

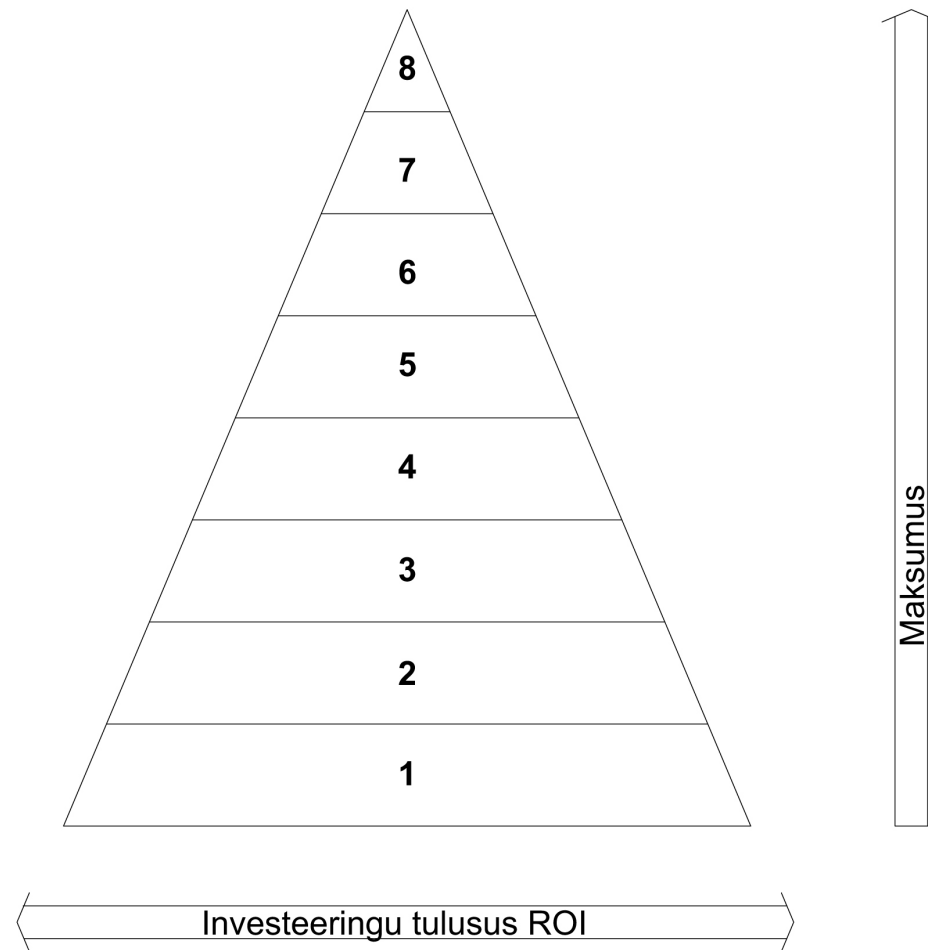
**ENERGIATÕHUSUSE JUHENDMATERJAL JA METOODIKA
PEAPROJEKTEERIJATELE JA ARHITEKTIDELE**

VILLA SAVOYE



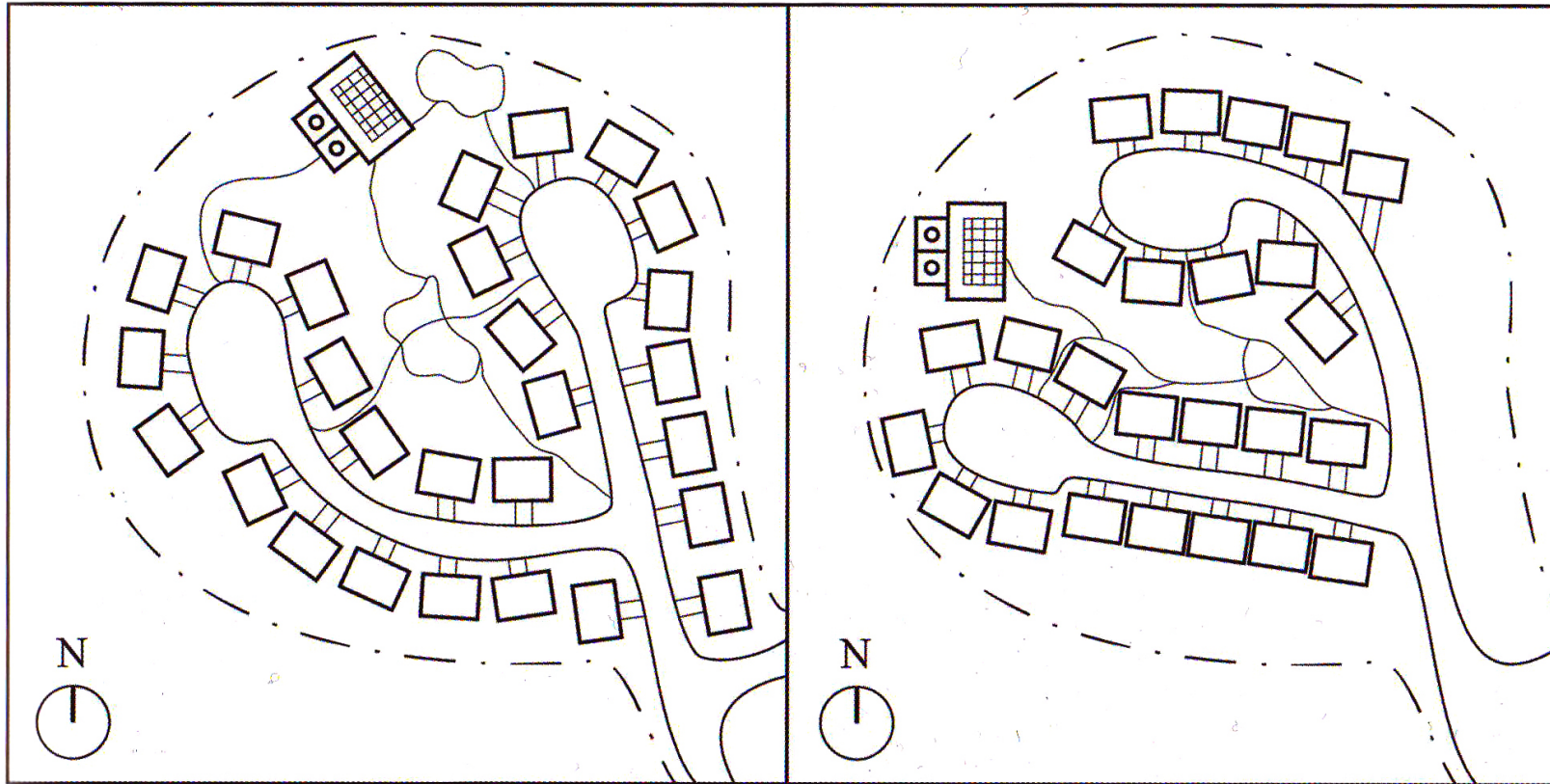


- 8 Lokaalne taastuenergia**
päikesepaneelid ja -kollektorid
- 7 Energiavarustus**
kaugküte, soojuspumbad, vabajahutus
- 6 Efektiivsed tehnosüsteemid**
vent, küte, jahutus, valgustus, juhtimine
- 5 Fassaadide kujundamine**
soojapidavus, valgusläbivus ja varjestus
- 4 Resilientsus,**
Kohanemisvõimelised ruumilahendused
- 3 Arhitektuurne maht ja vorm**
Energiasäästlik tüpoloogia
- 2 Tark asend**
asend, orientatsioon, tänavatevõrk
- 1 Linnaplaneeringuline lahendus**
Asukoht, linnakeskkond



Energiatõhususe kavanamise püramiid meenutab hoone ehitamist: ilma vundamenti tegemata ei saa järgmise korruse kallale asuda. Nii on ka energiatõhususe valikutega, mis on otstarbekas teha loogilises järjekorras.

LINNAPLANEERINGGULISED TEEMAD

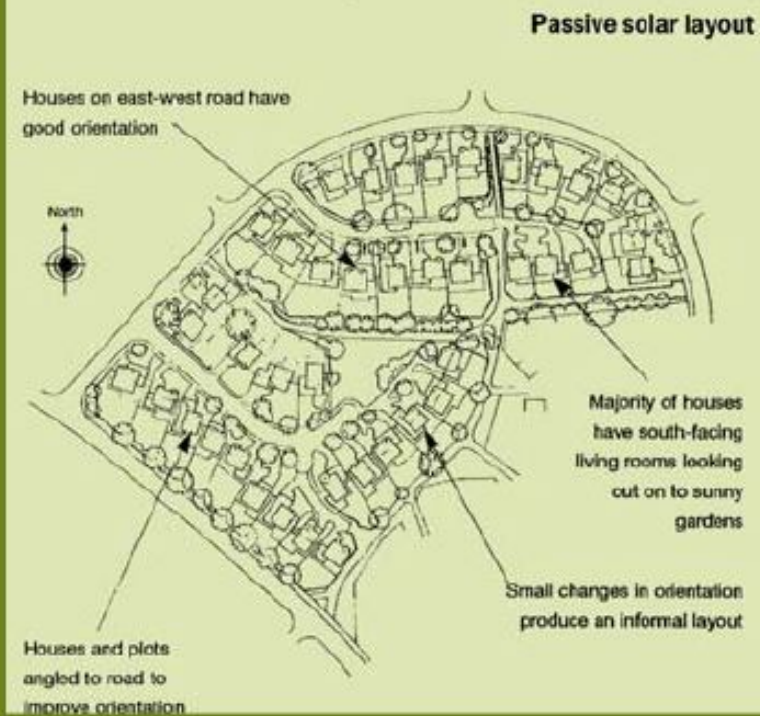
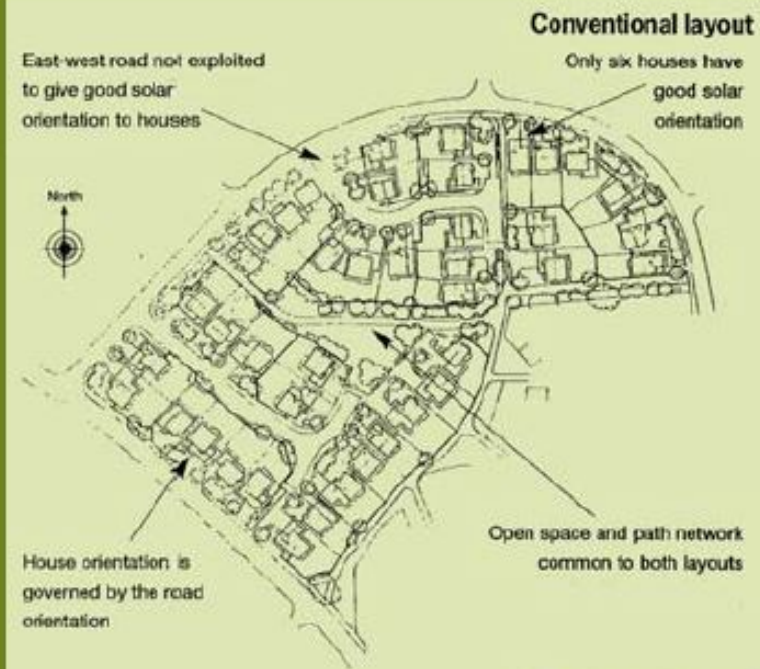


Original Plan - A

Alternative Plan - B

Figure 3.4.8 Site plan illustrating variations in housing layout. Layout B has very good solar orientation – north/south – for all buildings.

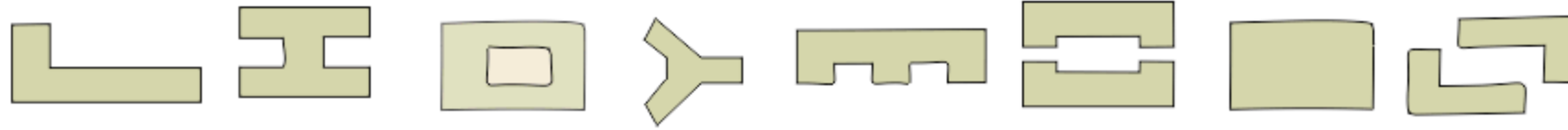
(Source: US Department of Energy.)



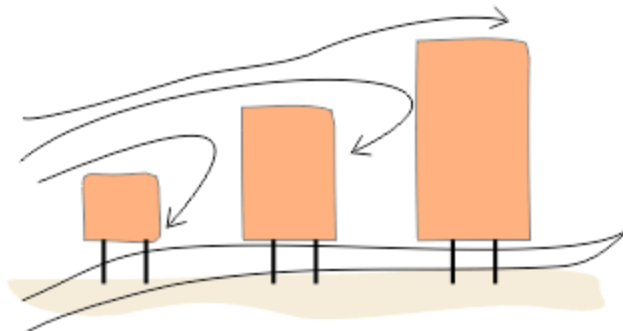
Building layout

In the conventional layout (top) only six of the houses have good solar orientation. Realigning the roads enables two-thirds of the homes to face within 30° of due south and only four face due east or west

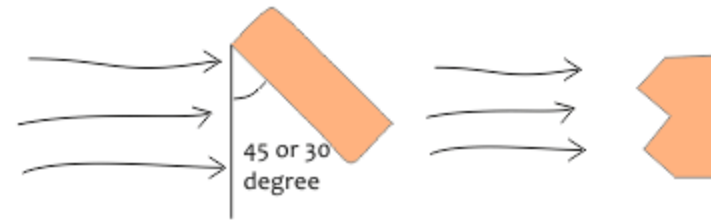
Source: BTP Architects for Lovell Homes



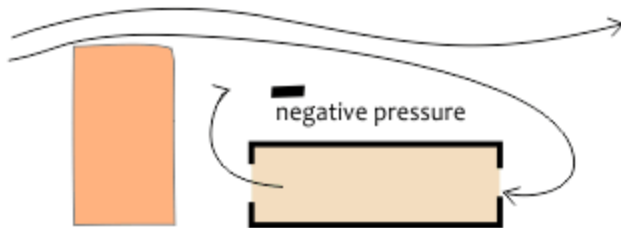
Orient longer facades along the north. This will provide glare free light in summer from north without shading and winter sun penetration from the south.



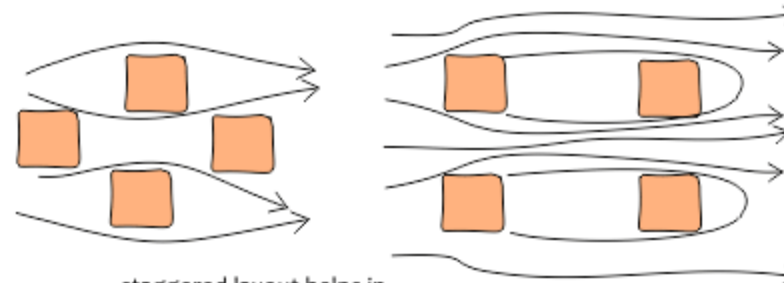
if a site has multiple buildings, they should be arranged in ascending order of their heights and be built on stilts to allow ventilation



Place buildings at a 30 or 45 degree angle to the direction of wind for enhanced ventilation. Form can be staggered in the wind facing direction also to achieve the same result.

