
TO
A MOVING CITY
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BY
MICHAEL VETTER

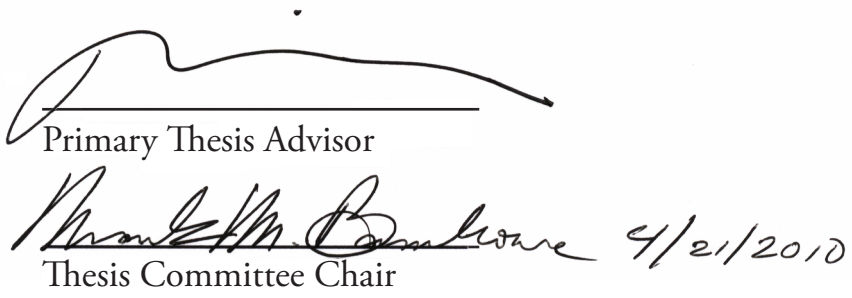
A MOVING CITY

A Deign Thesis Submitted to the
Department of Architecture and Landscape Architecture
of North Dakota State University

By

Michael Vetter

In Partial Fulfillment of the Requirements
for the Degree of
Master of Architecture



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ABSTRACT

This thesis will provide some answers to the question, "How can public transportation respond to the built environment to improve how we move within a city?" The typology for the examination of this problem is a light rail system, located in Phoenix, Arizona. The theoretical premise that is guides the research is, "public transportation must increase to improve how a society moves and functions in a built environment." This thesis will explore connecting the Phoenix area, Los Angeles, Tucson, and Flagstaff with a High Speed Rail system to help revitalize Phoenix's downtown. The project justification is, "To continue the growth of our built environment, we must put the public first, by studying the way a city moves, grows, and sustains."

Key words:
Moves, Grows, Sustains

Problem Statement

How can public transportation respond to the built environment to improve how we move within a city?

Statement of Intent

Statement of Intent

Typology

High Speed Metro Public Transportation

Claim

US cities cover vast areas of land, which makes public transportation difficult and expensive to build and allow people to travel from a part of the city to the next, or city to city.

Premises

As our built environment develops we put more emphasis on the individual rather than the society.

Building public transportation is important to every built environment; the way people move through a city relates directly to its public transportation.

The built environment is continuing to grow, causing a greater demand for effective public transportation.

Theoretical Premise

Public transportation must increase to improve how a society moves and functions in a built environment.

Project Justification

To continue the growth of our built environment we must put the public first, by studying the way a city moves, grows, and sustains.


HELLO!
HELLO!
HELLO!
HELLO!

The Proposal

NARRATIVE

Architecture can be used to connect people to their environment. Transportation is an important means of connection, with the vast areas of land in the United States we are forced to commute everyday.

Cities today are designed around transportation, in most cases for the US it is the automobile. Phoenix Arizona is one of these cities. Cities designed around automobile transportation end up covering a vast area of land and require people to travel long distances for work. This thesis will explore connecting the Phoenix area with a High Speed Metro system to help revitalize downtown.

Connecting the surrounding communities to the downtown area will increase the pedestrian flow. By increasing the pedestrian flow the demand for the built environment will change to build up rather than out.

II

User/Client Description

Building Management/ System

The Metro system will be designed for the general public of the Phoenix area. The city of Phoenix will own and operate the Metro.

Client

The City of Phoenix

The light rail stations located throughout the Phoenix area will be open 7 days a week and will close 12am to 5am Monday - Thursday.

Users

The Public

The rail will be open to the general public. Any rider with a valid ticket will be permitted on the Metro.

Major Project Elements

Public Plaza/Greenage

This will be a public area on street level that will direct pedestrians to the entrance. This area will connect to the green space of the public library.

Entrance Lobby

The entrance will be located on street level and will house the ticketing area, offices, retail and information spaces. The lobby will direct the users to the train platforms.

Information Areas

The information areas will be located throughout the metro station, this will include maps of the Phoenix area, the station itself, and layouts of the metro. The lobby area will have an information desk.

Platforms

The platforms will be where pedestrians are able to wait and load the trains. The platforms will also be the main connecting point from city to city in the Phoenix surrounding area.

Retail Spaces

The retail spaces will be located in the lobby area. This will be a way for the metro to generate income and support operating costs.

Site Information

The site is located in the middle of the downtown Phoenix area. The site has direct access to the freeways that connect the Valley of Phoenix

Site Location

The Intersection of N. 7th St. and Interstate 10

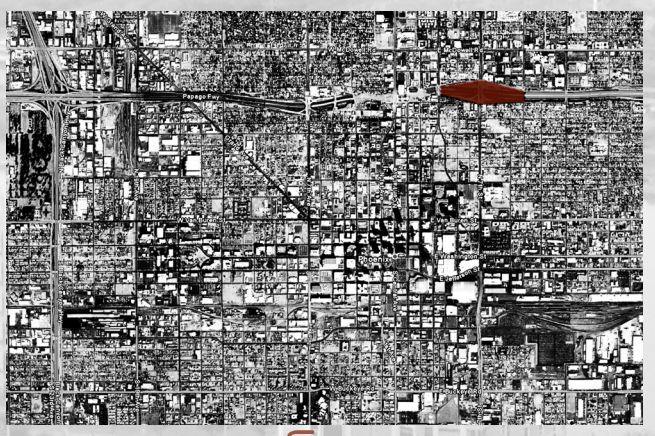
Landmarks

Phoenix Public Library
US Airways Stadium
Chase Field

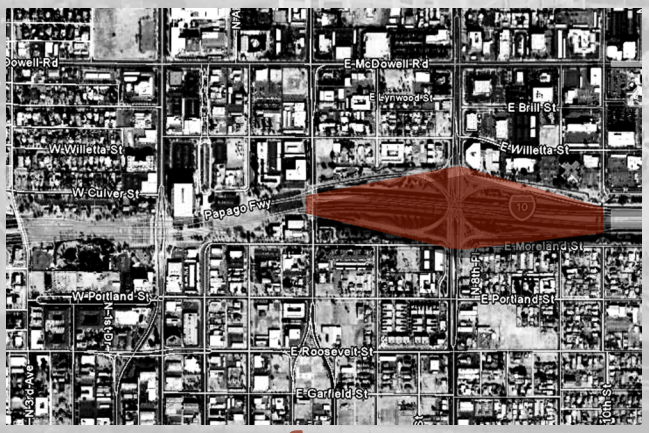
Views

Camelback Mountain
South Mountain

Region



City



Site

Project Emphasis

Public transportation must increase to improve how a society moves and functions in a built environment. The way cities are designed can be directly related to transportation. From macro to micro scale, the public needs to move from space to space.

This thesis will focus on the concept of the experience of moving through a city. Every city is unique in how traffic flows. Cities that are designed around pedestrian traffic have a greater need for transportation.

Plan for Proceeding

Research Direction

My research will require the investigation of city movements. Research will consist of city transits, urban design, historical context and a site analysis. Needed to make this thesis successful will be understanding of what makes a city move, grow, and sustain.

Design Methodology

Both quantitative and qualitative data will be gathered concurrently. Priority will be assigned by the requirements of the theoretical premise. Integration of the data will occur at several stages in the process of the research, and will depend on the requirements of examination of the theoretical premise.

Plan for Documentation

I plan to compile process work every two to three weeks. I will convert all my work to digital format so it will be easy to transfer to my thesis book and for final presentation.

Oct. 30	Case Studies
Nov. 6	Site Analysis
Nov. 13	Research Results and Goals
Nov. 20	Draft of Thesis Program Due
Nov. 27	Program Requirements
Dec. 4	Final Thesis Program Due
Dec. 11	Holiday Break
Jan. 15	Concept Sketches
Jan. 22	Concept Studies
Jan. 29	Determination of Design Direction
Feb. 5	Site Model
Feb. 12	Plans, Elevations, Sections
Feb. 19	Graphics of Space and Place
Feb. 26	Construction Assembly
Mar. 5	Energy Issues
Mar. 12	Mid-Thesis Review
Mar. 19	Further Graphical Representation
Mar. 26	Landscape Response
Apr. 2	Begin Final Presentation
Apr. 9	Continue Final Presentation
Apr. 16	Continue Final Presentation
Apr. 23	Practice Presentation
Apr. 30	Thesis Projects Due
May 7	Finish Thesis Document Refinement
May 14	Final Thesis Document Due

Previous Studio Experience

Arizona State University

FALL 2005 — Benjamin Mullings
space and experience

SPRING 2006 — Victor Irizarry
patchwork gardens
place and perception

FALL 2006 — Patrick Mayers
mediating wall
place of memory

North Dakota State University

FALL 2007 — Steve Martens
inuit school
childrens hospital

SPRING 2008 — David Crutchfield
food for thought
mixed greens

FALL 2008 — Bakr Aly Ahmed
life in a cigar box
san fransico high rise

SPRING 2009 — Stephen Wischer
train station

FALL 2009 — Mark Barnhouse
water resource experiment station

Program Document


Theoretical Premise Research

"Looking at cities can give a special pleasure, however commonplace the sight may be. Like a piece of architecture, the city is a construction in space, but one of vast scale, a thing perceived only in the course of long spans of time. City design is therefore a temporal art, but it can rarely use the controlled and limited sequences of other temporal arts like music. On different occasions and for different people, the sequences are reversed, interrupted, abandoned, cut across. It is seen in all lights and all weathers. At every instant, there is more than the eye can see, more than the ear can hear, a setting or view waiting to be explored. Nothing is experienced by itself, but always in relation to its surroundings, the sequences of events leading up to it, the memory of past experiences. Every citizen has had long associations with some part of his city, and his image is soaked in memories and meanings." (Lynch, 1960)

The word "city" can have many meanings, but can generally imply a concentration of people in a geographic area who can support themselves from the city's economic activties on a fairly permanent basis. (Gallion & Eisner, 1980) With this in mind, most cities today tend to become very large if their economic base is wide. Many times smaller cities surround and support the larger city, as these smaller cities allow for a better form of living and a more intimate feel of community.

The people are what makes the city, and the people must be provided with both satisfactory accommodations and healthful environments in which to live and work. It must be borne in mind that the family and its home are the cornerstones of society. (Saarinen, 1943)

To understand the city we must know where it has come from, look into the past to understand the problems, and design for the future city. The idea of town development is a slow process that takes many years to fold and expand onto itself.

The middle ages period is when city development began to stay anchored and expanded. The town of the middle ages has an expressive design-order of its own; this fact is ample reason to consider the medieval town a particularly good example of that creative sensitivity of form in the spirit of which towns and cities should be designed. (Saarinen, 1943) Many cities were built and began to expand without any order. This created some problems, as water drainage and sanitation became issues in new developing cities. In the fifth century an architect from Miletus by the name of Hippodamus, began to implement his advanced positive theories about the art and science of city planning. He is credited with the origination of the grid street system that is used in many cities even today. (Gallion & Eisner, 1980) This can be seen as a straight forward approach to city design,

making it a much easier time to get along. The precise right angles always keep us in check, enabling us to find our orientation rather quickly. The problem with cities that are mapped out on a grid is they often begin to cover a vast area of land while losing the character and its creative sense.

History of town-building shows that the character of town formation depended mainly on two factors: the tempo in which a town grew, and the changing conditions of life. (Saarinen, 1943)

Barcelona, Spain is an example of how living conditions and the tempo of growth change the way a city is designed. The city is separated into essentially two different parts, the old city and the new city. The old city was built within city walls that were in place by Madrid. Since Madrid was the capital of Spain, officials didn't want Barcelona to become too large so it was kept within walls. Barcelona, being a port city, was expanding rapidly. Since the walls constricted the growth of the city it became very dense, to the point that buildings where being built on top of other buildings, creating an organic character. Once the walls came down many years after development, Barcelona adopted Hippodamus' planning idea and the new city was laid out on a grid system. Today the city is very unique with the contrast between the new and the old. The old city has most of the life and action, whereas the new city houses most of the city's residents.

In the times after the middle ages with Hippodamus' grid system being used, the city went into decline in the design and planning aspects. The architect took a back seat with city planning, since it did not benefit him to deal with such non-artistic matters as the measuring of land and the making of maps. "While people moved into the town, while the town grew and became a crowded city, and while the surveyor measured lands and worked out his maps for further growth, the architect took but little part in these activities. The art of town building had slipped from his hands, and this had happened so gradually that the architect scarcely was aware of the fact that the most fundamental part of his art was gone." (Saarinen, 1943)

Because the architect took less interest in city planning it was in decline. The city was in need of a rebirth. We must bring back the city to the pedestrian level. After all, the city is made for and made by the pedestrian. In this state of reform, the city must start rebuilding the sidewalks and streets. Quoting Jane Jacobs, "streets and their sidewalks, the main public places of a city, are its most vital organs. Think of a city and what comes to mind? Its streets. If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull." (Jacobs, 1961)

"Life Takes Place on Foot," is the aphorism of Jan Gehl, a Danish architect who is an acute and sympathetic observer of the way that people interact with each other and with their surroundings. He believes that people still need the casual encounters once built into daily life, but now are made less frequent by automobiles, computers, and the internet. (Barnett, 2003) We have made our cities to streamline, not giving the people a place to slow down and just enjoy life. The city needs to give back to the public, and create places that make people linger, stop for a cup of tea, look at a statue or a fountain. Pedestians are guided by the environment, and if it is a poor environment people tend to rush through as quickly as possible. If it is an attractive environment, then people will slow down, giving more opportunities for these casual encounters.

Public spaces are important to the pedestrian. We as designers must strive to make these spaces inviting, catch our attention and at the same time be one with the environment. The automobile has almost completely eliminated the casual encounters in America. People drive their car from home to work, then work to the store. People even drive their cars to the health club to walk on a treadmill. (Barnett, 2003) Markets, plazas, and parks are examples of where people can go to relax and be surrounded by other people. People enjoy watching others and how they interact with one another. It takes

their mind off the busy and stressful day they have been having. The market can be a great place for people to interact. For example in Barcelona the city planners require a market to be located within walking distance to peoples homes. The market is not just a place where people get their food, it is a place where people go to socialize with the food venders. People tend to make relationships with the people of the market, and then return to the market to socialize and in turn get better choice on the meat selection.

Public spaces are still needed in city planning. A way of bringing their importance back to society is bringing the design the design to the pedestian. Life Takes Place on Foot. With the automobile being the means of our transportation, communting time takes up the part of the day that could otherwise be used for more leisurely activities or spent with family at home. Attempts to solve traffic problems by building new roads are seldom seccessful, because the roads attract more development and induce more traffic. (Barnett, 2003)

The consequence of this increased mobility have made an impact, not only on the architecture created for the interchange but on the shape of our cities which have had to adapt to the extensive use of the car and to the necessity of becoming a part of the global village.

Through transport, our cities have become larger and the Earth has become effectively smaller. The need to be adjacent to efficient forms of transportation has influenced urban plans. (Toy, 1994) Having a well-developed metro system has not eliminated traffic problems in the States; for example, Washington D.C. has one of the most comprehensive new rail transit systems and is often described as having the second worst highway traffic after Los Angeles. (Barnett, 2003)

With the automobile causing congestion and frustration, and the metro rail system not making the automobile traffic any more bearable the question arises: how shall we move? "Satellites in outer space make instantaneous audio-visual communication possible on a global space. Spaceships carry men to the moon, and television is projected into our living rooms from moon-walkers. Yet this same technology only complicates the movement of earth-bound persons in cities. (Gallion & Eisner, 1980)

We either need to pull back on the technology, take the technology to a new level of transportation, or have a solution somewhere in the middle using new technology and forgetting the technology that is causing problems today. Getting people back on their feet is an important goal in solving the transportation crisis. The bicycle is becoming ever more popular in this world.

According to David Sucher sixty-three percent of all automobile trips are less than two miles. The average person in normal health can ride a bicycle eight miles an hour. Therefore, sixty-three percent of the automobile trips can be done on bike in less than fifteen minutes. (Sucher, 2003)

How may these various and diverse characteristics of contemporary vehicles be merged into an effective transportation system? The high-speed trains used in Japan and Europe to link urban centers have been discussed in the States. The nearest we have so far is Amtrack's Acela service between Boston and Washington in the northeast corridor. The effect of high-speed train service is to strengthen the areas near train stations in cities.

"Higher densities, more traditional building relationships, intercity trains, and rapid transit are not the stuff only of romanticism and nostalgia, but could make a lot of economic sense as the next generation of development takes place." (Barnett, 2003)

SUMMARY: 30

The city can be looked at as a composition. This means that the city is one entire unit, made up of all sorts of different elements: streets, sidewalks, parks, stores, Freeways, buses, train, markets, stadiums, and of course its people. The people are one of the more important pieces of the composition. As Jan Gehl said before "like takes place on foot."

Life on foot brings back casual encounters, which we have almost lost completely. Today casual encounters have been replaced with the internet. Facebook is slowly taking over the world and we will soon have no need to see people anymore, just log on and instantly see how people's lives are progressing. This technology is taking away our life on foot. In order to bring back life to the foot, we must rediscover city planning from a design standpoint.

The grid system that has been used for so many cities in the United States needs to be reconsidered. Its main function was to make the transportation easy and efficient for the automobile traveler. Although the streets and roads where fine for the traffic when they were first designed, streets are often congested with automobiles today, causing frustration for their users.

The use of the bicycle be a compromise for bring life back to the foot. With the vast area of land our cities have taken up due to the ability of the automobile, we can get almost nowhere by walking. We only need to walk to and from our car.

The future of city planning lies within transportation, and deciding how people are going to move through a city is how we will plan for the future.

The implications of increased travel across the planet and beyond have had an unprecedented impact on the nature of our built environment. The need for increasingly more efficient transport interchanges has created a demand for buildings which not only provide the required ease of movement, but also celebrate the sense of arrival and departure. Through transport, our cities have become larger and the Earth has become effectively smaller. The need to be adjacent to efficient forms of transport has influenced urban plans. (Toy, 1994)

Stadelhofen Railway Station
Zurich, Switzerland

Canary Wharf Station
London, England

Orient Station
Lisbon, Portugal

Stadelhofen Railway Station 34

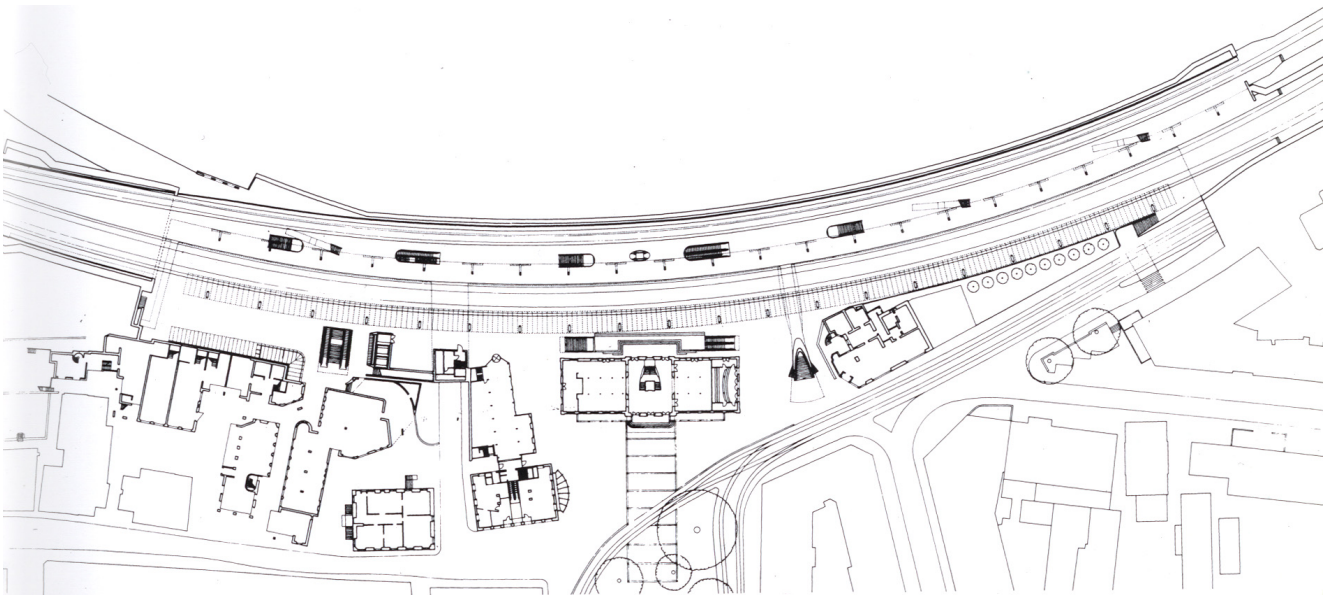
The Stadelhofen Train Station is located in Zurich, Switzerland and was designed by Santiago Calatrava from 1983-1990. This is the project that brought international recognition to Calatrava and his work. The station runs a length of 270 meters and contains train platforms, an underground shopping area and a city park. (Samsa, 1999)

"The complex of support and drainage, along with the tubes and cables that constitute the provisory links between the Hohe Promenade and the Stadelhofen create the impression of a highly sophisticated construction site, almost like an operating room on a geological scale: the morainic hill with its deep, open cleft between two tunnels if it were a wound that has been temporarily medicated. After completion of this more surgical phase comes the installation of the railway system and the superstructure of the station itself, whereby the wound of the cleft will be outfitted with a sort of refined prosthesis." (Samsa, 1999)

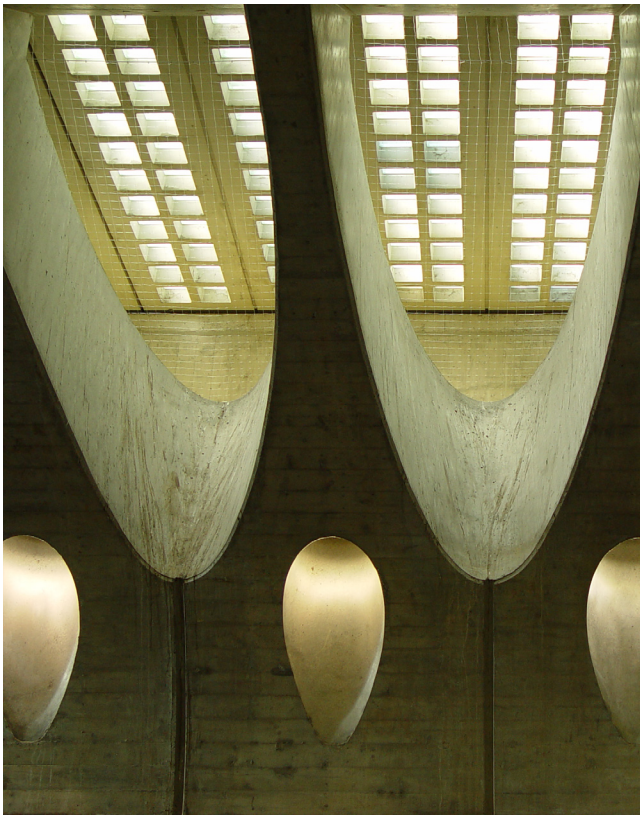
This project is very similar to the Jubilee Line and also the Orient Station, although for this station the platform is located on ground level. The site is cut into the side of an exsiting park and Calatrava drew inspiration from the contours of the surrounding terrain. Rather than build a tunnel, he opted to work around and within the old city's fortifications. Calatrava referred to this design scheme as "design by section."

