

## Advance Design 2015 / SP1

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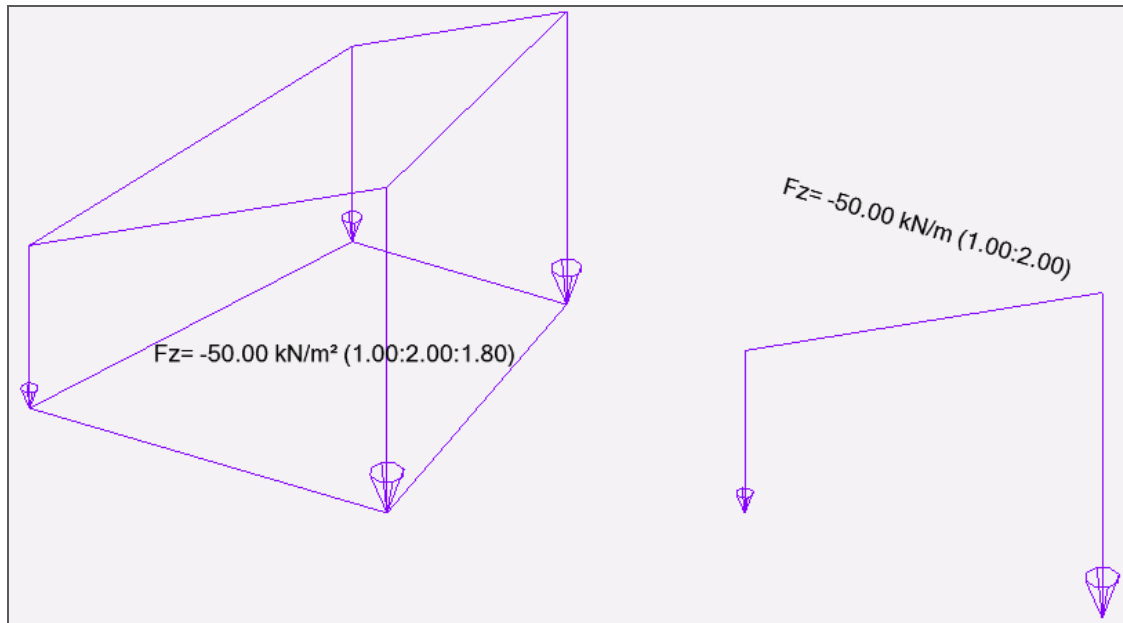
This first service pack for **ADVANCE Design 2015** offers more than 340 improvements and corrections.

The most significant improvements are listed below:

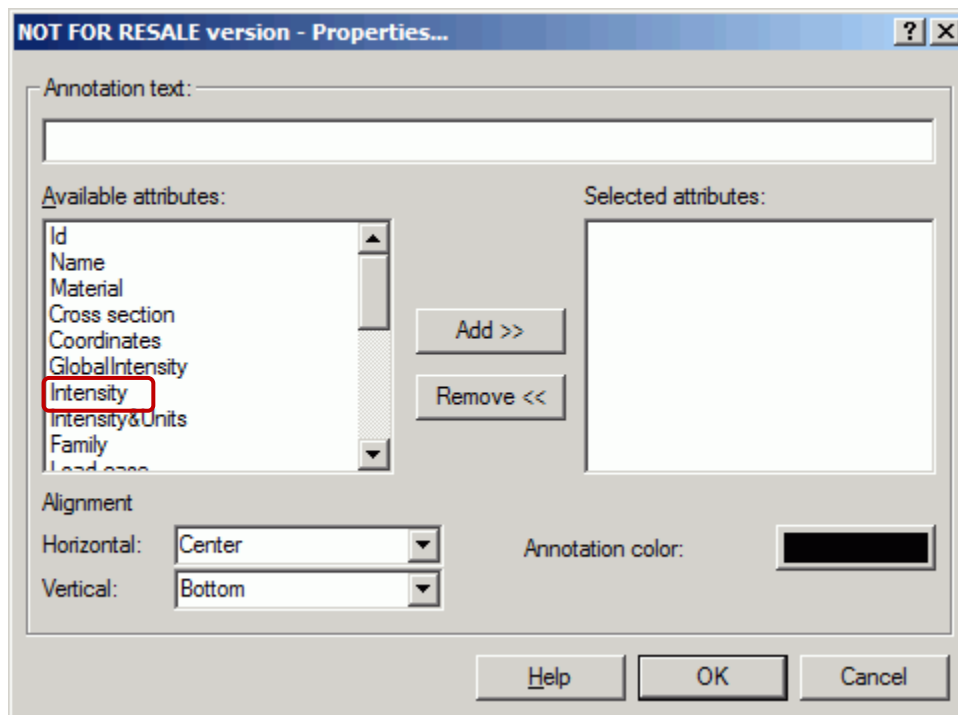
## VARIABLE LOAD DISPLAY

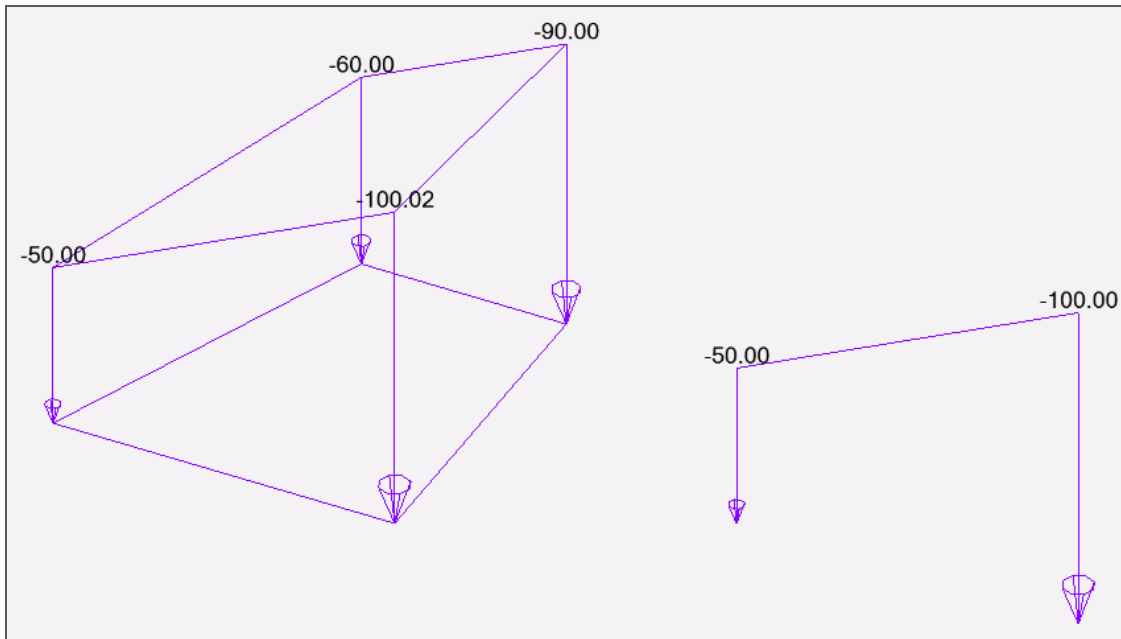
Advance Design 2015 SP1 significantly improves the way variable loads are displayed.

Until now, the annotations on variable loads would show the intensity as well as the coefficients for each end.

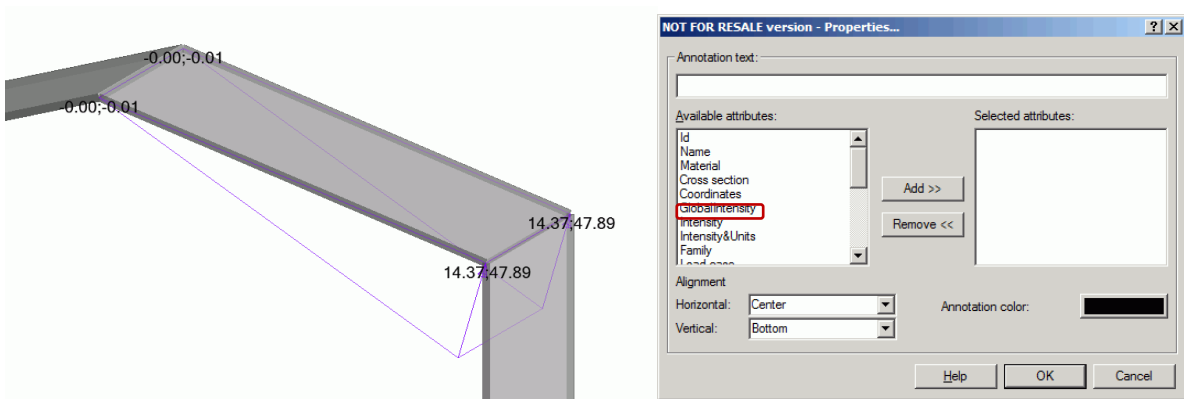


In Advance Design 2015 SP1, the "Intensity" annotation was modified to clearly show the intensity on each corner.



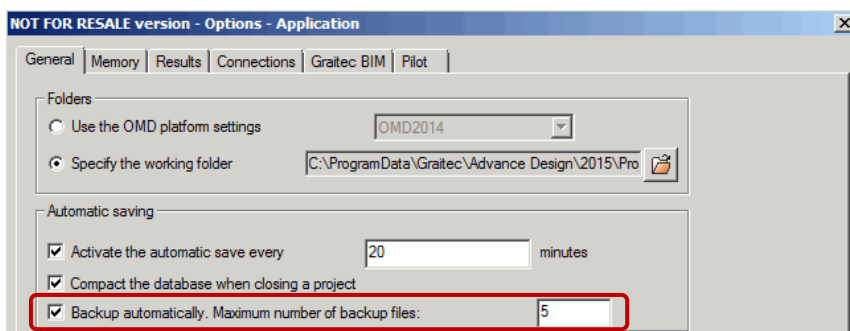


As for loads defined in a local coordinate system, the "Global intensity" annotation can show the load components in the global system:



## NEW BACKUP SYSTEM

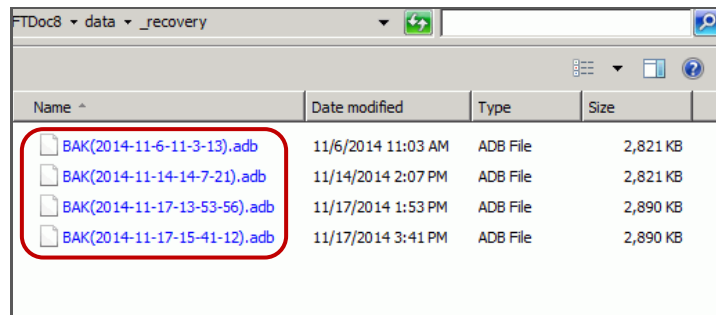
Advance Design 2015 SP1 now enables the user to decide whether or not he wants the application to automatically create backup files of his current model.



