

# ArCADiA-WATER SUPPLY INSTALLATIONS

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ArCADiA-WATER SUPPLY INSTALLATIONS User  
Manual



2019-05-15

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## Introduction

# 1. INTRODUCTION

## Introduction

### 1.1. SOFTWARE PURPOSE

**ArCADia-WATER-SUPPLY INSTALLATIONS** is a tool that extends the ArCADia-IntelliCAD/AutoCAD or ArCADia-START with the functionalities necessary to create professional internal water-supply installation designs. The software is meant both for water-supply installations design engineers, as well as all the people working in the sanitary branch and installations branch in the construction industry. When using the **ArCADia-WATER-SUPPLY INSTALLATIONS** software, the user can create drawings of the internal water-supply installation in architectural building projections based on items, with simultaneous creation of calculation diagrams and generation of three types of axonometric projections. There is an expandable library of elements used in water-supply installations available for the user, who can develop it and adjust according to their own needs regarding used equipment and types of materials used in a pipeline.

Merging specialized features used in the application for creating water-supply installation plans in the scope of selection, routing of pipelines, as well as selecting pipeline fitting along with the possibility to carry out calculations and run validity checks on the designed installation provides the perfect tool for designing internal water-supply installations.

### 1.2. FEATURES AND POSSIBILITIES OF THE PROGRAM

The **ArCADia-WATER-SUPPLY INSTALLATIONS** software allows the user to:

- create drawings of internal water-supply installations, starting from the connection point, through a water meter kit, up to the required fittings;
- insert water outlets and route of water supply pipelines;
- insert plumb lines and distributing pipes using the option of simultaneous drawing of several parallel tubes serving different functions and combining them in a smart way with pipes made of different materials, available in a substantial library;
- insert fittings and devices from the substantial manufacturers library (draw-off fitting, blocking fitting, return fitting, protective fitting, fire protection fitting and regulatory fitting, measurement devices, filters, mixers);
- insert different device types with customized shapes and sizes (exchangers and domestic hot water heaters, pressure boost devices);
- automatically create connections of water outlets localized along distributing pipes, using chosen geometric method with the detection of pipeline function, thanks to a water outlet connection wizard;
- automatically create outlets numeration and installation description with the edition option and the option of creating own templates;
- generate three axonometry types (also partial) and make them more legible using the offset method and shortening the segments during one short operation;
- calculate the total and partial pressure loss for each water flow path and chosen water flow paths, choosing the least favourable place for a demand point;
- preview of the installation in 3D aiding the correction of pipelines routing incorrections, which you cannot see in projection;
- validate the installation in terms of the correctness of connections, as well as clear method of errors detection and correction;
- check whether the criteria of ensuring available pressure in the system are met;

## Introduction

- generate reports of performed calculations with the summaries of losses at particular sections of installation;
- generate prepared lists of materials and devices included in the project and intended for further processing and creating estimates of costs and estimating prices.

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3. PN-76/B-02440 "Securing domestic hot water devices: requirements"
4. PN-EN 671-1 "Fixed firefighting systems. Hose systems. Hose reels with semi-rigid hose"
5. PN-EN 671-2 "Fixed firefighting systems. Hose systems. Hose systems with lay-flat hose"

## **2.INSTALLING AND LAUNCHING THE SOFTWARE**

## Installing and launching the software

### 2.1. HARDWARE REQUIREMENTS

- Pentium 4 class computer (Pentium Core2Duo recommended),
- 2 GB RAM (min. 4 GB recommended),
- approximately 1 GB of free HDD space for the installation,
- DirectX 9.0 compatible graphics card,
- system: Windows Vista 32/64-bit, Windows 7 32/64-bit, or Windows 8 32/64-bit,
- DVD-ROM drive.

### 2.2. INSTALLATION

Program installation usually starts automatically when the CD is inserted in the drive. The installation should be started manually if the Autostart function is disabled. Open the CD content (Computer/CD drive) and run the Setup.exe file from the program folder. Once the installation is started, proceed according to instructions displayed on the screen.

### 2.3. LAUNCHING

#### *ArCADia software:*

The software may be started by double-clicking on the **ArCADia-START** program icon located on the Desktop and then selecting on of the icons on the ribbon in the water tab

#### *AutoCAD or ArCADia-INTELLICAD software:*

The software may be started by double-clicking on the CAD program icon located on the Desktop and then selecting on of the icons in the **ArCADia-WATER SUPPLY INSTALLATIONS** toolbar.

### 2.4. OPENING A PROJECT (CAD)

Any of the following file types may be opened:

- a standard DWG drawing file.
- any of the following sample drawings supplied with the ArCADia-START or ArCADia-IntelliCAD software may be used.
- a DXG drawing exchange file.
- a DWF network transmission file.
- a DWT drawing template file.

In order to quickly access the last edited drawing choose **File>** <file name>. The software stores the names of the last four drawings. In order to quickly access a drawing from the **Open drawing** dialog box, double-click its name.

A drawing may be opened when browsing drawings on the computer, for example using the Windows Explorer. All you need to do to open a drawing in ArCADia-INTELLICAD is to double-click the file. Thumbnails displayed when browsing help identify the drawing you need.

#### Opening an existing drawing

##### *ArCADia software:*

Use one of the following methods:


- Choose the **Home** ribbon and then in the **Files** logical group choose the **Open** button.

- Press the **ArCADia**  button and then press the **Open** button.

## Installing and launching the software

### *AutoCAD or ArCADia-INTELLICAD software:*

Use one of the following methods:

- Choose **File>Open**.
- On the **Standard** toolbar, select the **Open**  tool.
- Write *Open* and then press Enter.

### *Common for ArCADia, AutoCAD or ArCADia-INTELLICAD software:*

1. Choose the type of the file you want to open from the file types.
2. Choose the folder that contains the selected drawing.
3. Do one of the following:
  - Choose the drawing that you want to open and click **Open**.
  - Double-click the drawing you want to open.

If the drawing requires a password, provide the password, then click **OK** to verify the password and then click **Open** again.

## 2.5. SAVING A PROJECT (CAD)

A drawing may be saved at any moment.

In order to save a drawing use one of the following methods:

- On the **Standard** toolbar, click **Save**.
- Choose **File>Save**.
- Write *save* and then press Enter.
- Write *qsave* and then press Enter.

When you save a particular drawing for the first time, the system will display a dialogue box **Save drawing as**, which allows you to select the folder and provide the name for the drawing. You may use any name when saving the drawing for the first time. In order to save the same drawing under a different name later, select **File>Save as** and then type in the new name.

## 2.6. AUTOSAVE AND BACK-UP COPY

In order to avoid data loss in case of a power outage or a system error, save your drawing files often. The software may be configured so that it saves your drawings automatically from time to time. The **Autosave** setting determines the interval between automatic saves in minutes. The software resets this interval each time when the user saves a drawing file (*feature available in ArCADia-IntelliCAD and AutoCAD*).

When the **Autosave** feature is activated, the software creates a copy of the drawing. That file is automatically saved in the folder specified under **Options>Paths/Files>Temporary file** and given the extension indicated in the **Drawing autosave file extension** (SV\$ by default).

Configuring the ArCADia-INTELLICAD to automatically save drawings:

1. Do one of the following:

## Installing and launching the software

- Select **Tools>Options**.
- Write *config* and then press Enter.
- 2. Click the **General** tab.
- 3. In the **Autosave** area, select the check box in order to turn the **Autosave** feature on and select autosave frequency.
- 4. Click **OK**.

## 3. WORKING WITH THE SOFTWARE

## Working with the software

### 3.1. BASIC SOFTWARE INFORMATION

**ArCADia- WATER SUPPLY INSTALLATIONS** allows the design of an internal water-supply installation, determining the route of water pipelines of water-supply installation, starting from the connection point of an installation connecting it to water outlets. The software allows to localize fittings and devices necessary to create a complete design of a water-supply installation in terms of drawing. The software checks whether the pipelines have been selected properly on the basis of an assessment of the pressure drop in the critical path and comparing it to the minimum available pressure given for a particular installation.

The first stage of a project is always to complete the drawing part. Inserting any water-supply installation item activates the software. The software was designed to ensure a flexible (free) course of action when creating a drawing.

Below is one of the possible workflows for creating a project.

#### Phase I - creating a drawing

1. You can start designing a water-supply installation by inserting an installation connection point or a local installation connection point. You need to enter project input parameters to the properties of this point – building purpose, the minimum and maximum available pressure, the maximum allowable pressure in the installation.
2. Then you can insert draw-off fittings and hot water preparation devices, giving them the appropriate geometric and technical parameters.
3. Then you can insert the installation route to connect draw-off fittings with the source in a logical way (installation connection point, hot water preparation device). When you draw pipeline routes you can assign to them the diameter, material, series of type or you can select series of type of manufacturers; the software, after calculations, will select the parameters meeting the criteria.
4. While drawing the route, appropriate blocking fittings, regulatory-protective fittings, measurement devices filters etc. need to be inserted.
5. After drawing N installation, you can run validity checks on the designed installation in terms of connection of all the designed items in the installation project, verifying the continuity of the installation, verifying the connection to the source and the hot water preparation device.

#### Phase II – calculations, lists and material lists

1. Once THE drawings are ready and validity checks of the installation have been performed, the user may perform calculations. Selection of calculations is possible for each of the installation paths, with the option of checking the worst installation in terms of pressure loss or length. The user has the ability to control THE chosen diameter adjustments and the application of the adjustments applies them automatically on the drawing and the installation is recalculated.
2. The calculations are available for each type of medium. The software performs calculations concerning the supply of hot and cold water and domestic hot water circulation.
3. The user receives information about: a total of linear and local loss, pressure in the particular section and the total pressure loss for the entire system.
4. The calculations and results for the selected installation path can be generated in a RTF report.
5. The user has also the possibility of performing axonometry of inserted installation, not only of the whole installation, but also of the selected part of the installation, as well as adjusting the appearance and location of the items in axonometry, e.g. for printing.
6. After confirming the correctness of the graphical part and the calculation part of the water-supply installation, the user may choose to generate:
  - an item list (legend) – can be saved in RTF format,

## Working with the software

- material list – can be saved in RTF format and can be exported to Ceninwest software in order to create estimates of costs and estimating prices with the use of the simplified method.



## 4.SOFTWARE ELEMENTS DESCRIPTION

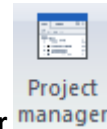
## Software elements description

### 4.1. PROJECT MANAGER

**Project Manager** allows to manage all **ArCADia-WATER SUPPLY INSTALLATIONS** software items: pipelines, draw-off fittings, blocking fittings, etc. In order to start the **Project Manager**, select the icon:

*ArCADia software:*

- The **System** ribbon ⇒ **Project** logical group ⇒ **Show/Hide the Project Manager**



*AutoCAD or ArCADia-INTELLICAD software:*

- ArCADia-ARCHITECTURE** toolbar ⇒ **Show/Hide the Project Manager**



or write

- isa\_tllv.

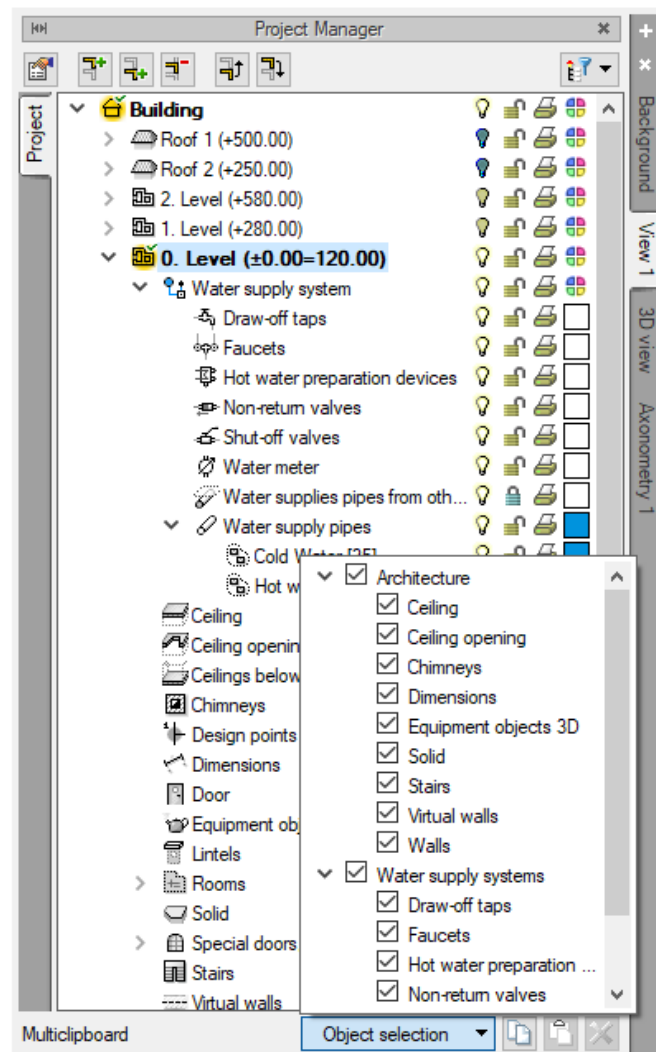


Fig. 1. Project Manager window

## Software elements description

From the **Project manager** window, the user can add and remove building levels and change their location against each other. The user can also switch between the views using the tabs on the right or left side of the manager.

The window manager can also hide the elements that are not useful for the user during designing, by clicking the bulb (dark bulb) located next to the names of the elements. After clicking the padlock (dark padlock), the user will not be able to make changes in selected element. After clicking the printer symbol you can similarly deactivate the elements selected for printing.

After you select the elements tree, in the level manager, at the bottom of the window there is a multi-clipboard. Using it, the user can copy elements from the selected level into the clipboard. Selecting the ones to be copied is done by selecting them in the list of item selection. Then it will be possible to paste them, e.g. into the next level.

### 4.1.1. Adding and editing groups, items management

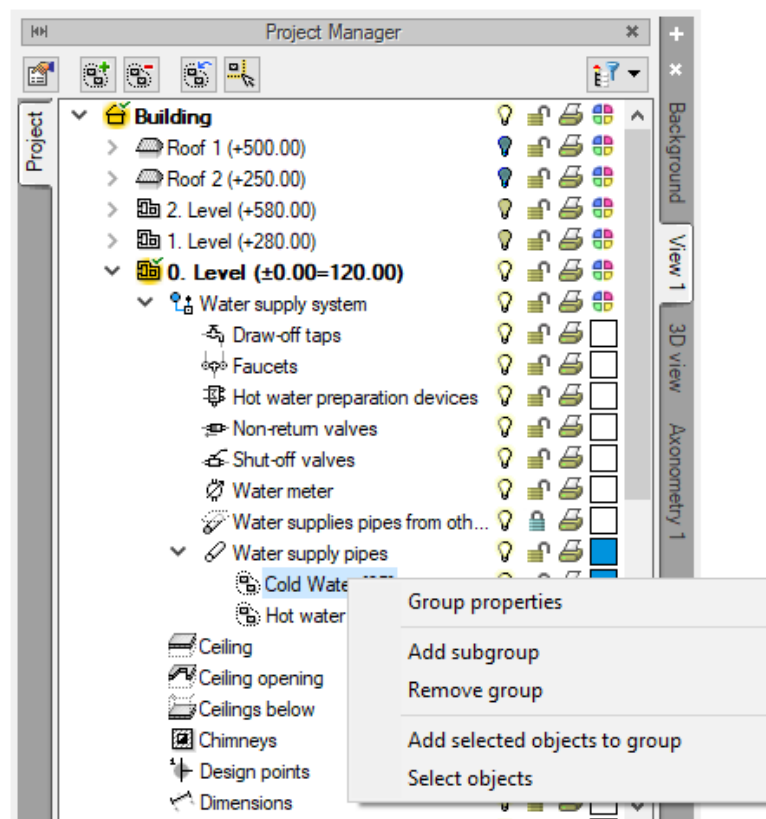


Fig. 2. Project Manager window, item management

From the level of this window, you can change general settings, such as colours or line thickness for a specific group of items. You can also select and edit the properties of all water-supply installation elements, by right-clicking on a group of items such as **Water supply pipes / Hot water**. By the group name in brackets [] there is a certain number of elements belonging to this group. When you right-click on a particular group, the user can select the operations to perform. Similarly to managing groups, the user can manage items. From the manager tree level, you can select, for example, all the valves and change the settings of the description, pens, fonts, perform renumbering etc.

## Software elements description

### 4.2. 3D PREVIEW

Each item created in the **ArCADia-WATER SUPPLY INSTALLATIONS** is reflected in a 3D view. The 3D view tree is different from the other views in that you cannot adjust item printing properties in the view tree, since only a saved image can be printed. Instead of printing, the view tree offers the feature to glaze an element with the use of the "glass" icon.

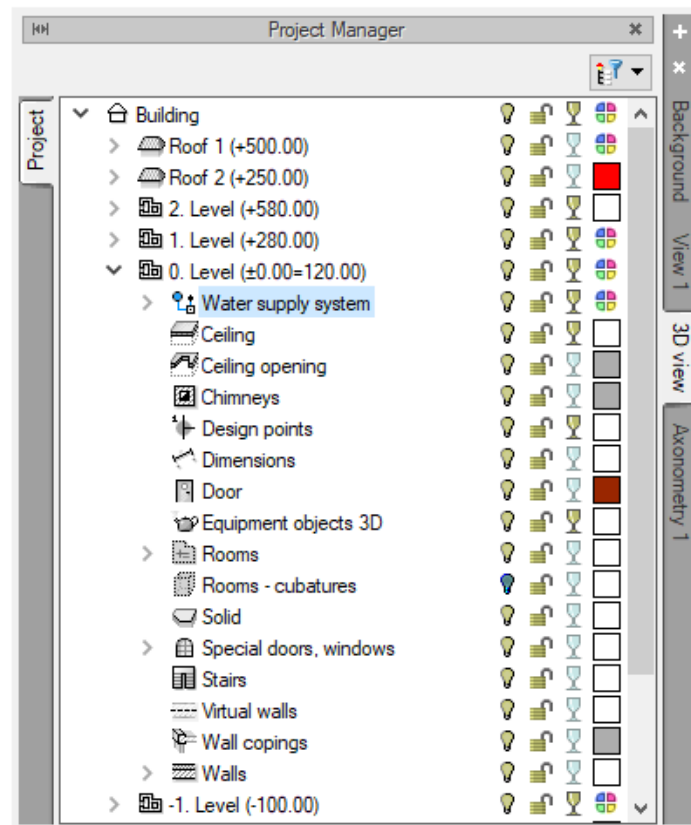
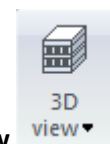


Fig. 3. 3D view properties in the Project manager window


In order to start the **3D view**, select the icon:

*ArCADia software*

- The **System** ribbon ⇒ **View** logical group ⇒ **Show/Hide 3D preview**



*AutoCAD or ArCADia-INTELLICAD software:*

- **ArCADia-ARCHITECTURE** toolbar ⇒ **Show/Hide 3D preview** 

or write

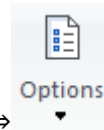
- isa\_tv3d.

## Software elements description

### 4.3. PROJECT OPTIONS

In order to start the **Project options**, start the **Software options** by clicking the icon:

*ArCADia software*



- **System ribbon** ⇒ **Options** logical group ⇒ **Options**

*AutoCAD or ArCADia-INTELLICAD software:*

- **ArCADia-WATER SUPPLY INSTALLATIONS** bar ⇒ **Project options**

or write

- iwtr\_popt.

The user may also display the options window from the **ArCADia** software menu by selecting the **Software options** icon. The general options window of **ArCADia** software will be displayed and then **ArCADia-WATER SUPPLY INSTALLATIONS**.

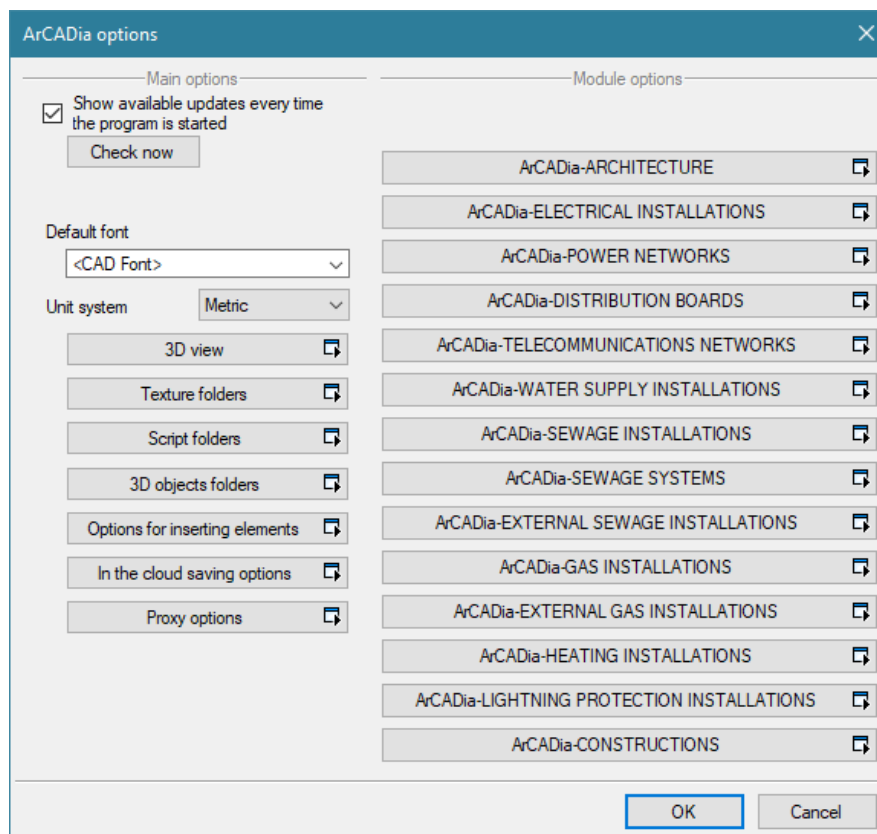


Fig. 4. ArCADia option window

The button **Options for inserting elements** is on the left side of the options window. This opens the following window:

## Software elements description

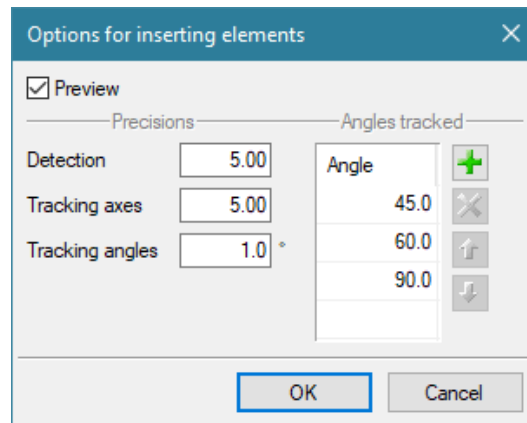







Fig. 5. Tracking options window

On the left side the user may define how precisely (maximum distance from the element axis which will allow for detection) will the elements, axes and angles be detected while element axis  and angles  tracking is enabled and elements detection  is enabled.

Angles tracked may be inserted on the right side of the window. In the table the user may add, using the  button, another angle that he wants to be tracked when entering elements. If the user wants to delete one of the angles, he needs to select it by clicking it in the table and then delete one of the values using the  button on the right.

After defining the modification precision and the number and values of the angles tracked, the user may confirm the changes using the **OK** button (changes will be saved in the software) or reject them using the **Cancel** button (all changes done at the time in the tracking options window will be canceled).

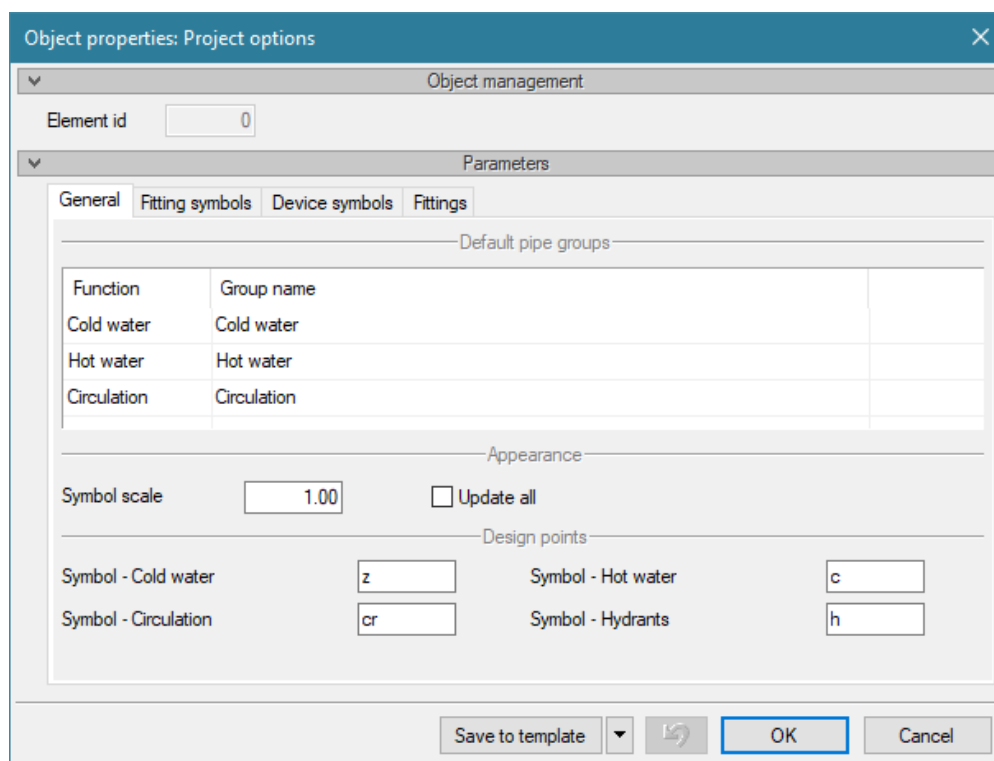


Fig. 6. Project options element properties window

## Software elements description

In the Project options properties, you can set the main features, using one of four tabs:

### General

Here, the user can define which default (groups) of pipelines they want to have available from the bar (ribbon) level while working with the software. The feature assigns certain pipelines to a group with certain default parameters of a specific function, e.g. Function – **Cold water** may begin with the start point of the installation and the default temperature is set to 10°C . In the column **Group name**, the user can set their name, which will be displayed on various reports, such as fire protection installation.

### Fitting symbols

The screenshot shows the 'Object properties: Project options' dialog box with the 'Fitting symbols' tab selected. The window is divided into several sections for different types of fittings:

- Outlet valves:**
  - Wash basin faucet: UM
  - Bath faucet: W
  - Shower faucet: NAT
  - Sink faucet: ZL
  - Bidet faucet: BID
  - Medical faucet: LEK
  - Washing machine valve: PR
  - Valve for dish washer: ZM
  - Flush valve: PŁ
  - Flushing valve for WC: WC
  - Flush unit for urinal: PIS
  - Draw-off tap: ZW
- Cut-off fittings:**
  - Cut-off valve: ZO
  - Non-return valve: ZZ
  - Antisiphoning valve: ZA
- Firefighting fittings:**
  - Hydrant: HP
- Filtering fittings:**
  - Water filter: FIL
- Control and protection fittings:**
  - Balancing valve: ZR
  - Pressure reducer: RED
  - Control valve: REG
  - Safety valve: ZB

At the bottom of the window, there are buttons for 'Save to template', 'OK', and 'Cancel'.

Fig. 7. Project options element properties window – fitting symbols

This is where the user can change the pipeline fitting symbols of items, set by default in the software.

## Software elements description

### Device symbols

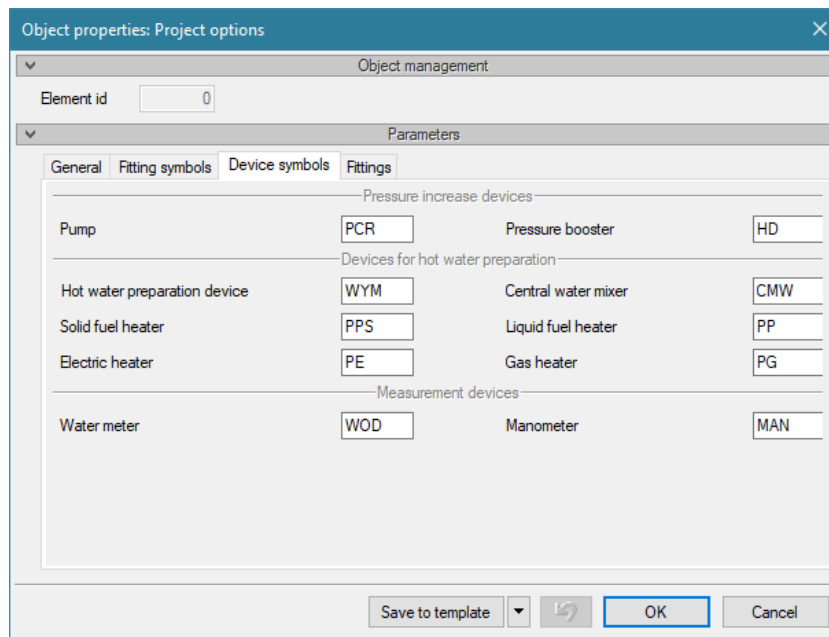


Fig. 8. Project options element properties window – device symbol

This is where the user can change the water-supply installation devices symbols of items, set by default in the software.

### Fittings

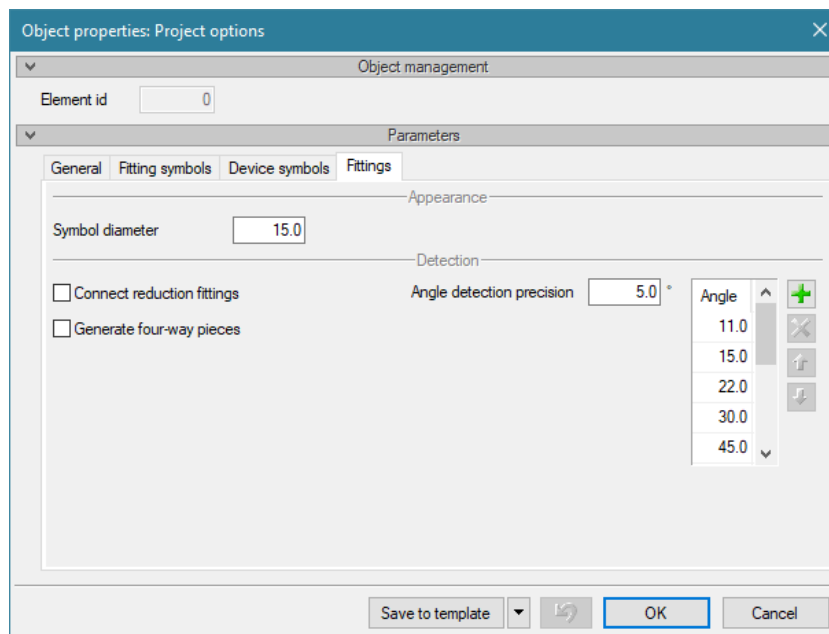


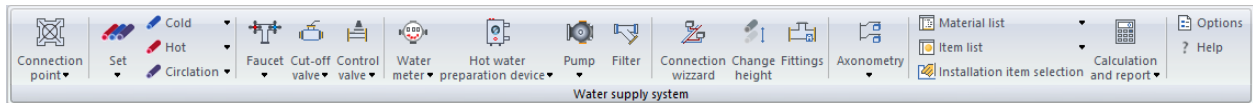
Fig. 9. Project options element properties window – fittings

This is where the user can change the default settings associated with generating of fittings in the water-supply installation.



## Software elements description

## 4.4. ARCADIA- WATER SUPPLY INSTALLATIONS MODULE TOOL BAR



Przyciski rozwijane ▼ include more than one command

Fig. 10. ArCADia-WATER-SUPPLY INSTALLATIONS module tools ribbon (*ArCADia software*)

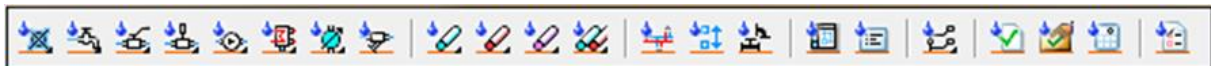





Fig. 11. ArCADia-WATER SUPPLY INSTALLATIONS module tools toolbar  
(*AutoCAD software or ArCADia-INTELLICAD*)

\***BIM** – options available in ArCADia BIM basic modul.

