

CUSHION COMFORT CONSTRAINT: CHOREOGRAPHING INFRASTRUCTURES OF MOBILITY
by Cynthia Latortue

Bachelor of Science in Art and Design
Massachusetts Institute of Technology, 2012

Submitted to the Department of Architecture in partial fulfillment of the requirements for the degree of Bachelor of Science in Art and Design at the Massachusetts Institute of Technology.

June 2012
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ABSTRACT

Surface in the city is scarce. As a typical day in the city progresses, the inhabitants' surface demands transform. A children's playground goes unused at night, the valuable surface should be re-adapted for an alternative use, say a parking space for the neighborhoods drivers.

This project seeks to transform the urban surface of the city, by deploying variable mobile autonomous infrastructures. The furnitures are programmed to be responsive to the temporal demands of the current city. They change position and rearrange themselves for the three major episodes of daily life, Morning and Afternoon, Commute, and Evening.

Physically the furnitures transform the city surface. Mobility in neighborhoods is dictated by their placement and type. Consequently the furniture's placement is dependent on a neighborhood's profile. The mobile infrastructures are capable of providing a safety buffer from traffic, creating new major transportation routes, and creating a new temporary program to a space. For example, a schoolyard in the Morning and Afternoon, would be protected from traffic by a buffer of infrastructures on the exterior perimeter. Meanwhile mobile sandboxes, sports fields, etc. occupy the interior pocket of space created.

The urban surface is also marked by a social transformation. This model reinforces building boundaries as private space, and any exterior surface (backyard, driveway, alley, street, sidewalk, parking lot, etc.) as inhabiting the public realm. Thusly the city is left available as social space, which is constantly adapting to inhabitants needs.

Thesis Supervisor: Filip Tejchman
Title: Lecturer of Architecture

ACKNOWLEDGMENTS

I'D LIKE TO THANK

FILIP TEJCHMAN,
MY ADVISOR

AUDREY BOSQUET,
FOR THE HELPING HAND

AND JESSE BROOKS,
FOR THE CONSTANT SUPPORT

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INTRODUCTION



BRADFORD STREET

INTRODUCTION

Shoes serve as the primary interface between a human body and the ground. Through shoes, bodies are mapped to the ground. Shoes are an extension of the city's infrastructure; a personal infrastructure. The discussion of footwear becomes relevant to this thesis when seen in parallel to the surfaces they traverse.

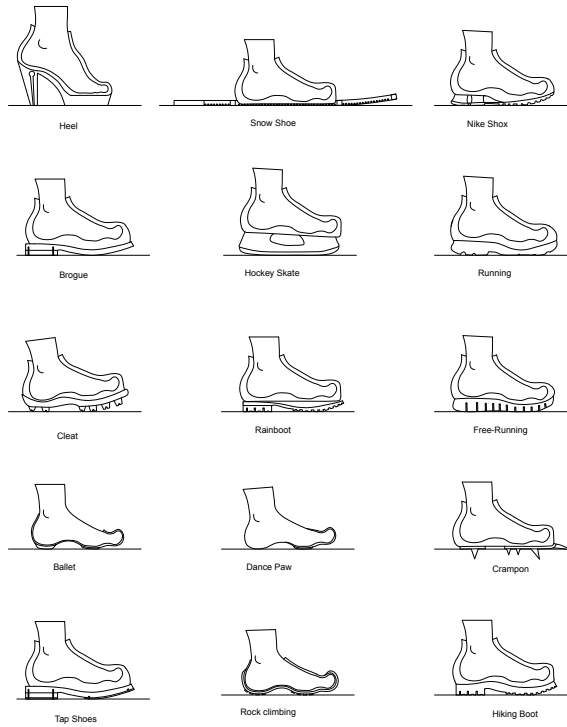
Disciplinary surfaces exist in the urban environment. These surfaces seek to prevent the public from certain behaviors. For example, grass acts as a disciplinary surface in urban areas. Grass is typically seen as a reserved space, or decoration outside of the setting of a park. As a foreign element, when it is present it is differentiated from the typical concrete walking surface. Pavers or concrete walkways are for circulation, while green space is typically reserved for a different behavior. The existing urban landscape is a collage of surfaces that suggests mobility.

In this light surfaces are equally responsible for dictating and asserting mobility as shoes. The difference is that the design and decision over constructing a surface happens at a much larger scale than an individual's footwear options. The design of an urban surface affects a larger amount of people, spanning various footwear types. So, on an urban scale, typical surfaces we encounter are generic and accommodating to most shoe types. What if we could reverse this relationship and plaster the city in highly specialized surfaces, as a sort of inverse shoe?

Of course the problem with a landscape of highly specialized surfaces is the issue of use and general transportation. A space's use and purpose is imperative in the city, where surface is scarce. Over-programmed and unused spaces unnecessarily contribute to the congestion and scarcity of surface in the city. Inhabitant's needs transform over the course of the day, yet surfaces in the city remain stagnant. When a park is bulldozed to create a new parking lot, the park is never replaced, because surface and horizontal real estate are scarce.

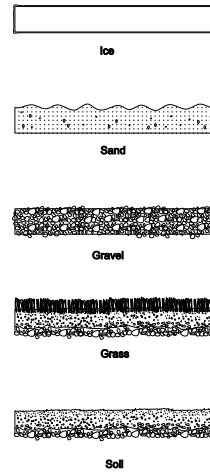
As a solution, this project proposes abolishing current surface divisions in the city and deploying mobile infrastructures. The mobility of the infrastructures allow for a dynamic metamorphosis of the urban landscape. Transportation, program and safety demands are met through the surfaces.

Shoes serve as the primary interface between a human body and the ground. Through shoes, bodies are mapped to the ground. Shoes are an extension of the city's infrastructure; a personal infrastructure. The discussion of footwear becomes relevant to this thesis when seen in parallel to the surfaces they traverse.

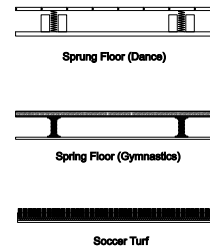


SHOE CATALOGUE

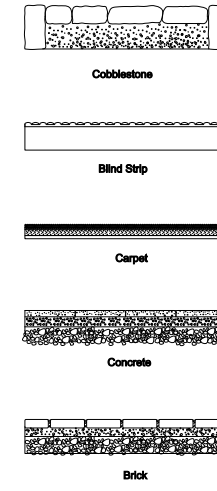
Natural



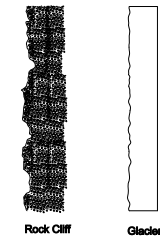
Specialized



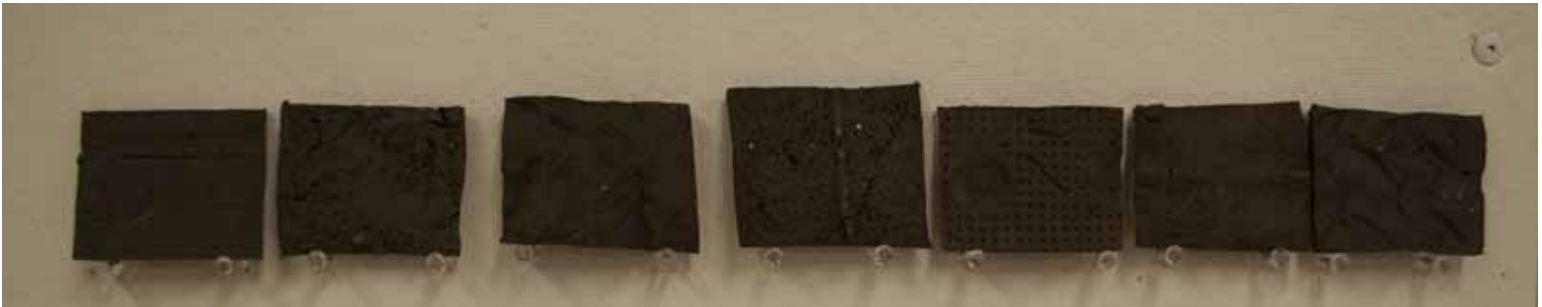
Infrastructure



Vertical



SURFACE CATALOGUE



SURFACE CASTINGS FROM SITE



DISSECTED SNEAKER

SURFACE ATTITUDE

For this project's purpose any horizontal space has the potential to be inhabited by mobile infrastructures. Typical conventions of public and private space become irrelevant. The infrastructures have the opportunity to transform several types of spaces from vast (parking lots, parks, vacant lots) to small and specific. Small and typically private spaces like backyards and driveways are now as public as municipal parks.

This starkly reinforces the boundary between building and exterior.



PARKING LOTS
LOADING DOCKS
BACK ALLEYS

SITE

SITE SELECTION

The South End, Boston was chosen as the site for this project. Demographically and physically, it is a site saturated with contrasts. Deep into the process of gentrification, there are a few specific environments in the South End. The first describes the area above Washington Street, the main shopping avenue. Dense rows of old brownstones are broken by randomly interspersed parks and urban gardens on former vacant lots on Shawmut Avenue. This is a neighborhood of affluent families.

South of Washington Street former industrial centers and factories replace the brownstones of Shawmut Ave. These buildings have been remodeled into luxury condominiums and artist galleries. In contrast to the small pockets of green space on Shawmut Avenue, any space not occupied with a building is plastered over with asphalt and designated as a parking lot. Half a block in either direction from the concentration of luxury amenities exist a homeless shelter and a low-income housing development.

The primary reason that this site was chosen was due to the contrasts. While a corner of the area is devoted to parking and vehicles, another street is the main route of the Silver Line. This project has the opportunity to blur the boundaries between the different inhabitants and neighborhoods.



Image credit: Google



ALBANY ST: OPEN, AIRY, INDUSTRIAL



SHAWMUT AVE: QUIET, RESIDENTIAL, STATELY



HARRISON AVE: COOL, CONTRAST, COMPACT



WASHINGTON ST: CONSUMER ORIENTED, ACTIVE, DIVERSE

Image credit: Google



Popular Pedestrian Routes, including plazas.

