

ArCADia-REINFORCED CONCRETE COLUMN

ArCADia-REINFORCED CONCRETE COLUMN
User Manual

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1.INTRODUCTION

Introduction

1.1. ABOUT

ArCADia-REINFORCED CONCRETE COLUMN Application is designed for structure designers. The Application was designed to maximally support the user during the development of reinforced concrete column drawings in CAD applications. **ArCADia-REINFORCED CONCRETE COLUMN** is an object-based Application which uses 2D data entered by the user (in the form of views and sections) to generate a 3D model of column reinforcement which may be freely modified and which enables, for example, the new sections to be created. The element reinforcement designing with this Application is in line with requirements of **EN 1992-1-1 Eurocode 2: September 2008**. The Application enables the designer to enter the reinforcement data manually and also captures these data directly from calculation applications: **EuroFerroConcrete** module of **R3D3 3D Frame** and **R2D2 2D Frame** software, and **Reinforced concrete column PN-EN** of **Constructor** system. It is also possible to copy selected, already completed column from the same or prepared previously file.

1.2. SOFTWARE BASIC FEATURES AND CAPABILITIES

ArCADia-REINFORCED CONCRETE COLUMN software features and capabilities are as follows:

- The ability to design multiple columns within a single file.
- The ability to create a new file by copying of finished columns from previously completed drawings or copying columns within the same file.
- The ability to design the element's geometry and reinforcement in two or four side primary views and arbitrary number of assumed column sections.
- Full control over a drawing visibility and printing of views and sections along with their elements, and the possibility to switch between them during working with the model.
- Non-limited moving and adding of column new sections.
- The ability to create almost any shape of a column section: rectangular, round, angled, T-shaped, C-shaped, Z-shaped and I-shaped along with adjoining elements in the top section of a column: transoms and column from upper level or transoms reaching its height.
- In case of rectangular section columns, support for automatic creation of longitudinal reinforcement with the option of its automatic bending into the transoms or inserting it into the upper level column.
- Automatic creation of rectangular section column transversal reinforcement in form of two- and four-legged stirrups, distributed in the areas defined by the user.
- Automatic creation of column typical transversal reinforcement for other shapes of section.
- Change of four-legged stirrup direction within the column section.
- The reinforcement dimensioning available in mm or cm units, with adjustable accuracy.
- Required bend radii of rebars are automatically taken into consideration.
- The anchoring lengths of longitudinal rebars are automatically taken into consideration when they are bent into the transoms and inserted into the upper level column, in case of rectangular and round columns.
- The cover of longitudinal and transversal reinforcement being distributed within the reinforced element is automatically taken into account.

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- The ability to design free-shape rebars.
- The rebar shape and properties are editable.
- The editing tools enable the reinforcement to be freely located within the Views and Section of the element.
- Automatic extraction of rebars along with their dimensions and descriptions (rebar details).
- The rebar descriptions may be placed in any location within the Views and Sections of elements.
- Automated and continuous numbering of each rebar within the single file.
- The dimensioning geometry of column may be freely modified.
- Automatic creation and modification of reinforcement steel list on the basis of created reinforcement model (The list covering the single element or whole drawing).
- Automatic generation of reinforced column model on the basis of calculation carried out in EuroFerroConcrete module of R3D3 3D Frame and R2D2 2D Frame Application and in Reinforced concrete column PN-EN module of Constructor Application.
- 3D view of the generated model of column reinforcement.

1.3. APPLICATION GENERAL SPECIFICATION

ArCADia-REINFORCED CONCRETE COLUMN Application is a part of general, object-oriented system aiding designers' works and at the same it is the first module dedicated to structures. It is designed to develop detailed design documentation for structures made of reinforced concrete monolithic columns. It may be used in two primary operation modes:

- As standalone Application designed to develop a detailed design documentation for reinforced concrete monolithic columns.
- As automated platform designed to capture calculation results from EuroFerroConcrete module of R3D3 3D Frame and R2D2 2D Frame software and from Reinforced concrete column PN-EN of Constructor system, enabling their graphical representation in form of reinforced column 3D model which can be further modified.

By introduction of column elements into the software (shape, transversal and longitudinal reinforcement) we create reinforced column spatial model, which may be displayed in 3D view whenever the user desires it. This model is generated from data entered by the user in form of 2D column views and sections. By default the Application opens two views and one section. The user is able to delete any view/section or add the new one in the selected position. The model elements (dimensioned column, column adjoining elements, longitudinal and transversal reinforcement) can be placed only in the one, active view or section (in other the elements are generated automatically according to their localization in the model, however the annotations and dimensions are omitted). The user can freely switch between the views or section. Along with the model elements, the project includes other elements, not related directly with views or sections. These are detail views of rebars (so called "extracted" rebars), reinforcement steel list and title block. The project elements available in the application we may divide into 3 main groups:

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- The model elements, the localization of which is represented in every view and section. These elements are: column shape and column adjoining elements, longitudinal and transversal reinforcement.
- Additional view elements not present in the model, the localization of which is not represented, linked to the particular view or section. These elements are: rebar annotations and dimensions.
- Additional elements not present in the model and not linked to any view or section. These elements are: annotations regarding rebar details, reinforcement steel list and title block.

Within a single document the user may insert few different types of columns. The reinforcement used in the model may be dimensioned in mm or cm. The rebars are assigned with numbers automatically, and, in general, the user has no influence on this process. The numeration is done sequentially and always concerns every rebar of the model within the single file/document, irrespectively of whether the rebars belong to single or more columns.

1.4. APPLICATION REQUIREMENTS AND CONSTRAINS

ArCADia-REINFORCED CONCRETE COLUMN Application is not a standalone application and needs a CAD software (**ArCADia-INTELLICAD**, **ArCADia-START** or **AutoCAD**) to be installed otherwise it cannot be run. When working in constructional mode of **ArCADia-REINFORCED CONCRETE COLUMN** module, the access to functions of other modules (e.g. **Architecture**) operating in the floor or building mode is blocked, because we are working in the structure detailed drawing mode. The same rule applies in the reverse situation - when working in the floor mode, the access to the functions of structure detailed drawing mode is blocked. Therefore, in active constructional mode, when you want to go back to work in e.g. Architecture in the floor mode, you must each time create a new project (file). The above not applies to the following general functions of whole **ArCADia** system: **Project Manager**, **3D View**, **Options etc.**, which are available in both modes, however their functioning may be slightly different due to the module specification.

2.INSTALLING AND RUNNING THE APPLICATION

Installing and running the Application

2.1. HARDWARE REQUIREMENTS

- Pentium IV PC (PIV D recommended)
- 2 GB RAM (4 GB recommended)
- Approximately 1GB of free HDD space for the installation
- DirectX 9.0 compatible graphics card
- Windows Vista 32/64-bit OS, Windows 7 32/64-bit or Windows 8 32/64-bit
- DVD-ROM drive

2.2. INSTALLING

The Application installation is started automatically, when the CD is inserted into the CD drive. The installation should be started manually, if the Autostart function is disabled. Explore the CD folder (My Computer/CD drive), and run Setup.exe. Once the installation is started, proceed according to the instructions displayed on the screen.

2.3. RUNNING

The Application may be initialized by double-click on the CAD software icon, which generally may be found on the desktop, and then selecting one of the icons on the ribbon or toolbar of **ArCADia-REINFORCED CONCRETE COLUMN** application.

2.4. OPENING PROJECT (CAD)

You can open any of the following files:

- Standard DWG file.
- It is possible to use any of example drawings delivered with ArCADia-INTELLICAD.
- Exchange file format DXF.
- Network file format DWF.
- Drawing templates DWT.

To open recently used drawing in the fastest way, select File > <file name>. The Application remembers names of four recently opened drawings. To open quickly a drawing from dialogue box, Open the drawing by double-clicking on its name.

It is possible to open a drawing during browsing of drawing files with Windows Explorer. You just have to double-click on a file to open it in **ArCADia-INTELLICAD**. In order to facilitate drawing identification during browsing of files, the miniatures showing their contents are displayed.

The method of opening existing drawing

- Choose one of the following methods:
- Select file > Open.

Installing and running the Application

- Click Open tool on Standard toolbar.
- Write "open" and then push Enter.
- Set file type to the type of your interest.
- Select folder containing a desired drawing.
- Use one of the following procedures:
- Select the drawing you want to open and click Open.
- Double-click on the drawing you want to open.

If the drawing requires password, enter the password, click on OK to check the password, and then click on Open.

2.5. SAVING PROJECT (CAD)

Drawing may be saved any time.

Use one of the following method to save a drawing:

- Click Save Standard toolbar.
- Select File > Save.
- Write "save" and then push Enter.
- Write "qsave" and then push Enter.

When saving the drawing for the first time, the Application opens dialogue box "Save drawing as", which allows the user to choose target folder and drawing name. You can give any name to the drawing saved for the first time. To save the drawing under the other name later, select again option File > Save as, and enter the new name.

2.6. AUTOSAVE AND BACK-UP COPY (CAD)

Save your drawing files as often as it possible in order to avoid loss of data in case of power failure or system error. The Application may be configured to auto save the drawing periodically. *Autosave* setting determines time period (in minutes) between auto saves. The application resets this timer every time user save the drawing file.

When *Autosave* function is enabled, the Application makes a drawing copy. This file is stored in a directory specified in Options > Paths/Files> Temporary file, and has an extension defined in the box Extension of drawing autosave file (SV\$ by default).

The method of configuring **ArCADia-INTELLICAD** for drawing auto saving

1. Do one of the following:
 - Select Tools > Options.
 - Write *config* and then push Enter.
2. Click on tab General.

Installing and running the Application

3. In the *Autosave* area tick the check box in order to activate the *Autosave* function and set the auto saving frequency.
4. Click on OK.

3. WORKING WITH THE APPLICATION















Working with the Application

3.1. ARCADIA-REINFORCED CONCRETE COLUMN TOOLBAR AND RIBBON











Fig. 1 The main ArCADia-REINFORCED CONCRETE COLUMN toolbar in AutoCAD and ArCADia-INTELLICAD software

The appearance of the main toolbar in CAD applications – **AutoCAD**, **ArCADia-INTELLICAD** is shown below. It offers the following functions:

<u>Icon:</u>	<u>Function name:</u>	<u>Function description:</u>
	- <i>isa_rcc_ip</i>	- <i>Inserts column</i>
	- <i>isa_rcc_xmlis</i>	- <i>Inserts complete column from xml file</i>
	- <i>isa_rcc_ihfp</i>	- <i>Inserts column of upper level</i>
	- <i>isa_rcc_isb</i>	- <i>Inserts transom</i>
	- <i>isa_rcc_isls</i>	- <i>Inserts single stirrup</i>
	- <i>isa_rcc_ils</i>	- <i>Inserts stirrup block</i>
	- <i>isa_rcc_iar</i>	- <i>Inserts automatic rebar block</i>
	- <i>isa_rcc_isar</i>	- <i>Inserts single automatic rebar</i>
	- <i>isa_rcc_ir</i>	- <i>Inserts user-defined rebar shape</i>
	- <i>isa_rcc_ird</i>	- <i>Inserts rebar detail</i>
	- <i>isa_rcc_iard</i>	- <i>Inserts details for all rebars</i>
	- <i>isa_rcc_igl</i>	- <i>Inserts rebar descriptions</i>
	- <i>isa_rcc_idm</i>	- <i>Inserts freely chosen dimension</i>
	- <i>isa_rcc_isl</i>	- <i>Inserts list of steels used in the project</i>

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	-	<i>isa_rcc_islb</i>	-	<i>Inserts list of steels used in the structural element</i>
	-	<i>isa_rcc_isv_n</i>	-	<i>Inserts front view</i>
	-	<i>isa_rcc_isv_s</i>	-	<i>Inserts rear view</i>
	-	<i>isa_rcc_isv_e</i>	-	<i>Inserts left-side view</i>
	-	<i>isa_rcc_isv_w</i>	-	<i>Inserts right-side view</i>
	-	<i>isa_rcc_icv_g</i>	-	<i>Insert section</i>
	-	<i>isa_rcc_av</i>	-	<i>Activates selected construction view</i>
	-	<i>isa_rcc_help</i>	-	<i>Opens help</i>