"The paths and passageways within the station are interwinded like a smooth-flowing circulatory system, directing different types of movement. The highly regulated movement of the trains on the ground level coexists with that of hurried pedestrians ascending and descending the three levels via the stairs and escalators that criss-cross the shopping mall under the tracks. Others cross above them over the three pedestrian bridges, while less-harried families and couples enjoy leisurely strolls up and down the hill along the promenade." (Tzonis, 1999)

The plan of the building follows the topography of the park that is directly conected to the station with a series of four brigdes that link the upper walkway to the lower platfor in punctual intervals that neatly connect the two zones. The section of the station accommodates multiple movements and articulates several functional transportation components.



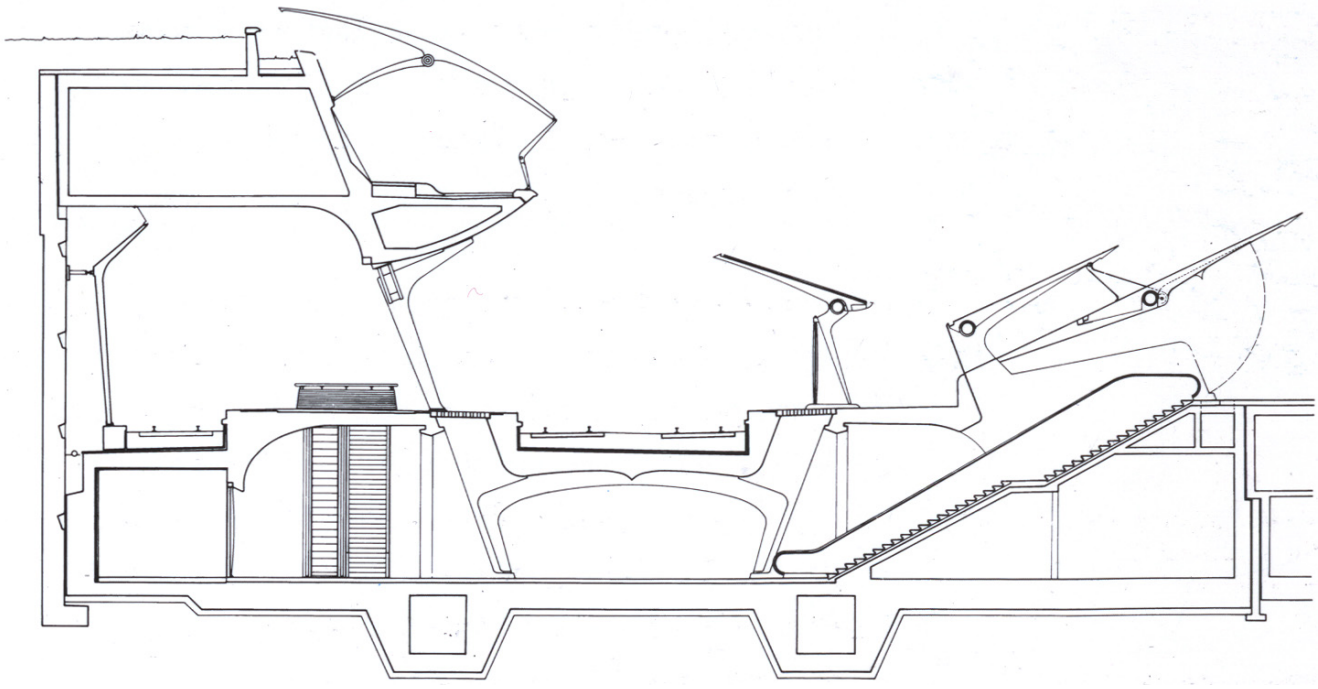
STADELHOFEN RAILWAY STATION 36



The structure of the railway station is made up of a hallow concrete boxbeam with a covex soffit which replaces the original wall, which is supported by an anchored, piled wall in the rear and by a series of slanted tapering columns in the front. These outstretched arms carry the additional weight of the walkway above, allowing trains to follow the gentle curve of the hillside. (Tzonis, 1999)

Light filters down to the shopping mall through the cantilevered glass-and-metal roof and through the glass blocks of the platfrom-level sidewalks.

The geometry of the station is best displayed in section. It is a combination of a concrete superstructure that makes of the underground shopping area and the metal cantilevered support arms.

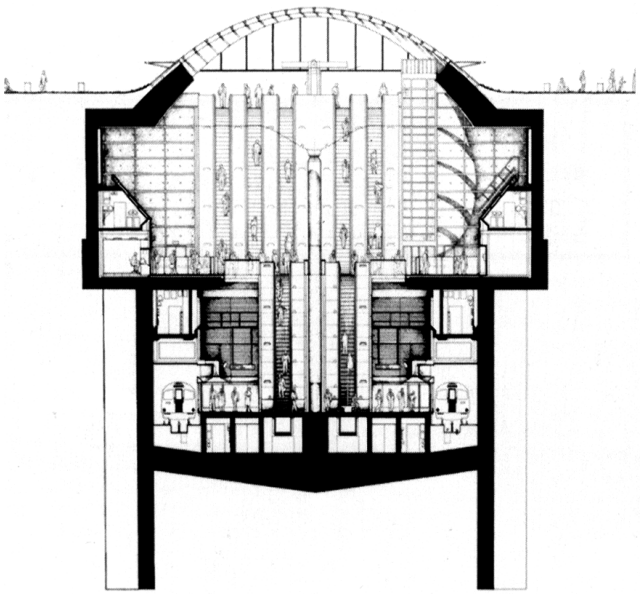


"Movement reigns throughout the structure. It can be read in the flow of forceds channeled down to the ground via the intricate configurations of steel and ferrovitreous and reinforced concrete. Movement is latent within the profile of columns, beams, cantilevers, platforms, and supporting walls." (Tzonis, 1999)

The Stadelhofen Railway Station is a good example of how public transportation can be built in a developed, community to meet the needs of the city's transportation problems. The city of Zurich needed to accommodate for a sharp increase in rail traffic. Calatrava was able to preserve the surrounding environment including a park which is incorperated into his design. The station is designed in layers which is important to be able to separate the train platforms from the rest of the program. Public transportation systems revolve around the pedestrian's access to, moving throughout, and the overall experience. Calatrava has been able to incoperate the pedestrian on all layers of the design. Moving from the park, through the bridges, down to the platforms and finally under ground to the shopping area. "It is an example of an architectural-infrastructure project that brings back the turn-of-the-century romance of travel, bringing together structure and movement." (Tzonis, 1999)

Canary Wharf Station

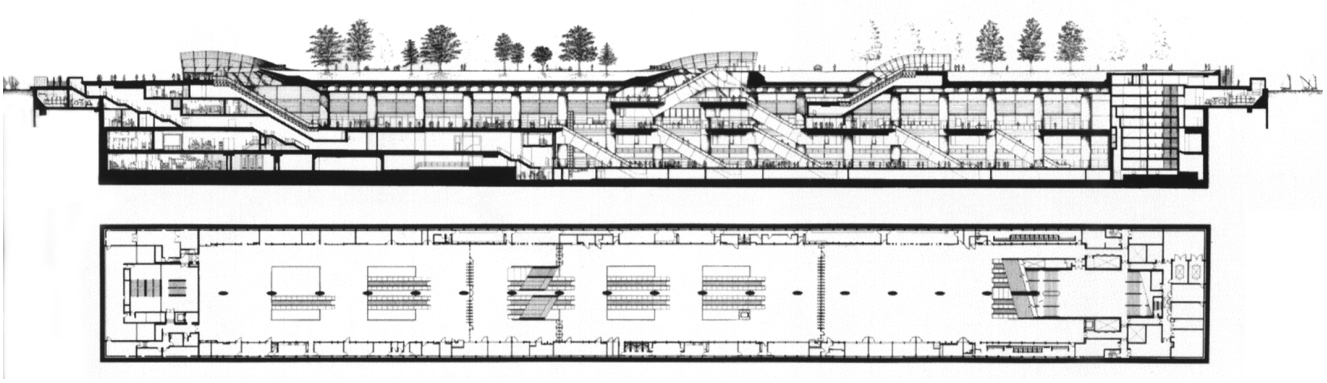
"Midway through the 20th century, investment in London's underground system came to a halt. The 'iron network', having set an example world-wide since the industral revolution, was rapidly becoming outdated. But with the extension of the Jubilee Line, which connects North and South London diagonally, the underground has once more become a model of innovation. The eleven new stations on the line were designed not by civil engineers, as is customary, but by eleven different architects." (Meijenfedt, 2003) The Canary Wharf is the largest station on the new extension of the Jubilee Line at 31,500 square meters. The design seeks to minimize the physical and visual impact of above-ground station structures by creating a park above it. The elements that make up the station are the platforms, ticket hall, shops, London Underground offices, the park, and public amenities. (Foster, 1997)



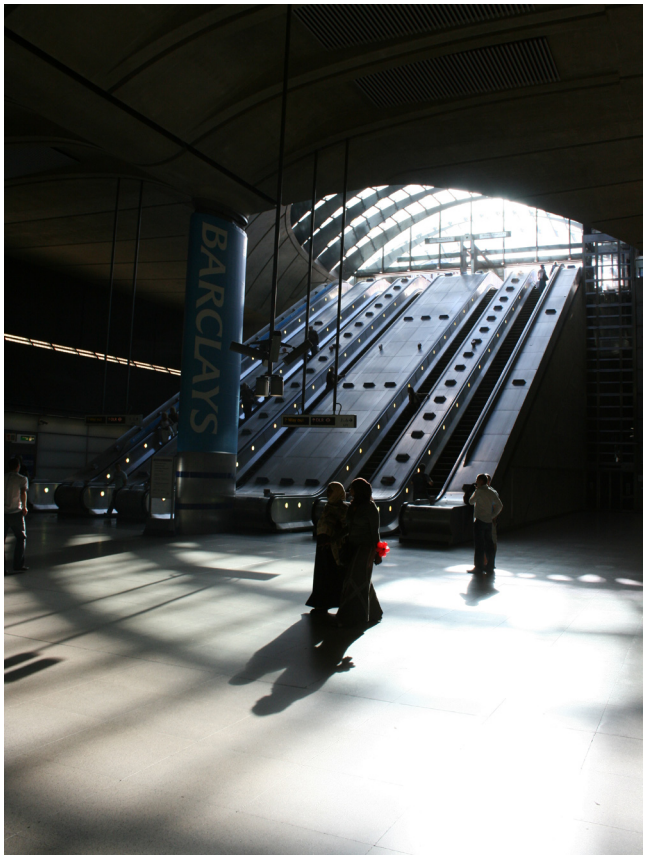
The Canary Wharf Station has most of the same elements that the Stadelhofen and Orient Stations do, but the major difference is that the platform is located 27 meters below grade. This is perhaps the busiest station in London. During rush hour, more people pass through this business station on the Thames than through busy Oxford Circus, which is currently London's busiest Underground destination. Each day, twenty banks of escalators transport 100,000 commuters to and from the platforms. (Meijenfedt, 2003)

This project is driven by the movement of people. Since it is the largest stop on the Jubilee Line it had to accomodate the traffic. Although the entrances are the only thing that can be seen from ground level, this is one of the most import parts of the project.

The super structure is very important to the Canary Wharf Station. The structure is concrete with stainless steel. The structure composition is straight forword and can be seen in the sectional drawings. The columns which run down the middle of the project separate traffic that is entering from exiting traffic.



Canary Wharf Station



The use of light being very important to this project, lights have been installed where needed, as in the escalators. The canopy shaped entrances that span over 20 meters, wide draws daylight deep into the stations concourse. By concentrating natural light at these points, orientation is enhanced, minimizing the need for directional signage. (Foster, 2005)

The plan of the station is simple. It was built within the hollow of the former West India Dock. Circulation happens in the middle of the building with shops, offices, and platforms on either side of circulation. The geometry of the building is a simple rectangle with three canopy entrances rising from the ground. (Foster, 2005)

The building was designed for the public, so instead of having the building take up space on ground level, Foster has sunk

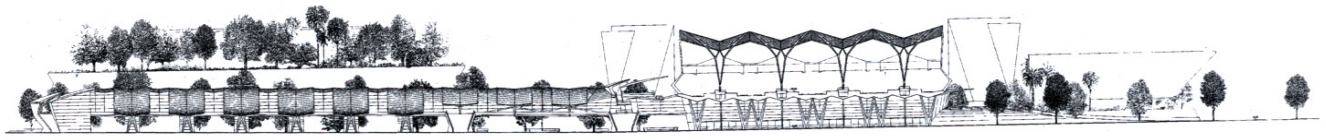
the building into the ground and created a park on the roof. The hierarchy of the building shows that the pedestrian is the most important part of the design.

Just like the Stadelhofen Station, Canary Wharf was able to take an urban site and respond to the surroundings. Movement was important to the design of the this station. Everything was designed for the pedestrian, even measures of saftey were taken where the platforms are separated from the rail by a barrier containing glass doors. Twenty banks of escalators transport passengers in and out of the station. With the other amenities located along the sides of the ticketing hall, this leaves the main concourse free and creates a sense of clarity and calm. (Foster, 2005)

Orient Station

For the Orient Station, Calatrava went beyond the original scope of the competition brief to create a veritable oasis, a zone of urban fertility in the middle of a once rundown industrial wasteland on the coast just north of Lisbon, Portugal. With the station being over 50,000 square meters he cultivated the remnants of a derelict harbor to create a nexus of high-speed intercity trains, standard rail services, regional bus lines, underground parking lots, and subterranean metro links. Among the transportation there is a multilevel reef of boutiques and ticket counters. (Tzonis, 1999)

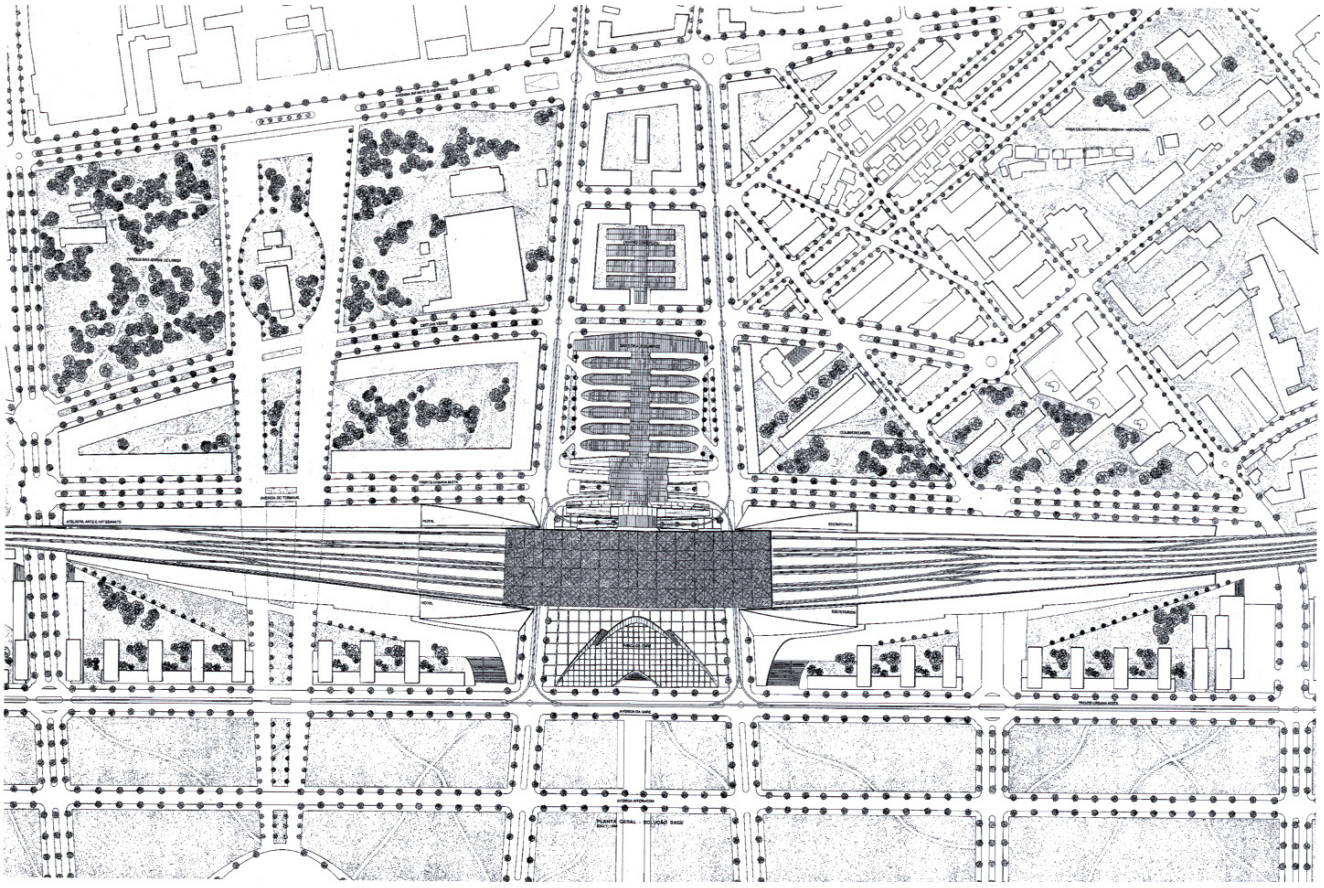
The Orient Station is much different than the previous two case studies. Though it is still a train station, it can also be viewed as a transportation hub. It incorporates many



forms of transportation, including trains, cars and buses. The platforms are raised 11 meters above the ground onto a bridge structure. This allows the existing perpendicular avenue to run seamlessly into the complex.

The complexity of Calatrava's solution brings many analogies to mind. The platform/oasis, "forested" with "tree" columns, is also a Mediterranean-style open market. A scalloped awning of glass and steel welcomes travelers to new experiences. (Tzonis, 1999)

The plan reads much different from the section. In plan view the station deals with the long rectangle which may represent a visual form of transportation. One really begins to understand the building in section. As in the previous Calatrava station this seems to be designed in section. When working with multiple levels, section is the only way to be able to relate the levels to each other and the surrounding environment. This station is an example of how it relates the pedestrian all the way to the high speed rail.