When the option is activated, a backup file ("BAK(20xx-xx-xx).adb") is created every time the user saves and closes the application.

Only the n last files are kept (n being the number specified in the **Options - Application** dialog).

These backup files can be found in the data / recovery folder of the current project:

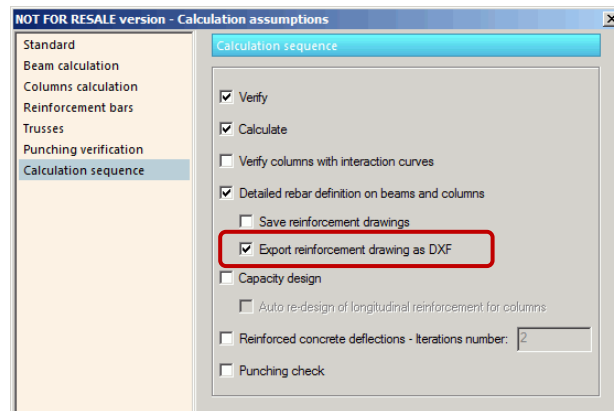


## DXF EXPORT OF DRAWINGS AND RESULTS

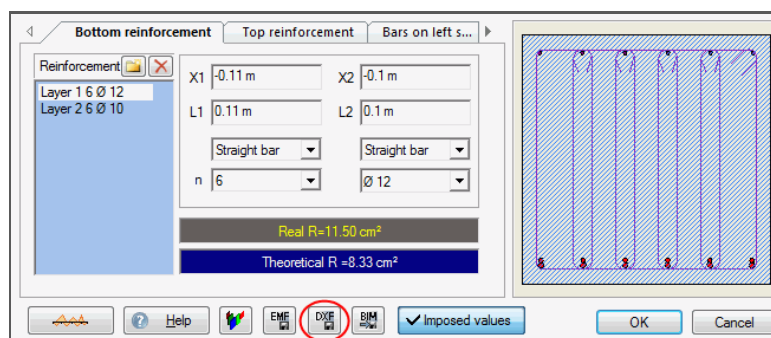
Advance Design 2015 SP1 now enables the user to create .DXF files from:

- reinforcement drawings
- post-processing views

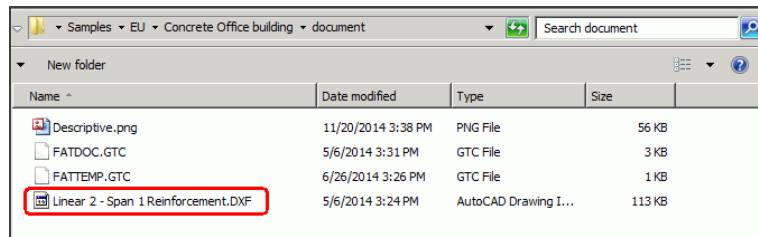
DXF files can be created automatically from reinforcement drawings as soon as the user activates the new option from the reinforced concrete design assumptions:



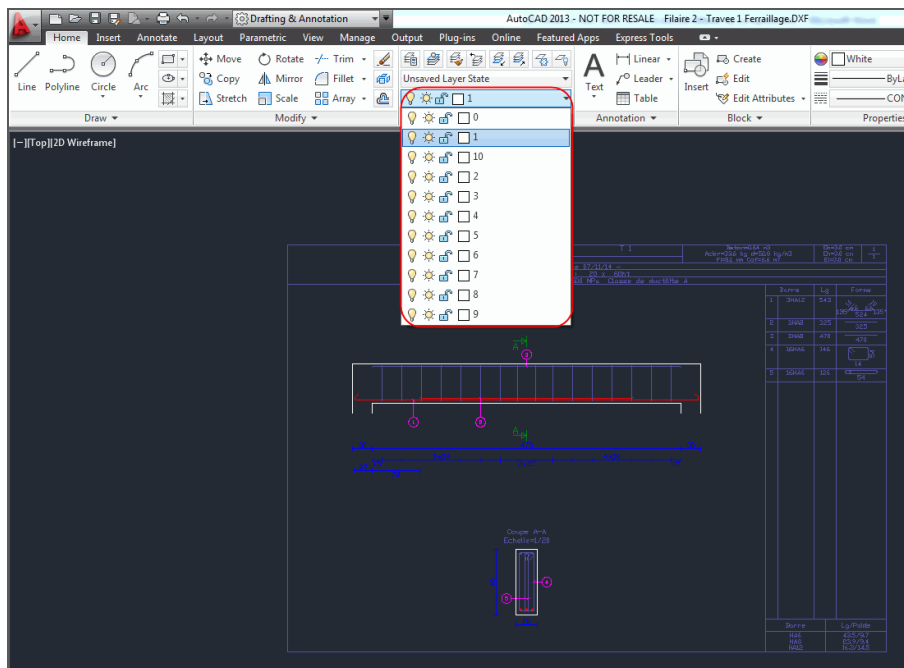
Reinforcement drawings can also be created on-demand in the reinforcement dialog of a selected beam or column, using the new **DXF** icon:



These DXF files will be located in the **document** folder of your current project.



