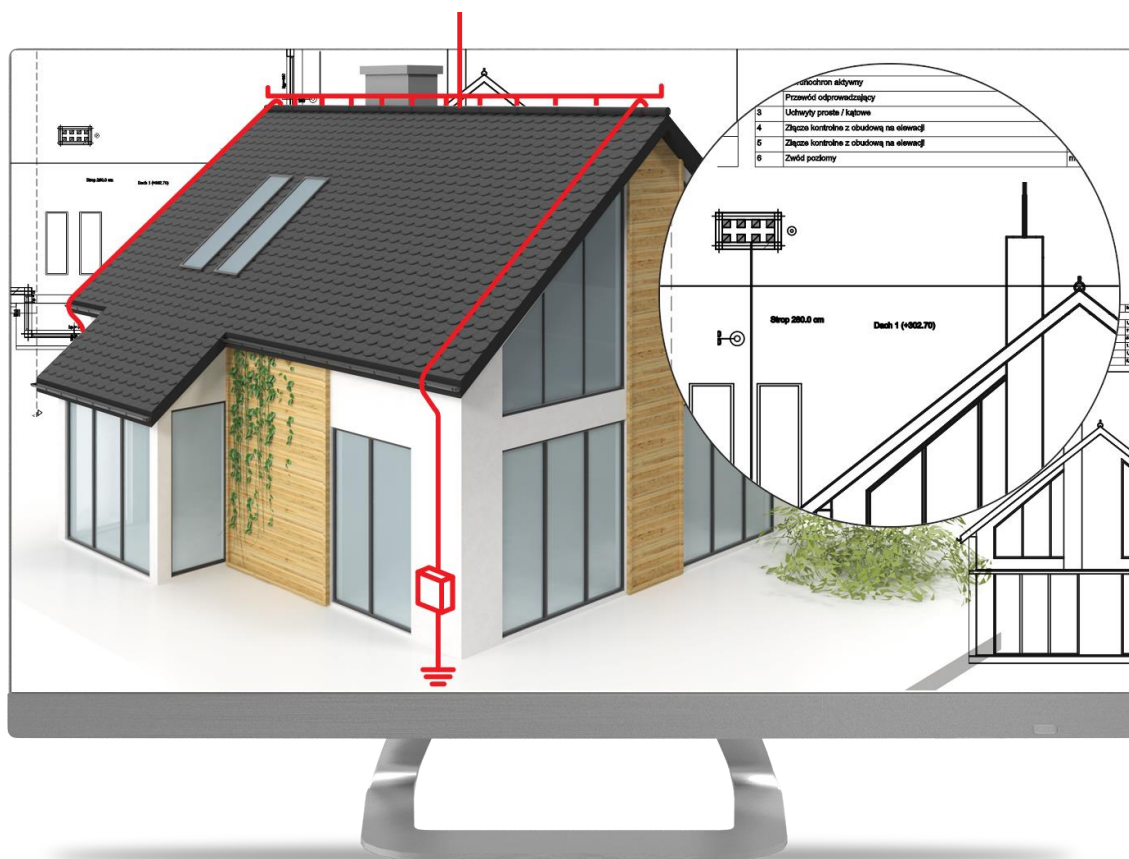


# ArCADia-LIGHTENING PROTECTION INSTALLATION

User manual for ArCADia-LIGHTENING  
PROTECTION INSTALLATION



2019-08-27

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# 1. INTRODUCTION

## 1.1. Purpose of the program

The ArcADia-LIGHTING PROTECTION INSTALLATION module allows you to create a project to protect the building against strong electrical discharges. The module allows you to secure a single-family building as well as create a full lightning protection system in block of flats or public utility buildings. The program allows you to create a project, check the correctness of its implementation (connection of elements and closing circuits) as well as to perform calculations and create a calculation report.

## 1.2. Features and possibilities of the program

The ArcADia-LIGHTING PROTECTION INSTALLATION module enables:

- Introduction of a *Conducting cable* on the roof slopes along the roof ridge, roof edge, baskets, corners and eaves.
- Introduction of a *Downlead* from the roof slope along the walls to the ground or to a *Control connector*.
- Introduction of a *Grounding wire*.
- Outlining the building with the *Surround earth electrode* or the introduction of a *Grate earth electrode* or *Earth rod*.
- Introduction of an *Air terminal*.
- Checking the correctness of element connections, creating lists and a report.

## 2. WORKING WITH THE PROGRAM

## 2.1. Information about the program

Working in the ArCADia BIM system allows you to create a building design as well as electric, water, heating, gas and lightening protection installations to name a few. Working on a three-dimensional building model changes the approach to design, facilitating it, with the ability to see elements not only on the view. It allows you to quickly find and correct errors. In addition, the options for checking the installation, counting elements and generating a report will significantly speed up the design process. The ArCADia-LIGHTNING PROTECTION INSTALLATION module will allow you to complete the virtual building project and allow you to create documentation needed to secure the building from strong electrical discharges.

## 2.2. Description of the program elements

All options of the ArCADia-LIGHTNING PROTECTION INSTALLATION module can be found on the Lightning ribbon

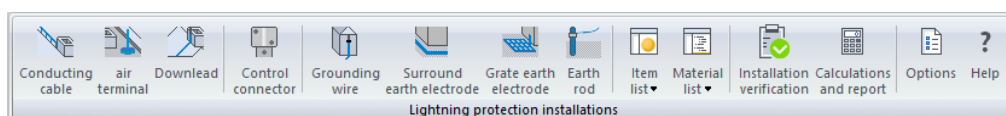








Fig. 1. The lightning ribbon with options of the ArCADia–LIGHTNING PROTECTION INSTALLATION module

Tab. 1 The ArCADia-LIGHTNING PROTECTION INSTALLATIONS module options:

|  |                                 |  |
|--|---------------------------------|--|
|  | <i>Conducting cable</i>         | Assembled on the roof, it is primarily placed along the roof ridge, on the side edges of the roof (baskets and corners), on the chimney and aerial mast.                                     |
|  | <i>Air terminal</i>             | Inserts the lightning rods on the roof, its purpose is to take a direct lightning strike and pass on the discharge further.  |
|  | <i>Download</i>                 | Galvanized steel wire used to create horizontal conducting and down conducting cable.  |
|  | <i>Control connector</i>        | Connects the discharge cable to the earthing. It allows to spread the elements of the lightning protection installation from the earth electrode and measure the resistance of the earthing. |
|  | <i>Grounding wire</i>           | Affixed on the wall of the building; It connects the conducting cable with the control connector.  |
|  | <i>Surround earth electrode</i> | It acts as an artificial earth electrode. It surrounds the building at a fixed distance and at a fixed depth.  |
|  | <i>Grate earth electrode</i>    | Also called net; It acts as an artificial earth electrode; usually used under power poles.   |
|  | <i>Earth rod</i>                | Also called vertical; It acts as an artificial earth electrode; alternative to the surround earth electrode.   |
|  | <i>Item list</i>                | List of elements used in the project.  |
|  | <i>Selected elements list</i>   | List of selected elements used in the project.   |

|   |  |   |
|---|--|---|
|  | <i>Material list</i>                   | List of materials used in the project.  |
|  | <i>Selected elements material list</i> | List of materials of selected objects.  |
|  | <i>Installation verification</i>       | Checks the correctness of the drawn installation.                                       |
|  | <i>Calculations and report</i>         | Performs the necessary calculations for the drawn installation and displays the report. |
|  | <i>Options</i>                         | Displays the options window.  |
|  | <i>Help</i>                            | Displays the help file.   |



### 3. DESCRIPTION OF PROGRAM ELEMENTS

### 3.1. Project Manager

The Project Manager is a project management window, adding buildings and levels, allowing elements to be turned on and off, their blocking and color definition. When designing in the ArCADia–LIGHTING PROTECTION INSTALLATION module, the elements of the project will be placed on the roof building (the roof is treated as separate elements, similarly to levels), and on the *External Area*, dividing them into appropriate groups: e.g. *Conducting cable*, *Downlead*, *Control connector*, etc.

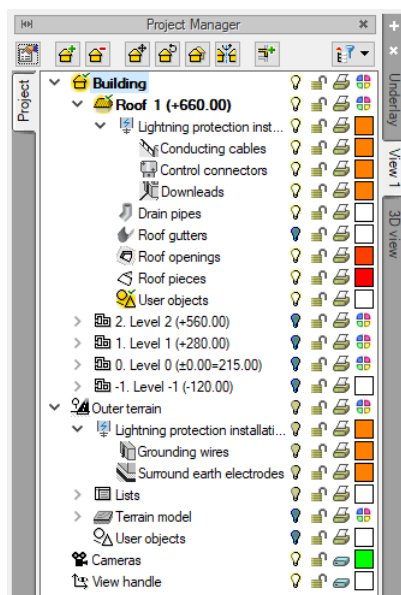


Fig. 2. A sample project in the Project Manager window

In the *Project Manager* window, switching between levels, outer terrain and roof takes place in the project tree by double clicking on the name of the element to which you want to switch. For example, after inserting the elements of the installation on the roof, to enter, for example, the *Surround earth electrode*, we should switch to the *Outer terrain*, i.e. you have to click on its name twice. The name will be bolded and the icon in front of it will change colour to yellow 🚧. Thus, the elements entered on the view are grayed out, and the elements of the *Outer terrain* are activated.

