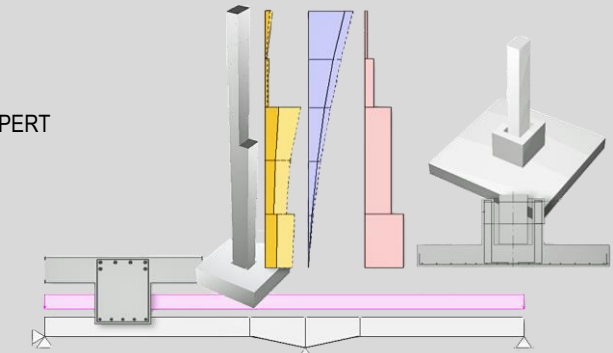


## RTec and RTec EXPERT

- 11.10.720 **RTec** Collection of structural engineering design tools incl. BALKEN, RTbest, RTfooting, RTslab and RTool
- 11.10.721 **RTec EXPERT** incl. RTec, BALKEN prestressing, BEST EXPERT ZWAX as well as sleeve, block and polygonal foundations

## Collections of structural engineering design tools

- Reinforced concrete, prestressed concrete, steel and wood design according to DIN and EN with national annexes for DE, AT, CZ/SK and UK
- Geotechnical design for footings according to DIN and EN with NAs for DE, AT and CZ/SK
- Simple application for efficient & clear work
- Ergonomic, graphic-interactive working environment with sensitive elements and dimension chains
- Integrated solutions for calculation, dimensioning & drawing
- Generation of design drawings which can be transferred to ZEICON or other CAD systems



Structural analysis package for simple handling and graphically interactive input, analysis and output of results. Individual proofs also provide information and suggestions for the constructive design of the processed components. In the simple version, the package contains 22 small structural analysis programs as well as the design of columns, continuous girders, simple foundations and building slabs in reinforced concrete. The extended EXPERT version additionally permits beam pre-stressing and the design of any cross-sections, columns and foundations.



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Chairman of Executive Board: Thomas Wolf.

## RTool Collection of design proofs: Reinforced Concrete

- morticed reinforced concrete beam with framework model according to Finger-loos/Stenzel
- box out design in reinforced concrete beams (according to design booklet 399 or 459 DAfStb) incl. reinforcement suggestion
- elastically bedded reinforced concrete beam with loss of bedding
- punching verifications incl. reinforcement suggestion for Schöck or HALFEN dowel bars
- bracket design
- uniaxial reinforced concrete design incl. reinforcement suggestion
- proofs for vibration stress ranges and strains
- design according to DIN 1045-1, EN 1992-1-1 and corresponding NADs for DE, AT, SK/CZ and UK

## Steel Construction

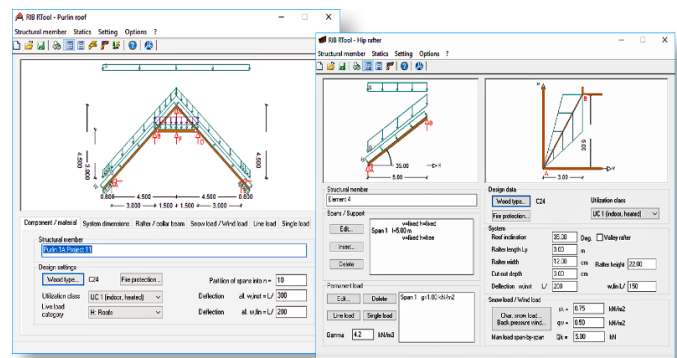
- verification of lateral-torsional buckling for symmetric profiles
- design of continuous steel beams
- verification of steel stress
- design according to DIN 18800 and EN 1993-1-1 and corresponding NAs for DE, AT, SK/CZ and UK

## Timber Construction

All verifications in timber construction are performed in accordance with DIN 1052:2004. All relevant proofs are performed also for structural fire design. The load parameters

for the roof design tools are shown in the integrated snow and wind load zone maps for Germany or the respective DIBt charts.

- continuous timber beam incl. proof for vibration of timber slabs
- continuous timber rafter
- one-storey timber column
- collar beam roof incl. verification for ridge and base points, collar beam connection and rafter support
- rafter roof incl. verification for ridge and base points as well as rafter supports
- purlin roof incl. verification for ridge and base points as well as rafter supports



- complete construction suggestion for the planning of all three roof types incl. detailed drawings of the ridge and base points as well as all collar beam connections

# Product Information

- spatial collar and ridge rafter
- bending rigidity of timber frame corner
- couple and rafter purlins
- evaluation of wind and snow loading according to DIN respectively EN 1991 with corresponding national annexes for DE, AT, CZ/SK and UK
- timber design according to DIN 1052:2008, EN 1995-1-1 and corresponding NADs for DE, AT, SK/CZ and UK
- The loads are evaluated according to the following codes for all timber design modules
- consideration of load contributions and evaluation of wind and snow loads for DIN 1055 and EN 1991 with according NAs for DE, AT, SK/CZ and UK
- assemblage of loads for DIN 1055 and EN 1991 with according NAs for DE, AT, SK/CZ and UK as load combinations

