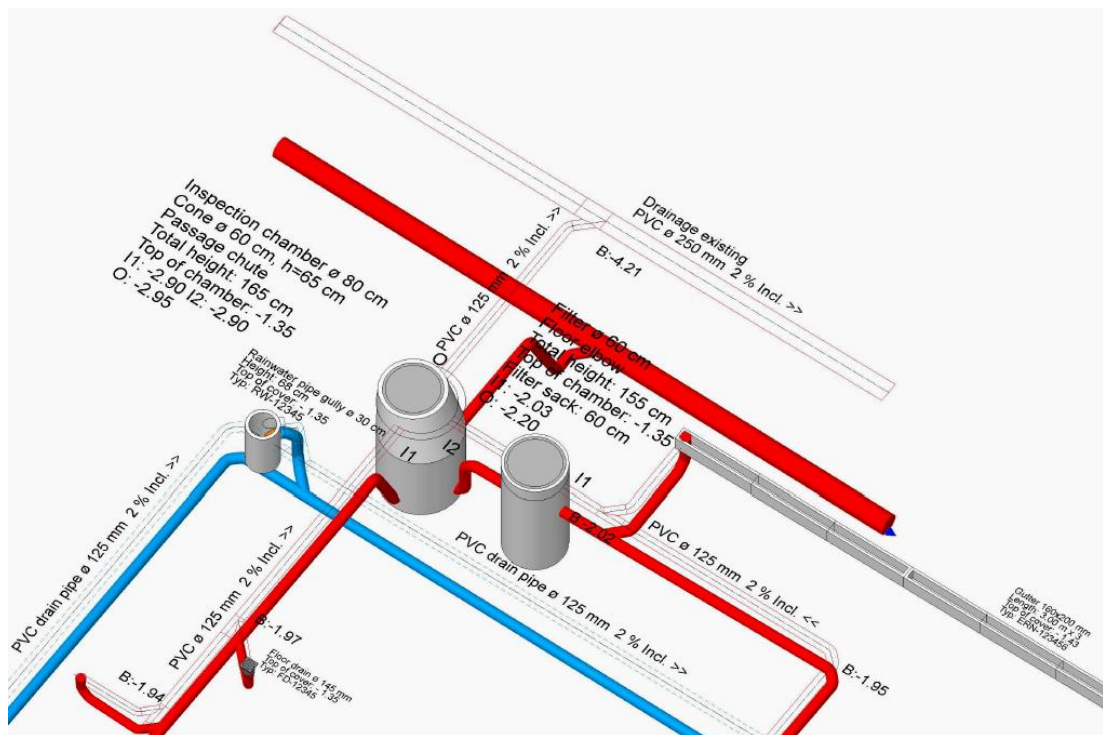


COURSE UNIT



Drainage

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INTRODUCTION

Drainage is an additional module and requires its own code word.

How to use this course unit

This course unit is not a manual but a combination of theory and workshops with which to learn the programme on a 1-to-1 basis. Every mouse-click and every entry is described in detail, providing you with a teaching resource that lets you learn the basics of the programme by yourself. Each chapter provides explanations, information, and a workshop to practise the functions. To enable the workshops to be completed smoothly, the explanations should be read through very carefully. The order of chapters should not be changed because each workshop builds on the previous one. The programme DVD contains examples stored as an ELITECAD file, enabling problematic places to be reviewed.

Conventions used in this course unit

The start and end of a workshop are marked as follows:

▼ ▼ ▼ ▼ **WORKSHOP**

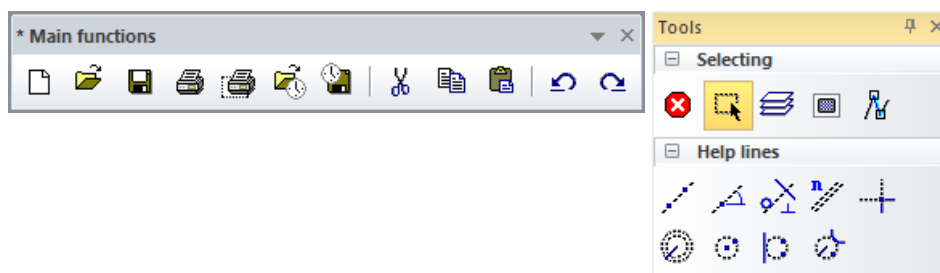
WORKSHOP END

Functions are written in block capitals. The corresponding icon also appears for new functions.

FUNCTIONS (BLOCK CAPITALS)



Functions can be accessed directly using icons (buttons). The functions are grouped together in toolbars or in the large tool management.



[Enter]

Function keys on the keyboard appear within square brackets.

Input values (bold)

Input values must be entered using the keyboard. When the text is entered in the input line, it must be confirmed with the [Enter] key.

Scope of function of the ELITECAD drainage module

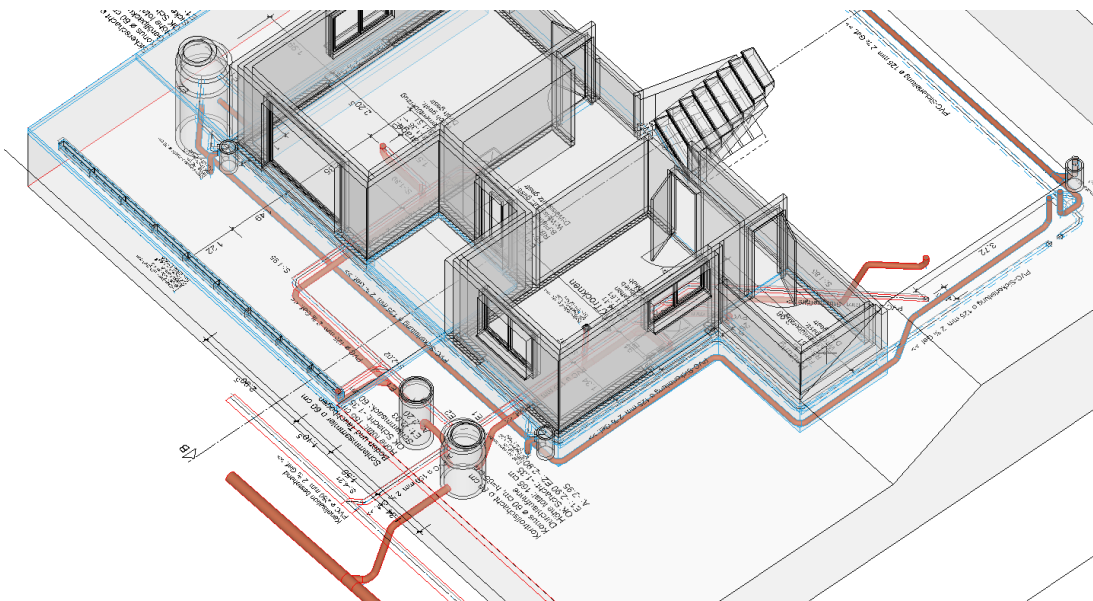


Input functions:

- LOAD POINT:** The highest point of a circuit section (e.g. device connection, inlet)
- CHAMBER:** Container at the lowest point of a circuit section. Type and measurements can be parameterised.
- CIRCUIT:** The axis of a circuit is entered in the plan in the same way as a poly line.
- SLOPE CALCULATION:** calculates the axis of the circuit in the room with the specified intended slope. Requirement: Load point and pipe axis are defined.
- DROP:** Overcoming of height shifts with specified angle. **SET HEIGHT:** Definition of a binding height in a point of the circuit.
- RAISE/LOWER LOAD POINTS:** Calculation of perpendicular circuit components independently of cross-section. Afterwards visible in the 3D model.
- THREE STRIPE:** Generates the display of the circuit in the floor plan and in the model with all fittings and attributes.
- LABEL:** Generates the label for the parameterised objects.

Automatic functions

Layer assignment of all components, bill of quantity, height calculation as of +/- 0.00, sea level or as of current storey, error control.



THEORY

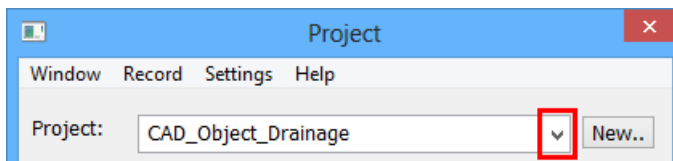
The drainage module is based on standard products available on the market. As a result, possible nominal widths and the form of components such as pipes and chambers are predefined. Suitable minimal values for branchings are taken into account by ELITECAD. The detailing of the branching with the necessary 45° angle and connecting pieces is automatically performed by the drainage module. The result of a drainage drawn with the module is therefore always an automatically generated 3D module which can be checked with the corresponding Report.

PREPARATION

▼ ▼ ▼ ▼ WORKSHOP

In this course unit we start with the CAD_Object_Drainage. First, load the project.

1. Open the project settings.



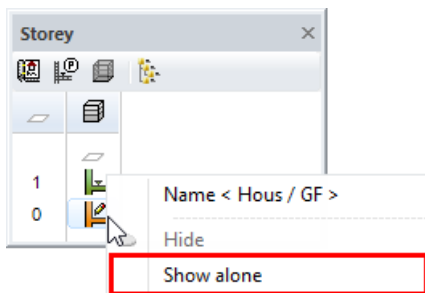
Select the project "CAD_Object_Drainage" and confirm it with OK.

2. Load the corresponding model file by clicking FILE > OPEN from the menu. Select the model "Starting Position".

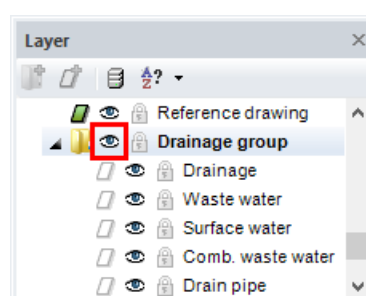
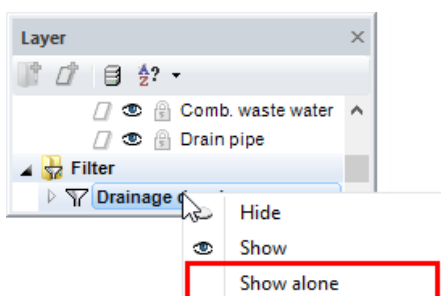
3. Menu INSERT > REFERENCE DRAWING > LOAD INTO
Import the prepared drawing "**Reference.d**".

4. Switch the "GF" floor to visible.

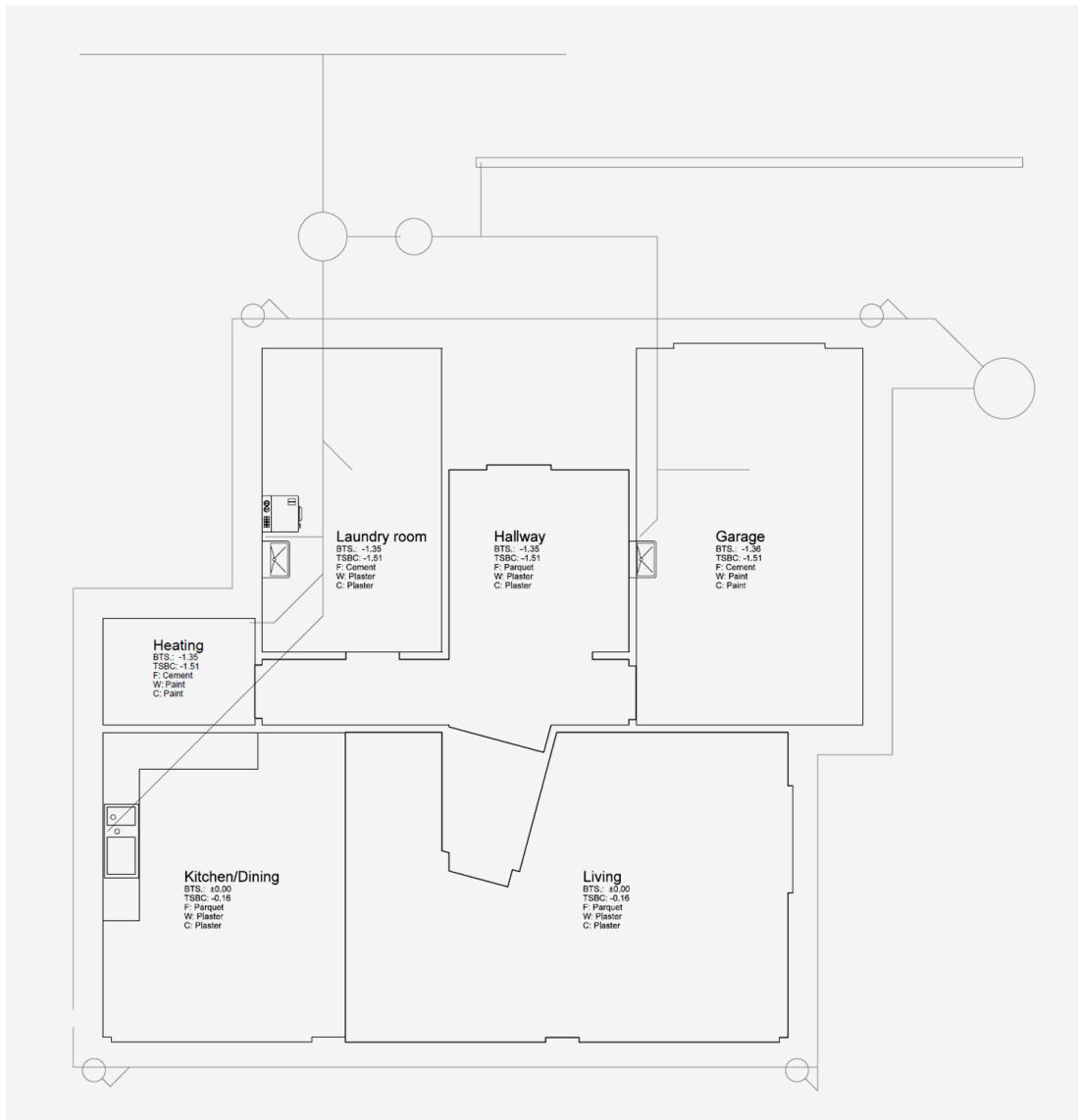
In the list of storeys, right-click on "GF" and select the option "Show alone" or double-click on the Storey icon.



5. Via layer management, show only those layers that you require for the next steps. Right-click on the name of the filter "Drainage drawing" and select *Show alone* and make the layer group "Drainage group" visible. For better orientation the room contours are also visible.



You should now see the following on screen:



A detailed description of the reference plan function can be found in the FUNCTIONS section of this course unit.

WORKSHOP END

WASTE WATER PIPES

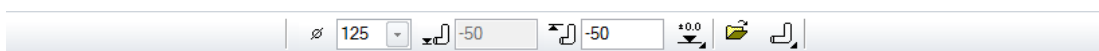
To show a drainage network, the determining values of the circuit such as height and location of begin points, end points and drops must be known. In the example the location is predetermined by the reference drawing.

▼ ▼ ▼ ▼ WORKSHOP

1. Enter load points



The first load point **P1** for the drainage water of the kitchen is at **-50** (14 cm below UK slab south). Ensure that the GF storey is active and enter the following values:



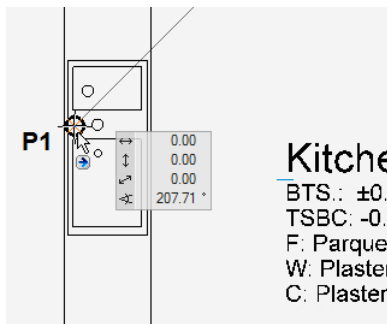
Nominal width: **125**

Connection height: **-50** (14 cm UK slab)

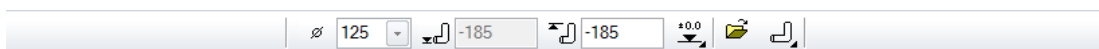
Height ref. **±0.00**

Conn.type - **up**

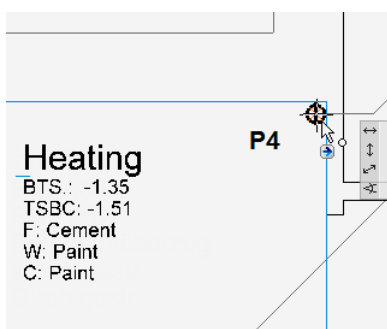
Click on the end point of the circuit in **P1**.



The second load point **P4** is the floor drain in the boiler room. Set the connection height **-185** (14 cm below the UK slab North).

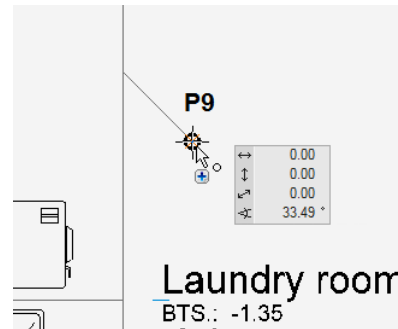
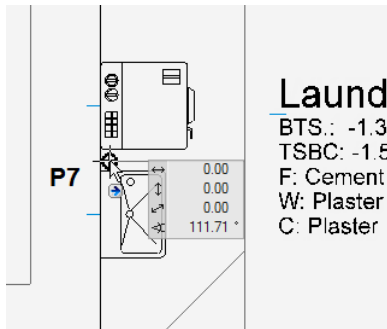


Click on the end point of the circuit in the boiler room **P4**.



The next two load points **P7** and **P9** are located at the same height as **P4** but have the nominal width 100. Enter the value and click on the end points of the circuit.





End the function.

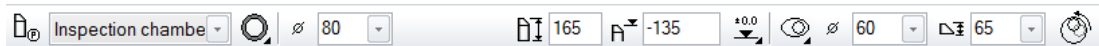
TIP

Clicking on a load point opens the properties bar with the values of the relevant load point.