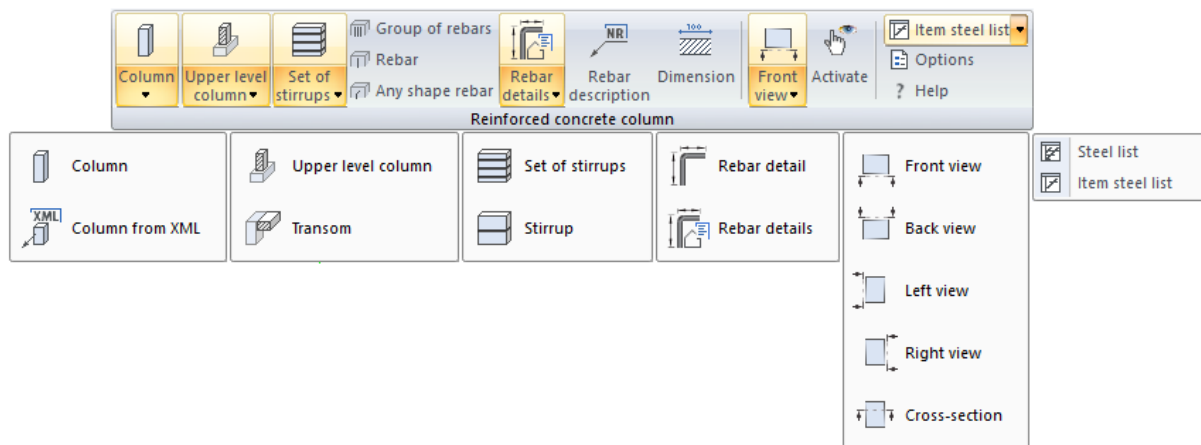
























Fig. 2 Main ribbon of ArCADia-START with ArCADia-REINFORCED CONCRETE COLUMN application

The appearance of main ribbon of **ArCADia-START** with **ArCADia - REINFORCED CONCRETE COLUMN** is shown above. It offers the following functions:

***BIM** – options available to ArCADia BIM license holders, i.e. after purchasing one of the following programs: ArCADia, ArCADia AC, ArCADia LT or ArCADia PLUS.

Icon	Option	Description	*BIM
	Column	Inserts column.	X
	Column from XML	Inserts complete column from xml file.	X
	Upper level column	Inserts column of upper level.	X
	Transom	Inserts transom.	X

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	Set of stirrup	Inserts stirrup block.	X
	Stirrup	Inserts single stirrup.	X
	Group of rebar	Inserts automatic rebar block.	X
	Rebar	Inserts single automatic rebar.	X
	Any shape rebar	Inserts user-defined rebar shape.	X
	Rebar details	Inserts rebar detail.	X
	All rebar details	Inserts details for all rebars.	X
	Rebars description	Inserts rebar descriptions.	X
	Dimension	Inserts freely chosen dimension.	X
	Steel list	Inserts list of steels used in the project.	X
	Item steel list	Inserts list of steels used in the structural element.	X
	Front view	Inserts front view.	X
	Back view	Inserts rear view.	X
	Left view	Inserts left-side view.	X
	Right view	Inserts right-side view.	X
	Cross-section	Insert section.	X
	Activate	Activates selected construction view.	X
	Help	Displays the help window.	X

3.2. *ARCADIA-REINFORCED CONCRETE COLUMN* SETTINGS AND OPTIONS

The general software settings may be found in **Options** window of **ArCADia-REINFORCED CONCRETE COLUMN** module.

Working with the Application

Fig. 3 Options window of ArCADia Construction module

The **Options** window incorporates basic settings relating to the presentation of reinforcement within the file/document. These are the following parameters (in the order of appearance):

Reinforcement bend radius – determines for which reinforcements the bend radius are to be visible:

- No visible bend radius.
- All visible.
- Visible only for reinforcement of diameter larger or equal to.

Bending radius value – determines the rebar bending radius value

- Basic ($2 \times \varnothing$ for a reinforcement diameter of ≤ 16 mm and $3.5 \times \varnothing$ for a reinforcement diameter of > 16 mm)
- Increased – as per the formula (8.1) in the PN-EN 1992-1-1 standard.

Hooks in reinforcement – due to the fact of using only ribbed steel in the Application, the shape of hooks relates generally only to stirrups (for other rebars, the possible hook must be introduced individually):

- At the angle of 90° .
- At the angle of 30° .

Working with the Application

Length unit used in rebar details, descriptions and dimensions – the parameter which enables the user to select desired unit for dimensioning of reinforcement and element, as well as to set its possible rounding off with 5 mm span (applies to rebar details and descriptions):

- In millimetres (with possible 5 mm rounding off).
- In centimetres (with possible 5 mm rounding off).

Arc length in rebar details – the parameter which enables the user to define for which reinforcements the arc lengths are to be visible when the bend radii are used:

- Visible for rebars (longitudinal).
- Visible for stirrups.

Rebar numbering:

- Common numbering of all bars in the document – subsequent numbers for all bars in the entire document, a list of reinforcement steel for the entire document or a single structural element.
- Separate numbers for the bars in each structural element – subsequent numbers for all bars in the element, starting from 1 for each element, thus providing the same numbers to different bars in the document. List of reinforcement steel only for a single structural element.

If the user selects bend radius visibility for rebars of diameters covering also the stirrups and simultaneously enables arc visibility only for longitudinal rebars, the arc length for the stirrup will be added to both legs (divided equally) of the stirrup adjacent to this arc .

The column model inserted with default settings into the drawing, will be represented in real scale, for which one unit from the drawing corresponds to one actual centimetre, independently from dimensioning units set in ***Options***, described above. The user is able to change the drawing unit any time during designing (e.g. to millimetres) by opening ***Properties*** window for selected ***View anchor*** – Layout 1.

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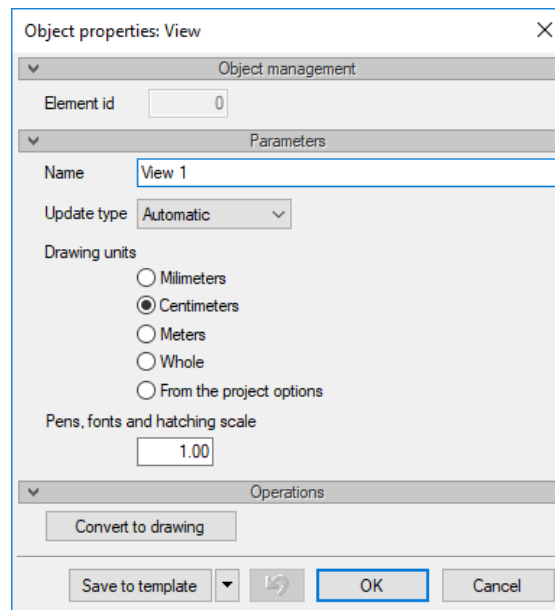


Fig. 4 The element Properties window for View anchor

The change of the drawing unit (e.g. from centimetres to millimetres) changes the scale of whole drawing (model, descriptions, dimensions, etc.) but does not change the dimensioning method, dimension line values and rebar details.

All the options and settings described above relate always to all the project elements used within the drawing.

3.3. PROJECT MANAGER AND 3D VIEW

After adding the column to the document, in **Project Manager** window for **ArCADia-REINFORCED CONCRETE COLUMN** module, two available views (front and rear view) and column section are visible by the default in the layout. Double-click on the view or section activates this view or section. The active view is displayed in **Project Manager** as bold text. You may delete the individual model elements or their views in **Manager**, the "tree" shown below (from context menu of the right mouse button). You may set visibility, block position or exclude from plotting the model elements included in the individual views.

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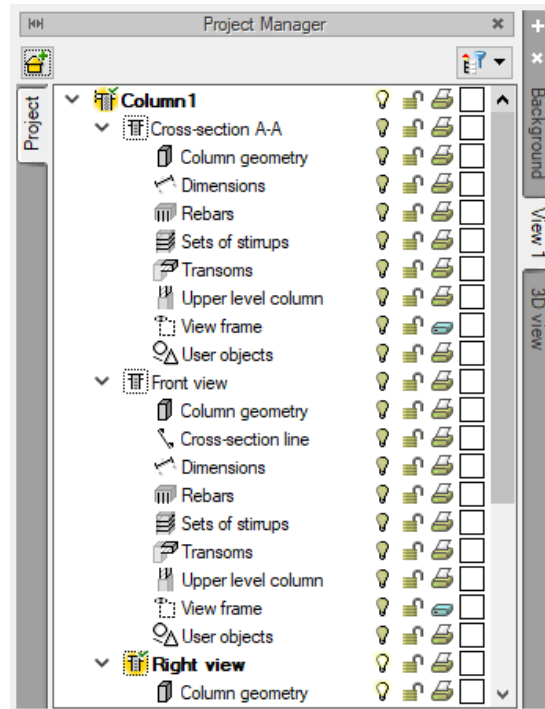


Fig. 5 Project Manager window

Switching to **3D View** tab in **Project Manager** window activates 3D view window of column model containing the designed reinforcement. After that, the individual model components in **Project Manager** may be set visible or invisible, it is possible to adjust their transparency etc. If single document contains few different columns, the model of only one column, the same which is active in **Project Manager**, in **3D View** tab will be visible in **3D View** at given time. To switch the activity status for the particular column in **Project Manager** in **3D View**, click on the icon of appropriate column.

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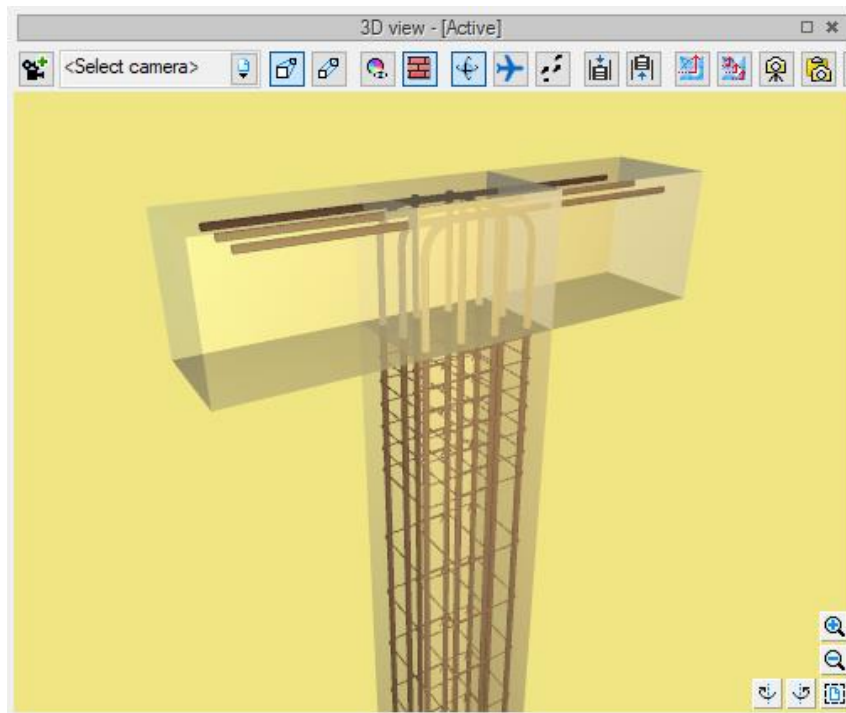








Fig. 6 3D View window for column

3.4. WORKING WITH VIEWS AND INSERTING SECTIONS

When the new column is added to the project, the column is presented in two views (front and right view) and with single section drawn in the views. This kind of presentation should be suitable for typical monolithic columns with equal longitudinal reinforcement on the whole height and with rectangular or round section. However, for columns with other sections or more complicated longitudinal reinforcement, two views and one section may be not enough. Therefore, there is always the possibility to add the new View from four available Views and set up the new section on any column height.

