Product Information **Structural engineering**

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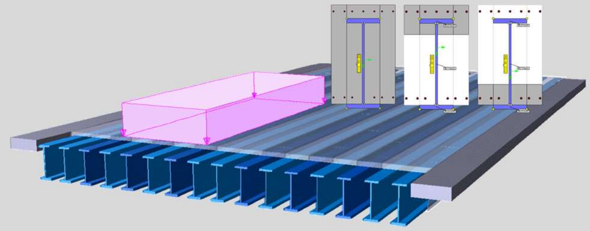
PONTIcompositesteel WIB

11.10.598 PONTI compositesteel WIB

FEM system for rolled beams in concrete

- **Dimensioning with interactive optimization**
- **Calculation and design of WIB beams with total cross-section method**
- **Recording system, cross-section & load history**
- **Verification of crack formation in concrete**
- **Automatic determination of secondary effects**
- **Economic design for DIN-EN, EN & DIN-FB**
- **Clear result list with targeted detailed information**
- **Document output according to user specifications**



Complete bridge construction solution for rolled beams in concrete with graphically interactive working environment for input, calculation and evaluation. Based on the basic solution of steel composite bridges, the program supports the special processing possibilities of WIB girders. For the checks in ULS, SLS & FLS, the cracked concrete section is calculated using time-dependent X-Section variants.

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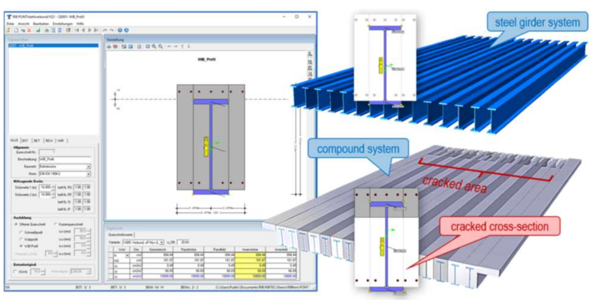


Model-based system input

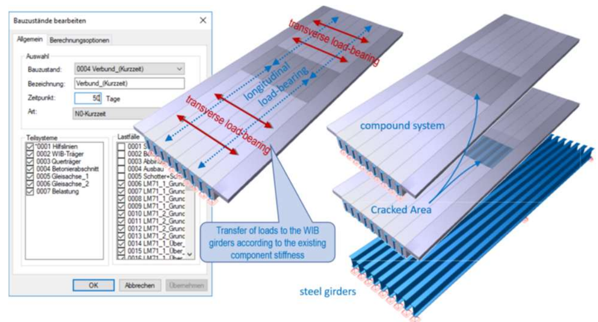
PONTIcompositesteel WIB takes into account the technological characteristics of WIB bridges, which influence the load-bearing and deformation behaviour due to the composite effect of both materials. The consideration of the crack formation areas in the concrete belt above the inner columns and in the field area is largely automated. The influence of the manufacturing layer, the load layer and system rearrangements are taken into account for each construction stage, as are the influences of the cross-sectional history via the variant technique.

Practical bridge construction system

The modular program system PONTIcompositesteel WIB consists of three interactive components for input, calculation/design and graphical evaluation. All application possibilities are optimally supported by the bridge construction-oriented working environment. The design generates clear result graphics, e.g. load curves for all checks in the ultimate limit state, fatigue limit state and serviceability limit state. The graphic-interactive program environment of the design allows to change the composite cross-sections or partial cross-sections at any time. After a change, the design management for the composite system is largely automatic.

Modelling for time-dependent structural effects

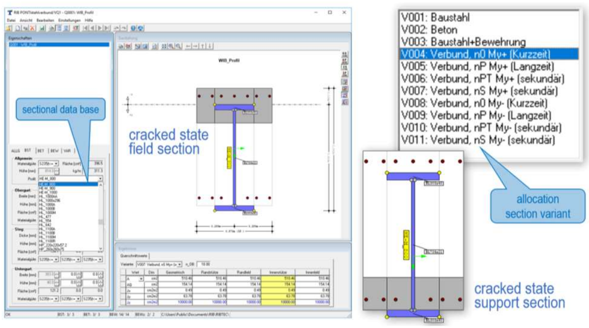
For steel composite bridges in WIB constructions, the description of the composite cross-sections through the application of the time-dependent total cross-section method is of central importance. During design, any change in the cross-section or a partial cross-section of the steel girder usually leads to a change in the stiffness of the system and to a change in the load from its own dead weight.



