

THE CONFIGURABLE TERMINAL

A design framework for an adaptable airport terminal

A4 Assessment

Explore Lab
AR4EX310

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PART 1: INTRODUCTION

AIRPORTS ARE COMPLEX STRUCTURES



Schiphol Airport
(Vermaat, n.d.)

RANGING FROM SMALL AIRFIELDS…



Breda Airport
(Vliegveld Seppe, n.d.)

…TO LARGE INTERNATIONAL HUBS



Schiphol Airport
(Jenkins, 2023)

THEY ARE ALWAYS ON THE MOVE...



DUE TO GROWING PASSENGER NUMBERS



DUE TO TECHNOLOGICAL DEVELOPMENTS



DUE TO NEW AIRCRAFT TECHNOLOGIES



(Schuurman, 2020)

BUT WHAT IF...

TERMINALS CANNOT HANDLE THESE CHANGES?



(Silk, 2023)

RESULTING IN...

INCREASED WAITING TIMES



(Rascius, 2026)

OVERCROWDED WAITING AREAS



(Tatinta, n.d.)

REDUCED OPERATIONAL EFFICIENCY



(McFaul, 2019)

THE CONSEQUENCE?

COSTLY RENOVATIONS OR DEMOLITIONS



(Bernstein, 2023)

TWA TERMINAL AT JFK AIRPORT



(Pham, 2015)

CONSTRUCTION OF A NEW TERMINAL



(Wikipedia, 2020)



(Wikipedia, 2020)

DEMOLITION OF HEATHROW TERMINAL 2



(Patel, 2014)

CONSTRUCTION OF A NEW TERMINAL



(Heathrow, 2017)



(Heathrow, 2017)



(Heathrow, 2017)

LITERATURE HIGHLIGHTS NEED FOR FLEXIBILITY

'As new types, sizes and patterns of aircraft are introduced, it is **the terminal that has to adapt**, not the runway.' (p.83, Edwards, 2004)

'Flexibility is a key driver of any **successful design**, especially in highly **unpredictable environments** such as **airport terminals**.' (p.2 , Shuchi et al., 2012)

'Airport environments must be **adaptable to change**.' (p. 1, Butters, 2010)

'Airport environments are dynamic.

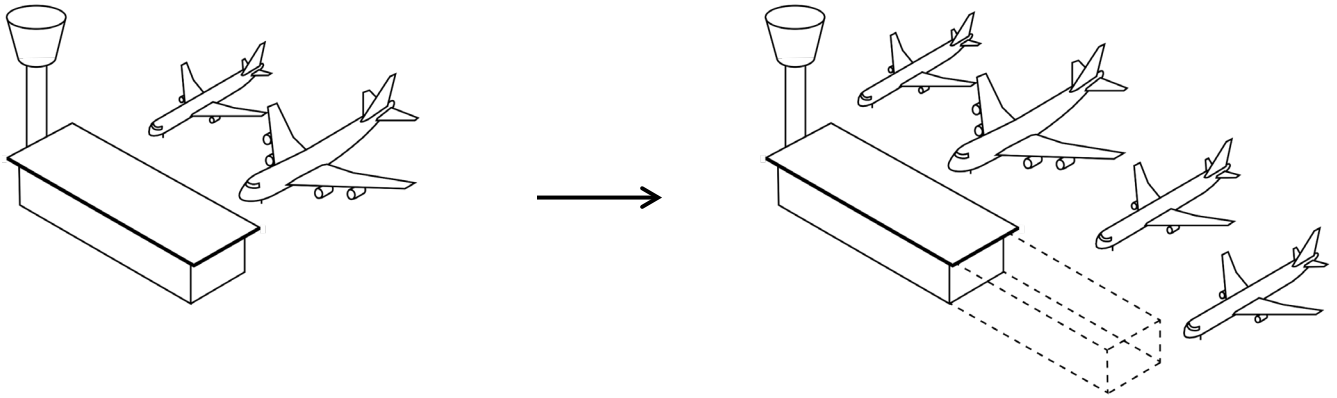
They must **be able to adapt** to change in the form of new security measures, new aircraft, customer expectations and growth.' (p.1, Butters, 2010)

'Growing urgency for flexibility in airport terminal design.' (p.15, Shuchi et al., 2012)

'If a **terminal does not have the ability to adapt** to these changes, it will become **unsatisfactory** and in the worst-case scenario it could become **obsolescent**.' (p.3, Shuchi et al., 2012)

RESEARCH QUESTION

How can an airport terminal be designed as an adaptable framework that can adjust to changing air travel conditions over time?



SUB-QUESTIONS

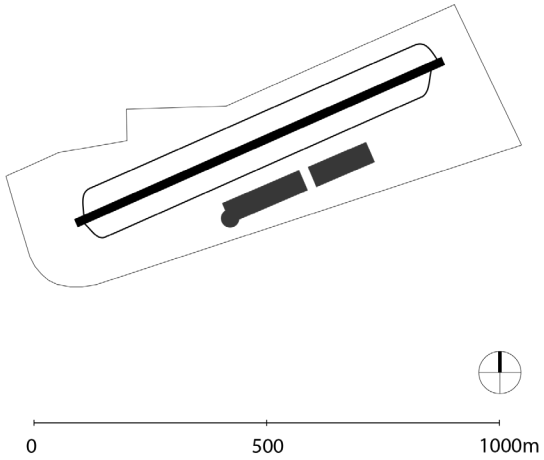
1. Which airport typology is most suitable for adaptive design?

2. Which elements of a terminal building need to be flexible, and to what extent?

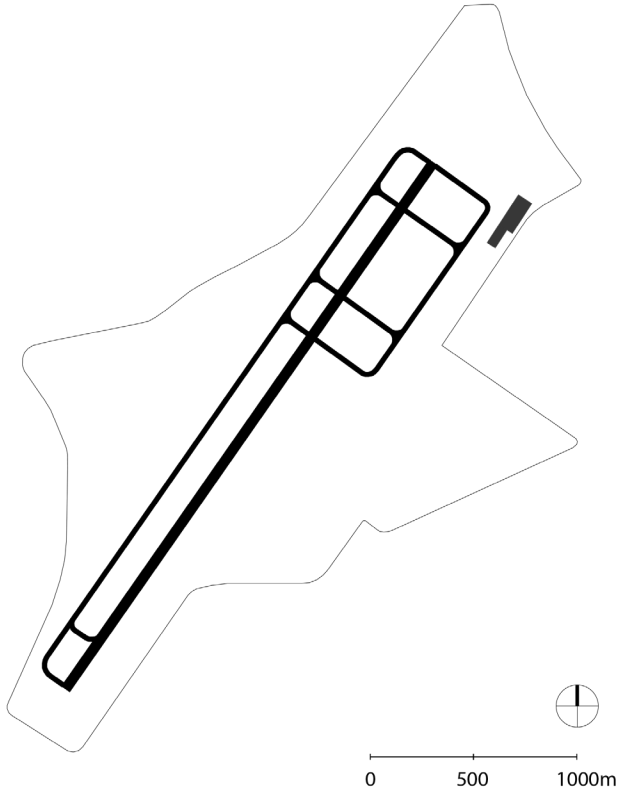
3. Which architectural design strategies can support long-term adaptability in an airport terminal?

PART 2: BRIEF THEORY

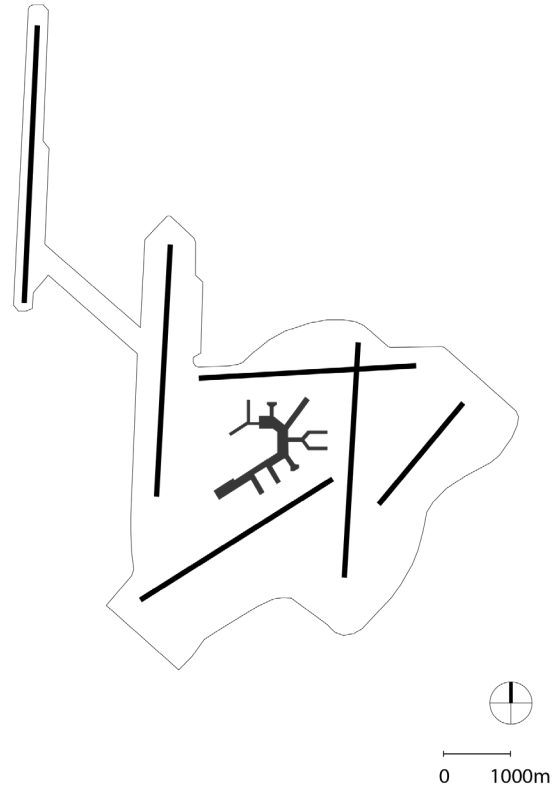
THREE TYPES OF AIRPORTS



Airfield

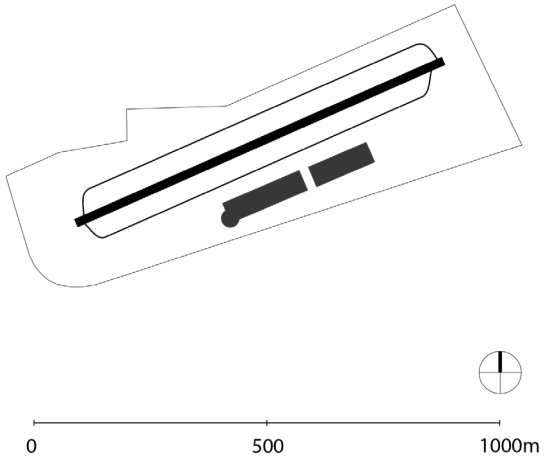


Origin & Destination airport



Hub

AIRFIELD

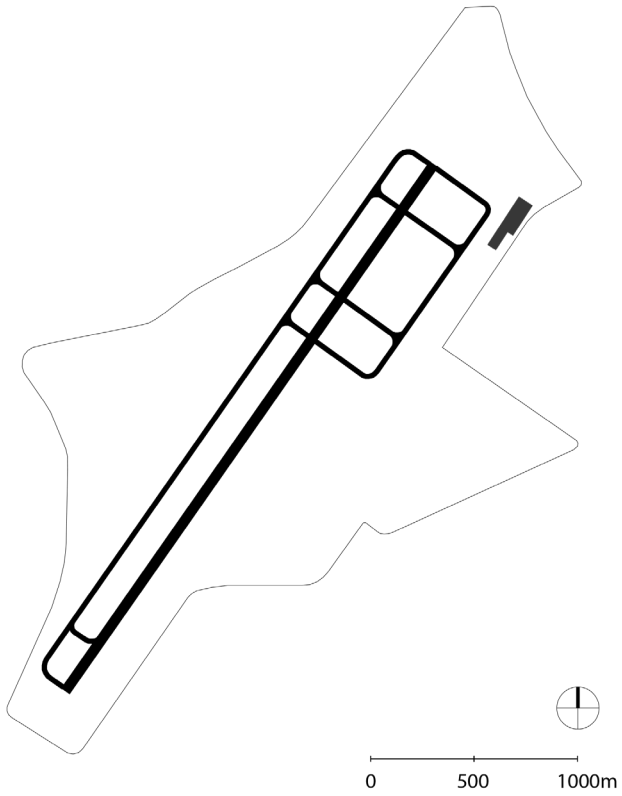




Breda Airport

(Vliegveld Seppe, n.d.)

ORIGIN & DESTINATION AIRPORT

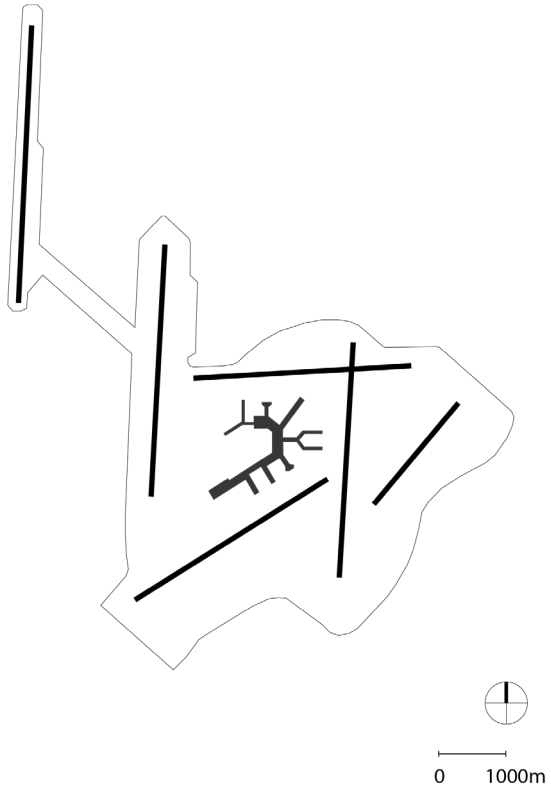




Eindhoven Airport

(Eindhoven Airport, 2024)

HUB

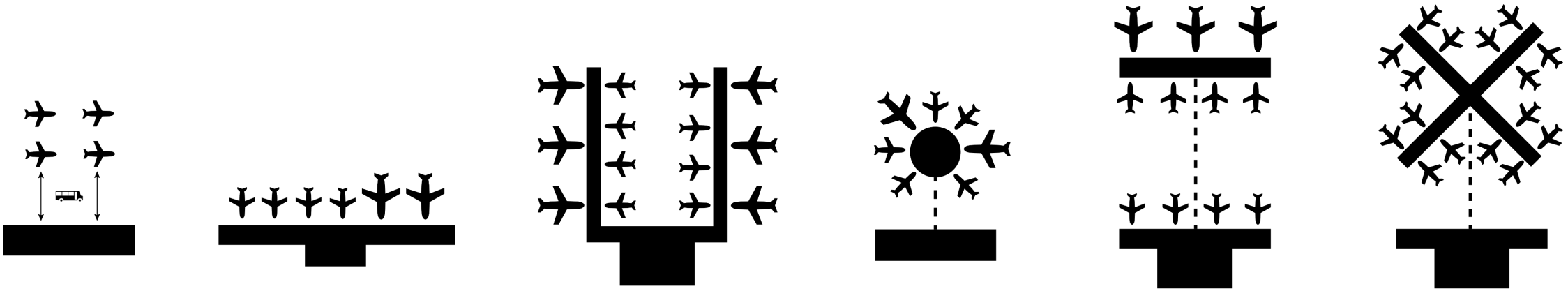




Schiphol Airport

(Jenkins, 2023)

TERMINAL CONFIGURATIONS



Transporter

Linear

Pier

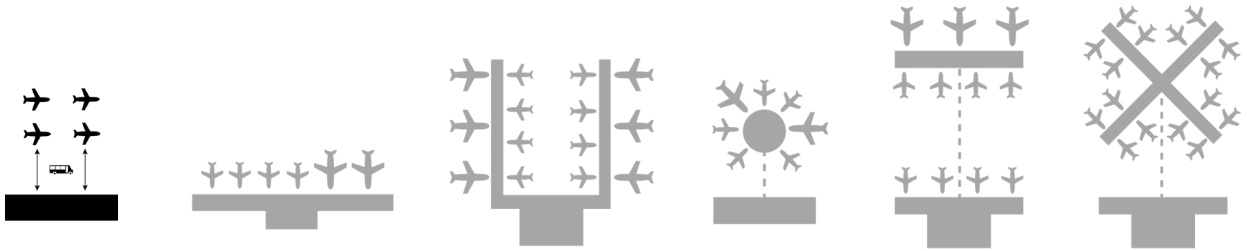
Satellite

Midfield (linear)

Midfield (X-shaped)

TRANSPORTER TERMINAL

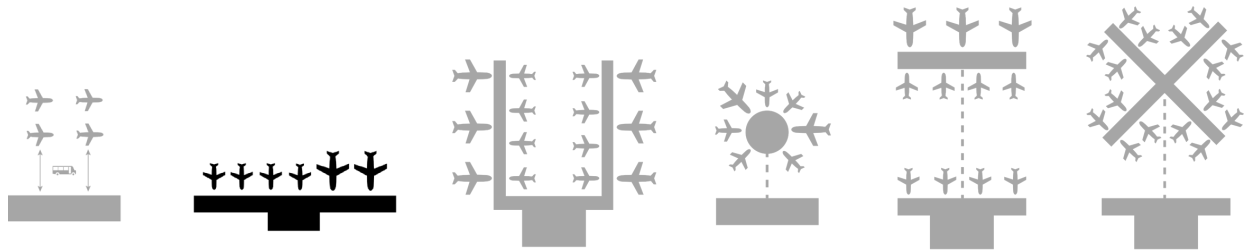




(Yutong, 2024)

LINEAR TERMINAL

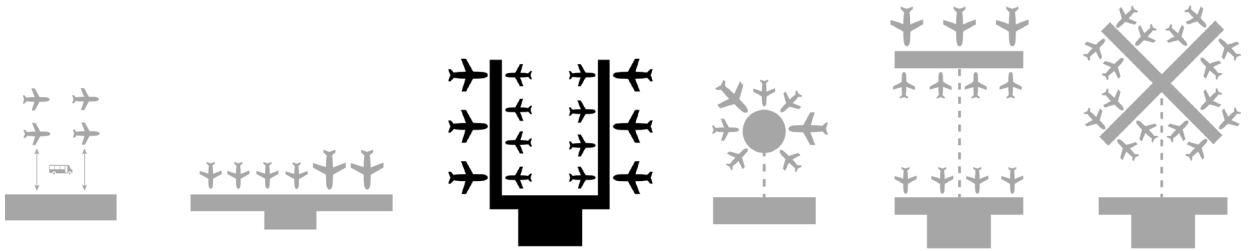




(Terminal 2 Gesellschaft, 2017)

PIER TERMINAL

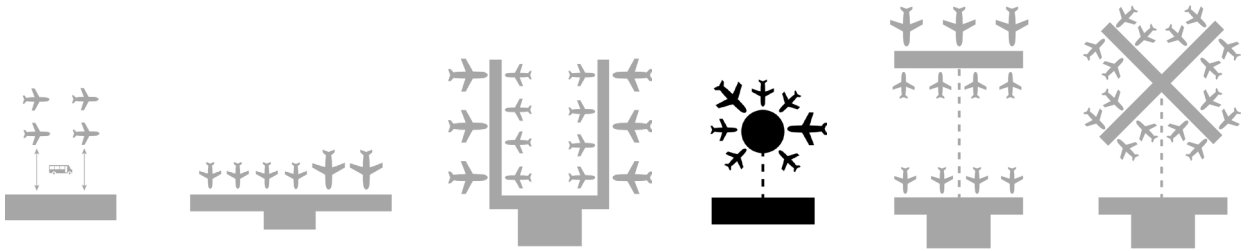




(Leven rondom Schiphol, 2025)

SATELLITE TERMINAL

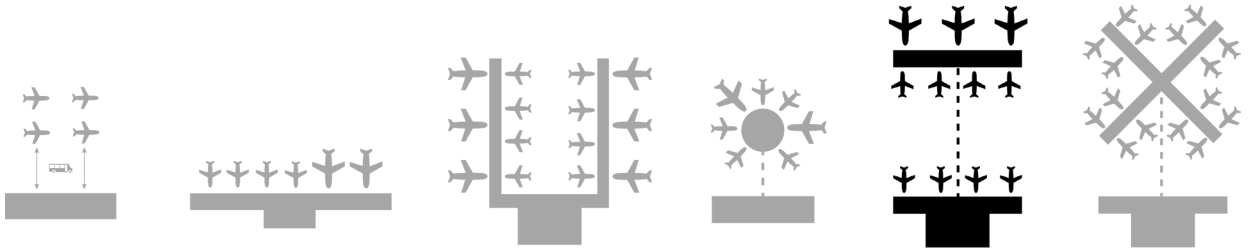




(World urban planning, n.d.)

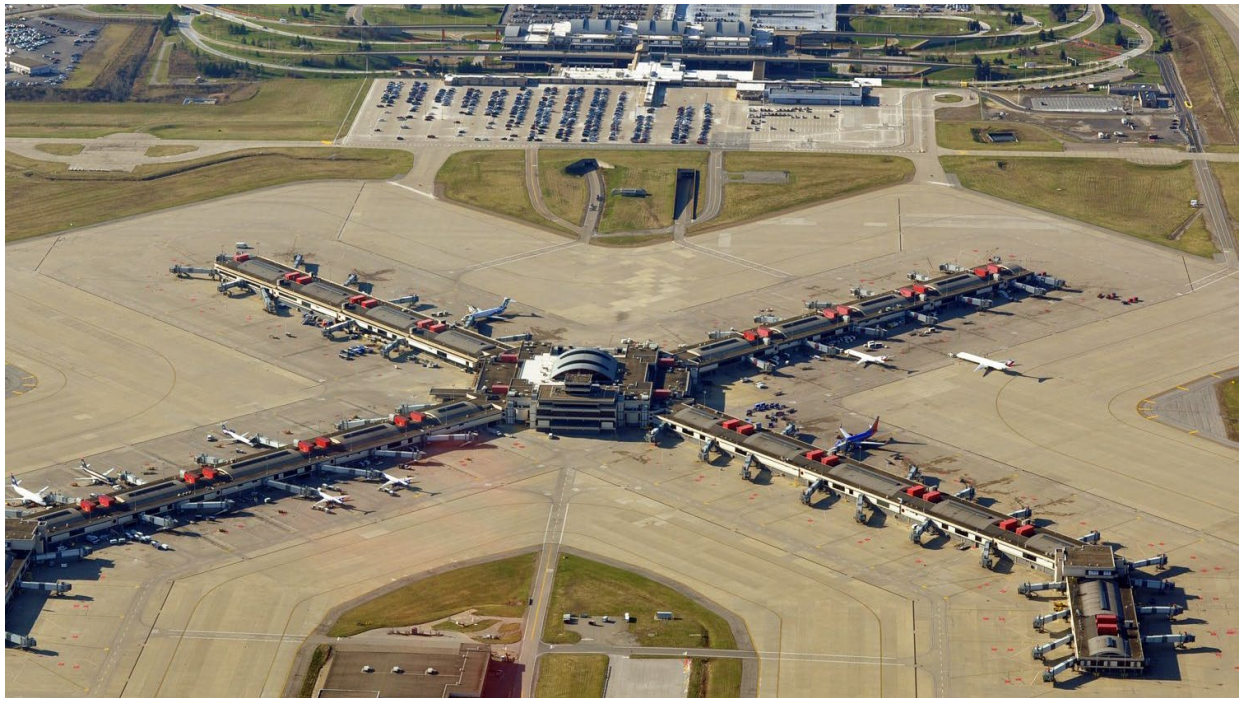
MIDFIELD LINEAR TERMINAL

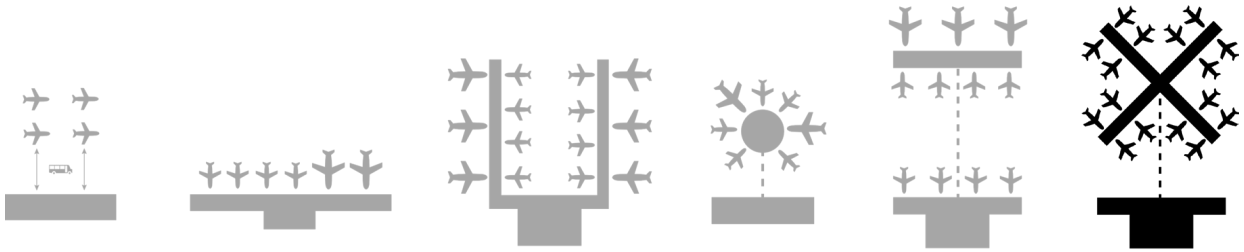




(Vliegveldinfo, n.d.)

MIDFIELD X-SHAPED TERMINAL





(Pittsburgh Beautiful, 2024)

PART 3: RESEARCH FINDINGS & DESIGN OUTCOME

ADAPTABILITY OF TERMINAL CONFIGURATIONS



1. Transporter

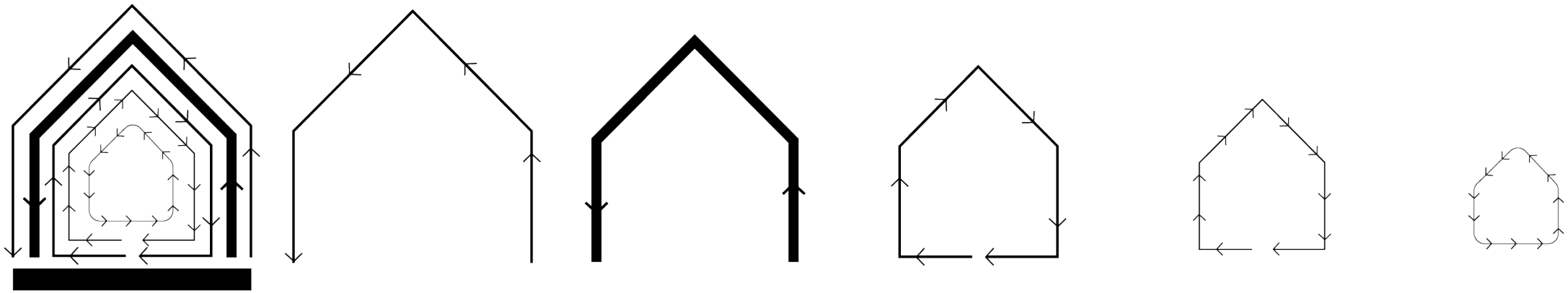


2. Linear



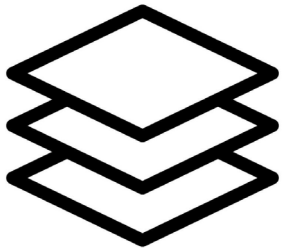
3. Pier

DIVISION OF TERMINAL ELEMENTS INTO LAYERS

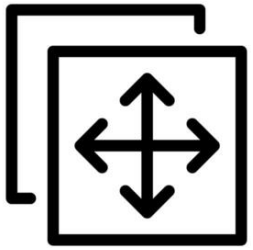


Brand's shearing layers | Skin | Structure | Services | Space plan | Stuff

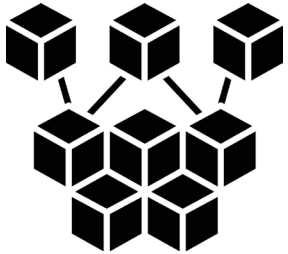
DESIGN STRATEGIES FOR ADAPTABLE DESIGN



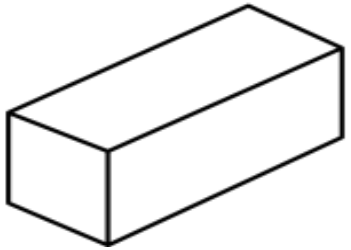
Design with layers



Open plan layout & buffer spaces



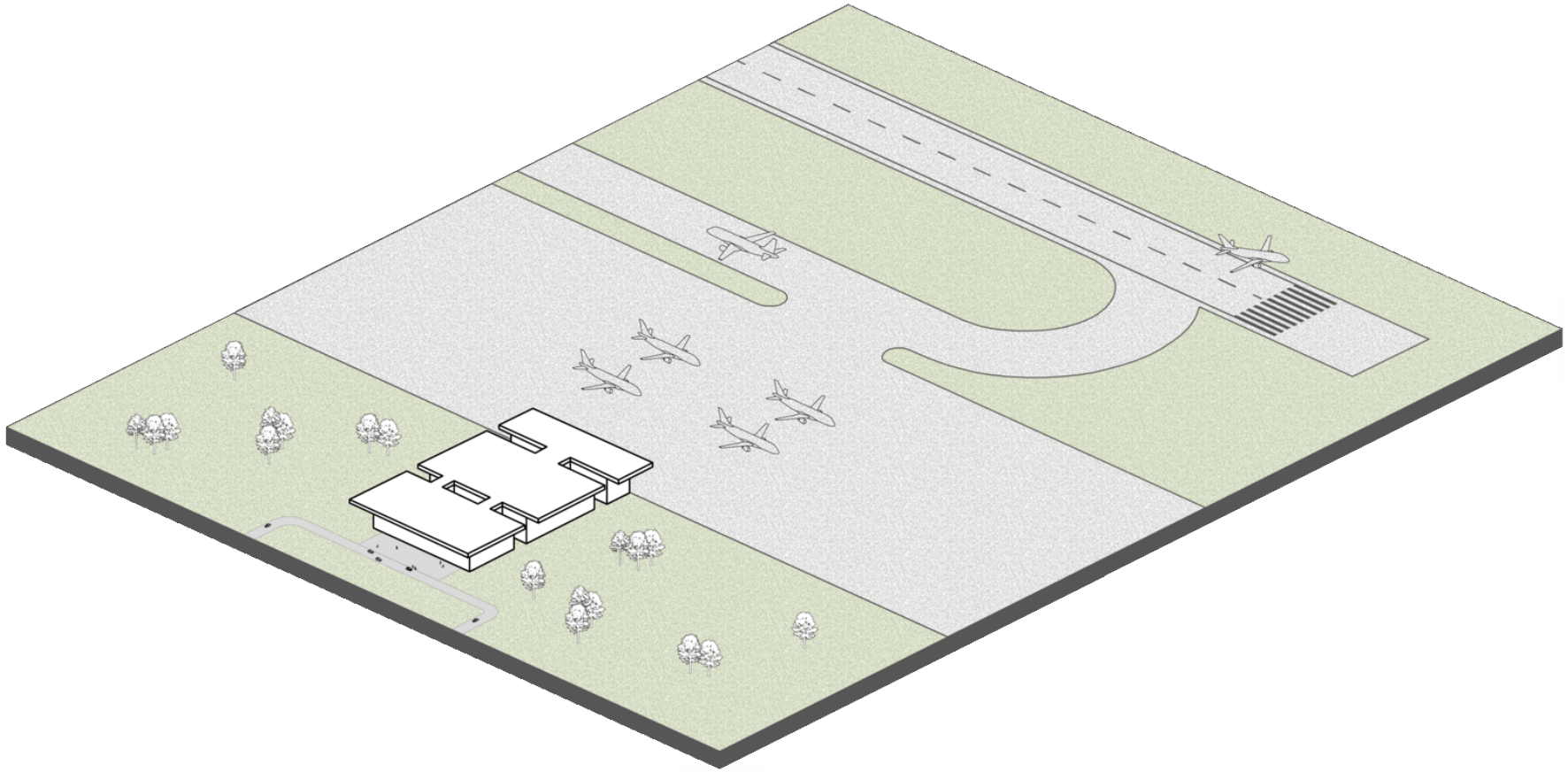
Modularity



Geometrical symplicity

THE RESULT?