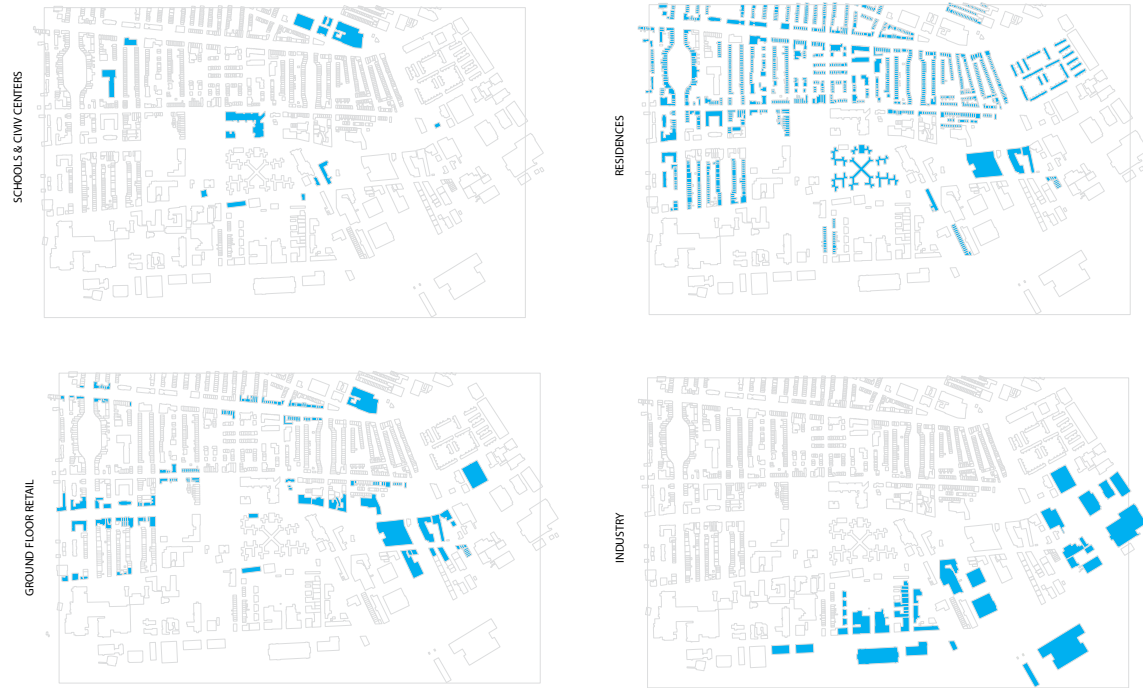
TRAFFIC ANALYSIS

Washington Street houses the major walking and bus routes. It is also the busiest commercial and retail street in the neighborhood. The commuting routes here are anchored by Interstate 93, which forms a strong edge condition for the South End, and the Boston Medical Center, the area's largest employer..

Public Transportation
Routes with Stops



Building Uses

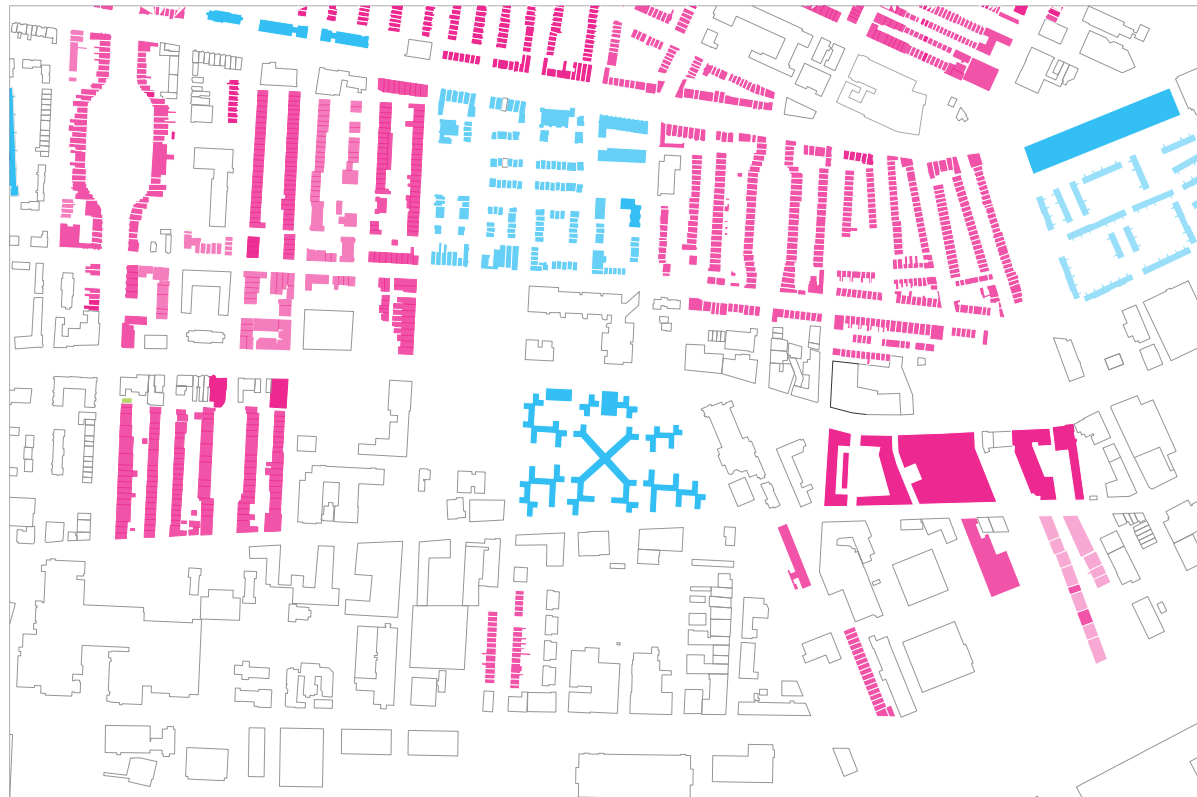


BUILDING TYPE

The different building types allow for varied exterior surface conditions. The Brownstones north of Shawmut Avenue create the typical front-stoop to street condition, but they also create long back alleyways, that give residents private parking and access to back gardens. In comparison, the Industrial buildings along Harrison Avenue, although much larger, leave vast spaces open and are less-densely positioned

Demographic Distribution
with Population Densities

- Lower-Income
- Higher-Income



DEMOGRAPHIC DISTRIBUTION

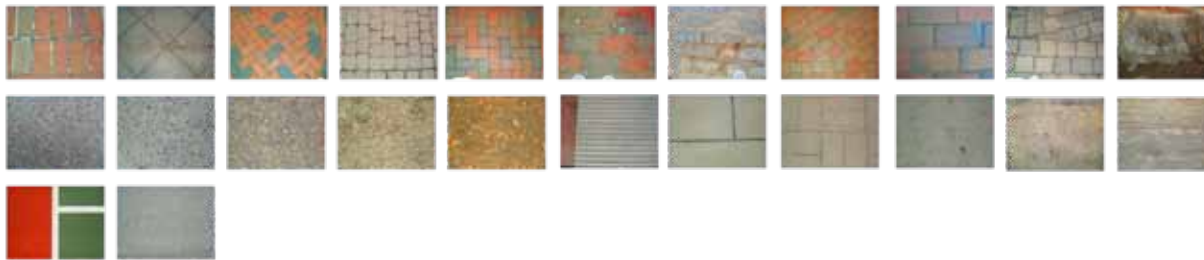
Deep into the gentrification process, pockets of lower income households are still existent south of Shawmut Avenue. Areas with large apartment developments are more densely populated in comparison to the Brownstone neighborhoods.

South End Surface
Inventory

VERTICAL SURFACE



HORIZONTAL SURFACE

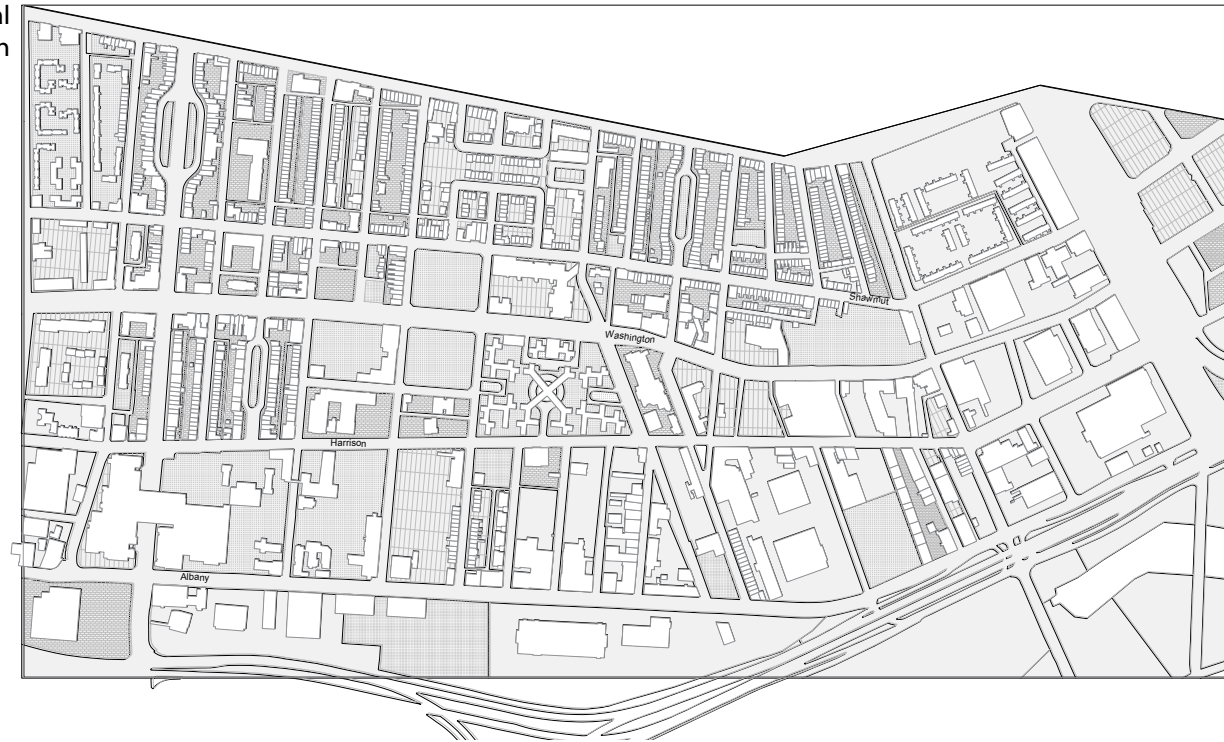


MUNICIPAL SURFACE



Majority of existing surfaces vertical and horizontal alike is brick.

Surface Material
Distribution



SURFACE DISTRIBUTION

While the Brownstone neighborhoods are layered in multiple layers of red brick, the former industrial zones are paved in asphalt, making little surface distinction from parking lot, loading area, or street. This is where the vehicle is king.

EVERYTHING TRANSFORMS OVER TIME,

.....EXCEPT SURFACE

SURFACE TEXTURES

CODIFYING SURFACE

The following plans seek to codify and describe the surface of the city, not in respect to material, but rather with respect to mobility. The hashes point to the general direction of motion in that space by pedestrians (magenta) and vehicles (cyan). Areas that heavily favor one mobile body over the other become apparent. Vehicles are limited to driving on streets, driveways and parking lots, whereas pedestrians are able to penetrate any surface, alley, or crook between buildings. In comparison I-93 is in the complete domain of the vehicle.

This model also took into account stationary space. That includes, parking lots, people at home, porches, backyards, outdoor dining, etc. It is important to note that these immobile conditions travel throughout the progression of the workday. In the mornings and afternoons schools, daycares, and business parks are where inhabitants occupy time. During the morning and evening commutes, very little is immobile. Again in the evening, people tend to stay at home. This plan serves as a model to directly inform how the project dictates mobility through a 24 hour period.

