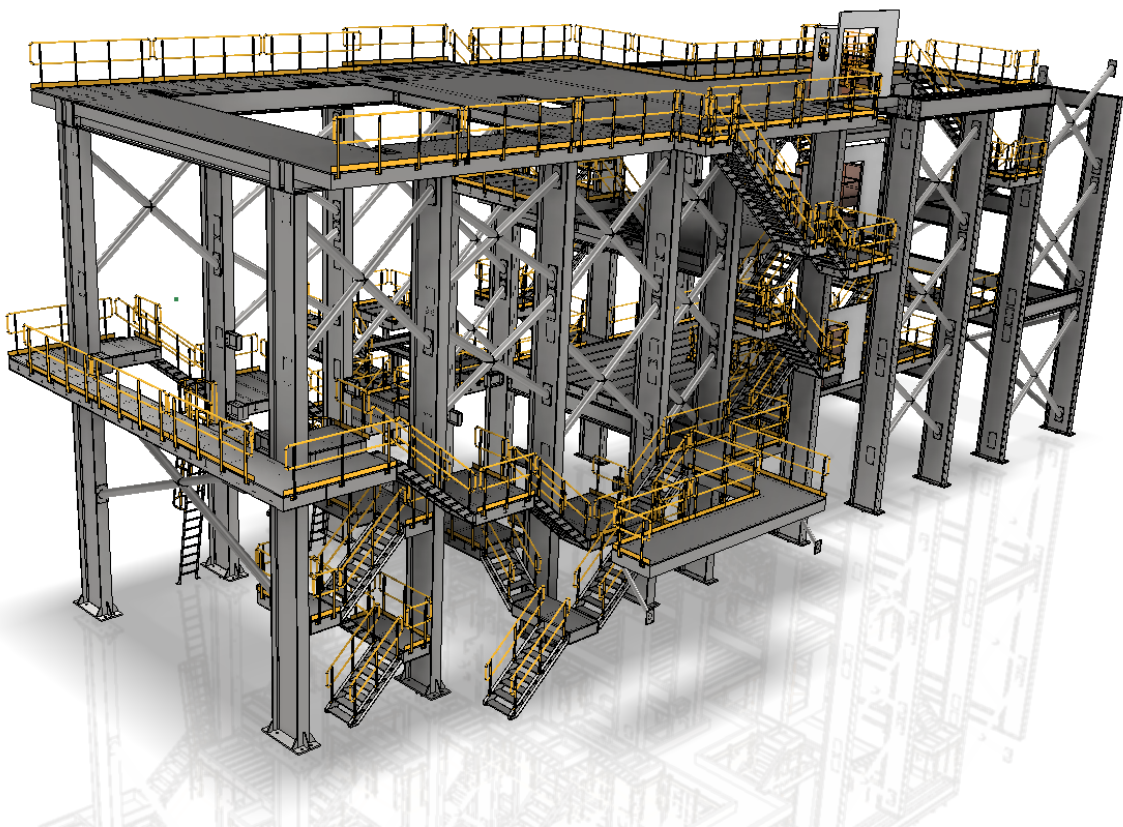


e-STAIRS

For



AUTODESK
Inventor Professional



Stairs, handrails, step ladders and cage ladders

According to ISO 14122

Table of contents

.....	1
1. Introduction.	3
2. Install the software.	4
3. The graphical interface.	6
4. Installing stairs.	7
5. Installing handrails.	10
6. Placing handrails on a perimeter.	12
7. Installing step ladders.	13
8. Installing cage ladders.....	15
9. Modifying existing parts.	17
10. Finally.....	18

1. Introduction.

Thank you for using our software.

e-Stairs is an add-in that has been built specifically for Autodesk Inventor. It is therefore necessary that Autodesk Inventor Professional is already installed on your workstation before you can use the software. More specifically, this version of e-Stairs is suitable for version Inventor 2025. Because Inventor 2025 works with the .NET 8.0 framework, this has the disadvantage that this version of e-Stairs will not work with all previous versions of Inventor.

e-Stairs was conceived and programmed in Belgium and works according to the metric system and international standards.

With e-Stairs, it is possible to configure and then insert stairs, ladders and handrails within the working environment of the Inventor Assembly. Although the add-in will follow ISO 14220 as strictly as possible, it is still possible to carry out configurations that deviate slightly from this standard.

e-Stairs creates multi-body part models for the stairs, ladders and handrails so that the assembly is not unnecessarily overloaded with parts and constraints. Although it is not the intention to use these models to generate production drawings, you will notice that the multi-body parts created still contain a considerable amount of detail. This makes it possible to provide installations with the necessary entrances and stairs to check them for feasibility, complexity and safety.

2. Install the software.

Before you can start installing e-Stairs, you need to make sure that Autodesk Inventor Professional is installed on your workstation and that the version corresponds to the version of e-Stairs.



Make sure that Inventor is completely shut down.

The files of the Add-in are in a directory called: "eStairs". This directory contains at least the files "eStairs.dll" and "Autodesk.eStairs.Inventor.addin".

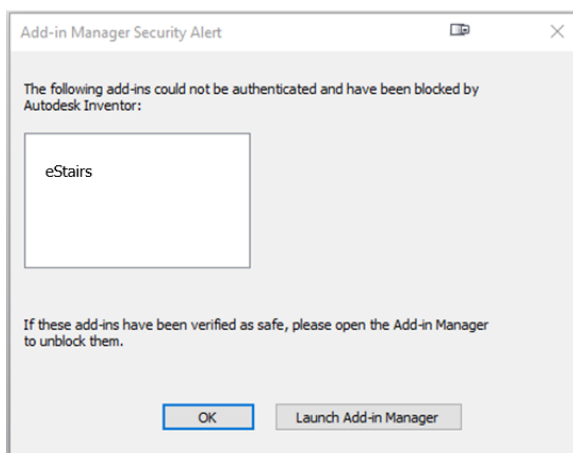
There is also a subdirectory "ButtonResources" which are all the images of the buttons. It goes without saying that you should not change anything in this structure. Any adjustment will result in the Add-in no longer working.

Copy the entire directory of the add-in to the following location:

C:\Users\ »YourName»\AppData\Roaming\Autodesk\ApplicationPlugins.

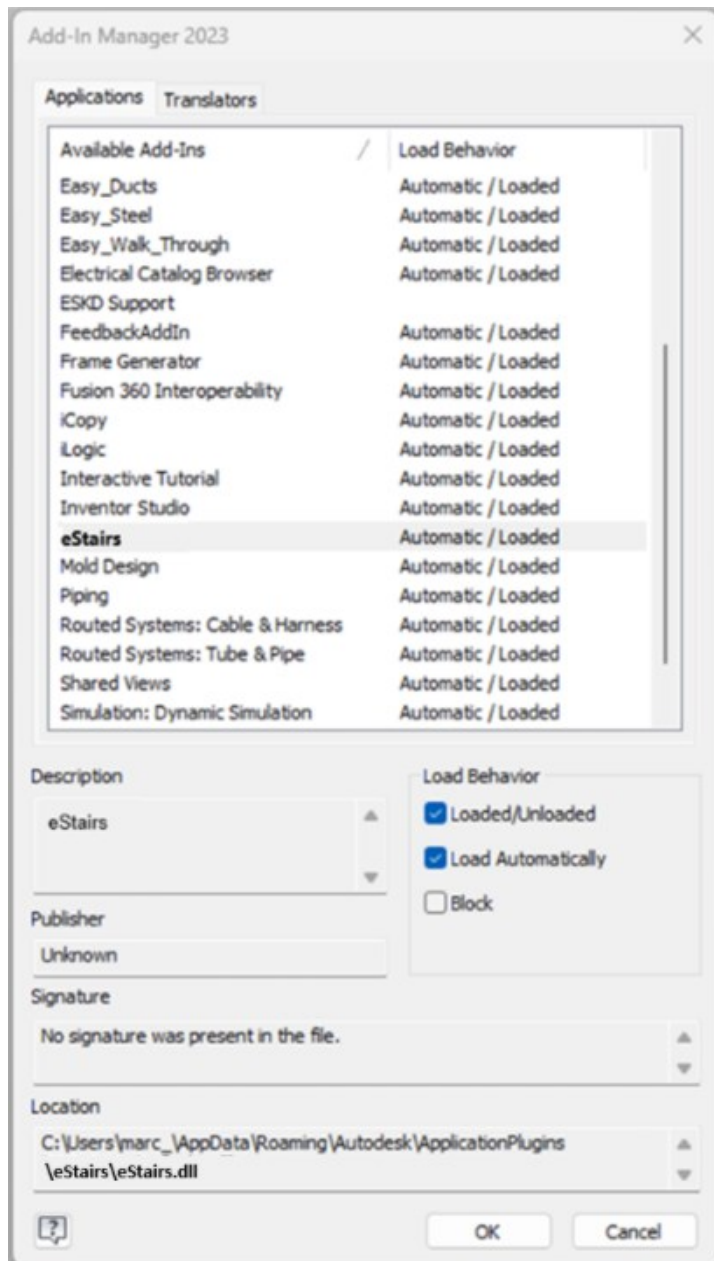
On the place »YourName» you must enter your username of windows.

Start Autodesk Inventor Professional, a window will appear during startup with the message that a new add-in has been found.



Accepted with OK, and Inventor will continue to be started.

On the **"Options" panel**, select the **"Add-in"** field and the "Add-in Manager" window will open. Select the **"Applications"** tab, if it is not selected, and search for "eStairs" in the list of applications.



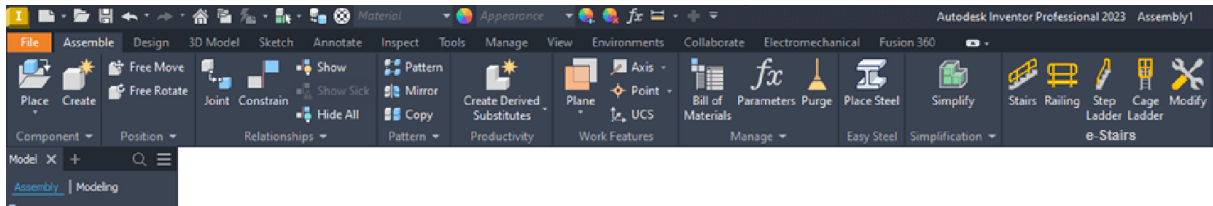
Select "eSTAIRS" and you will notice that at the bottom the "Load Behavior" is set to "Block". This is a safety for new applications.

Uncheck "Block" and check the "Load/Automatically" and "Loaded/Unloaded" options.

Click OK to exit the Add-in Manager and the e-Stairs add-in is installed.

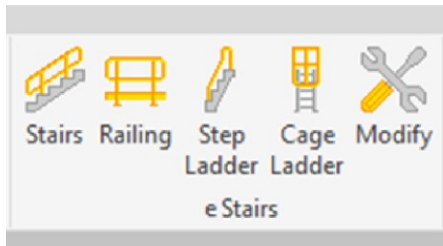
If you create a new assembly file or open an existing assembly file, the eStairs add-in panel will appear in the "Assemble" tab of the GUI (graphical user interface) of Inventor.

3. The graphical interface.

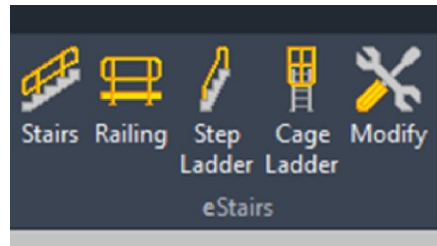


As you could already notice, the e-Stairs panel can only be reached via the Assemble tab of the Assembly work environment. This makes sense since the parts generated by e-Stairs must be placed in an assembly file.

Depending on which UI theme is selected, the e-Stairs panel will look like the one shown below. All other windows of the application will follow the UI theme used.



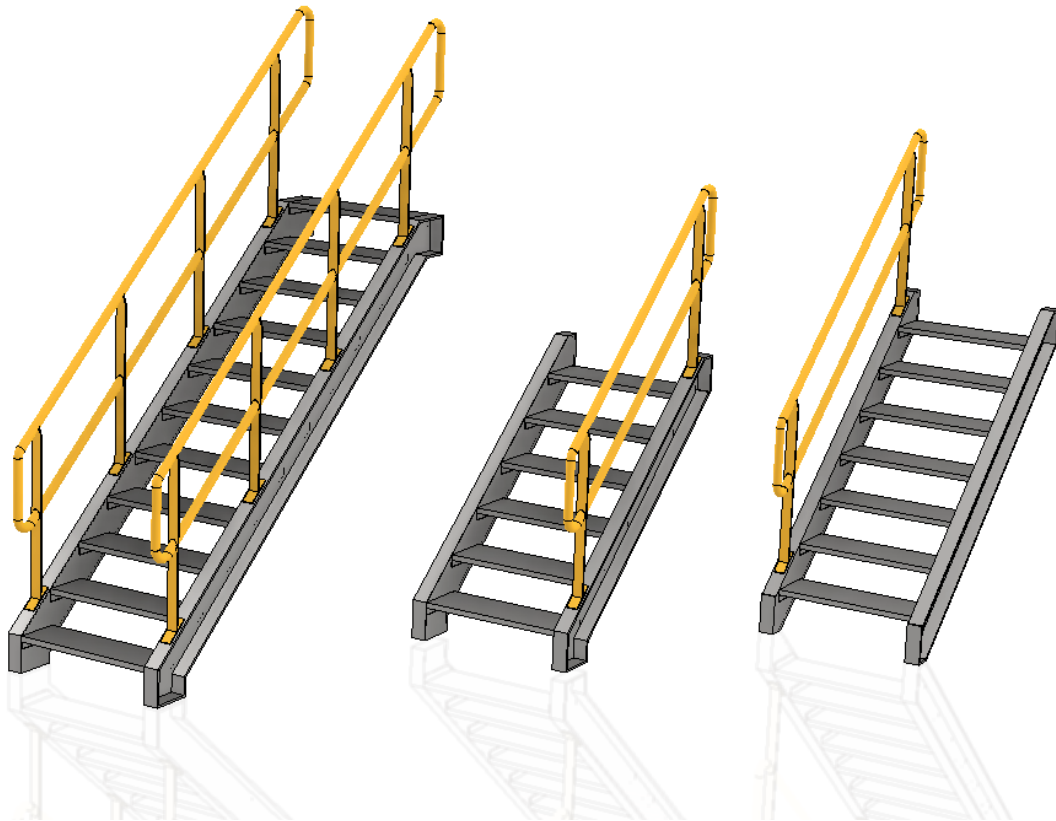
For the light UI theme



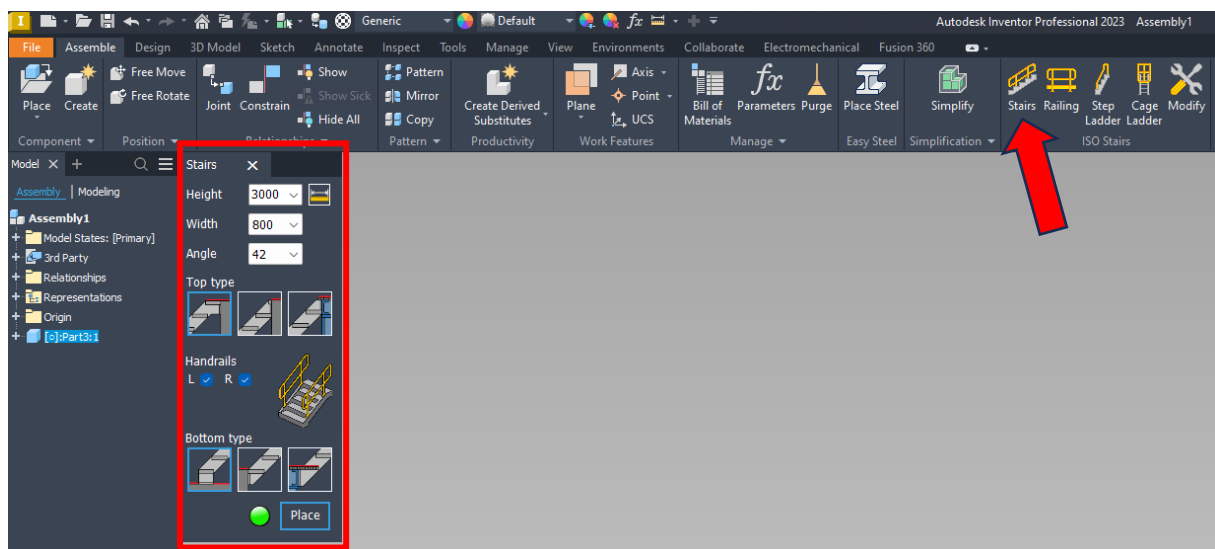
for the dark UI theme

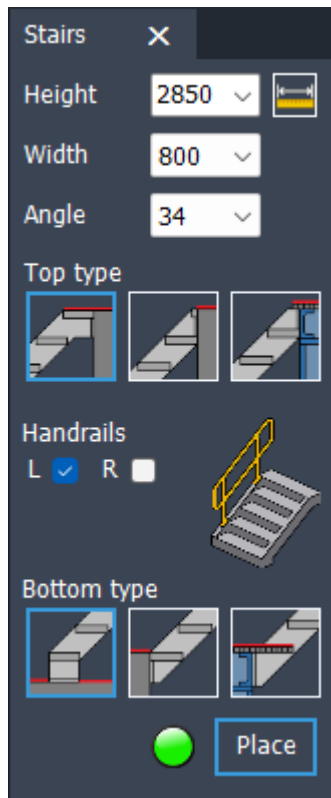
With the first four buttons you can select the type of part you are going to place. From left to right, this is a staircase, a handrail, a step ladder and the fourth is a cage ladder. The fifth button is used to adjust parts that have already been placed.

4. Inserting stairs.



Click on the first button of the e-Stairs panel to start inserting a staircase. The window to configure a staircase will open at the top left corner of the graphical screen.





At the very top next to the title is a cross. If you move the cursor over it, it will turn red. With a click on the cross you can close the window.

You can also close the window by clicking on the escape key.

Below the title are the three combo boxes to determine the dimensions of the stairs. The "Height" indicates the stair height, measured from the top of the departure floor to the top of the arrival floor in millimeters. The amount can be entered in different ways. You can choose a number from the list between 900 and 4000mm with a step of 50mm, or you can type in a number between 500 and 5000mm without decimal places.

You can also use the button next to the Height combo box. After you click on it, you will be asked to click on the lowest floor, then the highest floor will be asked. After clicking, the combo box is filled in with the distance rounded to millimeters.

The condition is that the floors are parallel and at least 500mm apart.

The "Width" is the width of the staircase measured over the full width of the step, in millimeters. You can choose the width from 450 to 1200mm.

The "Angle" is the stair angle measured from the floor and is expressed in degrees. This parameter can also be chosen from a list of 30 to 48 degrees.

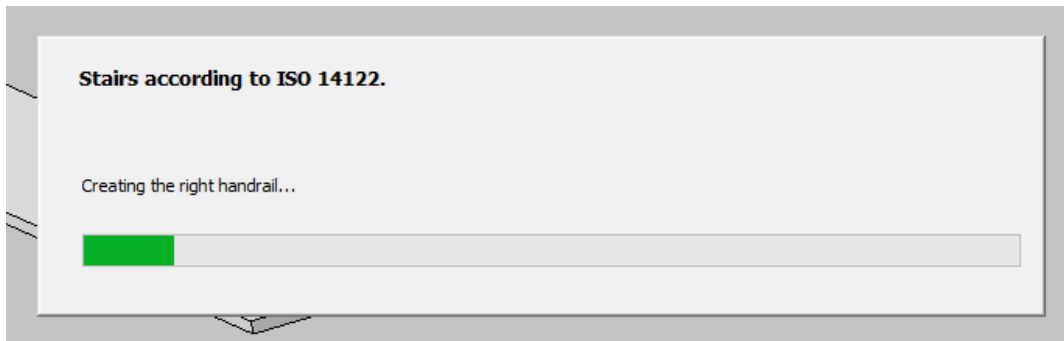
With the first configuration buttons, you let the stairs end with a full step against the landing floor. In the second configuration, the last full step is one step lower than the landing floor. The third configuration is about the same as the second, but a 30 mm grating floor is considered.

Below the "Top Type" buttons are the checkboxes for the handrails. Checking or unchecking the checkboxes will determine whether a handrail is created. The figure to the right of the checkboxes adjusts after each change of the checkboxes.

The last configurations buttons are those for the Bottom Type. With the selection of the first configuration, the staircase will start on top of the floor. With the selection of the second configuration, the staircase will start against the side of the floor, the first step will be flush with the floor. The third configuration is about the same as the second, but a grating of 30mm is considered.

At the very bottom right is the PLACE button that will start the routine to place the chosen staircase. To the left of the PLACE button is a control lamp that indicates whether the stairs are fully configured according to ISO 14220. If so, the lamp will burn green. If there is an abnormality, it burns red.

With a click on the PLACE Button, the routine that will place the configured staircase starts. A progress bar gives the progress and a description of the actions that are being carried out in the background during the creation of the part file.



Here are the tasks that run in the background:

- Creating a new part file.

- Modeling steps and side beams.

- Modeling the railings.

- Filling in the i-Properties.

The staircase is assigned the material "Steel, Mild" with the appearance "Semi-Polished".

Parts such as the handrails are given the color "RAL1023TrafficYellow".

The file is written to the project in the subdirectory **Steel**, subdirectory **Stairs**. If this directory does not exist, it is created. The filename is given the prefix "STAIRS_" followed by a unique number and the extension: ipt.

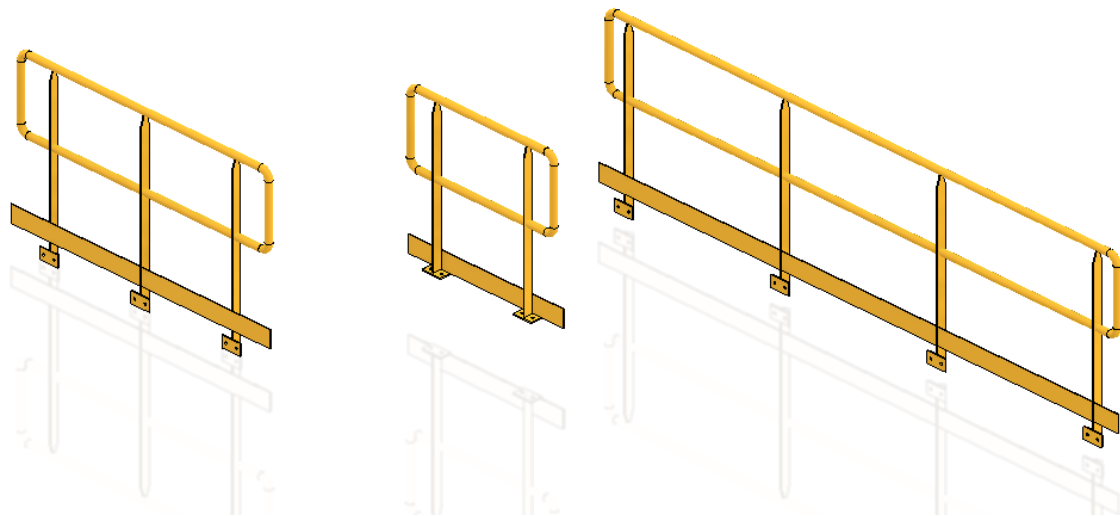
After the file has been saved, you will be asked to indicate the surface of the start (lower) floor. After you have designated this floor, the stairs are attached to this floor with one constraint.

The routine is terminated, and the window of e-Stairs is opened again, ready to install a new staircase. You must perform the constraints in the other two directions manually.

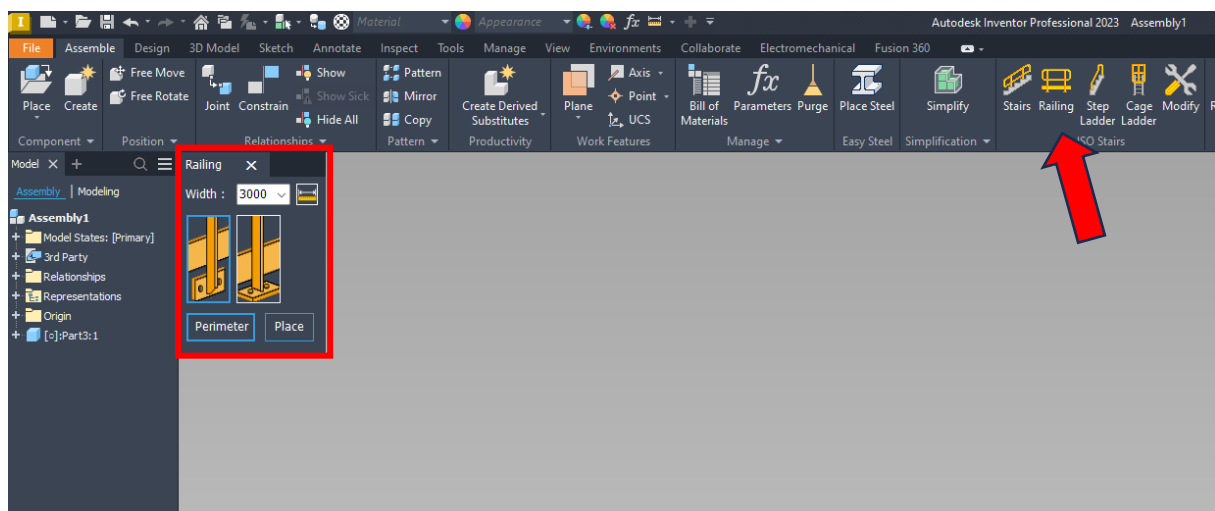
If you don't want to connect the stairs to a starting floor, you can also continue with an "ENTER" click. Autodesk Inventor will then execute the regular insert command with the new stairs.

Please note, after the first staircase is placed, the insert command will insert the same staircase again, but it is the same part. If one of these two stairs is modified with a regular Inventor command, the other staircase will change with it.

5. Inserting handrails.



Click on the second button of the e-Stairs panel to start installing a handrail. The window to configure a handrail will open at the top left corner of graphics display.



To close the window, you can click on the cross next to the title or click the escape key, as with the window of the stairs.

To configure a handrail, only one parameter must be entered. The "Width" is the distance taken by the handrail. The baffle plate will be 5mm shorter on each side to allow a mounting tolerance. The handrail tube is 25mm shorter on each side to prevent hand entrapment.

There are two possible configurations, either the handrail is bolted to the side of the floor, or the handrail is on top of the floor.

The width can be entered in different ways. You can choose a number from the list between 600 and 5000mm with an increment of 50mm, or you can type in a number between 450 and 5000mm without decimal places.

You can also use the button to the right of the Width ComboBox. After you click on it, you will be asked to click on a corner point, line or plane. Depending on what you have clicked, a second question will be asked or not.

After clicking, the Width ComboBox is filled in with the distance rounded to millimeters.

At the very bottom right is the PLACE button that will start the routine to place the chosen handrail. Like the stairs, a floor will be requested. After this has been clicked, the handrail will be attached to the floor with a constrain. The two other constraints to fully fasten the handrail must be done manually.

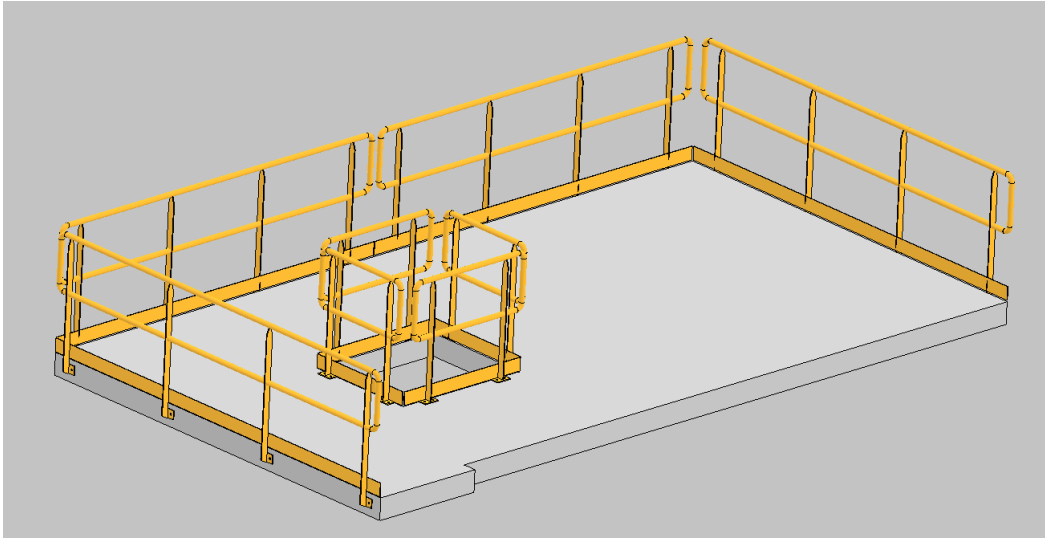
You can also click on ENTER during the demand for a floor and place the handrail in the normal way as with an insert of a part.

The handrail has a 120 mm high baffle plate, and it stands 10 mm above the selected floor.

The centerline from the top tube to the floor is 1080mm with a tube diameter of 48.3mm the top of the handrail comes just above 1100mm.

The centerlines of the two horizontal tubes are 500mm apart.

6. Placing handrails on a perimeter.



To the left of the PLACE button, there is a PERIMETER button. With this command it is possible to place a series of handrails around the surface of a Solid. There are some obvious conditions that must be met before this command can be used.

There must already be a part in the composition that represents the floor. The surface should be flat. The sides where handrails are to be placed must be straight, and longer than 500mm.

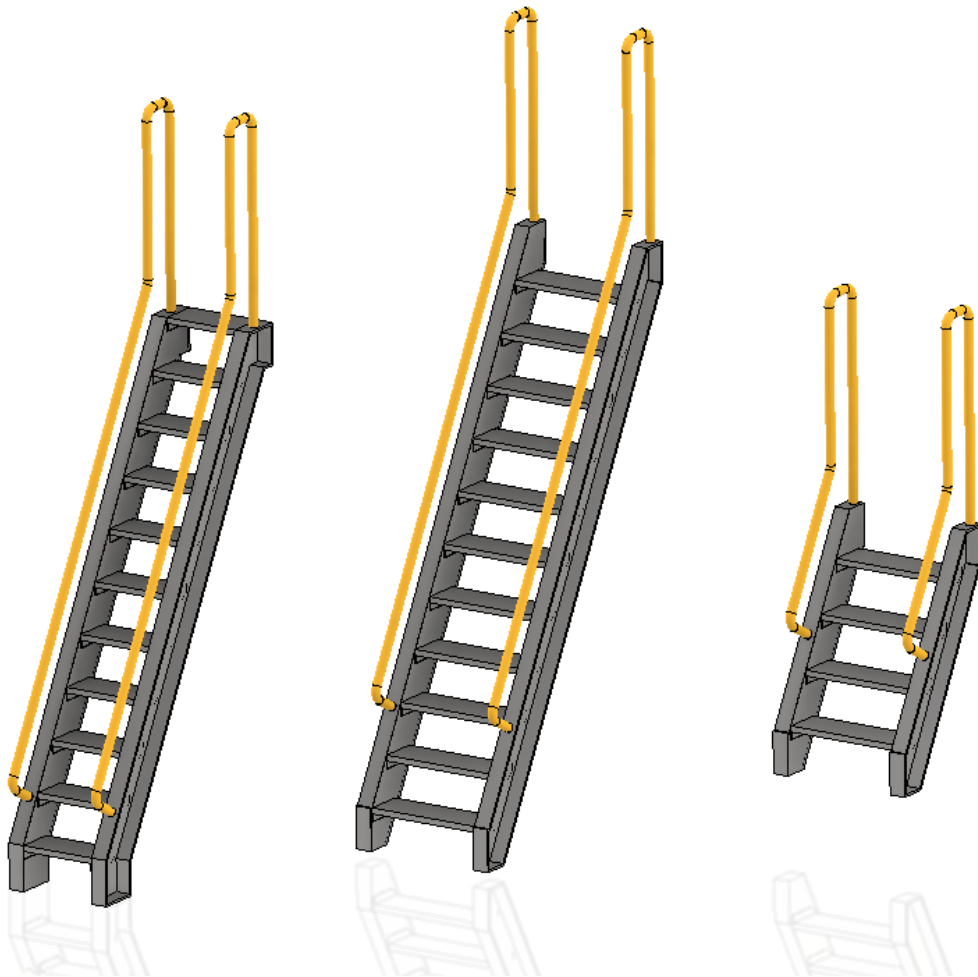
Configure the type of handrails and click on the PERIMETER button to start it. You will be asked to indicate a floor. After this has been clicked, you will be asked to indicate the sides that need to be fitted with handrails. Indicate them by selecting them, you can also deselect them with "Shift & click".

When all the sides to be fitted with handrails are selected, click ENTER to start the routine. Wait for the routine to end.

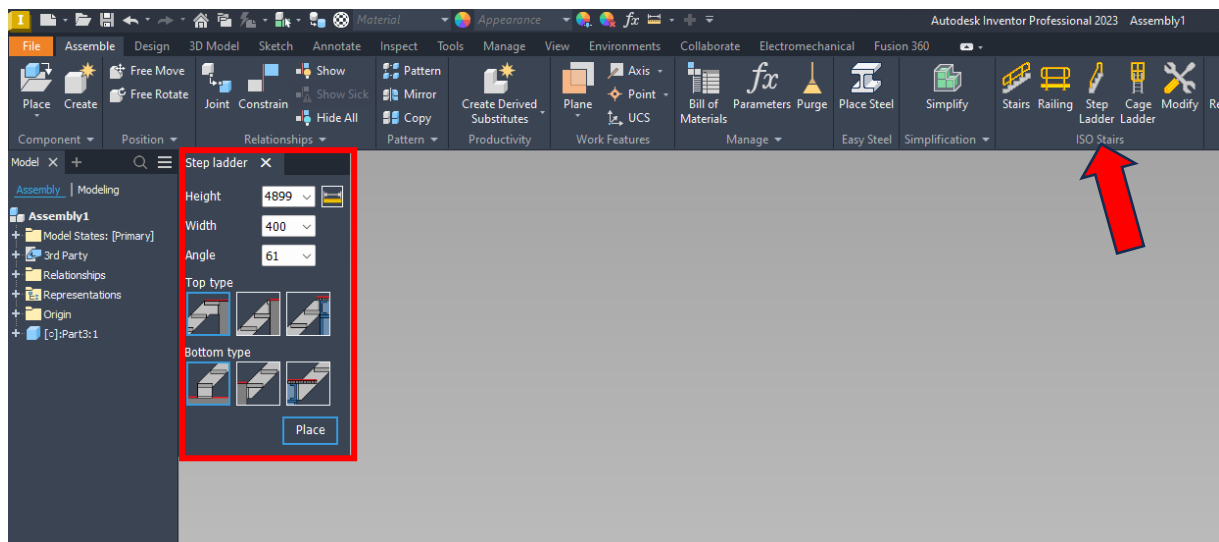
All sides smaller than 500mm and curved sides are skipped.

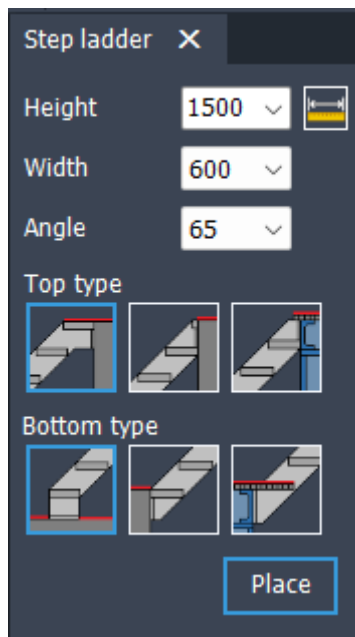
The other sides will be given a handrail one by one, and this will also be secured by three constraints. The sides longer than 5000 mm are given an array of handrails, of equal length, to cover the distance.

7. Installing step ladders.



With the third button of the eStairs panel you open the window to configure a stepladder the window will open at the top left corner of the graphical screen.





The configuration of the step ladder is as explained with the stairs, with the difference that there are other widths and angles to select.

It is not possible to tick off the handrails of a step ladder. As a result, they will always be modeled.

The "Height" indicates the height of the step ladder measured from top of the floor to top of floor in millimeters. The amount can be entered in different ways. You can choose a number from the list between 600 and 3000 mm with an increment of 50mm, or you can type in a number between 600 and 5000mm without decimal places.

You can also use the button next to the Height combo box. After you click on it, you will be asked to click on the lowest floor, then the highest floor will be asked. After clicking, the combo box is filled in with the distance rounded to millimeters.

The condition is that the floors are parallel and at least 500mm apart.

The "Width" is the width of the step ladder measured over the full width of step in millimeters. You can choose the width from a frame of 450 to 600 mm.

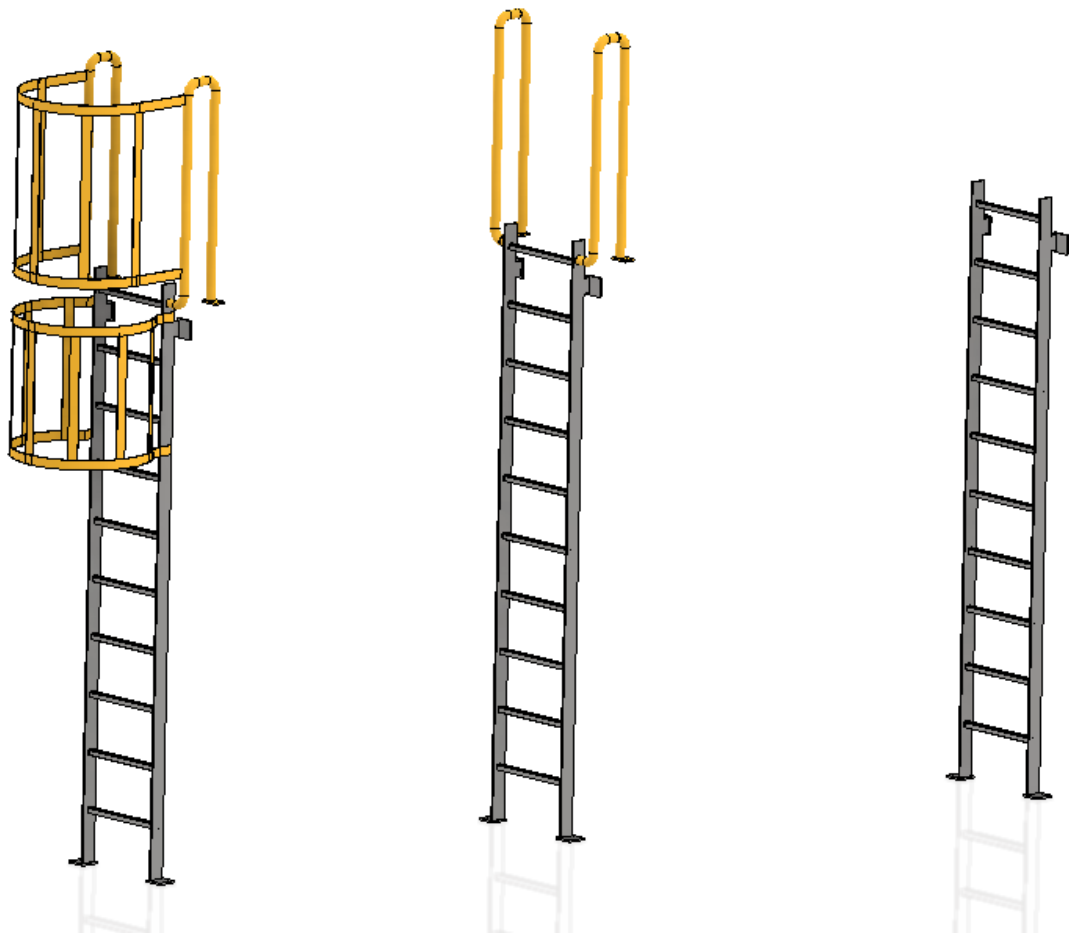
The "Angle" is the angle of the step ladder measured from the floor and is expressed in degrees; this parameter can also be chosen from a list of 60 to 70 degrees.

The configuration buttons are identical to the configuration of the stairs. With the first configuration button, you let the stepladder end with a full step against the landing floor. The second configuration is the last full step one step lower than the landing floor. The third configuration is about the same as the second, but a 30 mm slatted floor is considered.

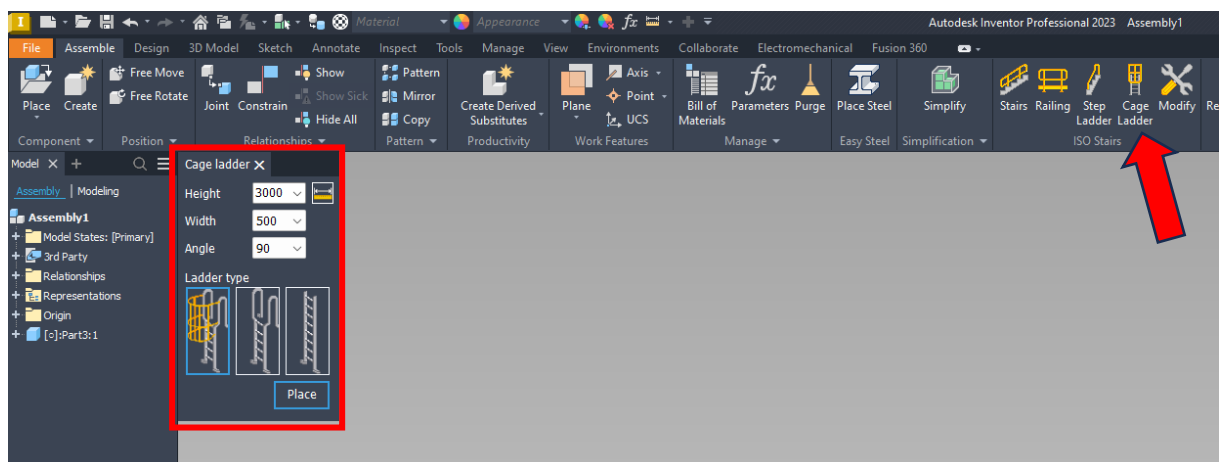
The bottom configurations buttons are those for the Bottom Type. With the selection of the first configuration, the step ladder will start on top of the floor. With the selection of the second configuration, the step ladder will start against the side of the floor, the first step will be flush with the floor. The third configuration is about the same as the second, but a grid of 30mm is considered.

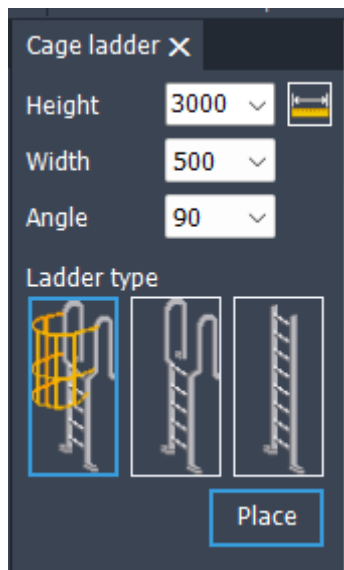
After the configuration is complete, you can start the routine that will place the configured stepladder with a click on the PLACE Button. A progress bar gives the progress and a description of the actions that are being carried out in the background during the creation of the part file.

8. Installing cage ladders.



With the fourth button of the e-Stairs panel you open the window to configure a cage ladder, the window will open at the top left corner of the graphics display.





The configuration of the cage ladder is as explained with the stairs, with the difference that other widths and angles can be selected.

The "Height" indicates the height of the cage ladder measured from the top of the floor to the top of the floor in millimeters. The amount can be entered in different ways. You can choose a number from the list between 600 and 3000 mm with an increment of 50mm, or you can type in a number between 600 and 5000mm without decimal places.

You can also use the button next to the Height combo box. After you click on it, you will be asked to click on the lowest floor, then the highest floor will be asked. After clicking, the combo box is filled in with the distance rounded to millimeters.

The condition is that the floors are parallel and at least 500mm apart.

The "Width" is the width of the cage ladder measured over the full width of step in millimeters. You can choose the width from a frame of 400 to 600 mm.

The "Angle" is the angle of the ladder measured from the floor and is expressed in degrees; this parameter can also be chosen from a list of 75 to 90 degrees. The part of the cage that is above the landing floor is at 90 degrees.

There are three possible configurations for the ladder, the first configuration is with a cage, but it is necessary that the height between the floors is more than or equal to 2500 mm. Otherwise, it is not possible to keep the minimum height of the cage at 2100 mm from the starting floor.

The second configuration is without a cage but with the handrail up to the landing floor.

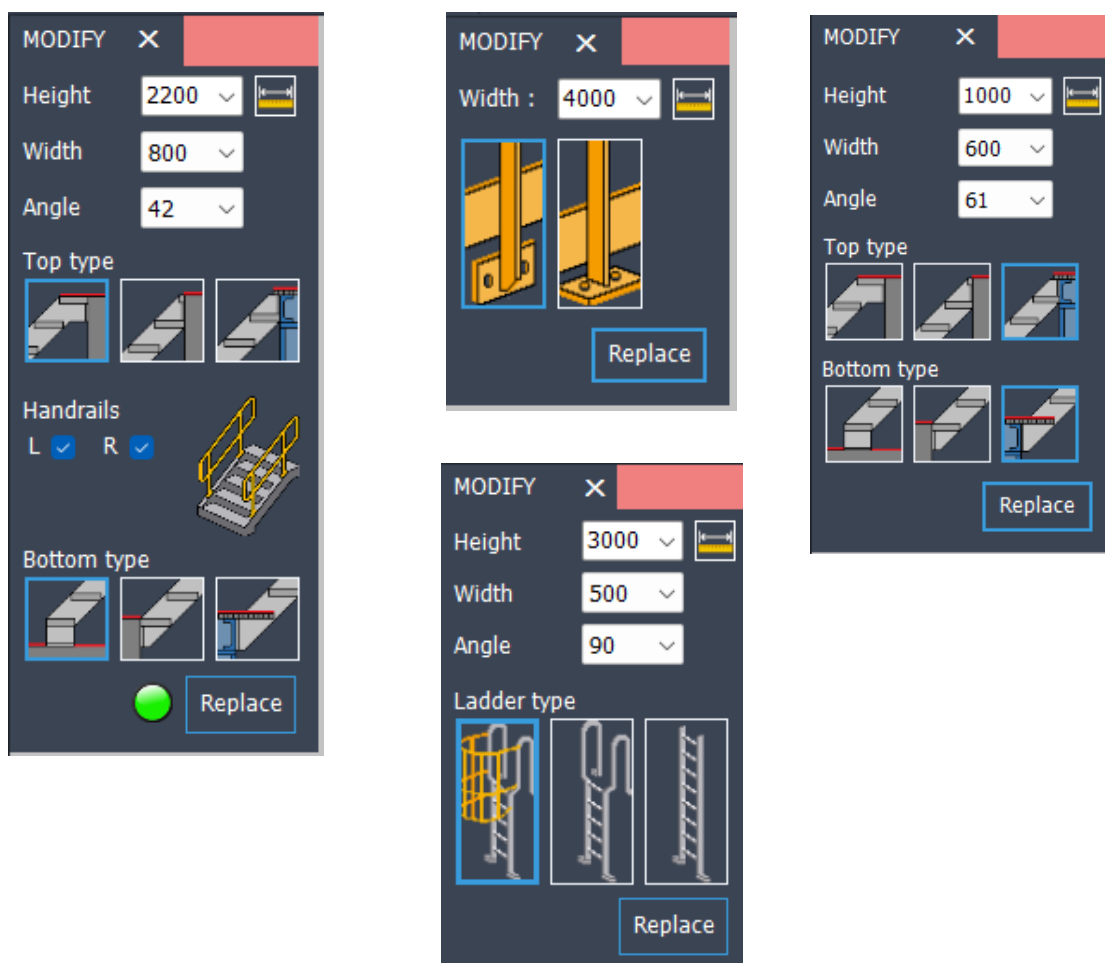
The third configuration is only the ladder.

9. Modifying existing parts.

The fifth button of the e-Stairs panel gives you access to the program to adjust stairs, handrails, step ladders and cage ladders that have already been installed.

An important condition for being able to modify these components is that they must be generated with the e-Stairs Add-in. During generation, the part is given a code with which the modify program identifies the part and can reconstruct the parameters with which the original was built.

To start, click on the fifth button with crossed screwdriver and key. You will be asked to indicate a staircase, ladder or handrail. You will also notice that you cannot indicate anything else at that moment. After selection, depending on what you have indicated, one of the windows below will appear at the top left corner of the graphical window.



These are almost copies of the windows to place the parts, but there are a few details that differ from them. The most striking detail is the red color in the header of the window that indicates that you are in modify mode. The title of all these windows is MODIFY.

The buttons at the bottom right are "Replace" buttons instead of "Place" buttons.

The modify program has identified your part and opened the appropriate modify window. But it has also taken over all parameters and configurations in the "modify" window. Now you can adjust parameters and configurations.

When you're done, click on the replace button.

The modify program will first create the new part and then replace the old part with the new one. If the part has been modified with Inventor features, these will not be carried over in the new part.

All existing constraints are inherited if they do not generate an error. Any constraint that generates an error is removed to preserve the integrity of the model. It is therefore necessary to check after a modification whether your part is still fully constrained.

In practice, constraints that are automatically placed will usually be recovered. These constraints use the work planes, work axes and work points of the part itself and are not sensitive to adjustments.

The manually placed constraints can only continue to exist if the used surfaces, sides or vertices have not been modified by the modify program.

10. Finally.

Because the way in which the stairs, ladder, handrail or step ladder must be attached or aligned is so different, it has not been considered during the installation routine of the parts. So, after placing one of these parts, you will have to continue constraining it. Placing handrails on a perimeter is an exception to this. These parts will be fully attached with three constraints.

The use of the application allows you to create a whole series of files in a short time and insert them into an assembly. As a result, Inventor itself can sometimes have problems with its RAM. It is advisable to save regularly.