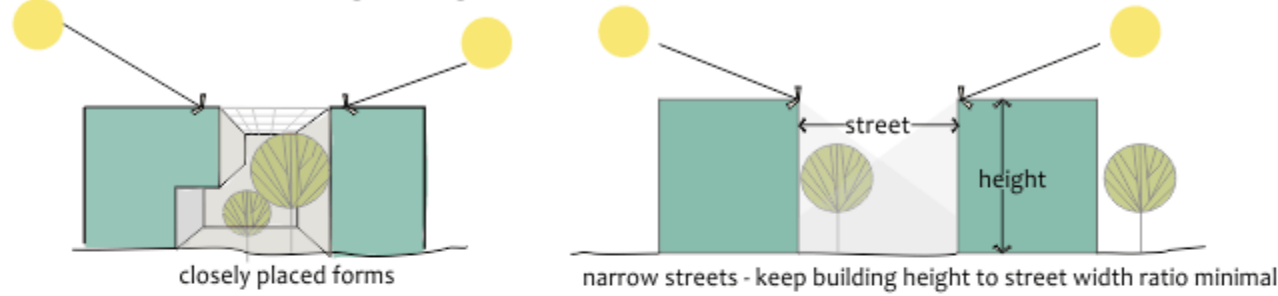


Taller forms in the wind direction of prevailing wind can alter the wind movement pattern for low lying buildings behind them

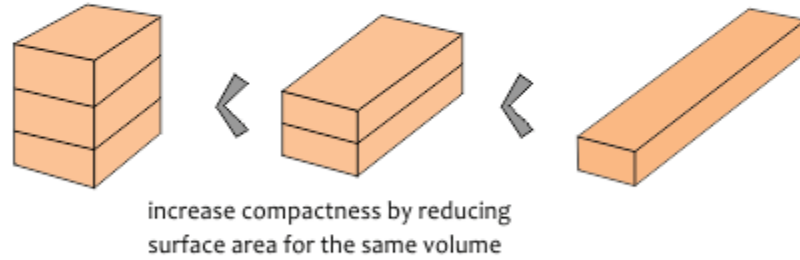


staggered layout helps in accentuating wind movement

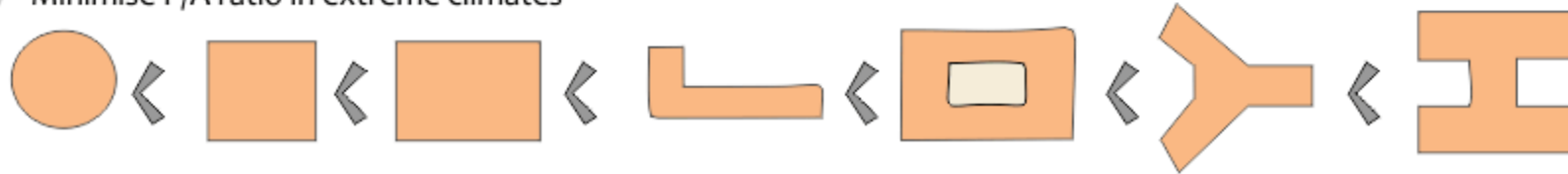
1 Maximise mutual shading through built forms



2 Minimise S/V ratio in extreme climates



3 Minimise P/A ratio in extreme climates

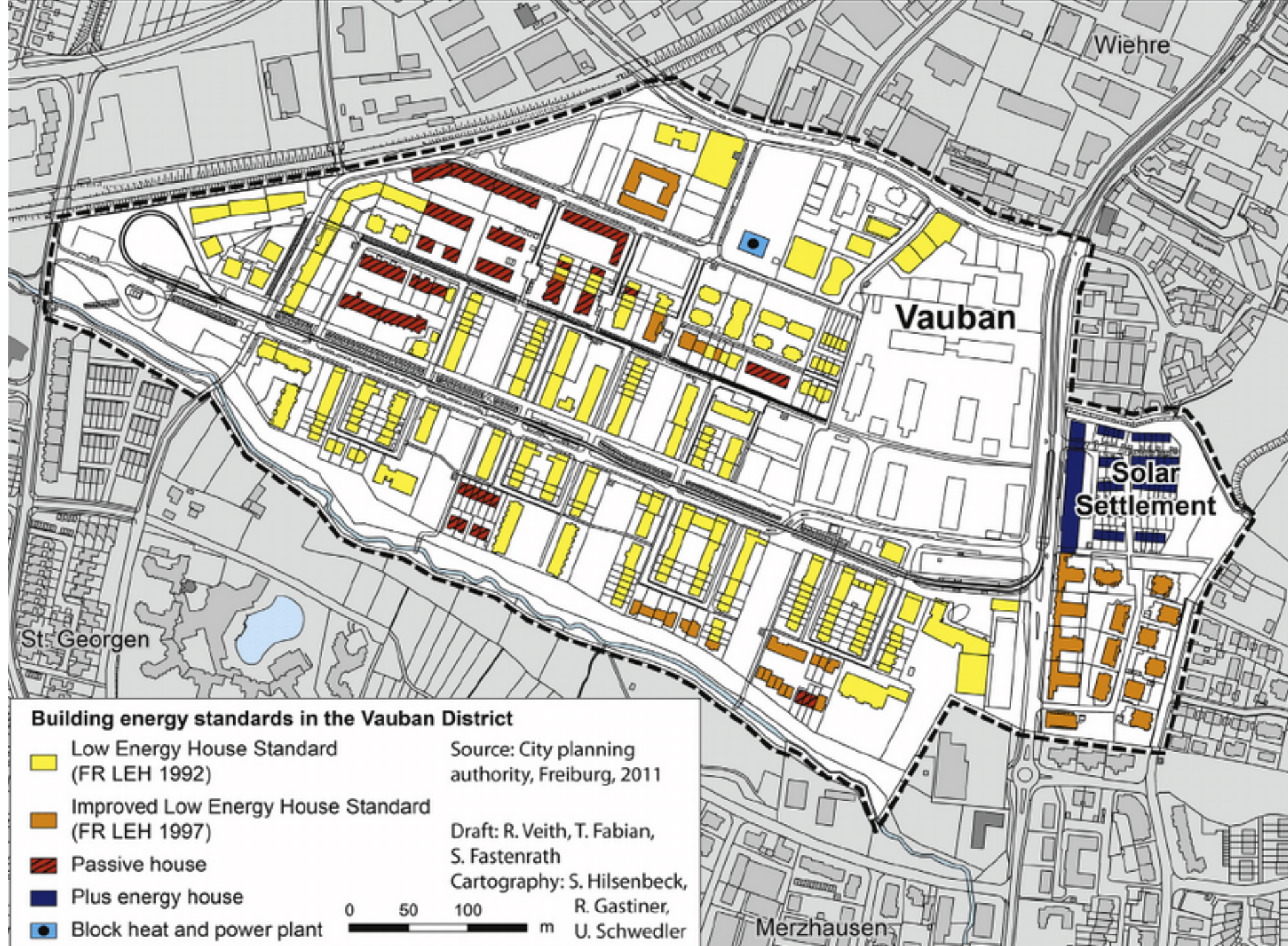


Freiburg



Layout: S. Fastenrath
Cartography: R. Spohner
Source: OpenStreetMap 08-2016 (changed)







Eisenbahner Sportverein
Freiburg eV

Z-LASER Optoelektronik

5 Senses Coffee

Vauban Ferienwohnung

Vauban

Evang. Kindertagesstätte
Immergrün

Restaurant Süden

Alfred-Döblin-Platz

Limette Eis-Cafe

Paula-Modersohn-Platz

Karoline-Kaspar-Schule

REWE

Aldi Süd

Hausarztpraxis
am Schlierberg

Heliotrop

Alnatura Super
Natur Markt

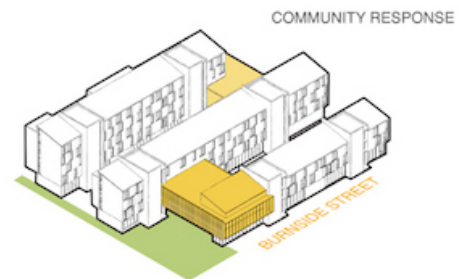
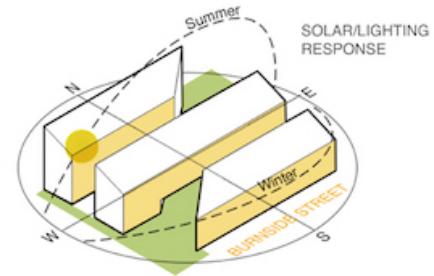
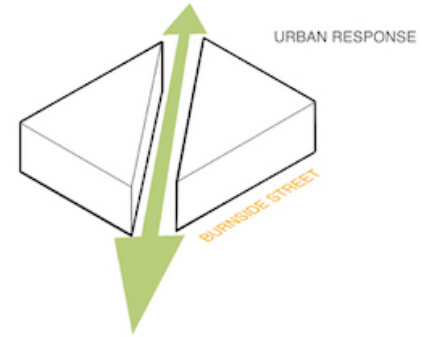
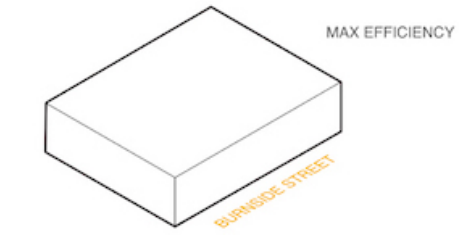
Freiburg Vauban Mitte

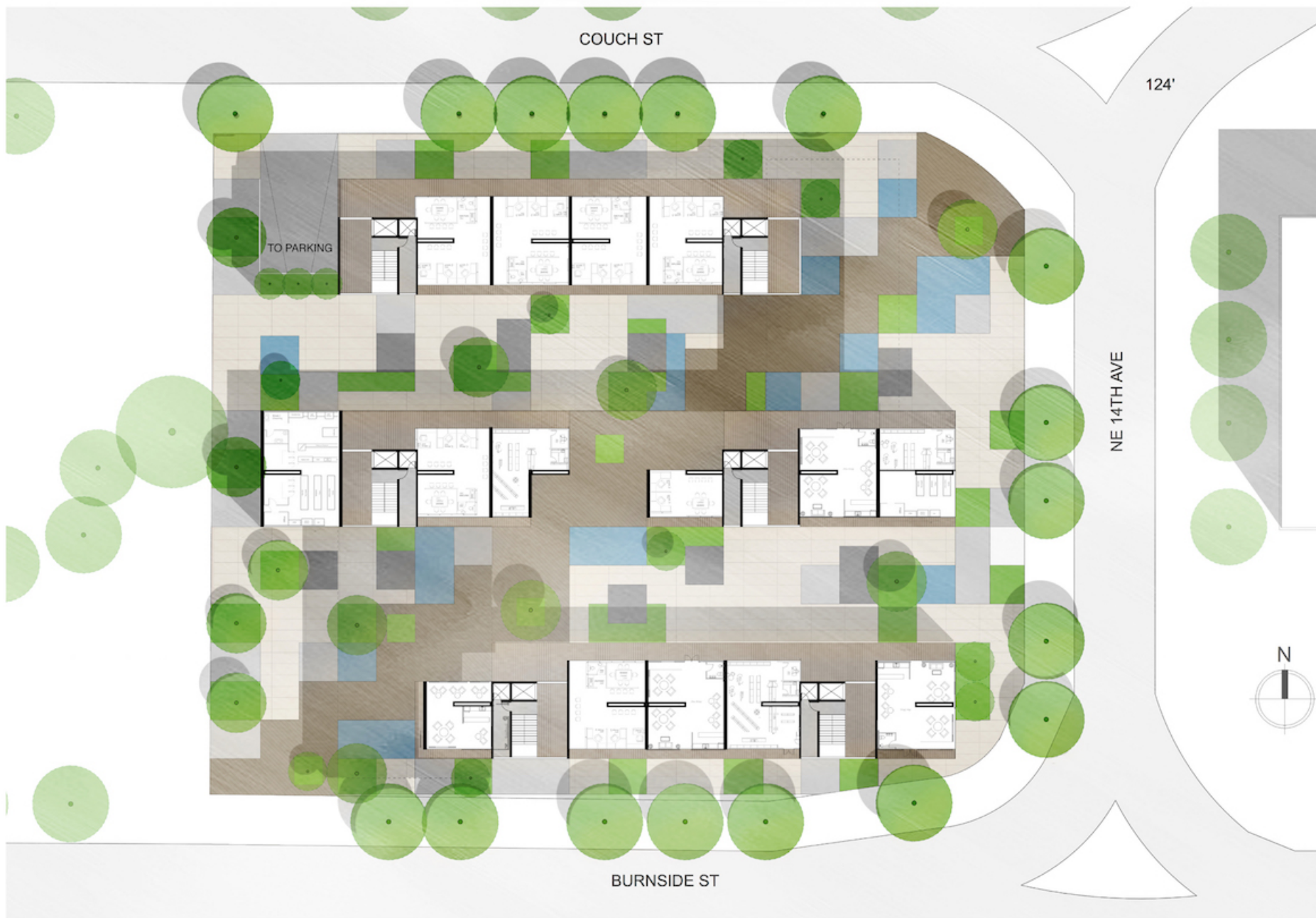
Augustinum Freiburg

Google

SITE STRATEGIES

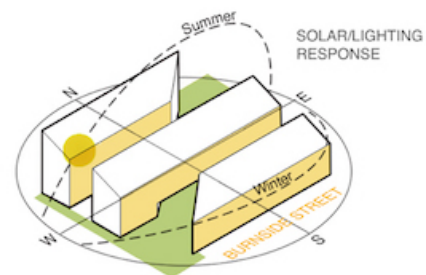
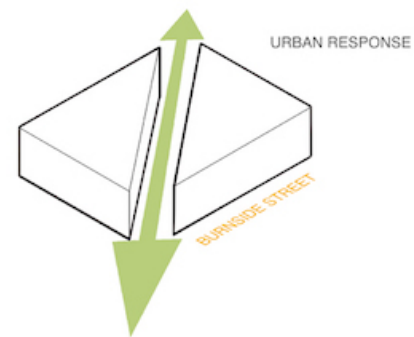
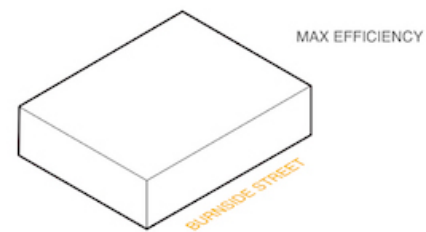
TARK ASEND