AFTERNOON TEXTURE

10 AM - 4 PM

VEHICULAR MOVEMENT



STREETS
FREEWAYS
BIKE LANES
ALLEYS

PEDESTRIAN MOVEMENT

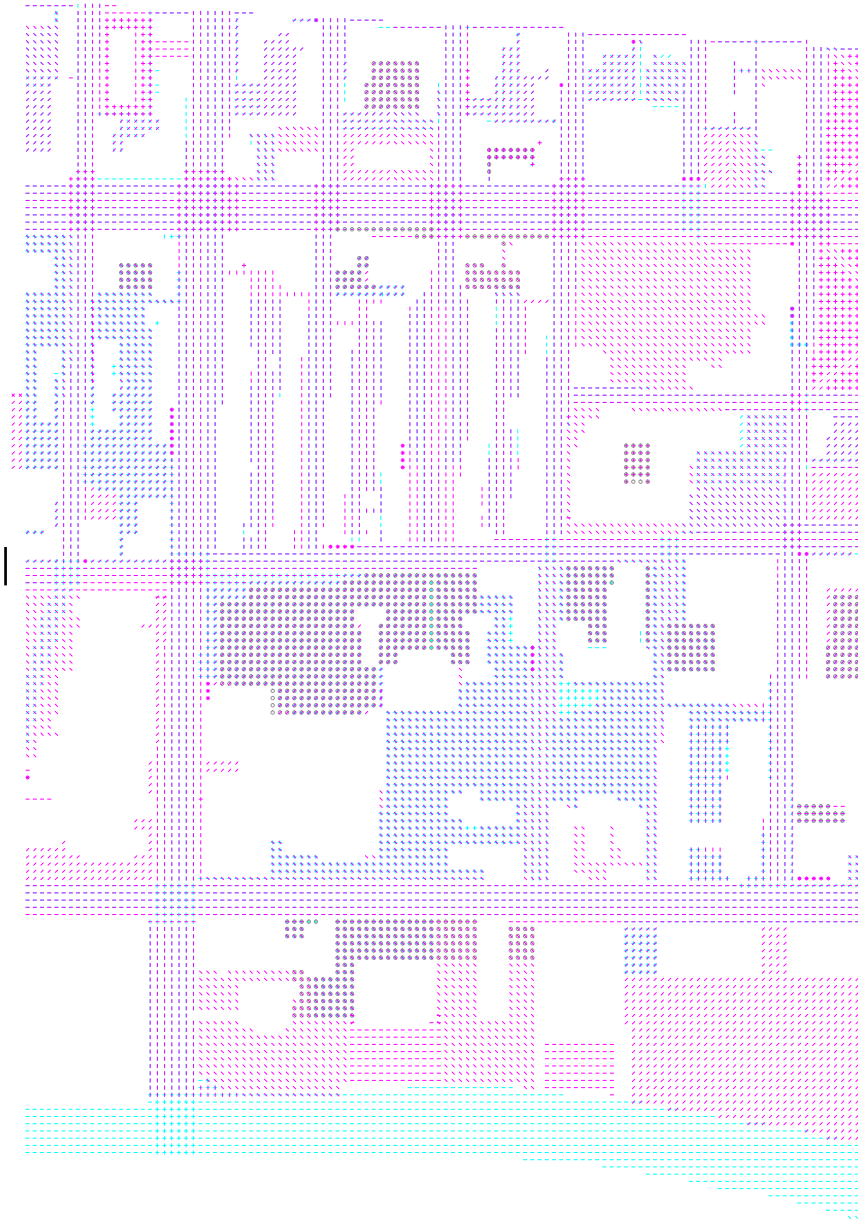


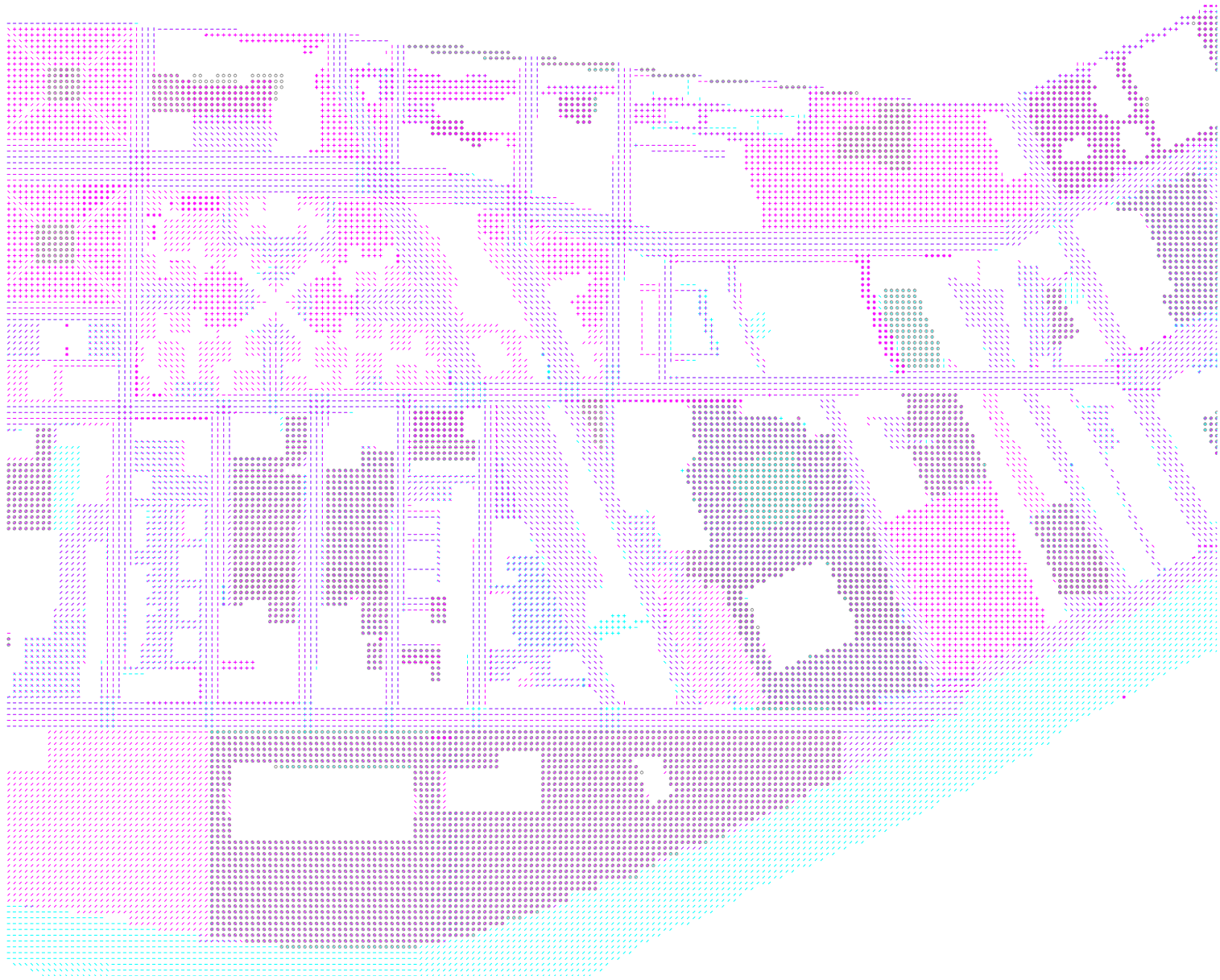
SIDEWALKS
PARKS
SPORTSFIELDS
ALLEYS

STATIONARY



PEOPLE AT HOME
OUTDOOR CAFES
MARKETPLACES
PARKING LOTS
VACANT LOTS





COMMUTE TEXTURE

8 AM - 10 AM
4 PM - 6 PM

VEHICULAR MOVEMENT



STREETS
FREEWAYS
BIKE LANES
ALLEYS

PEDESTRIAN MOVEMENT