## Brickwork

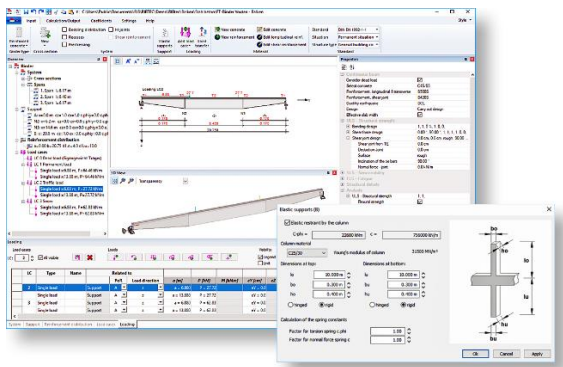
- simple proof for masonry according to DIN 1053-1 part I, DIN 1053-100 and DIN EN 1996-1

## BALKEN

Windows® program for the calculation and design of continuous reinforced concrete beams with a graphic interactive work environment for the input and output. Straight continuous beams including single span beams as well as cantilever beams can be calculated with BALKEN.

BALKEN is a multi-purpose structural analysis program and provides the following benefits:

- modern interface with ribbon bar, quick access bar, tree view and property grid as well as 2D- and 3D views
- graphics with sensitive elements and dimension chains as well as direct display of modifications
- possible change of material: reinforced concrete – prestressed concrete – structural steel – timber
- analyses according to DIN and EN with national annexes for DE, AT, SK/CZ and UK
- efficient input via quick input, from a template or user-defined data records possible
- load transfer and import from other projects
- well-arranged program control and configuration as well as independent language settings DE, UK and CZ for the input and output
- modern table-oriented and repeatable result list with integrated graphs or diagrams
- result output with configuration and filter options as short, long or detailed list
- user-defined templates



With BALKEN you are using a structural analysis program, which has proven itself in many cases both in the day to day business and in solving complex problems.

## BALKEN Option - Continuous RC beam

The uniaxial reinforced concrete design is possible according to DIN 1045-1, EN 1992-1 and the corresponding national annexes for DE, AT, SK/CZ and UK. The following tasks can be solved with BALKEN:

- homogeneous rectangular, T-beam, slab, standard I-beam cross-sections with variable web and flange thicknesses as well as upstand beam cross-sections
- typified cross-section gradients
- arbitrarily variable cross-section gradient including cross-section offsets
- simply symmetric – in special cases also asymmetric – cross-section shapes are possible
- structural systems with an unlimited number of spans and automatic consideration of the effective slab widths for the stress resultant calculation
- optional use of normal-strength concretes (up to C50/60), high-strength concretes (C55/67 up to C100/115), ultra-high strength concrete (UHC140)
- reinforcing steel reinforcement (up to B550), high-strength reinforcing steel reinforcement (SAS670) or glass fibre reinforcement (ComBAR®)
- rigid or elastic support with automatic calculation of the spring coefficients
- reliable generation of design combinations with load case attributes
- automatic generation of load cases by copying span by span or with a certain distance
- single loads, line loads, trapezoidal and triangular loads, temperature loads and support settlement
- loads can be applied centric or eccentric
- automatic generation of load positions in a load case
- linear stress resultant calculation with automatic generation of all design combinations
- linear stress resultant calculation with moment redistribution under consideration of the distribution boundaries
- moment round-off and automatic consideration of the minimum restraint and loads close to a support
- complete reinforced concrete design in the ULS
- minimum and ductility reinforcement
- bending bearing capacity due to N-M-interaction
- shear bearing capacity due to V-T-VT interaction
- flange connecting reinforcement
- composite joint
- tabular fire protection

## BALKEN Option – Additional design for SLS, FLS and refurbishment

- complete reinforced concrete design in the SLS, FLS and refurbishment
- minimum reinforcement for the crack width of thin and thick structural members
- minimum reinforcement due to discharge of the hydration heat for slabs
- limitation of the crack width
- limitation of concrete and steel stresses II
- limitation of the deformations in the uncracked state
- limitation of the effective deformations in the cracked state for  $l_{eff}/250$  and  $l_{eff}/500$
- deformations optionally for quasi-permanent, frequent or rare combination of actions
- analysis against fatigue of the longitudinal reinforcement

