



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

# Nviro Club Lab

UNIF(y)(inno)VATION

TANA GREYLING \_ 18043977 \_ MPROF \_ '23





**intro :**

LONGTERMISM (thinking beyond the present)  
 FLOURISHING REGENERATIVE ENVIRONMENT  
 utilizing the ACCUMULATION of INNOVATION

"we have the power to destroy ourselves without the wisdom to ensure we don't"



**issue | innovation :**

INNOVATION = the gradual succession of small changes  
 INNOVATION = invention applied  
 need to DEREGULATE EXPECTATIONS  
 need for CONTINUOUS ABUNDANT COLLABORATION



**issue | environmental destruction:**

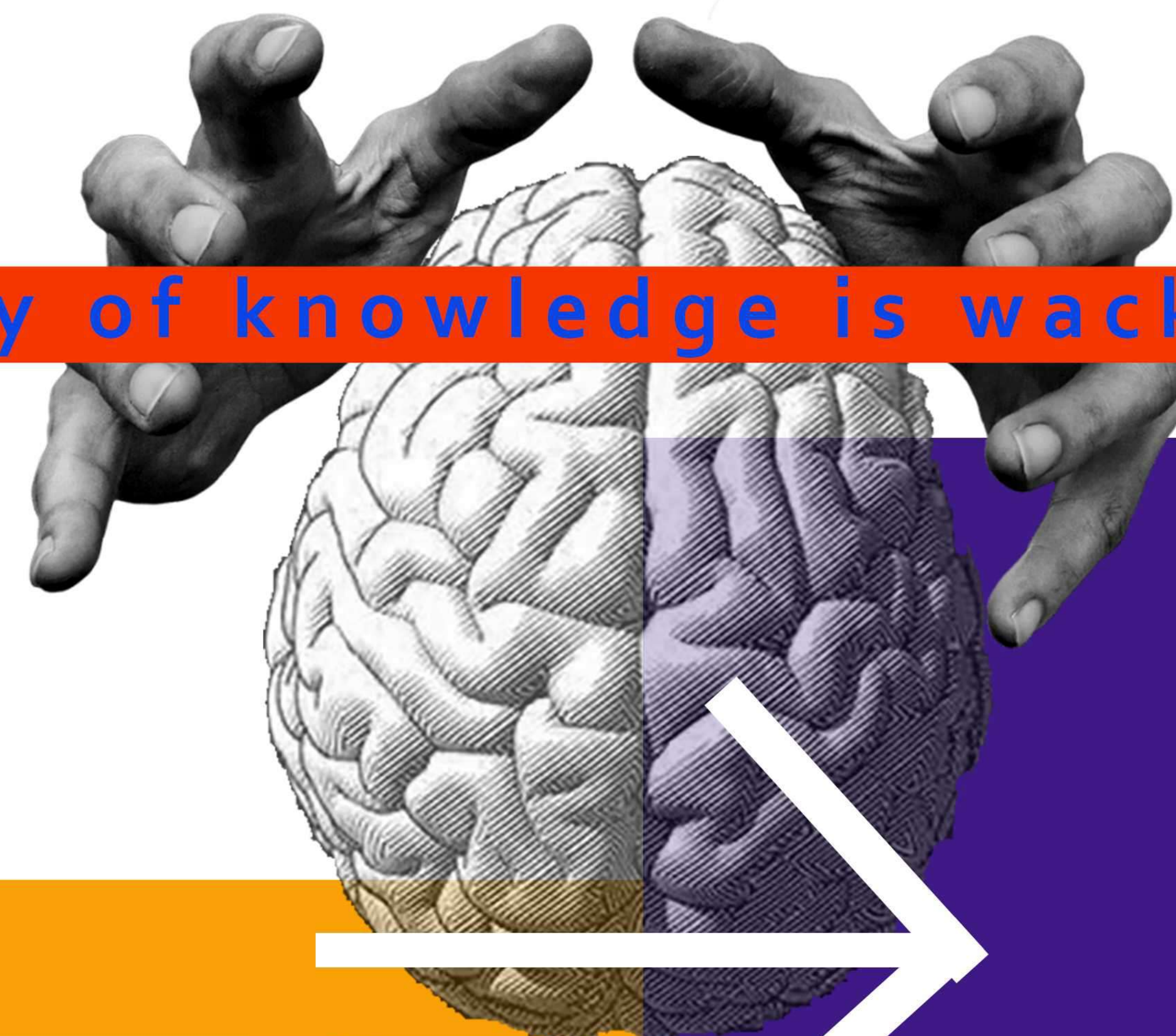
no success in 2030 GLOBAL WARMING GOALS  
 need for ENVIRONMENTAL INNOVATION  
 need for integrated BOTTOM-UP APPROACH



**the innovation problem :**

RETENTION OF KNOWLEDGE (by research institutions)  
TOP-DOWN deciding FOCUS FOR INNOVATION (strictly expert participation)  
no RECORD OF ACCUMULATION OF KNOWLEDGE

**the sacristy of knowledge is wack (bullshit)**



enthusias  
layman  
non-exper  
devotee

**citizen scientist**

**the architectural problem:**

ABSTRACTED BUILDINGS creates  
inaccessible user experiences



**the spatial problem :**

ISOLATED ISLANDS OF KNOWLEDGE  
INACCESSIBILITY OF KNOWLEDGE (fenced of)  
EXCLUSIVITY OF KNOWLEDGE // INNOVATION (contained behind closed doors)

**cathedrals**



How can unifying isolated environments, systems and bodies through the implementation of regenerative urbanism create innovative enabling spatial environments?

**DESIGN INVESTIGATION**

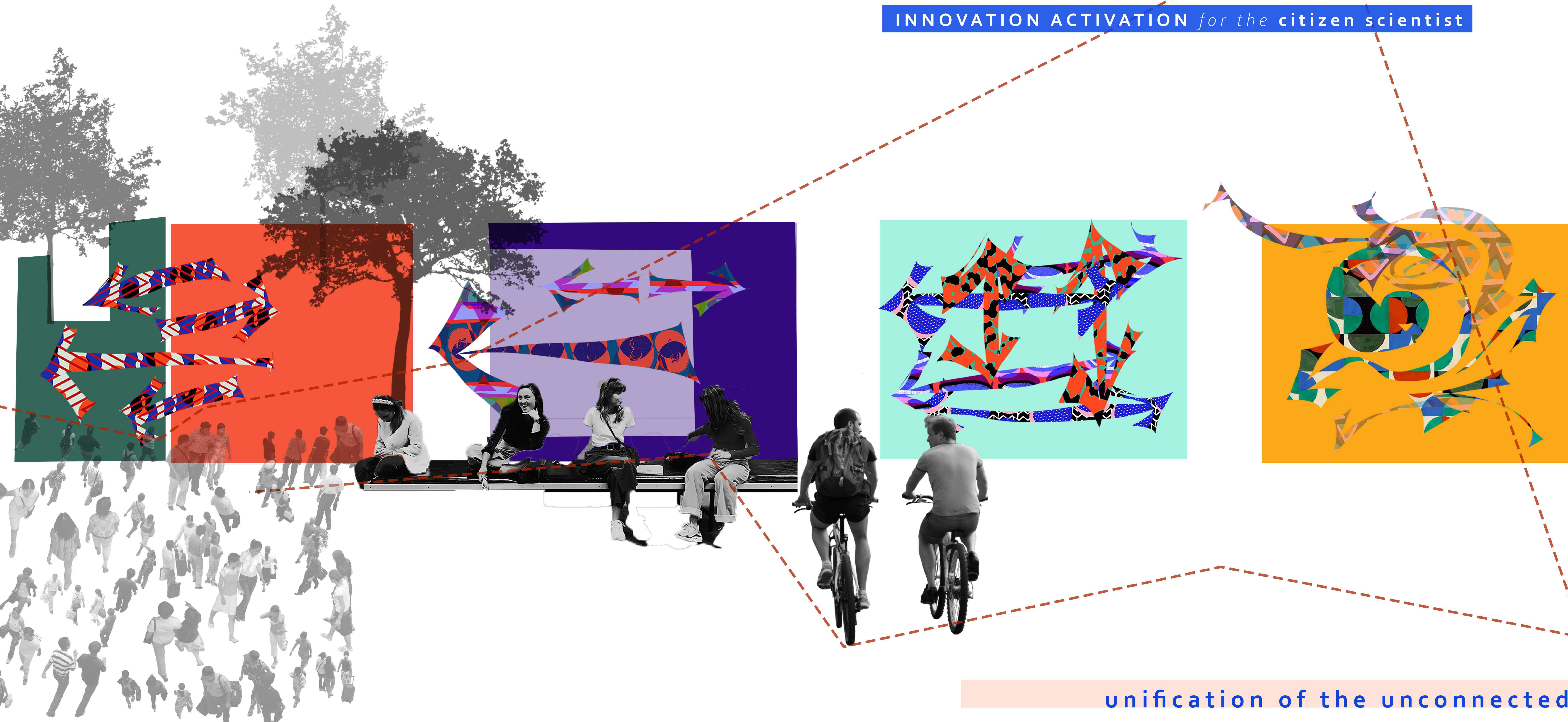


**spatial design objectives :**

ACCESSIBILITY (allows participation) RECIPROCAL INTERACTION | TRADING OF PERSPECTIVES  
CONNECTIVITY THROUGH INTEGRATION DE(ISLAND)IFICATION SPACES OF FREEDOM, CONTINUITY, COLLABORATION  
DOCUMENTING FOR MULTIPLICATION (recording and preservation of knowledge)

architecture as a gateway to knowledge

INNOVATION ACTIVATION *for the citizen scientist*



unification of the unconnected

**PROJECT OBJECTIVE**



HUMANE PEDESTRIAN SCALED INFRASTRUCTURE promoting WALKABILITY

DE-ISLANDIFICATION through context integration

knowledge on the streets

ACCESSIBILITY for PARTICIPATION

nodes of collaboration

CONNECTIVITY and INTEGRATION



living building

SHARING and the MULTIPLICATION of INNOVATION

a building where the citizen scientist practise innovation

SPATIAL DESIGN CONCEPT



investors :

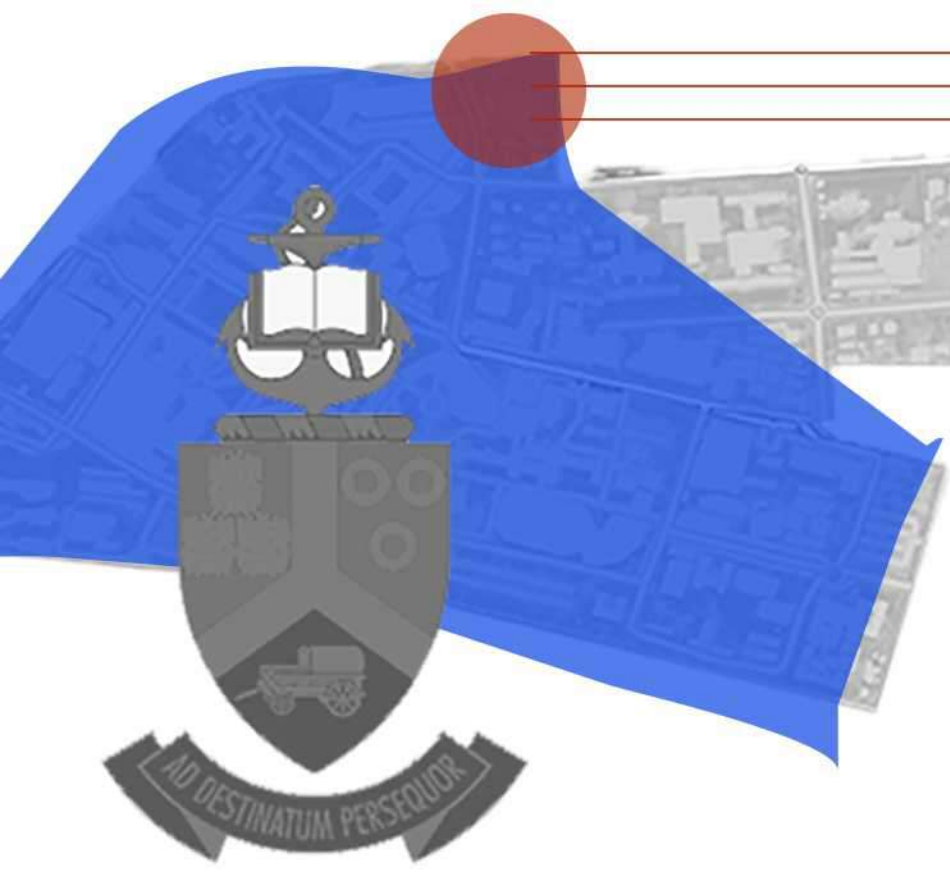
UNIVERSITY OF PRETORIA socially impactful research institution  
THE INNOVATION HUB MANAGEMENT COMPANY innovation and entrepreneurship

*innovation institutions*

investors :

professional bodies instilling CPD workshop systems

*established professionals*



*craftsman,  
tradesman*

*citizen scientists*

*artisans,  
young entrepreneurs*

**FUTURE  
WANTED  
CONDITION**

*students, young & established professionals, retired academics*

**A L L i n n o v a t i n g f o r t h e B U I L T e n v i r o n m e n t**

user // activator :

ARCHETYPE | the lifelong learner of the built environment  
MODEL INHABITANTS | citizen scientists

**STAKEHOLDERS**





## renewable energy

**bio-energy :**  
biomass, biofineries, biofuels, biopower

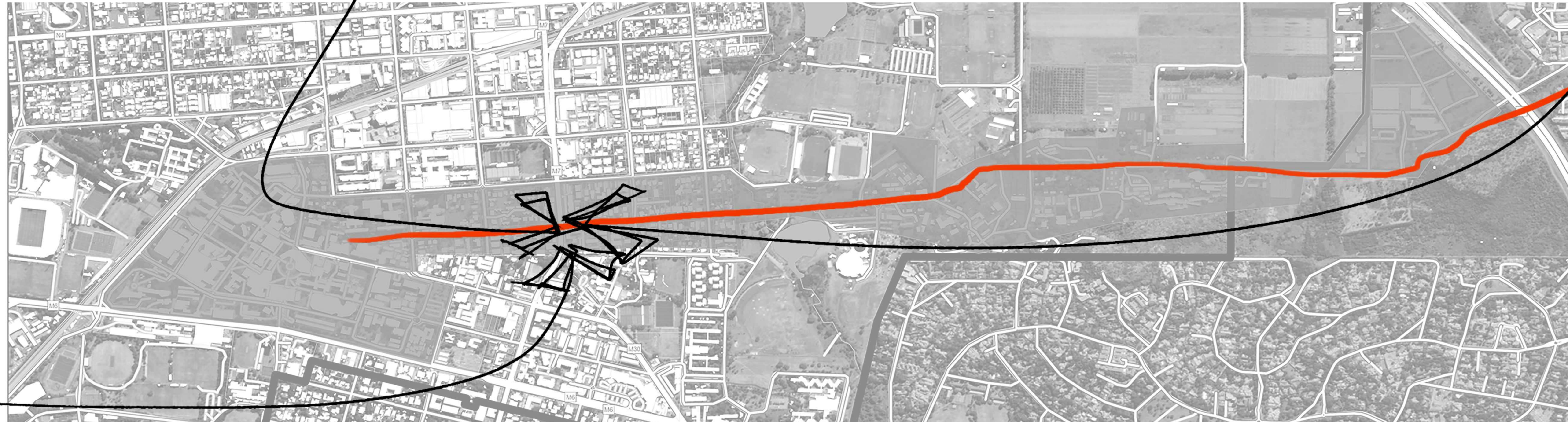
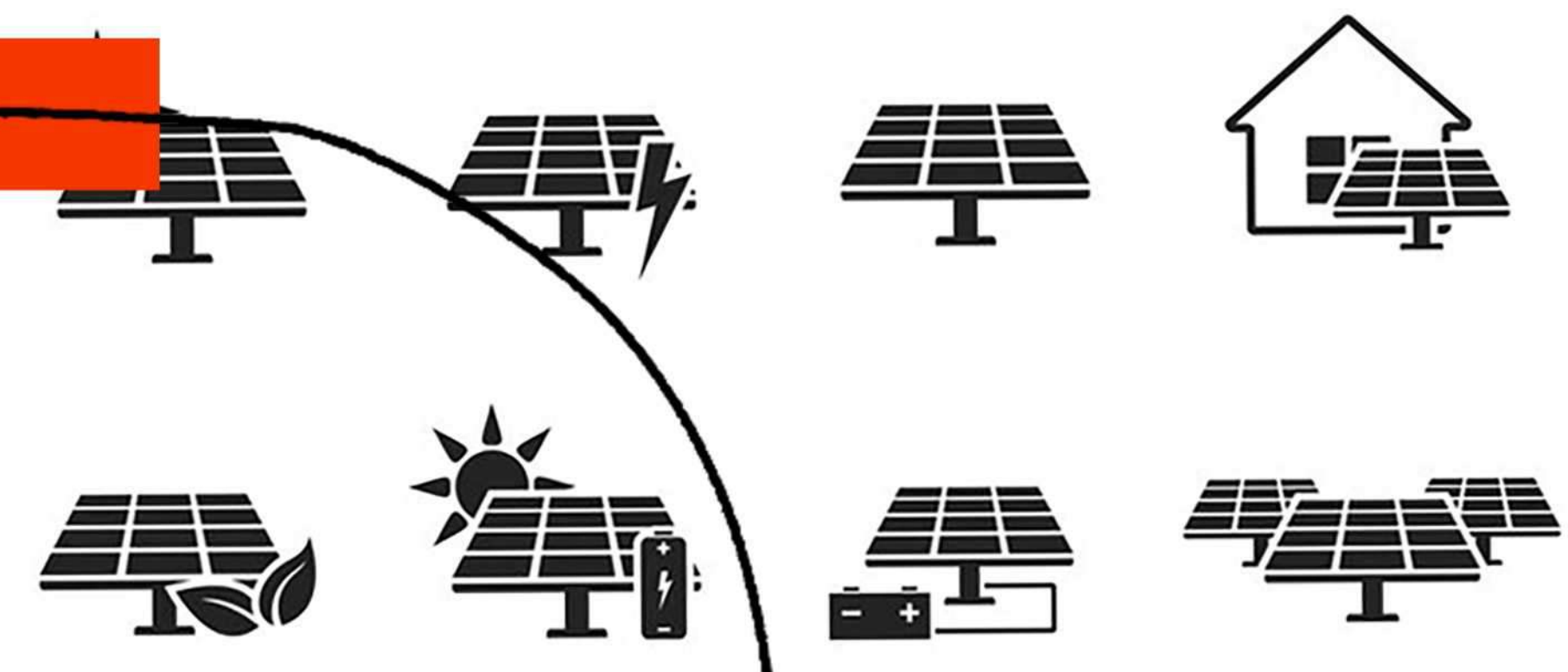
**geothermal :**  
earth heating, heat pumps

**hydrogen & fuel cells :**  
energy carrier, hydrogen & oxygen in a fuel cell

**solar :**  
solar water heating, solar photovoltaic tech,  
passive solar tech, concentrating solar power

**mobility :**  
power grid reliability, resource adequacy,  
power system resilience

**materials physics :**  
materials discovery,  
interfacial & surface science

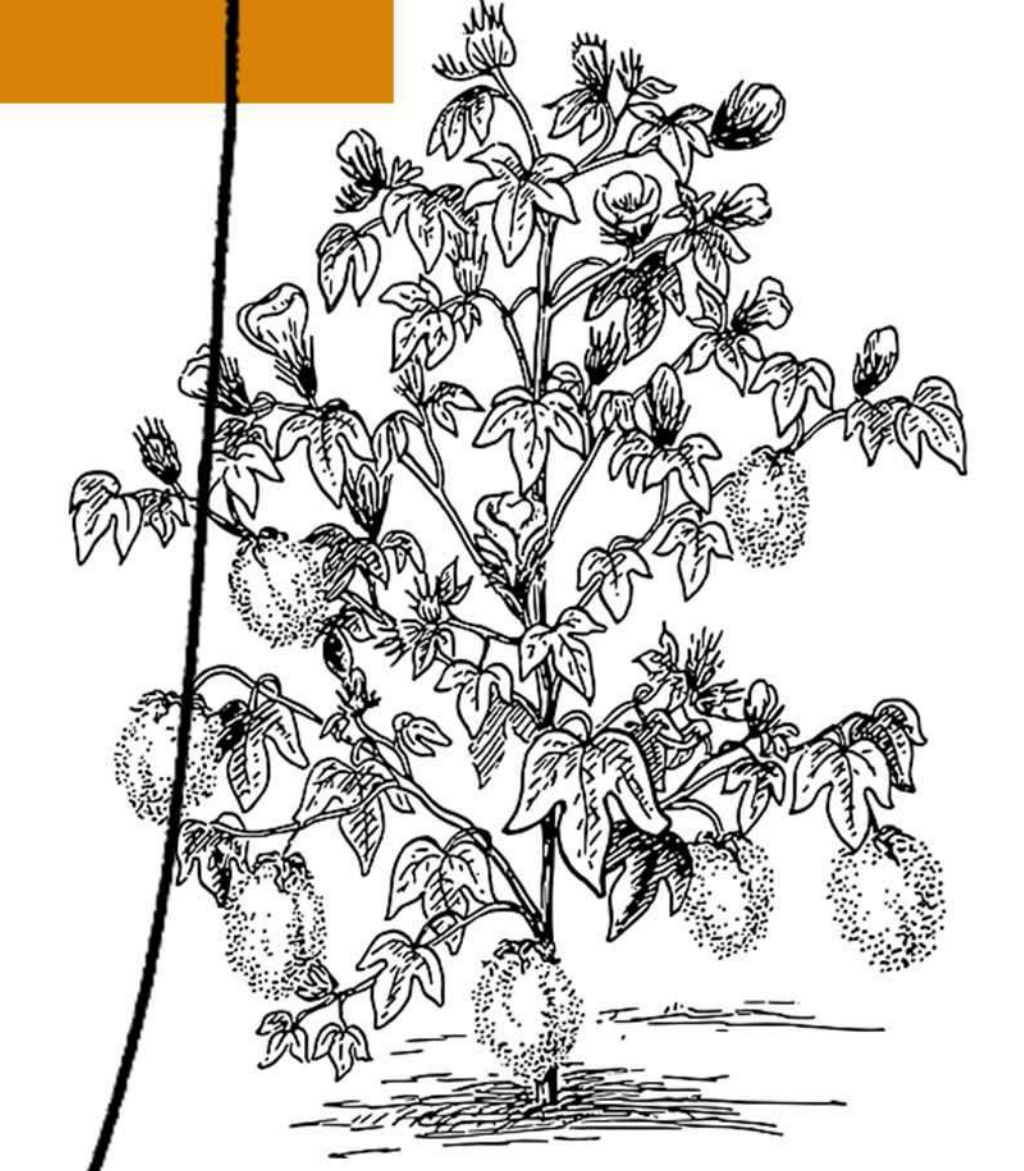


## ecological

**ecosystem services :**  
enhancing biodiversity, water systems

**vertical planting :**  
climate adaptation species, bamboo forest

**cultural relationships with nature :**  
potential of indigenous species



## materials & building systems

**material re-use :**  
timber-crete, bamboo ferrock, waste products,  
newspaper wood, recycled glass

**climate change adaptation strategies :**  
retrofitting technologies, roof material applications,  
bio-sensors, environmental monitoring

**advanced manufacturing of polymers :**  
chemical reaction of joining molecules, heating,  
shaping, forming



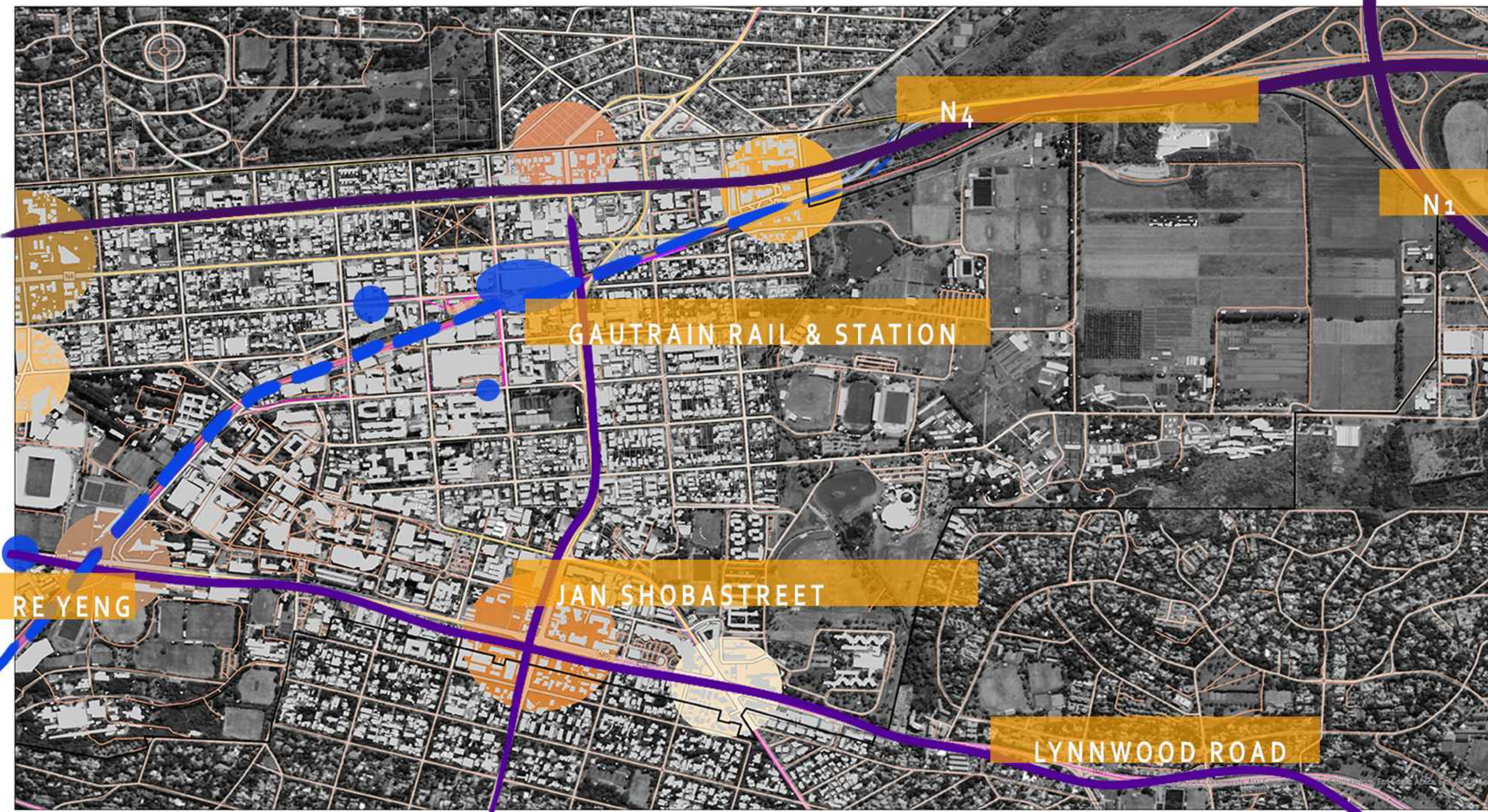
INNOVATION PROGRAMMATIC REQUIREMENTS

PROGRAM



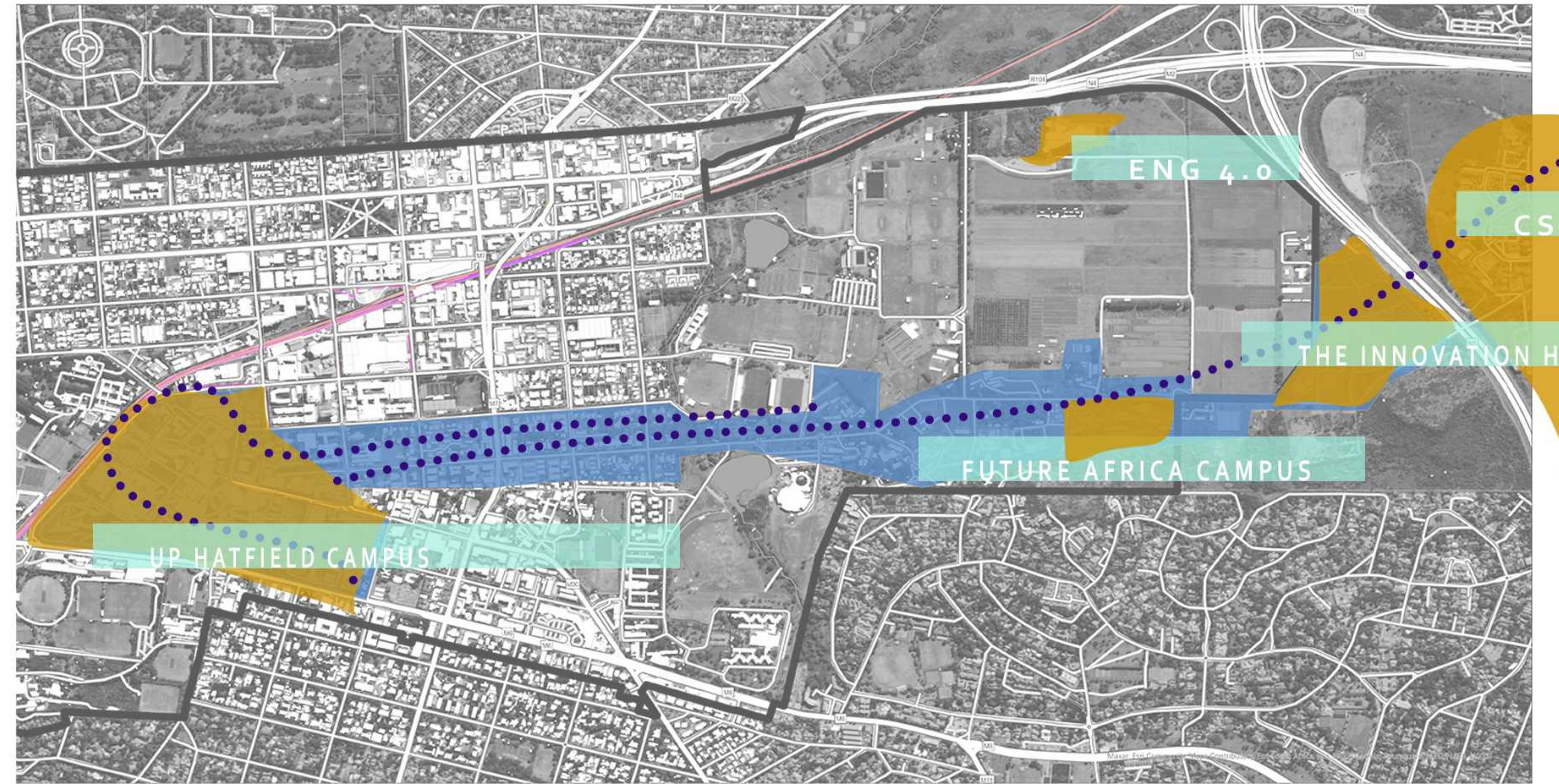






**transport | connectivity :**

PRIMARY GATEWAYS  
 AXIS'S | CORRIDORS  
 PUBLIC TRANSPORT



**meso site market connection :**

UNIVERSITY OF PRETORIA HILLCREST CAMPUS  
 SOUTH STREET CONNECTION  
 INNOVATION AFRICA



**hatfield development perspective**

**urban integration :**

CONNECTING KNOWLEDGE INSTITUTIONS THROUGH  
 UTILIZING THE SOUTH STREET CONNECTION BY  
 INTRODUCING KNOWLEDGE GATEWAYS

**policy support :**

TRANSPORT CONNECTION PEDESTRIANISED CORRIDOR



**MACRO CONTEXT**





1//  
BUILDING INTENTION

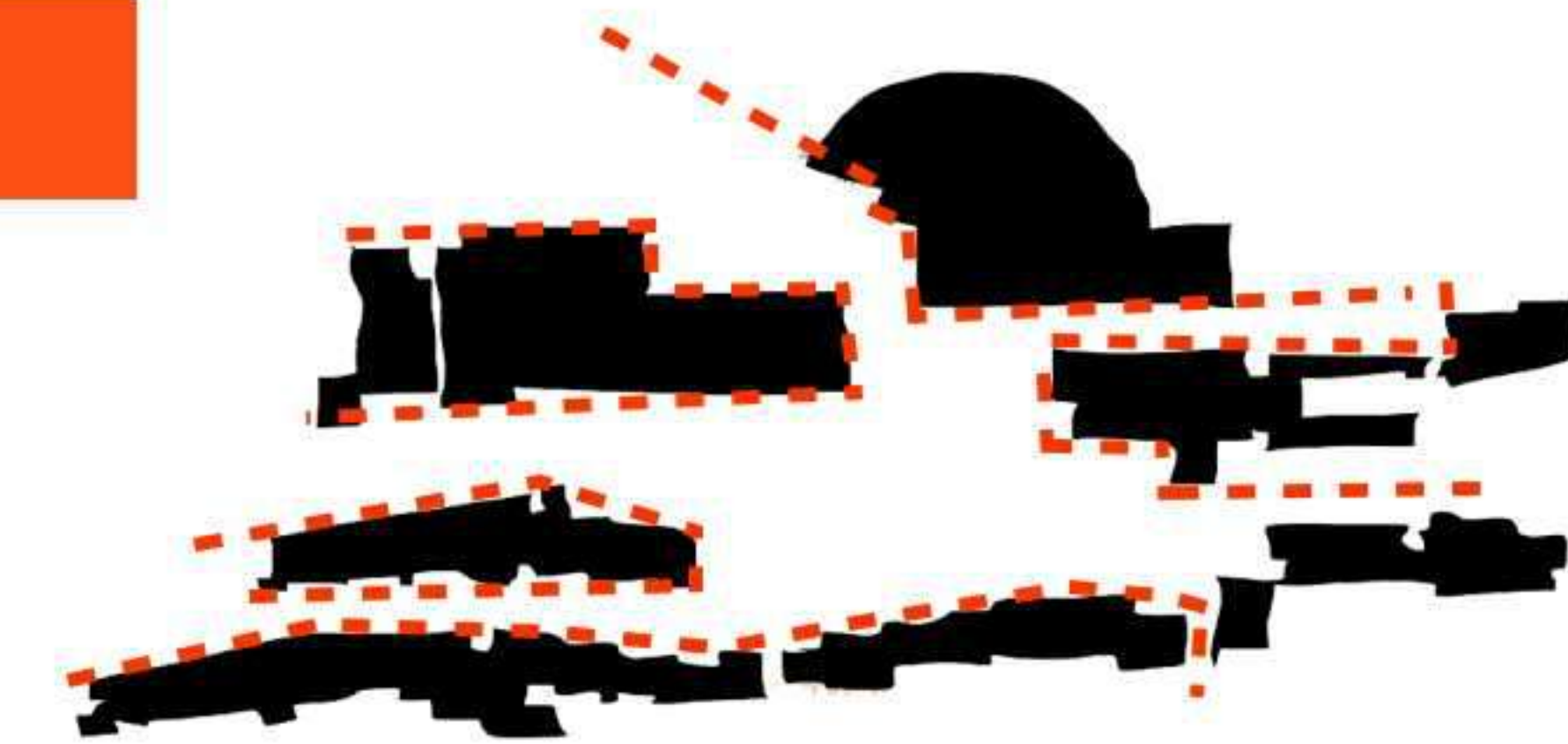
THE AMENITIES AND ACCOMODATION  
SCHEDULE OF LABORATORY,  
CO-WORKING AND WORKSHOP  
SPACES ARE SATISFACTORY



successfull  
unsuccessfull

2//  
PROGRAM SPACE INTEGRATION

SPACES AND PROGRAMS ARE ISOLATED THROUGH UNPERMEABLE PHYSICAL BOUNDARIES  
THE VISUAL ACCESS TO THE CONCRETE LAB READS AS A SHOW OR CONFERENCE



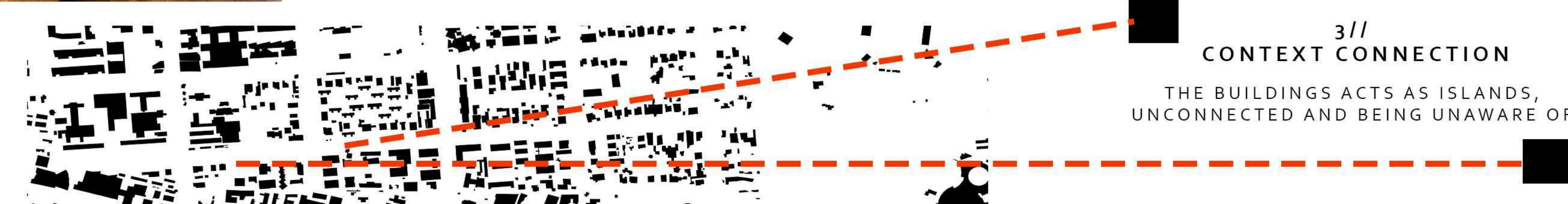
2//  
PROGRAM SPACE INTEGRATION

SPACES AND PROGRAMS AREN'T INTEGRATED AS  
BUILDINGS HOUSE SPECIFIC PROGRAMS AND SPACES  
AND PROGRAMS THUS BECOME DISJOINTED