Tab. 1 Features of the ArCADia-WATER SUPPLY INSTALLATIONS toolbar

I	II	Option	Description	*BIM
		Show/Hide Project Manager	Displays or hides the level management window. This feature is available in the <b>View</b> tab in the <b>Show/Hide</b> logical group.	✓
		Show options	Enables settings the basic drawing options. This feature is available in the <b>Home</b> tab in the <b>Modules</b> logical group.	✓
		Insert installation connection point	Inserts an installation connection point and allows to define installation and technical parameters of cold water supply necessary to perform the calculations further in the project.	✓
		Insert set of local installation connection points	Inserts a connection point for a part of an installation and allows to define installation and technical parameters of cold water supply necessary to perform the calculations further in the project. Here you can change the purpose of a selected part of the building.	✓
		Insert draw-off tap	Inserts a draw-off tap and allows you to select and/or define the characteristic tap parameters.	✓
		Insert faucet	Inserts a draw-off faucet and allows you to select and/or define the characteristic faucet parameters.	✓
		Insert hydrant	Inserts a hydrant and allows you to select and/or define the characteristic hydrant parameters, i.e. e.g. a hydrant cabinet.	✓
		Insert shut-off valve	Inserts a shut-off valve and allows you to select and/or define the characteristic valve parameters.	✓
		Insert non-return valve	Inserts a non-return valve and allows you to select and/or define the characteristic valve parameters.	✓

## Software elements description

		Insert pressure reducing valve	Inserts a pressure reducing valve and allows you to select and/or define the characteristic valve parameters.	✓
		Insert balancing valve	Inserts a balancing valve and allows you to select and/or define the characteristic valve parameters.	✓
		Insert safety valve	Inserts a safety valve and allows you to select and/or define the characteristic valve parameters.	✓
		Insert pump	Inserts a pump and allows you to select and/or define the characteristic pump parameters.	✓
		Insert pressure booster	Inserts a pressure booster and allows you to select and/or define the characteristic pressure booster parameters.	✓
		Insert heater	Inserts a heater and allows you to select and/or define the characteristic heater parameters.	✓
		Insert hot water preparation device	Inserts a hot water preparation device and allows you to select and/or define the parameters characteristic for the device, e.g. exchanger.	✓
		Insert central water mixer	Inserts a central water mixer and allows you to select and/or define the characteristic mixer parameters.	✓
		Insert water meter	Inserts a water meter and allows you to select and/or define the characteristic water meter parameters.	✓
		Insert manometer	Inserts a manometer and allows you to select and/or define the characteristic manometer parameters.	✓
		Insert filter	Inserts a filter and allows you to select and/or define the characteristic filter parameters.	✓
		Insert water supply pipe – Cold water	Inserts a water supply pipe from the <b>Cold water</b> group and/or allows you to define the parameters for a given pipeline and to choose cold water pipelines insulation.	✓
		Insert vertical water supply pipe - cold water	Inserts a vertical water supply pipe from the <b>Cold water</b> group and/or allows you to define the parameters for a given pipeline and to choose cold water pipelines insulation.	✓
		Convert line into pipe - cold water	Converts a line into a cold water pipe, at the active level	✗
		Insert water supply pipe - hot water	Inserts a water supply pipe from the <b>Hot water</b> group and/or allows you to define the parameters for a given pipeline and to choose hot water pipelines insulation.	✓
		vertical water supply pipe - hot water	Inserts a vertical water supply pipe from the <b>Hot water</b> group and/or allows you to define the parameters for a given pipeline and to choose hot water pipelines insulation.	✓
		Convert line into pipe – hot water	Converts a line into a hot water pipe, at the active level	✗
		Insert water supply pipe - circulation water	Inserts a water supply pipe from the <b>Circulating water</b> group and/or allows you to define the parameters for a given pipeline and to choose circulating water pipelines insulation.	✓
		vertical water supply pipe - circulation water	Inserts a vertical water supply pipe from the <b>Circulating water</b> group and/or allows you to define the parameters for a given pipeline and to choose circulating water pipelines insulation.	✓
		Convert line into pipe – circulation	Converts a line into a circulating water pipe, at the active level.	✗

## Software elements description

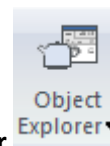
		Insert vertical water supply pipes set	Inserts a vertical water supply pipe set from the groups of any configuration and/or allows you to define the parameters for a given pipeline set and to choose pipelines insulation from this set.	✓
		Insert water supply pipe set	Inserts a water supply pipe set from the groups of any configuration and/or allows you to define the parameters for a given pipeline set and to choose pipelines insulation from this set.	✓
		Connection wizard	Automatically inserts connections with water outlets in three ways.	✗
		Change installation height	Moves water-supply installation vertically by a given value.	✓
		Insert item list	Inserts an item list with symbols used on the projection (drawing key).	✓
		Insert material list	Inserts material list, allows you to export the drawing to RTF file and Ceninwest.	✓
		Insert axonometry of installation branches	Inserts the axonometry of installation sections (branches).	✗
		Insert axonometry of entire installation	Inserts the axonometry of the water-supply installation.	✗
		Water supply system verification	Displays a window with installation verification, possible errors, information and warnings.	✓
		Perform a selection of system components	Displays a window with options for selection and allows to perform an automatic selection.	✗
		Calculations and report for water supply system	Displays the calculation of the water supply window: cold water, hot water and circulation.	✗
		Show project options	Displays project options window.	✓
		Show help	Displays Help file.	✓
		Automatically insert moulds	Inserts pipeline moulds according to the project settings.	✓

\* Icons marked with this triangle are extendable icons that have more than one command

## 4.5. CREATING AND INSERTING LAYOUTS

In order to start the **Items explorer**, select the icon:

*ArCADia software:*



- The **System** ribbon ⇒ **Insert** logical group ⇒ **Object Explorer**

*AutoCAD or ArCADia-INTELLICAD software:*

- ⇒ toolbar **Show/Hide Items Explorer**

or write

- isa\_o.

The **Object explorer** window is used to introduce and insert pre-defined 2D and 3D items, as well as layouts.

## Software elements description

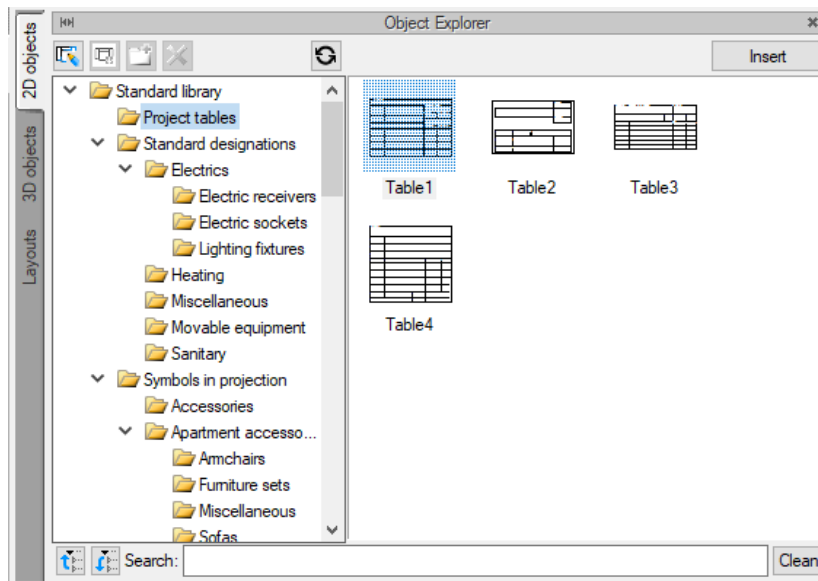


Fig. 12. Object explorer window


On the left side of the **Items explorer** window there are the following tabs:

**2D items**- this tab allows you to select an existing 2D item or introduce new 2D item such as **Title Block**.

**3D items**- this tab allows you to select an existing 3D item or introduce new 3D item.

**Layouts** – When designing e.g. water-supply installations you often use ready-made patterns that are the same for different projects in the scope of the elements used but may differ e.g. as far as diameters are concerned. Often, manufacturers offer products made of several different elements. In order to ensure a seamless design, we have added a feature that allows the user to create such a layout and save it to the Layouts library. This will enable using a set of elements with the pre-determined parameters as part of any project.

In order to add a new layout of elements that are already drawn, you need to do the following:

1. In the **Items explorer** in the **Layouts** tab select  **Create layout**.
2. Select the elements that are to be included in the group and confirm your selection by pressing Enter.
3. Select base point for the layout.

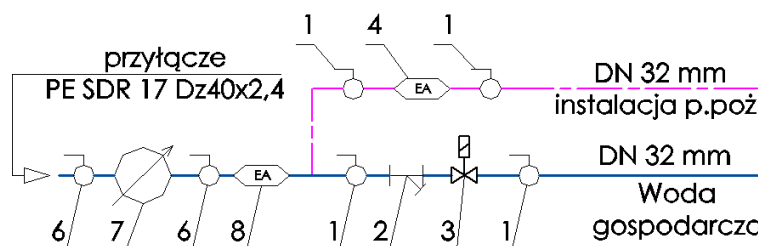


Fig. 13. Drawing elements before saving a layout

## Software elements description

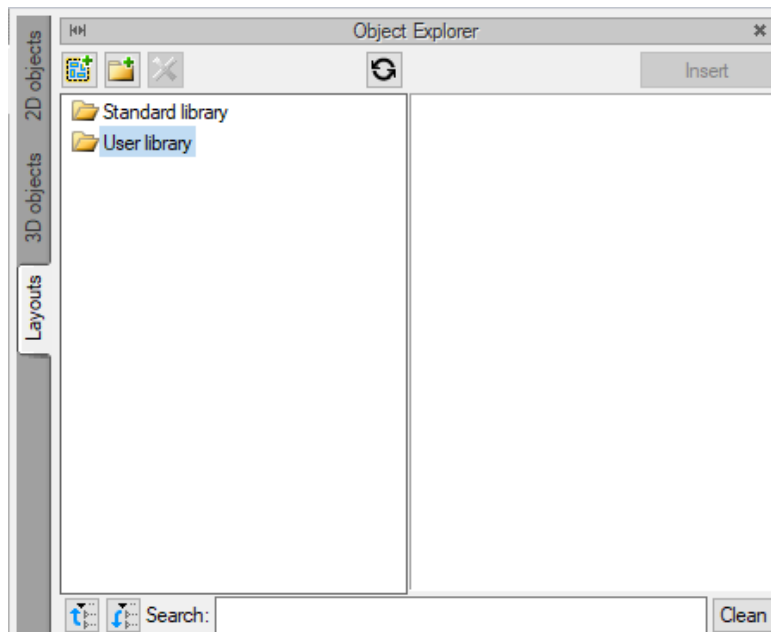
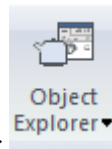


Fig. 14. Saved layout

In order to insert the layout to the drawing, you should:

*ArCADia software:*



- **System ribbon** ⇒ **Insert logical group** ⇒ **Show Object explorer** ⇒ **Layouts tab**

*AutoCAD or ArCADia-INTELLICAD software:*

- **ArCADia-ARCHITECTURE toolbar** ⇒  **Show Items explorer** ⇒ **Layouts tab**

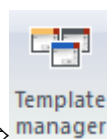
1. In the **Items explorer** in the **Layouts** tab select the layout to be inserted.

2. Press the **Insert** button and indicate the location for the layout in the project.

### 4.6. SAVE TEMPLATE

In order to select and/or edit a **template**, select the icon:


*ArCADia software:*



- **System ribbon** ⇒ **Libraries logical group** ⇒ **Template manager**

## Software elements description

### *AutoCAD or ArCADia-INTELLICAD software:*

- **ArCADia-ARCHITECTURE** tool bar ⇒  **Template manager**

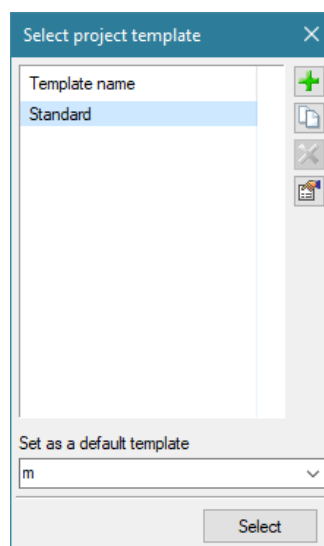
or write

- isa\_defaults.





A new template feature is provided to save all the element settings, not only their width and height, but also features such as pens, planes and level heights. This feature stores the settings selected by the user and recalls them for the next project. The number of templates is unlimited, it may be linked to the branch, project printing scale, e.g. with the type of the designed building, where the stored heights and level parameters for industrial buildings and single-family development are different and repeated changes consume more time than creating a template file with pre-selected values for all the necessary parameters.

This feature is not the same as the Element type, since it saves all additional parameters. For example, this feature will save the thickness and colour scheme of pens assigned to a wall (all the walls will from then on be drawn with the pens selected by the user), the selected heights (which is by default the level height), the wall inserted by default that does not need to be a single-layer 25 cm thick wall any more but may be any wall selected by the user (e.g. through the **Type**). The entered parameters will be saved to the active style once you press the **Save to template** button, located at the bottom of each element properties dialogue box.

The template is selected at the beginning of working with a project; after selecting the first feature of **ArCADia** you will see the following dialogue box:



## Software elements description

	Add template	Adds a new template.
	Create template copy	Copies the template along with all the parameters.
	Remove template	Removes the selected template.
	Template properties	Opens the Template properties window.

In the **Template properties** window you can see what elements are included in the template (e.g. modified parameters for the walls, windows etc.). You can remove a selected element or change the template name.

**NOTE!** When working with the software you can change the template, which will result in all the new elements being drawn with the new parameters. The drawing and its elements created before changing the template will not be modified.

### 4.7. TYPE LIBRARY EDITOR

To display the **Type library editor** dialog box, click the icon:

*ArCADia software:*

- The **System** ribbon ⇒ **Libraries** logical group ⇒



*AutoCAD or ArCADia-INTELLICAD software:*

- **Architecture** toolbar ⇒ 

or write

- isa\_etl.

The **Type library editor** is used to edit and introduce new item types into the **ArCADia** software. It facilitates access to manufacturers catalogues and enables selecting only those catalogues which the user uses most often when designing. Additionally it divides types into the Standard library (i.e., the library provided with a given software version) and User library, where all new or user modified element types are saved.

## Software elements description

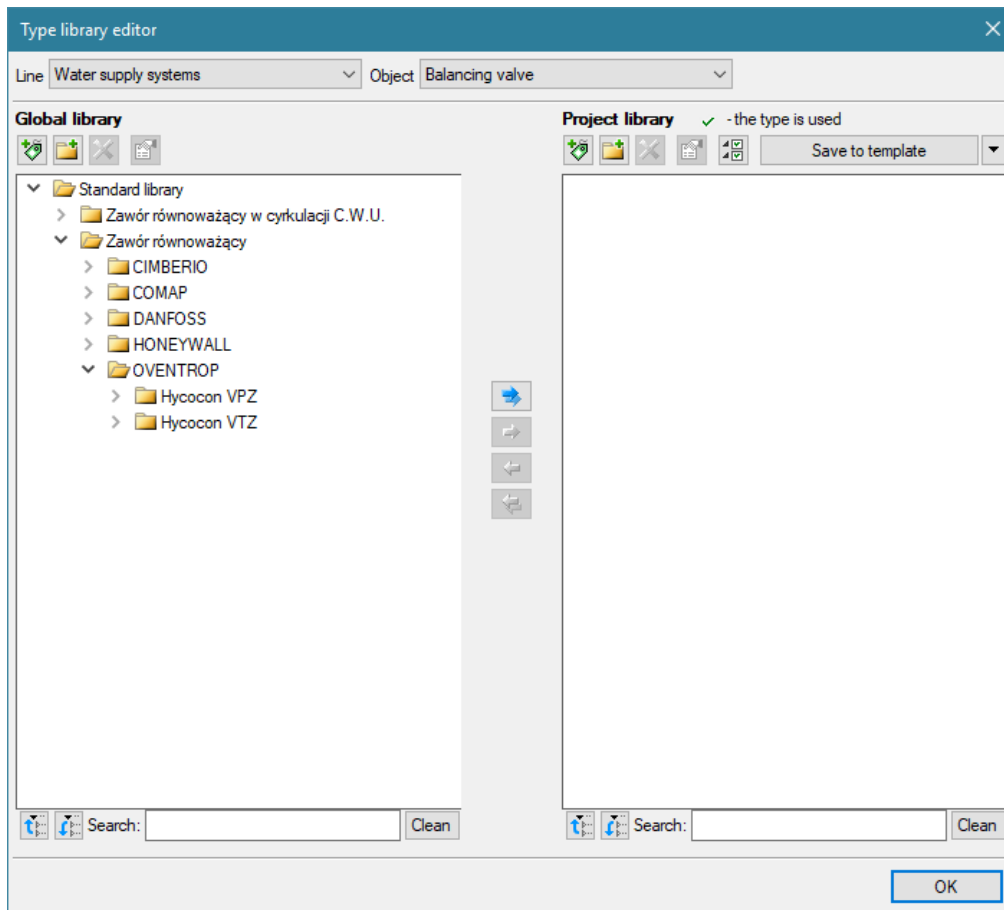


Fig. 15. Type library editor window

In the upper part of the **Type editor window** (Fig. 15) the user has the possibility to select a branch from the drop-down list where all the branch-modules available in **ArcADia** are listed.

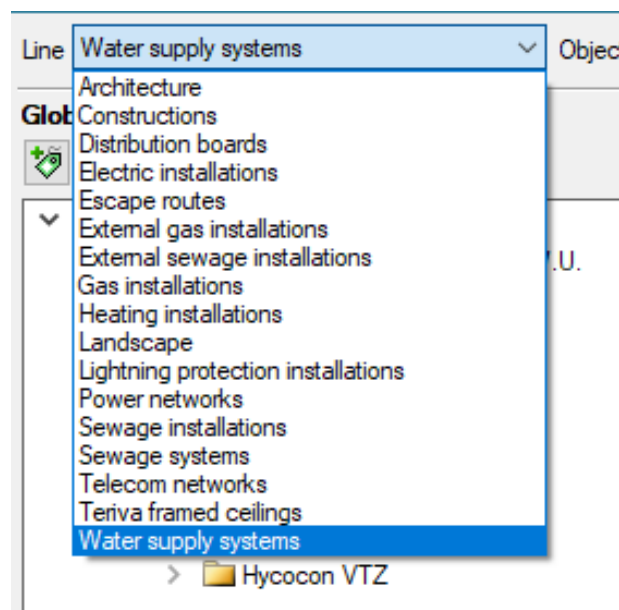


Fig. 16. Drop-down list view available in the ArcADia system.



## Software elements description

After selecting the appropriate branch the user has access to all the items, e.g. **water supply pipe**, available in the selected branch (module) from the **Elements** drop-down list (on the right side), after selecting the **Water supply installations**.

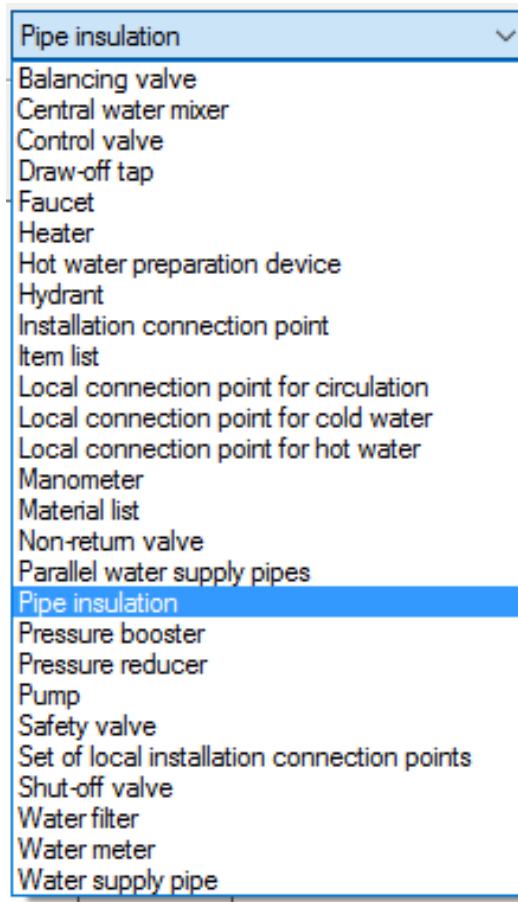


Fig. 17. Drop-down list view available in the ArCADia system.

Fig. 18. After clicking on the selected element in the **Global library** all element types will be available. During the first run it will be Standard library types (files provided with a given version of the software). During the design process you may add additional types into the libraries, creating a User library.

## Software elements description

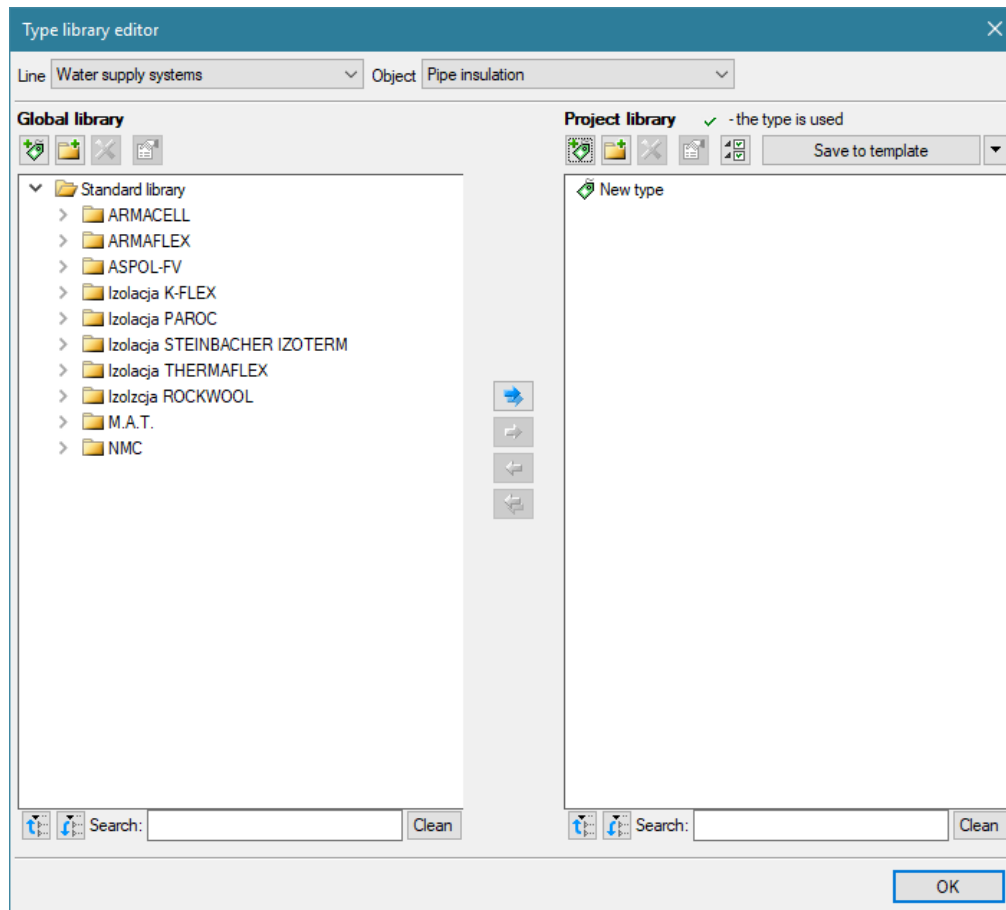


Fig. 19. Type library editor window after selecting an appropriate branch and one of its elements.

The lower part of the Editor window is divided into the **Global library** part (left) and **Project library** part (right).

Global library is the place where all the default element types available for the user and the elements added when working with the software are added, it is divided into Standard library (library provided with a given version of the software, which the user does not change) and User library, which contains elements (types) saved by the user during the work with the software.

**Project library** – where all the element types used or available for use in the project are listed. A type for an element can be selected from the Element properties window (Fig. 20, Fig. 21):

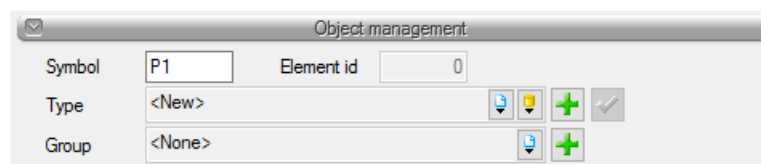


Fig. 20. Type insertion from the level of item properties and in the modification and insertion windows:

## Software elements description

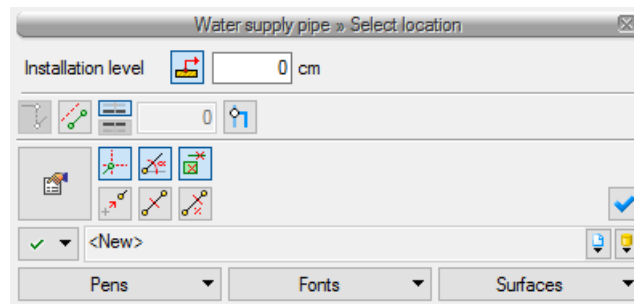


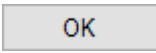
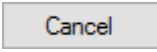


Fig. 21. Type insertion from the level of modification window and element insertion

Above the type library windows there are icons with the following functions:

**Add new type**  – after clicking this icon the user has the possibility to add a new type to the **Global library** or the **Project library** (to the **User library**). It is also possible to edit type properties for the particular element, where the user may determine all the parameters of the element that are characteristic for it are, among others, the type parameters, view.

*NOTE! Clicking the Add new type icon when a type has been previously highlighted in the Library will add a new type based on the highlighted one. This facilitates entering a catalogue of items to the library, e.g. supplied by one company, where the only distinctive feature is e.g. the diameter.*

**Add new folder**  – after clicking this icon the user has the possibility to add a new folder, where he can then later add element types. A window prompting for the folder name will appear. After entering the folder name you need to press the  button in order to add the folder to the library or  to cancel the command.

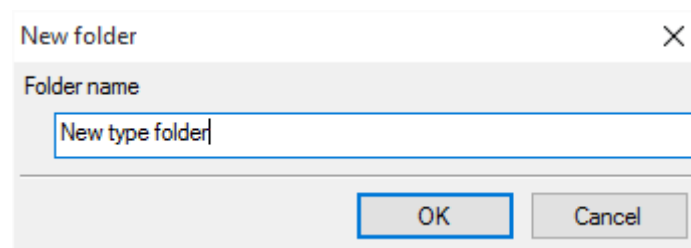



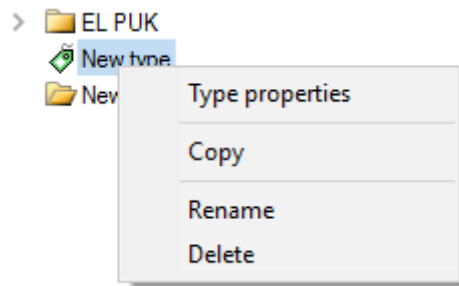
Fig. 22. Folder types insertion window


**Delete**  – after clicking this icon the user may delete the selected type or folder.

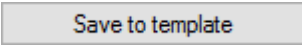

**Leave only the types used in the project**  – after clicking on this icon in the Project Library only the types used in the project (used in any object in the project) will remain visible

After clicking right mouse button on the type menu is available:

## Software elements description



**Type properties**  – after clicking this icon the user will have access to the properties of the selected type. These values can be edited and saved here.

**Save to template**  Button is located above the project library. Once you click this button, the **Project library** settings will be saved in the template and will be accessible for future projects using this template. Next to it there is an  icon – when clicked, it provides the user with a list of available templates.

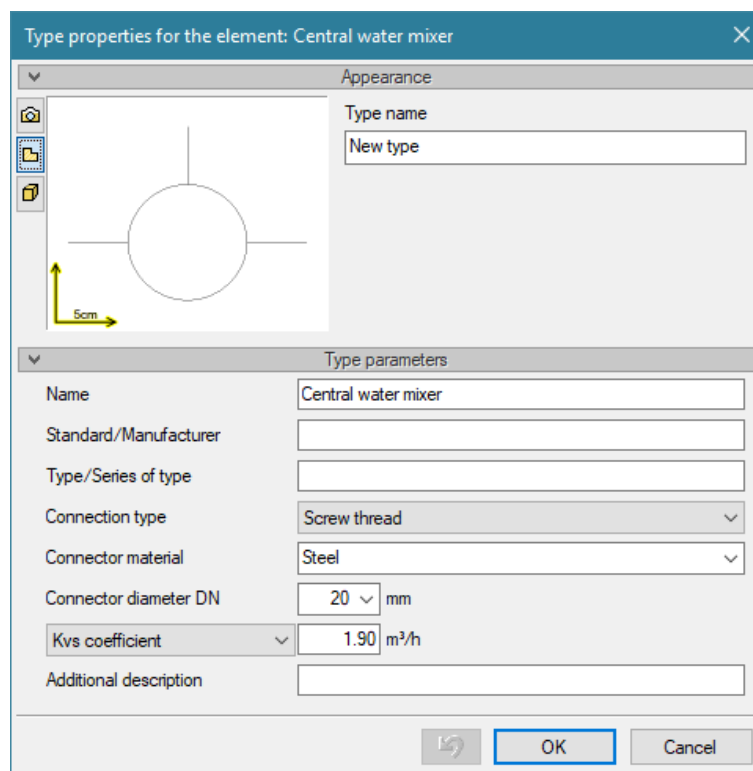



Fig. 23. Sample type properties window

In the **Project library** window you can also check what types of a particular element are currently in use in the projection, which is displayed in the form of a  symbol on the left of the name of a particular type.

## Software elements description

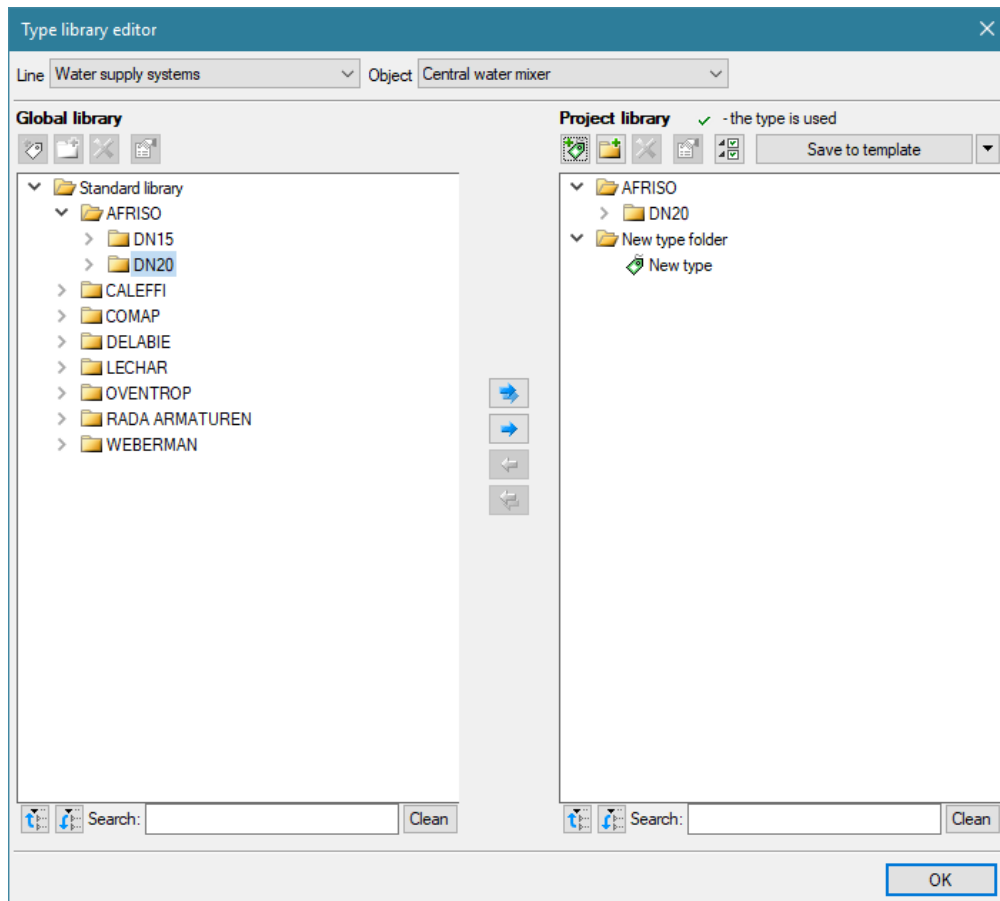



Fig. 24. The type library editor window after entering the type to the project library.


Below the two libraries there are icons:


**Hide everything**  After clicking on the same icon types tree in a given library will be hidden to the main catalogues..


**Extend everything**  After clicking on the same icon types tree in a given library will be extended.

The user may also search the library by typing a part or the entire name of the desired type in the **Search:**  field. After clicking the **Clean** button next to it, the editing search field will be cleared.

Once you select types or folders, the transfer buttons located between the libraries are activated.

**Copy all to the project library**  - copies the entire **Global library** content to the **Project library**.

**Copy to the project library**  – copies the selected elements to the **Project library**.

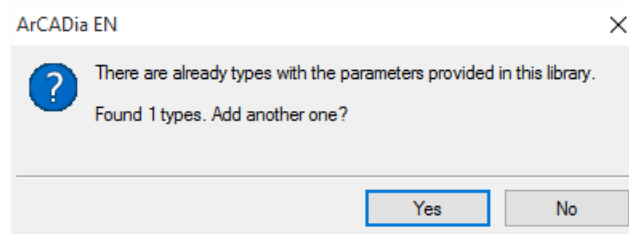
**Copy to the global library**  – copies the selected elements to the **Global library**.

**Copy all to the global library**  – copies the entire **Project library** content of the selected element to the **Global library**.

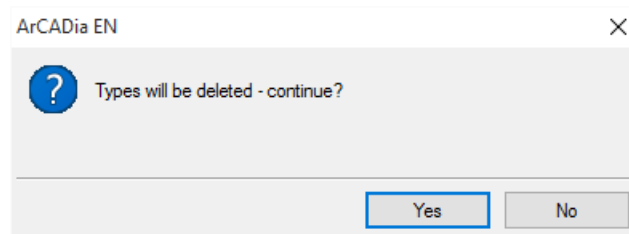
Messages that may be displayed when working with the **Type library editor**:

## Software elements description

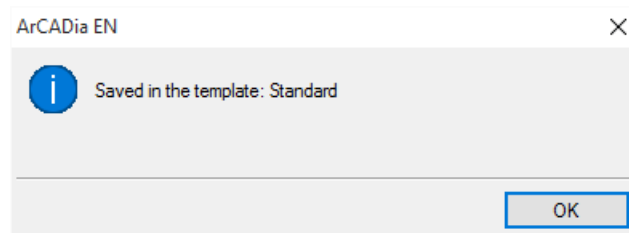
1. This message informs the user that there a type with this name already exists. After clicking the **OK** button, information from the new type will be saved and will overwrite the information in the previous type.



2. This message informs the user that the types marked by the user are going to be deleted. The **OK** button confirms type deletion.



3. This message informs that the layout of the project library was saved to a project template, e.g. **WATER-SUPPLY**.



---

**NOTE!** If the user has made any changes in the **Project library** while working with the project, modified existing types or expanded the library by adding new types, the new types will become available for future projects. The user should add the new types to the **Global library** using the transfer buttons.

---

## 5. DESCRIBING AND EDITING ITEMS


## Describing and editing items




### 5.1. PRELIMINARY NOTES ON EDITING ITEMS INSERTING ITEMS.

Editing each item involves inserting an item symbol into an architectural projection in the drawing model.