2. Set inspection chamber



In ELITECAD, inspection chambers (manholes) are parameterisable objects. The top side of the chamber is at -135. Enter the following values:



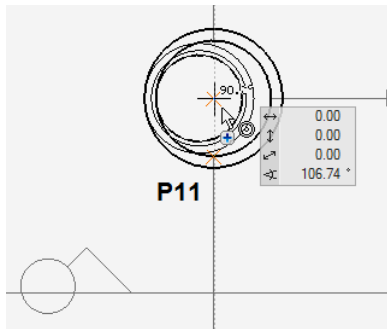
- Chamber type: **Inspection chamber**
- Chamber geometry: **circular**
- Nominal width: **80**
- Chamber height: **165**
- Top side: **-135**
- Height ref. **±0.00**
- Cone type: **eccentric cone, entry narrow side**
- Cone diameter: **60**
- Cone height: **65**

The entry should be located on the left-hand side, therefore rotate the chamber by 180 degrees before positioning it.

Click on LOCATE and set the angle of rotation.



The chamber symbol now appears on the cursor. Move the cursor under **P11** until a perpendicular, temporary help line appears, then move the cursor towards the centre of the circle of the template and click as soon as the capture symbol **CENTRE CIRCLE** appears.



The load points and the chamber together set the start and end of the circuit section.

3. Draw circuit



Use the CIRCUIT function to define the gradient, the dimension and the appearance of the circuits in 2D and in 3D.

Select the function and enter the following values for the first circuit:



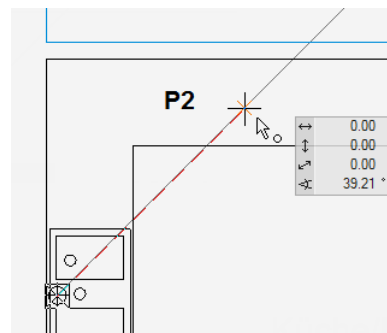
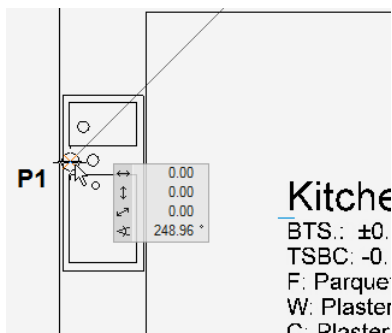
Circuit type: Waste water (pre-setting)

Nominal width: **125**

Pen colour: **80**

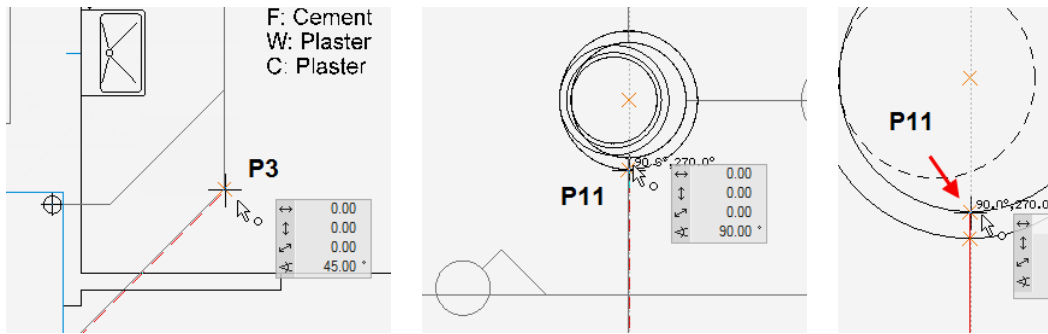
Line type: **1**

Start with the circuit at the highest point **P1** (sink in the kitchen).



Click on **P2** to define the start of a drop with which the height difference between the stores South/GF and North/GF are overcome.

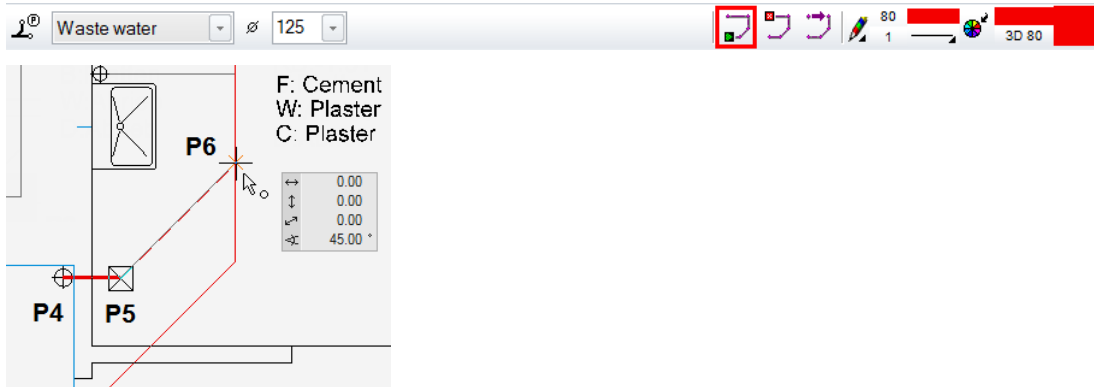
Continue with corner point **P3** and the end of the circuit in **P11** (connection to inspection chamber). Please note that **P11** is located on the inside of the chamber.



TIP

Press **[Ctrl/Strg]+[K]** to hide the 3D edges of the chamber. Click **[Ctrl/Strg]+[K]** to display the edges again.

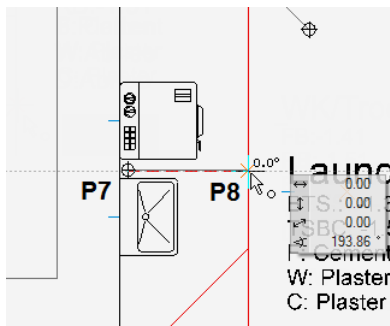
Now draw the connecting pipe of the boiler room. To do so, click on **START CIRCUIT** and draw the circuit from **P4** via **P5** to **P6** with the same settings.



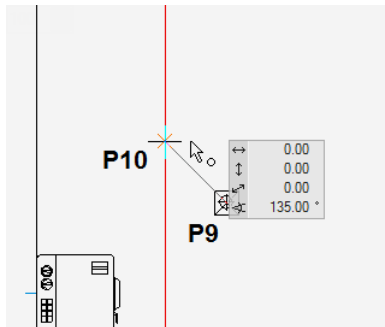
The next two connecting pipes in the laundry room have a smaller diameter. Click again on the function **START CIRCUIT** and set the nominal width to **100**.



Now draw the waste water circuit of the washing machine from **P7** to **P8**. Although the pipe layout is perpendicular along the main line, later on ELITECAD will show the connection in the correct way with a 45° branch fitting.



The drainage pipe in the laundry room from **P9** to **P10** has the same nominal width. Use the **START CIRCUIT** function to draw it.



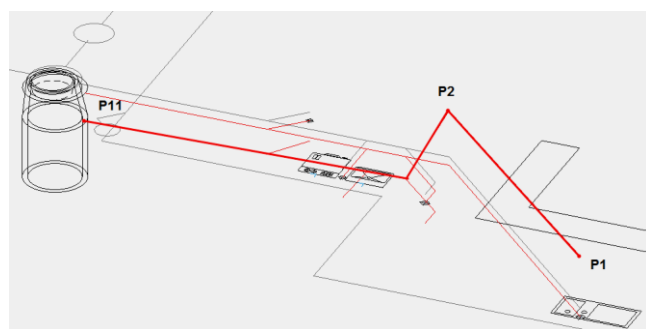
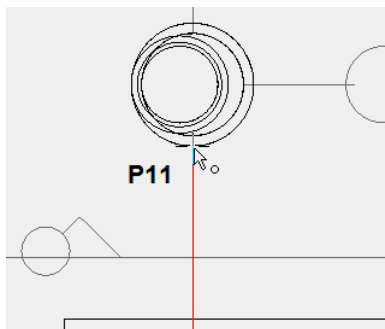
Complete the function with **[Esc]** or **END CIRCUIT**.



4. Slope calculation



For an initial estimate, a intended slope will be calculated across the entire network. For this purpose system must be told the lowest point. Click on the function **SLOPE CALCULATION** and then on the circuit at **P11**. Confirm the proposed value for the intended slope of 2%. The course of the duct will now appear in the 3D view.



TIP

Calculation of the intended slope is always in the direction of the load point until the next load or height point and must be recalculated if a new circuit is added.

5. Assign defined heights

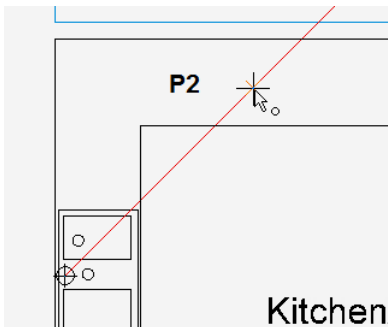


Binding heights must be set at two points: where the line must compensate for the height difference between north/GF and south/GF and then with the inlet into the chamber.

In **P2**, the bottom of the pipe must be located 14 cm lower than the UK slab of North/GF.

Select the function SET HEIGHT and click on the point in **P2**. Enter the height **-185**.

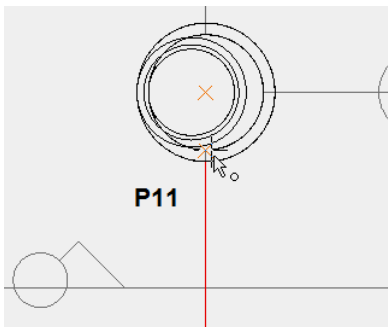
Enter height for heightreference ±0.00 (act. unit) (x=defrost)
-185



The inlet height on the chamber depends on its height and position:

- Top of chamber: **-1.35**,
- Chamber height: **1.65 m**
- Inlet height: **-2.90**

Click on the point in **P11**. Enter the height **-290**.



TIP

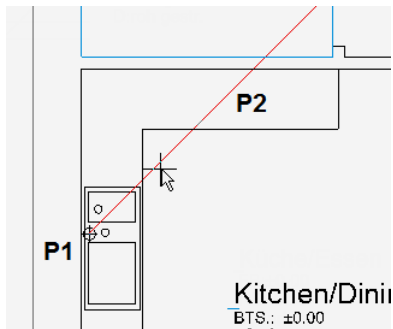
If the point cannot be selected as desired, hide the chamber and try again.

6. Cancel function [Esc], save work copy [Ctrl]+[W]

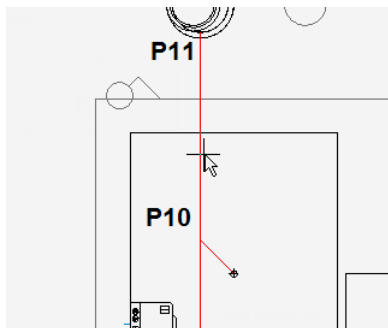
6. Set drop



Now specify where and with what angle the drop is to be calculated. Click on the function SET DROP. Click on the part between **P1** and **P2** in the kitchen. The circuit is highlighted in red. Click **[Enter]** and ELITECAD will automatically set the point for alignment. Also apply the proposed value for the height shift. When you are prompted to enter the angle, overwrite the proposed value with **67**.



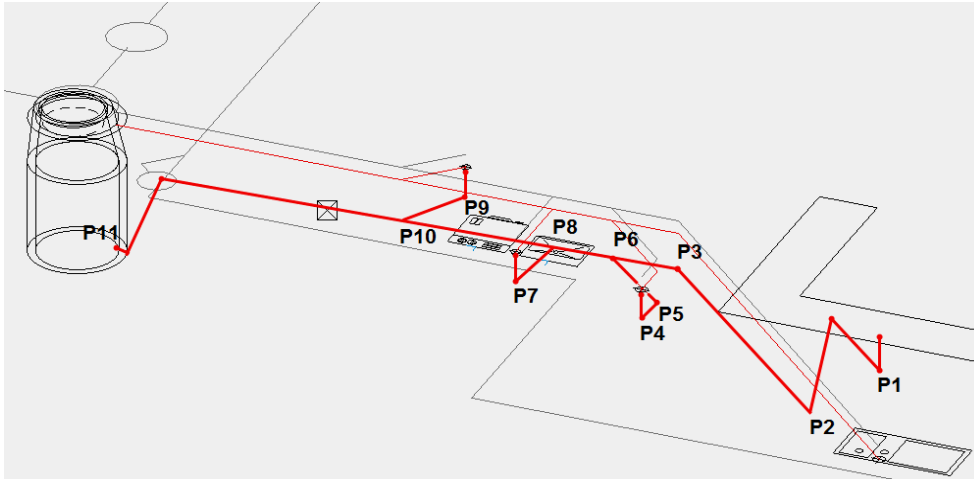
Set the values for the chamber inlet between **P10** and **P11** in exactly the same way, and respond to the remaining prompts in the same way. Cancel the function and check the view in 3D. Both drops are easily identifiable.



7. Raise load point



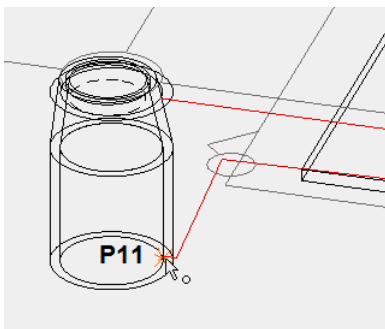
This function generates the vertical connections of the load points in the specified network. The lengths of the vertical lines are based on the nominal width. Click on the function and click on the pipe at any point. Check the result in 3D.



8. Three-line/three-dimensional display

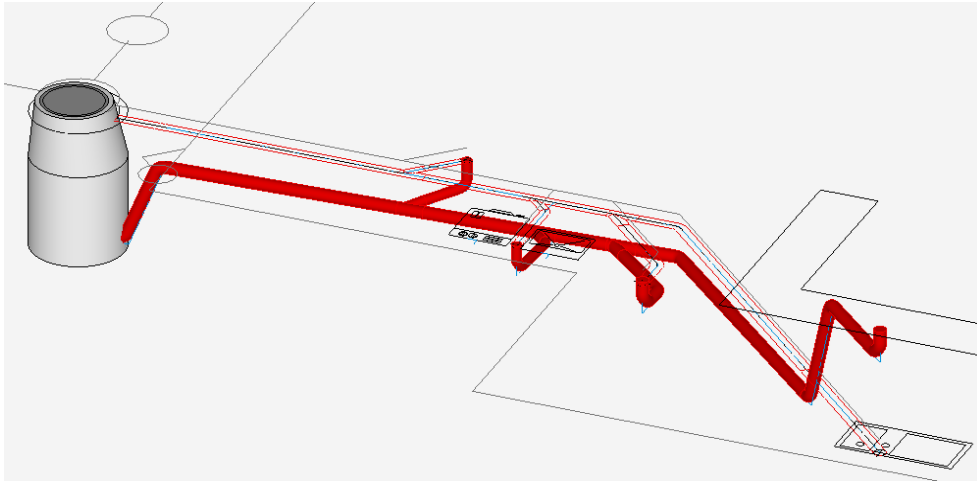


This function generates all form parts (pipes, elbows, branch fittings and reductions), the layout for the drainage plan and the 3D model as separate object. Following selection, click on the function in the 3D view or in the 2D view on the end of the pipe in **P11** (inside of the chamber).

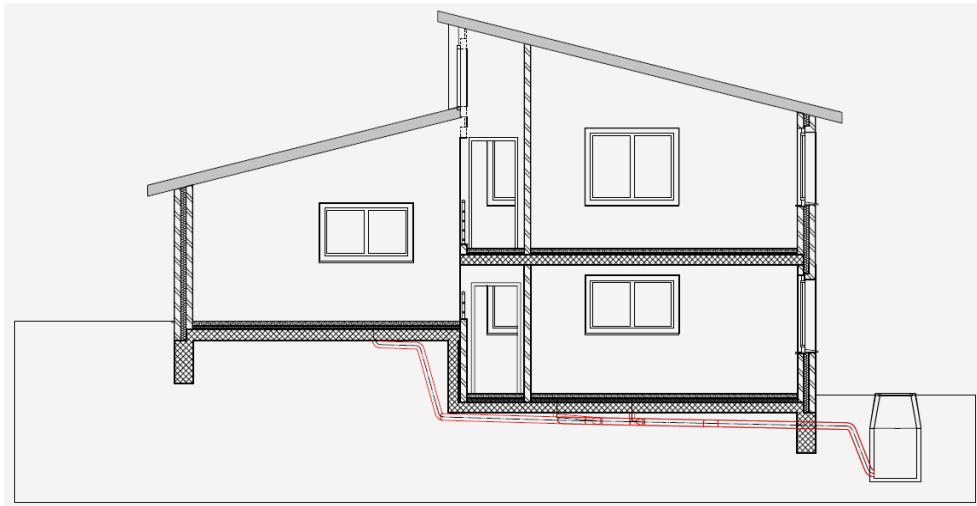


ELITECAD now generates the circuit with all fittings and the views in the plan and in the model. Floor drainage, channels and other parts will later be inserted as library parts.