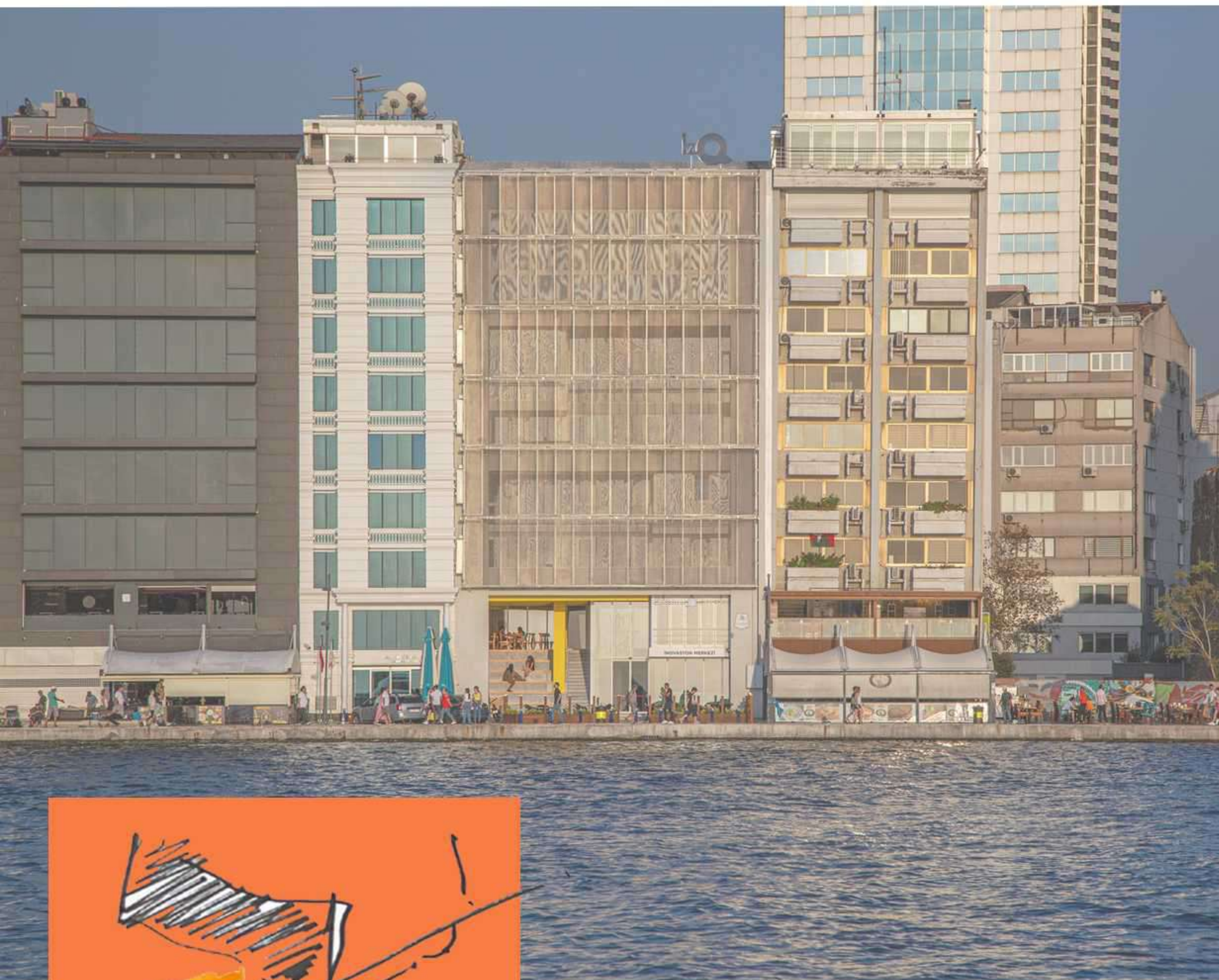
3//  
CONTEXT CONNECTION

THE BUILDINGS ACTS AS ISLANDS,  
UNCONNECTED AND BEING UNAWARE OF



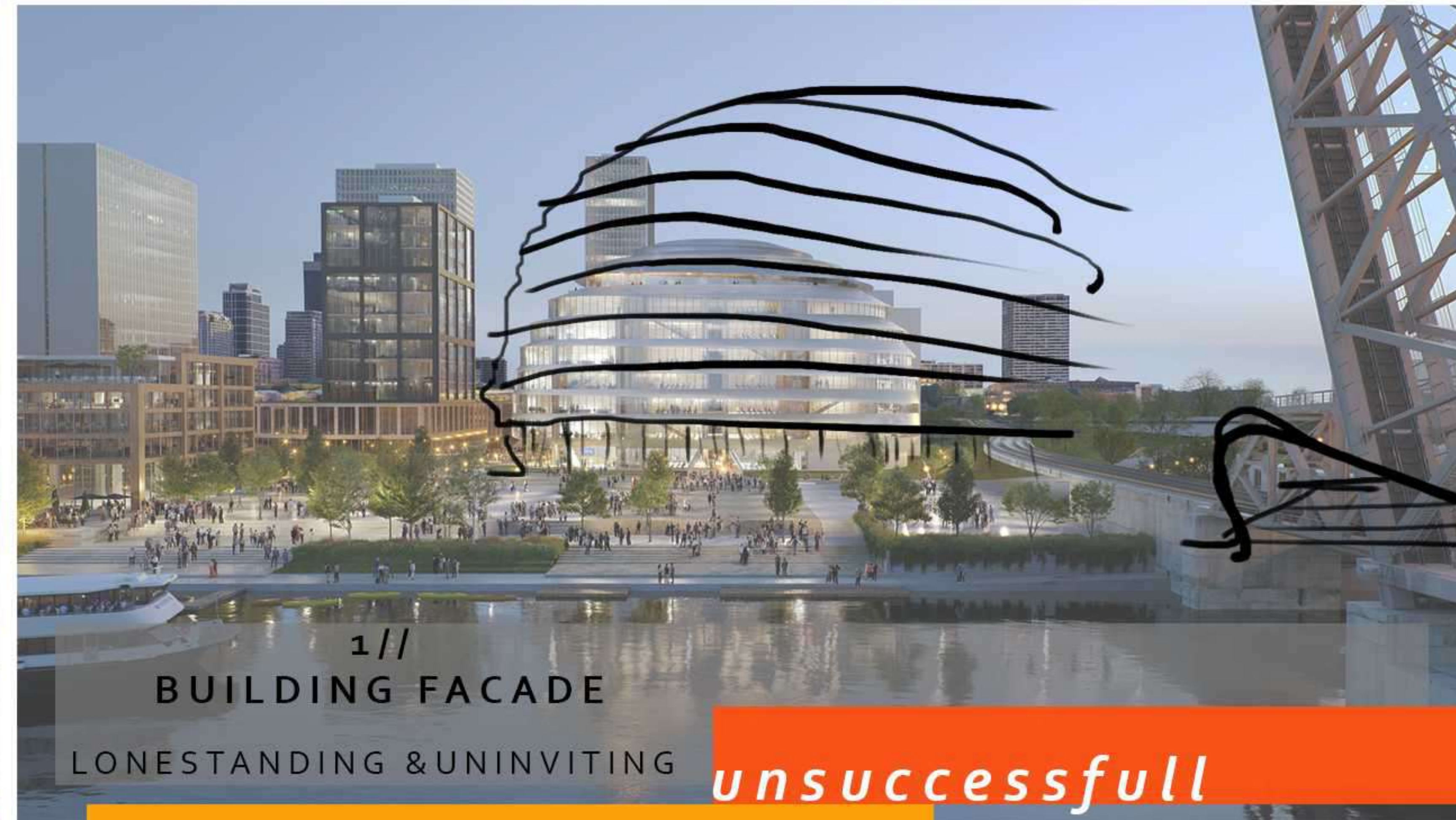


**IZO INNOVATION CENTRE**  
@IZMIR, TURKEY by OFISVESAIRE



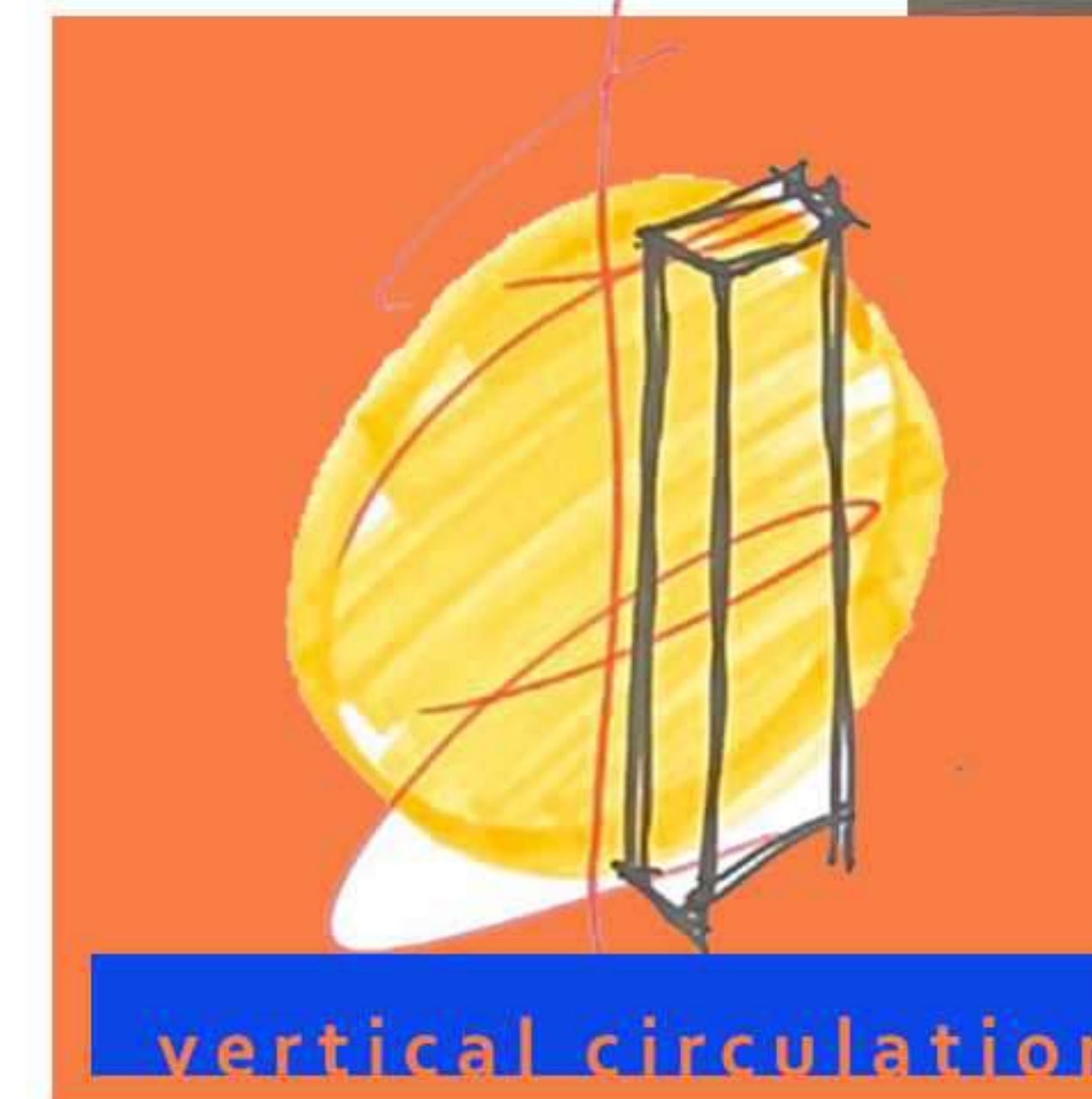
**3//**  
**CONTEXT CONNECTION**  
PEDESTRIAN FOCUSED ENTRANCES  
THAT INTEGRATES WITH PUBLIC  
SURROUNDING CONTEXT

**DISCOVERY PARTNERS INSTITUTE HEADQUARTERS**  
@UNIVERSITY OF ILLINOIS SYSTEM, CHICAGO by OMA

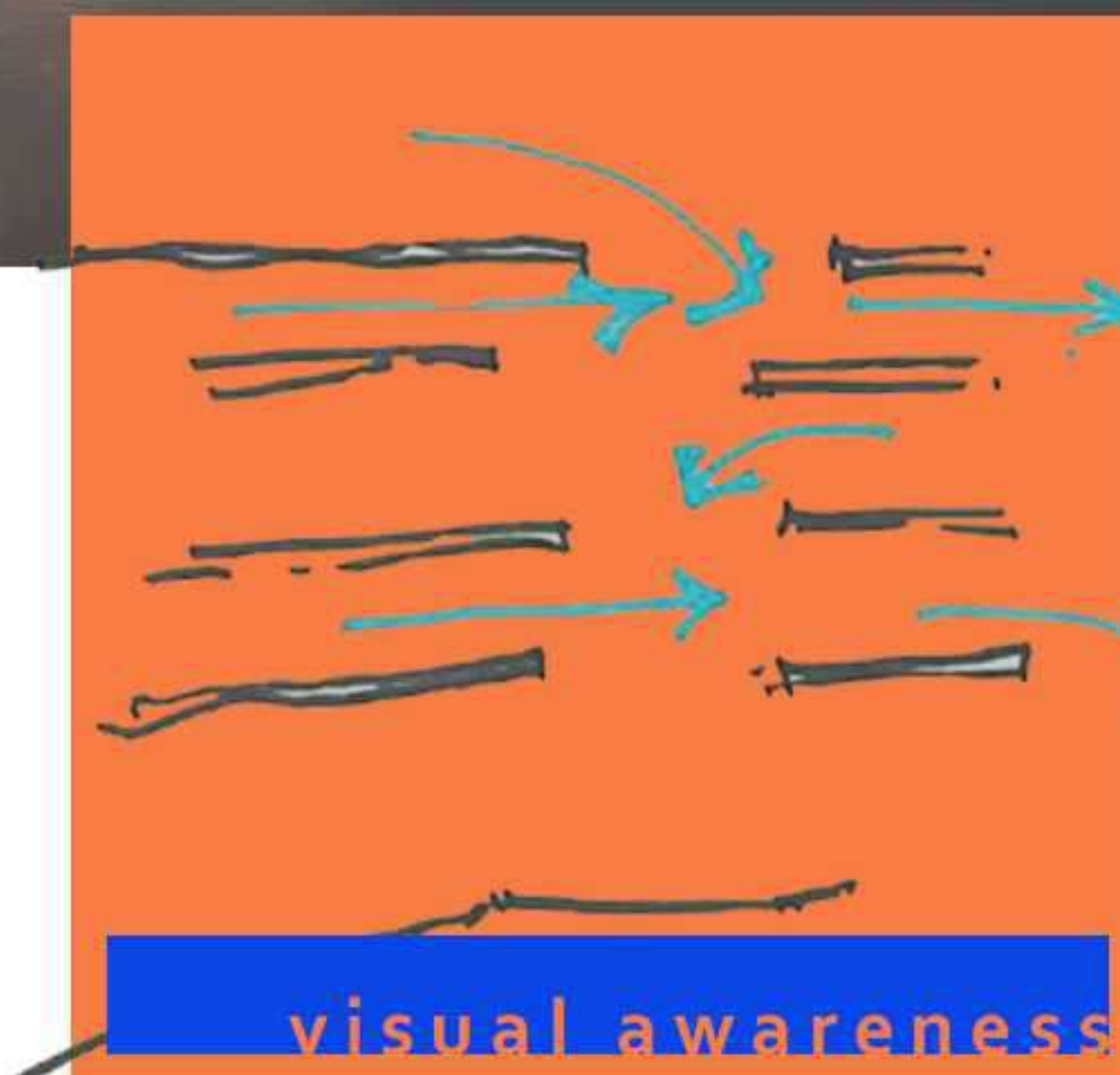


**1//**  
**BUILDING FACADE**  
LONESTANDING & UNINVITING *unsuccessful*  
*successful*

**2//**  
**BUILDINGS INTENTIONS**  
DRIVING INNOVATION OF THE EVOLUTION  
OF FUTURE CITIES THROUGH  
ENVIRONMENTAL SOLUTIONS



*vertical circulation*

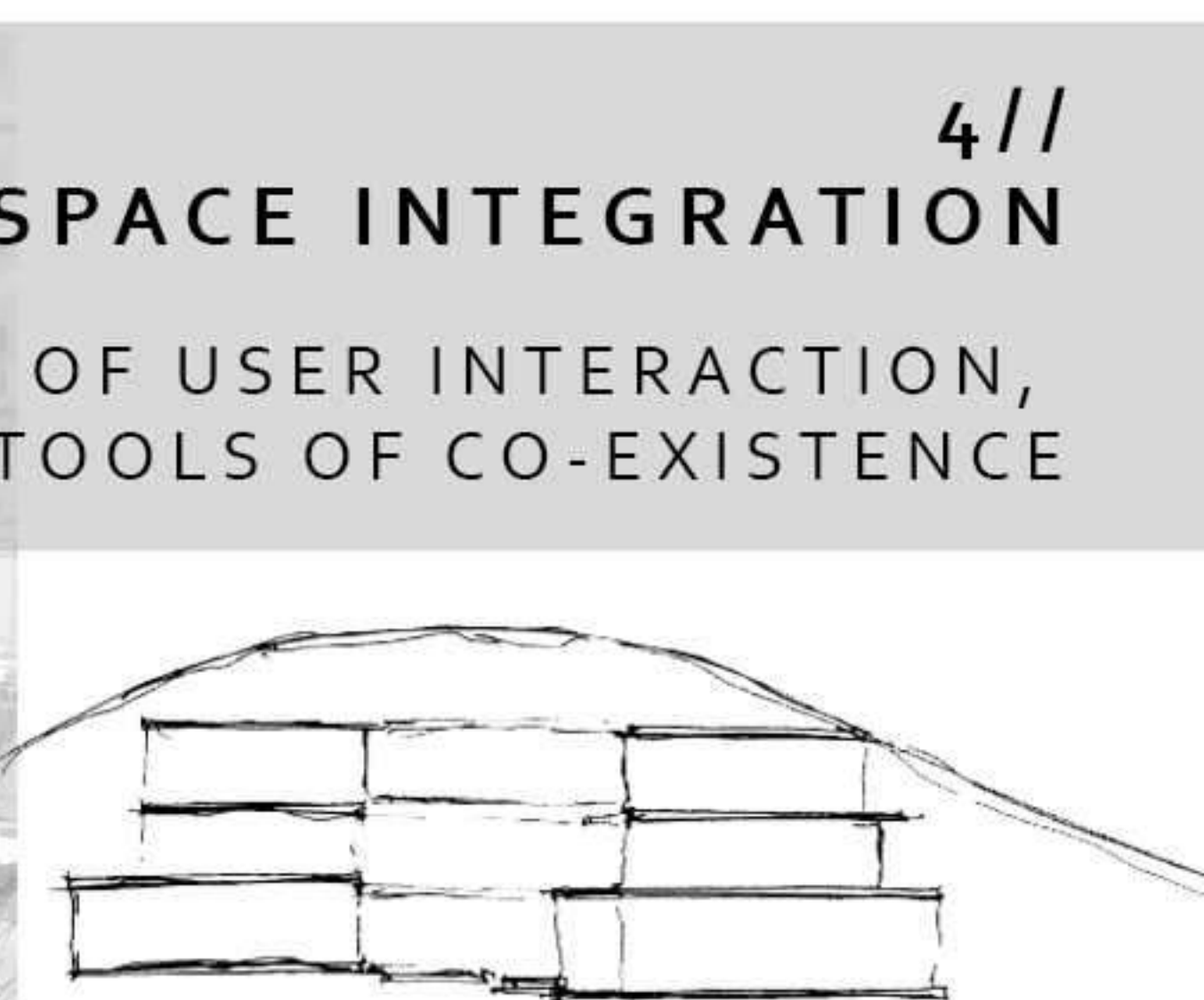
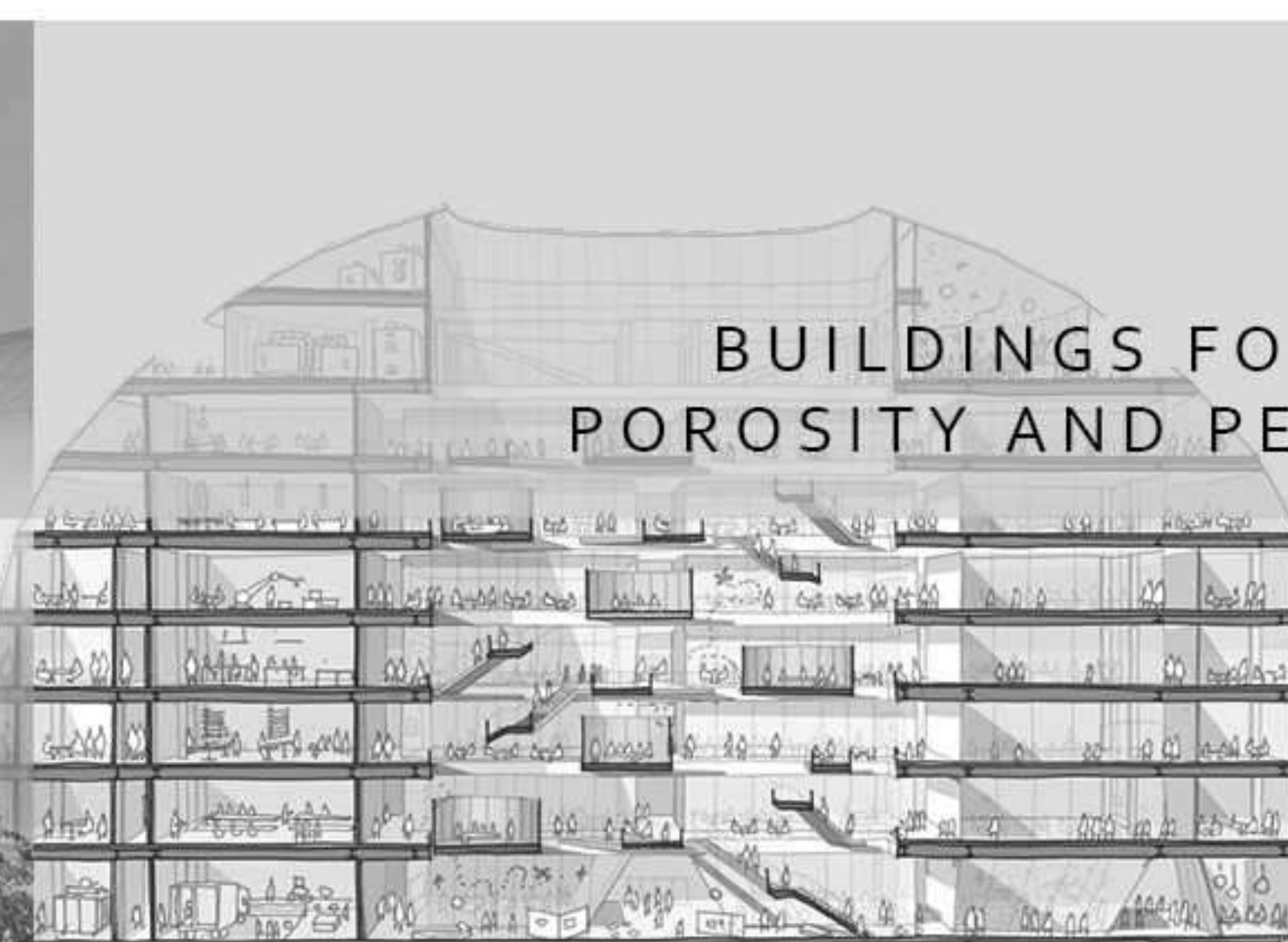


*visual awareness*



*micro-habitats*

**CREEKSIDE URBAN TECH INSTITUTE**  
@AL JADDAF, DUBAI by URB



**4//**  
**PROGRAM SPACE INTEGRATION**  
BUILDINGS FOSTER INTEGRATION THROUGH PRINCIPLES OF USER INTERACTION,  
POROSITY AND PERMEABILITY AS WELL AS TOGETHERNESS TOOLS OF CO-EXISTENCE

**INTERNATIONAL PRECEDENTS**



socio-economic characteristics

78% // 19-22 yrs  
POPULATION DEMOGRAPHIC

> 1/3 // bachelors|post grad  
HIGHEST EDUCATION

> 80% // between 18-64  
NON-ECONOMICALLY ACTIVE

> 80% // rental accommodation  
HOUSING TYPOLOGIES

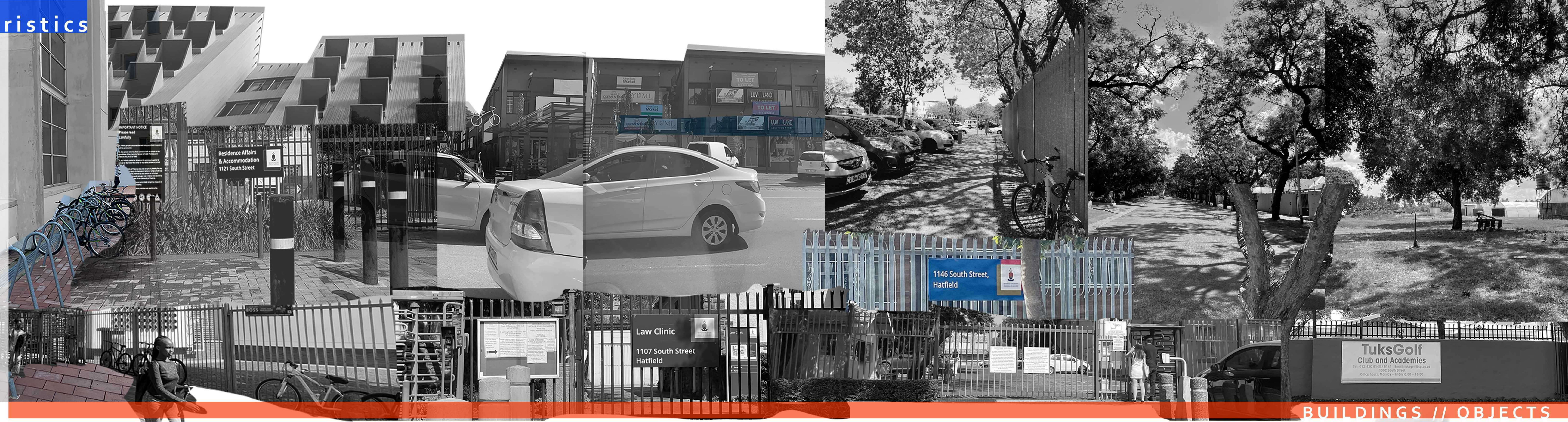
uni institution

uni residents

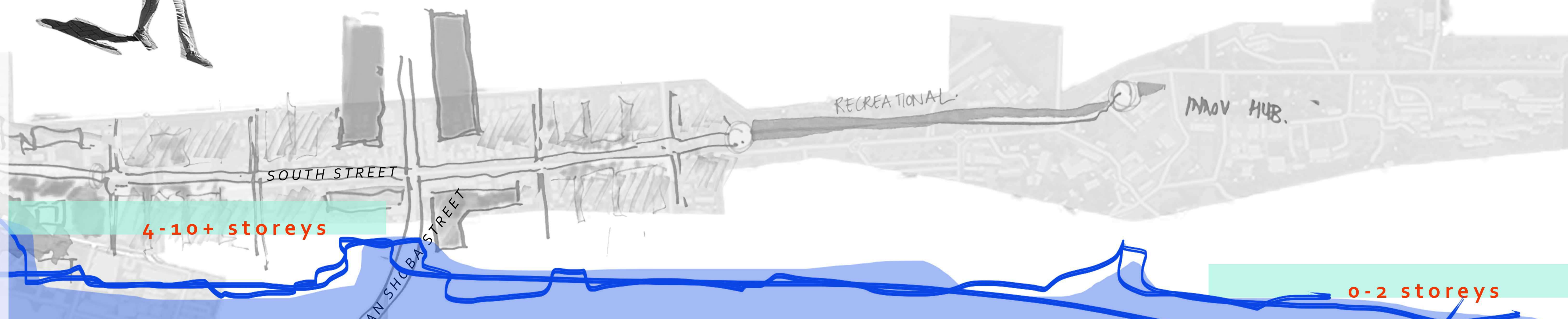
street scape

low uni-resi

experimental farm

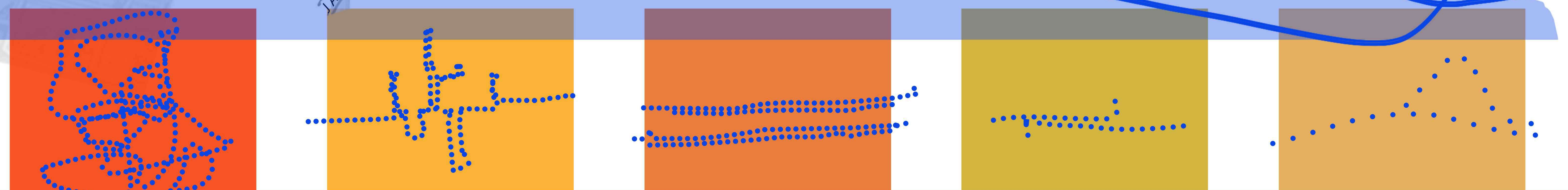


BUILDINGS // OBJECTS



4-10+ storeys

0-2 storeys



MOVEMENT // MASSING HEIGHT

SOUTH STREET MESO CONTEXT



university institution

uni residents // commercial

low uni-resi



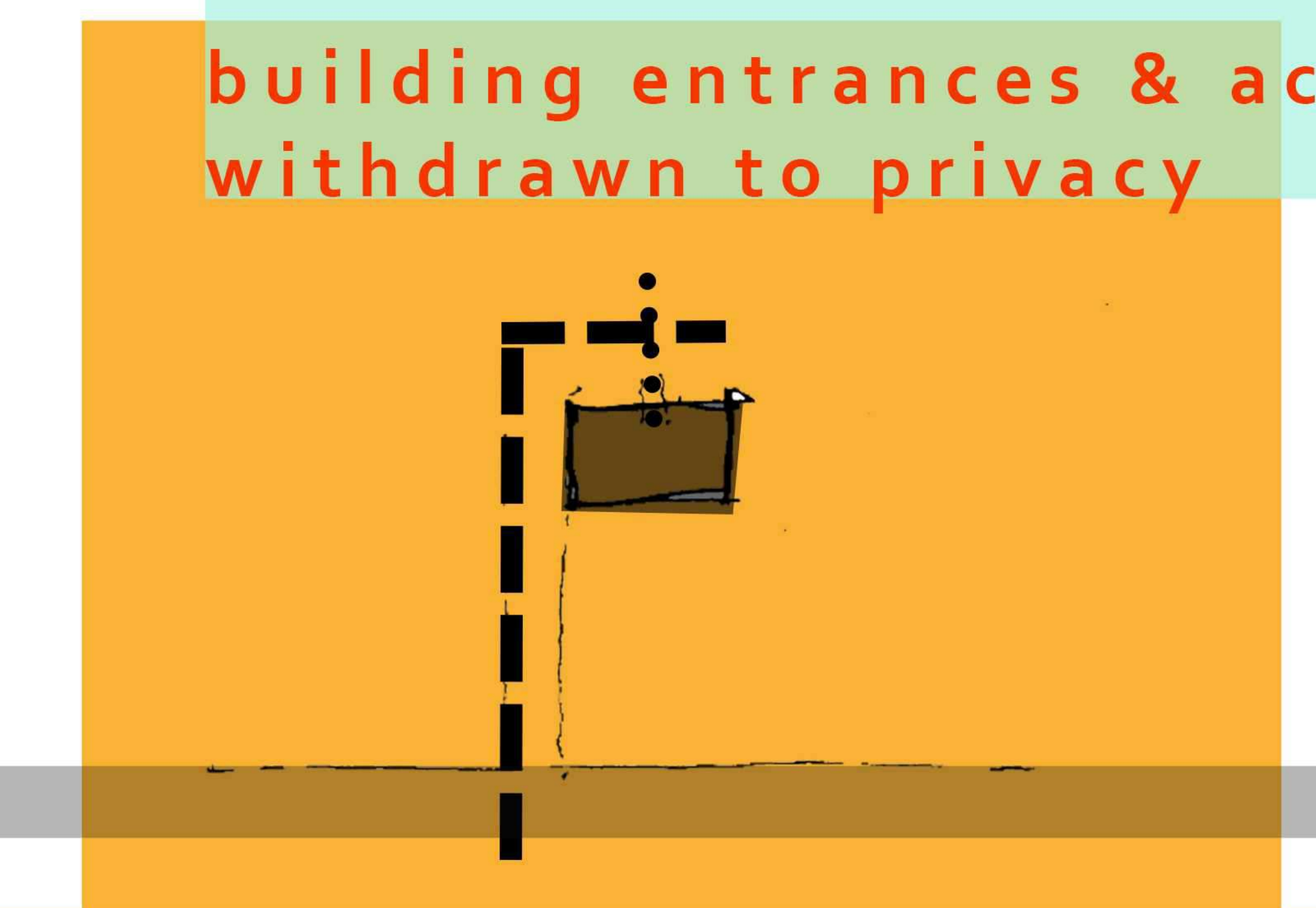
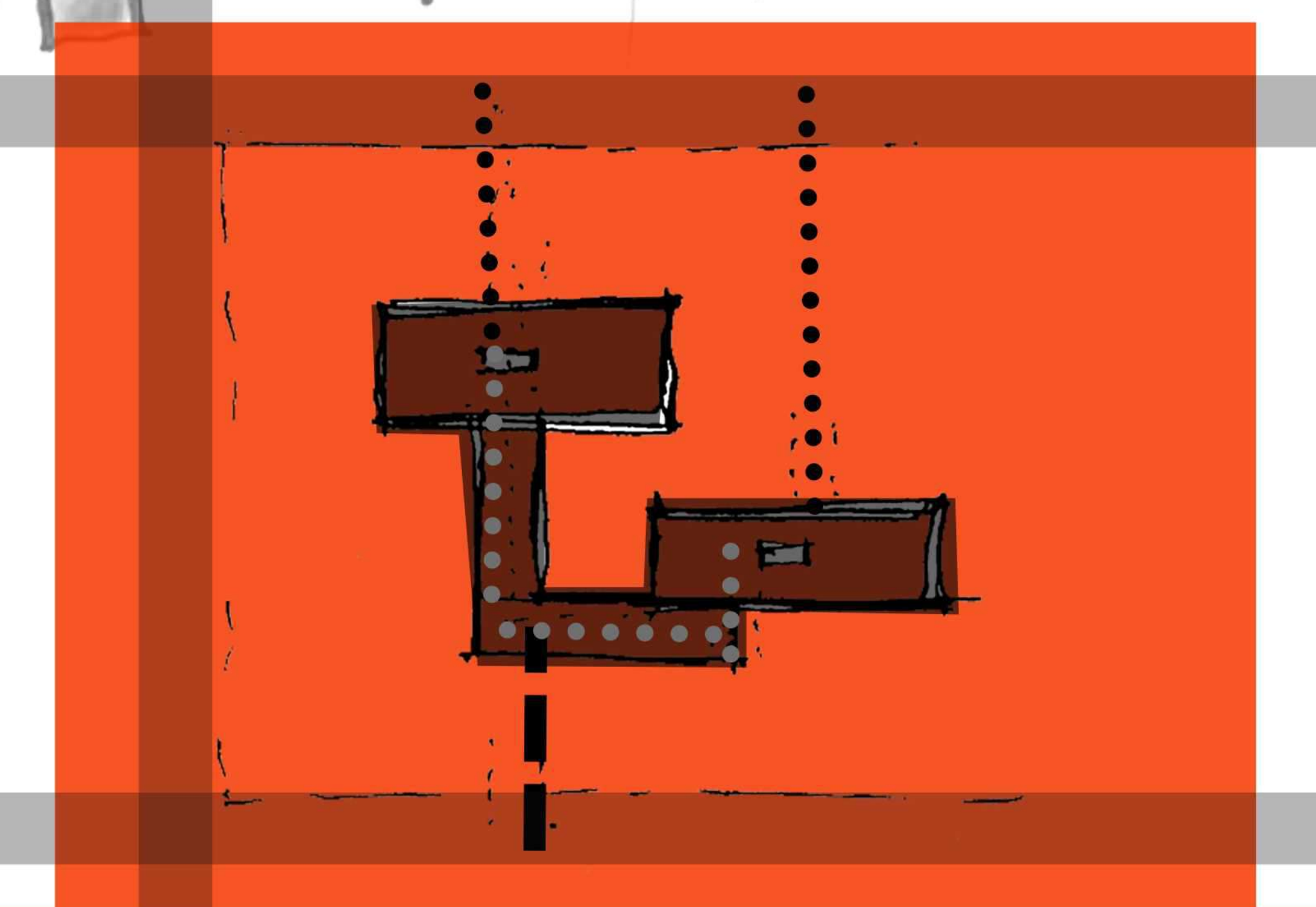
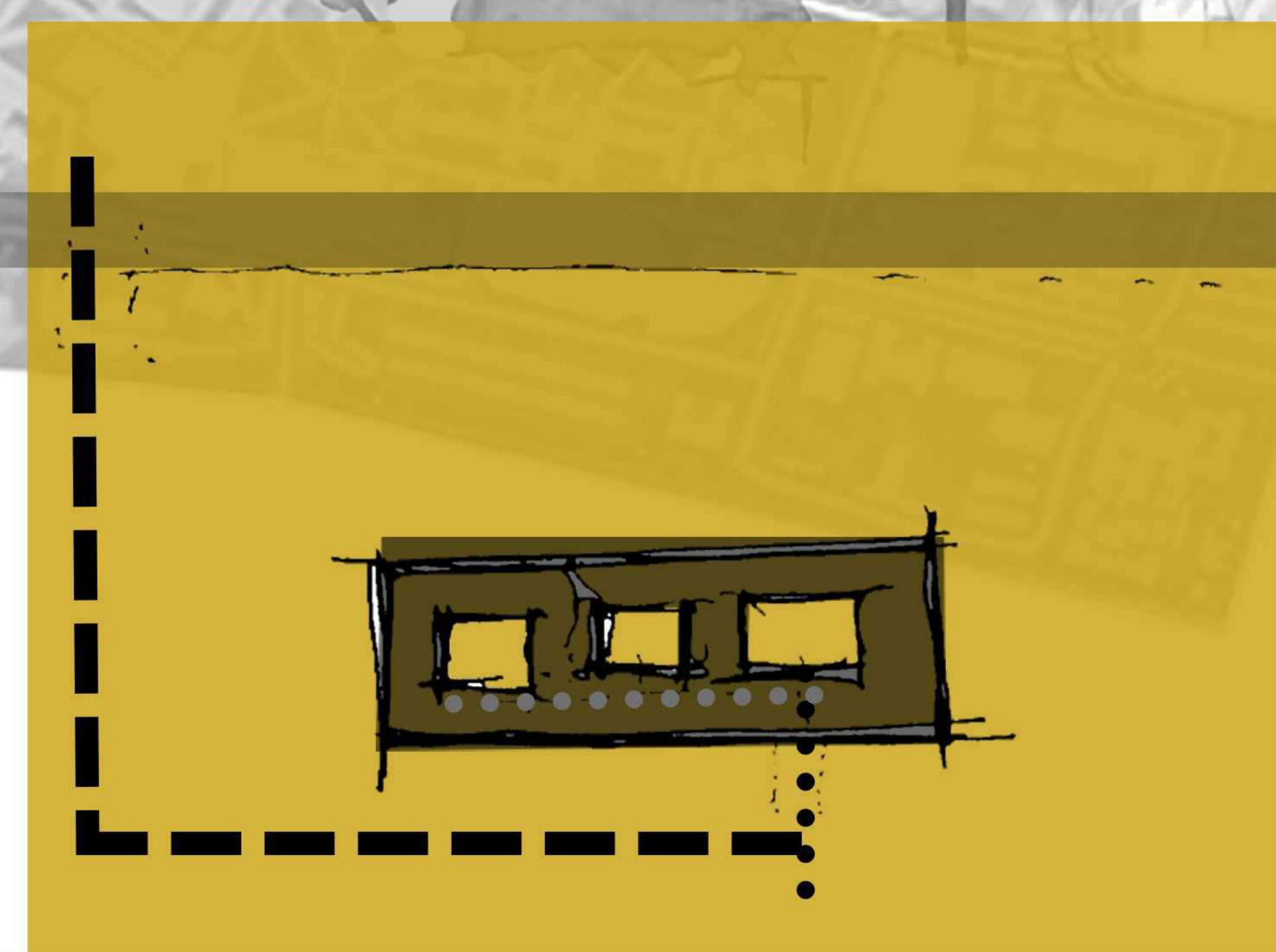
NON-PERMEABLE physical edge conditions

