

Feature Summary

Following is a ROBOT™ Millennium 21.0 software feature summary that provides an overview of new features in the following five categories:

- General** (Common features, display enhancements)
- Structure Definition** (Features for structure modeling, loads definition)
- Analysis** (New structure analysis options, seismic codes)
- RC Structures** (Features related to calculation and design of RC elements)
- Steel Structures** (Features related to calculation and design of steel members / connections)

You can find more complete descriptions in the help file and the user's manuals.

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GENERAL

Editing

New Selection Capabilities

When you highlight an element, the Context menu includes an extended list of options. This group of selection options (Select Adjoining Objects, Select According To...), lets you quickly select all elements that use the same material, section, or other parameters as the current element.

Copy Properties

To help you easily define object (bar and panel) parameters, this version provides a Copy Properties option. This feature is similar to the Format Painter in MS Word.

The Copy Properties option lets you quickly assign attributes taken from existing objects. For example, you can now assign all attributes of a bar, such as sections, releases, offsets, and so on to other bars. The general rule is that the first object selected (from the menu or toolbar) or highlighted (Context menu) becomes the reference object. The next objects selected of the same type take on the properties of the reference object.

Clipping Planes in XYZ Directions

This version of ROBOT™ Millennium provides a new button in the bottom-right corner of the screen. This button provides access to four sliders:

- The first three sliders let you control pairs of clipping planes along global coordinate axes. Parts of a structure presented outside of the clipping planes are displayed as a semi-transparent shades.
- The fourth slider allows you to control the transparency ratio. A transparency ratio equal to zero displays only that portion of an object inside the clipping planes.

These options allow for quick display/control of the internal part of a structure, as well as quick selection on the reduced display.

Vertical Objects Edited on a Plane

Vertical objects (columns/walls) may be inserted by positioning their bottom nodes, with the whole object placed perpendicularly according to a given height.

Load Symbols and Text Labels as Graphical Objects

If you highlight a load symbol, you can access, via the Context menu, its property – load definition and redefine its value, or delete the load. The change may apply only to a highlighted load, or to all elements for which the load was applied in the current record.

Additionally, you can now edit or move text labels with descriptions of loads, diagrams, or displacements. This ensures more readable printing. Editing is available from the Context menu after highlighting the text label.
Edited labels are printable.

Presentation

Map Scales as a Legend and Related Enhancements

This release of ROBOT Millennium allows you to include a legend for map displays. You can also choose the position of the legend.

In addition, you can now define the thickness of isolines, and display characteristic values on maps.

RC Elements and Steel Connections in the Structural View

RC design object names, steel connection parameters, and RC foundation plans may be displayed in the model view, similar to other objects or object properties.

Separate Display of Panels and Claddings

The Display option now allows for separate display of panels and claddings.

Dialog Boxes With Tabs as Option Lists

Tabbed dialog boxes now provide scrollable, vertical tabs. With one click all tab options are visible, providing easy access to options, especially for dialog boxes with a relatively long list of tabs (options). You can display this list using various transparency ratios, and can save both the transparency and the mode of display (unfolded or hidden list).

Multi-Selection in Label Manager (e.g., Database Sections)

This release provides for multiselection of objects (labels) from the list on the left-hand side of the dialog box. Until now you could only copy each label separately). This functionality is especially useful for database section selection, where the whole list of sections can be arranged before transferring from left to right and vice versa.

Group Selection Enhancements

This release lets you save selection groups for claddings and other objects.

XP Look of Dialogs

After re-compilation, dialog resources have either a “Windows® XP look” or “Windows Vista® look”.

Changes in the Main Preferences and Job Preferences

This release includes new options such as:

- Toggle Object Inspector
- Result buffering.

STRUCTURE DEFINITION

New Section Definitions

This release provides new section definitions:

- Compound sections - double I-sections rotated by 90 degrees
- Welded box sections with different flange plates
- Solid square and round sections

Joists

Steel joists are prefabricated standard steel truss and girders widely used in the US market. ROBOT Millennium implements a standard database and parametric definition of steel joists. Additionally, the Steel Design module allows for their verification (design) according to pre-defined tables.

Analytical Definition of Arc and Circle

You can now define Arc and Circle objects analytically. Previous versions only provided for discretization into a number of sides. (Currently discretization is applied to polyline and contour objects, but not bar objects).