Each reinforcement element (bottom bars, top bars, transversal bars...), as well as the bar schedule, belong to dedicated layers.

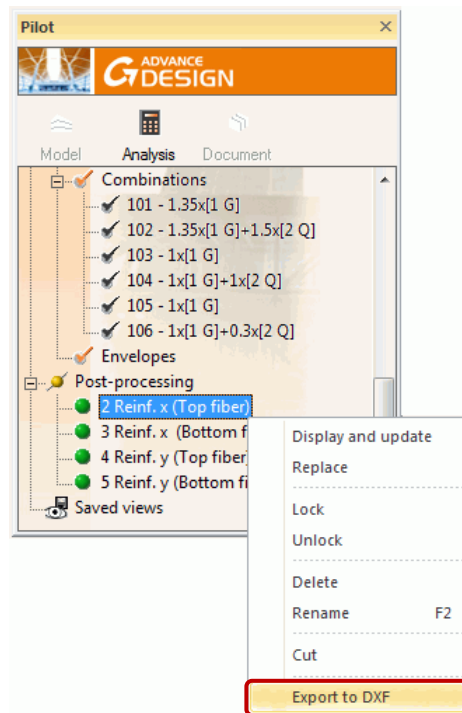


DXF files can also be created from **post-processing views**.

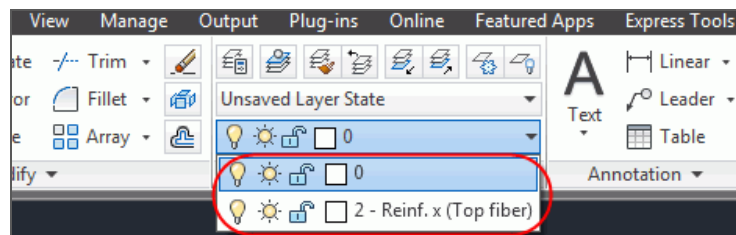
First, the user must save a graphical view, with results displayed as:

- **Colors** for linear elements;
- **Iso lines** for planar elements.

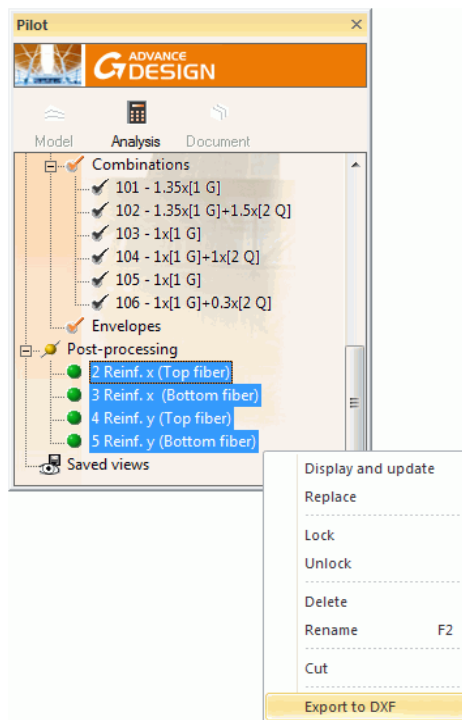
The DXF export will then be available by right-clicking the corresponding element in the **Pilot**.



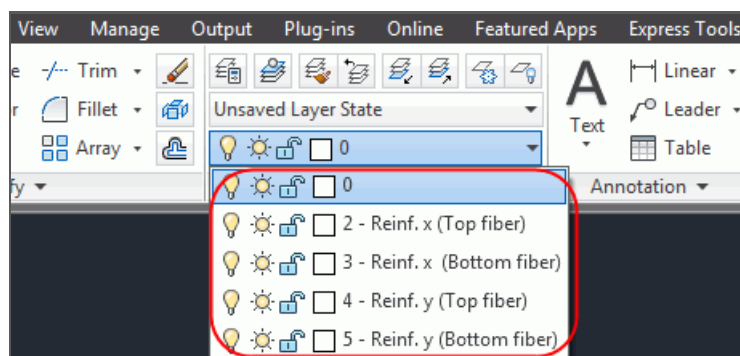
In the created DXF file, the descriptive model and the results will be located in separate layers.