The following five functions, available from main toolbar have been designed for this purpose:  - **Insert Front View**,  - **Insert Rear View**,  - **Insert Left View**,  - **Insert Right View**,  - **Insert Section**. Within the single project you may insert into a drawing few the same or different Views or Sections. After inserting into a drawing, always only one View or Section is active (the one with darker frame), it means that you can edit column model in this View or Section and add elements assigned to this View or Section, e.g. dimensions or descriptions. To change the active View/Section, double click on appropriate View or Section name in **Project Manager** "tree" or run function  - **Activate selected construction View** from the main toolbar. The toolbar function of switching active View has the additional feature, which maintains selection of reinforcement from the previously active View, provided that this reinforcement in the newly activated View or Section is visible. After selecting this function from the toolbar, point the mouse cursor on the View/Section, which you want to activate and click on any point within the frame of this View/Section. When you select the frame of inserted, active View or Section, four anchors enabling the user to resize the View area and one anchor (in the left, bottom corner of the frame) enabling the user to move the whole View within the drawing. Along with the View all the model elements and elements assigned to the View (dimensions and descriptions)

Working with the Application

are moved. The frames of individual Views and Sections may overlap each other. In this case it is important to avoid overlapping of elements within such a frames (presented model, descriptions, dimensions etc.). The name of the View, name of the element present in the View and the quantity of the elements with this name included in the reinforcement steel lists. This description and frame are invisible in plotting by default. The titles for individual Views as well as other annotations, e.g. scale or quantities supposed to be visible in the printed document, may be entered by the standard text entering function available in CAD applications. During insertion of the Section or after selection of the existing Section frame, using the insertion bar or task bar you may open **Properties** window for the section and configure graphical representation of the section as well as its symbol. In **Properties** window it is also possible to set View depth for stirrups, i.e. depth to which the stirrups will be visible in the particular View. This option is set by default to 40 cm and its change enables the user to control stirrups visibility. The following elements are always visible in the Section inserted in the drawing: cut out outlines of column section, cut out longitudinal reinforcement rebars and transversal reinforcement rebars included in **View depth for stirrups**.

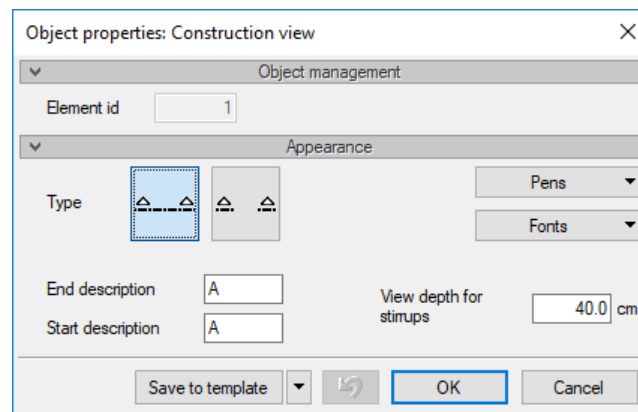



Fig. 7 Element Properties window for Section

3.5. INSERTING COLUMNS

3.5.1. Setting up the column shape – function Insert column

The basic method of column model creation is step-by-step defining of its elements: column shape, longitudinal and transversal reinforcement. Use function -  **Insert column** to define column geometry. When it is activated, you may optionally select the drawing template on the displayed **Column structure** insertion bar and click on **Properties** button.

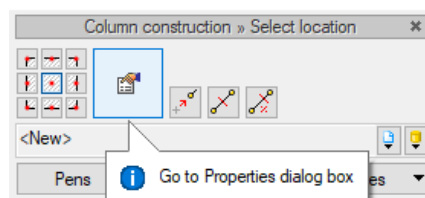


Fig. 8 Properties button on the Column structure insertion bar

Element properties: Column structure dialogue box opens.

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Fig. 9 Element properties window: Column structure

In the window displayed, the user should enter the column name, reinforcement cover, column quantity, height, concrete class and, in case of rectangular and round section, geometrical dimensions of section depending on its type. Note, that the specified column quantity will be used to calculate (by multiplication) reinforcement steel list quantities for individual column or whole drawing. In case of designing the last level column in frame configuration, it is also necessary to indicate the direction of main frame plane, against transoms of which the outside longitudinal reinforcement of column will be bent. Via button **Cross-section** you may choose one of the available column section shapes: rectangular, round or other. The geometrical dimensions of rectangular and round sections are entered directly into column **Properties** window. In case of other, less common shapes of section, push cross-section button **Other** and define type and section dimensions in the separate window. If the column section other than rectangular or round is selected, the column **Properties** window will show the third icon with the selected cross-section shape.

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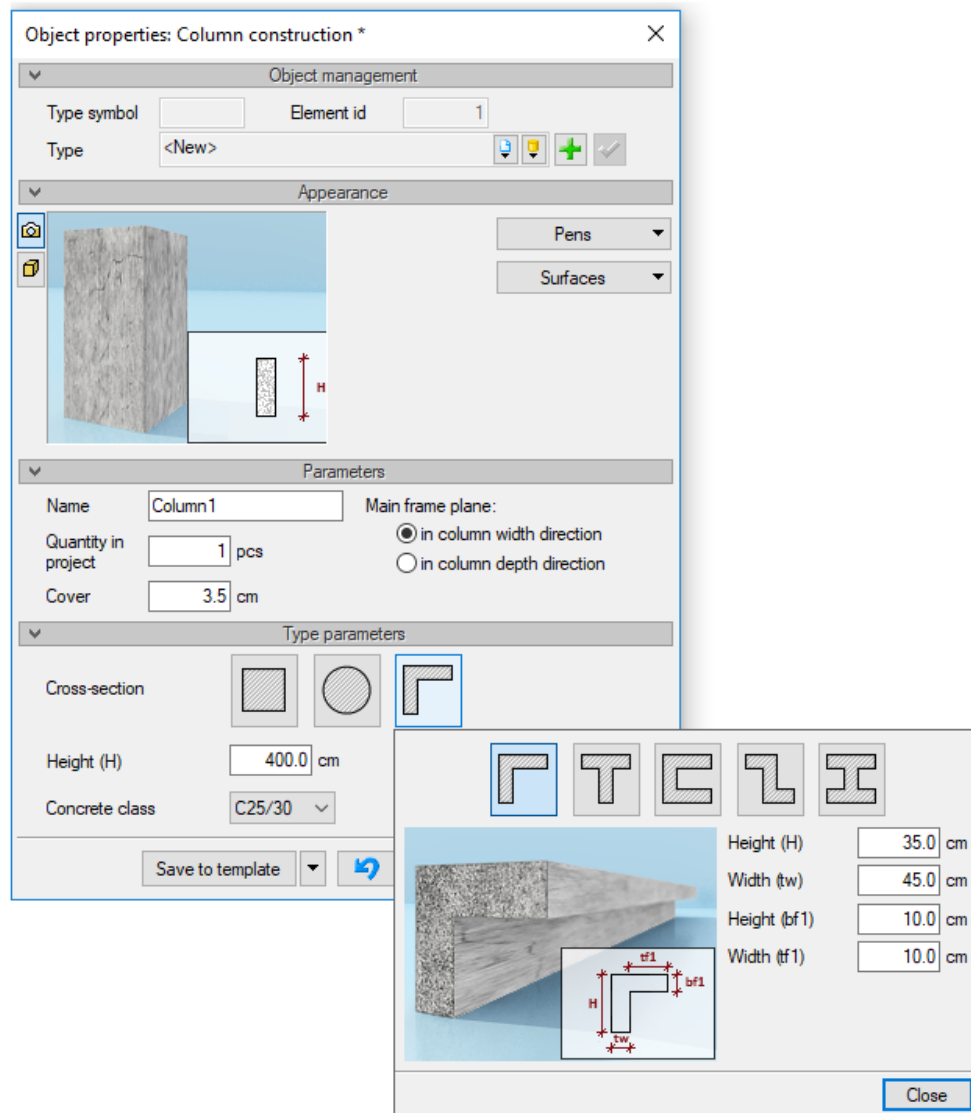


Fig. 10 The dimension definition window for column section shapes other than rectangular or round

When the column parameters are set in **Properties** window, two Views and one section will be inserted by default into the drawing in the selected localization. However just the one of them will be active, i.e. ready for insertion of other elements. After insertion of the column you may also insert two other Views; this operation is generally dedicated to columns with section other than rectangular or round. The active View of the column is indicated with black outline. Simultaneously only one View or Section of the column concerned may be active.

Working with the Application

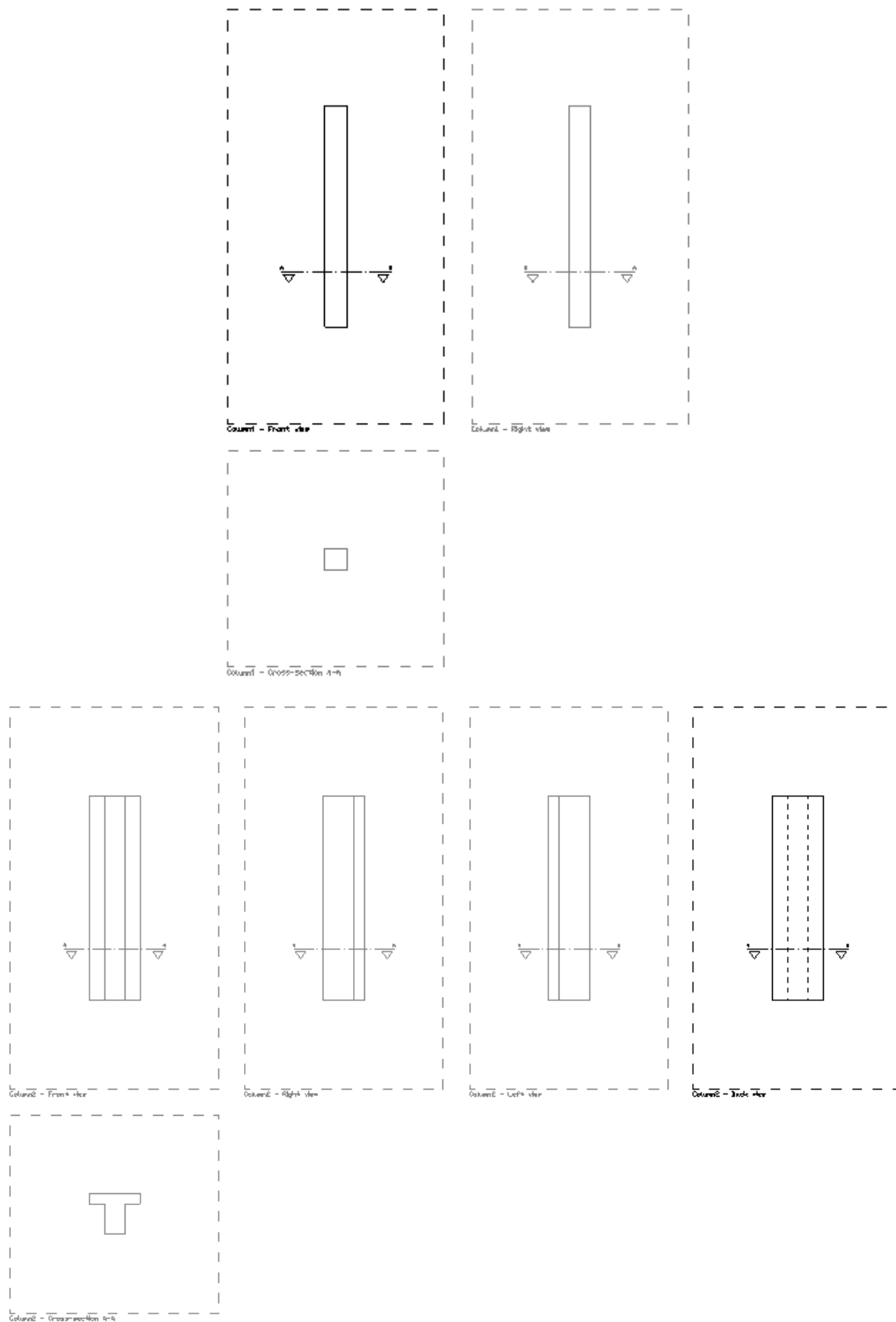



Fig. 11 Two Views and one Section of the rectangular column, and four Views and one Section of T-section column.