The item symbol includes information on the characteristic parameters, i.e. technical, process and geometric parameters of the item that are necessary to create supplementary drawings, carry out calculations and validate their correctness.

Items can be inserted onto a model by selecting an appropriate icon (Table 1 - Toolbar functions ArcADia - WATER SUPPLY INSTALLATIONS) from the software toolbar (Figure 6, 7, and 8). An item insertion window is displayed. The window for each item enables selecting the position of an item by defining a handle on the contour or at the item's characteristic point and enables localization in space (e.g. Bottom installation level).

By pressing the **Import from element**  button the user may insert an item by linking it at the appropriate point with a linking element of another item already inserted into the drawing.

Reference buttons    improve the element insertion function for pipelines in reference to one or two points. And so:



Reference:

After pressing the button, the user should first select a point on the pipeline (command line question). The software will display a "ruler", an item symbol in the suggested insertion point as well as the distance between the cursor and the chosen reference point (in cm). Next, the user chooses the desired insertion point using the displayed software help and its insertion angle.





Between points (centre):

After pressing the button, the user should select two points that the software will use to measure the centre between them and insert the item in that centre point. Lastly, the user chooses the item's insertion angle.



Between points (percentage):


After pressing the button, the user should first give the percentage distance from the first selected point, accept it by pressing ENTER and select the first point on the pipeline. The software will display a "ruler", an item symbol in the suggested insertion point as well as the distance between the cursor and the chosen reference point (in cm). Then the user should insert the second point using the distances displayed in the software help from which the program calculates the item's position (in percent). Lastly, the user chooses the item's insertion angle.

The window also includes options that help insert an item in an accurate way. These options are activated by pressing the appropriate tracking  or detection  buttons for other items already included in the drawing.

There are two methods to insert an item into a drawing:

#### METHOD 1:

After choosing an appropriate icon from the **ArcADia-WATER SUPPLY INSTALLATIONS** toolbar and displaying the item insertion window (Figure 12), the user can go to item parameters edition by clicking

the settings button  .



## Describing and editing items

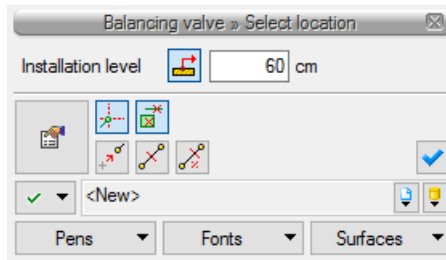


Fig. 25. Element insertion window, general view

Item insertion window is the same for every item with only minor differences concerning the insertion handles. Insertion handles are localized in reference to the inserted item's geometry (for example in the centre, top right corner, left edge centre, etc.)

The following types of insertion windows exist for items with insertion anchors:

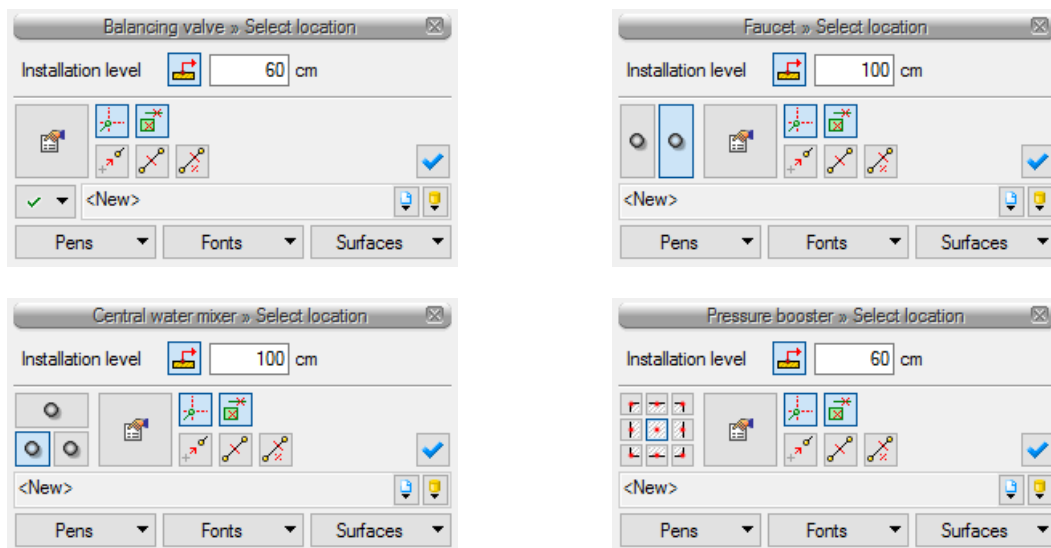


Fig. 26. Insertion window types

When the item insertion window is active, an item symbol shows up on the model's drawing field (projection). Clicking a chosen spot inside the drawing area inserts an item.

Insertion window elements:

**Installation level** - the user sets an item's characteristic point installation level (for example the angle, the bottom, etc.) in reference to the level of an active level.

**Import from element** - if the button is active, clicking the previously inserted element (for example a vertical pipe) will import the installation level from its characteristic points and automatically add the inserted element (for example a valve) on a similar level (for example to one end of the vertical pipe - example below).

If the previously inserted elements are for example two pipelines on different levels, one above the other and if the **Import from element** button is active, it will allow the user to insert an item (for example a valve) to one of the levels at the intersection point. The element will be added to the pipeline whose level is closer to the inserted level value - example below.

## Describing and editing items

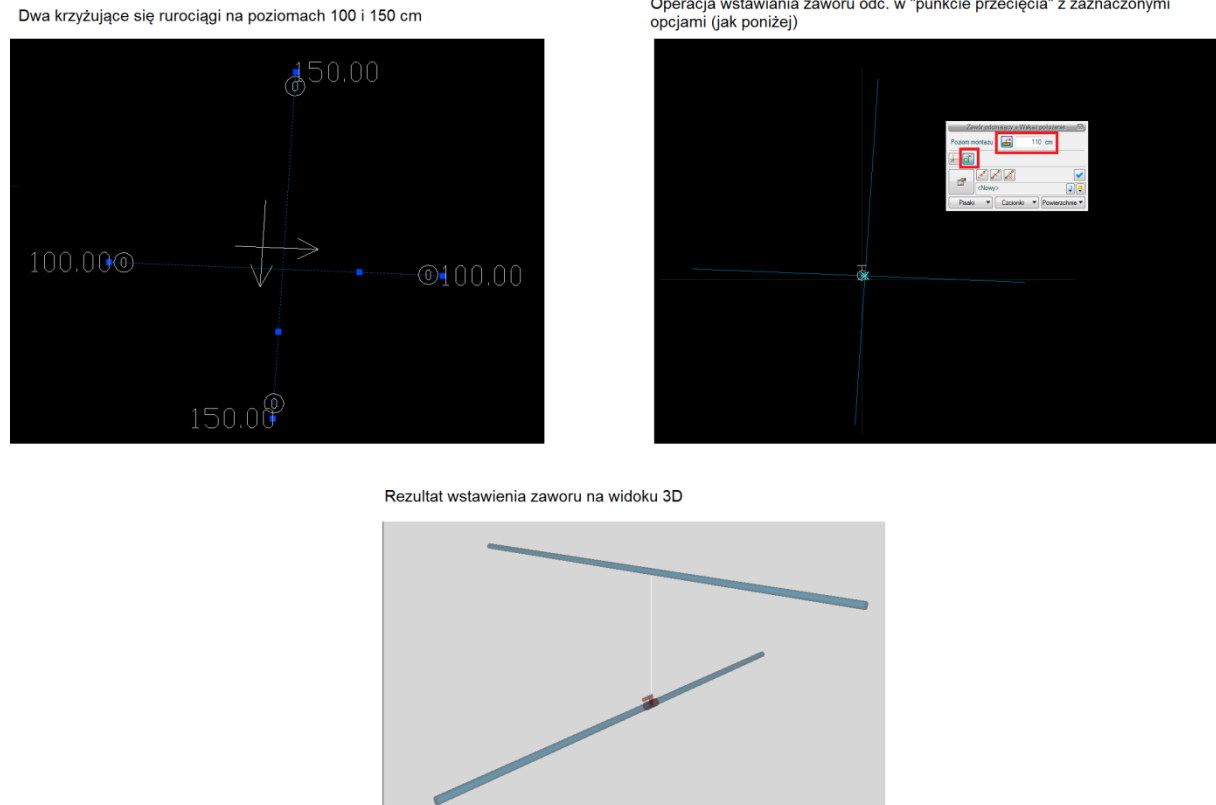


Fig. 27. An "Import from element" function usage example while inserting a valve onto one of the intersecting horizontal pipelines

The **Import from element** feature should be used when the **Elements and sections detection** feature is activated.

**Tracking function** - incorporating it allows you to track the ends of pipe sections and items away from the run route by using the on-screen dotted line connecting the end led to the detected pipeline (pipeline or item).

**Detection function** - a function that allows for precise and deliberate inclusion in an existing item. Detecting an element is notified using a marker (x) that appears on the screen.

**Item handle** - depending on item type, the item handle allows the user to choose a point on its contour that will become a handle while inserting a given item.

**Opening the properties window** - activates a given inserted item properties window.

**Reference** - inserts an item at a distance from the selected point displaying a subsidiary tag - "ruler".

**Between points (centre)** - inserts and item in the middle between two selected points.

**Between points (percentage)** - inserts and item at a distance specified in percent in reference to the distance between two selected points starting from the first point.

**Opening libraries** - allows the user to choose devices and items from the existing or updated type libraries. The drawing below presents sample water meter types.

## Describing and editing items

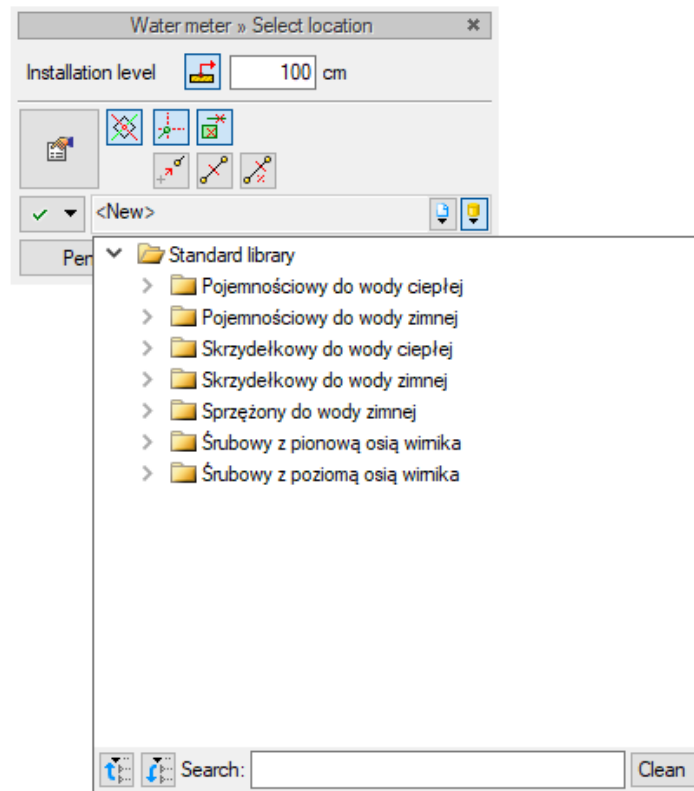




Fig. 28. Water meter library example

Select the  button to display the contents of an item library for the current project structured on the basis of the next level types "tree".

Clicking the  button "collapses" item library rows to the basic level:

## Describing and editing items

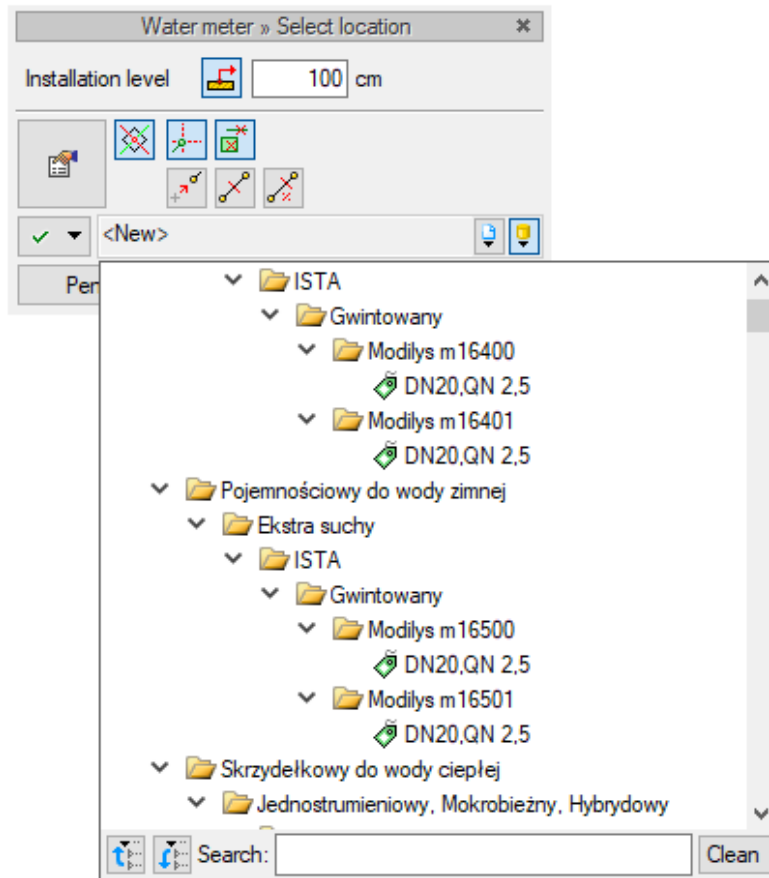


Fig. 29. An example of a collapsed "types tree" in a water meter library

**METHOD 2:**

After selecting an appropriate icon from the **ArCADia-WATER SUPPLY INSTALLATIONS** toolbar (Fig. 10, Fig. 11, Tab. 1), the user should insert the item symbol using the item localisation function and finish the insertion operation.

Next, after selecting the inserted item, use the displayed item modifications window (Fig. 30).

In the next step, proceed to modify item parameters (as in the first method) by selecting the setting

button  .

**5.2. ITEM MODIFICATION****5.2.1. Modification window and properties window**

The item modification window allows the user to select the type of drawing elements changes and set item parameters after selecting a given item type from the software libraries.

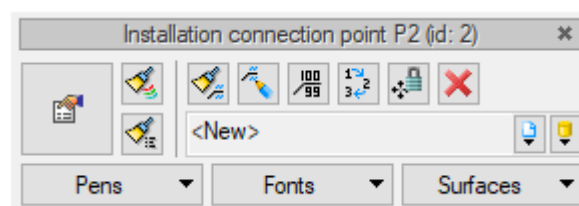














Fig. 30. Item modification window - a general view

## Describing and editing items

Icon	Description
	Go to properties dialog
	Fonts and pen painter
	Type painter
	Description painter
	Edit description
	Set description on the link
	Object renumbering
	Lengthen/shorten pipe maintaining slope
	Move with connections
	Move without connections
	Delete marked objects
	Project library / Global library

Each item can have its own icons (the additional icon field depends on the particular item) allowing the user to introduce appropriate changes intended solely for the given group of items. The number and type of icons may be different for a particular group of items.

#### 5.2.1.1. Setting an item for selection

The modification insertion window for the items that are selected looks different and has three modes of item insertion.

## Describing and editing items

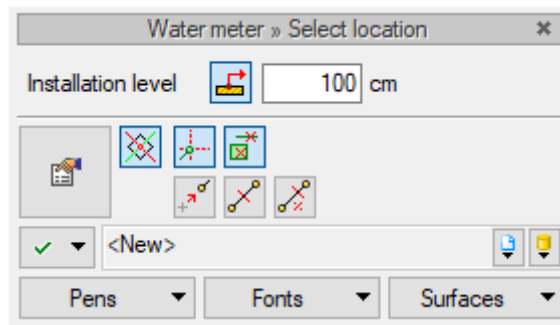



Fig. 31. Insertion window for an item selected in the software

Icon	Description
	Import for element
	Parallel offset
	Offset direction
	Insert vertical section
	Insert with rotation
	Tracking axes
	Tracking angles
	Element and section detection
	Reference
	Between points (center)
	Between points (percentage)

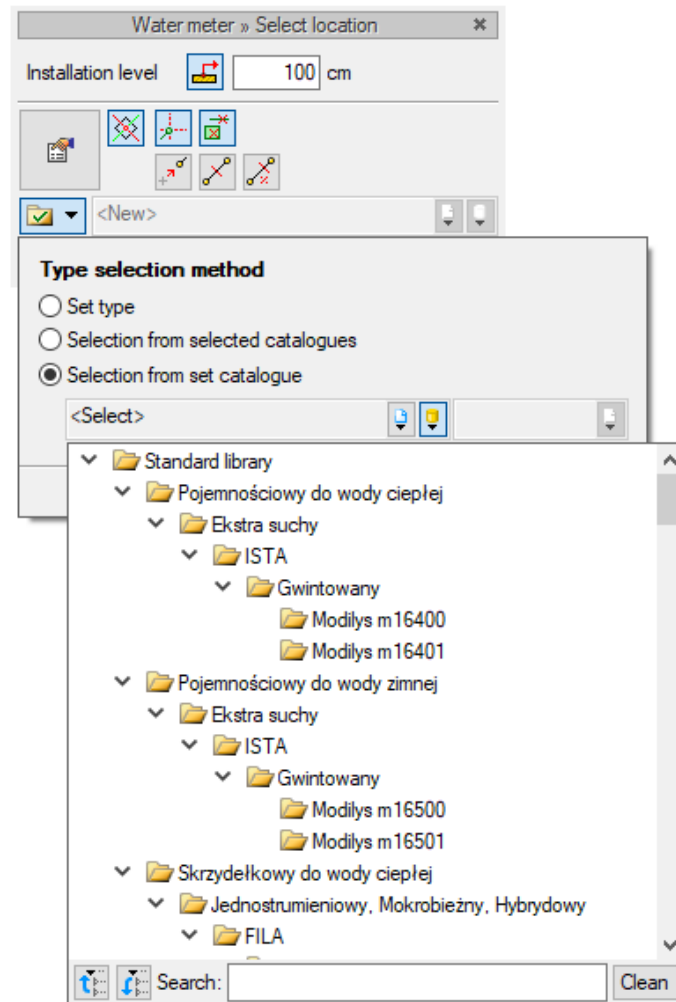
The  icon shows a particular status of an item in relation to the undergoing selection. After clicking on that icon, the user can change that status by selecting one of three possibilities:

**Fixed type** - while this option is selected, the user can set the type of a given element (the type library field is unlocked)

## Describing and editing items

**Selection from the selected catalogues** - while this option is selected, the elements are selected from the catalogues set in the **Project options**.

**Selection from the selected catalogue** - while this option is selected, the catalogue selection field is unlocked. The user has the possibility to select one of the catalogues from the project library. The element will be selected from that catalogue irrespectively to the **Project settings** options



### 5.2.1.2. Item properties

Entering item parameters editing (in the properties window) allows the user to select the button in the modifications window.



An item properties dialogue box will then be displayed where you can set the item parameters. Properties window with reduced control groups shown below. You can expand them by clicking the bar containing the group name in the selected point.

## Describing and editing items

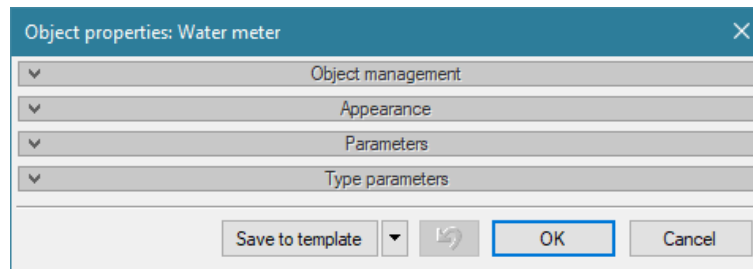


Fig. 32. Properties window with invisible (reduced) control groups

After entering the settings, press the **OK** confirmation button, which will take you back to the item insertion window where you need to click the selected location in the drawing field with the item symbol (attached to the cursor). This procedure ensures that the parameter settings and fonts, pens and areas are saved for each subsequent item of the same group.

The item properties windows are divided individually for each item into control groups:

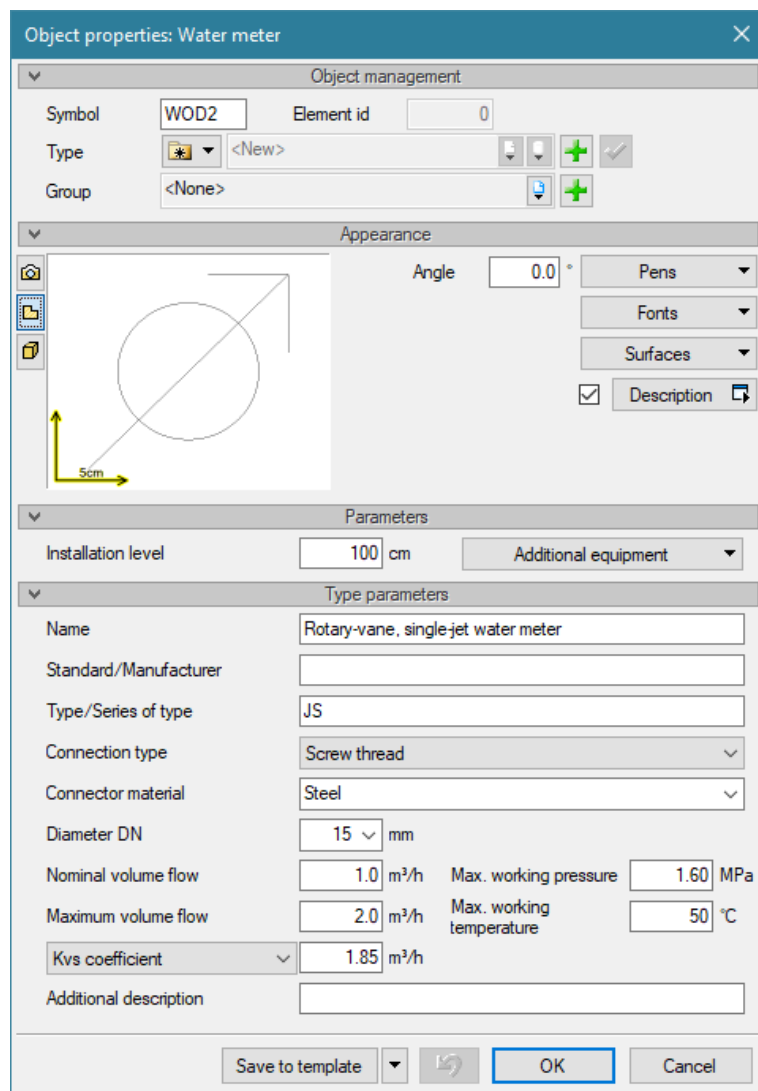


Fig. 33. Element properties window, general view



## Describing and editing items

### Item management control group

The set of controls included in this group is the same (or very similar) for all domain items included in the software.

**Symbol** - the default item designation and number that can be changed by the user show on the projection. If the user does not implement any change in the active window, the name will be generated from the **Options** window.

**Element ID** – the number of the subsequent inserted element of a given type.

The active item mode icons are displayed here 5.2.1.1



- means that the **Fixed type** is selected



- means that the **Selection from selected catalogues** is selected



- means that the **Selection from a set catalogue** is selected.

**Type** - Allows the user to insert items with shared parameters into the project library and the global library.

**Group** - common for every item. Allows the user to group selected items and transfer them to the **Project Manager**.

---

***NOTE!** Division into groups relates to all the objects and using the default groups the user may define the purpose of the water installation being drawn to be a cold water, hot water, circulation, process water, fire protection water etc. installation. While drawing the first item, the user will open the appropriate group edition window and the next item of that type will automatically be drawn in the same group.*

---

### Appearance control group

The set of controls included in this group is the same (or very similar) for all domain items included in the software.

**Angle** - by changing the value in the editing field, the user can change the angle at which an item will be inserted.

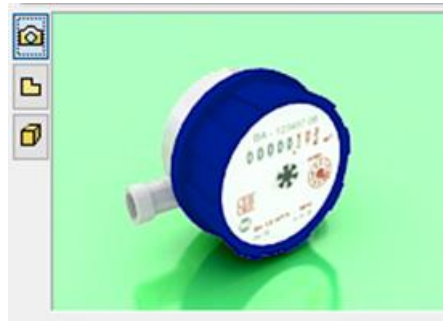
**Pens** – setting the thickness, contour drawing lines on a model and 3D view.

**Fonts** - setting the font format for the name displayed in drawing projections.

**Surfaces** – setting the colours and patterns of the surfaces visible in .

**Description** - allows to open the description content settings and its organisation wizard. The user decides whether a description will appear on a projection by marking the appropriate **Description** selection field.

## Describing and editing items



There are three view type switching buttons on the left side of the element view in the view window:



### 5.2.2. Description modification in the properties window

After pressing the **Description** button, the description appearance wizard window will appear.

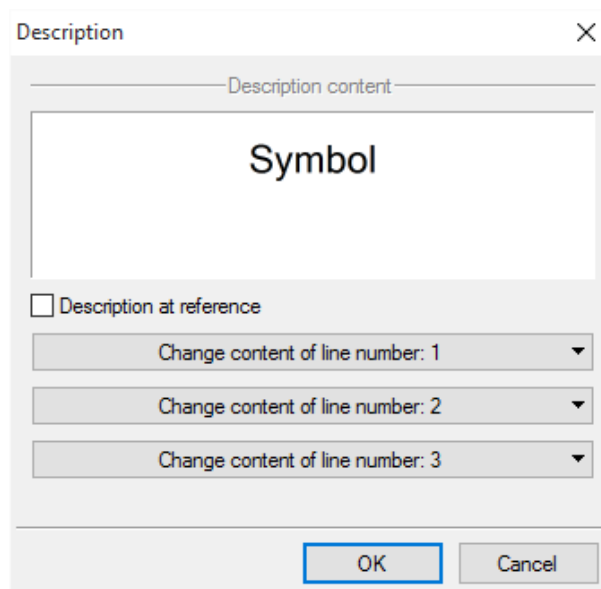


Fig. 34. Description wizard - general view

The description wizard allows the user to set the technical contents of the description components (different for the particular item) and their sequence of placement and localization against the description line.

After pressing the appropriate (upper or lower) line content button, an additional window is activated where you can select the layout and contents

## Describing and editing items

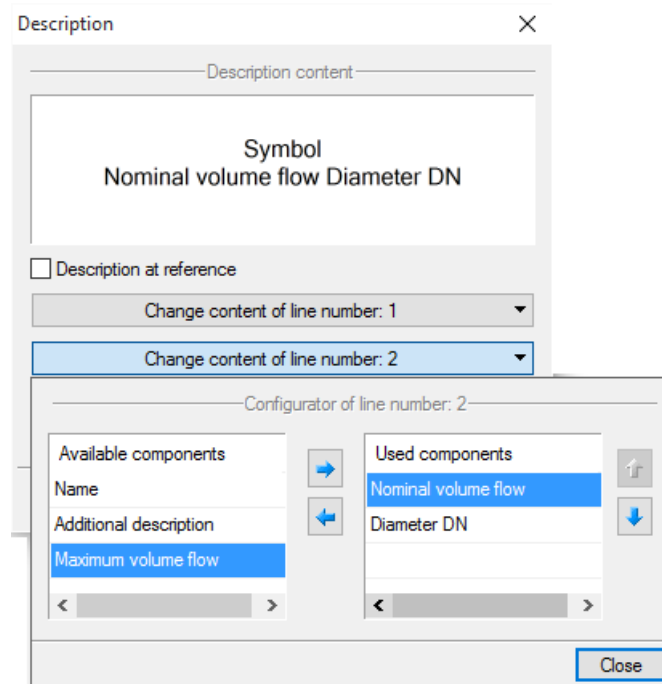







Fig. 35. Description wizard – settings window view

	Button for transferring a component from Available components to Used components
	Button for transferring a component from Used components to Available components
	Button for moving the component's position down
	Button for moving the component's position up

There are two tables in the description wizard window: the available components on the left side and the contents of a particular line on the right side. The availability of components for a particular line depends on introducing them into an inactive line. A description on the selected line is inserted by selecting the description name and pressing the arrow towards the line description content table. The selected description title will be transferred and therefore won't be visible in the Available components table. If the user wants to share the component, they need to act in a similar manner, marking the description components in the line content table and then using the arrow to transfer these to an available components table.

The sequence of description components in a particular line is set from left to right as per the top-down sequence in the line contents table. You can change the sequence by marking a component in the line contents table and controlling the sequence change buttons, which causes the sequence of the particular component to be changed by one field. Each use of the arrow moves the item one field up or down. The changes will be applied after pressing the **Close** button.

## Describing and editing items

By clicking the  **Edit description** button on the item modification toolbar (Fig. 35), you can open the item description editor. The description editor window will become available (Fig. 32)

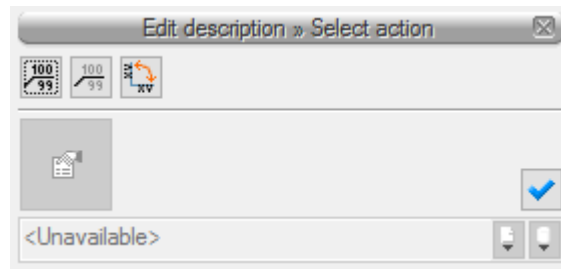






Fig. 36. Description editing window

Icon	Description
	Enable/disable description
	Enable/disable link
	Change direction

In order to transfer description settings from one elements, the user has to select the **Description painter** button  on the item modifications selection window (Fig. 30) toolbar. Then, a window will appear where by unticking the appropriate window the user may select which description parameters are to be transferred ("painted") to a subsequent element description.

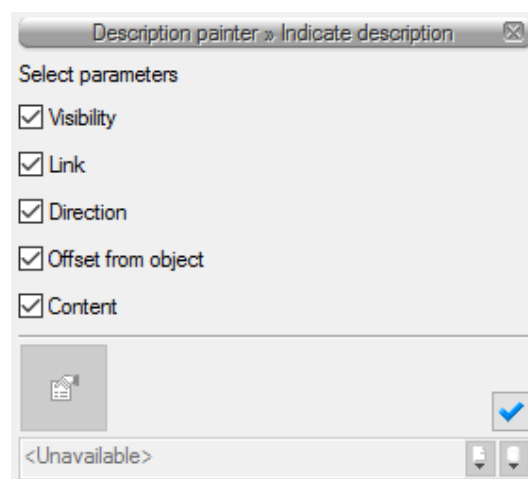


Fig. 37. Description painter selection window

The available parameters include:

**Visibility** - transfers the enabled/disabled description settings;

**Link** - transfers the description settings with/without a link;


## Describing and editing items

**Direction** - transfers the horizontal/vertical description settings;

**Offset from object** - transfers the description position settings to a subsequent elements in reference to an item;

**Content** - transfers the description lines content set in the description configurator.

### 5.2.2.1. Item renumbering in the description modifications window

In order to renumber installation elements, you should press the  **Item renumbering** button on the item modification toolbar. A renumbering window will appear. In that window, the user can set:

- A symbol for the item from which the renumbering will start.
- numbering method: Selecting the **Increase** field will cause the numbering to go up, starting from the number provided at the end of the item symbol. If the symbol does not end with a number but a letter, letter numbering will increase in the same way, with subsequent alphabet letters. If the **Increase** field is not selected, the software will assign the same symbol to all items of a given type.
- automatic renumbering,
- Direction: from which corner of the document the renumbering will start and whether it should “run” vertically or horizontally.
- Range: item renumbering in the whole building or at the active level only.

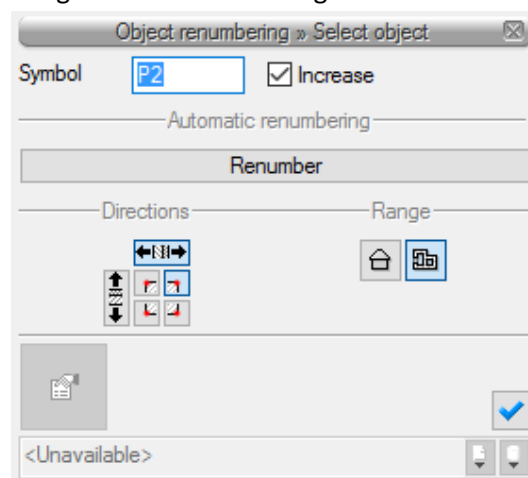


Fig. 38. Item renumbering window

### 5.2.3. Defining parameters and types in the item properties window

#### Parameters control group

Set of controls common for all items. Allows the user to set the installation parameters to define the item location and additional equipment. Some of the items from this group have an additional data field only for a given item type (for example balancing valve set point or the permissible pressure drop in a control valve).

## Describing and editing items

**Installation level** - the user sets an item's characteristic point installation level (for example the angle, the bottom, etc.) in reference to the level of an active level.

**Additional equipment** – a button opening a table where you can insert additional equipment, elements of which should be included in the material lists, is available for most items.