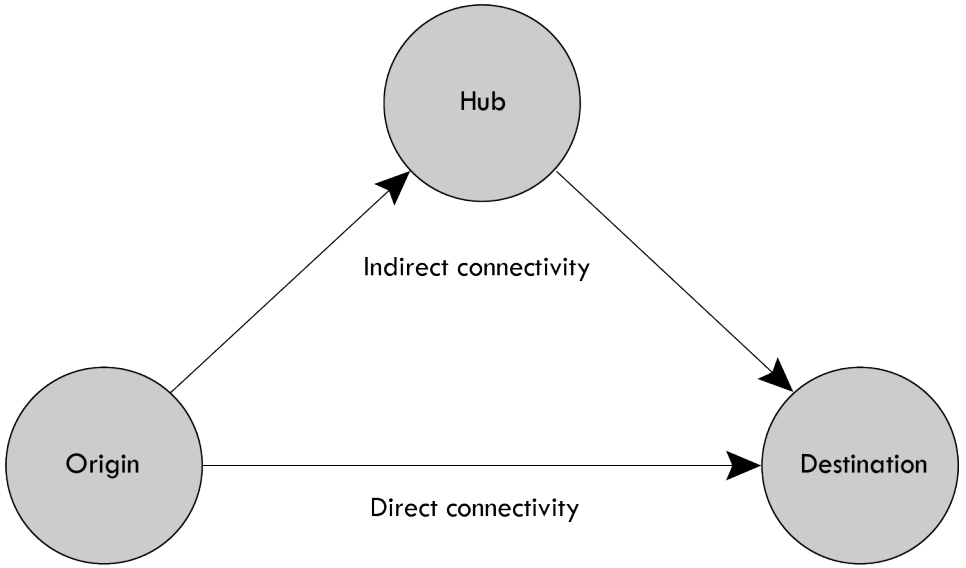
TERMINAL CONCEPT THAT MOVES WITH THE TIMES



PART 4 – EXPLANATION OF THE CONCEPT

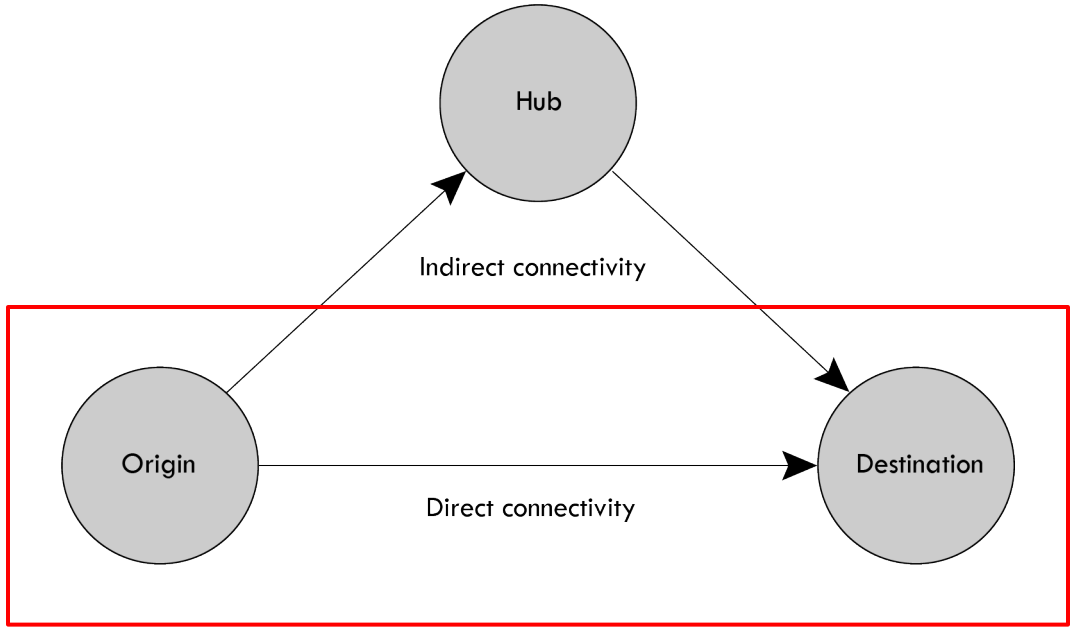
DESIGN PRINCIPLES

1. Focus on Origin & Destination airport



DESIGN PRINCIPLES

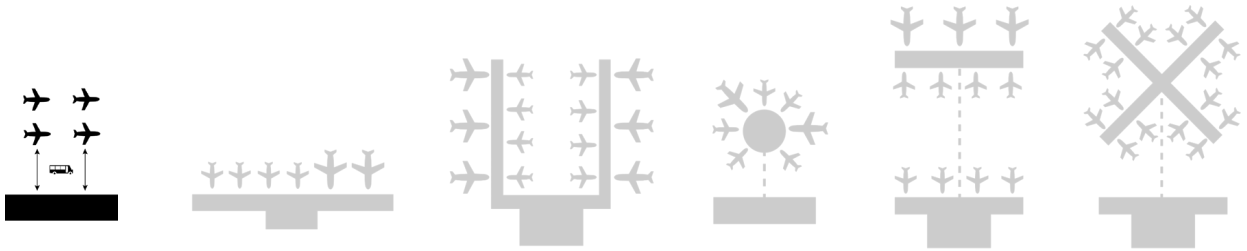
1. Focus on Origin & Destination airport



DESIGN PRINCIPLES

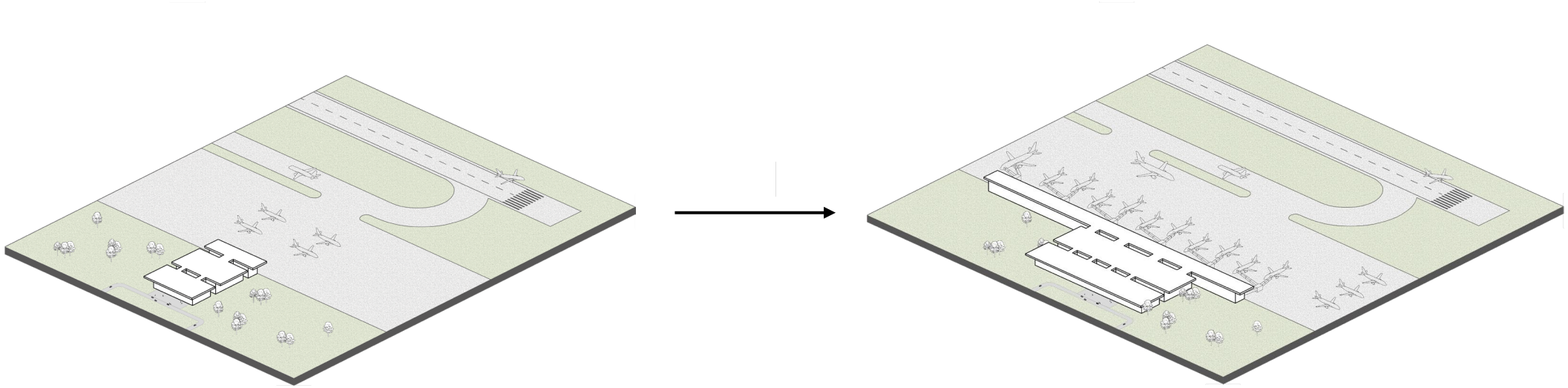
2. Transporter configuration as starting point





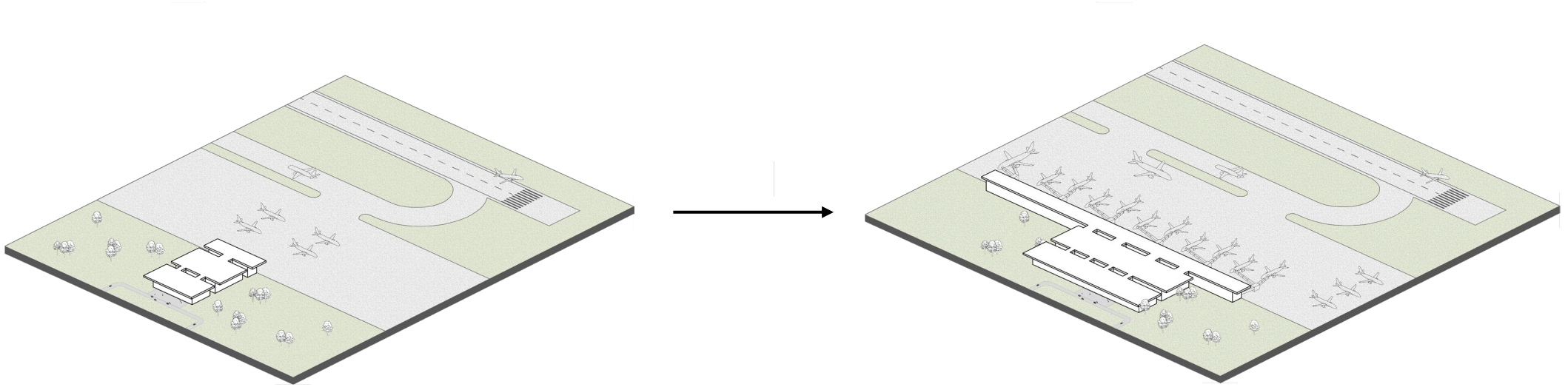
DESIGN PRINCIPLES

3. Design for growth possibilities



DESIGN CONSTRAINTS

1. Mainly focused on growth



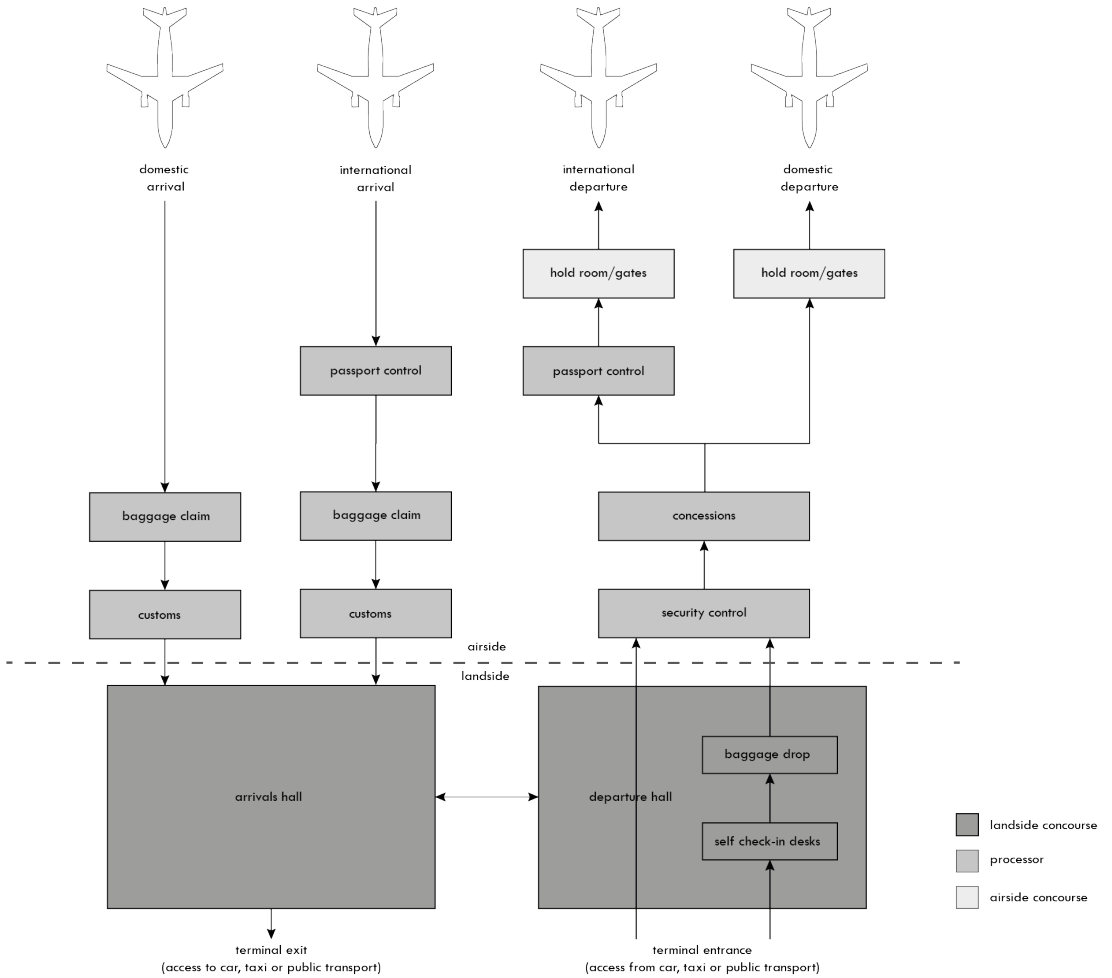
DESIGN CONSTRAINTS

2. Terminal design without context

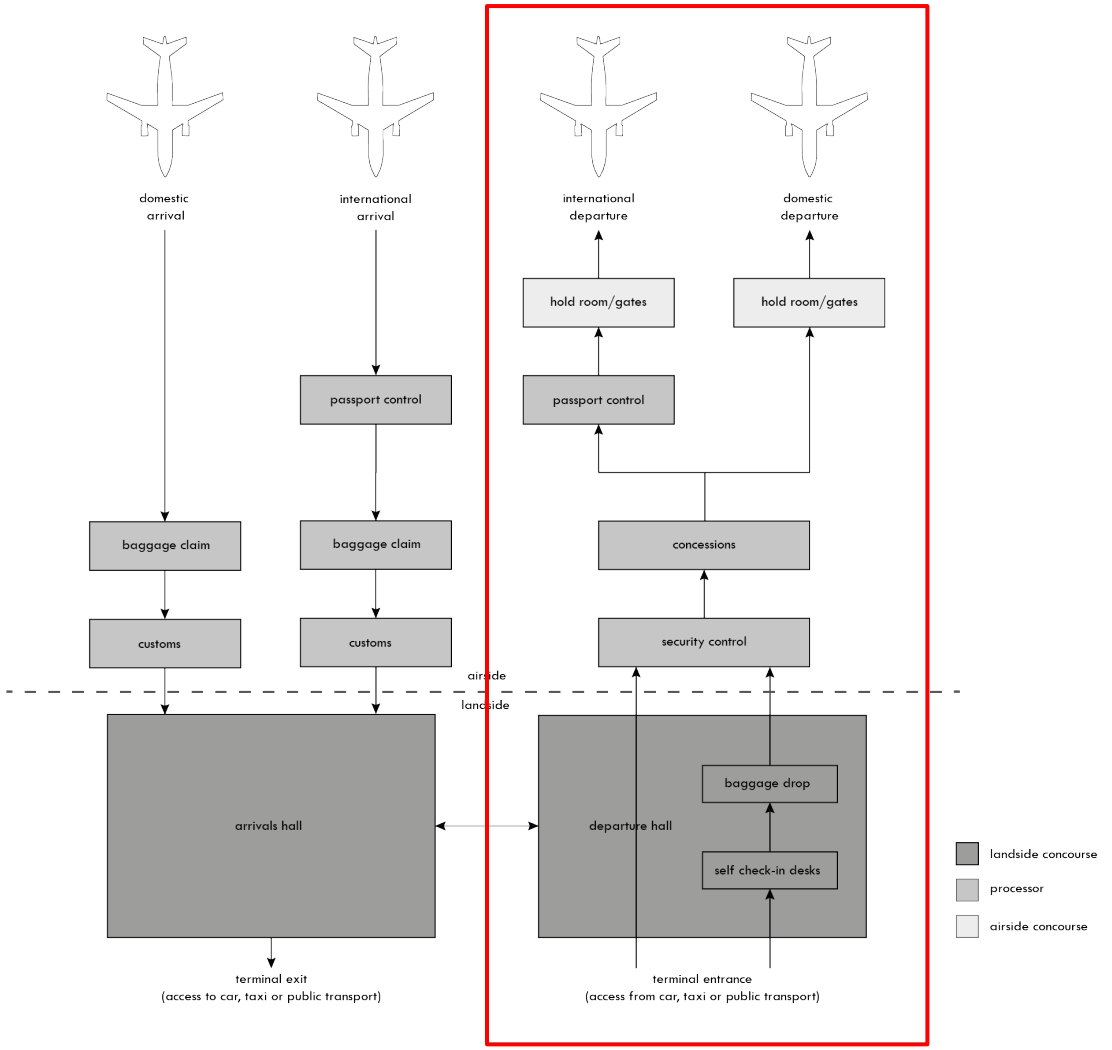


(Rotterdam transport, n.d.)

