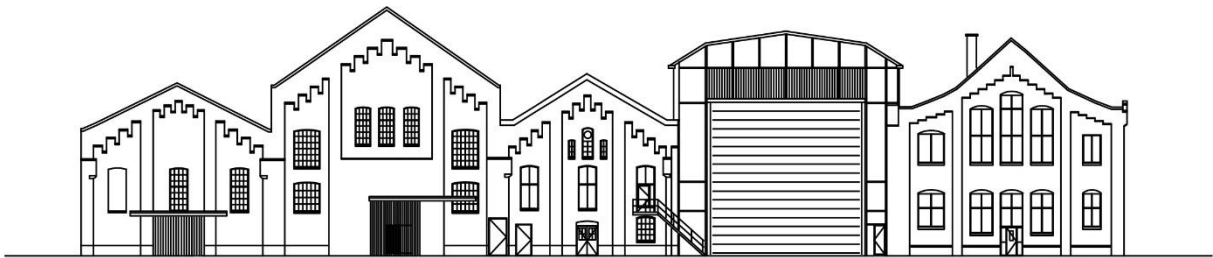


# Graduation Plan

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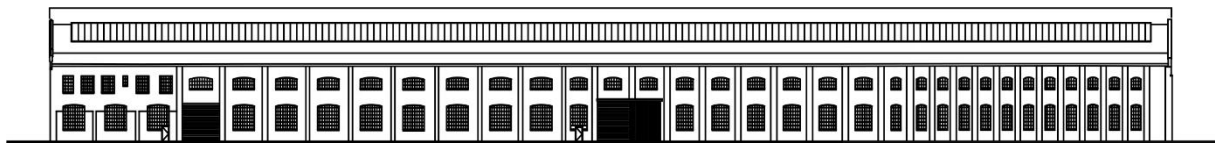
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Project	The Sports Factory
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# Graduation Plan

Engineering and architecture have always been my passion, as long as I remember I have been wondering how buildings function and how they are built. In my opinion the best architectural designs are made when the engineering solutions are an integral aspect of the overall design. The Architectural Engineering studio allows me to further examine and study integral design solutions.

## Title

The Sports Factory



## Graduation Project

### Problem Statement

The Van Gendhallen were built, rebuilt and expanded late 19<sup>th</sup> and early 20<sup>th</sup> century on Oostenburg island in Amsterdam as part of a larger complex of industrial buildings. The five long and narrow halls are built side by side sharing the long walls. In these halls ship and train engines were fabricated. After the factory left, a housing cooperative and a developer acquired the Van Gendhallen and most of the surrounding area. At this moment the building is leased to various small companies, while the owners and the municipality are looking for a more permanent destiny for the building.

Oostenburg island seems to be forgotten in recent transformations of Amsterdam. The rich history of the area in combination of its vicinity to the centre of Amsterdam makes this area ideal for an intervention. The Van Gendhallen hereby have the quality and potential needed to become the catalyst and centre point of this transformed area.

This listed building needs a desperate technical (climate, acoustical, structural, daylight, installations, etc.) intervention before this can happen. A large share of these technical problems stem from the shape of the building and its building envelope. The building is pragmatically made for an optimized manufacturing process, not to be an ecological and healthy work or living space. The inner halls don't have much outer façade, therefore daylight needs to enter through skylights in the roof. The long shape of the halls and the hard surfaces create a space with low acoustical quality. The tick brickwork façades and the roofs are not insulated. A new roof, insulated and optimized for daylight and acoustics, will start to solve some of the technical problems.

My technical fascination lies with shell structures and double curved surfaces. With these designs it is possible to make large yet elegant spans with minimal material usage. To be able to build a new roof over the halls is important to keep the weight down. Finding an optimized structural and architectural shape is therefore important for the overall design intervention. The double curved shape of the new roof will bring a new spatial quality to the building. It will also link the building to the new program and to the water next to the building.

**Objective**

The objective of this graduation project is to reactivate Oostenburg island in Amsterdam by making an intervention in the Van Gendhallen. Renewed activity in the building will also revitalise the surrounding area. Fitting a more permanent program into the building permits the owners to make new investments in the neglected building. The size of the halls allow for a multifunctional public program. The building will be transformed into a sports centre.

The architectural intervention will make the building suited to this new program, fix the problems caused by neglect and solve the technical problems. The goal hereby is to not lose the industrial heritage and character of the building and surrounding area. A bold technical design solution keeps the intervention in line with the spirit of the original design, while at the same time creates a contradiction between old and new. The intervention does not need to be sentimental or defensive of the original design.

**Overall design question**

How to transform the Van Gendhallen to a multifunctional sport centre, by creating a new shell roof structure?

**Thematic Research Question**

How to design a shell roof structure, on an existing building, by means of a flexible mould?

