THE EQUITABLE CITY

BETWEEN STANDARD AND IDEALS

The future of housing in the Netherlands

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MSc - 3 Dwelling graduation studio

DUTCH HOUSING

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This research was done for the Dwelling graduation studio for the master track Architecture, Urbanism and Building Sciences at TU Delft.

The goal for the Dwelling studio was to elaborate on the topic of the future of housing in the Netherlands. In short, how do we want to live in the future and what building permits that? The future housing of the Netherlands, as perceived through my eyes will be accessible and attainable for everyone. Cities like Amsterdam will grow even further in terms of residents and I think we should enable this by designing the built environment and in particular the residential building accordingly.

Before the design was established, research into the theme of an equitable city was performed. The equitable city is a place where adequate housing is attainable and accessible for everyone. Next, an urban precedent was analysed which served as inspiration for the urban design of the location of Minervahaven in Amsterdam. The location was then analysed according to in order to understand the building site.

Subsequently, building precedents were explored to understand how a building works. In addition, a programme of requirements is drafted to be included into the building design. The conceptual design shows the main workings of the building. To conclude, a summary is attached at the end of this research report.

Lastly, I would like to take the opportunity to thank Pierijn and Theo for their insightful advice and tutoring along this thrilling and sometimes scary journey of mine.

Christine Lie
Delft, January 10th 2019.
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THEME
AN EQUITABLE CITY
Cities are ever expanding and will get even more crowded because of the continuous migration towards the city. Life in the city is romanticised as having all the amenities in the near vicinity, having a rich social life and economic prosperity. With improving healthcare and technology, people are getting older and the world is getting smaller by the minute. In order to accommodate these people in cities, the most economical and practical solution is by building high-rise towers with its apartments classified by financial wealth.

The solution proposed by architects and urban planners; the monotonous vertical stacking of cages, topped off with the most luxurious penthouses overlooking the city are common and omnipresent. The penthouses are attainable for a few people and envied by the rest. Amenities are abundant, making it possible for the antisocial residents to never leave the vertical city if they don't want to. The social hierarchy designed into the vertical city is bound to slip into self-destruction. The vertical city is a reflection of our city as a whole. We need to ask ourselves if we want to live in this socially unjust city. A city where social polarization is encouraged by our built environment.

Inequality is often closely linked to income gaps, but the effects reach far beyond financial wealth. Social injustice manifests itself in physical and mental well-being, job opportunities, access to housing and overall future outlook. That is why we hold the responsibility to acknowledge the problem of inequality and initiate change. The city of the future is an equitable city, providing homes for every person imaginable regardless of their wealth. Equality is achieved by diversity, which can be employed in different scales, such as city, neighbourhood, building, dwelling type and people. By embracing diversity we prevent a growing segregation where parts of the city are cut off for certain groups of people. To provide decent homes for these vast variety of people, we should rethink our space. As city space is limited, we should be considerate towards our neighbour. We dwell in a compact and all-encompassing space, so our neighbour can too. Compact and decent houses make room for more people in the city. Life in the city with all its amenities is attainable for everyone. The cool, un-emotional resident of the vertical city is replaced with a social one, considerate of his or her neighbour.
A PRESSING MATTER

“A new social type was being created by the apartment building, a cool, unemotional personality impervious to the psychological pressures of high-rise life, with minimal needs for privacy, who thrived like an advanced species of machine in the neutral atmosphere. This was the sort of resident who was content to do nothing but sit in his over-priced apartment, watch television with the sound turned down, and wait for his neighbours to make a mistake.”

This excerpt from the book ‘High-Rise’ by J.G. Ballard from 1975 predicts a daunting dystopian future, manifested by the way our built environment is constructed. The residents of Ballard’s high-rise are cooped up in ‘vertical mounted cages’ with no regards to the outside world. This book, amongst others, has inspired me for the theme of my graduation. The future forecasted by Ballard is one I want to avoid.

Cities are dealing with an ongoing migration, with no indication of slowing down. In the city of Amsterdam, this is no different. With a current population of over 880,000 residents, the city of Amsterdam will most likely welcome her one millionth resident in 2040. Because of economic pressures, there is a much higher demand than supply, housing prices are skyrocketing making living in the city unaffordable for most people. These people are involuntarily displaced from their living area.

Image 1: Population growth (Amsterdam Conjunctuur, n.d.)

Image 2: News articles about Amsterdam prices (AT5, NRC, De Volkskrant)

EXCLUSION AND EFFECT

Amsterdam has been known as a tolerant city, where residents have equal rights to the city. But times seems to be changing. The social-economic polarisation between lower income, middle income and high income households is emphasised by not providing enough housing for different types of households within the city. Thus, making it inevitable for people to move from the city to the outskirts, where appropriate housing is scarcely available. These primarily low income and middle income households are experiencing social exclusion. Social exclusion is classified as a state of material deprivation, limited access to a comfortable living environment and healthcare, diminutive social participation and lack of integration. In order to make city life attainable for everyone, an equitable city is required.

Image 3: Average prices per square meter in Amsterdam (Gemeente Amsterdam, n.d.)

THE EQUITABLE CITY

The definition of equitable according to the Oxford Dictionaries is fair and impartial. Equity with regard to our built environment is interpreted by Community Solutions as:
- The ability and freedom to live to an old age, engage in economic transactions and participate in political associations
- The ability and freedom to transform decisions to valuable action
- The ability and freedom to access resources
- The ability and freedom to make choices

Societies and cities can measure progress by the increase in citizens who are more capable in these fundamental areas.

An equitable city as explained by Community Solutions can be achieved by providing housing for all types of households in the city. Within the city, residents have the ability and freedom to engage in economic transactions and participate in political associations, transform decisions in valuable actions, access resources. Most importantly within the scope of residential buildings within the built environment, residents have the ability and freedom to make choices as to where they live. Therefore, city life can be available and attainable for those who want it.

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This research will focus on answering the main question:

**How can the residential building contribute to an equitable city?**

The first part of this research focuses on the ways to make an equitable city by making it inclusive to everyone. The history of migration to and from the city will be investigated. Next, the wishes of the municipality of Amsterdam will be explicated. Subsequently, the dwellers of the residential building are analysed. The needs and wishes of the municipality and the residents are imperative for the final architectural design of the building.

The second part of this research is about opening up the city. The ways of opening a city are presented by means of the five urban design principles of Richard Sennett. These urban design principles are applied on a smaller scale, namely the whole of the residential building. By making the city inclusive and open to everyone, the city will become equitable. To conclude, an answer will be provided to the main question.
A BRIEF HISTORY OF TIME

Looking back to the history of Amsterdam, the city has known growth and decrease of its residents. The following timeline shows an overview of this development in general.

History has shown that migration towards the city is mainly due to economic reasons. Whilst the migration out of the city has mostly to do with lack of space.

The first mention of the city dates back from 1275, when residents of Amstel gained privilege from count Floris V to have free access over the waters. After the assassination of the count, the city fell back into the diocese of Utrecht. From this time on the city development in a rapid pace.