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3.5.2. Inserting adjoining elements

3.5.2.1. Top transoms

The adjoining elements in form of transoms may be added to the column at its height, in any direction perpendicular to the column axis. This is realized with function  - **Insert transom**. When it is activated, you may adjust **Properties** of the transom in transom insertion bar.

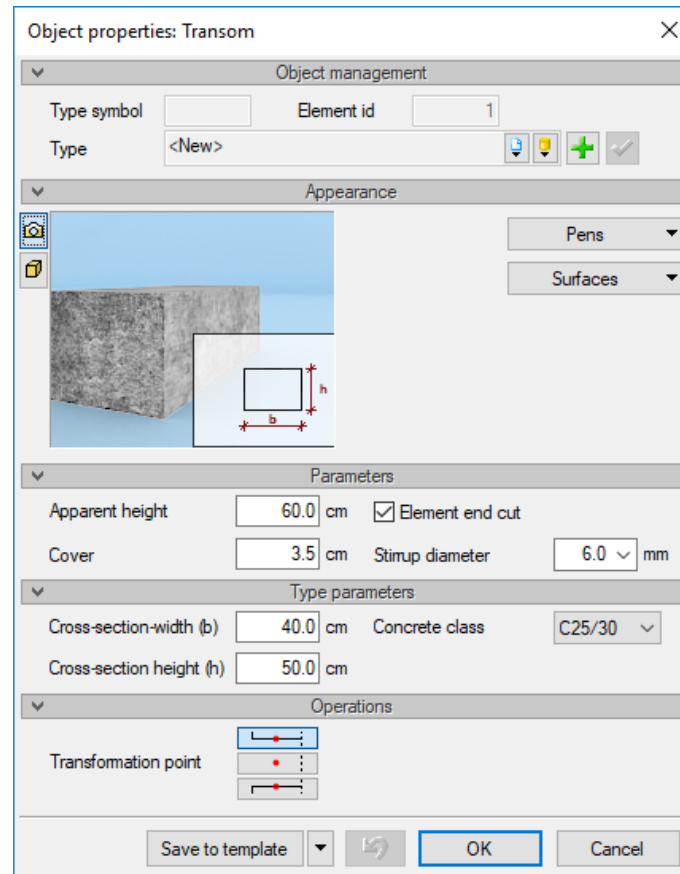



Fig. 12 Transom - element Properties window

These includes transom parameters such as: visible transom length, type of its end (cut out or not cut out), diameter of stirrups in transom, value of reinforcement cover for transom, transom dimensions and concrete class. The transom width, when it is inserted into the model, is automatically adjusted to the suitable dimension of column section and cannot be changed in this mode. The user is able to freely change the width after insertion of the transom from **Properties** window. The type of the transom end and possibility to place it in any point of column height enable the user to potentially design columns with short cantilever (reinforcement of such a cantilever should be designed individually, rebar-by-rebar). The Application allows the user to add only rectangular transoms to the column, in two perpendicular directions and perpendicularly to the column axis. When adding transoms to the columns you must keep in mind that in case of last level columns (if upper level column is not present), the column longitudinal reinforcement will be bent to the transoms in the plane of main frame. This reinforcement can be bent only if the transom upper edge will perfectly match in the direction of main frame with upper edge of the column inserted into project. In other cases, the automatically overlapped reinforcement of the column will reach the column upper edge, or in case of

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upper level column, will be inserted into this column. In the edition mode, also the transformation point change is available for selected transom in **Properties** window, e.g. during change of transom height (by default, it is the upper point of transom).

3.5.2.2. Upper level column

Besides the column adjoining elements in form of horizontal transoms, also the adjoining element in form of upper level column may be added. This is done with function  - **Insert column of upper level**. **Properties** window for upper level column is analogical as for transoms and contains similar parameters, such as: visible length of upper column, type of its end (by default: **Cut out element end**), diameter of stirrups in upper column, value of reinforcement cover for upper column, column dimensions and concrete class.

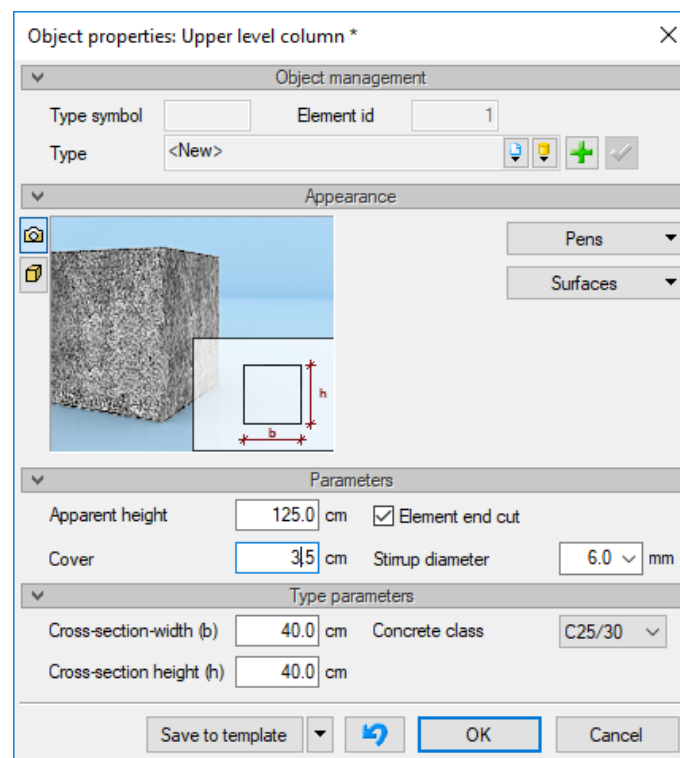


Fig. 13 Properties window for upper level column

The upper level column inserted in the project must always have the same shape of section like the column being designed, however for the columns with rectangular or round sections it may be the column with the same shape of section but with smaller dimensions (in this case the longitudinal reinforcement of column is bent into the upper level column). If the column with other section than round or rectangular is being designed, the upper level column being added must have exactly the same type of section and exactly the same dimensions as the column being designed. If the upper level column is used and has the same dimensions as the column being designed (or bigger dimensions - in case of rectangular or round section), the longitudinal reinforcement from the column is inserted into the upper level column to the anchoring depth, independently of adjoining transoms presence and their quantity. If the upper level column with rectangular or round section is used and has dimensions smaller than the column being designed, the longitudinal reinforcement from the column is bent into

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the upper level column to the anchoring depth, independently of adjoining transoms presence and their quantity. In this case the bending of reinforcement into upper level column is done at the height of upper adjoining transoms (if any). If the upper adjoining transoms are not used, the reinforcement is bent on the length which provides bending angle of 1:3. In this case stirrups on the bending length will be automatically adjusted to the full dimensions of the column section including the cover. In case of adding adjoining element in the form of upper level column, the geometrical axes of column being designed and adjoining column will coincide in every case.

3.5.3. Automatic designing of reinforced column on the basis of calculation

ArCADia-REINFORCED CONCRETE Application features function of importing data from calculation applications: **Constructor – REINFORCED CONCRETE COLUMN PN-EN** and **EuroFerroConcrete** module of **R3D3 3D Frame** and **R2D2 2D Frame** software and automatic generation of column reinforcement drawing on the basis of calculation and transmitted data. After running of calculation in **Constructor Reinforced Concrete Column PN-EN** module, open **Configuration of reinforced concrete element export** by clicking on **ArCADia** button at the bottom left corner of **Report configuration** window.

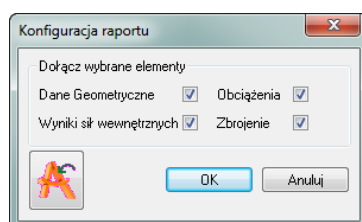


Fig. 14 Running data export to ArCADia software from Reinforced Concrete Column PN-EN module of Constructor software

Similarly, in **R3D3** and **R2D2** software, during individual dimensioning of rebar selected in **EuroFerroConcrete** module, **ArCADia** button which opens **Configuration of reinforced concrete element export** window is located at the bottom left corner of simple **View of element reinforcement** window.

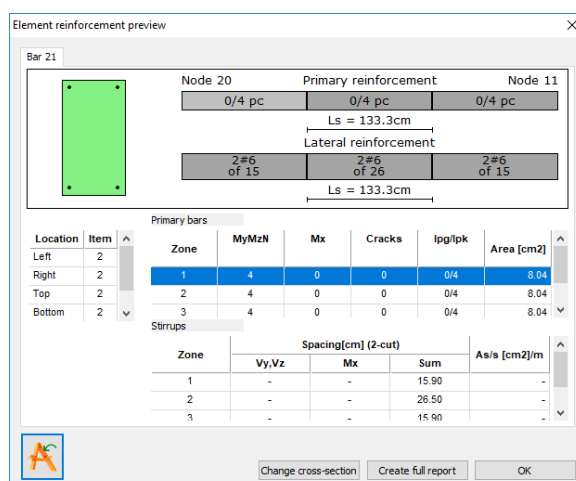


Fig. 15 Running data export to ArCADia software from EuroFerroConcrete module of R3D3 or R2D2 software

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In these both cases opening of the export window results in displaying of dialogue subwindow which enables the user to specify geometrical data designed for export and selecting the export method.

Export configuration of reinforced concrete element

Exported element type: Slup

☒ dimensions in support axis ☐ dimensions in support clear

No.	Support	Dimension [cm]
1	<input checked="" type="checkbox"/> Column up	30.0
2	<input checked="" type="checkbox"/> Upper left transom	50.0
3	<input checked="" type="checkbox"/> Upper right transom	50.0
4	<input checked="" type="checkbox"/> Lower left transom	50.0
5	<input checked="" type="checkbox"/> Lower right transom	50.0

☒ Automatic adjustment of primary reinforcement

Cancel

Fig. 16 Configuration of reinforced concrete element export window in Reinforced Concrete Column PN-EN and EuroFerroConcrete module

In the configuration window you may select the type of element designed for export (currently it can be only a column), specify the method of column calculated height representation on the drawing (in axis or between supports), select and specify the dimensions of elements adjoining from top and bottom and define whether the longitudinal reinforcement is to be matched to the upper adjoining elements automatically or not. By selecting the column height in the support (transom) axis the user defines that the column calculated height will be represented on the drawing in the axis of the highest bottom and upper transom. By selecting the column height between the supports (transoms), the user defines that the column calculated height will be drawn from the upper edge of bottom transom to the bottom edge of higher upper transom. Selection of the adjoining elements and their dimensions in the form of column and upper transoms will result in transmission of data regarding these elements and dimensions to a graphical software in order to draw them properly and determine appropriate column height. The adjoining elements in form of bottom transoms are not drawn in a graphical program - they are just used to determine appropriate height of the column on the drawing. The adjoining element widths are by default set as equal to the width of column being calculated. The automatic matching of longitudinal reinforcement option makes the longitudinal reinforcement of column to be automatically bent or inserted into the upper adjoining elements. This function is effective only for the most common columns with round or rectangular section. If the automatic matching of longitudinal reinforcement option is deselected, the reinforcement will be exported to **ArCADia** exactly in the form determined in a calculation application. Two export buttons are located at the left bottom corner: one is for direct export to **ArCADia** software, the second one is for saving the drawing data in XML file, which may be loaded into ArCADia drawing any time in the future by using function - **Insert complete column from xml file** from the top toolbar of the program. In order to use the direct calculation data export function from **Reinforced Concrete Column PN-EN** or **EuroFerroConcrete** application, you must open a CAD software (**ArCADia-INTELLICAD** or **AutoCAD**)

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with preinstalled full version of module **ArCADia-REINFORCED CONCRETE COLUMN** before running export function with the button.