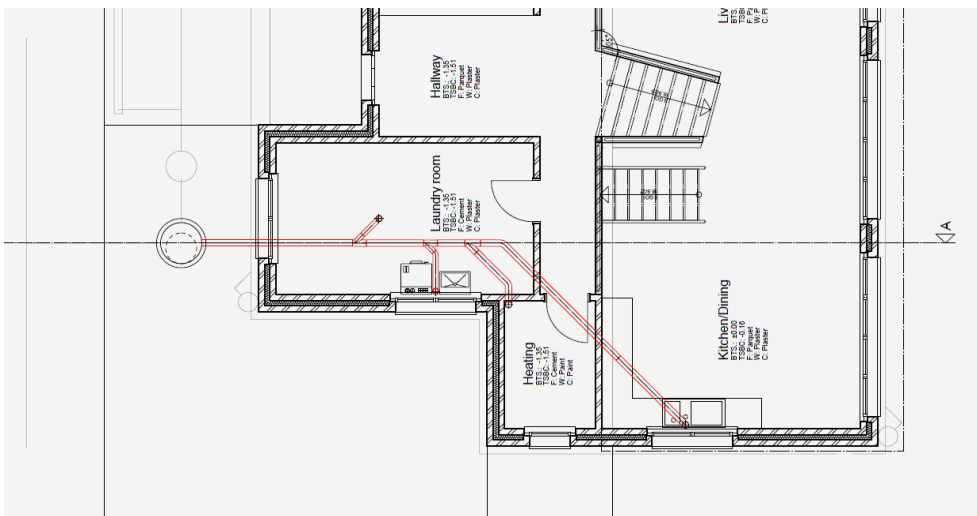
3D model



2D section



Floor plan

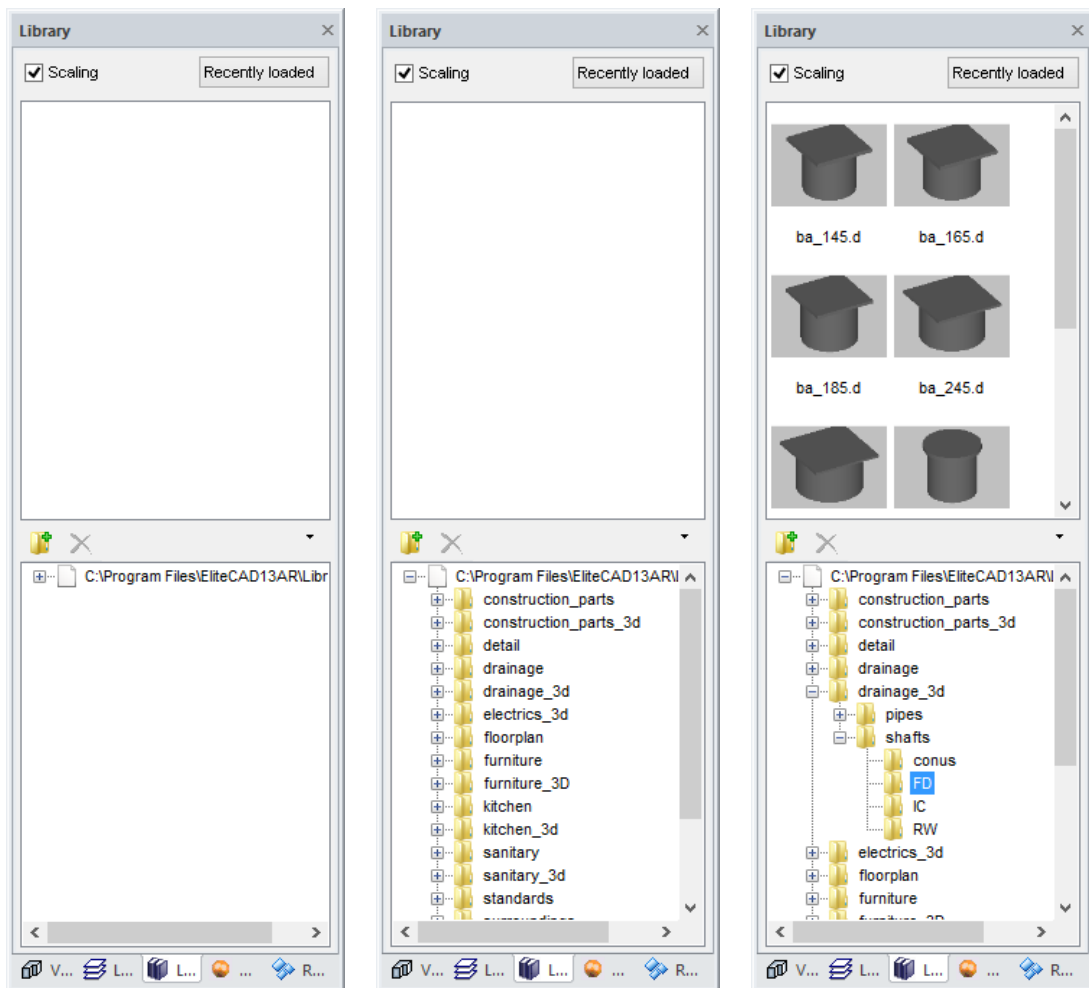


LIBRARY PART FLOOR DRAIN

To be able to create a complete parts list for drainage, individual parts are placed directly from the library into the drawing.

▼ ▼ ▼ ▼ WORKSHOP

If necessary, open the LIBRARY window from the VIEW window. In the bottom half of the window, switch to the library that you require. In the event of drainage, open the library supplied by clicking on the "+", open the directory drainage_3d and the directory FD. In the top half you now see a preview of the existing floor drainages.



TIP

Use the "Recently loaded" button to access library parts already used.



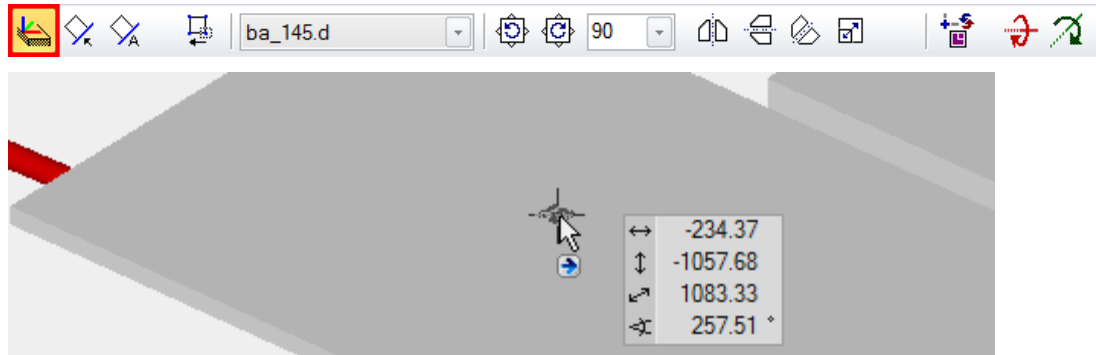
1. Apply floor drain

Click **[Ctrl/Strg]+[D]** to switch to the solid view and rotate the model in such a way that you can see the floor area of the laundry room.

Click on the floor drain **ba_145.d** in the preview window.

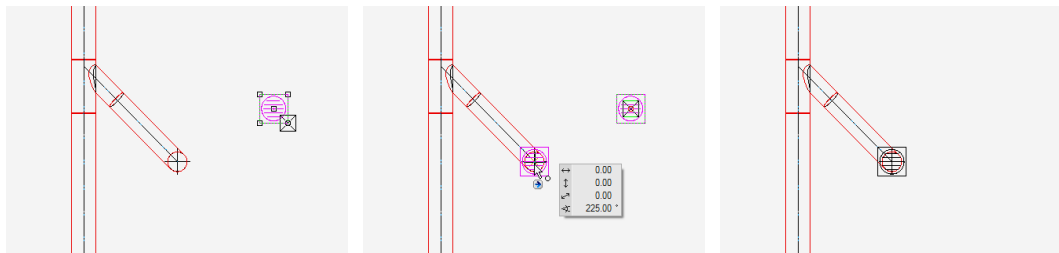
The tool bar for setting library parts appears.

Click on the function **ALIGN TO AREA / TERRAIN** and position the floor drain on the plane.



Click **[Ctrl/Strg]+[D]** to switch to the wire model and insert the view back into the top view by clicking **[Ctrl/Strg]+[Space]**.

Click on the floor drain and, using the handle, move it to the centre of the plane in **P9**.



6. Cancel function **[Esc]**, save work copy **[Ctrl]+[W]**

WORKSHOP END

CONNECT TO EXISTING CIRCUIT

The chamber must be connected to the drainage via a drop. At this point, the height about sea level is 467.30. Some of the existing circuit is displayed with 2% drop.

▼ ▼ ▼ ▼ WORKSHOP

First draw the part of the existing circuit. To do so define a fictitious load point in P15, located 4 meters to the left of the connection point and therefore 8 cm higher (2% drop).

1. Load point



Set the load point in **P15** with the following values:

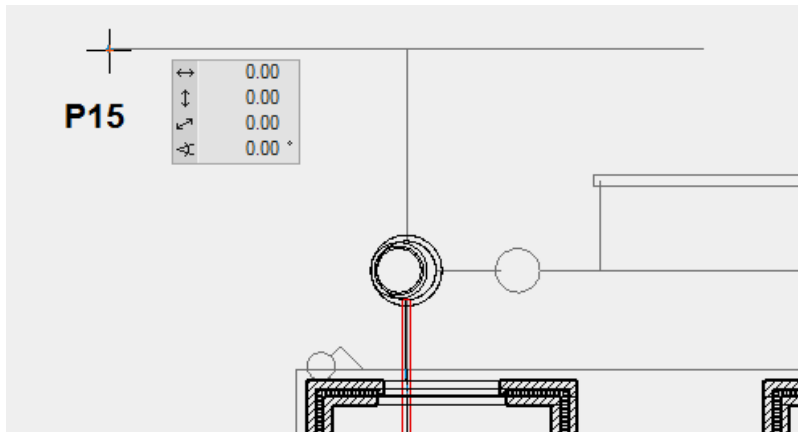


Nominal width: **250**

Connection height: **46738**

Height reference: **Sea level**

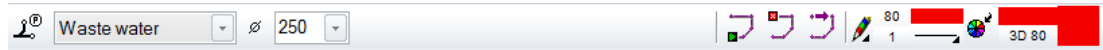
Conn.type: **horizontal**



2. Circuit



Draw the circuit from **P15** to **P16** with the following values:

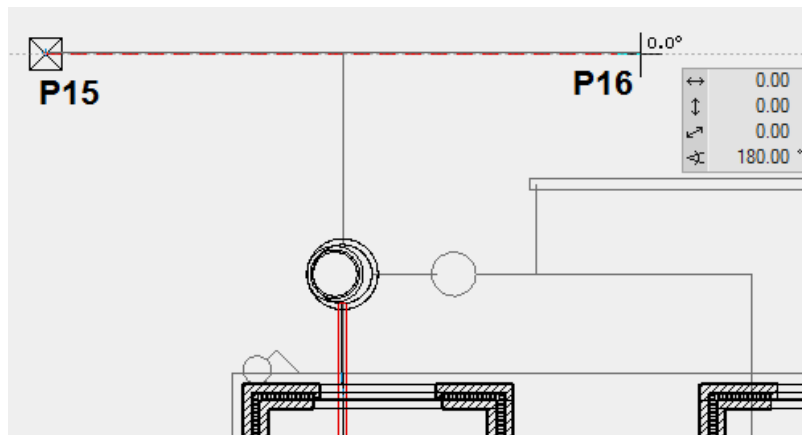


Circuit type: **Waste water**

Nominal width: **250**

Pen colour: **80**

Line type: **1**



3. Slope calculation



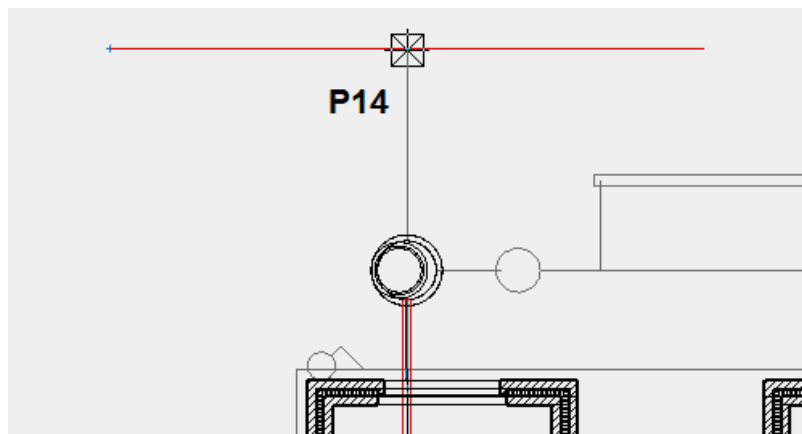
Click on the circuit at **P16** and confirm the value of **2** for the intended slope.

4. Check the connection point

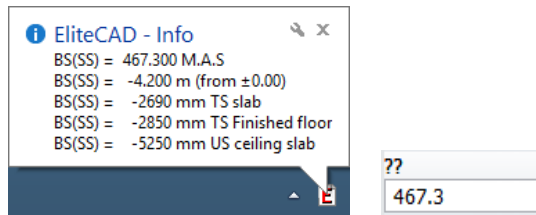


You can use this function to check the heights at any point and at any time.

Click on **P14**

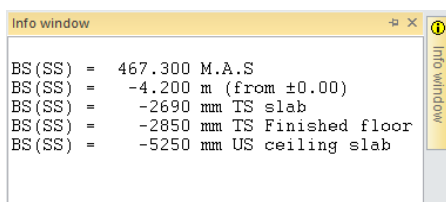


The heights in this point will be displayed at the bottom right as notification. Following cancellation of the function, the height in meters above sea level also appears in the entry line.



TIP

Clicking on the notification makes the entire info window appear. To delete the content, enter "S19" in the input line followed by [F8]



5. Load point for the connection chamber – drainage



Define the chamber outlet in **P12** with the following values:



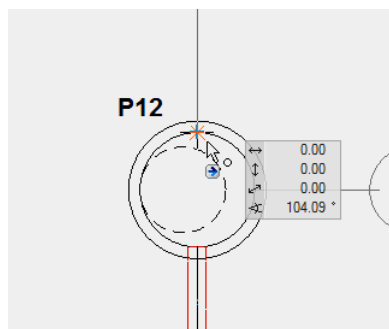
First enter the height reference: **±0.00**

Nominal width: **150**

Connection height: **-295**

Conn.type: **horizontal**

Apply the load point on the inside on the shaft edge at **P12**



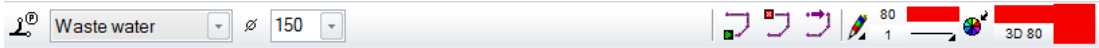
TIP

Click [Ctrl/Strg]+[K] to switch off the 3D edges of the chamber so that you can set the connection point accurately. Press [Ctrl/Strg]+[K] to switch the 3D edges on again.

6. Draw circuit



Enter the following values for the circuit:



Circuit type: **Waste water**

Nominal width: **150**

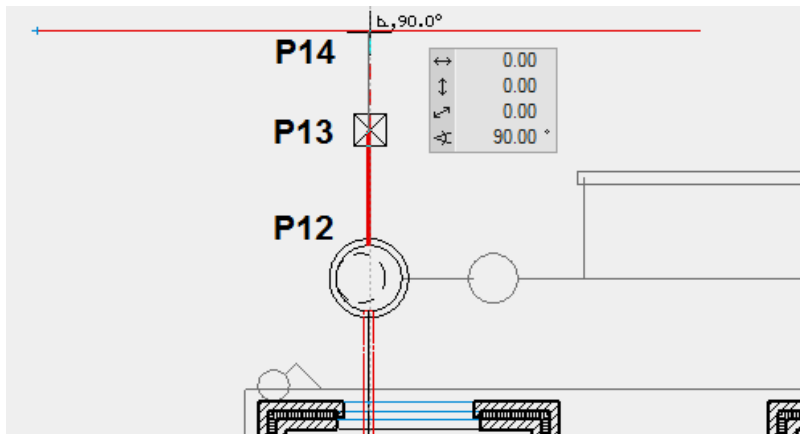
Pen colour: **80**

Line type: **1**

Start the circuit in **P12**, then click on **P13** and afterwards on **P14**. You can find **P13** by tracing the template until the capture symbol for points appears on the cursor.



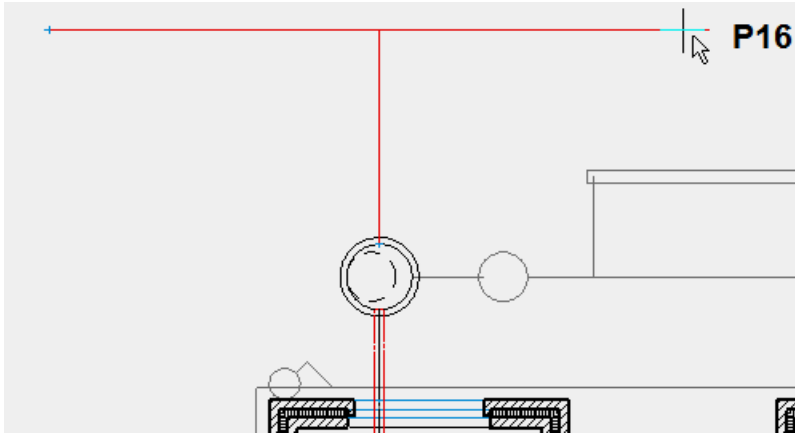
Later on a drop will be inserted at this point.



7. Slope calculation



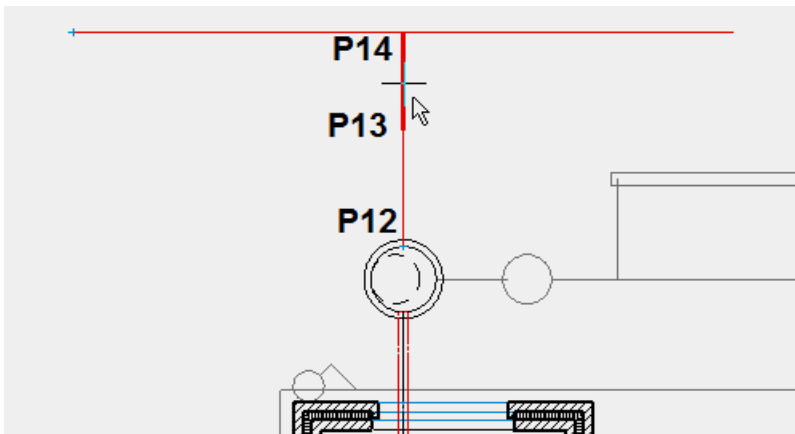
The slope must be recalculated after the connection line has been added. Click again on the circuit at **P16** and confirm the value of **2** for the intended slope.



8. Set drop



Specify where and at what angle of inclination the drop is to be calculated. Click on the part between **P13** and **P14**. Confirm the prompt asking you whether the Automatic should calculate the point and then accept the proposed value for the height shift. Afterwards overwrite the proposed value with **67**.