Orient Station

As in all of Calatrava's designs, structure is one of the main driving forces. The Orient Station is another example of Calatrava structure at its best. The concrete super structure is used here to house the many shops and ticketing counters while supporting the railway track above. In the central part of the platform, a modular steel structure covers the area of the station, which is articulated on multiple levels.

With the use of glass, Calatrava was able to use natural daylight in all parts of the building. Although the super structure is very robust, the way that it is placed on the site allows for light to penetrate all the way through the building.

Hierarchy and circulation work together in this project. In order to keep the already established transportation that was happening on ground level, the platforms were raise above the ground, while keeping the pedestrian traffic on ground level or one level below ground.

This example of the three does the best job bringing many forms of transportation together. The idea of movement throughout the space, from train, to buses, to cars, and all the way to the pedestrian level was a major driving force in this example. Taking on a project that was originally intended merely as a transport connection for the 1998 World's Fair, Calatrava sought to move the Orient Station into the realm of urban planning. He cultivated the remnants of a derelict harbor to create this nexus of transportation. (Tzonis, 1999)

SUMMARY:

Architecture of transportation is designed for the public, and in the three case studies it is apparent that the public was the main focus. The Stadelhofen station was designed around and to incorporate the existing park, Canary Wharf lowered the building into the ground and designed a park on ground level, and the Orient Station was designed around the existing transportation that was in place. The pedestrian takes center stage in all of the case study designs. Each project touches on urban planning. The designing of a public facility like a park or public transportation can bring back life to the city.

Diagonal Mar Park located in Barcelona, Spain was a part of the 2004 Forum of Cultures. The Barcelona City Council recovered a series of partially abandoned industrial lots near the sea. The urban reordering carried out on these configures a new neighborhood on the shores of the Mediterranean where a variety of activities are available. Enric Miralles and Benedetta Tagliabue organized the site via a road system that extends in different directions on a tree-like pattern. The main avenue directly connects the sea to the Avinguda Diagonal, which is a street that runs the length of Barcelona. (Miralles & Tagliabue, 2003)

Structure and movement go hand in hand when designing transportation. Structure should design space, articulate circulation, suggest movement, and develop compositions and modulations. The structure of Canary Wharf station is the most straight forward and easiest to interpret as far as directing movement. The three entrances are

the only element that brings daylight into the concourse making it easy for the pedestrian to locate the exterior. In addition, the columns run directly down the middle of the concourse, separating traffic flow.

Designing through section is important in all architecture, and the same is true with the train stations. The terminals are divided into levels, most often different levels of transportation, ranging from pedestrian traffic all the way up to the high speed rail. The Waterloo International Terminal located in Greater London is another example of a design of movement from section. "The objective was to create a streamline terminal that would allow passengers to pass through with the minimum fuss at maximum speed. Ramps and mechanical conveyors allow passengers to move with ease through the different levels of the building as well as ensuring full access for the disabled. It was imperative to British Rail that the terminal should provide a high quality environment even during times of heavy demand." (Powell, 1994)

The implications of increased travel across the planet, and beyond, have had an unprecedented impact on the nature of our built environment. The need for increasingly more efficient transport interchanges has created a demand for buildings which not only provide the required ease of movement but also celebrate the sense of arrival and departure. Through transport, our cities have become larger and the Earth has become effectively smaller. The need to be adjacent to efficient forms of transport has influenced urban plans. (Toy, 1994)

Historical Context

"The Building News declared in 1875 that railway termini and hotels are to the 19th century what monasteries and cathedrals were to the 13th century. With the great new London stations of the period, including St Pancras, Paddington and Liverpool Street in mind, the writer added that 'our metropolitan termini have been leaders of the art spirit of our time'. The railway was the single greatest and most far-reaching innovation of the 19th century, reshaping both town and country and transforming society. It quickly became the prime means of transportation for all classes, a cultural and social as much as an economic force. The railway quickly ceased to be a novelty and became a fact of life. Early stations had an ad hoc look - the passenger terminal at Manchester's Liverpool Road looked like (and was) an adjunct to the commercially more important freight terminal - equipped with the most up-to-date warehouses in 1830s Europe." (Powell, 1994)

With the 19th century in the distant past, the railway is still the most common form of public transportation, especially in Europe. Now in the beginning stages of the 21st century we must find a new way to move through the city, and apply new technology in order to continue the grow of our ever increasing city populations.

Although managing growth and consciously designing the urban transport system to help shape an area's future have been strong Canadian and European traditions, they have been little understood and even less practiced in the United States. Public transport systems were fairly successful in the United States before World War II, but their use was beginning to decline due to the increased competition with automobiles. (Cushman, 1988)

The beginning of public transportation came in the form of a horse drawn omnibuses in New York around 1827. From there the future of public transit looked hopeful in the United States, with many cities using technologies from the industrial revolution to power transit vehicles. The cable car was invented and became popular in San Francisco and is still in use today, mainly just for tourists. The electric street car in Chicago was elevated above the ground and built below ground in New York. Between 1890 and 1920, the "golden age" for electric street railways and electric trolley ridership grew from two billion annual riders to 15.5 billion. The all-time peak for transit ridership in the United States occurred in 1945 when, with few automobiles and little gasoline, there were almost 19 billion passengers carried by mass transit systems. (Cushman, 1988)

"A European visitor at a 1915 United States planning conference espoused a contrary and perhaps prophetic view of the automobile and transit issues. Dr. Werner Hegemann from Berlin charged that the automobile was dividing American city dwellers into two classes, the 'barons,' riding automobiles instead of horses, and the 'common people,' who depended upon public transportation. He feared that once the wealthier, more influential classes adopted the automobile, they would have little incentive to secure improved public transportation. Hegemann felt that promoting the auto would hurt mass transit, and that living spaces for the masses would be restricted to central cities which could best be served by streetcars, This was in 1915." (Cushman, 1988)

We can not really blame him for being correct. Throughout the past century the automobile has become affordable enough so that there is around one automobile for every household in the United States. The automobile has dominated every other form of transportation out of pure convenience and also the lack and design and enthusiasm for mass transit. Understanding the importance of the automobile to our culture, one can see how it has influenced the design of our cities and streets today. The future of mass transit must incorporate the automobile instead of trying to eliminate it.

Understanding movement in cities is important to any design. High-speed, intercity transport of 200-300 mph is now under consideration in several countries, yet the critical problem of intercity movement is covering the short distances of 5 miles. The first known moving platform was proposed for New York in 1874. It was to be an elevated system of articulated moving platforms on wheels, running on a track and moving at 15 mph. It would have also included a series of six trolleys running parallel with it and used for interchanging, a friction brake being applied either to slow it down to a standstill for leaving or to speed it up to 15 mph when the passenger wished to board the platform. (Richards, 1966)

The thought of moving sidewalks is an interesting idea, but in today's world one can see many problems implementing them. The city of Barcelona has brought this thought to a reality. Although no sidewalks are in motion, they encourage the motion to happen with the pedestrian. Bicing is a public bicycle system set up by the city of Barcelona. The system works by participants' purchasing a membership, which is under 50 dollars for a year. Once you have a membership card, you can unlock a bike from a station which are located through out the city. The bike does not need to be returned to the same station but can be returned anywhere in the city.

The city of Barcelona is one of the most efficient cities to move in, with many levels of transportation. The air travel connects it to the country, there are high speed rails that connect surrounding cities to Barcelona, and the underground metro rail connects the city itself. Bus service exists for above-ground transportation and an extension to the underground rail system. Finally bicing provides short distance travel after leaving the metro. Many of the citizens of Barcelona do not own an automobile, and if they do, use it for leisure activities not for daily commuting.

With the influence the automobile has had on the United States, it would be all but impossible to eliminate. Although public bike systems have been introduced in the United States, in most large cities today a bicycle can not get you very far. The thought to bring the public bike idea to the automobile would be an interesting concept.

A company out of Massachusetts named Zipcar has made this idea a reality. Although the Zipcar is not as universal as the public bicycle system, it is a step in the right direction. As the bicing system, Zipcars require a membership in order to "rent a car." After the membership is paid, one can reserve a car at any point of the day or for the entire day. The only fallback is you must return the car to where it was picked up. Connecting Zipcars to mass transit may be a look into the future of transportation.

"What does it take for public transportation to be well used, efficient and effective? The answer is indicated in a term frequently used to describe transit - mass transportation. In essence, transit should use the same principles of market economics that are practiced in any business or enterprise. The enterprise of transit is, quite simply, productively moving people. The more people transit can move per vehicle, per hour or per mile of service offered, the more effective and productive it is. The more densely concentrated those people are when you pick them up, whether at home, at work, or out shopping, the more people you are going to carry per unit of service offered, the more revenue you are going to bring in and the more productive your transit system is going to be." (Cushman, 1988)

SUMMARY: 56

How a city moves is how a city functions, and the most efficient cities take place on foot. This is done by means of transportation on multiple levels. Public transportation for a city should be able to cover the long distance journeys, from city to city, the intercity travel, and finally pedestrian travel.

The United States cities, generally speaking, are not able to provide this to the public for a number of reasons. First and foremost, our cities have grown too far outward rather than up, making it unreasonable for public transit to cover the entire area with one linking system. Secondly the automobile has made it all too convenient for us to travel.

Many people in the United States are automobile users. Since the price of gasoline in the United States is considerably less than in most other countries, the illusion exists that automobile use is less expensive than public transit. Add to this the apparent convenience and flexibility of the automobile and it is difficult to build a persuasive case for transit system development. A related argument is that the poor of America do not stop driving, they just drive older and cheaper vehicles. (Atkinson, 1988)

The automobile has been one of the most influenced means of city planning in the United States. We must bring life back to the pedestrian and the foot, but not at the cost of the automobile.

The future for transportation is the automobile at some level. Whether it be through Zipcars or if it is a mass transit system that incorporates the automobile. The automobile has been with us since the beginning of the Industrial Revolution and will continue to be with us. We as designers must incorporate it into our designs and create a new moving city.

Thesis Goals

Overall:

Develop and understand the future of high speed transit.

Explore Structure and how it can be used to direct movement.

Understand what makes cities move and how people move through them.

Explore the importance of making connections through a city.

Academic:

Provide a foundation for the further exploration of the relationship between the city and the pedestrian.

Establish a base of knowledge of the areas transit and how the public responds.

Provide a solid, well developed thesis project that will be useful to future students as a model for their own studies.

Provide North Dakota State University with a research document of the quality expected from a Master of Architecture degree recipient.

Professional:

Produce a design that is of the quality and, most importantly, the consideration expected of an architecture professional

Produce a design that not only has function but creates a great understanding of space and awareness for the user through architecture.

Demonstrate an understanding and consideration of the existing historic, social, economic, philosophic and ecologic context of the project.

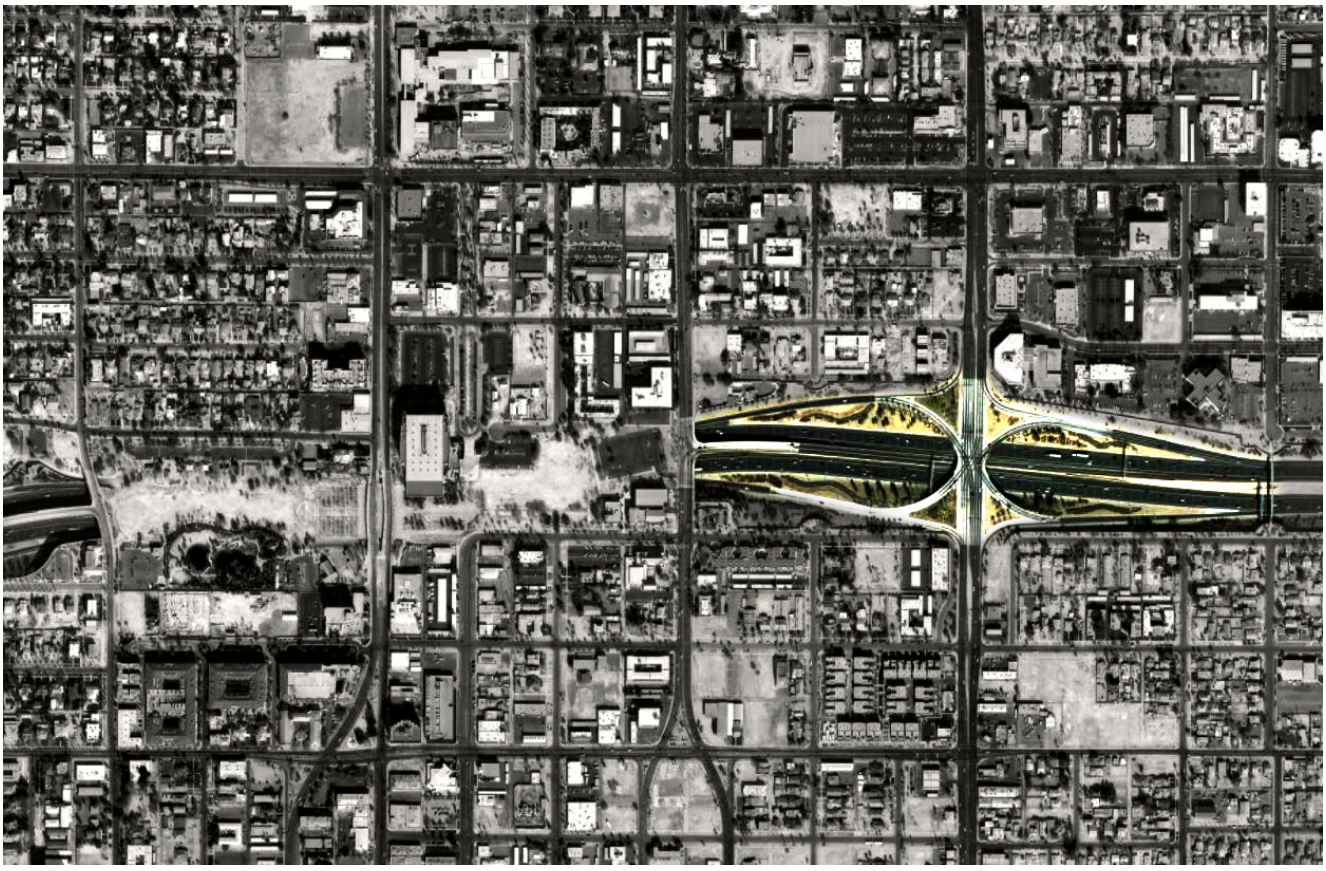
Personal:

Present a thesis project that demonstrates not only my ability to produce architectural design at a professional level, but, more importantly, present a project that illustrates my ability to think architecturally.

Develop the thesis as an open-ended beginning that fosters further exploration as opposed to viewing the project as a cumulative result of the architecture program.

Site Analysis

The city of Phoenix is a relatively new city and like most US cities was developed after the invention of the automobile. The city was then laid out on a grid system with roads running north-south and east-west, making it very easy for the traveler to find directions. The city has grown to be one of the largest cities in population, but more so on the land that it covers, making it almost impossible to experience Phoenix on foot. The city has understood this problem and is currently making steps to improve this with the new light rail system. The need to continue with this investigation is more evident now than ever, considering the weak economy and gass prices on the rise.



The site is located in Phoenix, Arizona. The idea behind the site selection is to propose the idea to extend the Interstate 10 tunnel to 10th Street. The tunnel currently runs from 3rd Avenue to 3rd Street. The Burton Barr Central Library and Deck Park currently sit atop the tunnel. The plan is to extend Deck park to 10th Street, meaning the park would cover an area from 3rd Avenue to 10th Street, a distance of around one mile. The Burton Barr has already established itself as a public attraction that is full of visitors. Extending the park and adding a nexus of public transportation will only improve the pedestrian traffic in the area.

The rough and rugged landscape of the valley is quite unique and very beautiful. The city of Phoenix is in a valley and is surrounded by mountains. A few peaks appear throughout the city, including: Camleback Mountain, which is the highest peak in the valley; "A" Mountain, located on the Arizona State Campus; Papago Butte in Papago Park; and South Mountain, which creates an edge for the city.

Phoenix's location in the desert allows one to count on the sun being out everyday. The sun brings two things: very intense light and extremely warm temperatures. With these two things in mind, it is clear the vegetation in this climate needs to withstand the dry, hot weather. The vegetation is a combination of desert bushes, short trees, and palm trees.

The depletion of water is becoming a nation-wide concern and Phoenix is at the heart of this problem. Lake Mead is the primary source from which Phoenix gets its water. The problem is that the city is taking out more water than the water cycle can replenish. Although the city is designed on a slope, enabling the water to drain throughout the valley, we must keep the water use to a minimum with the design of the landscape.

The soil in the desert would be classified under the silty or clayey gravel. This kind of soil makes it hard for a lot of vegetation to grow.

The site is located directly over the Interstate 10, which is the busiest freeway in the Phoenix area. The interstate connects Phoenix to Tucson and Los Angeles. Since I-10 is a freeway, there is currently no pedestrian traffic, but directly to the west is a park where pedestrian traffic is high.

Although this may be a challenging site to develop, the connection it has to the freeway circulation is already developed, and this is the true nexus of the Phoenix area.

	Average Year
Temperature: (F)	
-Normals	
Daily Maximum	85.9
Daily Minimum	59.3
Average	72.6
-Extremes	
Record High	122
Record Low	17
Cloudiness: (Days)	
Clear	221.0
Partly Cloudy	84.6
Cloudy	69.7
Precipitation: (in.)	
Normal	7.6
Maximum Monthly	5.6
Minimum Monthly	0.0
Maximum in 24 hours	3.1
Humidity: (%)	
Hour 04	51
Hour 10	32
Hour 16	23
Hour 22	39
Wind Speed: (mph)	
Mean Speed	6.2
Fastest Speed	43
Peak Gust	86
Wind Direction:	
Prevailing Direction	East

http://www.wrcc.dri.edu/

Programmatic Requirements

Public Plaza/Greenage

This will be a public area on street level that will direct pedestrians to the entrance. This area will connect to the green space of the public library.

Entrance Lobby

The entrance will be located on street level and will house the ticketing, offices, retail and information spaces. The lobby will direct the users to the train platforms.

Information Areas

The information areas will be located throughout the metro station, this will include maps of the Phoenix area, the station itself and also layouts of the metro. The lobby area will have an information desk.

Platforms

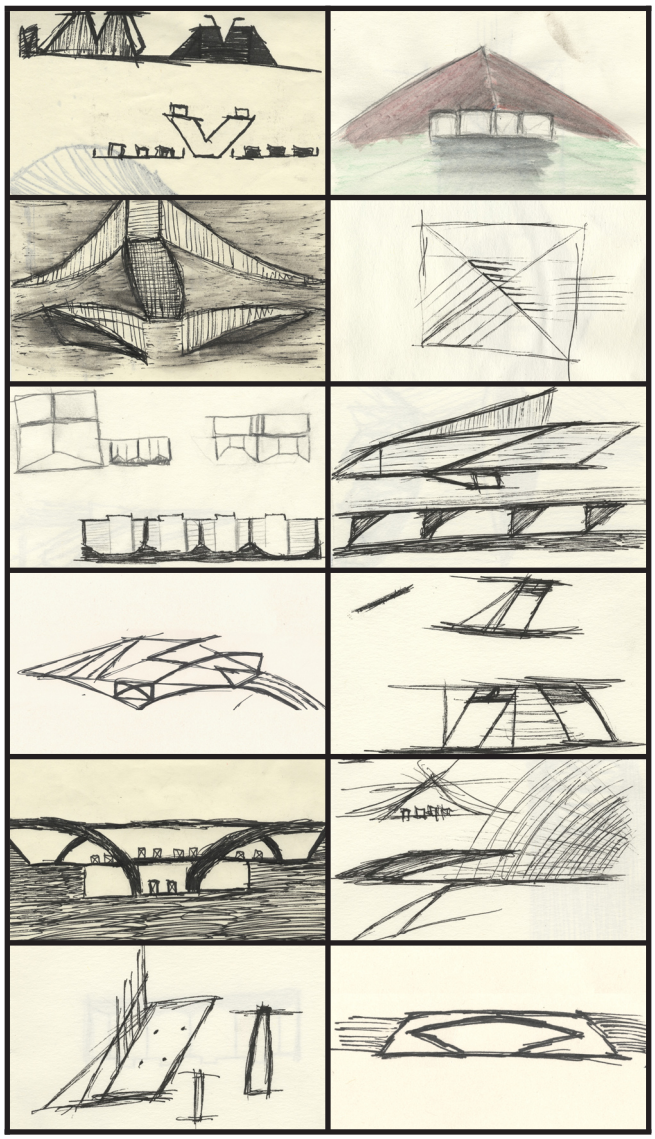
This will be where pedestrians will be able to wait and load the trains. The platforms will also be the main connecting point from city to city in the Phoenix surrounding area.