PERMEABLE visual edge conditions

BUILDINGS // OBJECTS



buildings living inwards // backs facing streetwards

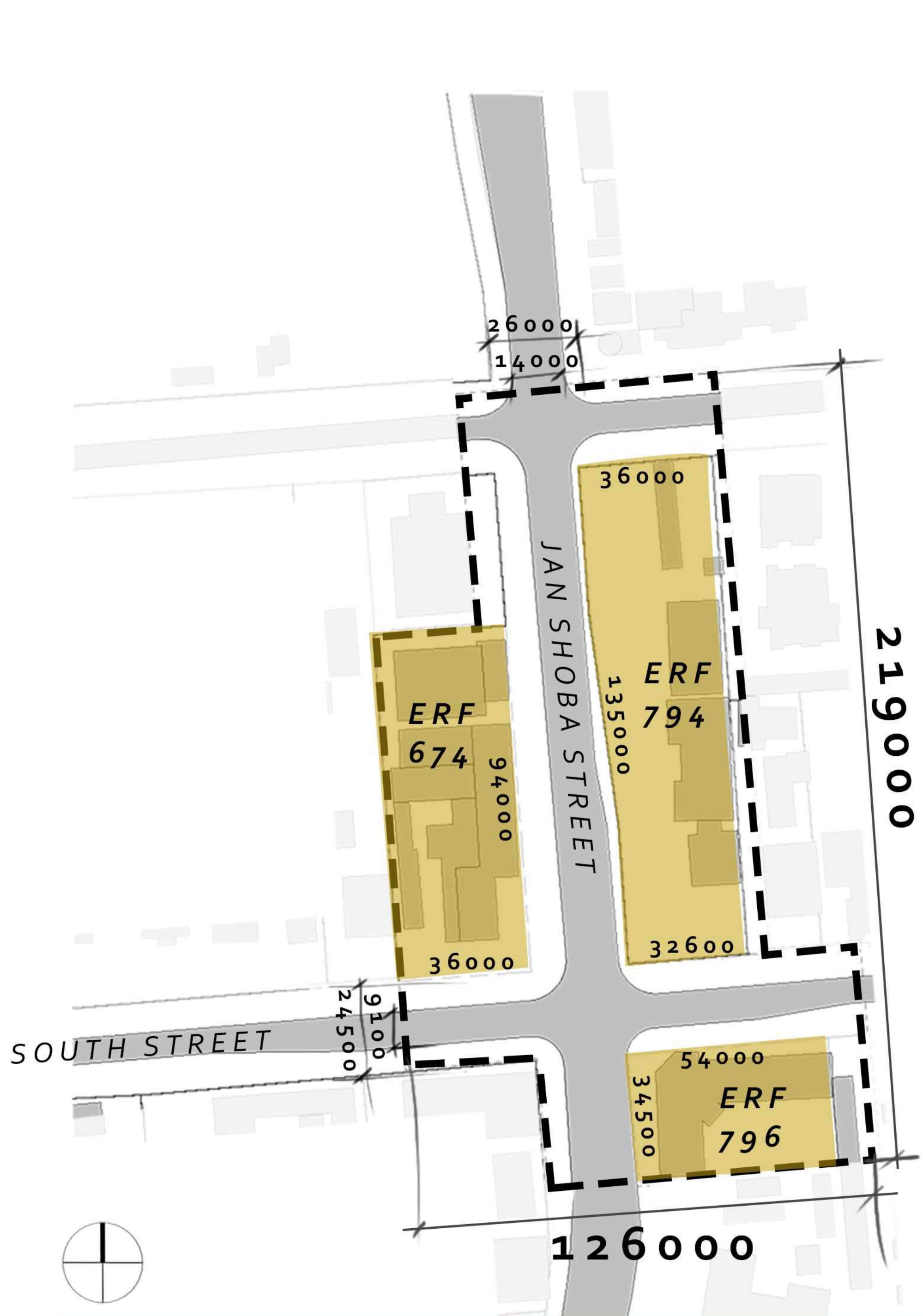


building entrances & accessibility withdrawn to privacy

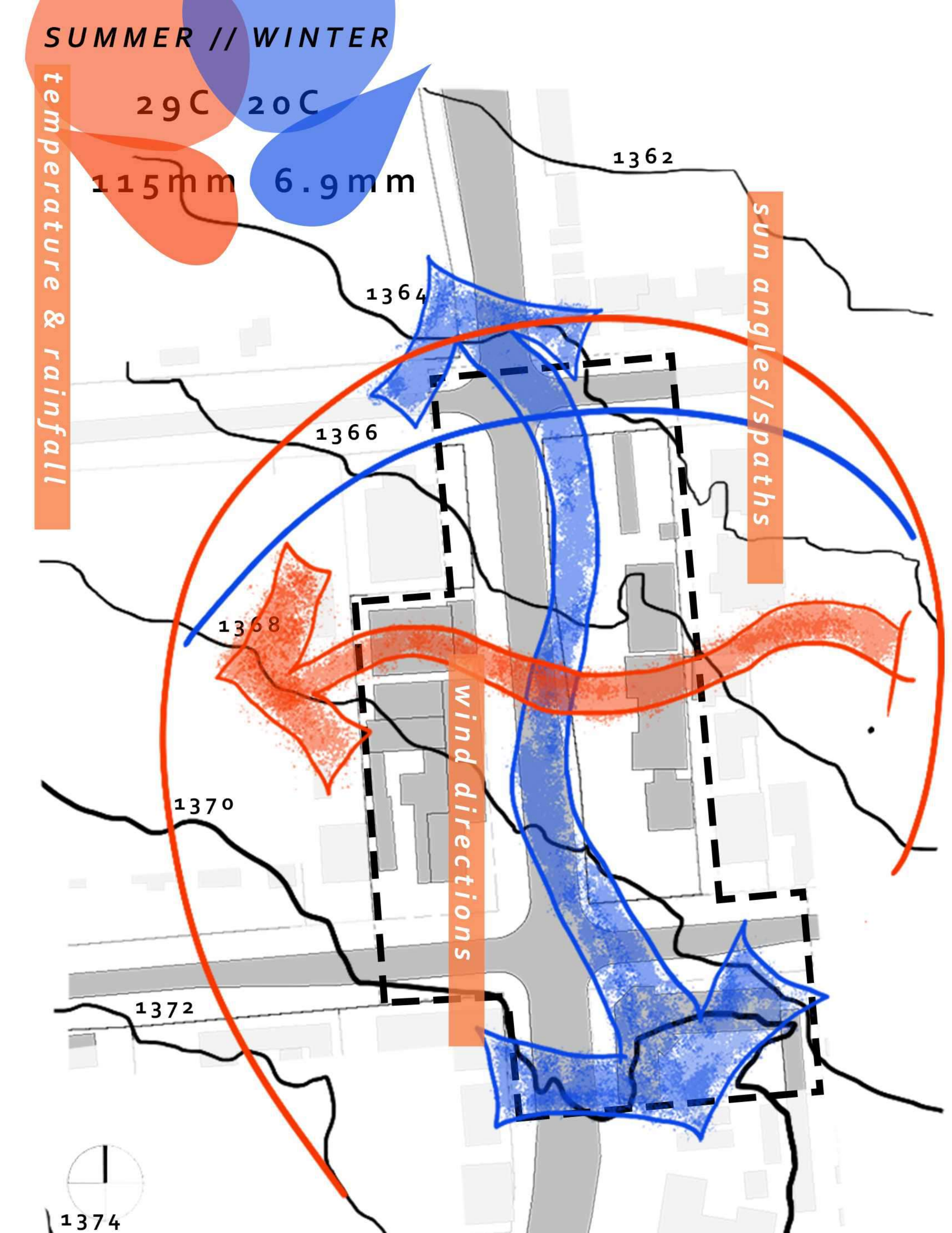
TPOLOGIES // ACCESSIBILITY

# SOUTH STREET MESO CONTEXT

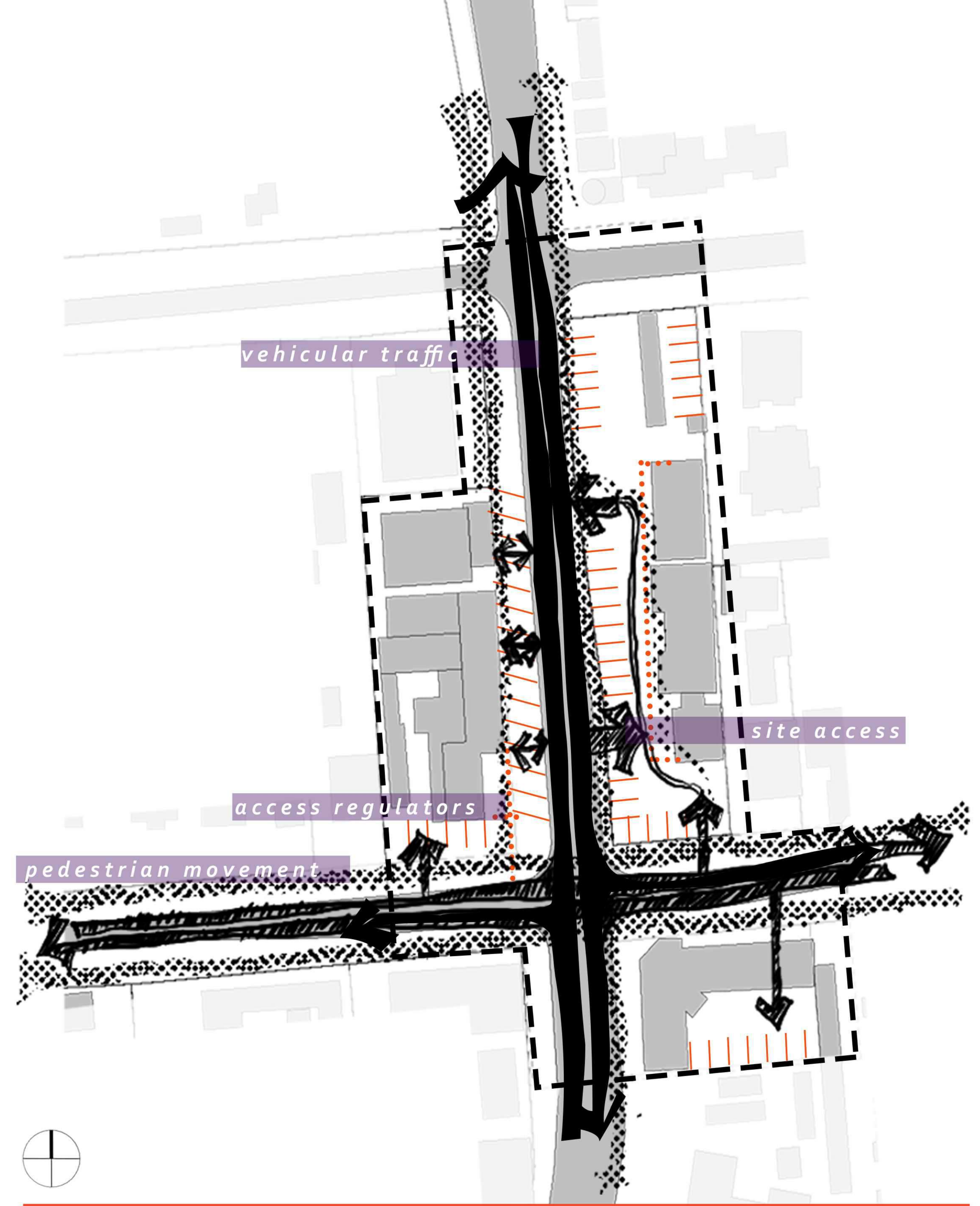




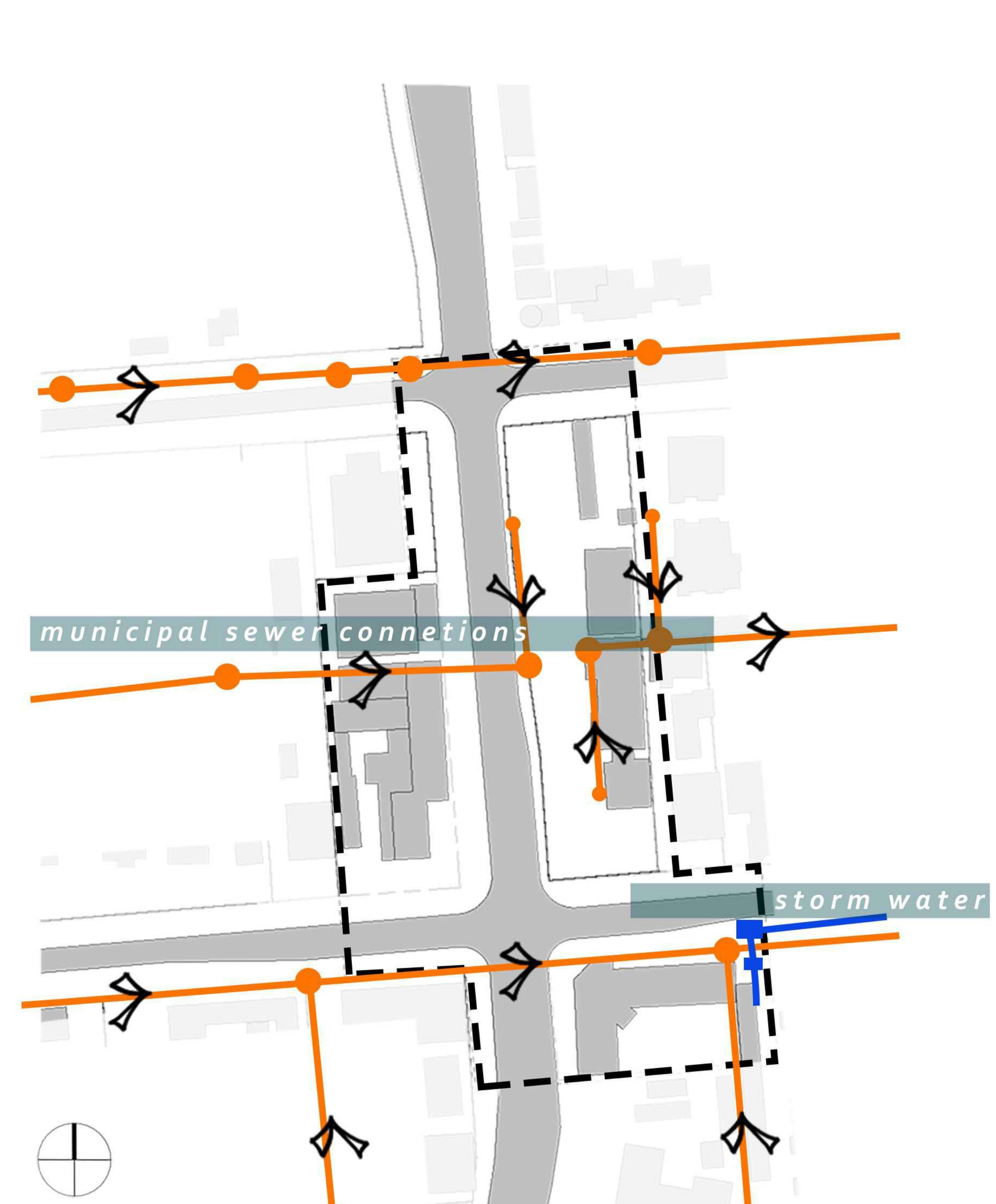
**SITE DIMENSIONS**



**CLIMATIC FEATURES**



**SITE CIRCULATION**



**UTILITIES**



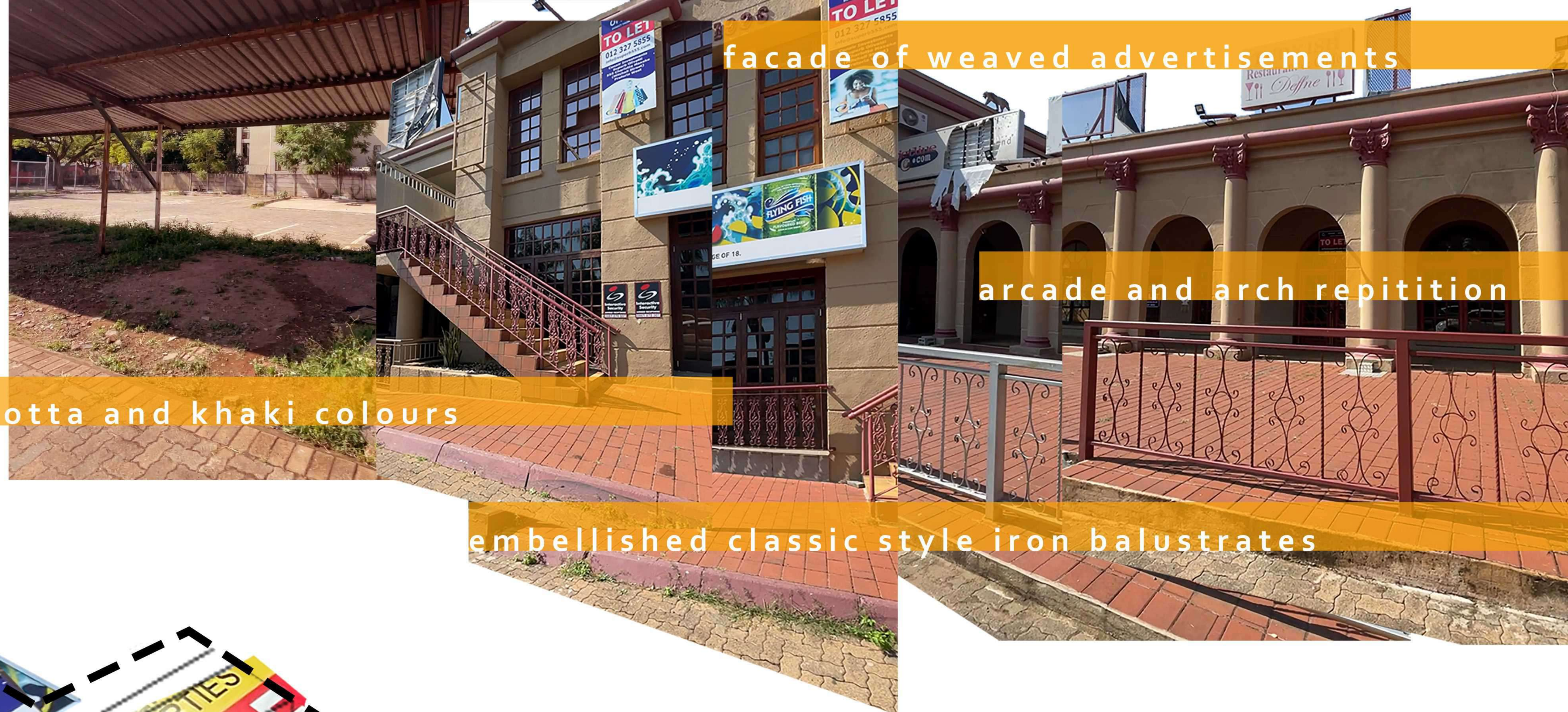
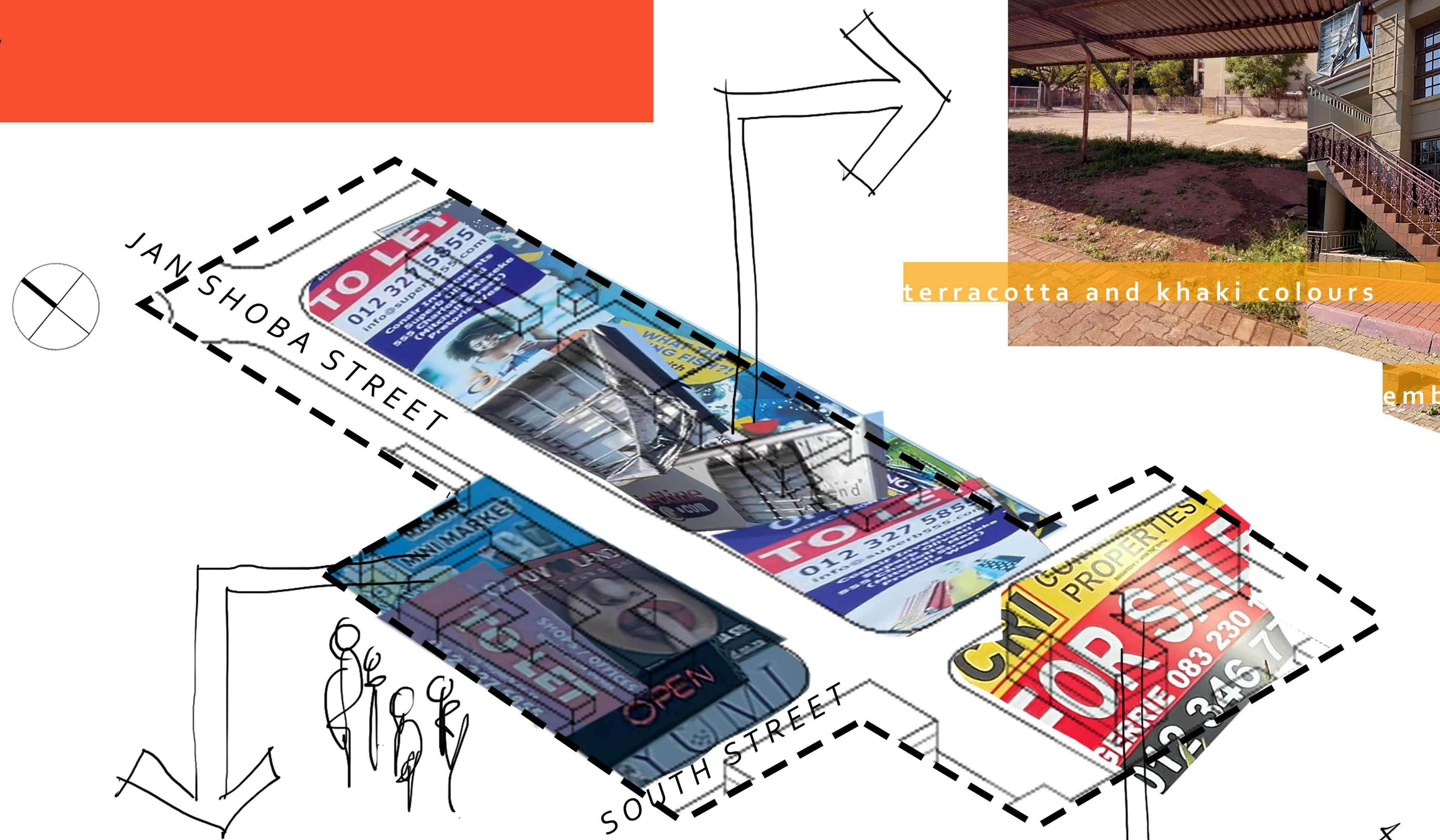
**HARD DATA FEATURES**

**SOLID VOID SPACE RELATION // NOISE EFFECT**

**MICRO SITE ANALYSIS**



VISUAL  
MAN MADE  
FEATURES



facade of weaved advertisements

arcade and arch repetition

terracotta and khaki colours

embellished classic style iron balustrates

black building without specific style & identity



facade of weaved advertisements

hard street surfaces



terracotta and khaki colours  
stone cladding texture

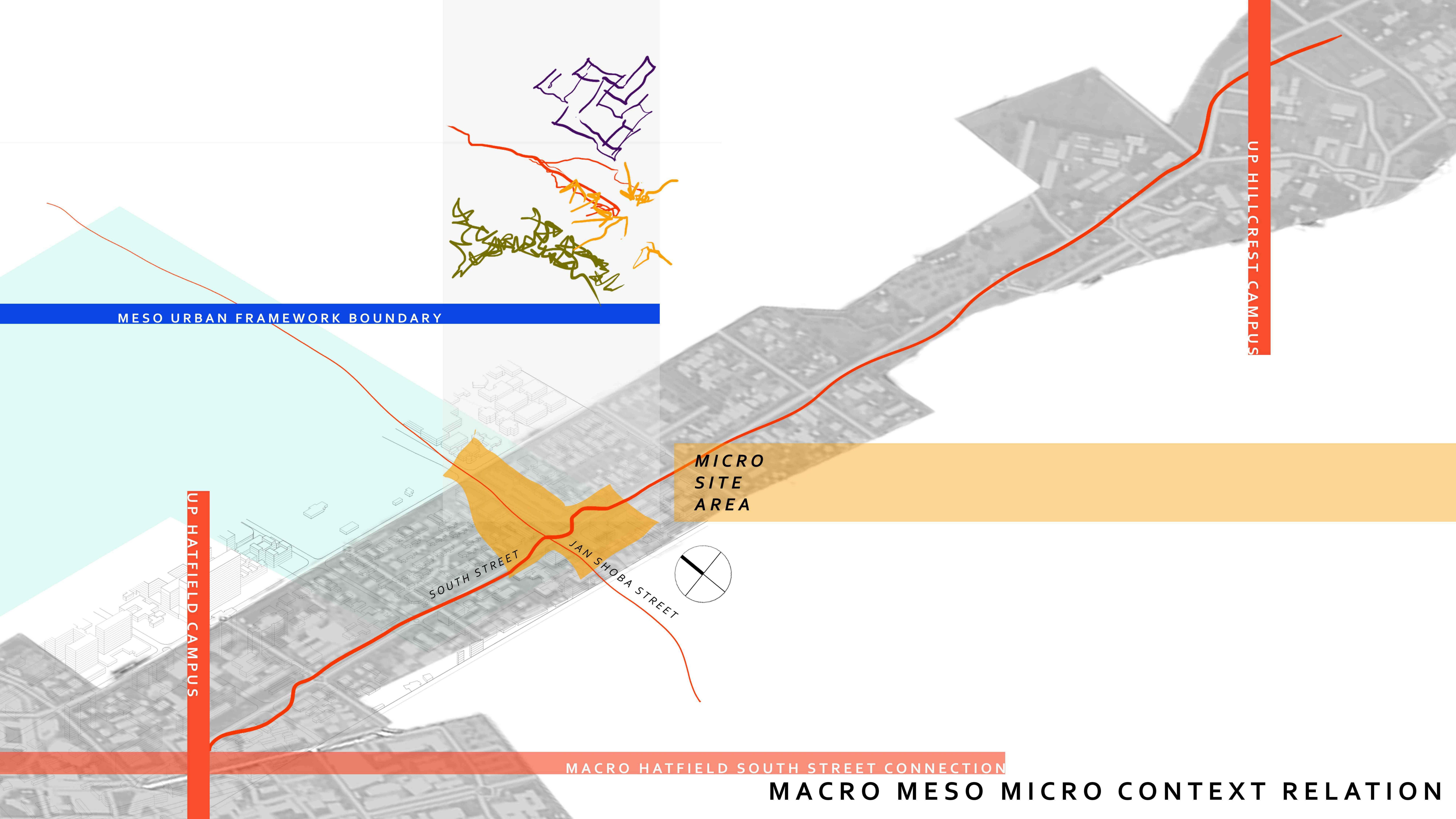
arch repetition

embellished classic style iron balustrates

hard street surfaces

MICRO SITE ANALYSIS





MESO URBAN FRAMEWORK BOUNDARY

UP HILLCREST CAMPUS

UP HATFIELD CAMPUS

MICRO SITE AREA

SOUTH STREET

JAN SHOBA STREET

MACRO HATFIELD SOUTH STREET CONNECTION

MACRO MESO MICRO CONTEXT RELATION



segregated & underutilized public-space LAND USE

motorised transport prioritise high speed MOVEMENT NETWORKS & intersections

GREEN NETWORK demoted by grey infrastructure



CONSTRAINTS

utilize & densify existing mixed LAND USE space

reversing MOVEMENT NETWORKS space to active transport

utilizing under-utilized public GREEN NETWORK



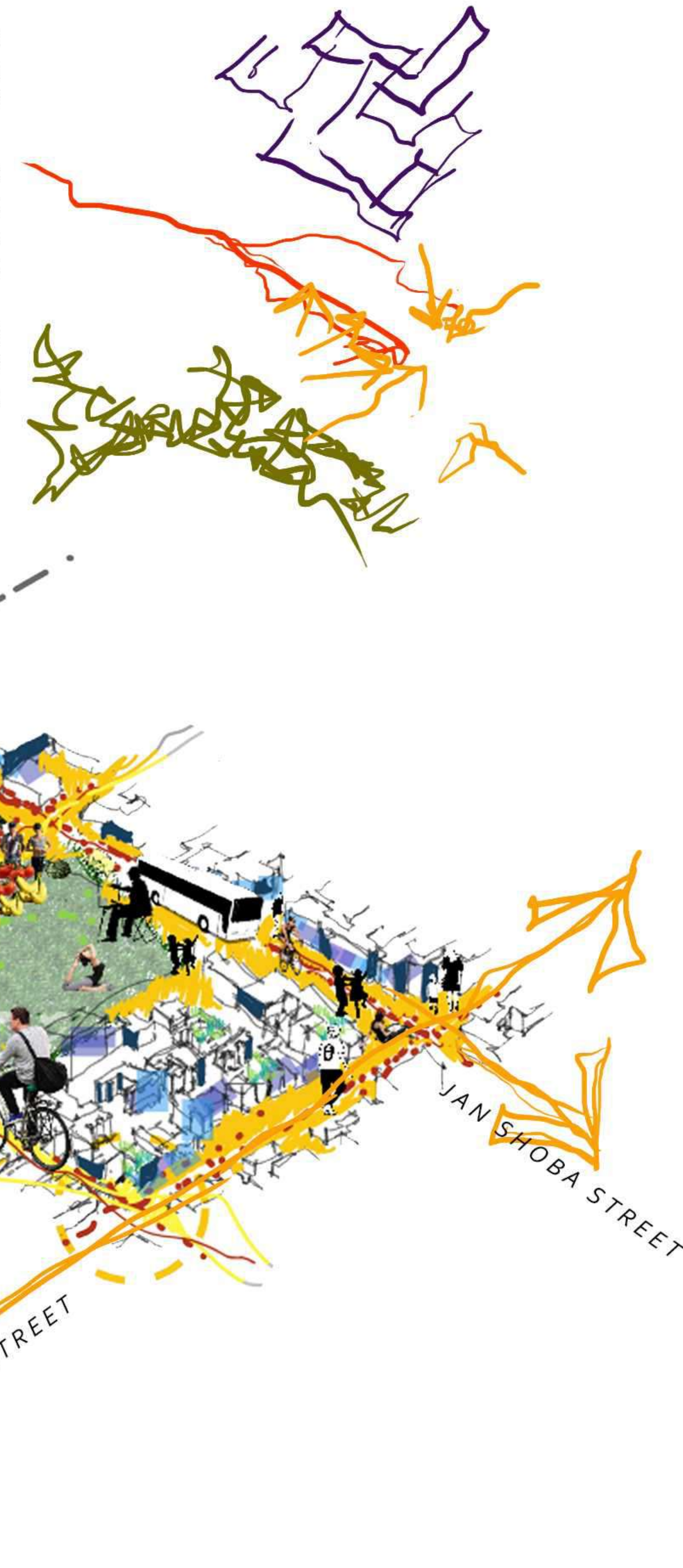
OPPORTUNITIES



INTERCHANGE OF USES ACROSS AND WITHIN PUBLIC SPACES  
activating semi-public/private place & space through  
densification and inter-use across boundaries

INTEGRATING MOVEMENT NETWORKS WITHIN PUBLIC SPACE  
Integrate active and public transport within public space as  
connector corridors and further pedestrian and active  
transport focused intersections

INTEGRATING GREEN INFRASTRUCTURE OF PUBLIC SPACE  
Unifying public nodes, space, place and corridors  
through the green network spine

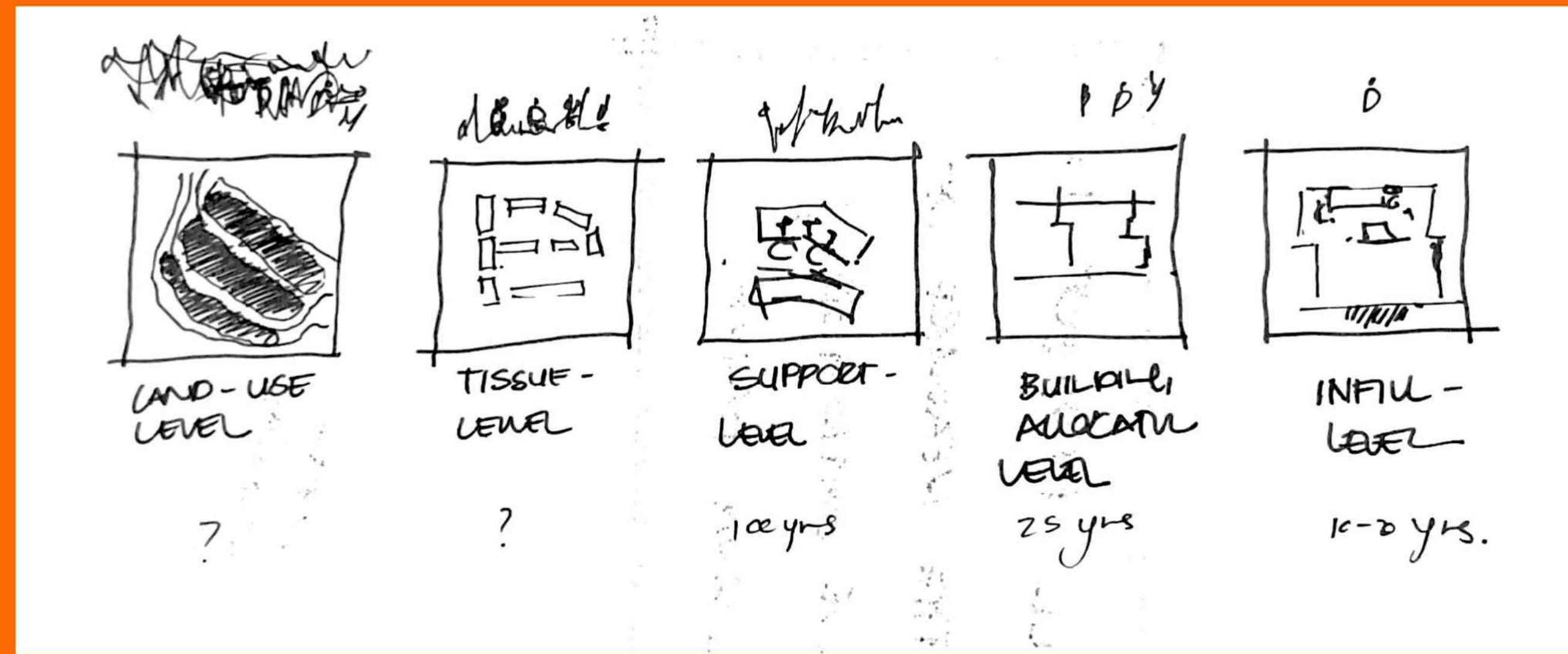


STRATEGIES

MESO CONTEXT URBAN FRAMEWORK INTEGRATION



**OPEN BUILDING**

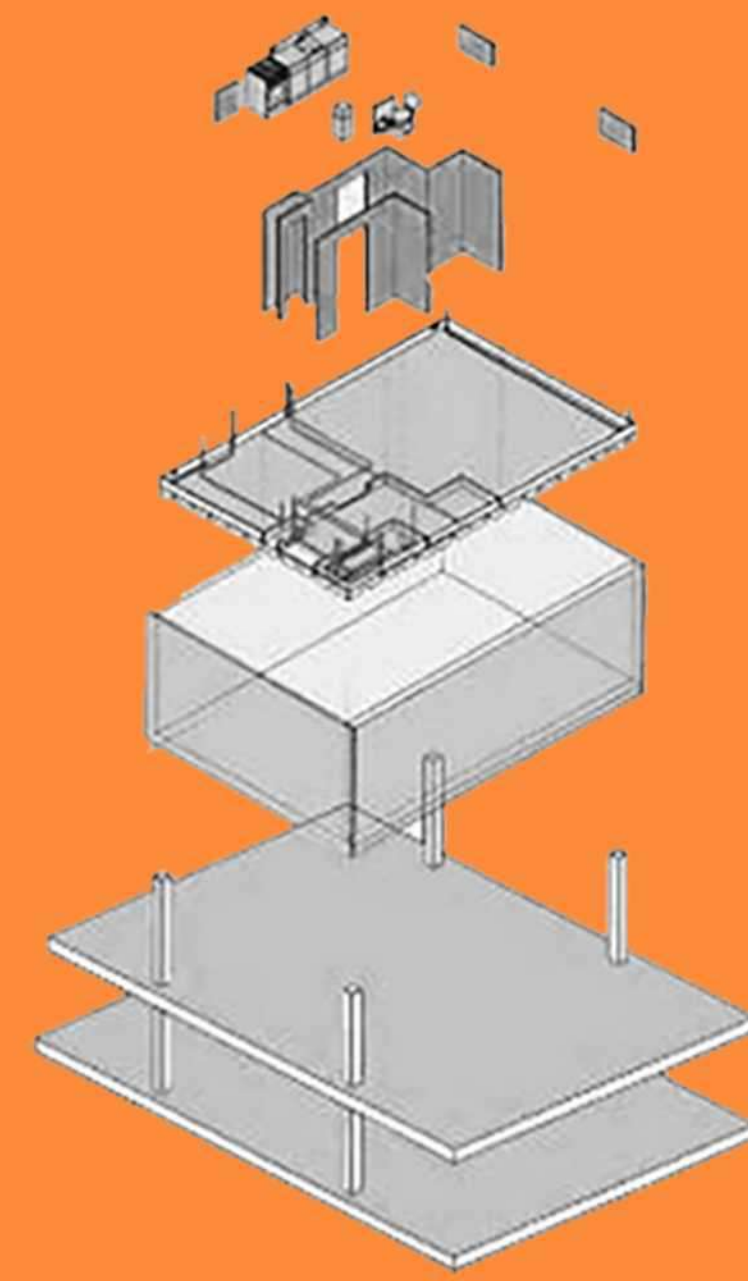
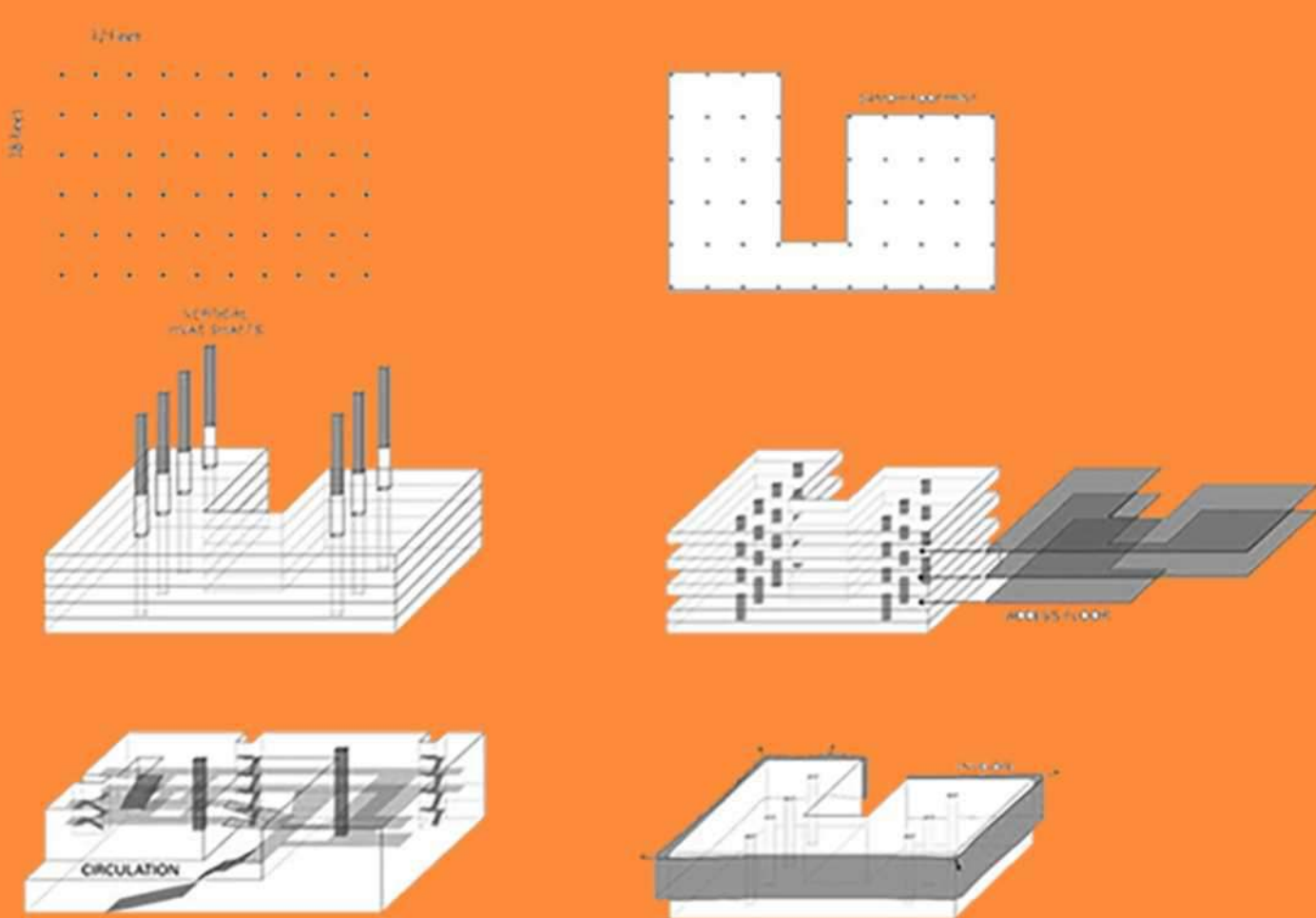