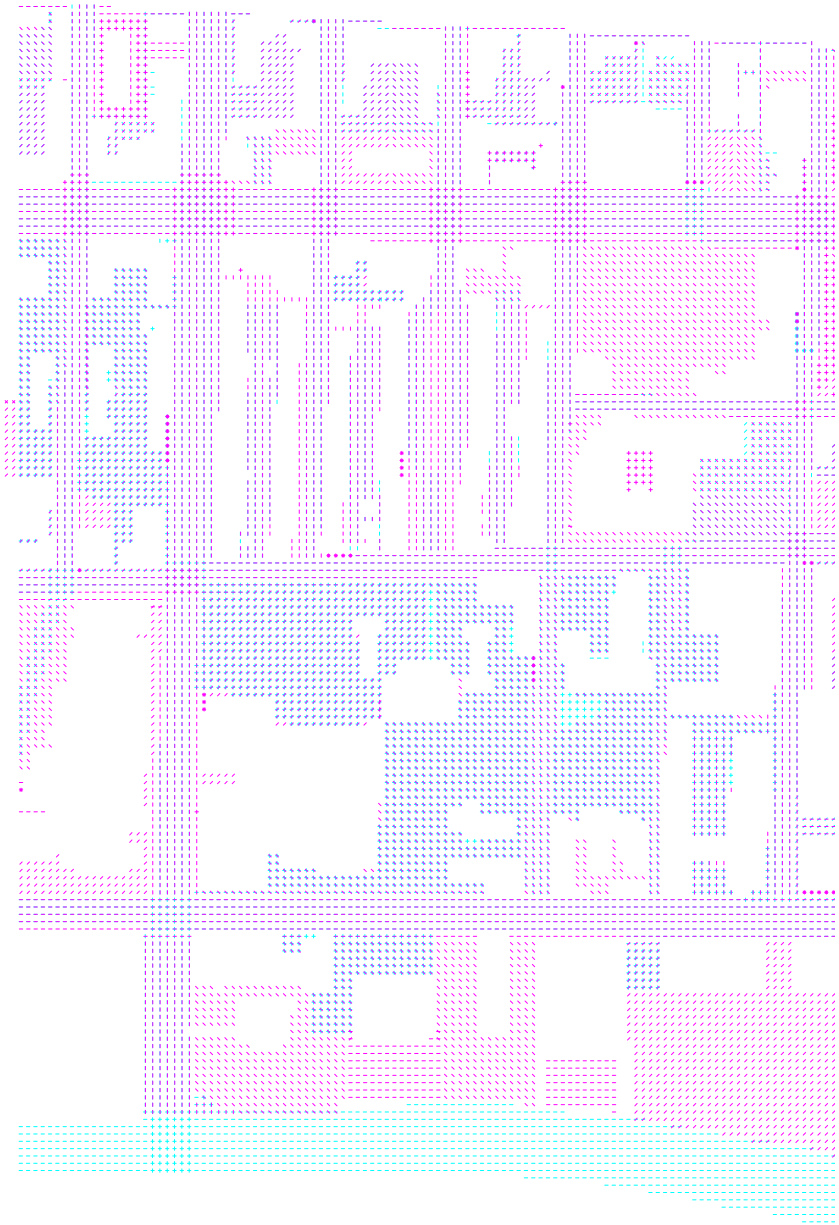


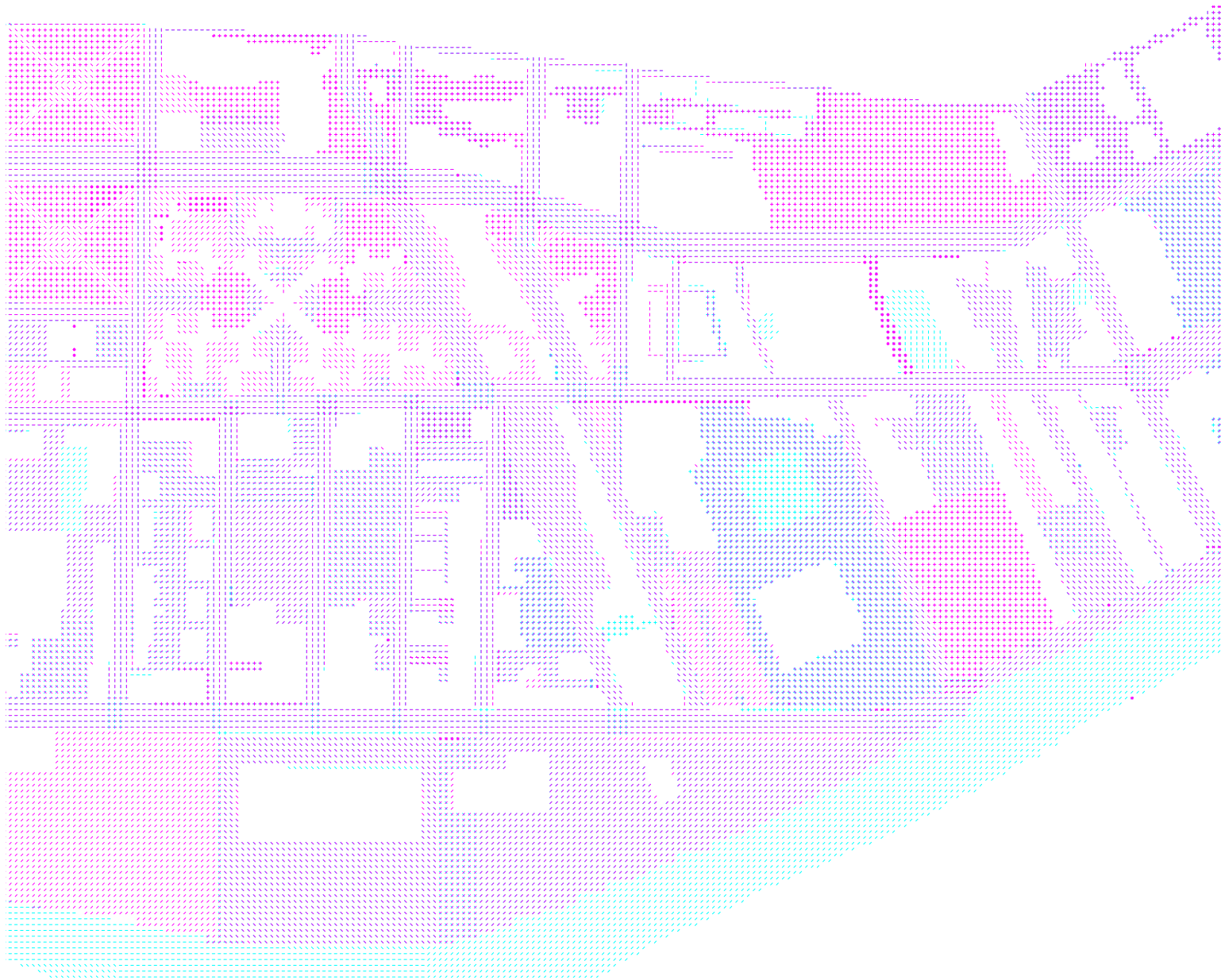
SIDEWALKS
PARKS
SPORTSFIELDS
ALLEYS

STATIONARY



PEOPLE AT HOME
OUTDOOR CAFES
MARKETPLACES
PARKING LOTS
VACANT LOTS





EVENING TEXTURE

6 PM - 8 AM

VEHICULAR MOVEMENT



- STREETS
- FREEWAYS
- BIKE LANES
- ALLEYS

PEDESTRIAN MOVEMENT

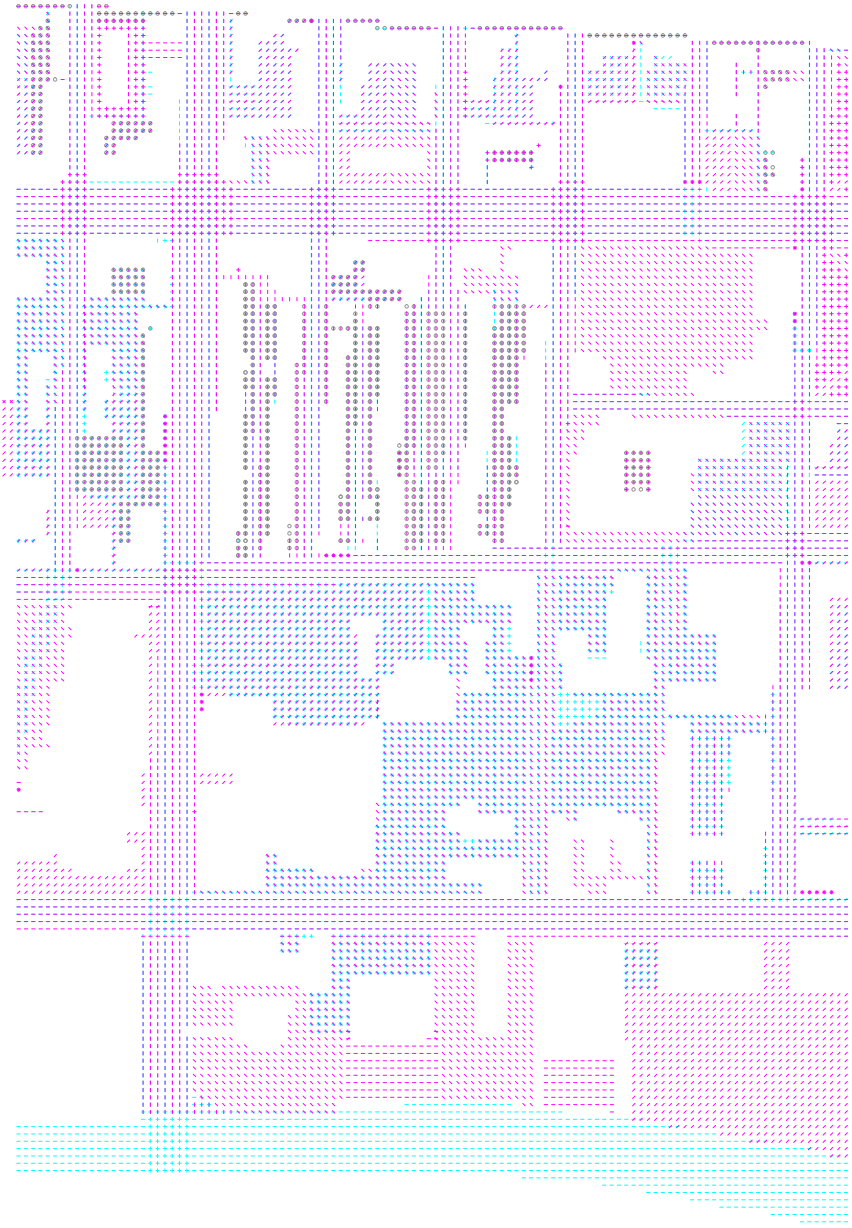


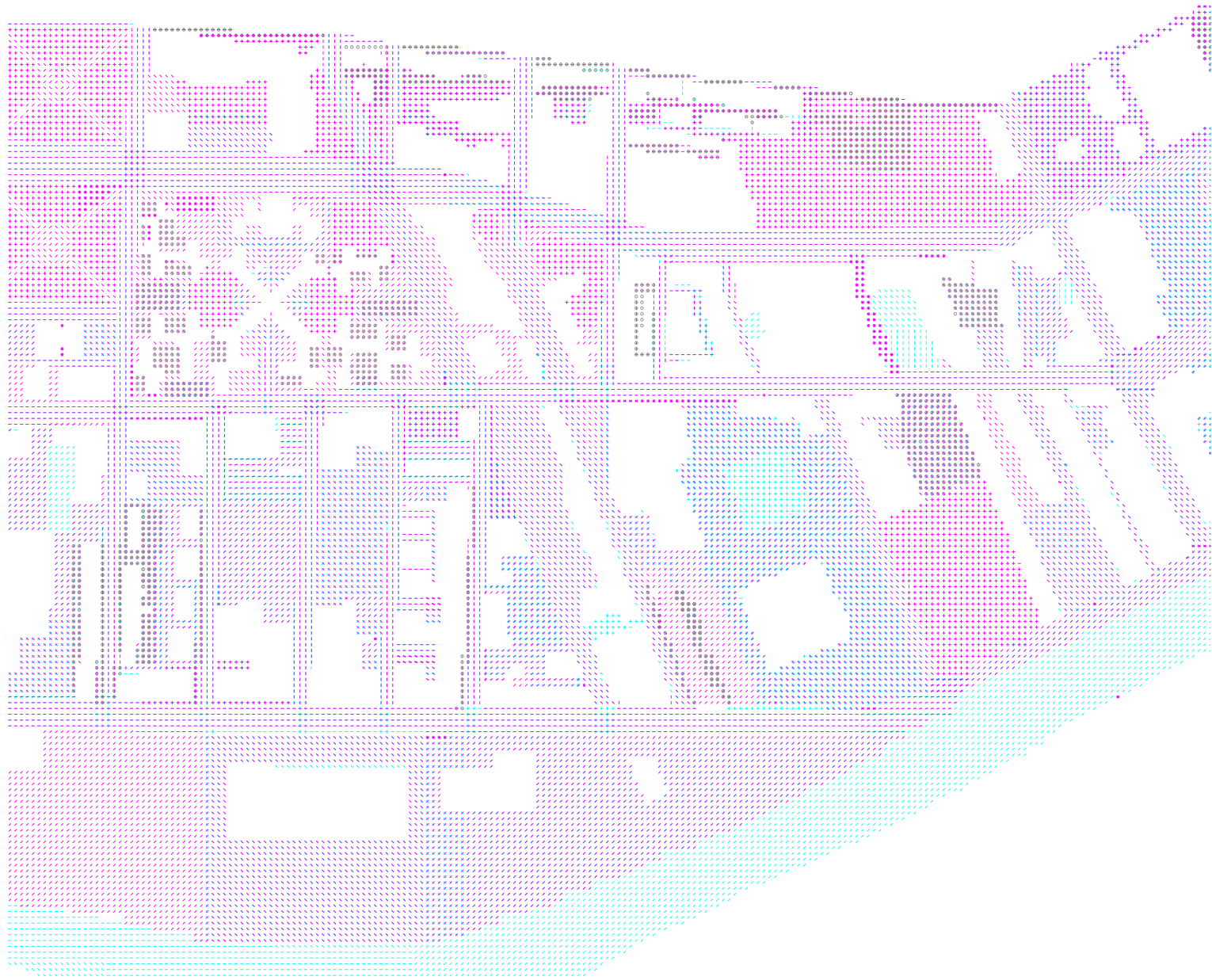
- SIDEWALKS
- PARKS
- SPORTSFIELDS
- ALLEYS