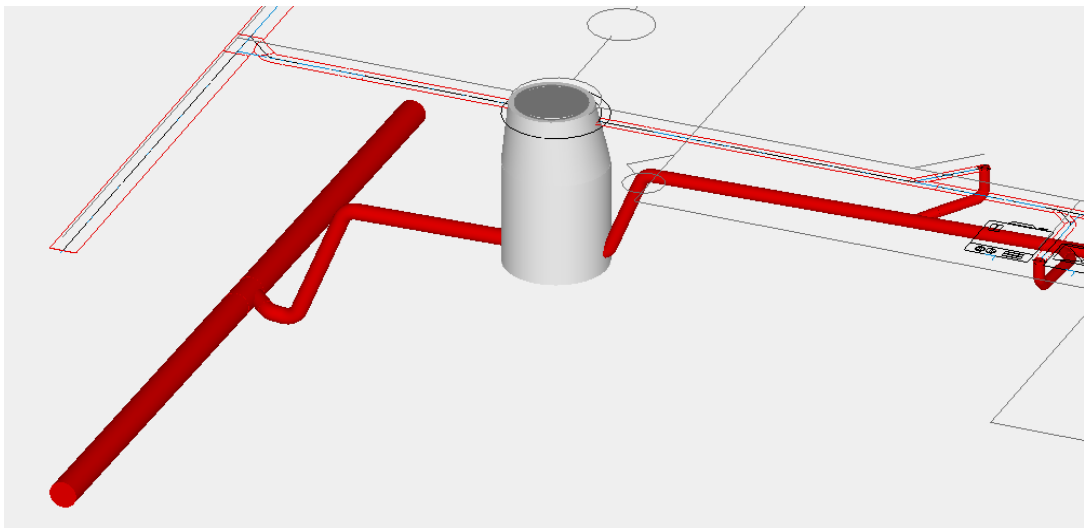
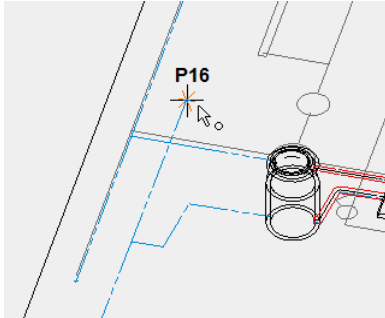


9. Three-line/three-dimensional display



The function generates the layout for the drainage plan and the 3D model as separate object.

Following selection, click on the function at the end of the circuit in **P16**.

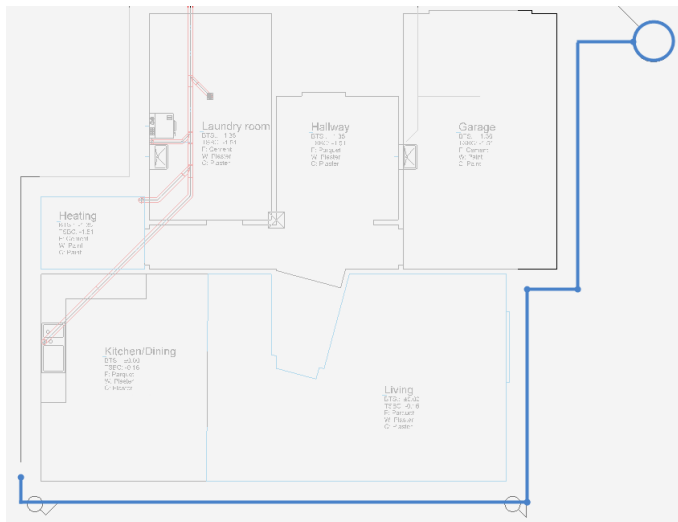


WORKSHOP END

DRAIN PIPE

The drain pipe on the south and east side must now be created. Ensure that the GF storey is still active: Even if a drainage network passes across multiple storeys, it may only belong to a single storey.

The circuit begins at the south façade with a cleaning arm and runs below the roof water connections along the east façade as far as the seepage chamber. The topographical change between the south and the north part is surmounted by a drop.

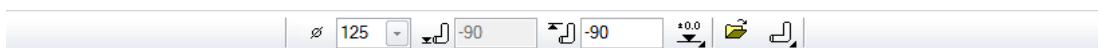


▼ ▼ ▼ ▼ WORKSHOP

1. Load point: Cleaning arm



Set the load point in **P17** with the following values:

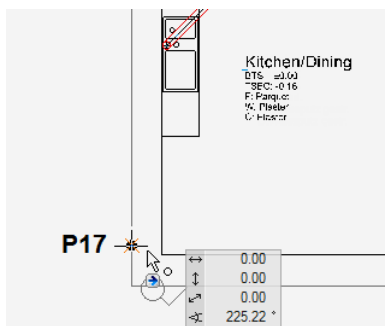


Nominal width: **125**

Connection height: **-90** (circuit must subsequently pass under the RW chamber)

Height ref. **±0.00**

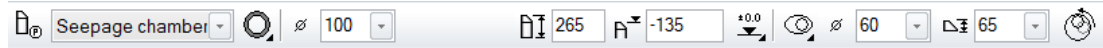
Conn.type - **up**



2. Apply seepage chamber



Upper edge chamber is located at -135. Enter the following values:



Chamber type: **Seepage chamber**

Chamber geometry: **circular**

Nominal width: **100**

Chamber height: **265**

Top side: **-135**

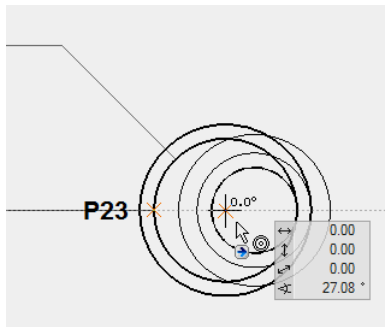
Height ref. **±0.00**

Cone type: **eccentric cone, entry narrow side**

Cone diameter: **60**

Cone height: **65**

Apply the chamber by pointing with the cursor to **P23** until a temporary help point appears. At the same time a temporary help point appears on the reference plan in the centre of the circle. Click on this point.



3. Drain pipe



Draw the circuit from **P17** to **P23** with the following values:

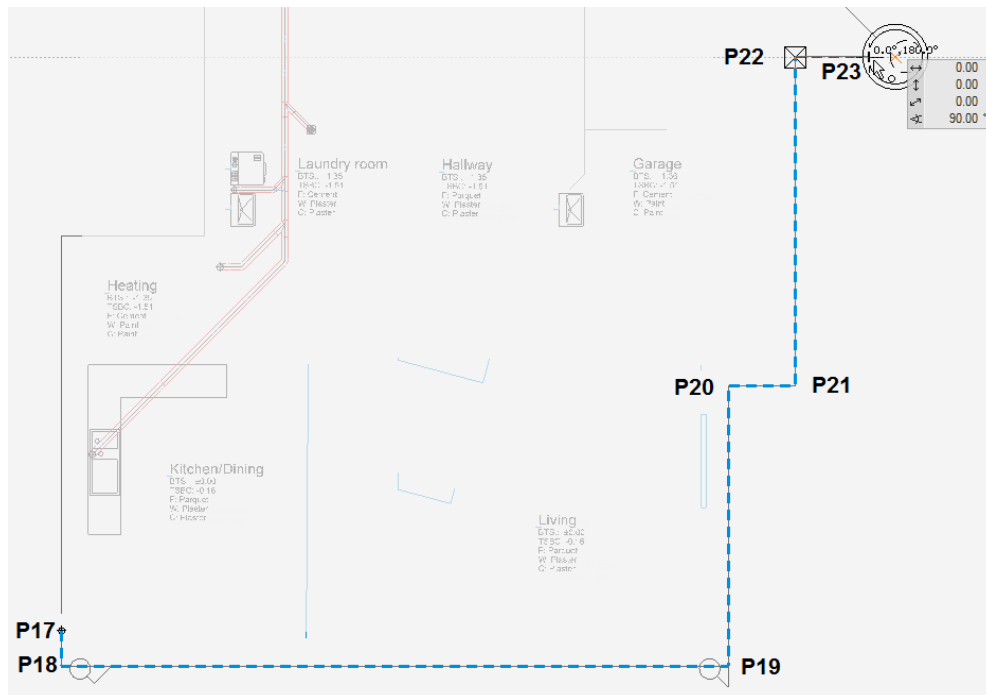


Circuit type: **Drain pipe**

Nominal width: **125**

Pen colour: **90**

Line type: **2**



4. Slope calculation



Click on the circuit at **P23** and confirm the value of **2** for the intended slope.

5. Raise load point

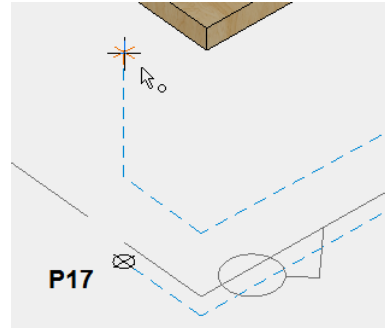
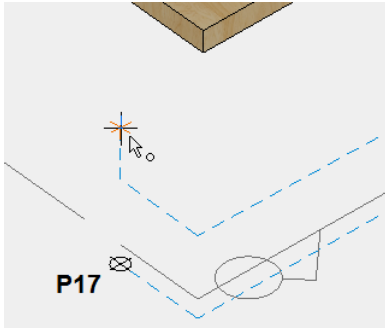


The load point in **P17** will be increased by 37.5 cm in accordance with the selected nominal width of 125 (context NW and height, see section Functions > Load point) Click on the function. When the *Select network* prompt appears, click anywhere on the pipe.

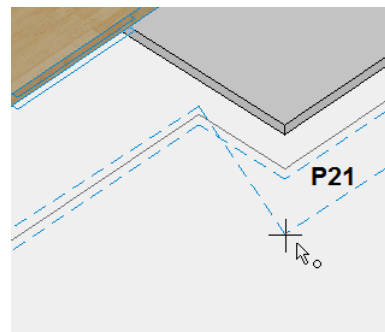
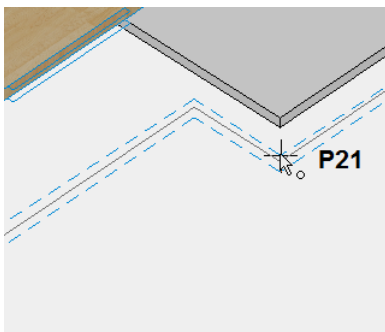
6. Set heights



Define the height at the start of the conduit in **P17** and there, where the line must compensate for the height difference between North/GF and South/GF. Rotate the model into the 3D view so that the corner is visible for the cleaning arm in **P17** and click on the upper end of the vertical line section. Enter **3** for the height. The point is raised to +0.03.



The function should still be active. Rotate the model onto the other side so that you see the line on the seepage chamber. Click on the corner in **P21** and enter the new height with **-225**.



The changes are immediately visible.

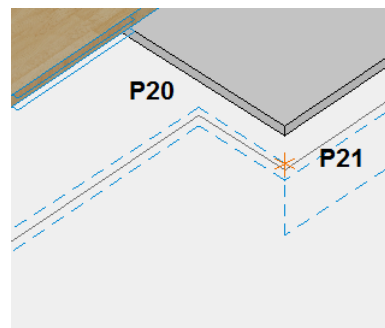
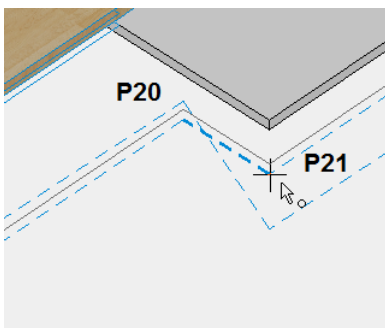
7. Set drop



The new height in **P21** is to be achieved by means of a vertical drop.

Click on the part between **P20** and **P21**. When the prompt appears *set slope at what point or <ENTER> for automatic?* Click on point **P21**.

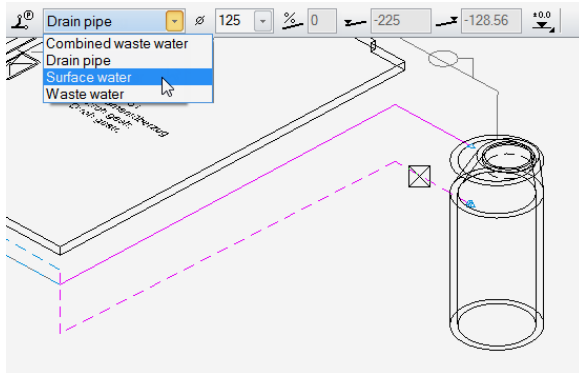
Also apply the proposed value for the height shift and confirm the angle of **90**. The vertical drop is inserted immediately.



8. Correct circuit type

The connection to the seepage chamber and the vertical connections for the cleaning arm and drop must be changed from type "Drain pipe" to type "Surface water".

Rotate the model into the 3D view and Shift-click on the parts of the line. Convert the conduit type in the configuration line.

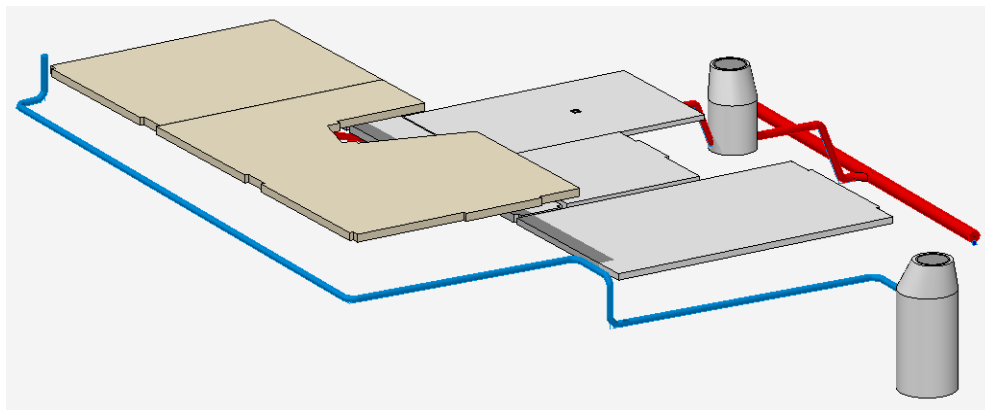
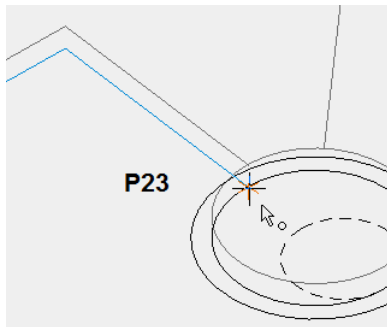


9. Three-line/three-dimensional display



Generate the 3D model and the layout for the drainage plan.

Following selection, click on the function in the 3D view or in the 2D view on the end of the pipe in **P23** (inside of the chamber).



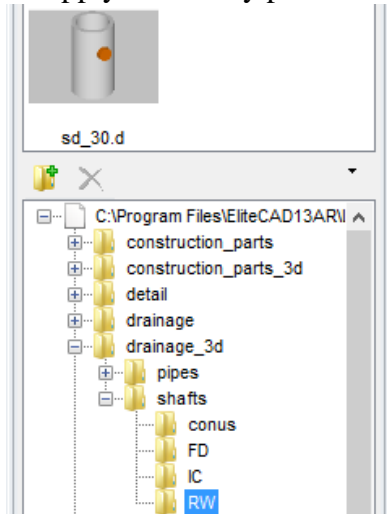
WORKSHOP END

RAINWATER PIPE GULLY

In the example one rainwater pipe gully is connected with 45° and one with 90°.

WORKSHOP

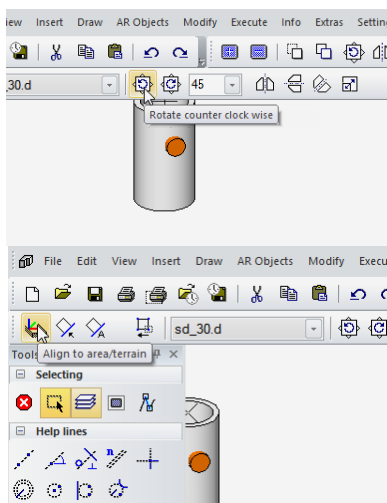
1. Apply the library part "rainwater pipe gully"



If the floor plan is to appear in the wire model, apply the solid view with [Ctrl/Strg]+[D].

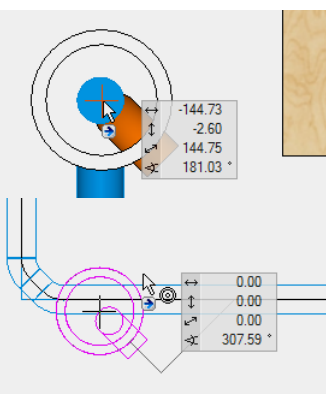
In the library window under "drainage_3d" click on the directory "RW" and on the drawing sd_30.d that appears in the preview.

The library part is now attached to the cursor.



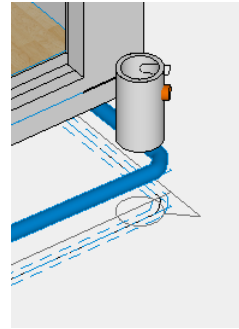
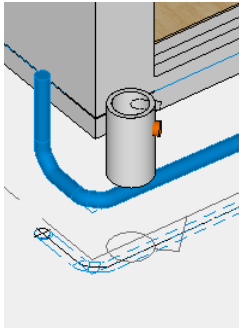
Turn the chamber counter clock wise by 45°.

Insert the location method "ALIGN TO AREA/TERRAIN".



Now place the chamber on the top of the cleaning arm in P17. The chamber will now lie at the same height with +0.03.

Click [Ctrl/Strg]+[D] to switch to the wire model and use the handle to move the chamber to the centre of the circle of the template.

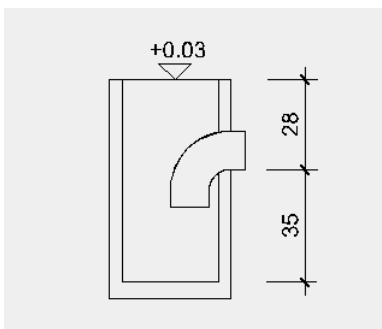


Copy the rainwater pipe gully to the right-hand corner of the south façade.