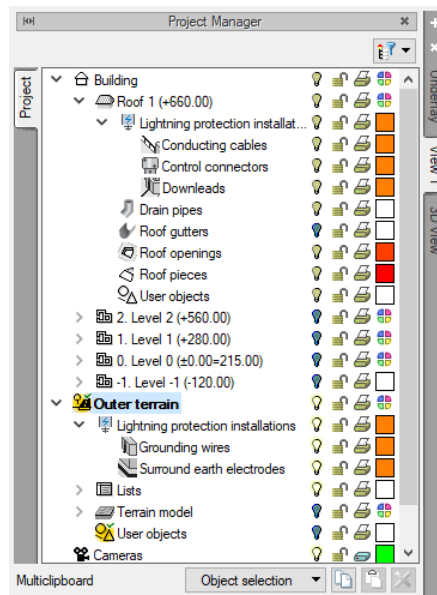



Fig. 3. An active outer terrain

The groups of elements can be divided into subgroups, which later makes it easier to manage elements, select them, enable or disable, block or edit them. Such a division is made in the *Project manager* window by selecting a group and selecting the icon  or by clicking the right mouse button and selecting the *Add group* option. We can create these groups, for example, for elements of the *Conducting cable*, if we have a roof with different slopes or material covered and some elements, e.g. we will have to enter above the covering, e.g. 0.4 m. Managing them and selecting with two clicks will significantly speed up the work on the project.

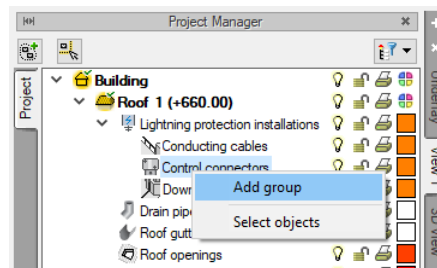







Fig. 4. Dividing elements into groups

Tab. 2 Options available in the Project Manager window

|   |   |  |
|---|---|--|
|  | <i>Group properties</i>                   | Open the window of <i>Group properties</i> .   |
|  | <i>Add subgroup</i>                       | Adds a group or subgroup of elements to the selected group or subgroup, e.g. plants. |
|  | <i>Remove group</i>                       | Removes the selected group or subgroup.  |
|  | <i>Add selected elements to the group</i> | Adds the selected element (s) to the selected group or subgroup.                     |
|  | <i>Select elements</i>                    | Selects all elements of a group or subgroup, e.g. all windows on a given level.      |

More information about the [Project Manager](#) window can be found in the ArCADia System help file.

## 3.2. Views

The ArCADia system allows you to build a building solid or to design, for example, gas or electricity installations, showing them in different views. The first one is always a view, the 3D view is created automatically based on the entered elements on the view. Other views depend on the industry in which the project is created. For architecture, for example, additional views will be cross-sections and elevations, for water supply installations - axonometry, for gas networks - the profile of the gas network, for the gas installation - view of the development, for the sewage installation - also the profile.

The views are available in the [Project Manager](#) window as the next tabs by default placed on the right side of the window.

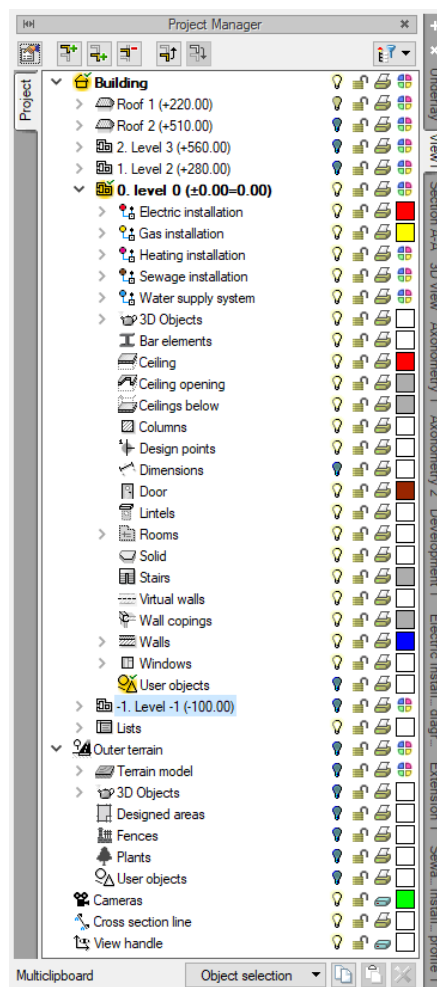


Fig. 5. The Project Manager window




In the ArCADia–LIGHTING PROTECTION INSTALLATION module the basic view is the floor view, the second view is the [3D View](#).

### 3.2.1. The view

The ArCADia system shows the project in views: floor views, cross-sections, elevations, etc. In the view, all existing buildings, floors, land development or only selected elements can be displayed.

#### Activation:

ArCADia and ArCADia PLUS

- [Project Manager](#) ⇒  ⇒ [Insert View](#)
- [Insert](#) Ribbon ⇒ logical group [View](#) ⇒  [Insert View](#)
- [ArCADia-SYSTEM](#) Toolbar ⇒  [Insert View](#)

ArCADia LT

- [Project Manager](#) ⇒  ⇒ [Insert View](#)
- [View](#) Ribbon ⇒ logical group [Insert](#) ⇒  [Insert View](#)

---

**NOTE:** The next (new) view can be inserted with only the floor view active. In other views: cross-sections, 3D view, axonometry, etc., the new views will not be inserted, but the information about the need to switch to the view will be displayed.

---

Switching and managing the view takes place in the [Project Manager](#).

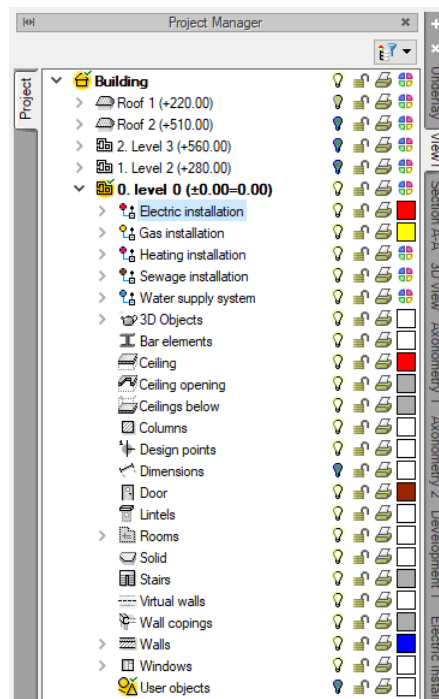






Fig. 6. The Project Manager window of the building with installation


Only one building, one floor or external area can be active in the view. The rest is just a trace that can be turned on or off with an icon . This means that the entry and editing takes place only on the level

marked with the icon  *Active floor*,  *Roof* or  *Outer terrain*. Switching what is active is done by double clicking on a given floor, roof or terrain.

---

**NOTE:** *The level is active only on the View and only for the model made with elements of the ArCADia system.*

---

After choosing the *Insert view* option  and indicating the location, the first and possible subsequent views are inserted. After entering the view, its properties can be set by right-clicking of the mouse on the tab of the given view and selecting from the context menu the *View properties*.

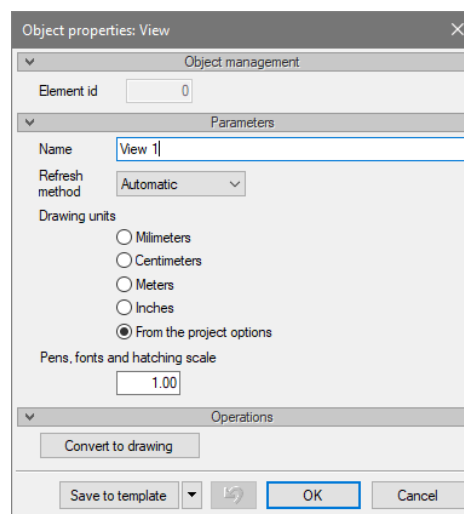


Fig. 7. The properties window of the selected view

In the window above, the *Name* can be assigned, the *Refresh method* and the *Drawing Units*. In addition, the selected view can be *Convert to drawing* so that from now on will only be composed of lines. This will make it possible, for example, to refine the details of cross-sections or other details, but in this view you will not be able to return to the project model.

---

**NOTE:** *With a large project consisting of several views, there might be a need to define the refresh method as Manual. This will significantly speed up the work on the project, because the element inserted in one view will not have to be presented on the others. Each mapping of all introduced options on more than one view significantly extends the drawing process.*

---

### 3.2.2. The 3D view

Projects done in the ArCADia program are three-dimensional projects. All entered elements have information about sizes on both the horizontal view as well as on a vertical view. The project can therefore be seen in the *3D view*.