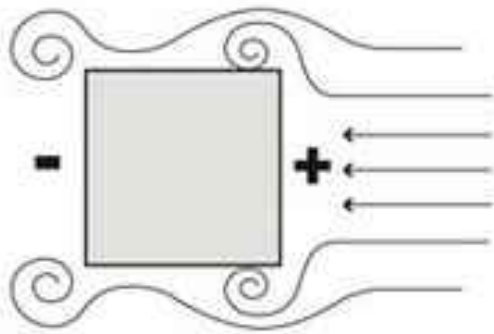
SITE PLAN

SITE STRATEGIES



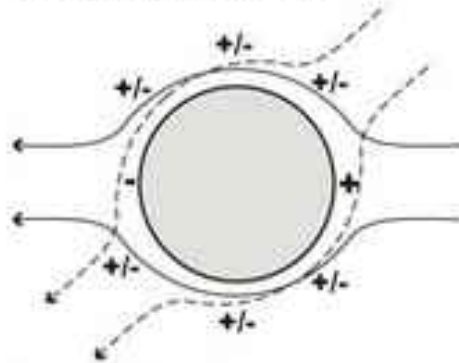
SOURCE: 3 GREEN BARS

TARK ASEND-BIOKLIMAATILINE ANALÜÜS JA MUDELDUS



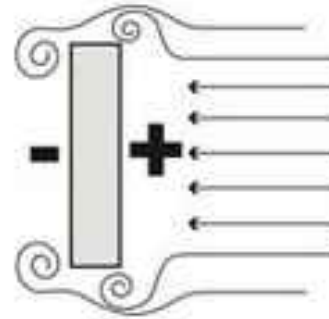
Positive pressure on windward side
Negative pressure on leeward side

AERODYNAMIC EFFICIENCY



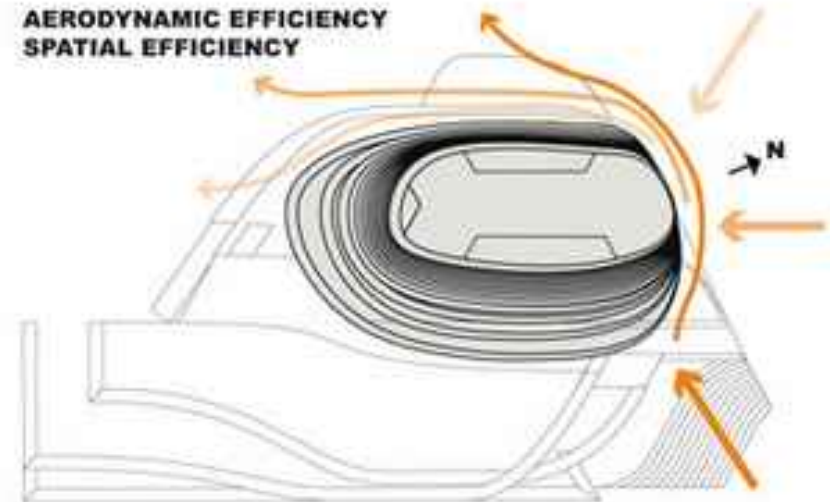
Even distribution of wind pressure.
Good in all wind directions.
Spatially inefficient for office layout.
Poor daylighting.

SPATIAL EFFICIENCY



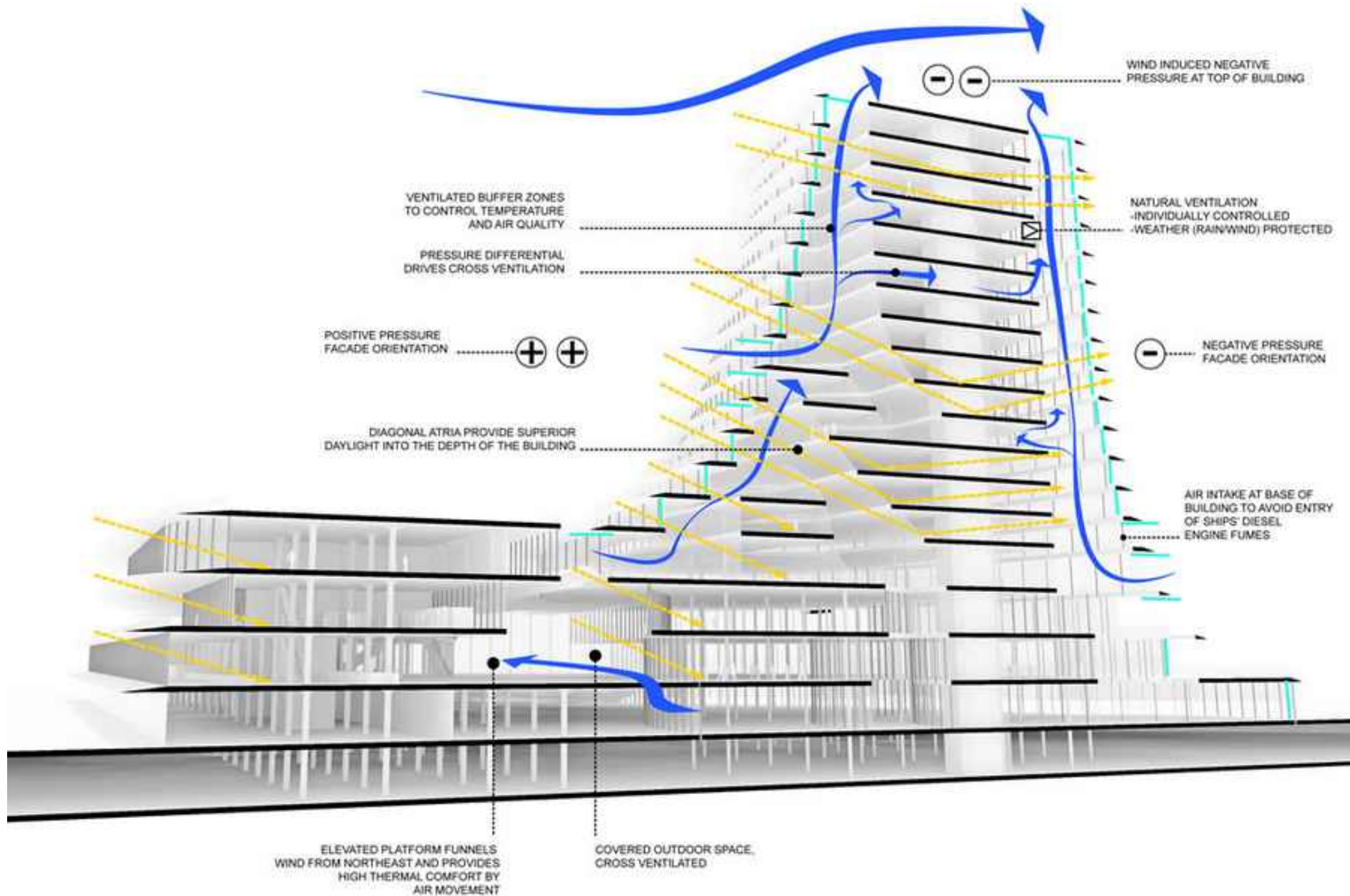
High Positive pressure on windward side
High Negative pressure on leeward side
Spatially efficient for office layout
Good daylighting

AERODYNAMIC EFFICIENCY
SPATIAL EFFICIENCY



Even distribution of wind pressure. Good in all wind directions
Spatially efficient for office layout and good daylighting.

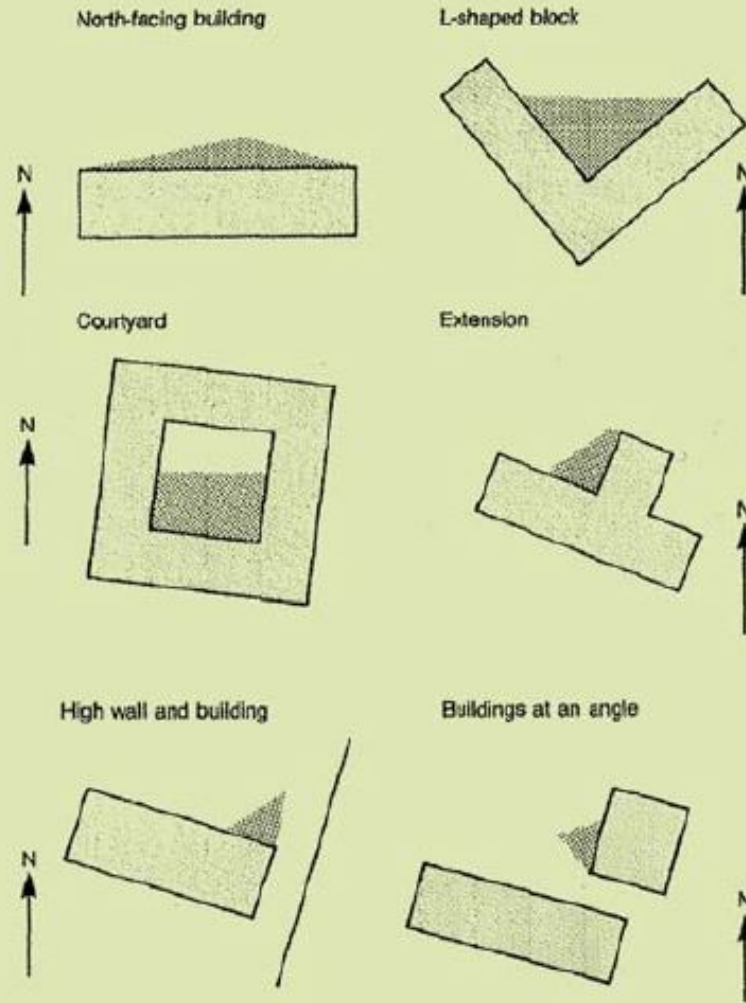
Keelung terminal





VARJUTUS

Sun shade for different layout



Examples of problem layouts where poor sunlighting on the ground can occur. The shaded areas will receive no sun at all for six months of the year

Source: P J Littlefair, 2000

ARHITEKTUURNE MAHT – ENERGIASÄÄSTLIK TÜPOMORFOLOOGIA

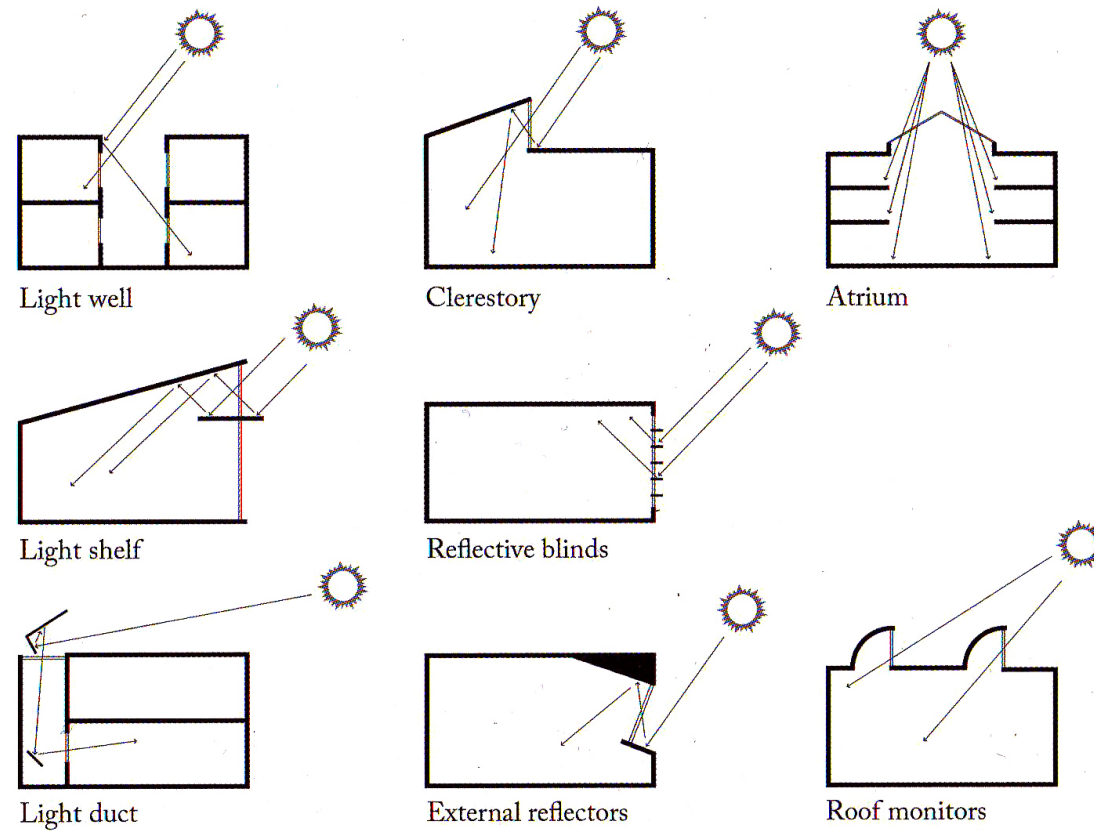


Figure 2.2.16 Daylight concepts for the design of building envelopes.

(Source: Owen J. Lewis, *A Green Vitruvius* (London: Architects Council of Europe, 1999, p. 91).)

ATRIUMHOONED

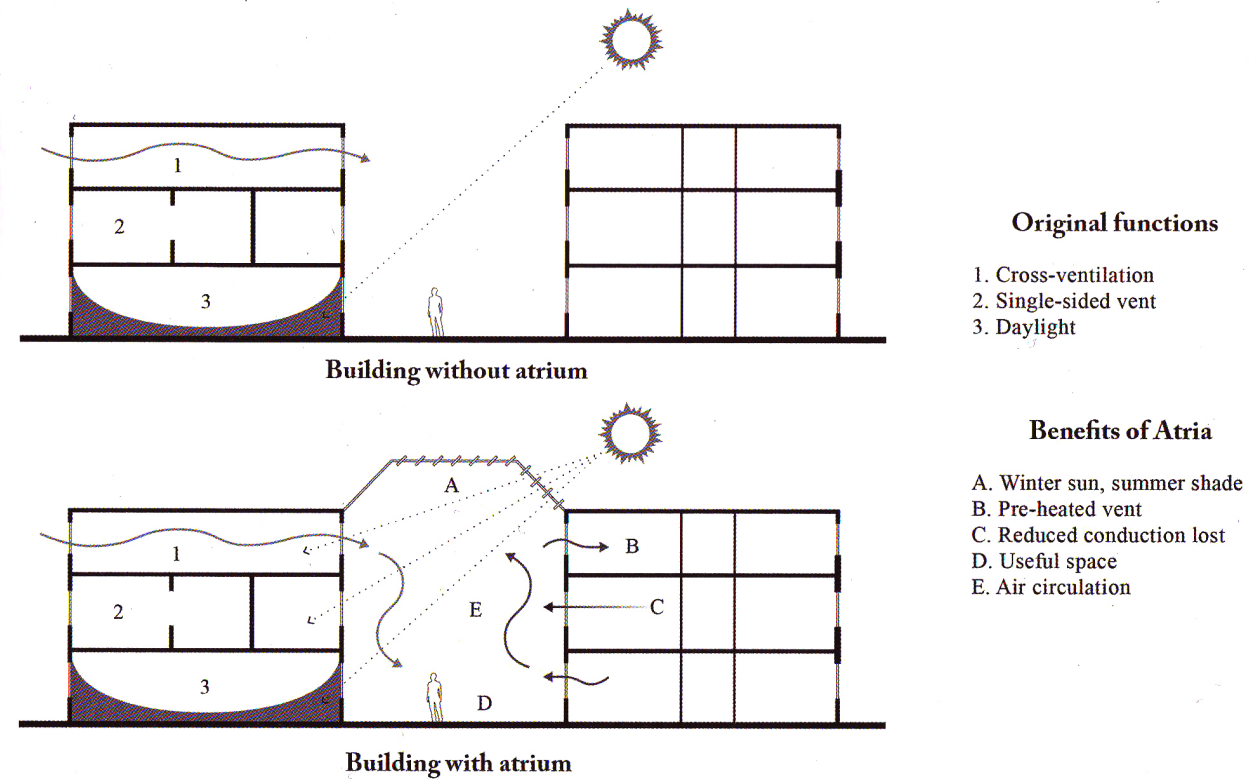


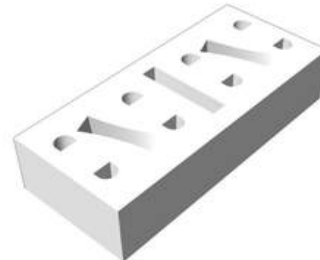
Figure 2.2.17 Atrium for heating a structure.
(Source: Owen J. Lewis, *A Green Vitruvius*. (Source: London: Architects Council of Europe, 1999, p. 74).)

