

# Reflection

## General

In order to find suitable solutions for the reinforcement of the Amsterdam School style buildings in the Province of Groningen there are many aspects which are of importance. Research on various different topics and disciplines had to be executed (learning the basics of earthquake resistant retrofit, interviewing residents of case study houses, researching prewar building methods, studying building plans, making a risk analysis of the buildings, etc.). All the information found during the research formed the basis for the created boundary conditions for the designs.

## Planning & process

To find all the pieces of information within the set timeframe during the early phase of the research a planning and a method have been made (Figure 1: Method, Figure 2: Planning)

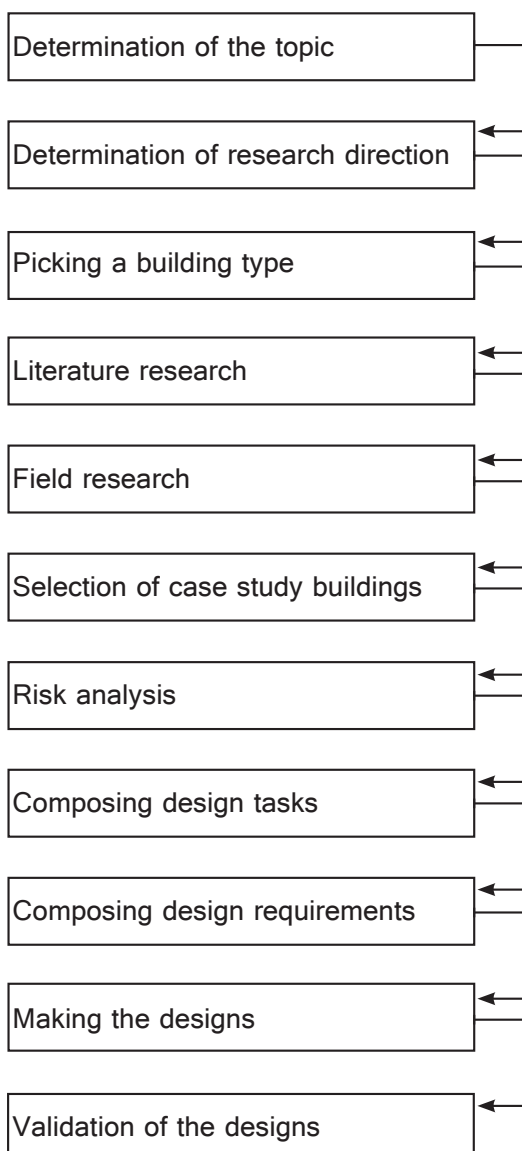


Figure 1: Method

In case of retrofit you are confronted with existing buildings and situations. Every new case has its own unique properties. Generalization for this reason is hard. Also there are a lot of stakeholders (residents, engineers, municipalities, historic preservation institutions, etc.) involved in the process of reinforcing heritage buildings which you in the end you have to please all. All stakeholders have different interests and satisfying all of them might not always be possible.

Within my research one of the problems I had to deal with was lacking information regarding the case study buildings. Not for all buildings the building plans were available. For the screening of the buildings without plans I was dependent on the residents of the houses. Therefore the assumptions of the build-up of the houses is merely an approach of the real situation.

Making appointments with residents of houses, the architect of the local archive in Loppersum, with employees of Arup, employees of the municipality of Loppersum, and employees of Libau (cultural heritage agency) for visiting the test houses and so on took quite some time. Also the site visits, since Groningen is not very close by, was very time consuming. That slowed down the process sometimes, and made that the planning which was made during the start of the process turned out slightly different as expected.

The topics "earthquakes" and "earthquake resistant building/retrofit" were completely new to me at the beginning of my research. Making myself familiar with the basic information, and defining the actual research proposal therefore was challenging. And still, in the end, knowledge of, for example, dynamic calculations is still outside my frame of reference. This makes it hard to prove the structural efficiency of the designs myself. However, the designs have been screened by an engineer of the engineering agency Arup.

Also switching between topics (earthquakes, Amsterdam School style, retrofit, prewar building methods, etc.) and switching between disciplines (fieldwork, literature research, interviews, designing, writing) was sometimes a challenge.

Looking back, I am satisfied with the resulting designs. Although some steps in the process that were part of the method have been time consuming, all activities in the process have been valuable.



contributions to the final product. With the knowledge and experience of this project in the future probably a more realistic planning can be made at the start of a new research.

### **Framework graduation lab**

The research fits well in the framework of the Sustainable Design Graduation Studio. The study goals following the study guide are:

The student:

- is capable of delivering innovative contributions toward the development of sustainable structural, façade and climate design, and to technical-scientific research in these areas
- has insight in the profession and competences of structural, façade or climate designers and their societal and professional role in sustainable development of the built environment

The research meets this requirements. The research and the designs contribute towards the development of structural design. In particular the meetings with experts in the field has increased the understanding of the profession and competences of structural designers and their societal and professional role in sustainable development of the built environment. The interviews with residents of houses in Loppersum created a deeper understanding of the societal wishes and needs of the end user, and the urgency of finding suitable solutions to the problem.



	Januari			Februari					March					April					May					June					July		
Weeks	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29				
Prior research																															
P2 presentation																															
Research on risk elements																															
Research on damage patterns																															
Research on seismic retrofit of nonstructural (masonry) elements																															
Visiting test houses																															
Visiting damage building with a damage expert																															
Defining the specific requirements/boundary conditions																															
Composing the "catalog"																															
P3 presentation																															
Readjusting catalog after P3 feedback																															
Application of the catalog on a case study building																															
Performance testing of the measures (computer modeling)																															
Drawing details																															
3D modeling																															
P4 presentation																															
Evaluation of the final method																															
Process remarks, further research directions																															
Final report/presentation preparation																															
P5 presentation																															

Figure 2: Planning

