Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	
Student number	

Studio		
Name / Theme	AR3AE100 Architectural Engineering Graduation Studio	
Main mentor		Design Tutor
Second mentor		Building Technology Tutor
Argumentation of choice of the studio	To integrate the use of vernacular materials in contemporary architecture to rekindle our innate, physical sensitivity to our environment. With archaic, atypical or non-canonical approaches in architecture, I would like to challenge the conceived idea of comfort and home.	

Graduation project	
Title of the graduation project	A-Common Houses
Goal	
Location:	Sloterdijk, Amsterdam
The posed problem,	Mass industrialisation and generic standardisation has slowly eroded our sensitivity towards our natural and built environment. Our definition of comfort and home is inclined towards big floor area, total control on our environment and detachment from people.
research questions and design assignment in which these results.	To achieve the goal, I focused my research on Common Reeds: the methods to technically apply reeds in facade design. I wish to use this somehow archaic or commoner's material in transforming the iconic modern tax administrative building, De Knip, into collective dwellings. It is also a material which can challenge our definition of comfort and control.
Design question:	

How can De Knip's façade be adapted to the building's new programme and architectural image?

Thematic research question:

How can Common Reeds be applied in façade to support the general functional requirements of a façade?

to promote the use of Common Reed as a sustainable and vernacular building material in contemporary architecture.

Sub-questions:

a. What criteria (and its corresponding definition) are considered as general functional requirements of a façade?
b. What are the characteristics and physical performance of Common Reed in regards to the aforementioned criteria?
c. What are the feasible vernacular solutions to overcome the physical limitations of Common Reed in fulfilling the criteria?
d. What are the applicable forms of realised reed façade designs? What can we learn from these designs in relation to its functional performance?
e. How can the efficacy of carbon footprint mitigation in the façade modules be quantified and evaluated?

Process

Material Study: Common Reed (Phragmites australis)

Sub Question	Data Required	Data Collection Method	Data Analysis Method	Expected Results
a. What criteria (and its corresponding definition) are considered as general functional requirements of a facade?	- List of building façade's functional needs: fire retardance, thermal insulation, acoustic insulation, maintenance ease and operational ease. The criteria will be defined clearly according to regulations (if applicable) or relevant parameters.	- Literature: Building Decree 2012, nearly energy-neutral new construction (BENG), Professional Thatcher Federation's datasheets	- Compile relevant data and refine a clear definition for each criterion.	- List of criteria (and its corresponding definition) that is relevant to be considered as façade's common functional need.
b. What are the characteristics and physical performance of Common Reed in regards to the aforementioned criteria?	- Characteristics and physical performance of Common Reed in regards to fire retardance, thermal insulation, acoustic insulation, maintenance ease and operational ease.	- Literature - Interview with experts	- 300mm thick untreated reed thatch in closed construction is set as a control sample in all evaluation. - Compile and analyse relevant data.	- Manipulative variables which influence reed's performance index will be identified. - Clear overview of which aspects should be given extra attention and etc.

				- List of design principles in designing reed facade.
c. What are the feasible vernacular solutions to overcome the physical limitations of Common Reed in complying with the criteria.	- Vernacular solutions to improve reed's limitation, especially in regards of fire retardance and thermal insulation.	- Literature - Professional Thatcher Federation's datasheet and guidelines	- Select the feasible vernacular solutions to improve or optimise reed's performance in the aforementioned aspect.	- List of feasible vernacular solutions to overcome the physical limitations of reed in complying with the criteria.
d. What are the applicable forms of realised reed façade designs? What can we learn from these designs in relation to its functional performance?	- Case studies	- Literature	- Redraw each case study's design into same isometric drawing at scale 1:20 to be compared and contrasted. - Evaluate each design in comparison with the 5 criteria defined at *a*.	- a catalogue of illustrated spreadsheets on different facade designs, with annotated exemplary design principles. - a matrix to show an overview of all designs' physical performance.
e. How can the efficacy of carbon footprint mitigation in the façade modules be quantified and evaluated?	- Amount of carbon footprint released (or absorbed) in each case study based on the amount of reed used and other materials used.	- Literature	- Calculate each case study's efficacy in mitigating carbon footprint.	- a numerical figure showing each case study's efficacy in mitigating carbon footprint.