ATRIUM

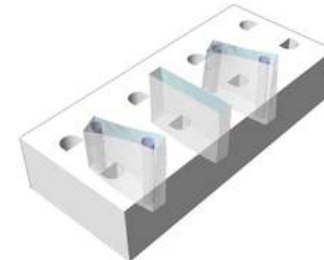


DIAGRAMS - ATRIUM SCHEMES & DEVELOPMENT

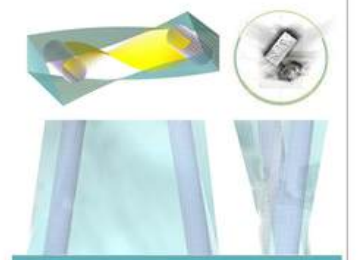
To maximize daylight harvesting while creating a comfortable interior, we carved atrium spaces that are perpendicular to the perimeter at ground level. Two large atria gradually rotate toward the optimum sun angle. The atrium curtain walls are composed of curvilinear twisting surfaces to increase the daylight reflection and refraction in a controlled manner.



VOIDED MASS



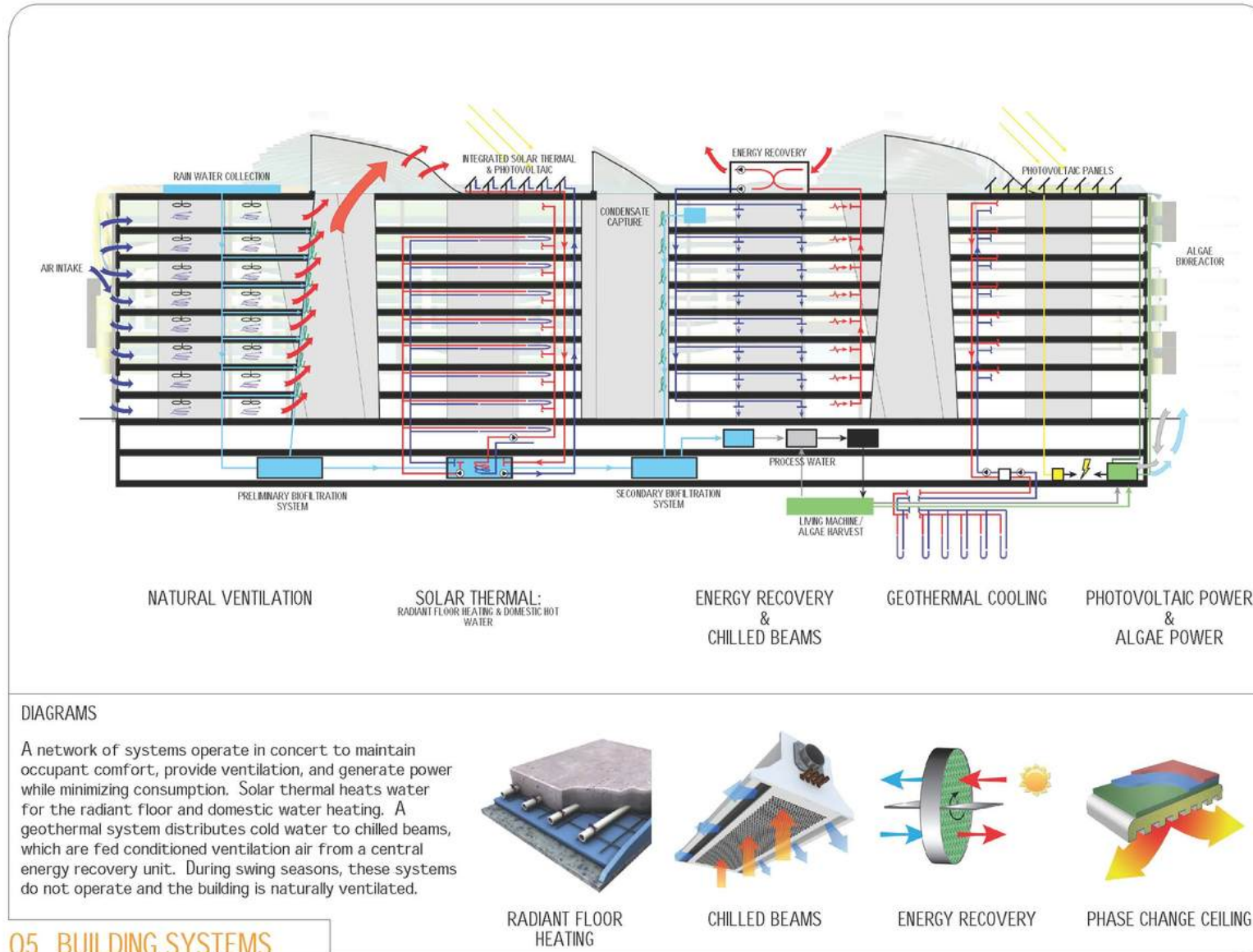
ATRIUMS AND LIGHTWELLS



ATRIUM GEOMETRY
COMPLEX CURVATURE FOLLOWS COMPOSITE DIAGRAM OF SUN PATHS

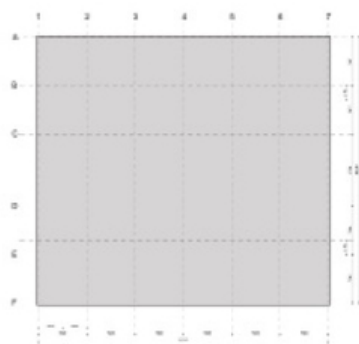
06 ATRIUM DEVELOPMENT

ATRIUMI TEHNOLOGILISED EELISED

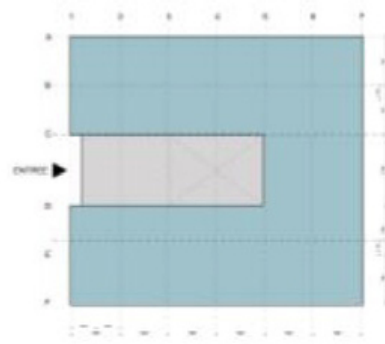


ATRIUMI KUJUNDAMINE

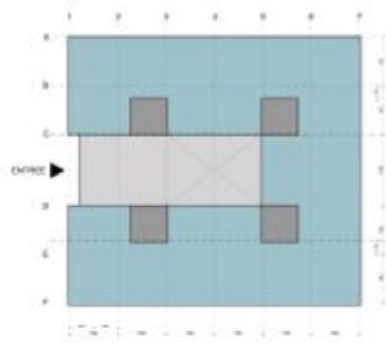
Concept plattegrond



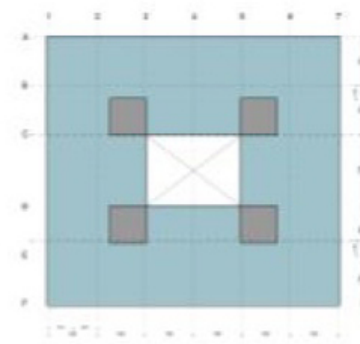
schema 1



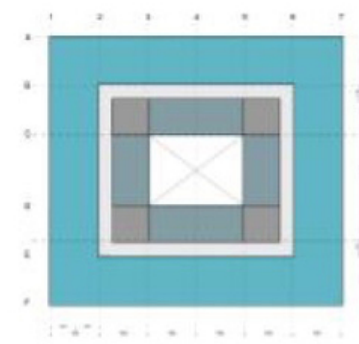
schema 2



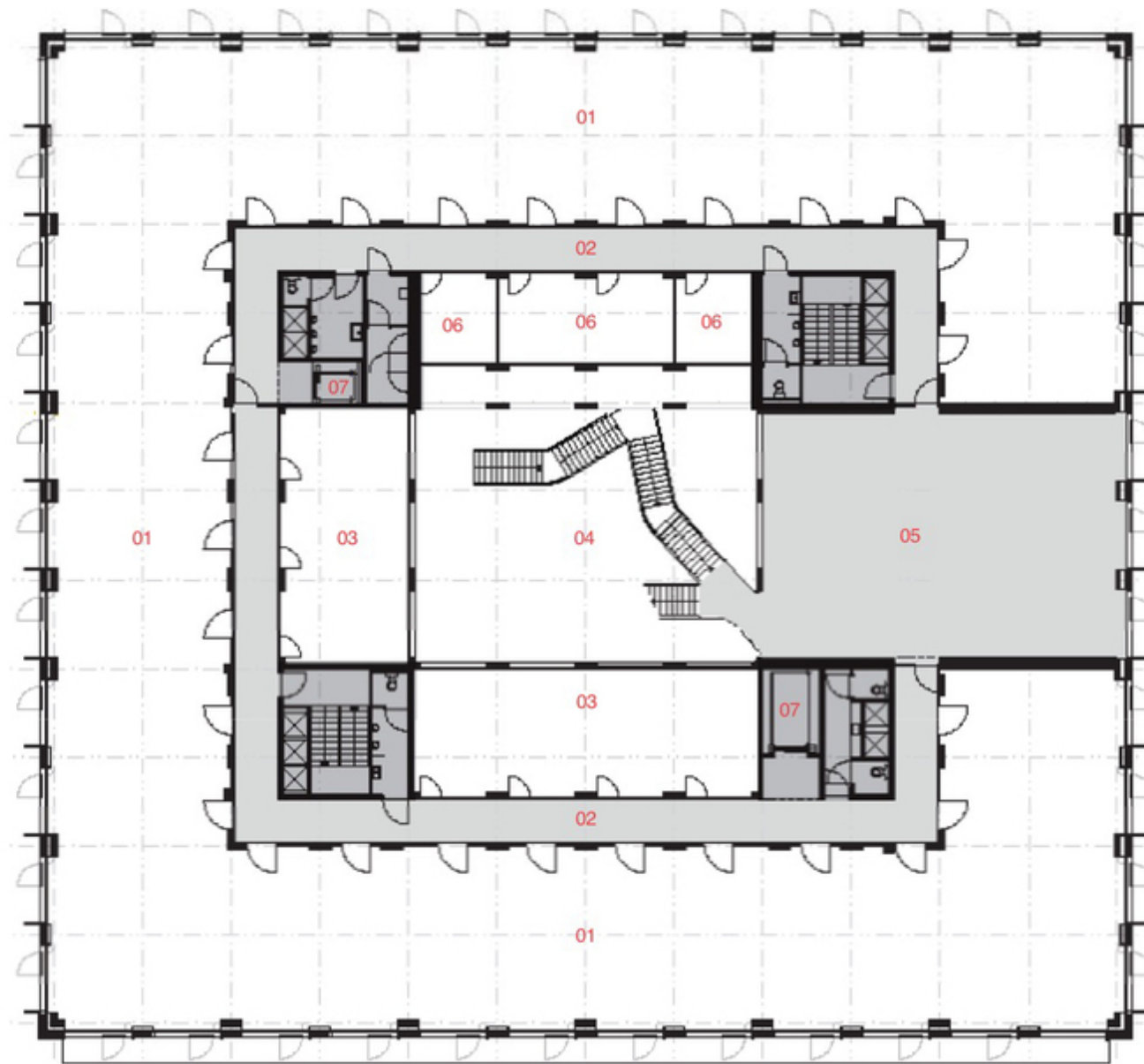
schema 3



schema 4



schema 5

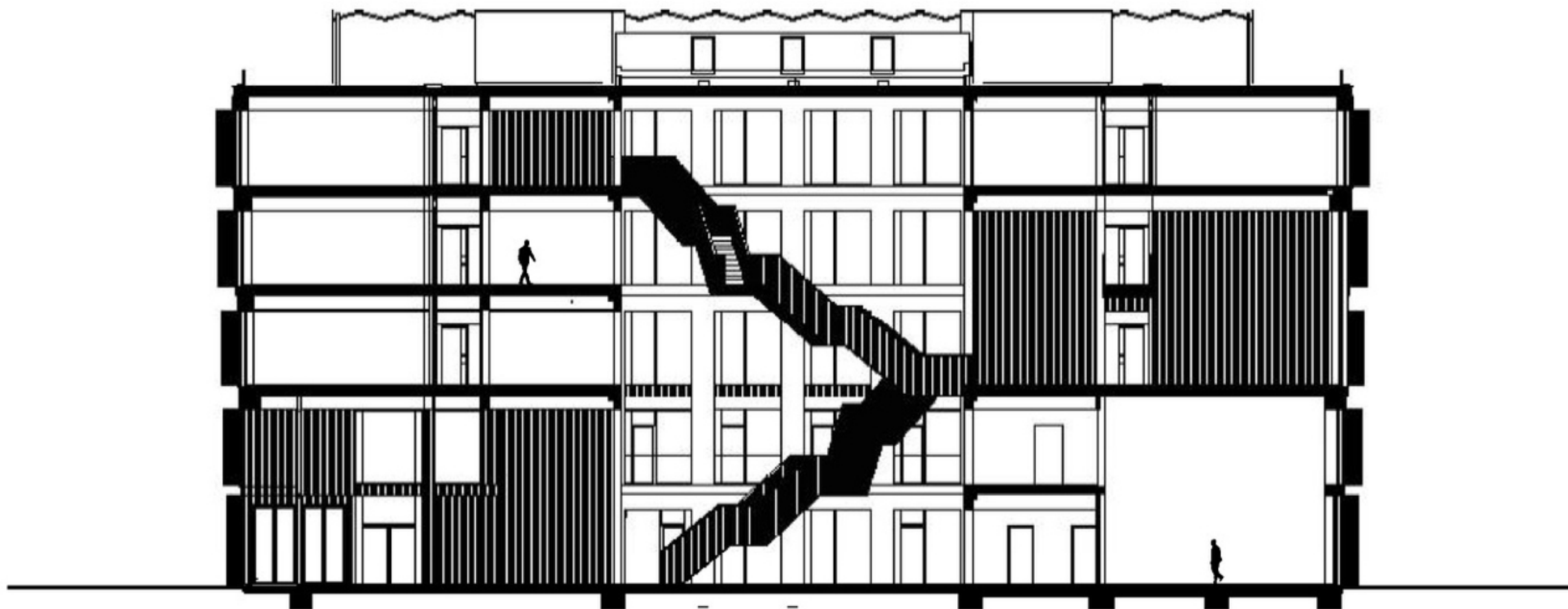


Second floor plan

01 laboratory / office

02 circulation

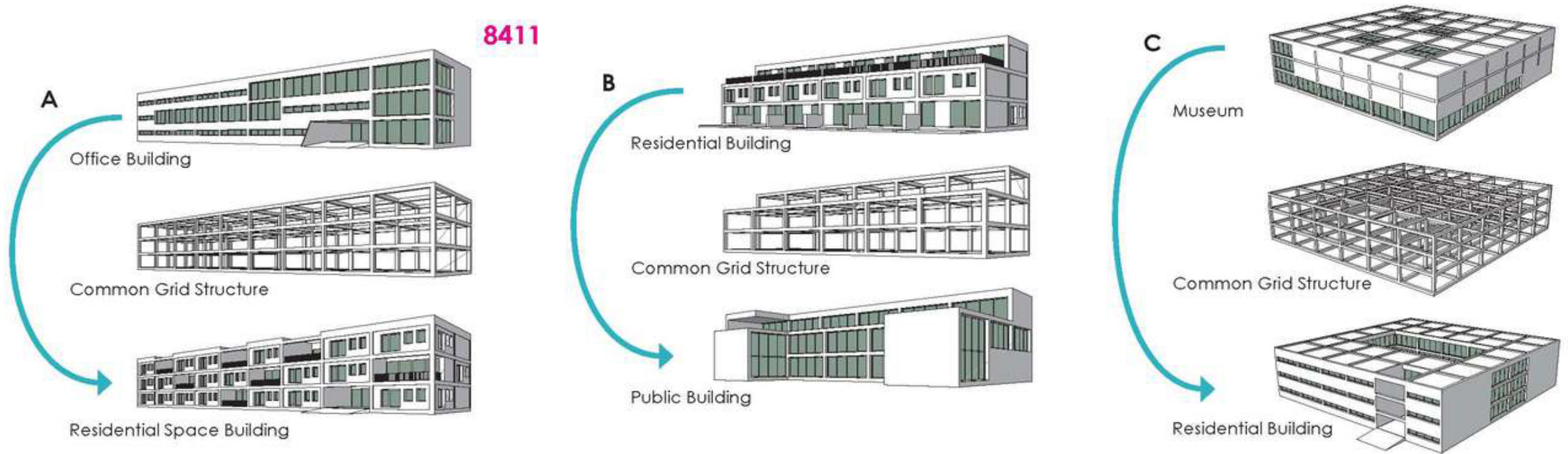
03 office





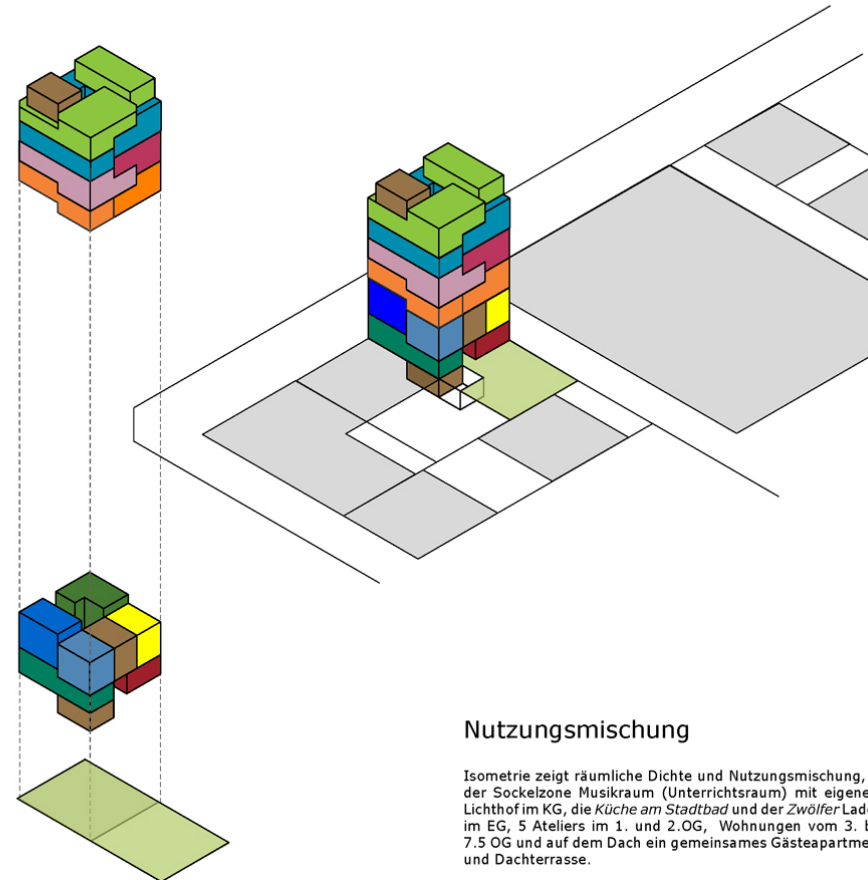


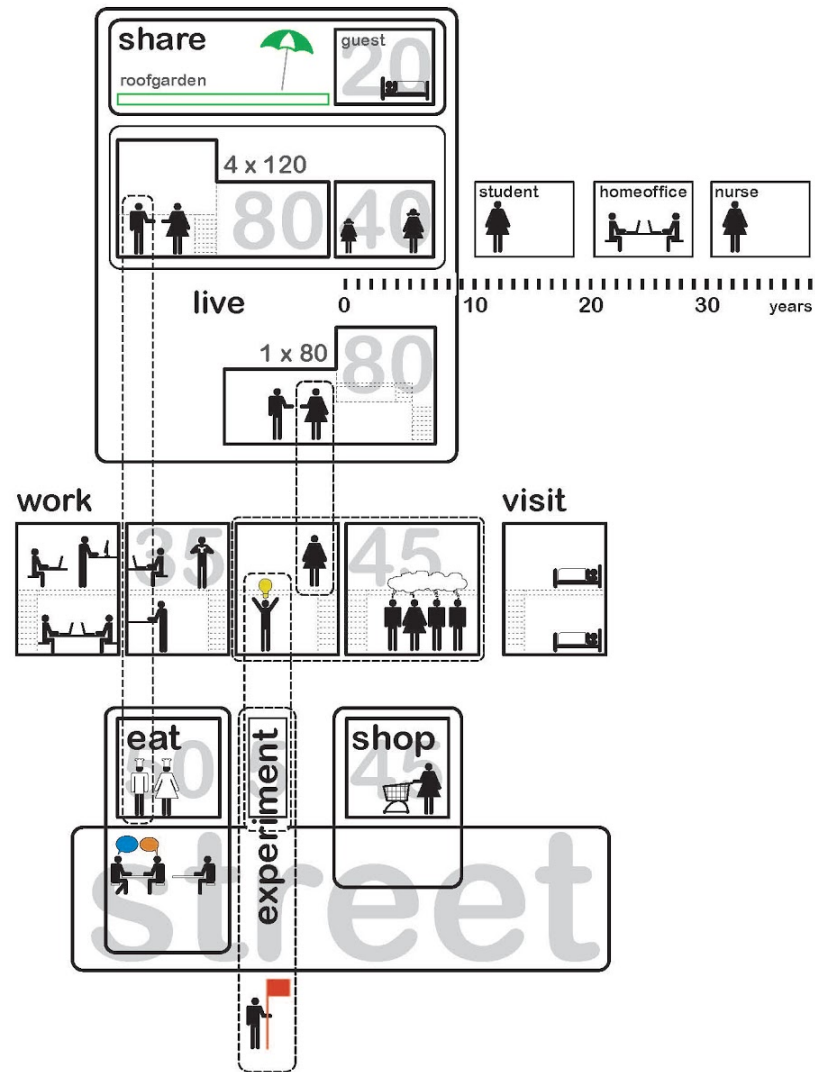
RESILIENTSUS-KOHANEMISVÕIMELISED HOONED



RESILIENTSUS-KOHANEMISVÕIMELISED RUUMILAHENDUSED-SEGATUD FUNKTSIOONID

	m ²
Gästapartment	16
Wohnung 5a	76
Wohnung 5b	35
	111
Wohnung 4a	83
Wohnung 4b	45
	128
Wohnung 3a	82
Wohnung 3b	27
	109