3.5.4. Copying of column between documents/files or within single document/file

The Application supports the function of copying completed columns between different documents or within a single file. This function enables the user to create new project using elements (columns) copied from previously completed multiple projects, which can be further suitably modified by the user. The column may be copied in form of complete model along with the reinforcement designed. The copy function is activated in the Application with standard method employing the clipboard. It means that you must select the column you want to copy, press **CTRL+C** keys, switch to the new document or stay in the same document, press **CTRL+V** keys and point on the localization within the drawing, where the copied column is to be placed. In order to copy complete column within the single drawing or between documents, at least the outline of the column being designed must be selected in the active View before copying it into the clipboard. Selecting of other elements in the View does not effect on the column copying method. Along with the column also the other column's elements are copied to the clipboard, such as: adjoining elements, longitudinal and transversal reinforcement, linear dimensions, rebars descriptions and all its Views and Sections. The copy function using the clipboard does not copies a drawing elements, which are not included in the particular Views and Sections, i.e. reinforcement steel list and rebar details. It is not possible to copy to the clipboard the following items: adjoining elements, reinforcement and its descriptions, and dimensions.

If standard copy function available in CAD software is used, such copying is possible only within a single document. In such a case, in order to copy the complete column along with all its elements, Views and Sections, before using copy function the user must select at least the outline of column being designed in the active View. In order to copy the reinforcement, the user must select just the rebars and before using the copy function must check if the option of automatic matching available in Properties window is disabled for these rebars. After selection of the View or Section frame, the copy function enables the user to insert another, the same View or Section within the same structural element (column).

3.6. REINFORCEMENT INSERTION

3.6.1. General characteristic of reinforcement designing

The component reinforcement designing rules applied in this Application are in line with requirements of **EN 1992-1-1 Eurocode 2: September 2008**. The following elements of rebars the Application inserts automatically during reinforcement designing:

- Stirrup hooks angled at 90 or 30 degrees, depending of settings in the Application **options**.
- Bend radii for rebars (if the option of taking into account of bend radii is enabled in the Application **Options**).
- Anchoring lengths of longitudinal rebars when the reinforcement is inserted into transoms or upper level column.

Straight hook length for stirrups has been set to 10x diameter, but not smaller than 7 cm. For stirrup hooks bent at angle of 30 degrees – 5x diameter, but not smaller than 5 cm. The automatic hooks are

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used only for stirrups, for other rebars, since the Eurocode concerns only reinforcements made of ribbed steel with yield strength from 400 to 600 MPa, the automatic hooks are not used.

Bend radius calculation procedure for stirrups is based on the rule defined in 8.1N table of **EN 1992-1-1 Eurocode 2**, and for other rebars the additional checking of minimum bend radius according to equation 8.1 of the above standard has been applied.

The longitudinal rebars anchoring lengths in adjoining elements (transoms or upper level column) has been calculated using equations 8.10 and 8.11 of **EN 1992-1-1 Eurocode 2**.

The sequence of reinforcement insertion into the column is not important. However, because the reinforcement being inserted is adjusted to the column section shape, or, to be more precisely, to the value of reinforcement cover specified in the column **Properties**, it is recommended to keep in mind the rule stating that the longitudinal reinforcement is inserted after the transversal reinforcement. Otherwise, if the automatic longitudinal reinforcement is inserted first, it will be arranged with the offset equal to the cover value against all the section edges, and next, after insertion of stirrups it is shifted again by the stirrup thickness in the direction of column inside. This situation occurs when the longitudinal and transversal reinforcements are overlapped in the automatic mode. Therefore it is important to keep in mind the rule stating, that if you want to disable automatic mode for stirrups, you must disable automatic mode for longitudinal rebars first. Otherwise the automatic longitudinal rebars once again will be arranged with the offset equal to the cover value against outside edges of the section while the thickness of stirrups with disabled automatic mode will be not considered.

3.6.2. Inserting transversal reinforcement into column

It is recommended to start the insertion of reinforcement into the column in the current version from transversal reinforcement in form of stirrups. For this purpose the Application is provided with two similar functions:  - **Insert single stirrup** and  – **Insert stirrup block**. The first one inserts single stirrup into the model, while the second one inserts stirrup block on the defined length (generally also with defined span). Since the stirrups are generally inserted in blocks, the optimal solution would be insertion of stirrups in one of active Side Views. It is also possible to insert the single stirrup in the Section; in this case this stirrup will be inserted in the place of location of the Section on the column View. The insertion bar is identical for both functions, and contains: definition of the insertion point on the stirrup (left, centre and right point), graphical options: **Reference**, **Between points (centre)** and **Between points (percentage)** and access to dialogue box **Stirrups properties**.

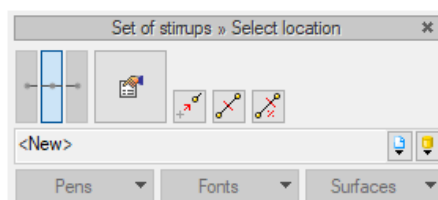


Fig. 17 Insertion bar for stirrups

For insertion of automatic stirrups only the centre insertion point is available. To change this setting deselect automatic insertion option in **Stirrup properties** window. During insertion of stirrup or stirrup block you may use characteristic points of CAD applications and additional graphical option from the

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insertion bar, described above. Click on **Properties** button to open dialogue box **Element properties: stirrup block**.

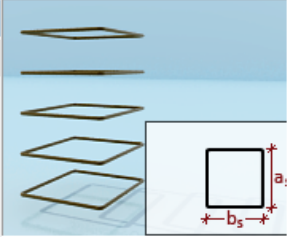
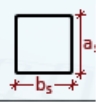
Object properties: Set of stirrups

Object management



Type symbol Element id

Type

Appearance

Parameters

Reinforcement type  

Width (bs) cm


Length (as) cm } ☒ Automatic size and location in cross-section

Number in set Spacing cm

Type parameters

Diameter mm Yield stress MPa

Operations

Transformation point 

Save to template

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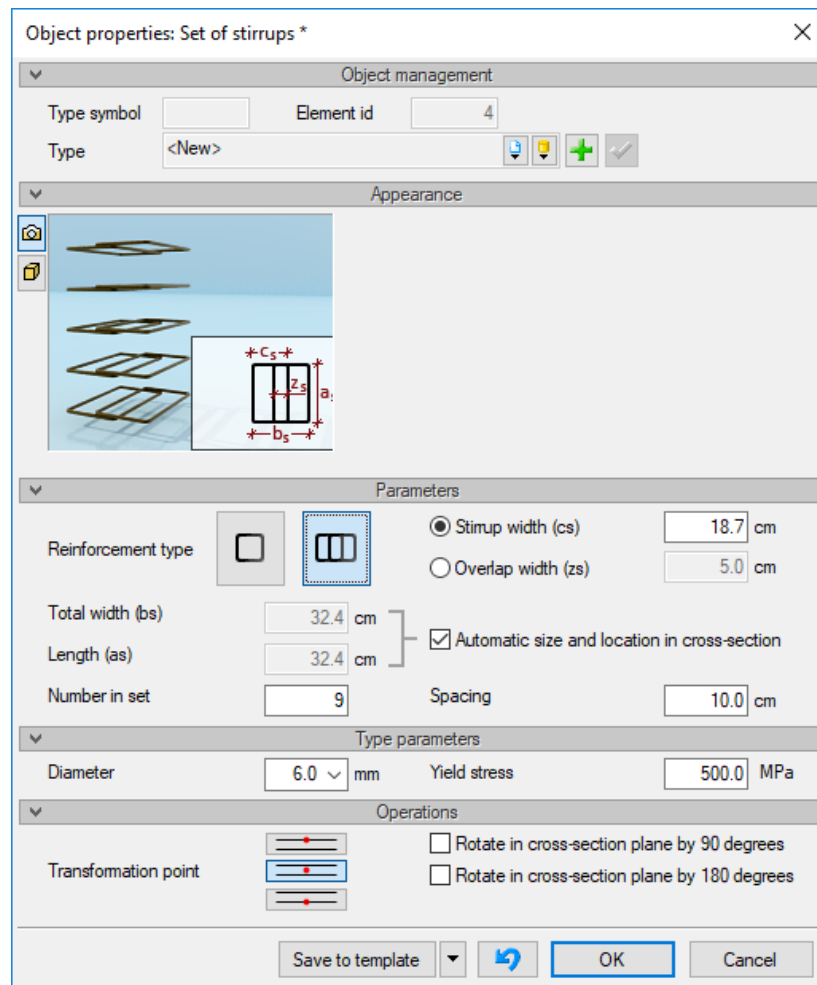


Fig. 18 Element properties window for two- and four-legged stirrups

You must first define the type of stirrup block (two- or four-legged) in **Properties** window. Next, define if the block size and location within the Section is to be determined automatically. If Yes, the Application will adjust the stirrup shape to the column section automatically, maintaining their appropriate cover. In such a case the only thing you must specify is the stirrups diameter and their yield strength, and in case of four-legged stirrups you must additionally specify the stirrup width or overlap width and rotation of the stirrups in the plane of the column section. If the automatic insertion option is enabled, you must specify the length and width of the single stirrup or stirrup block by yourself. Parameters: **quantity in block**, **span** and **transformation points**, available for edition when **Properties** window is being opened for the block inserted already.

When the single stirrup or stirrup block properties are defined, point the single stirrup or stirrup block localization within the column model or the origin of the block being inserted. When inserting the block of few stirrups, after pointing their origin the enhanced insertion bar will be displayed complemented with additional options for precise specification of the block end point, stirrup span or their quantity.

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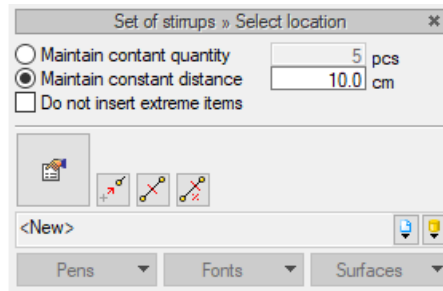


Fig. 19 Insertion bar for stirrup block

In such an enhanced insertion bar the user may decide whether the stirrup span (the quantity is the result) is to be maintained on the given length covering the stirrup block, may specify the stirrup quantity (the span is the result) and whether the external stirrups are to be inserted with the stirrup block or not.

After insertion and selection of the stirrup block, the task bar with the following three functions will be displayed: - **Explode block** of stirrups into individual stirrups, - **Insert rebar details**, actually stirrups, in this case ("extracted" rebar) and - **Insert rebar description** (stirrup block, in this case).

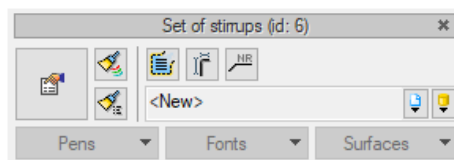


Fig. 20 Task bar for stirrup block

For the active Section, the task bar for four-legged stirrup or stirrup block is enhanced with the extra function - **Adjust width of four-leg stirrup overlap** enabling the user to adjust the overlap to the longitudinal rebar positions in the column section. This function operates for four-legged stirrup selected in the column section. It has effect on the all stirrups of the same type used in the column, located above and under the selected block. Function - **Adjust width of four-leg stirrup overlap** is not available in the task bar for four-legged stirrups in any of active Side Views.

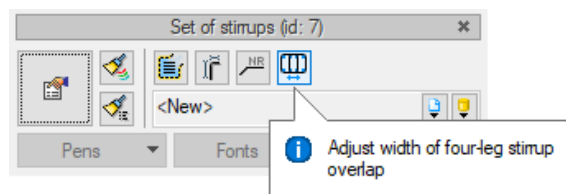


Fig. 21 Task bar for four-legged stirrups with Section active

The similar situation occurs when the stirrups are inserted into the round section columns. In this case only the single overlap stirrup or stirrup block with diameter adjusted in the automatic mode are available. For the active section, the task bar for round stirrup or round stirrup block is extended with extra function - **Adjust stirrup hook position**, which enables the stirrups to be rotated around the

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column axis and to be positioned such a way, which ensures the hook bending on the correct longitudinal rebar of the column.