**1// LEVELS OF INTERVENTION**

TISSUE  
TOWN FABRIC

SUPPORT  
BASE BUILDING

INFILL  
FIT-OUT



**2// STRUCTURAL FLEXIBILITY**

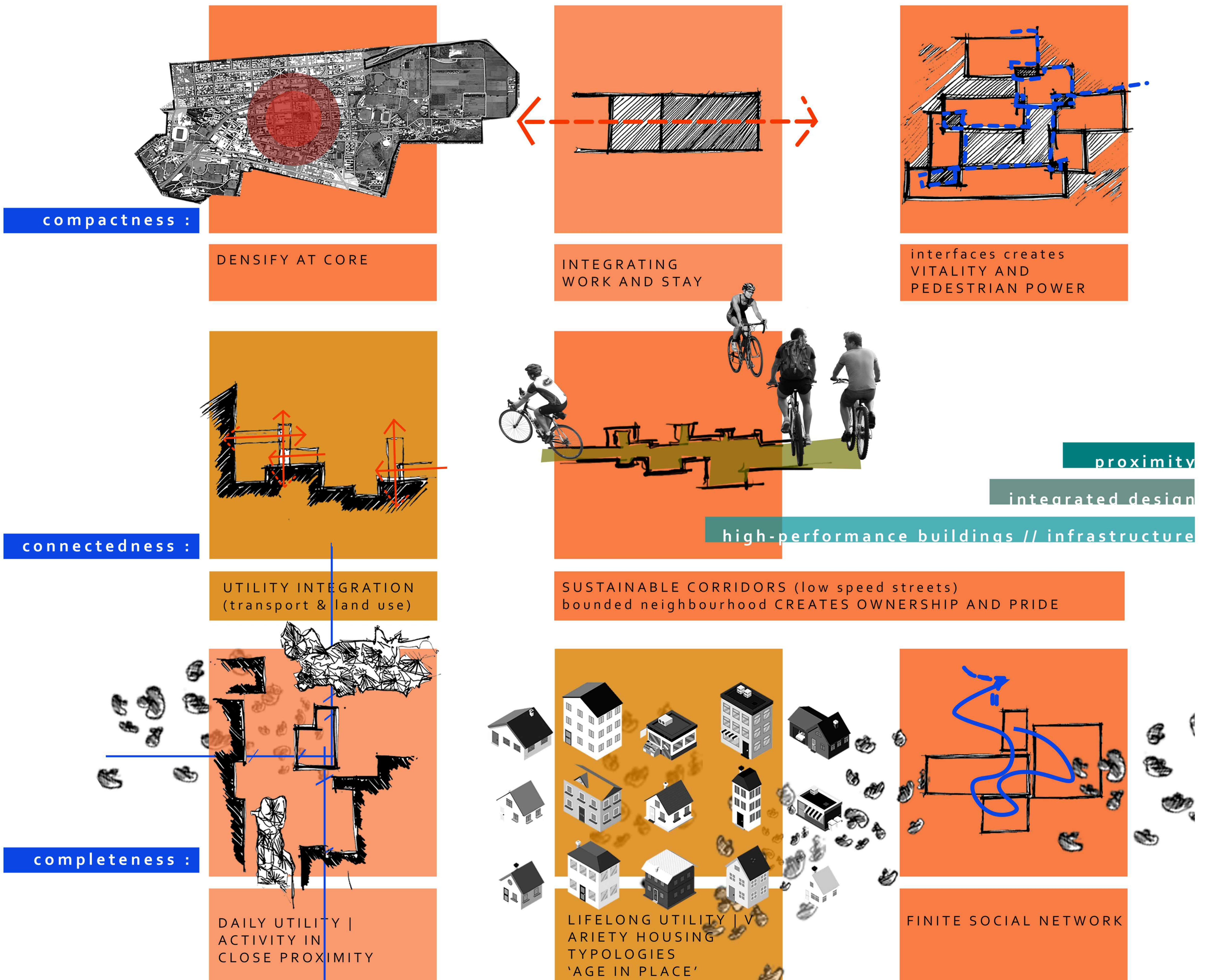
ADAPT TO CHANGING NEEDS  
TECHNICAL, ORGANIZATIONAL  
FINANCIAL

**3// SUBDIVISION OF TECHNICAL SYSTEMS**

FACADE  
ROOF (DECOUPLING ROOF FROM REST OF STRUCTURE)  
LOAD BEARING CONSTRUCTION  
INNER PARTITIONING  
HVAC  
CONDUITS & CABLES FREED FROM WALLS

*urbanism sustainable across*  
**triple bottom line : SOCIAL | ENVIRONMENTAL | ECONOMIC**

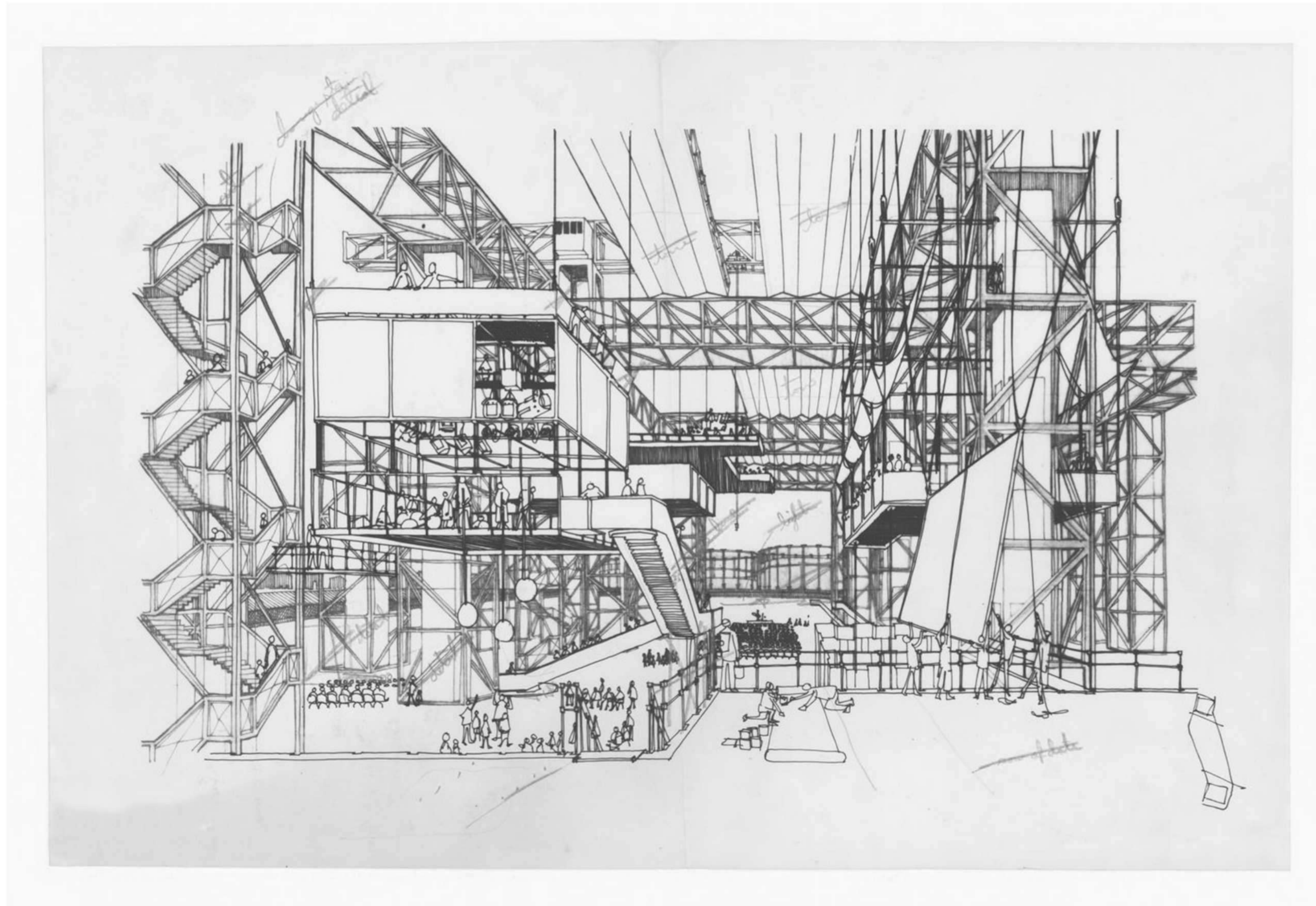
**SUSTAINABLE URBANISM**





### FUN PALACE by CEDRIC PRICE

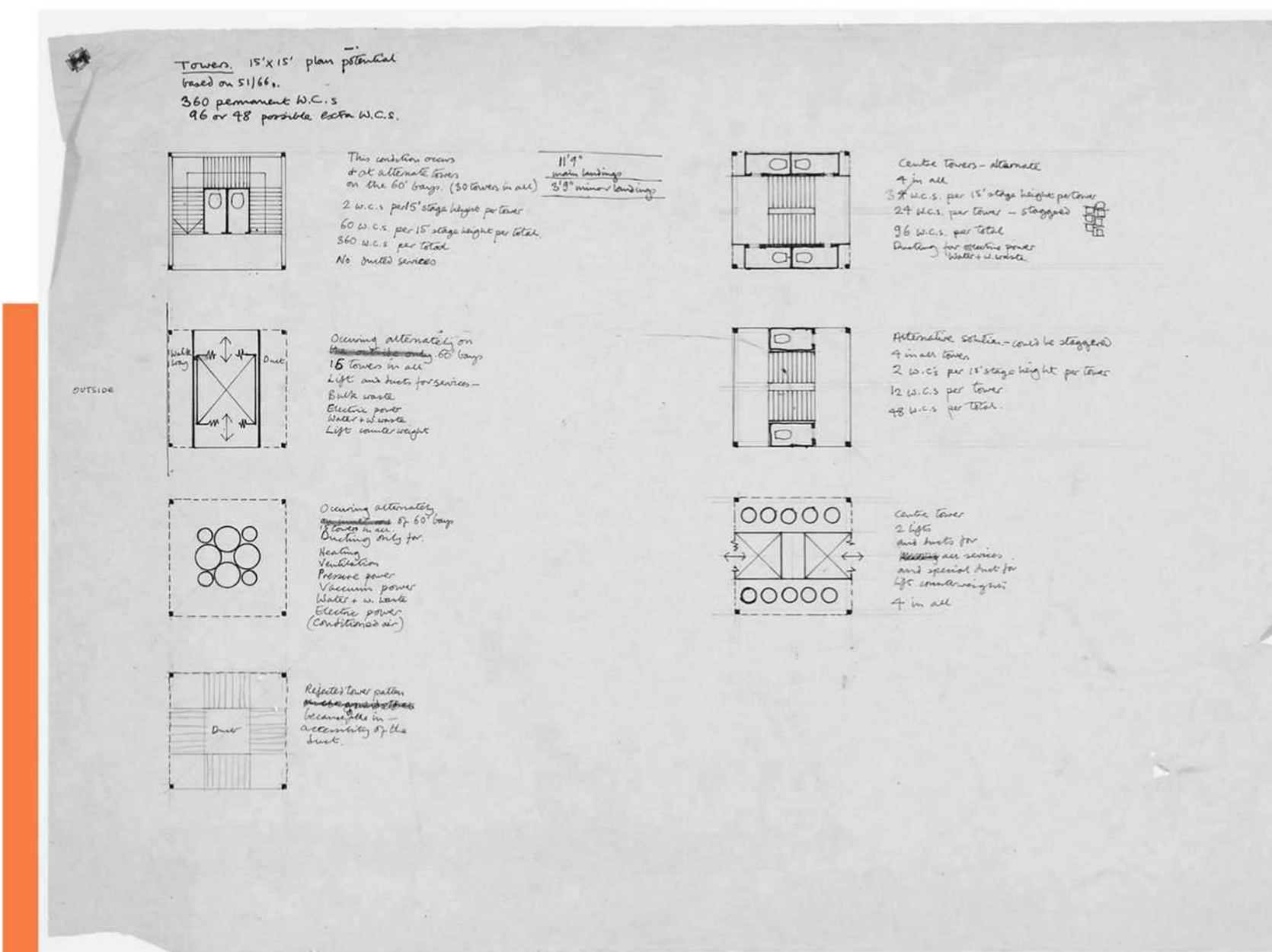
1//  
**PROGRAM SPACE INTEGRATION**  
RECONCEIVED AS A SITE OF PRODUCTION & REPRODUCTION  
FRAMEWORK INTO WHICH PROGRAMMABLE SPACES COULD BE PLUGGED,  
USERS COLLECTIVELY DEFINE THE SPACE



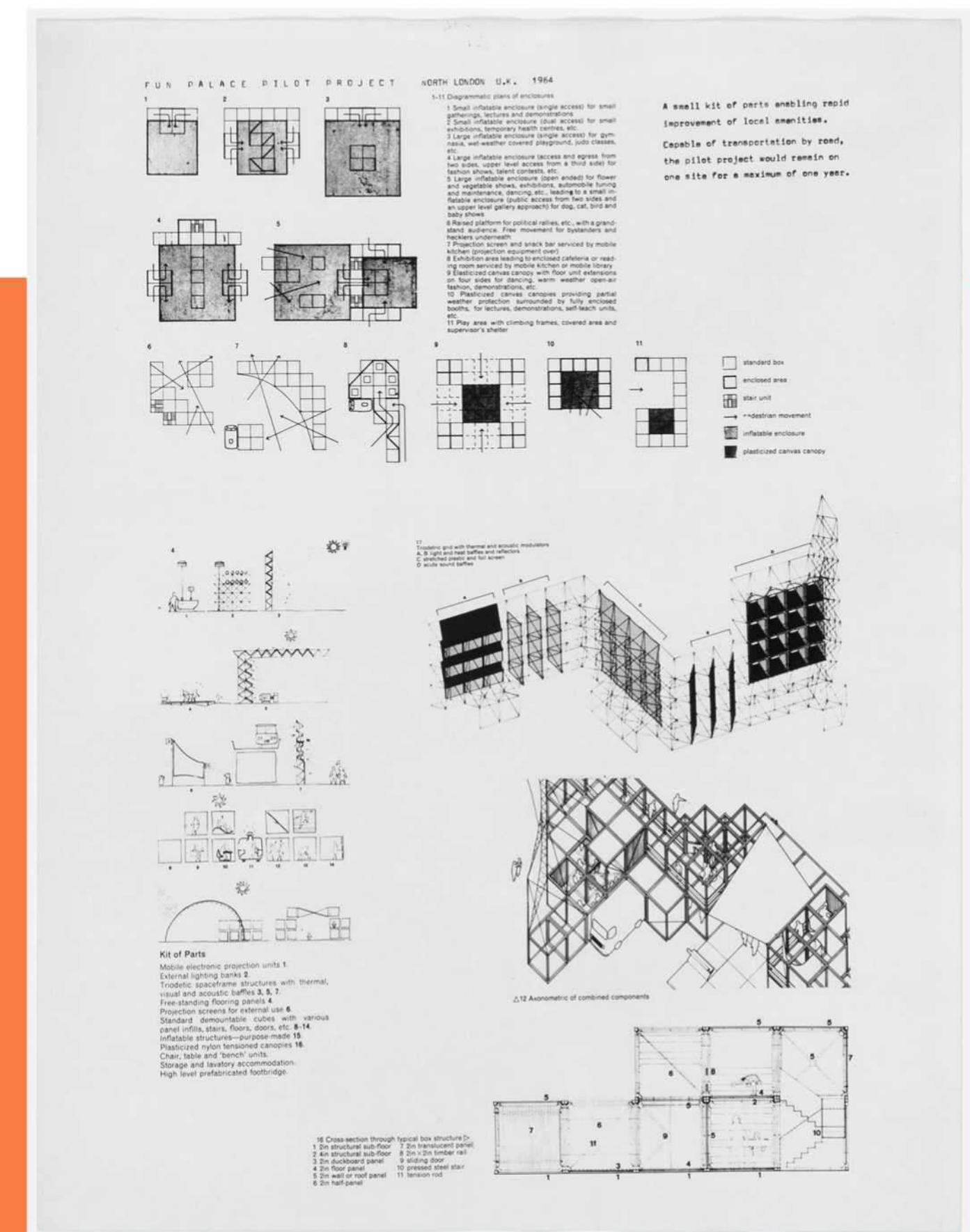
### 2// STRUCTURE FLEXIBILITY

FLEXIBLE FRAMEWORK WITH MOVEABLE PRE-FAB KIT OF PARTS

lifts,  
ducts for  
services  
of bulk  
waste,  
electronic  
and  
power



STRUCTURE & SERVICE TOWERS



KIT OF PARTS INFILL

protection screens and freestanding  
floor panels & canopies for partial  
weather protection

### INNOVATION PARK ARTIFICIAL INTELLIGENCE CAMPUS @HEILBRON, GERMANY by MVRDV

1//  
**CAMPUS INTENTIONS**  
INTER-USE CAMPUS DRIVING  
INNOVATION OF THE EVOLUTION OF  
FUTURE CITIES THROUGH AI TECHNOLOGIES



### 3// CONTEXT CONNECTION

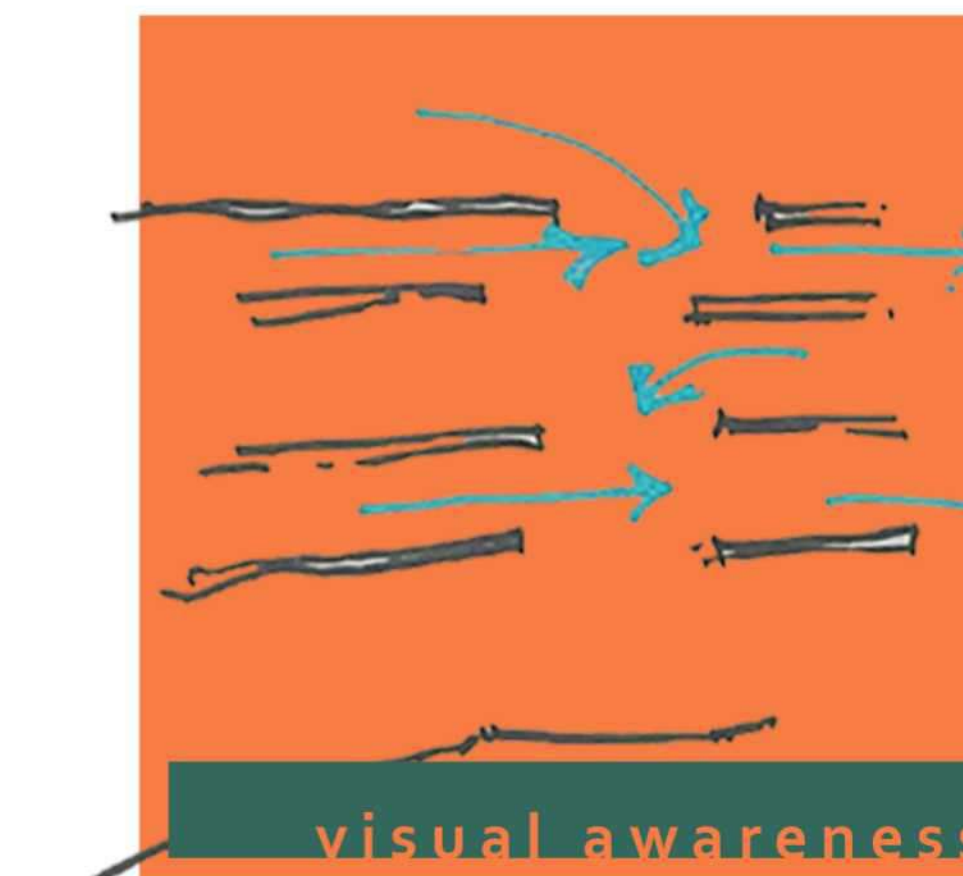
PEDESTRIAN FOCUSED ENTRANCES THAT  
INTEGRATES WITH PUBLIC SURROUNDING  
CONTEXT

### 4// PROGRAM SPACE INTEGRATION

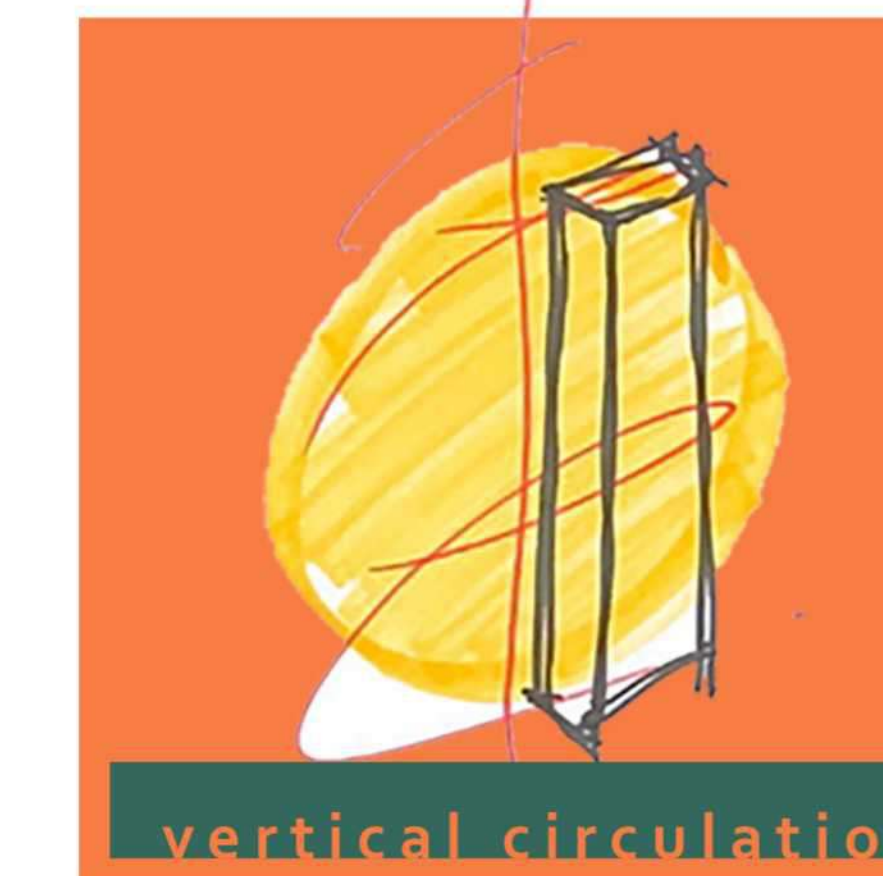
FOSTER INTEGRATION THROUGH PRINCIPLES OF USER INTERACTION,  
POROSITY AND PERMEABILITY AS WELL AS TOGETHERNESS TOOLS OF CO-EXISTENCE  
AND INTERACTIVE TOUCHPOINT TO EXPERIENCE DEVELOPMENT OF KNOWLEDGE



micro-habitats



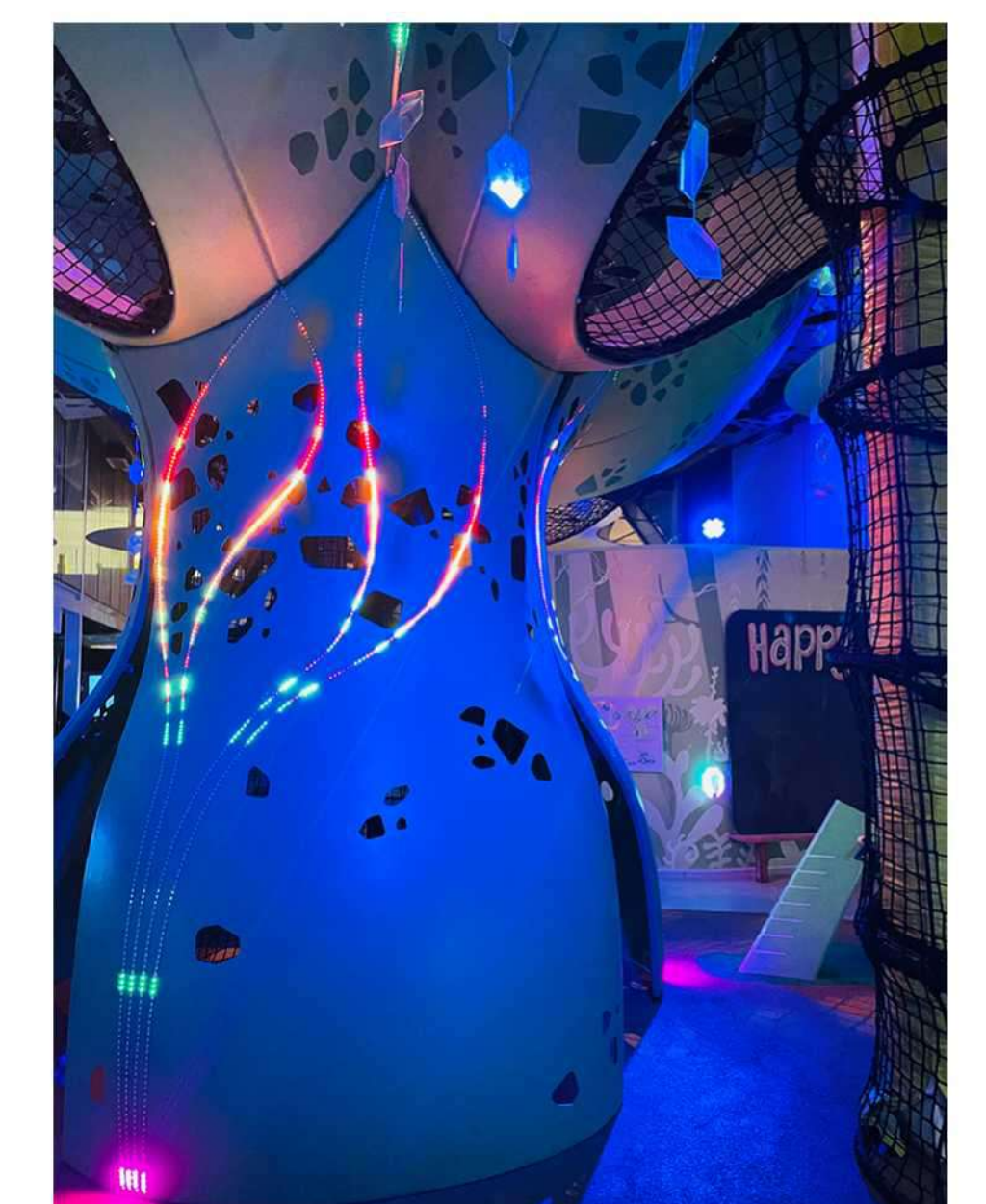
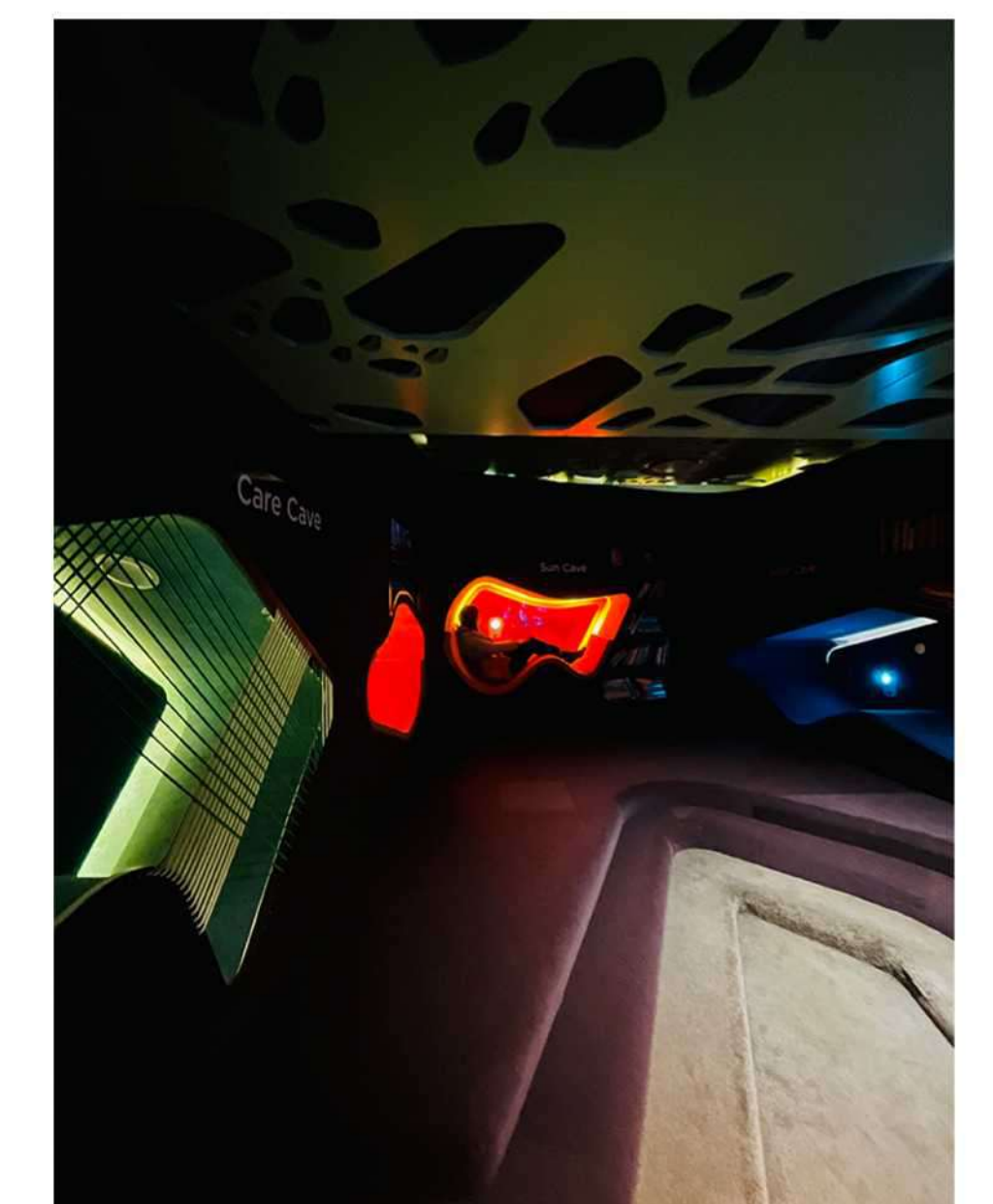
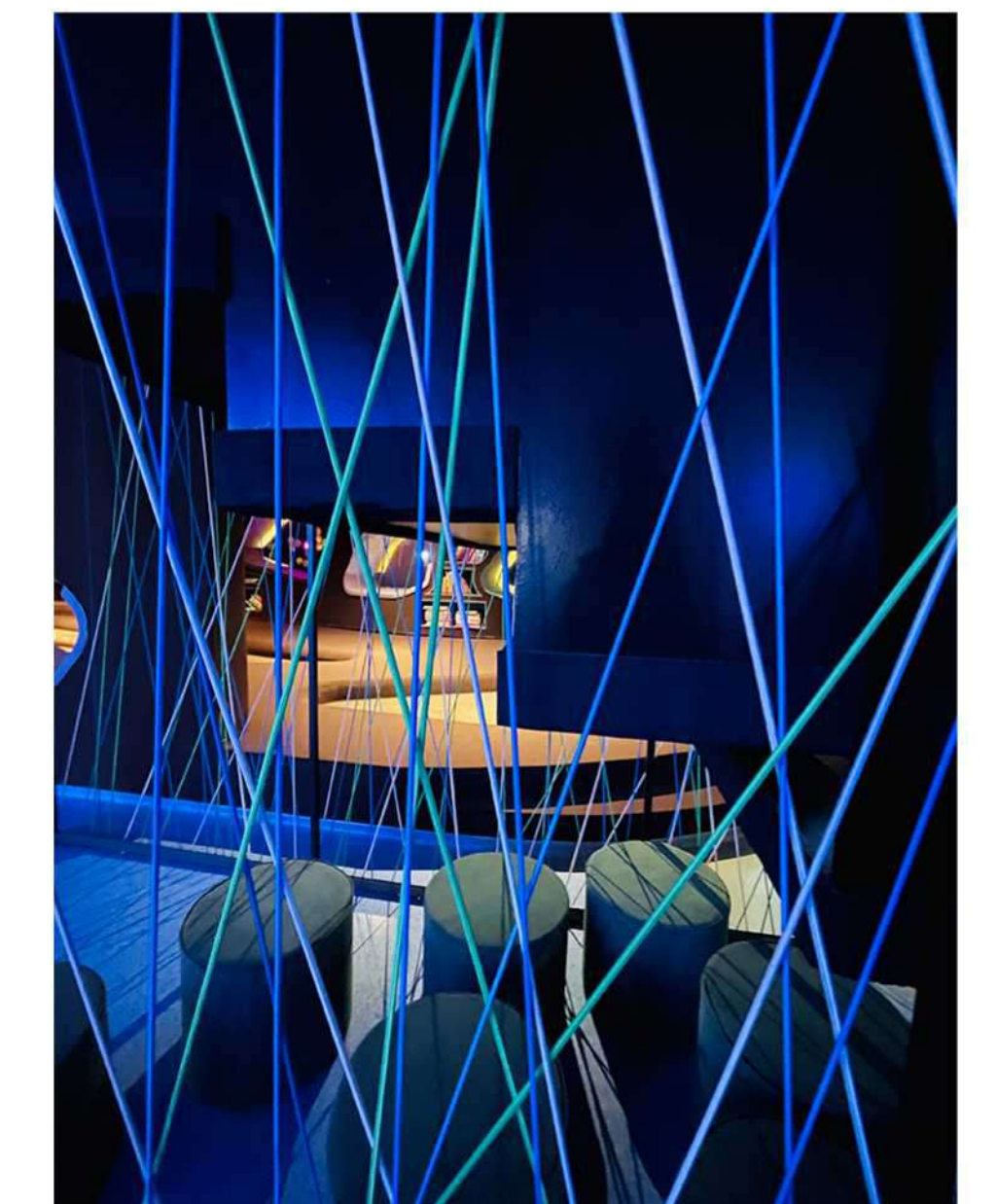
visual awareness



vertical circulation

### WONDERDAL EDUTAINMENT CENTRE @ HAZENDAL, WC by FORMULA D \_interactive & TeamArchitects

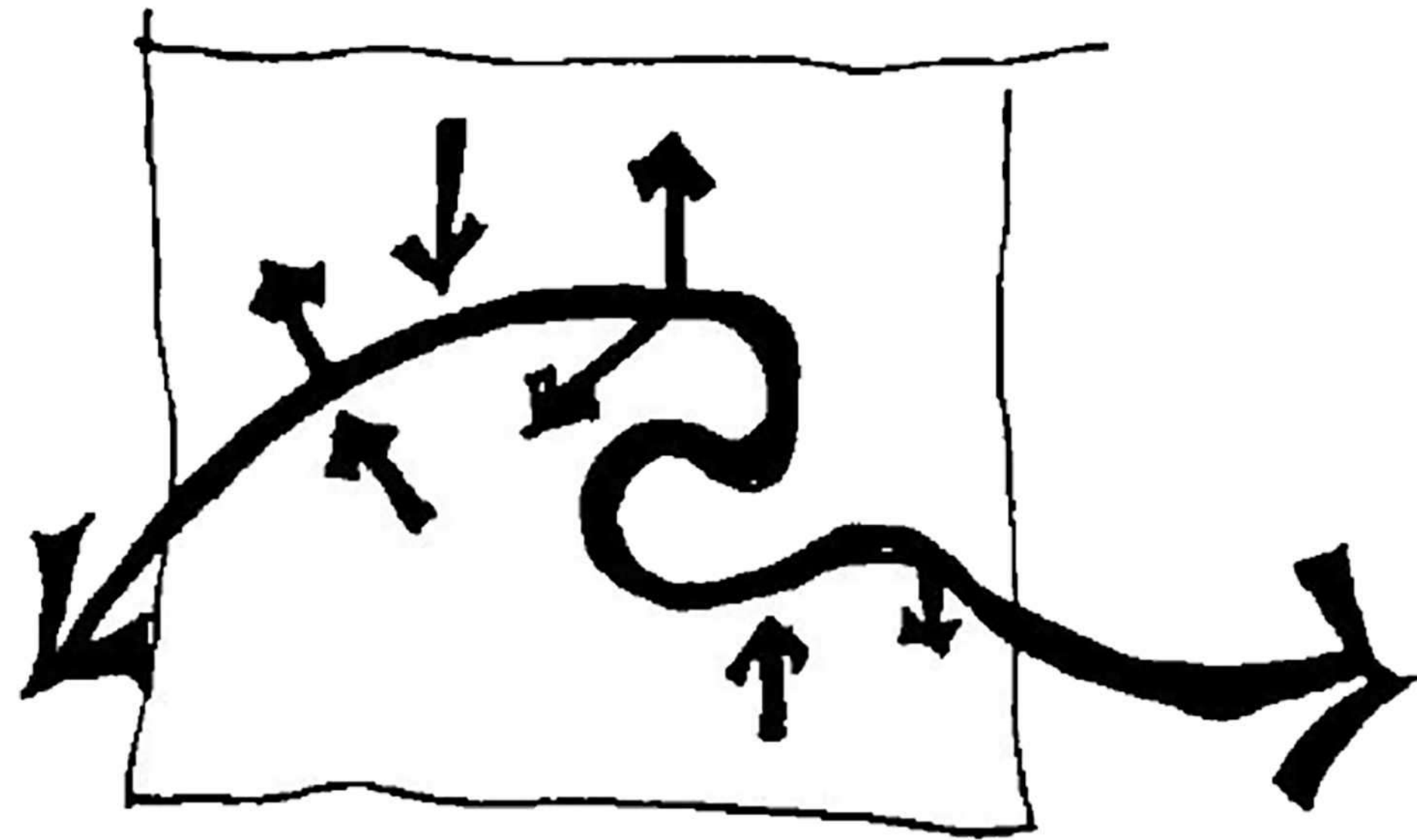
2//  
**CENTRE INTENTIONS**  
DIGITAL EDUTAINMENT CENTRE FOR CHILDREN,  
EDUCATING ON THE ENVIRONMENT