Wohnung 2	76
Wohnung 1a	82
Wohnung 3b	44
	126
Studio A	44
Studio B	33
Studio 1	30
Studio 2	30
Studio 3	30
Café	54
Miniladen	5
Laden	43
Musikraum	28





Die Austauschmöglichkeiten innerhalb des Hauses,
die Vernetzung mit dem öffentlichen Raum und die
Veränderbarkeit in der Zeit

FASSAADIDE KUJUNDAMINE – VARJESTUS, SOOJAPIDAVUS

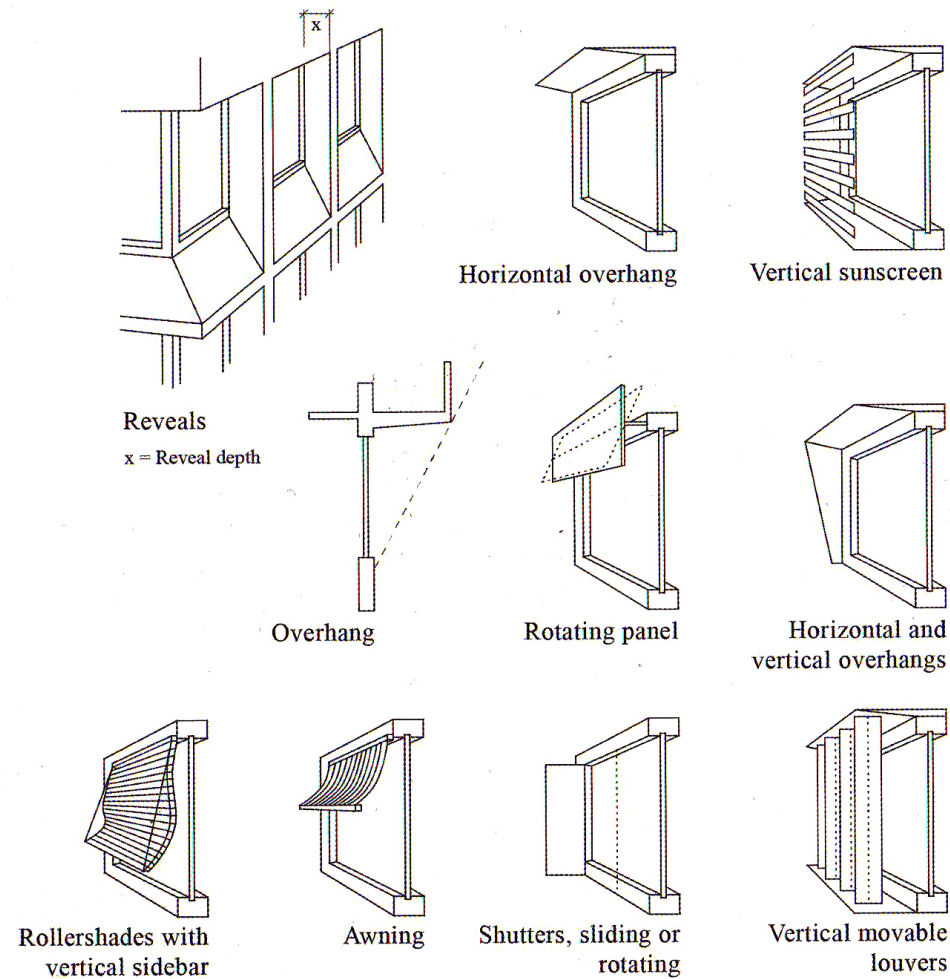
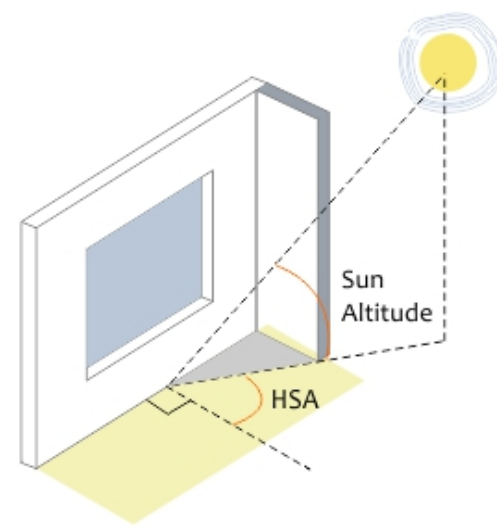
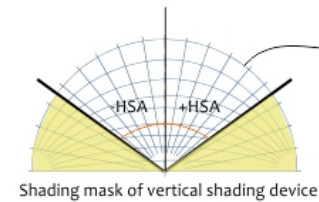
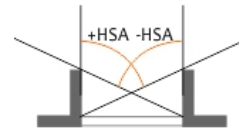
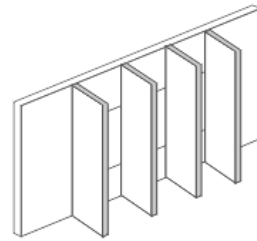


Figure 2.2.14 External shading devices.

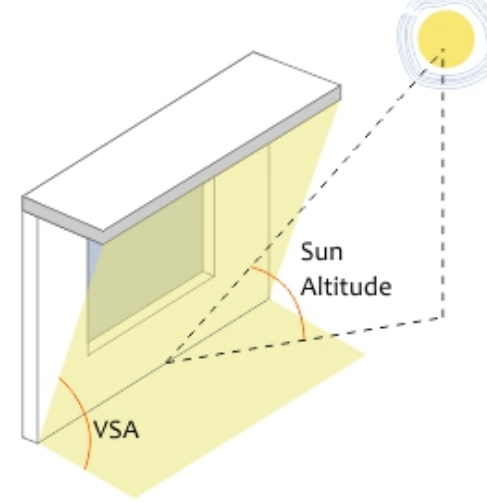
(Source: Gaia Research Report "Understanding Daylighting of Sports Halls".)



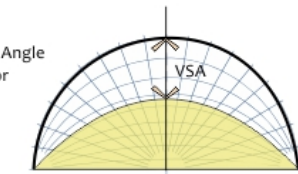
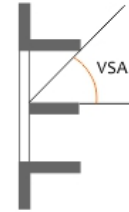
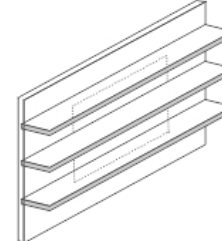
Vertical Shading



vertical shading devices protect from sun at sides of the elevation such as east and west side

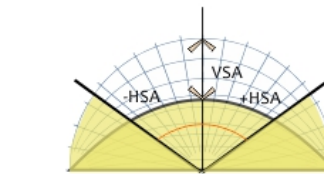
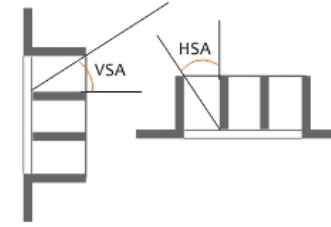
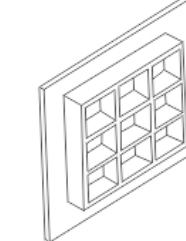


Horizontal Shading

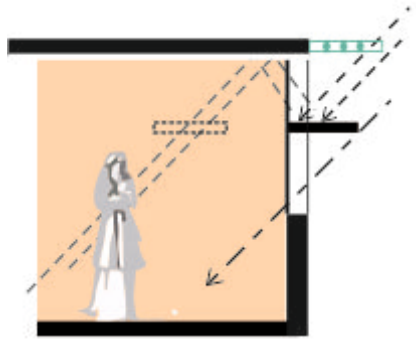


horizontal shading devices protect from sun at high angles and opposite to the wall to be shaded such as north and south sides

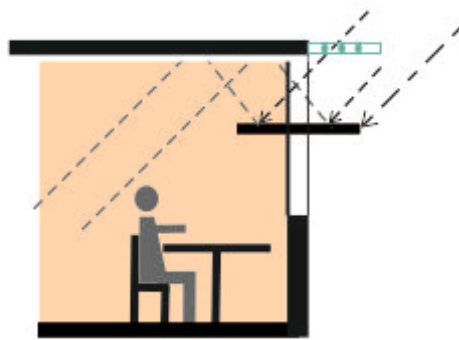
Horizontal & Vertical Shading



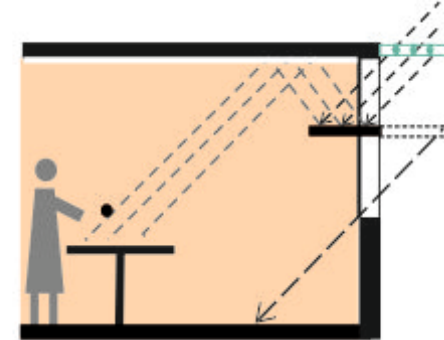
combination of horizontal and vertical shading devices protect from sun in all orientations



external light shelves allow diffused light penetration and shade.