For the modelling of the time-dependent load-bearing effect of the composite system, construction stages are used which are defined by the assignment of subsystems and load cases and take the cracked zones into account via cross-section variants. In addition, member and area elements can be used for the representation of the longitudinal load-bearing effect via beams and for the transverse load-bearing effect as orthotropic slab. This allows a simple load generation in which the loads are automatically distributed to the composite beams according to the available stiffnesses.

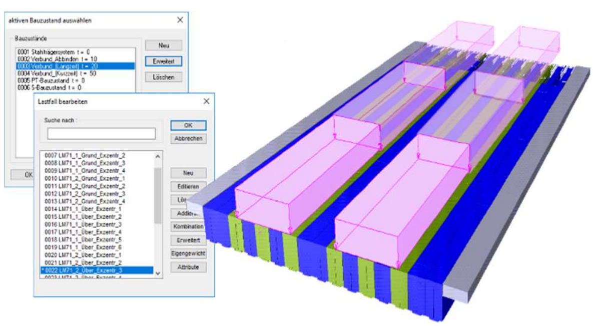
Cross-section input for all structural members

When applying the overall cross-section method, it is important that the composite cross-sections and the variants derived from them are defined as efficiently as possible and can be modified to accompany verification. For the representation of the cracked cross-sectional areas, further load-dependent variants are added for rolled beams in concrete, whose cross-sectional values depend on the cracked zones in the support and field areas. At this point it becomes obvious that an optimal cross section analysis is an essential factor of the whole working process. The steel girders can be selected as I-shaped rolled section girders from a database.



Flexible input of external loads

The generation of track-bound loads is carried out largely automatically using typified or self-defined load macros in accordance with the load standard. Each load case is assigned a load case attribute which takes into account not only the load type but also the load effect. All common load case attributes are set for bridge construction with norm-dependent partial safety factors and combination coefficients. The load macro of a traffic load model can be incrementally shifted relative to any polyline with or without eccentricity to the system axis. The program distinguishes between up to six traffic lanes. The assignment of load case attributes automatically results in the overlay specifications for the relevant action combinations in the design.



Representation of the load history

The load history must correspond to the fabrication process. The transverse load distribution is best achieved via an orthotropic deck plate on the composite beams. The dead loads are always determined from the cross-section values. Basically, all loads on a bridge are divided into three groups:

Long-term loads: steel girder loads, concreting loads, demounting loads or column subsidence or planned deformations

Short-time loads: traffic loads, fatigue loads, temperature loads, wind loads, acceleration and braking

Secondary loads: primary and secondary shrinkage, creep due to concreting loads, demounting loads and support subsidence

Each load case is assigned to a specific construction stage according to its mode of action. So that concrete and steel can be regarded as one cross-section, the stiffnesses for "long-term loads" and "secondary loads" are converted time-dependently with reduction numbers. In contrast, time-independent reduction numbers are used for "short-term loads".

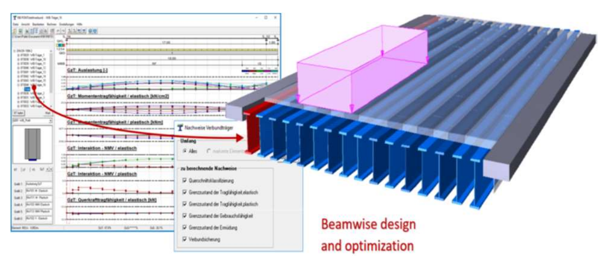
Composite design

In PONTIcompositesteel WIB the following girder checks are carried out:

Ultimate limit state
- Cross-sectional classification
- Plastic and elastic moment carrying capacity
- Plastic shear load capacity
- Normal force-moment-transverse force-interaction

Serviceability limit state
- Stress limitation Structural steel
- Stress limitation Reinforcing steel
- Stress limitation for concrete pressure
- Minimum reinforcement (first crack formation)
- Completed cracking
- Quasi-permanent deformations

Fatigue limit state
- Equivalent damage vibration amplitude structural steel
- Equivalent damage vibration amplitude reinforcing steel
- Concrete fatigue under pressure



Clear output of results

All system and result data are graphically displayed and output. The results can be displayed either on the static system or per component in the form of diagrams. The diagram display contains load curves for all designs as well as individual evaluations for special limit states of load carrying capacity, serviceability and fatigue. At the same time, each individual check can be displayed graphically. Detailed information can be displayed interactively at any time by clicking on any location in the viewer and output if necessary. In principle, all results can be output as a document according to guideline 504, including graphics that were previously selected as the result type and location. The output can also be in Word format.