# openNESS

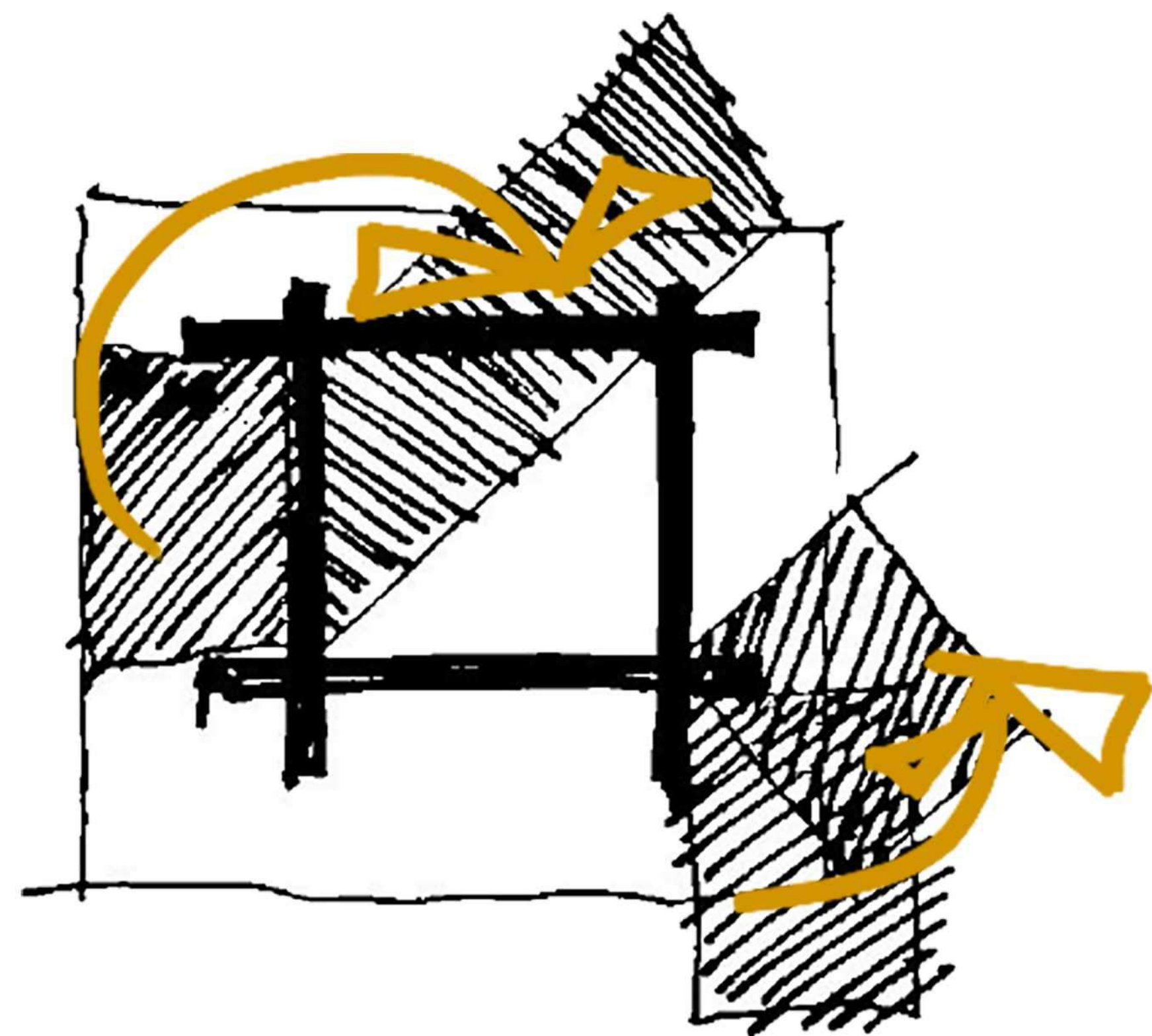
01 // threshold facade permeability



**nature of boundary and skin :**

// integrating and interweaving into urban context  
// ACCESSIBILITY THROUGH PERMEABILITY

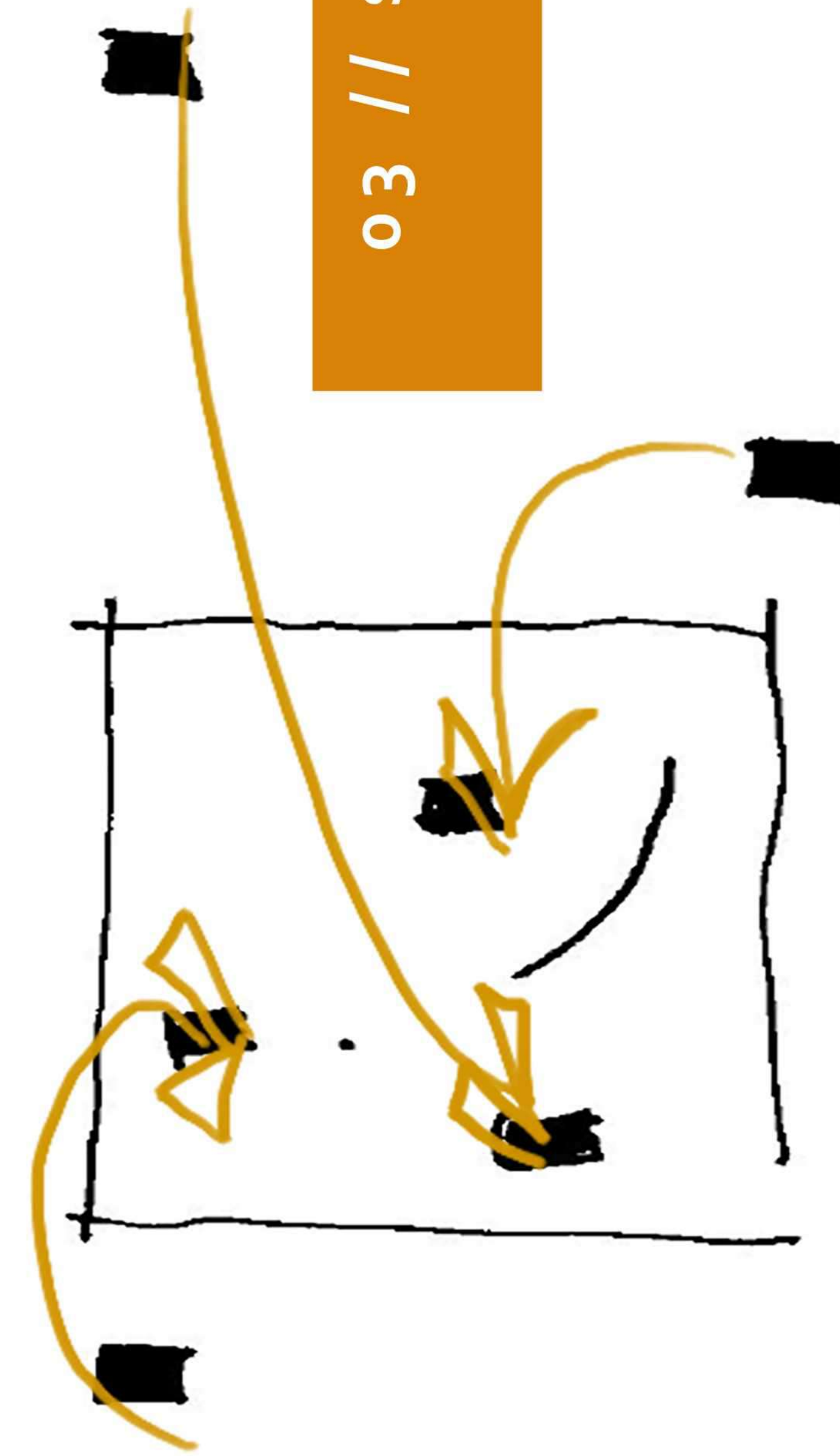
02 // contextual programmatic housing



**site position and context integration :**

// inviting in the social public  
CONNECTING TO EXISTING PROGRAM (COMPLETENESS) of cafe societies  
// PARTICIPATION AND INTERACTION THROUGH ACTIVATION

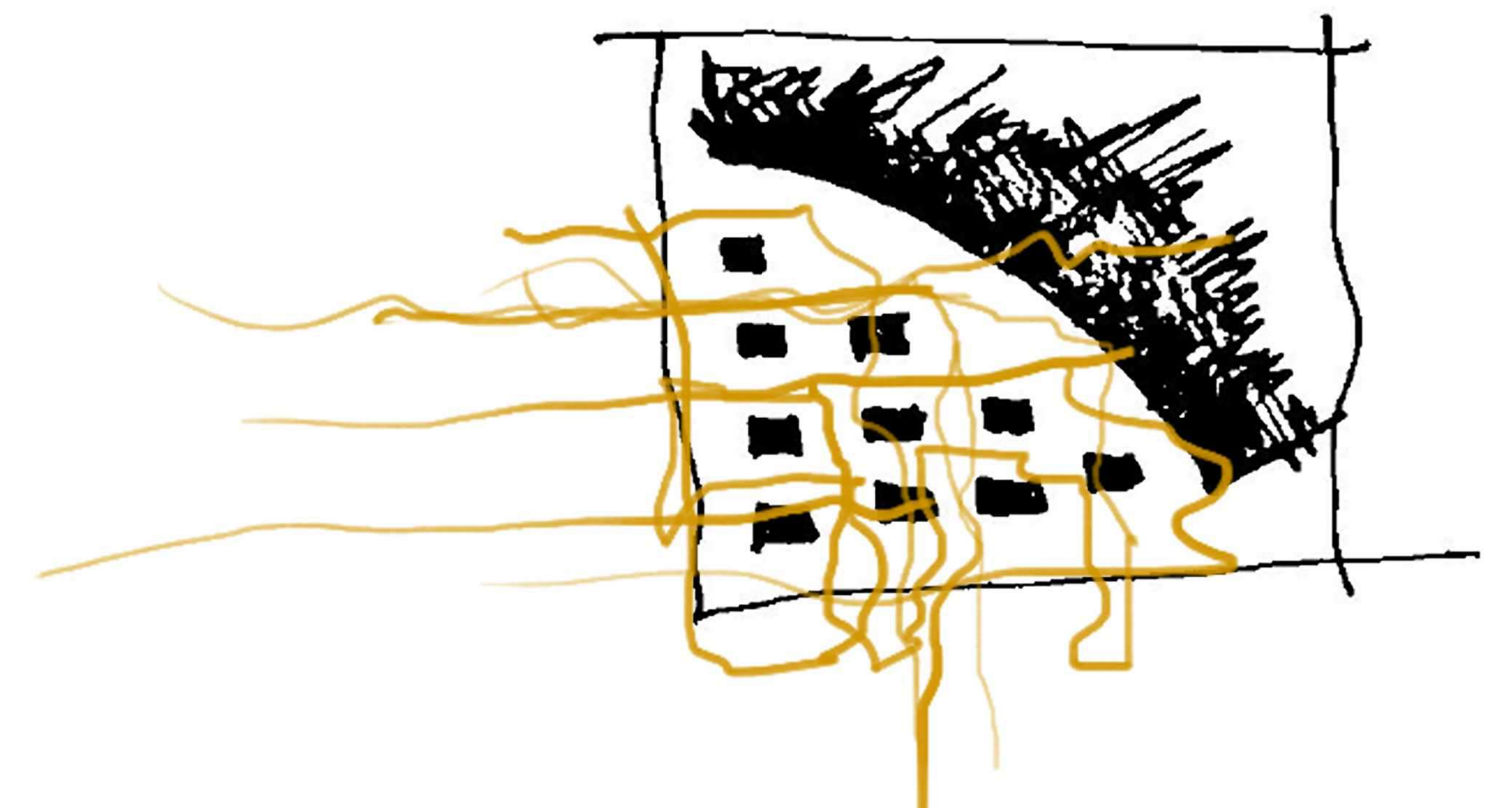
03 // spatial technical adaptation



**materiality and technical construction :**

// using existing brick that already lived  
// CONSTRUCTION PHASING that utilize bamboo forest  
// ADAPTABLE SPACES THAT IS CHANGEABLE INTO required PROGRAMS with a kit of parts

04 // circulation and program integration



**movement patterns and building accommodation :**

// COLLABORATION AND CONTINUITY OF SPACE that invites knowledge and shares innovation on the 'streets'  
// passive and active SHARING of innovation through manual and DIGITAL methods

# living



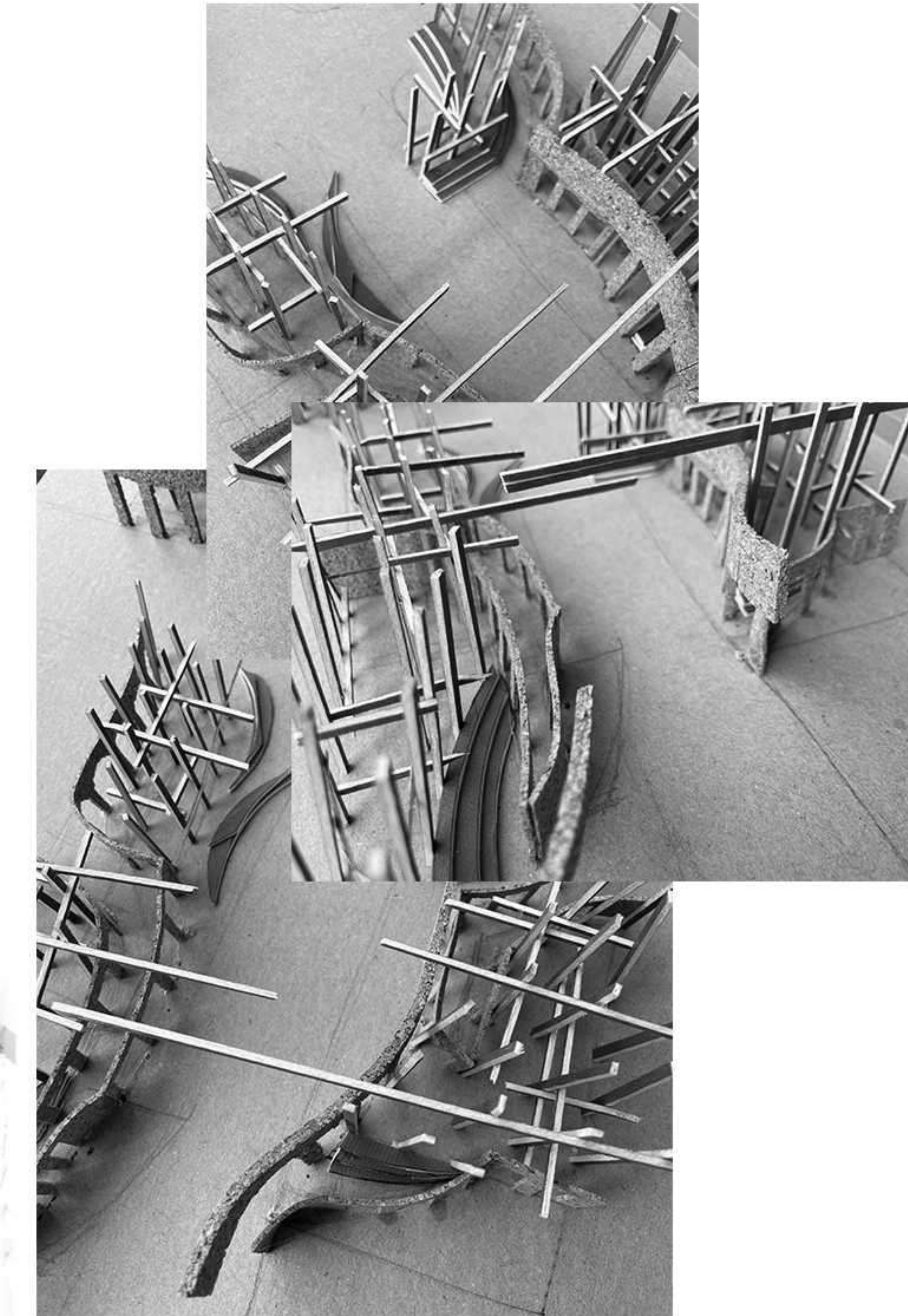
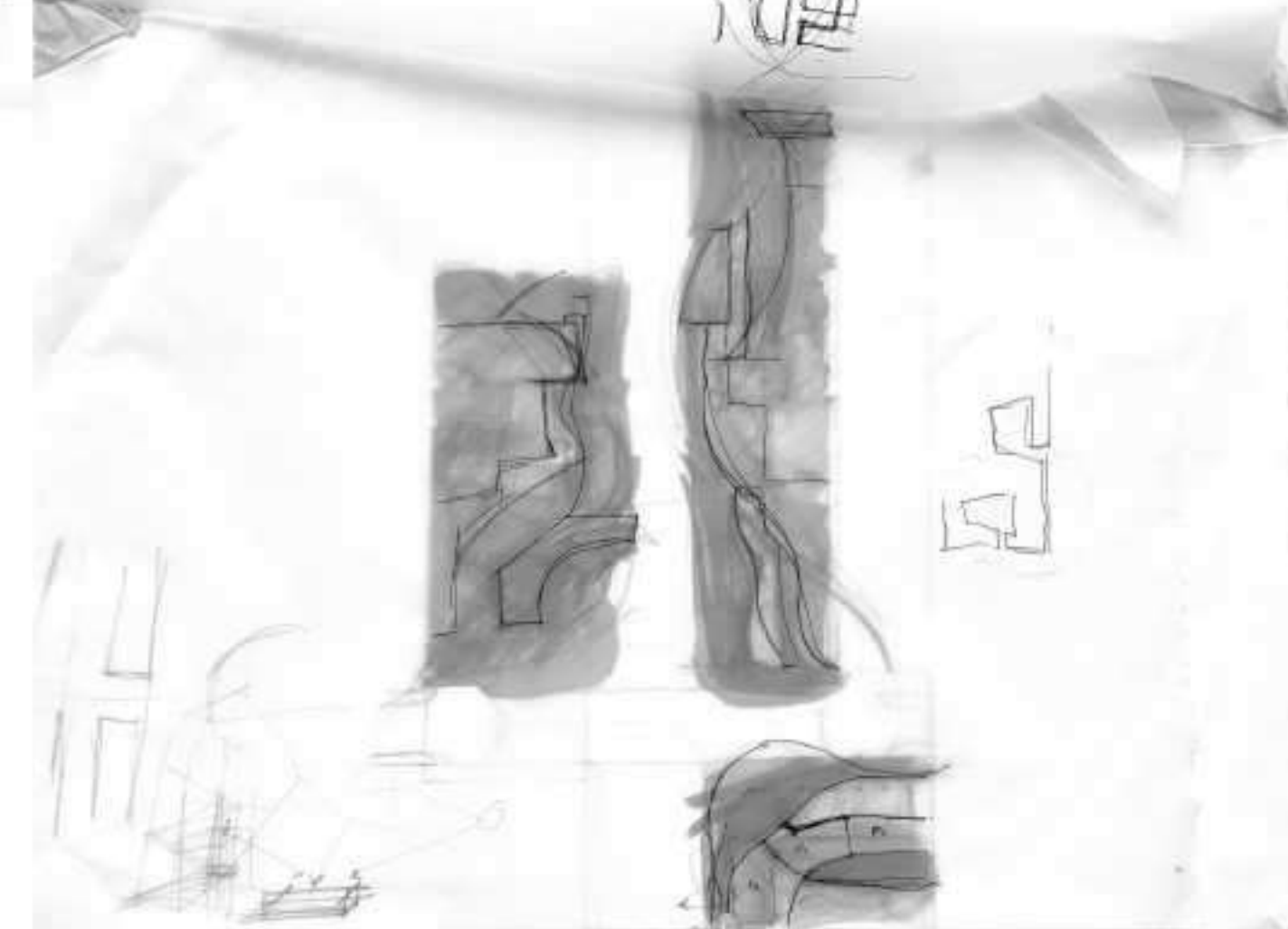
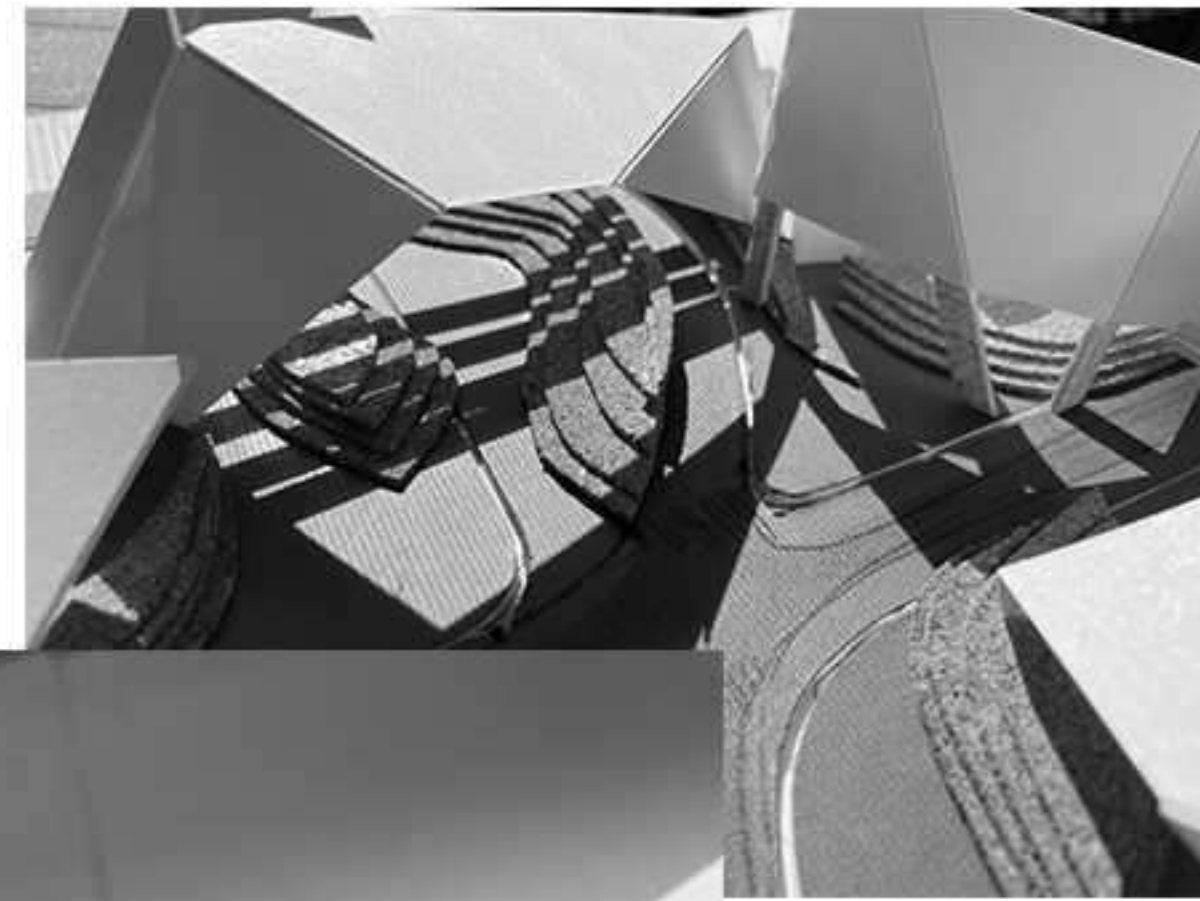
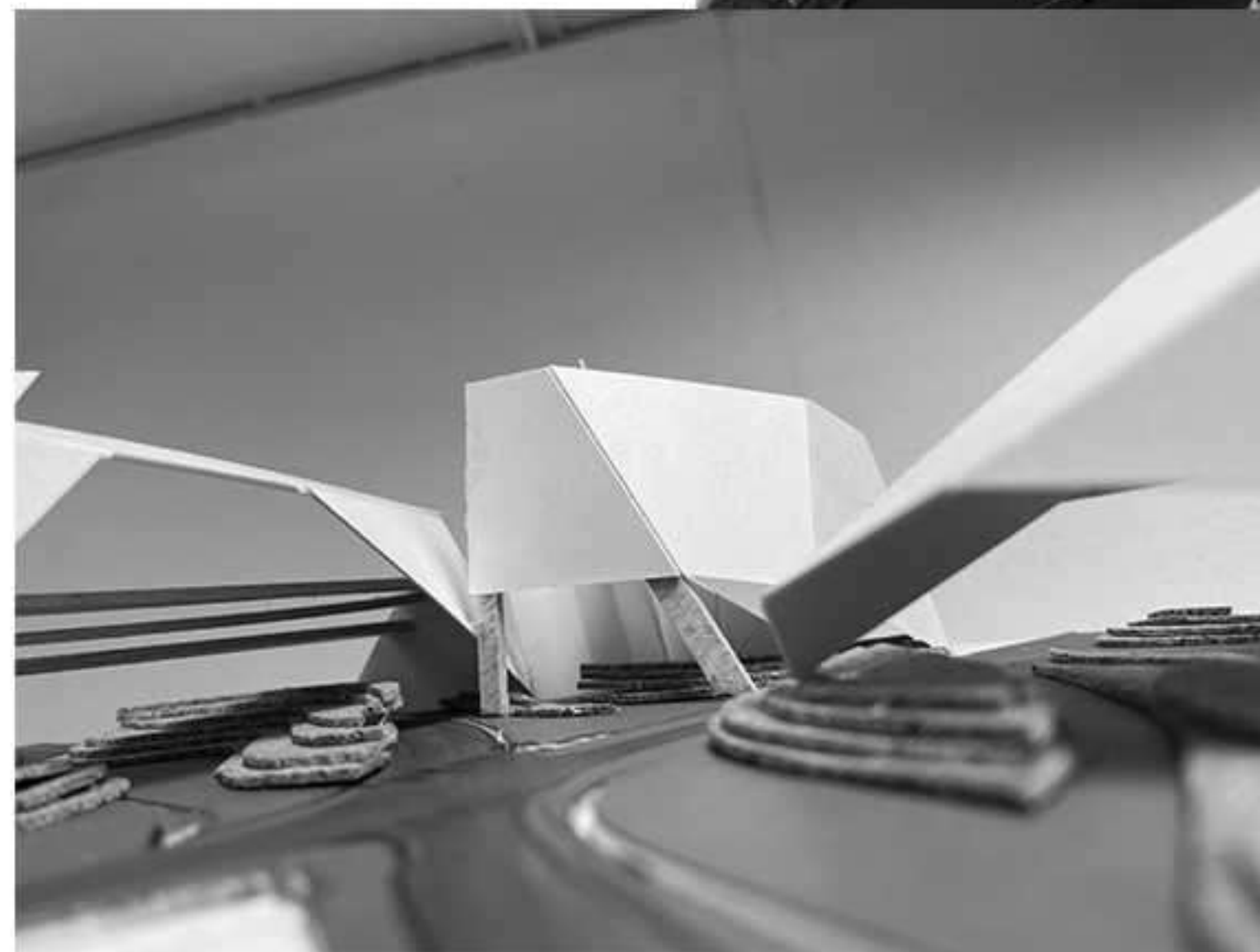
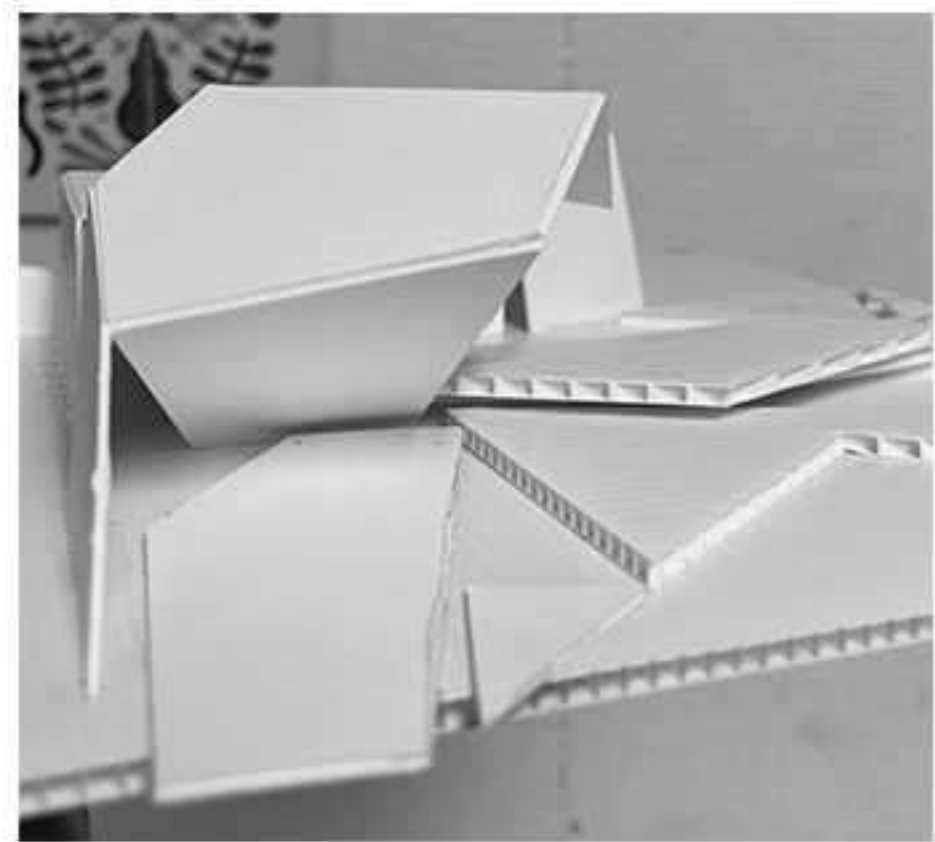
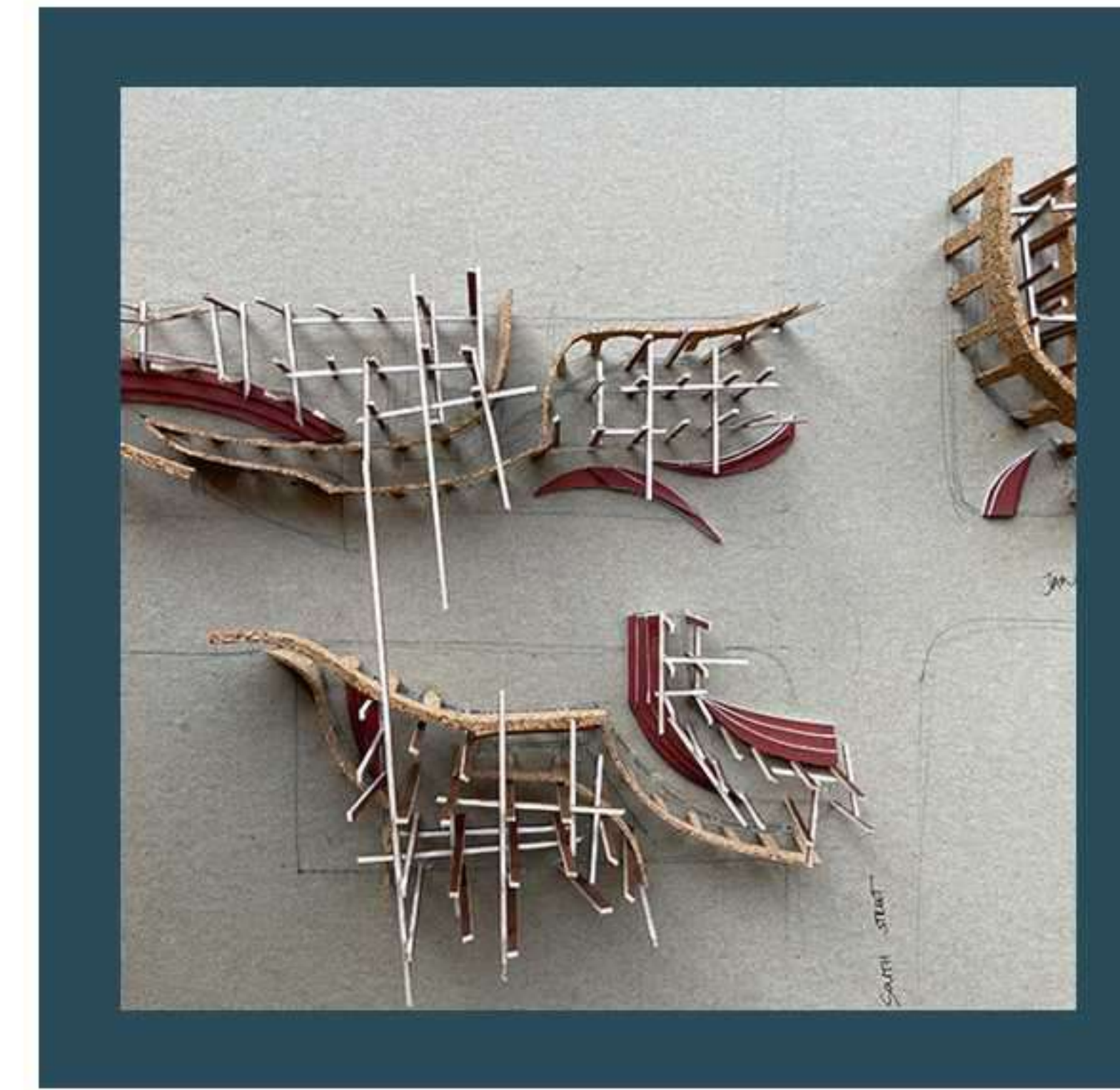
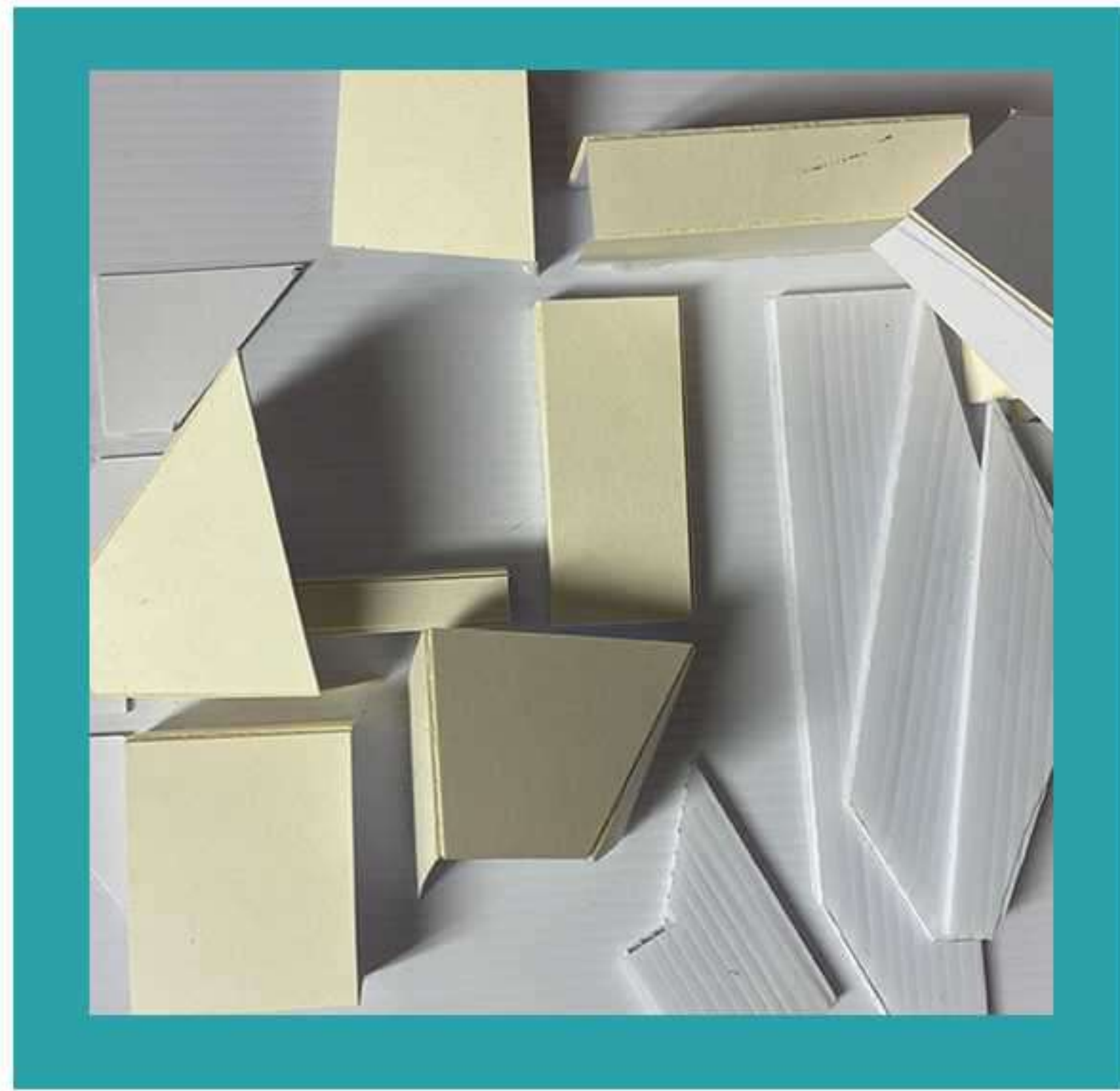
disjointed building