The economy of Amsterdam thrived on beer and haring during the fourteenth century, through which the city gained an important trade position within Holland. Throughout the fifteenth century, the city established its position by importing, storing, cultivating and selling other products such as iron ore, furs and codfish. The trade business also gave way for other industries like cartography, banking and insurance companies. This economic prosperity drew a lot of people to Amsterdam, making it the largest city around 1580, with approximately thirty thousand residents.

The Golden Age during the seventeenth century marked the glory time of the Republic and especially Amsterdam. During this period, the city realised two large city expansions. The now famous canal belt and the neighbourhood Jordaan are part of. The growth of the city came to a halt at the end of the seventeenth century, when Amsterdam lost its position in the world market.

Between 1850 and 1960 a lot of people moved from the country to the city in search of work and a better life in general. Improvement of healthcare and better hygiene, less people died which caused a growth of residents. The period after was marked by the outbreak of several epidemic diseases such as cholera. This was thought to be caused by the trash and offal that was clogging up the canals and smelled especially during hot summer months. In turn, this led to a exodus of residents out of the city. The Woningwet of 1901 was implemented to improve the living quality of people. This law established minimum requirements to ensure the construction of qualitative houses and the demolition of houses which did not meet the standards.

Over the years, people of all socio-economic classes always had a way of migrating from and towards the city without limitations. This movement proves to be near impossible in the near future because of lack of decent and affordable housing. Therefore, city life will be attainable for only the privileged, making forceful displacement inevitable for those who are not.

Although World War II did not cause a lot of material damage to the city, the composition of the population changed significantly. A lot of residents of Amsterdam moved away to neighbouring municipalities such as Almere and Purmerend. During this time, the population decreased from 880,000 to 680,000 residents. It was not until the eighties that people returned to the city, mostly to study or work at the universities and colleges.

The seventies and eighties of the last century is marked by an increase of migrants from Turkey and Morocco, who came to the Netherlands to work. At a later stage, their family settled in here too, mostly in the post-war suburbs of Amsterdam.

Migration towards the city becomes limited to only the privileged, due to lack of decent and affordable housing.

In the second half of the eighties and during the early nineties, new development like the Oostelijk Havengebied and IJburg made Amsterdam more attractive for highly educated people, but also for families. Although there are a lot of families residing in the city, a lot of them also leave the city for surrounding areas.
OPENING THE CITY

To design a residential building in an equitable city, the present must be confronted unconditionally. Architecture is always the result of the conflict between the designer and their personal attitude and formal intentions on one side, versus social, economic, or political conditions, which are often initially viewed as a challenge, sometimes even as a threat. This research is no different. The challenge to attain an equitable city comprises all these conditions.

Some conditions are beyond the scope of this research, profound change has to come from politics to reach an equitable city.

AMSTERDAM 2040 ACCORDING TO THE MUNICIPALITY

Politically, the municipality of Amsterdam mentioned several strategies to apply in Haven-Stad. An area north-west of the canal belt, which is to be transformed into a residential area in the near future. Looking at the current trend of average prices per square meter, the prices will most likely be around €6000,- per square meter (image 3). One goal the municipality wants to achieve is inclusiveness. The area is focused on housing different household types, which differ in composition. Within Haven-Stad, the municipality wants to carry on the Amsterdam tradition of creating neighbourhoods with a varied population of different social-economic status, age and type of household. The prerequisite for creating such a mixed area is to include social housing within the neighbourhood. Therefore, the housing program should include social housing and diversity of dwelling size with sufficient middle income segment rental houses.

Image 4: Haven-Stad, Amsterdam (TU Delft, 2018)

TO DWELL IN AN OPEN CITY

The municipality has shared their aspirations for the city in 2040. In addition to these aspirations, several topics are approached to make Amsterdam an equitable city for everyone regardless of their socio-economic background.

DENSITY, DIVERSITY AND COMPACTNESS

In order to make living in the residential building in the city attainable for as many people as possible, a high density should be achieved. The city of Amsterdam is unable to grow beyond the existing demarcation, as it is locked between the cities Zaandam, Amstelveen, Hoofddorp and Zaandam. Therefore the most obvious way to densify is by stacking vertically. Thus, creating a tower typology. To make sure these dwellings are suitable for different types of households, diverse dwelling types should be designed within the residential tower. Diversity ensures that the needs for each type of households is met.

Lastly, by rethinking the space needed for every type of household, dwellings can take a more compact size. This way more dwellings can be realised on the same building footprint. These compact dwellings make space for more households to attain a dwelling in the city.
MASS HOUSING

There are two ways to densify, by stacking houses on top of each other or placing them next to each other. Thereby creating a tower and a slab. These schemes were adopted by the modernist movement and marked the twentieth century. The goal of the modernist mass housing scheme was to try and solve the housing crisis which was provoked by demographic growth and country-to-city migration. It was also made to provide modern standards for the whole of society.

The mass housing scheme was based on two principal foundations, namely the development of the standardised design and the belief in egalitarian living as a social goal with the paternalistic state as the most effective promoter. The standardised design profoundly changed the nature of residential construction, whilst the state authorities claimed responsibility for the welfare of their citizens and counteract polarisation. Subsidised mass housing was part of a social program to guarantee material security for the whole of society, including the disadvantaged\textsuperscript{12}.

The tower scheme is the most promising scheme for Amsterdam, as it is unable to grow beyond the city limits. Like the modernists, this scheme can be adopted to try and solve the demographic growth in Amsterdam.

RECENT DEMOGRAPHIC TRENDS

The municipality of Amsterdam\textsuperscript{13} has monitored the demographic trends from the past twenty years and made predictions for the year 2036. In this research they observed types of household and differentiated five categories. These categories are: single person household, couple without children, couple with children, single parent household and other. Between 1996 and 2016, the total amount of households has increased with 14\%, from approximately 394.000 to 450.000. The municipality predicts that in the year 2036, the total amount of households will increase even further by 11\%, resulting to roughly 502.000 households.

The ratio between the different households remained roughly the same for decades, with the biggest household type consisting of single person households. This type takes up 53\% of the total households. The second largest type of household is the couple without children (20\% in 2016), followed by the couples with children (16\% in 2016).

The municipality measured 239.000 single person households on January 1st, 2016. According to the municipality, this number will increase to 272.000 households in 2036. This growth is a result of the aging population. Although the percentage of single households is larger than the average in the Netherlands, according to Centraal Bureau Statistiek\textsuperscript{13}. This average is not uncommon in metropolitan cities as Rotterdam, Utrecht and Den Haag, which share an equally large percentage of single person households compared to the total amount of households.

\textbf{Image 8: Household types in Amsterdam in 1996, 2006 and 2016 (Gemeente Amsterdam, 2016)}

**AVERAGE INCOME RESIDENTS OF AMSTERDAM**

Based on numbers provided by Onderzoek, Informatie and Statistiek the average income in 2015 of the Amsterdam resident (excluding students) is €36,800,- a year. The average income per household type is as follows.

