

# 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](mailto: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	Complex Projects Graduation Studio Bodies and Building, Berlin	
Main mentor	Marija Mateljan	Architectural Design
Second mentor	Arie Bergsma	Building technology
Argumentation of choice of the studio	I have a great interest in flows and movement of users / people / goods regarding public buildings. I want to investigate the potentials that the future Hyperloop system has to offer and this design studio seemed like a good environment to explore such a topic. There seemed to be a fair amount of freedom in the studio, which is important to me. Reviewing previous student work further strengthened my interest.	

  

Graduation project	
Title of the graduation project	From plane to pod: a design proposal connecting the Hyperloop system with aviation at Brandenburg Airport, Berlin.
Goal	
Location:	Berlin, Brandenburg
The posed problem,	There is a growing need for alternatives regarding aviation; the Hyperloop might offer a partial solution. However, there is a gap in knowledge, case studies and design concepts to investigate how the new system could be connected to aviation at airports. Such a space does not exist yet, and is therefore relatively undiscovered territory.
research questions and	What kind of space do we need in order to make passenger exchange between Hyperloop and aviation possible, and what does that look like in architectural terms?  What developments can we expect in aviation and how does this influence potential connections with the Hyperloop system?

<p>design assignment in which these result.</p>	<p>To develop and construct a detailed design concept that shows how the future Hyperloop system could be integrated into Brandenburg Airport Willy Brandt in 2040, making passenger transfers possible. The design, which is a spatial addition within the airport boundaries, should have a direct link or connection with the main terminal and take into consideration future plans regarding expansions of the airport and government ambitions. Since the design is projected in 2040, extensive research should be conducted about both Hyperloop and aviation forecasts, expectations and developments.</p> <p>Program:</p> <p>The initial program breakdown was derived from information gathered according to the methods described. I expect this chart to change extensively for numerous weeks. The most important element in the passenger experience sequence is the 'transition area'. Below you will find a description of the most important area's to be taken into consideration: note that the numbers are minimums and will likely increase.</p> <ul style="list-style-type: none"> <li>- Tracks (tubes): roughly 2000 m2</li> <li>- Platform ((dis)embarking)): roughly 1600 m2</li> <li>- Transition area (exchange of passengers): roughly 1200 m2</li> <li>- Commerce and other: roughly 800m2</li> <li>- Waiting areas (preferably dismissible due to a smart design that does not need waiting areas): roughly 800 m2</li> <li>- Security: roughly 400 m2</li> <li>- Logistics: roughly 400 m2</li> </ul>
<b>Process</b>	
<b>Method description</b>	
<p>The expected program and its approximate size are estimated by analysing case studies to allow for benchmarking. Literature review will support or oppose expectations and conclusions drawn from these methods. Historical mapping and further literature reviews support the site choice: by looking at previous airport locations and situations, this research extrapolates information to choose possible future locations. Possible clients for the future project and their role are derived from literature on both Brandenburg airport and Hyperloop. The recently finished airport project helps understand the client better, since many critiques and studies were published close to and after its opening.</p>	

s the Hyperloop system is non-existing, neither are the connections from and to airports. In order to form an idea about programme and its size, the following two methods give insight. Firstly, the conduct of case study analyses provides information about minimal program needs and their approximate size, which subsequently leads to the second method: enabling benchmarking.

The case studies are:

1. Schiphol Airport (Amsterdam, Netherlands) and a corresponding concept study 'Implementation Hyperloop in Schiphol airport', by Hardt Hyperloop.

2. Malpensa airport:

The passenger handling numbers of Malpensa Airport (Milan, Italy) is currently more comparable to the case of Brandenburg with respectively 28.000.000 and 34.000.000 expected yearly passengers traveling through, compared to the 72.000.000 travellers at Schiphol airport.

3. Brandenburg airport:

Initial literature review studies and personal preference indicate that Brandenburg Airport Willy Brandt (Berlin, Germany) is a likely possible location (and thus case study) for combining Hyperloop and aviation. Expectedly, this airport is the case study in which the graduation project is contextualised. Therefore it is important to understand its functionality, program and size. To prevent a too biased approach, depending on the research and new insights the location might change. If so, a new case study should be adopted and analysed.

