WHAT IS NEW in Advance Design 2014

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Welcome to Advance Design 2014

Advance Design 2014 is fully part of the Graitec Advance suite, consisting of Advance Concrete, Advance Design, Advance Steel and Advance CAD.

GRAITEC Advance is a Building Information Modelling (BIM) system that automates the entire structural design and construction documentation process from engineering design and structural analysis to member optimization, detailing and fabrication.

Advance Design 2014 has important improvements in several areas:

- New tools to tune a descriptive model imported from GTC
- Automatic supports stiffness calculation according soil properties
- Implementation of a 2D climatic generator
- New post-processing grid
- New option “Modified construction” for EC8 design
- New envelope tables on supports
- Rebar improvements on concrete columns
- Improvements on the link from Advance Design to Advance Concrete

Advance Design 2014 is the invaluable tool for all your projects.
What is new in Advance Design 2014

2D Climatic generator – Eurocode 1

Advances Design features a brand-new 2D climatic generator, based on EN1991-1-3 (snow effects) and EN1991-1-4 (wind effects).

It benefits from the same functionalities as the 3D climatic generator that has been in Advance Design for several years:

- CsCd coefficient taken into account
- Wind parameters given per direction
- Specificities from national appendices

This 2D climatic generator is available as soon as the workspace is set on plane:

Properties of wind load cases will then show new parameters.

These parameters enable users to define:

- Building length (out of plane dimension)
- Position of the structure
- Cpi coefficient (if needed)
- Openings

Additional parameters will be available through the linear element properties.

Users will be able to:

- Activate the 2D climatic generator on the selected elements
- Define the selected element as a parapet wall, an awning…
- Define the load span on both sides of the elements (so that Advance Design can convert planar wind and snow forces into appropriate linear forces).
- Enter a continuity coefficient (extremely useful when purlins are not simply supported).
The automatic generation will create the corresponding wind and snow forces:
Eurocode 8 – French appendix

According to a document published on October 22nd 2010, existing structures having their initial surface modified can be designed with a reduced value for acceleration.

In this case, AgR can be taken as 60% of the initial value.

<table>
<thead>
<tr>
<th>Zone</th>
<th>$a_g$ (new buildings) m/s²</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (very weak)</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (weak)</td>
<td>0.7</td>
<td></td>
<td></td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>3 (moderate)</td>
<td>1.1</td>
<td></td>
<td>0.66</td>
<td>0.66</td>
<td>0.66</td>
</tr>
<tr>
<td>4 (medium)</td>
<td>1.6</td>
<td></td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>5 (high)</td>
<td>3</td>
<td></td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
</tbody>
</table>

A new option has been introduced in the seismical properties in order to activate this reduced acceleration:

The initial AgR value is displayed in the property sheet, just for information.

This option is only available when set on the French appendix.
What is new in Advance Design 2014

Import/Export of support actions

In AD2014, users can export the actions on supports from a model in order to use them as inputs in another model.

This works on a selection of punctual supports, using a simple .TXT file.

Export

After the calculation, users must select one or several punctual supports and access the File / Export / Actions on supports menu:

Advance Design 2014 then exports support actions for all the active load cases from the combinations menu.
What is new in Advance Design 2014

This creates a .TXT file containing forces coordinates (X,Y,Z) and intensity (FX,FY,FZ, MX,MY,MZ) but also load case number and type (Dead loads, Live loads, Wind, Snow, etc.):

Import

The process is similar to export, except actions must be imported in model phase (i.e. before the calculation).

Users will simply open the File/Import/Actions on supports menu; select a .TXT file as well as an anchor point:

If load cases described in the file do not exist in the model, Advance Design will automatically create them.
Graphical offset

In Advance Design 2014, users are able to define an offset on elements without taking it into account in the calculation sequence.

After defining the offset, users will simply uncheck the **Considered for FEM** field from linear/planar element properties:

By doing this, the offset will have no impact on results.
Automatic support stiffness calculation

Advance Design 2014 now features a method to calculate support stiffness (in kN/m3) based on soil properties. Users will first define soil layers (soil type and thickness), by choosing from a customizable library:

Then, Advance Design will turn the support contour into a much simpler shape (equivalent rectangle).