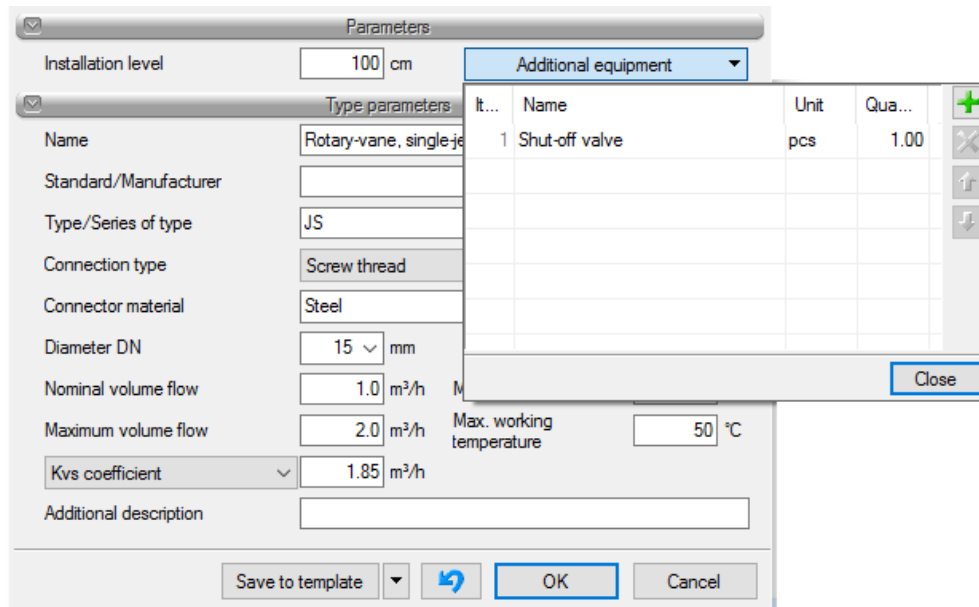



Fig. 39. Additional equipment window

The  sign may be used by the user to add a relevant item from the drop-down list. At the same time you can insert your own entry into a table cell, changing the units and quantity.

The  sign removes the marked item. The   arrows change the sequence of the marked element placement.

### Type parameters control group

Individual controls set for each item. Allows setting the specifying parameters for a given item, for example technical or geometric parameters (diameter, material, connection type, manufacturer, etc.).

A common field for every item:

**Additional description** – the user enters additional data that characterize the item and are moved to the material list after selecting the Description row in the list items.

### Approve (save/cancel) control group

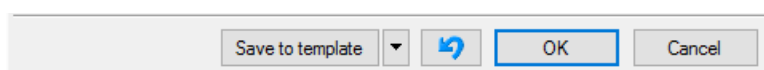



Fig. 40. Save/cancel buttons

## Describing and editing items

**Save in a template** - allows the user to save the default item for a given template.  - restores initial settings in a type.


**OK** - confirms and implements changes.

**Cancel** - reverts the changes and returns to the previous window.

### 5.2.4. Adding elements to the type library

The program includes a Standard library created on the basis of manufacturers' catalogues for most items. These are open closed sets. Should the user change any parameter in the type of a particular element from the standard library, after saving it will be already in the user library. This way the user can also add new types and type catalogues, which will be included in the user library.

The software uses a **Global library** and **Project library** (4.7) in the **Type library editor**.

The library content preview can be accessed by pressing the button **Document library** (current drawing) button , or using the following icon

You can add items to a library by defining fields in the **Type parameters** controls group.

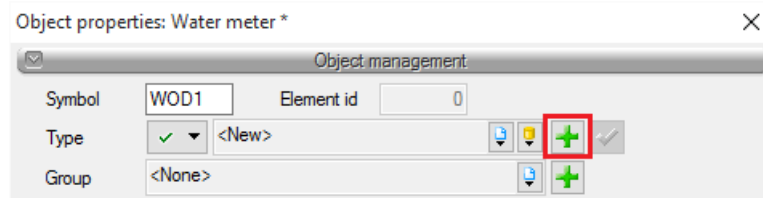

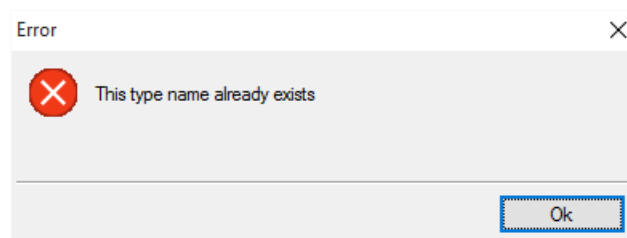


Fig. 41. Adding elements to a library

Next, using the  button, the user can open the elements adding window and type a name which will be saved for an item with the specified parameters.

After changing any of the **Type parameters** in the **Type** field - in the Type field (in the **Element management** control group) a record will appear: <New based on...> - the item will be named this way until the element is saved with a new name in any of the libraries.

If the user wants to add a file to the project library with a name that already exists in a given library, an error message will appear:



The newly inserted type name has to be changed.

#### 5.2.4.1. Type tree

The type tree is a method for organising and arranging elements in libraries.

## Describing and editing items

The tree type organisation method includes defining the items names using the name components depth on subsequent levels in order to facilitate finding an appropriate element and using it in a project.

Inserting an element to a project library from the item level (properties window) includes defining the type name divided into depth levels by the means of the "/" (slash) sign, which will result in correct placing it at the tree levels.

Below is an example of a name for a water meter and the method of finding the item in the tree:

Type name: **Rotary-vane/Single-jet/Threaded/DN20, QN 2.5**

Tree localisation is shown on Fig. 41

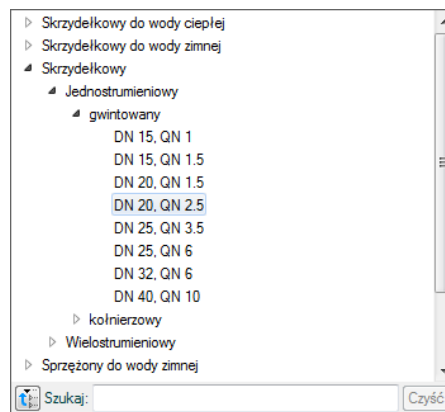



Fig. 42. Types tree - expanded

At the bottom of the type tree window, there is a **Search:**  toolbar which facilitates finding elements and the  button which allows the user to "reduce" the list to show only the first row elements as shown below:

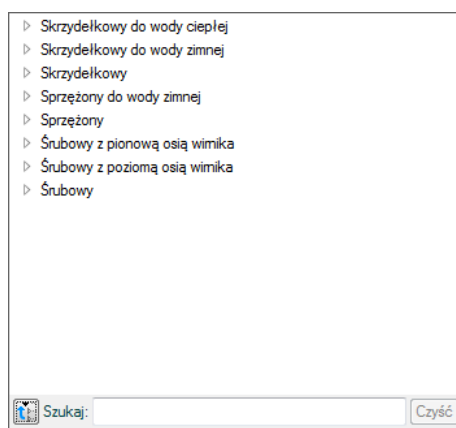


Fig. 43. Type tree - reduced

The **Clean** button is used for clearing the **Search:**  field.



## Describing and editing items

### 5.3. INSTALLATION CONNECTION POINTS

#### 5.3.1. Installation connection point (single)

To insert an **Installation connection point** object to the model, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write


- iwtr\_wcp.

The object insertion window becomes active.

**Installation connection point** is an item that is a virtual point from which the water supply installation project will be started.

The window also allows the user to use the **Project libraries** or the **Global libraries**. From the drop-down list of a particular library the user can select a sample type of connection point and use it in the project.

When the connection point insertion window is active, an item symbol shows up on the model's drawing field (projection). Clicking a chosen spot inside the drawing area inserts an item.

The properties window is activated by selecting the  button and double-clicking the inserted element:

## Describing and editing items

Fig. 44. Installation connection point element properties window

In the **Installation connection point** item properties window, the user can set a given item's appearance reflecting it on the drawing as well as installation and technical parameters necessary to perform the calculations further in the project.

Parameters control group

**Installation level** - as in item 5.2.3.

**Calculations type (flow value) as for items** - the user chooses which calculation type (depending on the installation's function or the building) will be performed further in the project.

Type parameters control group

**Minimum pressure at installation input** - set by the user.

**Maximum pressure at installation input** - as above.

**Minimum pressure in the installation** - as above.

**Design temperature for cold water** - used for further calculations.

**Additional description** - as in item 5.2.3.

## Describing and editing items

### 5.3.2. Set of local connection points

To insert a **Set of local connection points** object to the model, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write


- iwtr\_wcps.

The object insertion window becomes active.

This item is the relative point from which the water supply installation consisting of pipelines with different functions project will be started.

The insertion window allows the user to set the geometrically appropriate insertion position of a connection point set. The window also allows (as described in item 5.1.) the user to use the software libraries or the global libraries. From the drop-down list of a particular library the user can select a sample type of connection point and use it in the project.

When the local connection point set insertion window is active, an item symbol shows up on the model's drawing field (projection). Clicking a chosen spot inside the drawing area inserts an item.

By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 45. Designed Set of local connection points element parameters defining window


### Parameters control group


Setting the installation and process parameters of a connection points set.


**Installation level** - as in item 5.1.

### Type parameters control group

In this group the user sets the characteristic (specifying) parameters for the connection point set for every component (pipeline) individually.

By pressing the **Element properties**  icon, the user can gain access to the above mentioned settings. Then in the **Type parameters** group the user can assign the appropriate pipeline functions to the elements of the connection points set.

The  sign may be used by the user to add a relevant item from the drop-down list.

The  sign removes the marked item.

Arrows   change the sequence of placement of the element marked on the component list.

"**Leading**" is a handle used to insert items and "**Offset**" is used to set the particular set components position (in reference to the "**Leading**").

## Describing and editing items

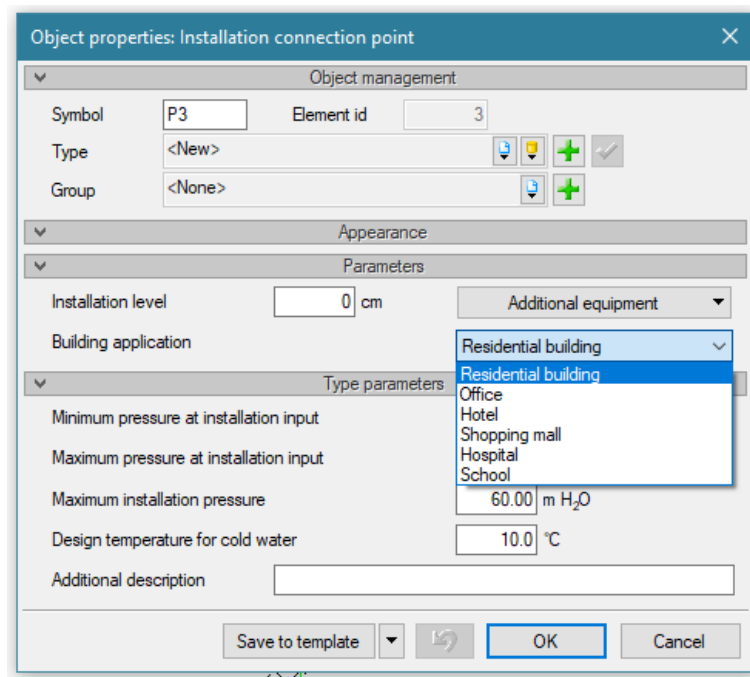


Fig. 46. Local connection point parameters defining window

**Minimum pressure at installation input** - set by the user.

**Maximum pressure at installation input** - as above.

**Minimum pressure in the installation** - as above.

**Design temperature for cold water** - used for further calculations.

**Additional description** - as in item 5.2.3.

## 5.4. DRAW-OFF FITTINGS

### 5.4.1. Draw-off valve

In order to insert a **draw-off valve**, click the icon:

*ArCADia software:*


- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wt.

By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.

## Describing and editing items

**Object properties: Draw-off tap \***

**Object management**

Symbol: ZW2    Element id: 0

Type: <New>    [Add] [Remove] [Reset] [OK]

Group: <None>    [Add] [Remove] [Reset] [OK]

**Appearance**

[Image icon] [Folder icon] [Icon icon]

Angle: 0.0°    Pens: [Dropdown]    Fonts: [Dropdown]    Surfaces: [Dropdown]    Description: [Checked] [Icon]

**Parameters**

Installation level: 100 cm    Additional equipment: [Dropdown]

**Type parameters**

Name: Draw-off tap with hose connector [Dropdown]

Standard/Manufacturer: [Text field]

Type/Series of type: [Text field]

Connector material: Steel [Dropdown]

Diameter DN: 15 mm [Dropdown]

Required pressure: 50 kPa [Dropdown]

Water outflow standard: 1.00 dm³/s [Dropdown]

Additional description: [Text field]

Save to template: [Dropdown]    [Undo]    OK    Cancel

Fig. 47. Draw-off valve item properties window.

**Parameters control group**

**Additional equipment** - for draw-off valve, as shown on Fig. 48.

Additional equipment [Dropdown]

It...	Name	Unit	Qua...
1		pcs	1.00

Extension for draw-off tap DN15  
 Extension for draw-off tap DN20  
 Filter  
 Flexible hose with steal strand for CW  
 Flexible hose with steal strand for HW  
 Hose connector

Close

Fig. 48. A window containing additional equipment available for the draw-off valve

## Describing and editing items

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type. By default several types of draw-off valves are defined, with standardized drawing symbols assigned to each of them:

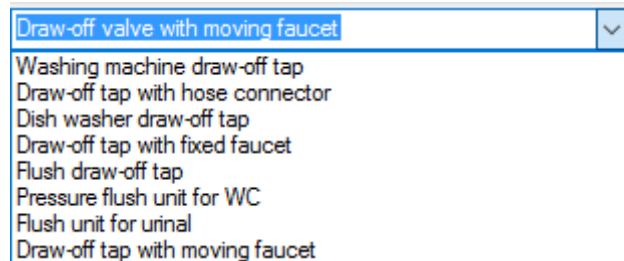


Fig. 49. Draw-off valves defined by default

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.


**DN diameter** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**Required pressure** – taken from the type library or input by the user in order to define a new type of object.

**Water outflow standard** - taken from the type library or input by the user to define a new item type.

Additionally for parameters: required pressure and water outflow standard. After clicking on the  button, the user will activate a window with the standard values. After clicking on the chosen draw-off valve type in the properties window, the field will be filled automatically.

Draw-off tap DN15 - DN25	50 kPa
Draw-off tap with tap aerator DN10 - DN15	100 kPa
Washing machine draw-off tap DN15	100 kPa
Dish washer draw-off tap DN15	100 kPa
Flush draw-off tap	100 kPa
Pressure flush unit for WC DN15 - DN20	120 kPa
Pressure flush unit for WC DN25	40 kPa
Flush unit for urinal DN15	100 kPa
Draw-off tap with hose connector DN15 - DN25	150 kPa

Fig. 50. Required pressure standard values window

## Describing and editing items

Draw-off tap DN15	0.30 dm <sup>3</sup> /s
Draw-off tap DN20	0.50 dm <sup>3</sup> /s
Draw-off tap DN25	1.00 dm <sup>3</sup> /s
Draw-off tap with tap aerator DN10 - DN15	0.15 dm <sup>3</sup> /s
Washing machine draw-off tap DN15	0.25 dm <sup>3</sup> /s
Dish washer draw-off tap DN15	0.15 dm <sup>3</sup> /s
Flush draw-off tap	0.13 dm <sup>3</sup> /s
Pressure flush unit for WC DN15	0.80 dm <sup>3</sup> /s
Pressure flush unit for WC DN20 - DN25	1.00 dm <sup>3</sup> /s
Flush unit for urinal DN15	0.30 dm <sup>3</sup> /s
Draw-off tap with hose connector DN15 - DN25	0.30 dm <sup>3</sup> /s

Fig. 51. Water outflow standard values window

**Additional description** - as in item 5.2.3.

#### 5.4.2. Draw-off faucet

In order to insert a **draw-off faucet**, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group


*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wmix.



By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.



## Describing and editing items

Fig. 52. Draw-off faucet item properties window

**Appearance control group**

Draw-off faucets, due to their design, are equipped with an additional control **Reverse connect.**. After clicking that control, the hot and cold water connectors will be switched. By default the cold water connector is located on the right side and the hot water connector is located on the left side.

**Parameters control group**

**Additional equipment** - for **draw-off faucets**, as shown on Fig. 53.

## Describing and editing items

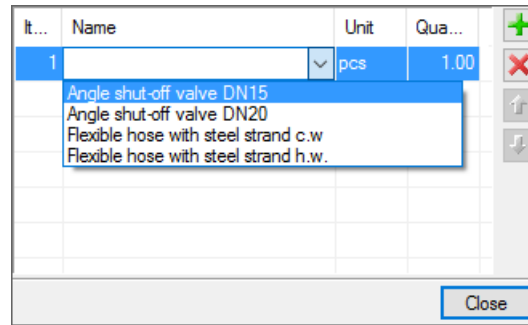


Fig. 53. Window containing the additional equipment available for the draw-off faucet

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type. A few new draw-off faucet types and their standard drawing symbols are set by default (Fig. 54).

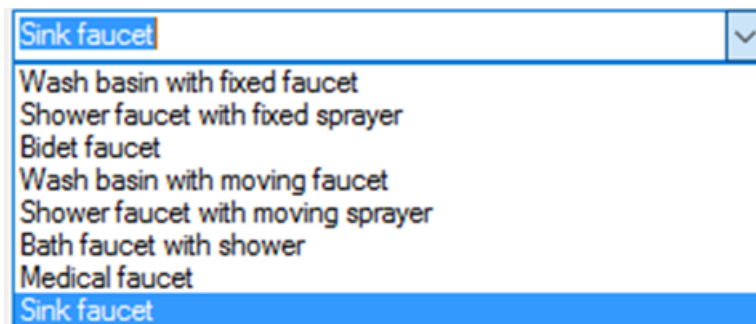


Fig. 54. Draw-off faucets defined by default

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.


**DN diameter** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**Required pressure** – taken from the type library or input by the user in order to define a new type of object.

**Cold water and Hot water outflow standard** - taken from the type library or input by the user to define a new item type.

Additionally for parameters: required pressure and water outflow standard. After clicking on the  button, the user will activate a window with the standard values. After clicking on the chosen draw-off faucet type in the properties window, the field will be filled automatically.

## Describing and editing items

Wash basin faucet DN15	100 kPa
Sink faucet DN15	100 kPa
Shower faucet DN15	100 kPa
Shower faucet with thermostat DN20	100 kPa
Bath faucet DN15	100 kPa
Bath faucet with thermostat DN20	100 kPa

Fig. 55. Required pressure standard values window

Wash basin faucet DN15	0.07 dm <sup>3</sup> /s
Sink faucet DN15	0.07 dm <sup>3</sup> /s
Shower faucet DN15	0.15 dm <sup>3</sup> /s
Shower faucet with thermostat DN20	0.30 dm <sup>3</sup> /s
Bath faucet DN15	0.15 dm <sup>3</sup> /s
Bath faucet with thermostat DN20	0.30 dm <sup>3</sup> /s

Fig. 56. Water outflow standard values window

**Additional description** - as in item 5.2.3.

### 5.4.3. Hydrant

In order to insert a **hydrant**, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group.

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_ht.

By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.

## Describing and editing items

**Object properties: Hydrant**

**Object management**

Symbol: HP1    Element id: 1

Type: <New>    [Icons]

Group: <None>    [Icons]

**Appearance**

[Icons]    Angle: 270.0°    Pens: [Dropdown]    Fonts: [Dropdown]    Surfaces: [Dropdown]    Description: [Checked]

**Parameters**

Valve axis installation level: 135 cm    Additional equipment: [Dropdown]

**Type parameters**

Name: Fire hydrant

Standard/Manufacturer: [Text]

Type/Series of type: [Text]

Connector material: Steel [Dropdown]

Valve diameter DN: 25 mm    ☒ Hydrant box

Required pressure: 200 kPa    Installation method: Surface-mounte [Dropdown]

Water outflow standard: 1.00 dm³/s    Width: 74.0 cm

Depth: 25.0 cm

Height: 79.0 cm

Additional description: [Text]

Save to template: [Dropdown]    [Icons]    OK    Cancel

Fig. 57. Hydrant element properties window

Parameters control group

**Additional equipment** - for hydrants, as shown on Fig. 58.

Additional equipment [Dropdown]

It...	Name	Unit	Qua...
1		pcs	1.00

- Fire hose cabinet base
- Fire hose cabinet door opening signal
- Fire hose cabinet frame
- Firefighting layflat hose fi52
- Firefighting nozzle
- Hose rewind facility
- Hydrant box body and door adapted for security seal
- MCP - manual call-point
- Powder extinguisher
- Semi-rigid hose fi19
- Semi-rigid hose fi25
- Semi-rigid hose fi33
- Valve opening signal

Close

Fig. 58. Window containing the additional equipment available for the draw-off faucet

## Describing and editing items

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type.

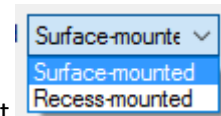
**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**DN valve diameter** - taken from the type library or input by the user to define a new item type.

**Required pressure** – taken from the type library or input by the user in order to define a new type of object.

**Water outflow standard** - taken from the type library or input by the user to define a new item type.

Additionally, after ticking the **Cabinet** checkbox, the user can insert a cabinet, its dimensions and a hydrant cabinet installation method.



The cabinet installation method can be selected from a drop-down list

All the type parameters, also the presence of a hydrant in the cabinet and the cabinet parameters can be saved in the type parameters

## 5.5. STOP VALVES

### 5.5.1. Shut-off valve

To insert a **Shut-off valve** object to the model, click the icon:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group


*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_sv.



By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 59. Draw-off valve item properties window

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Kvs factor** or optionally

**Local pressure loss** or

**Zeta coefficient** - the values taken from the type libraries if they were set or inserted by the user in the units displayed next to the field.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

## Describing and editing items

**5.5.2. Non-return valve, anti-siphoning valve**

To insert a **non-return valve** or an **antisiphoning valve** object to the model, click the icon:

*ArCADia software:*


- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

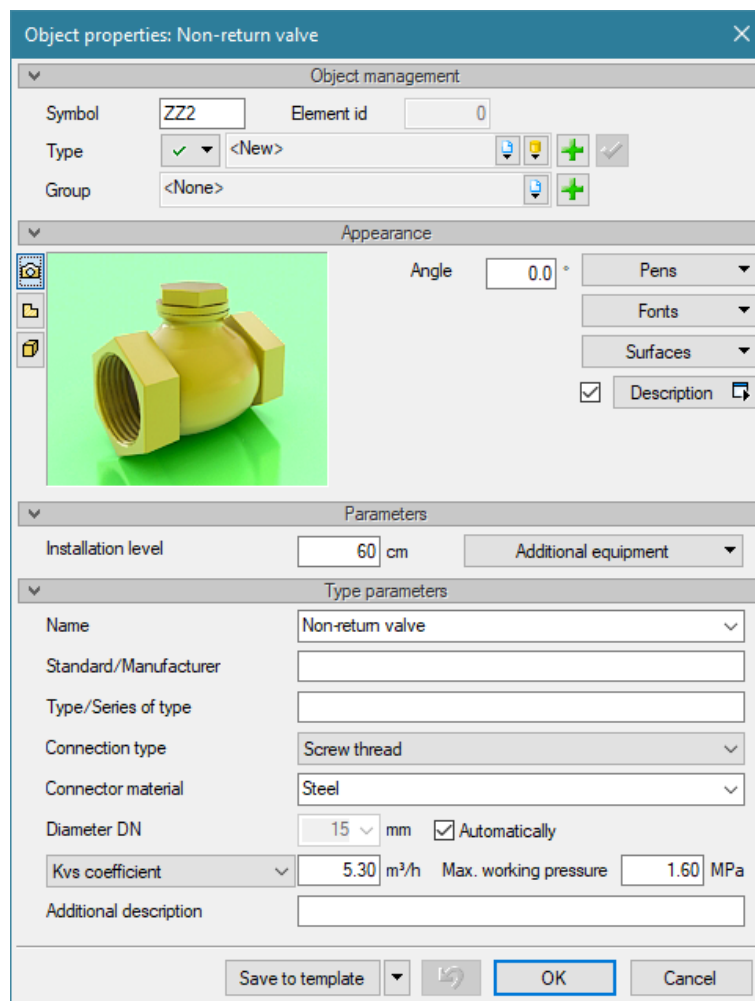
*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_rv.

By choosing the  button in the insertion window or double clicking the inserted element, the user can display a designed item properties defining window.



The image shows a software window titled "Object properties: Non-return valve". It contains several sections for configuring the valve object:

- Object management:** Includes fields for "Symbol" (ZZ2), "Element id" (0), "Type" (<New>), and "Group" (<None>), each with a small icon to the right.
- Appearance:** Features a 3D model of a yellow valve on the left. To the right are controls for "Angle" (0.0°), "Pens", "Fonts", "Surfaces", and a checked "Description" checkbox.
- Parameters:** Includes "Installation level" (60 cm) and "Additional equipment" (dropdown).
- Type parameters:** A list of fields for defining the valve's characteristics:
  - Name: Non-return valve (dropdown)
  - Standard/Manufacturer: (empty text field)
  - Type/Series of type: (empty text field)
  - Connection type: Screw thread (dropdown)
  - Connector material: Steel (dropdown)
  - Diameter DN: 15 mm (dropdown) with an "Automatically" checkbox.
  - Kvs coefficient: 5.30 m³/h (dropdown)
  - Max. working pressure: 1.60 MPa (text field)
  - Additional description: (empty text field)
- Buttons:** At the bottom are "Save to template" (dropdown), a circular arrow icon, "OK", and "Cancel".

Fig. 60. Non-return valve item properties window

## Describing and editing items

### Type parameters control group

**Name** - name of an item taken from the type library or input by the user to define a new item type. In this field the user chooses the non-return or anti-siphoning valve function which will result in inserting appropriate symbols that will be shown on the projection, in the properties window or on the elements list.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type (choosing a non-return or anti-siphoning valve function will result in changing the inserted symbol and its description on the drawing).

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Kvs factor** or optionally

**Local pressure loss** or

**Zeta coefficient** - the values taken from the type libraries if they were set or inserted by the user in the units displayed next to the field.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

## 5.6. CONTROL AND SAFETY VALVES

### 5.6.1. Balancing valve

To insert a **Balancing valve** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_bv.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.



## Describing and editing items

Fig. 61. Balancing valve item properties window.

**Parameters control group**

**Adjustment** - a selection button for a valve set point which was input by the user or pre-defined in the software (in the Type parameters group) as a Kvs value.

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

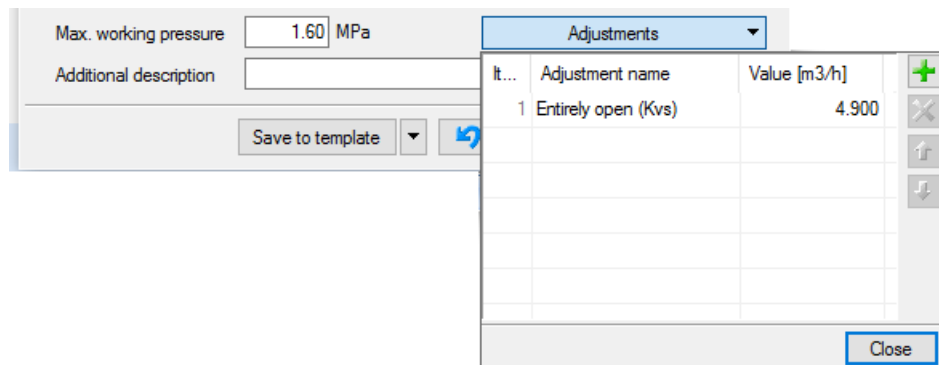
**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

## Describing and editing items

**Set points** - pre-defined in the software or set by the user as a Kvs value [m3/h]; they are displayed in the **Parameters** group selection window after the set points table has been defined.



Adding a line with individual set points can be done in the method described in item 5.2.3 (adding additional equipment).

**Additional description** - as in item 5.2.3.

### 5.6.2. Insert safety valve

To insert a **Safety valve** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_relv.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 62. Safety valve element properties window

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "**Automatically**" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Opening pressure** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

**Outlet diameter** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

**Influence factor** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

## Describing and editing items

**Additional description** - as in item 5.2.3.

### 5.6.3. Pressure reducer

To insert a **Pressure reducers** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_redv.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 63. Pressure reducer element properties window

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Pressure downstream the valve** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

**Additional description** - as in item 5.2.3.

## Describing and editing items

## 5.6.4. Control valve

To insert a **Control valve** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

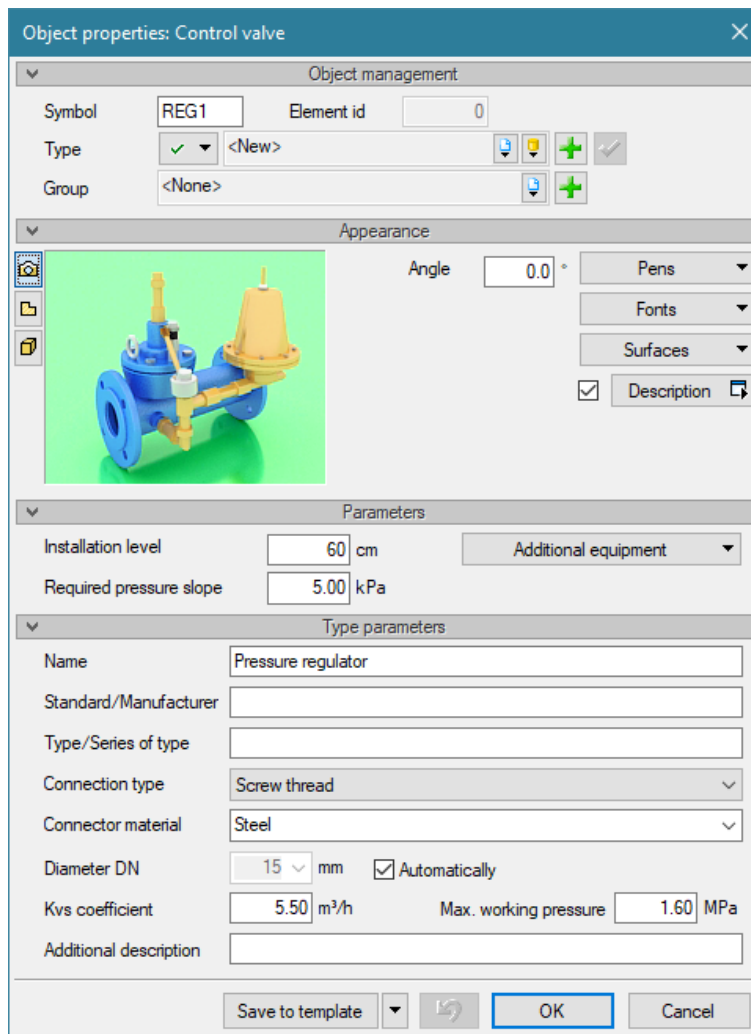
*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_frv.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.



The dialog box 'Object properties: Control valve' is divided into several sections:

- Object management:**
  - Symbol: REG1
  - Element id: 0
  - Type: <New> (with a dropdown arrow)
  - Group: <None> (with a dropdown arrow)
- Appearance:**
  - Angle: 0.0 °
  - Pens: (dropdown)
  - Fonts: (dropdown)
  - Surfaces: (dropdown)
  - Description: (checkbox checked)
- Parameters:**
  - Installation level: 60 cm
  - Required pressure slope: 5.00 kPa
  - Additional equipment: (dropdown)
- Type parameters:**
  - Name: Pressure regulator
  - Standard/Manufacturer: (text field)
  - Type/Series of type: (text field)
  - Connection type: Screw thread (dropdown)
  - Connector material: Steel (dropdown)
  - Diameter DN: 15 mm (dropdown) ☒ Automatically
  - Kvs coefficient: 5.50 m³/h
  - Max. working pressure: 1.60 MPa
  - Additional description: (text field)

At the bottom, there are buttons for 'Save to template' (with a dropdown), 'OK', and 'Cancel'.

Fig. 64. Control valve item properties window

## Describing and editing items

### Parameters control group

**Required pressure drop** - a value input by the user in the units displayed next to the field.

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Kvs factor** - the values taken from the type libraries if they were set or input by the user in the units displayed next to the field.

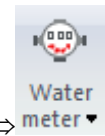
**Additional description** - as in item 5.2.3.

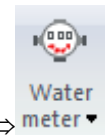
## 5.7. MEASUREMENT DEVICES

### 5.7.1. Water meter

To insert a **Water meter** object to the model, click the icon:

*ArCADia software:*



- **Water supply systems** ribbon ⇒ **Water supply installations** ⇒  logical group


*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wm.



By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 65. Water meter element properties window

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Nominal volume flow** - a parameter characteristic for this item imported from the type libraries if it was set or input by the user in the units displayed next to the field.

**Maximum volume flow** - a parameter characteristic for this item imported from the type libraries if it was set or input by the user in the units displayed next to the field.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.



## Describing and editing items

**Maximum working temperature** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Kvs factor** or optionally

**Local pressure loss** - values adopted from the type libraries, if they were input or entered by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

### 5.7.2. Manometer

To insert a **Manometer** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_m.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 66. Manometer element properties window

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Minimum scope of works** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

**Maximum scope of works** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

**Precision class** - a parameter characteristic for this item, taken from the type library or input by the user to define a new item type.

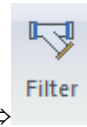
**Additional description** - as in item 5.2.3.

## Describing and editing items

**5.8. FILTER**

To insert an **Filter** object to the model, click the icon:

*ArcADia software:*



- **Water** ribbon ⇒ **Water supply installations** ⇒ logical group

*AutoCAD or ArcADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wf.



By choosing the button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

Fig. 67. Water filter element properties window

## Describing and editing items

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type. There are two default defined filter types: manually cleaned and self-cleaning sedimentation filter. Selecting one of the names will change the symbol of the item introduced in the projection.

Name	Manually cleaned sedimentation filter
Standard/Manufacturer	Self-cleaning filter
	Manually cleaned sedimentation filter

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN diameter** - after selecting the "Automatically" option, it will be downloaded from the pipeline on which the item will be inserted. It can be also input by the user.

**Kvs factor** or optionally

**Local pressure loss** or

**Zeta coefficient** - the values taken from the type libraries if they were set or inserted by the user in the units displayed next to the field.

**Maximum working pressure** - taken from the type libraries if it was set or input by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

## 5.9. INSTALLATION WATER PRESSURE BOOST DEVICES

### 5.9.1. Pump

To insert a **Pump** object to the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wpomp.





By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.