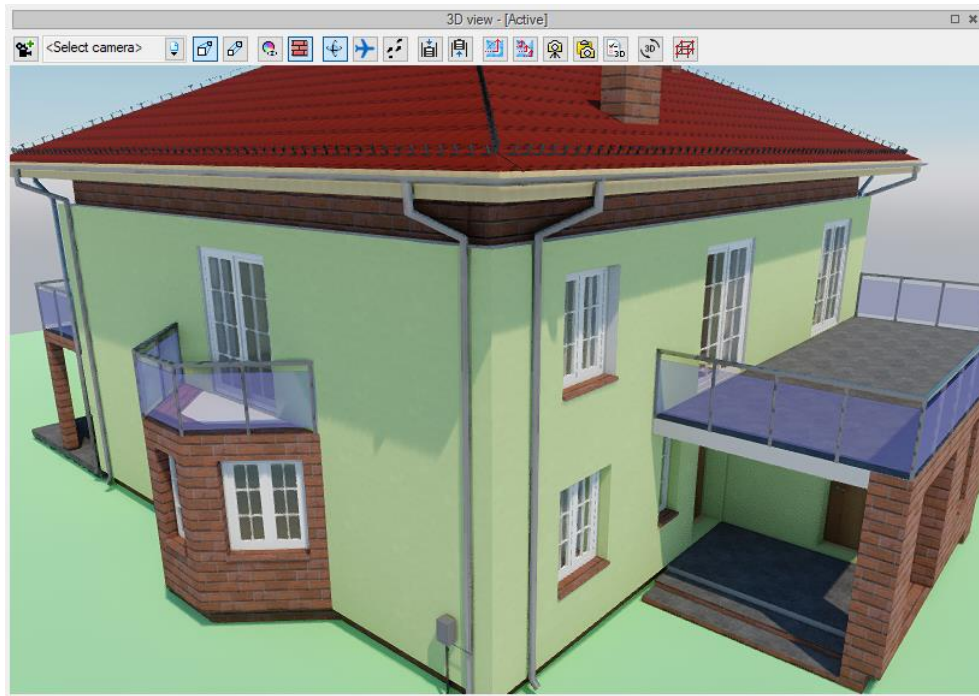


Fig. 8. A sample design in the 3D view window

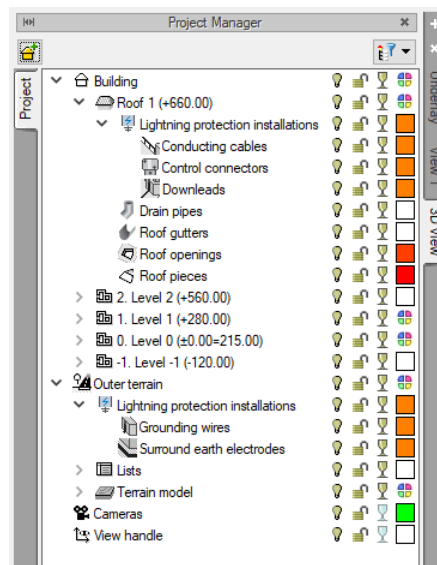



Fig. 9. The Project Manager window with a tree of elements of a sample document for the 3D view

The *3D view* tree differs from the other views in that print items cannot be defined, because only the saved image can be printed. Instead of printing in the view tree, it is possible to make an element transparent .

---

**NOTE:** the project trees on the View 1, 3D view tabs, etc. are separate trees, which means that elements can be turned on and off in every view, which will have no reference in other views. Each tree showing the same project can have a different status of displayed and blocked elements.

---

## 3.1. Inserting objects

### 3.1.1. The insert window

To facilitate the insertion of elements: selection of the input handle, access to *Properties* and type, the *Insert object* window was created.

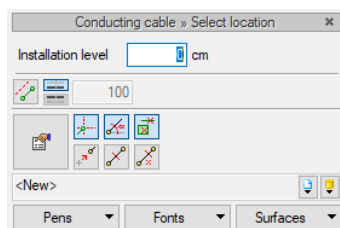


Fig. 10. A sample window that appears when inserting a conducting cable

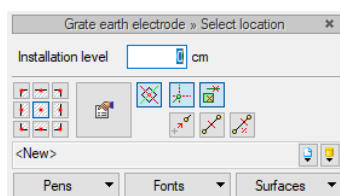


Fig. 11. A window displayed when inserting a grate earth electrode

Additional options to facilitate drawing are available after choosing the option of inserting an element in the insertion window in the ArCADia and ArCADia PLUS programs, also in the reporting window or in the command area. These options are available for all elements.

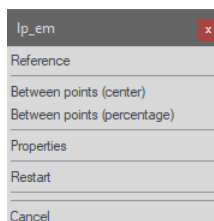


Fig. 12. The reporting window

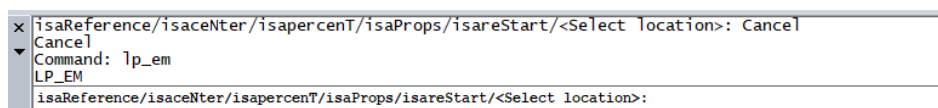





















Fig. 13. The command area

Tab. 3 The insertion windows options

|  |                           |   |
|--|---------------------------|---|
|  | <i>Installation level</i> | The height of the element's entry relative to the roof slope or ground level (depending on the base object of the element). |
|  | <i>Paralell offset</i>    | The option activates the <i>Offset direction</i> icons and the input field for the value of this offset.                    |



|   |                                    |   |
|---|------------------------------------|---|
|    | <i>Offset direction</i>            | After setting the distance, an element can be inserted, like a wire that goes parallel to the indicated line by drawing it from the right or left side of the line. The offset side depends on the selected icon and the drawing direction.   |
|    | <i>Insertion Point</i>             | Selection of the point of entry, e.g. <i>Grate earth electrode</i> .  |
|    | <i>Element properties</i>          | Opens <i>Element properties</i> : e.g. <i>Grate earth electrode</i> .   |
|    | <i>Insert with rotation</i>        | The default option which allows you to indicate the angle when entering elements: <i>Grate earth electrode</i> , <i>Air terminal</i> , <i>Earth rod</i> , <i>Control connector</i> , etc.   |
|    | <i>Tracking axes</i>               | The option displays horizontal and vertical straight lines directed from the detected points to the inserted elements. If the option will detect an edge of the inserted element it will display a straight line extending the detected edge. |
|    | <i>Tracking angles</i>             | This option displays the set angles determined from the existing elements in the project.   |
|    | <i>Elements detection</i>          | This option detects edges and points of the inserted elements.  |
|    | <i>Reference</i>                   | Enables inserting a chosen element at a selected distances from the indicated point.  |
|    | <i>Between points (centre)</i>     | Enables inserting an element in the middle of the indicated distance.   |
|  | <i>Between points (percentage)</i> | Enables inserting elements with a percentage division of the selected section.  |
|  | <i>Angle</i>                       | Inserts an element at a given angle.  |
|  | <i>Length</i>                      | Inserts an element of a given length.   |
|  | <i>Parallel</i>                    | Enables inserting an element parallel to the specified one  |
|  | <i>Type</i>                        | Saved set of the common features for many objects of the same type (elements template defined by the user).   |
|  | <i>Project library</i>             | Compatible with the selected template and created with the development of the drawing when saving subsequent types.   |
|  | <i>Global library</i>              | Type library supplied with the program and expanded by the <i>User library</i> where the user can save and store element types created by him for use in future projects.   |
|  | <i>Close</i>                       | Exists the options without inserting an element.  |
|  | <i>Pens</i>                        | Definition of the type of the line used to draw the inserted element.   |
|  | <i>Fonts</i>                       | Definition of the size and type of the font describing the element.   |
|  | <i>Surfaces</i>                    | Assigning materials or textures to the individual surfaces of the inserted element.   |

### 3.1. Working with types

Some of the ArCADia objects, such as a control connector, surround earth electrode etc., work with a *Type library*. The element type is a saved set of features common for many objects of the same type. For example, the wall type stores information about the number, type of layers, etc. The control connector contains data about the manufacturer, type series and material. A type is saved under the

name provided by the user. By default objects do not have a type assigned to them, unless the user selected a type from the library when introducing the object.

**There are two kinds of type libraries:**

- **Project library** (saved in the document) – it allows transferring types along with the document.
- **Global library** (saved on the computer in the user's folder) – it allows transferring types between different documents.

If the object works with the **Type library**, the **Object management** panel is available in the upper part of the **Properties** dialogue box for the item.

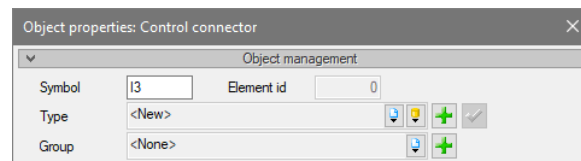


Fig. 14. The type manager when no type is active

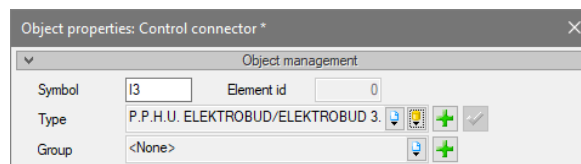




Fig. 15. The type manager with a type active

The available options are:

**Type** — to be selected from a drop-down list. A list of the types previously used in the document is also available. After selecting a type from this list the object properties are changed to match the ones set for the type. The type name will appear on the bar.

 **Add new** – creates a type based on currently set object features. The user is asked to give a name to the type and to save it to the global and (or) project library. Saving the type to the global library will allow for accessing it with every new project. If this type is only saved in the project library it will not be available for future projects.

 **Update** – if, once a type is applied to an item, the user modifies any of the type properties, the type name displayed in the bar will be preceded by the prefix "**<New> based on...**". This will also activate the button. Using it will overwrite the type with the properties of the current object and also propagate these changes to all the objects of this type.

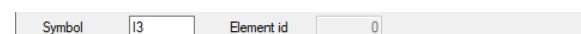


Fig. 16. The type symbol field

**Type symbol** – the command is active if a type has been applied to an object and it wasn't modified (see: **Update**). This enables adding a short designation to the object type, which can be used e.g. for creating lists or to quickly find the element on the view.

Moreover, right-clicking the extended type list will activate the pop-up menu with two options: *Rename* and *Remove type*.