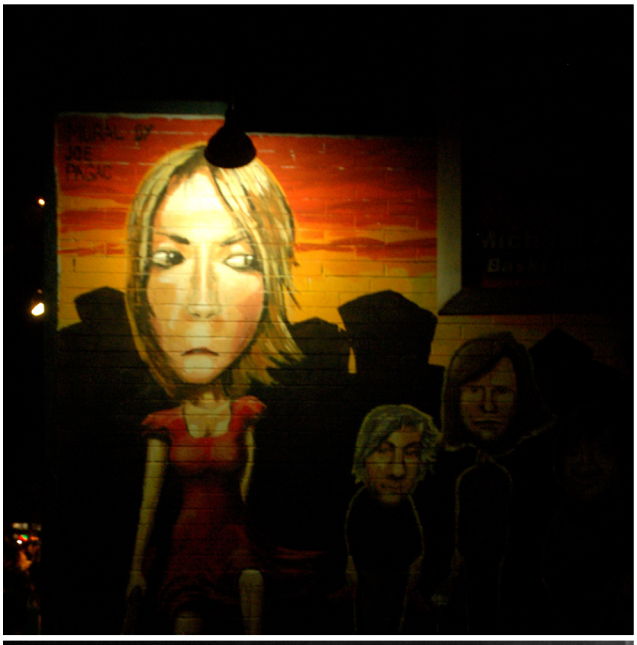
Retail Spaces

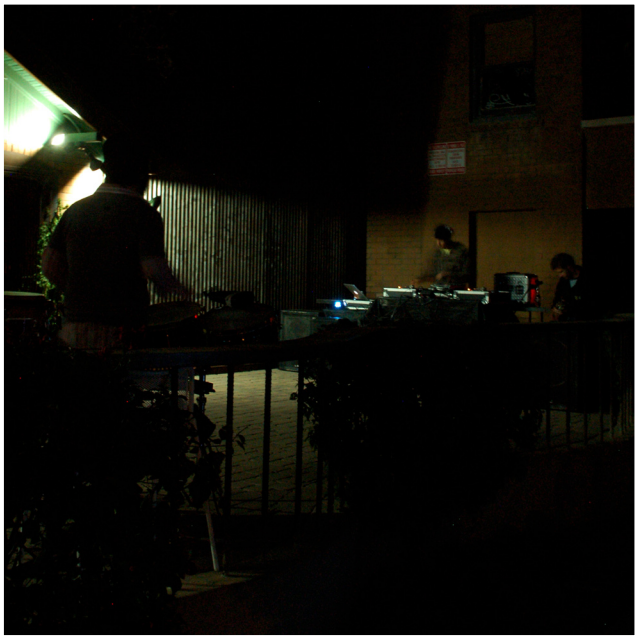
The retail spaces will be located in the lobby area. This will be a good way for the metro to generate income to support operating costs.

Design Solution

PROCESS





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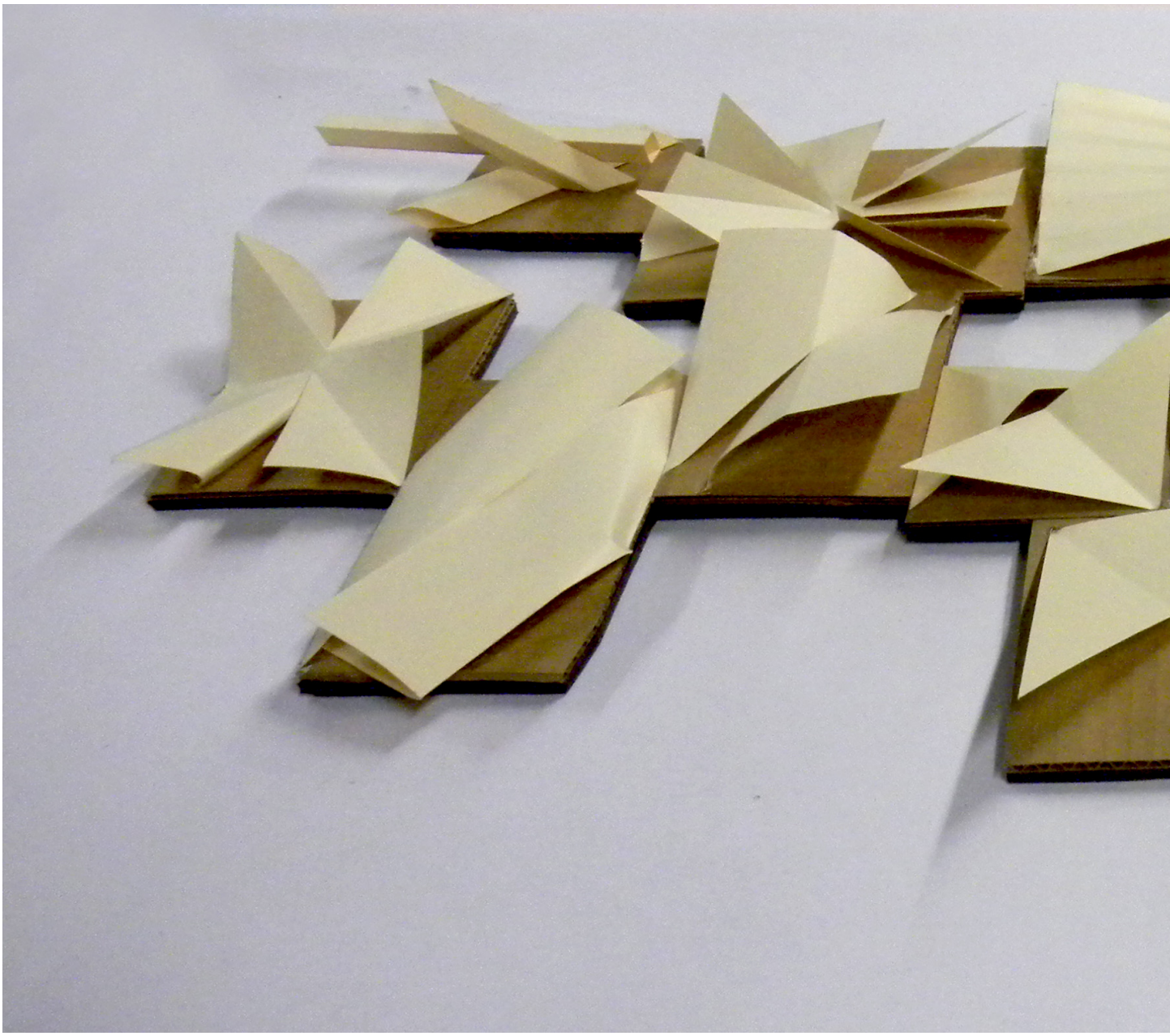