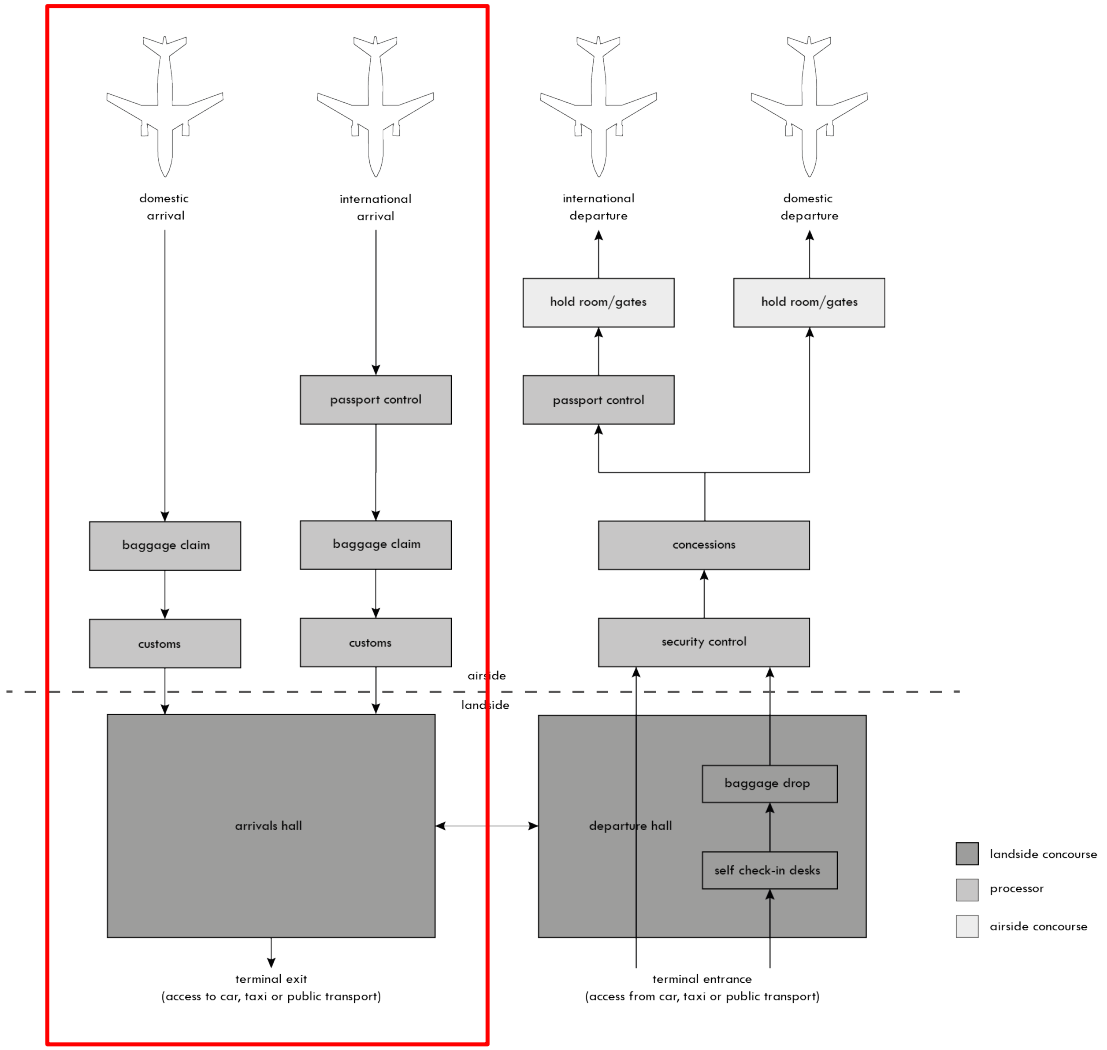
FLOW DIAGRAM



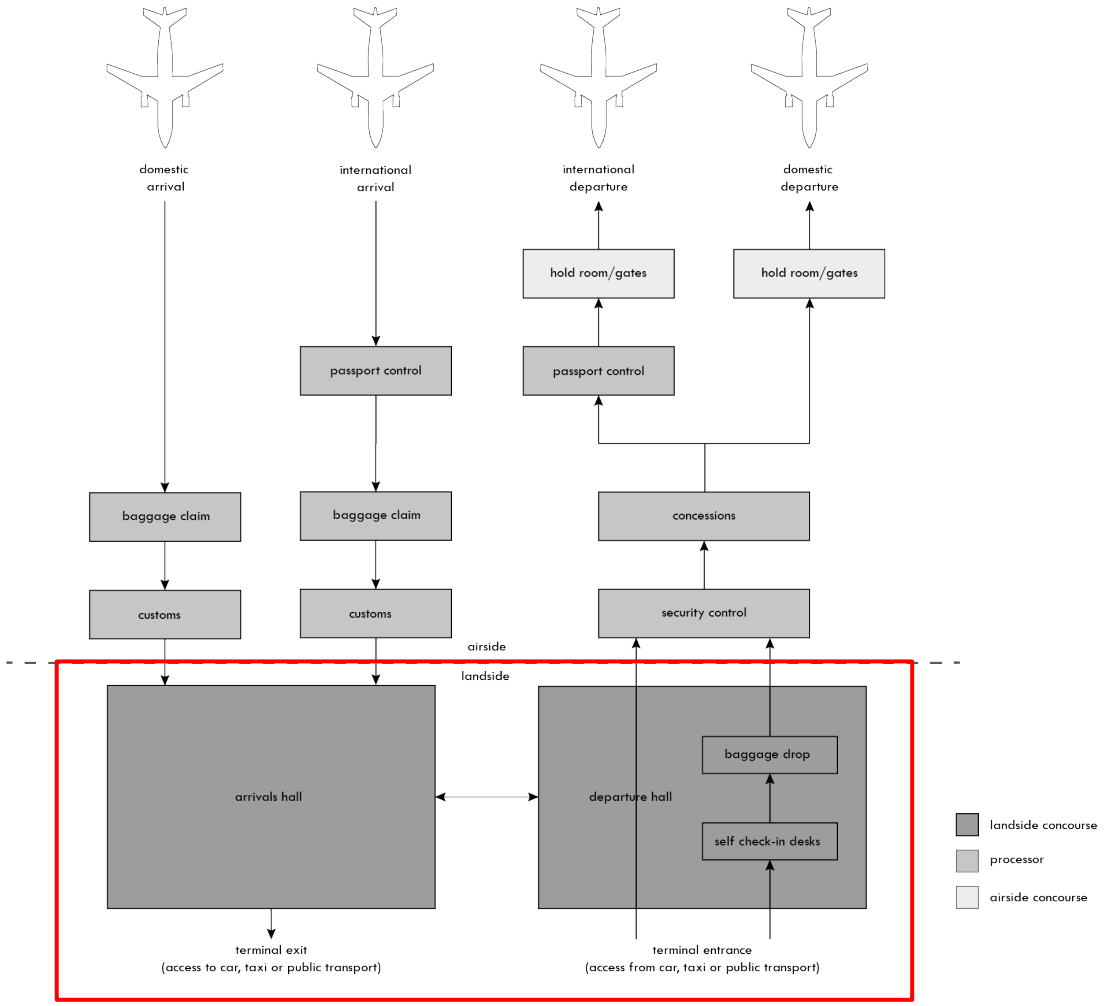
DEPARTURE FLOW



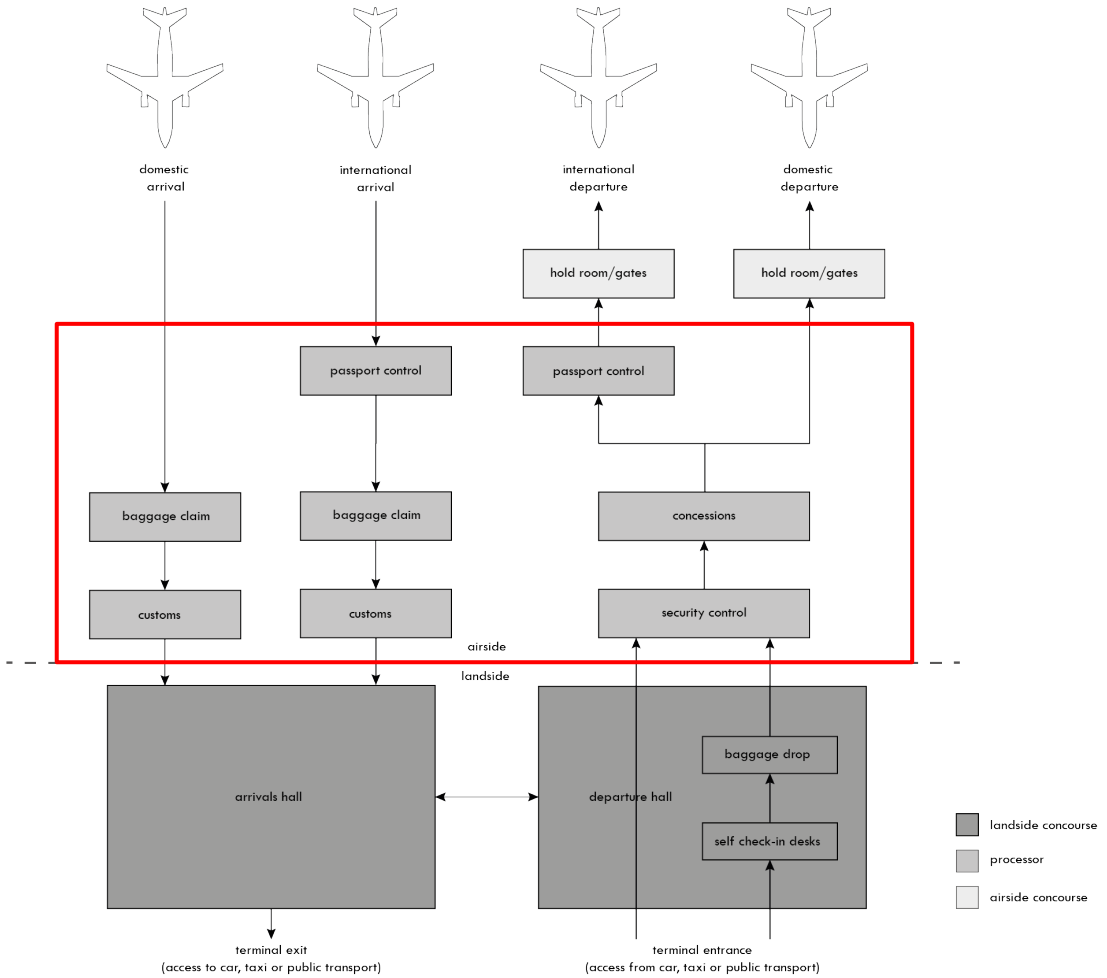
ARRIVAL FLOW



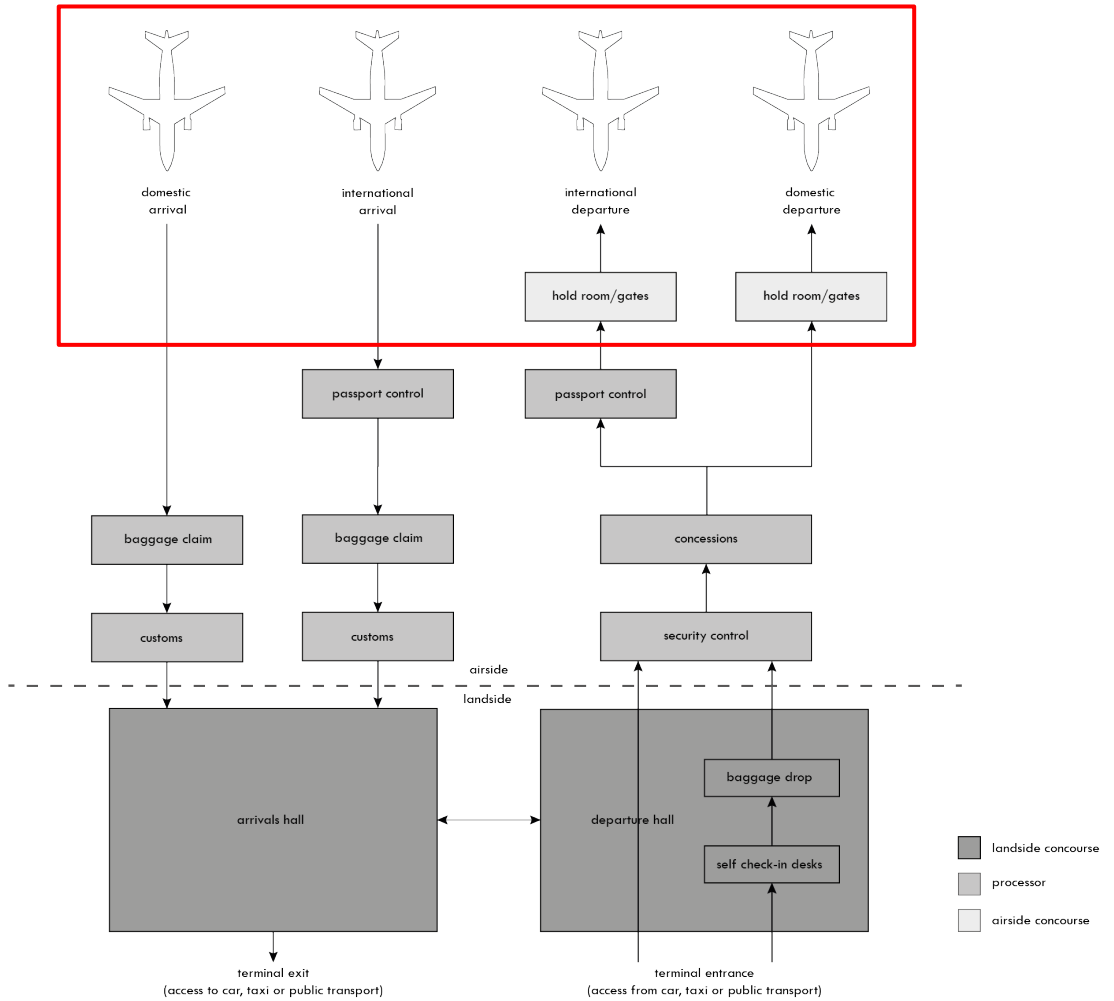
LANDSIDE CONCOURSE



PROCESSING AREA

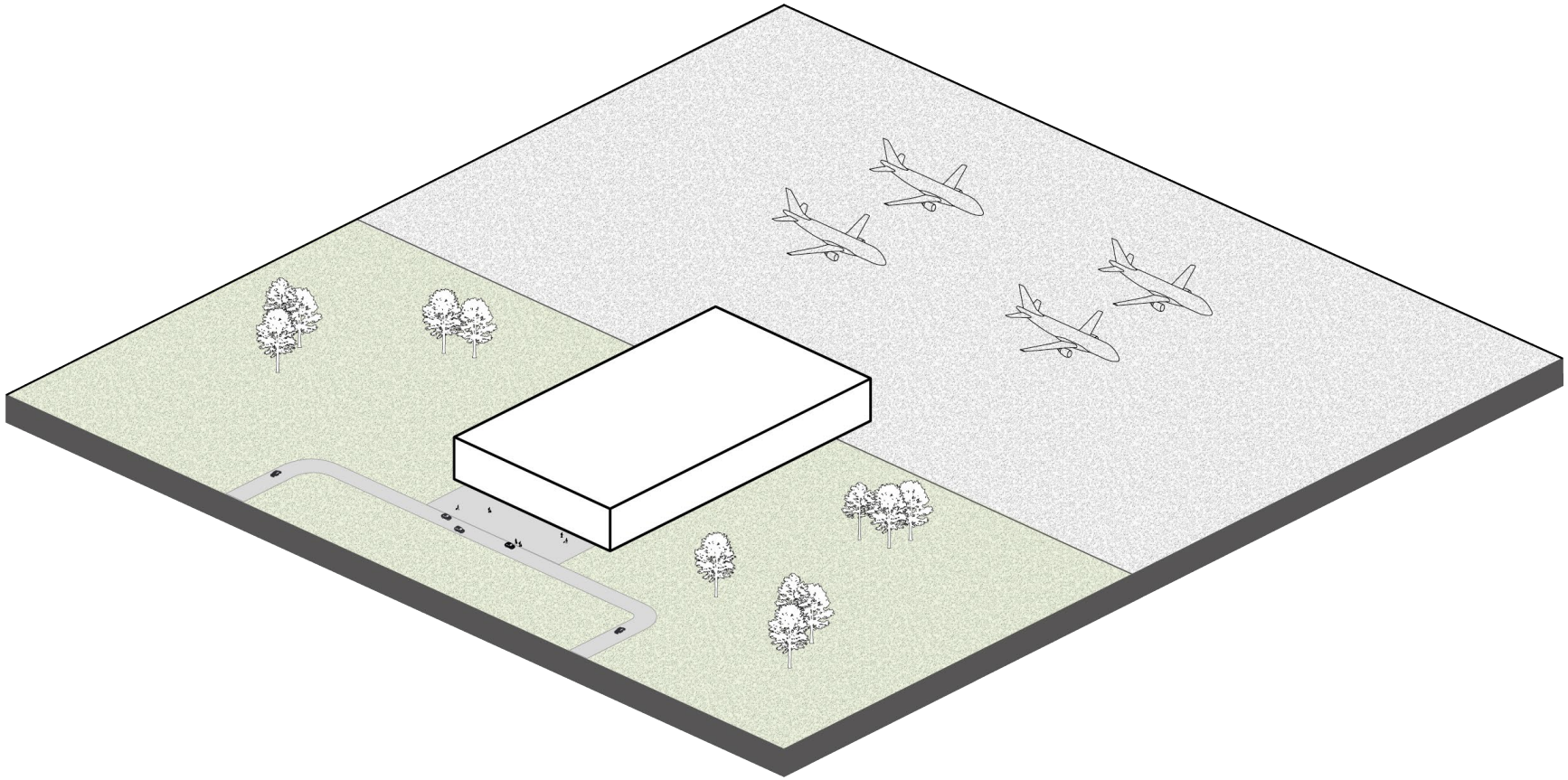


AIRSIDE CONCOURSE



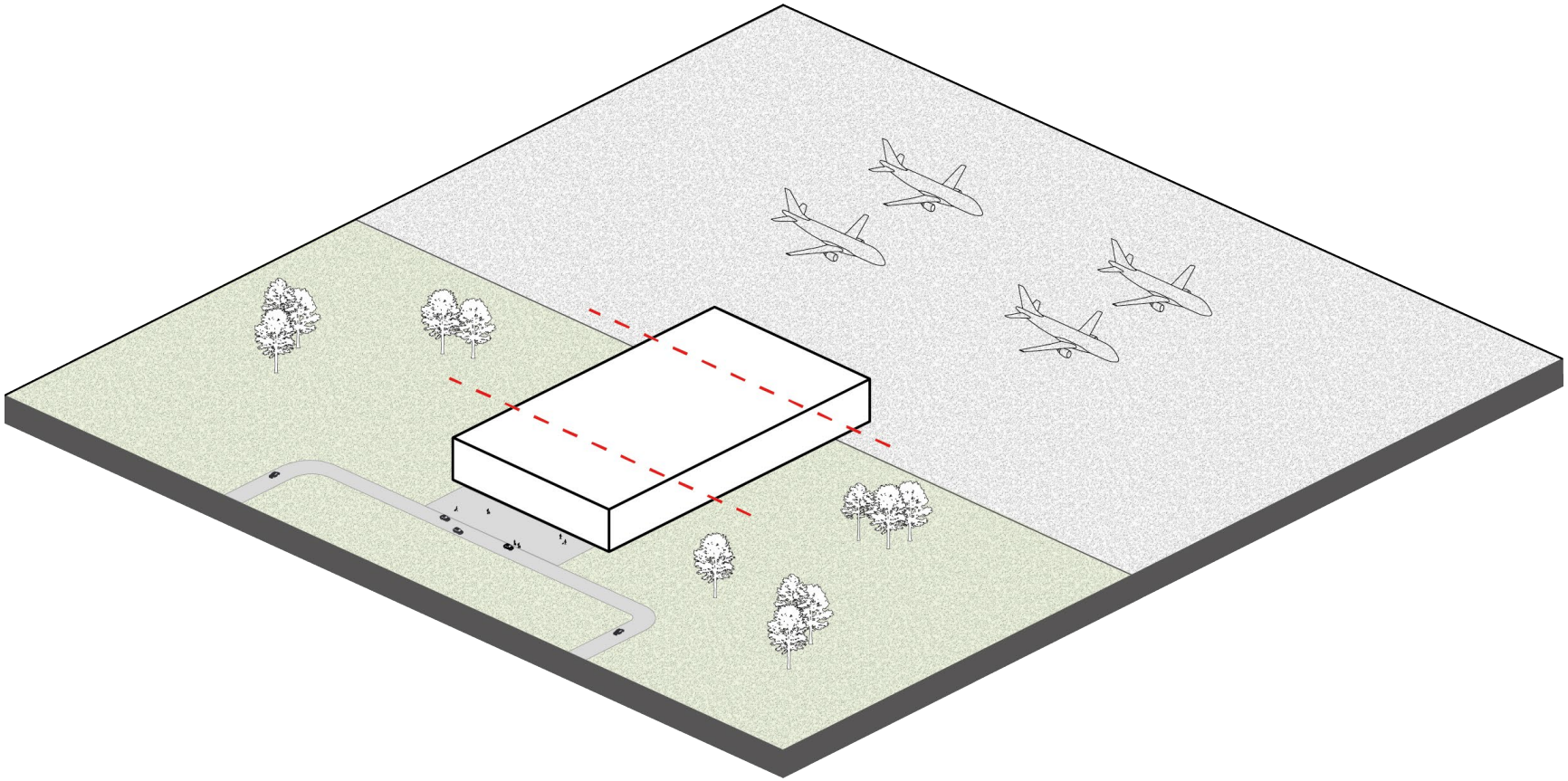
DESIGN CONCEPT

1. Simple geometrical shape



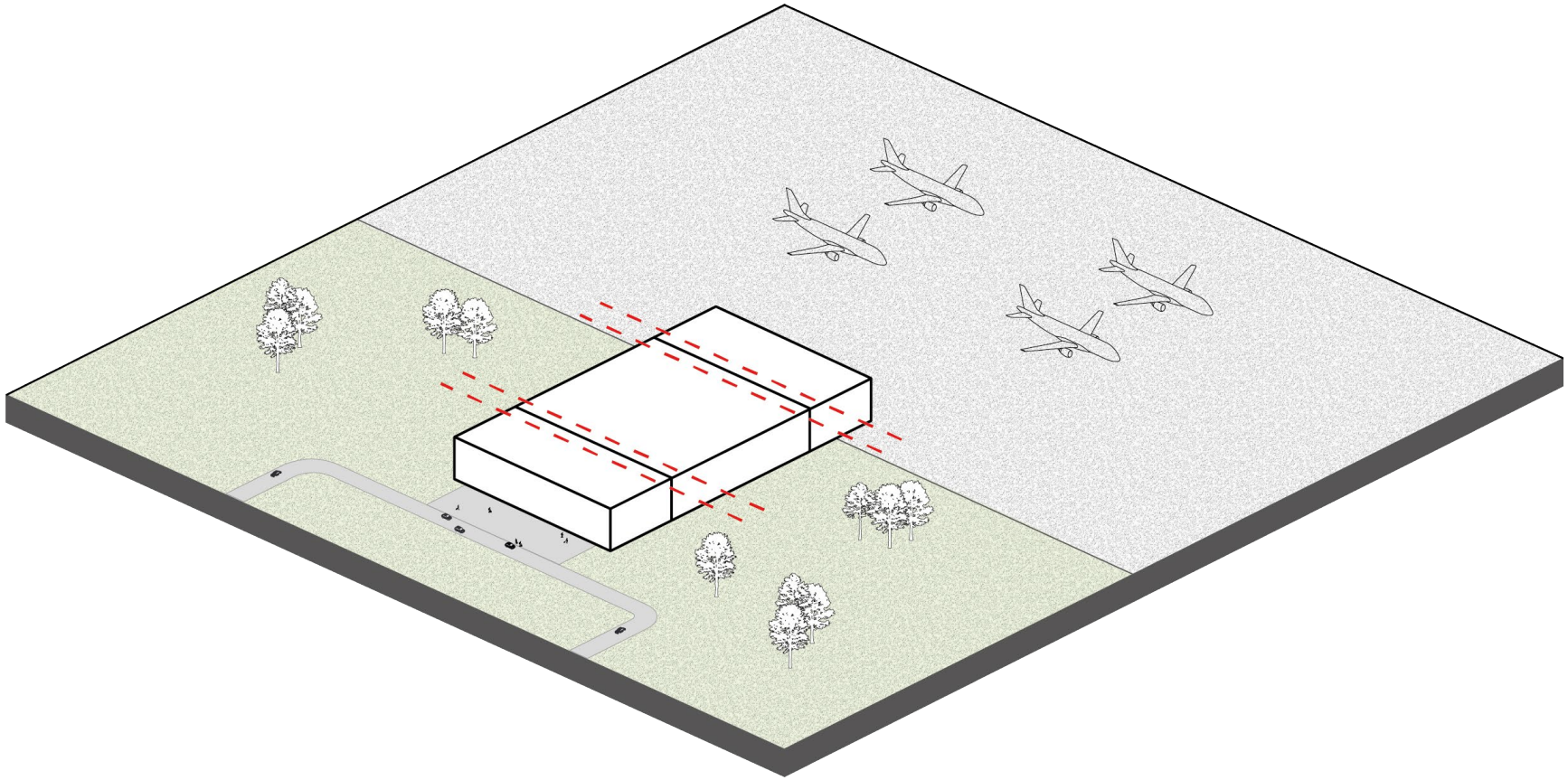
DESIGN CONCEPT

2. Dividing into three areas



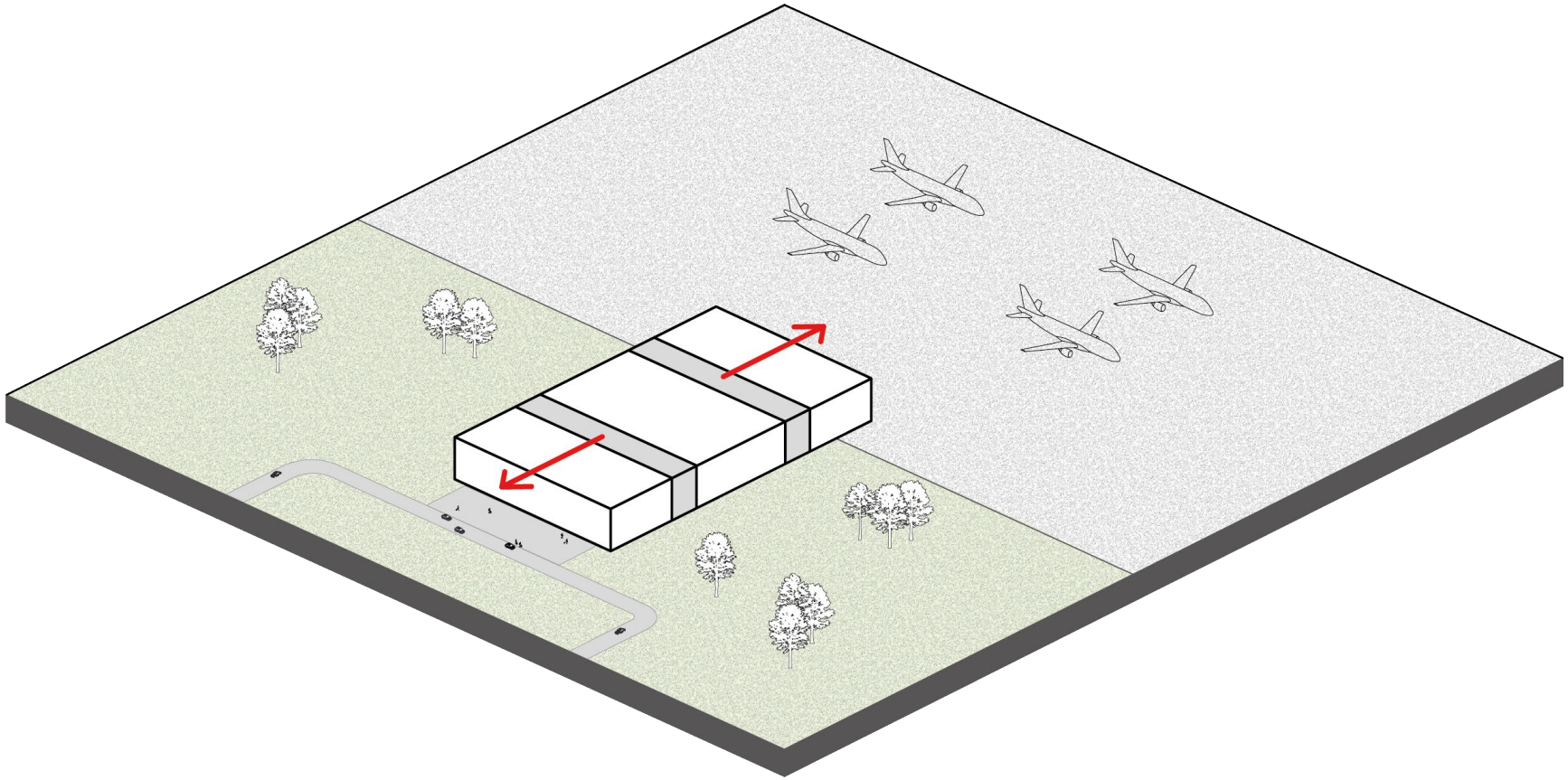
DESIGN CONCEPT

3. Adding two service zones



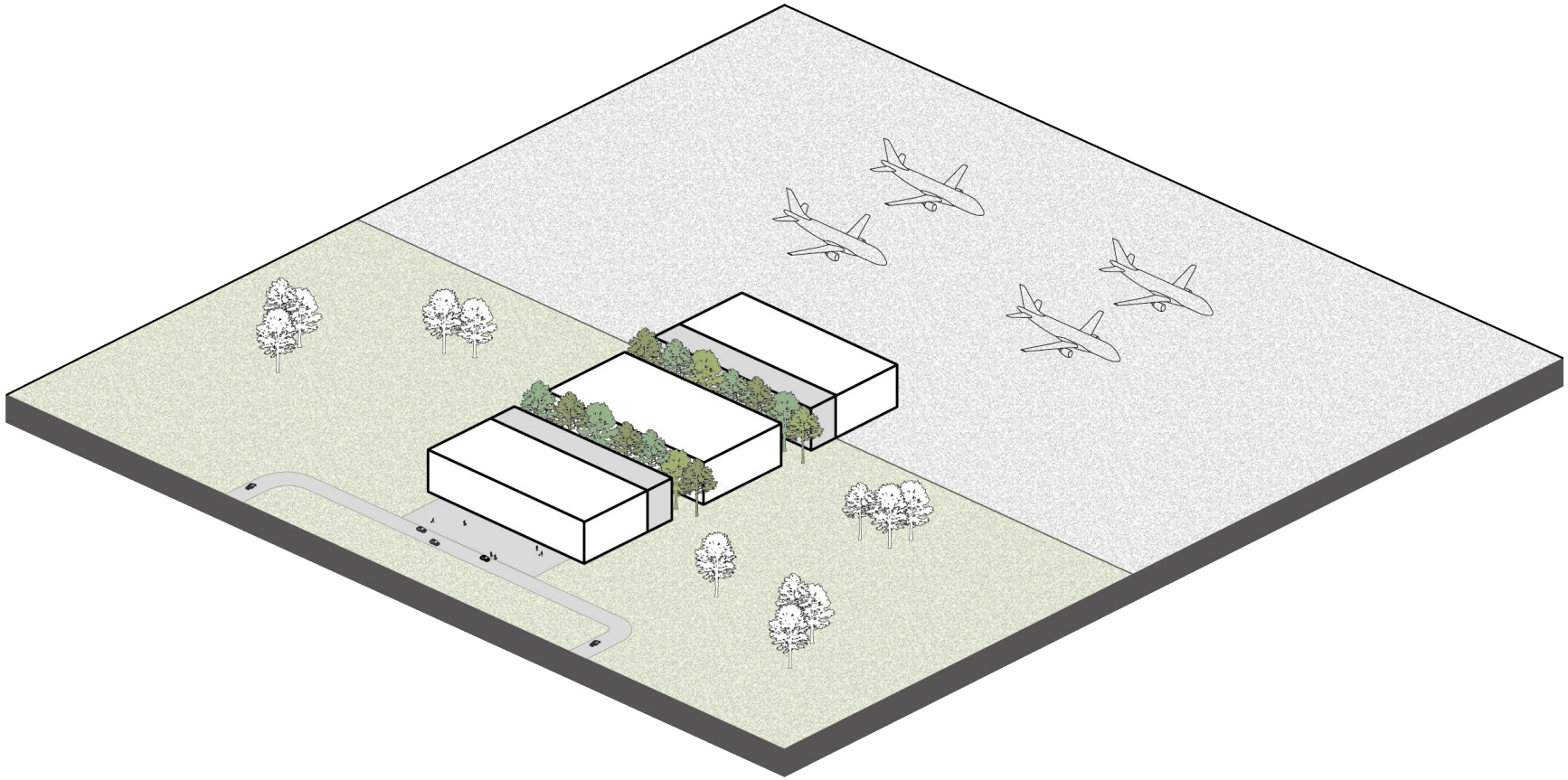
DESIGN CONCEPT

4. Splitting areas to create openings



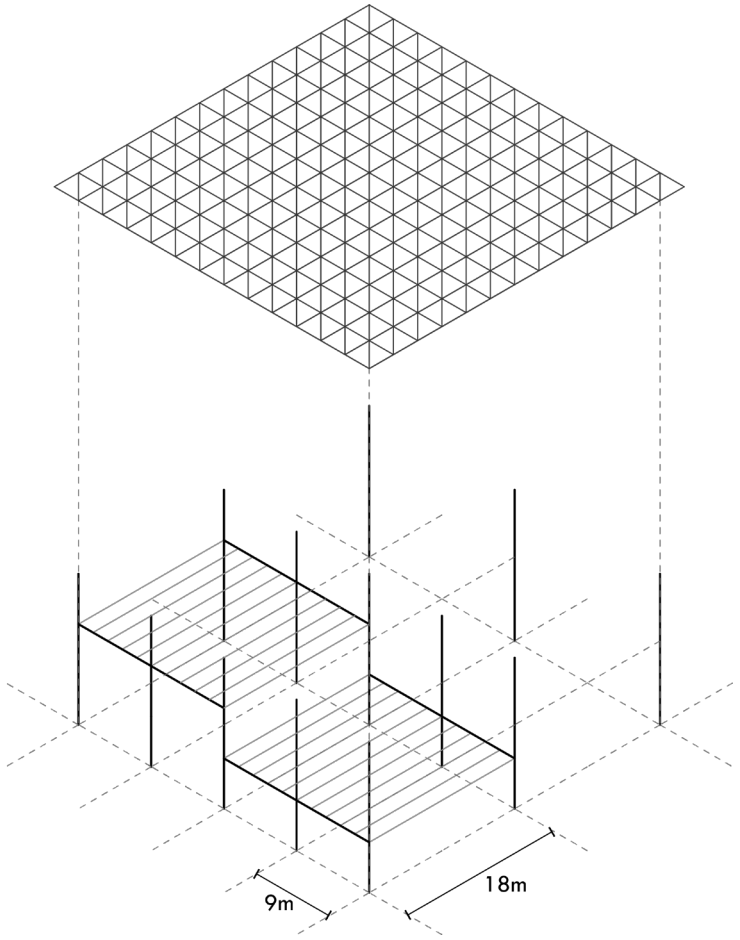
DESIGN CONCEPT

5. Created openings become green areas



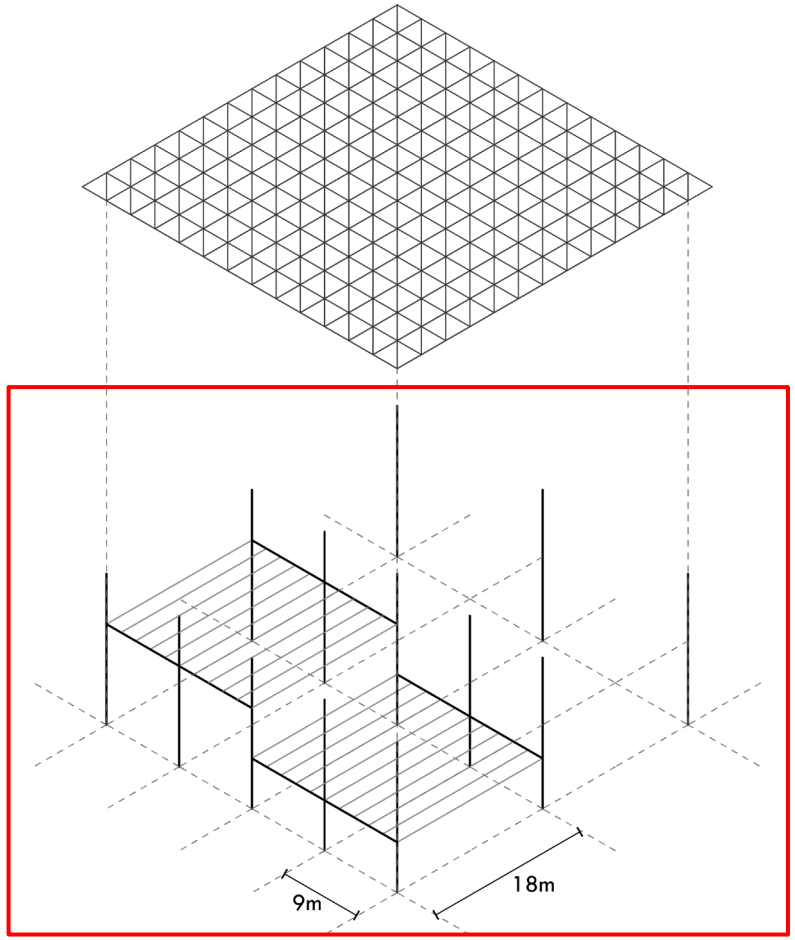
STRUCTURAL CONCEPT

Using modular and demountable construction



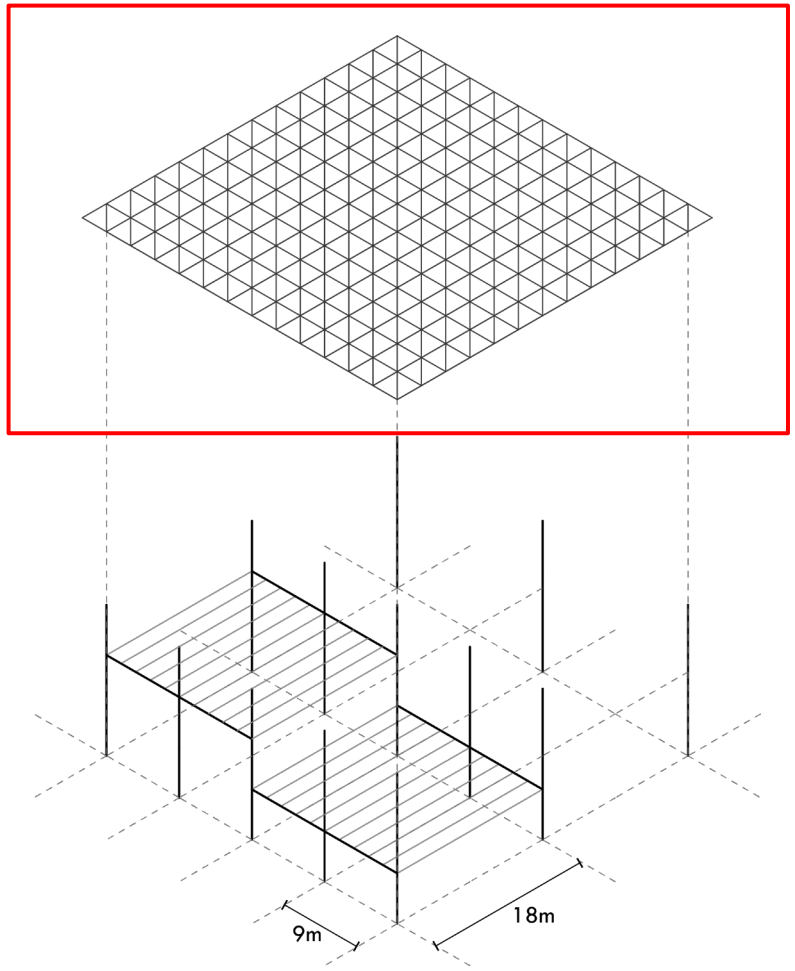
STRUCTURAL CONCEPT

Columns and beams



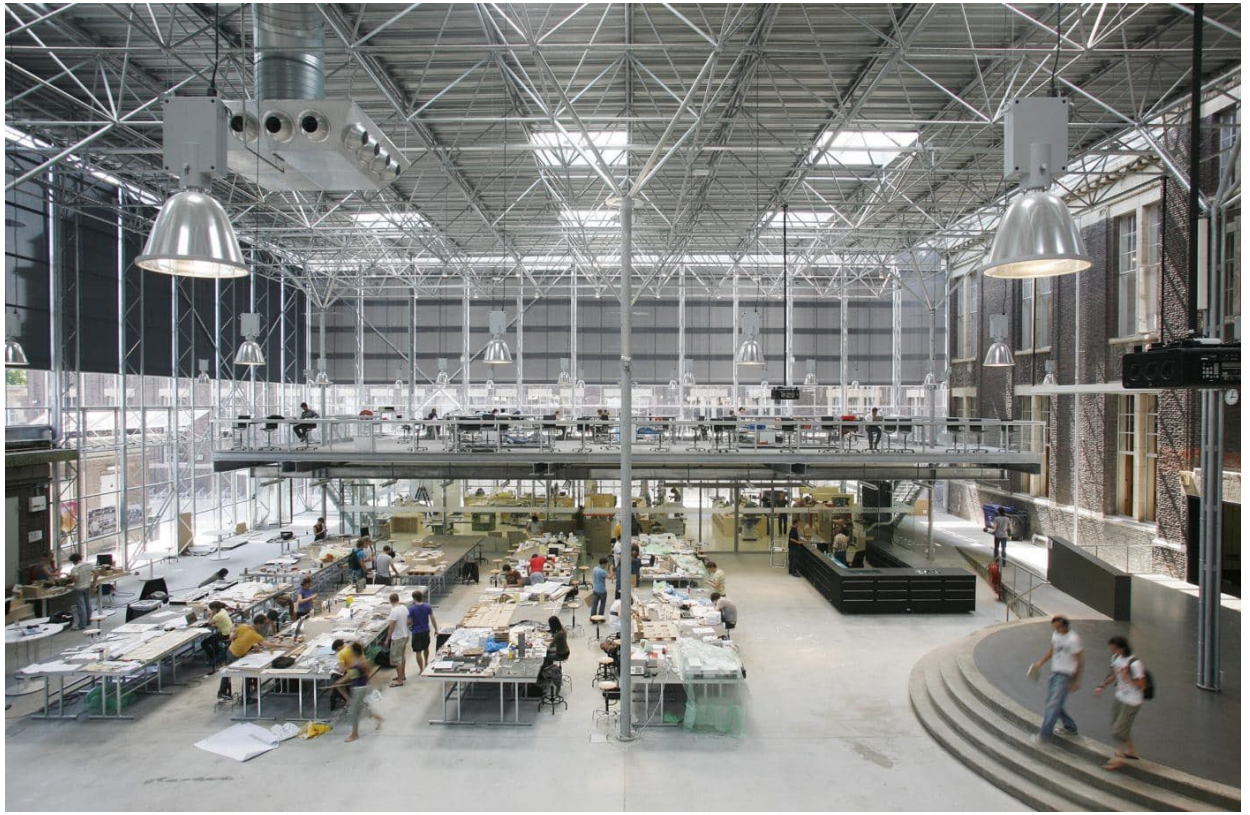
STRUCTURAL CONCEPT

Spaceframe roof