Several post-processing views can be exported at once:



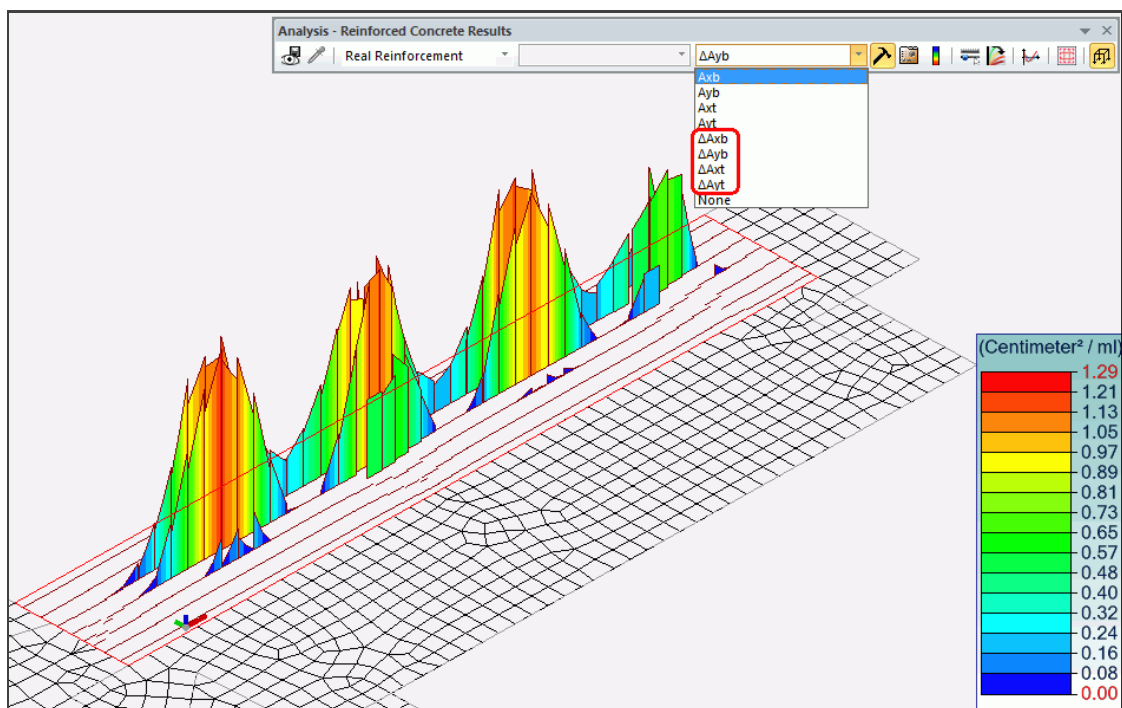
In this case, only one DXF file is created (named after the first view from the selection) and the results are stored in specific layers:



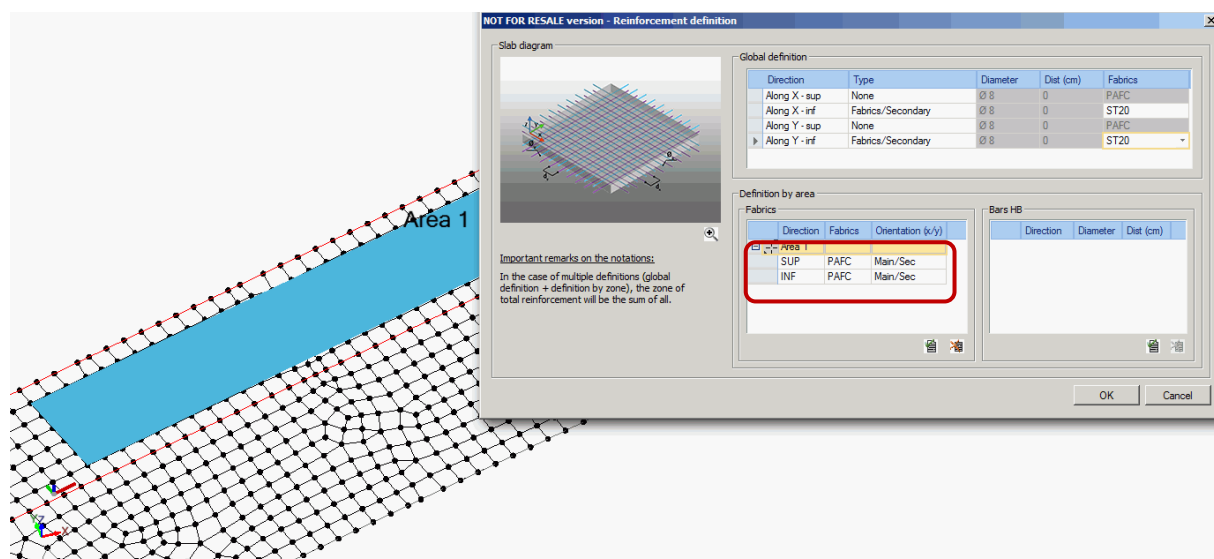
## NEW REINFORCEMENT RESULTS

New entries for planar elements in the **Reinforced Concrete Results** toolbar now enables the user to easily identify the areas where the provided reinforcement does not meet the required reinforcement:

- $\Delta A_{xb}$  shows the difference between  $A_{x_{theoretical}}$  and  $A_{x_{real}}$  on the bottom fiber
- $\Delta A_{yb}$  shows the difference between  $A_{y_{theoretical}}$  and  $A_{y_{real}}$  on the bottom fiber
- $\Delta A_{xt}$  shows the difference between  $A_{x_{theoretical}}$  and  $A_{x_{real}}$  on the top fiber
- $\Delta A_{yt}$  shows the difference between  $A_{y_{theoretical}}$  and  $A_{y_{real}}$  on the top fiber



In these areas, the user can then decide to locally increase the provided reinforcement by adding meshes or bars on a selected zone:

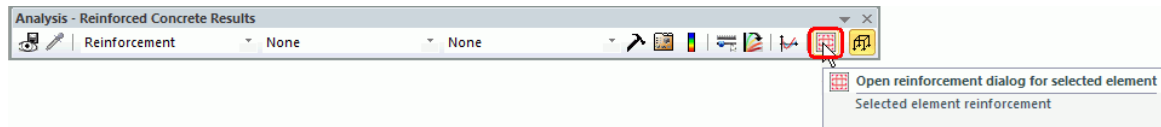




## VARIOUS IMPROVEMENTS AND CORRECTIONS

### EUROCODE 2

- [15075] Improvement: A single icon from the Reinforced Concrete results toolbar gives access to the reinforcement dialog for the selected beam, column or slab.



### EUROCODE 3

- [14967] Correction: The  $\lambda$  values from the simplified shape sheet now show the appropriate values for  $\lambda_y$ ,  $\lambda_z$  and  $\lambda_{LT}$ .

Elements stability (29%)	
Buckling Slend. and	LambdaFy = 0.993 LambdaFz = 0.993 Lfy = 3.50 m Lfz = 3.50 m
L.tors.buckl.	LambdaLT = 0.993 Ldi = 3.50 m Lds = 3.50 m
Unfavorable case	Case no102 : 1.35x[1 G]+1.5x[2 Q]
Magnification factor	kz=1.00 kw=0.00 C1=1.00 C2=1.00 Xy=0.54 Xz=0.54 XLT=INF kyy=1.01 kyz=1.01 kzy=1.01 kzz=1.01 zg=0.00 m Mcr=INF MbRd=INF NcrT=173202.57 kN
Verification (6.61)	$N_{ed} / (X_y N_{rk} / gM1) + k_{yy} (M_{y,Ed} + DM_{y,Ed}) / (X_{LT} M_{y,Rk} / gM1) + k_{yz} (M_{z,Ed} + DM_{z,Ed}) / (M_{z,Rk} / gM1) < 1$ 0.294 + 0.000 + 0.000 = 0.294 < 1 ( 29% )
Verification (6.62)	$N_{ed} / (X_z N_{rk} / gM1) + k_{zy} (M_{y,Ed} + DM_{y,Ed}) / (X_{LT} M_{y,Rk} / gM1) + k_{zz} (M_{z,Ed} + DM_{z,Ed}) / (M_{z,Rk} / gM1) < 1$ 0.294 + 0.000 + 0.000 = 0.294 < 1 ( 29% )

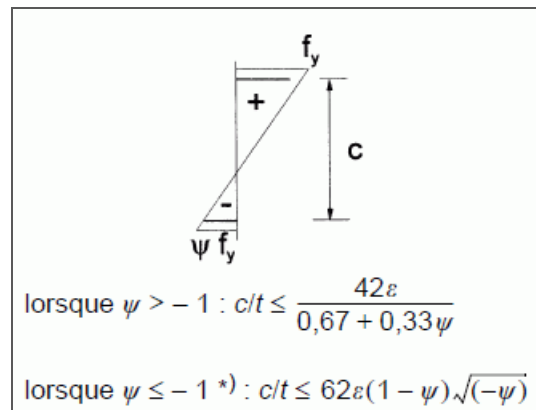
- [14083] Correction: Deflections are no longer checked with the Accidental ULS combinations.
- [16096] Improvement: As requested by our users, the  $a_{LT}$  and  $\varepsilon_y$  values are now displayed in the detailed shape sheet.

Shape sheet - Linear element No. 1 Linear	
Auxiliary terms (Annex A)	$C_{my0} = 0.79$ $C_{mz0} = 0.77$ $N_{crT} = 2634.76 \text{ kN}$ $\lambda_{max} = 1.11$ $\lambda_0 = 1.04$ $\lambda_{0limite} = 0.24$ $C_{my} = 0.95$ $C_{mz} = 0.77$ $C_{mLT} = 1.06$ $a_{LT} = 1.00$ $\varepsilon_y = 8.90$ $m_{uy} = 1.00$ $m_{uz} = 0.89$ $w_y = 1.11$ $w_z = 1.50$ $\eta_{pl} = 0.15$
Interaction coefficients (Annex A)	$k_{yy} = 1.01$ $k_{yz} = 0.95$ $k_{zy} = 0.90$ $k_{zz} = 0.84$
Vérification (6.61)	$\frac{N_{Ed}}{\chi_y \cdot \frac{N_{Rk}}{\gamma_{M1}}} + k_{yy} \cdot \frac{M_{y,Ed} + \Delta M_{y,Rd}}{\chi_{LT} \cdot \frac{M_{y,Rk}}{\gamma_{M1}}} + k_{yz} \cdot \frac{M_{z,Ed} + \Delta M_{z,Rd}}{\frac{M_{z,Rk}}{\gamma_{M1}}} \leq 1.00$ 0.15 + 2.50 + 1.81 = 4.46 > 1.00 (446%)
Vérification (6.62)	$\frac{N_{Ed}}{\chi_z \cdot \frac{N_{Rk}}{\gamma_{M1}}} + k_{zy} \cdot \frac{M_{y,Ed} + \Delta M_{y,Rd}}{\chi_{LT} \cdot \frac{M_{y,Rk}}{\gamma_{M1}}} + k_{zz} \cdot \frac{M_{z,Ed} + \Delta M_{z,Rd}}{\frac{M_{z,Rk}}{\gamma_{M1}}} \leq 1.00$ 0.32 + 2.23 + 1.61 = 4.16 > 1.00 (416%)