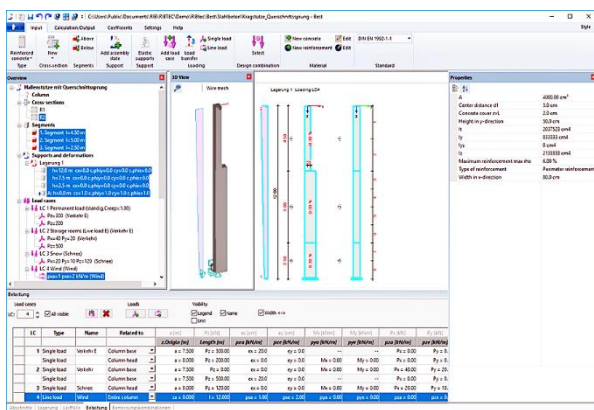
- analysis against fatigue of the shear reinforcement or stirrups
- load bearing capacity analysis for refurbishment with utilization levels for a specified longitudinal and shear reinforcement under consideration of possible corrosion damages

### BALKEN Option - Detail design

- design of geometrical discontinuity areas for small and large openings (recesses) according to DAfStb Heft 399/599 and DAfStb Heft 459
- post design for openings closely spaced  $< 0,8 h$
- design of geometrical discontinuity areas for offset supports (notches)

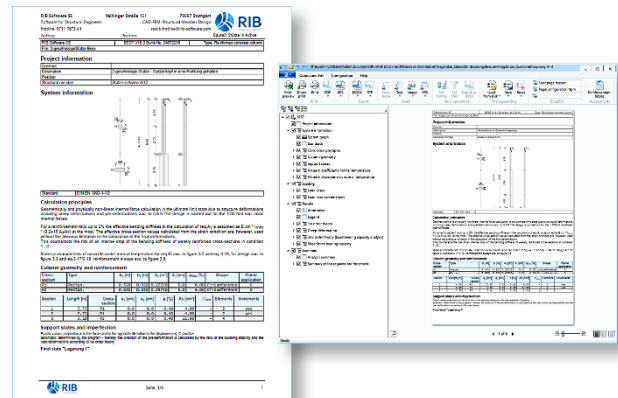
### RTbest

Windows® programme for the design of single or multi-storey reinforced concrete columns in the limit state of bearing capacity due to structure deformations (buckling analysis and design) with a graphically interactive working environment for the input and output. The calculation is categorically performed biaxially according to linear and nonlinear deformation theories considering as well effective stiffnesses in the cracked condition.



This application additionally supports the following calculation options:

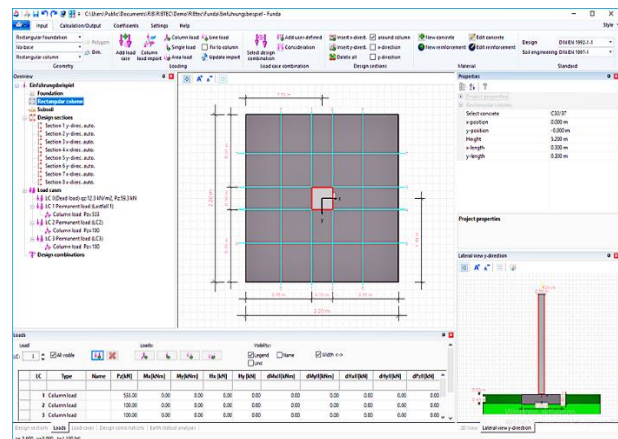
- regular cross sections can be graded according to storeys and arranged eccentrically
- the reinforcement can be distributed evenly over the extent or arranged as individual reinforcement in the corners of the cross section
- reinforcement can remain constant along a column or be graded according to each beam
- different static systems can be investigated in their transportation, assembly and final states via a completed calculation
- the pre-deformations are supposed affine to the buckled shape or in the form of a skew attitude
- creep deformations can be considered
- supports can be rigid or elastic
- loads can be entered as point loads, eccentric point loads and linearly variable line loads as well as pre-set translations and rotations
- the dead load of columns is formed automatically and considered on request
- there is specific input support for the formation of design combinations



- partial safety and combination factors are formed automatically per load case attribute
- design for permanent, transient and extraordinary design situations
- design is performed for biaxial bending with normal force and shear optionally according to DIN 1045, DIN 1045-1, EN 1992-1-1 and according NAs for AT & CZ
- consideration of constructive fire protection requirements according design tables
- evaluation of the steel stresses in the limit state of serviceability

For testing reasons, the results can also be shown in a clearly arranged manner via a result preview, additionally to the complete output list with graphics. Comparisons with the model column method can be made particularly because of the indication of the effective flexural rigidities.

### RTfooting



Windows® programme for the design of reinforced concrete Footings as rectangular slabs with a graphically interactive working environment for all in and output.