Eventually, knowing the equivalent rectangle dimensions and the definition of soil layers (level and modulus of elasticity), Advance Design 2014 will apply the bedding method to calculate the foundation modulus. The vertical stiffness (KTZ field) from support properties is then automatically updated.

This process is available for planar support (elastic and T/C) but also for punctual and linear supports.
In order to calculate the equivalent rectangle, new fields have been introduced in the punctual and linear support properties to define footing dimensions.

The soil profile can be defined from support properties, by setting the "Vertical stiffness" field to “auto calculation” and then by defining soil layers:

But one can also access the Soil manager through the Edit / Used soils… menu:

One or several soil profiles can be defined:
What is new in Advance Design 2014

These soil profiles are then available for selection in support properties:

A dedicated chapter from the report generator is available if automatic calculation of vertical stiffness has been activated on one or several supports.
New tools to improve BIM exchange

Advance Design 2014 features a set of new tools to easily correct a model from Advance Steel (or any other CAD software).

These icons are on the CAD Modifications toolbar.

The new available tools are:

- "Check control"
- "Auto trim & Extend"
- "Projection on plane"
- "Stretch to node"
- "Offset cancel"

"Check control" function

When using the "Check control" function, Advance Design will detect any objects with their bounding boxes intersecting each other, but without having their axes connected.

Typically, this function will point out the elements that seem to be connected, though they are not from a calculation point of view:
This function will also point out nodes that are abnormally close to each other (i.e. distance between these nodes is smaller than tolerance).

The tolerance for the Check control function is set manually in the Options / Application menu.

When using the "Check control" function, Advance Design will return a list of warnings in the console. Users can then double-click one of them for Advance Design to immediately select the corresponding elements on the 3D model.
"Auto trim & Extend" function

This function works in the same way as the existing "Trim" and "Extend" functions in Advance Design, except it can operate on a selection of elements.

Depending on the tolerance (from the "Options / Application" menu), Advance Design will automatically extend or trim the extremities of the close objects.

Yet, this function will not modify their axes, and it will not affect elements that are not in the same plane either.

In the following example, beams and columns are properly connected but columns are a bit too long.

Users will simply select the whole set of elements and run the "Auto Trim & Extend function" for perfectly connected objects.
"Projection on plane" function
This function will project a selection of elements on a given plane.
The plane can be defined by two lines, or by one line + one point, or by a planar element (or windwall).
This function can be useful if bracings were not created in the same plane as the supporting elements:

- Users will activate the "Projection on plane" function.
- Users select the elements to be projected and press [Enter].
- Users define a plane by clicking two columns and pressing [Enter].

Such issues are now easy to correct:
Elements now belong to the same plane.

"Stretch to node" function
This new function will automatically stretch a selection of objects to a specific node.

- Users activate the "Stretch to node" function.
- Users select the elements to stretch and press [Enter].

- Users then select the reference node and press [Enter]:

- Elements are now properly connected:
New "Magnetism" property on geometrical points

A new parameter has been added in the point properties.

This new parameter makes the “Stretch to node function” even easier to use. The objective is to automate this function by placing the “magnetic points” on the structure and running the function on a multiple selection of magnetic points.

- Users create points with their Magnetism property activated.

- Users can then select all elements and activate the "Stretch to node" function.
Advance Design corrects the elements within tolerance and it is able to ignore the others.

"Offset cancel" function

Sometimes, when importing a model from Advance Steel, the position of the column is correct but the members are created with a reference line defined on the exterior face of the column.

When importing such a model in Advance Design, we get the following result:

After importation in Advance Design, the properties of the column are the following:

To solve this issue, one solution is to move the column by 0.25m (in this example) and set the offset to 0. Then, the beam and the column will be well connected.

In Advance Design 2014, the new function “Offset cancel” will do it automatically:

- The user selects the columns.
- Then activates the “Offset cancel” function.
- Advance Design moves the column by a distance equal to the offset defined in the property list and sets the offset value to 0.

If the column has two different offset values at the two extremities, the software does not apply the command and returns the following message: [Impossible to apply this command on an element with different offset values at the extremities].
Rebar improvement for reinforced concrete columns

In previous versions of Advance Design, it was not possible to calculate/impose the real transverse reinforcement on columns, useful, for example, for the capacity design.

