Autodesk® Robot™ Structural Analysis 2013 and
Autodesk® Robot™ Structural Analysis Professional 2013

Feature Summary

Following is an Autodesk® Robot™ Structural Analysis 2013 and Autodesk® Robot™ Structural Analysis Professional 2013 software feature summary that provides an overview of new features.

New features and functionalities are grouped in three categories:

Structure analysis	*Features for structure modeling and analysis*
Steel design	*Features related to calculation and design of steel members and joints*
Reinforced concrete design	*Features related to calculation and design of RC elements*

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

Table of Contents

STRUCTURE ANALYSIS

Analysis

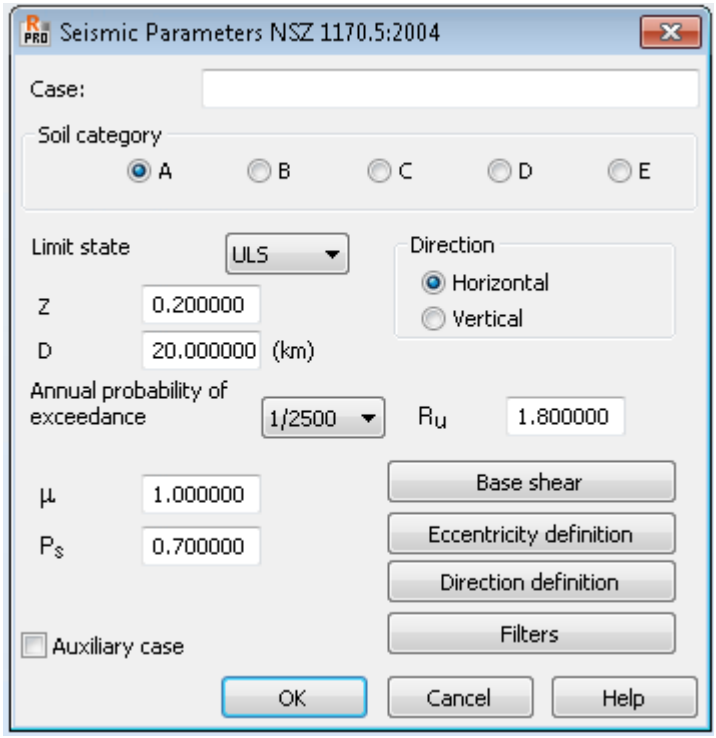
Seismic load analysis by Response Spectrum approach

Seismic load analysis using Response Spectrum approach has been extended with the following national codes:

Australia	AS 1170.4 - 2007	Earthquake actions in Australia.
Canada	NBCC 2010	National Building Code of Canada 2010
New Zealand	NZS 1170.5:2004	Earthquake actions - New Zealand.

New codes are the default codes for New Zealand, Australian and Canadian regional settings, and are settled automatically after selecting any of these regional settings in Preferences dialog. New codes may be chosen as well individually inside Job Preferences dialog.

Analysis parameters are defined using standard seismic parameters dialogs which are displayed while defining the new seismic analysis load case, or inspecting properties of existing (defined) seismic load cases. Parameters dialog displays the code name in the header, as is shown on the picture below for exemplary New Zealand code dialog.