formalistic building

program inter-use

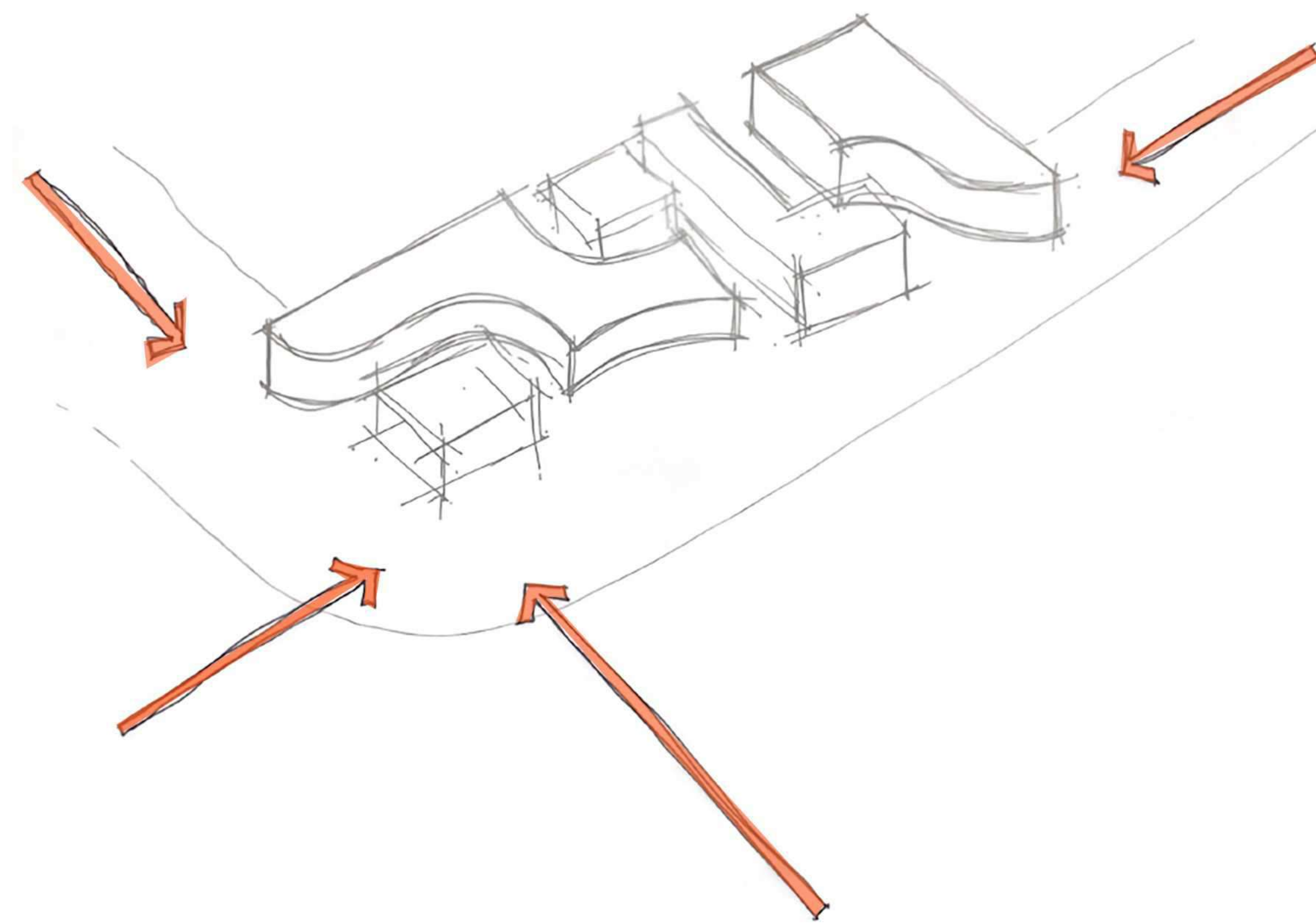
user sensitive building interface

open living building

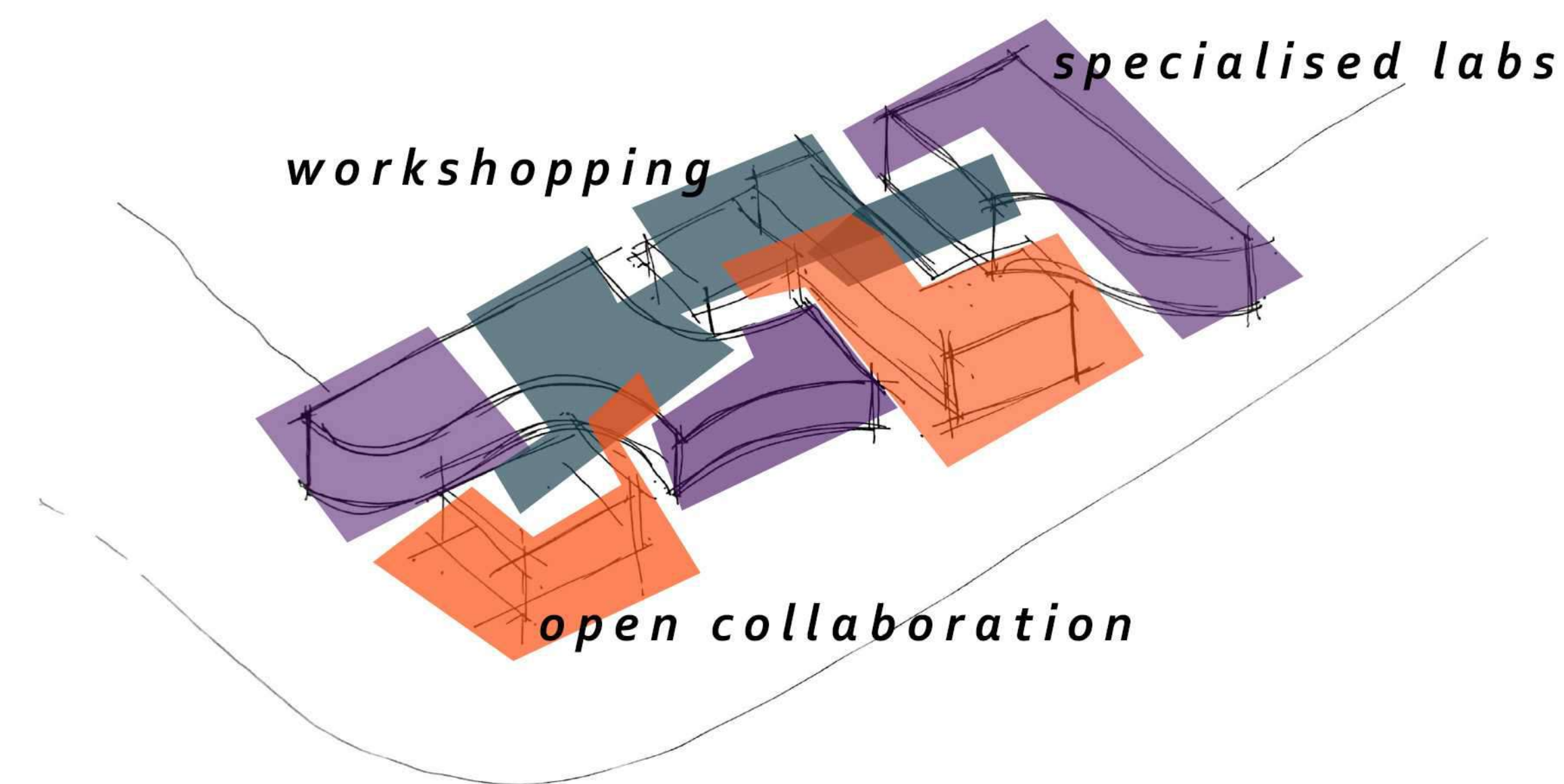


SPATIAL DESIGN DEVELOPMENT

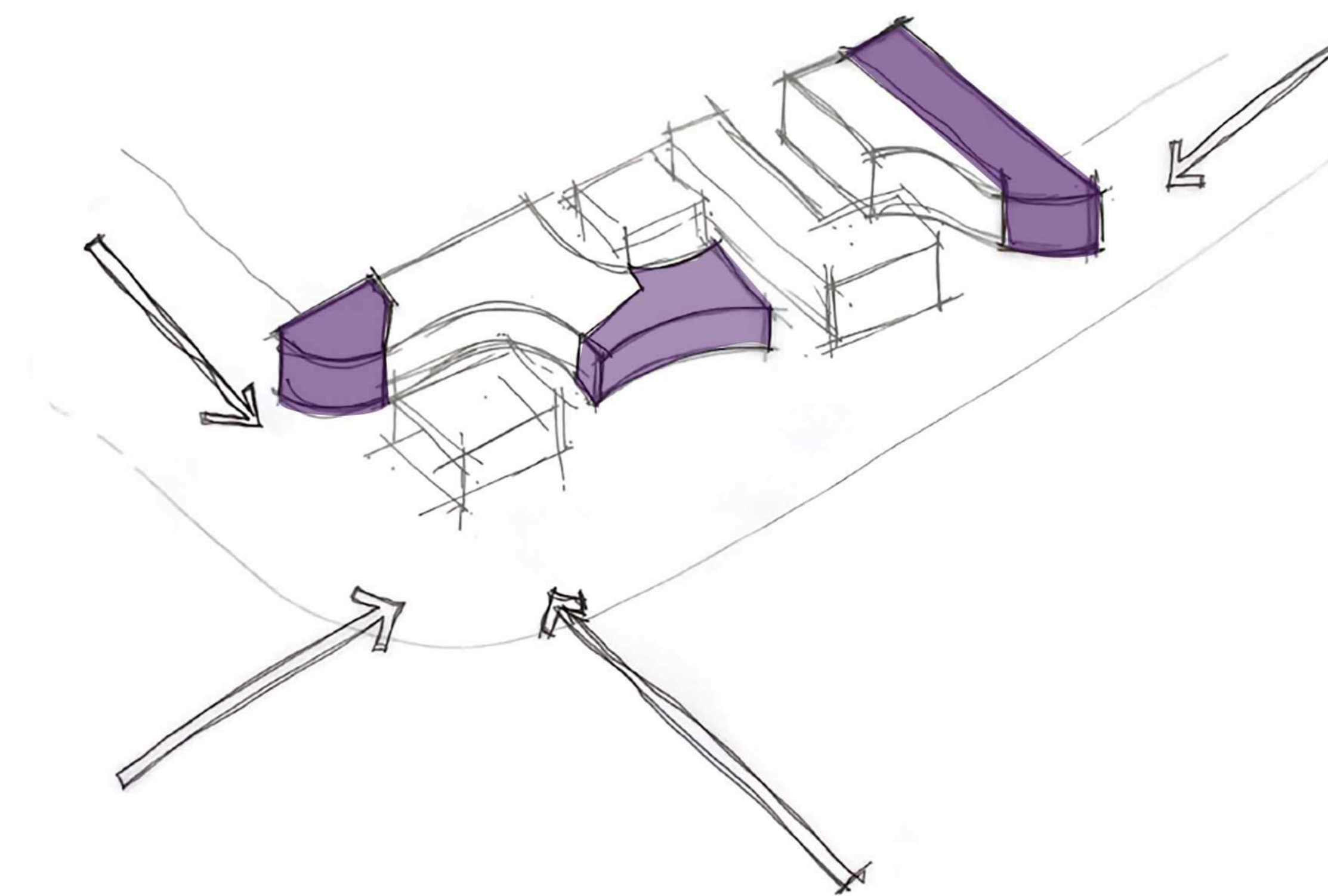




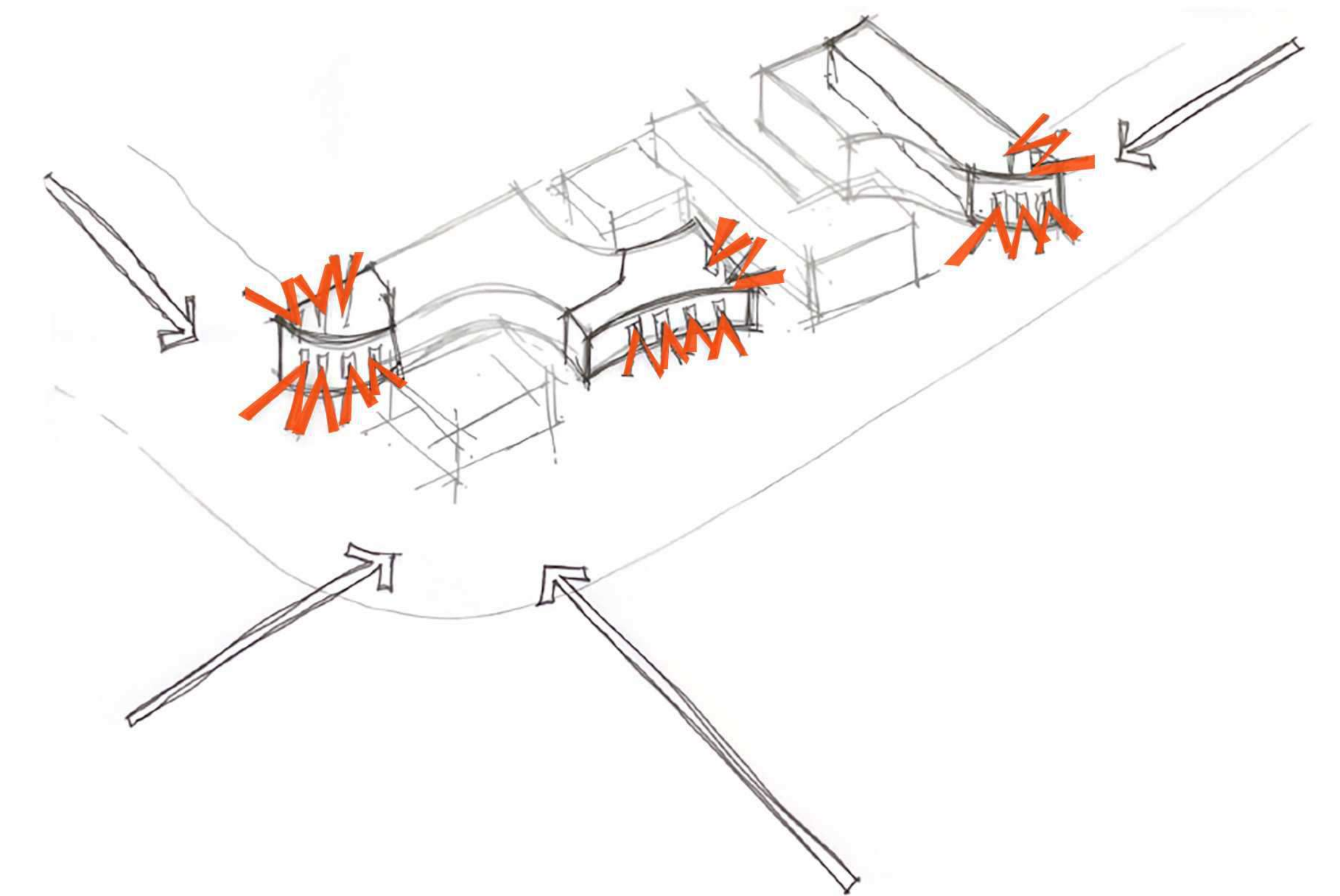
**SITE ACCESS**



**PROGRAMS**  
*open collaboration*  
*workshopping*  
*specialised labs*

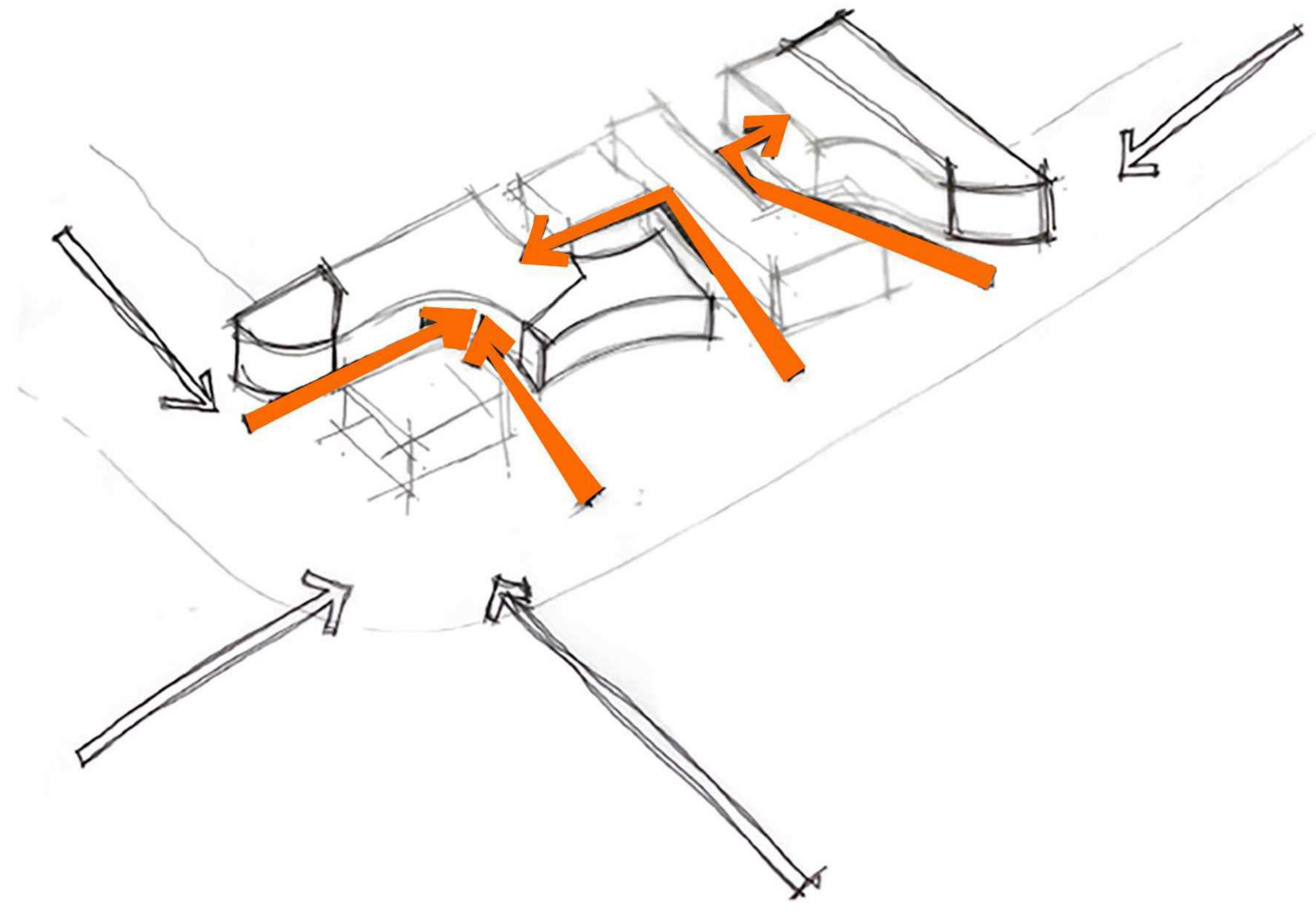


**CENTER PLACING**  
*creates awareness*

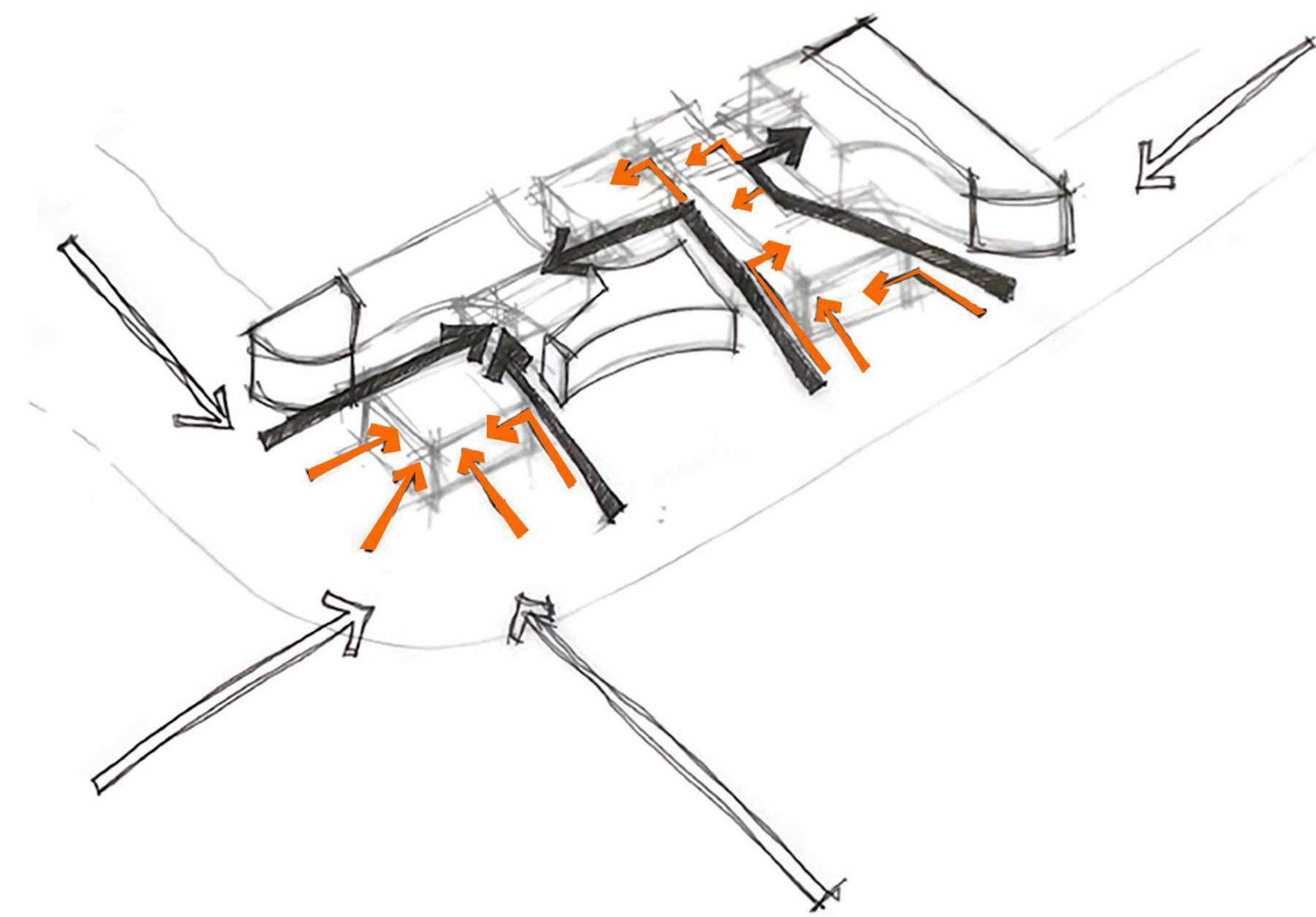


**VISUAL ACCESSIBILITY**  
*integrated approach to*  
*innovation*

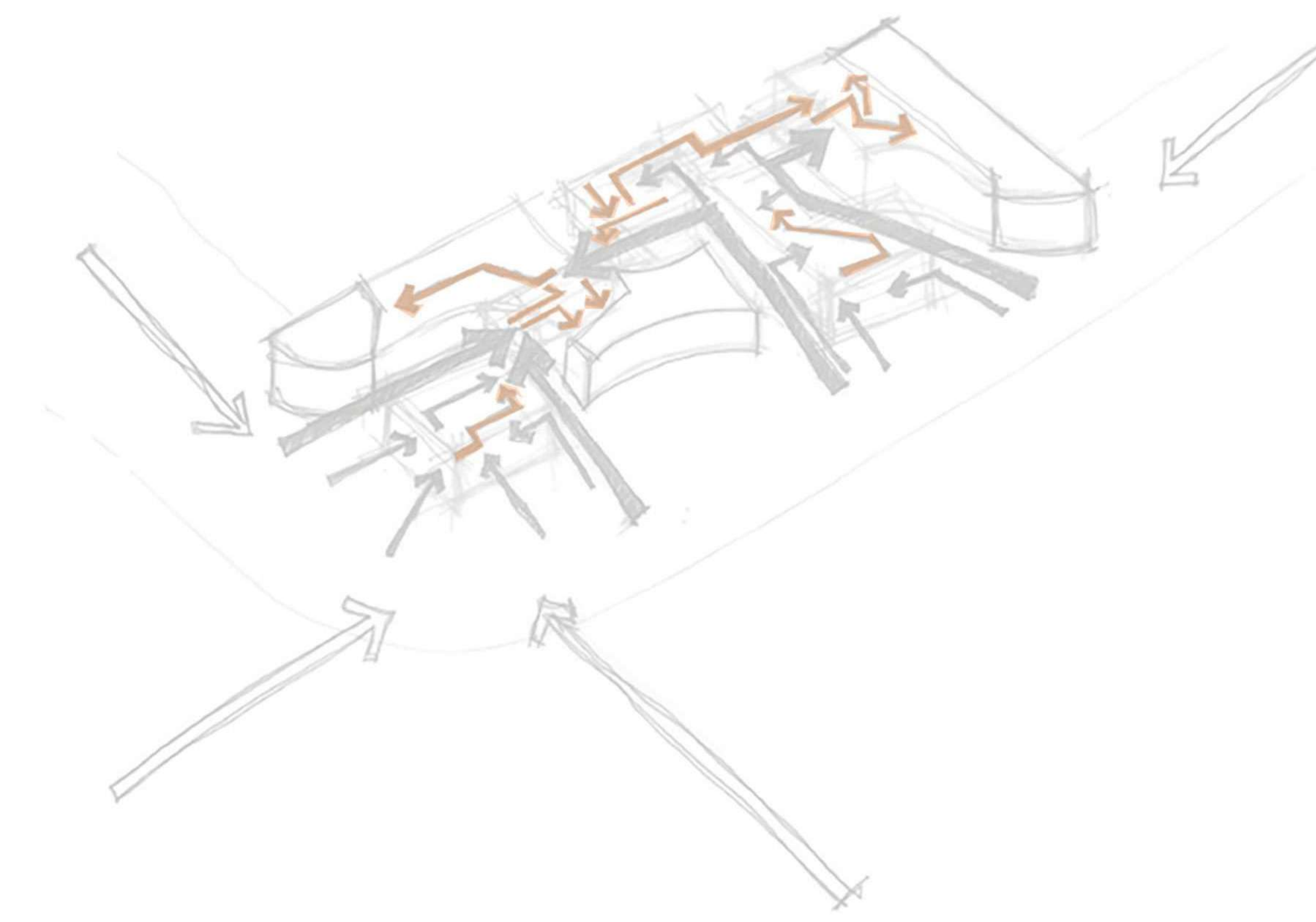




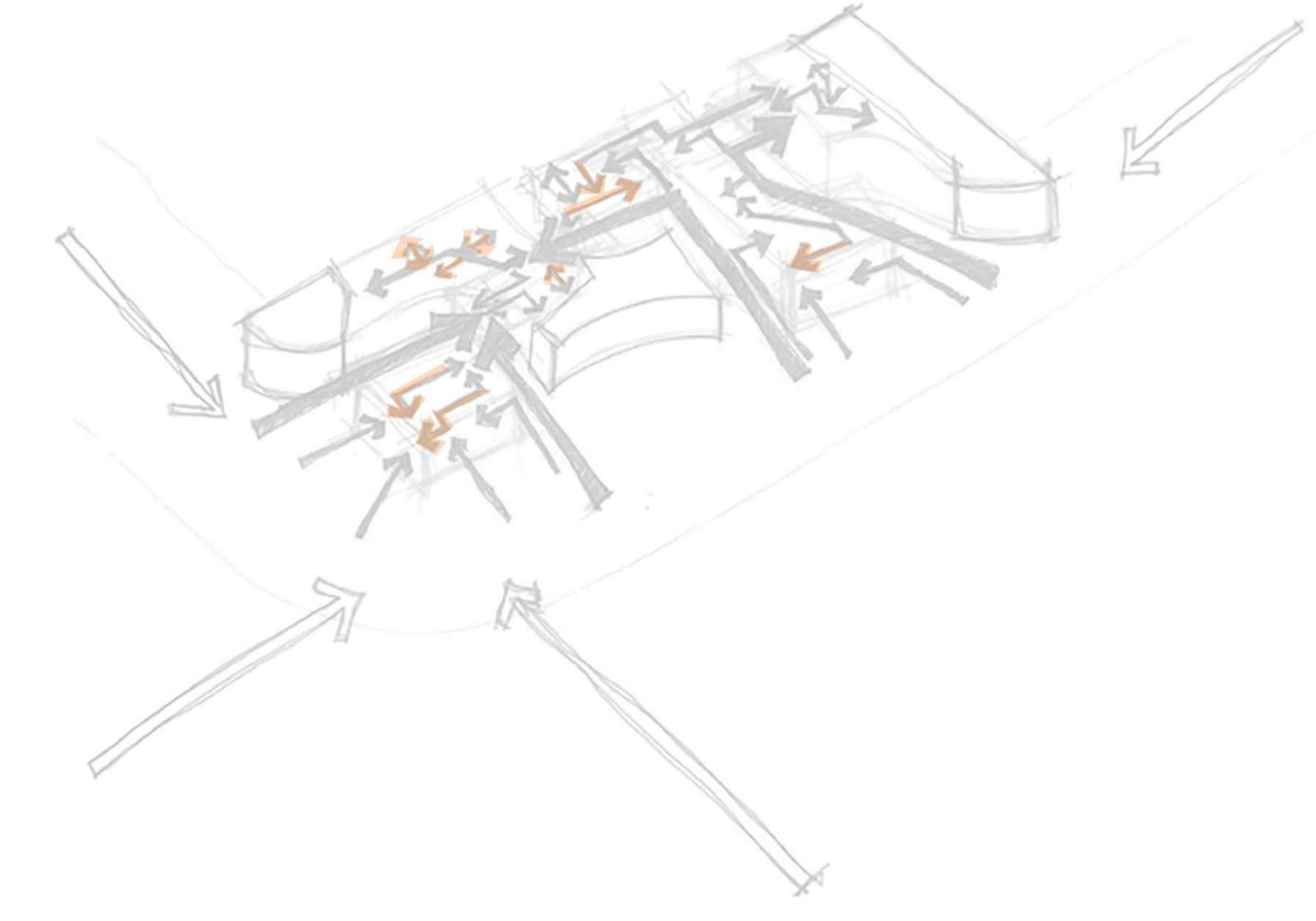
**CONVENTIONAL ACCESS**  
*entrance passageways*