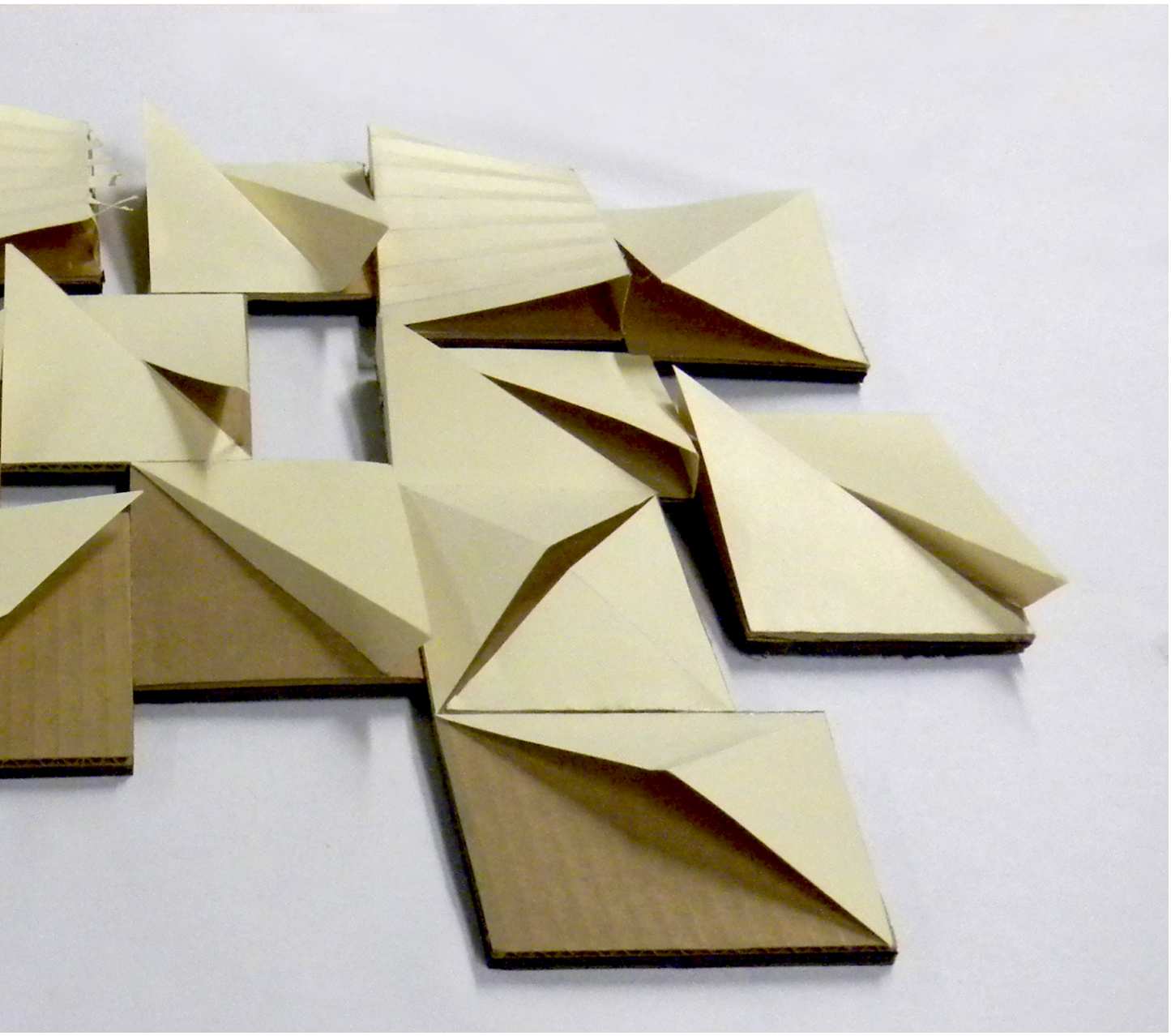

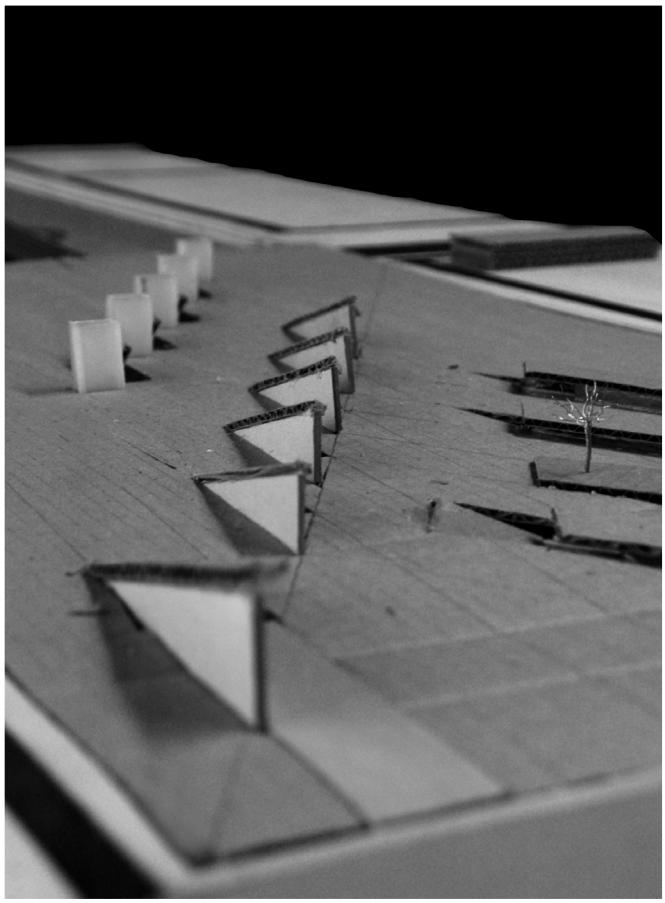

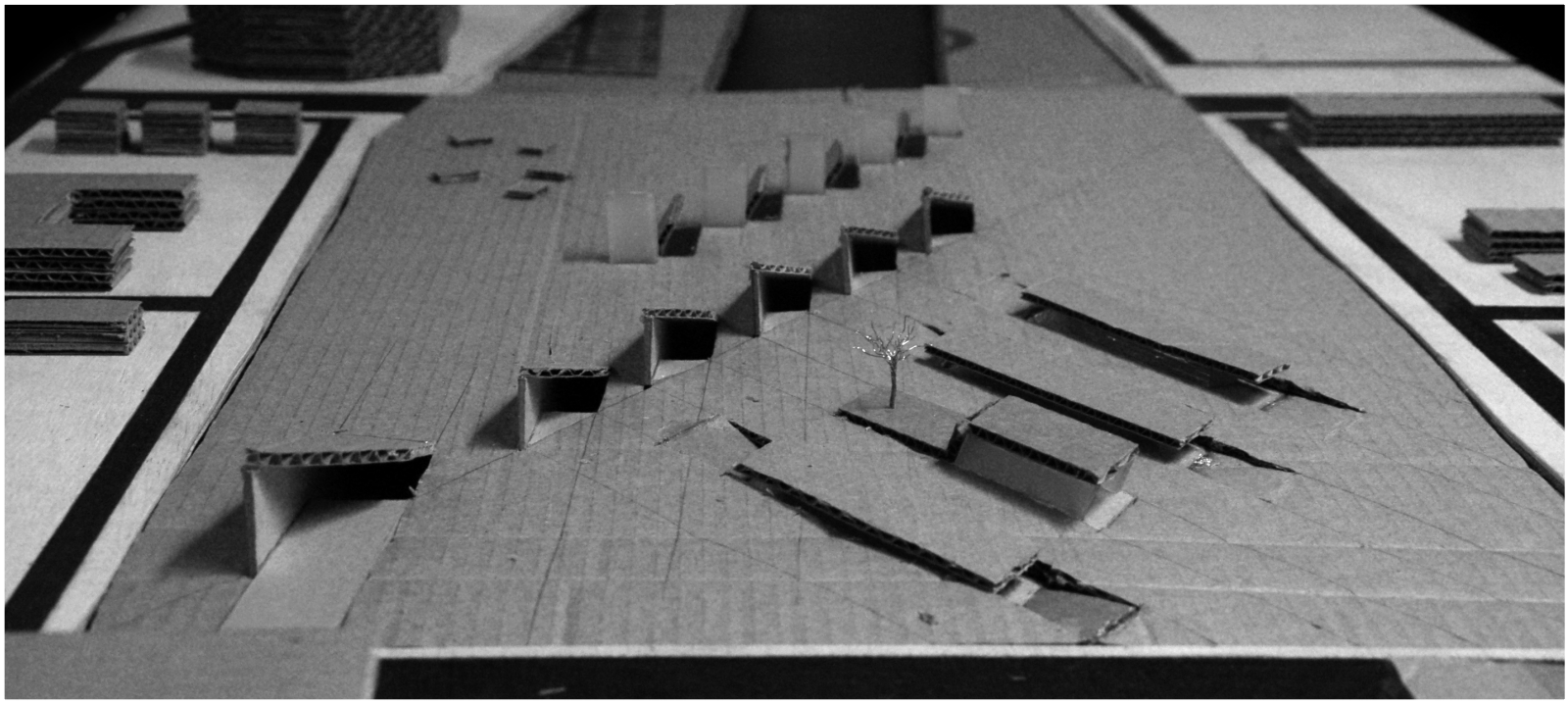

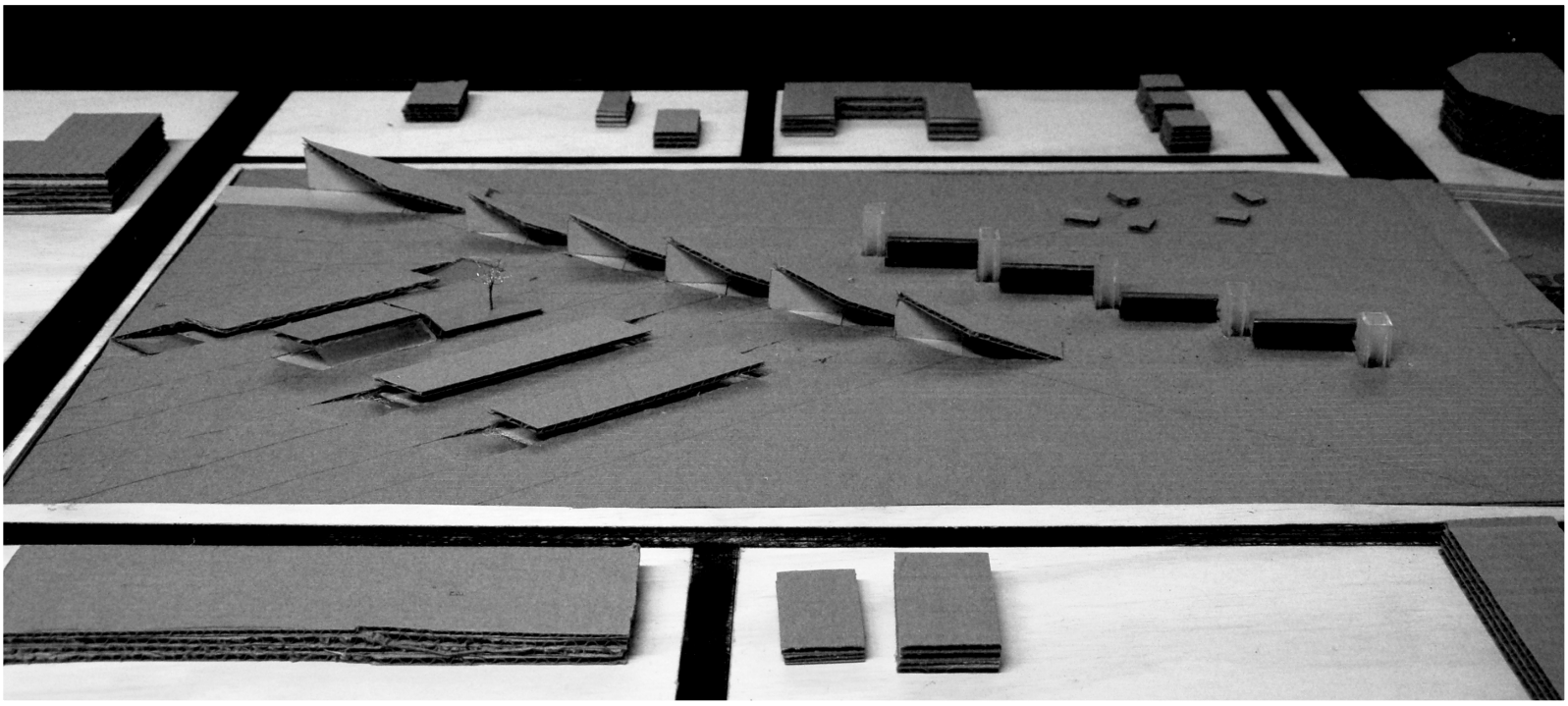

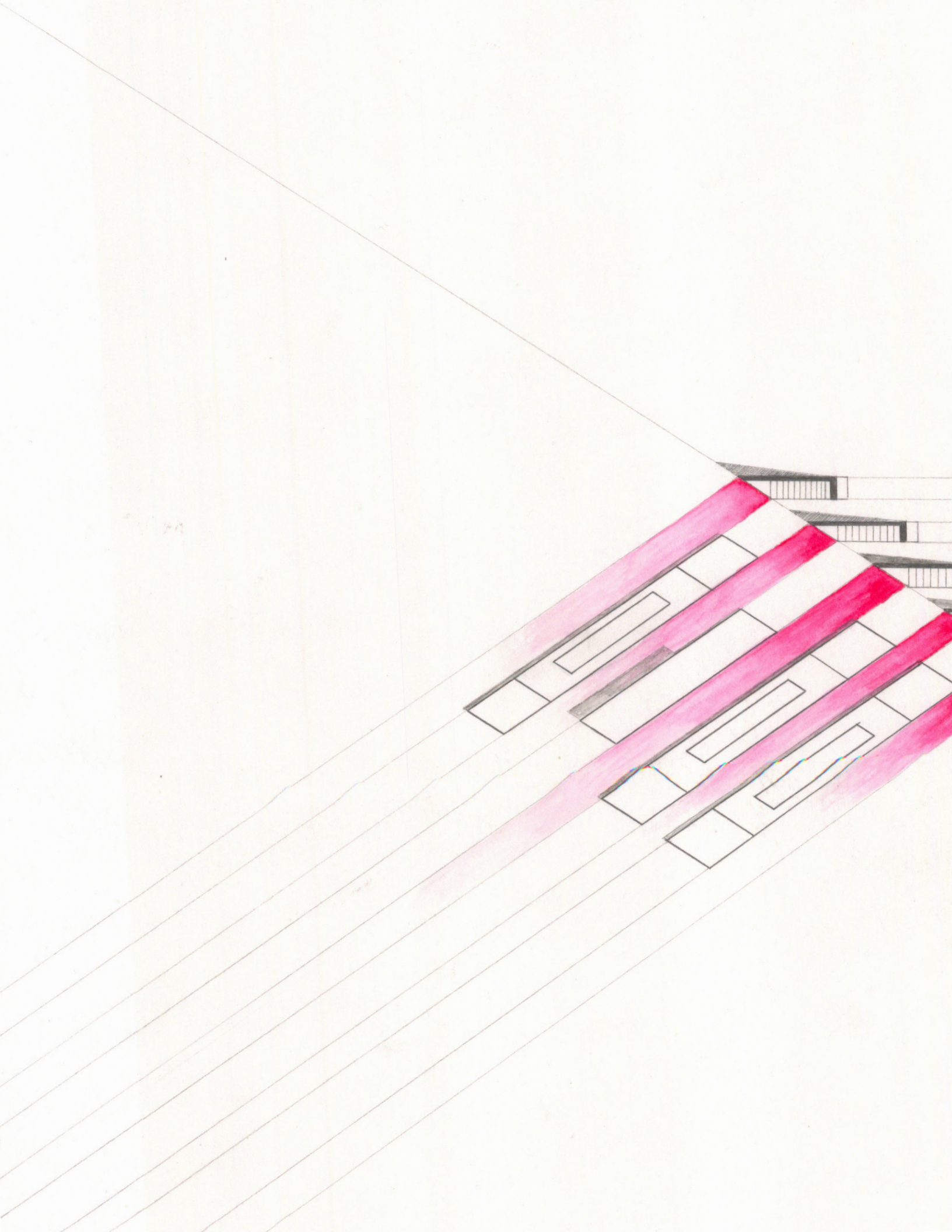

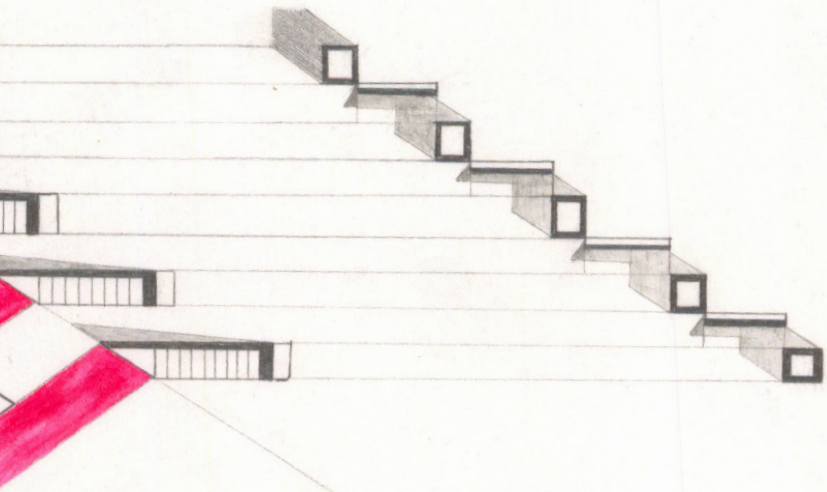

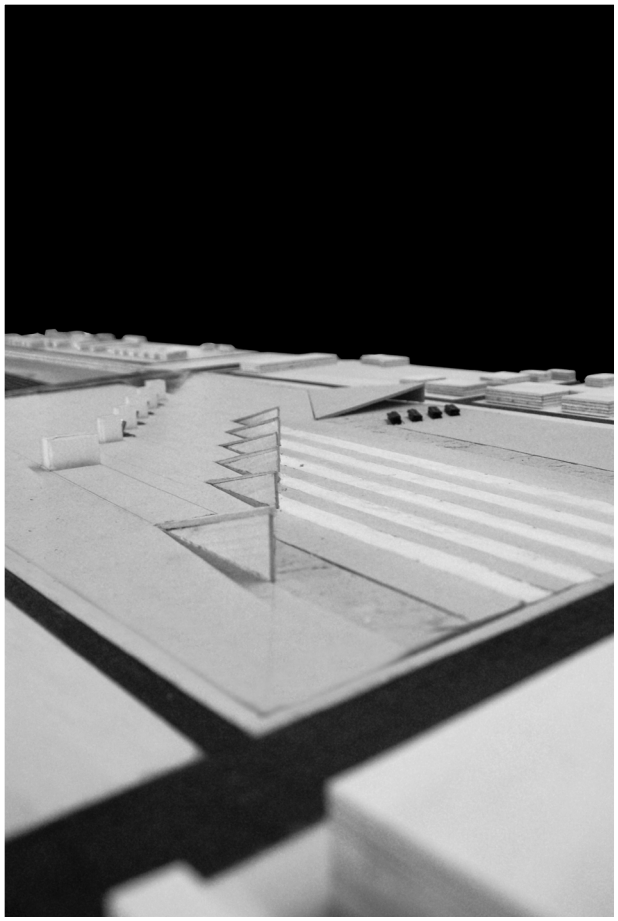

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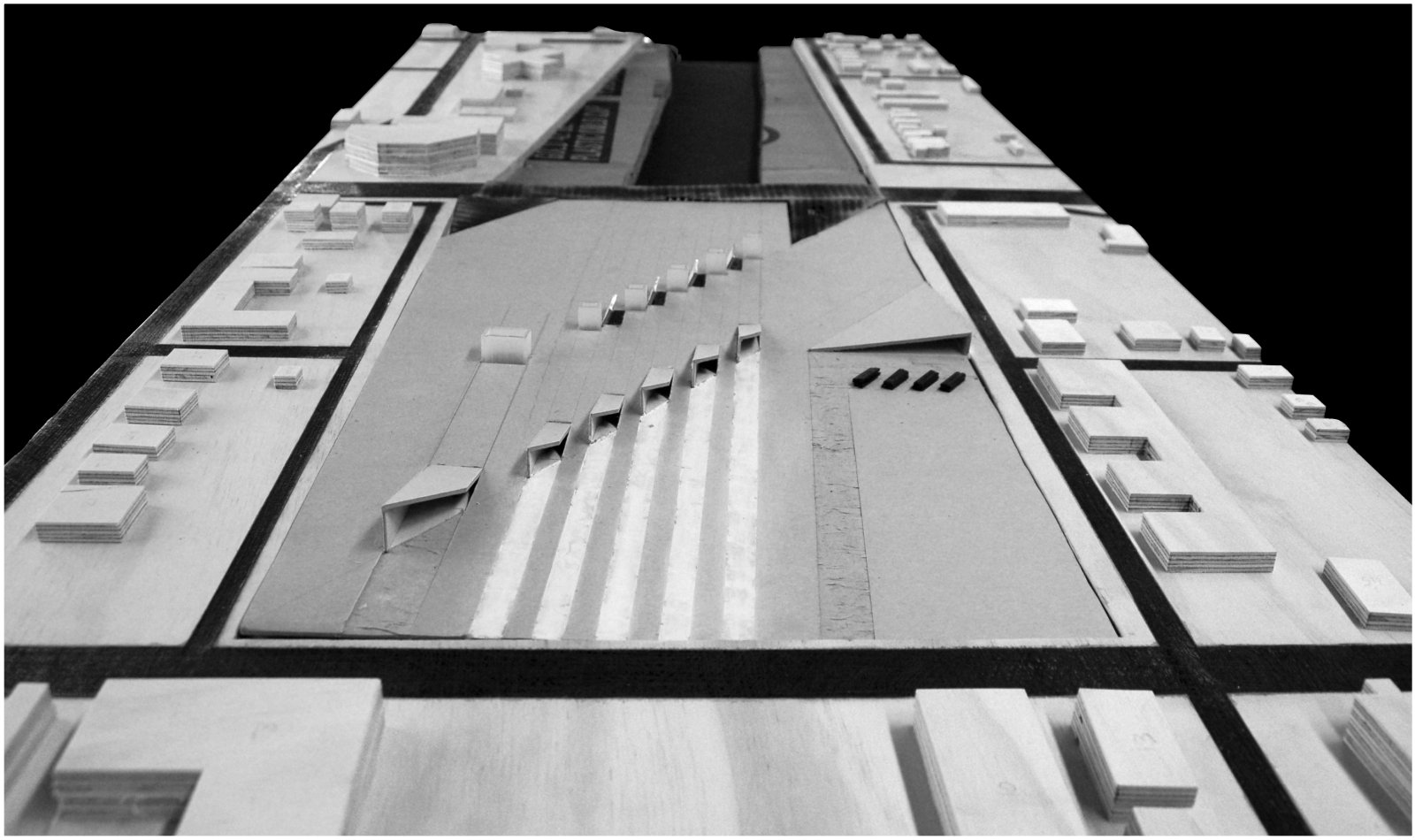