Analytical definition resolves problems in:

- Revit® - ROBOT Millennium link of arc walls and plates
- CBS Pro – ROBOT Millennium link of arc walls and plates
- Meshing on arc walls and plates

Reduction Factors

The new Reduction Factors functionality lets you define reduction factors for:

- Stiffness - Allows modeling of stiffness loss due to cracking in RC panels
- Weight - affects self-weight calculation
- Mass- affects dynamic analysis.

For example, you can now analyze a slab using a reduced value according to either a given percentage or the original percentage.

Releases as Percentage of Beam Stiffness

You can define beam end releases as a percentage of the original stiffness: 100% stands for a perfectly stiff connection (no release); 0% stands for a perfectly free (e.g. hinged) connection.

Loads on Claddings – Speed up of Load Generation

The calculation of load on cladding has been improved for speed.

Wind Load on Intermediate Columns (French Snow/Wind Code NV)

The previous Wind Load option let you generate loads for 3D frames made of repeating 2D frames. In the current version, you can automatically generate a wind load for intermediate columns between the main frames.

Concentrated Loads with Internal Node Generation

This option lets you generate nodes on bars at the points where concentrated forces are applied. Such generation divides the bars into finite elements, and automatically adds characteristic points for results analysis and design.

Non-linear Load Combinations

This feature allows for generation of code combinations for structures containing elements which require non-linear analysis (like compression only bars, non-linear supports, and so on). This produces a set of separate non-linear combinations.

Loads on Claddings

This version allows you to apply all the existing load types for panels to claddings, and distribute them onto bars.

ANALYSIS

Seismic Analysis - Reduction of the Size of Results

In this release, results of quadratic combinations are stored as the final result, instead of single mode results, for seismic analysis. An additional option in Job Preferences lets you save results for a single point in the shell finite elements which further reduces the size of results.

Seismic Analysis - Saving Results for Modal Combinations

This release includes a new option for saving seismic modal combinations without the need for full dynamic calculations.

Seismic Analysis – Automatic Generation of Newmark’s Combinations

You can now automatically generate modal analysis for different eccentricities, and the full list of seismic result combinations.

Seismic Analysis - New Seismic Codes (and Code Updates)

This release includes the following new seismic codes:

CANADA - NBCC 2005
FRANCE – PS 92 (update 2008)
INDIA - IS 1893: Part 1: 2002
RUSSIA - СП 31-114 2004, and SNIP II-7-81 (update 2000)
UKRAINA - ДБН В.1.1-12:2006

Damping in Transient (Time History) Analysis

You can now define constant damping for the nodal restraints (supports, bar releases, compatible nodes, and so on).

Calculations (Structure Analysis) as a Separate Application

The “Calculations - stand-alone application” option allows for the consecutive calculation of a list of examples.

The calculations run without loading the full ROBOT Millennium graphical interface, helping you manage system resources for large calculations.

Speed up of Results (Maps) Presentation

This release of ROBOT Millennium has improved the performance of map display by buffering the data calculated for the map. Map buffers can also be saved with the corresponding files for re-use.

RC STRUCTURES

Editing / Definition

New Graphical Viewer for RC Beam / Column Modules

This release includes a new graphical viewer that includes:

- Graphical modification of reinforcement
- Ability to add to final drawing (dimension lines, text, etc.)
- Export of drawing to DXF™/DWG™ file specification

Inspector

Additional integration with the FE model has been implemented. The following additional information may now be displayed for columns:

- Upper column
- Upper beam
- Column chain (as a new group)

Update of Imported Elements

Changes in the model are carried through previously imported structural elements. Levels, inclined beams, rigid links and column chains are recognized.

Slabs

Slab Reinforcement Reorganization

This release includes the following enhancements:

- Re-organization of calculation dialog box (linear/non-linear)
- Improvements in zone definitions (grid)
- Introduction of enhanced verification possibilities

Beams

Inclined Beams

This release includes inclined beams – definition, editing, calculations, and reinforcement generation

Openings in Beam Without the Need of Recalculation

An alternate beam model with openings to avoid recalculation of a whole beam when editing is available.

Columns

New Calculation Notes

Detailed notes are available for the following codes: ACI, BAEL, BS, CSA, DM, EC2, NS, PN.

Saving of Buckling Parameters

This option lets you use saved parameters for several columns rather than define them separately.

Import of a Column Chain (Multi-Leveled Columns)

It is possible to import a column in one chain.