STATIONARY



- PEOPLE AT HOME
- OUTDOOR CAFES
- MARKETPLACES
- PARKING LOTS
- VACANT LOTS



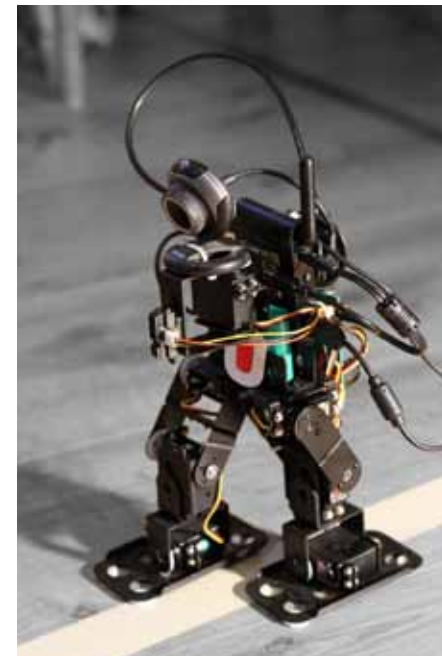


FURNITURES

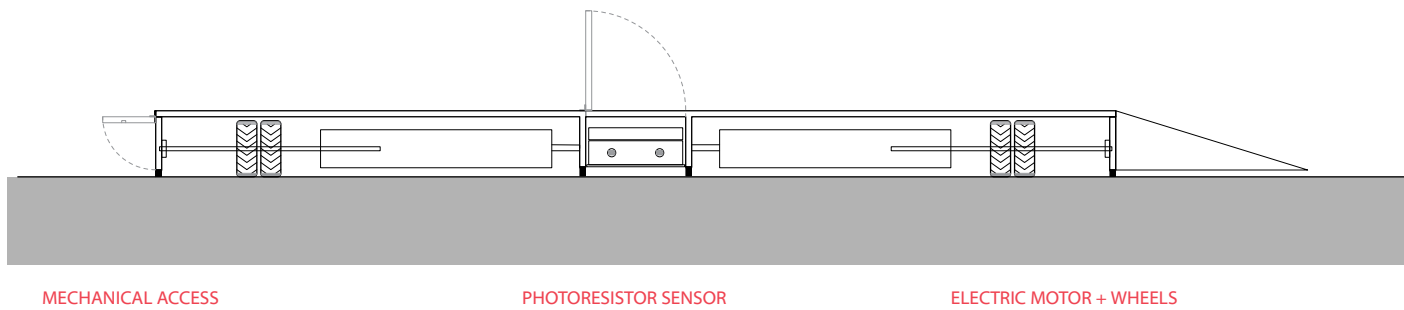
AUTONOMOUS ROBOT INFRASTRUCTURES

In order to make these infrastructures completely mobile, they will be carted around the city on mobile robotic bases. Similar to iRobot's Roomba cleaning robots, the infrastructures will be autonomous mobile objects. Specifically they are line-following robots. They rely on photoresistor sensors to follow concrete lines embedded into the current city surface, whether it is grass in a park or a concrete sidewalk.

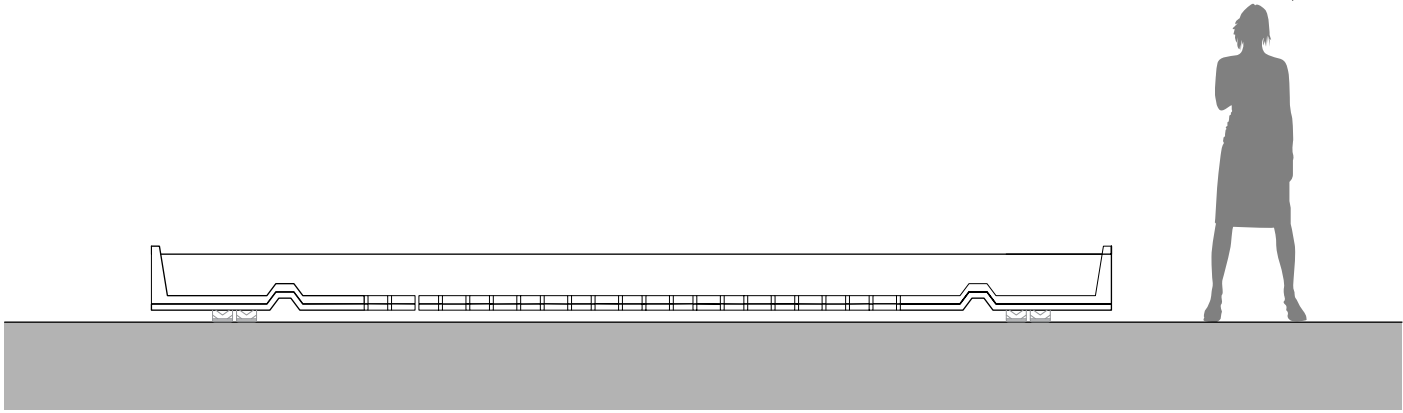
Every autonomous robot is constructed from a steel chassis with 4 sets of wheels connected to a single photoresistor sensor. On top of the chassis, sits a concrete bin of varying height, ready to be filled with whatever material is necessary.



Analog Line Follower Credit: XinCheJian
Roomba Credit: iRobot
Webcam Robot Credit: DSPRobotics

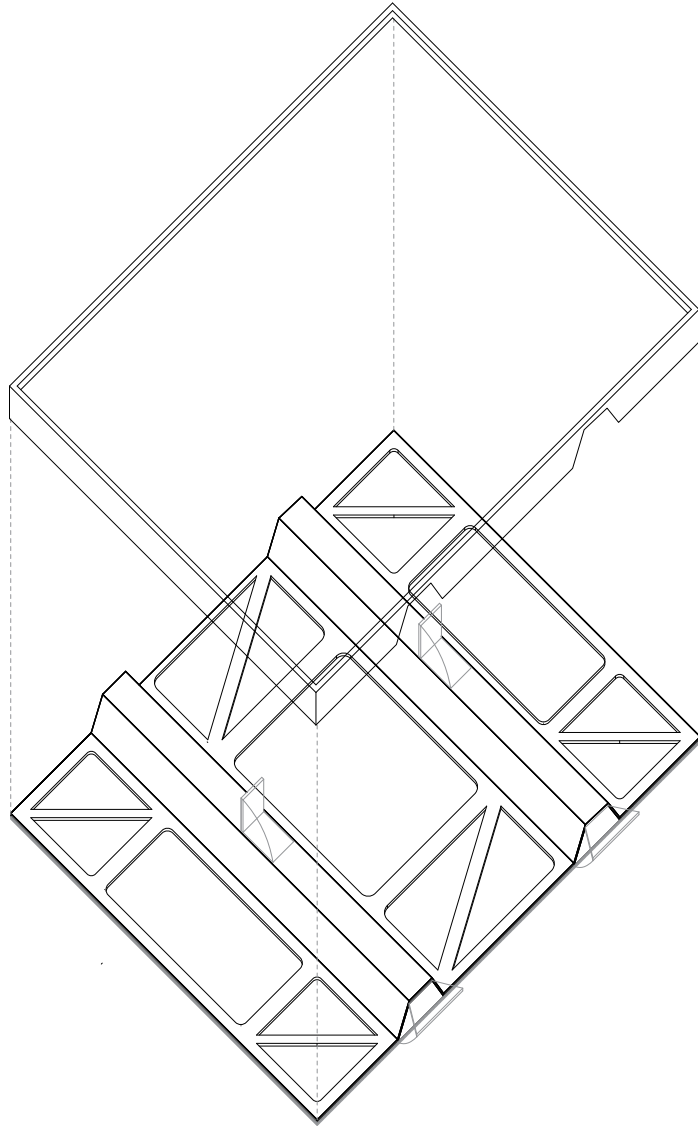


CHASSIS SENSOR AND MOTORS
1'=1/4"

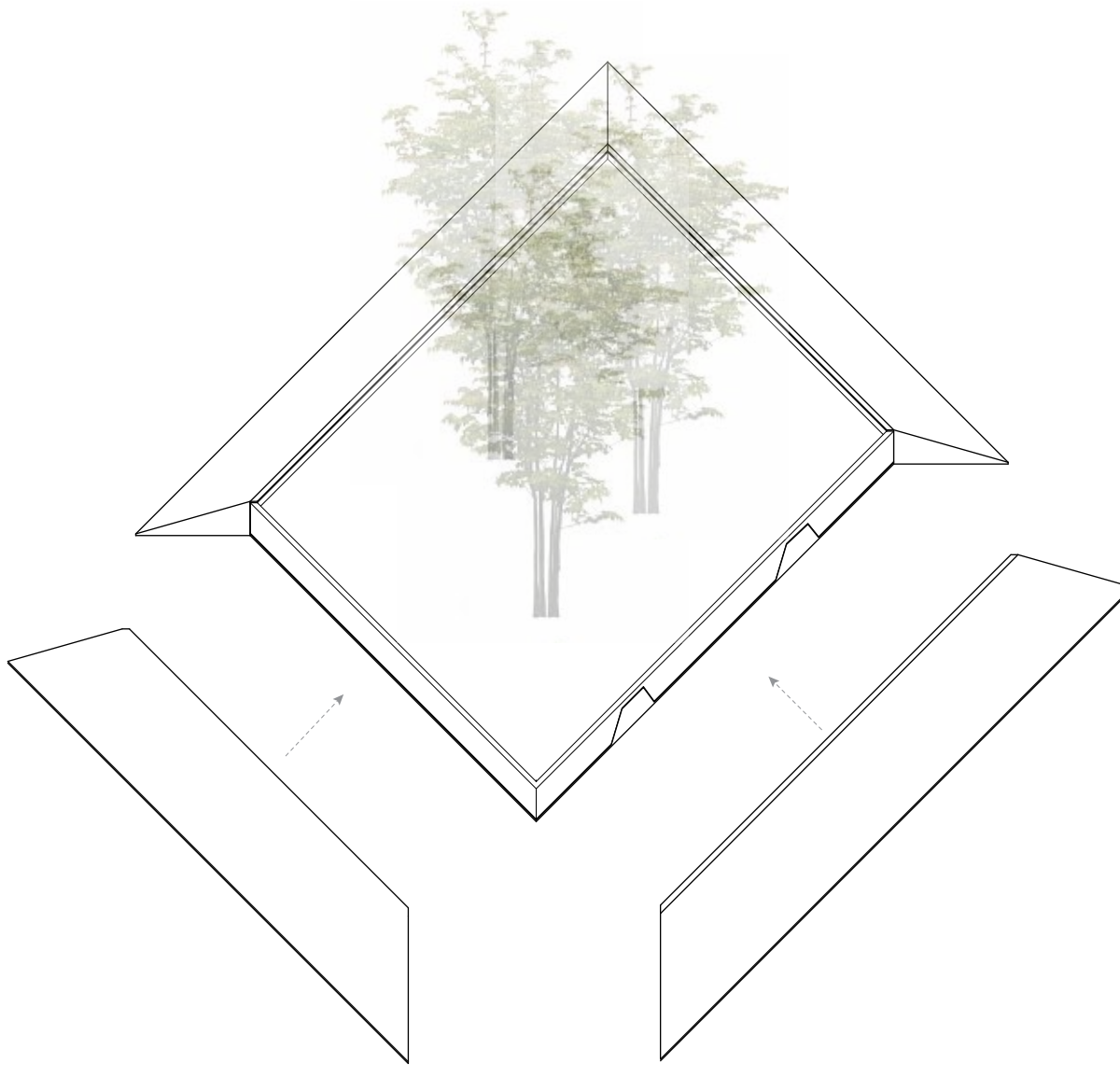


DRAINAGE GRATE

CHASSIS WITH BED
1'=1/4"



CHASSIS AXONOMETRIC
1'=1/4"



SURFACE INFRASTRUCTURE WITH RAMPS
1'=1/4"



PARKING INFRASTRUCTURES

Powering these electric infrastructures is necessary. Additionally these furnitures will not be in constant use and must be stored for a portion of a day. This project proposes parking the infrastructures into charging stations lining sidewalks. The infrastructures park on the curb and plug into the city's electric grid to recharge, before rearranging again for their purpose.