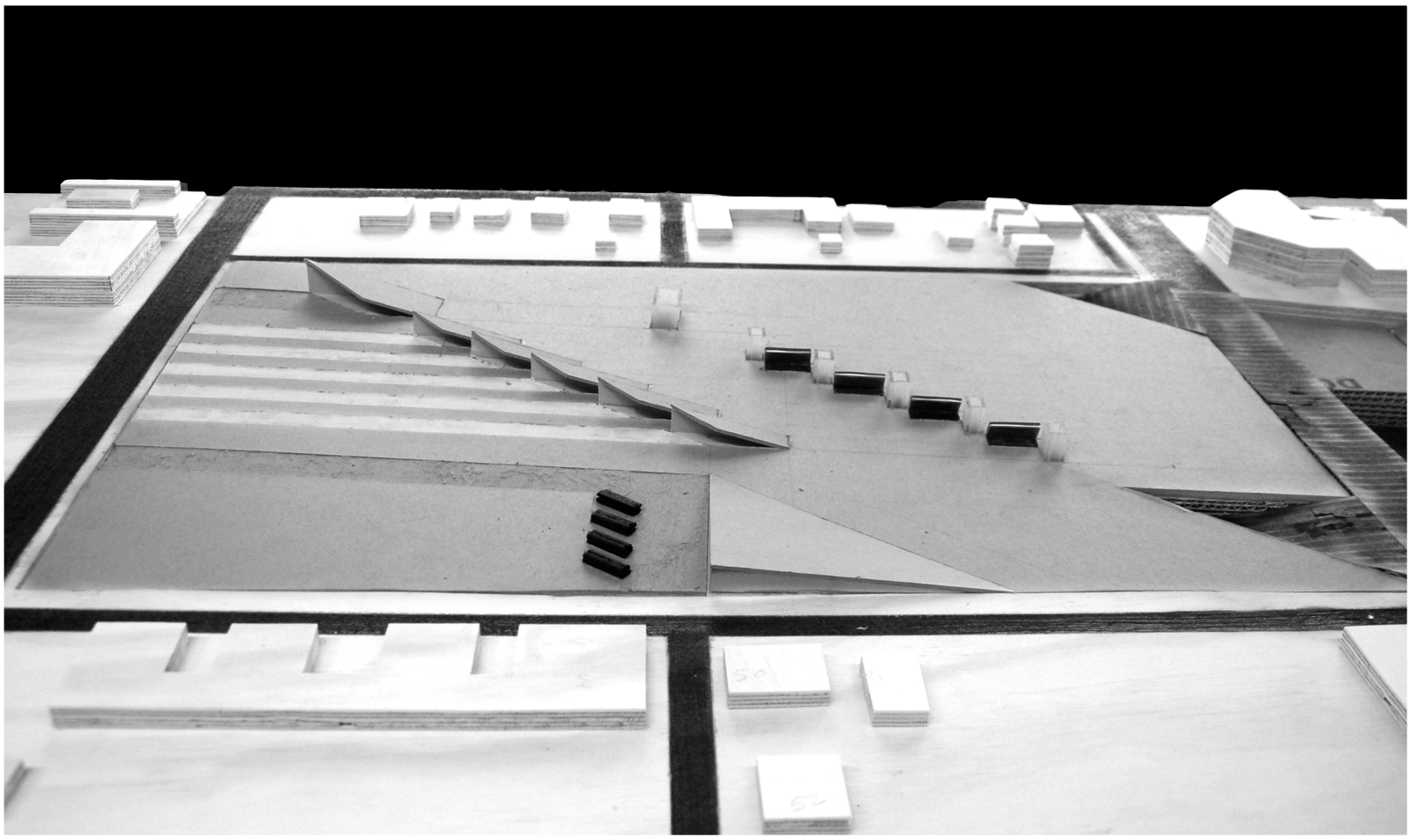

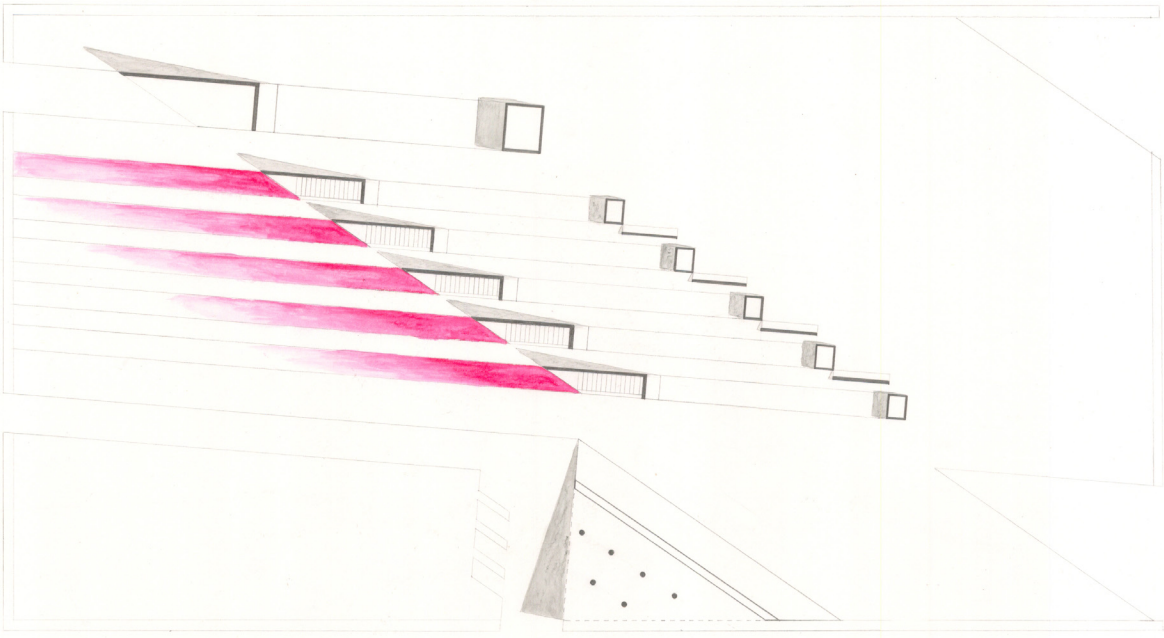

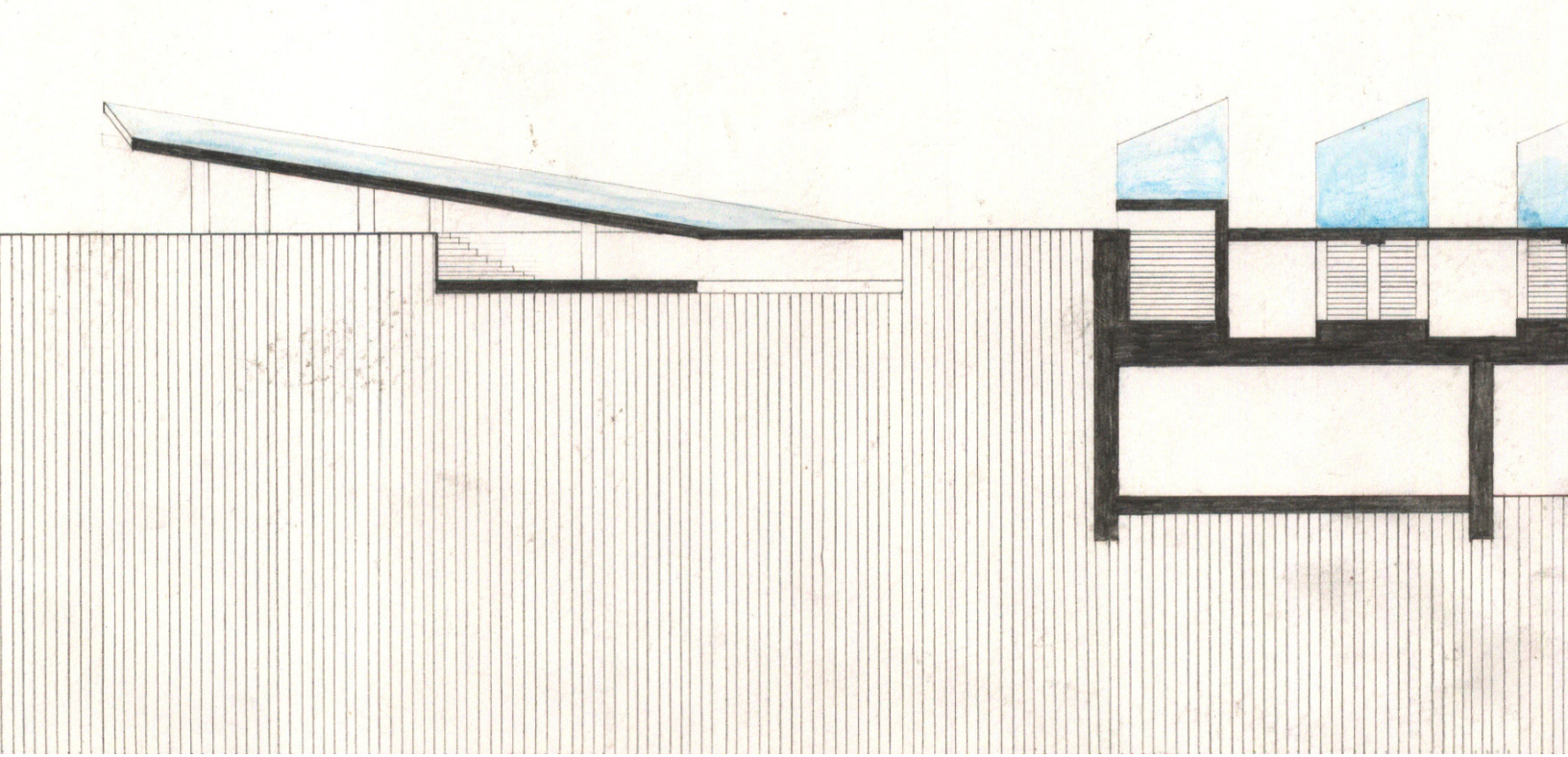

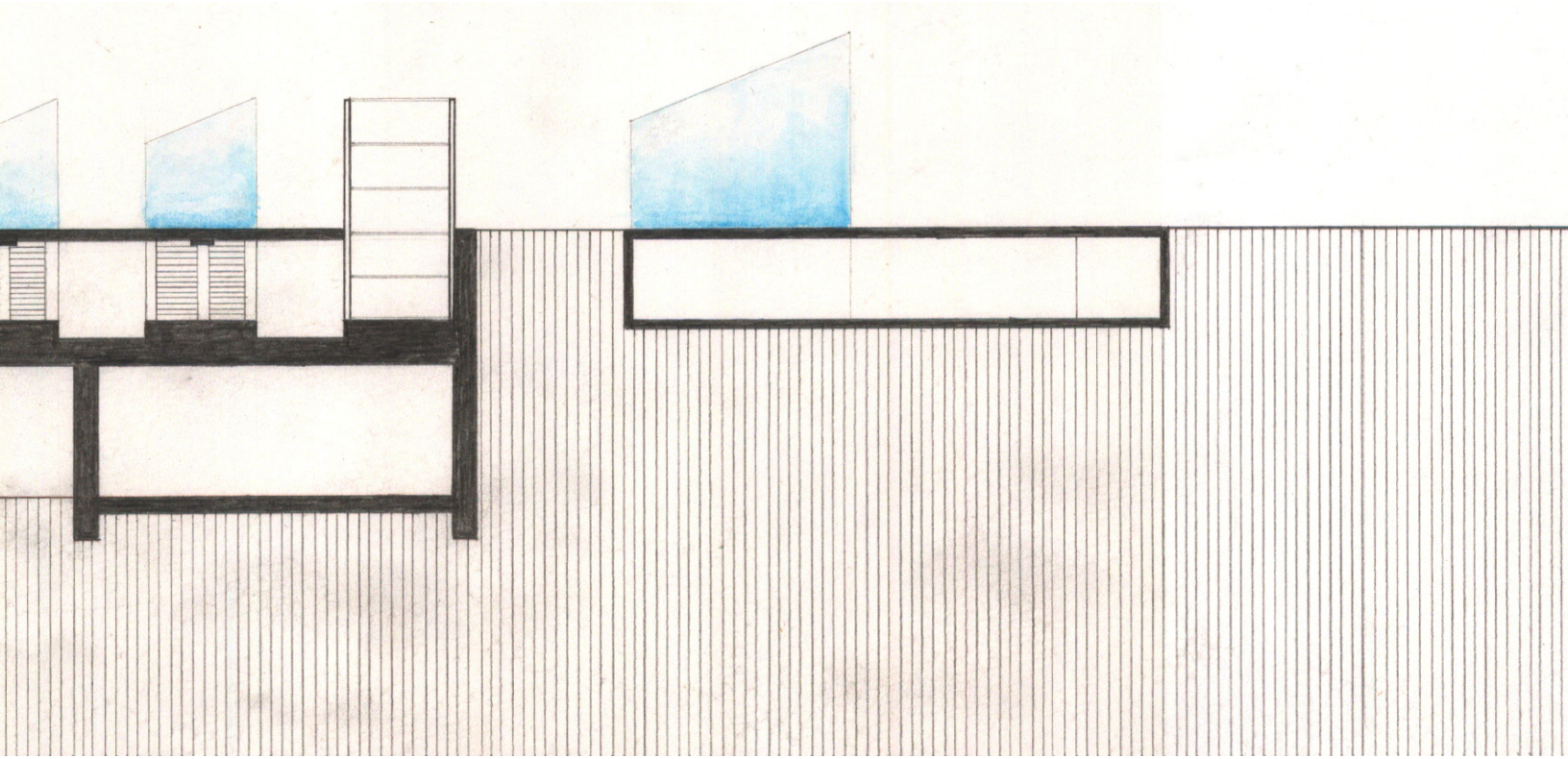

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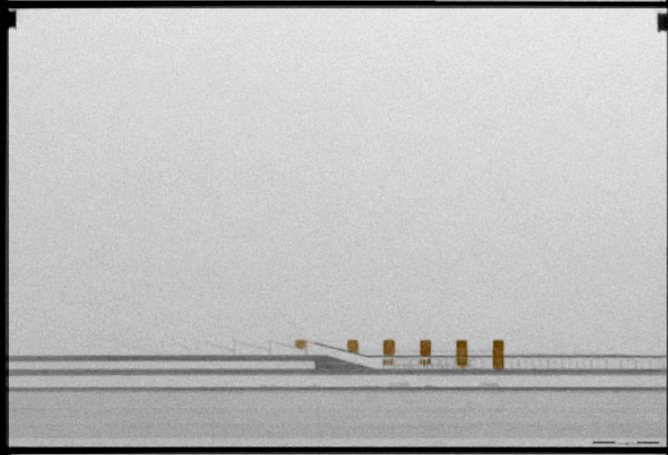
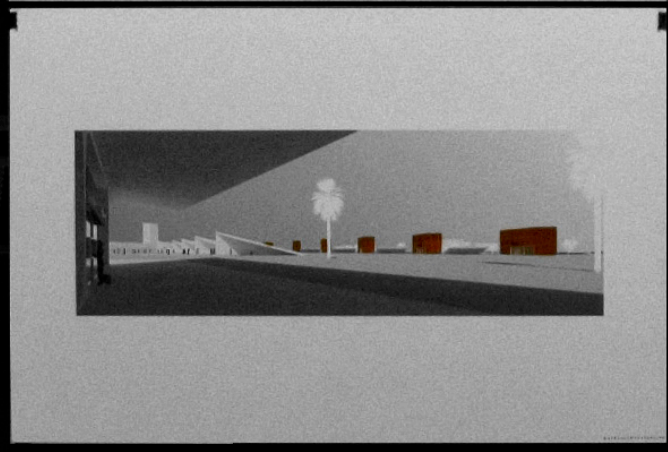
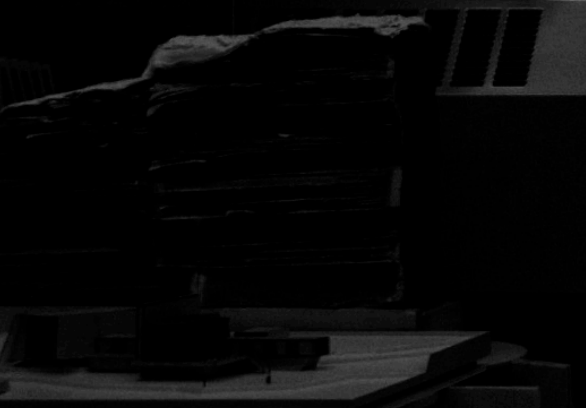
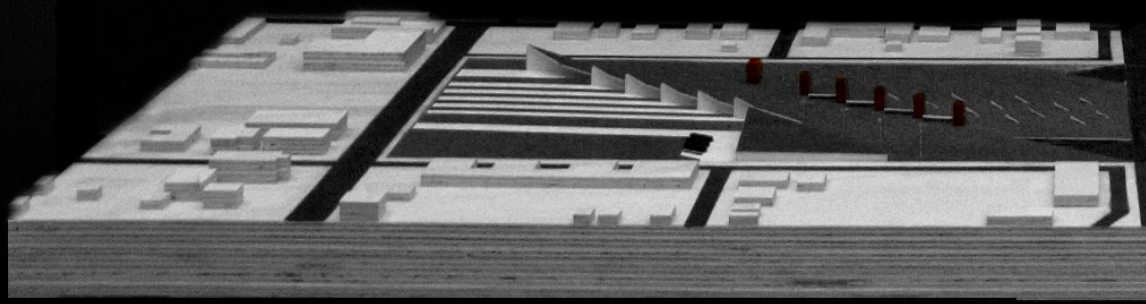
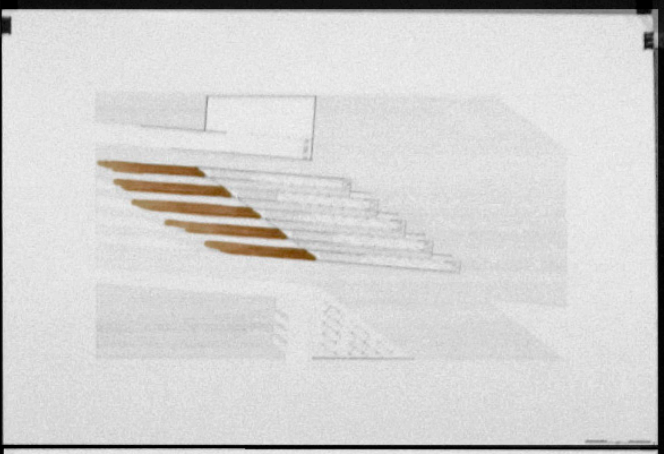


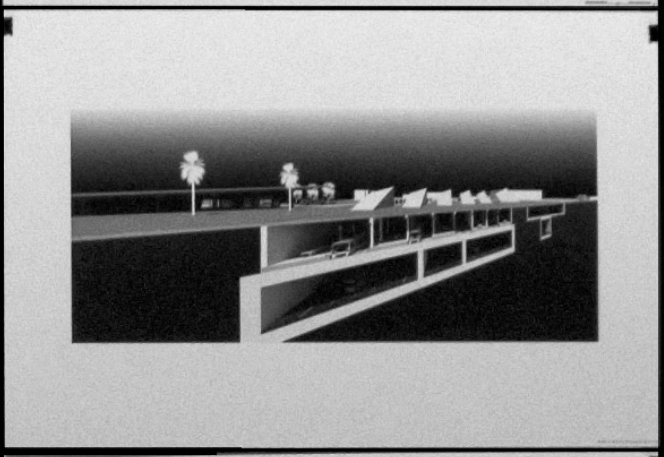


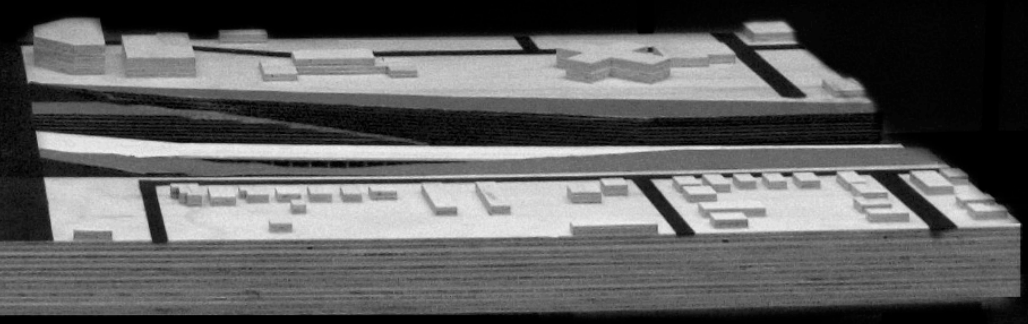


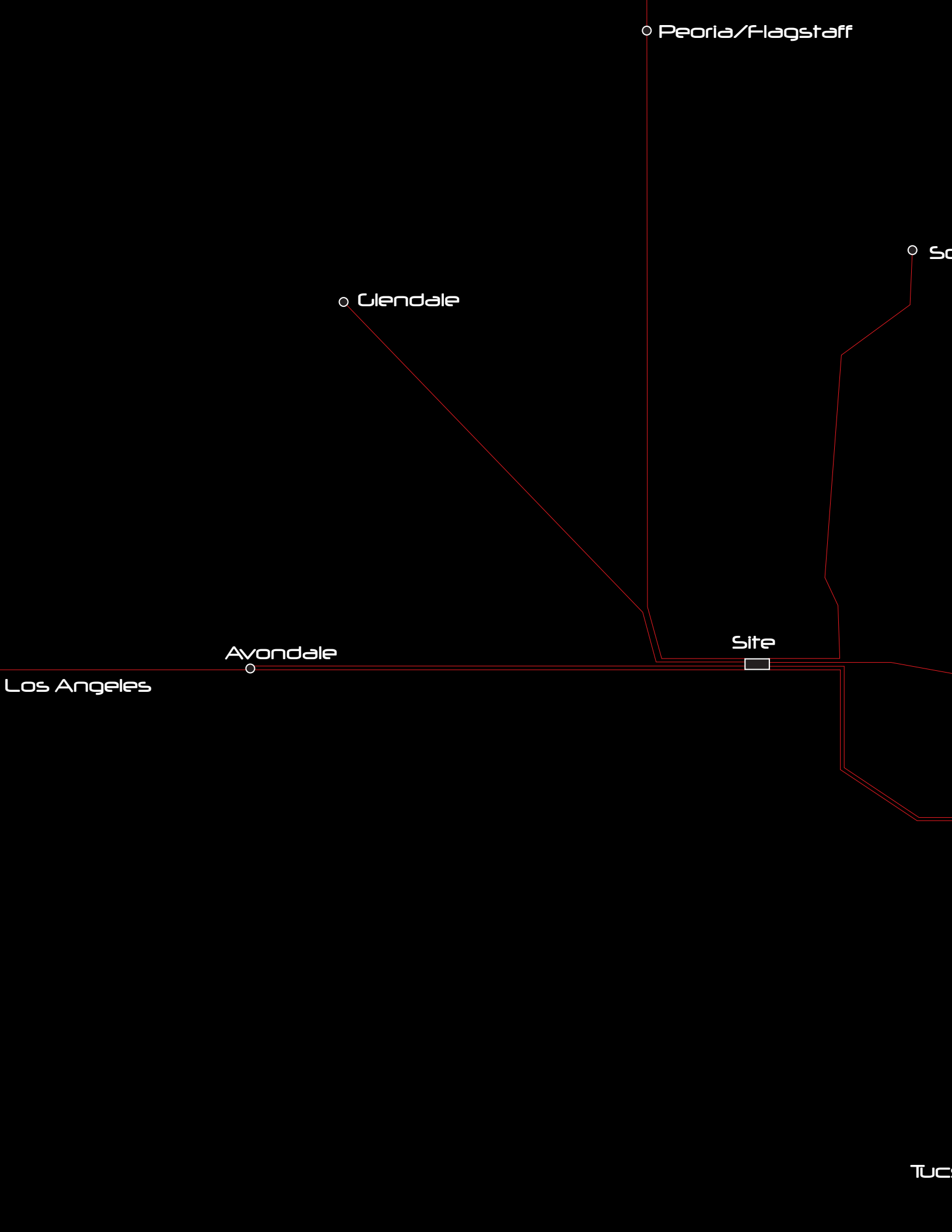


Final Design





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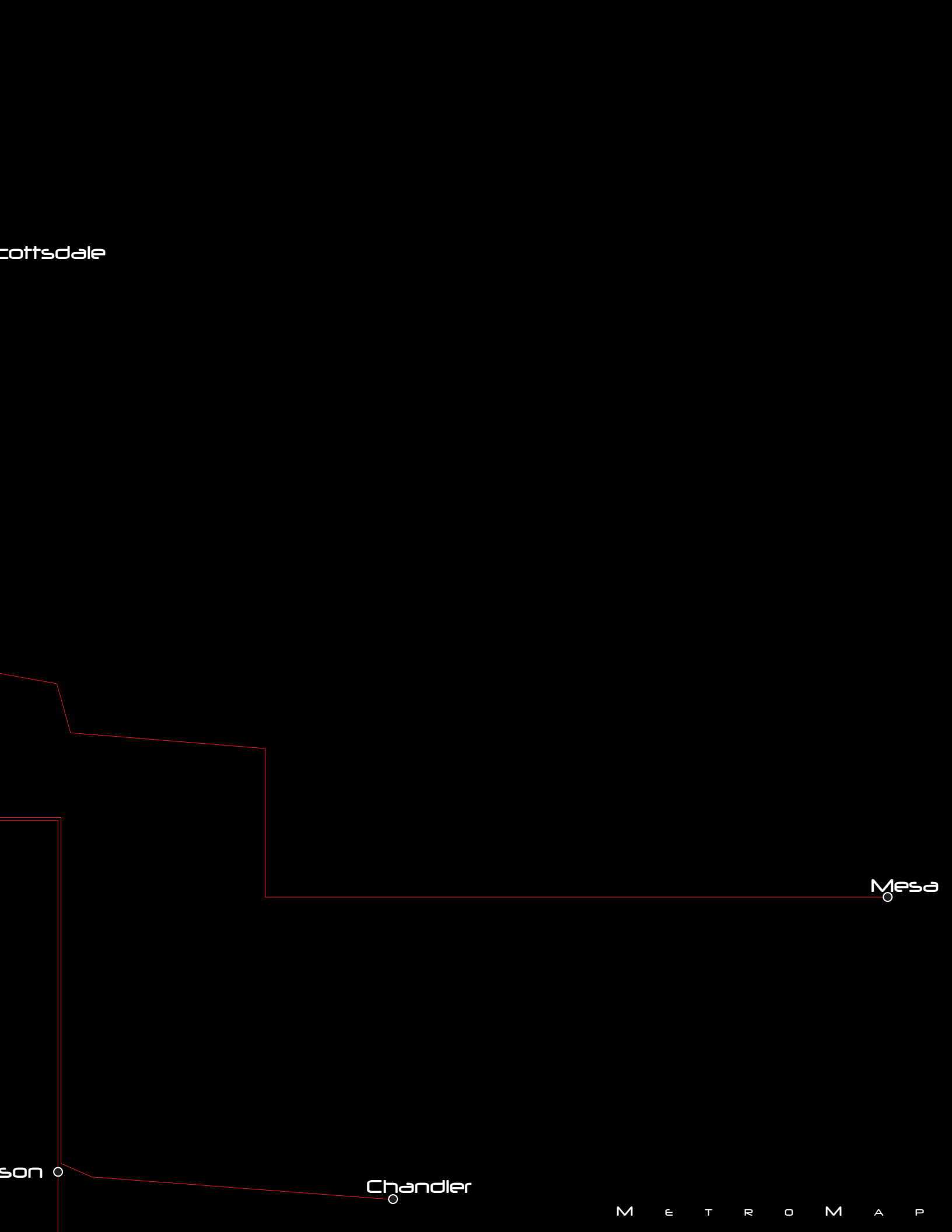
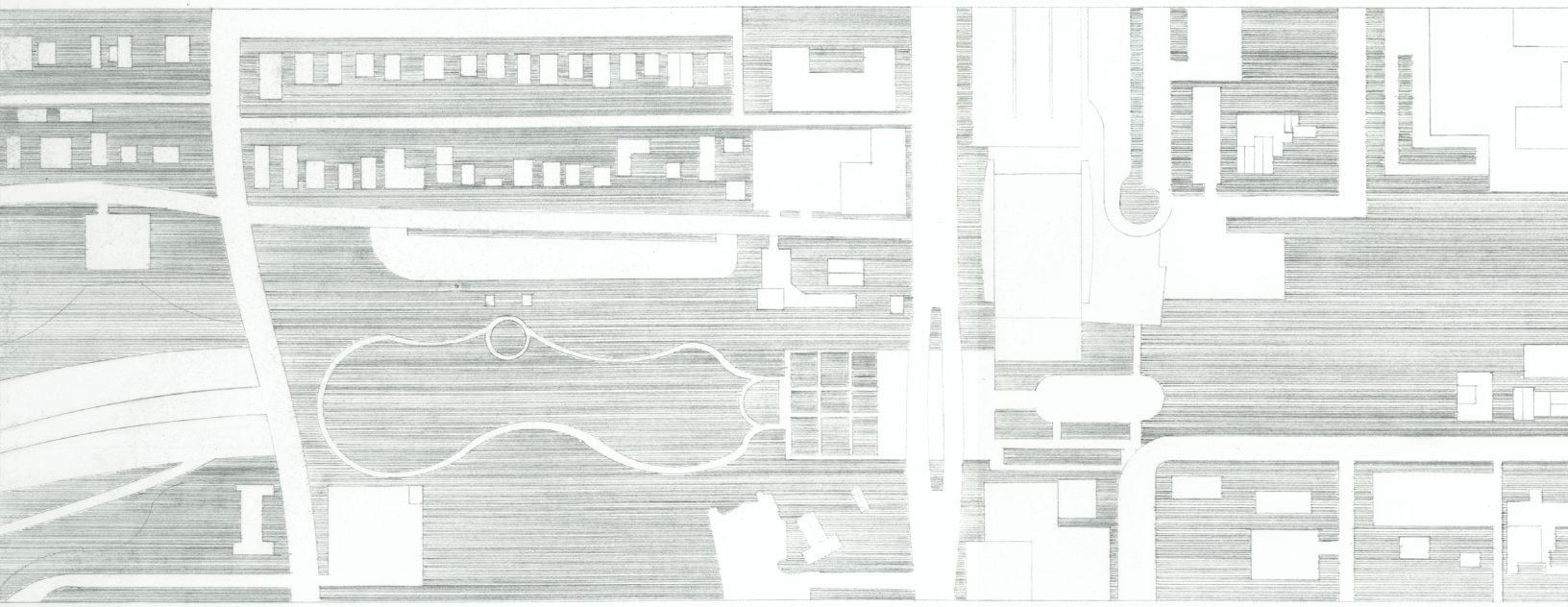
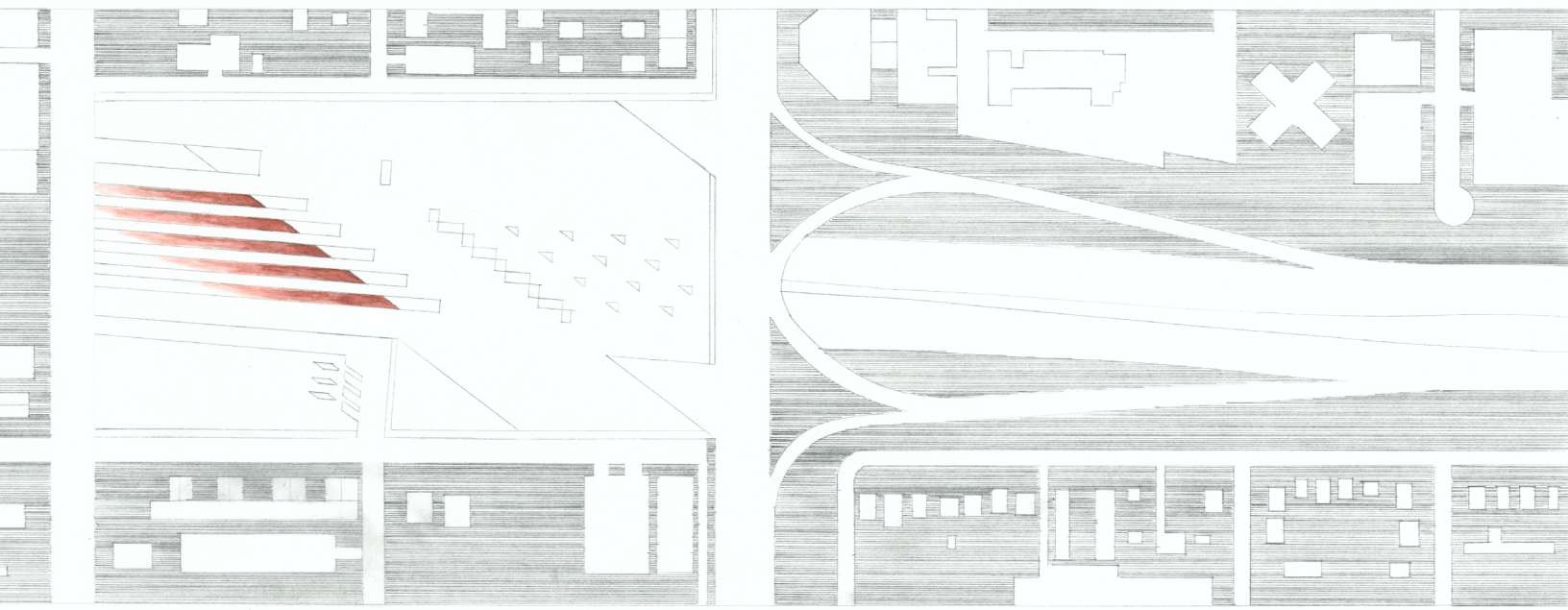