Technical sub questions:

- What types of flexible moulds, to create double curved elements, are already on the market?
- What are the limits of these existing flexible moulds?
- What is the quality of the panels made from these moulds?
- How connect panels together to make a roof surface?
- How to make this surface structural?

Architectural sub questions:

- What is the surface quality of the finished roof structure?
- How to optimise the roof structure for spatial quality?
- How to optimise the roof structure for daylight transmission and acoustics?
- Is it possible to integrate sustainable measures into the design of the roof? Like solar panels, water collection or a greenery.

## Methodologies

### Site and building analysis

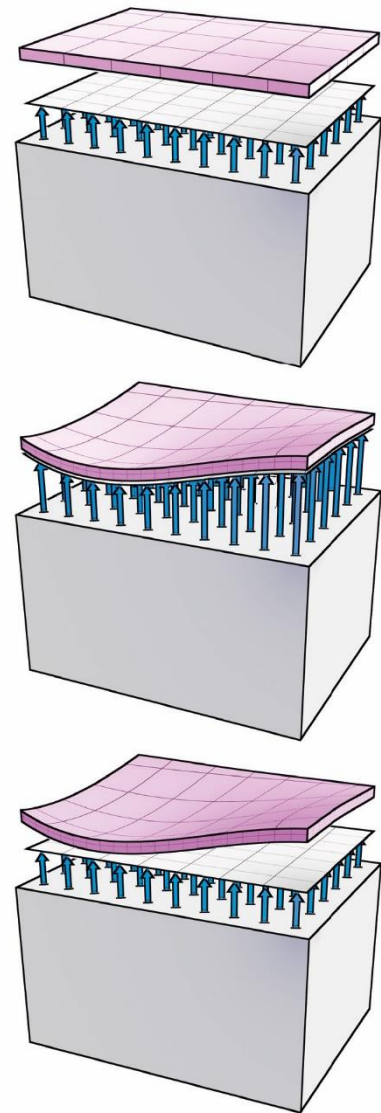
The first thing that needs to be analyzed is the context for this project. This analysis will point out hidden problems and opportunities. From here further research can be done and (sketch) designs can be made.

### Literature study

To be able to make this technical intervention it is important to do an extensive literature study. From literature studies I hope to learn more about general shell structure theory, different building technologies, material properties and possibilities, digital production methods and how to solve acoustical and daylight problems. Besides technical knowledge I would also like to learn more about interventions in industrial heritage in general.

### Case study

Reference buildings and interventions can help me find solutions for problems I will come across, inspire me or challenge me to ask new questions.



[1]

### Research by design

With the knowledge gained by the analysis and studies, it will be important to design different solutions. From designing and testing multiple design solutions I will learn which solutions work and which will not work. Branching out to many solutions early will give a good overview of the possibilities. From there onwards the solutions can be evolved through an iterative cyclical process till one (or more) optimal solution is found.

If time allows for it, maybe it will be possible to make physical models and test the predictions from the research.

### **Planning**

A planning is attached at the end.

### **Relevance**

Oostenburg island is in need of an intervention. The public space, in light of its vicinity to the centre of Amsterdam, is underutilized and of low quality. The existing buildings have the possibility to reactivate the island and bring back life to the site.

The Van Gendhallen, like many historical factories in Western Europe, have lost their initial function. Although neglected, the building has strong character and heritage. Demolishing old abandoned factory buildings like this would also mean losing the soul of the area. Leaving the building empty, neglected or filled with temporary programs on a potential prime location as this is also not desirable and sustainable. Finding a new program for this building and making an architectural intervention will revitalise the building. One of the programs missing in the surrounding area is a sports centre. The municipality of Amsterdam has stated in their vision for 2040 that sports is one of the focus points for the near future. Therefore creating a multifunctional sports centre in the Van Gendhallen is not only an exciting design project, but also has real world relevance.

Shell structures have a strong architectural and engineering history. Designs made by Nervi, Isler and Candela are still sources of inspiration and admiration for architects, engineers and students. Also more contemporary designs made are widely published. Advances in computational power and software tools in the last decade(s) have provided designers the possibility to rapidly find and calculate optimised (structural) forms. This digital revolution of the design process has not yet translated to the building process. Making shell structures or double curved surfaces still require a lot of man-hours and expensive unique moulds. Finding new ways of building and fabrication would open up more possibilities to designers.

The relevance of this project can be seen on multiple scales and varying abstraction levels. This project will give a direct design proposal to reactivate the Van Gendhallen and Oostenburg island. There are many more abandoned industrial sites and factories in Western Europe. The proposed design intervention can also be applied to these other contexts. Lastly, the outcome of the research may also be applicable to design interventions for other type and scale buildings or to completely new buildings.

## Literature

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Adapa – Adaptive moulds

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[1] Image from Adapa Adaptive Moulds brochure