## Describing and editing items

**Object properties: Pump**






**Object management**

Symbol: PCR1    Element id: 0


Type: <New>       

Group: <None>     

**Appearance**

    Angle: 0.0°    Pens:     Fonts:     Surfaces:     Description: ☒ 


**Parameters**


Axis installation level: 100 cm    Additional equipment: 


Required delivery head: 60.00 m H<sub>2</sub>O    Required efficiency: 0.50 m<sup>3</sup>/h


**Type parameters**

Name: HW circulation pump


Standard/Manufacturer: 

Type/Series of type: 

Connection type: Screw thread 

Connector material: Steel 

Connector diameter DN: 15 mm    ☒ Automatically

Additional description: 



Save to template:         OK    Cancel

Fig. 68. Pump element properties window

**Parameters control group**

**Required delivery head** – the value input by the user in the units displayed next to the field.

**Required efficiency** – the value input by the user in the units displayed next to the field.

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN connectors diameter** – after selecting the **Automatically** option imported from the pipeline, in which the item is being inserted; can also be input by the user.

**Additional description** - as in item 5.2.3.

## Describing and editing items

## 5.9.2. Pressure booster

To insert a **Pressure booster** object to the model, click the icon:

*ArCADia software:*



- **Water** ribbon ⇒ **Water supply installations** ⇒ **Pressure booster** logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_hf.




By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

Fig. 69. Pressure booster element properties window

## Describing and editing items

### Parameters control group

**Required delivery head** – the value input by the user in the units displayed next to the field.

**Required efficiency** – the value input by the user in the units displayed next to the field.

### Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN connector diameter** - taken from the type library or input by the user to define a new item type.

**Width/Depth/Height** – dimensions input by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

## 5.10. HOT WATER PREPARATION DEVICES

### 5.10.1. Hot water preparation device

In order to insert a **Hot water preparation device** element into the model, click the icon:

*ArCADia software:*


- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wi.

By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 70. Hot water preparation device element properties window

Parameters control group

**Hot water temperature** – the value input by the user in the units displayed next to the field.

**Permissible temperature drop** – the value input by the user in the units displayed next to the field.

**Replacement rate** – the value input by the user in the units displayed next to the field.

Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

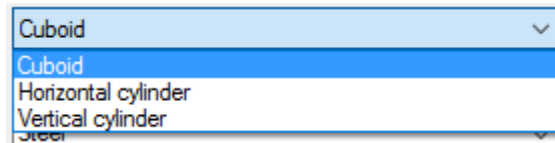
**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**Shape** – selected by the user from a drop-down window, from three available shapes: cuboid, horizontal cylinder, vertical cylinder.



## Describing and editing items



**Hot and cold water DN connector diameter** – input by the user.

**Circulating water DN connector diameter** – input by the user.

**Width/Depth/Height** – dimensions input by the user in the units displayed next to the field.

**Kvs factor** or optionally

**Local pressure loss** - values adopted from the type libraries, if they were input or entered by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

### 5.10.2. Local water heaters

To insert a **Local water heater** object to the model, click the icon:

*ArCADia software:*



- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*




- **Water supply installations** ⇒  toolbar

or write

- iwtr\_wh.







By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.



## Describing and editing items

**Object properties: Heater**




**Object management**



Symbol: PG1    Element id: 0



Type: <New>       


Group: <None>     

**Appearance**


    Angle: 0.0°    Pens:  

Fonts:  

Surfaces:  

☒ Description 


**Parameters**


Installation level: 0 cm    Additional equipment: 


Hot water temperature: 55 °C    Water replacement rate: 4  $\frac{1}{h}$


Permissible temperature loss: 5 °C


**Type parameters**


Name: Gas heater 

Standard/Manufacturer: 

Type/Series of type: 

Connection type: Screw thread 

Connector material: Steel 


Shape: Cuboid 


Connector diameter for hot and cold water DN: 20 mm    Width: 31.0 cm

☐ Circulating water connector diameter, DN: 15 mm    Depth: 22.0 cm

Max. working pressure: 1.60 MPa    Height: 58.0 cm

Power: 19.20 kW

Local pressure loss:  10.000 kPa

Additional description: 



Save to template:      OK    Cancel

Fig. 71. Local water heater element properties window

Parameters control group

**Hot water temperature** – the value input by the user in the units displayed next to the field.

**Permissible temperature drop** – the value input by the user in the units displayed next to the field.

**Replacement rate** – the value input by the user in the units displayed next to the field.

Type parameters control group

**Name** - item name taken from the type library or input by the user to define a new item type. By default there are four types of local water heaters: solid fuel, liquid fuel, gas and electric heaters.

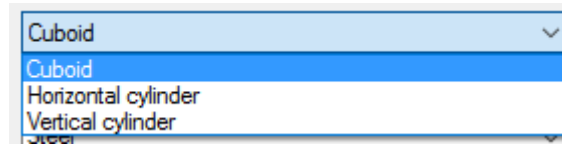
**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

## Describing and editing items

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**Shape** – selected by the user from a drop-down window, from three available shapes: cuboid, horizontal cylinder, vertical cylinder.



**Hot and cold water DN connector diameter** – input by the user.

**Circulating water DN connector diameter** – input by the user (if this option is selected in the field next to it).

**Width/Depth/Height** – dimensions input by the user in the units displayed next to the field.

**Maximum operating pressure**– value taken from the type libraries, if it was input or entered by the user in the units displayed next to the field.

**Power**– value taken from the type libraries, if it was input or entered by the user in the units displayed next to the field.

**Kvs factor** or optionally

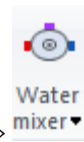
**Local pressure loss** - values adopted from the type libraries, if they were input or entered by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

### 5.10.3. Central water mixer

To insert a **Central water mixer** object to the model, click the icon:

*ArCADia software:*



- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group


*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_tmv.



By choosing the  button in the insertion window (that will be updated first) or double clicking the already inserted element, the user can display a designed item properties defining window.

## Describing and editing items

Fig. 72. Central water mixer element properties window

**Parameters control group**

**Mixed water temperature** – the value input by the user in the units displayed next to the field.

**Type parameters control group**

**Name** - item name taken from the type library or input by the user to define a new item type.

**Standard/Manufacturer** - taken from the type library or input by the user to define a new item type.

**Type/Series of type** – taken from the type library or input by the user in order to define a new type of object.

**Connection type** – taken from the type library or input by the user in order to define a new type of object.

**Connector material** – taken from the type library or input by the user in order to define a new type of object.

**DN connector diameter** – taken from the type libraries, if it was input or entered by the user.

**Kvs factor** or optionally

**Zeta coefficient** or

**Local pressure loss** - values adopted from the type libraries, if they were input or entered by the user in the units displayed next to the field.

**Additional description** - as in item 5.2.3.

## 6. PIPELINES

## Pipelines

### 6.1. HORIZONTAL PIPELINES INSERTING AND EDITING


#### 6.1.1. Inserting horizontal pipelines

In order to insert a **Horizontal pipeline** object, click the icon:

*ArCADia software*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*


- **Water supply installations** ⇒  toolbar
- or write
- iwtr\_cwp.

In order to insert a **Horizontal hot water pipeline** object, click the icon:

*ArCADia software*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*


- **Water supply installations** ⇒  toolbar
- or write
- iwtr\_hwp.

In order to insert a **Horizontal circulation pipeline** object, click the icon:

*ArCADia software*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar
- or write

## Pipelines

- iwtr\_cirwp.

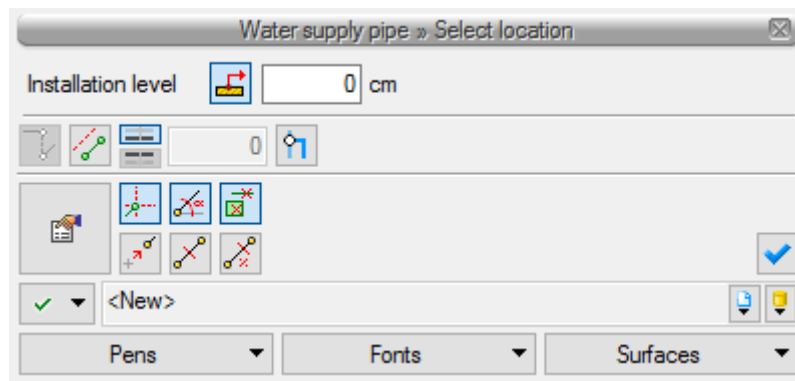


Fig. 73. Horizontal pipeline beginning insertion window

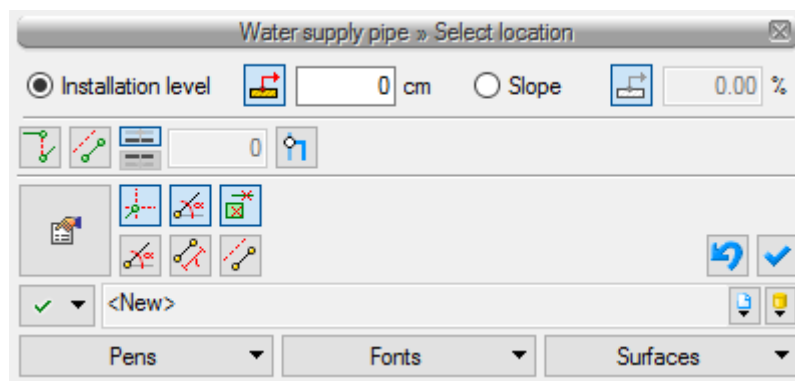







Fig. 74. Horizontal pipeline end insertion window

The general insertion options are described in item 5.1.

An additional feature available for horizontal pipelines is **Parallel offset**. Pressing the  button allows you to draw the installation in parallel to other elements, e.g. a wall which is offset for the indicated distance. To select the direction of the offset from an object you can choose between two **Offset direction** buttons  and . Next to them there is an editing field where you can enter an offset value (the field is activated after pressing the Parallel offset button).

Pressing the Connect pipes of various functions  icon allows you to connect e.g. a hot water pipeline with a circulating water pipeline (allows you to connect pipes from two different groups).

Pressing the **Insert vertical section**  button allows inserting without the need to disrupt the horizontal and vertical pipelines command. After pressing the button the insertion window will change into the horizontal pipeline end insertion window without indicating the slope and indicate the installation level for the vertical pipeline end. Next we draw the other horizontal sections and at any time the user can insert a vertical section by clicking on the **Insert vertical section** button

## Pipelines

### 6.1.2. Horizontal pipelines modification

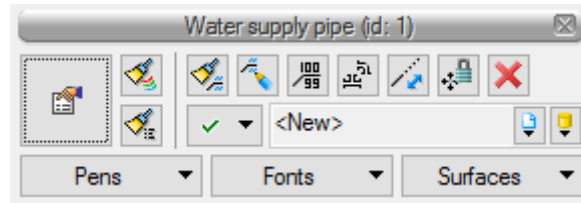


Fig. 75. Horizontal pipelines modification window

The horizontal pipelines modification window is displayed after you click one or more than one horizontal pipeline. Apart from the features generally available for all the items in item 5.2, the following are also available for horizontal pipes:

**Add description on ladder** - after marking several parallel pipelines you can insert a "ladder" description for all the selected pipelines (this feature is also available on the water supply installation axonometric view).

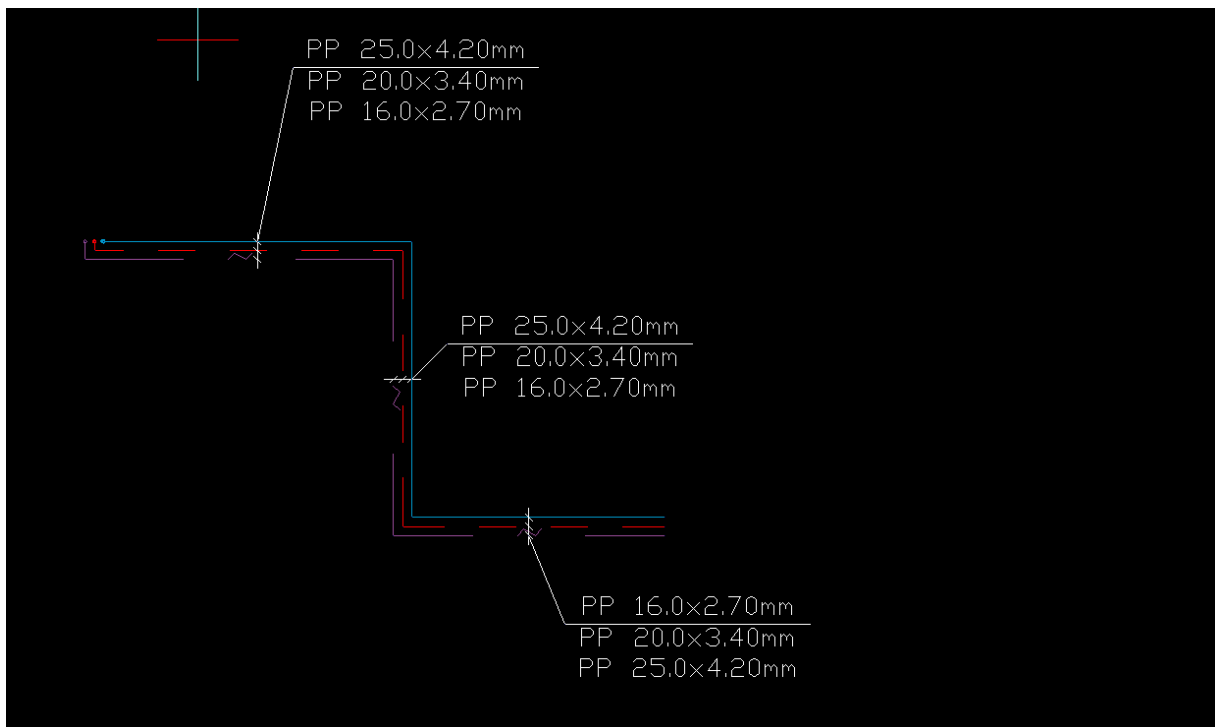


Fig. 76. View

**Move with connected pipes** - or . An open padlock indicates that the pipelines are going to be moved without disconnecting them from the other pipelines, a closed padlock allows moving and disconnecting them from other pipelines. To move several pipelines you need to select them, click the open or closed padlock button and then use the cursor to grab the point on the pipeline outline, not the handle (blue square).

**Lengthen/Shorten pipe maintaining slope** - - after clicking this icon a marker appears at the end of the pipeline that facilitates extending or shortening the pipeline, at the same time maintaining slope.



## Pipelines

### 6.1.3. Element properties: water supply pipe

Fig. 77. Horizontal pipes properties window

Typical element properties described in item 5.2 are available in the horizontal pipes properties window.

Additional pipes characteristic properties:

#### Parameters control group

**Outside diameter** - input the outside pipeline diameter [mm].

**Actual length and length in the projection** - as in description. Parameters will differ if the pipeline is routed with a slope and if the **Automatically** checkbox is not ticked.

**Slope** - the value calculated as the difference between the beginning and ending of the pipeline installation levels. The slope can be set in the section ending insertion window Fig. 74.

## Pipelines

**Ambient temperature** – in the editing field you need to input the ambient design temperature of the inserted pipeline. The temperature is set to 20°C by default.

**Insulation** – a checkbox with the description **Insulation** allows the insertion of thermal insulation on the particular pipeline. After pressing the **Insulation** button a Pipe insulation properties window will open.

### 6.1.4. Insulation element properties

Fig. 78. Insulation properties window

#### Type parameters control group

**Name, Standard/Manufacturer, Type/Series of type** – in the editing field the user inputs data as in the controls names, appropriate for the particular type of insulation.

**Wall thickness** – in the editing field you need to insert the insulation wall thickness [mm].

**Thermal conductivity coefficient** – in the editing field the user should specify the insulation thermal conductivity coefficient characteristic for the particular material. The default value is 0.035 W/(m · K)

## 6.2. INSERTING AND EDITING VERTICAL PIPELINES

To insert a **Vertical cold water pipeline** object to the model, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

## Pipelines

- **Water supply installations**⇒  toolbar

or write

- iwtr\_vcwp.

To insert a **Vertical hot water pipeline** object to the model, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations**⇒  toolbar

or write

- iwtr\_vhwp.

To insert a **Vertical circulation water pipeline** object to the model, click the icon:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations**⇒  toolbar

or write

- iwtr\_vcirwp.

### 6.2.1. Inserting a vertical water supply pipe

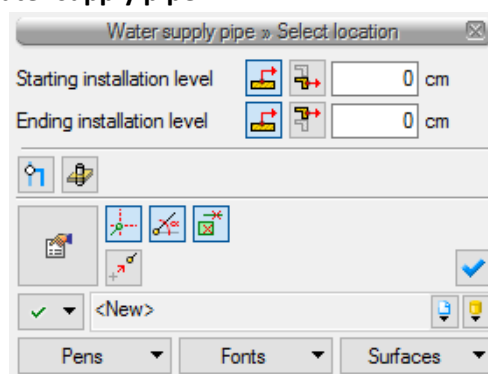




Fig. 79. Vertical water supply pipe insertion window

## Pipelines

While inserting a vertical pipe the user can select additional insertion functions, including the **Import from level above**  / **Import from level below** . Clicking the **Import from level above** feature inserts the end of a vertical section at the maximum active level height (280 cm by default).

### 6.2.2. Inserting water supply stacks

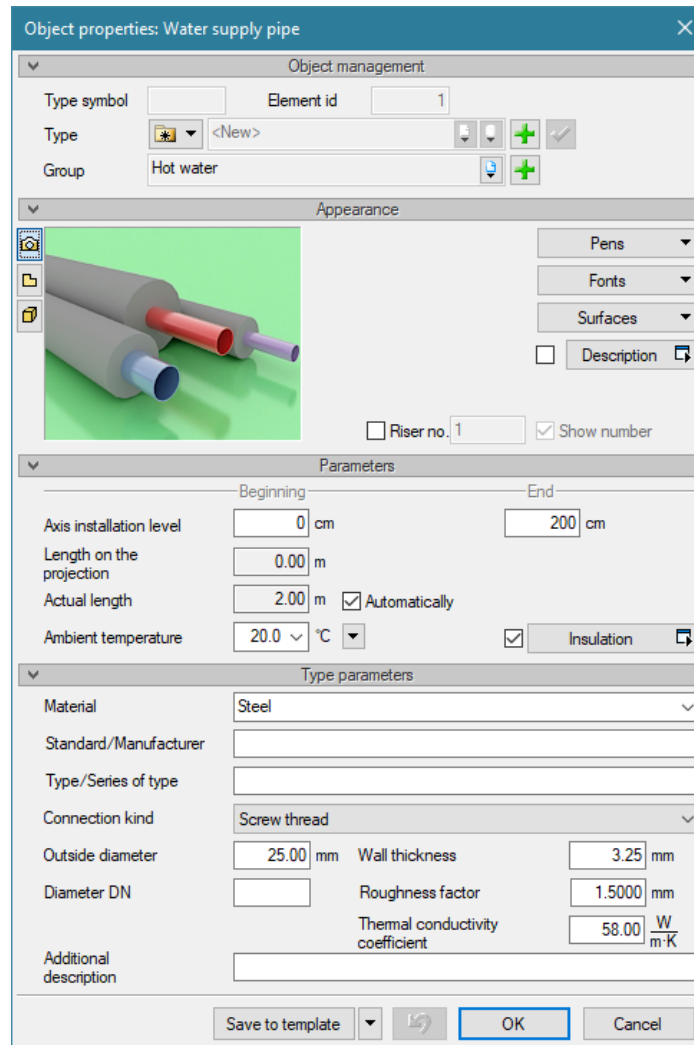



Fig. 80. Vertical water supply pipe properties window

To insert a water supply stack the user can select the **Insert as a stack**  icon or in the pipeline properties tick the **Stack** checkbox. Then inserted vertical pipeline will then become a stack and will have its number in a circle. In order to mark a vertical pipeline as a stack after inserting it you need to click on the vertical pipeline properties and then, in the **Appearance** controls group, you need to tick the **Stack** checkbox and if necessary, the **Show number** checkbox. The user may assign any number by typing it in the editing window.

### 6.3. CONVERT LINE INTO PIPE

The user may convert a line into a **Water supply pipe** object

In order to convert a **Water supply pipe** select one of the icons, depending on the type of the designed installation:

## Pipelines

*ArCADia software:*

**Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

A window will then become available where the user selected the installation level on which the new objects are to be installed (pipelines) and may also select a type and method of selection for these pipelines. Then the user needs to select the lines that are to be converted into a water supply pipe and press Enter.

### 6.4. INSERTING PARALLEL PIPELINES SET

To insert a **Parallel water supply pipes** object to the model, click the icon:

*ArCADia software:*

**Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_mwp.

To insert a **Parallel vertical water supply pipes** object to the model, click the icon:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_vmwp.

## Pipelines

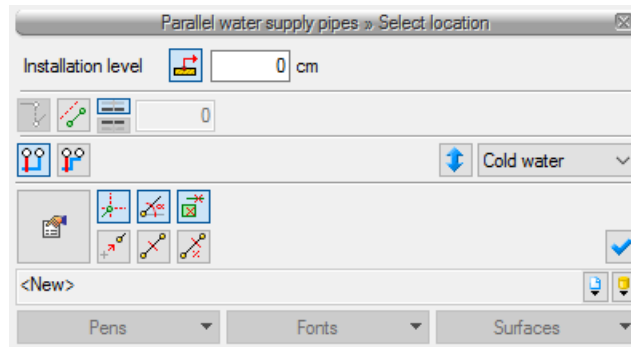


Fig. 81. Parallel water supply pipes insertion window

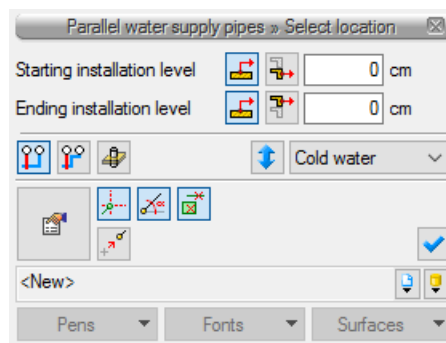
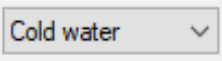


Fig. 82. Parallel vertical water supply pipes insertion window

Inserting parallel water supply pipes is similar to inserting single water supply pipes. Additionally, in the insertion window the user may select a method of automatically connecting parallel pipelines (item 6.4.1). You can also reverse the order of pipelines which are being inserted and change the leading

pipeline after clicking the black arrow on the Change the leading  button, the user can select one of the pipelines located in the series of parallel pipelines to be the leading pipeline.

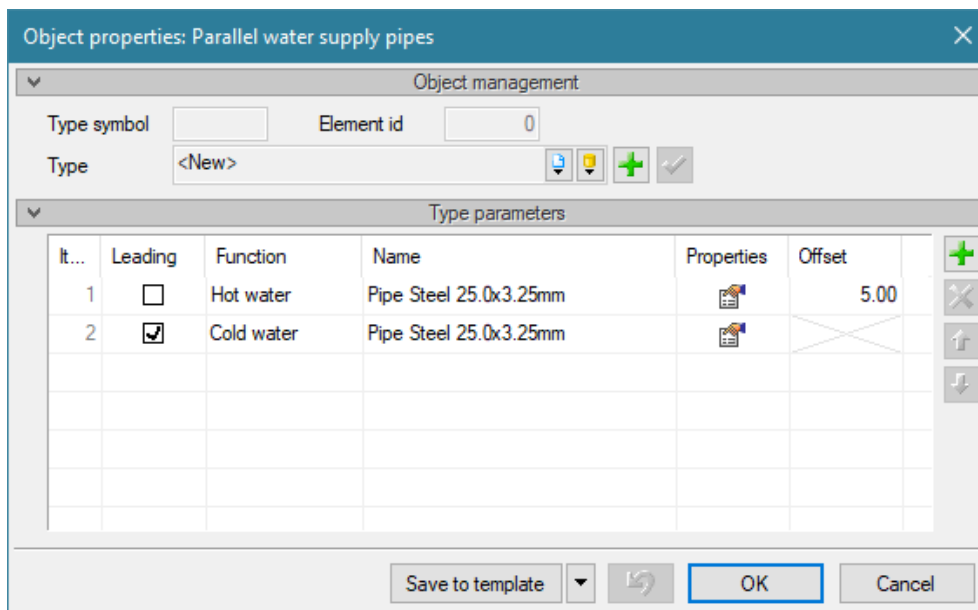


Fig. 83. Parallel water supply pipes element properties window

## Pipelines

The following elements are available in the **Parallel water supply pipes** properties window (Fig. 83):

### Item management control group

**Type symbol, Element Id and Type** - controls are the same for all the elements described in item 5.

### Type parameters control group

A table is available where each column has the following features:

**No.** – subsequent number.

**Leading** – in this column the user ticks the checkbox next to the pipeline that will be the leading pipeline during the insertion of parallel pipes. The pipeline that was selected as the leading one will determine the insertion point and other pipelines will be inserted in the appropriate offset from it. In Fig. 80 shows the insertion of parallel hot and cold water pipes with the leading pipe being the cold water pipe. The insertion location and the cross marking indicating the leading pipeline and the button shown in the insertion window, where the hot water pipeline is selected, are marked in the green circle.

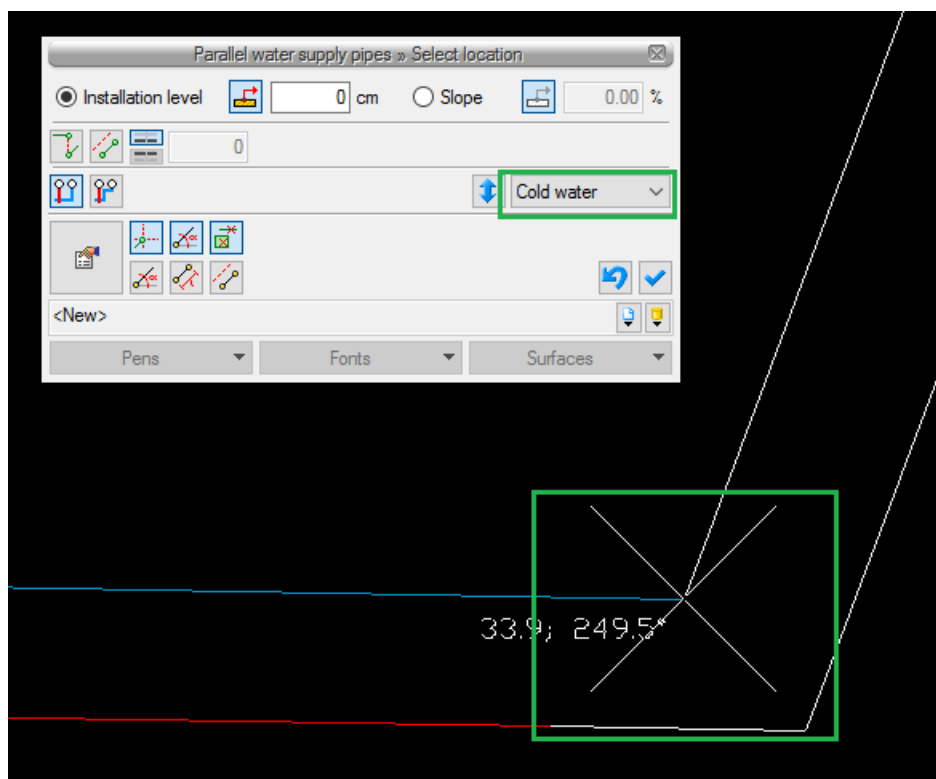


Fig. 84. Figure showing the insertion of parallel water supply pipes with the leading cold water pipeline

**Function** – allows the user to select a function for the pipeline.

**Name** – in the case of parallel water supply pipes the name displayed in this column consists of the element designation, "Pipe" in this case, and the material of the inserted pipeline, e.g. steel.


**Properties** – in this column, by clicking the **Properties** icon, the user can open the **Water supply pipe properties** window which allows editing and changing parameters.



**Offset** – in this column the user defines the offset value for the water supply pipes that run parallel to each other. There is no possibility to enter the offset for the leading pipeline.

## Pipelines

### 6.4.1. Automatic connection methods

Drawing parallel water supply pipes, connecting them and connecting them to items can be done manually or automatically. Automatic drawing can be done using the two methods described below in items 6.4.1.1 and 6.4.1.2., whereas at any moment when inserting (drawing) parallel water supply pipes the user may change the drawing method. The user should disable elements detection if they do not want to use any of the automated features in the insertion window. 

#### 6.4.1.1. Drawing parallel pipelines with the spacing adjusted to the item

This automatic drawing method allows to route parallel pipelines with the spacing defined in the parallel water supply pipes properties window. The spacing changes when approaching stakes or items such as draw-off faucets and adapts to their spacing.

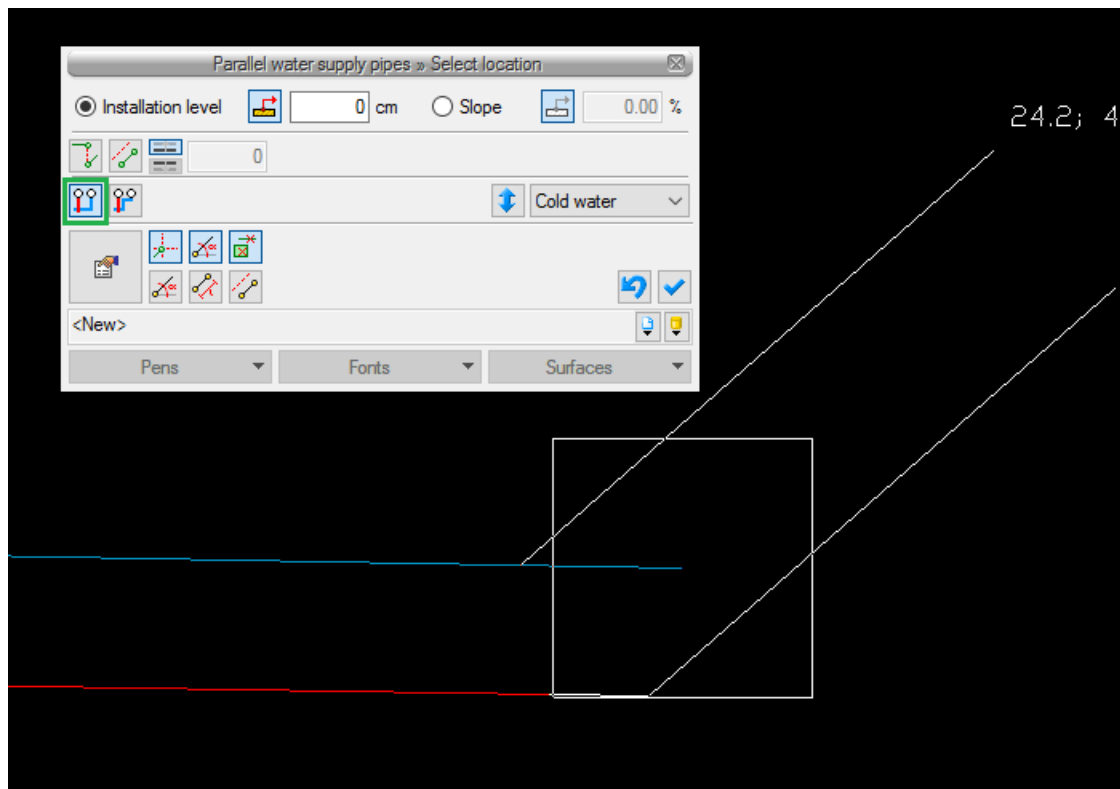


Fig. 85. An example of connecting parallel water supply pipes with the use of the automatic connection method with the spacing adjusted to the spacing of faucet connectors



## Pipelines

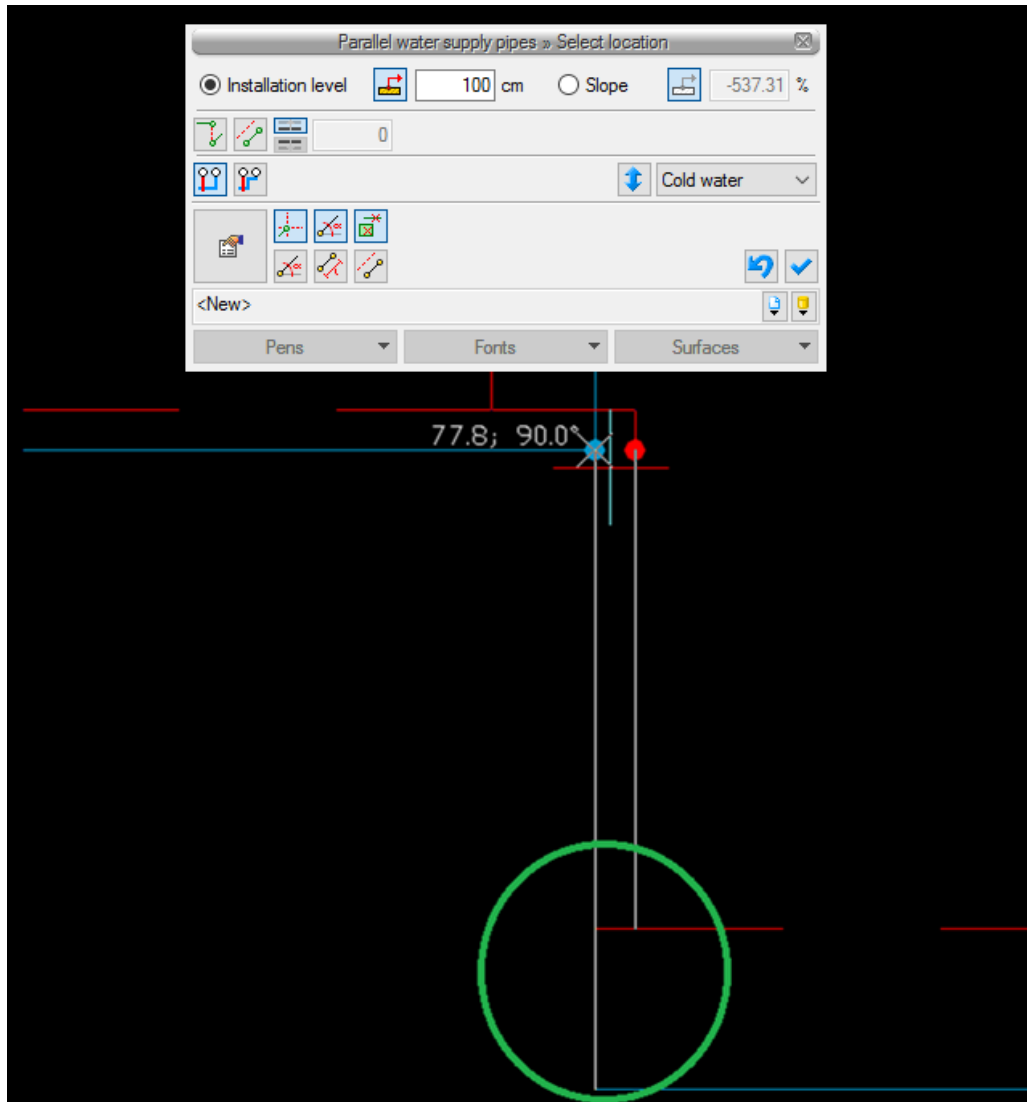


Fig. 86. An example of connecting parallel water supply pipes with the use of the automatic connection method with the spacing adjusted to stacks

### 6.4.1.2. Drawing parallel pipelines with fixed spacing

This automatic drawing method allows to route parallel pipelines with the spacing defined in the parallel water supply pipes properties window. The spacing does not change if you connect pipes, stacks or items with different connector spacing. In order to enable connecting the software connects the elements by means of automatically generated pipelines.