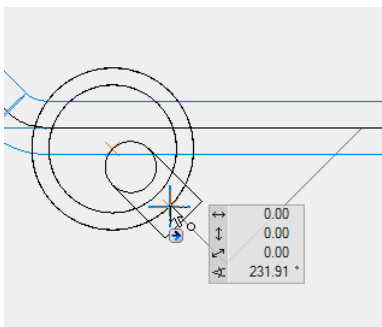
2. Load point for connection of the rainwater pipe gully



Apply the following values to the load points for both shafts:



Nominal width: **125**
 Connection height: **-25** (connection lies 28 cm below the top edge of the shaft)
 Height ref. **±0.00**
 Conn.type - **horizontal**



Rotate the model into the floor plan view with [Ctrl/Strg]+[space]. Set the load point at the section point of the rainwater pipe gully outer contour in each case, with the axis of the dip elbow

3. Circuit



For the two chambers, draw the circuit from the load point to the connection to the land drain pipe in **P25 / P19** with the following values:

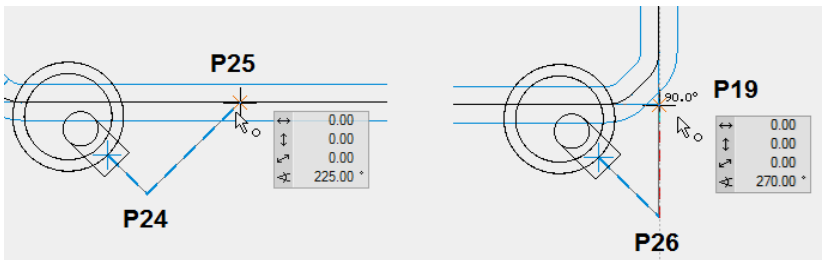


Surface water (predefined)

Nominal width: **125**

Pen colour: **90**

Line type: **1**

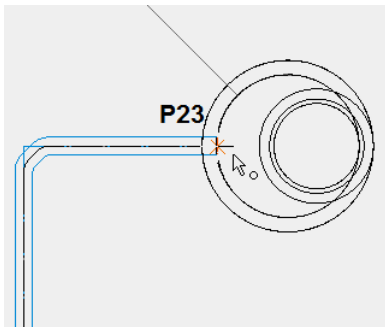


4. Slope calculation



The slope must be recalculated after the connection line has been added.

Click on the end point of the circuit for the seepage shaft in **P23** and confirm the value of **2** for the intended slope.

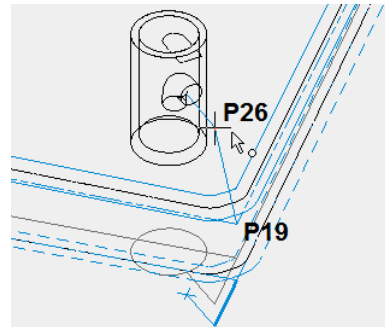
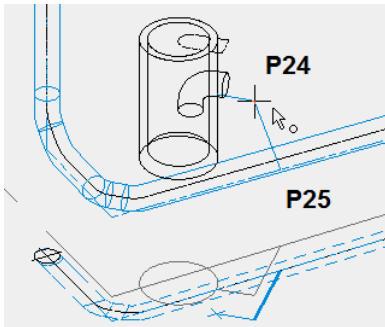


5. Set drop



Define the position and inclination angle for the drop for both shafts.

Rotate the model into the 3D view and click on the pipe layout of the left-hand shaft just drawn, between **P24** and **P25**. When the prompt appears *set slope at what point or <ENTER> for automatic?* Click on point **P24** and then accept the proposed value for the height shift and the angle of **90**.



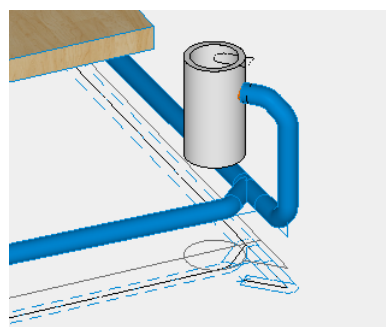
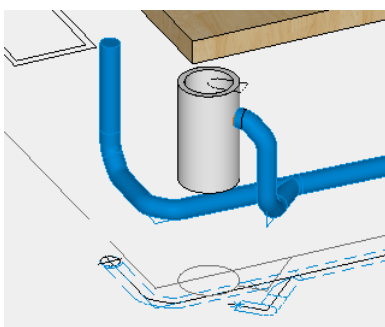
The vertical drop is inserted immediately. Apply the vertical drop between **P26** and **P19** for the rainwater pipe gully in the same way.

6. Three-line/three-dimensional display



The function generates the layout for the drainage plan and the 3D model as separate object.

After selecting the function, click on the end of the conduit for the seepage shaft in **P23**. The circuit is recalculated.



WORKSHOP END

WASTE WATER PIPE II

WORKSHOP

Now add to the waste water pipe from the garage to the Mire collector (MC) and the connection to the inspection chamber (see sketch on following page). Proceed in the same way again:

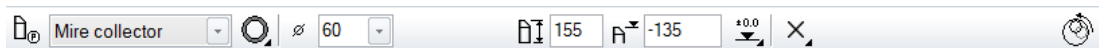
- Ensure that the storey North/GF is active and hide any layers not required.
- Set the two load points in the garage with these values:



- Set the load point for the connection circuit of the channel with these values:



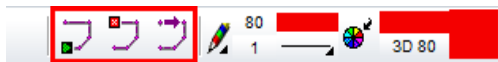
- Set the following values for the Mire collector:



- Draw the lines as far as the Mire collector (garage and connection to channel) with these settings:



- Here also use the functions for continuing and cancelling the function:



- Allow the intended slope to be calculated (2%).
- Lift up the load points.
- Set the height for connection of the channel to -138.
- Use the THREE LINE function to run calculation of the 3D.
- Apply the library parts BA in the garage and the gutter (use the height of an existing plane).
- Set the load point in the MC for connection to the IC with the following settings:



- Draw the circuit from MC to IC with a DN125.
- Calculate the slope (2%).
- Lift up the load points.
- Set the height at the IC to -290.
- Set the drop at the IC to 90°.
- Use the THREE LINE function to run calculation of the 3D.

Compare the result with the ELITECAD drawing "Drainage".

WORKSHOP END

DRAIN PIPE II

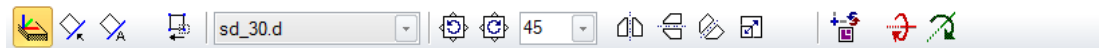
▼ ▼ ▼ ▼ WORKSHOP

On the west and north façade, now add to the drain pipe lines the corresponding rainwater pipe gullies as far as the seepage chamber (see sketch on following page). To do so, proceed as follows:

- Ensure that the storey North/GF is active and hide any layers not required.
- Set the load point for the cleaning arm:



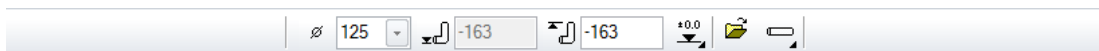
- Set the two rainwater pipe gullies by placing the first shaft on the plane of the IC to apply the same height:



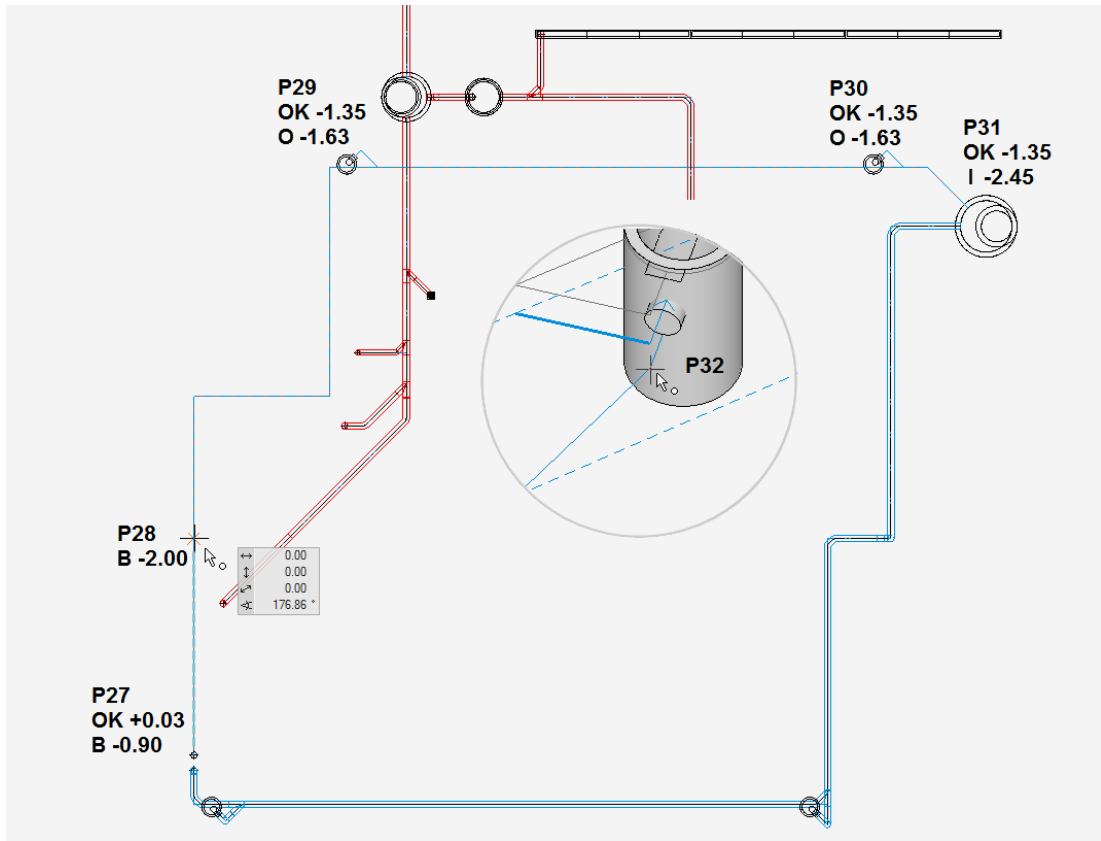
- Rotate and then move it using CAPTURE CENTRE CIRCLE to **P29** and copy it to **P30**.
- Start with the circuit in **P27** and then click on **P28** (on the reference drawing the point is displayed as capture point as soon as you run your cursor over it). Later on a drop will be inserted here.
- Draw the circuit as far as the connection to the shaft in **P31**:



- Run a slope calculation with 2% and check the 3D view. The slope of the half-circuits should be clearly visible.
- Set the heights of the floor: - 200 in **P28** and -245 in **P31**.
- Raise the heights.
- Set the height of the upper edge of the cleaning arm in **P27** to 3 (work in 3D view).
- Apply the vertical drop between **P27** and **P28**. Begin the slope at **P28** with the suggested height and an angle of 67.
- Set the load points for the horizontal connections of the RW shafts in **P29** and **P30** to -163:



- Draw the two connection lines of the RW shafts as surface water pipelines.
- Run another slope calculation with 2%.
- For the two RW connection lines, set the drop by clicking once on the angled connection to the main pipeline and click as *Point for Alignment* on the top end in **P32**. Confirm the angle of 90.
- Change the circuit type where necessary.
- Have the system calculate the 3D model and the fittings with the function THREE LINE.



Compare the result with the ELITECAD drawing "Drainage".

WORKSHOP END

LABELS

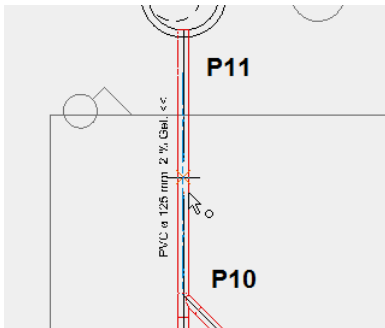
For the display in the floor plan and the section, accessories for labelling are available. The height information can be written as meters above sea level, as of project null (+/- 0.00) or in relation to the storey height.

▼ ▼ ▼ ▼ WORKSHOP

1. Labelling of circuits



Click on the pipe section between **P10** and **P11**. The text is automatically placed along the line.



The text can be manipulated as usual:

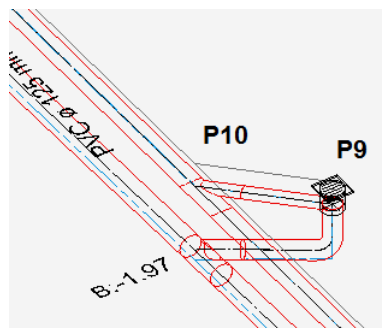
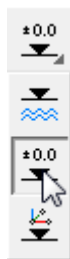
Click in partial mode or Shift-click, afterwards the text can be moved by dragging on the centre handle.

By double-clicking in partial mode, the text editor appears.

2. Label underside of pipe:



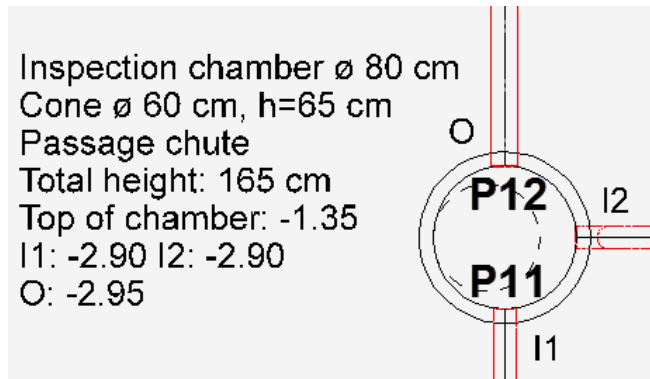
Set the height reference to ± 0.00 . Rotate the model into the 3D view and click on the base of the pipe in the connection point of the part **P9** – **P10**. Click again to locate the text.



3. Label shaft



Switch back to the 2D view with **[Ctrl/Strg]+[space]** and switch off the 3D edges with **[Ctrl/Strg]+[K]**. Click on the inlet in **P11** and position the text "I1". You could now position additional inlets that are automatically numbered consecutively by ELITECAD. After "I2" click again on the **[Esc]** key and ELITECAD will switch to labelling of the outlet. Click on the base of the shaft in **P12** and position the text "O". Next the text appears for shaft description on the cursor. Position this text as well.

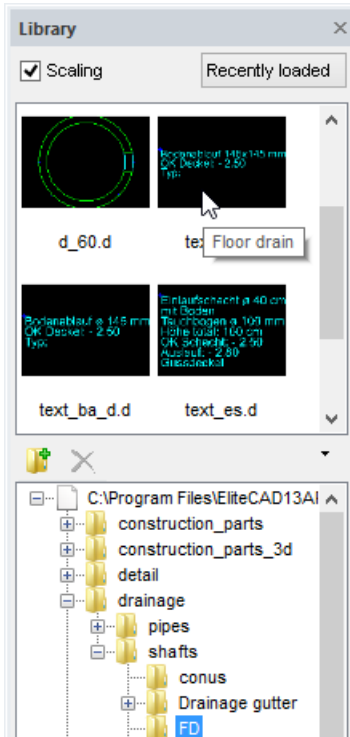


TIP

The texts of the drainage label are automatically stored in the relevant layer. Drainage parts and their corresponding texts represent one object. Clicking in selection mode element part or with the **[Alt]** key depressed activates only the text. The text settings correspond to the text parameter "circuit" and "chamber".

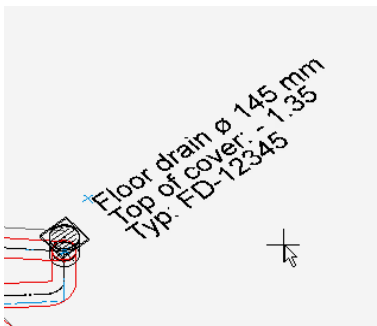
4. Labelling of non-parameterised drainage parts

For the parts inserted from the library, prepared texts are also available at the same location which can be imported and adjusted:



- | | |
|-------------------------|-----------------|
| Rainwater pipe gully | RW\text_dws.d |
| Floor drain rectangular | FD\text_ba.d |
| Floor drain round | FD\text_ba_d.d |
| Inlet shaft | FD\text_es.d |
| Inlet channel | FD\text_rinne.d |
| Inspection chamber | IC\text_ks.d |
| Mire collector | MC\text_ss.d |

In the library window click on > **drainage > shafts > FD > text_ba.d**
 And label the floor drain at **P9**.



Change the text to suit your needs:
 Click with SELECTION ELEMENT PART on the text and enter the values.



WORKSHOP END

PARTS LIST

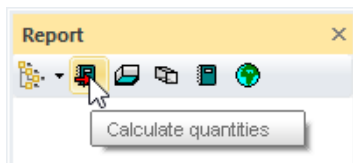
The parts list is part of the evaluation and can be accessed via the function Quantities manager.

▼ ▼ ▼ ▼ WORKSHOP

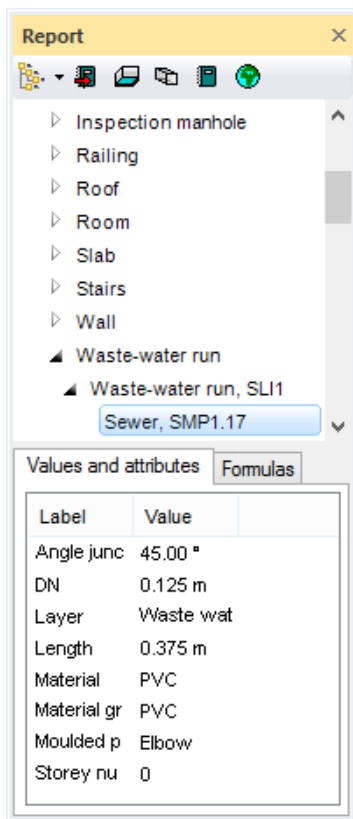
1. First open the Quantities manager.



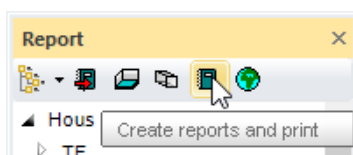
2. Run an evaluation in the database.