---

**NOTE:** Once the parameters of an element are defined, the type needs to be saved. Saving the type will automatically add a Type symbol, or it will provide a field for the symbol to be given by the user. The type symbols may be changed freely, however they can't be defined without saving the type.

---

### 3.1. Editing objects

Elements of the ArCADia system can be modified in various ways, but each element may be subject to different modifications. Some objects can be copied and mirrored, some objects cannot, therefore the options for modifying individual elements are described at the given object. Moreover, besides modifications such as: copying, moving, deleting or rotating, these elements often have their own unique options available in the edit window, which is always displayed after selecting the element.

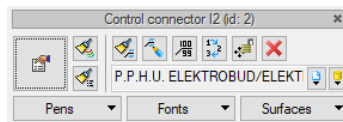


Fig. 17. A sample editing window

### 3.2. Options

The ArCADia BIM system has a program settings window for drawings made with all industry modules or specifically defined ones, e.g. in ArCADia–LIGHTNING PROTECTION INSTALLATIONS. The general settings include the definition of the font, the ability to automatically check for upcoming program updates, information about texture and script folders used in the program, tracking options and saving model in the cloud. The settings of specific modules are located under the buttons located on the right part of the window and in the module's ribbon.

#### **Activation:**

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Options*
- *ArCADia–LIGHTNING PROTECTION INSTALLATION* Toolbar ⇒  *Project options*

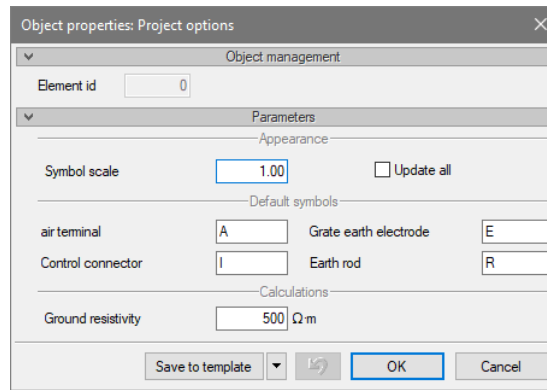


Fig. 18. ArCADia–LIGHTNING INSTALLATIONS module options window

In the above window there are default symbols type data for module elements, size of symbols and *Ground resistivity*. The default data can be modified, which will be included in the document, in subsequent documents the program will return to the default values again. If you want to permanently change the data in the Options window, create a new template (the *Template manager* option is on the *System* ribbon) and after editing the data, select the *Save to template* option. Your own template can be set as default, which means that each project will have default settings by the user and will not go back to the default settings.

---

**NOTE:** more information on the *Template Manager* can be found in the *ArCADia* and *ArCADia LT System help file*.

---

## 4. DESCRIBING AND OBJECT EDITING

## 4.1. The conducting cable

The conducting cable is a metal wire (stainless, galvanized or copper) assembled directly on the roof or on brackets (corbels). This cable is placed on the roof edges: ridge, baskets and corners, at a certain distance from the edge of the roof and eaves. This element should be a closed system surrounding each roof slope.

### Activation:

- [Lightening](#) Ribbon ⇒ logical group [Lightening](#) ⇒  [Conducting cable](#)
- [ArCADia-LIGHTING PROTECTION INSTALLATION](#) Toolbar ⇒  [Insert conducting cable](#)

After selecting in the insertion window the option Go to the [Properties dialog box](#), the [Object management: Conducting cable](#) window will appear.

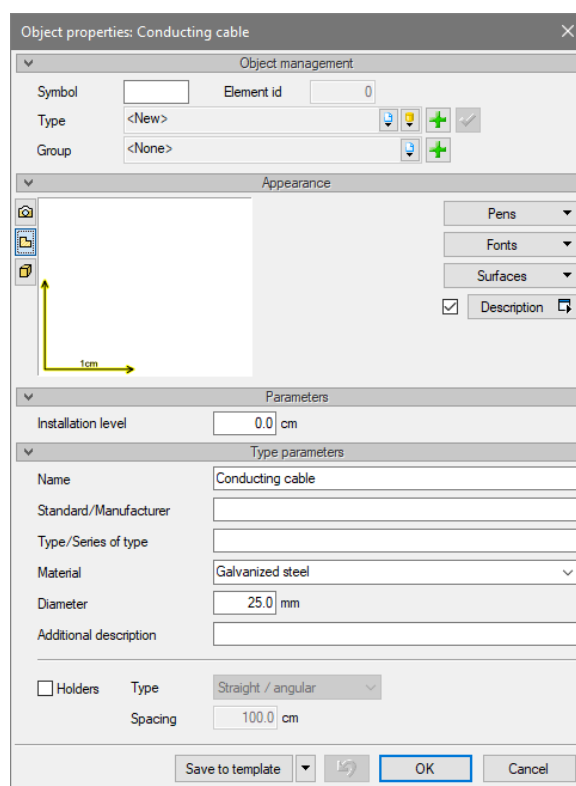




Fig. 19. The conducting cable properties window

### Object management

A panel that allows you to save the element type to the [Project library](#) or [Global library](#) or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before insertion an element is not available, after entering it, it can be seen in different views activated by icons  [2D View](#) or  [3D View](#). Additionally, it is possible to define a description of an element and its display.

## Parameters

**Installation level** – the height of the conducting cable is determined relative to the roof slope.

## Type parameters

**Name** – the name of the element shown e.g. on the view.

**Standard/Manufacturer** – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

**Type/Series of type** – the type of element to be inserted.

**Material** – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

**Diameter** – the cable diameter.

**Additional description** – the possibility to add additional information that can be shown on the view and in the lists.

**Holders** – when mounting the cable above the surface of the roof slope, fixing elements will be useful, which *Type* and *Spacing* can be defined by ticking the field in front of the option.

**Save to template** – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

After data approval, the conducting cable are drawn on the roof slopes and dorms. The option finds the roof height and slope and is placed exactly on the roof slopes or above them if such data is defined.

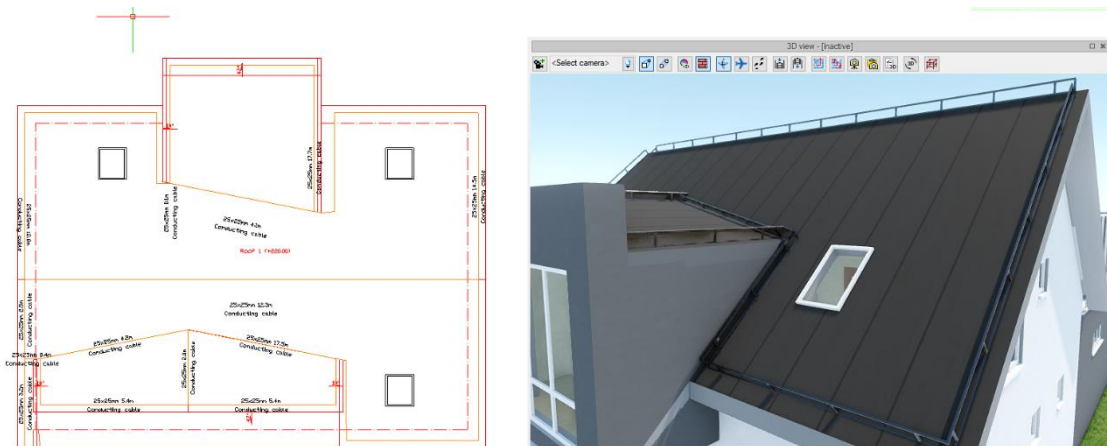


Fig. 20. A sample of entering a conducting cable

---

**NOTE:** an active roof  is required in the Project Manager window to enter the element.

---

## 4.2. The air terminal

The air terminal is an element introduced on the roof which is usually mounted next to the chimney.

### Activation:

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Air terminal*
- *ArCADia–LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert air terminal*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Air terminal* window will appear.

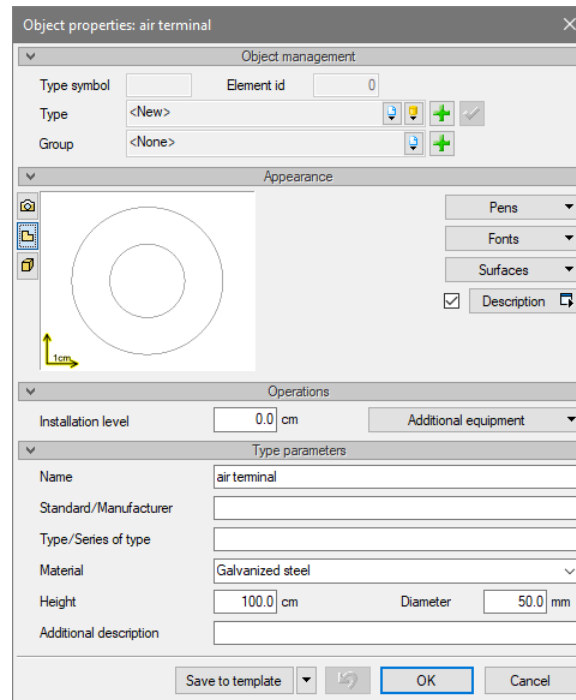




Fig. 21. The air terminal properties window

### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, the element can be seen in different views activated by icons  *2D View* or  *3D View*. Additionally, it is possible to define a description of an element and its display.

### Parameters

*Installation level* – the height of the air terminal is determined relative to the roof slope.