## Pipelines

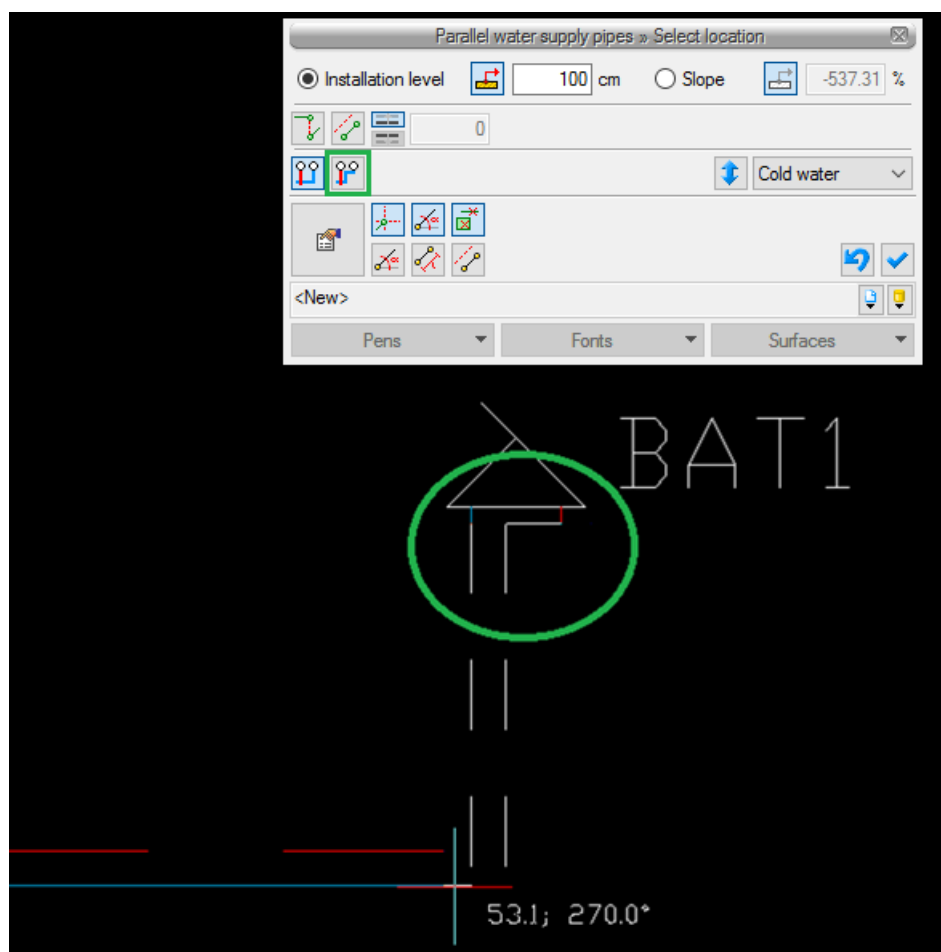


Fig. 87. An example of connecting parallel water supply pipes with the use of the automatic connection method with fixed spacing

## 7.MOULDS

## Moulds

### 7.1. MOULDS – INTRODUCTION

The software allows you generate fittings on pipelines automatically and place them on the material list.

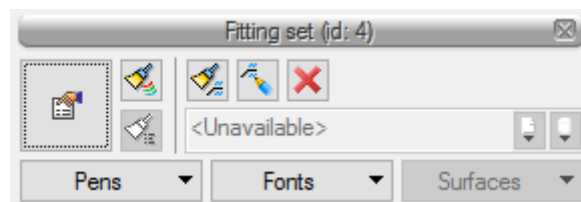
The following changes are defined in the installation, with the following types of fittings assigned:

- direction change  $\alpha^\circ$  - "Elbow  $\alpha^\circ$ "
- diameter change DN1/DN2 – "Reduction DN1/DN2"
- 3-directional branch – "DN three-way fitting" ("DN1/DN2 reduction three-way fitting")
- 4-directional branch – "DN four-way fitting" ("DN1/DN2/DN3 reduction four-way fitting")
- branch x directions – "X pipes connection" (node to be modified by the user)
- material and connections change MAT1-POŁ1/MAT2-POŁ2 – "MAT1-POŁ1/MAT2-POŁ2 transition"
- pipeline end – "End cap"

If more than one change (multiple change) is being implemented at one point, the software generates fitting sets for different combinations of settings in the options, from among which it then selects the one in accordance with the properties set in the project options. This enables the user to change the set for a particular installation point with requirements different than the options settings.

If the user generates the moulds automatically, then by default these will be displayed symbolically as circles with the diameter set in the project options and preliminarily without a description.

In order to reach the set contents (or disable a description) you need to initiate the properties window by double-clicking on the symbol (circle) or click the symbol and then in the modification window:



click the  button.

A fittings set properties window will be displayed (described in item 7.2)

The software assumes the following order of executing multiple changes:

If there is NO three-way or four-way fitting in the connection:

- 1) MAT1-POŁ1/MAT2-POŁ2 transition
- 2) elbow
- 3) reduction
- 4) end cap.

If there is a three-way or four-way fitting in the connection:

- 1) four-way fitting,

## Moulds

- 2) three-way fitting (and subsequent, if in the settings the options do not allow for four-way fitting generation).

Then the software inserts moulds towards the “pass-through” (direction with the smallest node bend angle), followed by selecting sets for the particular branches in the same order:

- 1) MAT1-POŁ1/MAT2-POŁ2 transition
- 2) elbow
- 3) reduction
- 4) end cap.

The “start” mould (from where the software starts the execution of changes) is located by default on the side of the pipeline with the largest node diameter, however for the purposes of the user the software also created a set that starts the changes from the side of the pipeline with the smallest diameter.

The MAT1-POŁ1/MAT2-POŁ2 transition type that is generated in the beginning is created based on the properties of the connected pipes. If an object is connected by means of a female , the software will create a transition mould with a male thread.

Below is an example where the change of diameter and material (and connection) provides a general presentation of the sets of moulds generated by the software depending on the start mould:

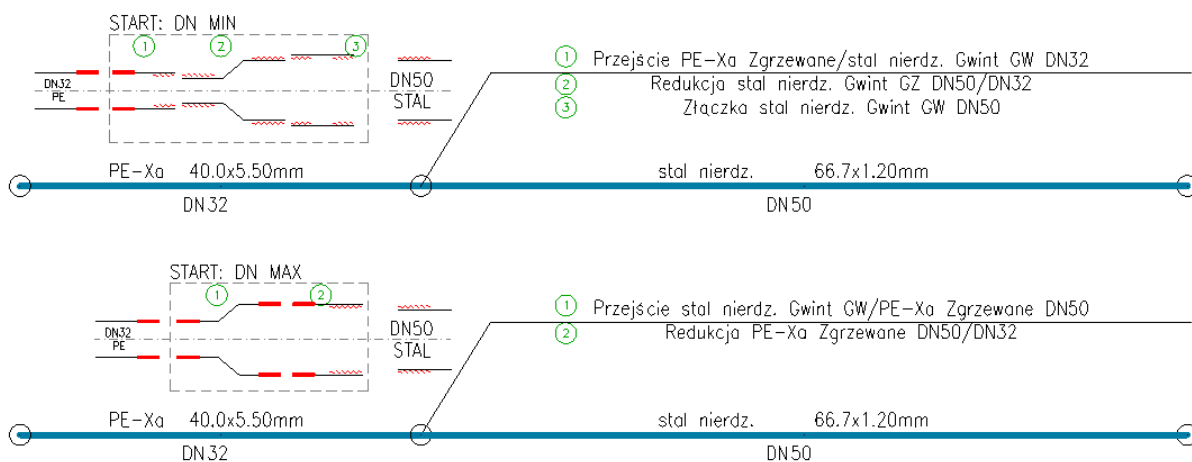


Fig. 88. Fitting sets for the STEEL-DN50/PE-DN32 transition

## Moulds

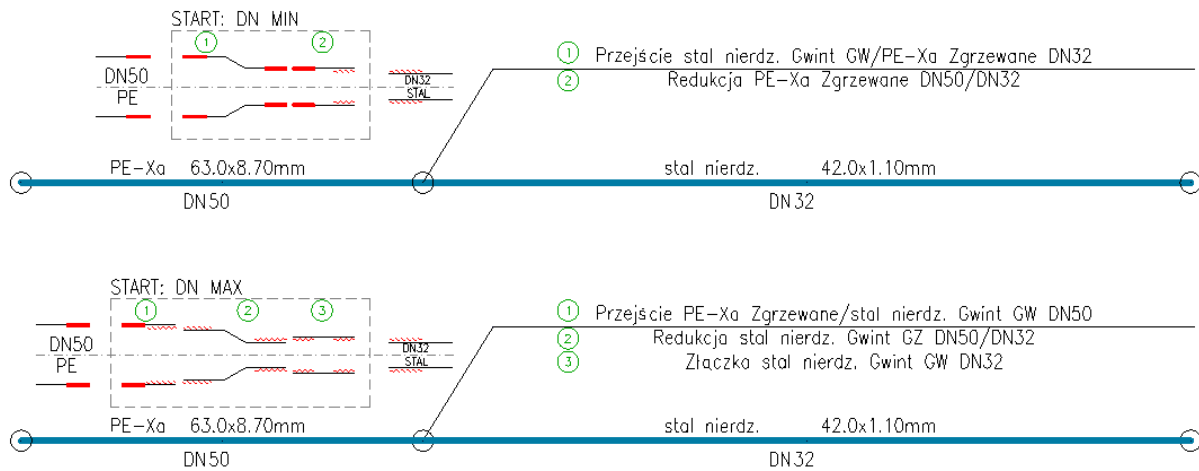


Fig. 89. Fitting sets for the STEEL-DN32/PE-DN50 transition

## 7.2. INSTALLATION MOULDS – “PROJECT OPTIONS” WINDOW

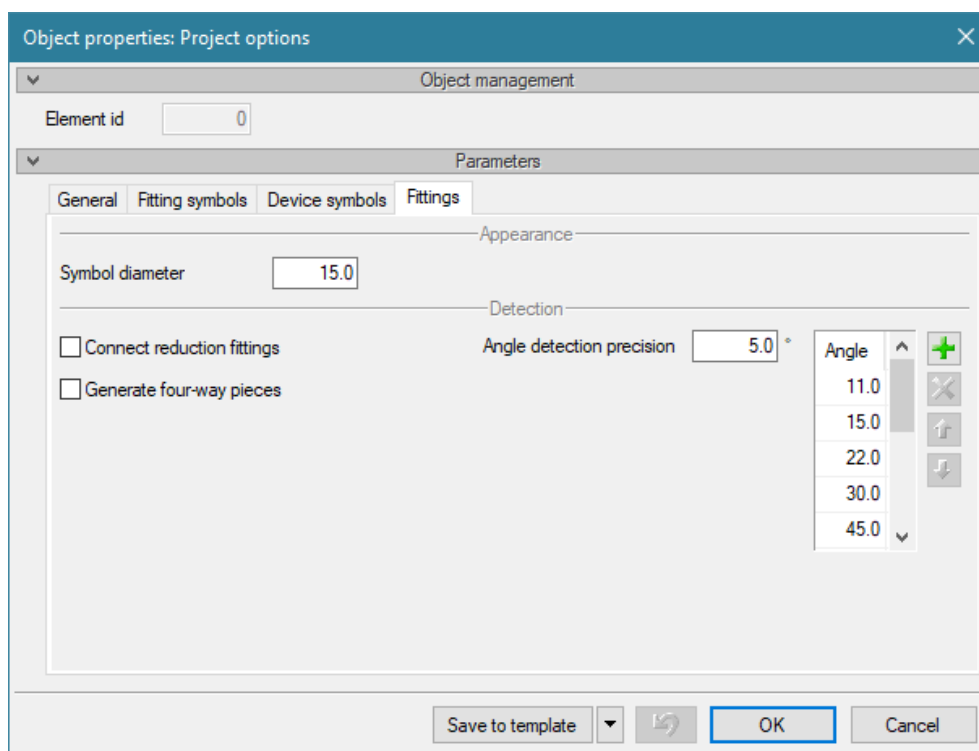


Fig. 90. “Project options” window, “Moulds” tab

The **Moulds** tab enables determining the manner of generating and presenting the moulds for installation geometry and material changes.

**Symbol diameter** – in this field the user determines the size of the symbol inserted at the point where the fittings set is generated (circle diameter).

## Moulds

**Connect into reduction moulds** – ticking this box means that a change of diameter and direction or a change of diameter and a branch will be executed by means of a DN1/DN2 reduction elbow (three-way or four-way reduction mould) and not by means of two separate moulds (DN1 elbow + DN1/DN2 reduction, three-way mould or four-way mould DN1 + DN1/DN2 reduction).

**Generate four-way fittings** - ticking this box means that four-way fittings will be generated for nodes where 4 pipelines meet, and not three-way fittings, as would be the case if the box is not ticked.

**Typical angles and Typical angle detection precision** – in this table the user determines the bends to be treated as typical in the installation (e.g.: 30°, 45°, 60°, 90°) and what angle value range (+/-) should be interpreted as a typical angle.

If in the case of the above example set of typical angles the users inputs 2° in the Angle detection precision field, then:

- angles in the range of 28-32° will be treated as 30°,
- angles in the range of 43-47° will be treated as 45°,
- angles in the range of 58-62° will be treated as 60°,
- angles in the range of 88-92° will be treated as 90°,

The remaining turn angle will be represented by values read from element geometry.

To summarize, as per the example angle settings assumed above:

- a 30° elbow will be generated for a 31.5° route turn,
- a 78.4° elbow will be generated for a 78.4° route turn.

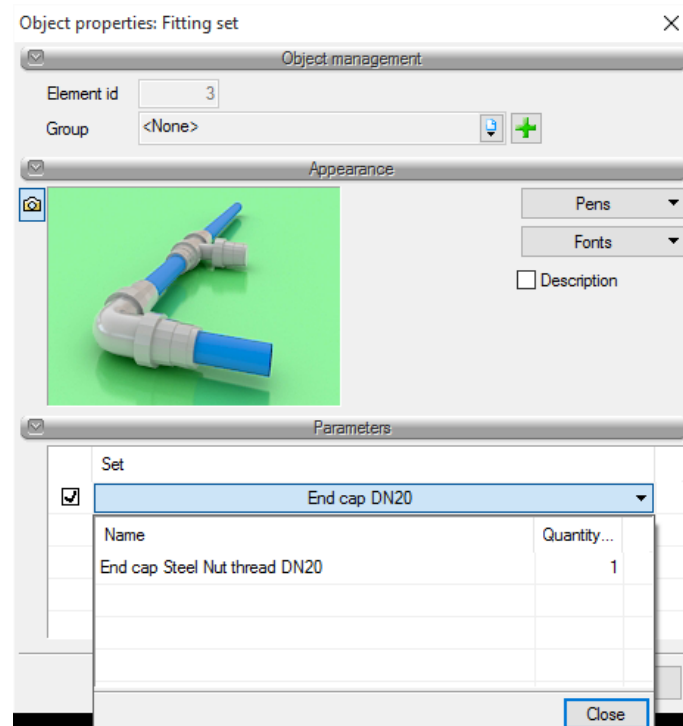


Fig. 91. The Properties window for the Moulds set element

## 8. INSTALLATION CHANGES AND CONNECTIONS WIZARD



## Installation changes and connections wizard

### 8.1. CHANGING THE HEIGHT OF ELEMENTS IN THE INSTALLATION

In order to change installation elements height, click the icon:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_cih.

After drawing the entire or part of the installation the user may change the height of the installation by the selected value. Press the **Change installation height** icon. Then enter the offset value in the insertion window and then select the items to be offset.

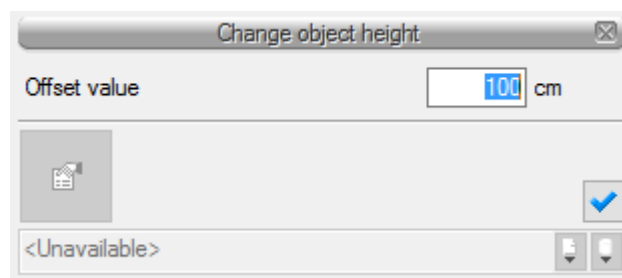


Fig. 92. Item height modification window

Then press Enter. The installation height of the selected elements was changed by the selected value.

### 8.2. DRAW-OFF FITTINGS CONNECTION WIZARD

In **ArCADia- WATER SUPPLY INSTALLATIONS** the user may automatically create connections for draw-off fittings: valves, faucets and hydrants. In order to activate the **Connection wizard** window, click the icon:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

## Installation changes and connections wizard

- iwtr\_ciw.

After clicking the particular icon a window will become available, where you can insert and create automatic connections between draw-off fittings (faucets, valves and hydrants) and water supply pipelines. The user clicks on one of the three icons representing the types of connections, selects the items meant for connection and then presses enter or the right mouse button.

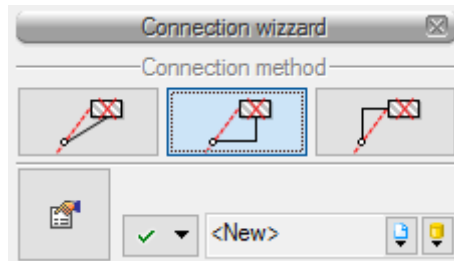





Fig. 93. Connection wizard window

The user may select three types of connections:

**Direct connection (with resulting slope)** –  – the wizard will automatically connect the selected draw-off fitting with the pipelines. The connection will be executed at a straight angle with a single pipeline section directly from e.g. a draw-off valve to the selected pipeline located closest to the fitting (Fig. 94, Connection 1).

**Vertical connection from point** –  – the wizard will automatically connect the selected draw-off fitting with the pipelines. The connection is created by means of two pipeline sections: a vertical section between the water outlet up to the installation height of the selected pipeline and then by means of a horizontal section perpendicular to the selected pipeline (Fig. 94, connection 2).

**Horizontal connection from point** –  – the wizard will automatically connect the selected draw-off fitting with the pipelines. The connection will be executed by means of two pipeline sections: a horizontal section from the water outlet perpendicular to the point where the vertical section will be routed to the selected pipeline (Fig. 94, connection 3).

## Installation changes and connections wizard

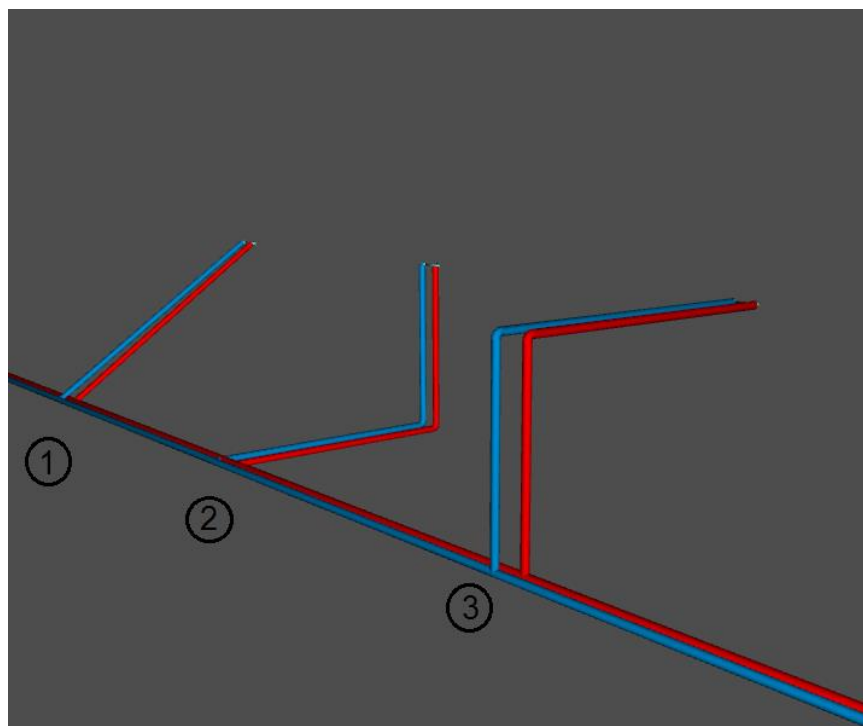


Fig. 94. 3D view wizard connection methods

## 9. AUTOMATIC PROPERTIES SELECTION FOR WATER-SUPPLY INSTALLATION ELEMENTS

## Automatic properties selection for water-supply installation elements

### 9.1. GENERAL ASSUMPTIONS FOR AUTOMATIC SELECTION MADE BY THE SOFTWARE

The designer will find it extremely useful when carrying out process calculations that technical parameters of the main elements in the water-supply installation can be automatically selected by the software.

Objects which have their parameters selected are:

- common cold and hot water pipelines with a division into distribution pipelines, stacks and branch lines
- pipelines operating in circulation circuits of the domestic hot water installation
- water pipelines insulation
- stop valves
- control and balance valves
- flow measurement valves

The remaining items are assigned based on the equal values of the nominal diameter and the nominal diameter of the pipeline in which the item was installed. The selection of items was configured in a manner ensuring that all the borderline conditions determined by the user are met, i.e. conditions for minimum and maximum velocity for design flows in pipelines depending on their purpose, total pressure loss optimization conditions, required pressure values for the water outlet and conditions where pressure increase is necessary. When it is necessary to increase the pressure, the user receives the following information: **Installation requires pressure increase – deficit upstream from ZW1**. This way the user is informed about the need to incorporate a pressure-increase device: a pressure booster or pump. These devices are not selectable. They will however take over the parameters of the pipeline in which they are installed, i.e.: the device minimum required efficiency and minimum required pressure increase.

### 9.2. INTRODUCING ITEMS MEANT FOR SELECTION

At the beginning the user must input into the **Project library** the types of items they will use in the project, i.e. they select entire catalogues from the pipes and appliances database or select only specific series of type. This is done via the **Type library editor**. From among the selected catalogues the software will select the appropriate item types that meet all the borderline conditions, both for the item, as well as globally.

Each item meant for automatic selection is introduced by defining the state of its technical parameters. In the item insertion window and in the properties window in the **Item management** part you will find a button to extend the selection window – **Type selection method**.

## Automatic properties selection for water-supply installation elements

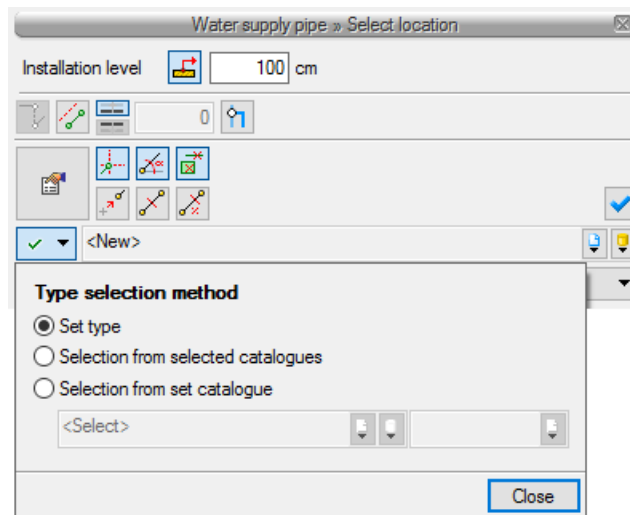


Fig. 95. Parameter selection method switching window – selection method for Set type

After pressing the button a list containing three methods of setting the parameter selection method is extended.

**Set type** – in this method the users determines the type of an item, i.e. selects exactly one type. In the case of a pipeline it will be a type from the given catalogue PP 40x3.7 PN 10. Selecting this method activates the **Project library** button, which allows extending the list marked with a red arrow in Fig. 41. From a list of item types the user selects one item type (one pipeline). After starting automatic selection this item will be included in the calculations, however it will not change its parameters and will not be replaced, even if it does not meet the selection criteria. This way the user “freezes” the item.

**Selection from selected catalogues** – this method is the default for each item. This involves the full range of item selection.

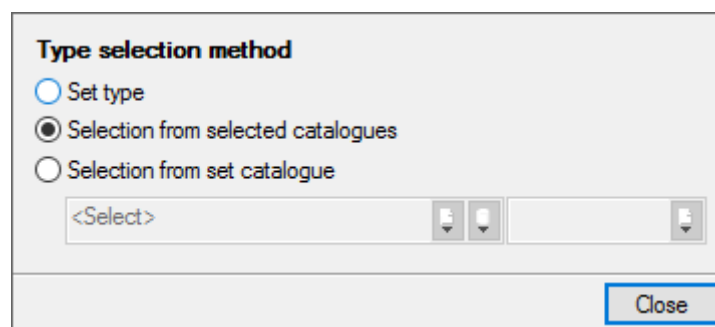


Fig. 96. Parameter selection method switching window – selection method for Selection from selected catalogues

The Project libraries lists are greyed out. Parameters are selected from the catalogue of items selected in the **Selection options**, which is activated with the button from the toolbar.

## Automatic properties selection for water-supply installation elements

**Selection from a pre-determined catalogue** – this selection feature enables selecting an item from a single pre-determined catalogue, independent of the catalogues selected in the options.

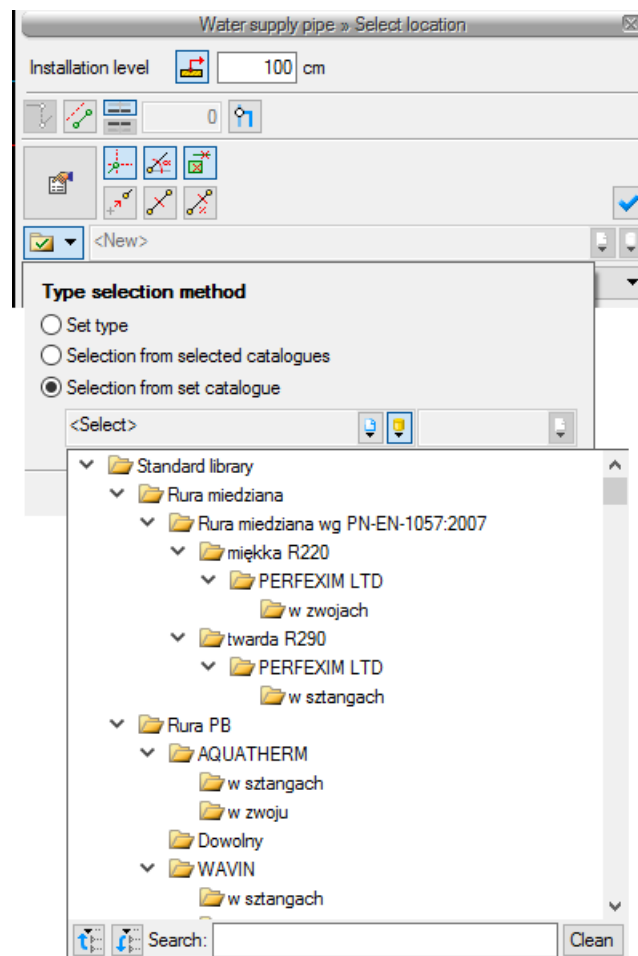


Fig. 97. Parameter selection method switching window – selection method  
Selection from a pre-determined catalogue

This method of selection enables the user to automatically select a type of item from a particular catalogue. In the case of pipelines, when using this selection option the user may ensure that a section will be made of steel, regardless of the entire installation be made of pipes of a different material. Only the section diameter will be selected then, with the pre-determined material and series of type.

### 9.3. STARTING ITEM SELECTION AND SETTING UP SELECTION OPTIONS

Once an installation is drawn and connections are verified, you can select pipelines and fittings. To start the action of automatic selection, click the icon from the toolbar:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group.

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

## Automatic properties selection for water-supply installation elements

or write

- iwtr\_mat.

#### 9.4. SELECTION CRITERIA DETERMINATION

Once the icon is pressed, the following selection options window is activated:

Matching options

Velocity criteria

Standard: PN-92/B-01706

Supply water velocit...	Distribution	Risers	Branches
Min.	0.50	0.50	0.50
Max.	1.00	1.50	1.50

Circulation water velocity: Min. 0.20 m/s, Max. 0.50 m/s

Buttons: Save, Choose, Close

Fig. 98. Selection options window – determining velocity criteria

Before pressing **OK** the user may use the default selection criteria or input their own item selection criteria. The basic criteria determined by the user are the velocity in the pipelines and the minimum insulation thickness values for each thermal conductivity coefficient.

The user may determine the velocity criteria after selecting the **Water supply pipe** item from the items tree. The same applies to the user selecting **Pipe insulation → Hot water + Circulation** - in this window the user will be able to determine the minimum thickness parameters with the pre-determined thermal conductivity coefficient.

Velocity criteria for water in the pipelines are determined based on the purpose of the particular pipeline in the installation: distribution pipelines, stacks, branch lines and circulation pipelines. The standard pursuant to which the velocities will be set is available in the drop-down list. Once the item with the **standard number** is selected, the velocity cannot be modified. It can be modified when selecting the item none (no standard) from the drop-down list. Changing the selection criteria for other items is not available for the user. Should the user make a full selection of pipelines or other items, they must indicate the catalogues or items for selection from the **Project library**.



## Automatic properties selection for water-supply installation elements

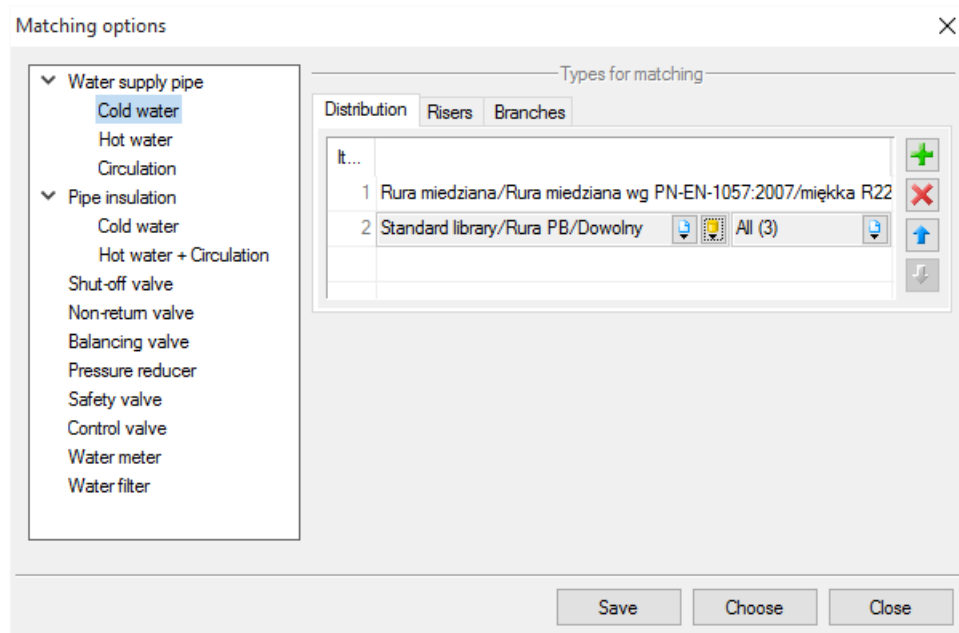


Fig. 99. Options selection window – selecting item types for selections

Once a particular group of items is selected (e.g. Water pipe → Cold water), the user may add catalogues to the particular position using the green sign. In the case of pipelines you need to remember that you can select pipelines separately, divided by their purpose (tabs: distribution, stacks, branch lines).

Then in the drop-down list available on the left the user selects the items catalogue, whereas in the drop-down list on the right he can select the required pipe types by marking them. An item in the table corresponds to the sequence of approximations in case of a lack. If the user would like to give priority to a particular catalogue, he should put it in a higher position. Positions can be changed with the arrows. After setting all the items included in a project and pressing the **OK** button, an item will be selected.

The user may preview calculations in the calculations table, where he can introduce the necessary corrections.

## 9.5. RTF CALCULATIONS REPORT

After the designer introduces corrections or changes, you should always click the **Apply** button in the calculation tables in each tab and with each selected path. In order to exit the calculations you need to press the **Close** button, which will close the window and take you to the drawing model. In the projection and the axonometry you will see descriptions of design sections (these need to be arranged not to overlap).

**NOTE!** *Introducing any change into the model will reset the calculation points and the calculations. The changes introduced into the calculation tables will be saved.*

In order to obtain a complete set of all the required reports for the particular paths the user should open the calculations table and then (for each tab) tick the box in the **Report** column of the calculation paths selection table. The designer may select reports only from critical paths or from other interesting paths. Once the relevant reports are selected by marking, you need to press the **Report** button, which will activate a window where you can name the generated RTF file and save it in a selected folder.