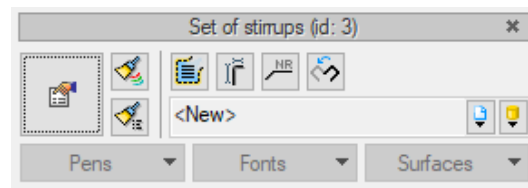


Fig. 22 Task bar for round stirrups with Section active

In case of other shape columns, the automatic stirrups (single or in blocks) are overlapped in a single operation in the single column section branch, depending on the View which is active at that moment. By appropriate switching of the active Views, you may distribute the stirrups in the every column branch.

3.6.3. Inserting longitudinal reinforcement into column

When the transversal reinforcement insertion has been completed, you may start with the insertion of longitudinal reinforcement into the column. For this purpose the Application has been provided with the following two options: - **Insert single automatic rebar** and - **Insert automatic rebar block**. Both functions are dedicated to insertion of standard longitudinal reinforcement into columns. The optimal solution available in the Application is insertion of automatic longitudinal rebars in the active column Section. The longitudinal rebars may be also inserted in the active column View; in such a case they will be distributed on the View wall, which is nearest to the Observer. After running one of the above functions, you may switch from Insertion bar to **Properties** for the rebars being inserted.

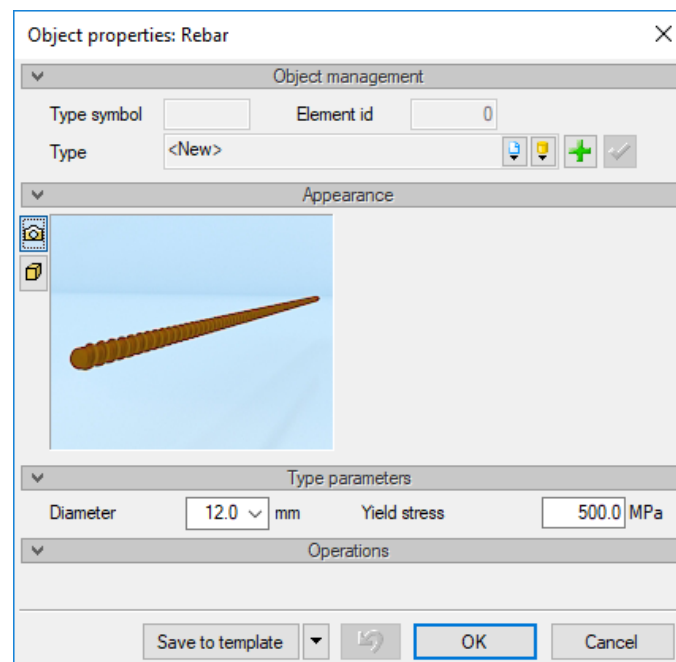



Fig. 23 Element properties window: Rebar in insertion mode

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You may specify the rebar diameters, steel yield strength in Properties window. The shape of longitudinal rebars in the automatic mode (default for rebar insertion) will be adopted to the shape of column being reinforced, with the adjoining elements being considered. It means that in case of adjoining element presence, e.g. in the form of upper level column, the longitudinal rebars will be bent or inserted on the anchoring length into this column (depending on its dimensions). However, if the column being reinforced is on the last level and there is no upper level column, the longitudinal reinforcement will be bent on the anchoring length into the opposite, upper horizontal transoms in the plane of main frame. In this both cases, the anchoring length is calculated automatically as the length inserted into the upper column or bent into the transom, measured from the bottom of lower transom. If the column being designed has no adjoining elements at the upper end, automatically inserted rebars will be straight on the whole column height with necessary upper and bottom cover maintained. When the reinforcement properties are specified, during insertion of the single rebar point directly its localization in the active Section or View. Select  - **Insert automatic rebars group** option, and then point the localization of the first rebar of the block, in the extended Insertion bar specify the rebar quantity for the selected length (**Maintain constant quantity** option) or the rebar quantity will be calculated for the constant span (**Keep constant distance**). Also, similarly to stirrup block, you may additionally select **Do not insert external elements** option.

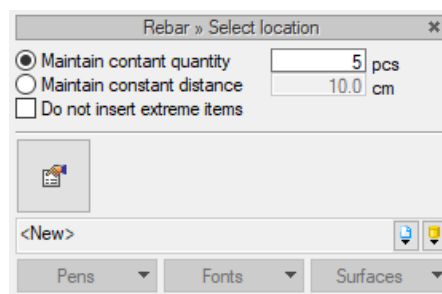


Fig. 24 Extended insertion bar for rebar block

When the above parameters are set properly, you may point localization of the last rebar of block on the active View or Section. In order to reinforce rectangular column symmetrically, to have 5 rebars on the opposite sides and 3 rebars on other sided, insert 5 rebars from one corner to the second while having option **Maintain constant quantity** of 5 pcs enabled. The same applies for insertion of 5 rebars on the opposite side. Next, in the other sides insert 3 rebars (in the same way, from the corner to the corner) while having option **Do not insert external elements** enabled. As you can see in the above description, the most convenient way for automatic insertion of rebars is to use the column Section.

As opposed to the stirrup blocks, the automatic rebar block is visible only during its insertion. After insertion, each rebar of the block may be considered individually.

When the automatic rebar or rebars are inserted into the drawing, you may select them and open **Properties** window from task bar. The window will feature additional mark for disabling the mode of reinforcement adjustment to column – **Disable automatic adjustment to column**. The operation of disabling the automatic adjustment of the rebar is irreversible, and when it has been chosen, the automatic rebar becomes rebar of any type, which may be freely modified.

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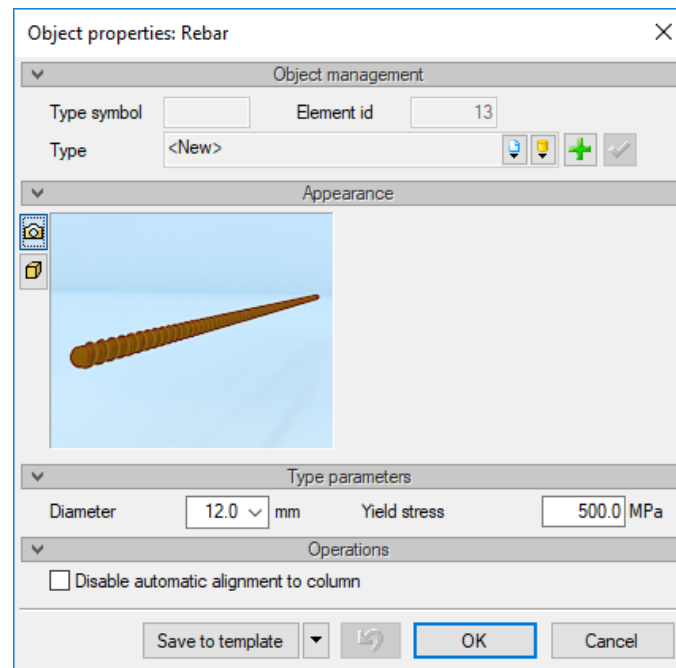



Fig. 25 Element properties window: Rebar in edition mode

In case of columns with section other than round or rectangular, the automatic rebars are inserted always only on the whole column height, without their automatic bending into transoms or insertion into upper level column. Similar to the stirrups, the longitudinal rebars may be overlapped in the View, in a single operation in the single column section branch, on the wall, which is nearest to the Observer. Therefore, for these type of sections it is recommended to create a reinforcement model using all the available Views. The most convenient way of automatic longitudinal rebar insertion into sections other than rectangular or round (however, it is also the most convenient way for these sections) is insertion of the longitudinal reinforcement in the Section, where you have easy access to all walls of the section.

3.7. INSERTION OF ANY TYPE REBAR AND REINFORCEMENT MODIFICATION

Also the rebars of any shape may be inserted individually into the columns. This is realized with function  - **Insert user-defined rebar shape**. When the function is activated, you may switch from Insertion bar to **Properties** window for the rebar being inserted, where you may specify its diameter and yield strength. This **Properties** window appearance is similar to the Properties window appearance for automatic rebar; the only exception is that in the insertion mode nor edition mode there is no possibility to deselect automatic adjustment to column, which as rule is not effective for such a rebars.

When the rebar parameters are specified in **Properties window**, you may start defining the rebar shape - it is realized by pointing successive points of polyline using for this purpose graphical tools available in Insertion bar and standard tools available in CAD software, such as: precise relative coordinates, snapping points, etc. Free-shape rebar is inserted always into the active View (Section) and is drawn automatically on other Views and Sections. When defining free-shape rebar, each of its bend is rounded with bend radius the suitable for the given rebar diameter, according to rules set out in the

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Application **Options**. After selection few rebars in the model, few operation will become available in the taskbar.

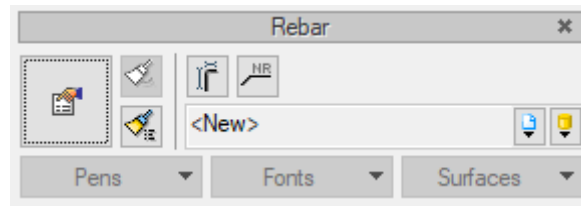


Fig. 26 Task bar appearance after selection of few free-shape rebars

These are, from the left:

- - The function inserting details of the rebars selected (insertion of extracted rebars).
- - The function inserting descriptions for every rebar selected on the single common reference line (select the View in which the description reference lines are to be inserted and then point the reference line localization).

If only one free-shape rebar is selected, the list of available operation for this rebar is much longer.

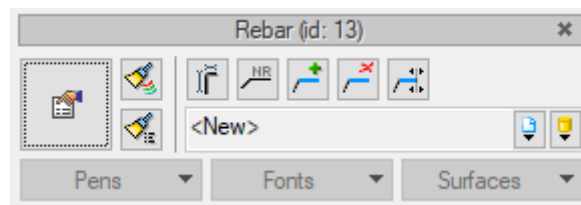


Fig. 27 Task bar appearance after selection of single free-shape rebar

In such a case three more, extremely important operations are added:

- - The function inserting successive segments on the one end of the rebar selected (select the one end of rebar and then select successive point of polyline, similar to free-shape rebar insertion).
- - The function deleting the first or the last segment of rebar selected (point on the first or the last rebar segment).
- - The function modifying any segment of rebar selected (select any segment of rebar selected and then point on the end of segment, which is to be changed, and enter or indicate on the drawing the target length of the segment being modified). During modification of the selected rebar segment, all the others segments located after the selected end will be translated simultaneously.

Similar operations to the above described will be available for automatic rebar with automatic adjustment to column option disabled. The free-shape rebar is inserted always into the active View, by default in the plane crossing with the column section axis, or, in case of active Section, in the section plane. The rebars inserted into model in this way (in any View/Section selected by the user) may be further deleted, moved, copied, rotated, mirrored with the use of CAD tools, coordinates and snapping

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points. Correct use of the tools available for the free-shape rebar, such as: rebar insertion, View switching and adding successive rebar segments enables the model to be enriched with spatial rebars.

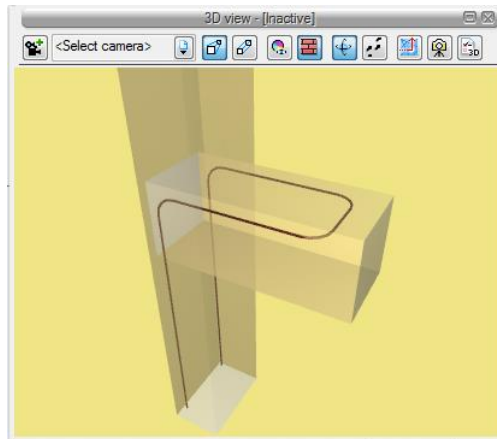





Fig. 28 Example of free-shape spatial rebar in 3D View

3.8. INSERTION OF REINFORCEMENT DETAILS

Each rebar inserted into the model may be "extracted" on the reinforcement drawing in the form of rebar copy with details (dimensions) of its structure and annotations. For this purpose the Application is provided with two functions:  - **Insert rebar details** and  - **Insert details for all rebars**. Both functions are available from the Application main toolbar. Additionally, the first one function is available from taskbar for single automatic rebar, free-shape rebar and stirrup block. After selection of  - **Insert rebar details** and selection of the rebar in the model, for which the function is to be applied, point the localization on the extracted rebar drawing. The extracted rebar drawing is not the model object (it is not visible in the **3D View**), is not included into reinforcement steel list and is not associated with any View nor Section. The rebar detailed drawing, along with the rebar geometry includes: automatically generated rebar number, its diameter, total length, lengths of particular segments, dimensioned bend radii and arc lengths. The method of presentation for these elements is dependent on the settings in the Application **Options** window. In the element **Properties** window: For **Rebar details** you may select font size.