- [15908] Correction: The formula used for  $\psi$  calculation was incorrect when set on French

$$\psi = \frac{2N_{Ed}}{A \times f_y} - 1$$

appendix. Advance Design now properly uses



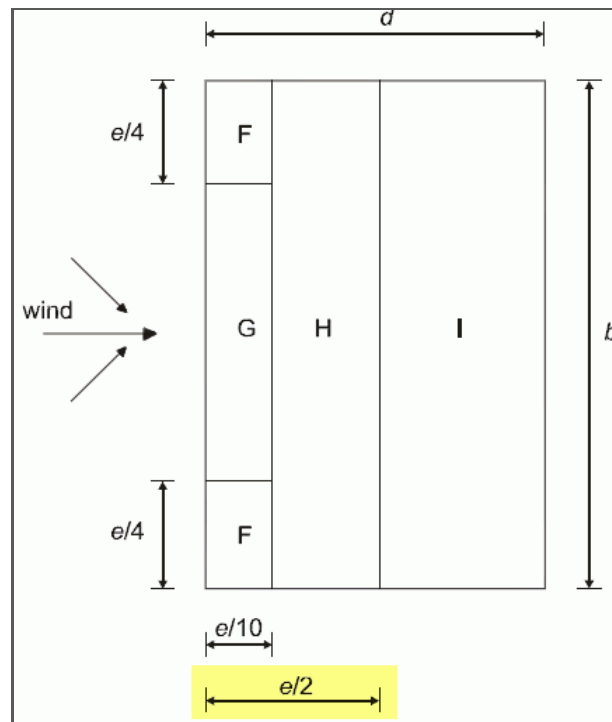
- [15241] Improvement: The intermediate values used in the fire calculation are now displayed in the detailed shape sheet.

6) Fire resistance	
Tension	Case no 106 : 1x[1 G]+0.5x[2 Q], Mesh No. 1.4
Compression	N <sub>fi,Ed</sub> ≤ N <sub>b,fi,t,Rd</sub> (4.5) : 50.00 < 98.35 kN (51 %)
Bending /yy	Case no -, Mesh No. -, : not done (-)
Bending /zz	Case no -, Mesh No. -, : not done (-)
Auxiliary terms	$k_y = 1.65$ $k_z = 1.10$ $k_{LT} = 0.92$ $k_{y,\theta} = 0.28$ $\chi_{z,fi} = 0.37$ $\chi_{LT,fi} = 0.28$ $\chi_{min,fi} = 0.37$ L <sub>fy</sub> = 1.10 m L <sub>fz</sub> = 1.10 m
Oblique bending	Case no 106 : 1x[1 G]+0.5x[2 Q], Mesh No. 1.4 $\frac{N_{fi,Ed}}{\chi_{min,fi} \cdot A \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} + \frac{k_y \cdot M_{y,fi,Ed}}{W_{pl,y} \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} + \frac{k_z \cdot M_{z,fi,Ed}}{W_{pl,z} \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} \leq 1.00 \quad (4.21a)$ 0.51 + 0.00 + 0.00 = 0.50837 < 1 (51 %)
Oblique bending	Case no 106 : 1x[1 G]+0.5x[2 Q], Mesh No. 1.4 $\frac{N_{fi,Ed}}{\chi_{z,fi} \cdot A \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} + \frac{k_{LT} \cdot M_{y,fi,Ed}}{\chi_{LT,fi} \cdot W_{pl,y} \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} + \frac{k_z \cdot M_{z,fi,Ed}}{W_{pl,z} \cdot k_{y,\theta} \cdot \frac{f_y}{\gamma_{M,fi}}} \leq 1.00 \quad (4.21b)$ 0.51 + 0.00 + 0.00 = 0.50837 < 1 (51 %)
Temperature	Case no 106 : 1x[1 G]+0.5x[2 Q], Mesh No. 1.4 O <sub>a,t</sub> < O <sub>a,CT</sub> : 677 °C < 774 °C (87.54%)
Verification	duration : 15 min 4 exposed faces

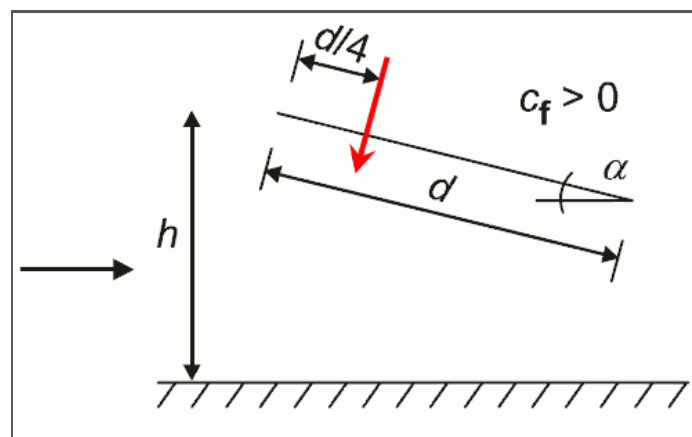
## EUROCODE 1

- [15923] Correction: The snow accumulation due to a higher building was not created as a variable load in a particular case.
- [13999] Correction: The F and G wind areas were missing on a windwall set as "awning" for the Y+ and Y- wind directions.