# 10.CALCULATIONS AND RESULT INTERPRETATION

## Calculations and result interpretation

### 10.1. GENERAL ASSUMPTIONS FOR CALCULATIONS

As of version 2.0 of the software, calculations consist in verifying the drawn installation layout. The designer must finish introducing elements and assume their process parameters. The software enables the verification of operational parameters for the installation and all its elements, as well as inform the user about errors and erroneously assumed elements. The user modifies parameters by controlling the results of calculations for the selected paths and elements at the same time.

Software calculation features:

1. Verifying the correct connections of items in the water-supply installation.
2. Determining the design water flows in the particular branches and sections for the water outlet supply installations.
3. Verifying the pipeline diameters selected by the user in the scope of their hydraulic properties (verifying the velocity and unit pressure drop).
4. Calculating line losses and local losses in the paths selected by the user.
5. Determining the required differential pressure.
6. Comparing the required differential pressure with the design differential pressure at the installation input.
7. Determining the calculation parameters for pressure increase devices.
8. Determining the water flow for the circulation circuit.
9. Determining heat losses for the hot water pipelines system.
10. Verifying water circulation circuits in the hydraulic scope.
11. Determining hydraulic parameters for the pressure increase devices in the circulation circuit.
12. Introducing changes to the pipelines from the level of the calculation tables.

### 10.2. VERIFYING THE VALIDITY OF A DRAWN INSTALLATION

Once drawing is completed (or in the course of drawing), if the user has connected all the installation elements, there is the option of verifying the design execution in the scope of correct pipeline connections and connections between the installation and the water intake points and installation start points. To start the water supply installation verification feature, click the following icon in the software toolbar:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_ver.

## Calculations and result interpretation

A window containing an error table is displayed.

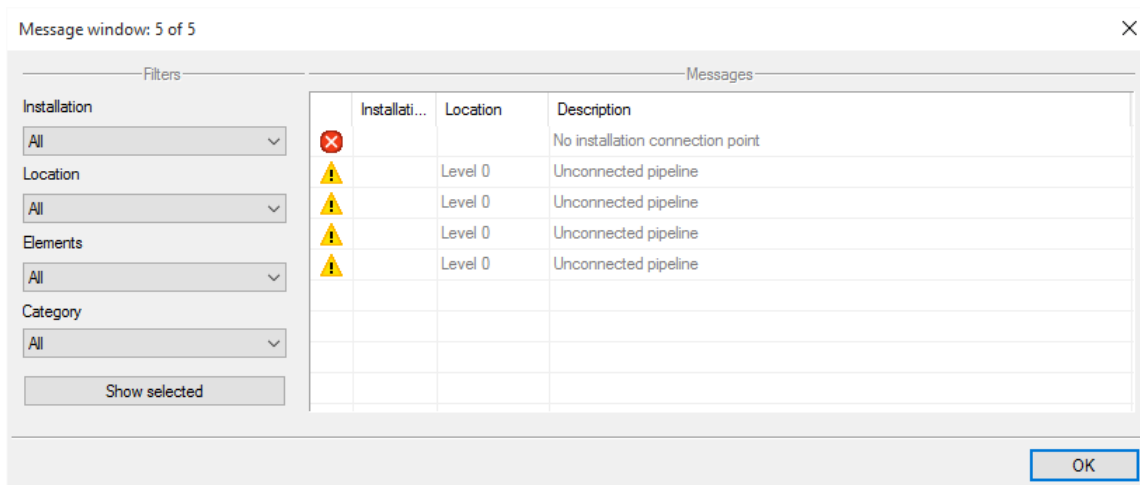


Fig. 100. Table - Water-supply installation report containing information about the validity of the designed installation

The table contains information concerning the number of discontinuities in the installation. The software automatically identifies elements of the installation that have not been connected and pipeline sections that do not have a connection with an installation inflow point or a water outlet.

After clicking the error information, the user will activate the drawing error detection feature. The software will highlight the routes and elements where errors occur. The designer can correct the drawing by connecting elements in order to ensure continuity of the installation. After the corrections are implemented, the software will prepare a report informing the user about the validity of the designed installation.

In the left part of the window the user may filter errors and display only the selected descriptions.

In the **Installation** drop-down list the user may select an installation connection point or a set of connection points.

The user may limit the range of errors displayed for a particular level in the **Placement** drop-down list.

The **Elements** drop-down list gives the user the possibility to choose one of the several element groups that were not connected. If there are connection errors in the groups of faucets, pipelines and water meters, the user can select e.g. only the water meters.

From the **Category** drop-down list the user selects the error type that occurs in the project: unconnected elements, faulty connection.

After selecting from the drop-down lists the user can select the items that are not connected and that have been assigned to a particular grouping in the drawing. To do that, press the **Show selected** button. The installation projection view field will then be moved to the particular part of the installation drawing that includes the group of connection errors and will mark it with dotted lines with a view of the handles.

## Calculations and result interpretation

Message window: 5 of 5

Filters

Installation

All

Location

All

Elements






All

Category

All

Show selected



Messages

	Installati...	Location	Description
			No installation connection point
		Level 0	Unconnected pipeline
		Level 0	Unconnected pipeline
		Level 0	Unconnected pipeline
		Level 0	Unconnected pipeline







OK

Fig. 101. Table - Water-supply installation report containing information about the validity of the designed installation

### Message types (message icons differ):

- Information 
- Warning 
- Error 

### Message content - interpretation:

-  **The installation design is correct**  
The message appears when there is a connection point present in the installation and all the items which are directly or indirectly connected to that point are creating an installation that is correctly designed in terms of connections.
-  **No installation connection point**  
This message appears when there is no connection nor a local connection point in the project.
-  **Incorrectly connected element: e.g. UM1 faucet**  
This message appears when an item is connected to the pipeline but the connection is incorrect, e.g. a faucet is only connected to the cold water pipeline, flow valves are connected only on one side etc.
-  **Unconnected pipeline**  
The message appears when there is an unconnected pipeline in the project.
-  **Unconnected elements: e.g. UM1 faucet**  
The message appears when an item is not connected to any pipeline.
-  **Elements not connected to any path: e.g. hydrant**  
The message appears when an item (also a pipeline) is not directly or indirectly connected to a connection point. (Can be connected to pipelines, although these pipelines will not be connected to a connection point).

## Calculations and result interpretation

## 10.3. CALCULATION METHODOLOGY

## 10.3.1. Design flows

Design flows are calculated for design sections separated based on the installation geometry. The division into design sections comes from the change of one of the parameters that impacts the calculation of the flow resistance through the pipeline: flow, coarseness coefficient (pipeline material) or pipeline diameter.

The design flow is calculated separately for the hot and cold distribution main and for the circulation circuits.

The design flow rate in the design sections of the hot and cold distribution main are calculated based on the total standard outflow for water outlets supplied by the particular design section. Standard water outflows from the individual water outlets are determined based on the type of water outlet in accordance with the applicable standard. It is possible to use non-standard settings for the water outlets by the application of a user-defined outflow standard value. Determination of the formula to calculate the flow rate should be set at the connection point of the water supply installation.

Wzory do określania przepływów obliczeniowych w instalacjach wodociągowych dla różnych rodzajów budynków.

Rodzaj obiektu <sup>*)</sup>	Wzór	Uwagi
Budynki mieszkalne	$q = 0,682 \cdot \left(\sum q_n\right)^{0,45} - 0,14$	dla $0,07 \leq \sum q_n \leq 20 \text{ dm}^3/\text{s}$ oraz dla armatury o $q_n < 0,5 \text{ dm}^3/\text{s}$
	$q = 1,7 \cdot \left(\sum q_n\right)^{0,21} - 0,7$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$ oraz dla armatury o $q_n \geq 0,5 \text{ dm}^3/\text{s}$
Budynki biurowe i administracyjne	$q = 0,682 \cdot \left(\sum q_n\right)^{0,45} - 0,14$	dla $\sum q_n \leq 20 \text{ dm}^3/\text{s}$
	$q = 0,4 \cdot \left(\sum q_n\right)^{0,54} + 0,48$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$
Hotele i domy towarowe	$q = \left(\sum q_n\right)^{0,366}$	dla punktów czerpalnych o $q_n > 0,5 \text{ dm}^3/\text{s}$ oraz w obszarze $1 < \sum q_n \leq 20 \text{ dm}^3/\text{s}$
	$q = 0,698 \cdot \left(\sum q_n\right)^{0,5} - 0,12$	dla punktów czerpalnych o $q_n < 0,5 \text{ dm}^3/\text{s}$ oraz w obszarze $0,1 < \sum q_n \leq 20 \text{ dm}^3/\text{s}$
	$q = 1,08 \cdot \left(\sum q_n\right)^{0,5} - 1,83$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$ (dla hoteli)
	$q = 4,3 \cdot \left(\sum q_n\right)^{0,27} - 6,65$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$ (dla domów towarowych)
Szpitale	$q = 0,698 \cdot \left(\sum q_n\right)^{0,5} - 0,12$	dla $\sum q_n \leq 20 \text{ dm}^3/\text{s}$
	$q = 0,25 \cdot \left(\sum q_n\right)^{0,65} + 1,25$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$
Szkoły	$q = 4,4 \cdot \left(\sum q_n\right)^{0,27} - 3,41$	dla $1,5 < \sum q_n \leq 20 \text{ dm}^3/\text{s}$ ; dla $\sum q_n \leq 1,5 \text{ dm}^3/\text{s}$ $q = \sum q_n$
	$q = -22,5 \cdot \left(\sum q_n\right)^{-0,5} + 11,5$	dla $\sum q_n > 20 \text{ dm}^3/\text{s}$

Objaśnienia:

$q_n$  – normatywny wypływ z punktów czerpalnych,  $\text{dm}^3/\text{s}$

$\sum q_n$  – suma wszystkich normatywnych wypływów z punktów czerpalnych obsługiwanych przez wymiarowany odcinek instalacji,  $\text{dm}^3/\text{s}$

$q$  – przepływ obliczeniowy,  $\text{dm}^3/\text{s}$

<sup>\*)</sup> Dla instalacji wodociągowych w obiektach innych niż wymienione należy dobrać wzór do ustalenia przepływu obliczeniowego przez analogię do sposobu korzystania z instalacji przez użytkowników.

Total water flow for the circulation circuits is calculated in the software with the use of two methods:  
— by calculating the installation capacity and assuming a number of exchanges per hour:

$$q_{cr} = \frac{V_p u}{3,6} [\text{dm}^3/\text{s}]$$

## Calculations and result interpretation

$V_p$  – installation capacity [ $m^3$ ],

$u$  – number of exchanges per hour – the designer assumes the values to be between 3 and 5

— by determining the heat loss from the hot water installation, including the circulation pipelines:

$$q_{mc} = \frac{Q_c}{\Delta t \cdot c_w} [\text{kg/s, the software converts this to } dm^3/s],$$

$Q_c$  – total heat loss in the entire hot water installation and circulation [W],

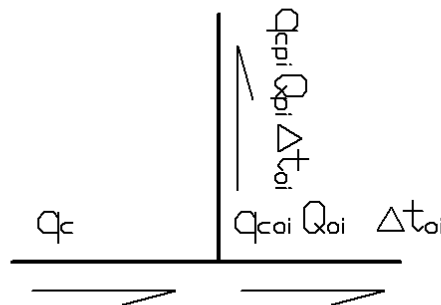
$\Delta t$  – assumed maximum temperature drop between the hot water preparation device and the least favourably located water outlet [K].

$c_w$  – specific heat for water at 60 K [kJ/(kg × K)].

**The software assumes a higher total flow value for further hydraulic calculations and determining the required circulation pump efficiency.**

The software distributes the flow into the particular design sections of circulation circuits by adopting the principle that the flow through the return pipeline for the specific branch is the same as that through the flow pipeline, so the flows for each section are calculated only for the flow pipeline. The flow through each section of the flow pipelines operating in the circulation circuit is pre-determined on the basis of the proportion of each branch's volume.

The software calculates the heat loss in the circulation circuits for the pre-determined flow values. After determining the proportion of heat loss in the pipelines for the particular branches the software calculates the total flow resulting from the heat loss and then adjusts the flow values for the branches.



The installation circulation flow is determined from the source side. At the beginning of the installation, looking from the source (the first section downstream from the exchanger), the circulating water flow will be equal to the flow rate ensured by the circulation pump. The value for the next segment it is calculated by subtracting the determined branch flow value.

$$\begin{cases} q_c = q_{cpi} + q_{coi} \\ q_{cpi} = \frac{Q_{pi}}{\rho_{cw} \cdot c_w \cdot \Delta t_{pi}} \\ q_{cpi} = \frac{Q_{oi}}{\rho_{cw} \cdot c_w \cdot \Delta t_{oi}} \end{cases}$$

## Calculations and result interpretation

The additional assumption is as follows:  $\Delta t_{pi} = \Delta t_{oi}$ .

$q_c$  – circulating water stream entering the node (in the distribution main upstream from the node in the corresponding return section upstream from the node) [l/s],

$q_{coi}$  – circulating water stream output from the node (in the distribution main downstream from the node) [l/s],

$Q_{pi}$  – design heat loss in the distribution main branch pipelines [W],

$Q_{oi}$  – design heat loss in distribution main branch pipelines in the subsequent part of the installation [W].

Remaining items:  $\rho_{cw}$  - water density at the design temperature and  $c_w$  – specific heat.

After solving the system of equations the results are:

$$q_{cpi} = q_c \frac{Q_{pi}}{Q_{pi} + Q_{oi}} \quad (1)$$

After determining the branch water flow you can calculate the amount of circulating water flowing out of the node:

$$q_{coi} = q_c - q_{cpi} \quad (2)$$

For the next node the value above becomes the initial value and we calculate the flow rate for the next plot as per the formula (1) and formula (2).

After determining the water flow in all the plots you need to calculate the pressure losses.

### 10.3.2. Calculating heat losses in the hot water installation

Heat losses in the circulation circuits were calculated using formulas that include the thermal resistance of the pipeline material, the ambient temperature and the heat transfer coefficients between the insulation or pipe and the air, as well as the heat transfer between the water and the pipe wall.

The ambient temperature for the pipeline is defined by the user in the pipe properties window. It is recommended to set temperatures using the pipelines grouping feature.

Calculating heat loss for the initial total flow calculation

The heat loss for an insulated pipeline was calculated using the formula:

$$Q_L = \frac{\pi \cdot (t_{srw} - t_o) \cdot L}{\frac{1}{\alpha_A \cdot d_w} + \left( \frac{1}{2 \cdot \lambda_r} \ln \frac{d_z}{d_w} + \frac{1}{2 \cdot \lambda_{iz}} \ln \frac{d_{zi}}{d_{wi}} \right) + \frac{1}{\alpha_B \cdot d_{zi}}} \quad [W]$$

The heat loss for a non-insulated pipeline was calculated using the formula:

$$Q_L = \frac{\pi \cdot (t_{srw} - t_o) \cdot L}{\frac{1}{\alpha_A \cdot d_w} + \left( \frac{1}{2 \cdot \lambda_r} \ln \frac{d_z}{d_w} \right) + \frac{1}{\alpha_B \cdot d_z}} \quad [W]$$

$t_{avw}$  – average water temperature [K],

$t_o$  – temperature of the room through which the design section runs [K],



## Calculations and result interpretation

$d_o$  – pipe outer diameter [m],

$d_i$  – pipe inside diameter [m],

$d_{oi}$  – pipe insulation outer diameter [m],

$d_{ii}$  – pipe insulation inside diameter [m],

$\lambda_p$  – thermal conductivity coefficient of the pipeline wall material [W/m×K],

$\lambda_{ins}$  – thermal conductivity coefficient of the insulation material wall [W/m×K],

$L$  – pipeline length with calculated average temperature,

$\alpha_A$  – heat transfer coefficient between water and the pipe wall,

$\alpha_B$  – heat transfer coefficient between the insulation or pipe and air.

### 10.3.3. Hydraulic calculations

Hydraulic calculations are carried out for the system supplying water to water outlets and the circulation circuit. These consist in determining the pressure losses: linear (over the pipeline length), local (in connecting moulds and stop valves).

Unit **linear losses** are calculated with the use of the Darcy-Weisbach formulas.

$$\Delta h_i = \frac{\lambda}{D} \cdot \frac{V_{obl}^2}{2} \cdot \rho$$

The linear resistance coefficient  $\lambda$  was determined with the use of the implicit formula based on the outcomes of the Colebrook-White studies.

$$\frac{1}{\sqrt{\lambda}} = -2 \lg \left( \frac{2,51}{Re \sqrt{\lambda}} + \frac{k}{3,72 D_w} \right)$$

Total pressure losses in the design section are determined by multiplying the line pressure loss unit value.

$$\Delta h_{odc} = \Delta h_i l$$

The total line pressure loss value in the design path consists of the total of the section losses.

**Local losses** are determined using the Darcy and Colebrook-White formulas and the local resistance coefficients. Moreover, in the case of stop valves and measurement valves it is possible to determine the  $k_{vs}$  resistances coefficient or to have the local loss value input directly by the user.

Local losses for the item in the design section along with a determination of the resistance coefficient  $\zeta$ :

$$Z_z = \left( \zeta \frac{V^2}{2} \rho \right)$$

Local losses for the item in the design section along with a determination of the resistance coefficient  $k_{vs}$ :

$$Z_k = \left( \frac{q}{k_{vs}} \right)^2$$

Regardless of the method use for their determination, local resistances for items in the particular design section are then summarized. Local resistances at the plot borders are included with the plot

## Calculations and result interpretation

with the smaller flow if the design sections have the same flow rate values (two pipes with different diameters connected together), then local resistances shall be included in the section with the smaller inside diameter (possibly also greater velocity) with the same flow rate.

Designations used in the formulas:

$$\Delta h_c = \Sigma \Delta h_{odc} \text{ [Pa]},$$

$\Delta h_l$  – unit pressure drop per pipeline linear meter [Pa],

$Z_z$  – local pressure loss [Pa],

$Z_k$  – local pressure loss [bar] – converted into the appropriate units by the software,

$V$  – water velocity in the pipeline [m/s],

$P$  – average water density [kg/m<sup>3</sup>],

$k$  – material coarseness coefficient [mm],

$d$  – pipeline inside diameter [mm],

$Re$  – Reynolds number,

$L$  – design pipeline length [m],

$q$  – design flow [m<sup>3</sup>/h].

All the units are converted by the software into the units displayed in the dialogue boxes.

The required supply differential pressure is calculated based on the calculated pressure losses for the selected flow pipeline path with the assumed design flow, required pressure upstream from the water outlet and the geometrical height. This enables determining the critical path and comparing with the differential pressure defined at the Connection point. Informs about the need to use a water pressure increasing device.

In the case of circulation circuits knowing the pressure losses in the least favourable circuit is the base for determining the pump head for the circulating pump. Pump output is determined depending on the place where it is connected to the installation.

## 10.4. CALCULATIONS

After verifying the validity of the installation model created and preliminarily selecting diameters, you can carry out calculations. In order to do that, click the following icon in the software toolbar:

*ArCADia software:*

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

## Calculations and result interpretation

- iwtr\_calc.

Then a window with calculation tables will appear. The calculations window contains separate tabs for each installation type: cold water, hot water, circulation and hydrants. Each tab contains a path selection table, calculation table and a window with a list of messages.

At the beginning the user selects from the tabs the type of installation included in the designed system:

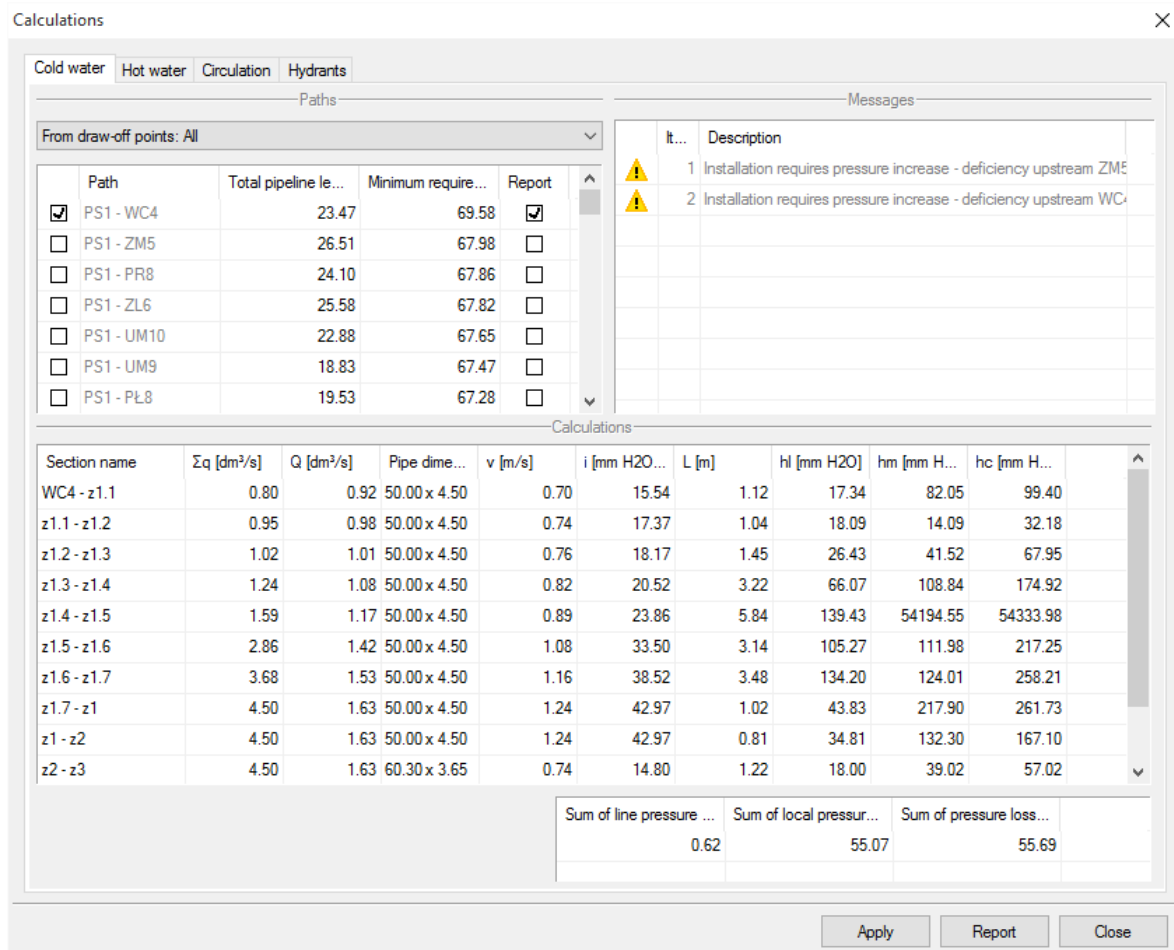


Fig. 102. Calculation tables window – cold water circulation calculations

### Path table

In the upper left part of the window the user selects the path for calculations. By default the sequence is arranged as per the required pressure for the particular water outlet. You can change the sorting by clicking the column name (e.g. Minimum required pressure). You can do the same with length segregation sequence. Moreover, above the table there is a drop-down list that allows to limit the number of setting design paths:

**From water outlets – all** – a list of all the paths terminating with a water outlet will appear in the table.

**From water outlets – most beneficial in stacks** – a list of the paths terminating with water outlets, for which an increased pressure value in the stack is required, will appear in the table.

**From stack end** – a list of the paths with the highest water outlet location in the particular stack will appear in the table.




## Calculations and result interpretation

After marking the selected path in the **Calculations** table (Fig. 95) the user may track the distribution of pressure losses divided by design sections in the particular path from the connection point to the installation up to the water outlet. The table includes information about the marking of the design section, total flow rate factors for the water outlet supplied by the particular design section and the resulting design water flow and flow velocity. Then the designer may analyze the pressure losses present in the particular design section: a unit pressure loss per 1 linear meter of the pipeline, total line pressure loss in the design section, total local pressure losses and the total of the pressure losses in the design section. Due the reading accuracy, especially in the case of smaller flow rates, pressure losses in the table were provided in mm.








Under the table there is another table that summarizes the total pressure losses occurring in the analyzed path. Here the values are provided in meters H<sub>2</sub>O. The user is informed about the totals for the particular pressure losses and the total pressure loss.

On the left there is the **Messages** table.

**Message types** (message icons differ):

- Information 
- Warning 
- Error 

**Message content - interpretation:**

7.  **Installation does not require a H1 pressure booster – min. pressure reserve upstream from ZAW6 amounts to 3.55 m H<sub>2</sub>O**  
This message is displayed when a pressure booster (pump) was inserted into the installation by the user, however the installation does not require a pressure booster (pump). Upstream from the least favourably installed water outlet, e.g. ZAW6 (all the paths in the entire installation are always considered) the pressure reserve without the installation of a pressure booster (pump) amounts to e.g. 3.55 m H<sub>2</sub>O.
8.  **No min. pressure to supply the H1 pressure booster (pump) – missing 3.55 m H<sub>2</sub>O**  
The message appear when no water reaches the particular pressure booster (pump).
9.  **Too small H1 pressure booster pump head – deficit for ZAW6 amounts to 3.55 m H<sub>2</sub>O**  
This message appears when despite the installation of a pressure booster (pump) there is still a pressure deficit at the least favourably located water outlet in the installation, e.g. ZAW6.
10.  **Pressure reserve upstream from the UM1 water outlet amounts to: 2.50 m H<sub>2</sub>O**  
This message informs the user that in the particular path upstream from the water outlet, e.g. UM1, there is a pressure reserve in relation to what is required.
11.  **Installation requires pressure increase – deficit upstream from ZAW6 amounts to 5.50 m H<sub>2</sub>O**  
This message appears when there is not enough pressure upstream from the least favourably installed water outlet in the installation, e.g. ZAW6, (all the paths in the entire installation are considered) and an adequate pressure is not ensured.
12.  **Pressure deficit upstream from the UM1 water outlet amounts to: 2.50 m H<sub>2</sub>O**  
This message informs the user that in the particular path upstream from the water outlet, e.g. UM1, there is a pressure deficit in relation to what is required.
13.  **Min. pressure upstream from ZAW6 (62.34 m H<sub>2</sub>O) exceeds the max pressure for the installation (60.00 m H<sub>2</sub>O)**

## Calculations and result interpretation

The message appears if upstream from the least beneficially located draw-off valve, e.g. ZAW6, the pressure exceeds the minimum pressure value available installation input pressure.

**Pipe properties**

Type parameters

Material: PE-X\_Al\_PE-RT

Standard/Manufacturer:

Type/Series of type:

Outside diameter: 50.00 mm Wall thickness: 4.50 mm

Diameter DN:

Roughness factor: 0.0070 mm

Thermal conductivity coefficient: 0.42 W/m·K

Additional description:

Rura PE/Rura PE-X\_Al\_PE-RT/Dowolny/50 x 4.5

OK Cancel

Fig. 103. Calculation tables window – changing the pipeline in the design section

If the designer decides that it is necessary to change the pipeline diameters due to the high water velocity, it is possible to do this from the level of the table. To do so you need to click the cell with the pipe diameter description (marked red – 25.0 x 4.2 velocity 2.02 m/s), which will open the pipe properties window for type parameters.

The user may change the type parameters (e.g. PP PN 10 25 x 2.3, which results in re-calculating all the scores – 1.34 m/s velocity).

**NOTE!** In order for the changes introduced into the table be reflected in the drawing, you need to press the **Apply** button. Once this move is done the change will be introduced in the drawing model in the design sections (the change may only apply to pipes consisting of at least a single design section).

Design sections for the particular installation was done by means of a letter before the subsequent connection node number:

- c – for cold water,
- h – for hot water,
- cr – for circulation circuit.

Once the **Circulation** tab is opened the user may track pressure and heat losses in the circulation circuits and determine the flow velocity through the particular circulation branches in the design section system for a closed circulation system.

Similar as in the cases of carrying out calculations for water outlet supply systems the user may select a path (in this case a circuit) from the hot domestic water exchanger to the hot water supply pipeline with the return pipelines. For the selected circulation circuit the designer may track the circuit structure and the pressure and heat losses in the particular circuit, divided into design sections. In the

## Calculations and result interpretation

case of the heat losses tables you cannot edit pipes from the calculation table level. Editing pipelines in design sections is only possible from the flow tables.

Calculations

Cold water Hot water **Circulation** Hydrants

Paths

Path	Total pipeline le...	Minimum require...	Report
<input checked="" type="checkbox"/> PS1 - cr1	40.96	0.36	<input checked="" type="checkbox"/>
<input type="checkbox"/> PS1 - cr5	33.59	0.28	<input type="checkbox"/>
<input type="checkbox"/> PS1 - cr9	33.30	0.28	<input type="checkbox"/>
<input type="checkbox"/> PS1 - cr11	27.52	0.16	<input type="checkbox"/>
<input type="checkbox"/> PS1 - cr15	27.24	0.15	<input type="checkbox"/>
<input type="checkbox"/> PS1 - cr16	21.70	0.13	<input type="checkbox"/>
<input type="checkbox"/> PS1 - cr17	19.01	0.11	<input type="checkbox"/>

Messages

It...	Description
1	Installation requires pressure increase - deficiency upstream ZM

Calculations

Pressure losses Heat losses

Section name	Q [dm³/s]	Pipe dime...	v [m/s]	i [mm H2O...]	L [m]	hl [mm H2O]	hm [mm H...]	hc [mm H...]
PS1 - c5	0.1308	42.40 x 3.25	0.1292	0.8393	1.22	1.0278	1.1746	2.2023
c5 - c4	0.0673	33.70 x 3.25	0.1158	0.9940	10.79	10.7249	7.7497	18.4746
c4 - cr1	0.0351	26.90 x 2.65	0.0958	0.9684	8.61	8.3425	57.8313	66.1738
cr1 - cr2	0.0351	21.30 x 2.65	0.1745	4.2472	8.61	36.5886	11.3457	47.9343
cr2 - cr3	0.0673	21.30 x 2.65	0.3346	14.0713	10.69	150.4312	63.1628	213.5940
cr3 - PS1	0.1308	26.90 x 2.65	0.3569	10.7139	1.03	10.9877	3.2098	14.1975

Sum of line pressure ...	Sum of local pressur...	Sum of pressure loss...
218.10	144.47	362.58

Apply Report Close

Fig. 104. Calculation table window – view of the circulation calculation tables

### 10.5. RTF CALCULATIONS REPORT

After the designer introduces corrections or changes, you should always click the **Apply** button in the calculation tables in each tab and with each selected path. In order to exit the calculations you need to press the **Close** button, which will close the window and take you to the drawing model. In the projection and the axonometry you will see descriptions of design sections (these need to be arranged not to overlap).

**NOTE!** Introducing any change into the model will reset the calculation points and the calculations. The changes introduced into the calculation tables will be saved.

In order to obtain a complete set of all the required reports for the particular paths the user should open the calculations table and then (for each tab) tick the box in the **Report** column of the calculation paths selection table. The designer may either select reports only from critical paths or from other interesting paths. Once the relevant reports are selected by marking, you need to press the **Report** button, which will activate a window where you can name the generated RTF file and save it in a selected folder.

# 11.AXONOMETRY

## Axonometry

### 11.1. INSERTING AXONOMETRY

Entire installation

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_axva.

Installation branches

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_axvb.

If the user wants to change the properties of the specific axonometry, they can click the axonometry frame and then the new axonometry modification window will become available.

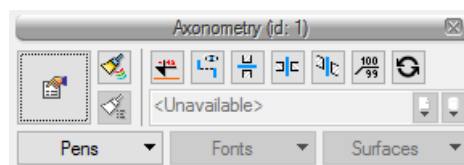



Fig. 105. Axonometry modification window

The item properties editing window appears after selecting the  button in the insertion window or by double-clicking the inserted element.



## Axonometry

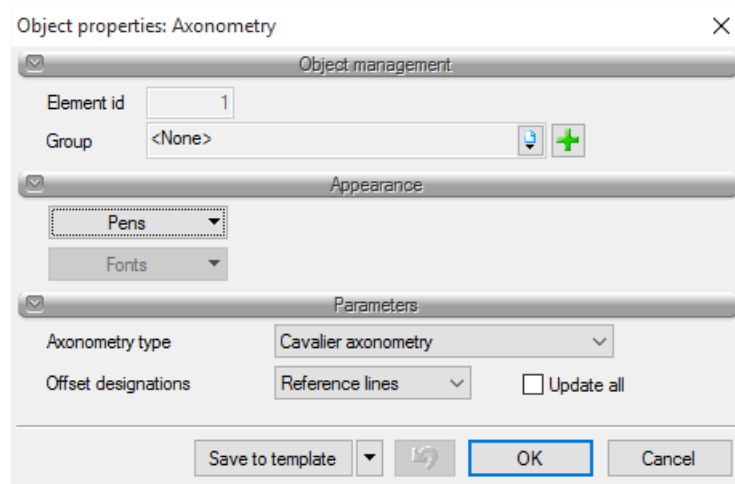
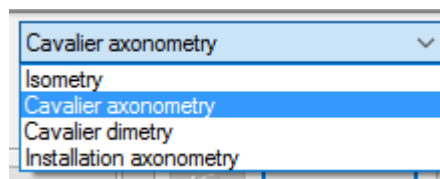


Fig. 106. Axonometry element properties window

### Parameters control group

**Axonometry type** – the user can select four types of axonometry from a drop-down list. Installation axonometry is also available apart from the standard types such as **Isometry**, **Cavalier axonometry** and **Cavalier dimetry**. The former maintains the lengths from the projections in the axonometric view and is recommended when drawing a view of the entire system, rather than a branch of the installation and in the case of an installation that runs with parallel pipelines without slope.



**Offset designations** – the user selects one of the two offset insertion possibilities for the axonometry: these can be reference lines or reference symbols and an **Update all** checkbox. Once the checkbox is ticked, all the offsets introduced into the axonometry will change their reference markings and the subsequently introduced ones will already be those selected from the list.

