

GROOF
Greenhouses to Reduce CO₂ on roofS

Interreg 
North-West Europe
GROOF
European Regional Development Fund



PART 3 –
INSTALLATION
OF THE
GREENHOUSE
STRUCTURE



AUTHOR: DAVID VOLK

INTRODUCTION



The construction of the rooftop greenhouse pilot in Germany has started early 2020 and we from ebf GmbH are sharing in a multiple part series in detail how the construction took place, which obstacles were met, how we overcame them and in general what solutions and measures were taken to achieve the proper construction of a rooftop greenhouse while minimizing the environmental impact

This is the third part of this series which revolves around the installation of the steel and aluminum structure giving the greenhouse its distinct shape.

After having finished the platform on top the support building, the base for further construction and a nice working space were created to finally building the greenhouse itself.

It started off with the installation of the steel structure which carries the highest load. It needed to be aligned perfectly onto the wooden support beams under the platform itself to achieve maximum stability.

To fix main posts of the greenhouse to the platform, we had to drill through the roofing felt. This destroys the full sealing capability of the platform, a risk which could be taken, since the posts are all under the roof of the future greenhouse and it is not expected that any atmospheric influences take place within the greenhouse. For any other internal event (like pipe damage etc.) drains are integrated to preserve the platform from any damage.

Through several iterations, all parts of the structure of the greenhouse were developed and designed by ebf in the last five years. That meant all necessary functions down to every single screw had been placed beforehand and therefore could be planned out exactly before execution.

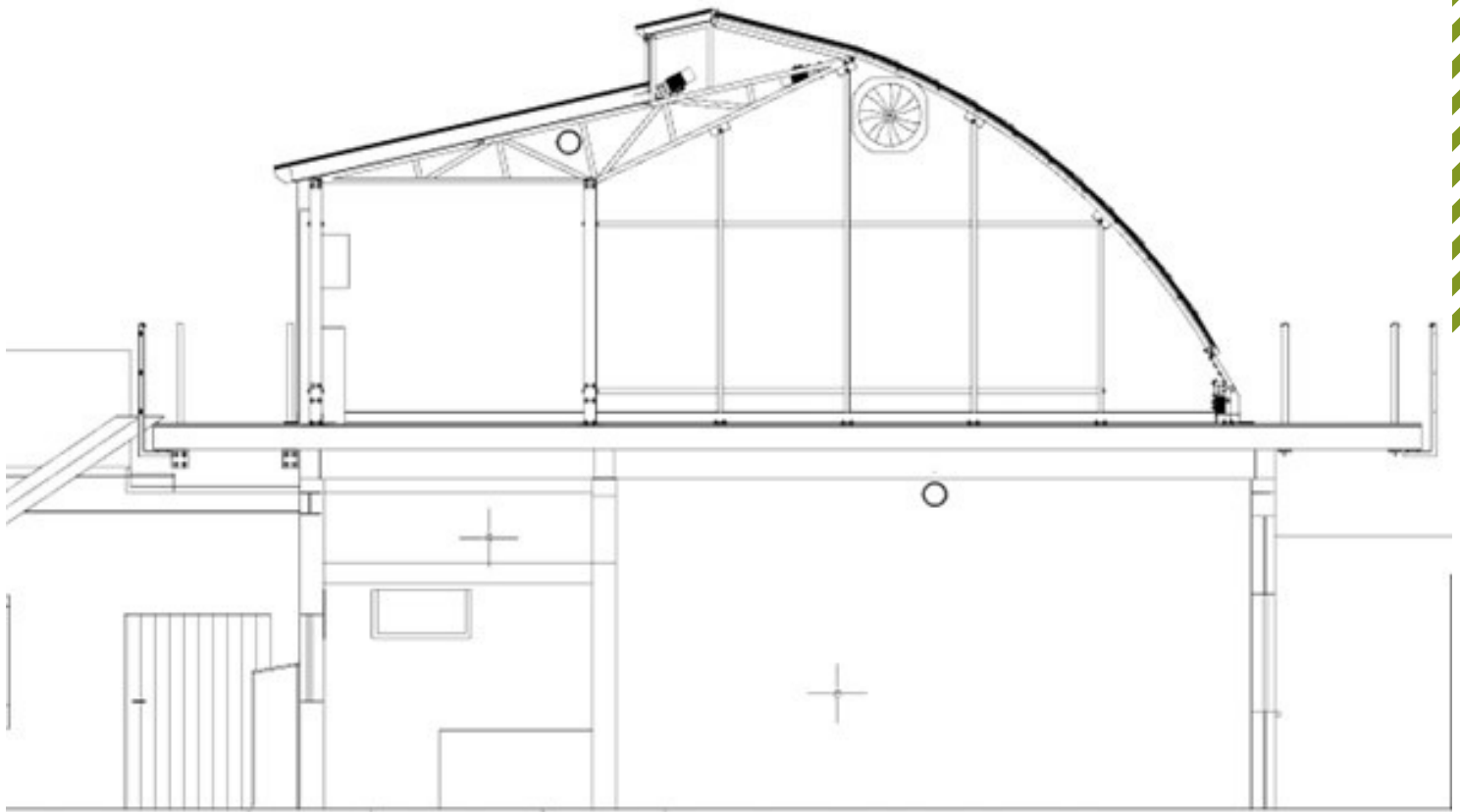


This also helped a lot while the construction was underway since the workers could ask for certain details and the office could provide them with updated and adjusted plans immediately. The rooftop greenhouse in Bürstadt is the fifth time this greenhouse model is being built, the first time by ebf.



Now doing the construction on our own site, with using new and interesting materials (See our articles about the building materials or the next article in this series) gave us the opportunity to adjust the approach to some aspects of the construction, so that we could implement a lot of advancements for future developments.

As mentioned before one of the most important aspects of the steel structure is the load bearing. But this also means, the posts of the greenhouse generate the most force which has to be transferred into the support building. There is no direct connection between the steel posts and the support building due to the wooden beam structure in the platform. Here, the layout of the support building helps out quite a lot, since the north and south wall are more or less directly underneath the posts of the planned-out greenhouse structure, and one of the walls inside is perfectly aligning with the middle post row as it can be seen in the following cross section, an excerpt of the construction plans.



The load is mainly coming down on the north and middle wall (left side), making the spanning from the middle to the south wall the leading factor for the wooden beam strength, reducing it to a minimum and optimized weight.

With a lot of ingenuity and clever approaches, using a crane or other heavy machinery could have been avoided despite especially the large trusses of the greenhouse roof being hard to handle.

For this part of the construction, we can show you a video: <https://www.youtube.com/watch?v=ZWg8H6xbytM>

After the installation of the steel structure, the aluminum profiles for the film installation were installed. Two different materials, steel and aluminum are used, because of their vastly different properties. Steel is heavier and more stable but comparatively cheaper. Fixing film with clamping techniques means that the film moves, even if it is only slightly, over the metal. Using galvanized steel, particles of the zinc will introduce themselves into the film which can lead to film damage over time. Aluminum does not damage the film in these ways and was therefore chosen for all film related mountings.

Since the shape of the greenhouse has a big arch towards the south side (main sun direction), the tracks needed to be bent. Due to easier transportation, they arrive straight as 7m long profiles. That meant the bending process had to be done on site. This was executed by our own workers with a bending machine with which the arches could be adjusted directly to the rest of the greenhouse.



The structure itself had some slight deviations which could be evened out during this process. The aluminum track profiles have an upper side with a base for an additional clamping profile to fixate the film (Details can be found in the next article in this series). On the bottom, channel rails can be found, to fixate growing equipment and additional structural components.

After installing the film, the pressure on the film leads to transversal forces on the aluminum arch. To prevent the greenhouse from collapsing, small aluminum pipes are installed which distribute the force into the whole structure. As all parts in the greenhouse none come with only one singular function, the pipes are also used to mount the PV Panels later on.

After finishing the greenhouse structure, the next working steps could be tackled. In the next article we are going to talk about the construction of the greenhouse hull which will be released two weeks from now.

VISUAL



PARTNERS



Do not hesitate to visit GROOF website : www.groof.eu

Discover GROOF Guidelines : <https://www.urbanfarming-greenhouse.eu/>
This is a summary of GROOF's experience in designing and building an energy efficient rooftop greenhouse.