- [15954] Correction: for duo-pitch roofs with a slope  $< 5^\circ$ , the  $e/2$  distance was sometimes incorrect.



- [16010] Correction: the location of the centre of force  $C_f$  for monopitch canopies is now correct, with  $d$  taken as an inclined length.



## IMPORT / EXPORT

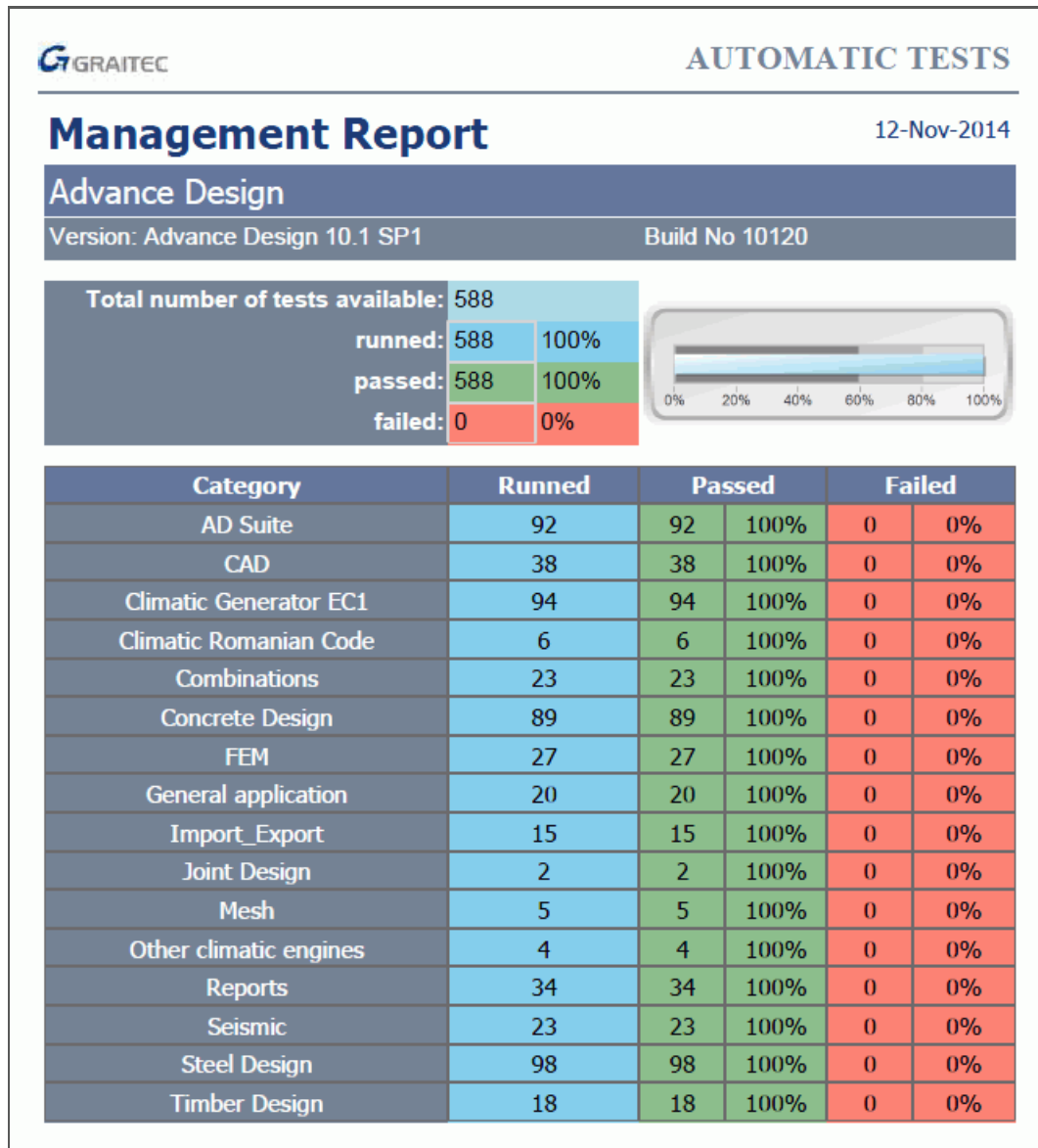
- [15152] Improvement: The DXF import was updated and it now supports the following versions: AutoCAD2000 DXF, AutoCAD2004 DXF, AutoCAD2007 DXF, AutoCAD2010 DXF and AutoCAD2013 DXF.

## VALIDATION

As all the other versions or major service packs, the SP1 has been submitted to a validation process.

It represents 588 tests passed automatically, each of them have a detailed validation report.

Here is the synthetic validation report:



The complete validation guide has been updated and is available for download on the Graitec Advantage website, under the chapter "Downloads \ Documentation \ Advance Design").

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**Note:** The reference number [xxxx] refers to an index of the internal GRAITEC Database.

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