<table>
<thead>
<tr>
<th>Household type</th>
<th>Average income (2015)</th>
</tr>
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<tbody>
<tr>
<td>Single person household</td>
<td>€ 24,800,-</td>
</tr>
<tr>
<td>Couple without children</td>
<td>€ 49,000,-</td>
</tr>
<tr>
<td>Couple with children</td>
<td>€ 60,800,-</td>
</tr>
<tr>
<td>Single parent household</td>
<td>€ 30,800,-</td>
</tr>
</tbody>
</table>

Table 1: Average income per household type (OIS, 2018).

To make the dwellings affordable for each type of these households, the average income should be taken into account.

As mentioned before, the average price per square meter for the Haven-Stad area, and most notably Minervahaven will most probably be around €6,000,-. The average size of a single family dwelling in Amsterdam is around 139 m² in 2018, whilst apartments are roughly 52 m² on average. Meaning that these houses will cost approximately €840,000,- and €312,000,- respectively on Minervahaven.

To include every type of household in the residential tower, it is imperative to design compact housing to increase affordability.
Social Housing

To accomplish the goal of an equitable city, none of the types of households should be overlooked. This includes those who are unable to pay independently for their housing. Social housing in the Netherlands are non-profitable subsidised dwellings which are mostly owned by housing corporations. These dwellings are meant for people who are unable to rent a house in the free sector of the market or to buy a house. Including social housing is also one of the goals of the municipality, as to generate a mixture on social and economic level\(^\text{16}\).

Social housing dwellings are houses with a maximum rent of €720,40 per month till July 2019. All the houses with a higher rent per month are part of the free sector of the housing market. To obtain a social housing dwelling, the household income should be no more than €38,035,-\(^\text{17}\). Therefore, households who earn more than this minimum on a yearly basis will not qualify for a social housing dwelling.

The rent per month is based on the 'woningwaardestel'. The higher the value of the dwelling, the more points it receives. The point distribution is based on the elements each house comprises. For example, each square meter of a house is worth one point\(^\text{18}\). The maximum total points a social housing dwelling can receive is 144 points\(^\text{19}\). Every dwelling above these points can not be part of the social housing program, because this point system is only applicable for social housing, as there is no maximum amount of points for the free sector.

<table>
<thead>
<tr>
<th>Area</th>
<th>Points</th>
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<tr>
<td>Surface area rooms</td>
<td>1 point per m(^2)</td>
</tr>
<tr>
<td>(living room, bedrooms, kitchen, bathroom)</td>
<td></td>
</tr>
<tr>
<td>Surface area other rooms</td>
<td>0,75 points per m(^2)</td>
</tr>
<tr>
<td>(storage, attic, garage)</td>
<td></td>
</tr>
<tr>
<td>Heating</td>
<td>2 points</td>
</tr>
<tr>
<td>Per heated room</td>
<td></td>
</tr>
<tr>
<td>Each other room</td>
<td>1 point</td>
</tr>
<tr>
<td>Energy performance</td>
<td></td>
</tr>
<tr>
<td>(Energy index or Energy label)</td>
<td>Single/multiple household(s)</td>
</tr>
<tr>
<td>EI &lt; 0,6</td>
<td>label A++</td>
</tr>
<tr>
<td>0,6 &lt; EI ≤ 0,8</td>
<td>label A+</td>
</tr>
<tr>
<td>0,8 &lt; EI ≤ 1,2</td>
<td>label A</td>
</tr>
<tr>
<td>1,2 &lt; EI ≤ 1,4</td>
<td>label B</td>
</tr>
<tr>
<td>1,4 &lt; EI ≤ 1,6</td>
<td>label C</td>
</tr>
<tr>
<td>1,8 &lt; EI ≤ 2,1</td>
<td>label D</td>
</tr>
<tr>
<td>2,1 &lt; EI ≤ 2,4</td>
<td>label E</td>
</tr>
<tr>
<td>2,4 &lt; EI ≤ 2,7</td>
<td>label F</td>
</tr>
<tr>
<td>EI &gt; 2,7</td>
<td>label G</td>
</tr>
<tr>
<td>Kitchen</td>
<td></td>
</tr>
<tr>
<td>Kitchen counter up to 1 meter</td>
<td>0 points</td>
</tr>
<tr>
<td>1 to 2 meter</td>
<td>4 points</td>
</tr>
<tr>
<td>2 meter or more</td>
<td>7 points</td>
</tr>
<tr>
<td>Sanitary unit</td>
<td></td>
</tr>
<tr>
<td>Toilet</td>
<td>3 points</td>
</tr>
<tr>
<td>Sink</td>
<td>1 point</td>
</tr>
<tr>
<td>Shower</td>
<td>4 points</td>
</tr>
<tr>
<td>Bath</td>
<td>6 points</td>
</tr>
<tr>
<td>Bath/shower</td>
<td>7 points</td>
</tr>
<tr>
<td>Private outdoor space</td>
<td></td>
</tr>
<tr>
<td>Up to 25 m(^2)</td>
<td>2 points</td>
</tr>
<tr>
<td>25 - 50 m(^2)</td>
<td>4 points</td>
</tr>
<tr>
<td>50 - 75 m(^2)</td>
<td>6 points</td>
</tr>
<tr>
<td>75 - 100 m(^2)</td>
<td>8 points</td>
</tr>
<tr>
<td>WOZ value (value real estate)</td>
<td></td>
</tr>
<tr>
<td>For each €8,747,- WOZ value</td>
<td>1 point</td>
</tr>
<tr>
<td>Minimum WOZ value €44,284,-</td>
<td>1 point</td>
</tr>
<tr>
<td>even if actual value is lower: divided by surface area, per €57,-</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Point distribution ‘woningwaardestel’ (Rijksoverheid, 2018).

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DWELLING DIVERSITY

The dwellings in the residential tower are meant for different type of households. The division of dwellings is a reflection of Amsterdam as a whole, to accommodate the difference in demand. As predicted by the municipality of Amsterdam, most households will be single person households (53% of total), followed by a couple without kids (20%). The third largest category is the couple with kids (16%), with the smallest category being the single parent households (roughly 11%). Although the couple without kids and the single parent households contain the same amount of people, these type of households are different categories as they have different needs.

To design dwellings for these four types of household, the spaced needed for each type are investigated. As each dwelling should be all-encompassing and self-sufficient, the only variable is the amount of bedrooms. There will be dwellings containing a single room; a studio, a single bedroom apartment, a two bedroom apartment and a three bedroom apartment. The reason for the maximum amount of three bedrooms is because of the trend that the average Dutch woman has 1.7 children, which is on average 2.2. This way a household consisting of one or two parents can have a bedroom for each of the children. Instead of looking at the Amsterdam average, the average for the entire country is used as to anticipate migration towards the city.