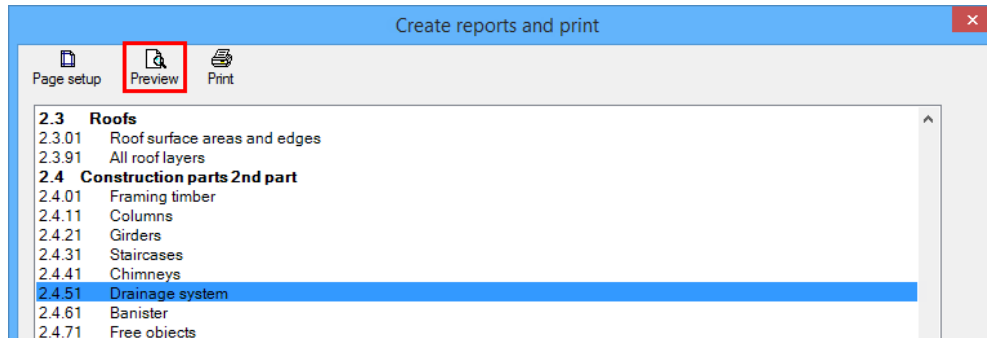


3. In the top half of the window an overview appears of the individual components and below it the values and attributes of the individual component just clicked on.



The list function provides you with a complete parts list of components used.





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Drainage system

Project CAD_Object_Drainage
Variant Drainage.d

Structure Hous

Sewer PVC DN 100 mm

No.	Length	Number	Total
SP1.10	0.07 m	1	0.07 m
SP1.4	0.14 m	1	0.14 m
SP1.2	0.36 m	1	0.36 m
SP1.7	0.48 m	1	0.48 m
Total		4	1.05 m

Sewer PVC DN 125 mm

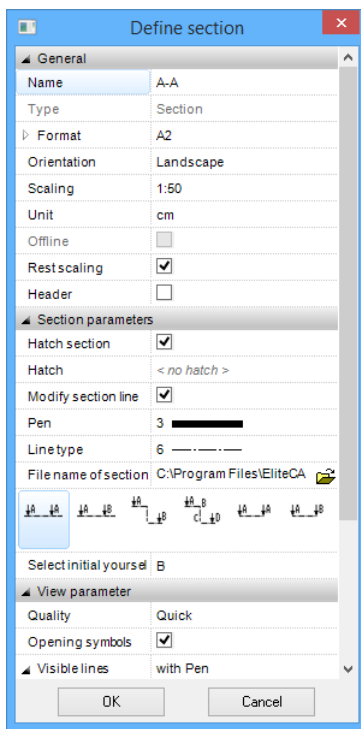
No.	Length	Number	Total
SP15.1, SP11.31, SP11.20	0.00 m	3	0.00 m
SP16.10	0.01 m	1	0.01 m
SP12.4, SP13.2, SP16.2	0.02 m	3	0.05 m
SP13.25	0.03 m	1	0.03 m
SP11.18, SP15.9, SP12.8, SP11.27, SP14.18, SP14.12	0.05 m	6	0.32 m
SP13.8, SP16.16, SP16.8	0.07 m	3	0.21 m
SP11.15	0.08 m	1	0.08 m
SP14.15	0.10 m	1	0.10 m
SP16.13	0.13 m	1	0.13 m
SP13.19	0.17 m	1	0.17 m
SP13.5	0.23 m	1	0.23 m
SP15.4	0.25 m	1	0.25 m
SP14.6	0.29 m	1	0.29 m
SP15.7	0.31 m	1	0.31 m
SP16.5	0.34 m	1	0.34 m
SP11.28	0.38 m	1	0.38 m
SP13.22	0.46 m	1	0.46 m
SP13.32, SP11.19	0.53 m	2	1.05 m
SP14.23	0.54 m	1	0.54 m
SP14.3	0.69 m	1	0.69 m
SP11.33	0.70 m	1	0.70 m
SP14.13	0.72 m	1	0.72 m
SP11.13	0.83 m	1	0.83 m
SP11.24	0.89 m	1	0.89 m
SP14.9	0.99 m	1	0.99 m
SP12.6	1.05 m	1	1.05 m
SP11.11	1.11 m	1	1.11 m
SP13.26	1.17 m	1	1.17 m
SP11.22	1.18 m	1	1.18 m
SP12.1	1.40 m	1	1.40 m
SP11.35	2.33 m	1	2.33 m
SP14.19	2.69 m	1	2.69 m
SP11.30	3.04 m	1	3.04 m
SP14.22	3.31 m	1	3.31 m

4. Close the evaluation manager again.

DRAINAGE SECTION

The 3D components created with the drainage module are also represented in the section.

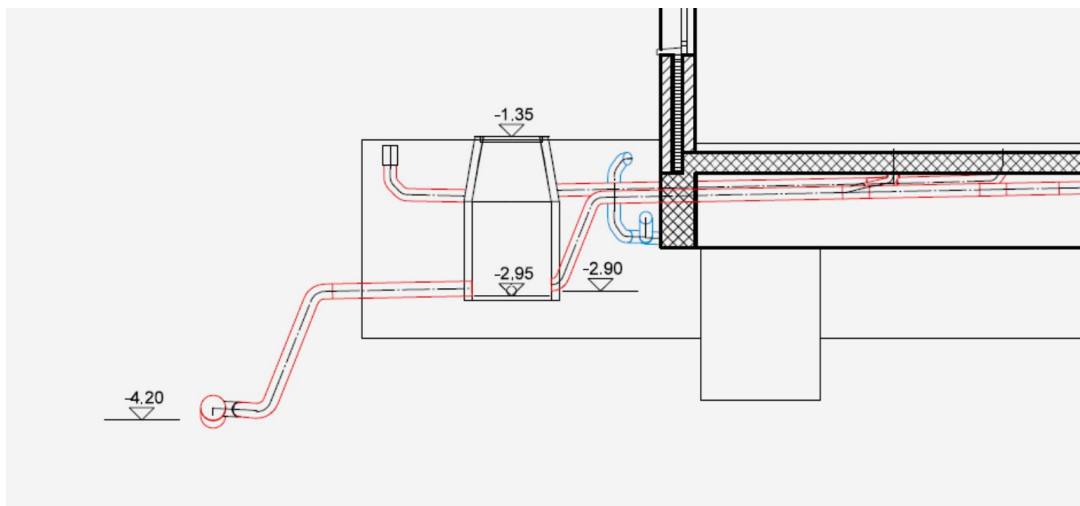
▼ ▼ ▼ ▼ WORKSHOP



Create a long section through the main pipe along the axis.

You can add markers, dimensions and texts to the section.

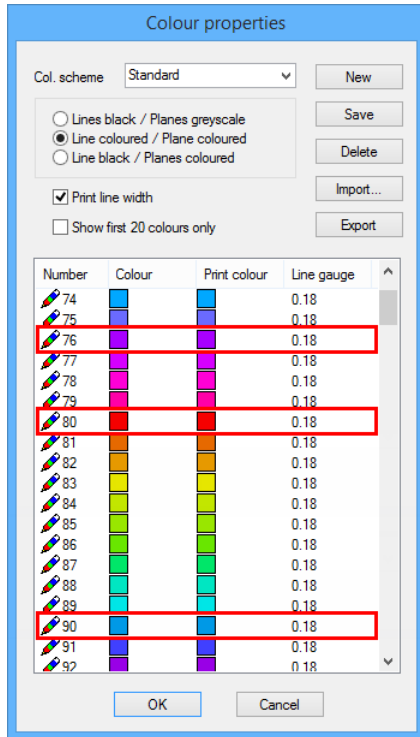
A description of the general settings options of the section function can be found in the manual in chapter 11.



WORKSHOP END

PRINTOUT

Pen and line types for display of the drainage components are defined in the parameter "Standard" in the SETTINGS > COLOUR PROPERTIES:

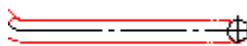

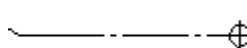


Parameter circuit:

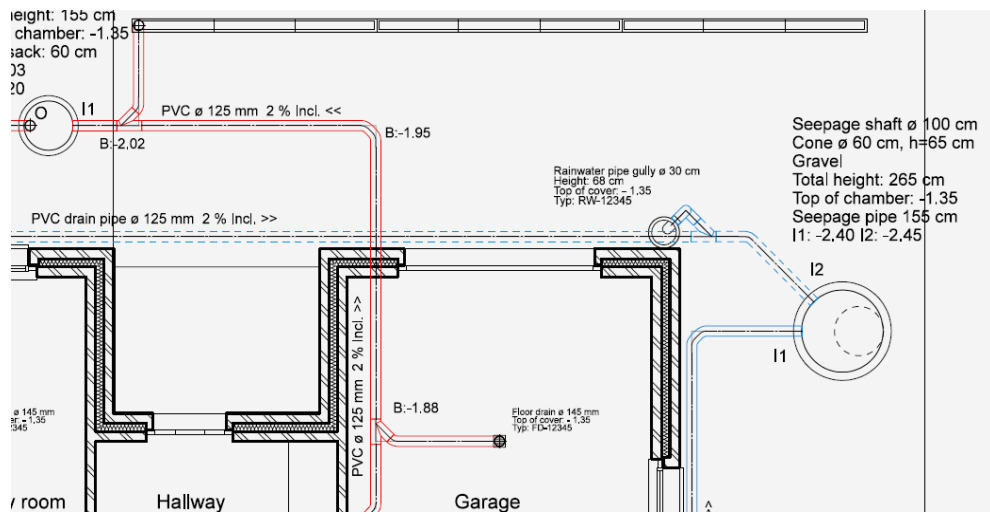
Pen colour	Perimeter line	Centre line
Comb. waste water	76	5
Drain pipe	90	5
Surface water	90	5
Waste water	80	5

With this setting, the drainage lines (and also the colours of the walls for conversion/new build/demolition) are printed out in colour on suitable printers.

The drainage can be printed out with three different displays of circuits:

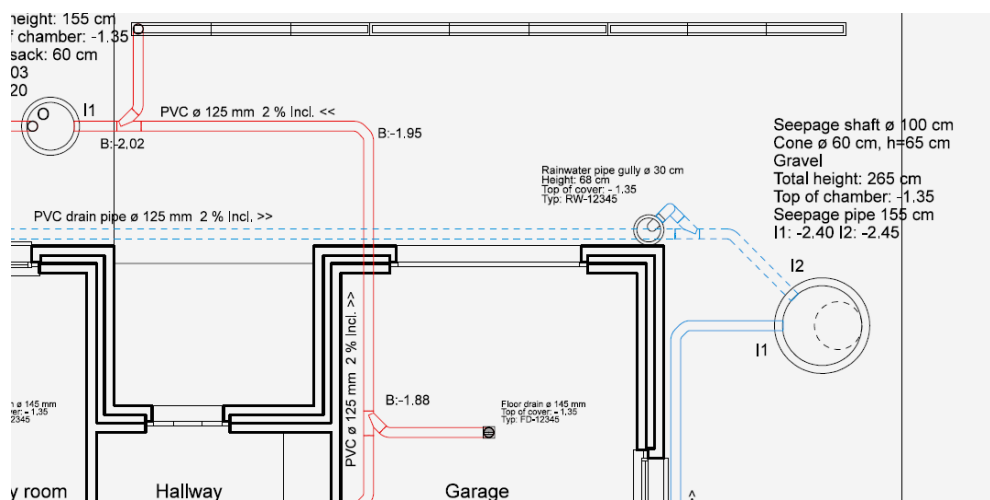
- Three line: Axis and pipe wall lines 
- Two line: Only outlines 
- One line: Only axis 

3-line



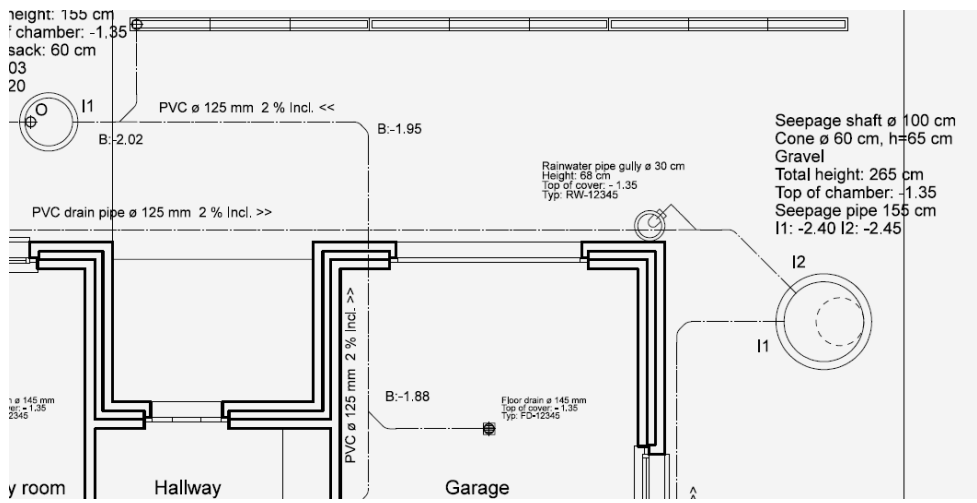
This display is preset. In the example, hatching was switched off prior to printing.

2-line (no axle lines)



For this display, the axle lines must be hidden before printing.
 Menu VIEW > LINE TYPES... Enter line type number: ^6
 Caution: this also hides the axes of the section designation.

Printout: 1-line (only axis lines)



For this display, the axle lines must be hidden before printing:
 Menu VIEW > PEN...Enter pen numbers: ^76, 80, 90

If the axis lines "**wider**" and "**coloured**" need to be displayed, this cannot be carried out using only view settings.

The axis line is drawn as standard with pen 5 and line type 6. This setting is also used by many other drawing functions. In order just to display the axis line of the drainage differently, the pipes must be drawn with other pen and line types.

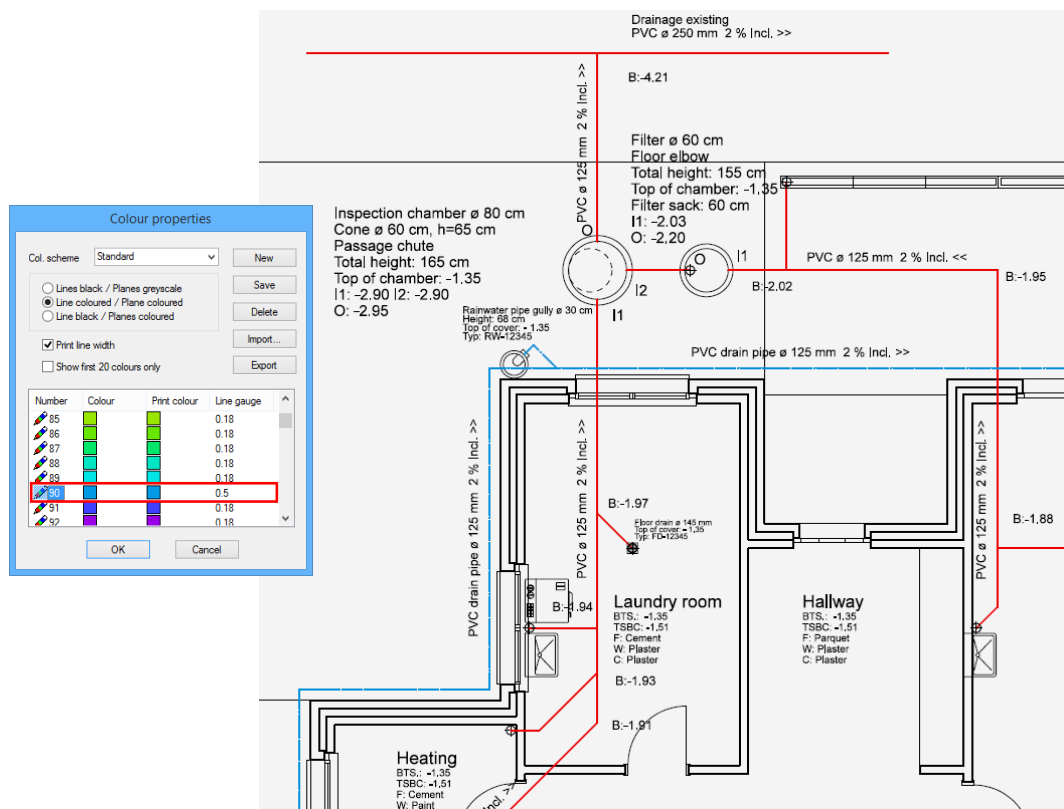
There are two options:

1. Construct pipes directly with the following settings:

Pen colour	Perimeter line	Centre line
Comb. waste water	0	76
Drain pipe	0	90
Surface water	0	90
Waste water	0	80

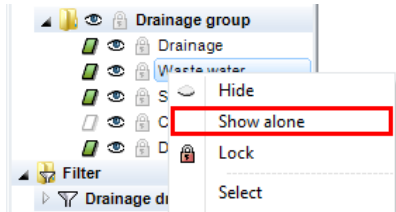
Line type	Perimeter line	Centre line
Comb. waste water	1	1
Drain pipe	2	2
Surface water	1	1
Waste water	1	1

Increase the line gauges for pen numbers 76, 80 and 90 using colour properties.



2. Change the pen colour and line type:
 Use the function "Transfer parameters" to modify the 2D pens. However this change is retained only until you execute the 3-line again.