The existing dialog box was the following:

This dialog box has been improved in order to be able to define all bars (longitudinal and transverse) of a reinforced concrete column:

Longitudinal reinforcement bars

The “Longitudinal reinforcement bars” tab allows the user to define all parameters for this rebar family:

- Diameters of the main and secondary longitudinal bars.
- Hook angles at the two extremities of the column.
- Number of longitudinal bars (main and secondary ones) on each side of the column.

This “real” rebar definition will be used for the capacity design check.
Transverse reinforcement bars
The “Transverse bars” tab allows the user to define the transverse bars in the 3 different zones of the column (extremities and current zones), as defined in the EN1992-1-1:

Users can define as many series as they want, with the diameter and the spacing for each one.
Extra information for failed checks

If a check fails, the calculation report now points out the element causing trouble. **Example**: if the limiting value is related to plate thickness ($F_{t1, ep, Rd}$), this information will be clearly shown in the report.

That way, users know exactly which parameter they have to reconsider (#289).

The connection status window also shows the work ratio for each failed part of the joint.

New set of icons

Icons have been added in the top-left corner of the window in order to:

- Create a new project.
- Open an existing project
- Save the current project
- Save the current project under a different name
- Send an email to technical support (this will automatically compress the current project and prepare an email).
What is new in Advance Design 2014

Other icons enable users to enlarge or hide the 3D model or the joint details (#184 # 244 #256).

**Ability to open the ADSC drawing with AutoCAD**

Previously, the .dwg file produced by ADSC could only be opened by Advance Steel users.

This limitation has been removed in version 2014.

Users only need to launch the "Explode" function before being able to open the ADSC details like any other .dwg file (#309).

**Collision check**

Collision check has been implemented in ADSC 2014 (#70).

This new tool gives the list of elements causing trouble.

Double-clicking a line will automatically zoom on the corresponding area from the 3D model.

The corresponding elements can even be marked with a red arrow.
In the following example, bolts are pointed out as they are too close to the web of the column.

**Easy switch from RTF to HTML report**

Users can now switch a RTF report to an HTML one without having to run a new calculation sequence (#180).

**New "Project parameters" menu**

The "Project parameter" menu enables users to define common parameters for all joints from the project, instead of defining them for every single connection (#109 – #111 – #187 – #250 – #288).
New post-processing grid

The objective of this new functionality is to simplify the results post-processing of planar elements, for FEM and concrete design results.

The user will have the possibility to display the FEM results in a post-processing grid which is independent from the mesh density.

Planar element’s property list update

The post-processing grid dimensions are defined in the property list of planar elements, in the new section “Results grid”:

The two spacing values, X and Y, are defined in the local axes of the planar element.

The grid is created starting from the “center” of the element => then on the edge; the software automatically “cuts” the grid (see the following example):
Graphical display and post-processing settings

After the calculation, in previous versions, it was only possible to post-process the results depending on the mesh of the planar element:

- Either displaying the iso-regions values (example with 0.50m mesh size):

![Iso-regions display example](image)

- Or displaying the values per mesh (example with 0.50m mesh size):

![Values per mesh display example](image)

Now, with the release 2014 of Advance Design, the user can activate the “grid” functionality directly from the results setting dialog box with the option to display the minimal values on each mesh, the maximum or the average values:
What is new in Advance Design 2014

New envelope tables on supports

Two new envelope tables are available on punctual and linear supports:

- The “Complete algebraic concomitant envelope on punctual supports” table lists the concomitant envelopes on a selection of supports and a selection of load-cases combinations:

- The “Complete concomitant envelope of torsors on linear supports” table is similar to the new one on punctual supports, except that it gives the envelope of torsors for the selected linear supports:
New entries in the RC results toolbar

Advance Design 2014 has new options to post-process the concrete results on planar elements. These new options are available from the “Reinforced Concrete Results” toolbar:

It is possible to post-process the maximum values per local directions (top and bottom):

- Max (Axb, Axt): maximum reinforcement values (top and bottom) on x local direction.
- Max (Ayb, Ayt): maximum reinforcement values (top and bottom) on y local direction.

But also to post-process the maximum values per face (taking into account the two directions):

- Max (Axb, Ayb): maximum reinforcement values (x and y directions) on the bottom face.
- Max (Axt, Ayt): maximum reinforcement values (x and y directions) on the top face.
Extended functionalities for time history analysis

The time history analysis capabilities have been extended in Advance Design 2014:

- Possibility to define the selection per system
- New envelope tables with accelerations on nodes.