Module Reorganization

This release features:

- Acceleration of calculations (verification of typical reinforcement patterns instead of design of required reinforcement).
- Improved speed and enhancements in the creation of integration diagrams.

RC Walls

Import of Walls from ROBOT Model

Walls may be imported from a current ROBOT Millennium structure.

ACI/BAEL – Reinforcement Generation Using Wire Fabric

A new reinforcement type, wire fabrics, may be used.

BAEL – Improvements

The following enhancements have been implemented:

- Combination names are presented in the results layout.
- More complete calculation notes are available.
- Reinforcement design can take into account average or maximum tensile forces.

Foundations

Block Foundations (French Market Only – “*Massif Encastré*”)

This option is available only for codes DTU 13.12 and Fascicule No 62

DTU/Fascicule Separation of Calculation Paths for Soil Capacity

Three methods are now available:

- Laboratory
- Pressometric
- Simplified pressometric with rectification

Lateral Soil Pressure Considered During Sliding Calculations

During sliding calculation (verification) the interaction of soil on foundation sides may be taken into account. This allows more realistic spread footing design.

New Codes

ACI Edition 2005

It is possible to design RC elements according to ACI 318-05.

EC2:2004 Edition

Required (theoretical) reinforcement according to the new (final) edition of EC2 (EN 1992-1-1:2004) is available for beams, columns, and slabs.

Results Presentation

Presentation of Stresses

This release allow for display of stresses presentation in reinforcement and concrete for the specified load cases for RC slabs, beams, and columns (improvement of existing BAEL code option).

HTML Notes for Calculation Option

All reinforcement parameters (including slab definition and calculation/reinforcement options for the module of calculations of bar reinforcement) are available in the form of HTML notes. They may be added into the final note.

Integration

Common Wire-Fabric Databases

All modules now utilize common AutoCAD® Structural Detailing / ROBOT wire fabric databases.

Common Naming of Levels and Elements

RC elements imported from a structure are grouped by levels if such definition exists. In addition, names of RC elements may be displayed on the structural view.

STEEL STRUCTURES

Steel Connections Design

EC3:2005 Connections

Now available:

- Beam-column and beam-beam connections (using numerous detail arrangements, and two principal fixing methods: welding / bolting) conforming to the new edition of Eurocode – EN 1993-1-8:2005
- Truss connections of types KT, X, and simple bar conforming to the new edition of Eurocode – EN 1993-1-8:2005

PN-90/B-03200 Connections

Truss connections of types KT, X, and simple bar conforming to the Polish National Code PN-90/B-03200 are now available.

Conversion Between Codes

Joints defined (or calculated) for one code can be now “transferred” to another one, with some limitations. This allows for recalculation by Eurocodes of the connections originally defined for national codes, or vice versa.

Renaming of Connections

Renaming and renumbering of joints (without the necessity of connection recalculations) is possible for both defined and calculated connections.

Calculation Notes for the List of Connections

HTML notes (with results) may be now edited, and provided with additional comments, if necessary.

Notes may be printed for the whole list of connections.

Steel Members Design

Calculation Parameters Presentation

The whole set of parameters of steel "labels" can be transferred into an HTML note (initially for EC3:2005, PN90 and CM66).

Intermediate Points Presentation

Intermediate points, whose position might be uncertain, are presented to give clear and definitive information for an engineer.

Automatic positioning of intermediate points in areas with zero bending moments is now possible.

Results Saving

The results of calculations (verification/design/optimization) may now be saved and instantly accessed.

Tapered Member Properties

Buckling parameters may now be calculated taking into account a defined point in a section (not necessarily the mid-point).

French Code ADD80 (*Additifs 80*) – Detailed Analysis

This is available in this release and is similar to the CM66 implementation.

NADs to the EC3:2005

This release includes implementation of the French and Danish NADs to the new EC3 issue.

Spanish Code SEA:2006

The 2006 edition of the Spanish code SEA:2006 is available (since maintenance MP2).

New Edition of the US Code ANSI/AISC 360-05

The 2005 edition of the code AISC is available, replacing the ASD and LRFD codes.

Joists Design

This release features simplified design of new member types (joists). This is available only for American codes, on the basis of a calculated equivalent uniform load as opposed to a tabularized one.

Purlins Verification (EC3:2005)

Calculation procedures, described by point 10 of EN 1993-1-3 "*Special considerations for purlins, linear trays and sheetings*" have been implemented.

The provisions given in clause 10 may be applied to beams (purlins) of Z, C, Omega, and U section types.

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