*Additional equipment* – a window in which additional elements can be entered by giving them a name, unit and quantity.

### Type parameters

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.



*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Height* – the height of the air terminal.

*Diameter* – the diameter of the element.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

After defining the data, the air terminal is inserted by indicating the position point. The coordinates of a point can be given instead of indicating the position.

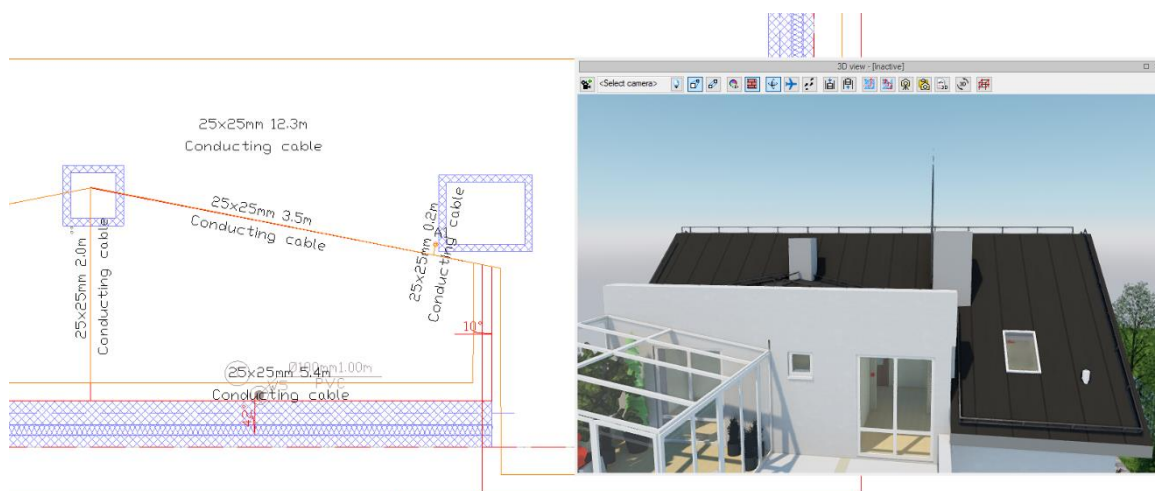


Fig. 22. An active air terminal in a sample project.

---

**NOTE:** an active roof  is required in the Project Manager window to enter the element.

---

### 4.3. The download

The *Download* is the connecting element of the *Conducting cable* with the *Control connector*. This option automatically finds the path between the elements by placing the wire on the roof slope, under it and then on the wall, if it goes under the roof outline. Finally, the wire connects automatically to the control connector. It does not matter whether you first enter the *Download* or the *Control connection*.

**Activation:**

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Download*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert download*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Download* window will appear.

Fig. 23. The download properties window

### *Object management*

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### *Appearance*

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before inserting an element is not available, after entering, it can be seen in different views activated by icons *2D View* or *3D View*. Additionally, it is possible to define a description of an element and its display.

*Assembly level on the roof* – the height of the download position determined in relation to the roof slope. The value of this part of the download that goes on the roof is taken into account.

*Assembly level on the ground* – the height at which the download will end up on the wall if it does not find the *Control Connector*.

### *Type parameters*

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Diameter* – the diameter of the download.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Holders* – when mounting the cable above the surface of the roof slope, fixing elements will be useful, which *Type* and *Spacing* can be defined by ticking the field in front of the option.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

The download is entered on the roof, its beginning should be on the *Conducting cable*. The end of the download may be indicated on the *Control connector*, if it is entered into the project or outside the roof plane. The program will adapt itself to the roof slope and then the wall and go down to the control connector or ground.



Fig. 24. The download connecting the conducting cable with the control connector

---

**NOTE:** an active roof  is required in the Project Manager window to enter the element.

---

## 4.4. The control connector

The *control connector* enables the elements of the lightning protection system to be disconnected from the ground and the measurement of the earthing resistance. This option connects the *Download* with the *Grounding wire* going further to the *Surround earth electrode*, *Grate earth electrode* or *Earth rod*.

**Activation:**

- *Lightening* Ribbon  $\Rightarrow$  logical group *Lightening*  $\Rightarrow$   *Control connector*

- *ArCADia–LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert control connector*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Control connector* window will appear.

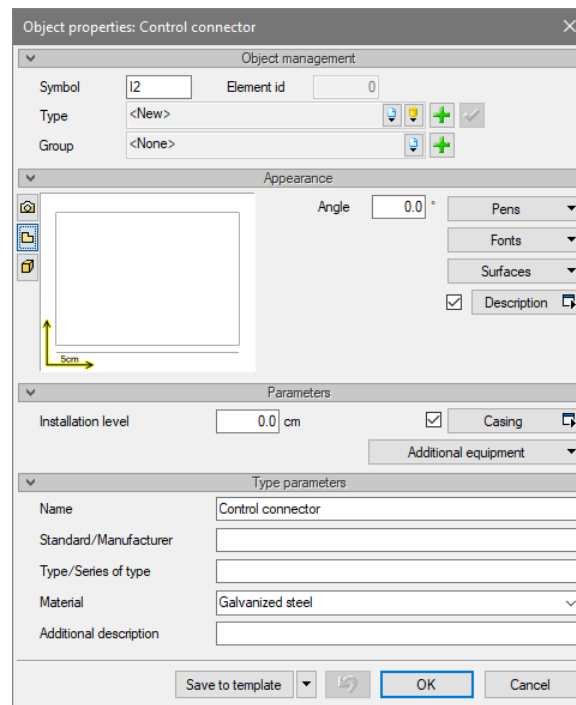




Fig. 25. The control connector properties window

### *Object management*

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### *Appearance*

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, the element can be seen in different views activated by icons  *2D View* or  *3D View*. Additionally, it is possible to define a description of an element and its display as well as angle insertion set.

### *Parameters*

*Installation level* – the height of the control connector is determined relative to the roof slope.

*Housing* – the option enabled by default allows you to enter the connector together with the housing. Pressing the button goes to the properties window of the *Control connector housing*, where pen and surfaces of the element can be defined, name, manufacturer, type, material and size of the cabinet.

*Additional equipment* – a window in which additional elements can be entered by giving them the name, unit and quantity.

### *Type parameters*

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

After defining the parameters, the control connector is entered on the view by showing or providing the coordinates of its position point.



Fig. 26. A control connector on a sample project

---

**NOTE:** an active roof  is required in the Project Manager window to enter the element.

---

## 4.5. The grounding wire

The option connecting a control connector with an earth electrode.

**Activation:**

- *Lightening* Ribbon  $\Rightarrow$  logical group *Lightening*  $\Rightarrow$   *Grounding wire*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar  $\Rightarrow$   *Insert grounding wire*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Grounding wire* window will appear.

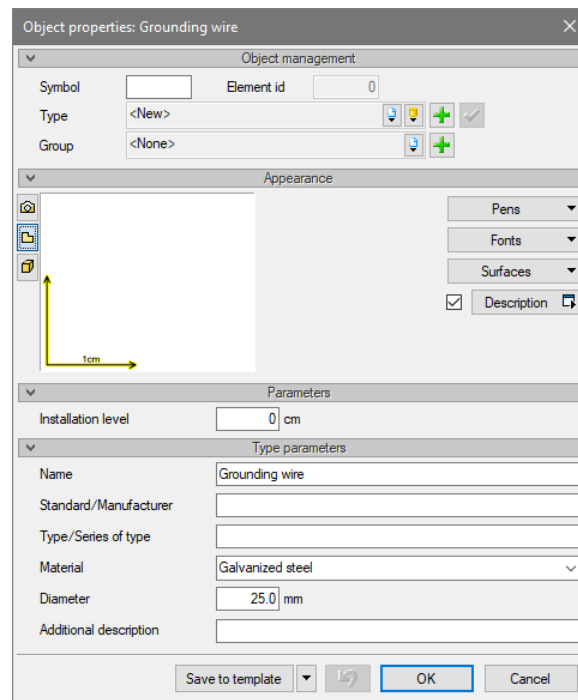


Fig. 27. The grounding wire properties window

#### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

#### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before inserting an element is not available, after entering, it can be seen in different views activated by icons *2D View* or *3D View*. Additionally, it is possible to define a description of an element and its display.

#### Parameters

*Installation level* – the height of the grounding wire is relative to the terrain.

#### Type parameters

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Diameter* – the diameter of the grounding wire.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

The grounding wire is introduced on the external area by indicating its beginning and end. It would be good if one of the points was a control connector and the other one was an earth electrode. The earth electrode can be also introduced after inserting the grounding wire.