STRUCTURAL CONCEPT

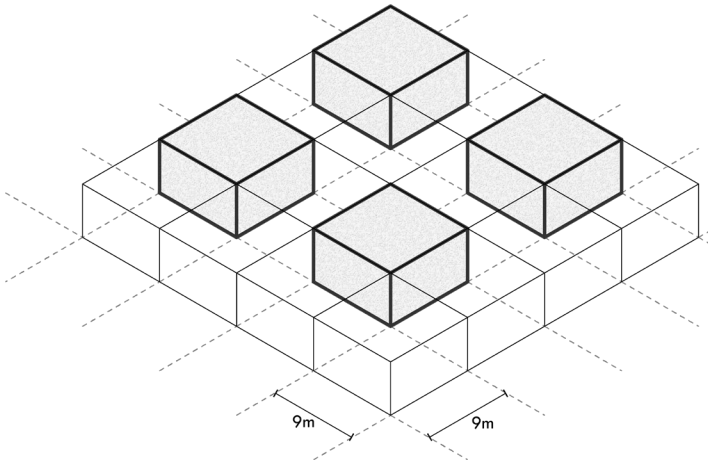
Spaceframe roof



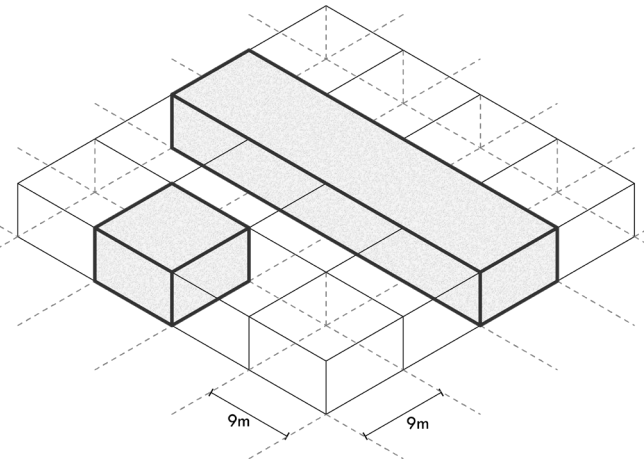
(Braaksma & Roos, n.d.)

INTERNAL CONCEPT

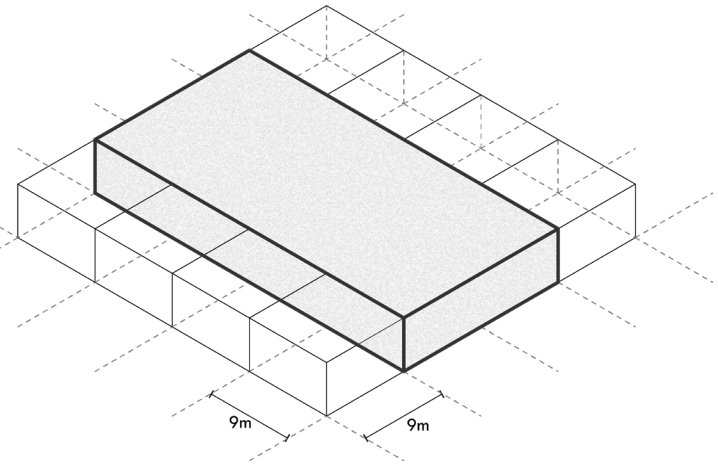
Organising terminal elements into expandable modules



Ancillary facilities: offices, restrooms, tech. install. rooms, vertical circulation



Processing area: security control, e-passport control

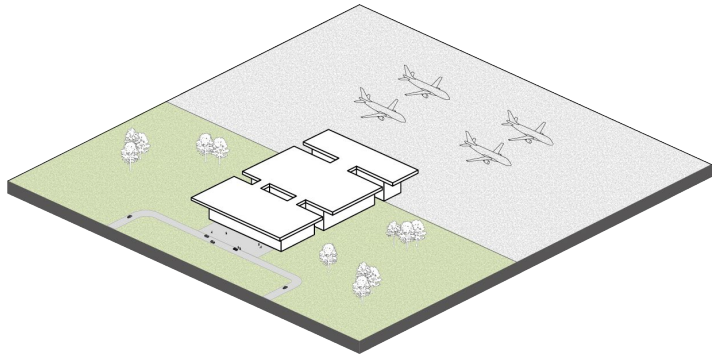


Baggage claim area: one baggage belt

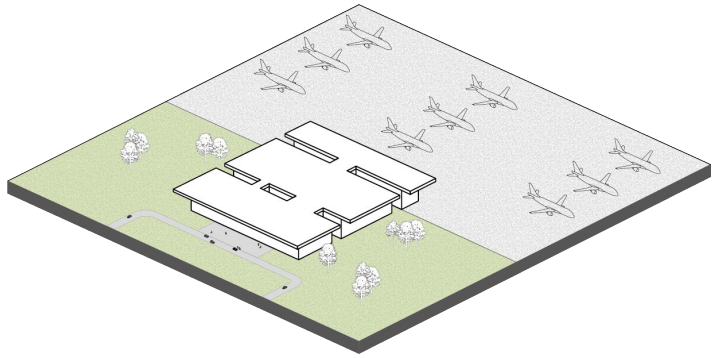
PART 5 – TERMINAL CONFIGURATOR

STEP 1

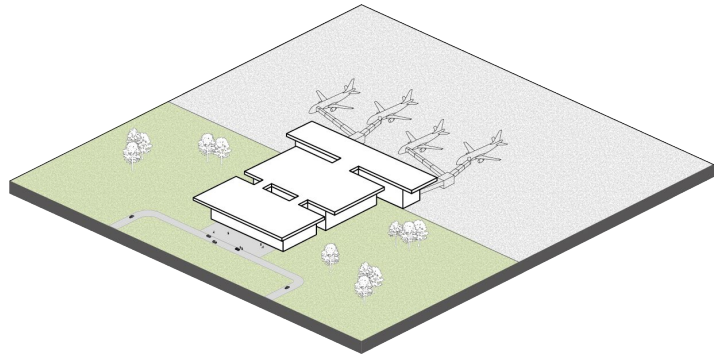
Select basic typology



Transporter typology,
terminal size 12,000 m²



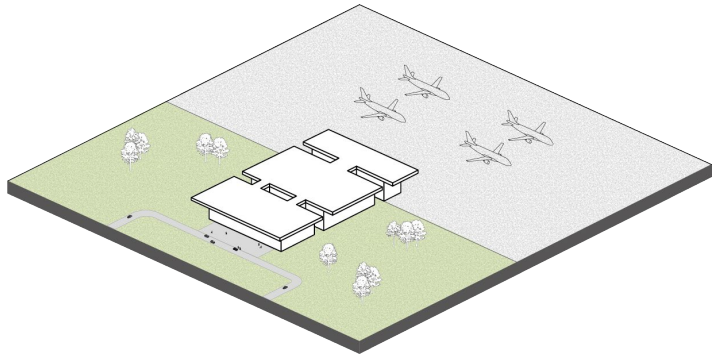
Transporter typology,
terminal size 15,000 m²



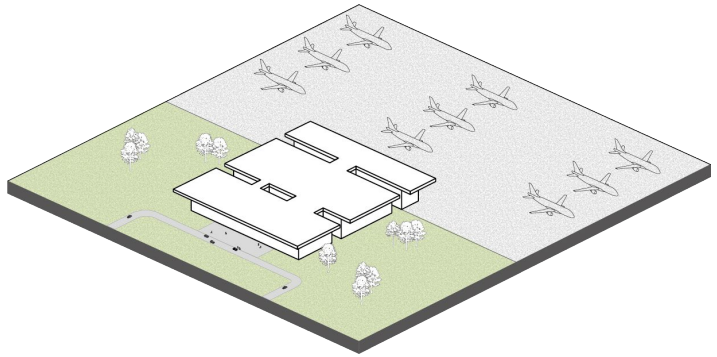
Linear typology,
terminal size 13,000 m²

STEP 1

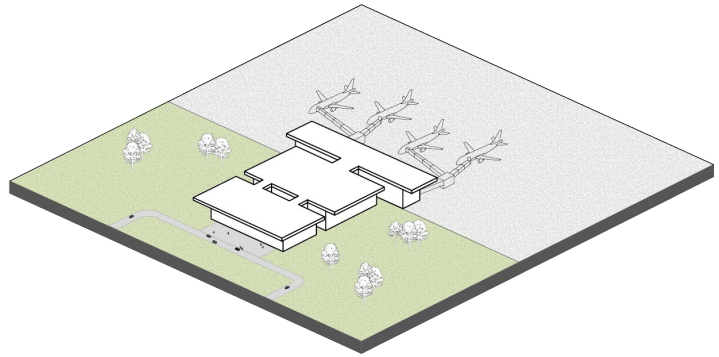
Select basic typology



Transporter typology,
terminal size 12,000 m²



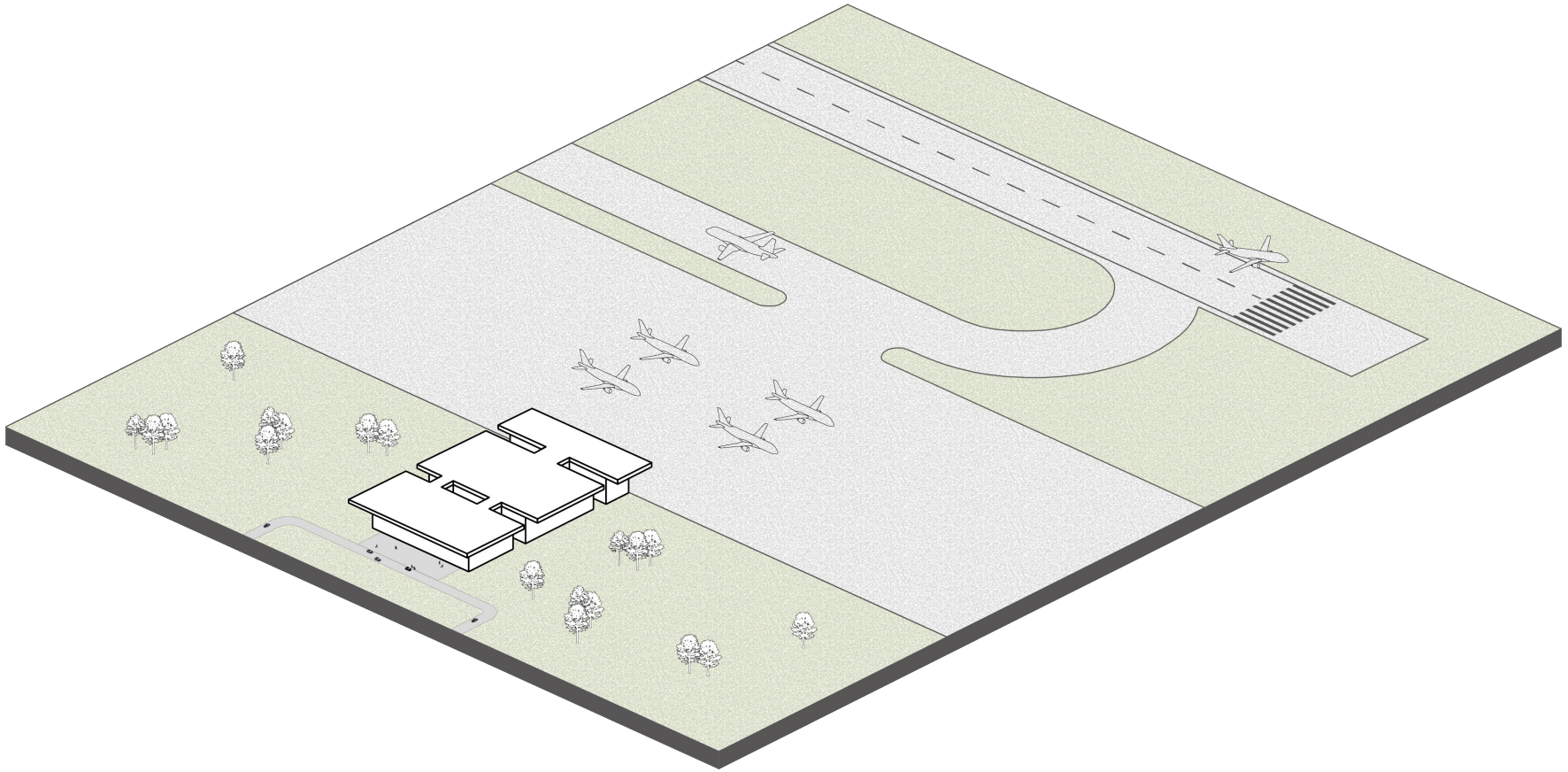
Transporter typology,
terminal size 15,000 m²