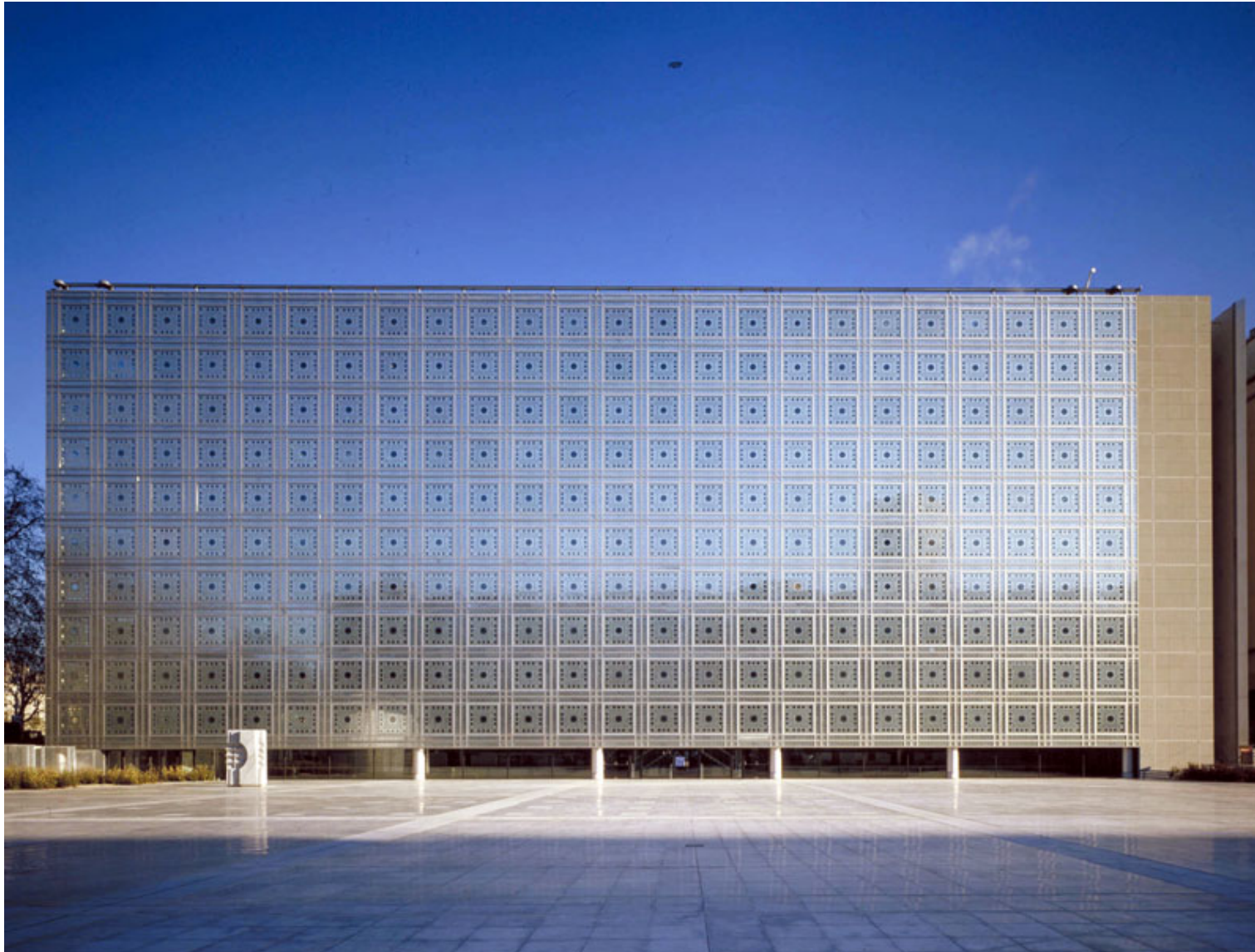


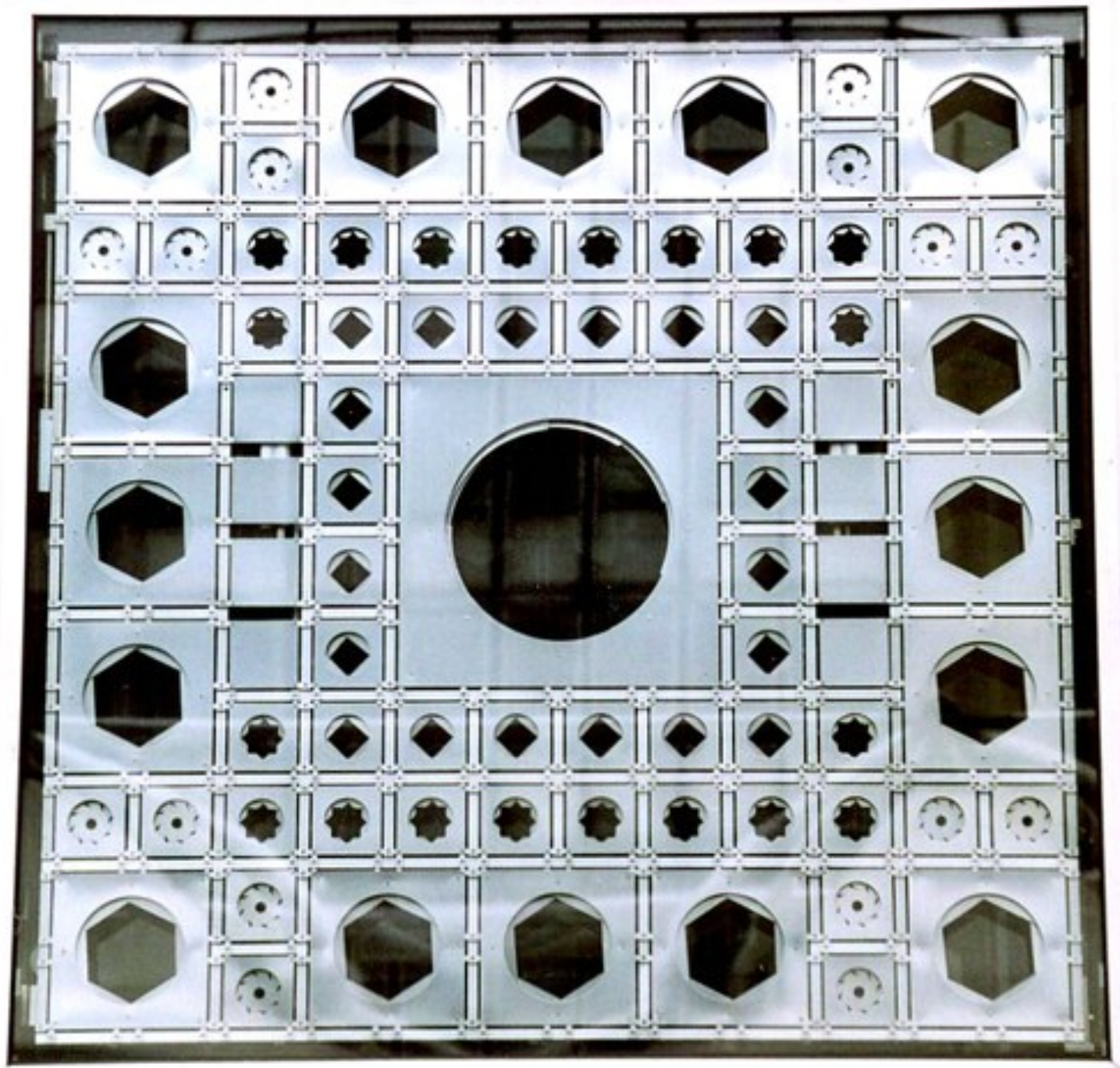
external/ internal light shelves allow deeper diffused light penetration and shade.



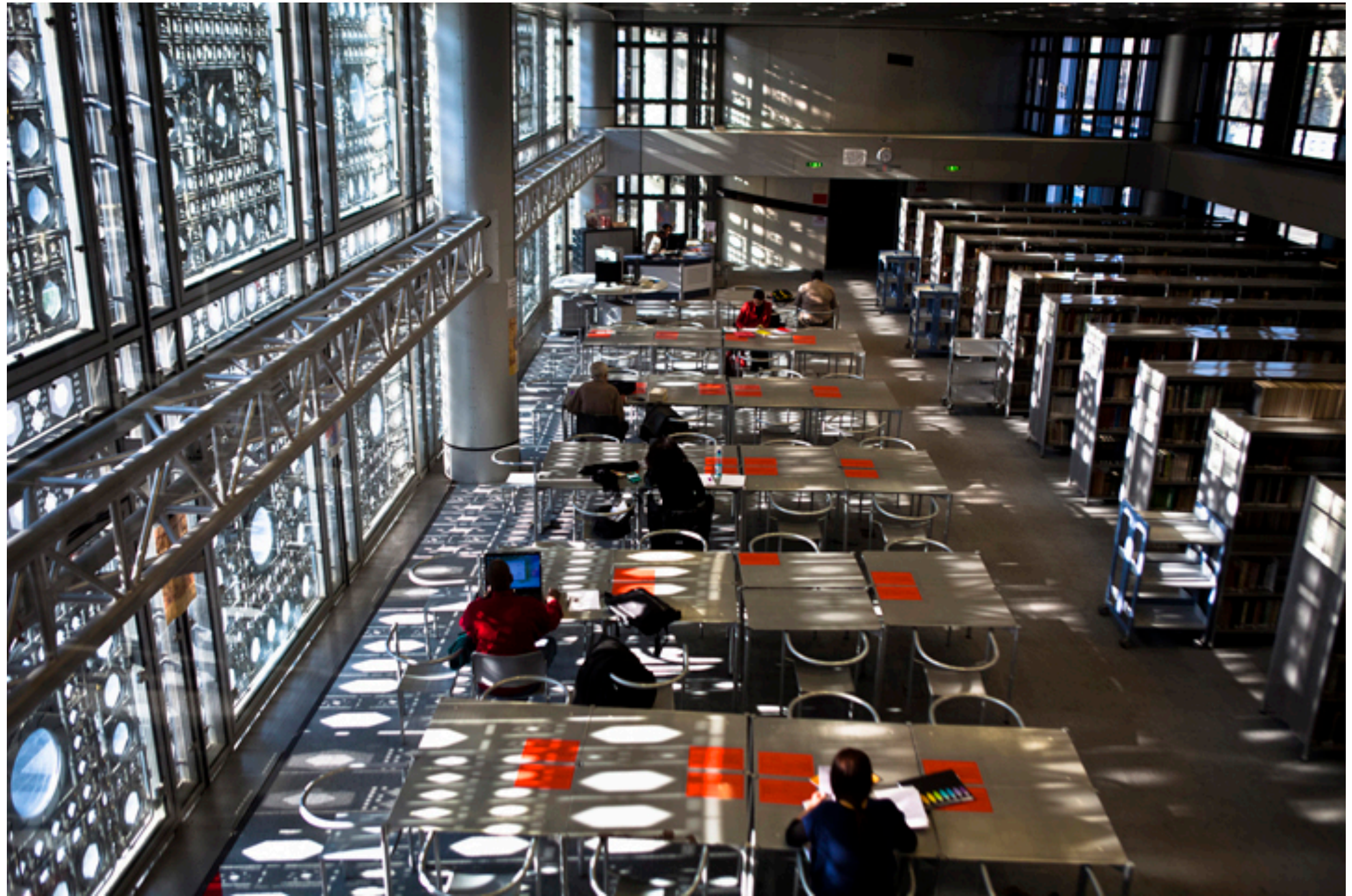
internal light shelves allow deeper light penetration and solar access. Light shelves can be added inside to increase daylight penetration.