Complex Projects graduates are classified in different groups, each with their own focus and themes. Combined with the students own vision, this results in different project types and locations. The hypothesis is that students can exchange information, allowing to incorporate elements from other projects to complement their own design brief. Some themes, such as public transport (connections), future visions, design goals or functions might be similar and comparable. In- studio discussions and brief analyses of those topics make way for a mutual future vision for Berlin. For example: could a station project from 'group X' amplify another transport based project from 'group Y', by working together and come up with a mutual plan?

In order to understand passenger experience- and flows, the graduation project suggests a descriptive research method, that tells the story of three different passengers using the possibility to change to the European Hyperloop network. One fictive person will change from an intercontinental flight to the European network,

whilst another arrives at BER by train and then continues their trip by Hyperloop. Lastly, one person is 'followed' during their exchange from an European flight to the Hyperloop network. Even though the graduation project focusses on passengers connecting from intercontinental flights to the European Hyperloop network, the other flows cannot be ignored and are an integral part of the final design solution.

## Literature and general practical preference

Below you find a list with key literature that helps understand the fundamentals about aviation, (Brandenburg) airport design and the Hyperloop system.

- Hyperloop case studies and benchmarking:
  - Geuze, m., Beerlage, i., Kurganova, o., Eduardo sánchez, j., Ramírez gallego, j., Goñi ros, b., & Marges, s. (2020). Schiphol-hyperloop: pre-feasibility study schiphol—hyperloop. Hardt hyperloop.
  - Geuze, m., Beerlage, i., Ramírez gallego, j., & Marges, s. (2020). Rapport-hyperloop-noordholland concept: study on the impact of hyperloop on the development perspective “compacte metropool”. Hardt hyperloop.
- Airport design and data:
  - Federal aviation administration. (2022). AC 150/5300-13b, airport design, march 31, 2022 updated with errata (150/5300-13b; pp. 1–434). U.S. Department of transportation. [https://www.faa.gov/documentlibrary/media/advisory\\_circular/150-5300-13b-airport-design.pdf](https://www.faa.gov/documentlibrary/media/advisory_circular/150-5300-13b-airport-design.pdf)
  - Wendler, a., & Fiedler, j. (2016). 4: Berlin brandenburg airport. In large infrastructure projects in germany: between ambition and realities (pp. 87–145). Springer international publishing ag. <https://ebookcentral-proquest-com.tudelft.idm.oclc.org/lib/delft/detail.action?docid=4531670#>
  - Gedeon, g. (2018). Airport terminal planning (no. A08-001; u.s. Department of transportation, pp. 1–101). Federal aviation administration.
- Aviation data:
  - Eurocontrol. (2018). European aviation in 2040 (annex 1; challenges of growth, pp. 1–92). [https://www.eurocontrol.int/sites/default/files/2019-07/challenges-of-growth-2018-annex1\\_0.pdf](https://www.eurocontrol.int/sites/default/files/2019-07/challenges-of-growth-2018-annex1_0.pdf)

Besides case studies and literature review, Delft Hyperloop and Hardt Hyperloop companies are expected to be an important source of information. They both have ties with Delft and are therefore (hopefully) easy to access as intended consultants.

In my previous design studio I have gotten to know a variety of teachers from different departments at TU Delft who are involved in or have extensive knowledge in the topics of public transport (Transport & Planning), train stations, airports, (Architecture) city planning and Hyperloop (Urbanism).

## Reflection

The design studio investigates 'body and building', the relation between the building and the user. Therefore, user experience, flows of people and goods and organisation of programme are key topics. My graduation topic investigates exactly that with the Hyperloop to aviation connection at an airport. The goal is that the design brief asks for solutions on these topics.

The architecture faculty focusses on technical, social and spatial challenges within the built environment. My graduation project touches upon all those topics from different angles:

- The project raises ambitious and undiscovered technical requirements in architectural design, since the development of the Hyperloop system is still in relatively early stages. Technical aspects in airport design, stations and large public projects are typically of a challenging character which provides a great fit.
- The social impact of such a project is not only sought in the direct context of the project site, but is looked at in a broader scale. What effect does this have on public transport and our perception of distance and travelling? Does this call for a new type of social system / new type of building?
- Especially forming a spatial solution for a 'to be built' system is an exciting design task. I think the master programme requires students to challenge themselves and push them to think outside of conventional or apparent solutions. The graduation project offers a great deal of potential in order to do so.