cottsdale
Mesa
son
Chandler
M e t r o M a p

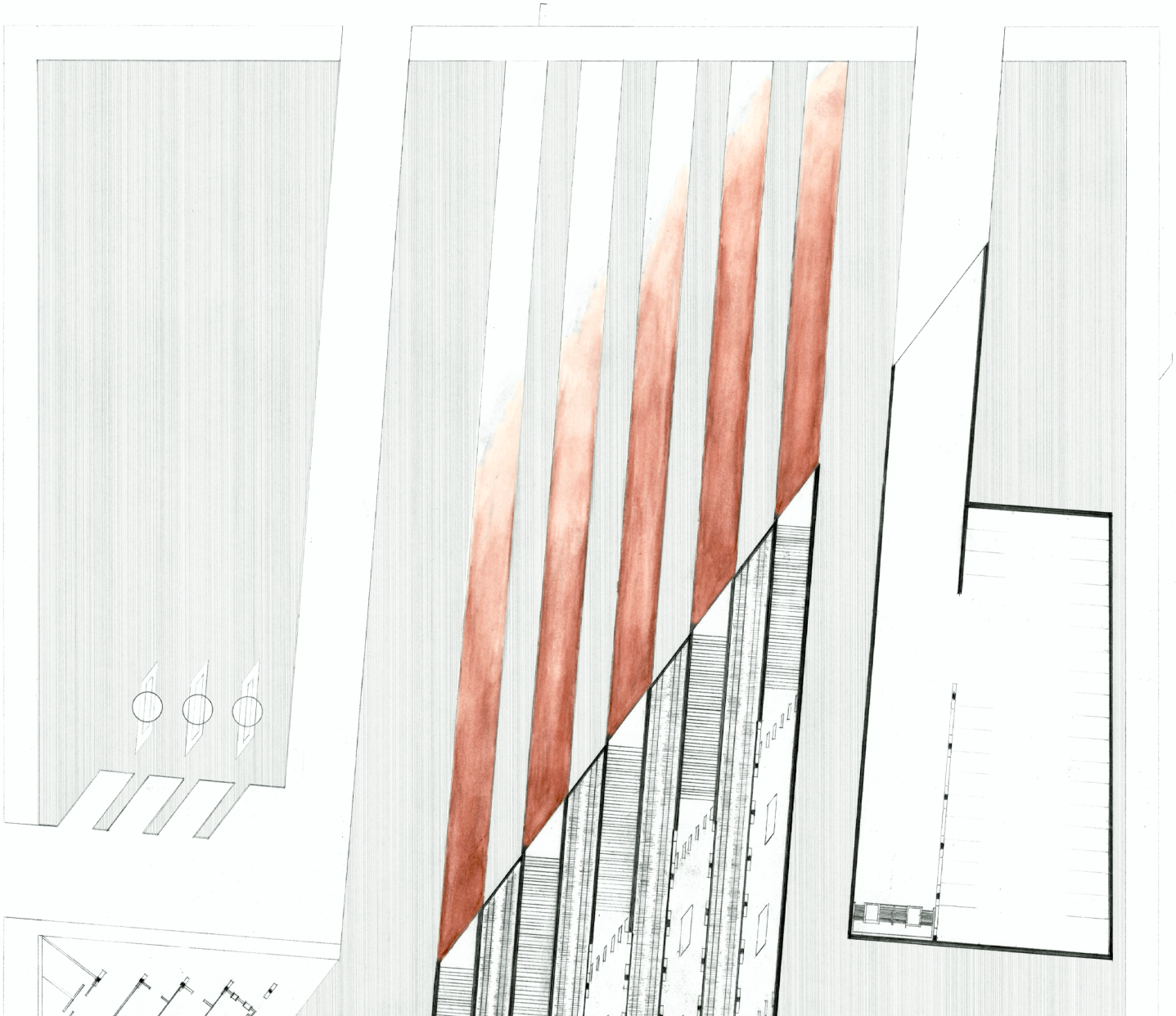
A MOVING CITY

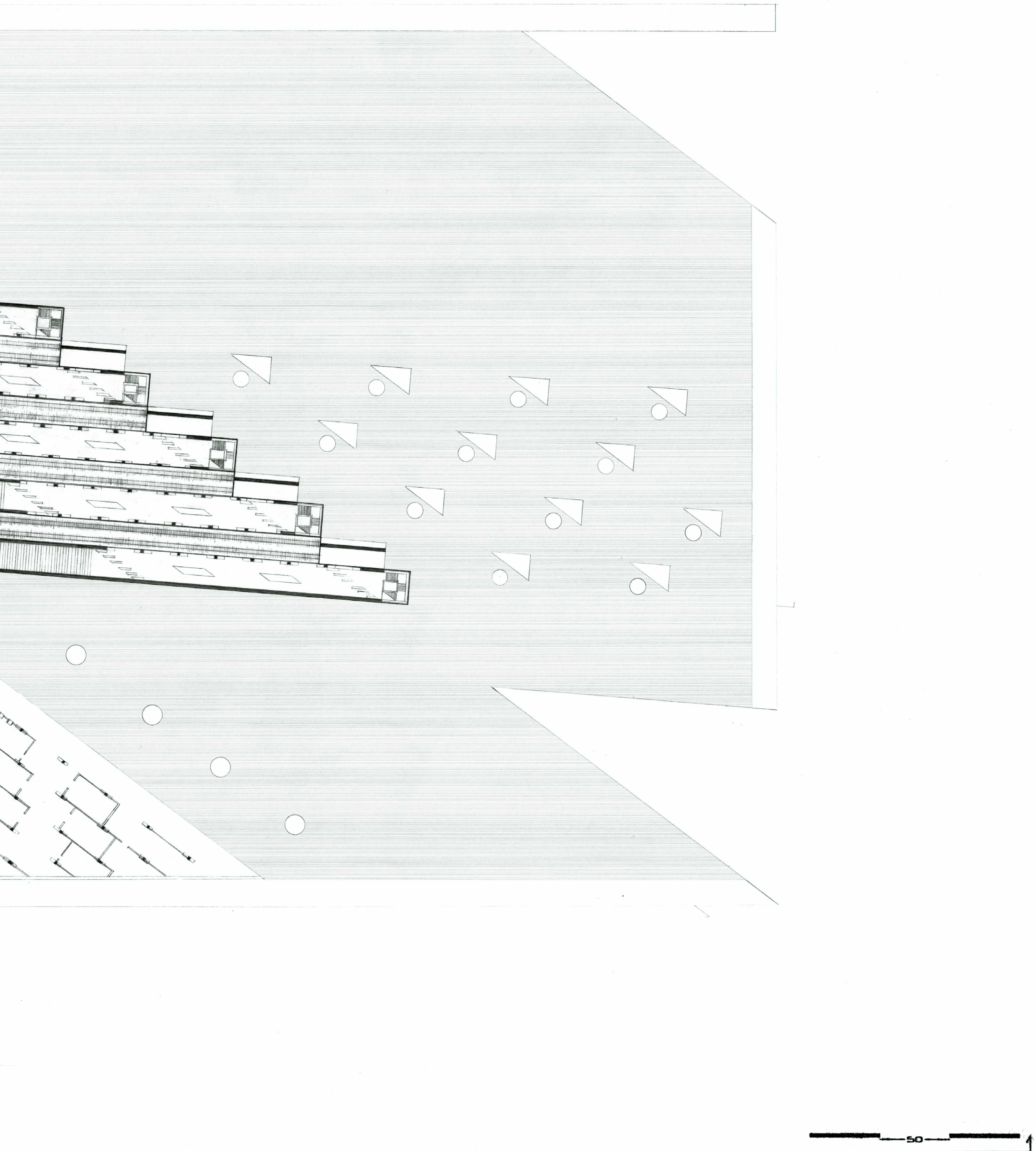
MICHAEL VETTER - REGINE SCHWAEN



How can public transportation respond to the built environment to improve how we move within a city? As our built environment develops we put more emphasis on the ***individual rather than the society***. The way people move through a city relates directly to its public transportation. To continue the growth of our built environment we must put the public first, by studying the way a city ***moves***, ***grows***, and ***sustains***. Cities today are designed around transportation, for the US it is the automobile. Phoenix, Arizona is a city that was designed around the automobile. With Phoenix taking up a vast area of land this requires its residents to travel long distances. This thesis will explore connecting the Phoenix area, Los Angeles, Tucson, and Flagstaff, with a High Speed Rail system to help revitalize the downtown.



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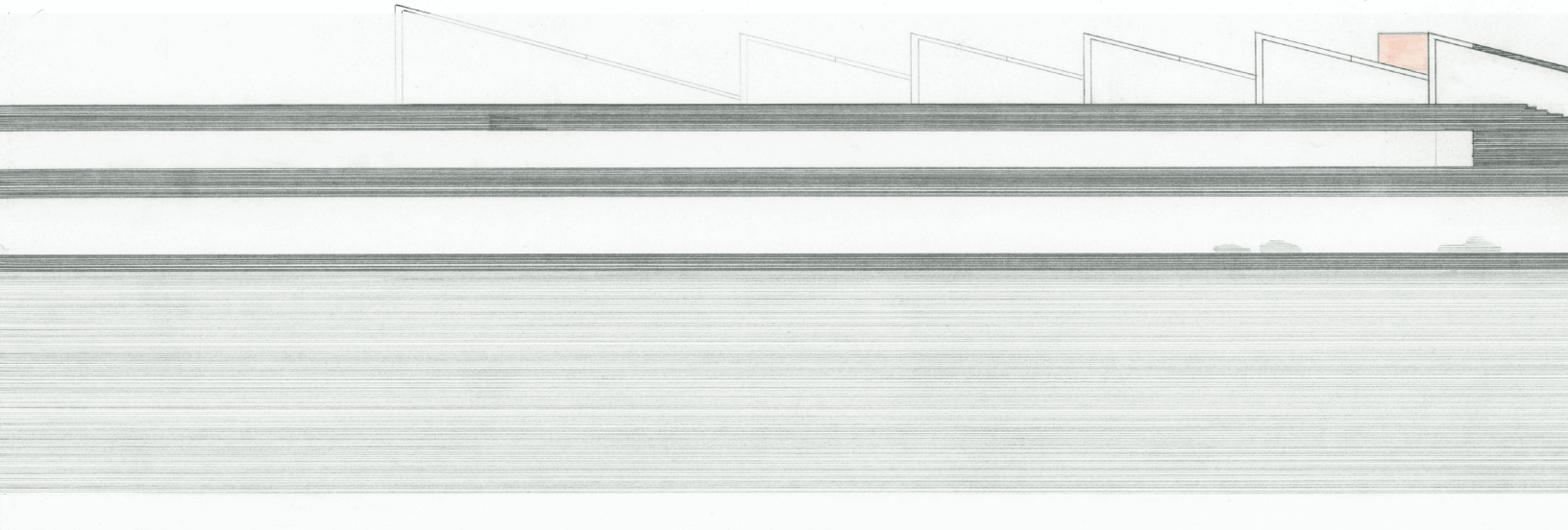