**POROUS ACCESS**  
*tectonic structure*



**PROGRAM & CIRCULATION  
FILTERING**  
*integrated access approach*



**INTEGRATED CIRCULATION**  
*filtering from the outside in and  
reciprocally from the inside out*



movement | site access

precinct

EXISTING TRANSPORT & PEDESTRIAN MOVEMENT

SITE ACCESS POINTS

JAN SHOBA STREET

SOUTH STREET

circulation | entrance thresholds

building

JAN SHOBA STREET

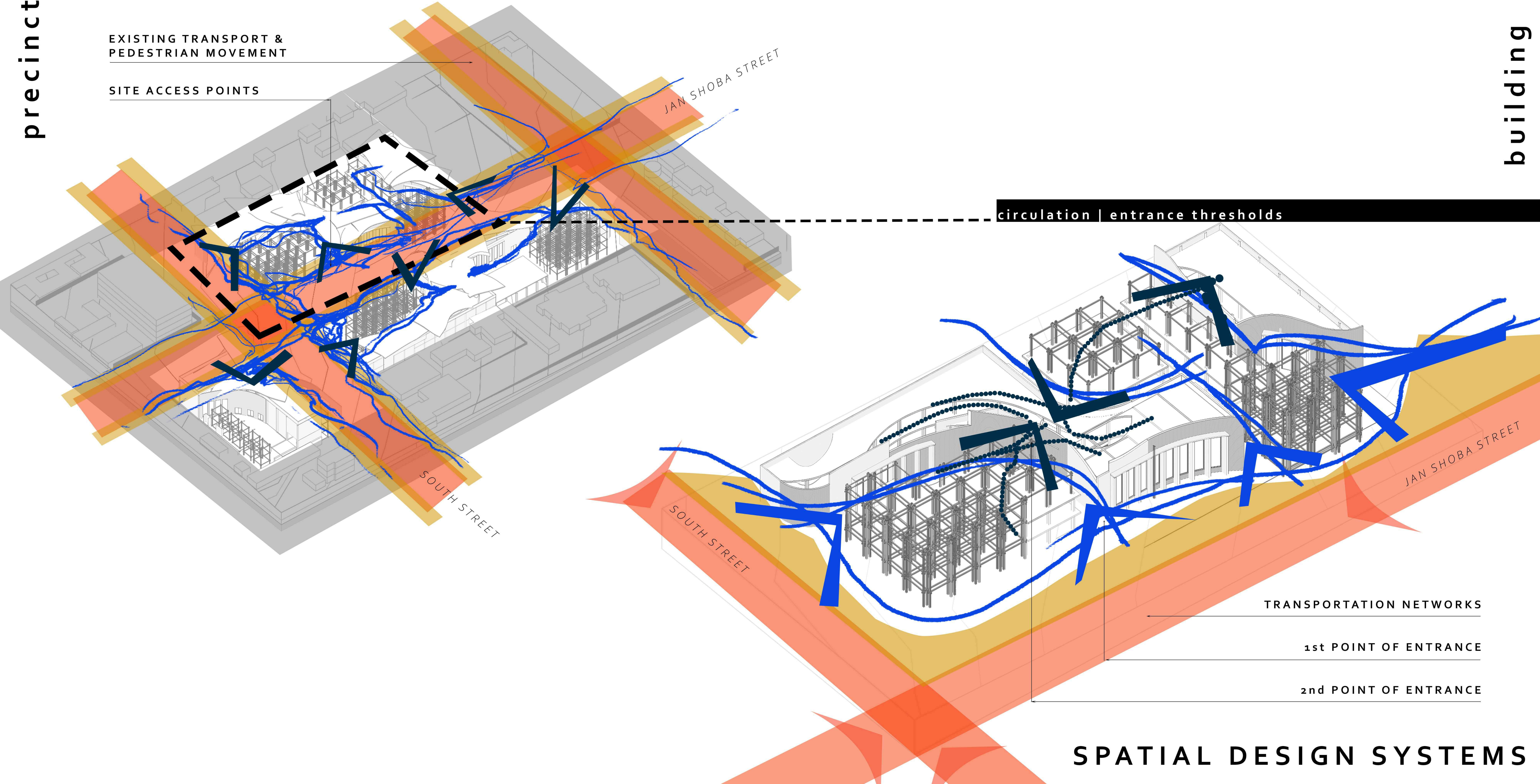
SOUTH STREET

TRANSPORTATION NETWORKS

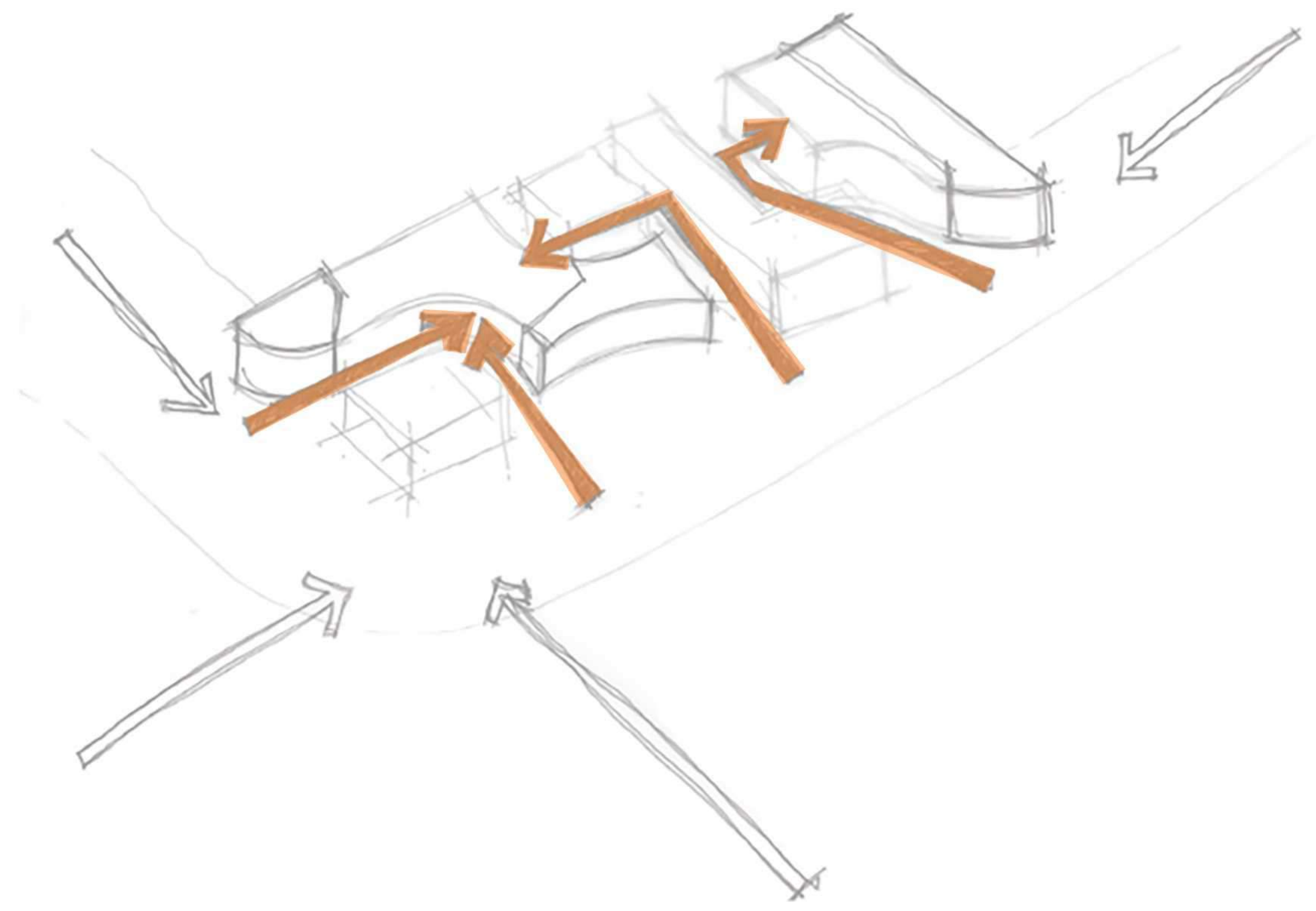
1st POINT OF ENTRANCE

2nd POINT OF ENTRANCE

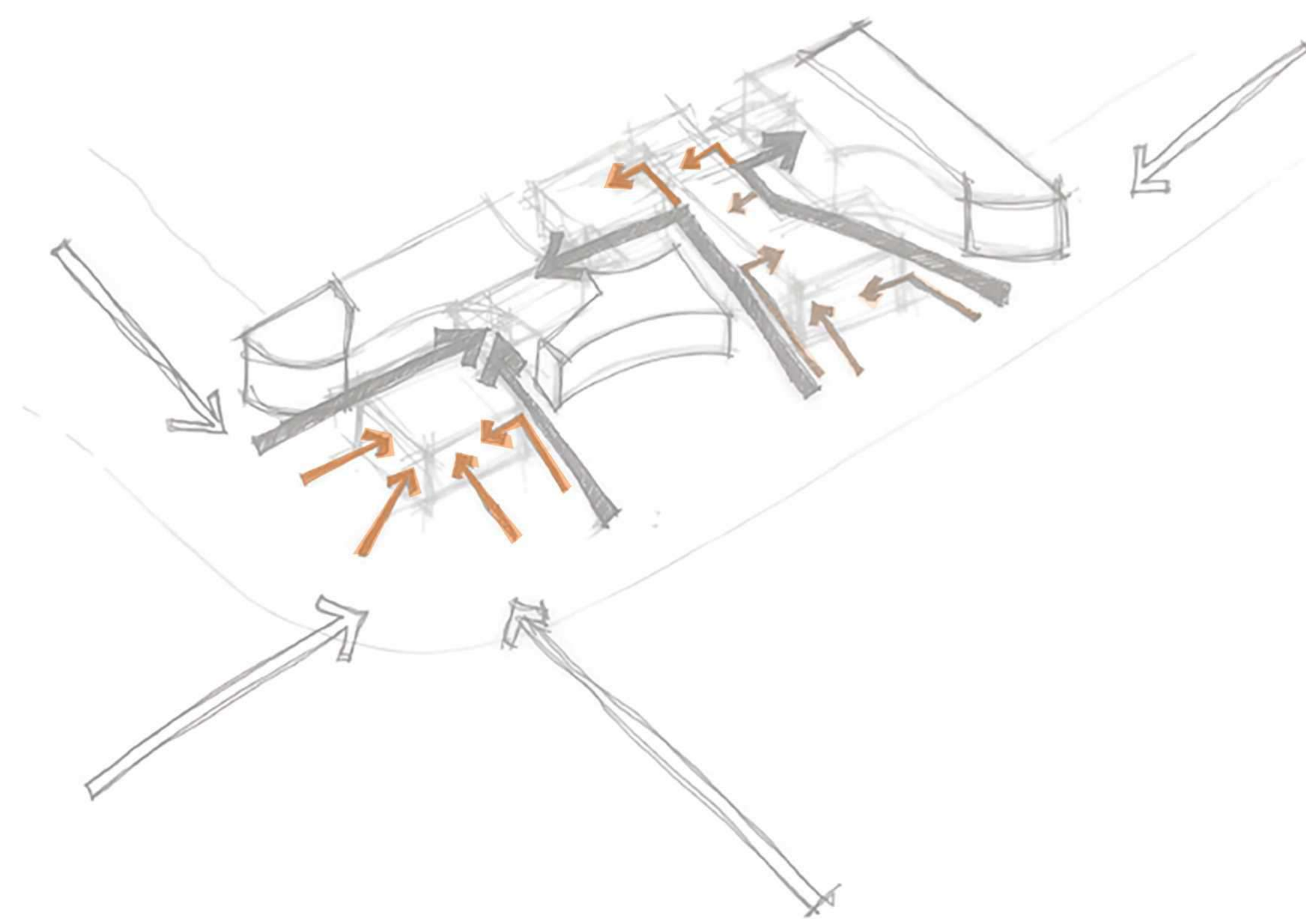
SPATIAL DESIGN SYSTEMS



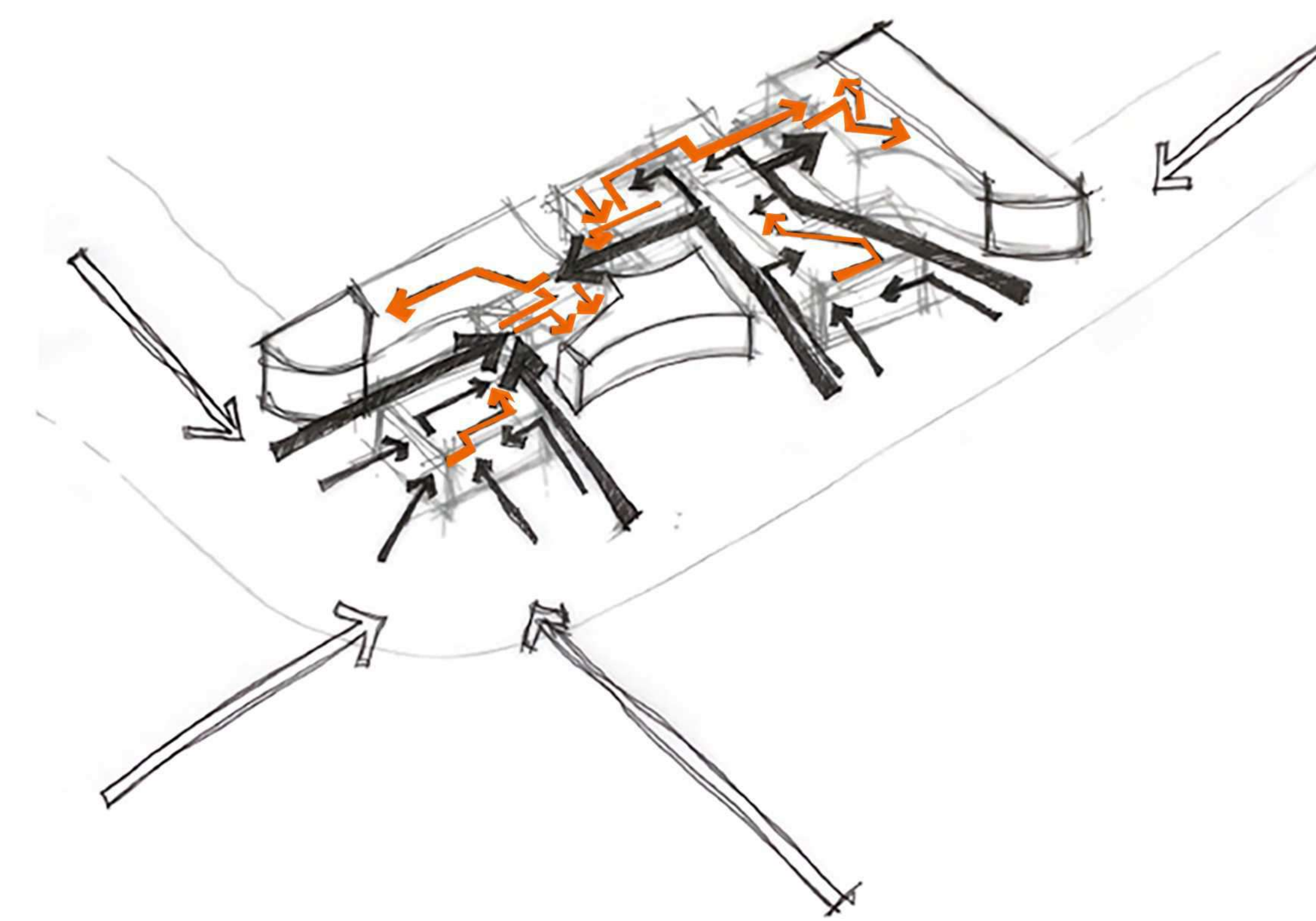




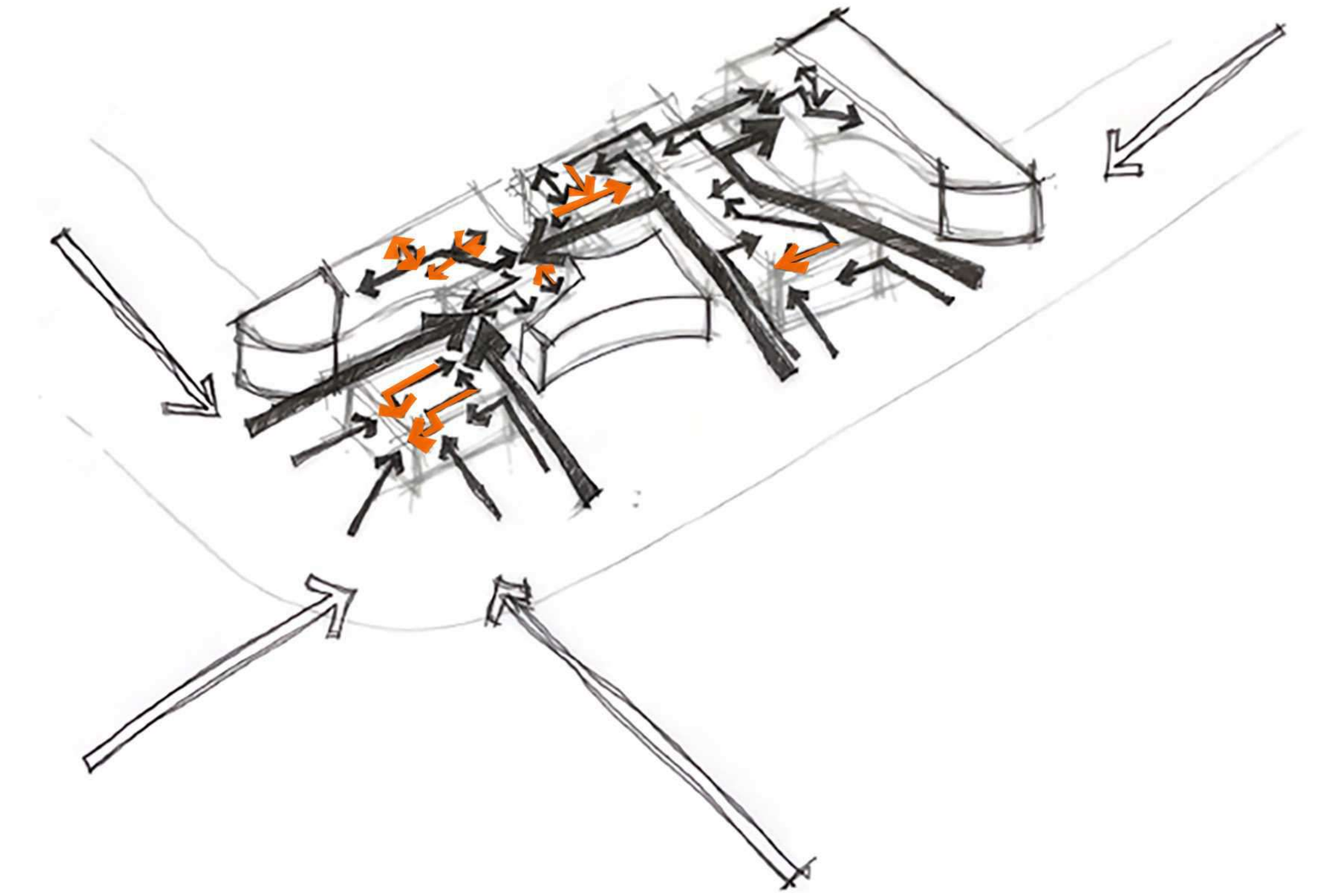
**CONVENTIONAL ACCESS**  
*entrance passageways*



**POROUS ACCESS**  
*tectonic structure*

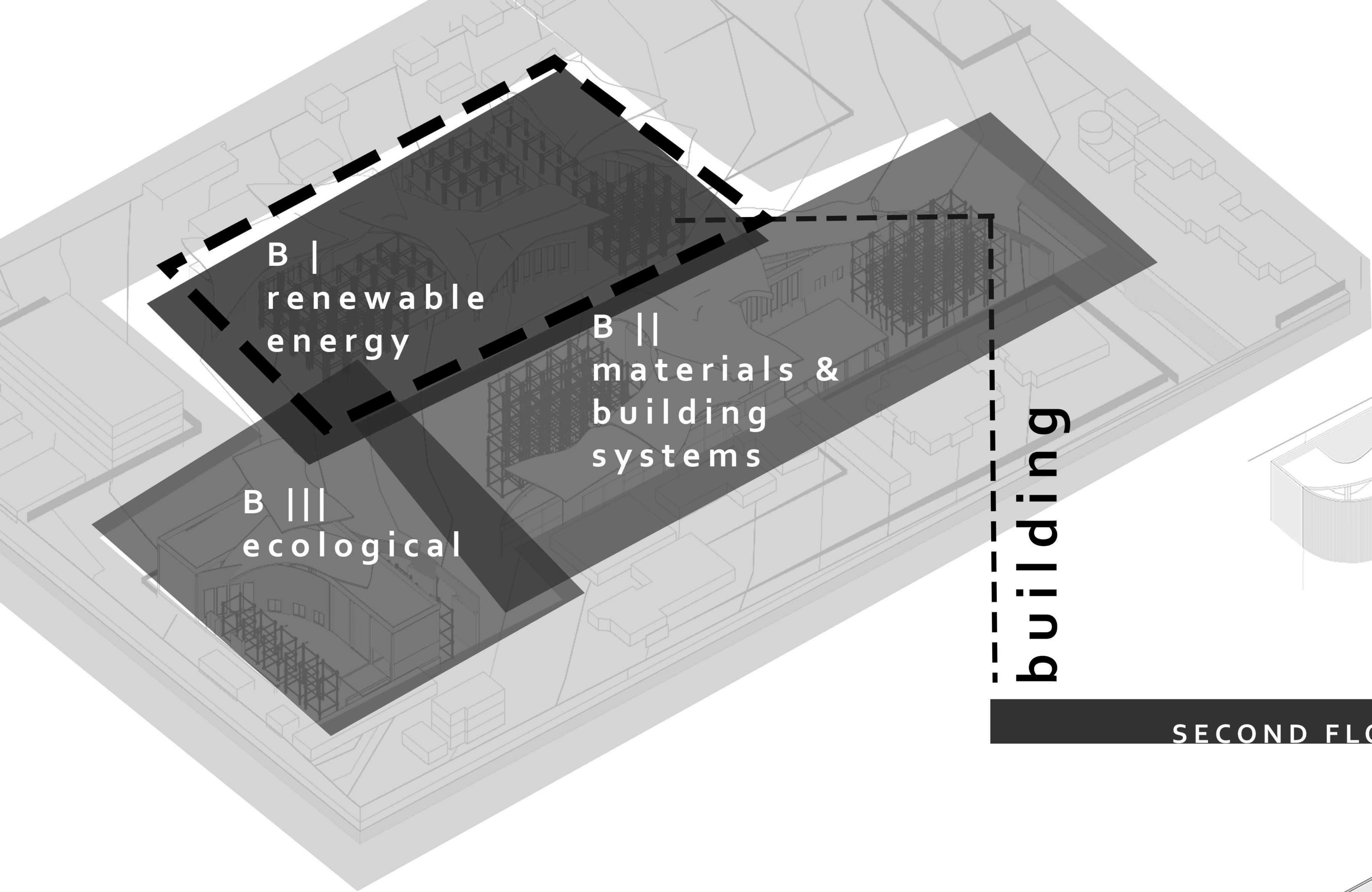


**PROGRAM & CIRCULATION  
FILTERING**  
*integrated access approach*



**INTEGRATED CIRCULATION**  
*filtering from the outside in and  
reciprocally from the inside out*

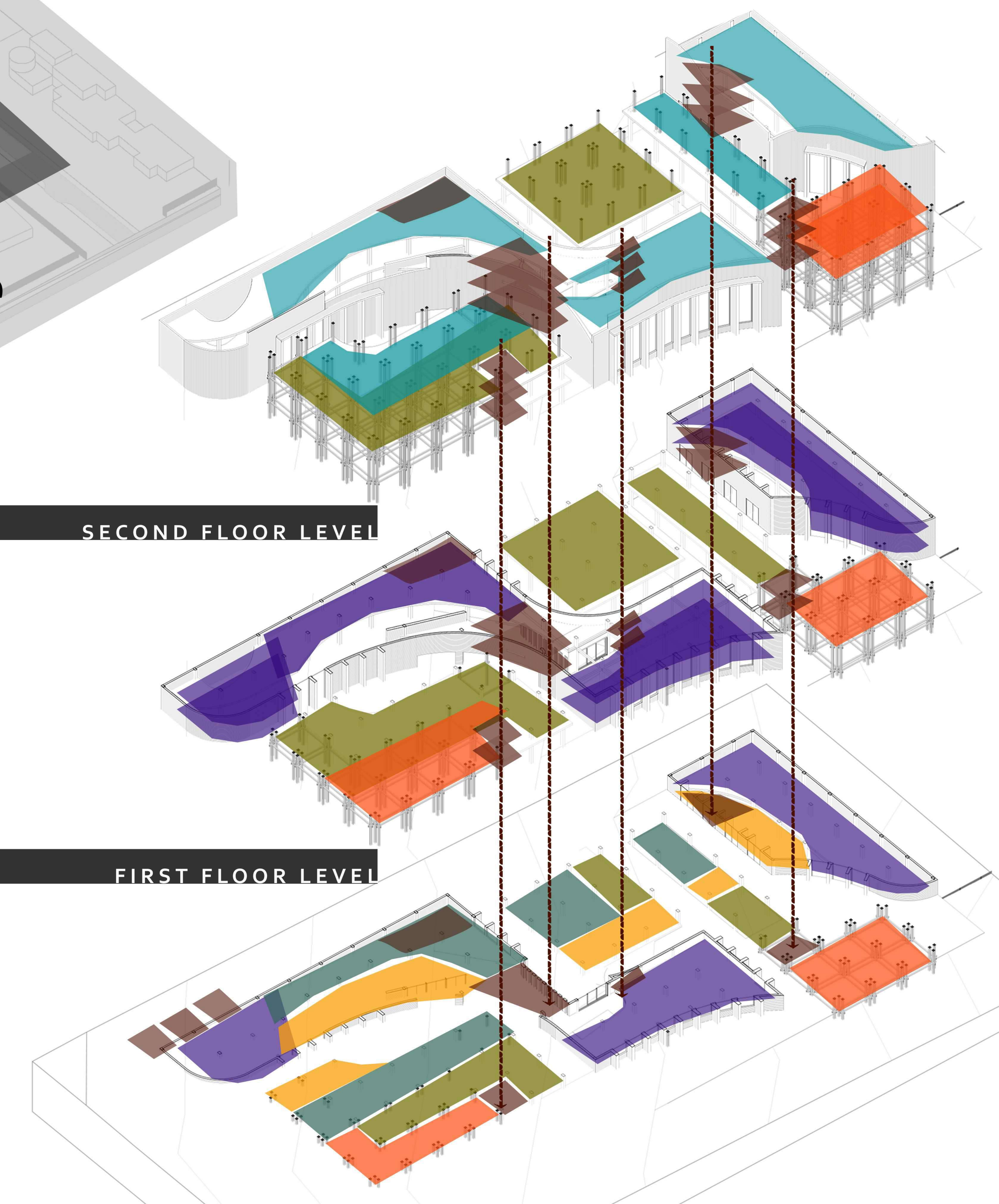




**SECOND FLOOR LEVEL**

**FIRST FLOOR LEVEL**

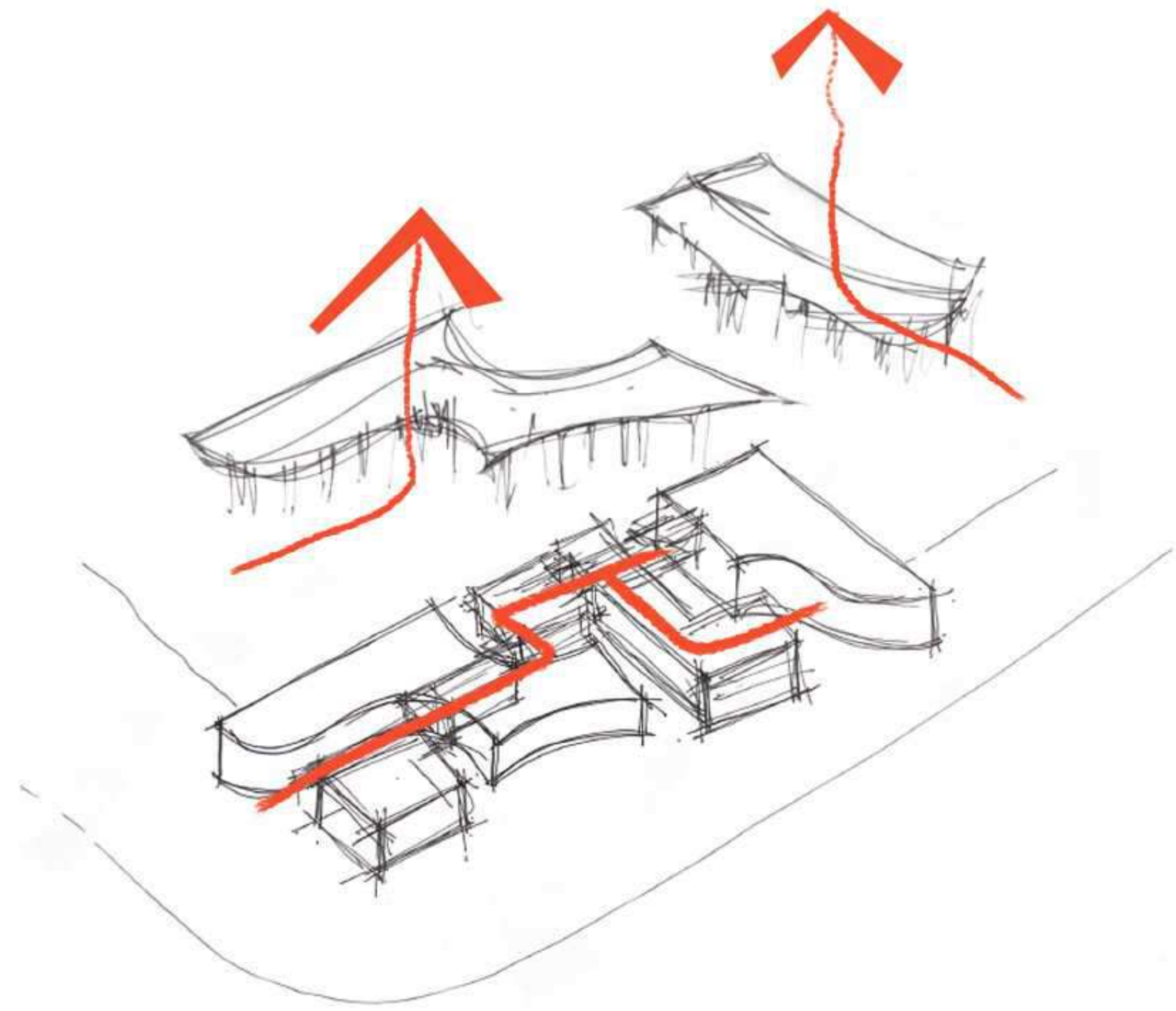
**GROUND FLOOR LEVEL**



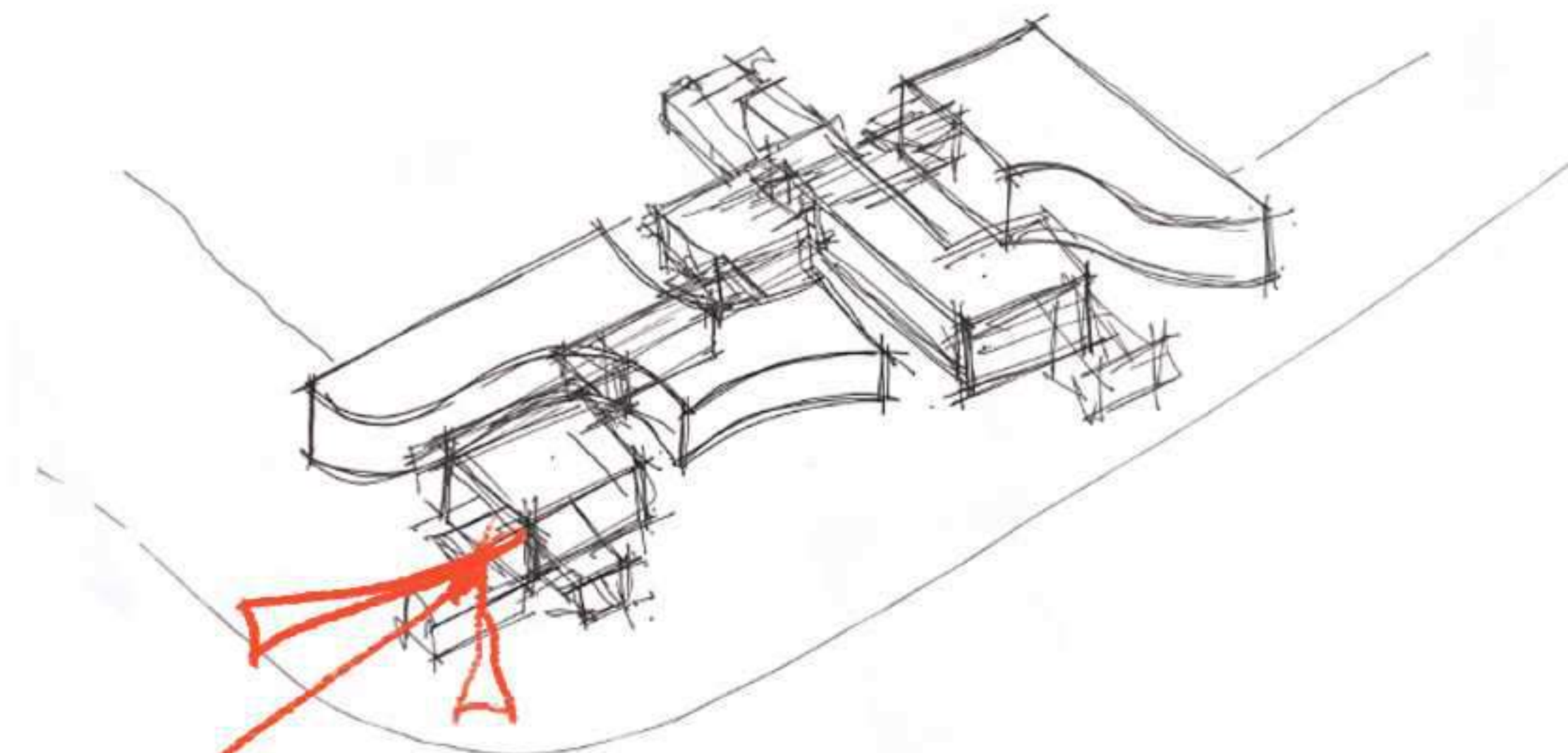
- 1 // LABORATORY :**  
IT LAB  
ENERGY MATERIALS LAB  
ENERGY SYSTEMS LAB  
ENERGY FUELS LAB
- 2 // INDIV LEARNING SPACE :**  
LIBRARY  
STUDY SPACES  
DATA CENTRES
- 3 // CO-WORKSHOP SPACE :**  
FABRICATION AND MAKERS LABS
- HOT DESK WORKSPACES  
COLLABORATIVE WORKING SPACES  
CLOSED MEETING ROOMS
- 4 // CONFERENCE SPACE :**  
OPEN VISUALIZATION &  
COLLABORATION AUDITORIUM  
DIGITAL INTERACTIVE EXHIBTION  
& LECTURE SPACE
- 5 // SOCIAL SPACE :**  
SOCIAL BAR  
CAFES  
EVENT SPACE
- 6 // SERVICE SPACE :**  
VERTICAL CIRCULATION  
BATHROOMS  
REFUSE REMOVAL AREA

**PROGRAM LAYOUT DESIGN**

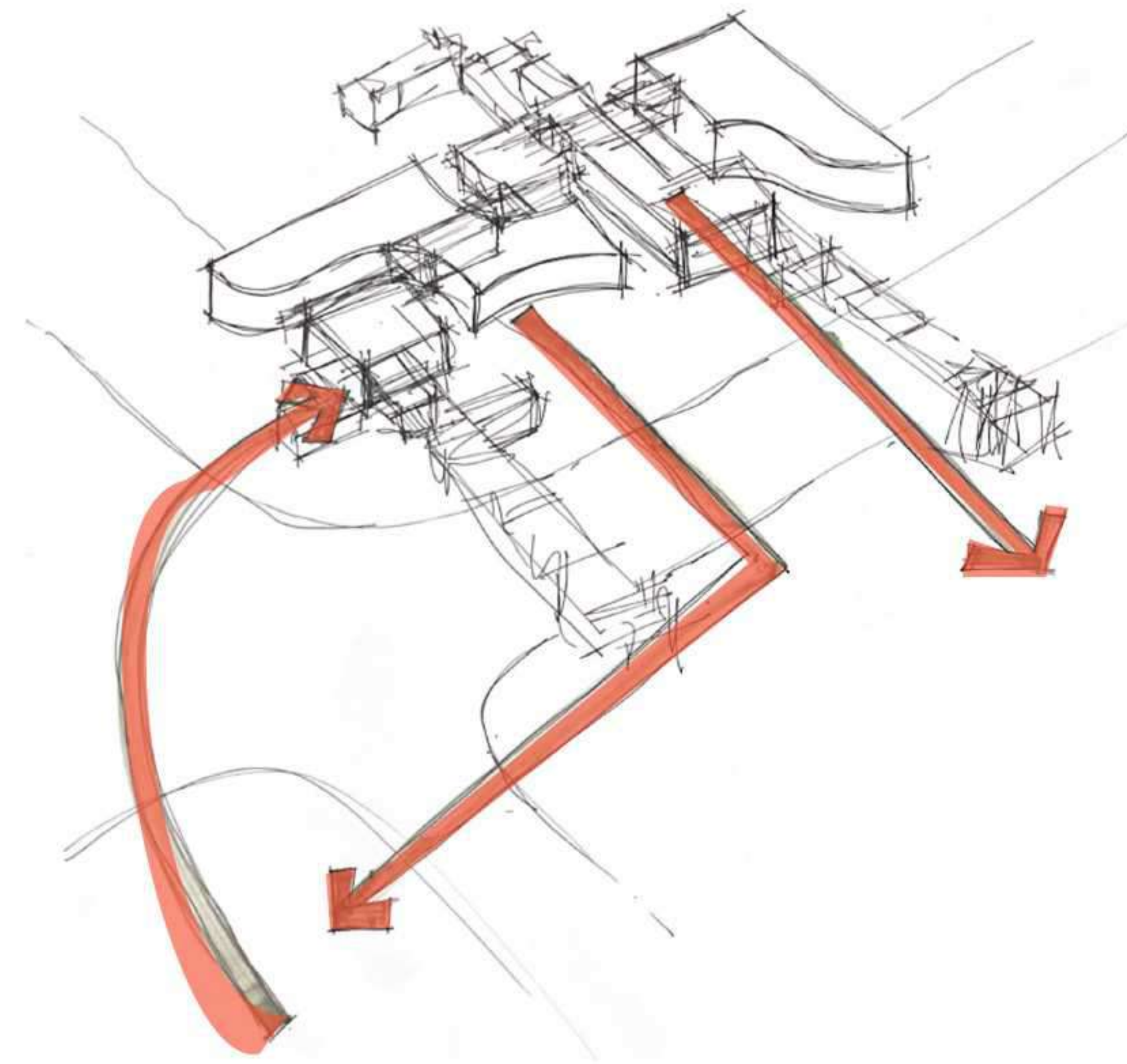




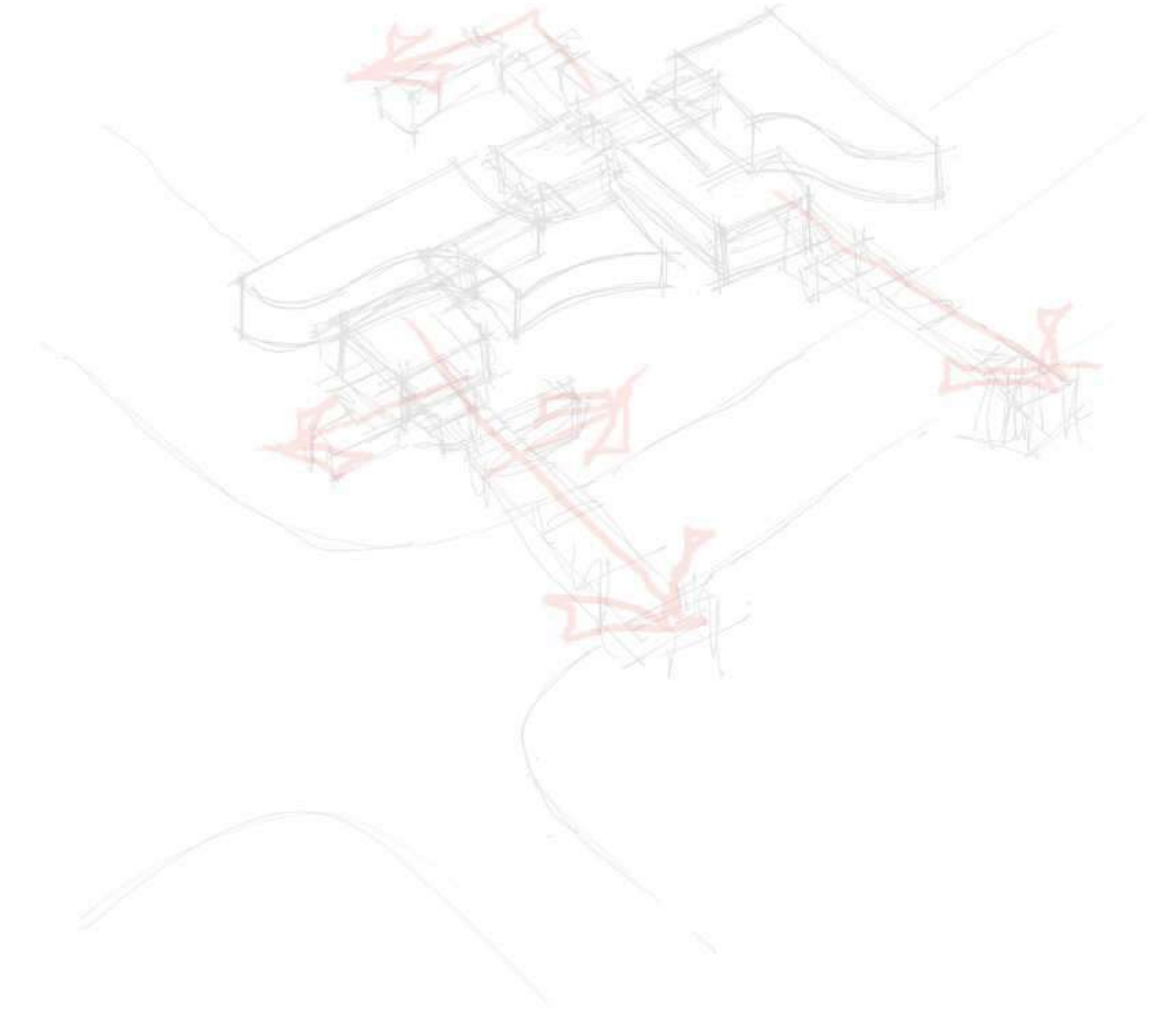
**MATERIAL EXTENTION**  
*tectonic bamboo structure  
extending into roof scape*



**INNOVATION MATERIAL  
IN BUILDING FORM**



**LIVING SYSTEMS AND  
PHASING**



**FUTURE ADAPTABILITY**



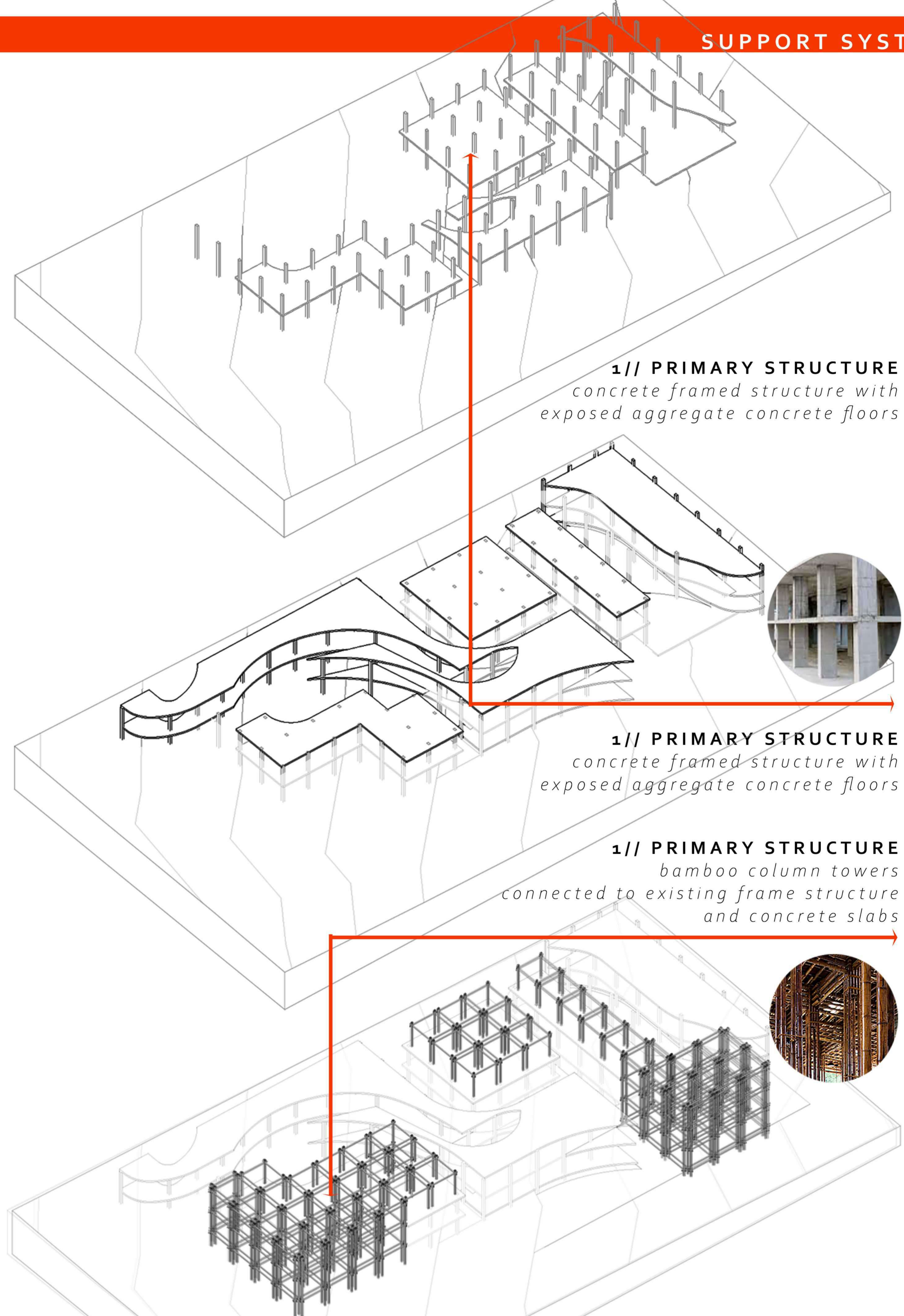
SUPPORT SYSTEM

ENVELOPE SYSTEM

exist

new  
new

SYSTEM # 1  
SYSTEM # 2



**1// PRIMARY STRUCTURE**  
concrete framed structure with  
exposed aggregate concrete floors

**1// PRIMARY STRUCTURE**  
concrete framed structure with  
exposed aggregate concrete floors

**1// PRIMARY STRUCTURE**  
bamboo column towers  
connected to existing frame structure  
and concrete slabs

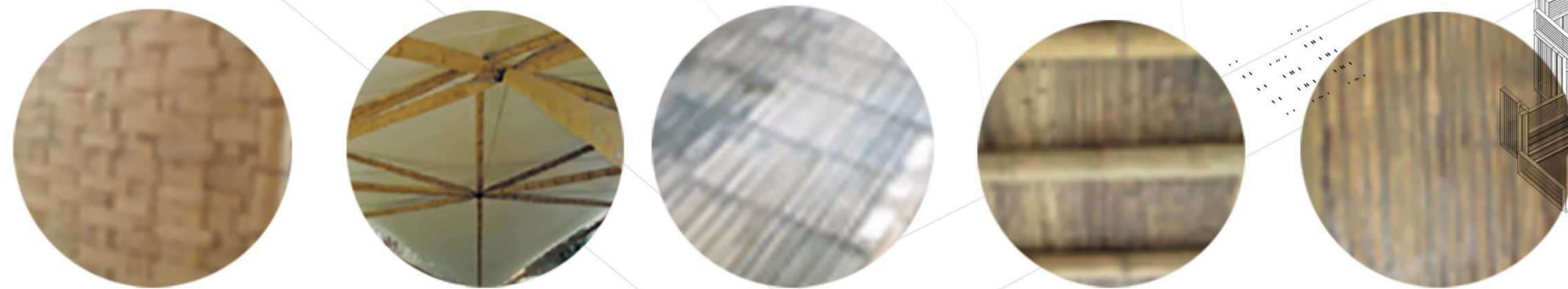
**3// SECONDARY ROOF STRUCTURE**  
bamboo roof shell truss structure  
with bamboo roof skin