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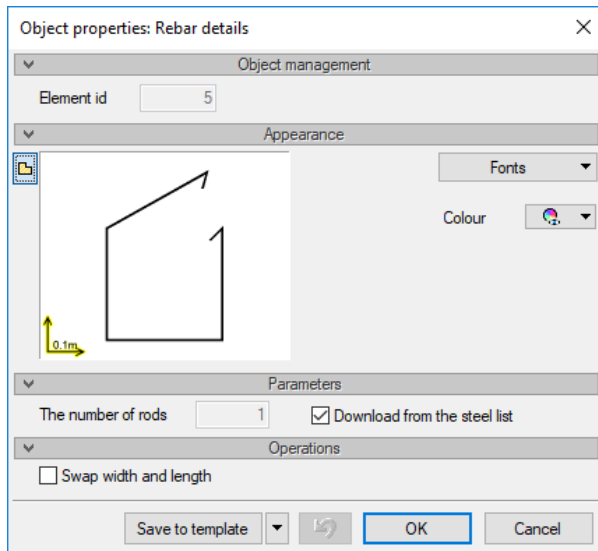



Fig. 29 Properties window for rebar details

Function  - **Insert details for all rebars** operates in the similar way to insertion of details for single rebar, however in this case you do not have to select rebars for which the details are to be inserted - the Application automatically finds all the rebars of any shape used in the drawing and generates extracted rebars for all these rebars in a single operation. Within the extracted rebars you may insert into the drawing few identical rebar details, and their quantity do not effect on the quantity of rebars in the model and steel list. Each modification of the actual rebar in the model (change of dimension, shape, diameter, etc.) is automatically appropriately represented in the extracted rebar associated with the rebar modified.

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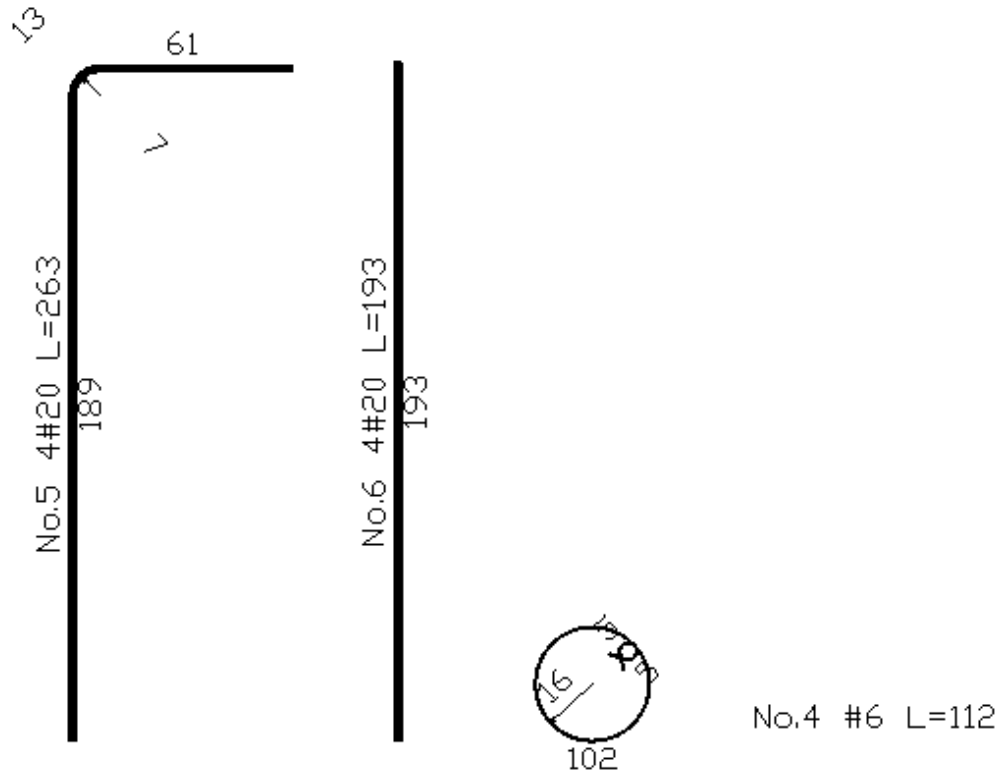



Fig. 30 Example drawings of extracted rebar details

After selection of any drawing with rebar details, the three base points enabling the user to change the extracted rebar localization and to independently change its description localization and the description length in relation to the length of the rebar extracted become available.

3.9. INSERTION OF REINFORCEMENT DESCRIPTIONS IN VIEWS AND SECTIONS

For rebars inserted into individual Views and Sections it is possible to insert the reinforcement descriptions. For these purposes the Application has been provided with function  - **Insert rebar description** available from main toolbar. After selection of this function, point the rebar or rebars (identical or different) in the active View or Sections, for which the description is to be inserted. Next, select the View or Section, in which the description is to be inserted. It is possible to choose another View than the one in which the rebars were selected. The reference line of description being inserted refers always to all the rebars selected, and when different rebars were selected, the reference line takes the form of a list, in which every rebar with different number and shape is described in the separate line of the list. The last operation during insertion of descriptions is pointing on localization for the description being inserted on the drawing. The rebar descriptions are not the model elements, but as opposed to the inserted rebar, they belong to the particular View and are deleted or hidden with this View. When inserting a rebar descriptions into the drawing, you may open their **Properties** window from taskbar.

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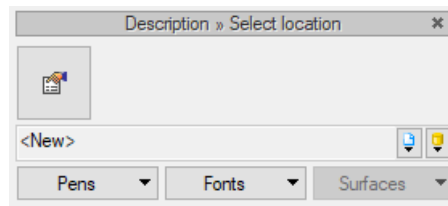


Fig. 31 Taskbar appearance during insertion of rebar descriptions

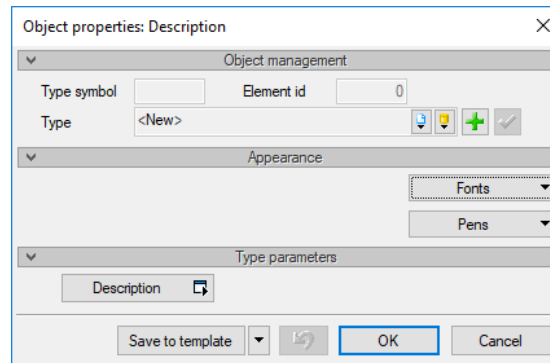


Fig. 32 Properties window for rebar description

In this window, along with font resizing you may define the appearance of particular description. To do so, push **Description appearance** button, which opens additional window for configuration of description appearance.

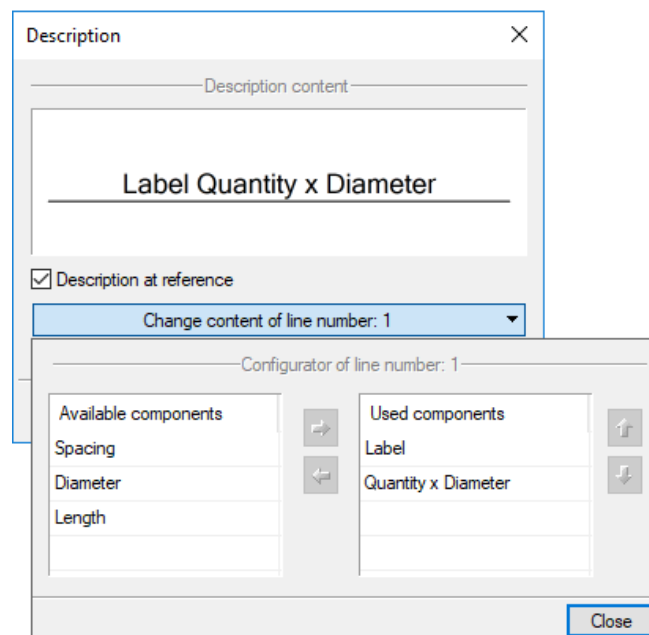


Fig. 33 The window for configuration of description appearance

By deselecting the option **Description on reference line** you may remove the reference line from the description. You may also decide which elements will be included in the description by selecting and moving the appropriate items from the left to right panel, or vice versa. The following items are available: **Label** (with rebar number), **Quantity**, **Diameter**, **Span** and **Length**. By default, the following

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items are selected in the Application for the longitudinal rebars: **Label** (with rebar number), **Quantity**, **Diameter**, and for stirrups these are: **Label**, **Diameter** and **Spacing**. The option that allows to insert the descriptions of the rebars can be activated for the automatic rebars or any rebars from its task bar.

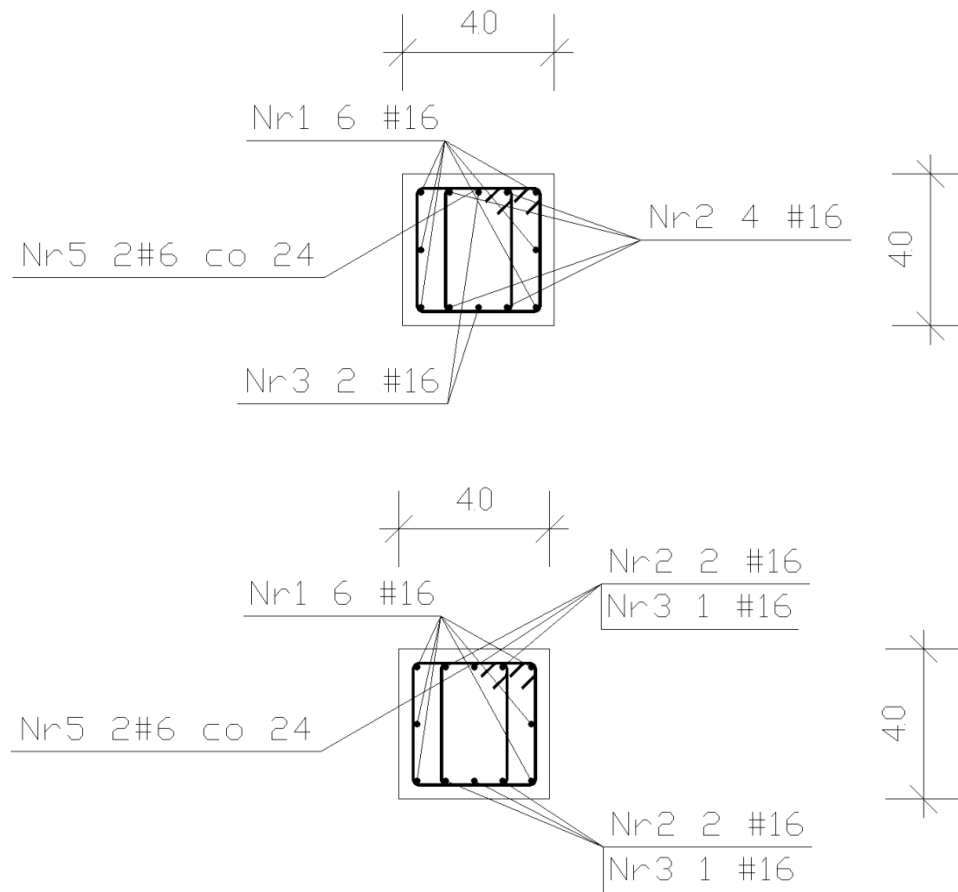



Fig. 34 Two identical sections with different types of rebars description

3.10. INSERTING REINFORCEMENT STEEL LIST

There are two different methods to insert the reinforcement steel list using functions of the main toolbar. Using  - **Insert list of steels used in structural element** function you may insert the list for currently active structural element, multiplied by the quantity of this elements entered by the user in **Properties** window of the column.