## Axonometry

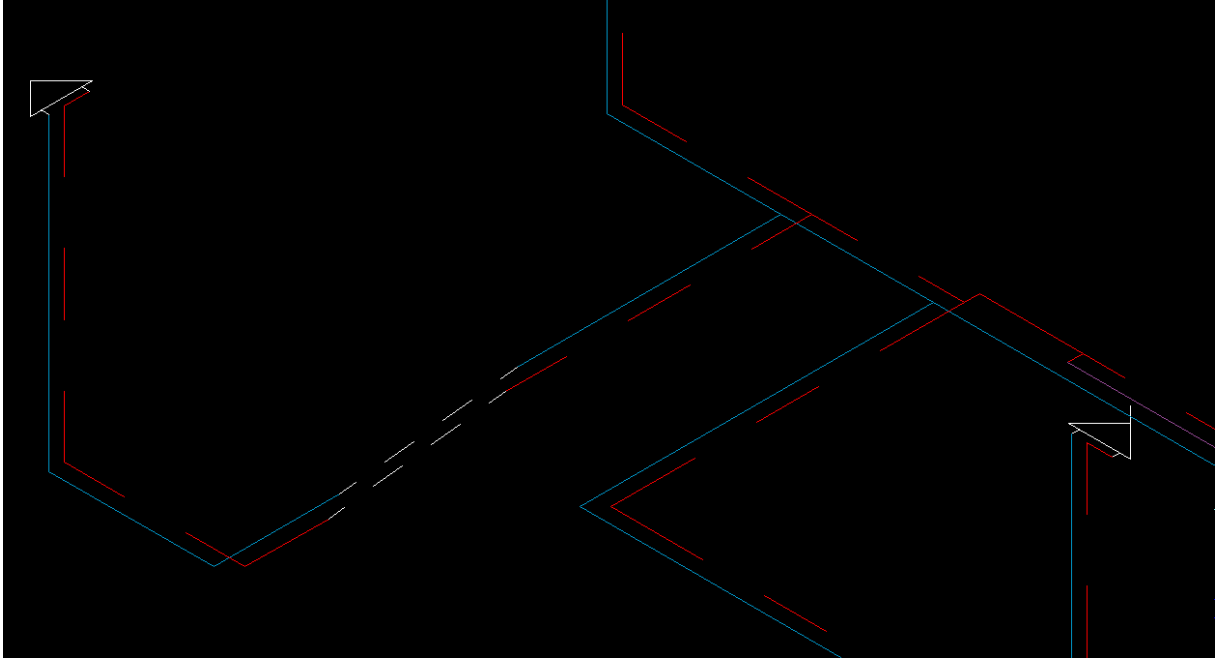


Fig. 107. An example of an offset with lines as reference.

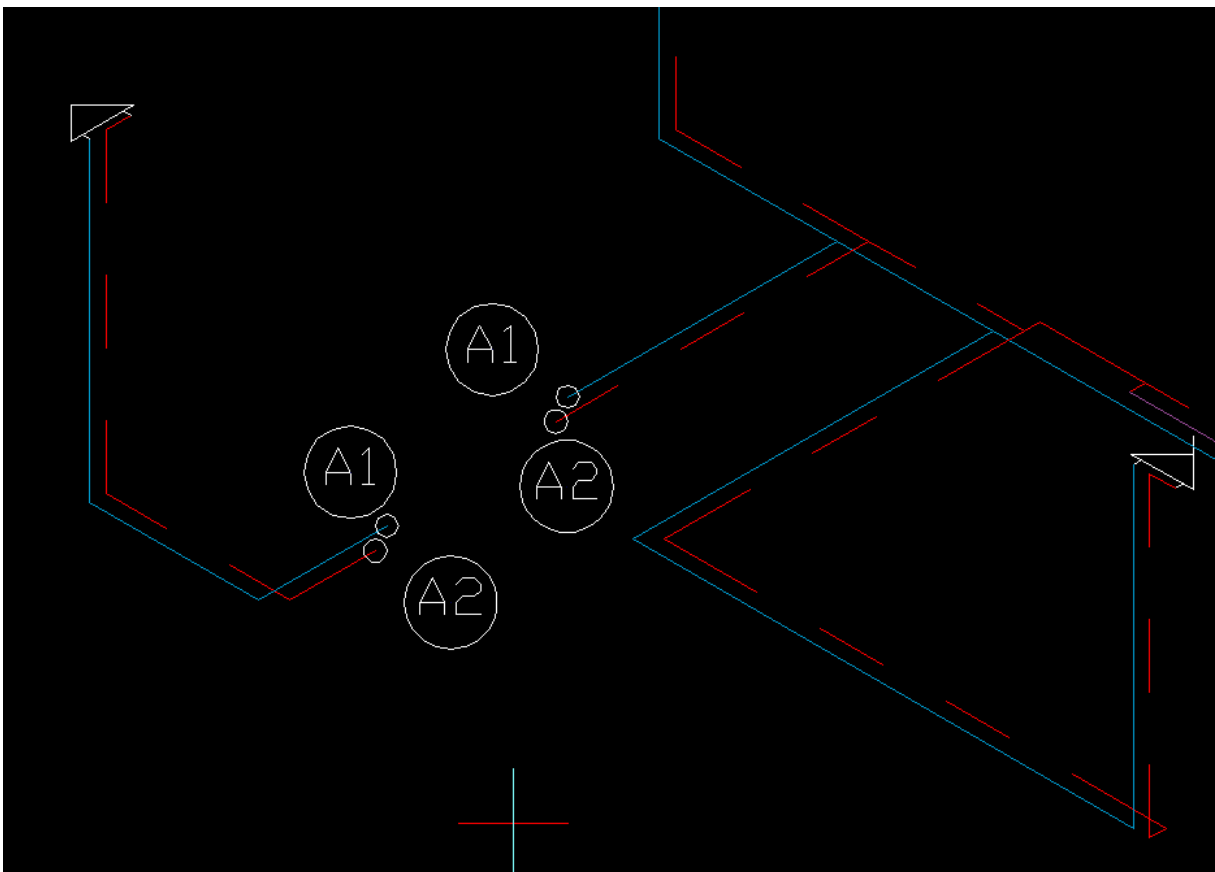




Fig. 108. An example of an offset with symbols as reference.


All offsets reference markings can be changed or disabled from the water supply pipe axonometry modification window for each pipe separately.


## Axonometry


Other modifications of elements already drawn on axonometry are possible in addition to modifying the properties in the axonometry modification window (Fig. 105).

The user can click the Enable/Disable offset designations  icon in the axonometry modification window and disable or enable all the designations for the entire axonometry.

The user can click the Enable/Disable wall passages  icon in the axonometry modification window and disable or enable all the symbols of wall passages for the entire axonometry.

The user can click the Enable/Disable ceilings passages  icon in the axonometry modification window and disable or enable all the symbols of ceiling passages for the entire axonometry.

The user can click the Enable/Disable roof passages  icon in the axonometry modification window and disable or enable all the symbols of roof passages for the entire axonometry.

The user can click the Enable/Disable roof passages  icon in the axonometry modification window and disable or enable all the symbols of roof passages for the entire axonometry.

## 11.2. AXONOMETRY ELEMENTS EDITION AND SETTINGS

Elements inserted into the axonometry can be modified. After clicking the pipeline the user can use the pipe modification window.

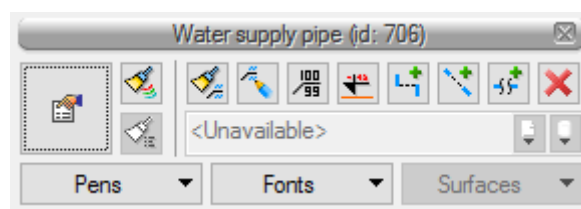


Fig. 109. Water supply pipe modification window in the axonometry view




Fig. 110. Action window icons


Modification possibilities depend from the following factors:

- pipeline location,
- whether the pipeline is vertical or horizontal,
- whether the pipeline is displaced or not.

The content of the modification windows can differ depending on the selected pipeline and the number of selected pipelines. All the possible icons that can be displayed in the modification window are available in Fig. 110.

## Axonometry

The **Fonts and pens painter**  icon is used to “paint” and transfer settings for the fonts and pens from one icon to another, without the need to change settings manually.

The **Description painter**  icon is used to “paint” and transfer description settings from one item to another, without the need to change settings manually. Then the user may select which description parameters should be transferred. This is done in the description painter window, where the user should mark the checkbox next to the appropriate parameter:

**Visibility** – the description is enabled or disabled,

**Link** – the description link is enabled or disabled,

**Direction** – vertical or horizontal link settings,

**Offset from item** – the distance and the location of the description against the item,

**Content** – description content setting from the description configurator.

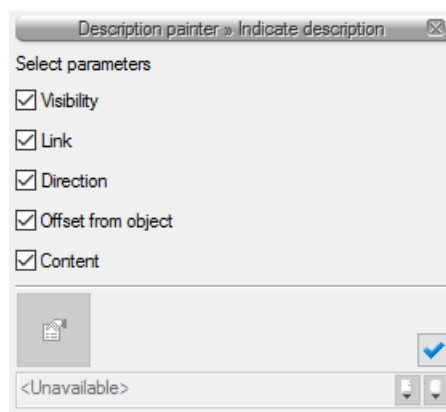







Fig. 111. Description painter window

The **Edit description**  icon is used for editing and modifying the description; once the user presses the icon they can determine in the modification window whether to add the link to a description or not and they can determine the description visibility.


The **Set description on the link**  icon is used for inserting the description in the link. This feature is available for a specific element once you press the icon and you can select another element and set a description without interrupting the command. That way you can set a description on each pipeline during the execution of one command. Once you select an element you need to click the pipeline where the link will be anchored and then indicate the location of the description offset in relation to the element.


The **Enable/disable roof passages**  icon is used to enable or disable roof passages symbols for the specific pipeline or several selected pipelines.

The **Enable/disable level passages**  icon is used to enable or disable level passages symbols for the specific pipeline or several selected pipelines.

The **Enable/disable wall passages**  icon is used to enable or disable wall passages symbols for the specific pipeline or several selected pipelines.

## Axonometry

The **Enable/disable displacement designation**  icon is used to enable or disable offset lines and symbols of the specific pipe.

The **Displace**  icon is used to insert installation displacements in order to make the axonometry drawing more legible. Once you click the icon you need to position the cursor on the selected pipeline, after which the a marker will be displayed, which you can use to indicate the point where the displacement will begin. Then you need to indicate the position of the section which is being displaced.

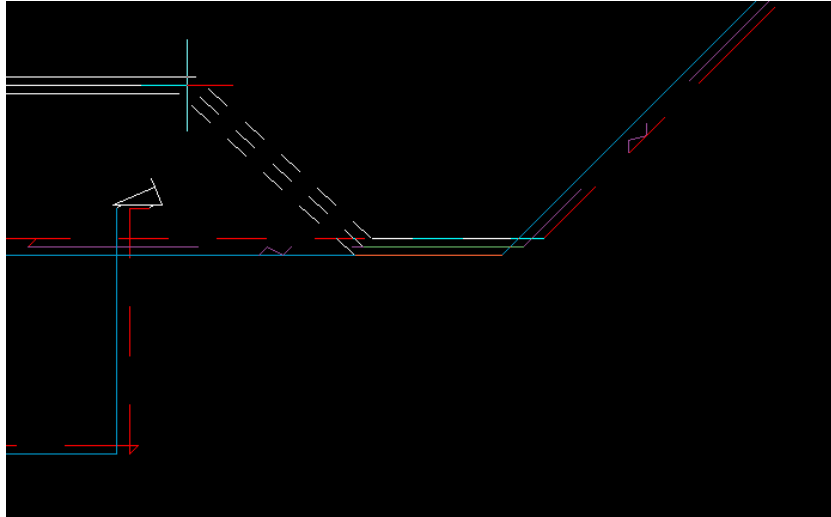


Fig. 112. Displacement

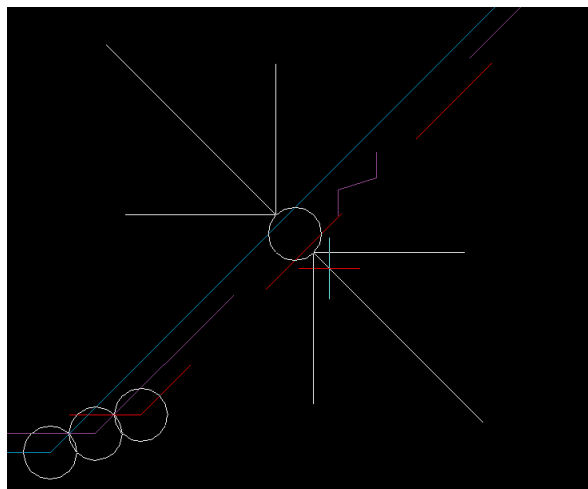



Fig. 113. Modification marker

The **Displace in parallel**  icon is used to introduce installation displacements in parallel to the displaced pipeline in order to make the axonometry drawing more legible. Once you click the icon you need to position the cursor on the selected pipeline, after which the a marker will be displayed, which you can use to indicate the point where the displacement will begin. Then you need to indicate the position of the displaced section in the parallel extension of the divided section.

## Axonometry

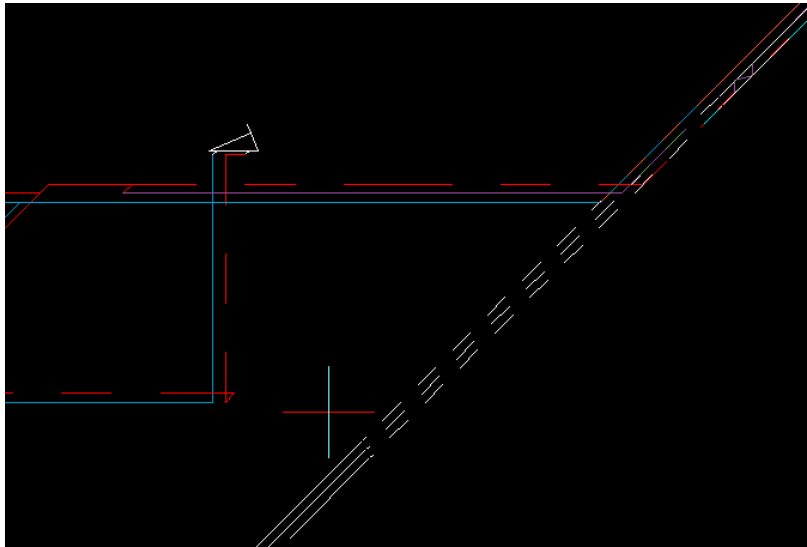




Fig. 114. Parallel displacement

The **Remove displacement**  icon is used by the user to remove the displacement previously introduced into the pipeline.

The **Shorten apparently**  icon is used to introduce an apparent shortening of the pipeline or several pipelines in the axonometry view. Once the user selects this icon, using the modification marker they can select the starting and the ending point. Instead of the section located between these points, an apparent shortening symbol will appear. The most frequent use of the apparent shortening is to create in the axonometry view an apparent cut of a pipeline part that does not have any fittings and branch lines in the longer section.

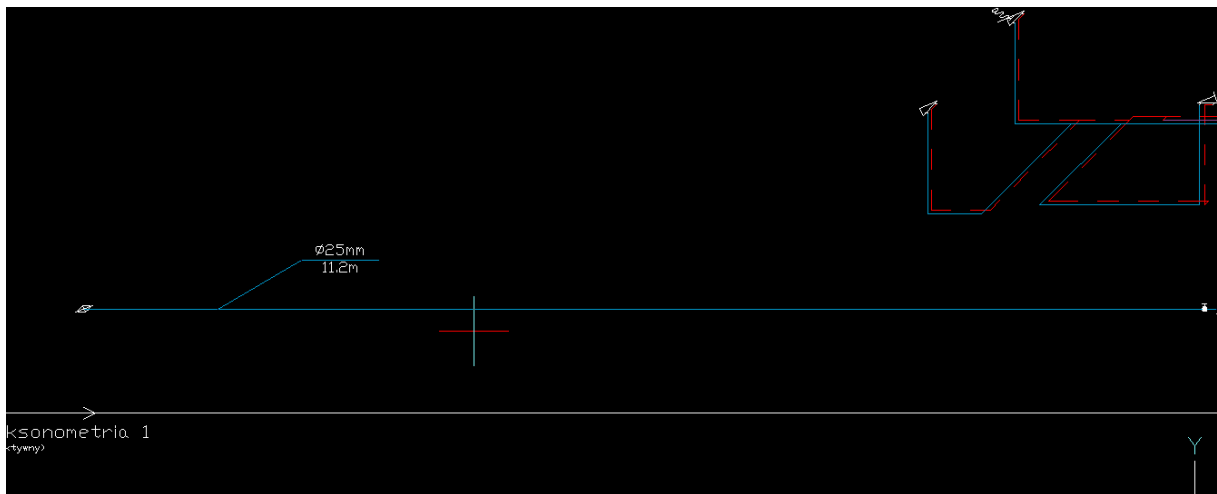


Fig. 115. The view of an installation part before shortening

## Axonometry

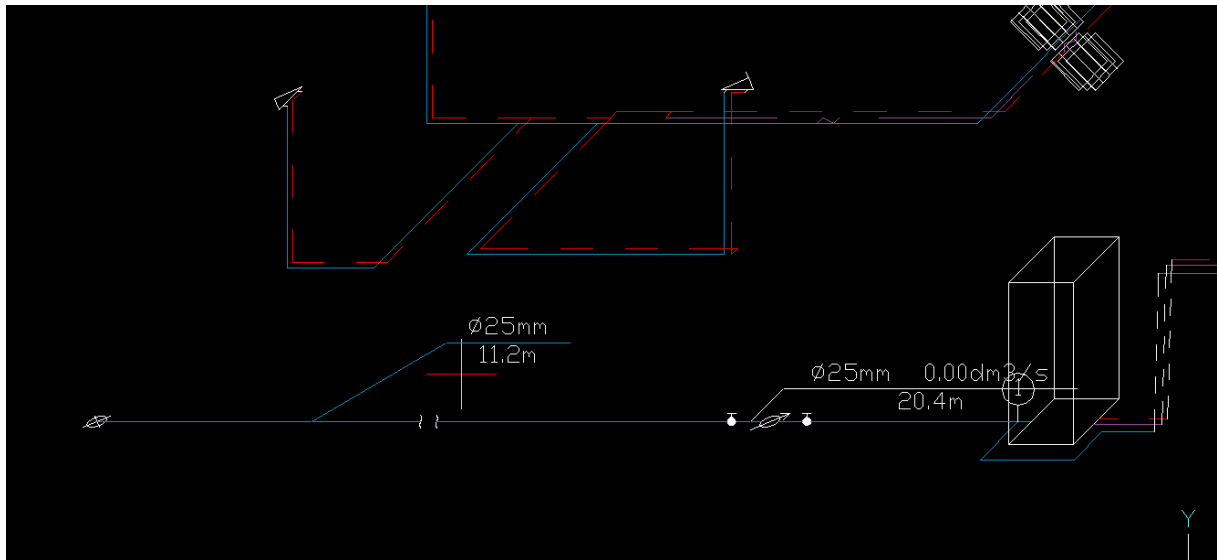




Fig. 116. The view of the installation part after shortening

The **Remove shortening**  icon is used to remove a previously inserted shortening from the pipeline or from several pipelines.

The **Add description on ladder**  icon is used to insert a description common for several parallel pipelines, e.g. cold water, hot water and circulation (Fig. 117).

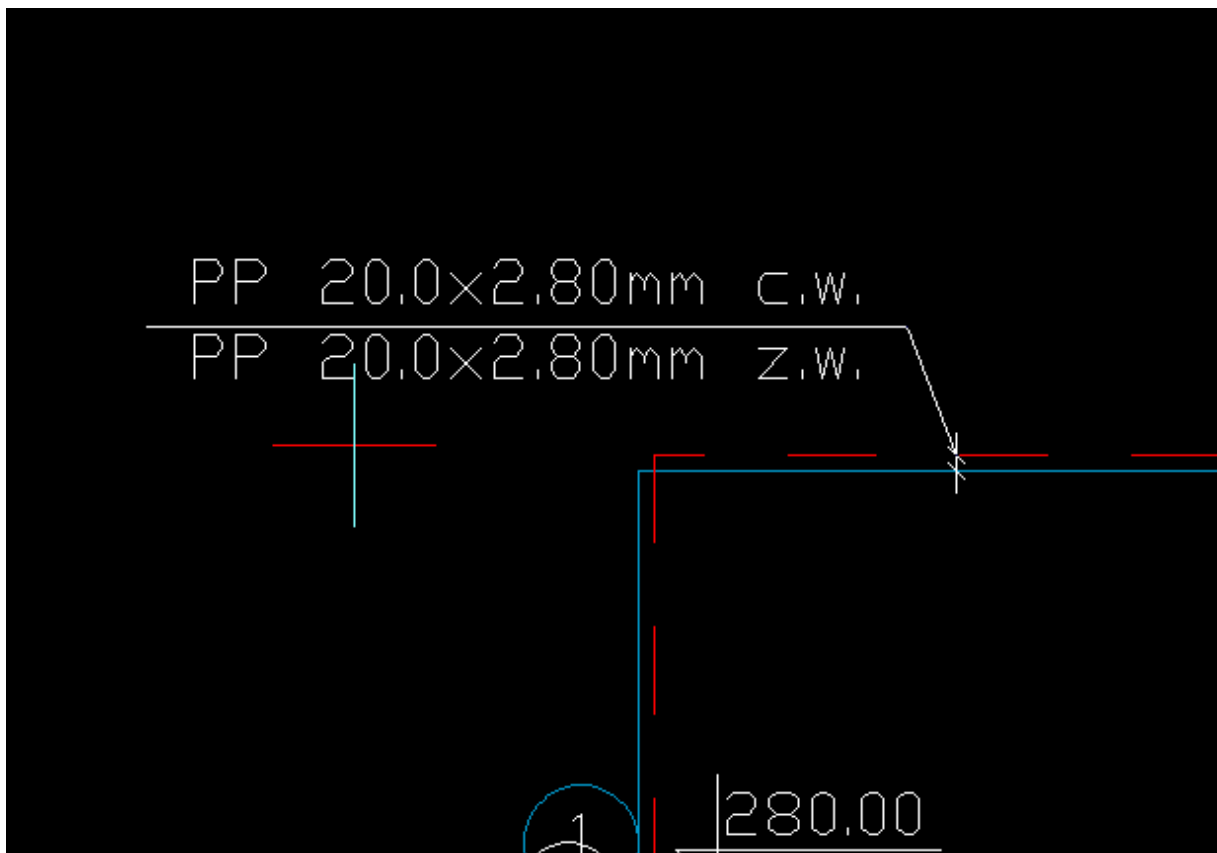


Fig. 117. Description in the ladder in the axonometry

## Axonometry

### 11.3. VIEW OPTIONS

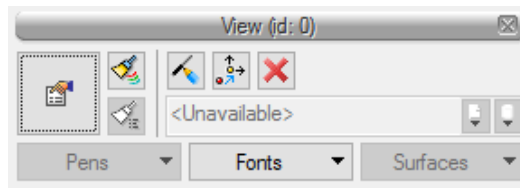



Fig. 118. Axonometry view insertion window

The view properties window appears after selecting the  button in the insertion window or by double-clicking the axonometry view anchor. In the case of the axonometry, it will be the axonometry view properties window.

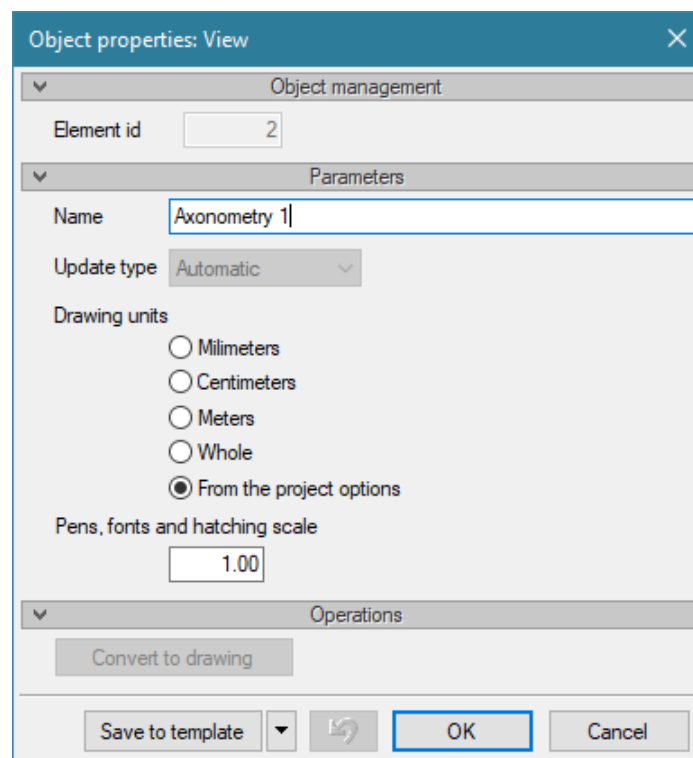


Fig. 119. Axonometry view properties window

#### Parameters control group

**Name** – here the user can name the specific axonometry view and the name will be displayed in the project manager and next to the view anchor.

**Update type** – the user can set the automatic view update method that does not involve any user intervention and a manual method.

**Drawing units** – the user has the possibility to select drawing units by choosing the appropriate unit: millimeters, centimeters or meters.

**Pens, fonts and hatching scale** – the user can adjust the pens, fonts and hatching scale to match their needs without changing the scale of the items.



## Axonometry

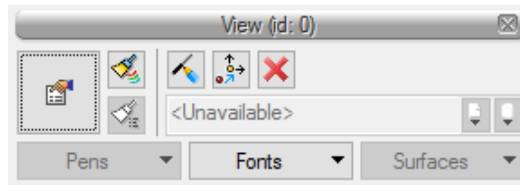





Fig. 120. Axonometry view modification window

The following functions are available in the axonometry view modification window:

-  icon – used to manually refresh the axonometry view,
-  icon – once the user presses this icon they can change the view anchor location in relation to the axonometry view,
-  icon – is used to remove the axonometry view.

# 12.LISTS AND MATERIAL LISTS

## Lists and material lists

### 12.1. INSTALLATION ELEMENTS LIST AND MATERIAL LIST

In order to activate the list of items used in the project, click the button in the toolbar:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_il.

To obtain a material list, click the button:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_sl.

In order to activate the list of marked items, mark the items and click the button in the toolbar:

*ArCADia software:*

- **Water ribbon** ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_sil.

In order to obtain a list of materials for the marked items, mark the items and click the button in the toolbar:

*ArCADia software:*

## Lists and material lists

- **Water** ribbon ⇒ **Water supply installations** ⇒  logical group

*AutoCAD or ArCADia-INTELLICAD software:*

- **Water supply installations** ⇒  toolbar

or write

- iwtr\_slsi.

Then the appropriate table is generated in the drawing field. The table is anchored to the mouse cursor and by clicking anywhere you can insert it into the drawing field.

Tables may be edited by clicking their frame, which activates an action window.

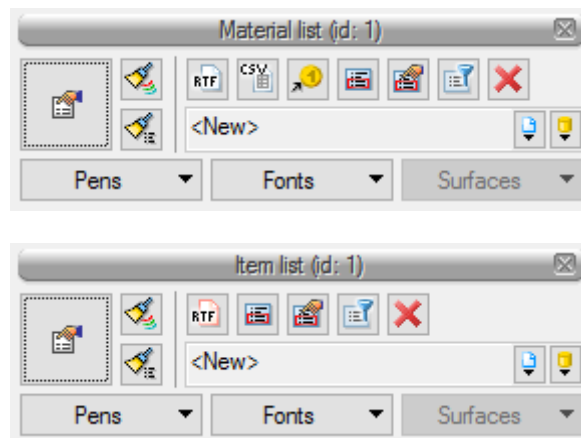




Fig. 121. Go to the material list and elements list editing window

In these windows the user may send a RTF table by clicking the  button – a window will be displayed where the user can provide a name for the file being generated and indicate its location. In the case of a Material lists data may be transferred to **Ceninwest** after pressing the  button.

Additionally, you can also filter the elements or paths for the material list. Filtering types allows to limit they types of items used in the project only to those that are interesting for the designer.

Clicking the big button in the go to editing window or double-clicking the frame takes you to the table properties window.

## Lists and material lists

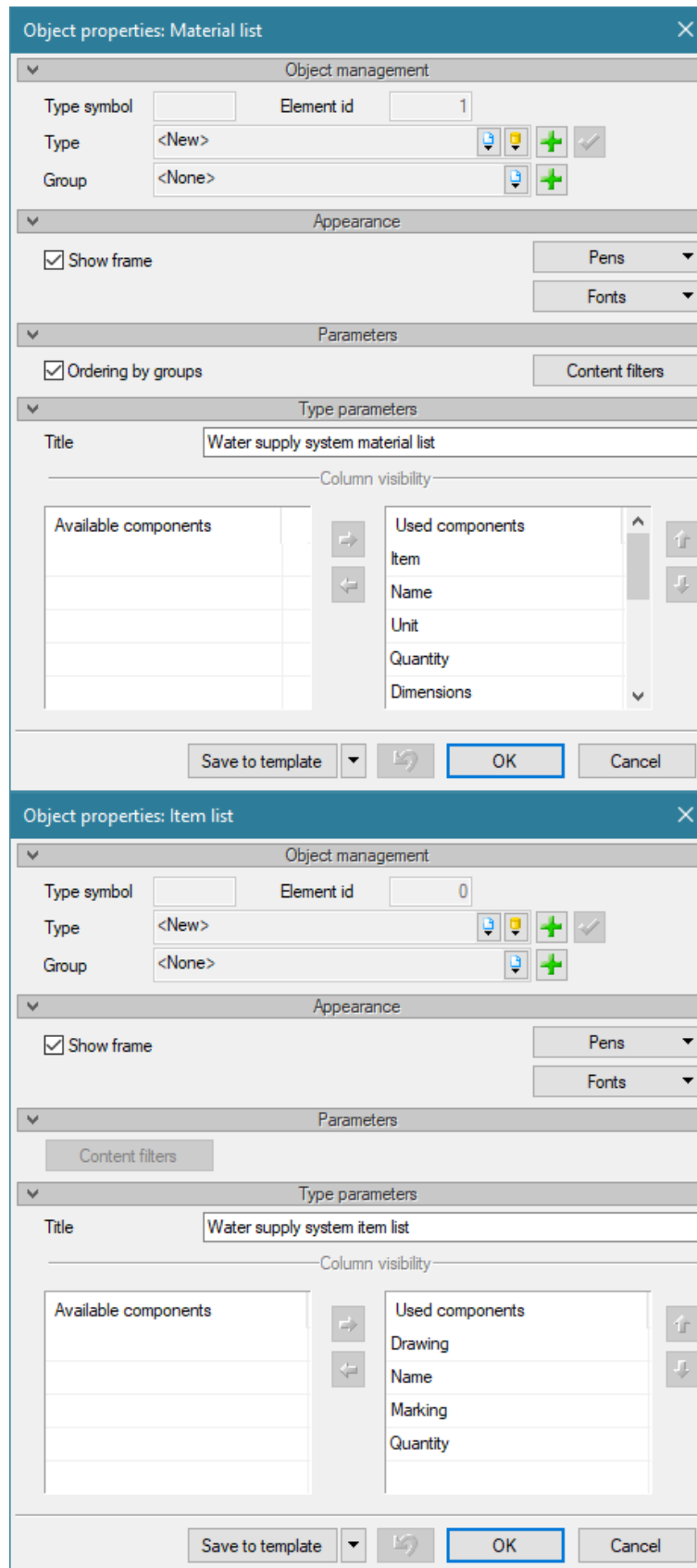




Fig. 122. Material list and elements list properties windows

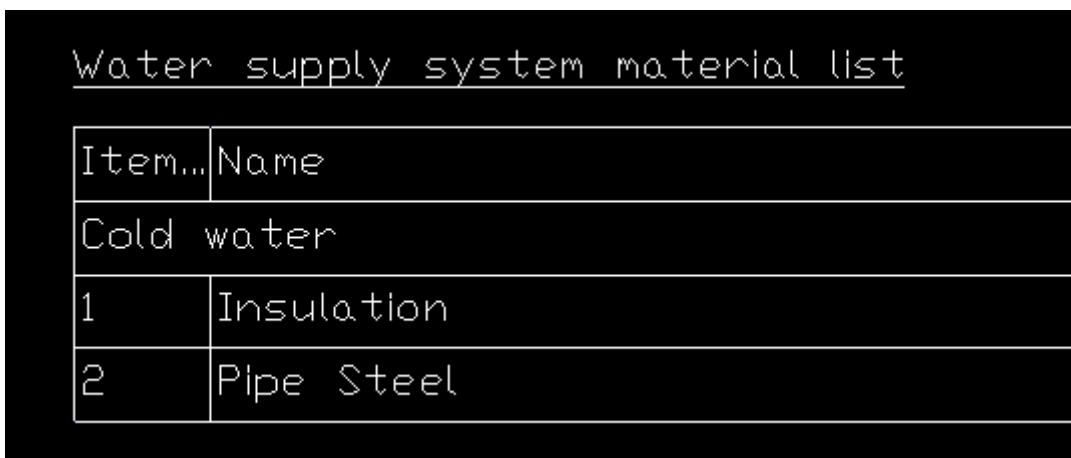
In both cases you can edit the number of columns and their order the same way. By clicking the particular component the users selects it. Then the user can transfer the element by clicking the arrow

## Lists and material lists

that indicates the specific table (side arrows). You can set the order of columns using the up and down arrows. If you click the proper vertical direction with a component marked, it will move the used components in the table. The order of the rows in the table corresponds to the order of the columns in the material list table.

A **Material list** or an **Item list** may be selected after inserting. In such a case a modifications window with the Marking selected elements on the projection  icon becomes available. After clicking on a given icon the user may define the position in the list using the mouse. The highlighted table row can be clicked and all the elements from this row will be selected on the projection.

In order to change properties for all selected elements, e.g. type parameters (diameter, manufacturer, connection type or other parameters), you must click the icon  **Change properties of selected elements**.



Item...	Name
	Cold water
1	Insulation
2	Pipe Steel

Fig. 123. Settings view with selected elements