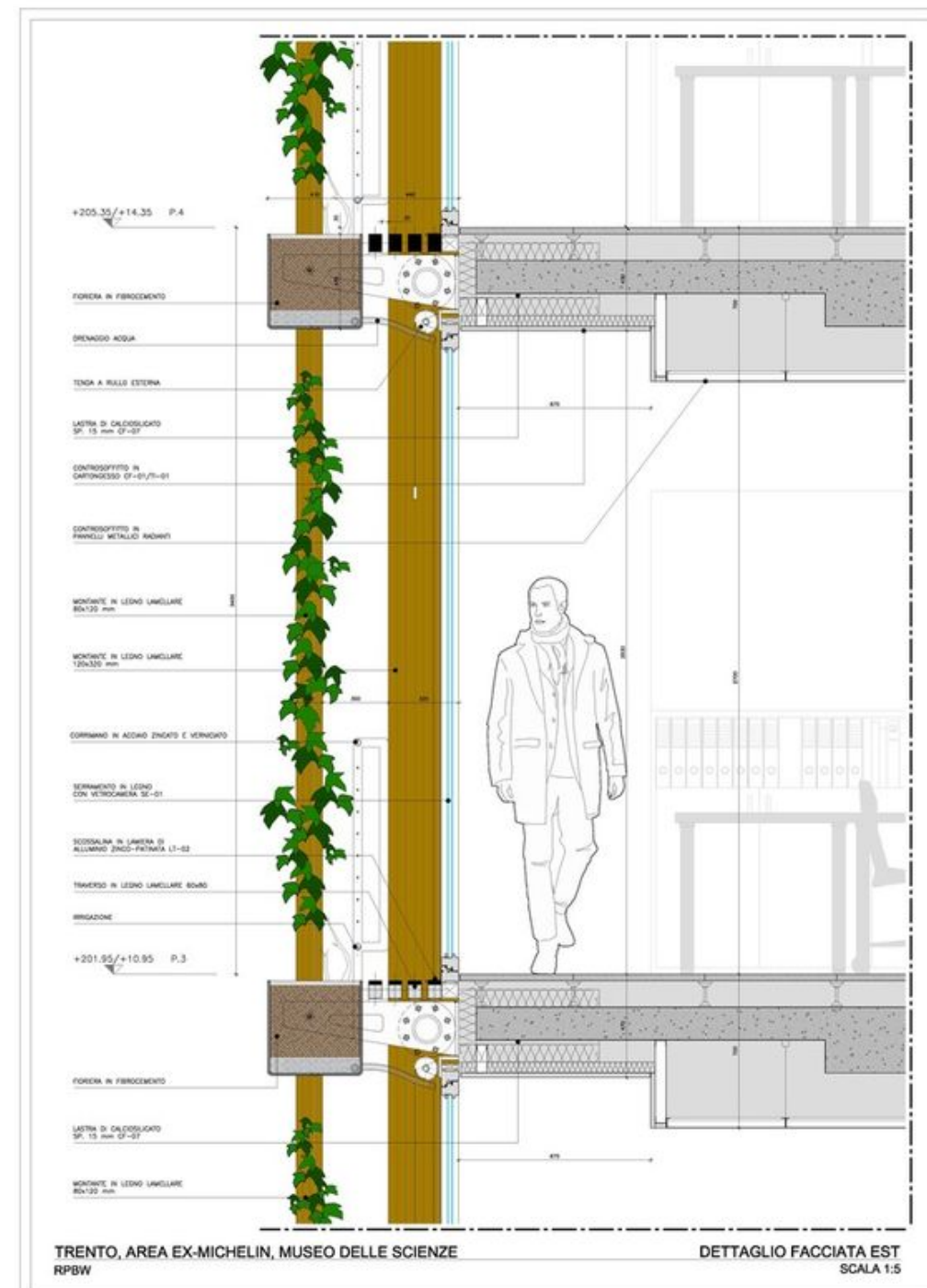
Arab World Institute, 1981, 1987 / Jean Nouvel



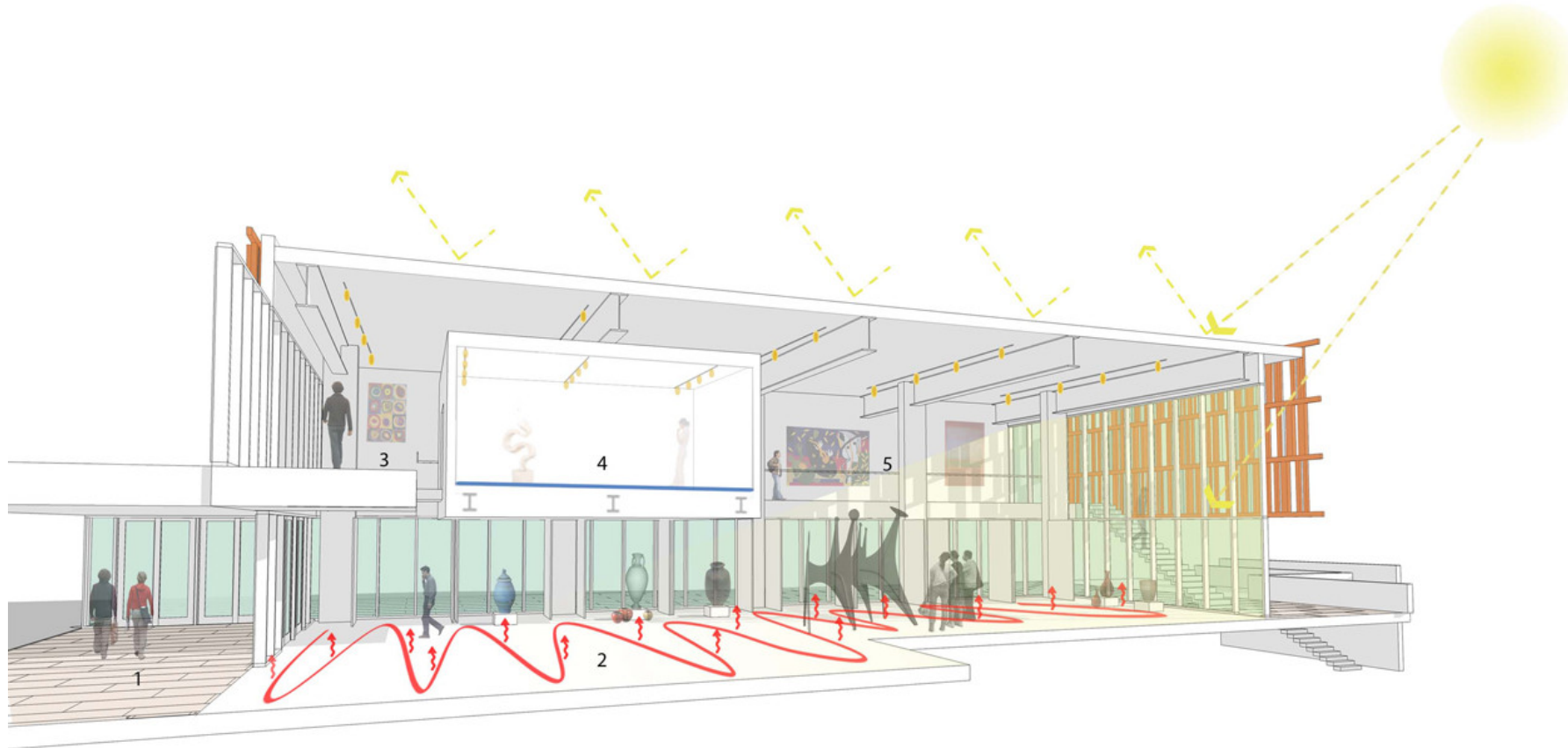








VARJESTUS- VERTIKAALSED LAMELLID



SUSTAINABILITY DIAGRAM

1. Lobby
2. Exhibition

3. Bridge
4. Immersive Gallery

5. Upper Gallery

Daylight Harvesting
Dimming Control Lighting

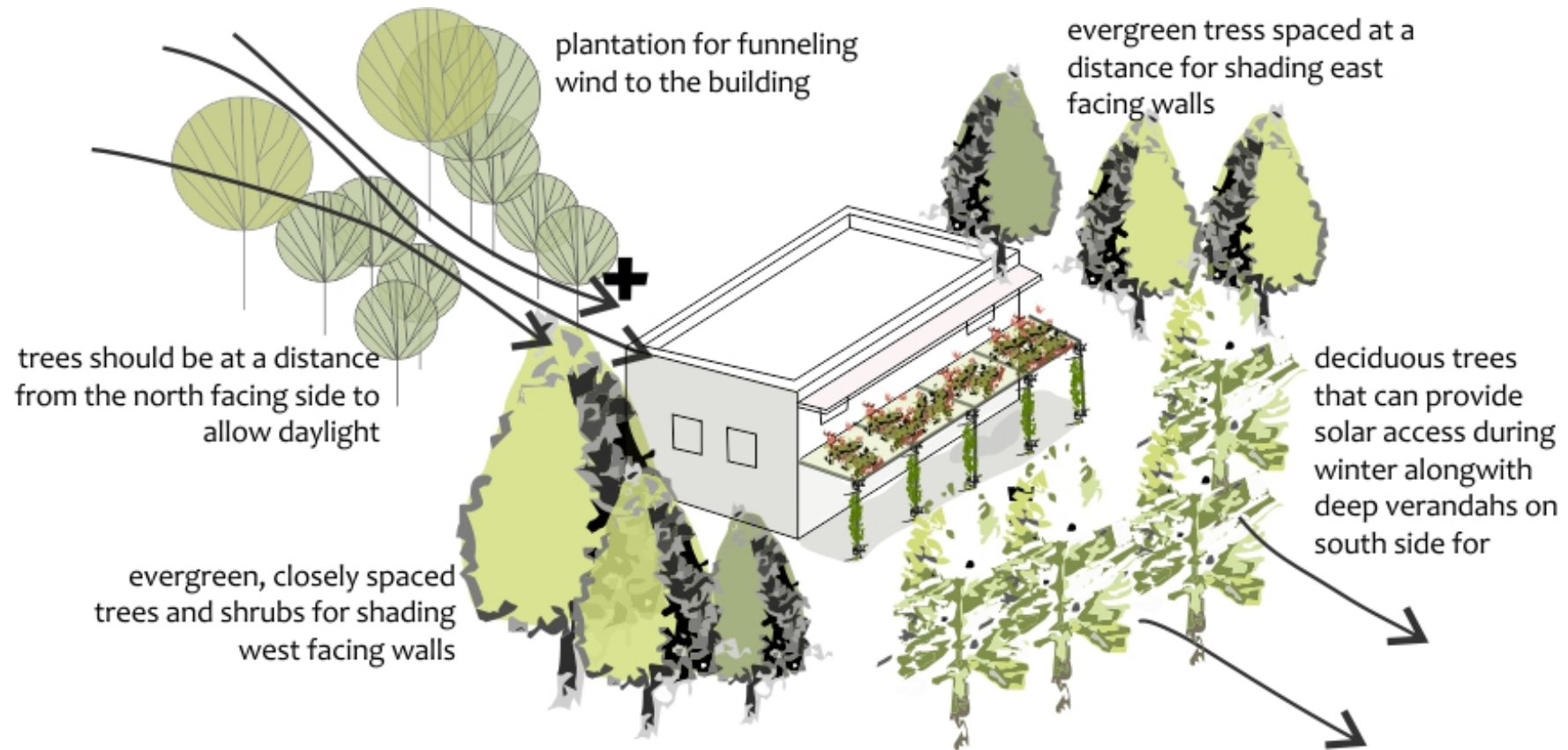
Low VOC & Natural Materials
Terracotta Solar Screen

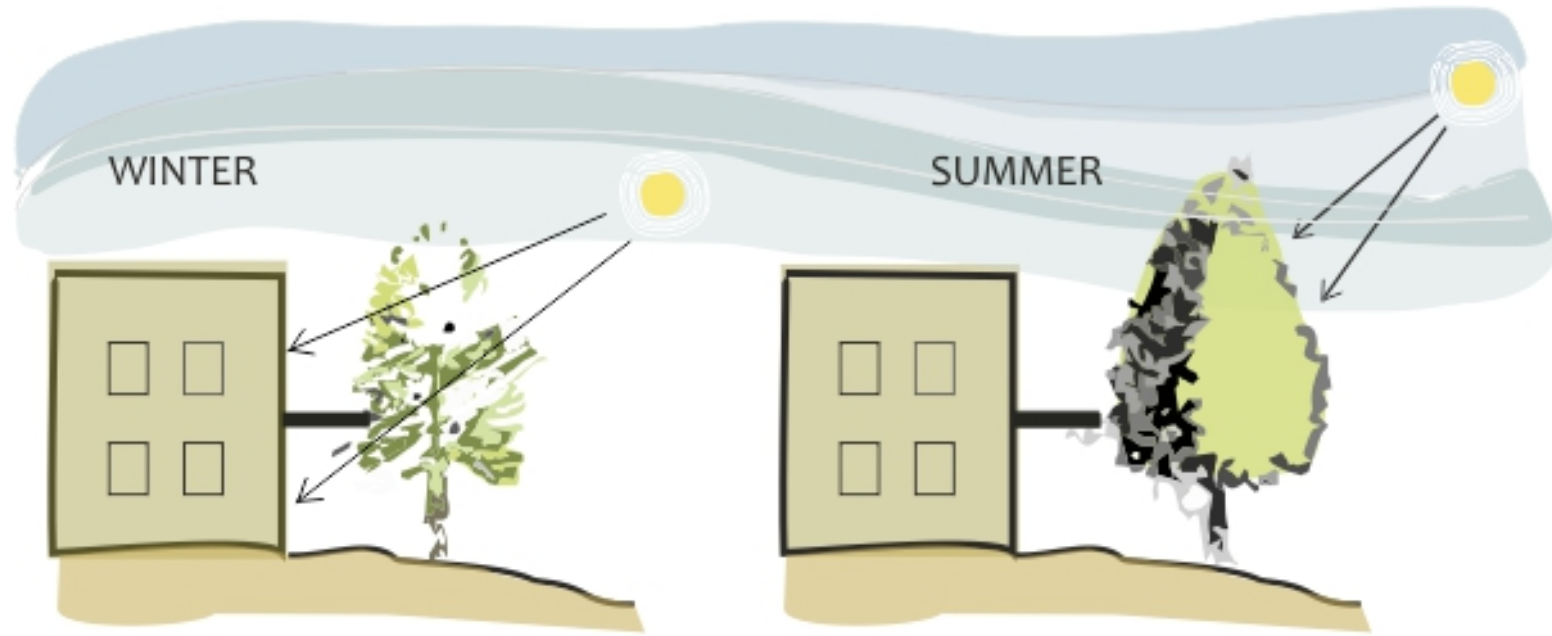
Radiant Heating
Reflective Roof



Munkendamsveien 62/ LPO arkitekter VARJAV HALJASTUS

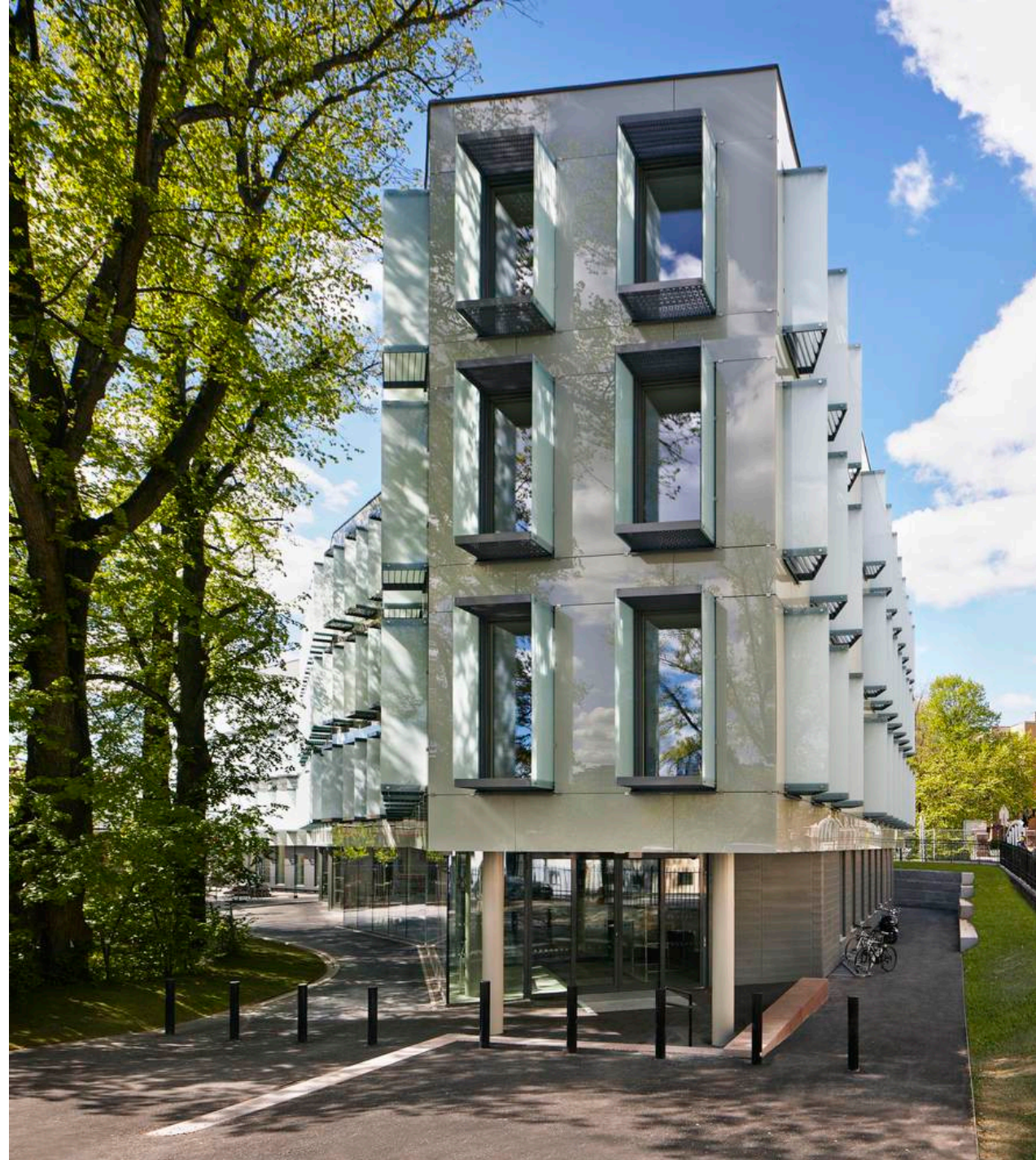






deciduous trees allow sun penetration in winter and block sun access during summer