Selection per system

In order to reduce the calculation time, it can be useful to select only a few nodes on which the user wants to post-process the results depending on time.

In previous releases, it was only possible to define a list of geometrical points to be considered (the corresponding nodes) in the time history analysis:

If the user defines a list of systems, Advance Design will save the time history results on all nodes of the elements from the selected systems.

We have implemented this new option in order to avoid the creation of several geometrical points, which can take time on a big model.

New envelope tables

New tables with envelopes on nodes are available in the report generator, under a new “Time history analysis” chapter:

Note: these new features are also available on AD2013 SP1.
Link Advance Design – Advance Concrete

In Advance Design, in the concrete design assumptions, an option allows the user to ask for a detailed reinforcement design on reinforced concrete beams and columns:

When this option is enabled, the user can access the detailed reinforcement dialog box, available directly from the property list of linear element. In this dialog box, there are two icons related to the reinforcement drawing:

- The icon to view the reinforcement dialog box (is just a viewer dialog box with no possibilities to make modifications).
- The icon to create a BIM file which can be imported in Advance Concrete.
When the user activates the icon, it creates a GTC file, in the “Results \ reinforcement” folder of the current project, which can be imported in Advance Concrete, as reinforcement objects:
What is new in Advance Design 2014

Miscellaneous improvements / corrections

Advance Design 2014 has more than 400 small improvements / corrections. The following list is just an extract of all of them.

Graphical post-processing for capacity design check

With version 2014, the capacity design results can be post-processed graphically in the CAD zone:

The user can display:

- Design and resistant bending moments on beams.
- Design and resistant bending moments on columns, in the two local planes of the element.

Imperial units for loads

The management of imperial units used for loads definition has changed in Advance Design 2014. The unit depends now on the unit system (imperial or metric) used for length:

- If the software detects a metric system for the “length” units, then the linear and planar loads will be entered in “Forces_unit/m” or “Forces_unit/m²”.
- If the software detects an imperial unit system for “lengths”, then the loads will be entered in “Forces_unit/ft” or in “Forces_unit/ft²”.

The unit system is displayed on the header of the corresponding section, in the property list of linear and planar loads:
Option to automatically compact the database

A new option has been implemented to automatically compact the *.adb database when closing an existing project. This new option is available from the “Options \ Application” menu, in the “Automatic saving” section:

New option “Truss structure”

AD2014 has new options in the “Assumptions \ Structure” dialog box to no longer confuse the user about the “truss” structure assumption:

We have replaced the previous check box with two choices:

- “Truss structure” => means that the software will not consider the degrees of freedom in rotation. This option is useful when the user wants, for example, to calculate a structure composed only with truss linear elements (no rotational degrees of freedom).
- “Bending rigid structure” => means that the software will consider the rotational degrees of freedom.

Miscellaneous corrections

- Correction of the number of digits displayed in the copy and move dialog boxes (#14437).
- Correction of a CAD problem when trying to make a rotation with imperial units: the problem was in the definition of the rotation axes with this kind of units (#13715).
- In previous releases, it was impossible to display on screen an envelope of results for a non-linear analysis: problem fixed (#14343).
- Correction of a problem making impossible the access to the harmonic function editor in a model with several dynamic load cases (#14596).
- With previous releases running on windows 8, the steel design according CM66 was not possible on some models: issue fixed (#14306).
- Improvement of the default size of the arrows on result’s cross sections (# 13155).
What is new in Advance Design 2014

- Wind EC1 – UK appendix: the default “Wind Direction” is 240°, which means a direction coefficient equal to 1. In previous versions, the default angle was 90°, corresponding to a default coefficient value equal to 0.74:

- In some cases, the lateral torsional buckling length was correctly initialized according the grid definition from the property list (# 14507):

- Correction of an algorithm problem making the load discharge impossible on small circular windwalls (# 14389)
- Correction of a problem with local axes when making a copy (#14883)
- In previous versions, the background color was restored to white when saving the model (#14406).
- Improvement of the default templates management when exporting an element from Advance Design to Arche’s modules: before, the default reinforcement templates defined in the OMD platform were not taken into account (#13822).
- Improvement of the results display on planar elements as “Diagrams”: in AD2014, the display is done with curves and not only with histograms as before: