

The slaughterhouse and glasshouse

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ENGAGE PHASE

THE FORMER SLAUGHTERHOUSE IN HRADEC KRÁLOVÉ



- **What is the main question or idea of the challenge?**

To find and create a design solution for a future object as part of the former slaughterhouse in Hradec Králové using computational design. The challenge is to attract attention with an amazingly clever, cool, or even crazy object. It can be placed on the roof, next to the slaughterhouse in a new garden, inside the building, or even be accessible via the internet.

- **How can computational design techniques help to understand the challenge?**

For example, using Grasshopper as part of the Rhino program allows me to design more organic or kinetic objects while ensuring that individual parts do not collide. The program helps ensure that each part of the object fits perfectly and also each part of the object can have its own scripts, therefore later it can be combined and they will be exchangeable. Finally, I can create more versions of the model.

- **How to support principles such as sustainability, fairness, and inclusiveness?**

Sustainability can be supported by using recycled materials from the former slaughterhouse in Hradec Králové, which helps avoid purchasing new materials and reduces waste generated during reconstruction or revitalization.

To support fairness and inclusiveness, the future object could function as a space for workshops or as a community center. If the object is placed next to the building or in the garden, it could also take the form of a community garden with a greenhouse.

- **What sources should be consulted?**

Since the object will mainly be made from recycled materials, it is important to consult experts about the structural properties of these materials—such as their load-bearing capacity and whether they will still perform adequately after recycling. It would also be useful to consult a specialist in computational design to ensure the object is both aesthetically attractive and at the same time technologically functional.

- **Am I lacking certain skills? Do I need to consult with someone?**

Currently, I am learning to work with Grasshopper within Rhino. Therefore, consulting an experienced specialist in this software would be very helpful. As an architecture student, I also have only basic knowledge of structural design, so consultation in this area would also be beneficial.

- **What do I need to research?**

I need to look for similar projects that use recycled materials in construction if I want to stay within architecture. I also need to explore which materials can be recycled, since not all materials retain their specific functional properties after recycling.

- **What materials can be recycled in architecture?**

Steel, concrete, wood, glass, plastic, brick and masonry, insulation materials, rubber, aluminium.

- **Can I do this alone?**

Since this is a project involving a small-scale object I do not think teamwork is necessary. On the contrary, I would like to take on this challenge independently to improve my skills in the software.

INVESTIGATE PHASE

INSPIRATION

- Mehr.WERT Pavilion



BRAUN, Zooey. Mehr.WERT.Pavillon (Added.VALUE.Pavilion) [online]. 2019 [cited 2026-03-25]. Available from: <https://archello.com/project/mehrwertpavillon-addedvaluepavilion>

A pavilion located in Heilbronn, Germany, was designed to demonstrate potential of circular construction using 100% recycled glass. The recycled glass is made from waste such as bottles (white, green, or brown). The process preserves the original colors and shapes of the glass fragments, creating unique patterns.

Glass from old window and door frames can be recycled either by reusing the original frames or by industrial recycling processes, where old glass is melted down and transformed into a new product.

- Thomas Heatherwick's Bombay Sapphire Distillery



HEATHERWICK STUDIO. Thomas Heatherwick's Bombay Sapphire Distillery [online]. 2014 [cited 2026-03-25]. Available from: <https://www.architecturalrecord.com/articles/3253-first-look-thomas-heatherwicks-bombay-sapphire-distillery>

A forgotten Victorian industrial site has been brought back to life as a sustainable modern hub thanks to glasshouses as its centerpiece. The glasshouses are inspired by Paxton's Crystal Palace. There are 2 glass objects with 2 different types of plants such as temperate and tropical ones. The Bombay Sapphire glasshouse project uses heat energy from the distillation process of gin and also cultivate the ten botanical spices used to flavor the gin.

LIST OF RESOURCES

Video tutorials and websites are on:

- Parametric House (Paracourse)
- How to Rhino
- Rhino3D Official Tutorials

YouTube Channels:

- Nick Senske
- Alphonso Peluso

Essential Grasshopper Plugins :

- Kangaroo
- Elefront
- Ladybug / Honeybee and so on

ACT PHASE

MY PROPOSAL - INTEGRATING A GREENHOUSE INTO THE DESIGN

The greenhouse could serve as a community space, supporting inclusiveness and bringing together people of different generations, cultures, and social groups.

In terms of sustainability, I would use recycled glass from the former slaughterhouse, particularly from window and door openings that will likely be replaced during renovation.

To connect the former slaughterhouse and the glasshouse, in terms of design, construction and sustainability it is amazing how the studio of Heatherwick created the Bombay Sapphire glasshouse project which uses heat energy from the distillation process of gin. I think I can create something similar.

From a technological perspective, it would allow me, as a student, to explore and more complex form of glasshouse than traditional ones. Conceptually, the greenhouse reflects the transformation of the site—from a former slaughterhouse to a space aligned with contemporary values, where people increasingly focus on a healthy lifestyle and plant-based food.

ACTION PLAN

First, I will focus on self-study to improve my skills in computational design, especially in Rhinoceros 3D and Grasshopper, which are essential tools for developing and testing my proposal.

I will also consult experts, particularly in structural engineering, to ensure that the recycled materials meet safety and stability requirements.

Another important step is to research existing architectural projects that use recycled materials in order to better understand their possibilities, limitations, and practical applications.

I will gradually develop my concept, starting with simple forms and moving toward a more complex structure, potentially inspired by natural systems.

Finally, I will refine the design based on feedback and continuously improve both its technical and aesthetic qualities.

BRAINSTORMING WITH AI TOOL GEMINI

Question:
I've been tasked with designing a greenhouse connected to a former slaughterhouse. One option is to place the greenhouse on the roof of the building. What do you think about that?"

Answer:

Technical Advantages

Thermal Mass: Former slaughterhouses often have thick masonry walls or heavy concrete structures (originally for insulation and cold storage). This provides excellent thermal mass to help regulate the temperature of the greenhouse above.

Structural Integrity: These buildings were designed for heavy industrial equipment and hanging carcasses, meaning the roof structure is likely robust enough to support the weight of soil, water, and glass.

Energy Loops: You can create a circular system where the building's waste heat (from the spaces below) helps warm the greenhouse in winter.

Challenges to Watch

Waterproofing: Converting an old roof into a greenhouse requires high-end drainage and moisture protection to prevent the old structure from rotting.

Access: You'll need to integrate modern elevators or stairs into the old floor plan to get people and supplies up to the roof.

What if I designed a 14-meter diameter greenhouse that would, in a way, cut through the building, making it visible from both the outside and the inside? Would it be technically feasible to cut through the exterior wall if the building is a single-story, slab-on-grade bungalow?

The main problems:

The Problem: The roof and the remaining wall sections will want to collapse toward the hole.

New Foundations: You will likely need to dig new, deeper foundations specifically for the 14m greenhouse structure to ensure it doesn't sink or move differently than the original building.

And what if the greenhouse diameter was only 6m and there was just a hole in the roof instead of the perimeter wall?

By cutting only the roof, you create a central light well (an oculus). In a former slaughterhouse, which usually has deep, dark floor plans, this brings a "column of light" into the very center of the space. It creates a protected, secret garden that isn't visible until you actually enter the building.

Structural Load: A 6-meter span is very manageable. Most industrial buildings have a grid of columns or load-bearing walls. You would likely only need to remove a small portion of the roof deck and add a steel ring beam around the 6m opening to support the weight of the glass dome or cylinder.

No Wall Breaching: Since you aren't touching the exterior walls, you don't have to worry about the building's overall lateral stability. You are simply replacing a piece of the "ceiling" with a "hat" of glass.

The "Winter Garden" Micro-climate

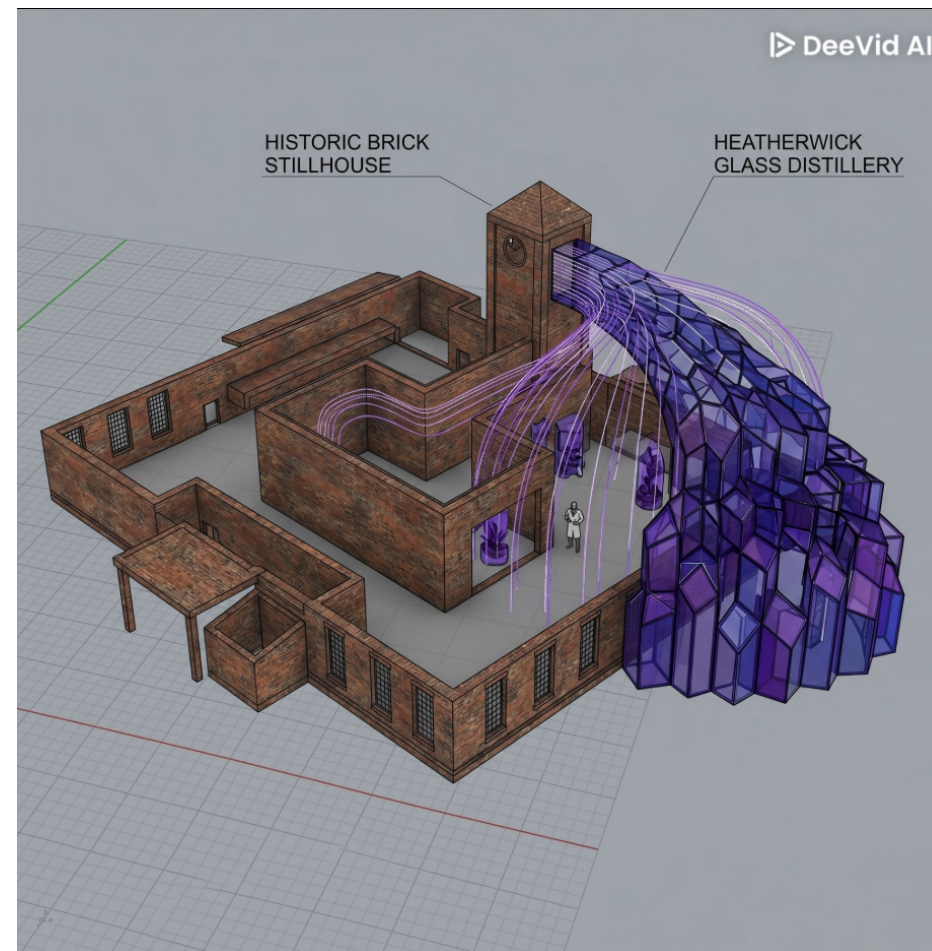
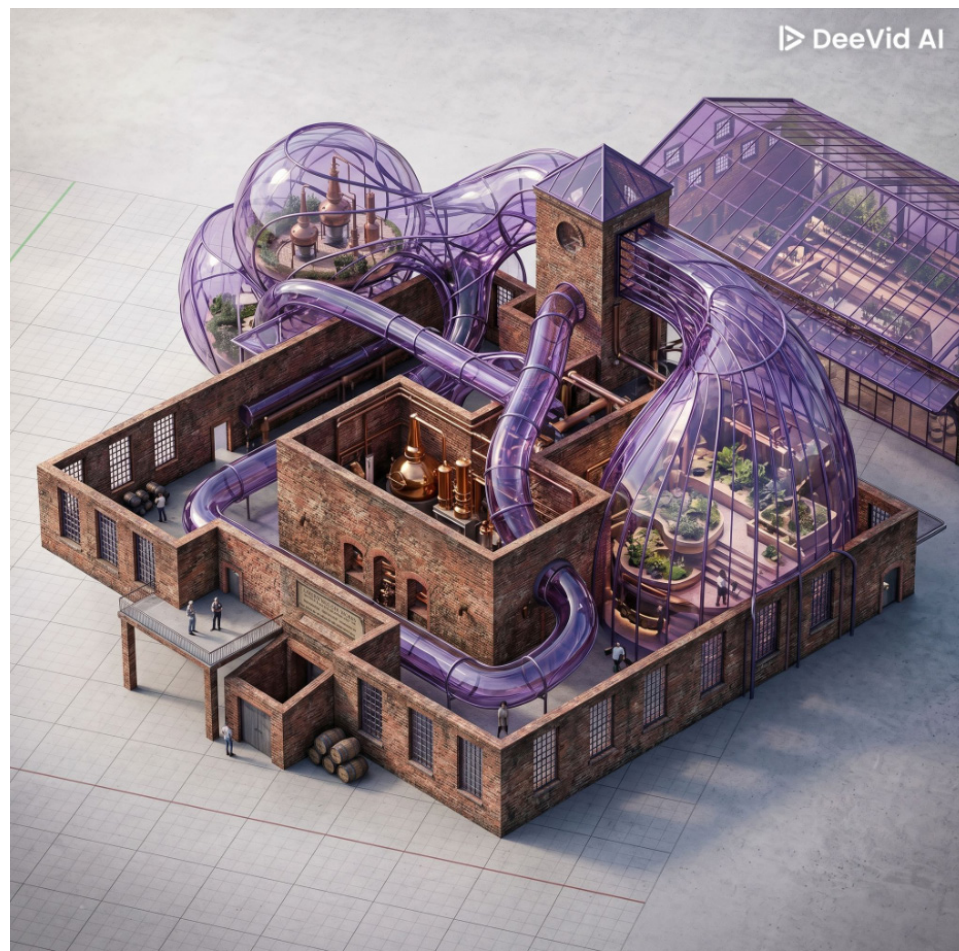
Natural Ventilation: In the summer, you can open the top of the greenhouse to create a "chimney effect," drawing hot air out of the entire building.

Passive Heating: In the winter, the sun warms the 6m core, and that heat radiates into the surrounding rooms.

Space Planning

With a 6m diameter (approx. 28 m²), the greenhouse becomes a feature focal point: It could be a lush tropical garden in the middle of a cafe, library, or exhibition space.

The contrast between the heavy, industrial floor of the slaughterhouse and a soft, green circular center is visually very powerful

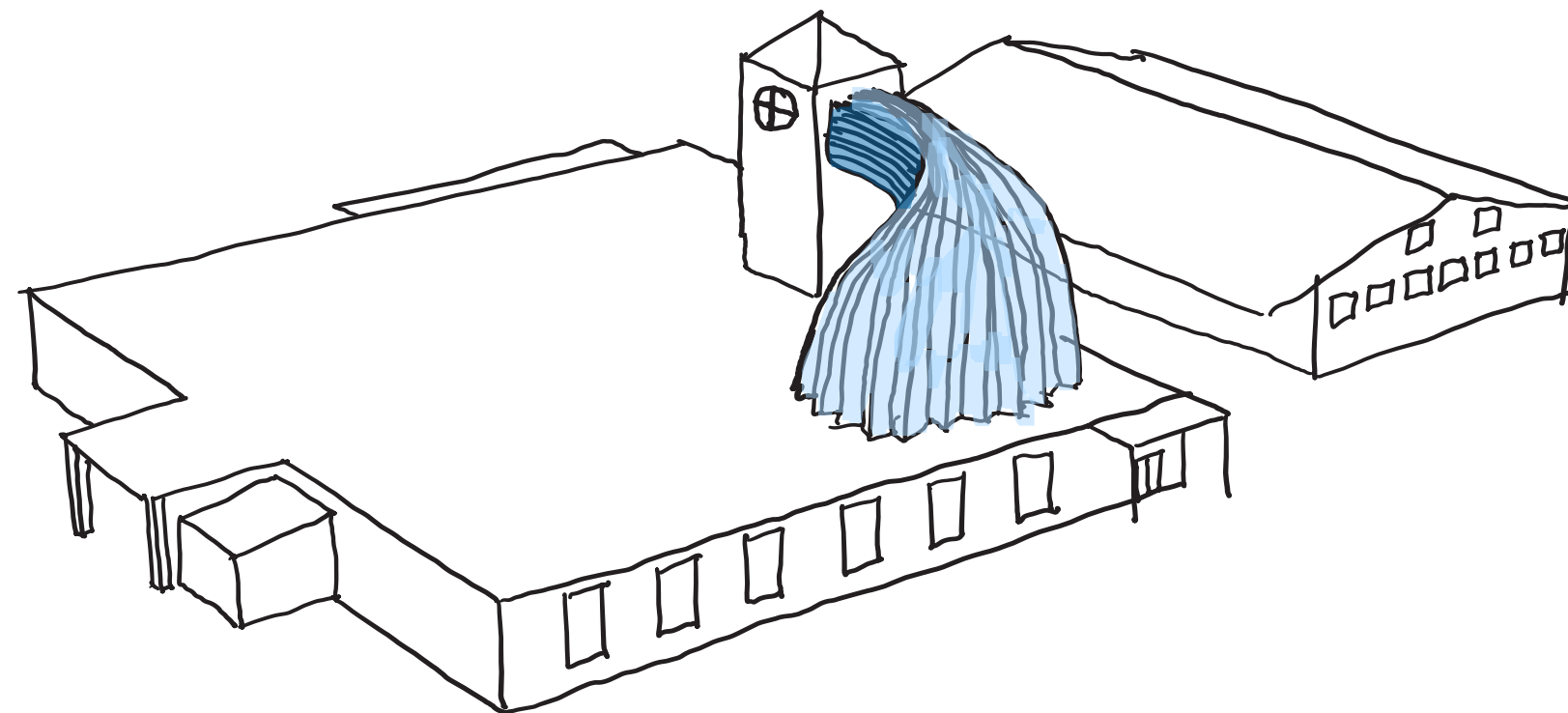
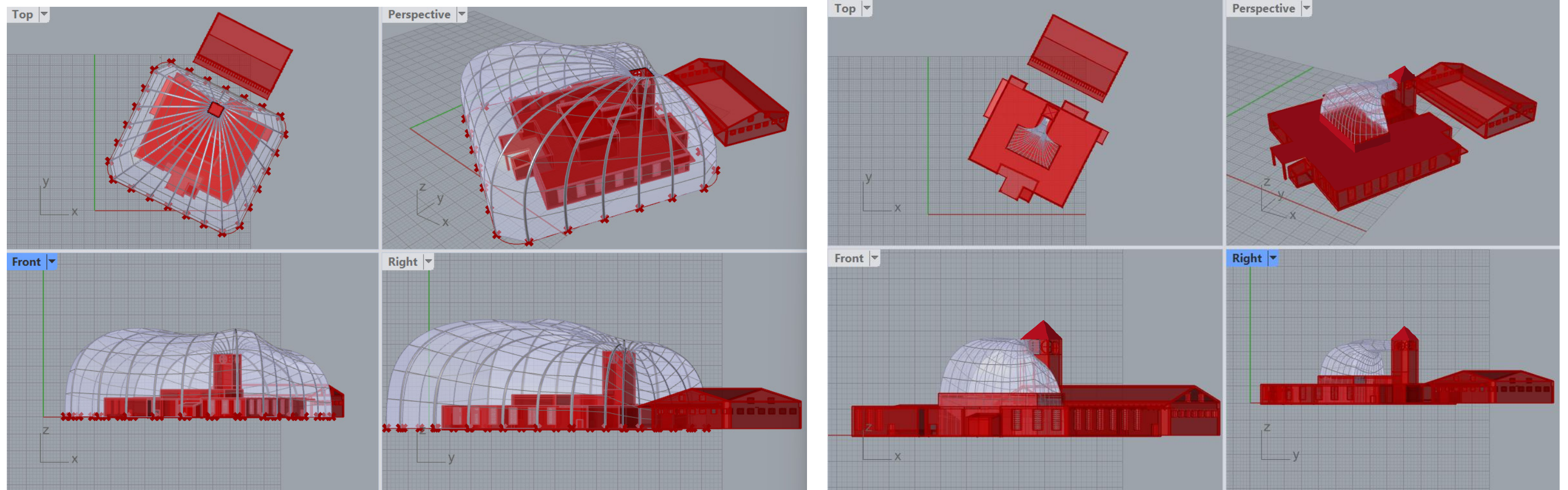


BRAINSTORMING WITH AI GENERATOR STABLE DIFFUSION



the source: <https://deevid.ai/ai-image-generator>

OPTIONS OF THE SHAPE AND POSITION OF THE GLASSHOUSE



REPORT

- Defining the goal: First, I defined my objective, which was to create an attractive structure on the roof of the slaughterhouse, leading me to choose an organic shape.
- Material selection: Once defined, I answered the questions that guided me to a specific solution using recycled materials. I chose to use recycled glass (not necessarily limited to the former slaughterhouse) and melt it down to create a new material for the greenhouse design.
- Design inspiration: To determine the specific shape, I drew inspiration from the Bombay Sapphire Distillery glasshouse design by Heatherwick Studio, which utilizes the heat generated during alcohol production to warm the greenhouse.
- Modeling process: In the action phase, after sketching initial designs, I focused on creating the object in Rhinoceros and Grasshopper. This was an extra challenge as it was my very first time using these programs.
- Building integration: The greenhouse ultimately sits on the existing elevated roof and penetrates the slaughterhouse tower to harness the rising heat from the building through the chimney effect. Aesthetically, a “tail” section cuts through the tower from the opposite side.





REFLECT

- For the first time, I used Rhino and its plugin, Grasshopper.
- To improve my skills during this semester, I attended computer-aided design classes at our university.
- During the process, I also tried workflow integration by transferring a model originally created in Revit into the Rhino environment and vice versa. I was surprised by how easy this was thanks to Rhino.Inside Revit.
- It was my first time designing architecture meant to be integrated into an existing historical structure—in this case, the former slaughterhouse in Hradec Králové.

Additionally, I used artificial intelligence in my design process for the first time. I utilized AI during the post-production phase of creating visualizations in Adobe Photoshop, after first generating the base render in Lumion.

- Finally, I became familiar with the Challenge-Based Learning (CBL) framework, where guiding the project through the ENGAGE, INVESTIGATE, and ACT phases was highly effective in reaching the final solution.