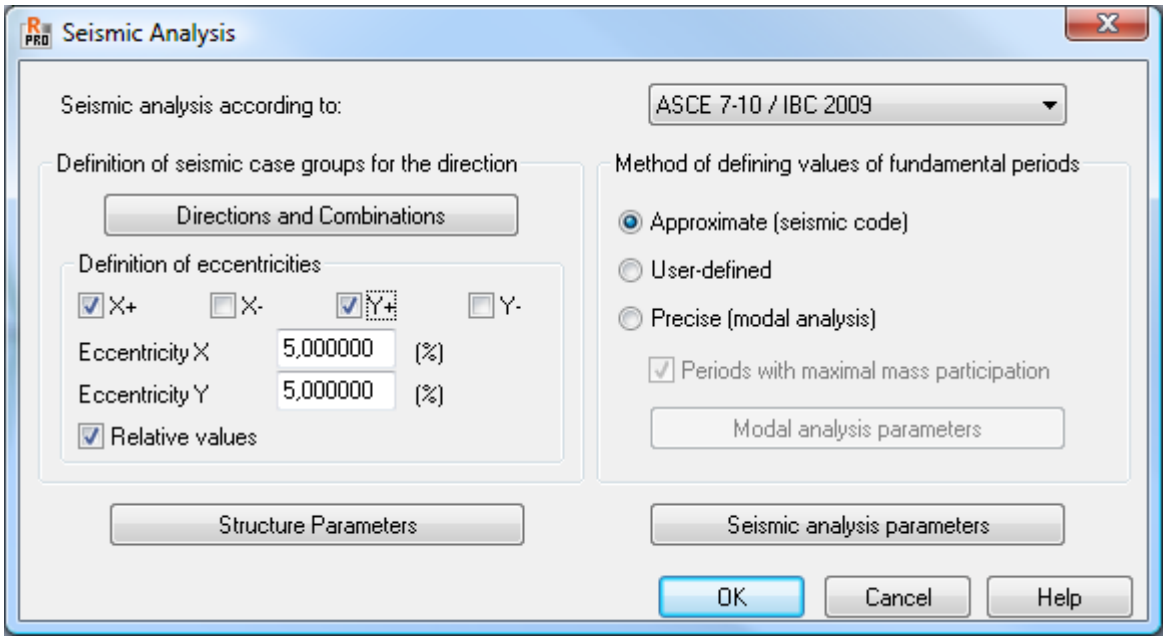
Seismic load analysis by Equivalent Lateral Force method

The Equivalent Lateral Force method was developed to allow seismic analysis according the following national codes:

Australia	AS 1170.4 - 2007	Earthquake actions in Australia.
Europe	EC8 1998-1:2005	Eurocode 8. Design of structures for earthquake resistance
United States	ASCE 7-10	Minimum Design Loads for Buildings (recalled in the IBC 2009 requirements)

The Equivalent Lateral Force method is an alternative (simplified) approach for determining distribution of seismic base shear force on the height of regular, multistory building. This method is the most commonly used design procedure allowing determination of design seismic forces by a linear elastic static analysis of the structure.

Applying this approach needs definition of a load case of a separate analysis type: 'Seismic (Equivalent Lateral Force Method)". Seismic codes for this option are selected independently on the seismic analysis codes defined in Job Preferences.



Depending on directions and eccentricities definition series of 'static – seismic' load cases are generated. X/Y components of direction vectors are understood as additional "multipliers" for the calculated horizontal forces on each direction.

When mass eccentricities (5% displacement of the center of mass) are defined on both directions load cases are generated for all combinations of mass displacements but on both orthogonal directions at the same time.

Acting forces for the load cases created while Equivalent Lateral Force Method analysis is defined are generated during structural analysis phase. This is why they cannot be seen before launching structure analysis. To be displayed graphically on the screen it is needed to check the option "forces generated automatically" in the Display dialog. Their tabular values may be seen on "Pseudostatic forces" table.

The seismic design story shear is distributed among the story nodes reflecting the mass distribution. When a floor is modeled by diaphragm (no internal nodes are defined) the shear force is attached to its gravity center.

The structure model has got to stories defined, however they are understood more as geometry division and do not need to have real floors presented (frame structures may be analyzed as well).

Seismic load analysis according to the updated French Eurocode 8

Seismic analysis according to the latest French regulation "*Arrêté du 19 juillet 2011*" which specifies the usage of the Eurocode "NF EN 1998-1/NA décembre 2007" is now available after selecting the code: "NF EN 1998-1/NA:2007 19.juil.2011".

Actions

New load combinations according to the Australian and New Zealand code AS/NZS 1170.0:2002

Imposed action characters and combination factors defined in AS/NZS 1170.0:2002 are now taken into account when the above code is selected in *Job Preferences* (section *Design codes\Loads*) or in *Automatic Combinations* dialogs.

It is possible now to generate automatically load combinations according to this code.

New load combinations according to the Canadian code NRCC NBCC-2010

New regulation file conforming National Building Code of Canada 2010 is now available. This regulation governs when NBCC 2010 design code is selected.

New load combinations according to the US code ASCE/SEI 7-10

New combination factor for Wind load and other changes introduced by the new code edition ASCE/SEI 7-10 were incorporated into regulation files for ASD and LRFD approaches.

Two new regulation files for automatic generation of combinations have been added, presented in the list of load combinations under the names: LRFD ASCE 7-10 and ASD ASCE 7-10.