The differentiation between a studio and a single bedroom apartment is to ensure the needs for a young(er) single person household and an aging single person household.

MINIMUM DWELLING

The housing crisis provoked by the country-to-city migration and the aftermath World War I was thought to be solved by the introduction of the minimum dwelling\(^{21}\). The minimum dwelling is not to be mistaken for a miniature version of a villa or a reduced version of an apartment, rather it is to be intended as a new dwelling type. As with the mass housing scheme, mass production plays an important role. Because of the mass production in housing construction, the cost reduction can exert a beneficial influence on architectural development by rationalising space. The modernist architects formulated this new dwelling form as: minimal area and maximal liveability. This concept, also known as the mini-max dwelling concept is defined as a dwelling that does not fall below standards needed for biological survival (sanitary and hygienic forms). This dwelling should also provide the resident with sufficient light, access to sun and air, and a sense of open space.

In order to make the minimum dwelling affordable, not only the surface area should be reduced. The price for a small apartment does not drop in proportion to their reduced floor area. Overall construction costs, mechanical services and electrical installations contribute to the price of a dwelling. These are considerably more expensive in a small apartment than in a large one\(^{22}\). Therefore, simplifying and reduction expensive mechanical installations are primary approaches at reducing costs.

The problem of the minimum dwelling can not be solved by simply reducing the size and number of rooms, as this would lead to apartments lacking comfort with just enough light and ventilation to meet minimum requirements.

As long as the minimum dwelling is defined as a traditional household type, the design will undoubtedly affect the reduction of size and number of rooms. Therefore, the strategy according to Teige to make an affordable minimum dwelling is to attempt to reorganise the floor plan.

\(^{22}\) ibid, p. 234-239.
SHARED COMMUNAL AMENITIES

Each dwelling is compact, but self-sufficient on its own. Meaning every residents can live comfortably in his or her private space. Additional amenities become more affordable when shared.

The goal for mobility for the municipality is to discourage car traffic. The parking norm for the future is going to be lowered to 0.2 per household, which makes car share an obvious solution which is also proposed by the municipality. Other means of slow transportation such as scooter and bicycle will take a prominent place in the future plans of the municipality\(^{24}\), as it increases the so called smart mobility. Therefore, these amenities will also be available to be shared between the residents.

Furthermore, shared amenities can include laundry service room, guest room and a communal space. These amenities are not needed in their private space, but can be used in deliberation with other residents.

PUBLIC AMENITIES

According to the municipality, the plinth of a residential building should include creative and productive business or amenities\(^{25}\). In addition, this is also a way to connect the residential tower with its surroundings, and not be an autonomous object in space.

These amenities in the plinth should be chosen according to certain guidelines. First of all, the amenities should be within walking distance, thus making it available for the immediate surrounding area. It should also be an addition to the area, meaning that there is not already such an amenity available. Lastly, the public amenities should cater to most everyone and not exclude people as to be part of an equitable city. Therefore, amenities should not be age restricted, such as a kindergarten.

Public amenities in the building could be: a library, a fitness, dance and health centre, a restaurant or an other small businesses. These public amenities can employ people from the Minervahaven area and therefore increase employment.

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5 OPEN FORMS

The idea of an equitable city mostly resides in social morality. It is unjust to exclude certain types of households out of the city. By including different households within the city, social cohesion can be strengthened\(^{26}\). In turn, this can lead to an increase in solidarity\(^{27}\). Consequently, increase in solidarity results in less polarisation.

In his most recent book Building and Dwelling - Ethics for the City\(^{28}\), sociologist and urbanist Richard Sennett pleads for an open city whilst criticising the closed city which is regimented, restricted and controlled. The open, urban design explores the connection between the *ville*, our built environment and the *cité*, which is the character of life in a place. It refers to a kind of consciousness and the way people conduct their human affairs within the built environment. Sennett is primarily interested in the way the *ville* affects our lived experience in the *cité*. Meaning, how urban planning decisions which are focused on the shape and form of the ville, make thought, expression and action in the *cité* more open and free rather than regimented and restricted.

He envisions a ville that is incomplete and intense, with spaces that allows the identities of the residents to be as fluid and complex as the city itself. Residents should help craft and forge the city they live in, rather than passively inhabiting it.

In his book, Sennett described five design principles one can employ in order to design and maintain an open city\(^{29}\). As an urbanist, these five design principles apply to the city as a whole. These five principles are: the synchronous space. This is a public space where human interaction can take place. The second is the punctuation of urban places by markers. These markers are necessary to break the repetitiveness of the city and acquire a distinctive character. The third principle is the porosity of urban boundaries. This in-between space is to keep urban spaces connected to each other. The fourth is a revolutionary approach, by which buildings are never complete. They are to be repaired and re-purposed over time. The last design principle, according to Sennett is the rejection of the rigid plans in favour of the collage approach. This concept of seed-planning is based on the notion that places gradually become more differentiated from another by following a same set of common pattern language which is a set of unwritten rules embedded in the culture of a city.

The goal of this research is to try and find how a residential building can contribute to an equitable city. To make this happen, the five design principles proposed by Sennett can also be applied to a residential building.

I. SYNCHRONOUS SPACE

The synchronous space, as opposed to a sequential space, is a space where multiple activities take place at the same time. Similar to the Greek agora, the open space invites people to take an actively participate. There are three rules to be followed to design a synchronous space. The first is the number of activities that should take place within this open space. The number of activities reflects to the William Jevon's rule of multitasking. He proposed that a person can mentally hold four marbles at the same time. So, four activities at most occurring at the same time confirms to Jevon's studies\(^{15}\). The second design rule is that truly different things should be occurring. Lastly, the space should invite people to mix, rather than impose mixing. For the space to be truly synchronous, it must offer people something they cannot easily access elsewhere. The challenge of a synchronous space is that it is both stimulating and disorientating. To benefit from the stimulations as with an agora, the space needs to be marked in some way to provide orientation.

Within a residential building, this synchronous space should be a space accessible for all residents. An example of such a space is a communal garden. In this space people can tend to their vegetable garden, chat with their neighbours, bask in the sun or play with their children in the grass. These activities can occur at the same time, in the same space and can not be found elsewhere in the building.

30. Ibid, p. 206 - 211.
II. PUNCTUATED - MONUMENTAL AND MUNDANE MARKERS

There are several ways to punctuate spaces as a way to distinguish them and break the homogeneity. Big bold monuments serve as exclamation points within the city declaring its importance, whilst a corner indicates a semicolon. The corner marks a zone of transition between a street and an avenue as exemplified in New York. A corner therefore functions as a marker where people experiences a shift in focus, to make aware to adjust to the difference in scale. The quotation mark is another type of marker. This type of marker draws attention to a specific place. An example given by Sennett is the use of primary colours on otherwise blank walls or varying pavement of the streets. These urban gestures do not mark a space in particular, but rather put a mark on it.31

Markers can find their way into different places within a residential building. One of those markers can emphasise the transition from a public space to a private space, such as a dwelling. The shift in focus can occur by introducing something as obvious as a door.32

III. POROUS - THE MEMBRANE

According to Sennett, a building is porous whenever there is a flow between inside and outside, whilst the structure retains the shape of its functions and form. There are two types of edges, the border which is porous and the boundary which is not. The boundary is an edge, which marks a low-intensity edge. This type of membrane prevails in a closed city. Meanwhile, border is an edge where different groups can interact. An open city contains more borders which functions like cell membranes, with a dynamic porosity and resistance.