FURNITURE TYPOLOGIES

The furniture type dictates whether an area is passable, and what kind of activity can occur on that site. The furniture typologies are divided into three categories: BARRIER, SURFACE, and ROOF.

SURFACE

Surface types allow passage to pedestrians, while simultaneously excluding vehicle. They offer a different surface condition from what is available in the city. For example, they allow planters of mobile woodlands to occupy a city street.

BARRIER

Barrier types do not allow various kinds of passage. They may be physical or visual barriers, including planters, benches, and kiosks. Barrier types are not limited to vertical orientation. Horizontal barriers also exist. Simple fields of tall vegetation or water act as horizontal barriers.

Sports fields act as barriers because of the activity occurring on them, people typically avoid interrupting matches.

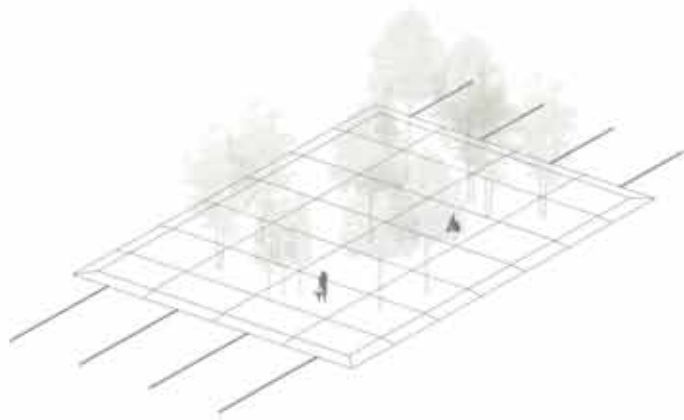
ROOF

Offers protection and covered spaces.

FURNITURE DICTATES MOBILITY AND ACCESS



WOODLAND SURFACE SECTION
1'=1/16"



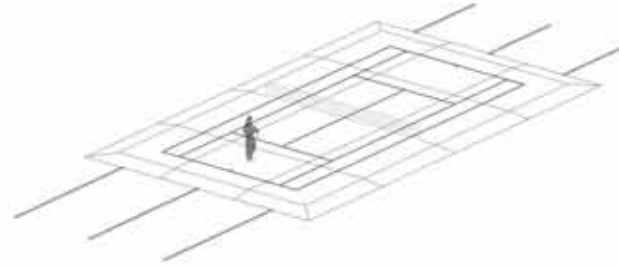
WOODLAND SURFACE
1'=1/32"



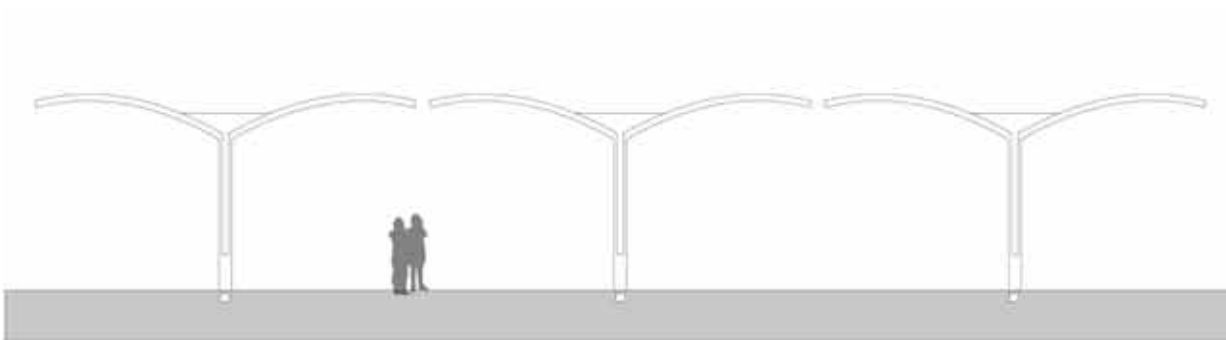
KIOSK BARRIER SECTION
1'=1/16"



KIOSK BARRIER
1'=1/16"



TENNIS COURT BARRIER
1'=1/32"



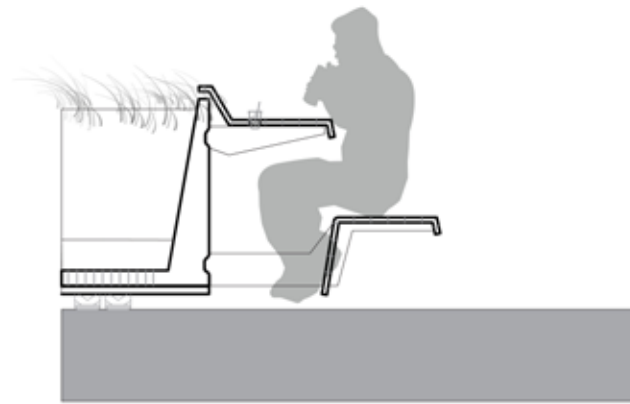
MARKET ROOF SECTION
1'=1/16"

ATTACHMENTS

Attachments provide an additional level of utility to the transformed social space of the city. They provide the pragmatic street furniture that residents demand.

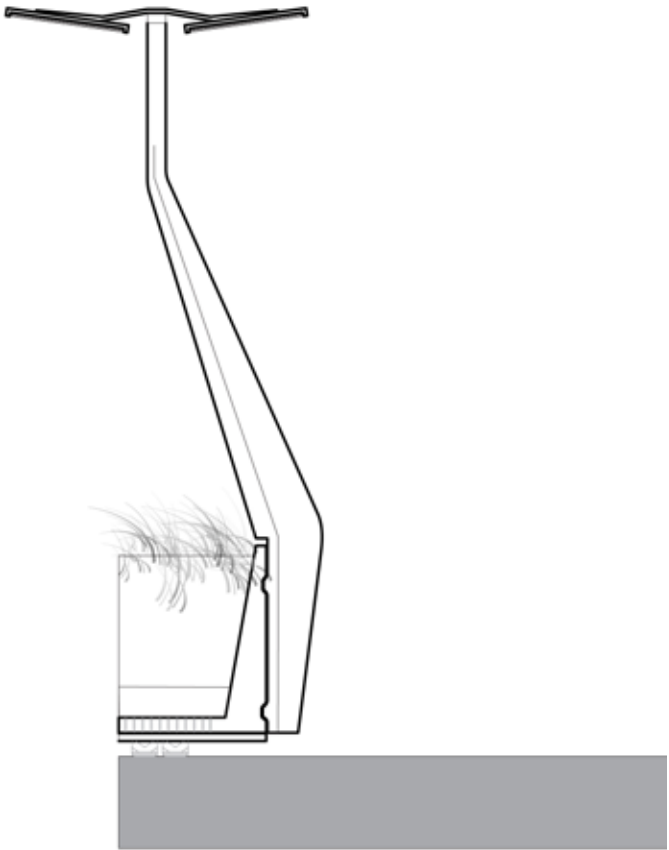


BENCH ATTACHMENT
1'=1/2"

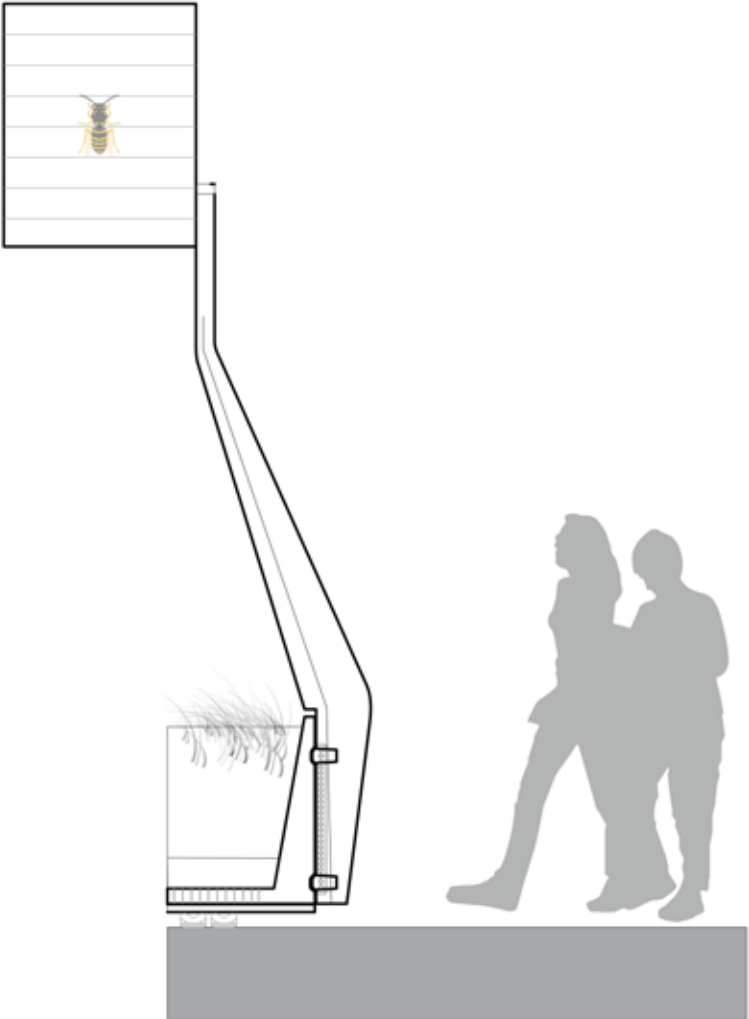


LUNCH COUNTER ATTACHMENT
1'=1/2"