Integration with Autodesk Revit Structure models

Updating analytical model changes for floors in a Revit model

When updating a model in the Autodesk® Revit® Structure 2013 software after changes made by Autodesk® Robot™ Structural Analysis Professional 2013 software, the corresponding floors analytical models are compared. If any difference is detected, the link attempts to update the Revit floor analytical model by setting new analytical model curves.
Note: Some restrictions apply – please check the Autodesk Revit Structure help for details.

Sending analytical links defined in a Revit model as Robot rigid links

Autodesk Revit Structure 2013 introduces an analytical link (an element connecting 2 separate analytical nodes). When sending model from Revit to Robot analytical links are converted and transferred to Robot as rigid links.
Note: Transfer of rigidity of the analytical link which can be defined in the Type Properties is not yet supported.

Structure Definition

Japanese materials and section database update

Japanese materials – concrete and steel grades – were updated to correspond to the current code requirements and market state. Similarly database with H and I families of hot-rolled steel section was updated.

Improvements

Speed-up of quadratic combination calculation

Seismic modes are now combined much faster, due to optimization and refactoring of the mathematical operations on vectors with large zero numbers. Observed acceleration varies from 2 up to 8 times depending on a model.

Optimization of cladding loads treatment

Smaller memory consumption and file size as well as quicker model generation are observed after optimizing distributed loads defined on claddings.

UI CHANGES

New UI language

German working language

The new German working language was added. Selecting the regional settings for Germany activates it automatically.

Small changes in the software behavior

Inspector dialog

When the inspector data is recalculated, and the dialog is inaccessible for the user actions, appropriate info about refreshing the inspector dialog is displayed in the comment line, at the screen bottom.

Load cases selection

Load cases are not selected as “all” any longer without an intentional user action. This prevents the user from receiving unwanted information.

STEEL DESIGN

Steel Members Design

Belgian Eurocode

It is possible now to perform steel member design according to requirements of the Belgian National Annexes for Eurocode 3, published recently:

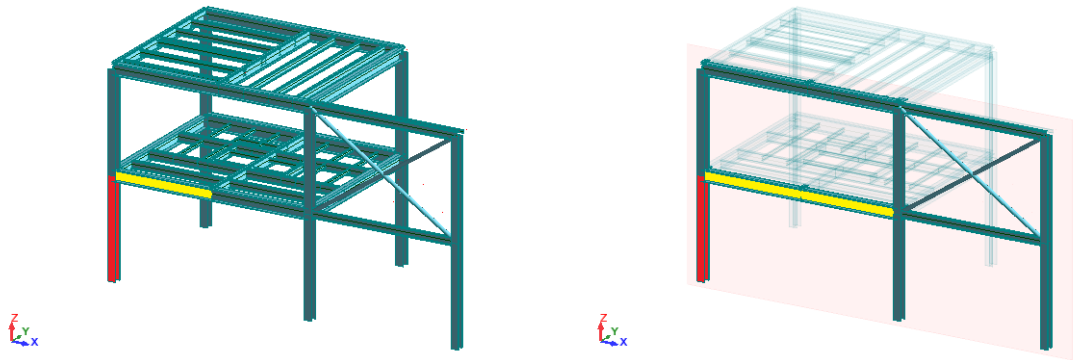
NBN EN 1993-1-1 ANB:2010 –	General rules and rules for buildings
NBN EN 1993-1-2 ANB:2010 –	General rules - Structural fire design
NBN EN 1993-1-3 ANB:2011 –	General rules - Supplementary rules for cold-formed members and sheeting
NBN EN 1993-1-5 ANB:2011 –	Plated structural elements

Common label NBN EN 1993-1:2005/AC:2009/ ANB:2010 is used in the software to allow selecting design procedures according to the above documents.

Modification of an automatic buckling length calculation procedure

Automatic buckling length calculation procedure was designed for the regular frames of semi-perpendicular systems of columns and beams. The procedure analyzes an individual element and its end node stiffness according to the code regulations. This involves analyzing all chains all adjoining elements.

The procedure modification limits the adjoining elements chains to the elements lying in the considering buckling plane. Thus additional ‘out-of-plane’ elements do not influence any longer on the length, and stiffness of adjoining branches as shown on the picture below. Marked with yellow color beam was previously understood as ended in a middle length, where a calculation node was created by adjoining perpendicular beam. Now, when only elements lying in the same planes are considered, the length of a horizontal beam is two times bigger which influences on the upper column node stiffness.