There are the following input and processing options:

- pre-setting of different water zones and backfillings
- input of loads in the column connection as well as arbitrary point or area loads on the slab
- column loads can be transferred from columns design and different load combinations can be pre-set
- configuration of the result list and pre-setting of arbitrary design sections



# Product Information

The application supports the following calculation and design methods:

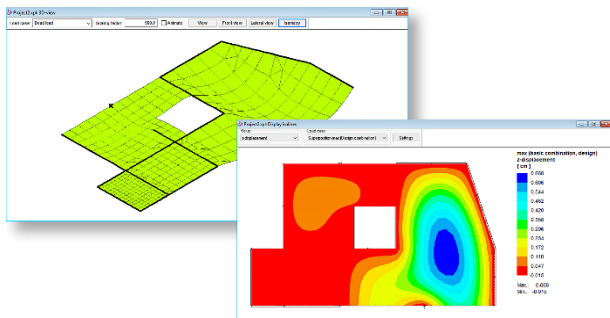
- verification and dimensioning of rectangular foundation slabs according to DIN 1045, DIN 1045-1 or ÖNorm B4700
- soil-mechanics verifications and reinforced concrete verifications for individual load cases and load case combinations
- calculation of the soil pressures with a double eccentricity
- determination of the position of the neutral axis with a gaping joint
- verifications of the bearing capacity safety and sliding safety
- bending and shear design of slab at generated or selected sections
- punching verifications for circularly and rectangularly connected columns according to DIN 1045 and DIN 1045-1

A construction suggestion for the reinforcement design can be created. For rectangular foundation slabs, the reinforcement drawing can be transferred directly into ZEICON® as a ZAC macro, or in the DXF format via ZACView to any CAD system.

## RTslab

Windows® programme with graphically interactive input, calculation, design and evaluation of plane, rectangular and polygonal slab systems. This application is simple to handle, has an integrated user's guide and contains in detail the following features:

- integrated learning wizard with processing hints
- interfaces to ZEICON® and DXF for direct import of CAD data
- complete undo / redo functionality at system input
- object- and context-sensitive working environment
- clear toolbars for all essential programme functions
- simple 2D constructions for slab fields, walls, columns and box outs as well as point, line and area loads on grids, on axes and in dialogue
- integration of downstand beams for the illustration of more realistic stiffnesses
- 3D viewer for the visualisation of slab geometry and loads
- powerful FE solution with the calculation core of TRIMAS®



- element formulation according to the Reissner- Mindlin-Theory for arbitrarily thin and thick slabs
- consideration of an elastic bedding
- animation of deformations for a better control of input data for each load case

- definition of arbitrary section window for the graphics in the output list
- loading with automatic load case generation and reinforcement steel (As) superposition for each field
- import function for loads from previous slab applications
- bending design for reinforced concrete according to DIN 1045, DIN 1045-1, EN 1992-1 and according NAs for DE, AT, SK/CZ and UK
- shear design for reinforced concrete according to DIN 1045, DIN 1045-1, EN 1992-1 and according NAs for DE, AT, SK/CZ and UK
- punching verification according to DIN 1045, DIN 1045-1, EN 1992-1 and according NAs for DE, AT, SK/CZ and UK
- automatic design of areas near walls and columns
- illustration of results via isolines with freely setttable contour lines
- preview for position and load drawing
- result preview for deformations, bearing reactions and slab stress resultants as well as reinforcement steel (As) values
- selective output control with preconfiguration, document preview and outline
- automatic generation of the complete result list including diagrams and graphics
- list generator for RTPrint, RTF or HTML format
- Online supports and manual, introductory example

The slab system application can also be started as an integrated tool from the CAD programme ZEICON®. In this case, the design results from the internal data transfer are available and can be used directly for the reinforcement of the slab.

## RTviewer

General CAD tool under Windows® with the following functions:

- viewer for different CAD formats: HPGL, BGL, DXF, ZAC
- converting of these formats to DXF
- fast zoom and pan functions
- page facilities, optionally true to scale
- plot output via Windows®
- creation of drawings from the ZAC variants
- creation of steel and material lists
- processing of ZAC variants in OLE-compatible applications, such as e.g. MS Word, AutoCAD or TurboCAD
- visualisation of generated constructions and reinforcements from different static applications
- transfer of ZAC variants into different CAD systems via DXF-Export

## Performance upgrade with RTec EXPERT

All the above-mentioned calculation and design options of the structural analysis package are also included in RTec EXPERT. The RTec EXPERT structural analysis package is available as an enhancement with additional functions for reinforced concrete girders (multi-span prestressed girders), columns with polygonal cross-sections with/without longitudinal prestressing, polygonal foundations incl. circular, block and sleeve foundations and reinforced concrete design. This enables particularly demanding engineering tasks to be solved using "EXPERT".

For further and more detailed information regarding each program and the EXPERT version, please visit [www.rib.de/structural-engineering](http://www.rib.de/structural-engineering)