Linear typology,
terminal size 13,000 m²

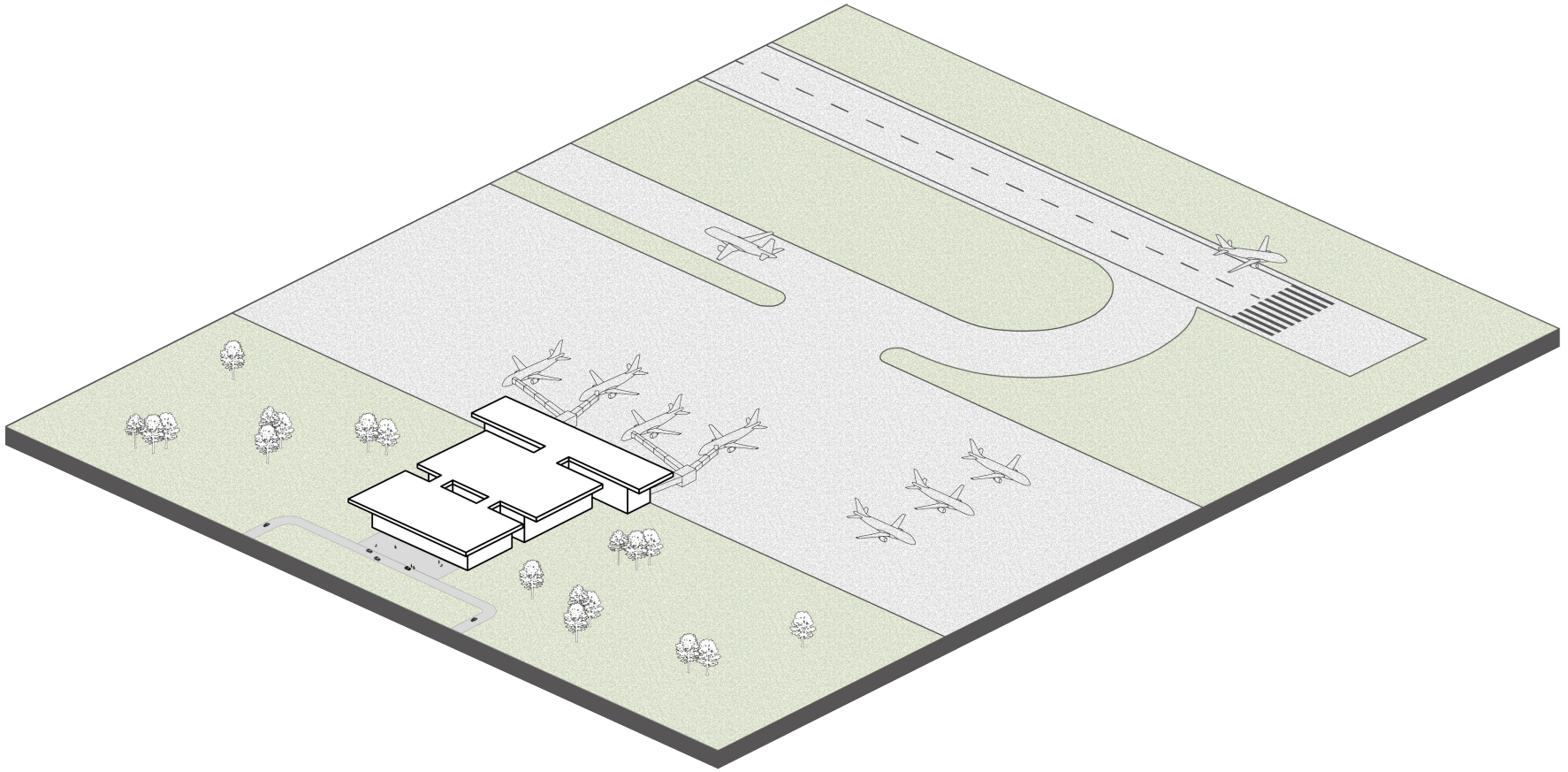
PHASE 1: CA. 500,000 PASSENGERS/YEAR

12,000 m²



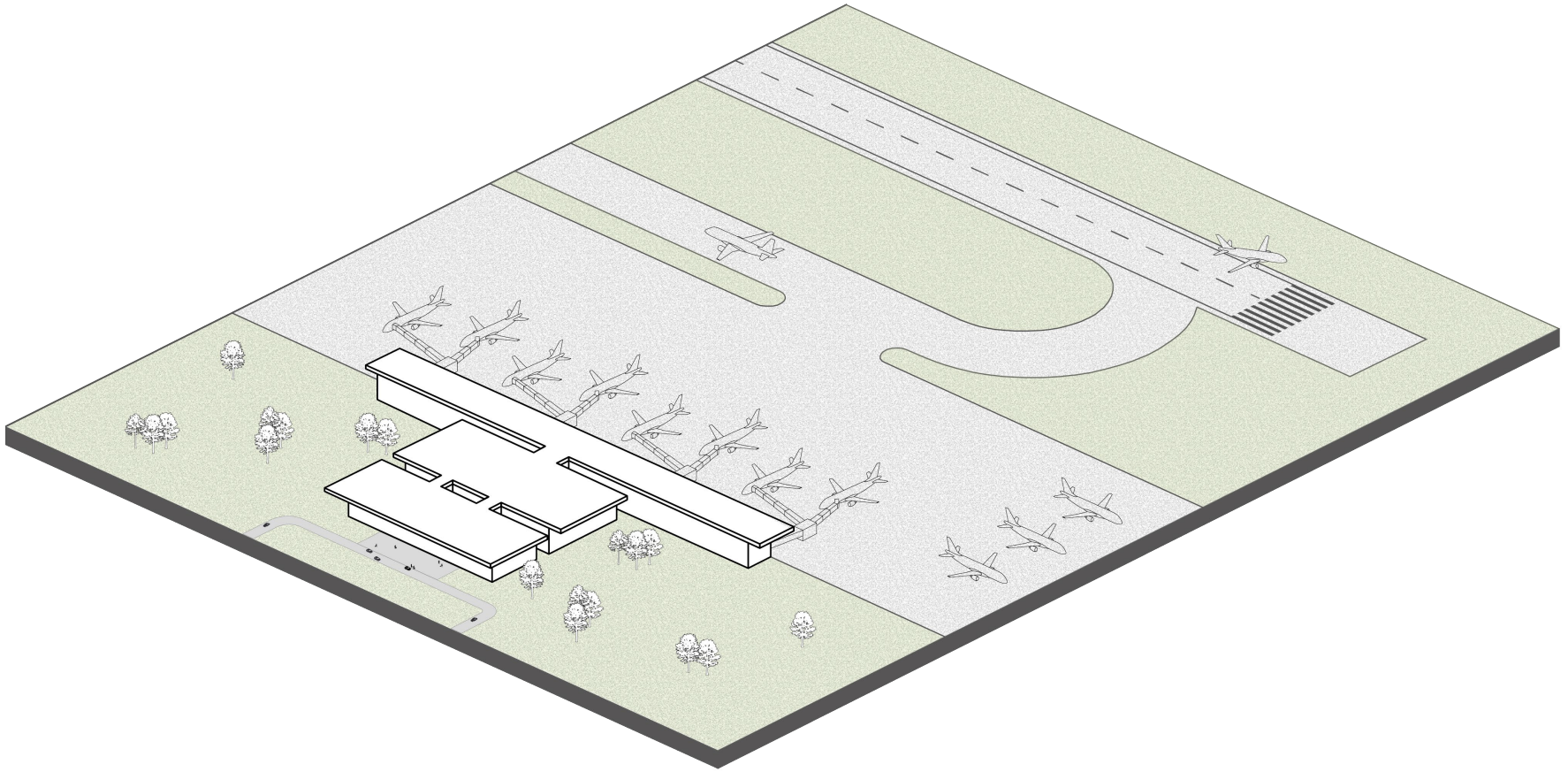
PHASE 2: CA. 800,000 PASSENGERS/YEAR

13,000 m²



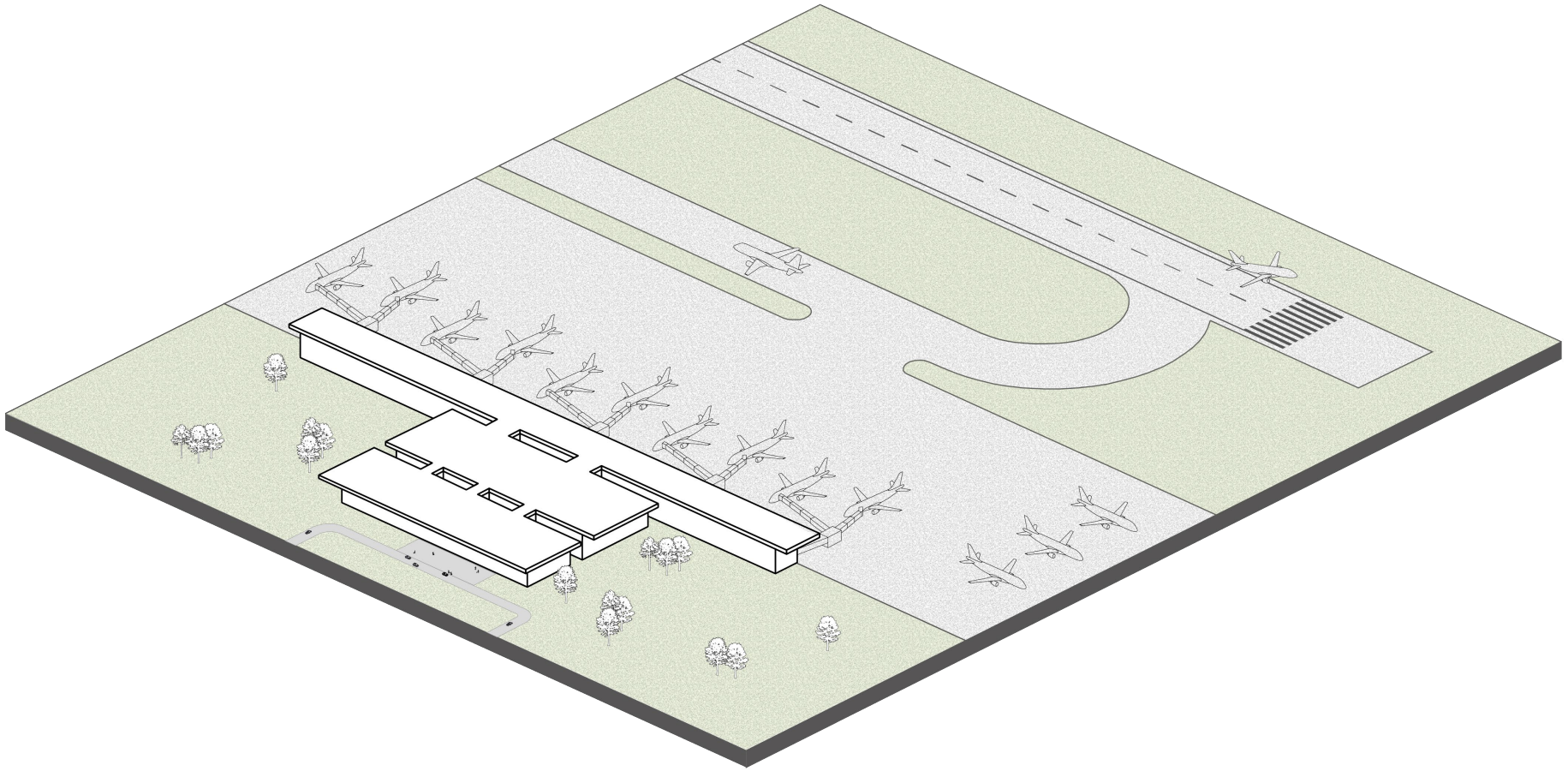
PHASE 3: CA. 1,300,000 PASSENGERS/YEAR

19,000 m²



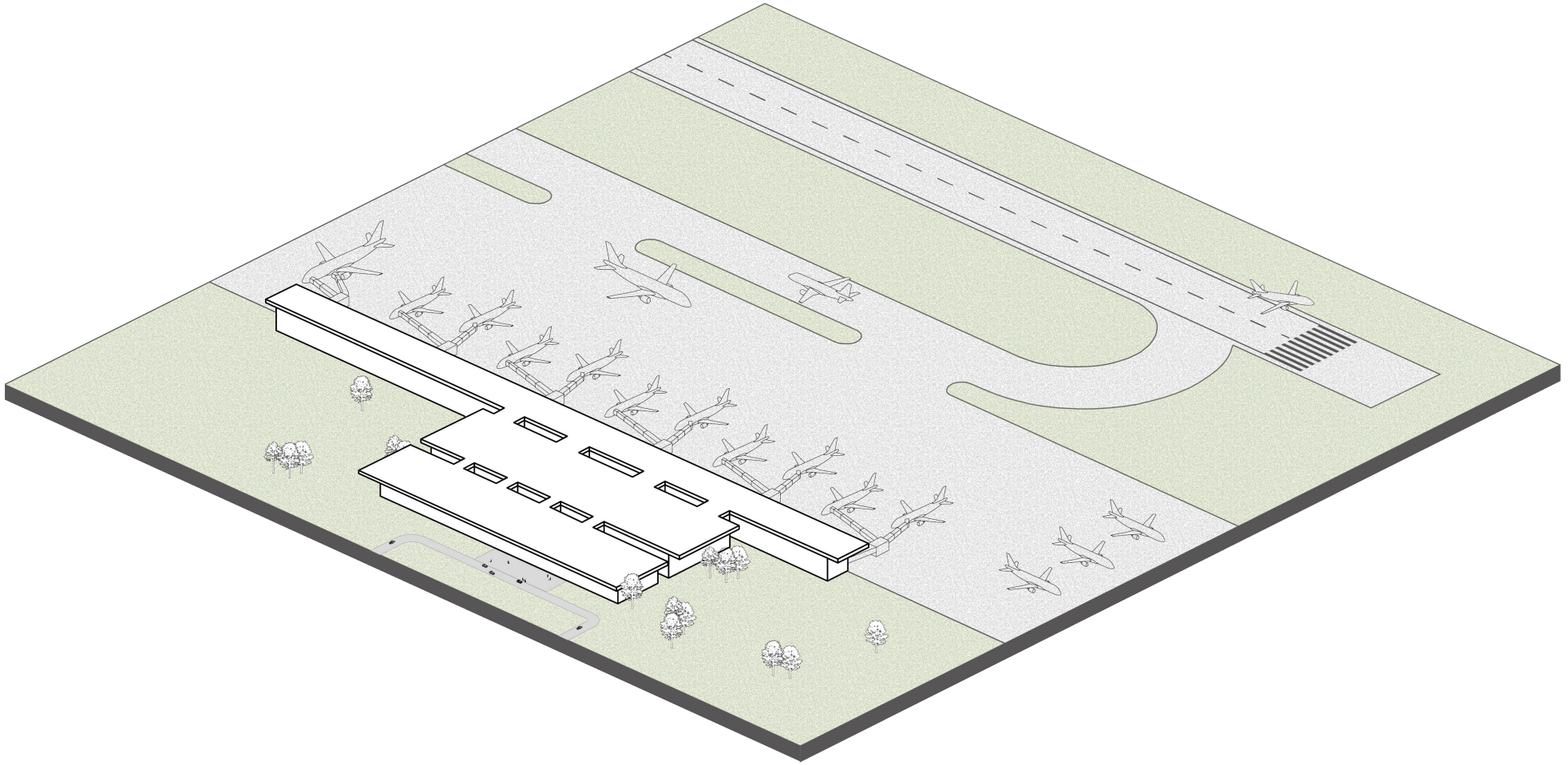
PHASE 4: CA. 2,500,000 PASSENGERS/YEAR

30,000 m²



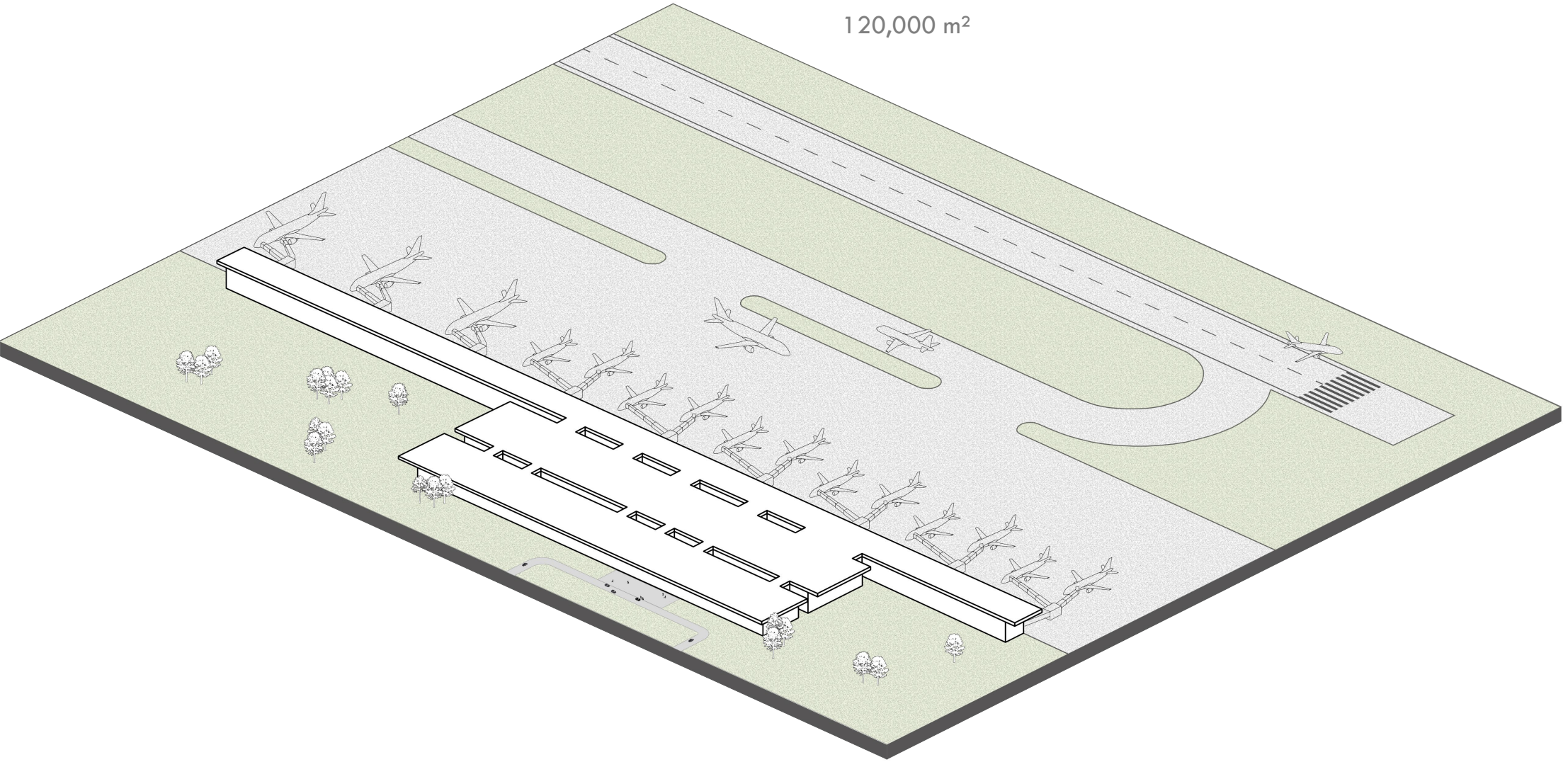
PHASE 5: CA. 4,000,000 PASSENGERS/YEAR

45,000 m²



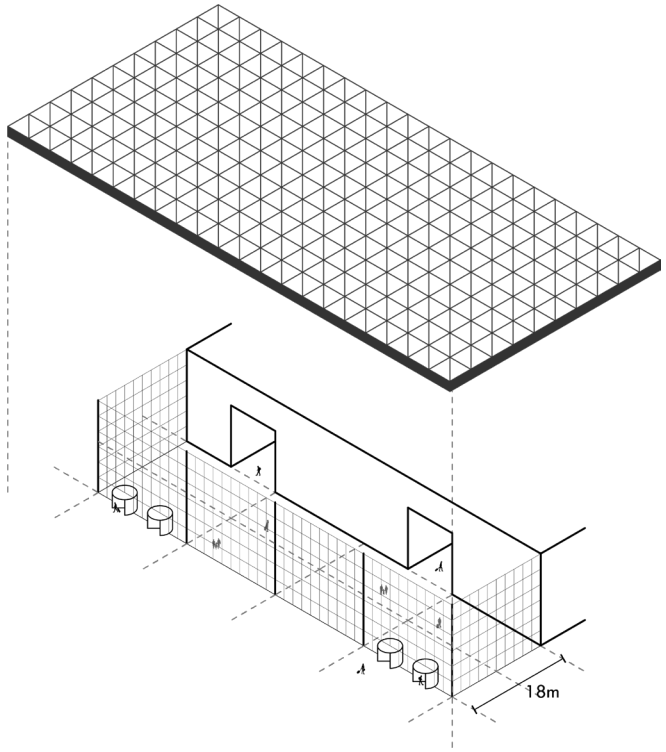
PHASE 6: CA. 10,000,000 PASSENGERS/YEAR

120,000 m²

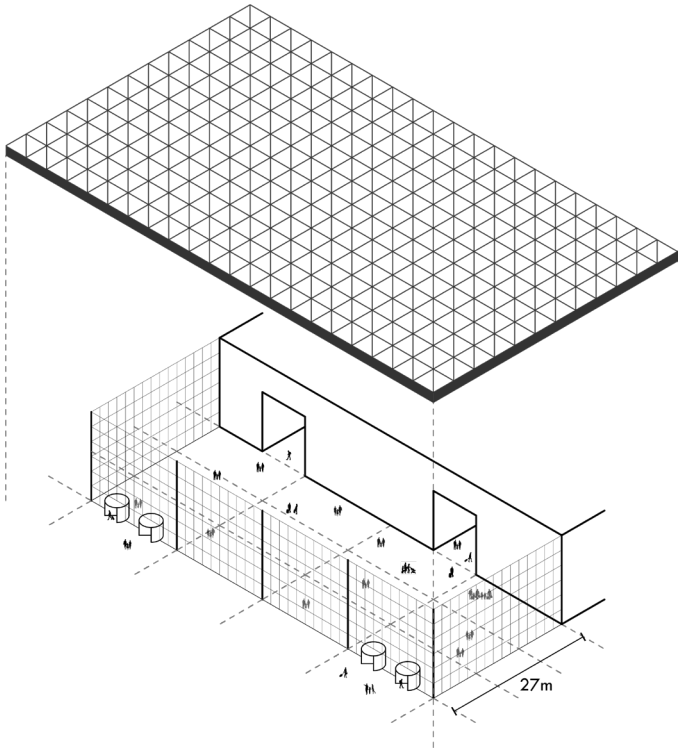


STEP 2

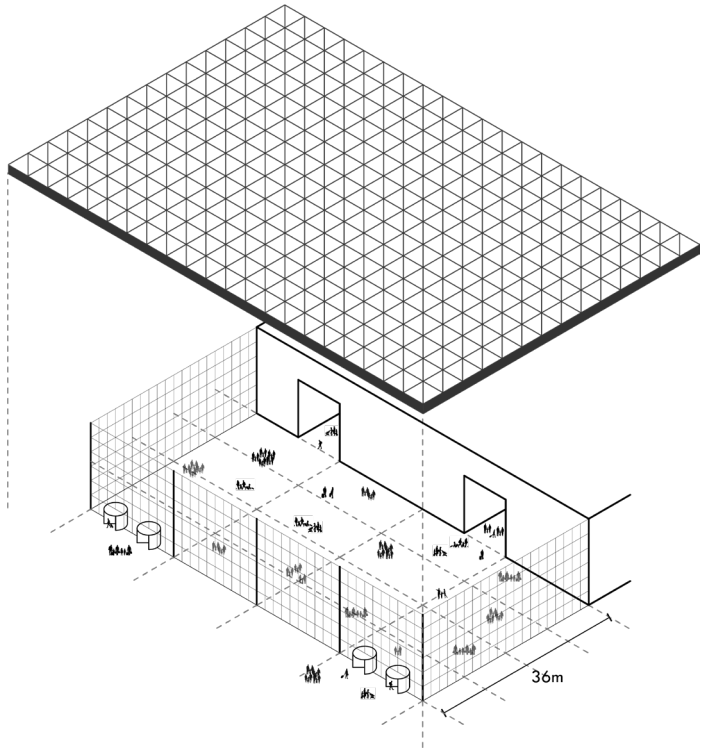
Determine the size of the departure hall



Smaller departure hall (18 metre)



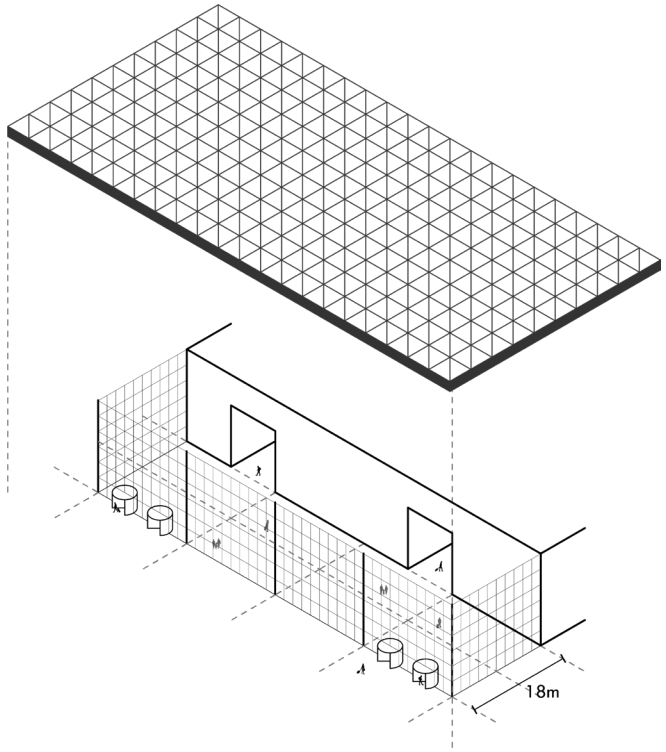
Standard departure hall (27 metre)



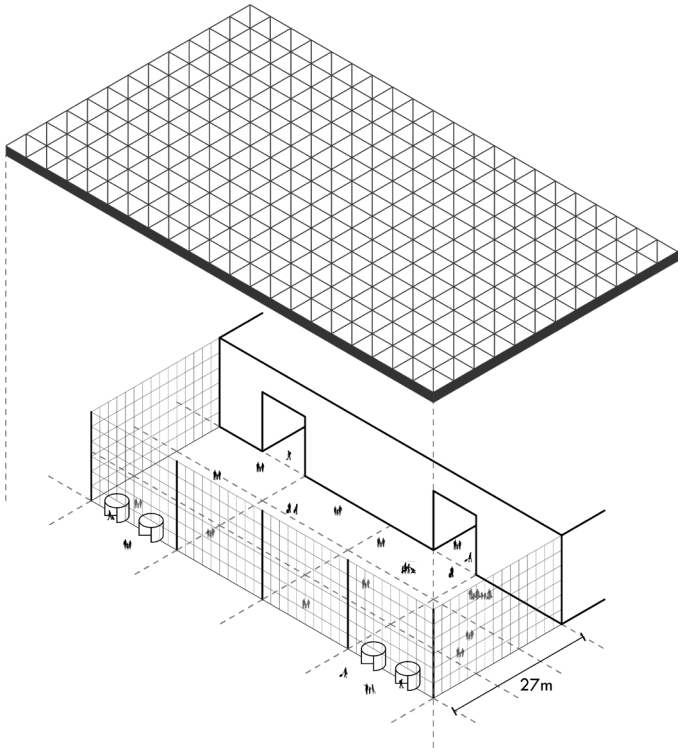
Extended departure hall (36+ metre)

STEP 2

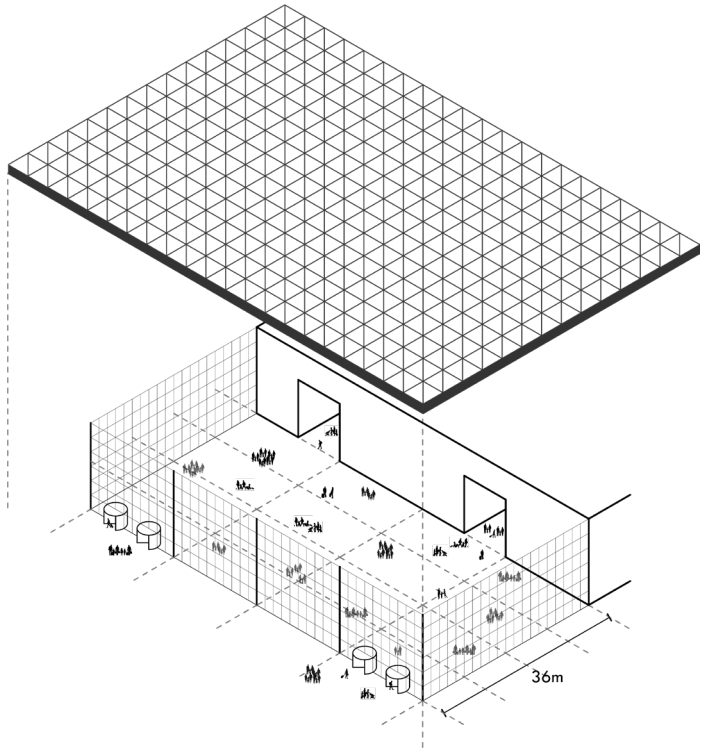
Determine the size of the departure hall



Smaller departure hall (18 metre)



Standard departure hall (27 metre)



Extended departure hall (36+ metre)