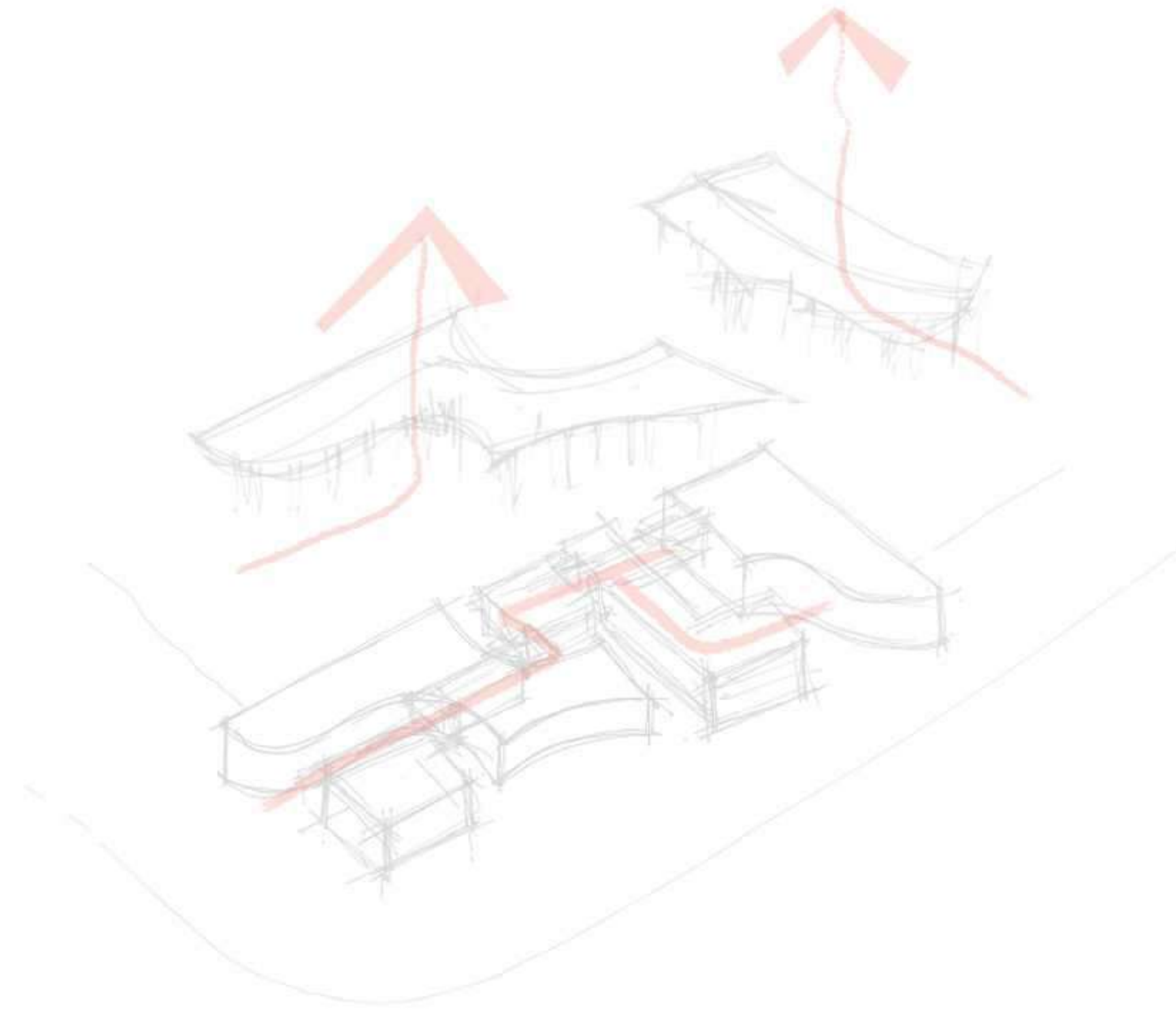
**2// SKIN**  
masonry recycled brick infill walls  
steel windows and doors



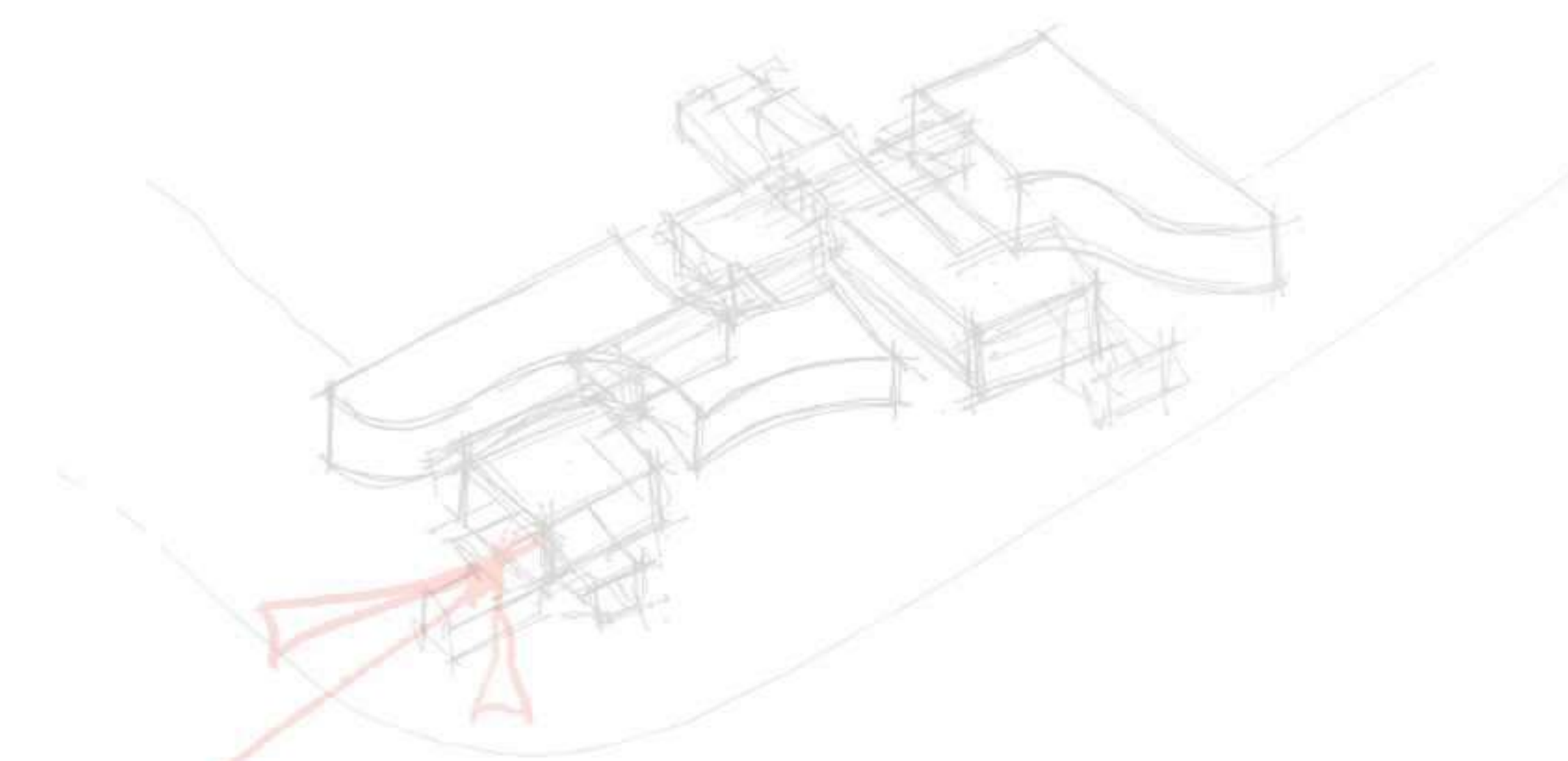
**2// SKIN AND INFILL**  
kit of parts acting as infill  
consisting of bamboo floor panels  
weaved bamboo wall panels  
and tensile fabrics



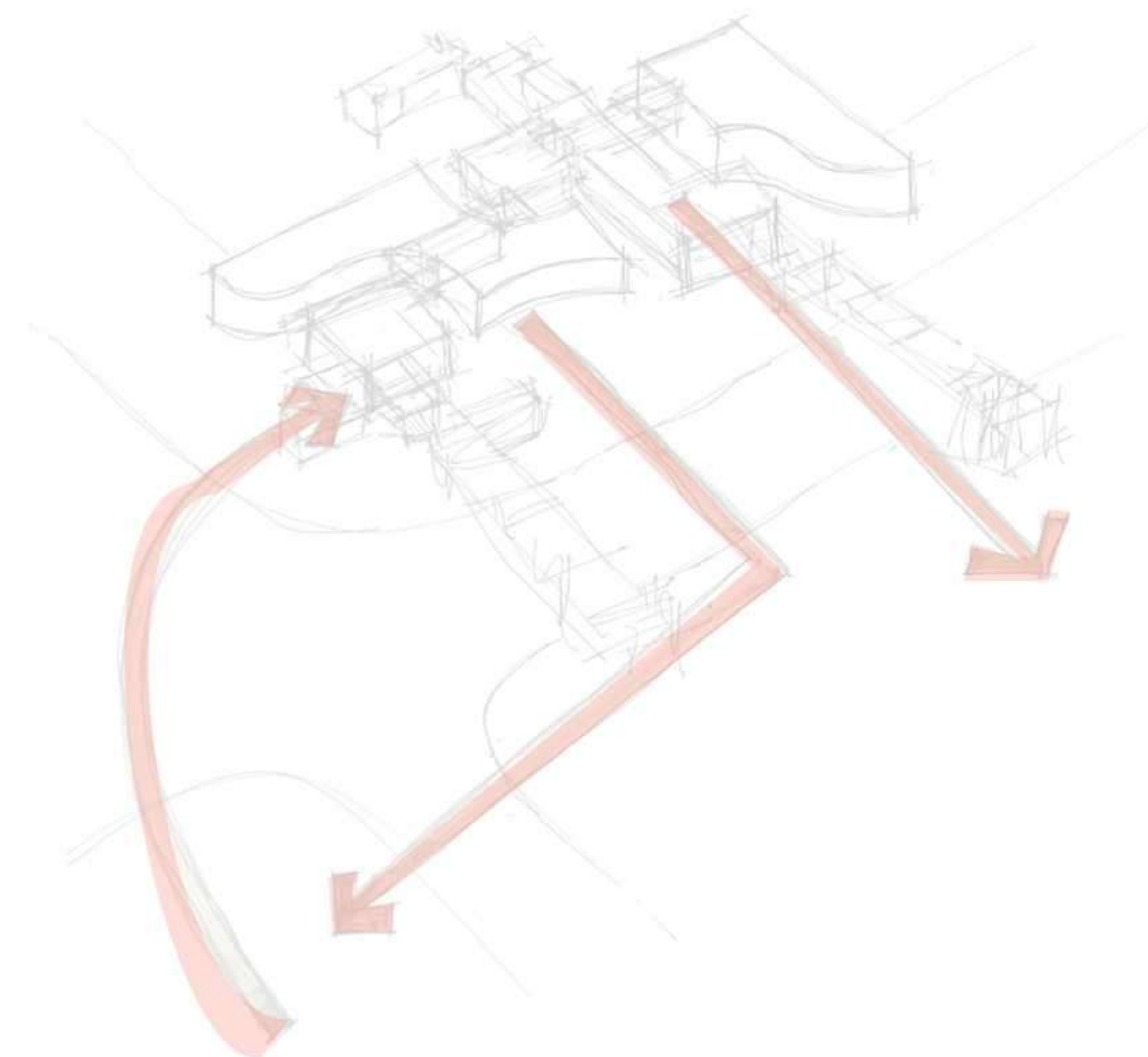




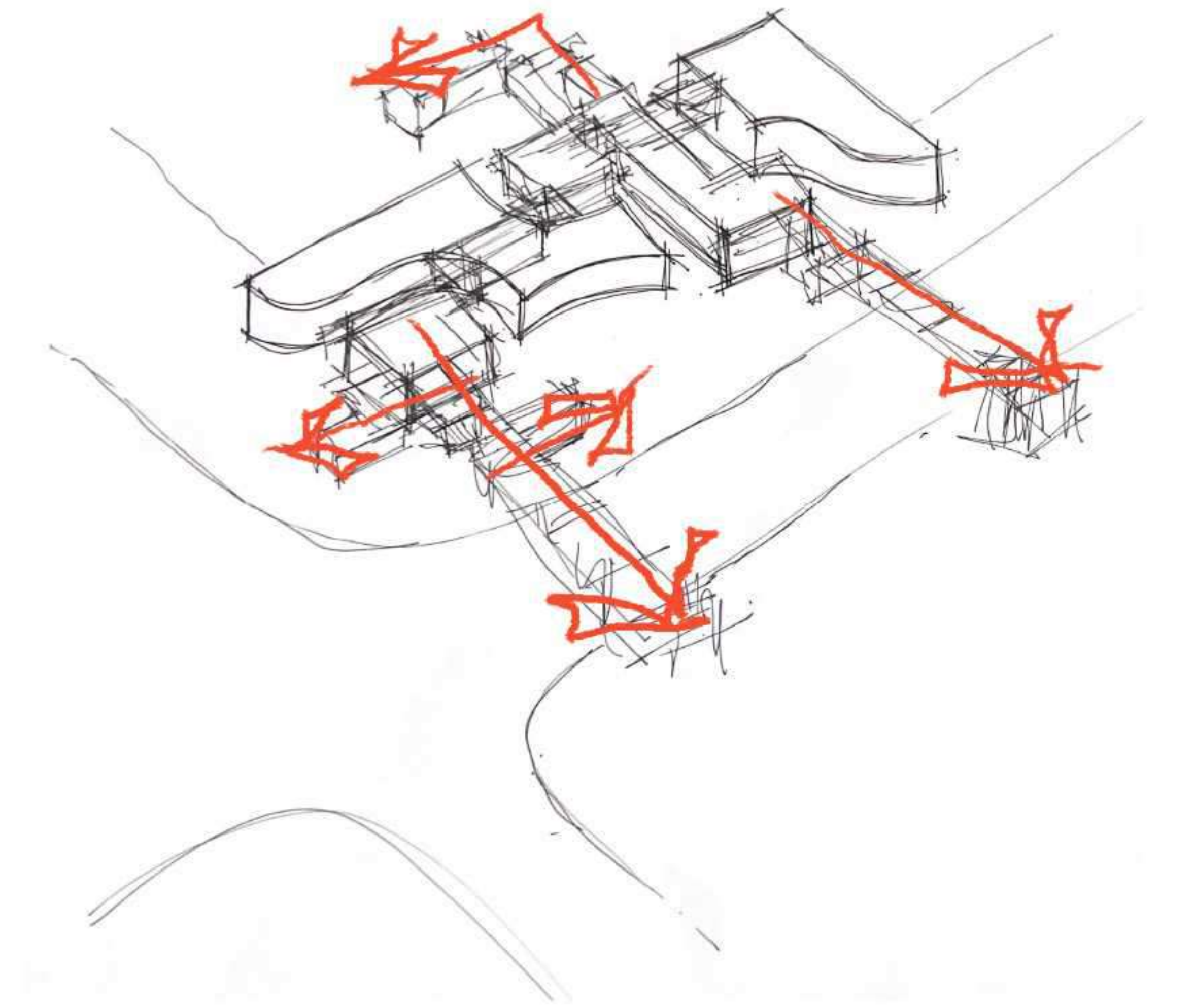
MATERIAL EXTENTION  
*tectonic bamboo structure  
extending into roof scape*



INNOVATION MATERIAL  
IN BUILDING FORM



LIVING SYSTEMS AND  
PHASING



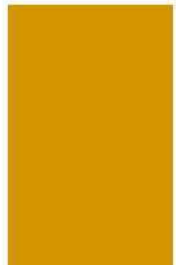


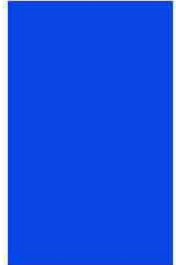
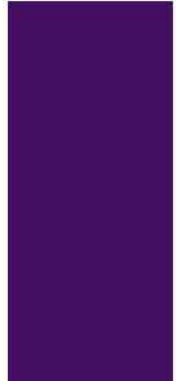
FUTURE ADAPTABILITY



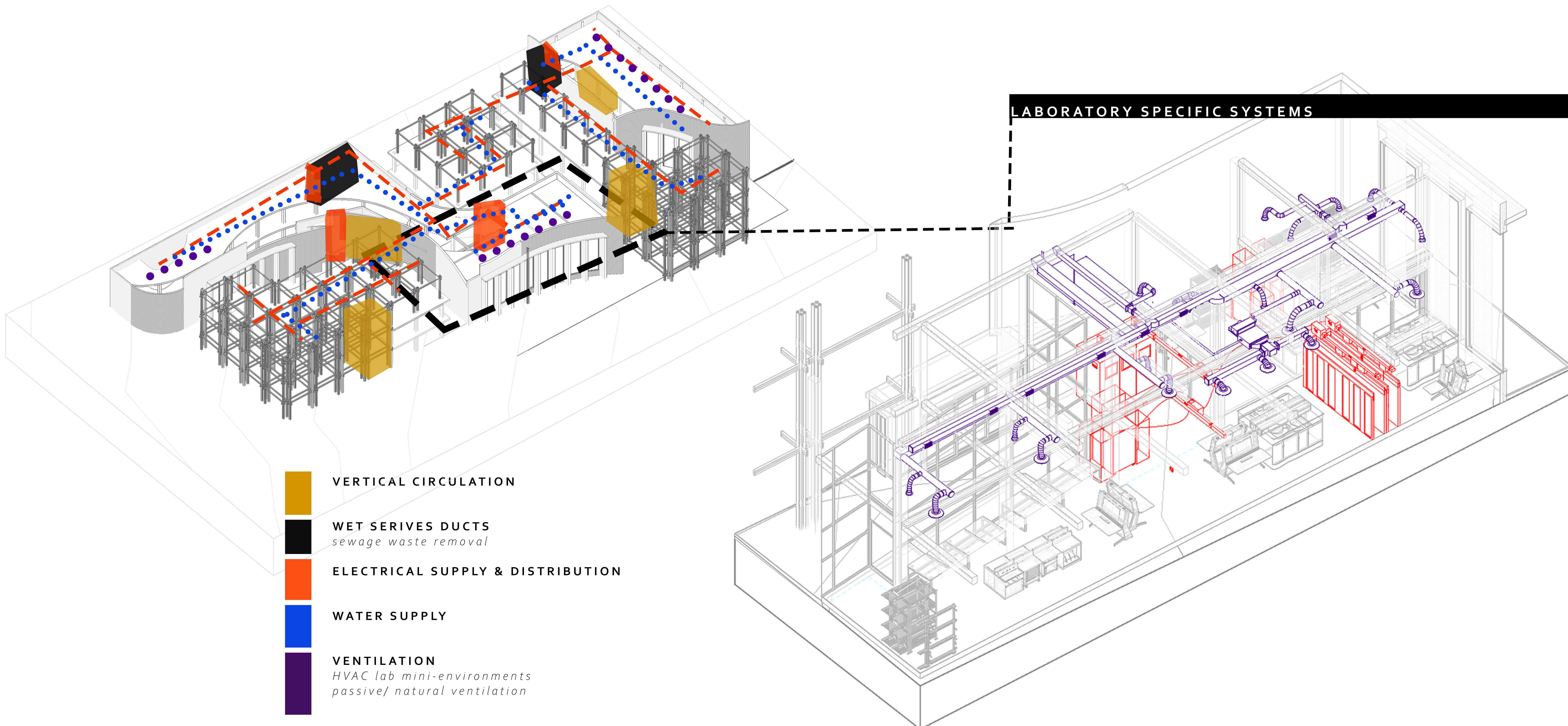
# WHOLE BUILDING MECHANICAL SERVICES

cable trays | exposed services  
service ducts | covered but accessible

# LABORATORY SPECIFIC SYSTEMS

-  VERTICAL CIRCULATION
-  WET SERVICES DUCTS  
*sewage waste removal*
-  ELECTRICAL SUPPLY & DISTRIBUTION
-  WATER SUPPLY
-  VENTILATION  
*HVAC lab mini-environments  
passive/ natural ventilation*

# TECHNICAL SYSTEM | MECHANICAL





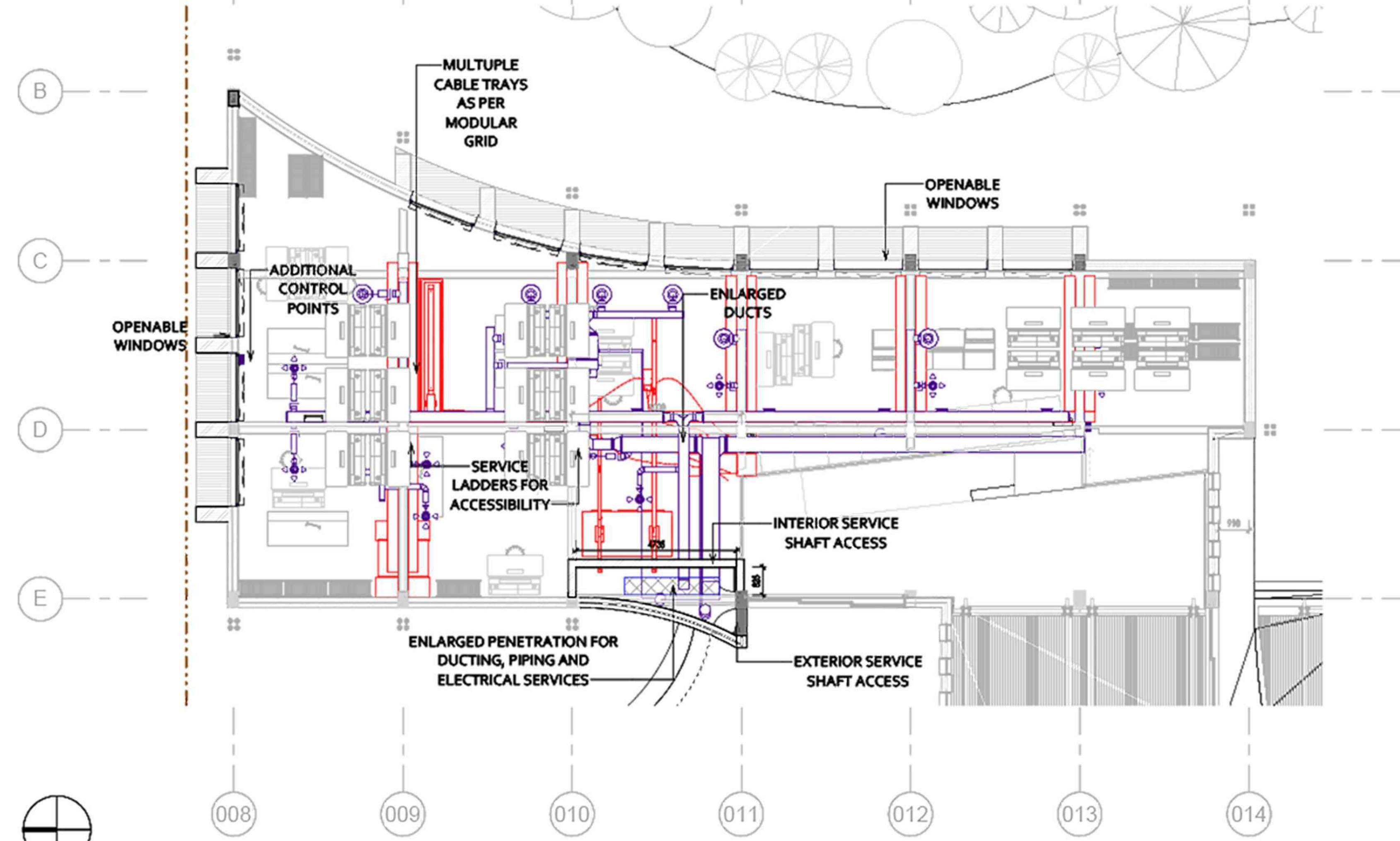
PERFORMANCE ASSESSMENT FRAMEWORK

LAYER	SUB-LAYER	NR	FLEXIBILITY PERFORMANCE INDICATOR	DESCRIPTION	ASSESSMENT VALUE INDICATOR	REPORTING SCENARIO CROSS
SITE	Expandable site location	1	Expandable site location	Does the building have a surplus of space and is the building located at the corner?	1. No site has a surplus of space at all. 2. No 50% surplus 3. 1-2 functions, suited for offices or living or care or shops 4. 2-3 functions 5. 3-4 functions 6. 4-5 functions, suited for offices, living, care and shops as well	1
		2	Multi-functional building	Is the location capable of supporting new functions, like offices, living, care and shops?	1. Not intended 2. 1 or 20% Overhead 3. 30-50% Overhead 4. 50-70% Overhead 5. 70-90% Overhead	1
		3	Surplus of building floor space	Does the building or the user units have a surplus of the needed usable floor space?	1. No, the building or user units have no surplus of floor space at all 2. 10-20% surplus 3. 20-30% surplus 4. The building has a surplus of floor space of > 20%	1
		4	Available floor space of building	Does the building or the user units have a surplus of the needed usable floor space?	1. The usable floor space < 400 m <sup>2</sup> 2. 400 - 600 m <sup>2</sup> 3. 600 - 800 m <sup>2</sup> 4. The usable floor space > 800 m <sup>2</sup>	1
STRUCTURE	Measurement	1	Size of floor building	What is the size of the usable floor surface?	1. < 2.5 m x 3.5 m 2. 2.5 - 3.5 m 3. 3.5 - 4.5 m 4. > 4.5 m	1
		2	Surplus free of floor height	How much is the net free floor height?	1. Rules for modular coordination are not implemented 2. 50% implemented 3. 75% implemented 4. Rules for modular coordination are > 50% implemented	1
		3	Measurement system modular co-ordination	Have positioning/measurement modular rules for construction components been used?	1. No zoning system of zoning system without intermediate margins 2. Yes, with 50-70% intermediate margins 3. Yes, with 70-80% intermediate margins 4. Yes, with 80-90% intermediate margins	1
		4	Access to building	To what extent a centralized building access has been implemented?	1. Decentralized/separated building entrances 2. Decentralized/separated building entrances 3. Building is divided in different wings, each with centralized entrances 4. Centralized building entrance and different wings with separate entrances	1
ACCESS	Construction	1	Surplus of load-bearing capacity of floors	How large is the load-bearing capacity of the floors in the building?	1. < 3 kN/m <sup>2</sup> 2. 3.5 - 4 kN/m <sup>2</sup> 3. 4.5 - 5 kN/m <sup>2</sup> 4. > 5 kN/m <sup>2</sup> and several areas > 8 kN/m <sup>2</sup>	1
		2	Shape of columns	How are the columns in the building shaped?	1. The columns are shaped round and/or have vertical different sizes 2. The columns are shaped octagonal 3. The columns are shaped rectangular 4. The columns are shaped square	1
		3	Positioning obstacles in load-bearing structure	In the adaptation of the building, are load-bearing obstacles in load-bearing structure?	1. Adaptation completely obstructed by difficult to replace load-bearing obstacles 2. 50% of the building adaptation is obstructed by load-bearing obstacles 3. 25% of the building adaptation is obstructed by load-bearing obstacles 4. No building space is obstructed by difficult to replace load-bearing obstacles	1
		4	Horizontal extension	Are facilities zones and vertical shafts located at central building level and/or level below?	1. All facilities zones and vertical shafts are only located at central level 2. Facilities zones and vertical shafts are located at central level and level below 3. Facility components are located at central level and level below 4. Facility components are located at central level and level below	1
FACILITY	Facility	1	Fire resistance of load-bearing structure	How many minutes is the fire resistance of the main load-bearing construction?	1. The fire resistance of the load-bearing construction is 30 minutes 2. The fire resistance of the load-bearing construction is 60 minutes 3. The fire resistance of the load-bearing construction is 90 minutes 4. The fire resistance of the load-bearing construction is 120 minutes	1
		2	Extendable building horizontally	Is it possible to extend the building horizontally, for a new building?	1. Horizontal extension of buildings is not possible at all 2. Horizontal extension of buildings is very limited possible (only at one side) 3. Horizontal extension of buildings is limited possible (at more sides) 4. Horizontal extension of buildings is nearly possible at all sides	1
		3	Extendable building vertically	Is it possible to extend the building vertically, to add new floors or a new basement?	1. Vertical extension of buildings is not possible at all 2. Vertical extension is limited possible, only for few units in the building 3. Vertical extension (sub-level or basement) is possible after total management 4. Vertical extension from floor/basement is limited (user units) to possible	1
		4	Reconfigurable part of building	Is it possible to re-part of the building for other uses in the part?	1. It is not possible to re-part of the buildings 2. It is possible to re-part 25% of the buildings 3. It is possible to re-part 50% of the buildings 4. It is possible to re-part 75% of the buildings	1
ENVIRONMENT	Facility	1	Insulation between different zones and units	How is the thermal and acoustic insulation between the different zones and units?	1. Insulation does not meet the current demands for office buildings anymore 2. Meets the current demands for office buildings 3. Meets the current demands for housing and care 4. Meets the current demands for office, housing and care	1
		2	Disremovable facade	To what extent can facade components be dismantled in case of transformation?	1. Facade components can not or hardly be dismantled without demolition 2. A large part of the facade components can be dismantled (> 50% > 90%) 3. All facade components are easily dismantlable (> 90%)	1
		3	Facade windows to be opened	Can windows in the facade be opened per planning grid too?	1. No of > 50% of the windows can be opened 2. 50 - 70% 3. 70 - 80% 4. 80 - 90%	1
		4	Daylight facilities	What is the daylight factor for the building?	1. Daylight factor < 10% 2. Daylight factor 10% - 15% 3. Daylight factor 15% - 20% 4. Daylight factor > 20%	1
MEASURE & CONTROL	Facilities Control	1	Location and shape of daylight facilities	In what way are the building/daylight facilities positioned and shaped?	1. There are large, closed surfaces in the facade 2. There are small horizontal open surfaces in the facade 3. Large open surfaces in the facade, but with different heights 4. Large continuous horizontal, open surfaces, connections according to planning grid	1
		2	Insulation of facade	How is the thermal and acoustic insulation quality of the facade of the building?	1. Insulation does not meet the current demands for office buildings anymore 2. Meets the current demands for office buildings 3. Meets the current demands for housing and care 4. Meets the current demands for office, housing and care	1
		3	Control measurement	Is it possible to control measurement facilities on the building level as well as on user level?	1. Control measurement takes place only at central building level 2. On central level and occasionally on user level 3. On central level and limited on user level 4. As well central on building level as well completely on unit level	1
		4	Control measurement	Is it possible to customize the building control, ventilation, cooling and heating components without any intervention?	1. Limited customizable after design interventions 2. Fully customizable, also after design interventions 3. Fully customizable, also after design interventions 4. Fully customizable, also after design interventions	1
MEASURE & CONTROL	Facilities Control	1	Surplus of facilities shafts and ducts	Do the facilities shafts and ducts have a surplus of space heating, cooling, electricity, etc?	1. Limited customizable after design interventions 2. Fully customizable, also after design interventions 3. Fully customizable, also after design interventions 4. Fully customizable, also after design interventions	1
		2	Surplus capacity of facilities	Does the capacity of the sources of the facilities have a surplus of capacity?	1. The capacities of facilities have no surplus at all 2. The capacities of facilities have a surplus of 10-20% 3. The capacities of facilities have a surplus of 20-30% 4. The capacities of facilities have a surplus of > 30%	1
		3	Modularity of facilities	Are the facilities separated by modular components according to the facade planning grid?	1. No facility is divided in modular components according to the facade planning grid 2. 1-2 of the facilities are divided according to the facade planning grid 3. All of the facilities are divided according to the facade planning grid	1
		4	Distribution	Does the building have a specific distribution facility for heating, water, heating, cooling, gas?	1. There is a specific distribution facility for all of the different sources 2. There is a specific distribution facility for some of the different sources 3. There is no specific distribution facility for any of the different sources	1
SPACE	Functional	1	Location sources of facilities (heating, cooling)	What is the location of the central facility sources?	1. The facilities sources are located at only one central location in the building 2. The facilities sources are located at several locations in the building 3. The sources are located at a central location and a decentralized location as well 4. The sources are located at outside the building at the level (district heating)	1
		2	Disconnection of facilities components	Can the components of the facilities be easily disconnected?	1. Facility parts can not be disconnected or dismantled, user connections 2. Facility parts can be disconnected or dismantled, user connections 3. Facility parts can be disconnected or dismantled, user connections 4. Facility parts can be disconnected or dismantled, user connections	1
		3	Accessibility of facilities components	To what extent are facilities components self-accessible?	1. Facility parts can be disconnected or dismantled, user connections 2. Limited accessible partly on support and level 3. Good accessible, most components at 100 level, completely dismountable 4. Very good accessible, most components at 100 level, completely dismountable	1
		4	Independence of user units	In what way are user units independently related to services or pantry, and toilet facilities?	1. No services available at user unit level 2. 1 - 2 services available 3. 3 - 4 services available 4. 5 services available	1
SPACE	Technical	1	Multi-functional building units	Is the building capable of supporting different functions, like offices, living, care and shops?	1. The building supports only one function 2. The building supports 2 functions 3. The building supports 3 functions 4. The building supports > 3 functions	1
		2	Horizontal access to building	In what way are the horizontal access of the units in the building accompanied?	1. Horizontal access is by a double internal corridor 2. Horizontal access is by a central core in the building with a surrounding passage 3. Horizontal access is directly by a central core in the building, or an external gallery	1
		3	Disconnectable, removable, relocatable	To what extent are the user units in a building removable, and relocatable?	1. The user units in the building are not removable, relocatable 2. The units are only relocatable with drastic expensive measures 3. Units are easily relocatable and constructed with demountable components 4. Easy relocatable, constructed with 2000 modules, transportable by road	1
		4	Disconnectable, removable, relocatable	To what extent are the inner walls in a building easily replaceable?	1. Inner walls are not replaceable, but good deconstructible 2. Inner walls replaceable by dismantling and re-installing at another location 3. Inner walls are easily replaceable without radical/expensive interventions 4. The detailing connection consists of penetrating connections	1
SPACE	Suspended ceiling	1	Disconnection of connection detail	Which detailed construction is applied between the inner walls and support structure and facade?	1. The detailing connection consists of wet connections (mortar, sealant, glue) 2. The detailing consists of specific project bonded connection elements 3. The detailing consists of project, unbonded demountable connections	1
		2	Suspended ceiling	Is it possible to apply suspended ceilings (> 2m) and to adapt these to the different user demands?	1. Suspended ceiling results in free floor height of < 2.50m 2. Suspended ceiling results in free floor height of 2.50 - 3.00m 3. Suspended ceiling results in free floor height of 3.00 - 3.50m 4. Suspended ceiling results in free floor height of > 3.50m	1
		3	Possibility of raised floors	Is it possible to apply raised floors and to adapt these to the different user demands?	1. Raised floor results in free floor height of < 0.20m 2. Raised floor results in free floor height of 0.20 - 0.30m 3. Raised floor results in free floor height of 0.30 - 0.40m 4. Raised floor results in free floor height of > 0.40m	1
		4	Possibility of raised floors	Is it possible to apply raised floors and to adapt these to the different user demands?	1. Raised floor results in free floor height of < 0.20m 2. Raised floor results in free floor height of 0.20 - 0.30m 3. Raised floor results in free floor height of 0.30 - 0.40m 4. Raised floor results in free floor height of > 0.40m	1
TOTAL SCORE						84

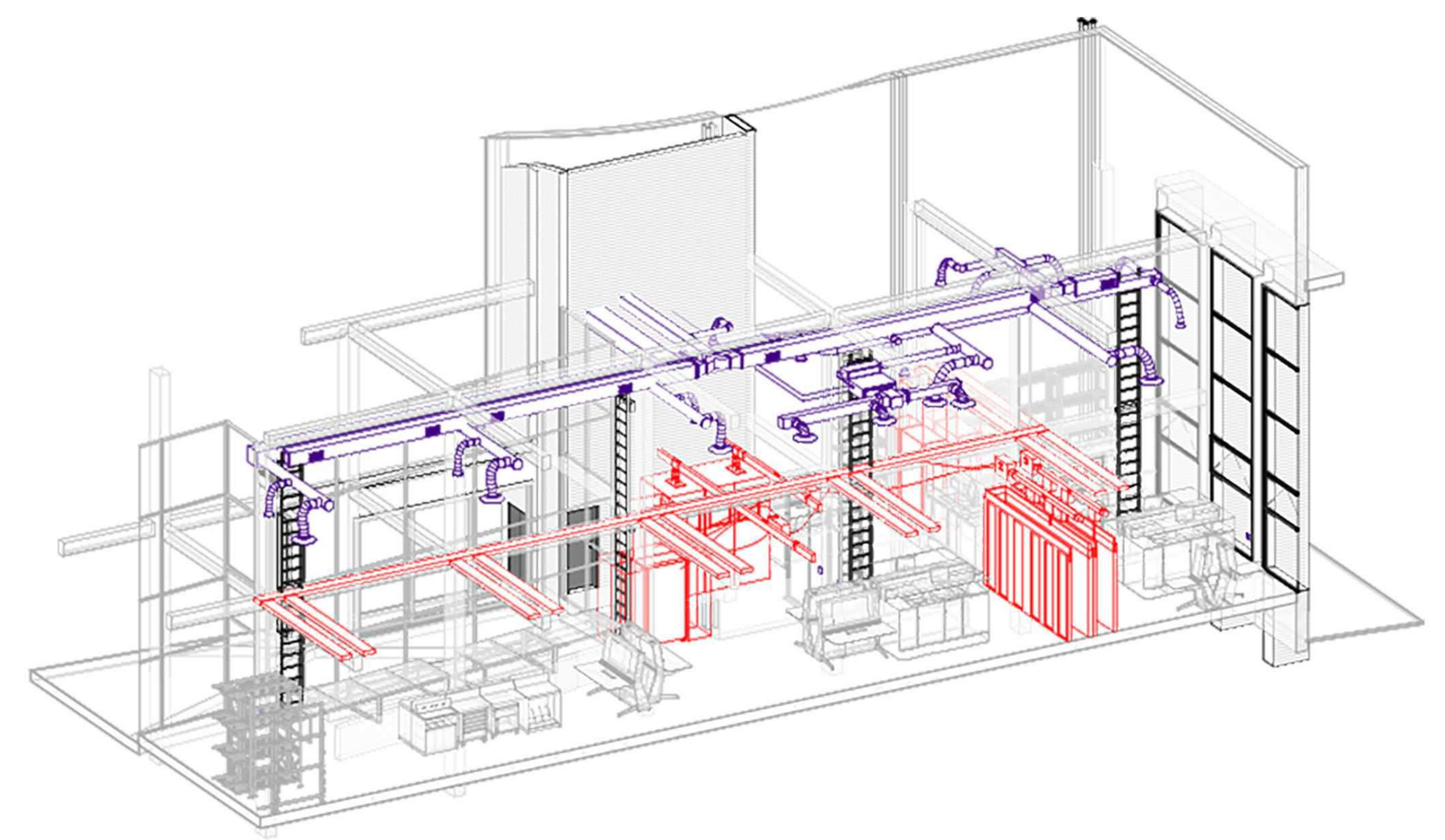
SCENARIOS

SCENARIO	LOCATION IN BUILDING	ASSESSMENT VALUE INDICATOR
SCENARIO 1	BUILDING SECTIONS & SERVICE ROUTES	1. Surplus of service space 2. No site has a surplus of space at all. 3. No 50% surplus 4. 1-2 functions, suited for offices or living or care or shops 5. 2-3 functions 6. 3-4 functions, suited for offices, living, care and shops as well
SCENARIO 2	SYSTEM SIZE & OPERABILITY	1. The building supports only one function 2. The building supports 2 functions 3. The building supports 3 functions 4. The building supports > 3 functions
SCENARIO 3	BUILDING DESIGN	1. Horizontal access is by a double internal corridor 2. Horizontal access is by a central core in the building with a surrounding passage 3. Horizontal access is directly by a central core in the building, or an external gallery
SCENARIO 4	SYSTEM CONTROL	1. No services available at user unit level 2. 1 - 2 services available 3. 3 - 4 services available 4. 5 services available

FINAL SCENARIO



102-ENERGY BUILDING LAB SERVICES MECH PLAN



LAB SERVICES MECH AXO VIEW