Method description

The paper is first set to identify the multitudes of functional requirements a façade has to fulfil, namely fire retardance, thermal insulation, acoustic insulation, maintenance ease and operational ease. The definition of each functional requirement is defined according to relevant regulations and requirements (if applicable) such as Building Decree 2012, nearly energy-neutral new construction (BENG), etc. which directly influence the feasibility of using reed as a façade material (refer Appendix 2).

Next, the paper will study the physical performance of reed corresponding to the aforementioned requirements. The data will be collected through literature and interviews with experts. The manipulating variables which influence reed's performance index will be determined. These will give an overview of which aspect should be given extra attention or has the potential to be improved in the design stage.

Based on the acquired results, the paper will move on to study feasible vernacular solutions to overcome reeds' limitations as shown by previous evaluation. Combined with the previous parts, these findings will be concluded as a list of design principles readily to be referred in the design of reed façade module.

Next, the study will look into realised case studies of different reed façade designs in multiple contexts. The designs will be illustrated in the same scale (1:20) and drawing conventions to be analysed, compared and contrasted. The outcome is a catalogue of illustrated spreadsheets on different façade designs, with annotated exemplary design principles (refer Appendix 3). The efficacy of carbon footprint mitigation in the façade modules be will be calculated and evaluated (refer Appendix 4). This last stage will conclude how the designs fulfil its ecological responsibility while meeting functional requirements and articulating architectural expressions.

Lastly, a performance matrix (refer Appendix 5) will be provided to show an overview of all designs' physical performance. These will address how different designs can result in different performance yields.

Literature and general practical preference

Association:
Vakfederatue Rietdakkers

Literature:

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Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

My graduation project is entitled “A-Common Houses". It is a project aimed to rekindle our innate, physical sensitivity to our environment. This statement is to problematise the widespread adoption of generic industrialisation and mass-standardisation. The interventions or approaches can be archaic or non-canonical to challenge the conceived idea of comfort and home. I believe this approach is relevant in the AE studio topic entitled “Second Life”, a decision to transform De Knip from an office block into housing, which involves evidential changes on the entire spatial quality that the building is to portray.

From this AE Graduation project, I learn how comprehensive understandings of technology and practicality inform design decisions. The focus of the studio is on research by design. I found this trajectory helpful to base our design on sharp research methodology and in turn the research feeds the design. I believe this is also the mastery that is essential to an MSc of Science in AUBS.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

From the research point of view, the development of reed as a façade material not only celebrate the beauty of this vernacular material but also do our part to address the issue of carbon footprint incurred by our building industry. As a carbon sequestering agent, reed beds can store large amounts of CO2 besides mitigating the erosion of wetlands. This approach is also a direct answer to the Dutch Ministry of Agriculture, Nature and Food Quality calls for the development of high-quality wet crop products (Ministry of Agriculture, Nature and Food Quality, 2021). This development can establish new marketing opportunities to encourage agricultural entrepreneurs to switch to such cultivation to mitigate land subsidence, peat oxidation and greenhouse gas release that is happening drastically in the North and West region due to pastoral agricultural activities.

From the design perspective, this project suggests new housing typologies which have small footprints and atypical configurations. These typologies diverted from the canonical conventions in dwellings to problematise our definition of comfort and house. Each typology has a unique character to trigger users to rethink their innate sensibility to spatial relationships. If this idea can be disseminated, we may be able to promote small living concept to mitigate the tension of housing crisis. Perhaps also, making people to be actively reflecting on the needs and definition on quality living.

Appendix: Research Plan Diagram, Timeline Schedule

Stage	Schedule
P1	1. Defined the scope of study 2. Conducted case studies on realised reed façade design
P2	1. Delivered the research paper 2. Drafted preliminary design on the façade of De Knip, based on contextual background: - orientation of the building - surrounding context - architectural expressions
P3	1. Delivered refined design on De Knip's façade 2. Delivered transformed residential interior spatial configuration and organisation 3. Ensured the façade is informed by informed by internal spatial organisation as well as external image

P4	1. Refined the entire design scheme, which includes human circulation, dwelling typology, sustainability considerations etc. 2. Delivered the scheme in proper drawing conventions, which include plans, sections, elevations, connection detail, etc. 3. Expressed the façade design in collage to show the overall impression after transformation. 4. Integrated building technology and climatic response approaches in the design. Show in sections and details. 5. Addressed the transformation of the building in relation to the urban fabric (changes brought to the surrounding context)