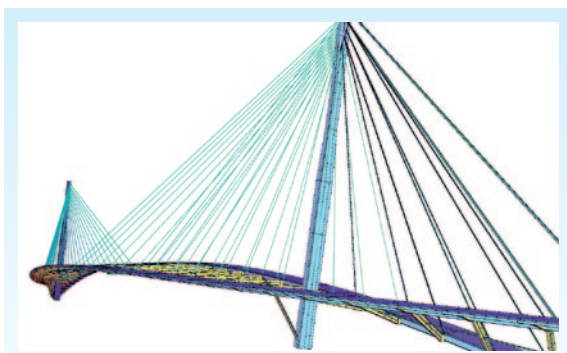
Project: Passerelle des deux Rives, Strasbourg–Kehl, France–Germany
Architecture: Marc Mimram
Engineering: Leonhardt, Andrä und Partner

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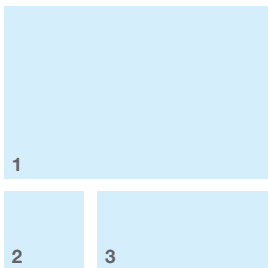
1 Forth Replacement Crossing
Client: Transport Scotland
Contractor: Forth Crossing Bridge Constructors
Design Joint Venture: Ramboll, Grontmij, Leonhardt, Andrä und Partner
2 Pabellón Puente (Expo 2008 Zaragoza)
Architecture: Zaha Hadid Architects · Engineering: FEHCOR, Ingenieros Consultores, Madrid
3 Bridge over River IJssel Hanzelijn, Netherlands
Architecture: Quist Wintermans BV · Engineering: SSF Engineers AG, ABT BV

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Structural Engineering

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