façade system

MSc4 Hybrid Buildings BT
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façade system

MSc4 Hybrid Buildings BT

- the design criteria
- the design concept
- development of the design
- simulation of the design
- implementation of the design
- reflection & feedback
Urban concept

Design criteria

Teleport as transport hub

a green "band aid"

the membrane

< Slow Traffic >

< Fast Traffic >

Intensify urban space

Concept

- Mixed program
- Multiple layers
- Optimized infrastructure
- Comfort & safety
Design criteria
Masterplan
Design criteria

Building outlines
Design criteria

General requirements

**OUTSIDE**
- location specific conditions
- solar radiation
- temperature
- humidity
- precipitation
- wind
- sources of noise in surroundings
- amount of gas and dust
- mechanical loads
- electromagnetic radiation
- urban/formative surroundings
- local resources
- socio-cultural context

**FACADE**
- severe fluctuations in external climate
- minimal fluctuations

**INSIDE**
- requirements
- comfortable temperature range
- comfortable humidity range
- amount and quality of light
- fresh air supply at comfortable air velocity
- comfortable sound level
- visual relationship with exterior
- demarcation between private and public
- protection against mechanical damage
- fire protection if necessary
- limitation of toxic loads
Design concept
Pattern & Lighting

- privacy vs interaction
- light vs sun shading
- expression
- integration
Design concept
Pattern system
Design concept
Facade pattern

900 x 900 x 4mm PC

- min cover 20%
- max cover 95%
- black -> silver

Polycarbonate (PC)
- highly transparent
- lightweight (1200kg/m3)
- temperature resistance
- impact resistance
- thermoplastic (recyclable)

(not to scale)
Design concept
Horizontal movement

0 - 5mm
Design concept

Vertical movement

IN

OUT

5mm

OUT

IN
Design development
Skew panel

side panel with molded layer hinges
Design development
Skew & slide mechanism
Skew & slide mechanism

Design development

skew mechanism: panel hinge & electro magnets
Design development
Skew & slide mechanism

Slide mechanism: layer hinge & electro magnets
Facade profiles

Design development
Design development
Mood lighting
Design development

Daylighting
Ventilation

Design development
Design development

Ventilation

OUT

IN

OUT

IN

no ventilation
Design development

Ventilation

indirect ventilation
Design development

Ventilation

IN

OUT

direct ventilation
Design development
Ventilation

- Direct ventilation
- Indirect ventilation
- No ventilation
Ventilation Design development
Design development
Ventilation
Design development

Ventilation

section west - east

section north - south
Design development

Rotate mechanism

Electro magnets

to slide B-layers
5mm vertical

electro magnets

to slide A-layers
5mm horizontal

Panel hinch layer hinch panel axis rotation mechanism

Rubber with gel filling

Electro magnets
to slide A-layers
5mm horizontal

Electro magnets
to slide B-layers
5mm vertical

IN

OUT
Design development
Rotate mechanism
Design development
Construction

Original

Optimized

OUT

IN
Design development

Heat

- high thermic resistance via PC and multiple cavities
- pre heating air intake
- additional cooling / heating via low temperature surface heating in floor

note: due to fire facade system is not tested in BP lab.
Design development

Sound
Sound Design development

OUT

IN

OUT

external sound sources

sound reflection

IN
Design development
Sealing & Insulation

OUT

IN

OUT

IN
Aim prototype

Focus of simulation:
- effect of pattern
- effect of mechanism
- detailing of mechanism

note: mood lighting is not simulated in prototype
Adjustments:
- steel facade profiles
- reduced panel size
- 1 rotating panel
- spray paint pattern
Design simulation

Adjustments:
- metal piano hinches
- no sealing / insulation
- slide rails
- regular magnets
Design simulation
Result prototype

Max transparency

Less transparency
Design simulation
Result prototype
Design simulation
Result prototype
Design implementation
Indoor spaces

View outside (with previous construction system)
Design implementation
Adaption facade
Design implementation
Adaption facade

Upper floors
Design implementation
Adaption facade

kindergarten?

interact

adaption facade

invite

pedestrian zone

invite
terrace
Reflection & Feedback

Facade panel

Improvements:
- decrease cavity width
  -> improve sight
- rotate pattern 90'
  -> improve sight
- panel hinge over full height
Reflection & Feedback

Facade fragment

Development:
- Facade pattern
- Mood lighting
- Connection facade to indoor spaces

placement indoor walls
Reflection & Feedback

Building scale

Development:
- Ground floor: glass
- Lower levels: profiles only
- Entire facade: mood lighting
- Water drainage
- Positioning core
- Building installations