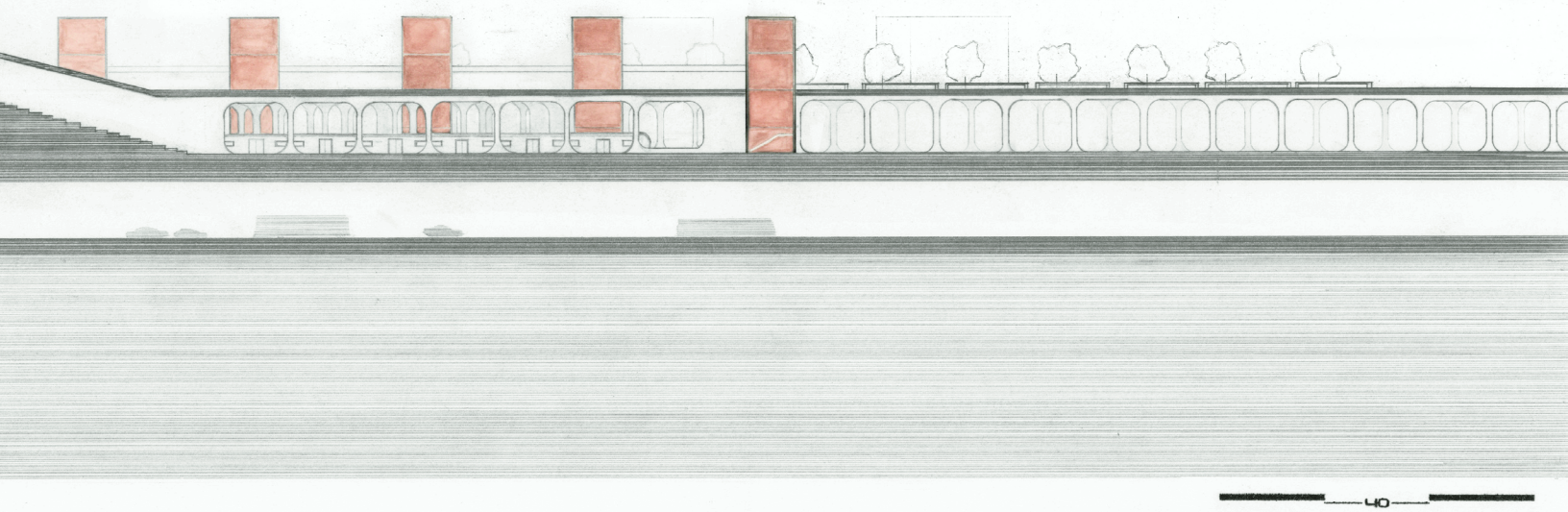
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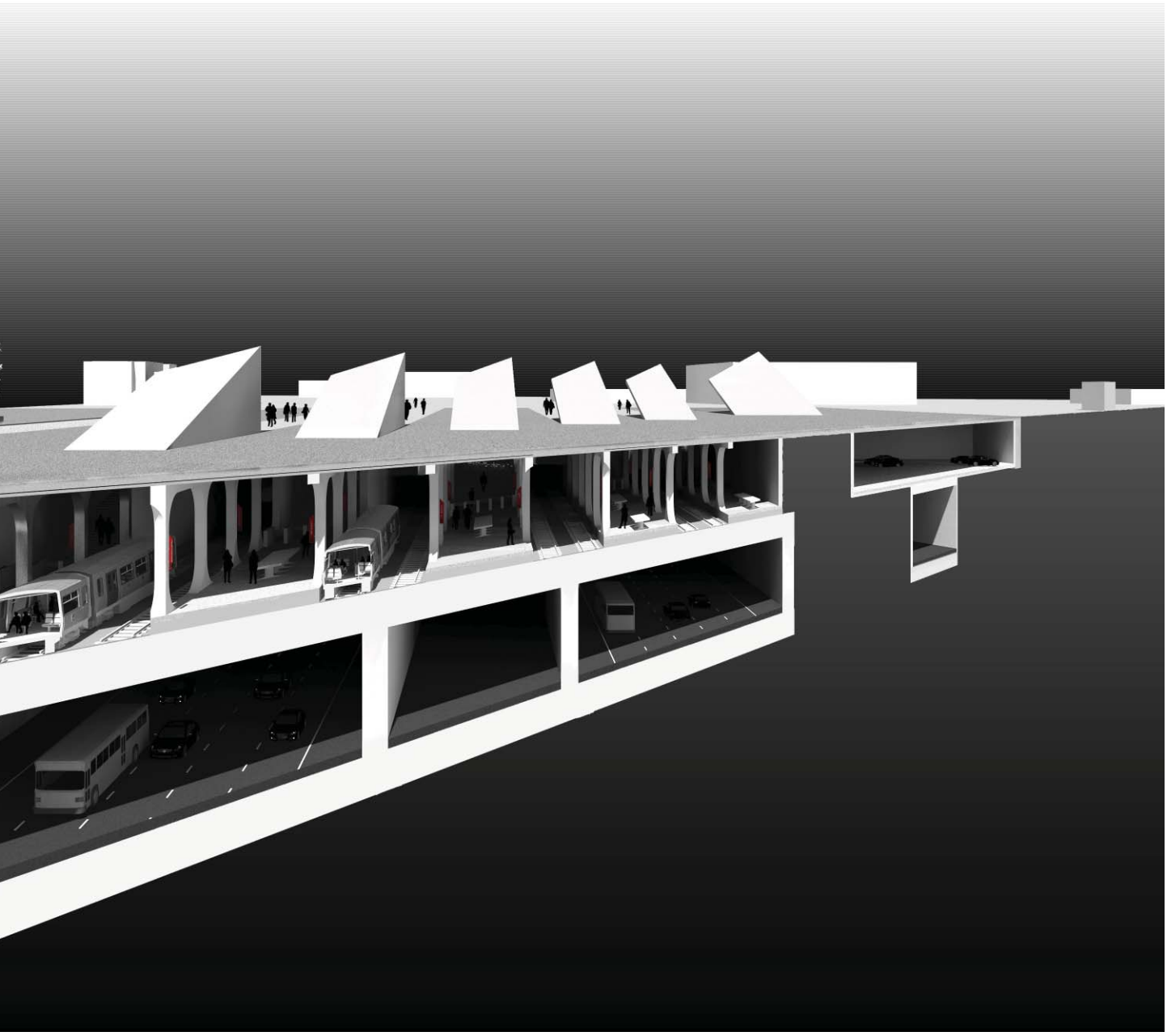
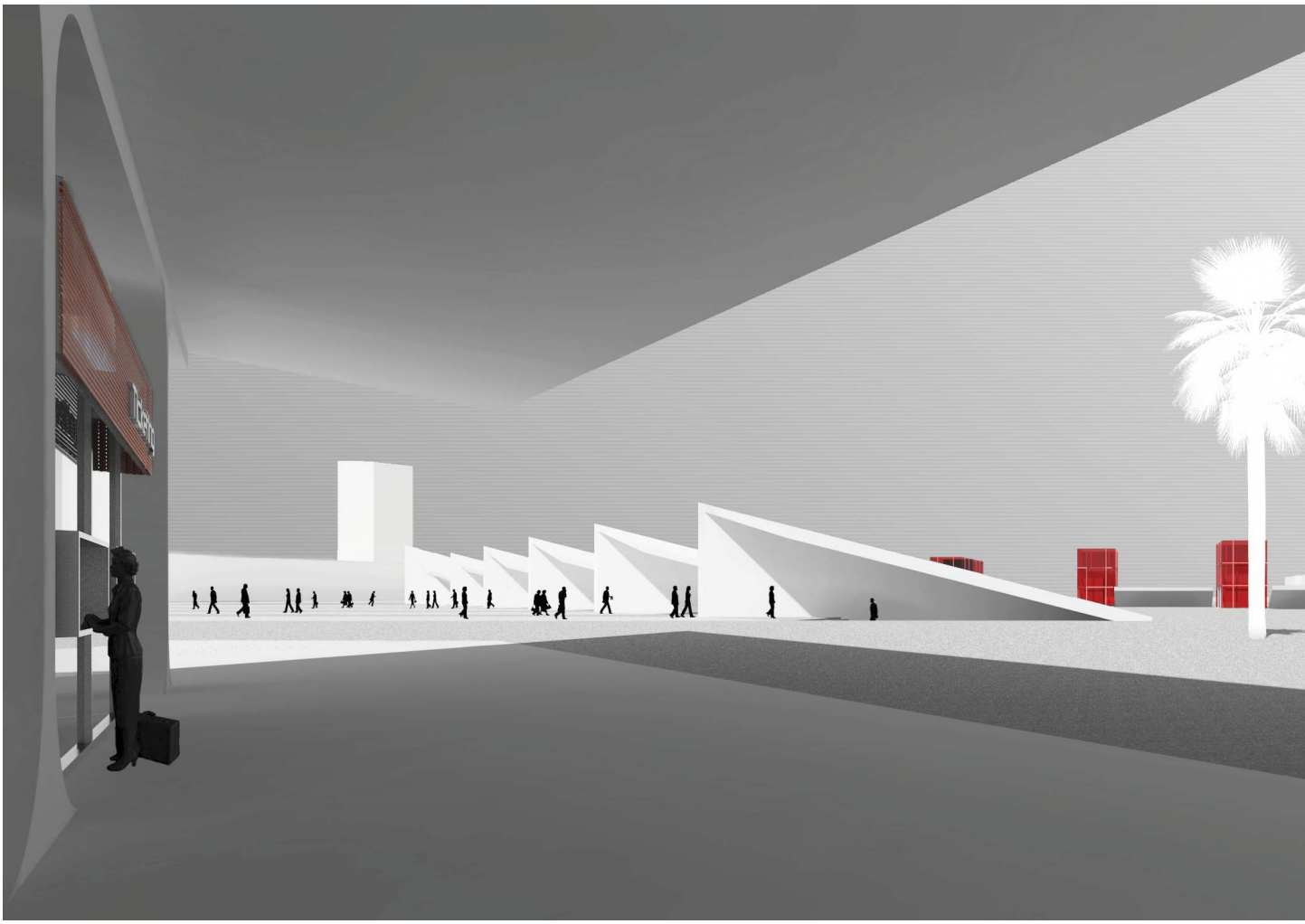
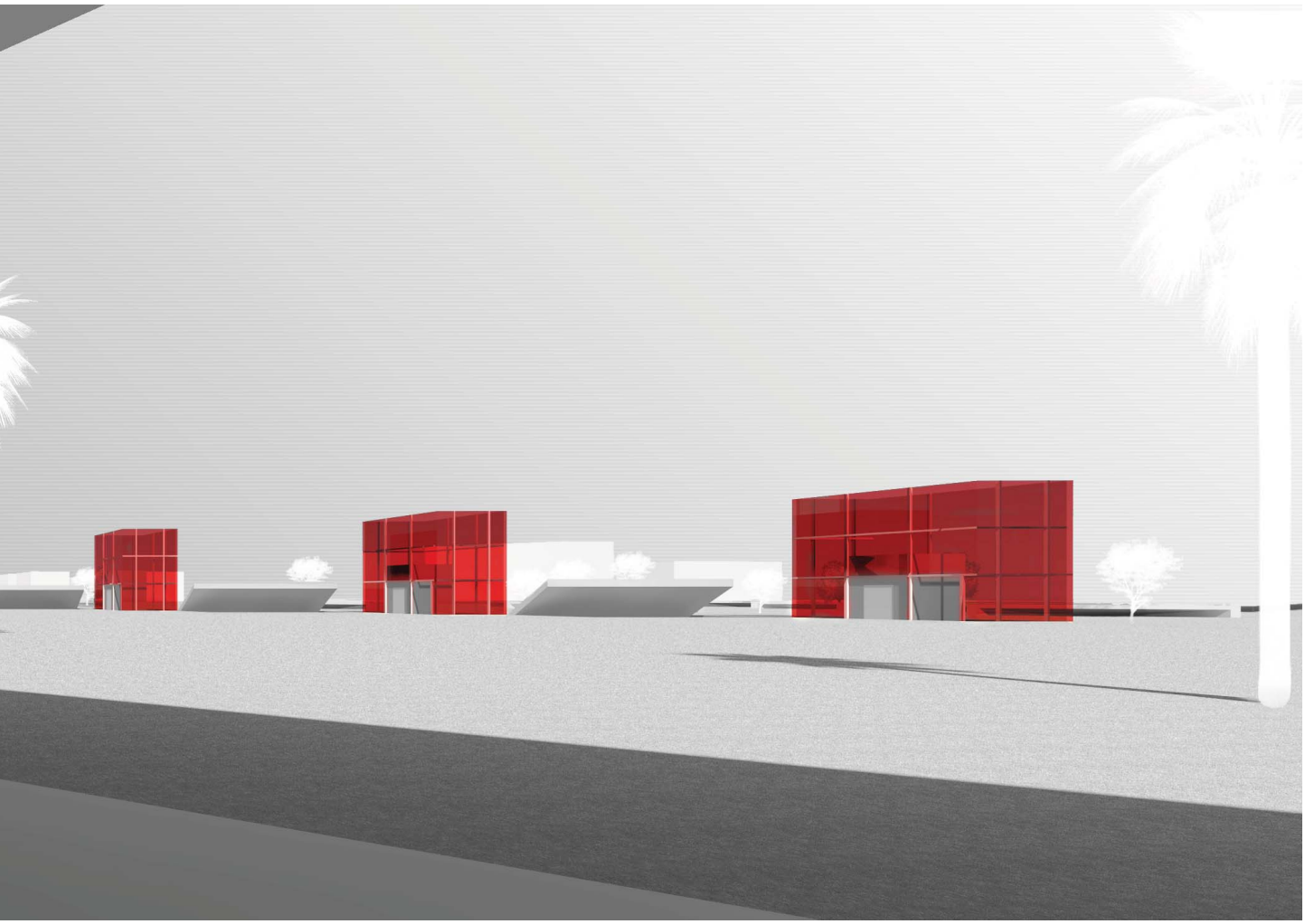
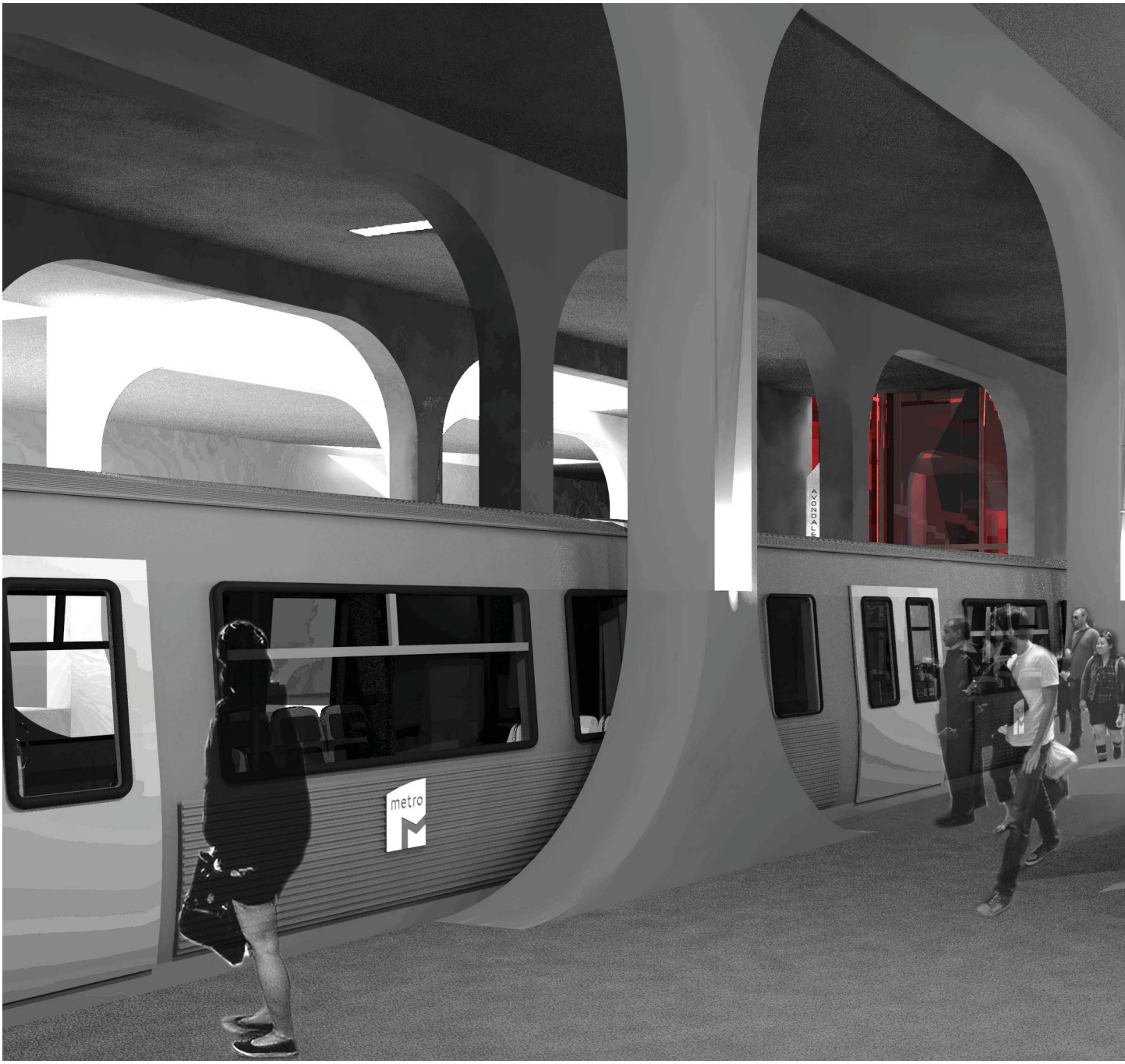


Sectional Perspective





Entrance Perspective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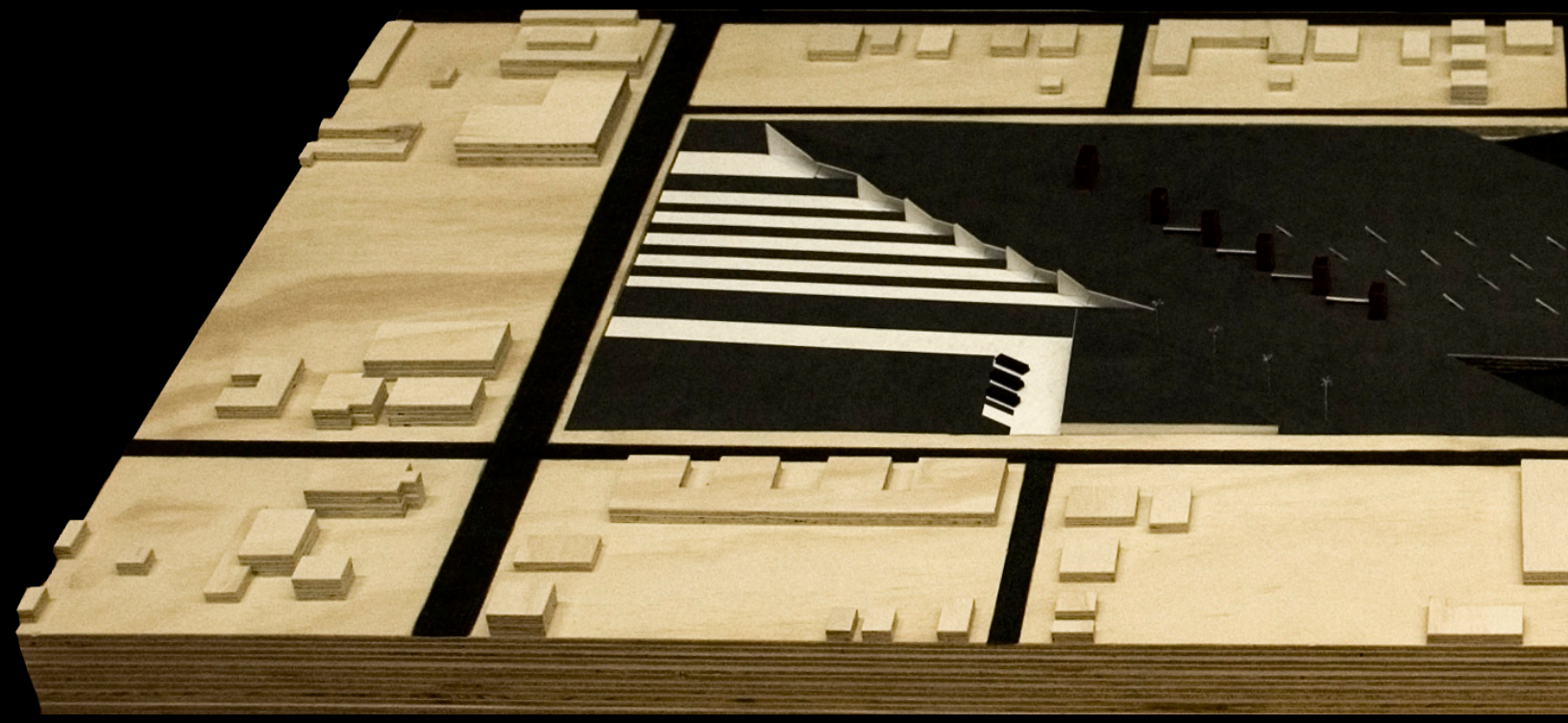
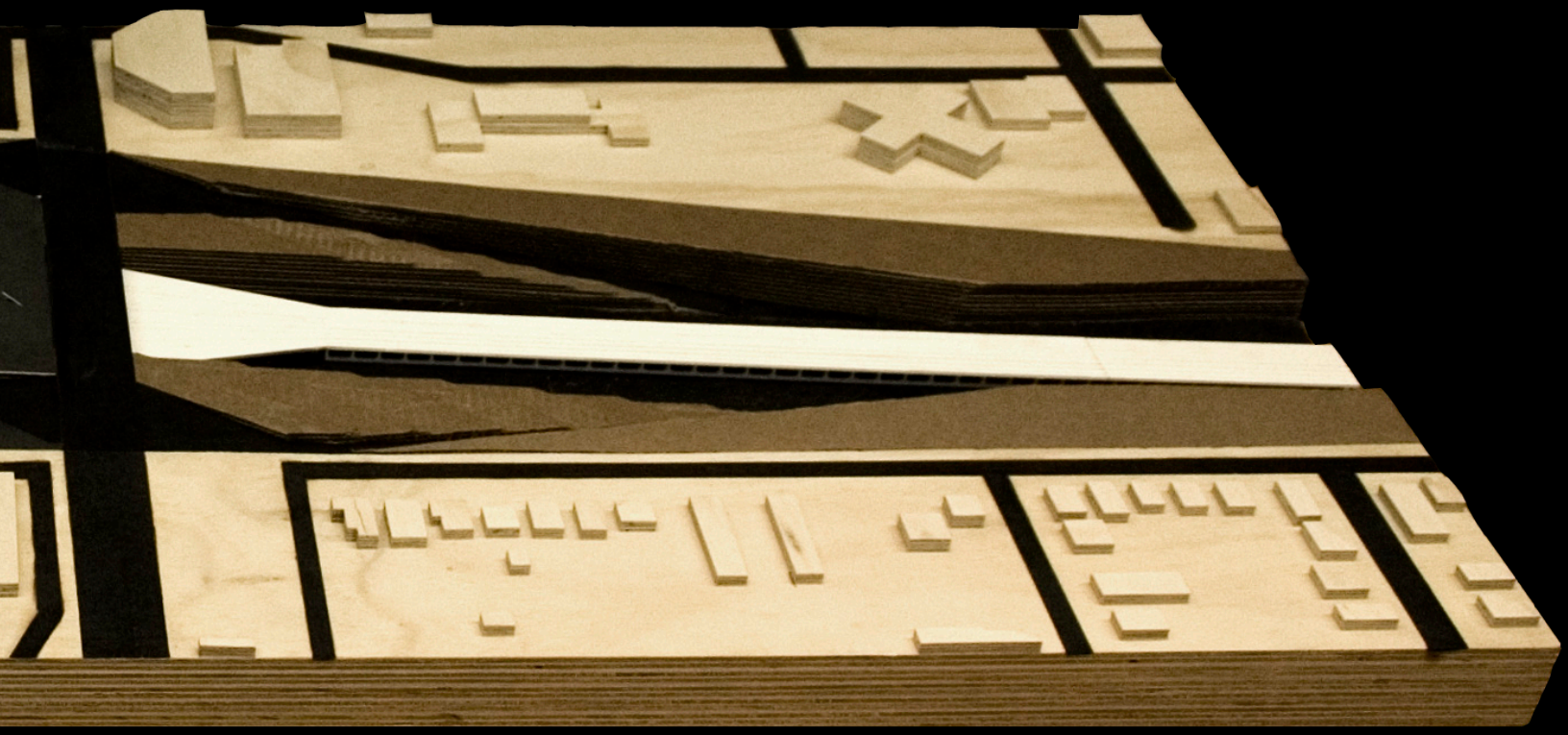
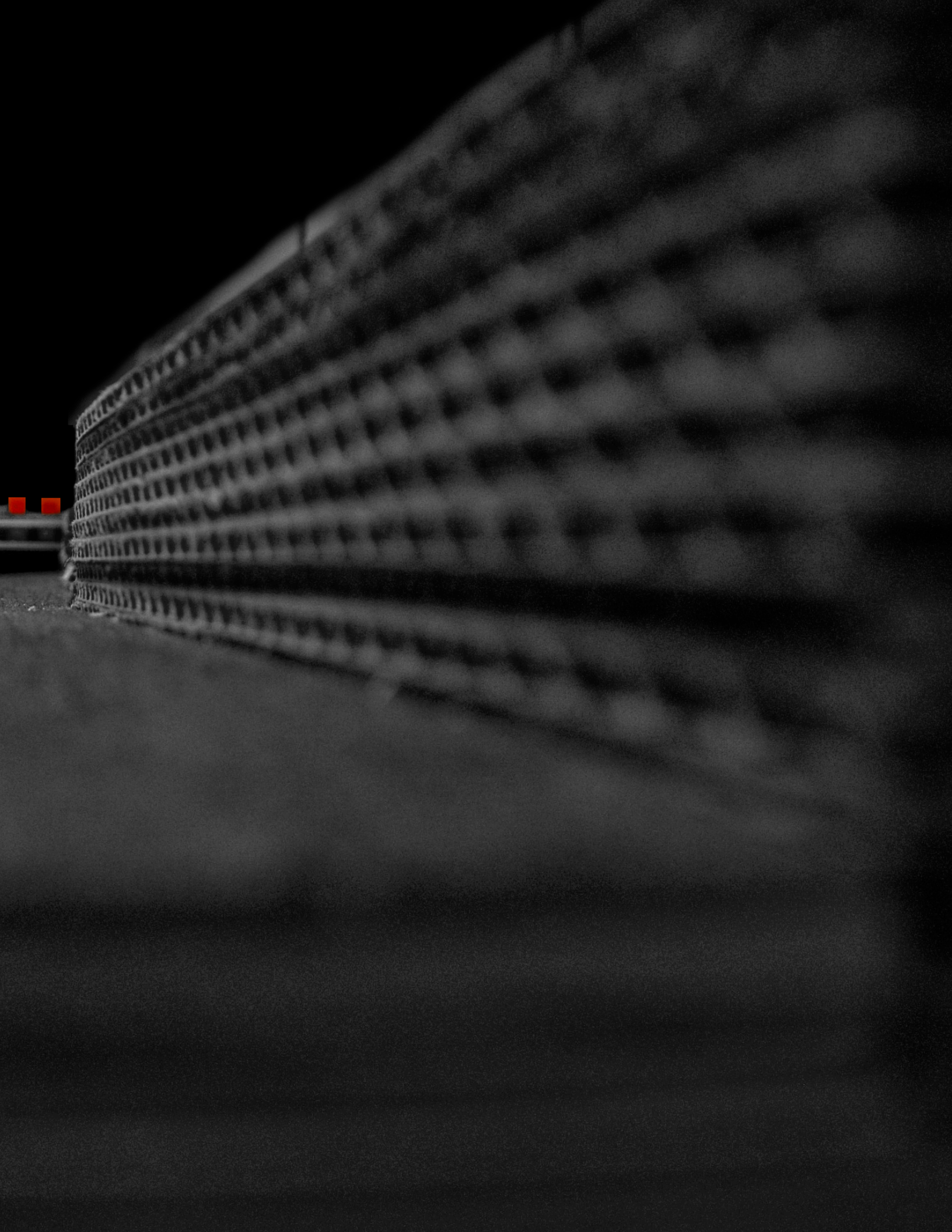
PLATFORM PERSPECTIVE







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NDSU
NDSU gave me an opportunity study architecture in Spain.