STEP 3

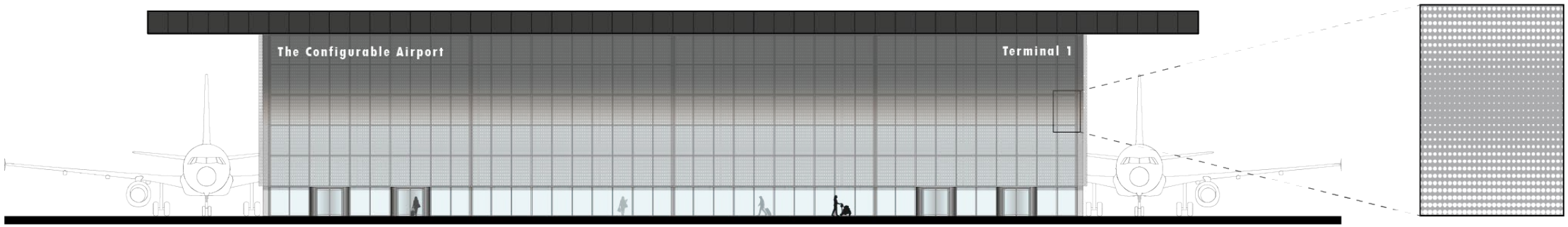
Choose the terminal facade



Possible facade for Scandinavia

STEP 3

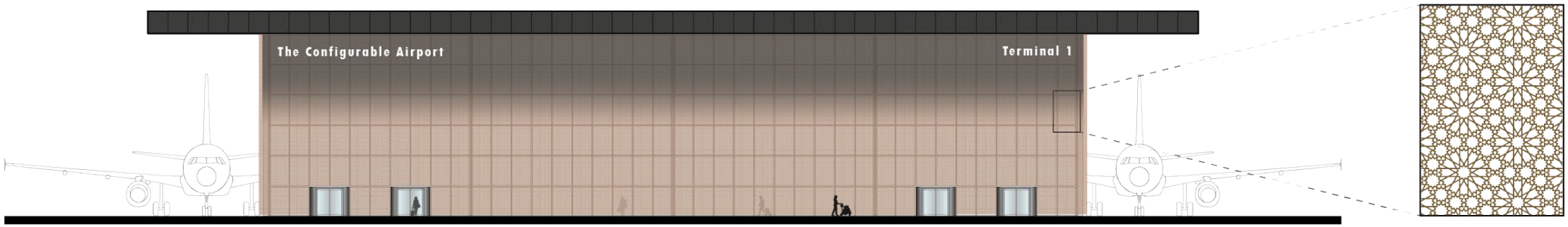
Choose the terminal facade



Possible facade for The Netherlands

STEP 3

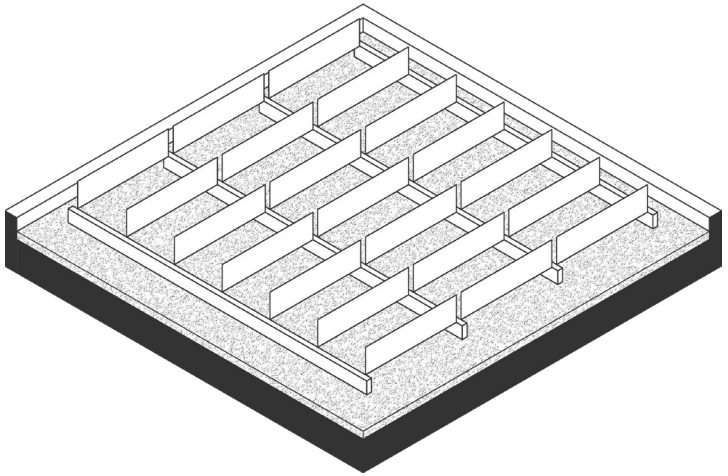
Choose the terminal facade



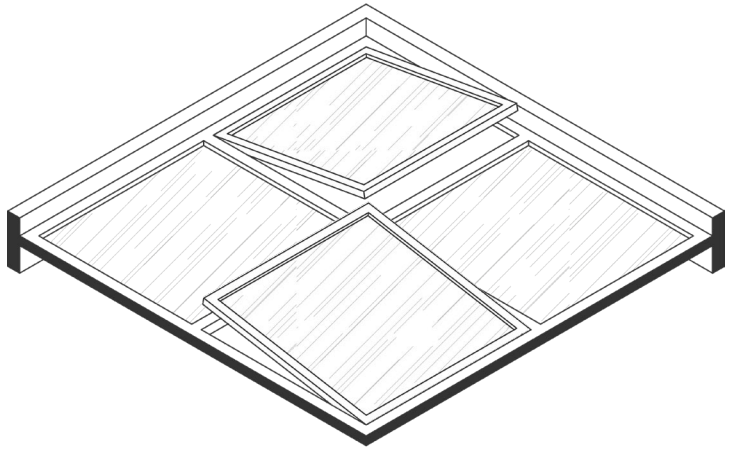
Possible facade for Middle East

STEP 4

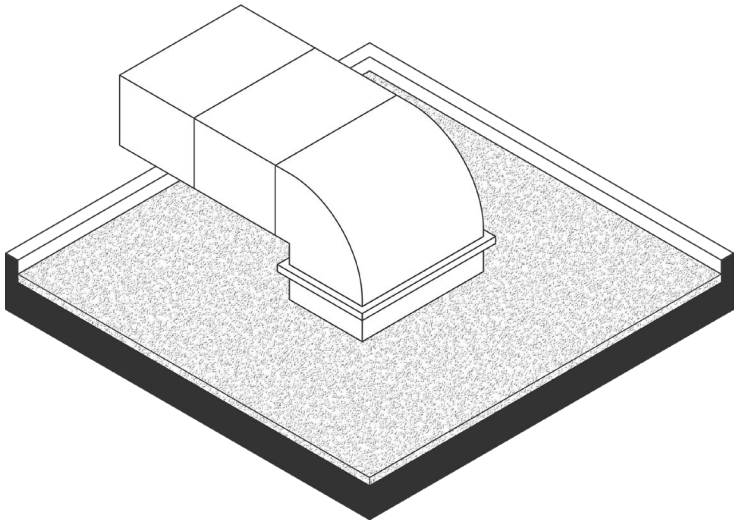
Design the terminal roof



Green roof component with vertical solar panels (Solargreen bificial)



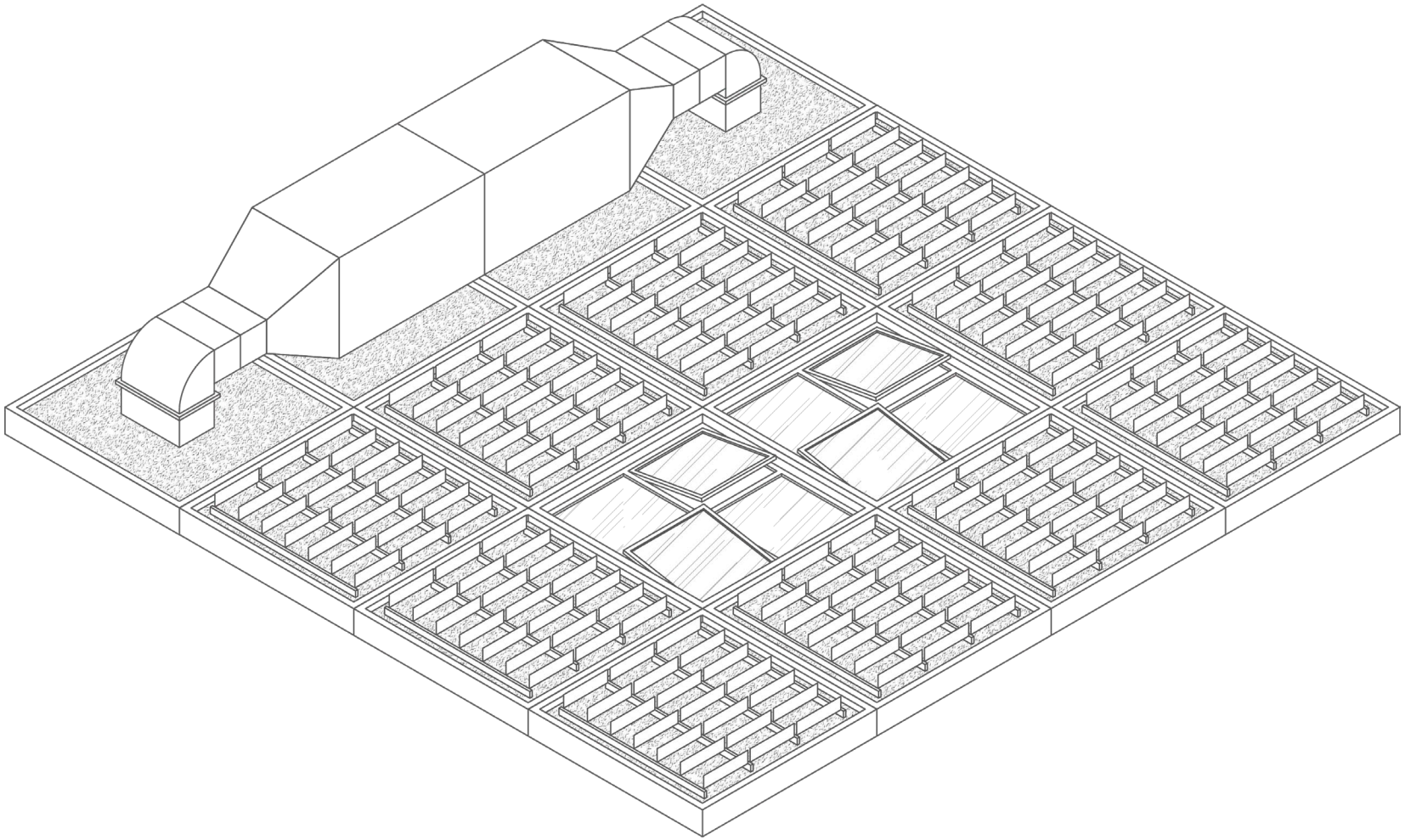
Skylight component with openable parts



Installation component for air handling units and air ducts

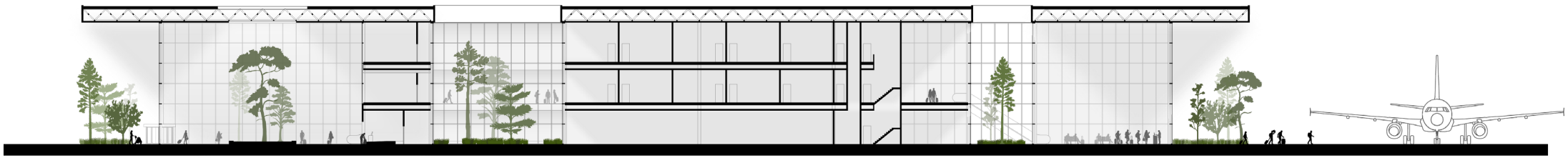
STEP 4

Configuration used in the elaborated design



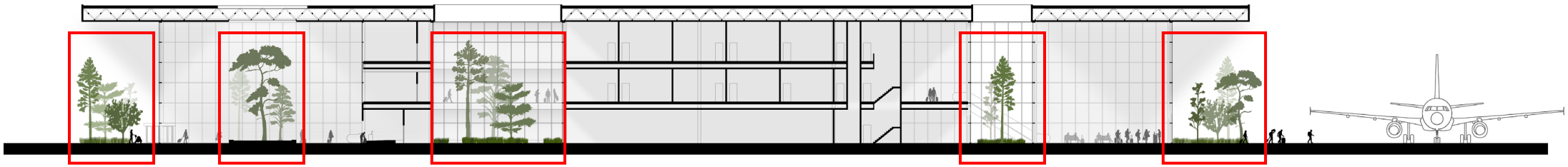
STEP 5

Adding green spaces

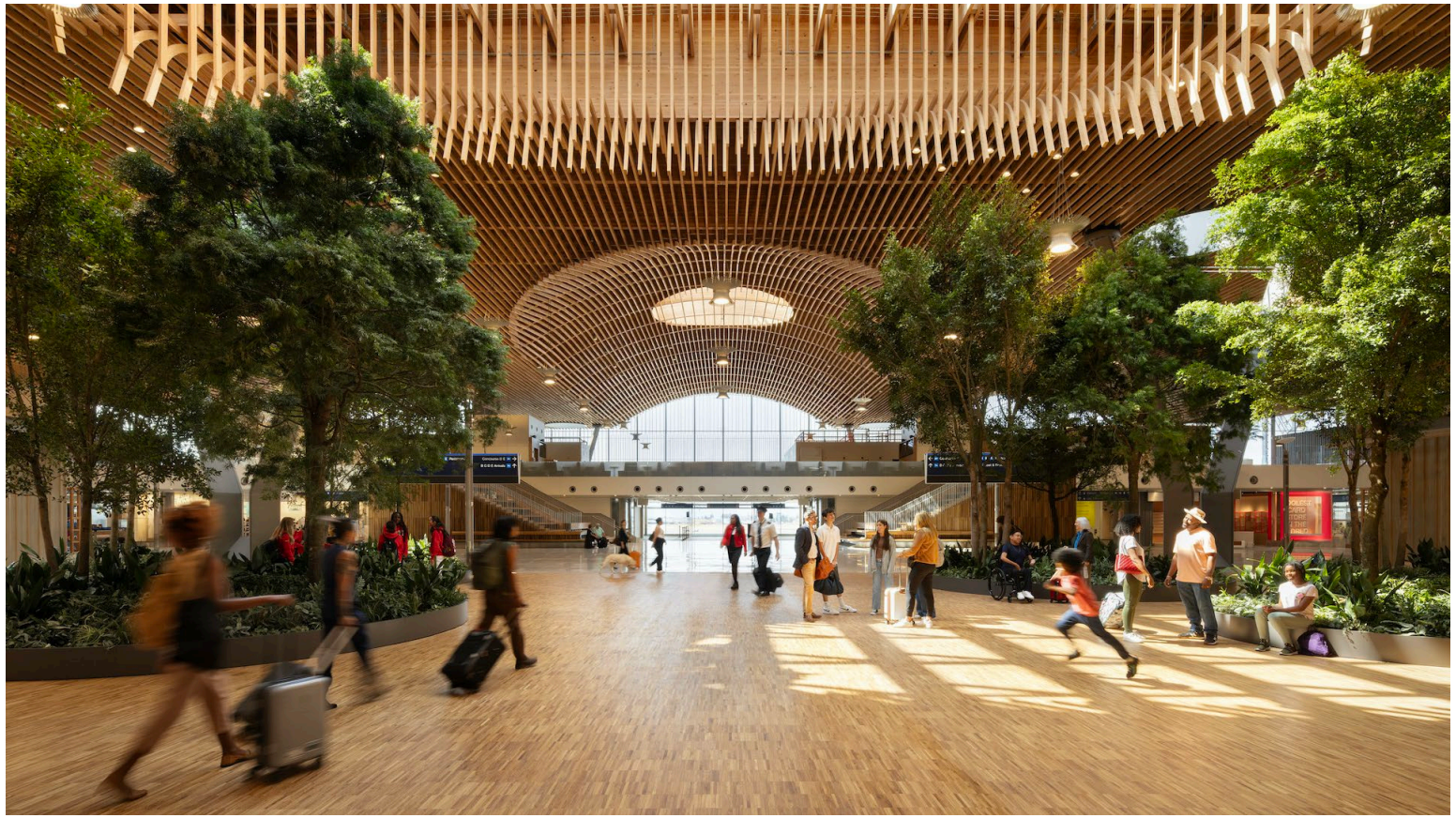


STEP 5

Adding green spaces

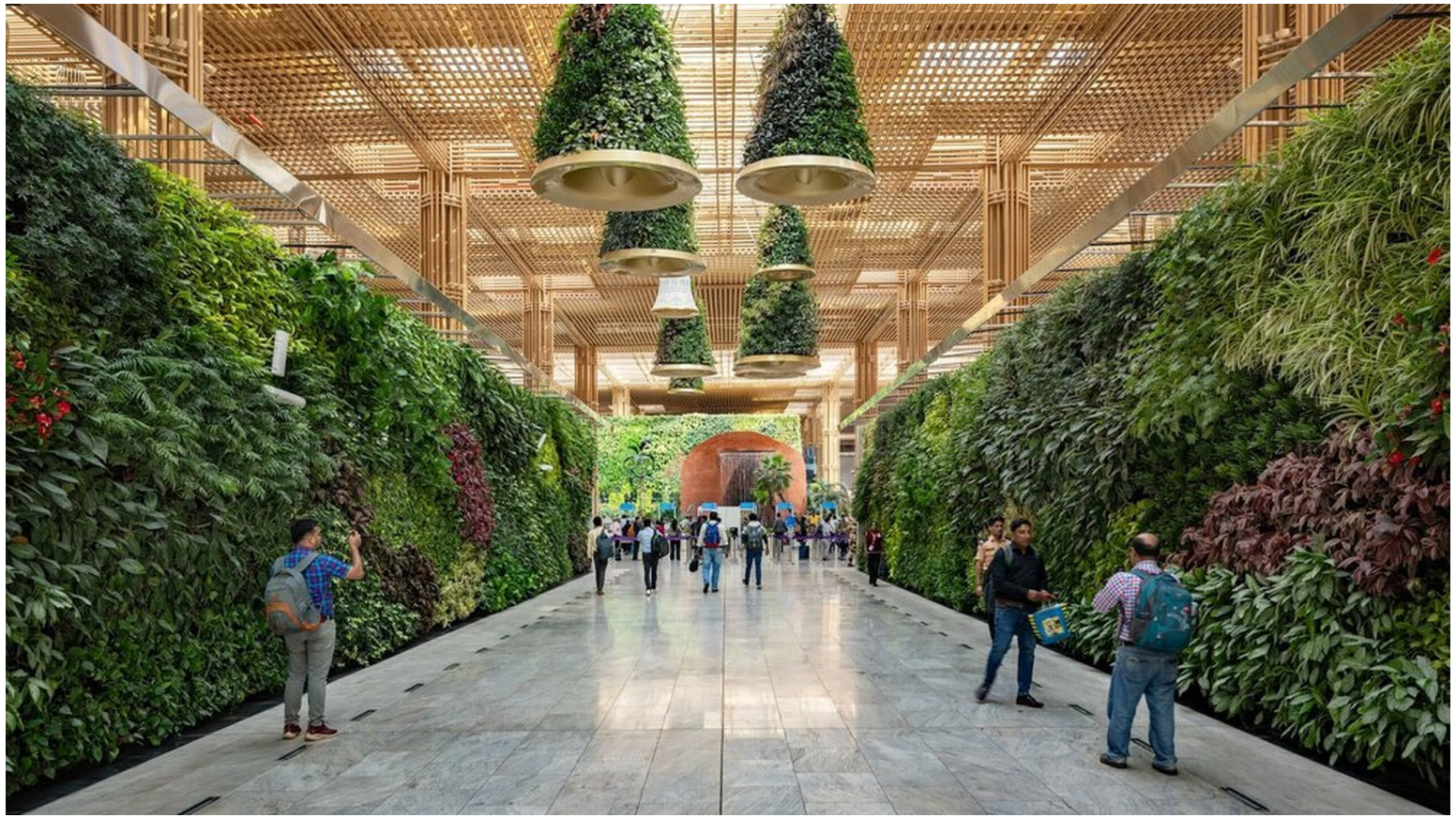


REDUCES STRESS AMONGTS PASSENGERS



(Frameweb, 2024)

IMPROVES PASSENGER EXPERIENCE



(Grant Associates, 2024)

FUNCTIONS AS TRANSITION ZONE

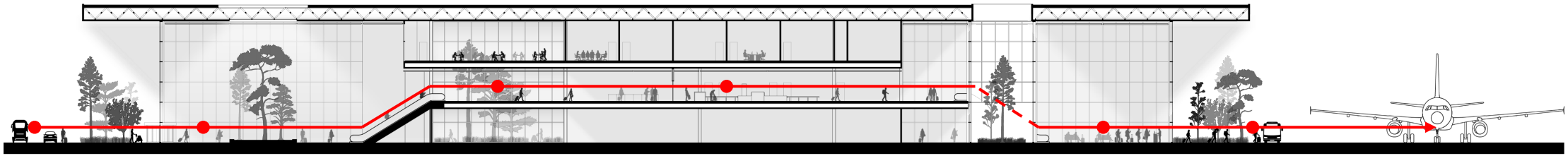


(Behance, n.d.)

PART 6 – ELABORATED DESIGN

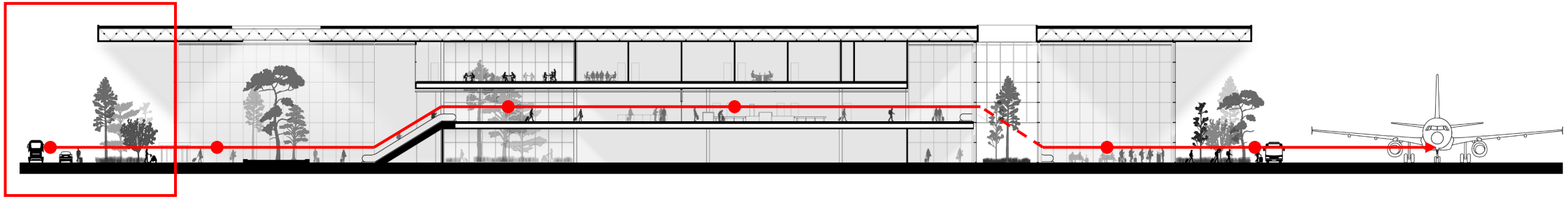
A TOUR OF THE TERMINAL

Through the eyes of a departing passenger

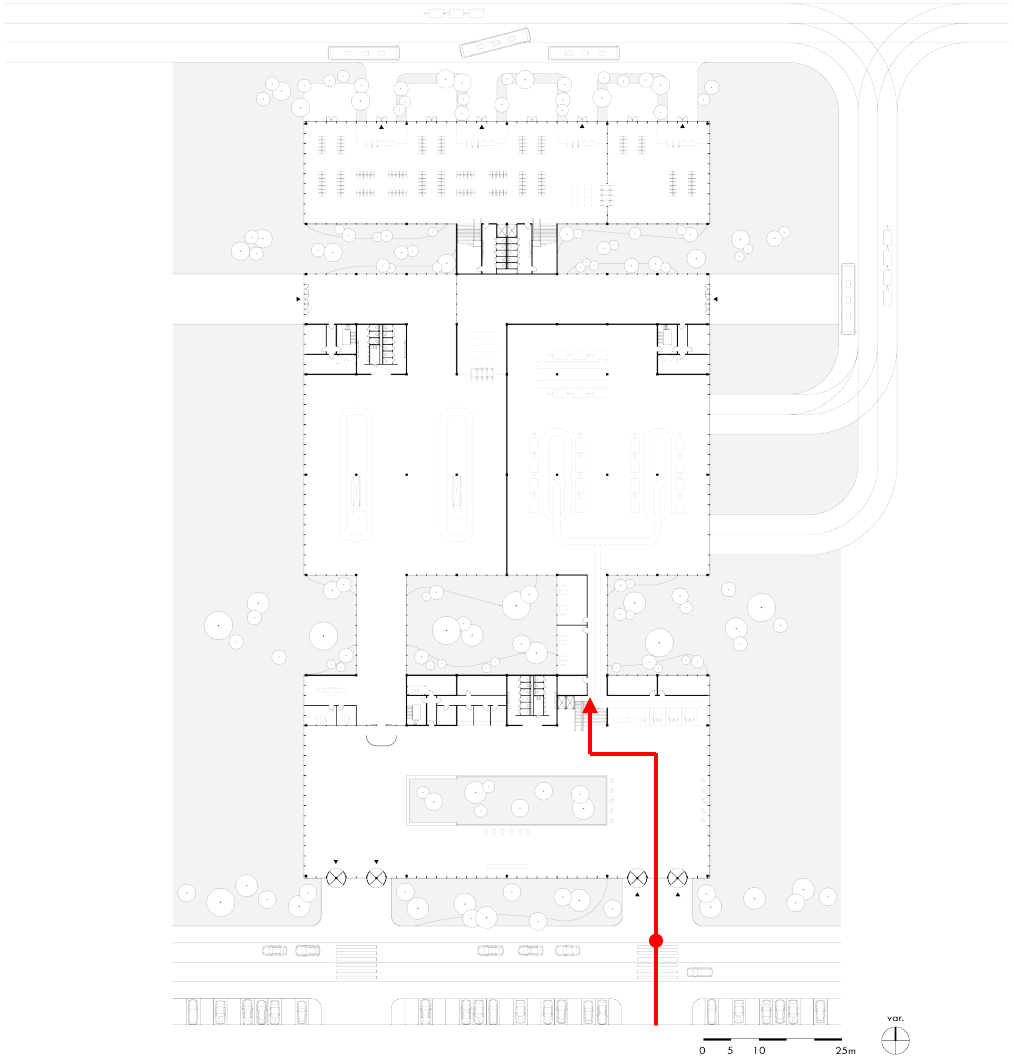


A TOUR OF THE TERMINAL

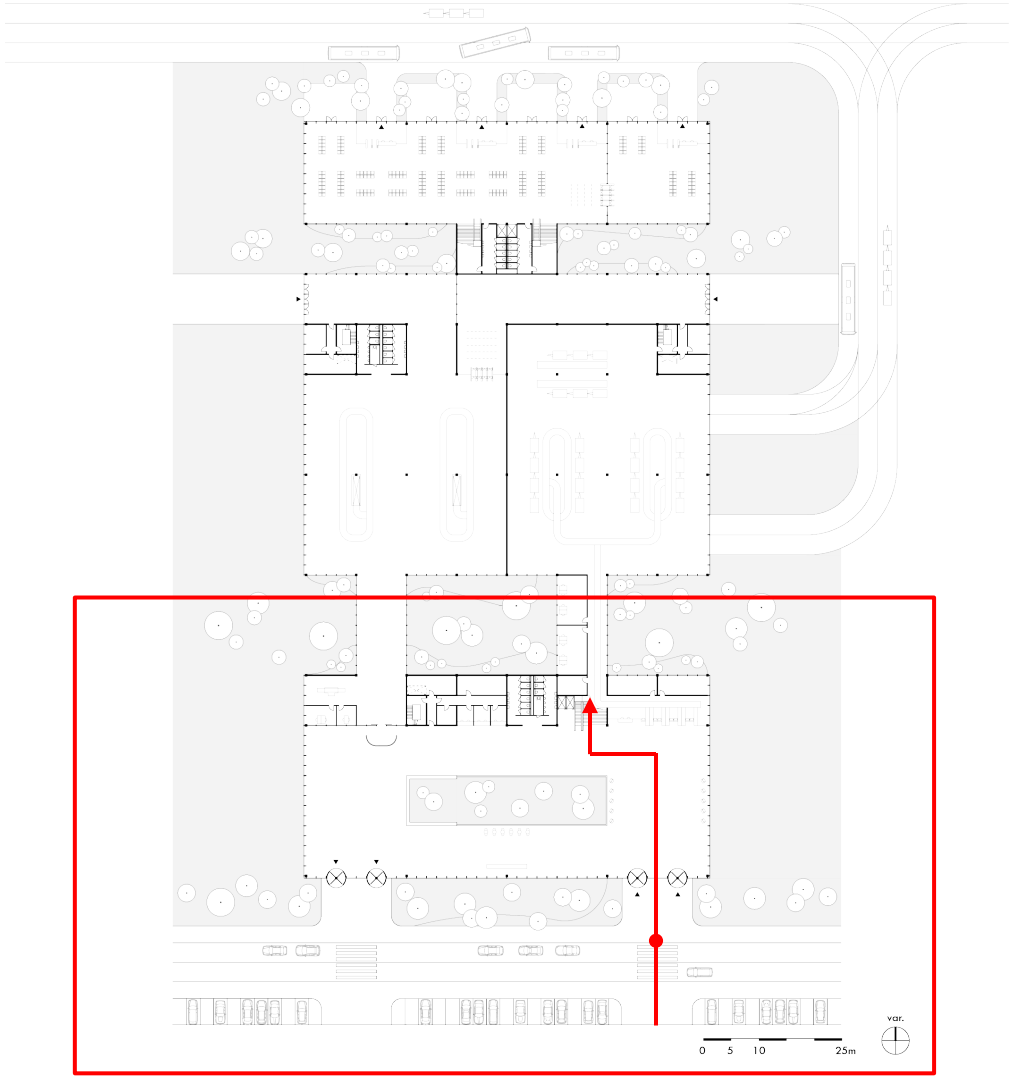
Through the eyes of a departing passenger