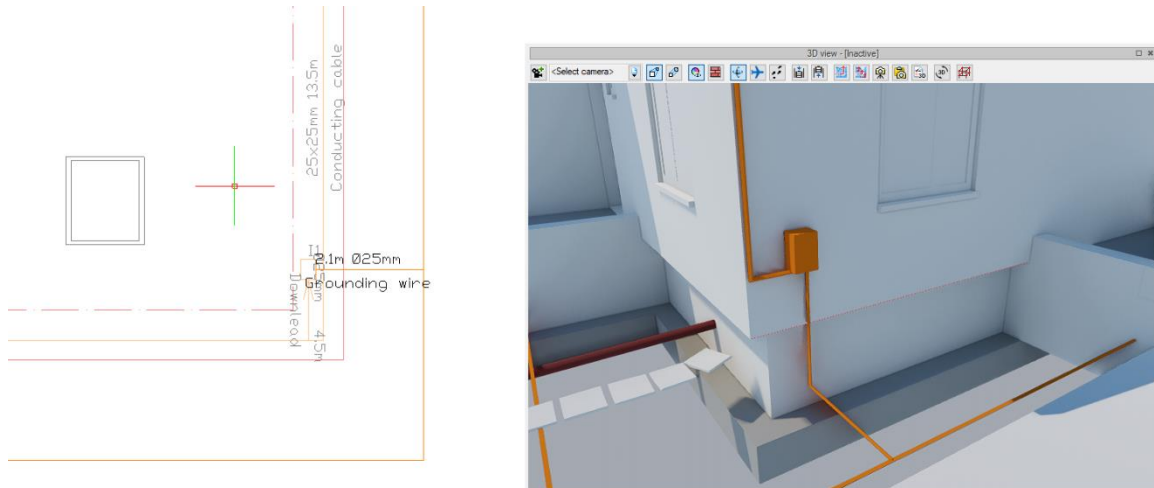


Fig. 28. The grounding wire connecting the surround earth electrode and the control connector.

---


**NOTE:** an active Outer terrain  is required in the Project Manager window to enter the element.

---

## 4.6. The surround earth electrode

The earth electrode is a metal element run in the ground around the building, designed to disperse the energy of lightning discharge.

### Activation:

- *Lightening* Ribbon  $\Rightarrow$  logical group *Lightening*  $\Rightarrow$   *Surround earth electrode*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar  $\Rightarrow$   *Insert surround earth electrode*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Surround earth electrode* window will appear.

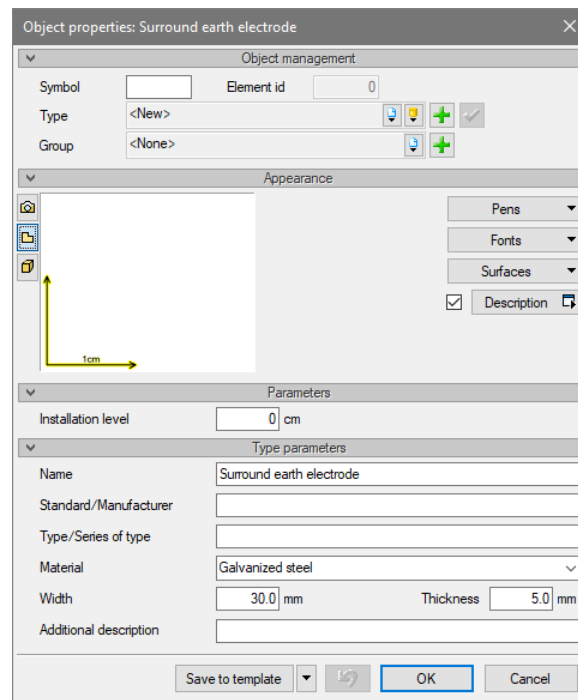


Fig. 29. The surround earth electrode properties window

#### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

#### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before inserting an element is not available, after entering, it can be seen in different views activated by icons *2D View* or *3D View*. Additionally, it is possible to define a description of an element and its display.

#### Parameters

*Installation level* – the height of the element is relative to the terrain.

#### Type parameters

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Width* – the width of the element's cross-section.

*Thickness* – the thickness of the element's cross-section.



*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

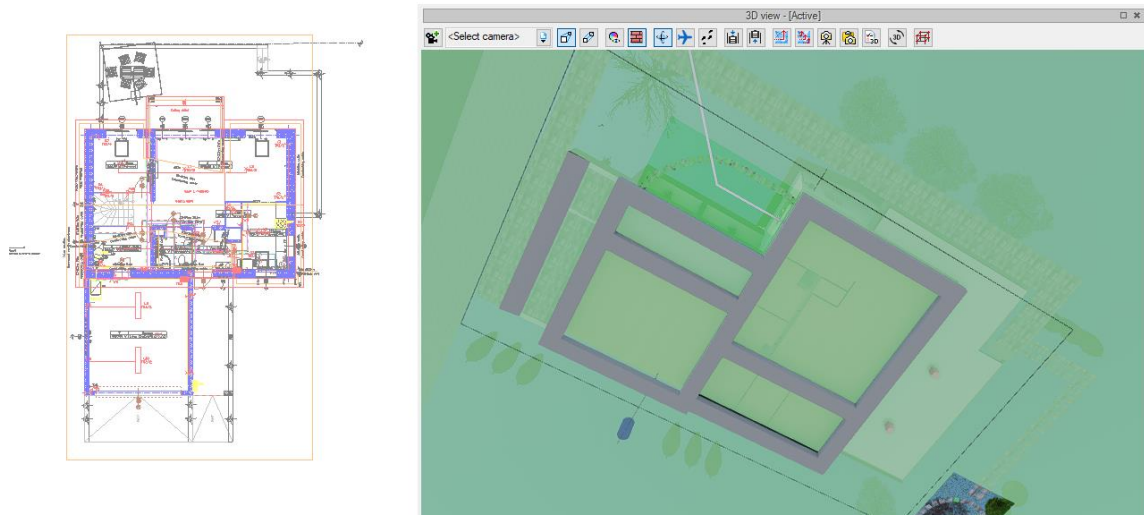


Fig. 30. A sample of the surround earth electrode

---



*NOTE: an active Outer terrain  is required in the Project Manager window to enter the element.*

---

## 4.7. The grate earth electrode

A grate earth electrode is a metal element placed in the ground, usually under high voltage posts, designed to disperse the energy of lightning.

### *Activation:*

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Grate earth electrode*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert grate earth electrode*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Grate earth electrode* window will appear.

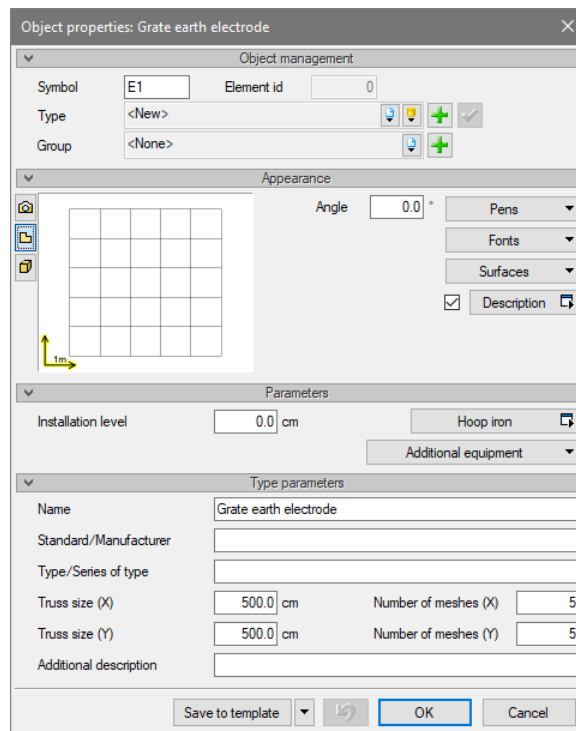


Fig. 31. The grate earth electrode properties window

### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before inserting an element is not available, after entering, it can be seen in different views activated by icons *2D View* or *3D View*. Additionally, it is possible to define a description of an element and its display as well as the angle of the grate earth electrode insertion.

### Parameters

*Installation level* – the height of the grate earth electrode is relative to the terrain.

*Bend iron* – the button opens the properties window of the grate earth electrode *bend iron*, in which the element's data can be defined: name, manufacturer, type series, material and dimensions.

*Additional equipment* – the window in which additional elements can be entered, giving them the name, unit and quantity.

### Type parameters

*Name* – the name of the element shown e.g. on the view.

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Truss size (X)/(Y)* – the grate earth electrode size given in centimetres.

*Number of meshes (X)/(Y)* – the partition of the grate earth electrode grid.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

After setting the parameters, the *grate earth electrode* is entered by a point. The switching options of the insertion point (a corner of the truss, its center or center of the side) and the possibility of changing the angle during insertion may be helpful in this case.

---

**NOTE:** an active *Outer terrain*  is required in the *Project Manager* window to enter the element.

---

## 4.8. The earth rod

The *earth rod*, also known as the vertical one, acts as an artificial earthing and is an alternative to the surround earth electrode.

### **Activation:**

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Earth rod*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert earth rod*

After selecting in the insertion window the option *Go to the Properties dialog box*, the *Object management: Earth rod* window will appear.

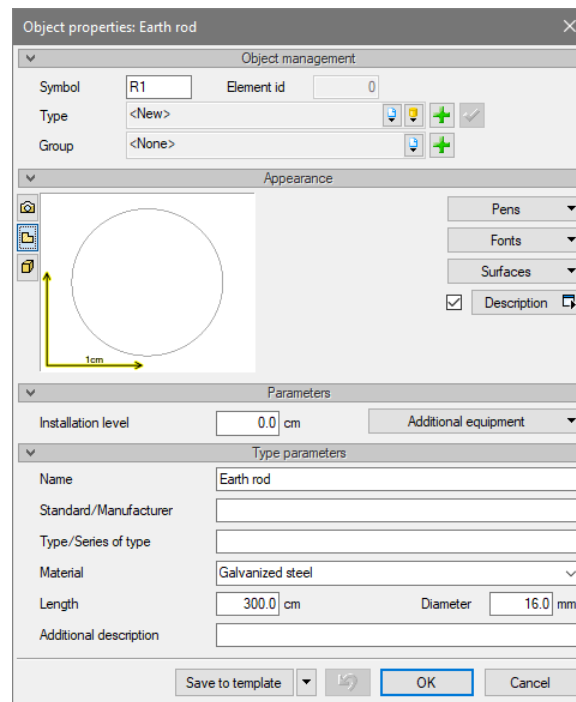


Fig. 32. The earth rod properties window

### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### Appearance

A panel in which pens, fonts and surfaces of an element are defined. In the preview window, before inserting an element is not available, after entering, it can be seen in different views activated by icons *2D View* or *3D View*. Additionally, it is possible to define a description of an element and its display.