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Steel list - Column1 (pcs 1)

No.	Diameter [mm]	Single length [mm]	Quantity [pcs]	Total length [m]	
				500,0 MPa	
				#6,0	#12,0
1	12,0	3930	5	---	19,65
2	6,0	962	12	11,54	---
Total length [m]				11,5	19,7
Unit weight [kh/m]				0,222	0,888
Weight [kg]				2,6	17,4
Total weight [kg]				20,0	

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Fig. 35 Example of reinforcement steel list for selected element (column)

The second function enabling the reinforcement steel list to be inserted into the project is  - **Insert list of steels used in project** option. After selecting it and specifying location of the list in the drawing, the inserted list will include summary of all structural elements used in the drawing, multiplied by its appropriate quantities defined in the **Properties** window of the individual columns.


Steel list

No.	Diameter [mm]	Single length [mm]	Quantity [pcs]	Total length [m]	
				500,0 MPa	
				#2,0	#4,0
1	2,0	3930	1	3,93	---
2	4,0	1028	1	---	1,03
3	4,0	768	1	---	0,77
4	4,0	805	1	---	0,81
5	4,0	1664	1	---	1,66
6	4,0	741	1	---	0,74
7	4,0	1592	1	---	1,59
Total length [m]				3,9	6,6
Unit weight [kh/m]				0,025	0,099
Weight [kg]				0,1	0,8
Total weight [kg]				0,9	

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Fig. 36 Example of reinforcement steel list for entire project and all columns arranged within it

3.11. INSERTING COLUMN GEOMETRY DIMENSIONS

The most convenient way to insert the geometrical dimensions of the column into the drawing is to use the dimensioning provided by **ArCADia**. Then, the dimensions inserted in a such way will belong to the appropriate Views and Section of the column and altogether with them may be removed, hidden or moved. The dimensions inserted into the drawing are not the column model elements but belong to its individual Views and Sections. Insertion of the dimensions is always performed in the active View, using  - **Insert user-defined dimension** function from the main toolbar. After running this function,

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you may choose orientation of dimensions: vertical and horizontal (default option) or parallel to points selected on the drawing.

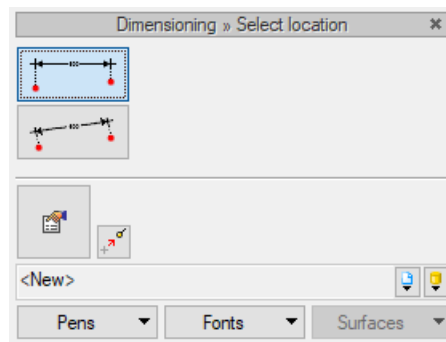


Fig. 37 Insertion bar for geometrical dimensions

Next, select successive points of the structure being dimensioned. When the points are selected press the right mouse button and specify the location for the dimension on the drawing. After it, the linear chain dimension associated with the selected points will appear in the selected localization. When parallel dimensioning of several points which are not arranged in line is selected, the parallel dimension will be offset against to the line determined by the first and the last point being dimensioned.

By opening the **Properties** window for the dimension being inserted or already inserted dimension from Insertion bar or taskbar, you can define the dimension style and font size.

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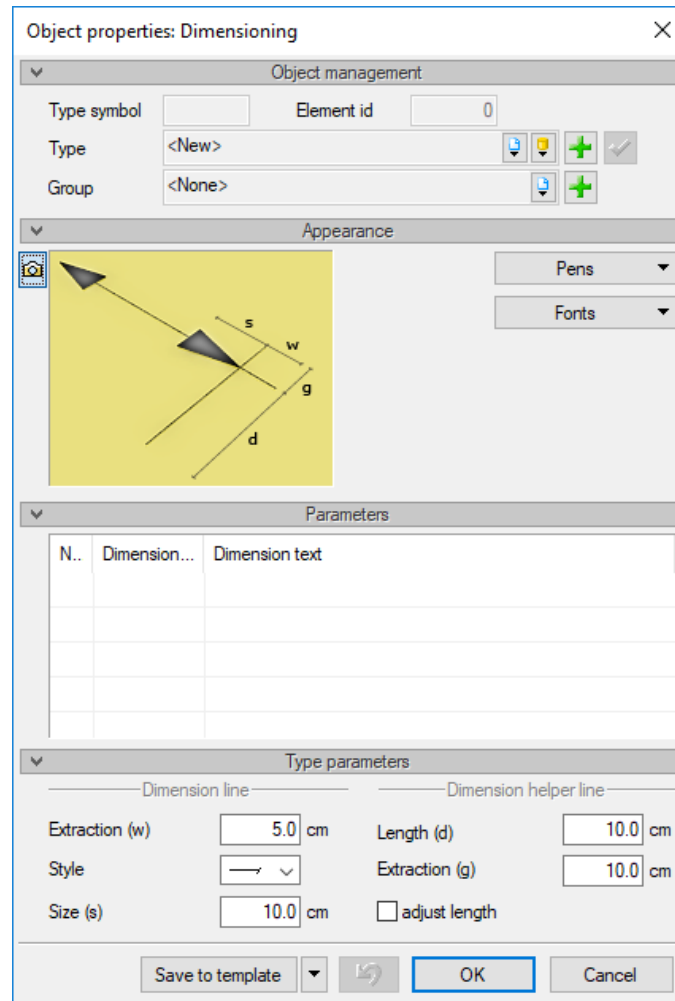
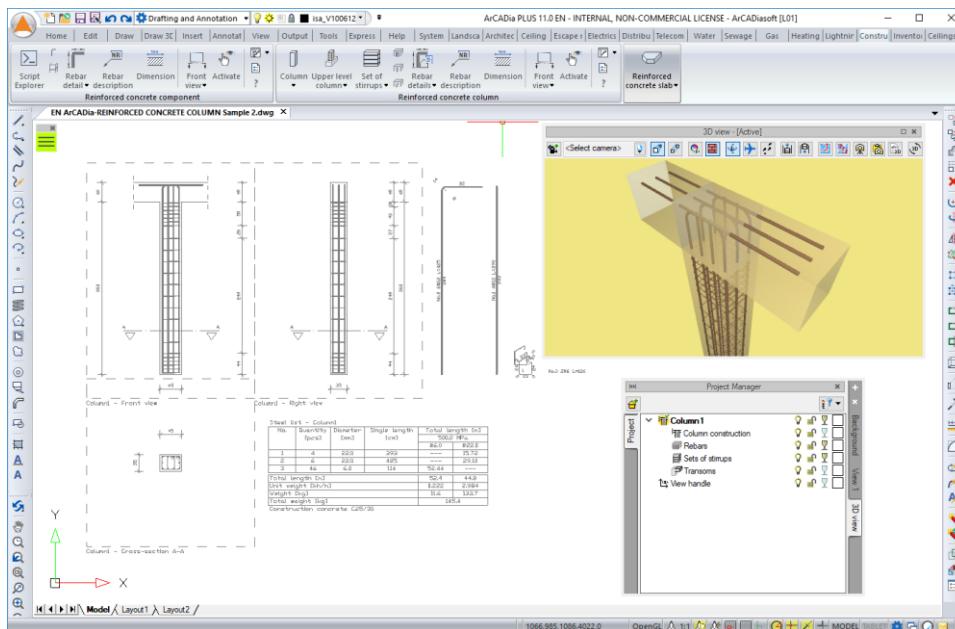
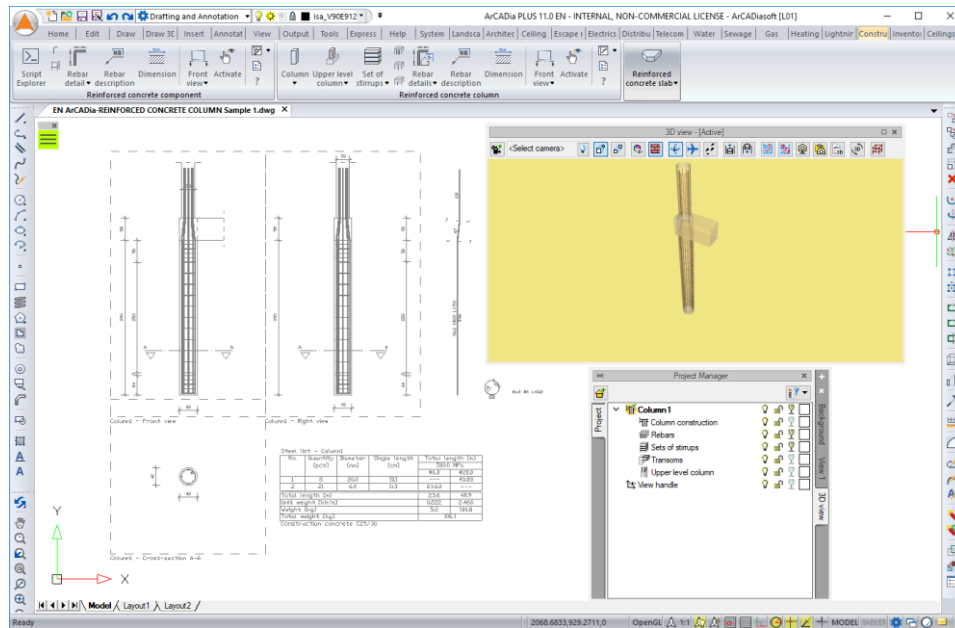


Fig. 38 Properties window for dimensioning

The units of the linear dimensions can be selected between cm and mm depending on the global settings made by the user in the **Options** window of the Application. The dimensions inserted into the drawing may be moved (using the anchors visible after selection of dimension) and deleted.

3.12. EXAMPLE DRAWINGS OF TYPICAL COLUMNS CREATED IN ARCADIA–REINFORCED CONCRETE COLUMN APPLICATION

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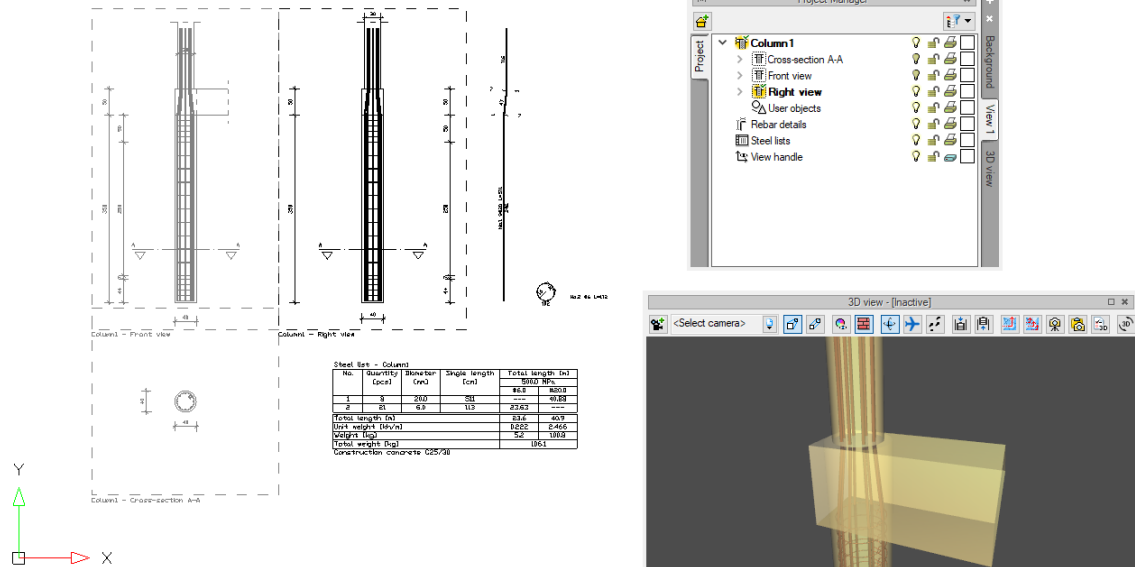


Fig. 39 Example drawings of the columns and 3D model view created in ArCADia-REINFORCED CONCRETE COLUMN application.