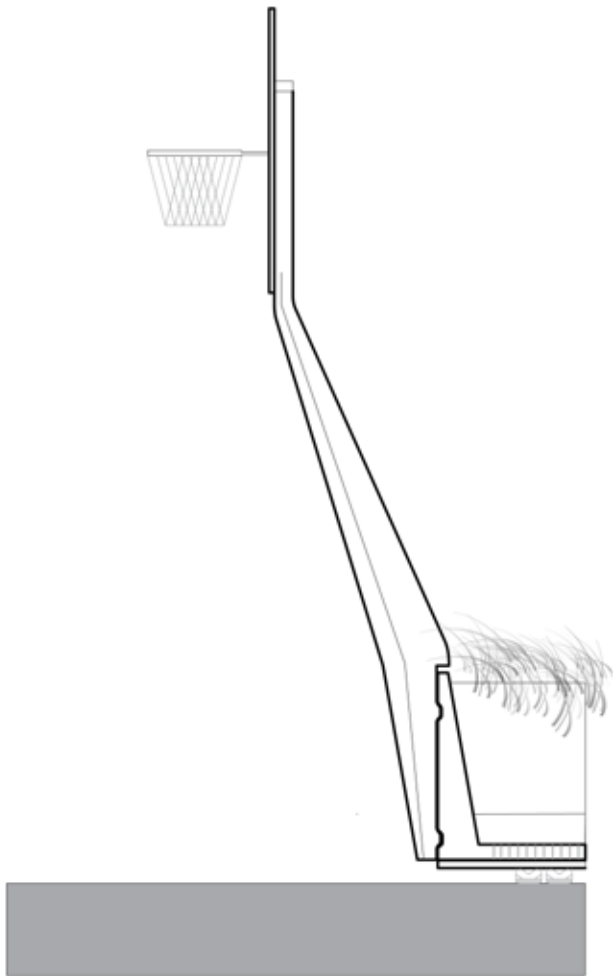
STREET LAMP ATTACHMENT
1'=1/2"



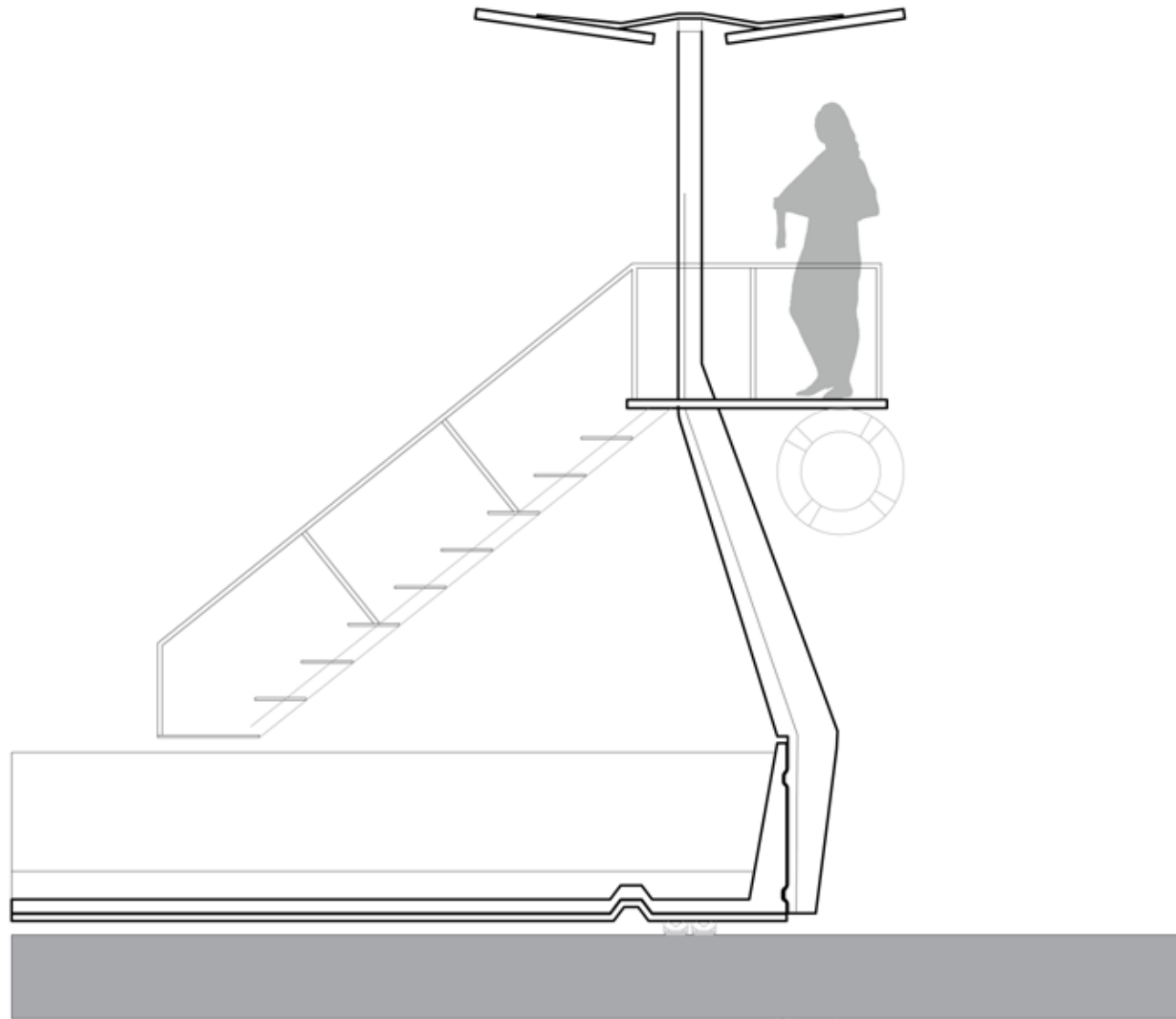
HONEYBEE HIVE ATTACHMENT
1'=1/2"



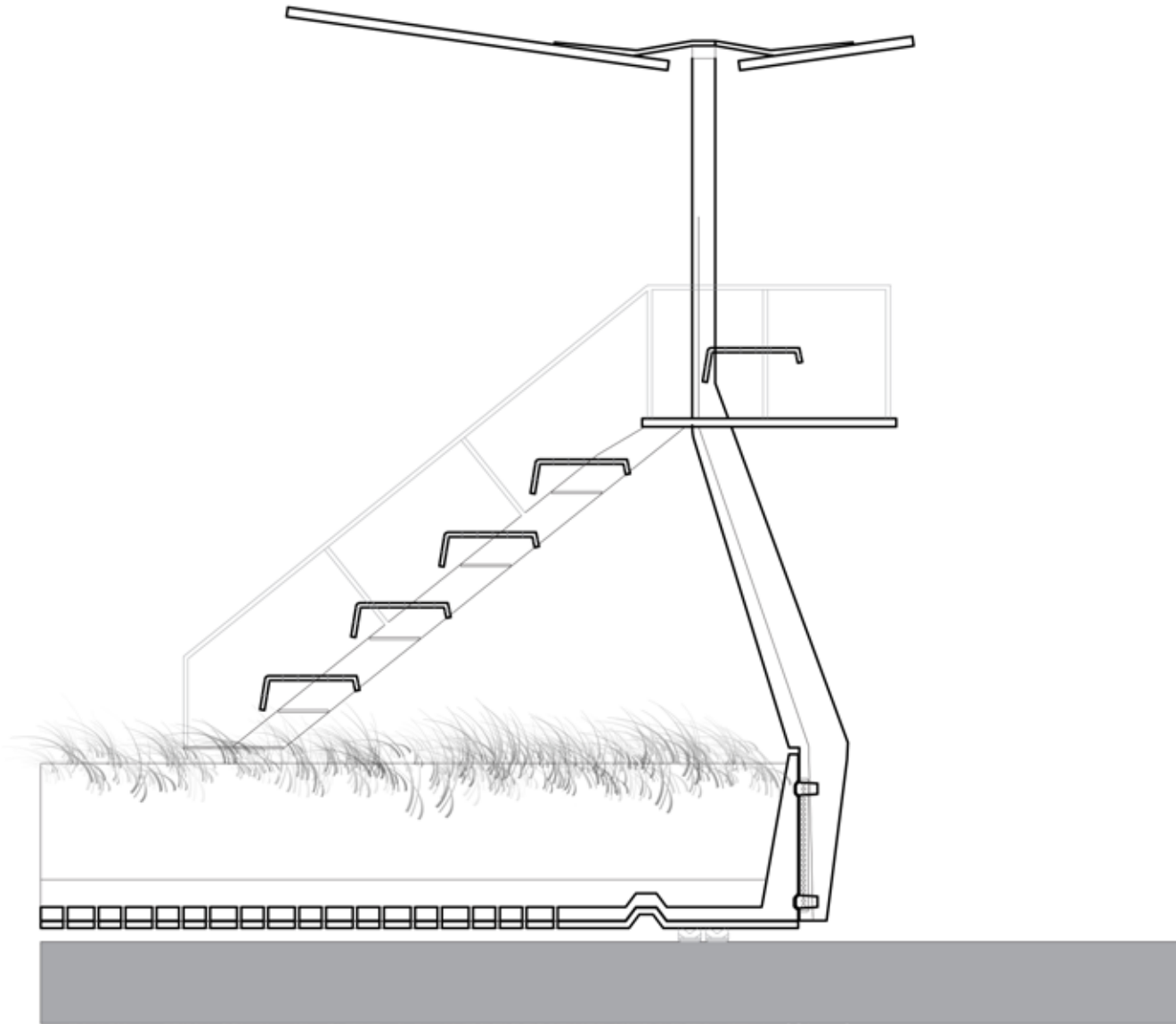
BASKETBALL HOOP ATTACHMENT
1'=1/2"



LIFEGUARD STATION ATTACHMENT
1'=1/2"



BLEACHER ATTACHMENT
1'=1/2"



DEPLOYMENT

TRANSFORMING SURFACE

The infrastructure tiles are concentrated in areas that are immobile or occupied by the city's inhabitants, in the afternoon schools and business parks, in the evening residences. These dense clusters of tiles are impassable to vehicles and provide a safe zone for pedestrians. The city surface in the inhabitants' direct vicinity is directed at safe exploration.

The tiles clustering becomes more and more loosely packed further from the epicenter of the safe zones. These areas are more passable to vehicles while still providing small clusters of programmed space.

Most traffic is brought to the South End in order to enter I-93. The infrastructure tiles still allow this possibility by delineating traffic routes to I-93, around the safe zones. Like the constantly migrating safe zones, the traffic routes also shift.

VARIETY

One advantage of this proposal is the variety of programs that can be accommodated with this system. The programs in this neighborhood change with the seasons. In the summer woodland forest with biking and walking trails are available, whereas in the winter the surface transforms into a corn maze situated in center of the city. This kind of variety is valuable and imperative to evolving surface demands.