STEP 1: ARRIVING AT THE TERMINAL

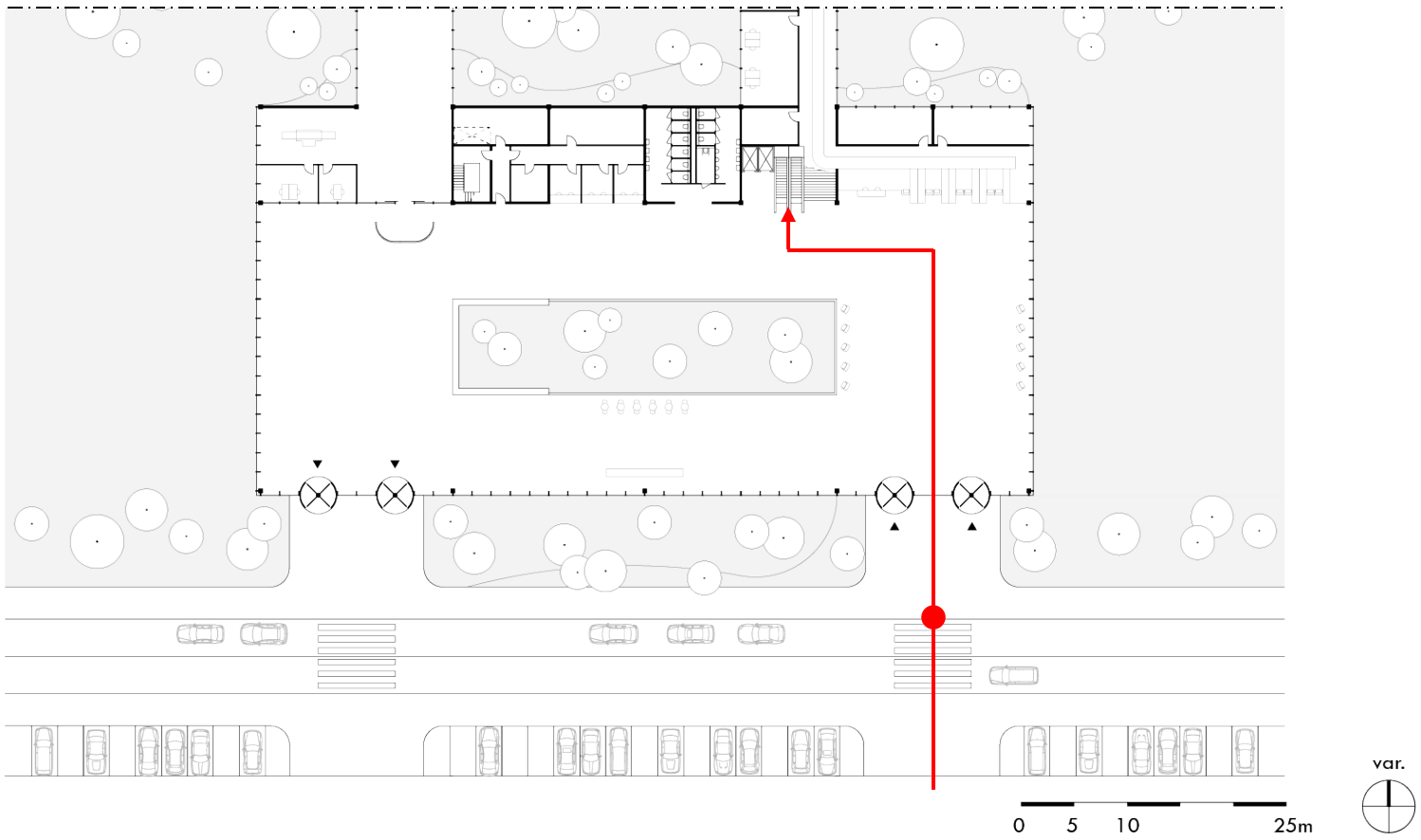


STEP 1: ARRIVING AT THE TERMINAL



STEP 1: ARRIVING AT THE TERMINAL

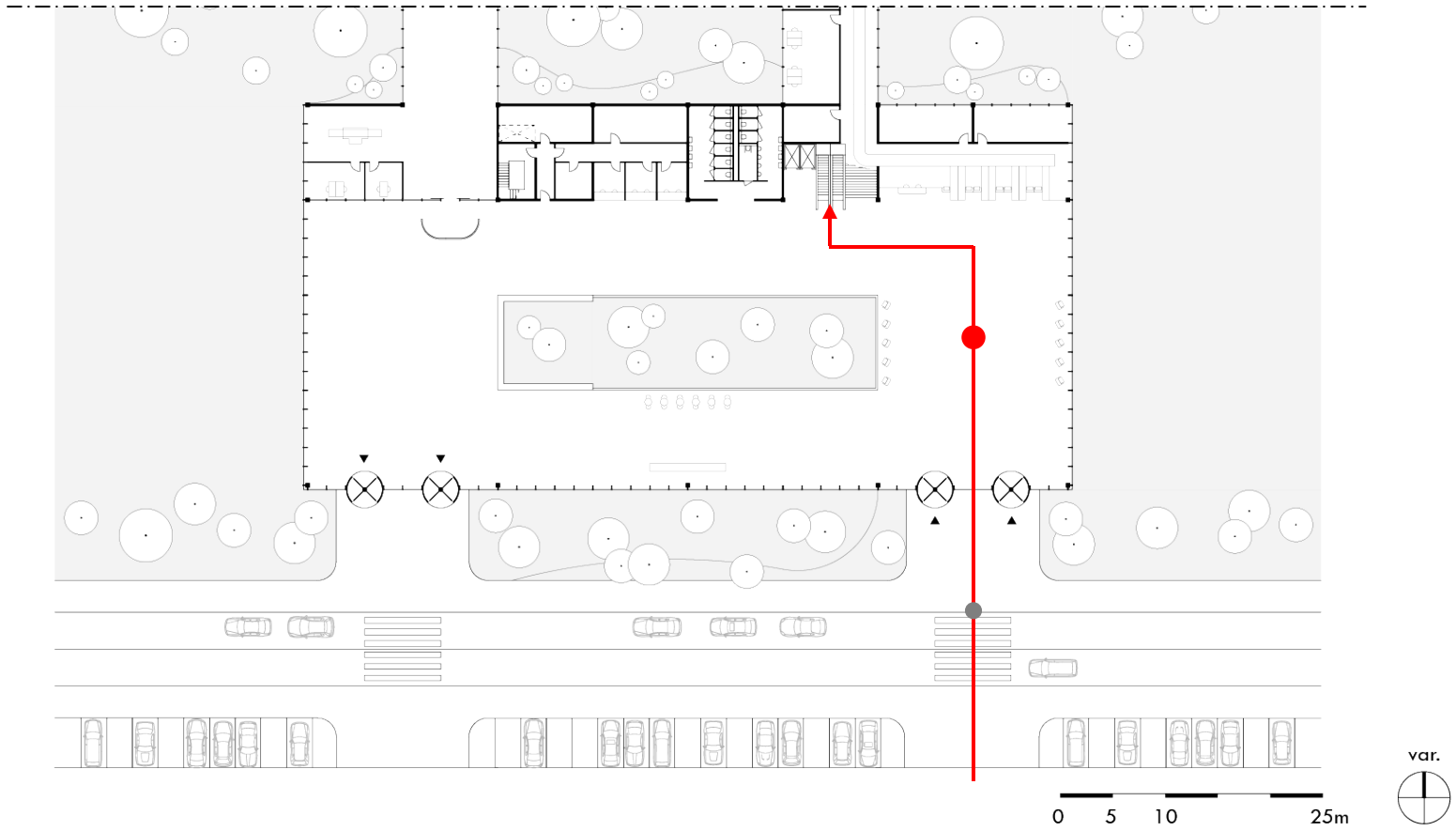
Ground floor




Departures ↓
Departures ↓

STEP 2: CHECK-IN & BAGGAGE DROP

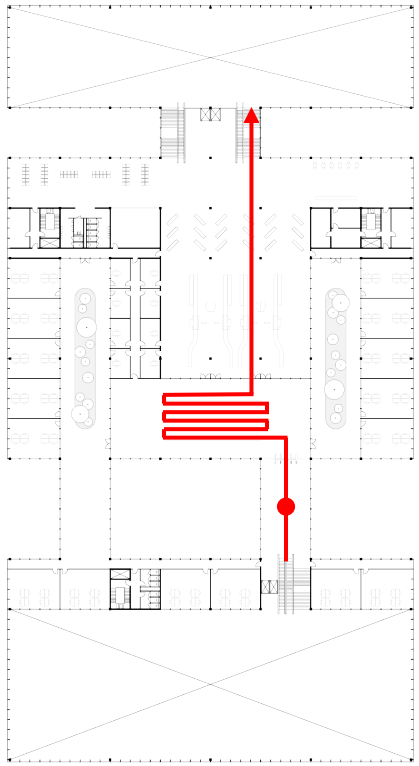
Ground floor

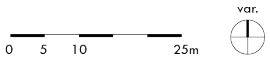



All departure gates
Check-in

INTERMEZZO: GREEN ZONE PASSAGE

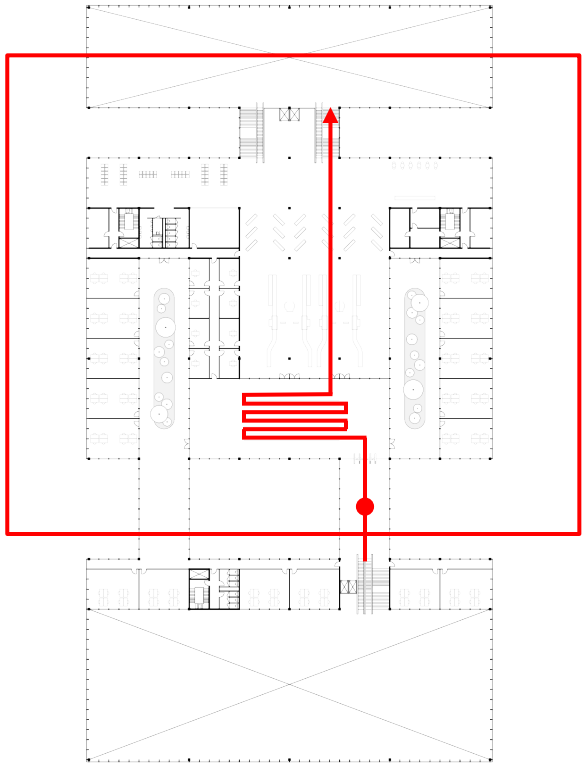
First floor

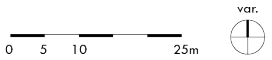




INTERMEZZO: GREEN ZONE PASSAGE

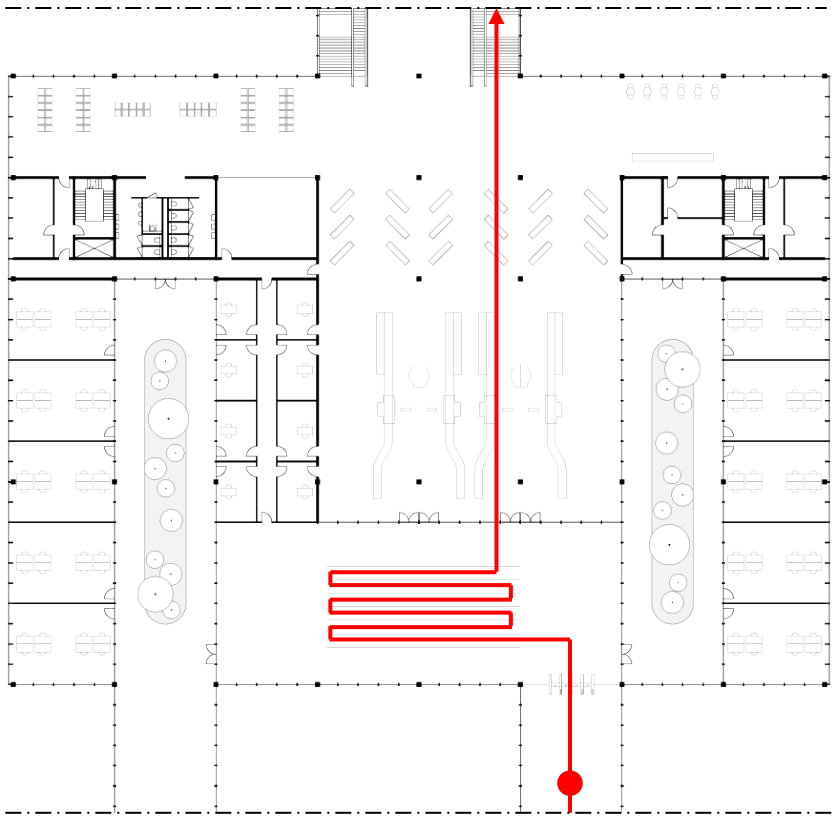
First floor

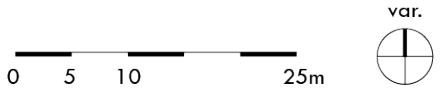




INTERMEZZO: GREEN ZONE PASSAGE

First floor



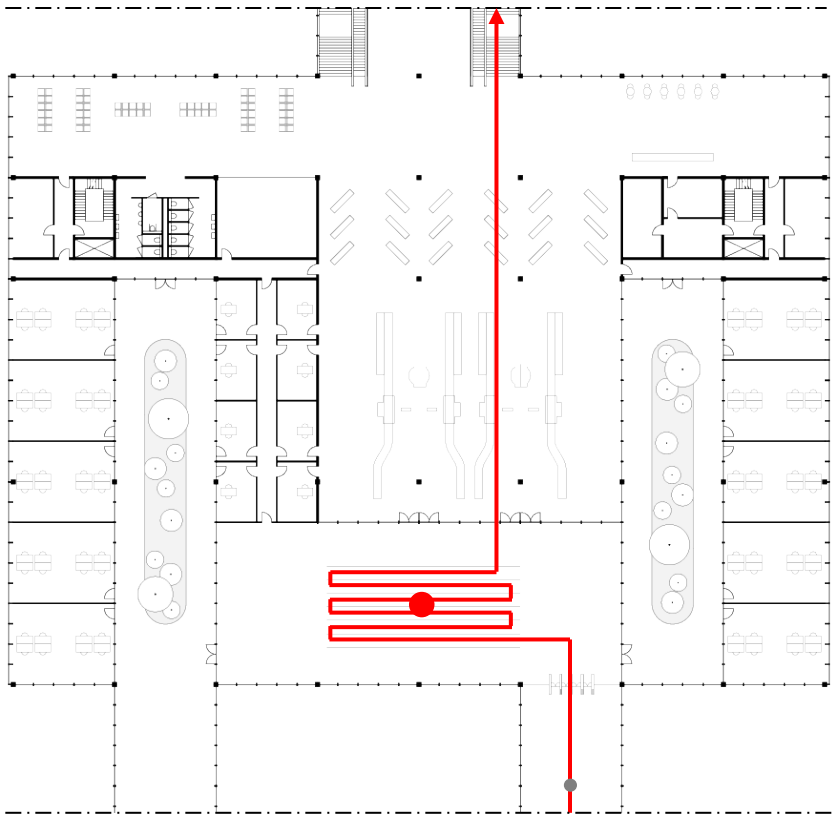


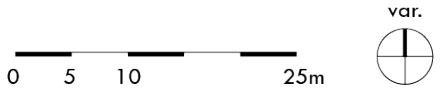

Security Check


Security Check

STEP 3: SECURITY CONTROL

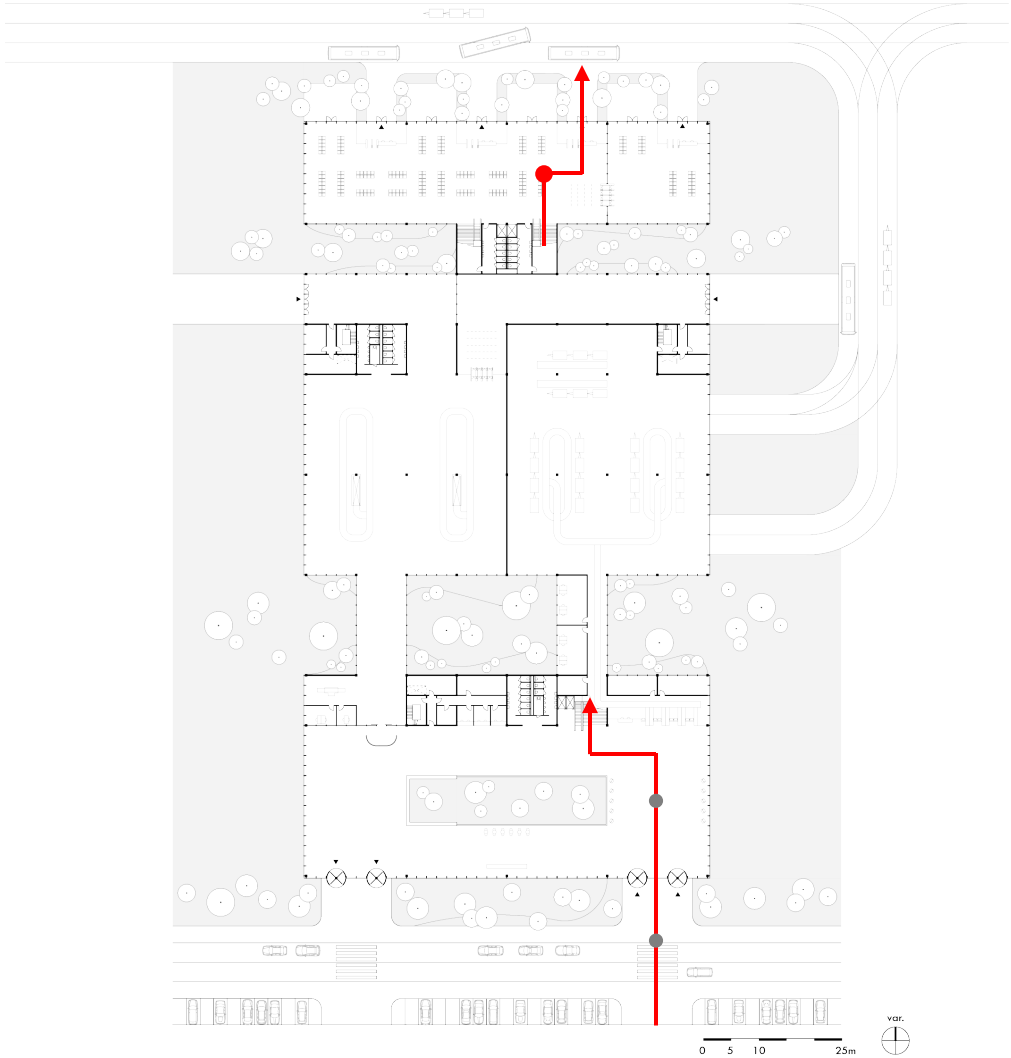
First floor



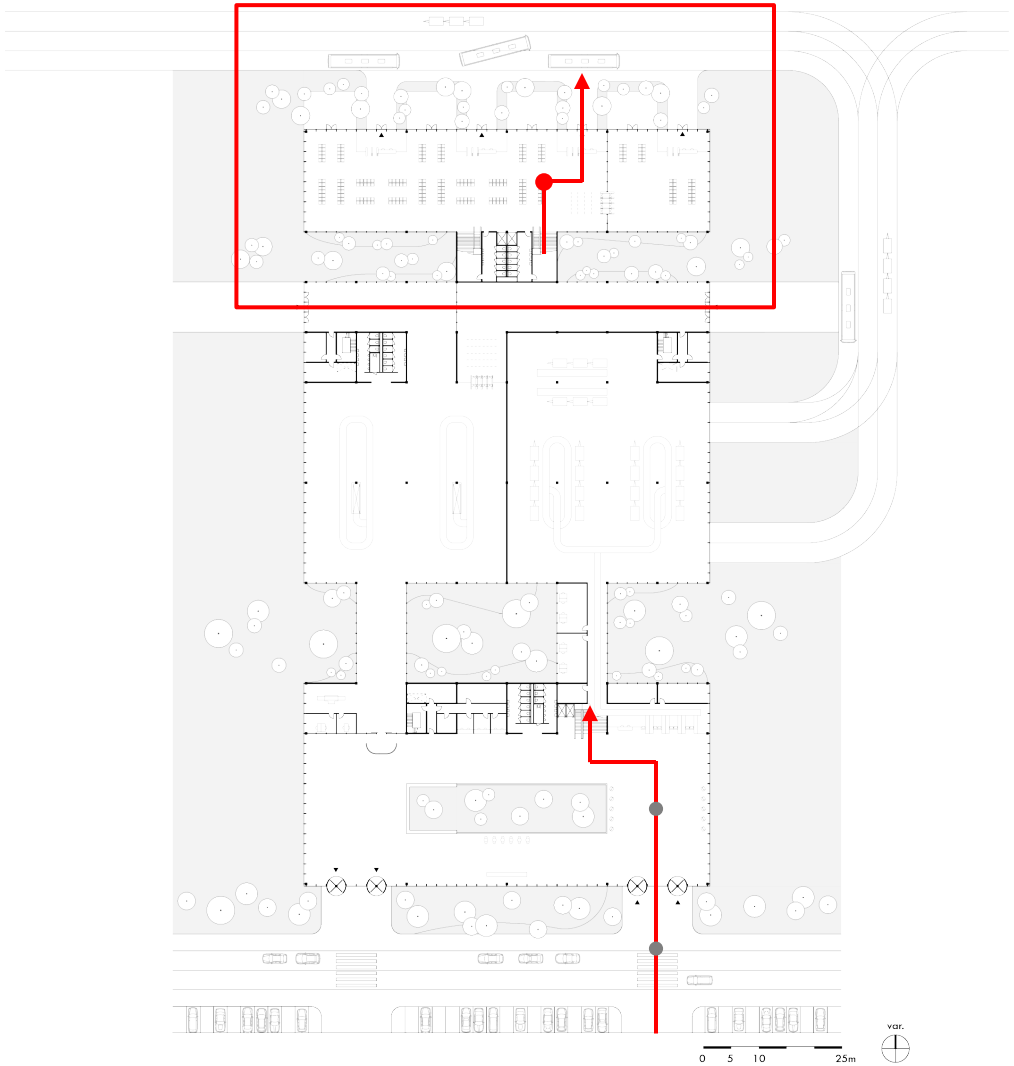



Security Check

STEP 4: HOLD ROOM & GATES

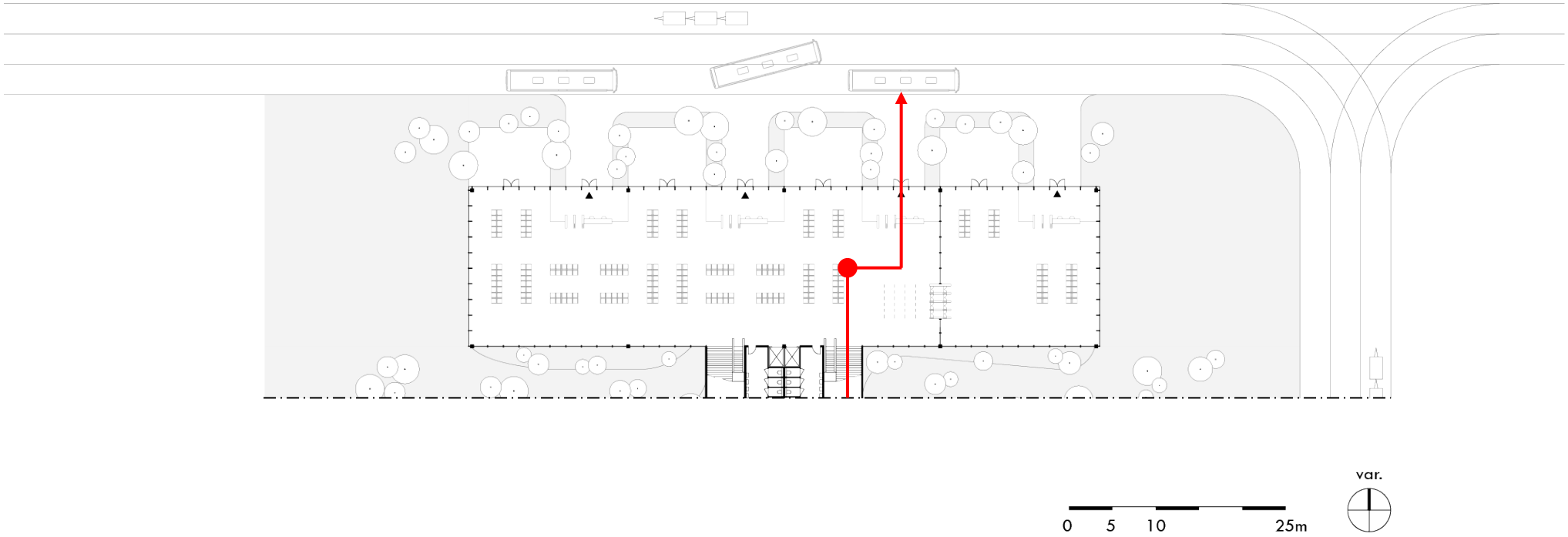


STEP 4: HOLD ROOM & GATES



STEP 4: HOLD ROOM & GATES

Ground floor

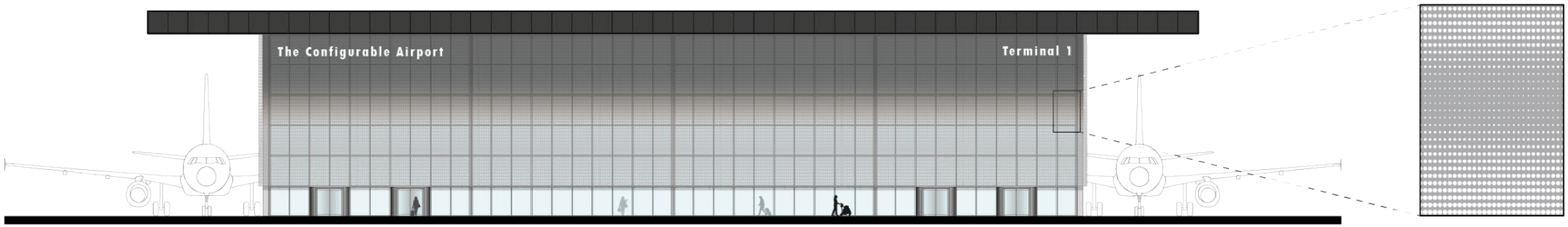



C7


All departure
gates
AIRFRANCE

ELEVATION

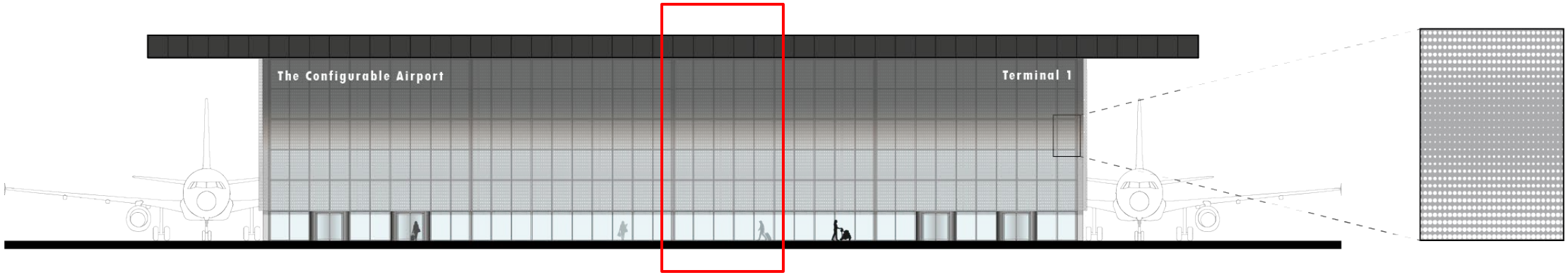
Modular and demountable



Front elevation (variable orientation)