The building in an open city should contain borders, rather than boundaries. At these borders, different groups can interact. To ensure interaction between different people, a central space within a building can function as a border. This central space should provide benches or other type of places to sit so people can converse.

There are two different types of people to be distinguished within a residential building, namely the residents and the non-residents. For them to meet, both types of people should have a reason to enter the building. This is why the central space should give access to different types of spaces, not only dwellings, but also public functions such as a restaurant or a gym for example. This way residents and non-residents can mingle in the porous membrane of the building.

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IV. COMPLETE - THE SHELL AND TYPE FORM

The shell can be used in an urban context as an unfinished space. The shell creates forms which are not exhausted in any particular composition at the start. In addition, the shell also creates porosity, as there are only a few fixed barriers. The shell is the opposite of the type form. Which is according to Sennett a piece of urban DNA which takes on different shapes in different circumstances. Within the realm of buildings, the type form is open to substitutions as variations.

The shell is empty, in contrast to the type form. The type form sets the terms for making a family of possible objects, in contrast to a prototype, which already exists in built form.

Sennett gives an example of the design of dwellings in Iquique, Chile by architect Alejandro Aravena. This version of the incomplete form is designed in such a way to ensure maximum flexibility in filling the space. In addition, the entrance stairs is built outside the house, giving residents the option, if desired to divide the first en second storey into independent dwellings.

This idea of an incomplete form can also be applied within the residential building. In order to do that, a fixed rhythm of structure is required. As well as fixed services with wet cells for each dwelling. Around the fixed services, rooms can be divided according to the needs of the residents. Some residents might require two separate rooms, whilst others need more to accommodate their needs. In addition, a number of the dwellings should have a double high ceiling, so that residents have the option to add floor into their dwelling if they need additional space.

V. SEED - PLANNING

The seeds in this case serve as type forms whose manifestations - plants - change character in different circumstances. The essence of this design principle is in fact minimum specification of how form relates to function; leaving room for maximum variation and innovation.

This technique is exemplified by libraries in Medellin, Colombia. The planners who commissioned libraries only specified the maximum costs and minimum construction standards, leaving the rest of the decisions to be made by the communities and local architects. The end result differs in many ways: some are open all hours, as some shut at night. Some libraries are designed especially for children, others for adults only.

Seed-planning can also be applied on a smaller scale, namely on building level. The residential building can have spaces which are to be designed by the users, the residents of the building. They can decide amongst themselves what space they need for an activity, hobby, or other use that cannot be employed within their dwelling. Like the incomplete form, this space should be receptive to different kinds of functions, designed and collaborated by the residents of the building.

34. Ibid, p. 228.
An open ville is marked by the five aforementioned design principles, which allow the cité to become more intricate. Public space allows for synchronous activities. It favours the border over the boundary, aiming to make the relations porous rather than rigid. It marks the city in modest ways to highlight nondescript places and breaking the monotony. It makes use of type forms to create themes and variations. Through seed planning, the themes are allowed to develop independently throughout the city, ultimately yielding a complex image of an urban whole. An open ville, in contrast to a closed one, will avoid repetition and static form, whilst creating the material conditions in which people can deepen their experience of collective life.

By employing these five design principles into a residential building, this building can contribute to an open city.

THE RESIDENTIAL TOWER IN THE EQUITABLE CITY

Looking at the general history of the city of Amsterdam, the city has mostly known a growth of residents which is still increasing today. Because of this growing number of people who want to live in Amsterdam, suitable dwellings are scarce and those that are available are becoming more and more expensive. This leads to forced displacement of people.

To make city life attainable for most everyone, an equitable city is required. This means that social-economic polarisation is minimised by giving everyone equal and impartial chances to acquire a city dwelling. To accomplish the goal of an equitable city, the main question at the beginning of this research was:

How can the residential building contribute to an equitable city?

The first part of this research focused on the ways to make an inclusive city.

To design a residential building within an equitable city, no one should be excluded. Therefore, different household types should find their place within the building. There are four main household categories which are in order of size, the single person household, couple without children, couple without children and the single parent household. Each of these categories require a different dwelling configuration.

Affordability plays a massive role to ensure equity of different household types in the city. Social housing should be included, so that even the people with a low social-economic status can afford to live in the city.

Lastly, dwelling space should be reconsidered. Not only to make it more affordable as smaller surface area means lower costs, but to also leave space for others. Additional amenities which can not find their way into the individual dwellings can be communally or publicly shared. Thereby making it more affordable, as more people are contributing to the incurred costs.
To answer the main question, the residential can contribute to an equitable city by making the residential building inclusive for most everyone. This can be achieved by densifying the residential building by stacking. Thus, creating a residential tower. Subsequently, it should be suitable for most everyone by not excluding any type of households. Lastly, the dwellings should be compact to make it affordable, whilst making space for others. In addition to inclusivity, the residential building should be open for everyone. The 5 design principles of Sennett are thereby employed to create this openness on a building level.

To conclude, as a result of employing the 5 design principles of Sennett on a building scale, in addition to densifying, diversifying and compacting dwellings most everyone can find their space in the residential tower. In this way, the residential tower can contribute to an equitable city.

The second part of the research dived deeper into Sennett’s theory of the 5 open forms he described in his book Building and Dwelling - Ethics for the city. These five open forms are the synchronous space, the monumental and mundane markers, the membrane, the shell and type form and lastly seed planning. By applying these design principles into a residential building, this building can contribute to an open city.

The synchronous space can take form as an communal garden where many activities can happen at the same time. Residents of the building are invited to join, but does not impose. Markers can find their way into different places in the building. For instance, one of these markers can emphasise the transition from a public corridor to a private dwelling. A building, like the urban fabric should contain more borders than boundaries. At these borders, different people can interact. A central space connecting private and public spaces can ensure the interaction between different types of people such as the resident and the non-resident of the building. The design of the interior space can contribute to this interaction.

The shell can be applied to the individual dwelling within the residential building. The incomplete form has fixed services and wet cells that require shafts and fixtures, whilst the rooms around it are open for interpretation. As with the shell and type form, seed-planning relies on the unfinished form. Space within the residential building can be left blank intentionally, so residents can ultimately design how they want to use that space and what for. Thereby stimulating interaction and collaboration between them.
INTRODUCTION

Müllerpier is a peninsula which is located north of the Meuse river in Rotterdam and is surrounded by the areas Parkhaven to the east and Sint-Jobshaven on the west side. This former harbour area was named after the founder of the transportation and trading company that owned the pier in the early twentieth century; the German Wilhelm Müller. Remains of the harbour activity are still visible today, such as the disused railways and warehouses.