### Parameters

*Installation level* – the height of the earth rod position is determined relative to the "0" of the building. The earth rod is introduced below the given value.

*Additional equipment* – the window in which additional elements can be entered, giving them the name, unit and quantity.

### Type parameters

*Standard/Manufacturer* – if a type from the library is selected, the field is automatically filled in by the manufacturer of the item. However, the norm or manufacturer can be specified by the user.

*Type/Series of type* – the type of element to be inserted.

*Material* – the list of available materials: *Galvanized steel*, *Copper*, *Aluminium*, *With brass separator*.

*Length* – the height of the element.

*Diameter* – the diameter of the earth rod.

*Additional description* – the possibility to add additional information that can be shown on the view and in the lists.

*Save to template* – saves pen settings, selected type and other element parameters to the template, which will replace the default values of the element.

The earth rod is introduced by indicating or entering the coordinates of the point.

---

**NOTE:** an active Outer terrain  is required in the Project Manager window to enter the element.

---

## 4.9. Modifications of elements

Elements of the The ArCADia–LIGHTING PROTECTION INSTALLATION module can be copied, moved, mirrored, rotated and removed. In addition, after selecting an element in the edit window, the options are:

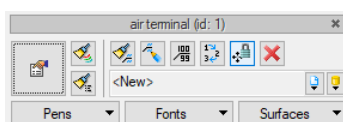


Fig. 33. The air terminal editing window

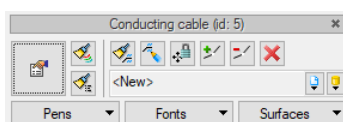


Fig. 34. The conducting cable editing window

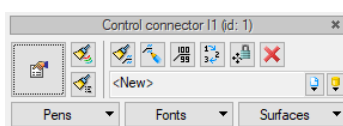
















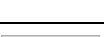


Fig. 35. The control connector editing window

Tab. 4 The available editing tools for the ArCADia-LIGHTING PROTECTION INSTALLATION module

|   |                              |  |
|---|------------------------------|--|
|  | <i>Properties</i>            | Opens the <i>Properties</i> window.  |
|  | <i>Fonts and pen painter</i> | Takes over the settings of pens (thickness and line types), and the size, and the type of the font.                  |
|  | <i>Type painter</i>          | Takes over the element type by copying data from the <i>Properties window</i> from the <i>Type Parameters</i> panel. |
|  | <i>Description painter</i>   | Moves the description settings from the selected element to the indicated one.                                       |

|   |                                    |   |
|---|------------------------------------|---|
|    | <i>Edit description</i>            | Goes to the description edit window, where all the descriptions and references can be switch on and off.  |
|    | <i>Set description on the link</i> | Enters the description located by default along the element on the link.  |
|    | <i>Object renumbering</i>          | Opens a window that allows renumbering the symbol's type of the installation elements.  |
|    | <i>Move without connection</i>     | Allows you to move a single element, without its links to other objects. After clicking on the icon, the Move with connections option is switched on, then by moving the length of the wire it extends or shortens the wires connected to it. |
|    | <i>Add point</i>                   | Adds a point (which can be another tip) on the element contour, allowing you to modify the view   |
|    | <i>Remove point</i>                | Removes the selected tip.   |
|    | <i>Delete marked objects</i>       | Deletes selected elements.  |
|    | <i>Type</i>                        | Save set of features common for many objects of the same type (elements template defined by the user).  |
|    | <i>Project library</i>             | Compatible with the selected template and created with the development of the drawing when saving subsequent types.   |
|    | <i>Global library</i>              | Type library supplied with the program and expanded by the <i>User library</i> where the user can save and store element types created by him for use in future projects.   |
|    | <i>Close</i>                       | Exists the options without inserting an element.  |
|  | <i>Pens</i>                        | Definition of the type of the line used to draw the inserted element.   |
|  | <i>Fonts</i>                       | Definition of the size and type of the font describing the element.   |
|  | <i>Surfaces</i>                    | Assigning materials or textures to the individual surfaces of the inserted element.   |

## 5. CALCULATIONS

## 5.1. Checking the correctness of the drawn installation

While working with the ArCADia-LIGHTING PROTECTION INSTALLATION module, it is possible to check the introduced installation in terms of connection of individual elements. These connections are necessary for the correctness of the designed installation and the carrying out the necessary calculations.

### Activation:

- **Lightening** Ribbon  $\Rightarrow$  logical group **Lightening**  $\Rightarrow$  **Installation verifications**
- **ArCADia-LIGHTING PROTECTION INSTALLATION** Toolbar  $\Rightarrow$  **Verification**

After calling the function the message window appears

| Control connector |     | Ground resistivity |  |
|-------------------|-----|--------------------|--|
| I1                | 500 | Ω m                |  |

| Surround earth electrode |      |            |            |                |
|--------------------------|------|------------|------------|----------------|
| No.                      | Name | Width [mm] | Length [m] | Resistance [Ω] |
|                          |      |            |            |                |

| Grate earth electrode |                             |           |            |                |
|-----------------------|-----------------------------|-----------|------------|----------------|
| No.                   | Name                        | Area [m²] | Length [m] | Resistance [Ω] |
| 1                     | Grate earth electrode (5x5) | 25.00     | 60.00      | 52.64          |

| Earth rod |      |               |            |                |
|-----------|------|---------------|------------|----------------|
| No.       | Name | Diameter [mm] | Length [m] | Resistance [Ω] |
|           |      |               |            |                |

Total resistance: 52.64 Ω

Report Close

Fig. 36. An example of checking the correctness of the installation connections

On the left side of the window there are filters, which in the case of a large number of messages will allow you to read the information about errors. The right side of the window communicates whether and which elements are correctly or incorrectly entered. The icon informs about the correctness of elements, the second icon informs about connection errors. After clicking on the row of the table with the message e.g. error, the window will be closed, the element from the message will be centered and selected on the view. The element that needs to be corrected.

If there are only icons in the table, it means that the installation is done correctly and you can do the calculations.

## 5.2. Calculations

The calculations inform about the resistance value of the vertical and horizontal earth electrode and the total resistance of the above mentioned earth electrodes.

*The surround earth electrode is calculated from the formula:*

$$R_H = \frac{\rho}{2\pi l} \ln \frac{l^2}{dh}$$

where:  $\rho$  – the ground resistivity measured in the terrain



$l$  – the length of the earth electrode,

$d$  – the diameter of the earth electrode in the case of a tape – half of its width,

$h$  – the depth of earth electrode location.

**The grate earth electrode is calculated from the formula:**

$$R_H = \frac{\rho}{4r_e} + \frac{\rho}{l}$$

where:  $\rho$  – the ground resistivity measured in the terrain

$l$  – the length of the earth electrode,

$r_e$  – the substitute radius calculated from the formula:

$$r_e = \sqrt{\frac{P}{\pi}}$$

where:  $P$  – The surface area of the earth electrode.

**The earth rod is calculated from the formula:**

$$R_V = \frac{\rho}{2\pi l} \ln \frac{4l}{d} \sqrt{\frac{4h + 3l}{4h + l}}$$

where:  $\rho$  – the ground resistivity measured in the terrain

$l$  – the length of the earth electrode,

$d$  – the diameter of the earth electrode

$h$  – the depth of the earth electrode location.

**The total resistance is calculated as follows:**

$$R = \frac{\sum R_H \cdot \sum R_V}{\sum R_H + \sum R_V}$$

where:  $\sum R_H$  – the sum of the horizontal earth electrodes resistance (surrounded and grated),

$\sum R_V$  – the sum of the vertical earth electrodes resistance (rod)

**Activation:**

- **Lightening** Ribbon  $\Rightarrow$  logical group **Lightening**  $\Rightarrow$   **Calculations and report**
- **ArCADia-LIGHTING PROTECTION INSTALLATION** Toolbar  $\Rightarrow$   **Calculations and report**

Fig. 37. The calculation window

### 5.3. Calculation report:

#### 5.3.1. Calculations of earth electrode resistance

Control connector: I1  
 Soil resistivity (ρ): 150 Ωm

##### The surround earth electrode

Name: Surround earth electrode  
 Width (d): 15.0 mm  
 Length (l): 43.83 m  
 Hollow (h): 0.00 m

$$R_H = \frac{\rho}{2 \cdot \pi \cdot l} \cdot \ln\left(\frac{l^2}{0.5 \cdot d \cdot h}\right) = \frac{150}{2 \cdot \pi \cdot 43.83} \cdot \ln\left(\frac{43.83^2}{0.5 \cdot 0.0150 \cdot 0.00}\right) = 0.00 [\Omega]$$

##### The grate earth electrode

Name: Grate earth electrode (5x5)  
 Field (P): 25.0 mm  
 Length (l): 60.00 m  
 Hollow (h): 0.00 m

##### The substitute radius:

$$r_s = \sqrt{\frac{P}{\pi}} = \sqrt{\frac{25.00}{\pi}} = 2.82 [m]$$

$$R_H = \frac{\rho}{4 \cdot r} + \frac{\rho}{l} = \frac{150}{4 \cdot 2.82} + \frac{150}{60.00} = 15.79 [\Omega]$$

**The earth rod**

|               |           |
|---------------|-----------|
| Name:         | Earth rod |
| Diameter (d): | 16.0 mm   |
| Length (l):   | 3.00 m    |
| Hollow (h):   | 0.00 m    |
| Number (n):   | 2         |

$$R_v = \frac{\rho}{2 \cdot \pi \cdot l} \cdot \ln\left(\frac{4 \cdot l}{d}\right) = \frac{150}{2 \cdot \pi \cdot 3.00} \cdot \ln\left(\frac{4 \cdot 3.00}{0.0160}\right) = 52.68 [\Omega]$$

**The total resistance**

$$R = \frac{\Sigma R_H \cdot \Sigma R_v}{\Sigma R_H + \Sigma R_v} = \frac{15.79 \cdot 105.36}{15.79 + 105.36} = 13.73 [\Omega]$$

## 6. LISTS

The ArCADia-LIGHTING PROTECTION INSTALLATION module allows you to design the installation, calculate it, create a report, list of material and list of the elements used in the project.