Optimally displayed and tiled result windows

Summarized results windows displayed automatically after steel member verification are now placed in the top left corner of the graphical viewer allowing on easy access to all menu and toolbar commands. Adding or closing windows creates automatically ordering tiled windows sequence.

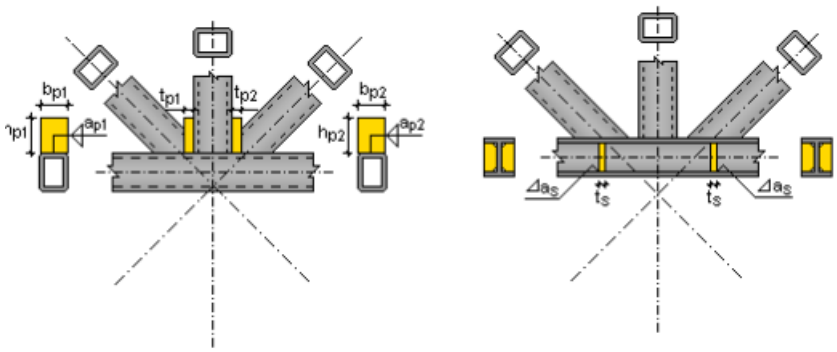
Windows moved manually to different position keeps it position until closing.

Steel Connections Design

Additional vertical plates and stiffeners in tube truss connection

Transverse plates are subjected to use in case of overlapping diagonal (post) bars. This usually occurs when bars have different dimensions or when, from constructional reasons, adjoining elements can't be welded directly to each other. The use of such plates facilitates the installation of such connection as well as increases its capacity.

Another way to increase connection capacity is to add chord transverse plates, which increases web shear capacity and eliminating buckling effects in chord web.



Bothe elements may be defined now for tube truss connections.

Possibility to calculate shear bolt resistance on threaded portion

Until now capacity of bolted connections was calculated taking into account shear on unthreaded part of bolts. This is a typical approach which allows taking full advantage of the maximum bolts capacities.

However in some situations shear plane may pass through the threaded part of a bolt which decreases bolt capacity and the resultant connection capacity.

To allow this - bolted connections may be now checked taking into account reduced bolts capacities sheared through threaded or unthreaded portion.

REINFORCED CONCRETE DESIGN

Design

RC Beam and Columns design according to DM 2008

New Italian code DM 2008 has been extended on Beams and Columns provided reinforcement design/checking.

RC Walls design according to NF EN 1992-1-1/NA:2007

RC Walls may now be designed according to the French Eurocode NF EN 1992-1-1/NA:2007

Required reinforcement calculation according to SNiP 52-01-2003

It is possible now to calculate required reinforcement of RC elements according to the Russian code SNiP 52-01-2003.

SLS calculations for RC Columns

Serviceability Limit Stress requirements may be now taken into account while designing rc columns.

Depending on the code two conditions are checked: stress limit in concrete/steel, and crack width. Crack width is calculated using code formulas for beams, substituting used values by their column counterparts.

The following codes take into account both conditions:

BS EN1992-1-1:2004 NA:2005
DM 2008
EN 1992-1-1 DK NA:2007
EN 1992-1-1:2004/ AC 2008
NF EN 1992-1-1/NA:2007
NS -EN 1992-1-1:2004/NA:2008
PN-EN 1992-1-1:2008
SFS-EN 1992-1-1
UNI-EN1992-1-1

Cracking width is checked exclusively while using the code

PN-B-03264(2002)

Solely stress limit calculations governs for:

BAEL 91 mod. 99

Automatic generation of RC seismic joints while columns design

For rc columns imported from the structure model, when seismic calculations are launched seismic joints are automatically created. This is possible if all adjoining beams were previously designed and the same sets of loads were accepted while importing columns and beams.

The option is available for the following codes:

ACI 318/08
ACI 318/08 metric
ACI 318/08 Thailand
BAEL 91 mod. 99
DM 2008
EN 1992-1-1:2004
EN 1992-1-1 DK NA:2007
NA to BS EN1992-1-1:2004
NF EN 1992-1-1/NA:2007
NS-EN 1992-1-1:2004/NA:2008
PN -EN 1992-1-1:2004/AC 2008
SFS EN 1992-1-1
UNI EN 1992-1-1:2004

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