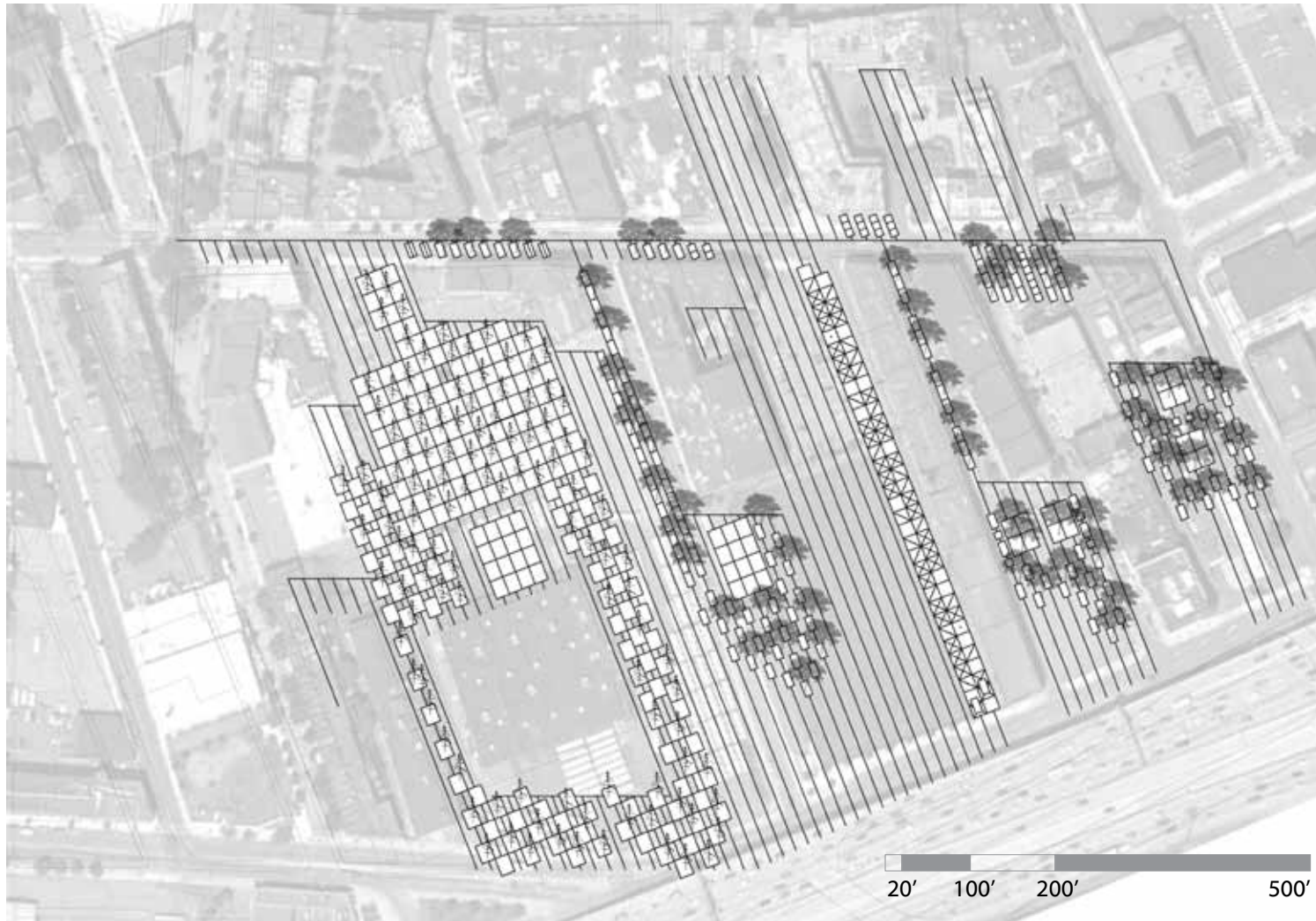
ARTIST NEIGHBORHOOD w/ WOODLAND TRAILS
SUMMER AFTERNOON



ARTIST NEIGHBORHOOD w/ WOODLAND TRAILS
SUMMER EVENING

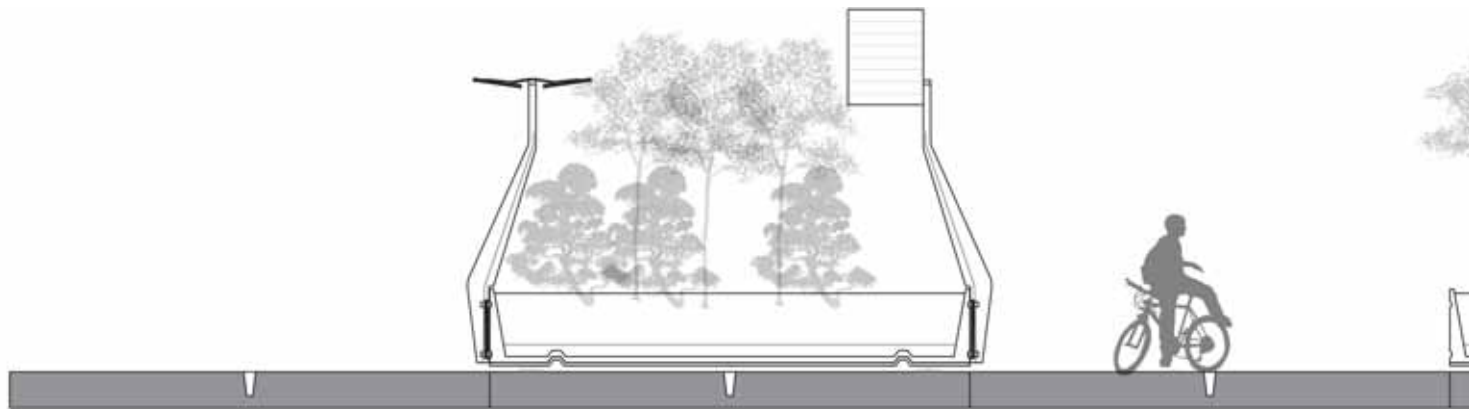


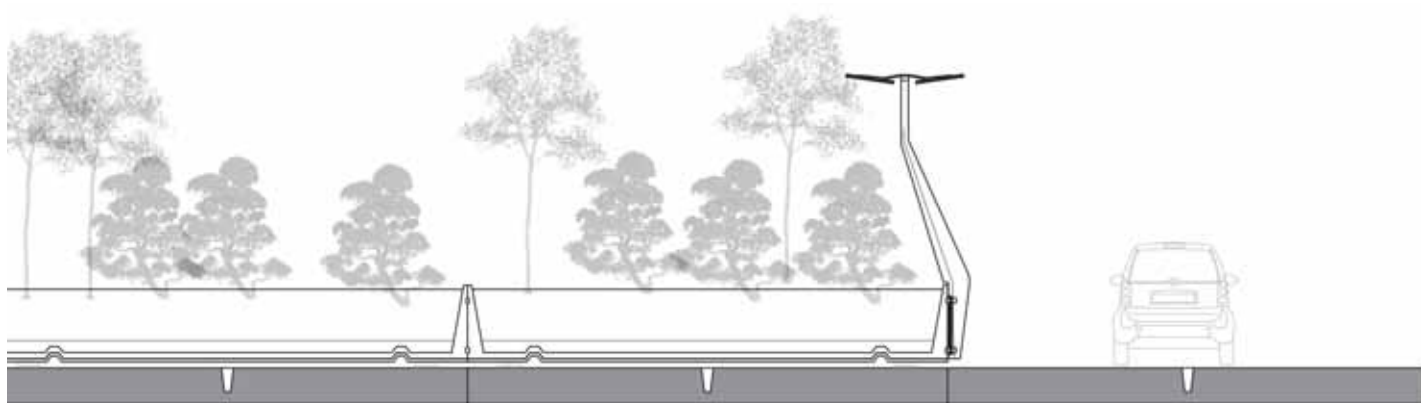
ARTIST NEIGHBORHOOD w/ CORNMAZE
AUTUMN AFTERNOON



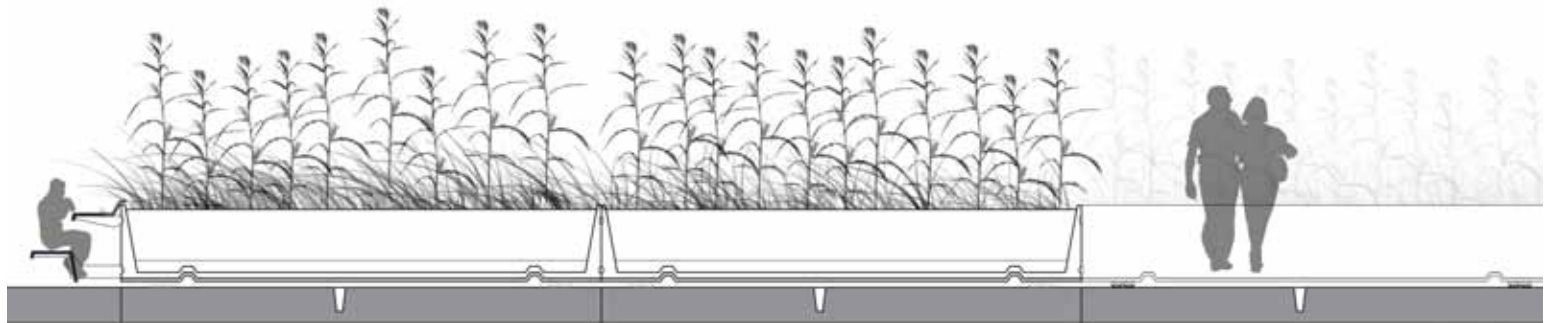
ARTIST NEIGHBORHOOF w/ CORN MAZE
AUTUMN EVENING

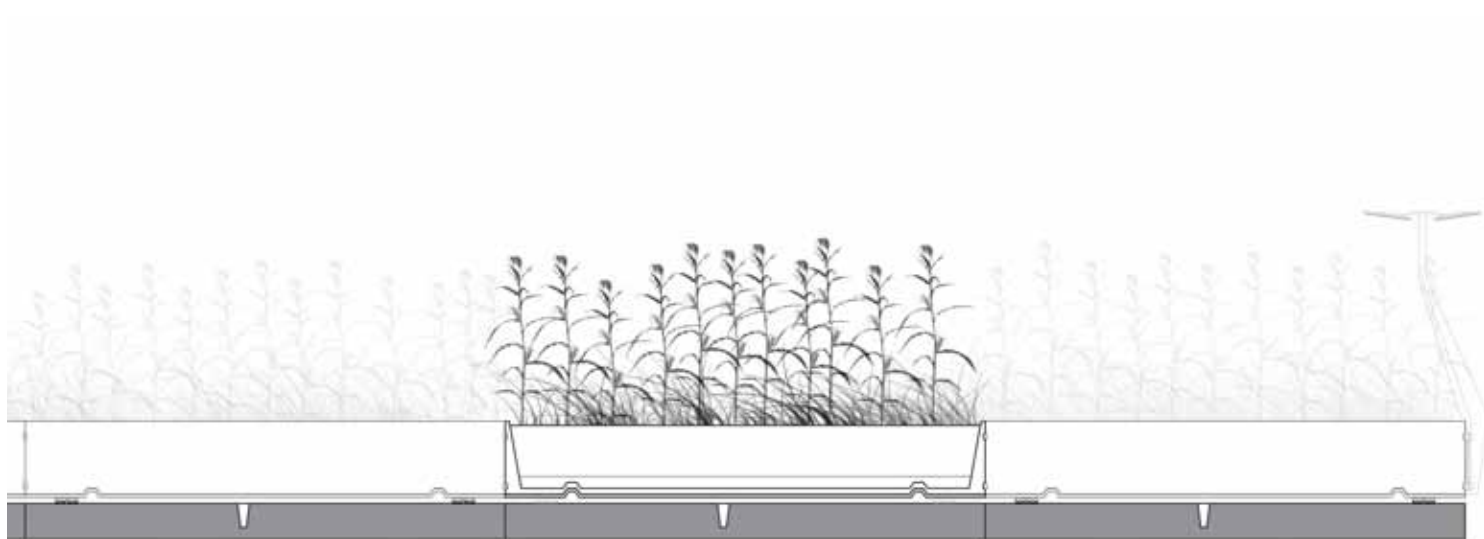
SUMMER WOODLAND SECTION
1'=1/8"





AUTUMN CORN MAZE SECTION
1'=1/8"





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