## 6.1. List of elements

In the list of elements there are objects such as: air terminal, control connector or grate earth electrode. The table can contain all or selected elements of the installation.

### Activation:

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Item list*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert item list*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Item list* window will appear.

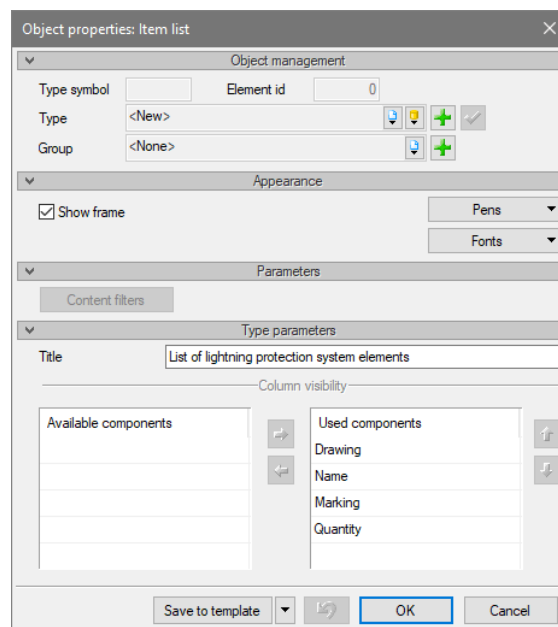


Fig. 38. The item list properties window

### Object management

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### Appearance

The panel in which the pens and fonts of the list are defined as well as the display of the frame.

### Parameters

*Content filter* – the option available after inserting the table, it allows you to select the filter of the displayed elements (the selection is: filter of paths, types and objects).

### Type parameters

The panel that allows you to define the name of the list, the number and quality of table columns.

*Save to template* – saves pen settings, selected type and other element parameters to the template.

After defining the table, the list is entered by indicating the point.

List of lightning protection system elements





| Drawing   | Name                        | Marking | Quantity |
|---|-----------------------------|---------|----------|
|  | Control connector           | I1      | 1 pcs    |
|  | Grate earth electrode (5x5) | E1      | 1 pcs    |

Fig. 39. A sample list of elements

We proceed with the list of selected elements in the same way, the only difference that after calling the command, we need to select the elements that should be included in this list.

**Activation:**

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Selected elements list*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert selected elements list*

## 6.2. The material list

Elements such as conducting cable, downleads and earth electrodes can be counted in the *Materials list*.

**Activation:**

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Material list*
- *ArCADia-LIGHTING PROTECTION INSTALLATION* Toolbar ⇒  *Insert material list*

After selecting in the insertion window the option Go to the *Properties dialog box*, the *Object management: Material list* window will appear.

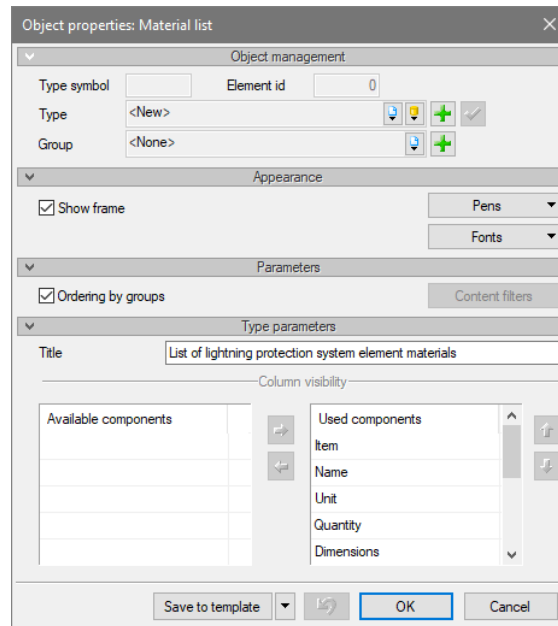


Fig. 40. Material list properties window

### *Object management*

A panel that allows you to save the element type to the *Project library* or *Global library* or finding in the library a previously saved element and using it in the current document. Additionally, you can select or indicate to which group the given element will belong.

### *Appearance*

The panel in which the pens and fonts of the list are defined as well as the display of the frame.

### *Parameters*

*Ordering by groups* – the option allows you to segregate fences by the groups in which they were introduced.

*Content filters* – option available after inserting the table allows you to select the filter of the displayed elements (you can choose between: types filter and objects filter).

### *Type parameters*

The panel that allows you to define the name of the list, the number and quality of table columns.

*Save to template* – saves pen settings, selected type and other element parameters to the template.

The list is entered by indicating or providing coordinates of the point.



List of lightning protection system element materials

| Item...   | Name                                    | Unit | Quantity | Dimensions       | Material         |
|-----------|---|------|----------|------------------|------------------|
| Ungrouped |   |      |          |                  |                  |
| 1         | Conducting cable                        | m    | 90.04    | 25x25mm          | Galvanized steel |
| 2         | Control connector                       | pcs  | 1.00     |                  | Galvanized steel |
| 3         | Control connector housing for elevation | pcs  | 1.00     | 200x150x300mm... | Plastic          |
| 4         | Downlead                                | m    | 7.31     | Ø25mm            | Galvanized steel |
| 5         | Grate earth electrode (5x5)             | pcs  | 1.00     | 5000x5000mm      | Galvanized steel |

Fig. 41. A sample of material list

In the same way, the *Selected elements material list* is done, with the difference that after calling the command, the elements from which the list of materials is to be created should be selected.

#### Activation:

- *Lightening* Ribbon ⇒ logical group *Lightening* ⇒  *Selected elements material list*
- *ArCADia–LIGHTNING PROTECTION INSTALLATION* Toolbar ⇒  *Insert material list for selected elements*

### 6.3. List editing

The entered tables of counted elements and materials can be moved, copied, rotated and deleted. Additionally, after selecting the list, the following options are available in the edit window.

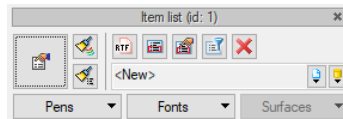


Fig. 42. The item list editing window

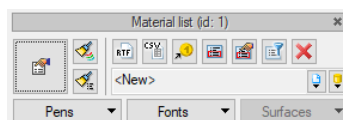
















Fig. 43. The material list editing window

Tab. 5 The Material list modification tools

|   |                                       |  |
|---|---------------------------------------|--|
|  | <i>Properties</i>                     | Opens the <i>Properties</i> window.  |
|  | <i>Fonts and pen painter</i>          | Takes over the settings of pens (thickness and line types), and the size, and the type of the font.  |
|  | <i>Type painter</i>                   | Takes over the type of element, its scheme and size, transferring them to the indicated element or elements.                                       |
|  | <i>Save to text editor file (RTF)</i> | Exports the list to a file in RTF format, opened by default in the ArCADia-TEXT browser, which will allow you to edit the list, print and save it. |
|  | <i>Save to spreadsheet file (CSV)</i> | Saves the list to a file in CSV format. The list will be saved on the disk.  |



|   |   |  |
|---|---|--|
|    | <i>Mark selected elements on the view</i>     | Shows the element on which the selected material is located. After calling the command, select the row with the material you want to check in the table. The program centers the element in which the material was used.   |
|    | <i>Change properties of selected elements</i> | Opens the properties window of the element in which the material selected from the table is located. After calling the command, select the row with the material you want to modify in the table. If the material is used in one element, the property window of the object will be displayed. If the material is used in more than one element, the element selection window will be displayed and access to the properties of subsequent objects containing this material will be displayed. |
|    | <i>List filter manager</i>                    | Displays the window in which the filter is selected, which will modify the list.   |
|    | <i>Delete marked objects</i>                  | Deletes the selected elements.   |
|    | <i>Type</i>                                   | Saved set of features common for many objects of the same type (elements template defined by the user).  |
|    | <i>Project library</i>                        | Compatible with the selected template and created with the development of the drawing when saving subsequent types.  |
|    | <i>Global library</i>                         | Type library supplied with the program and expanded by the <i>User library</i> where the user can save and store element types created by him for use in future projects.  |
|  | <i>Pens</i>                                   | Definition of the type of the line used to draw the inserted element.  |
|  | <i>Fonts</i>                                  | Definition of the size and type of the font describing the element.  |