In 1998, KCAP Architects & Planners was commissioned the design of the redevelopment of the pier into a living, working and care area. The 6 hectares of land consists today of 13 autonomous objects placed carefully next to each other to create an intimate, urban labyrinth which contrast the vast expanse of water.

The 13 buildings with 575 dwelling units and public amenities were designed by four different architectural firms, namely: EGM Architects, Architecten Cie, Neutelings Riedijk and KCAP Architects & Planners.

LLOYDKWARTIER

Lloydkwartier is part of the municipality of Delfshaven. This former harbour district consists of four areas of which Müllerpier is one of. The other areas are Lloydpier, Schiehaven Noord and Lloydstraat together with Entreegebied. The two aforementioned are developed as residential areas, whilst Schiehaven Noord will be created as a combination of a living and working area. The Lloydstraat and Entreegebied are characterised by the mix of living, working and recreation.

Although different in location, programme and so on, the areas are connected by use of similar colours and texture of materials. The architecture refers back to the former tough harbour environment.
Müllerpier is characterised by the water surrounding the pier from three sides. During the 19th century this area was characterised as rural, whilst the 20th century marked the transformation to a harbour environment. The practicality of the warehouses close to the water with adjacent railways had a great influence on the urban design. During the mid 20th century, most of the transport by railways had been replaced by car roads and other slow traffic. The late 20th century marks the final transition into the current plan we see today, as a residential, working and recreation area.

Five buildings are deemed historic and therefore valuable according to the municipality of Rotterdam. These buildings are the Maastheater, Schiecentrale, Jobsveem, Kühne and Nagel and a building which is used for commercial enterprises with an unknown name.

An urban plan for Lloydkwartier was developed in 1997 by dS+V. The plan for Müllerpier was created in 1998 by KCAP Architects & Planners.
URBAN DESIGN

Müllerpier consists of 6 hectares of land with three existing buildings on the north side. The remainder of land is cleared of all existing buildings.

The new plan by KCAP Architects & Planner is designed as a car free area. Therefore, the only main car access road is encircling the area. There are 13 geometrical blocks carefully placed. Two of the geometrical blocks are shifted from their axis, in order to face so called landmarks. These landmarks are the main street Pieter de Hoochweg and the ventilation building of the Maastunnel, which is running beneath the Meuse and connecting the north and south part of Rotterdam.
**FUNCTION**

The area is predominated by residential buildings. There are a few amenities located in the plinth of several buildings. These amenities include a kindergarten, restaurant and a gym. The amenities are mostly located north of the plinth, making it easy accessible for residents of the surrounding area.

The ground floor to ceiling height of each of the 13 buildings is 3.20 meters to accommodate both living and working program and therefore anticipate future change.

**GREENERY**

On the location are two green areas, one of which is a basketball field with surround green and the other is a grass field on which children can play.

Trees are predominately placed on the west side adjacent to the water, to reduce the inconvenience of the prevailing west wind.
CAR ACCESS AND PARKING

- street parking
- ground level parking
- underground parking

N

0 200 400 600 m.
PEDESTRIAN LABYRINTH

The middle part of the pier is designed as an elevated paved path, therefore making it only accessible for pedestrians.
Each of the 13 building blocks is accessible from all sides in order to avoid dead corners. To accentuate the all sidedness, ground bound dwellings are placed in the base of the building block.
DWELLING TYPOLOGIES

GROUND BOUND DWELLING

HIGH RISE TOWER ON LOW RISE BASE

MEDIUM SIZED CUBE

MIXED CITY BLOCK
Minervahaven is located west of Amsterdam city centre. The area is located within the motorway A10 and between two train stations, namely Amsterdam Central Station and Amsterdam Sloterdijk.

In the future, the municipality has plans to change the area by making better bicycle connections and connecting the different areas over water. In addition, the municipality wants to extend the green spaces in the area by connecting different types together.
The strategy taken to tackle the area is to value the existing buildings. Some buildings are deemed invaluable as they do not have a historic, economic or cultural value. Those that are deemed valuable do hold one or more of these values.

The next step in the design process was to divide the Minervahaven up into three parts to make it more manageable. These three parts are characterised by the wide embankment, the elongated embankment and the land locked part.
THE BUILT AREA

The municipality of Amsterdam has set a goal to build 72,650 dwellings, 58,208 work places and 51 educational buildings within Havenstad.

Minervahaven will have approximately 11,620 dwellings, 7,747 work places and 9 educational facilities in the near future. The goal for this area is to get to an FSI of 2.0.

The focus from this point onwards is on the Moermons-kade. This embankment has a lot of potential to be developed into a residential area as there are only a few valuable buildings compared to the other areas which have to make way for dwellings.
The concept for the design is to involve the quality of the water to the living area. In order to do so, a slow traffic route is created, which is characterised by different identities. These identities are as following as one would encounter by departing from the train station Amsterdam Sloterdijk and following the water:

- Living in the park
- Living with a view
- Urban waterfront living
- Commercial zone
- Urban waterfront and transition
- Living by the harbour
- Culture strip

The infrastructure for this area will be improved in the future by a new ferry connection and an additional metro station next to the Amsterdam Theatre. Parking is provided in such a way that every resident has access to it, whilst maintaining the parking norm of 0.2 as envisioned by the city’s municipality.

The new design proposal will commence in two phases. Phase one will be the construction of dwellings predominantly on the east and north side of Moermanskkade. Four buildings will maintain their office function during this phase, as these buildings are relatively newly built.

The second phase, in 2050, will be characterised by the complete transformation of the area into a residential area. The four office buildings will be demolished in favour of residential buildings.
PHASE 2 - 2050
Moermanskkade is characterised by three different sightlines. Towards the west, sightlines are short as the adjacent embankment is very close. On the north side, views are expansive overlooking the river Mercuriushaven. The distance between the two embankments is approximately 200 meters, which makes for wide sightlines whilst maintaining contact with the opposite side. Therefore there are 3 identities to be distinguished on the Moermanskkade, based on the different sightlines.

1. WATERFRONT LIVING

The first identity can be described as waterfront living. Closed residential blocks with a communal space in between characterises this area. The second identity is living in the park. This area can be distinguished as smaller scale buildings in a predominantly green area. The third identity is called living with a view. This high density area ensure expansive views over the water. Residential tower buildings dominant the skyline in this area.
2. LIVING IN THE PARK

3. LIVING WITH A VIEW
SECTION MOERMANSKKADE
SITE ANALYSIS

LIVING WITH A VIEW
ORIENTATION AND PREVAILING WIND DIRECTION
The two towers are 20° tilted to the right from the north. The left tower will cast a shadow on the right tower during the afternoon. The apartments with views overlooking the water will be predominantly on the shadow side.

