

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	Olympia Apostolopoulou	
Student number	5140242	
Studio		
Name / Theme	Urban Facades	
Main mentor	Alejandro Prieto Hoces	Architectural Façades and Products
Second mentor	Barbara Lubelli	Heritage and Technology
Argumentation of choice of the studio	Having followed last year's studio "Façade Design", it was evident that the façade constitutes an important part of a building's envelope, capable of influencing its performance. A proper design of the façade can lead to an effective and long-term function, but it can also introduce new tools that affect not only the inside, but also the outside. Urban facades are such an example, since they face a number of problems, taking place in an urban environment on a daily basis. This was the reason why I chose this specific graduation theme, as façade of new or existing buildings can contribute to the improvement of an urban environment.	
Graduation project		
Title of the graduation project	TiO ₂ -coated façade system integrated into Athens' historical buildings for air purification purposes	
Goal		
Location:	Athens, Greece	
The posed problem,	To increase the durability of TiO ₂ photocatalytic coatings that thanks to their application, a reduction in air pollution levels can take place, in areas that are highly affected by.	
research questions and	How can a prefabricated façade product/system, coated with TiO ₂ be designed to find widespread application on façades of existing historical	

	buildings in Athens, in order to reduce air pollution levels in the proximity of its application?
design assignment in which these results.	A façade product/system, based on photocatalytic properties of TiO ₂ , which can find widespread application in existing buildings in Athens by its proper design and enhancement of TiO ₂ coating's durability
<p>[This should be formulated in such a way that the graduation project can answer these questions. The definition of the problem has to be significant to a clearly defined area of research and design.]</p>	
Process	
Method description	
<p>[A description of the methods and techniques of research and design, which are going to be utilized.]</p> <p>The proposed facade product/system aims not only to the remediation of air pollution, but also to the improvement of the building envelope of the chosen building. Athens offers a variety of different building typologies and it would be wise to take them into account, when trying to enhance the urban landscape. Therefore, a theoretical framework is of paramount importance. Literature study is conducted, concerning the contextual analysis of Athens as well as research on TiO₂ coatings and their photocatalytic mechanism.</p> <p>Research and analysis on the climate context, city's morphology and the built environment had been conducted in parallel, to point out parameters, influencing air pollution levels and therefore, photocatalytic performance of coatings. Then, the focus was on the selection of a specific area that has been affected by high levels of pollution, met the criteria of an urban canyon and offered a wide range of historical buildings, where the proposed facade product could be applied into. NO_x measurements, identification of urban canyon characteristics and its building traits were part of this step. Conservation strategies regarding the application of coatings are also necessary.</p> <p>The next step will be to access all this data, evaluate it and start setting design goals and restrictions. Apart from literature and material research, experiments can also prove beneficial, in order to determine the behavior of the coatings. It goes without saying that simulations and other digital design tools are detrimental throughout the process for further comparative reviews and evaluations.</p>	



Literature and general practical preference

[The literature (theories or research data) and general practical experience/precedent you intend to consult.]

The main source of literature that is to be consulted is scientific journals with or without experimental data, books regarding materials, conservation or other important topics, theses about façade design tools, conservation techniques and the like, TiO₂ manufacturers websites. What is more, some experiments carried out at the university may be proven necessary, in order to test the efficiency and durability of proposed façade designs.

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)?

I am following the track of Building Technology and my graduation topic concerns Façade Design, since the outcome of the thesis aims to the design of a product that can be applied on existing historical buildings in Athens. The other aspect of the topic is related to Heritage, as the design revolves around existing buildings that can be upgraded and contribute to NOx reduction, since they are daily exposed to these pollutants.

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

The aim of my graduation work and its results is not only to come up with a façade product that may be the state-of-the-art, but something that is applicable in a larger scale. Air pollution constitutes a serious environmental problem globally. Athens is a city that suffers from it and its results, which is obvious not only to people, but also to the built environment. Athens' historical buildings are being deteriorated despite being an important part of the city's history. For this reason, the design doesn't only have technical and scientific aspects, but social as well, by conserving and improving existing building envelopes. The design and realization of new buildings have been seriously reduced, especially lately due to the pandemic. Generally, they are highly affected by economic, environmental or other reasons and the idea of the final façade product is to offer a cost-effective solution that it can be easily prefabricated, contributing to its price and ease of installation and be as durable as it is possible, in order to preserve its effectiveness and subsequently reduce further maintenance costs.