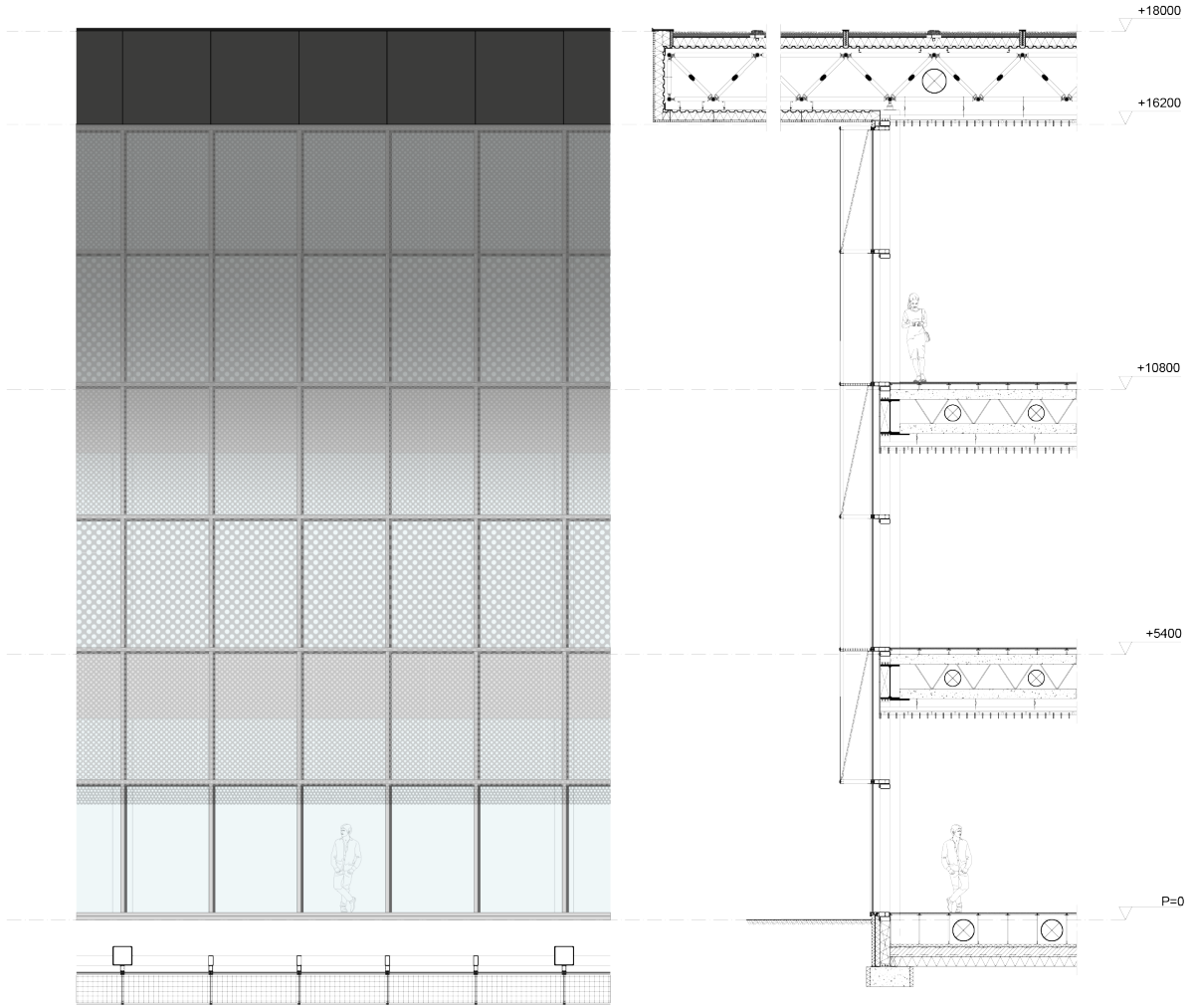
ELEVATION

Modular and demountable



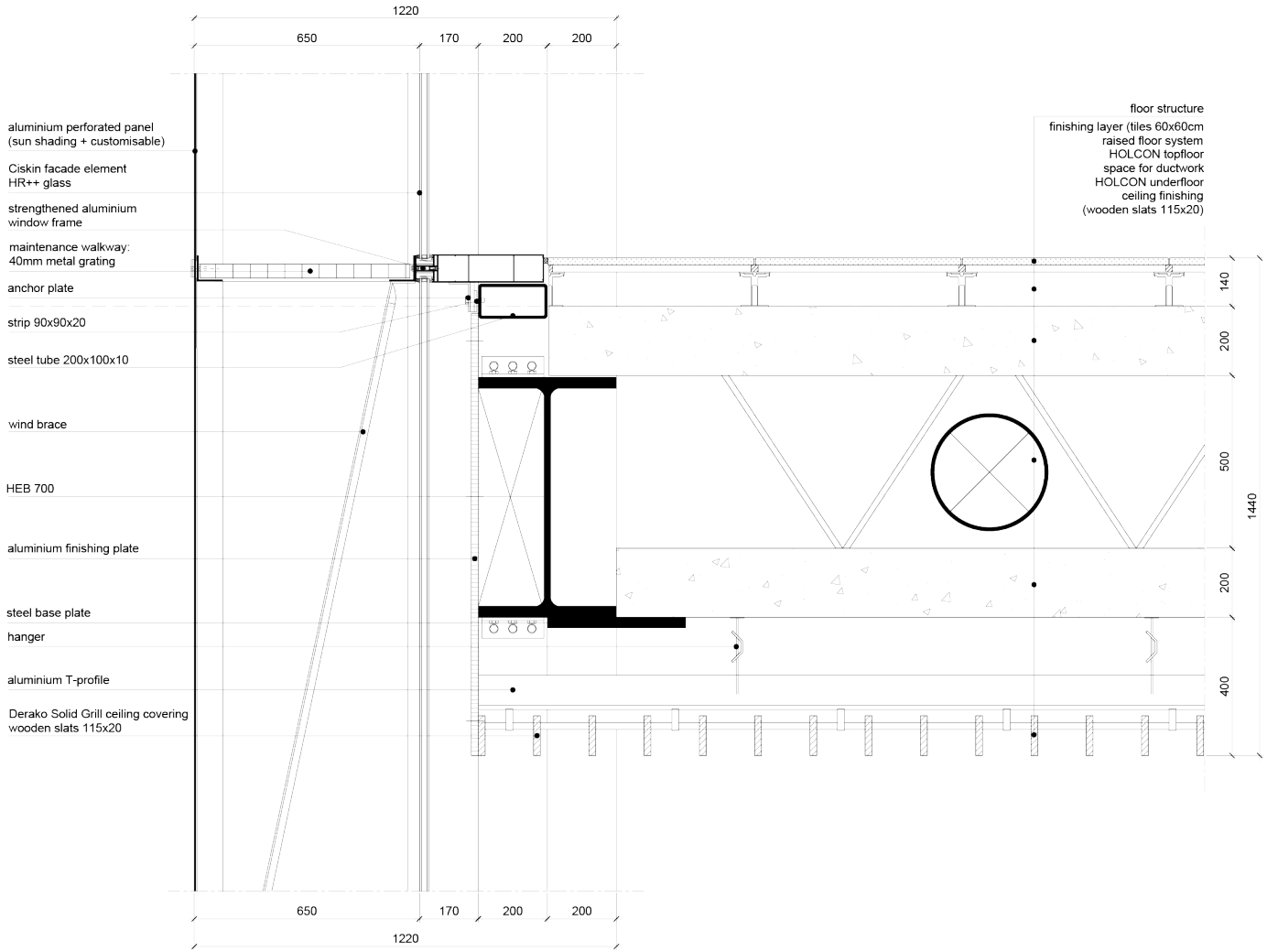
ELEVATION

Modular and demountable

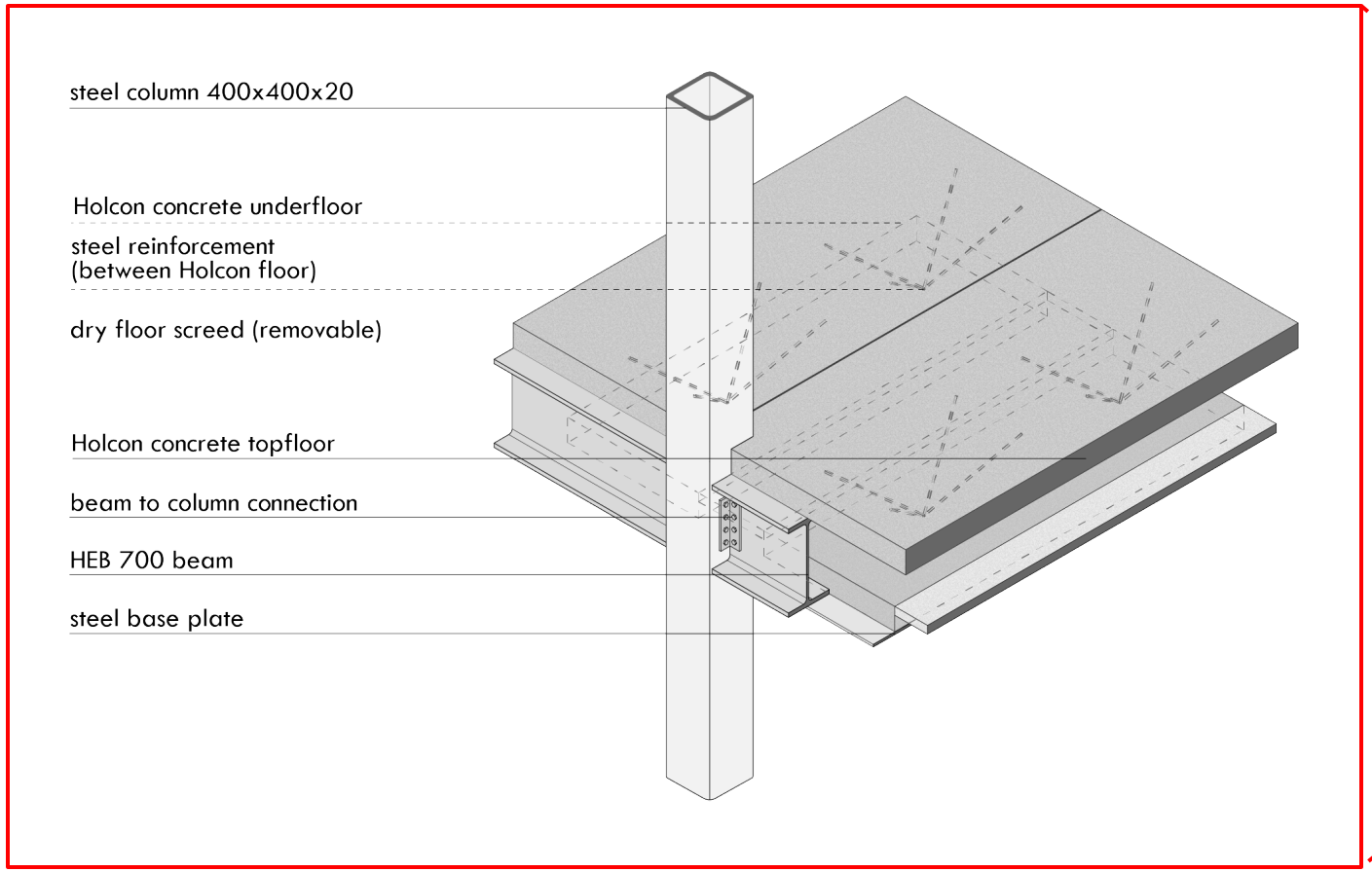


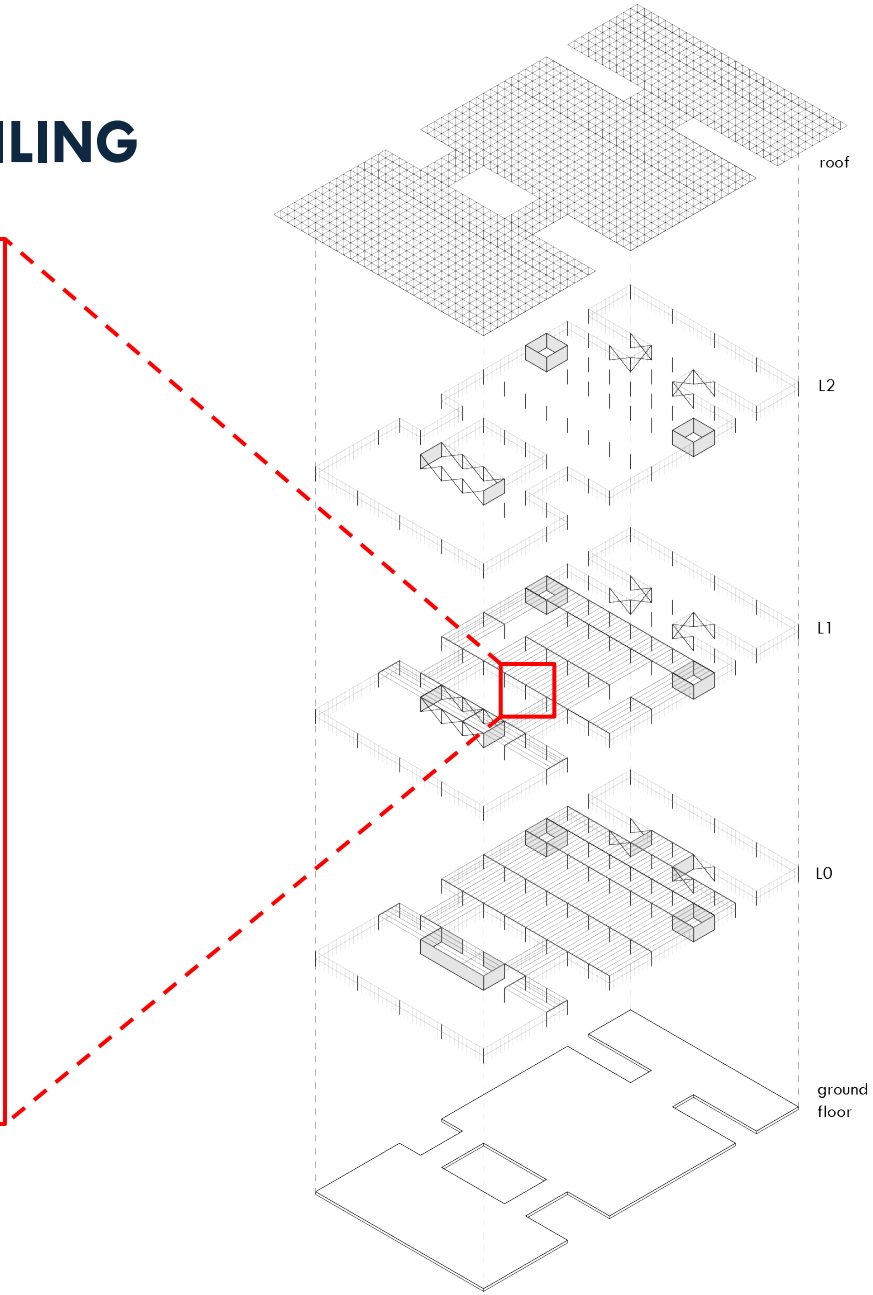
FACADE DETAIL

Demountable system

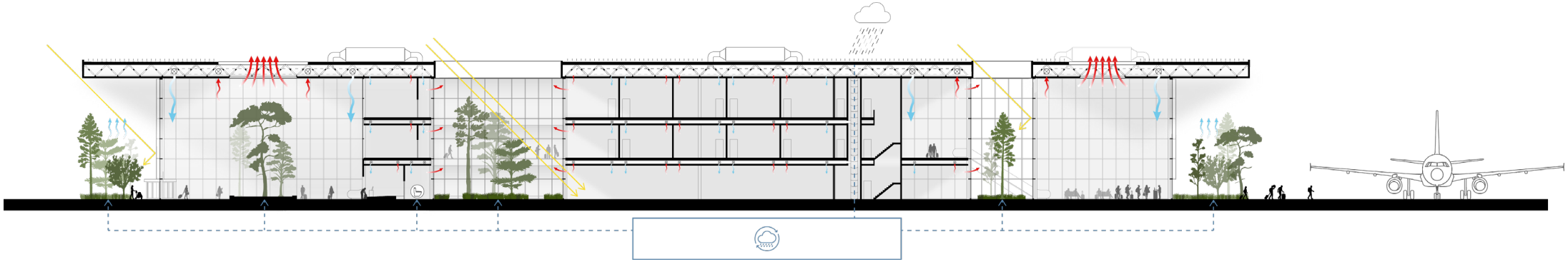


CONSTRUCTION DETAILING

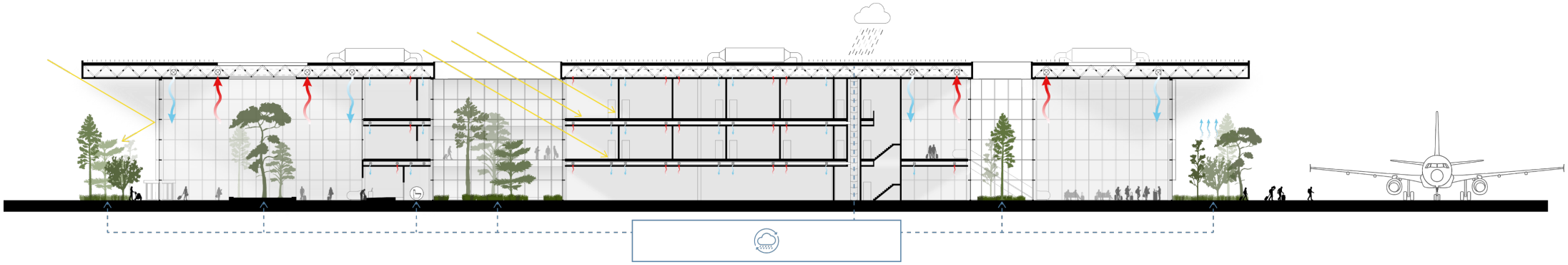




INDOOR CLIMATE



Summer

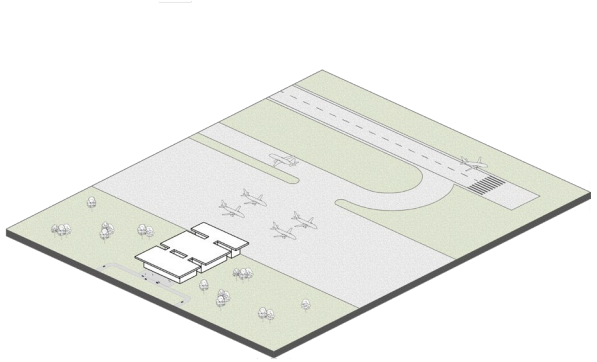
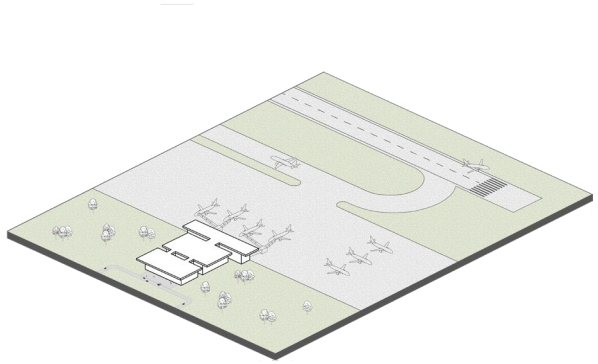
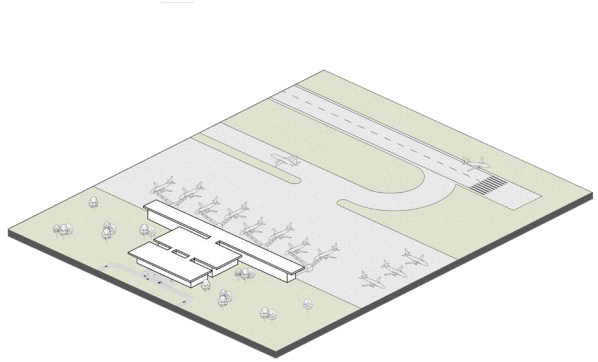
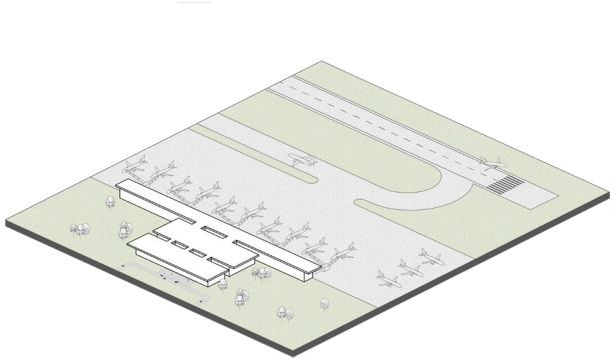
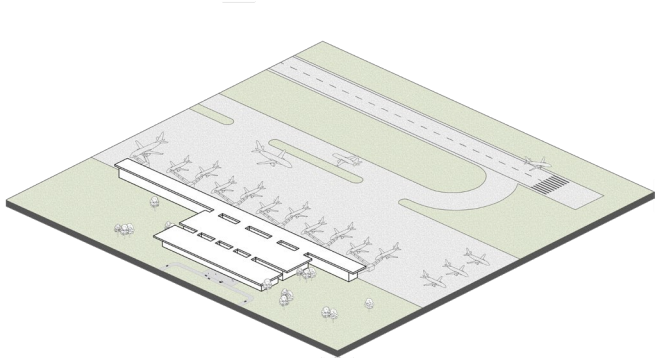
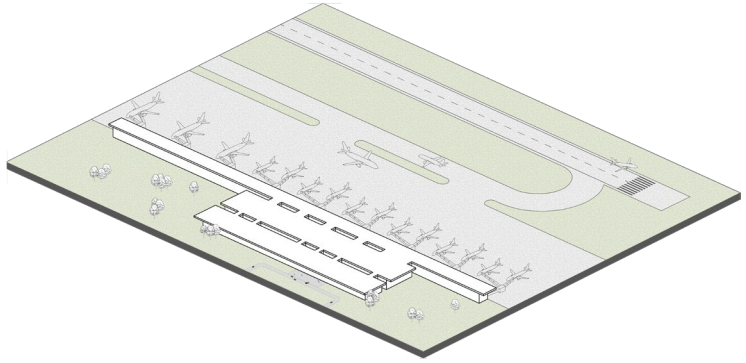


Winter

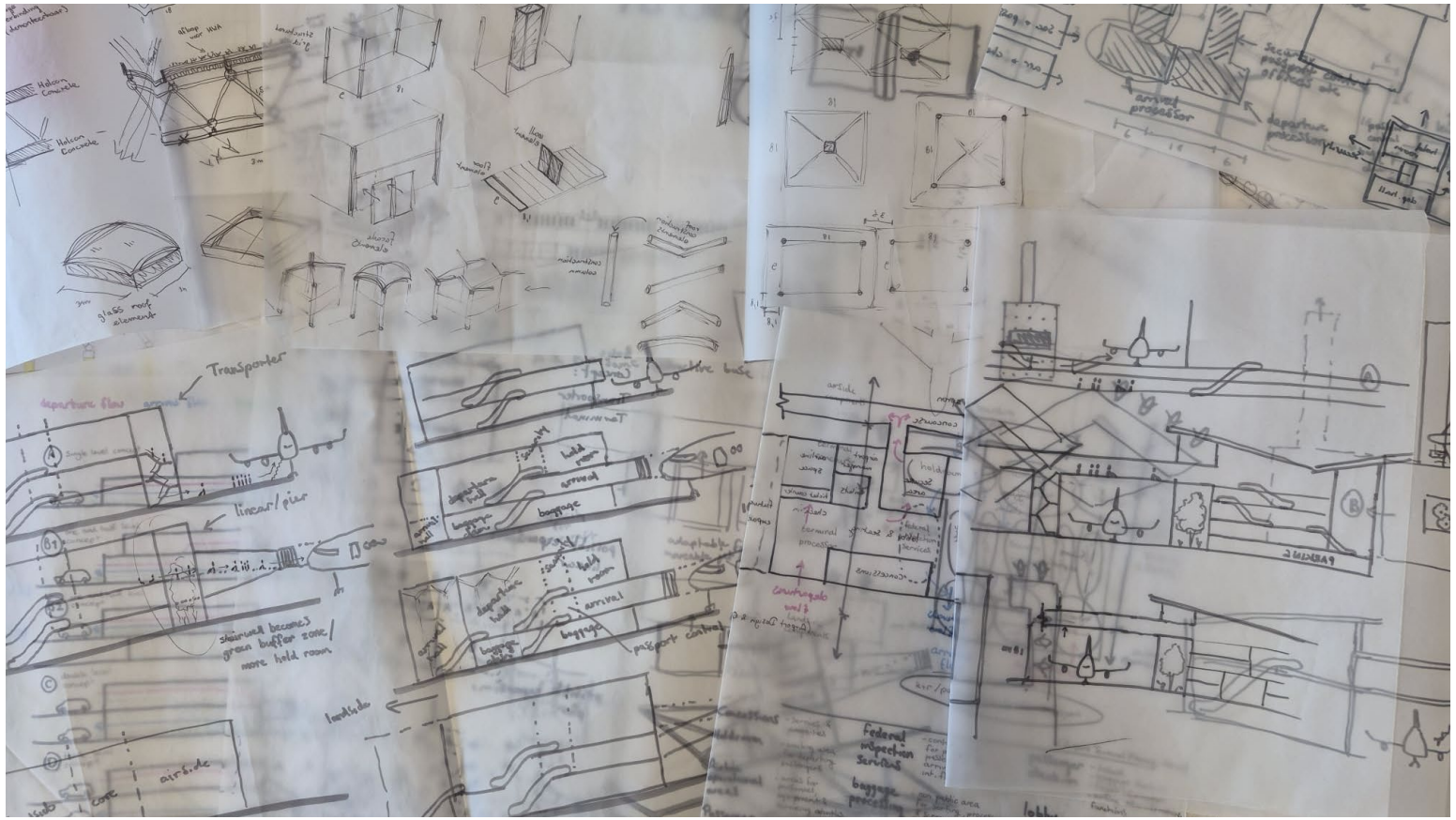
PART 7 – CONCLUSION & REFLECTION

CONCLUSION

How can an airport terminal be designed as an adaptable framework that can adjust to changing air travel conditions over time?

REFLECTION


Transporter
departure flow
linear/pier
departure hall
arrival
baggage
hold room
passport control
Federal inspection services
arrival processor
departure processing



THE CONFIGURABLE TERMINAL

A design framework for an adaptable airport terminal

A4 Assessment

Explore Lab
AR4EX310

Steef Suijs
5307023

24-06-2026