The dominant wind direction, as is in the rest of the country, is from the south west direction of the area. The numbers around the circle suggest the total amount of hours the wind comes from a certain direction.
SOUND AND NOISE

The most noise is produced by traffic in the area. In the near future a metro line is proposed to run through the Minervahaven area. Additionally, this comes with extra sound and noise during the day and night. The two towers on the edge of the pier will most likely encounter noise within the 55 - 60 dB up to 65dB.
ARCHITECTURAL STYLE

The municipality of Amsterdam prescribed that Haven-Stad will have a tough character, by referring to the water and the harbour activities from the past⁴⁶.

The following photos show the current material quality of the environment.

PRECEDENTS ANALYSIS
DE VOORTUINEN, AMSTERDAM
PRINSENHOF, DEN HAAG
NORRA TORNEN, STOCKHOLM
THE CUBE, BEIRUT
To achieve an equitable city of high density, a residential tower building is desirable. To inspire and gain more knowledge about the workings of a residential tower, four precedent projects are analysed. Each of these projects are selected according to different qualities they own. De Voortuinen in Amsterdam is chosen because of the innovative and efficient entrance solution. Prinsenhof in Den Haag is picked out because of the large dwelling diversity they claim to have. Norra Tornen in Stockholm is analysed because of the distinct tower shape. Lastly, the Cube in Beirut is chosen because of the radical way the tower is constructed.

Each of these projects were analysed according to three main elements: design of the core, with lifts and (emergency) stairs, load bearing structure and shafts solutions in relation to dwelling differentiation and configuration.
There are two spaces reserved on the ground floor to include public amenities in the future. Examples of these amenities are a coffee shop, restaurant or a gym.

**General information**

- **Dwelling size**: ~81 - 153 m²
- **Floors**: 14

**Amenities**

- **Collective**
  - Bicycle storage
  - Gym

- **Public**
  - Coffee shop
  - Restaurant
PRINSENHOF, DEN HAAG
Rijnboutt, 1999-2006

The Prinsenhof is a mixed use building consisting of office, hotel, residential spaces and a garage.

The three residential towers designed consists, according to the architect Kees Rijnboutt of 63 different dwelling types.

General information

- Dwelling units: 207
- Dwelling size: 65 - 170 m²
- Floors: 27
- Building height: 72 m

Amenities

Public

Garage
NORRA TORNEN, STOCKHOLM
OMA - 2018

Norra Tornen consists of two residential towers named ‘Helix’ and ‘Innovationen’. With a prescribed building envelop, the architects sought to combine the slab and the tower by creating a new typology. Each of the towers consists of apartments and retail spaces in between. The design of the apartments focused on multiple sided orientation and large outdoor spaces.

General information

- **Dwelling units**
  - Helix: 138
  - Innovationen: 182

- **Dwelling size**
  - Helix: 44 - 271 m² (mostly 80 and 120 m²)
  - Innovationen: 44 - 271 m² (mostly 80 and 120 m²)

- **Floors**
  - Helix: 30
  - Innovationen: 35

- **Building height**
  - Helix: 110 m
  - Innovationen 125 m

Amenities

- **Collective**
  - Cinema room
  - Party/Celebration room

- **Public**
  - Retail
  - Gym
THE CUBE, BEIRUT
Orange Architects

The goal for the design of The Cube in Beirut was to include panoramic views for all apartments. As a means to achieve that, each of the floors is rotated to include outdoor areas and panoramic windows up to 12 meters wide.

Each level consists of two apartments, with two single apartments located on the top floors providing 360 panoramic views.

General information

- Dwelling units: 19
- Dwelling size: 117 - 234 m²
- Floors: 14
- Building height: 50 m

Amenities
Collective

Garage
DESIGN OF THE CORE
Including lift, (emergency) stairs and shafts

DE VOORTUINEN

PRINSENHOF
The core efficiency is the ratio total surface area of the floor subtracted by the % surface area core. Therefore, the smaller the core and the bigger the floor area, the more efficient a core is, as it gives access to more floor area. The following average core efficiencies are calculated:

De Voortuinen: 90%
Prinsenhof: 84%
Norra Tornen: 84%
The Cube: 82%

The Voortuinen core has proven to be the most efficient, followed by the Prinsenhof and Norra Tornen. The Cube is less efficient, most likely because of the overall size of the building.

The shafts, predominately from the wet cells such as toilets and bathrooms can be distinguished in 2 types: centralised and decentralised. De Voortuinen en The Cube are examples of centralised shafts, whilst Prinsenhof en Norra Tornen show the opposite.
LOAD BEARING STRUCTURE

DE VOORTUINEN, AMSTERDAM
- columns
- core

PRINSENHOF, DEN HAAG
- walls
- cores

NORRA TORNEN
- walls
- core

THE CUBE
- open-web girders
- core
DWELLING TYPES

DE VOORTUINEN, AMSTERDAM

Type A

Type B

Type C

PRINSENHOF, DEN HAAG

Type A

Type B

Type C

Type D

Type E

Type F
NORRA TORNEN

Type A

Type B

Type C

Type D

THE CUBE

Type A

Type B
A schedule above shows the summary of the four precedent projects categorised according to the design of the core, the load bearing structure and the dwelling typologies.

Both Prinsenhof and The Cube have a central core access, but they differ the most when it comes to dwelling types. The architects of Prinsenhof claimed to have designed 63 different dwelling types, but I have found only 6 types with the information at hand. The other dwellings were of the same type, but differed in size and/or orientation. However, the different types of dwelling that they did manage to design, I can take as inspiration towards my own design.

Although there are only three dwelling types to be distinguished in the Voortuinen project, the load bearing structure proved to be the most flexible when it comes to the size of the individual dwellings. This is something I can implement in my residential building.

Lastly, the centralised and de-centralised shafts correspond with dwelling diversity. The centralised shaft is implemented in both Voortuinen and The Cube project, resulting in the least amount of different dwelling types, whilst the de-centralised shafts implemented in Prinsenhof and Norra Tornen result in more dwelling diversity.
PROGRAMME OF REQUIREMENTS
GENERAL BUILDING INFORMATION

Size (length x width): 25 x 40 meters
Height: 80 and 100 meters
Plinth floor height: 5 meters
Floor height: 3.5 meters
Floor area: 22,000 and 27,000 m²
Amount of dwellings: 200 + 250 = 450 dwellings
Parking norm 0.2: 90 parking spots

COMMUNAL AMENITIES

- Shared car, scooter and bicycles
- Laundry room 30 m²
- Communal room 90 m²
- Garden 900 m²

PUBLIC AMENITIES in building plinth

- Library 300 m²
- Gym 180 m²
- Restaurant 120 m²

DWELLING TYPES

- 55% single person household
- 20% couple without children
- 15% couple with children
- 10% single parent household

75% of households falls into category A and/or B. 25% in category C, D and/or E.