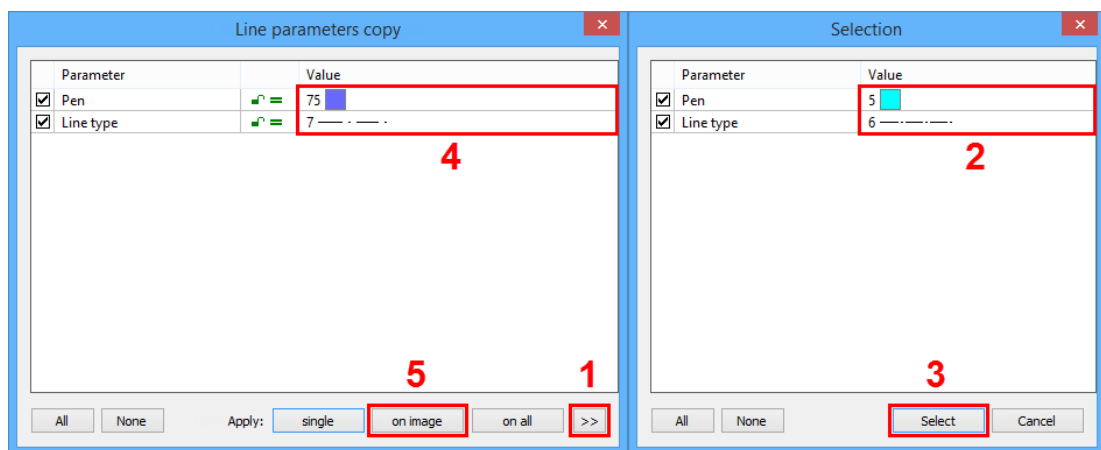
Set up relevant layer



To take up the parameters, first draw a polygon (can be deleted again afterwards)

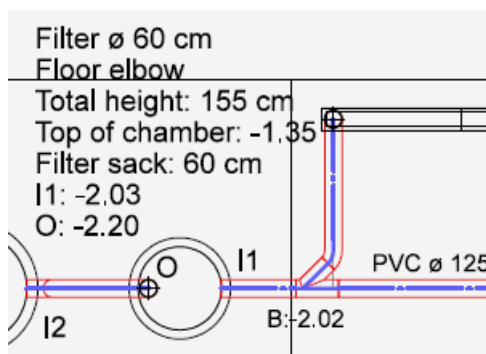
Modify axis:

Start the function COPY PARAMETERS, click on the polygon and make the following settings.



TIP

The perimeter line could be modified in the same way



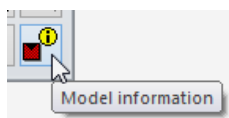
In this example, pen and line type of the axis were changed and the gauge of the pen 75 set to 0.5 mm in the colour properties.

TIP

Drawing and editing

- A new circuit must be drawn in one go, without cancelling the function and reapplying it.
- When manipulating an existing drainage system, always check the axis lines in the 3D view.
- After adding or modifying circuits, always carry out the slope calculation.
- Do not use the three-line function for generating the plan view and the 3D model until all sub-areas are correct in terms of height and location and the slope calculation can be performed without an error message.
- Clicking on a load point, a pipe component, a shaft, etc. opens the properties bar with the values of the relevant object.
- It is often faster to draw a pipe component from scratch than to modify one.
- After the following CAD functions, a slope calculation is required:
 - COPY, STRETCH, DELETE of pipes or parts thereof.
 - STRETCHING of networks
 - COPY INTO ACTIVE STOREY
 - AR-OBJECT ALLOCATION
- Slope calculation is not required after COPYING load points and shafts.
- Errors:

Error messages in the form of a large X are displayed if a calculation cannot be carried out (if for example the start point for the slope calculation was not specified correctly). The cross shows where the error lies in the plan and can be queried for more detailed information about the error using the SAMPLE INFORMATION function. The message is output in the info window.



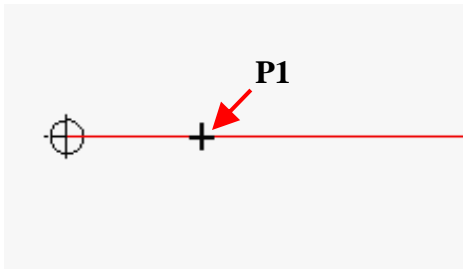
You must correct or redraw at these points.
The crosses can be removed again through selection and deletion.

Split circuit / Insert point

▼ ▼ ▼ ▼ WORKSHOP

The height of a circuit can only be changed at its beginning and end point. Often, to introduce a drop later on for example, an additional point is required in which a fixed height can be assigned. To do so the pipe must be split.


The CIRCUIT function can be used to insert a subpoint.



Split workflow for pipe:

 Draw pipe

P1 cross on the pipe)
Calculate immediately with [Esc]

 Slope calculation

as of the lowest point of the network

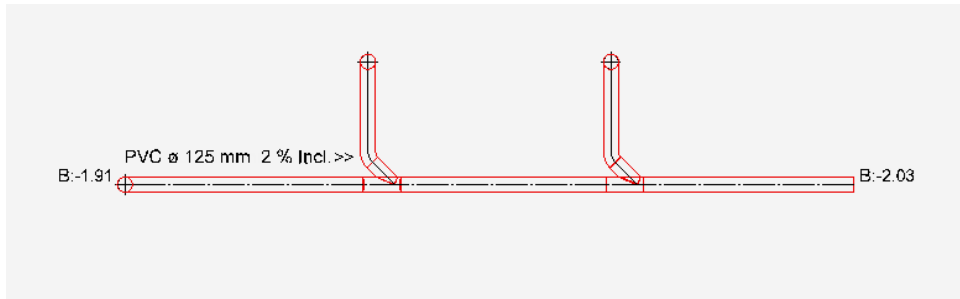
The height and drop can now be modified within/as of point **P1**.

WORKSHOP END

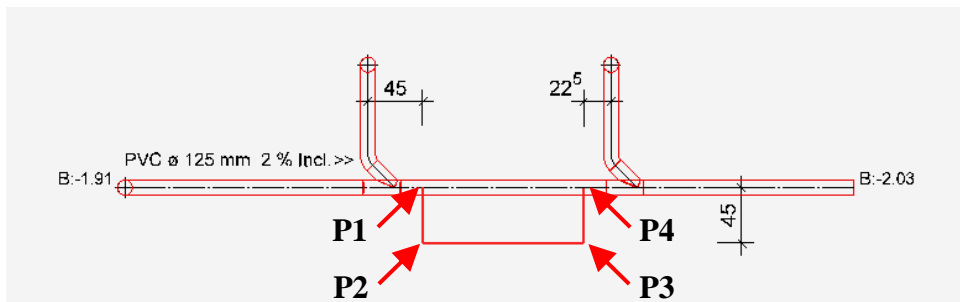
Modify pipe layout


▼ ▼ ▼ ▼ WORKSHOP

Existing circuit




The pipe layout must be modified between the left-hand and right-hand branch fitting.



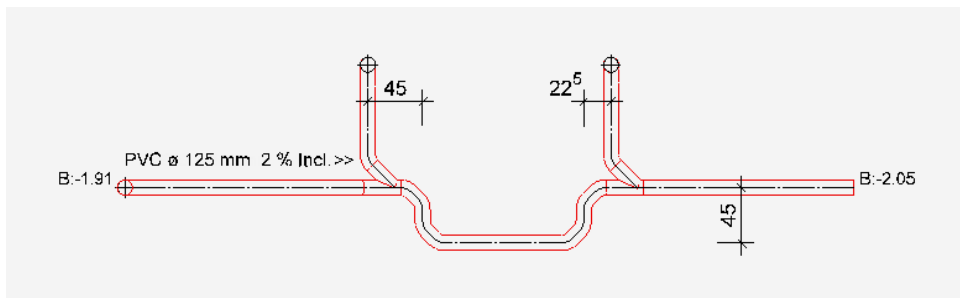
 Draw circuit from axis to axis (observe minimum gaps)

P1 P2 P3 P4, finish with [Esc]

Tap on and delete connection line between **P1** and **P4**

 Slope calculation

 Three-line



Done!

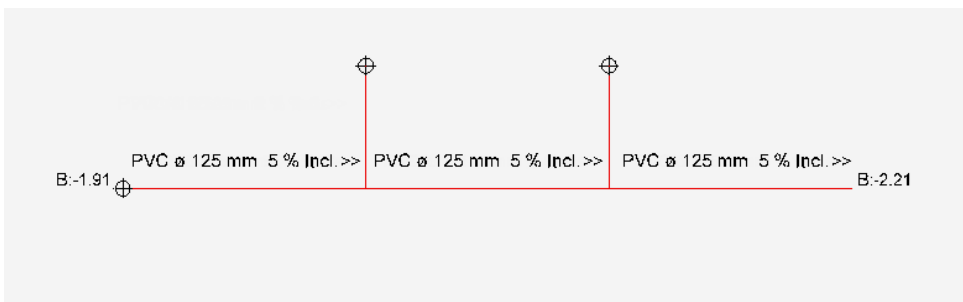
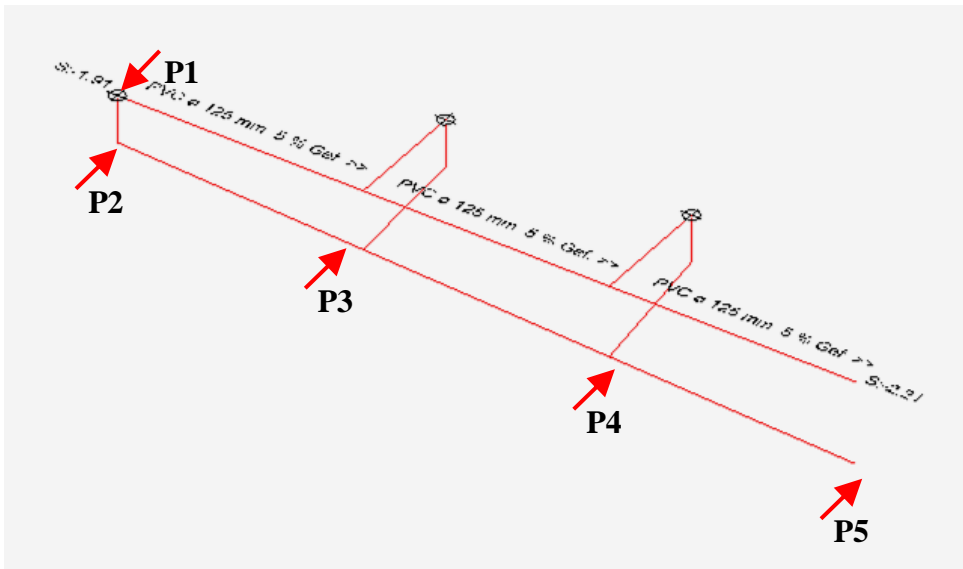
The base of the duct on the right-hand side can be lowered by 2 cm.

WORKSHOP END

Include drop

The height can be modified in every 3D node. Here the intended slope must always be checked.

Slope information applies in an inclined direction starting from the specified node. Fixed heights have priority over actual inclines.



▼ ▼ ▼ ▼ **WORKSHOP**

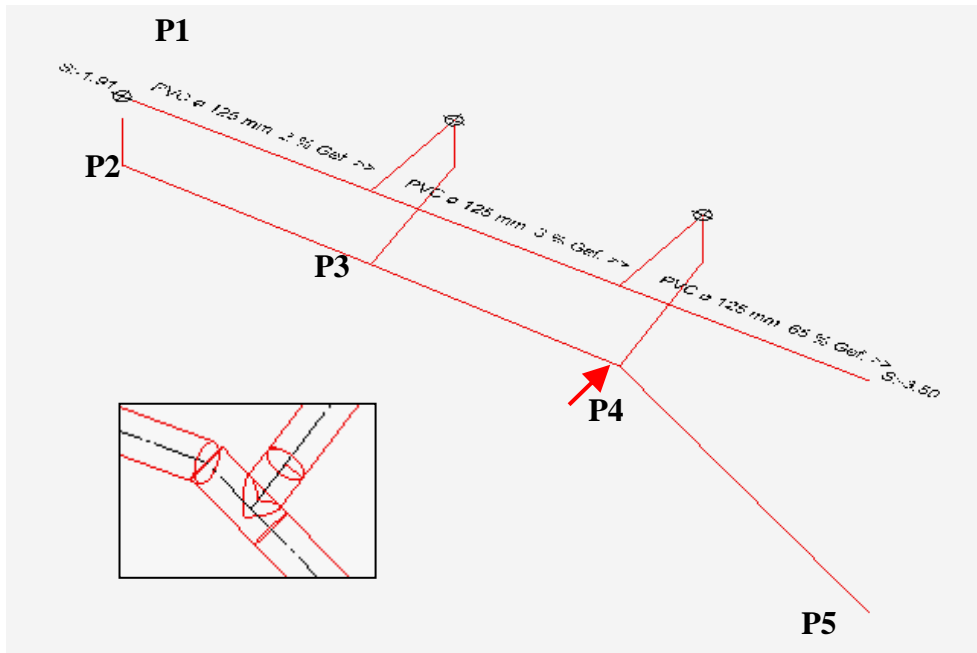
Workflow for this example:

Set heights in **P1** with **-170** and in **P2** with **-210**

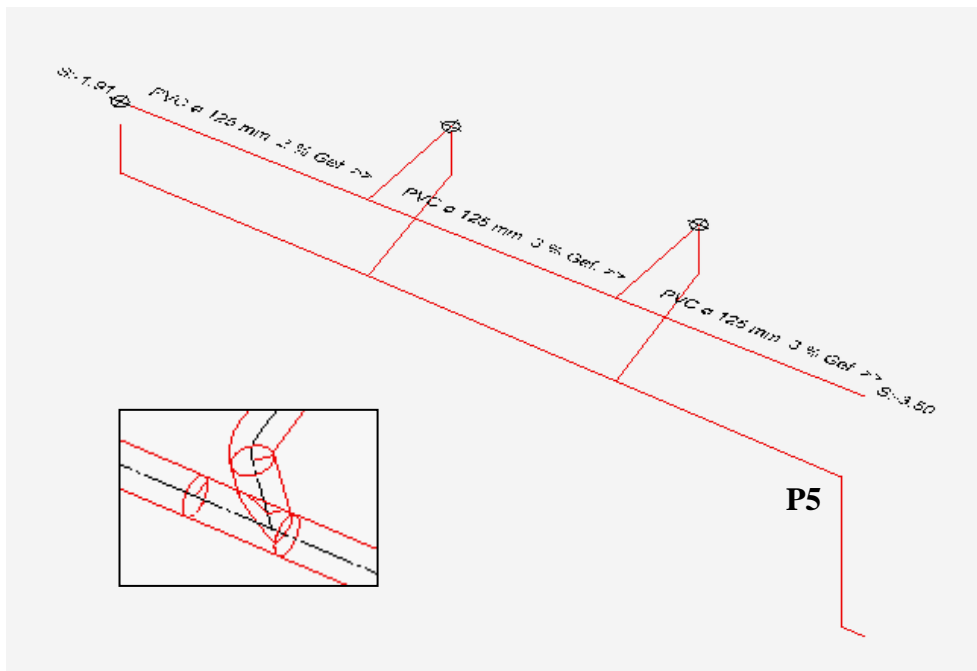
Slope calculation in **P3** (on circuit) with **2**

Set height in **P5** with **-350**

Slope calculation in **P4** with **3**



Set drop
P5 (on circuit) [Return] [Return] [Return]
 Cancel with [Esc]



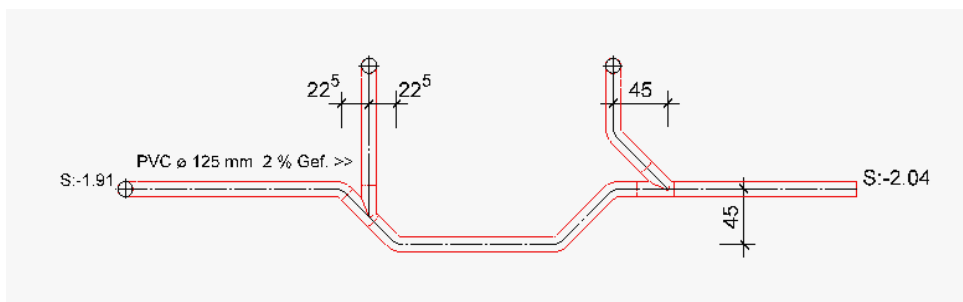
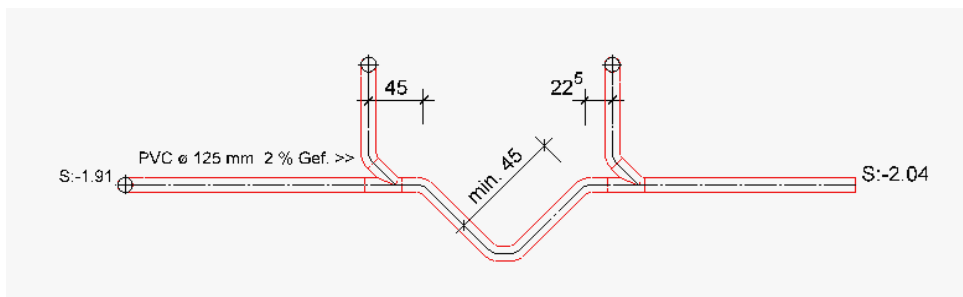
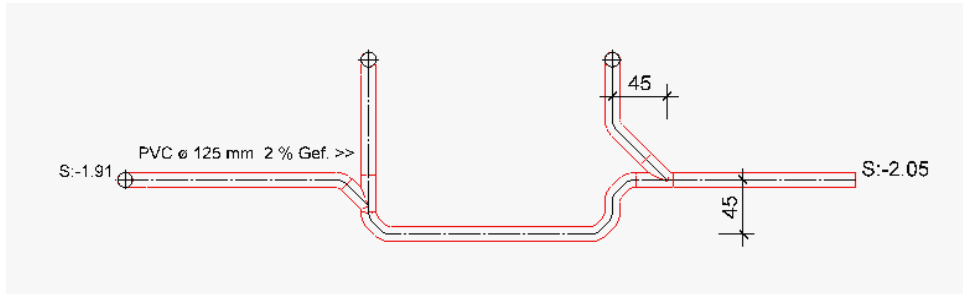
Caution when using the "Change height and incline" function with drops. Here, heights are fixed that must be separately adjusted or whose fixing needs to be removed. Therefore always save a work copy before hand.

WORKSHOP END

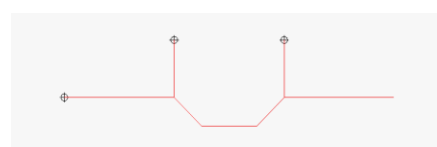
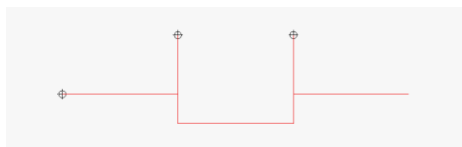
Minimum gaps pipe layout

For all variants you must observe the minimum gaps.

These gaps determine the sizes of these fittings, for larger nominal widths the values increase accordingly.



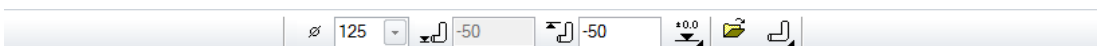
The following pipe layouts are not possible: There are no suitable fittings for them!



FUNCTIONS

This section summarises the functions described in the manual, chapter 13 for rapid access while working with the course unit.

LOAD POINT

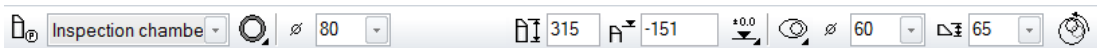


- Nominal width (mm)
- Height1
- Height2 (connection height)
- Height reference: Sea level / ±0.00 / Storey
- Storage location of load point graphics
- Conn.type - up / horizontal / down

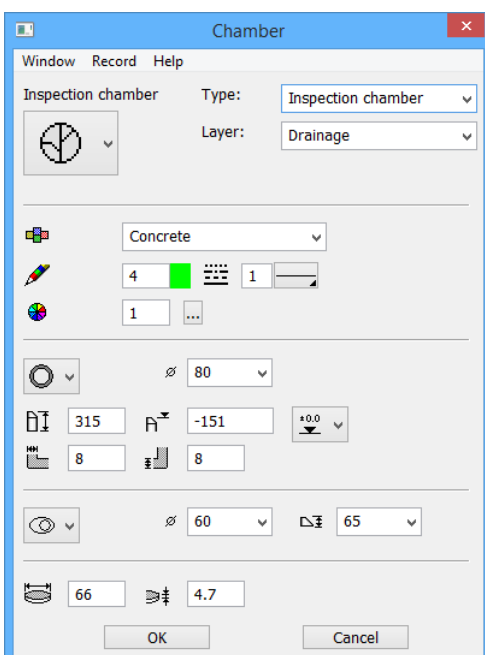
TIP

Clicking on a load point opens the properties bar with the values of the relevant load point.

SHAFT



Shaft parameters



- Shaft type
- Geometry of the shaft: circular/elliptical
- Dimension (cm)
- Shaft height (cm)
- Upper edge (cm)
- Height reference: Sea level / ±0.00 / Storey
- Cone type: none / central / eccentric narrow / eccentric wide
- Cone diameter (cm)
- Cone height (cm)
- Place (rotate, etc.)

The shaft is displayed directly in 3D, switching to the 2D view with **[Strg/Ctrl]+[K]** shows the reduced 2D display.

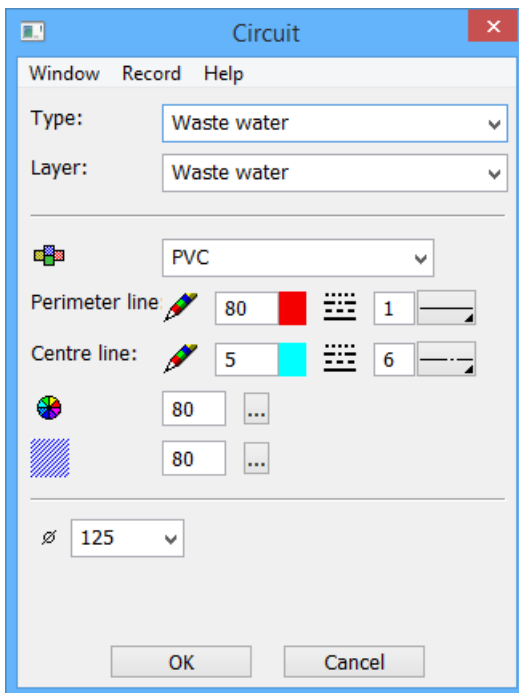
TIP

Label seepage shaft: same procedure as for the inspection chamber but click on an inlet point for the outlet. The label will also be automatically generated, the entries for the outlet in the chamber description must be manually deleted.

 **CIRCUIT**



Circuit parameters



- Circuit type
- Dimension (mm)
- Start circuit
- End circuit
- Circuit back
- Display attributes

It is important that the pipe layout is drawn in a way that is technically correct. There are no 60° connections or multi-branch fittings, etc. available on the market.

The programme takes into account the situation as entered, but when the form parts are generated this could lead to unrealistic results.

Minimum gaps to be observed:

Nominal width:	Distance x:
100 mm	16.0 cm
125 mm	18.5 cm
150 mm	20.5 cm
200 mm	25.5 cm
250 mm	30.5 cm



Automatic: If a circuit is drawn vertically over another circuit, ELITECAD uses the THREE LINE function to calculate a 45° branch fitting automatically.



SLOPE CALCULATION

The slope calculation determines the intended slope of the network, and a network analysis is also carried out.

This function will always be required after ending and pasting a circuit (including multi-part).

Errors in the analysis (e.g. intended slope undercut) are marked by a large cross, "model information" shows the message in the info window.

The intended slope applies as of the specified point
until the load point or
until the next "fixed" height point or
until the next intended slope, in the direction of the last point in each case.

The intended slope is removed by an "x" in this area.



SET HEIGHT

The height of every start and end point of a circuit can be moved and fixed using the "Set height" function.

The height of fixed circuit points can no longer be moved with a new slope calculation; only the intended slope is corrected.

A difference between actual slope and intended slope enables a drop to be inserted. (see "Set drop")

Observe height reference: Sea level / ± 0.00 / Storey

The fixing on this point is removed with an "x".



DIMENSION

The nominal width of the circuits can be modified subsequently.

Adjust nominal width in the properties bar, select relevant circuits, click [Return] to perform the change and to complete the function.

TIP

For a clearer view, rotate the image into the 3D view (vertical circuits can scarcely be selected in the top view).



SET DROP

A drop overcomes a large height difference within a short distance. This function assumes that there is a difference between the actual slope and the intended slope. This must be defined using the "Set height" function (which in term requires a point in a circuit – see split circuit).

Process: click on the relevant circuit part, then determine the location as of which the drop is to be calculated. This location can be determined with capture functions or be set by the system using the "Automatic" function. Next the alignment height is proposed by the system. For the third query, the angle for the alignment must be specified, which should be a standard value: (E.g.: 30, 45, 67, 87 or 90):

If the location was determined via the "Automatic" function, the drop will be inserted immediately.

If the position was determined manually and if the angle is less than 90, the following prompt appears: *Shift in which direction?*
Next click on the desired direction and the drop is inserted.

The intended slope takes on the circuit parts below and above the drop.

TIP

Before clicking "Set drop", always save a work copy, this function can in many cases not be reversed. Alternative: Drop, delete circuit parts below and above, then reconstruct.



LOAD POINT HIGHER/LOWER

Depending on the definition, the relevant vertical circuit will be added upwards (attachments from above), or downwards (dip pipe). The vertical lengthening of the axis is only visible once you rotate in 3D.

Before this function is used the slope calculation must be up to date.

Connection between nominal width and length of the vertical circuit

Nominal width:	Length of vertical circuit:
100 mm	35.0 cm
125 mm	37.5 cm
150 mm	40.0 cm
200 mm	45.0 cm
250 mm	50.0 cm

The upper and lower point of the vertical circuit can be modified with "Set height". (If necessary, rotate image in the 3D view).



THREE-LINE

Moulded parts (pipes, elbows, branch fittings and reductions) are generated. The three-line layout is a 3D model and a separate object. The function takes on all display attributes from "Circuit" and reduces the 2D display for the printout.
Key combination: [Strg/Ctrl] + [K]

TIP

The existing three-line layout is automatically deleted when the function is repeated, i.e. it does not exist in duplicate.



LABEL CIRCUIT

Labels circuits with material, nominal width, incline, and direction.
Example: **PVC ø 125 mm 2 % incl. >>**

The text is automatically placed along the line.

Circuit texts are associative and are immediately corrected when changes are made to material, nominal width and inclines.

Edit texts:

The text properties are predefined in the text parameter CIRCUIT and can be changed from there at any time.

Move or delete text: [Alt] + click on text:
Modify text: [Alt] + double-click on text:



LABEL UNDERSIDE PIPE

Labels the underside of the pipe at the selected point as of the height reference set (sea level / ±0.00 / storey).
Example: **B: -3.00**

Edit texts:

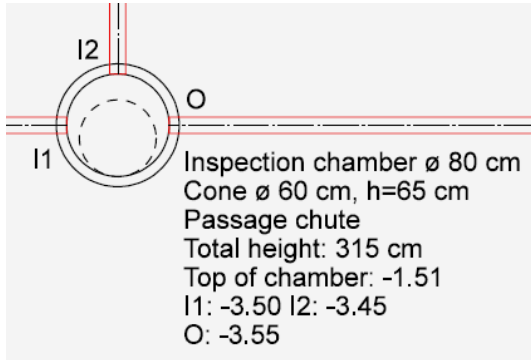
The text properties are predefined in the text parameter CIRCUIT and can be changed from there at any time.

Move or delete text: [Alt] + click on text:
Modify text: [Alt] + double-click on text:

 **LABEL SHAFT**

Labels parameterised shafts with I1, I2 .../O for inlets and outlets and with the general information of the relevant shaft.

Examples:



Edit texts:

The text properties are predefined in the text parameter CHAMBER and can be changed there at any time.

Move or delete text:

[Alt] + click on text:

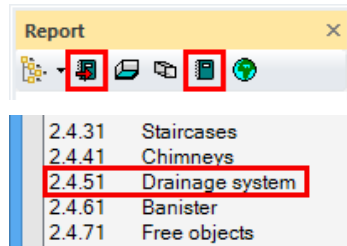
Modify text:

[Alt] + double-click on text:



QUANTITIES MANAGER

The function "Create and print lists" generates a formatted parts list (following evaluation in DB).

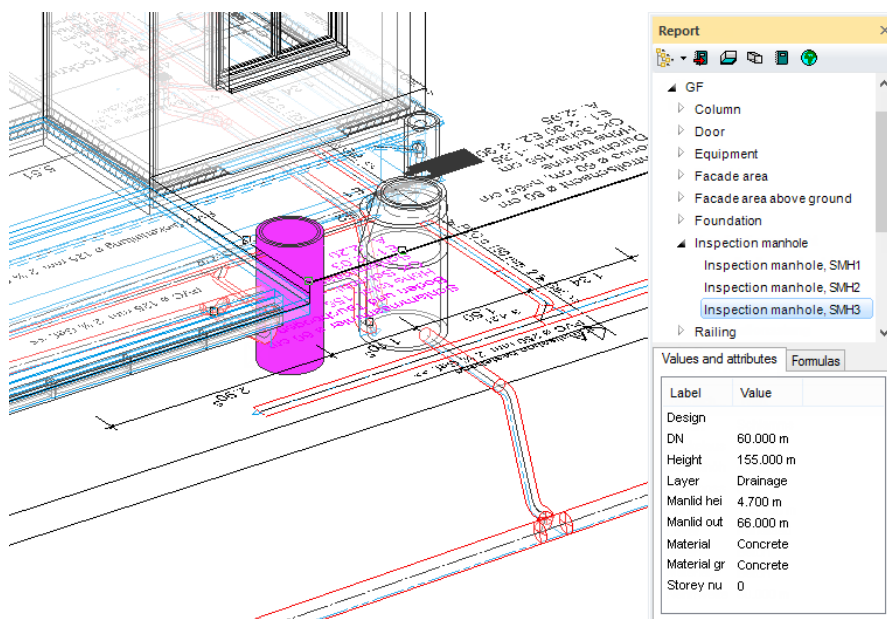


Drainage system			
No.	Length	Number	Total
SPI3.29	5.59 m	1	5.59 m
Total		47	32.65 m

Sewer PVC DN 250 mm			
No.	Length	Number	Total
SPI2.10	3.71 m	1	3.71 m
SPI2.9	3.96 m	1	3.96 m
Total		2	7.67 m

Sewer PVC drain pipe DN 125 mm			
No.	Length	Number	Total
SPI3.12	0.21 m	1	0.21 m
SPI6.37	0.27 m	1	0.27 m
SPI6.18, SPI3.9	0.49 m	2	0.98 m
SPI6.34, SPI3.15	0.61 m	2	1.22 m
SPI3.35	0.79 m	1	0.79 m
SPI6.29	0.86 m	1	0.86 m
SPI6.35	1.08 m	1	1.08 m
SPI6.24	2.18 m	1	2.18 m

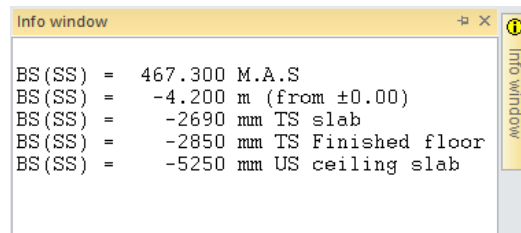
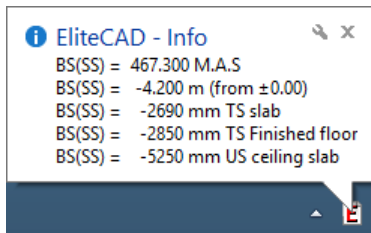
If an individual element is clicked on, its values appear in the properties field of the Quantities Manager.





DISPLAY BOTTOM OF PIPE

If the height data of any given point on the power line.

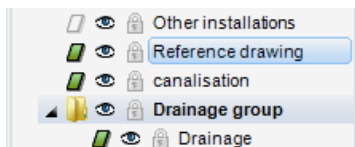


REFERENCE PLAN

A reference plan is an ELITECAD drawing already created that is inserted "behind" the actual new drawing. All elements will be displayed in one colour only. When drawing you can access all of the catchable points in the reference drawing.

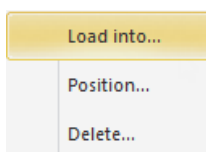
Whilst creating a template with help lines may be sufficient for smaller objects, for larger drainages it is very helpful to work with a reference drawing. The amount of work is no greater than when the drainage is traced out with help lines.

For the course example the reference drawing was also stored in the "Reference plan" layer. The drawing can then be shown and hidden via the layer or via the parameter view screen.



Paste the reference plan

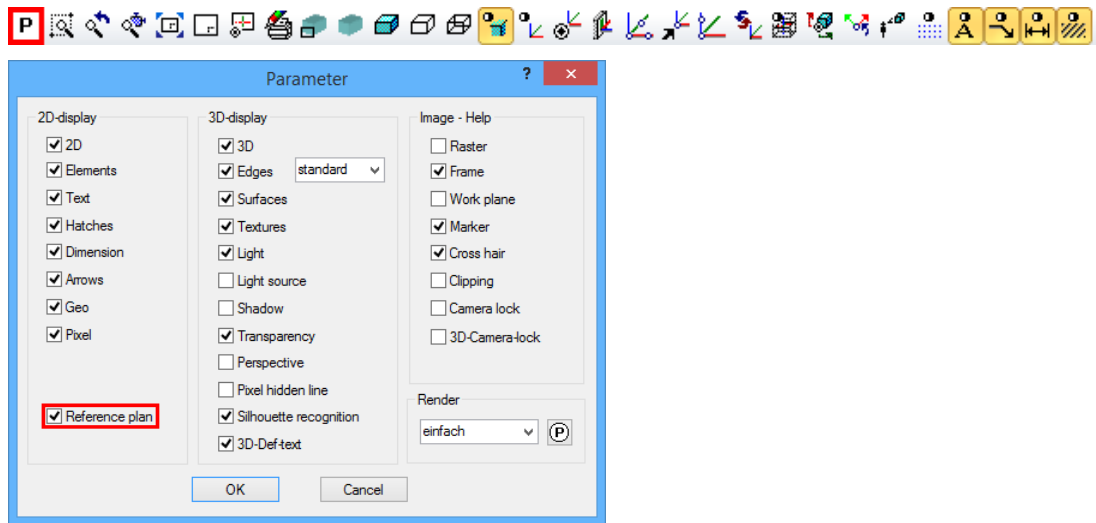
Menu INSERT > REFERENCE DRAWING



- | | |
|--------------|--|
| Load into... | Reference plan is imported into the <u>s</u> aved storey |
| Position... | Reference plan is imported into the <u>a</u> ctive storey and can also be positioned |
| Delete... | Delete and deactivate reference plan |

Show/hide

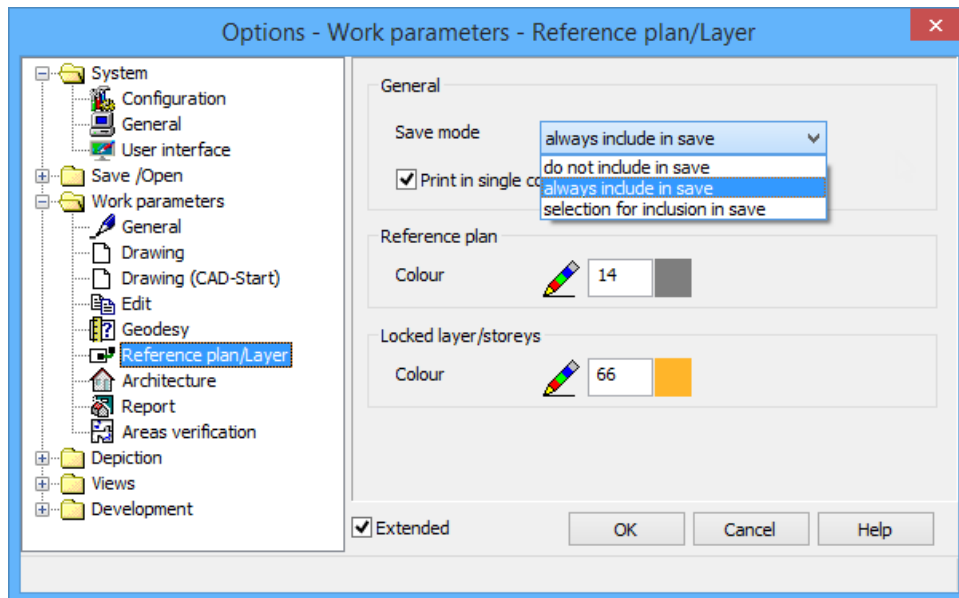
The visibility can be set in the parameter view Screen.



On: visible in image and printout
 Off: hidden

Settings

Menu SETTINGS > OPTIONS



Storage mode: do not include in save
always include in save
 selection for inclusion in save

Colour Colour number in which the reference plan is displayed