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<th>B</th>
<th>C</th>
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<td>Couple with one child / Single parent</td>
<td>Couple with child / Single parent</td>
<td>Couple with two children</td>
</tr>
</tbody>
</table>
CONCEPT DESIGN

The prevailing residential tower exists of apartments stacked on top of each other with the most luxurious penthouses on top. To design a residential tower in an equitable city, each apartment should have a certain degree of quality.

The apartments in the lower base of the design will have large outdoor space, whilst the apartments on top will have views overlooking the pier.

The division is based on the surrounding area. The closed building block south of the Equilibrit is 30 meters high, so the apartments from the eight floor and up will look down on the block giving them views of the surrounding area. The apartments on the second to seventh floor have the quality of outdoor space, because they do not necessary have a great panoramic view.
BUILDING CONFIGURATION

Division of spaces within the Equilibrit. Public spaces are located on the ground floor to create an open space. Parking is completely underground, so as to make the ground floor equal to the ground level outdoor. Communal spaces are located at the top level of the connection between the two towers, making it accessible for residents of the building.
FLOOR PLANS

Ground floor

6th floor
The grid of 3.6 x 5.4 meter is carefully chosen so that each dwelling has enough sunlight throughout the day, since the apartments are mostly one sided orientated.

The floor plan above shows an example of the dwelling configuration which is possible in the existing grid.

The shaft in the middle of each tower is reserved for the bathroom for each apartment. From the 8th floor onwards this space will be used as a corridor to gain entrance to the individual apartments. The escape route for each of the tower parts exists of a helix staircases located in the darkest parts of the towers, which is the part connected to the lower base of the building.
BUILDING IMPRESSION
From the southwest
IMPRESSSION STAIRCASES
West elevation
SUMMARY

AN EQUITABLE CITY
SUMMARY OF AN EQUITABLE CITY

This research was done for the Dwelling graduation studio for the master track Architecture, Urbanism and Building Sciences at TU Delft.

The goal for the Dwelling studio was to elaborate on the topic of the future of housing in the Netherlands. In short, how do we want to live in the future and what building permits that? The future housing of the Netherlands, as perceived through my eyes will be accessible and attainable for everyone. Cities like Amsterdam will grow even further in terms of residents and I think we should enable this by designing the built environment and in particular the residential building accordingly.

THE EQUITABLE CITY

Cities today are dealing with an ongoing migration, with no indication of slowing down. Amsterdam will most likely welcome their one millionth resident in the near future. Because of economic pressures, with an increasing demand of housing within the city and an insufficient supply, city life becomes unaffordable for most people. Making involuntary displacement inevitable.

Although Amsterdam has been known as a tolerant city throughout the years, times seems to be changing. Social-economic polarisation is emphasised by not providing enough housing for different types of households, which in turn leads to social exclusion. To avoid this from further happening in the future, city life should be attainable for everyone. Therefore, an equitable city is required.

The main question of this research was: How can the residential building contribute to an equitable city?

This research was divided into two parts. The first part focused on ongoing trends and things to take into account whilst designing for an equitable city. The second part was about the implementation of the five open forms by Richard Sennett on a building level.

To make a dwelling in a city as Amsterdam attainable and affordable for most everyone, a few things should be reconsidered. The first one being that the city should be open to everyone, meaning no exclusion of a certain type of household. Within the Netherlands, there are four main categories of households to be distinguished. These are the single person household, the couple without children, the couple with children and the single parent household. Each of these types of household requires a different dwelling configuration.

Affordability plays a massive role to ensure equity of different household types in the city. Social housing should be included, so that even the people with a low social-economic status can afford to live in the city.

Lastly, dwelling space should be reconsidered. Not only to make it more affordable as smaller surface area means lower costs, but to also leave space for others. Additional amenities which can not find their way into the individual dwellings can be communally or publicly shared. Thereby making it more affordable, as more people are contributing to the incurred costs.
To answer the main question, the residential can contribute to an equitable city by making the residential building inclusive for most everyone. This can be achieved by densifying the residential building by stacking. Thus, creating a residential tower. Subsequently, it should be suitable for most everyone by not excluding any type of households. Lastly, the dwellings should be compact to make it affordable, whilst making space for others. In addition to inclusivity, the residential building should be open for everyone. The 5 design principles of Sennett are thereby employed to create this openness on a building level.

The second part of the research dived deeper into Sennett's theory of the 5 open forms he described in his book Building and Dwelling - Ethics for the city. These five open forms are the synchronous space, the monumental and mundane markers, the membrane, the shell and type form and lastly seed planning. By applying these design principles into a residential building, this building can contribute to an open city.

The synchronous space can take form as an communal garden where many activities can happen at the same time. Residents of the building are invited to join, but does not impose. Markers can find their way into different places in the building. For instance, one of these markers can emphasise the transition from a public corridor to a private dwelling. A building, like the urban fabric should contain more borders than boundaries. At these borders, different people can interact. A central space connecting private and public spaces can ensure the interaction between different types of people such as the resident and the non-resident of the building. The design of the interior space can contribute to this interaction.

The shell can be applied to the individual dwelling within the residential building. The incomplete form has fixed services and wet cells that require shafts and fixtures, whilst the rooms around it are open for interpretation. As with the shell and type form, seed-planning relies on the unfinished form. Space within the residential building can be left blank intentionally, so residents can ultimately design how they want to use that space and what for. Thereby stimulating interaction and collaboration between them.

To conclude, as a result of employing the 5 design principles of Sennett on a building scale, in addition to densifying, diversifying and compacting dwellings most everyone can find their space in the residential tower. In this way, the residential tower can contribute to an equitable city.
URBAN DESIGN

To implement the research into a residential building, precedents were analysed in order to gain knowledge and inspiration from existing projects. The Müllerpier in Rotterdam was used as an urban precedent analysis. This project was based on 13 building blocks of four different categories which were seemingly randomly distributed on location. These four categories were the ground bound dwelling, the high rise on a low base, medium sized cube and the mixed city block. On the new urban design for Minervahaven, Amsterdam three different categories were implemented to create different areas. These categories are the small cube, closed block and towers. To make city life possible for most everyone, a high density is required. Therefore the two towers area to be designed for the equitable city.

ARCHITECTURAL DESIGN

To understand the tower typology, four precedent projects were analysed. These four projects are De Vooruuien in Amsterdam, Prinsenhof in Den Haag, Norra Tornen in Stockholm and The Cube in Beirut. These projects were analysed according to three main elements, namely the core design, construction method and the shafts solution in relation to dwelling diversity. To design a residential tower in an equitable city, dwellings should be diverse to fit every type of household. In addition, it has to be efficient with regards to the core and shafts.

THE EQUILIBRITY

The Equilibrity is the name for the two towers which are connected by a lower base. The name, meaning the state of being in equilibrium, refers to the balance of types of households who can call the building their home.


IMAGE 5 - 7: Own image (2019).


IMAGE 10- 13: Own image (2019).