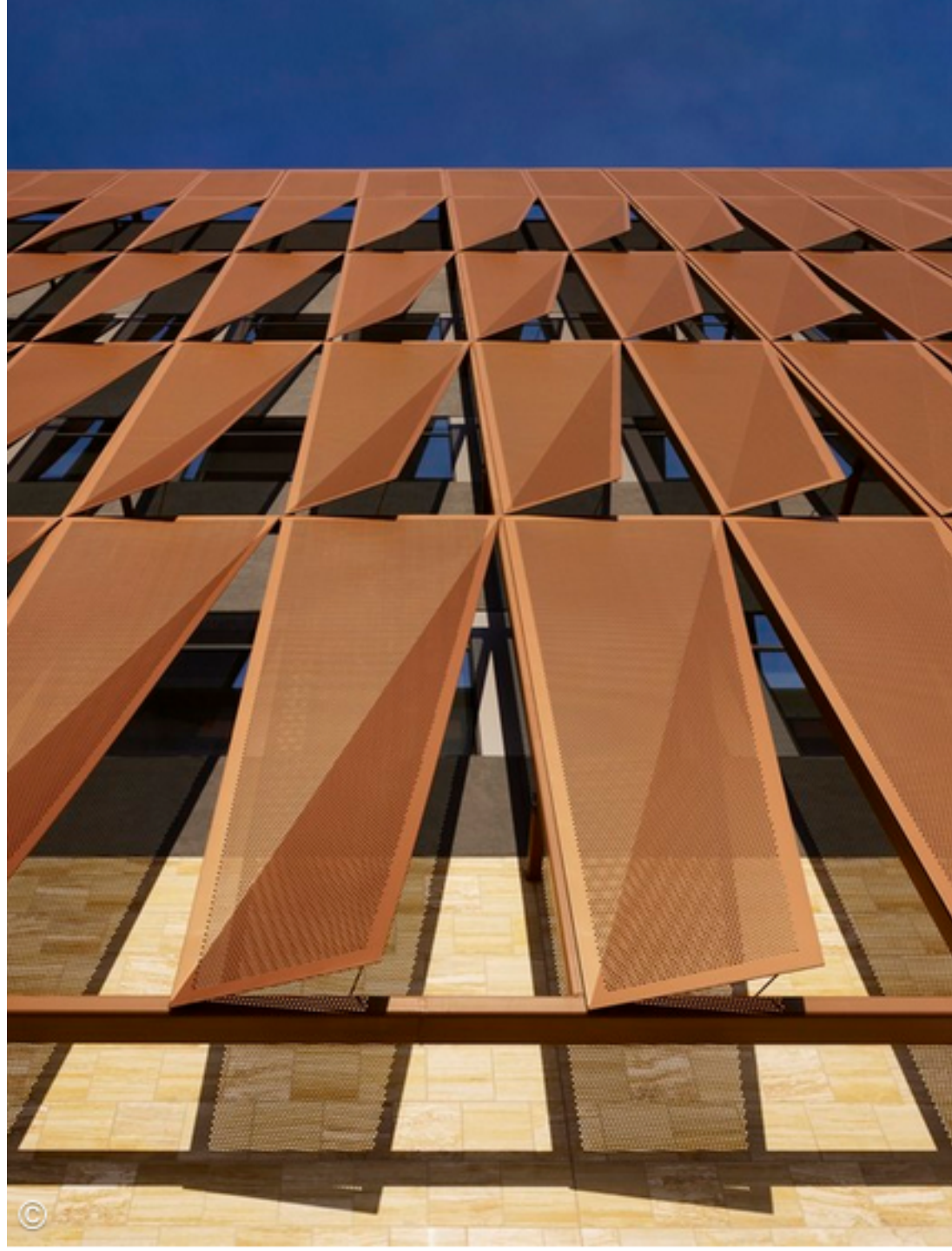
John Cancer an Wellness Center/ Jackson Architecure +

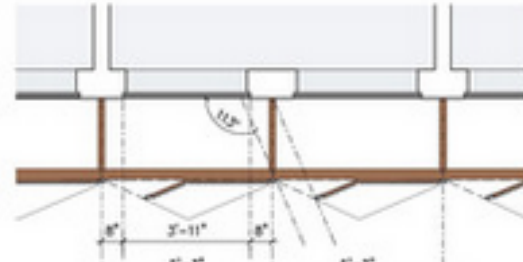
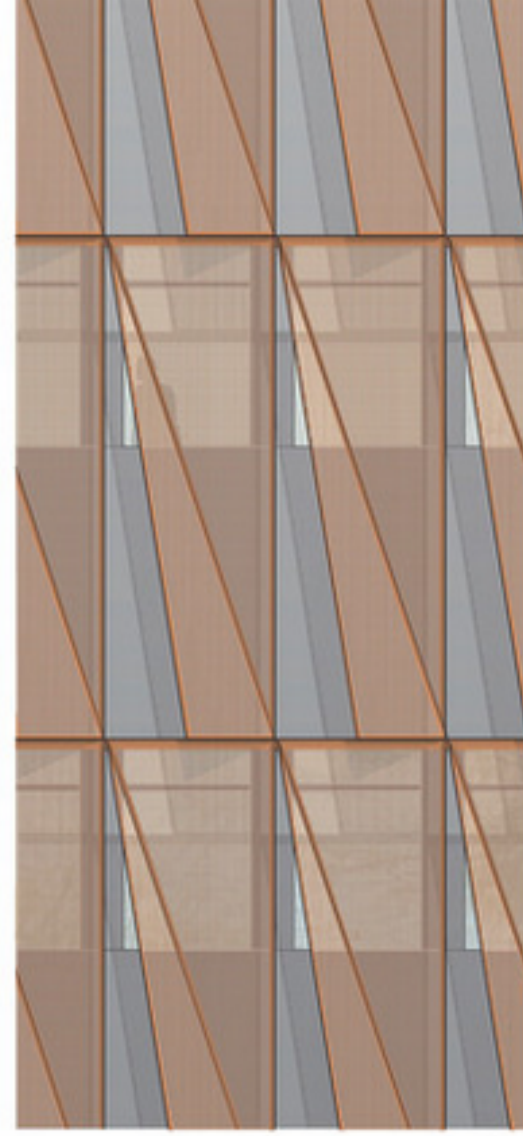
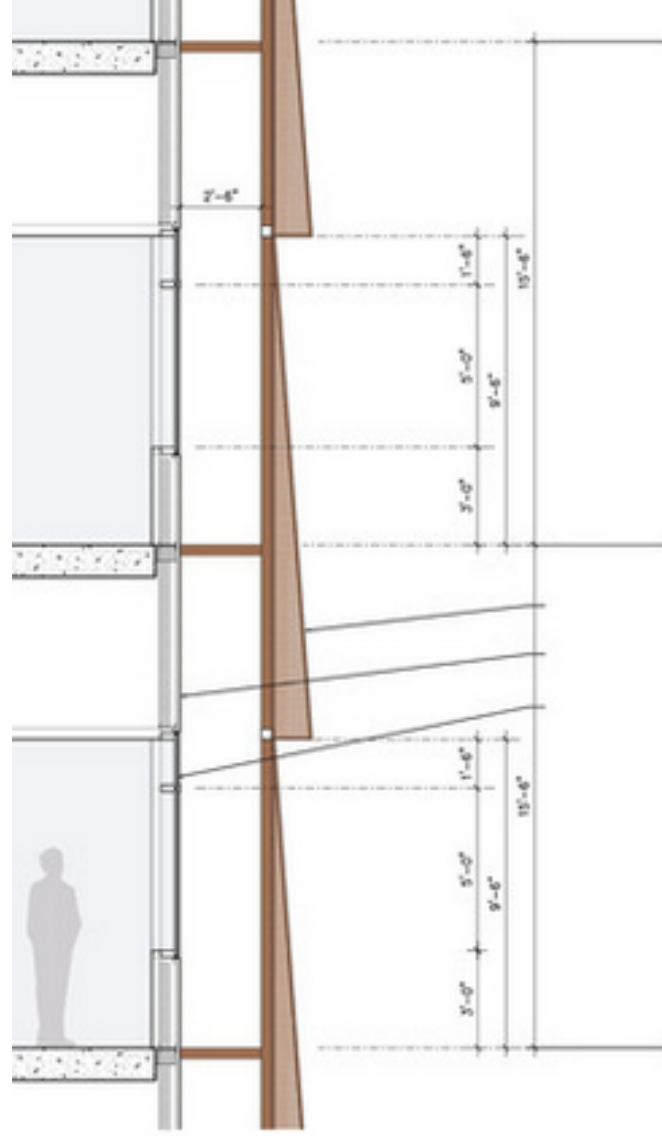




University of Arizona Cancer Center/ ZGF Architects

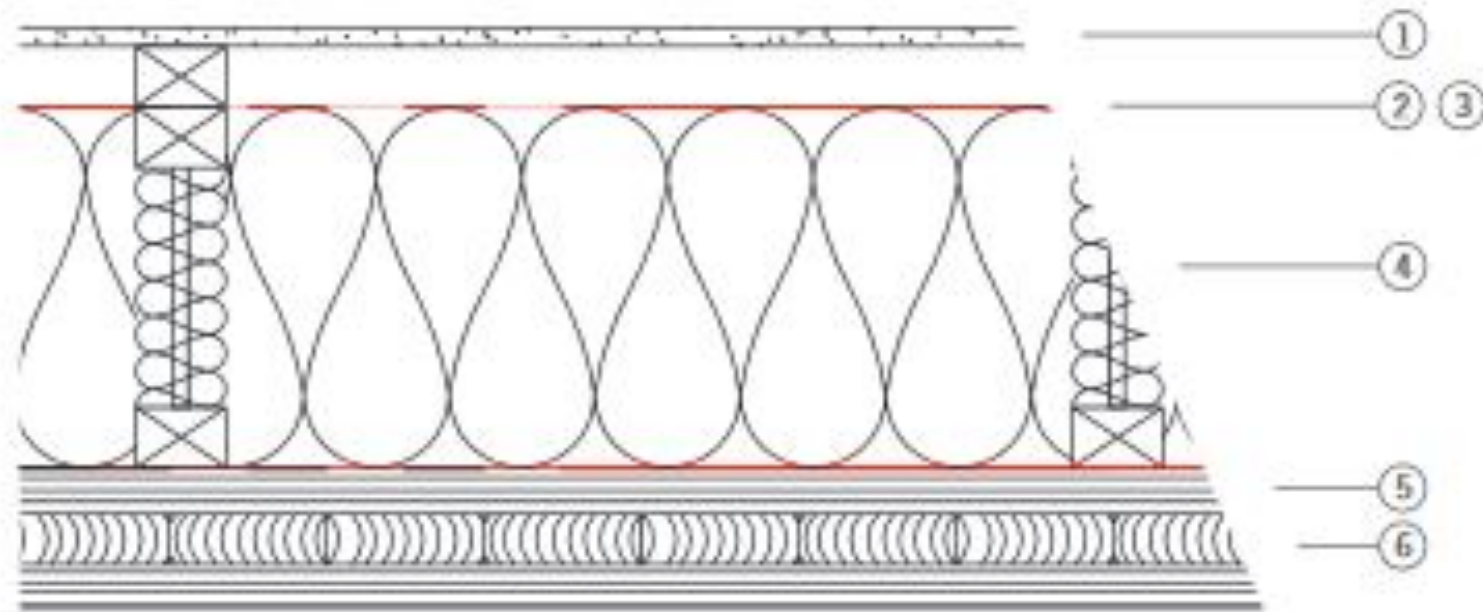




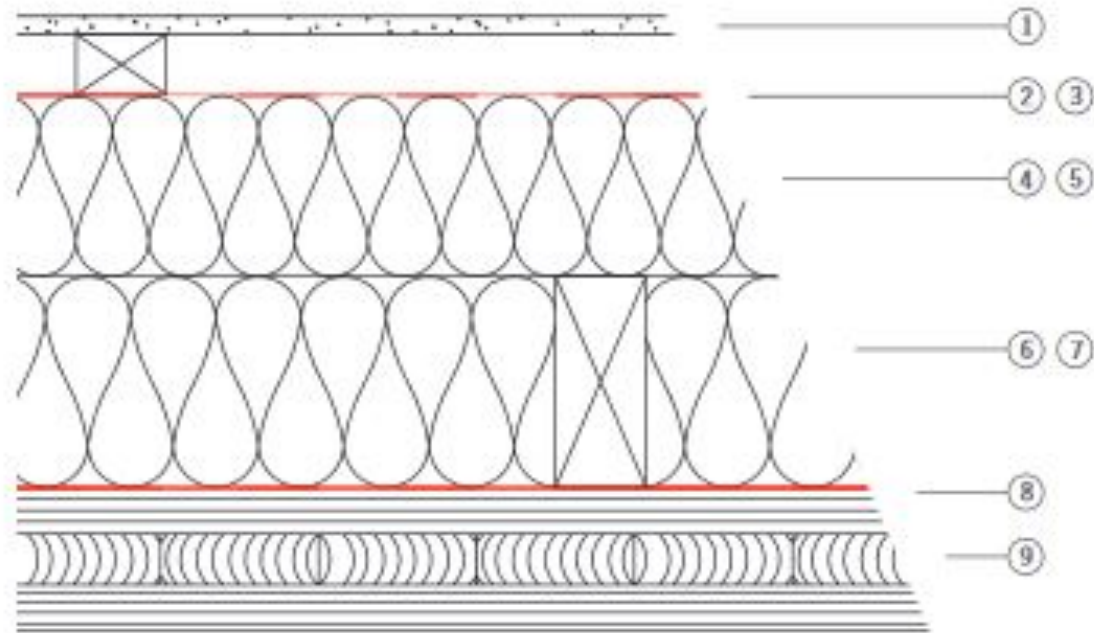


SOOJAPIDAV SEIN, LAGI, AKEN

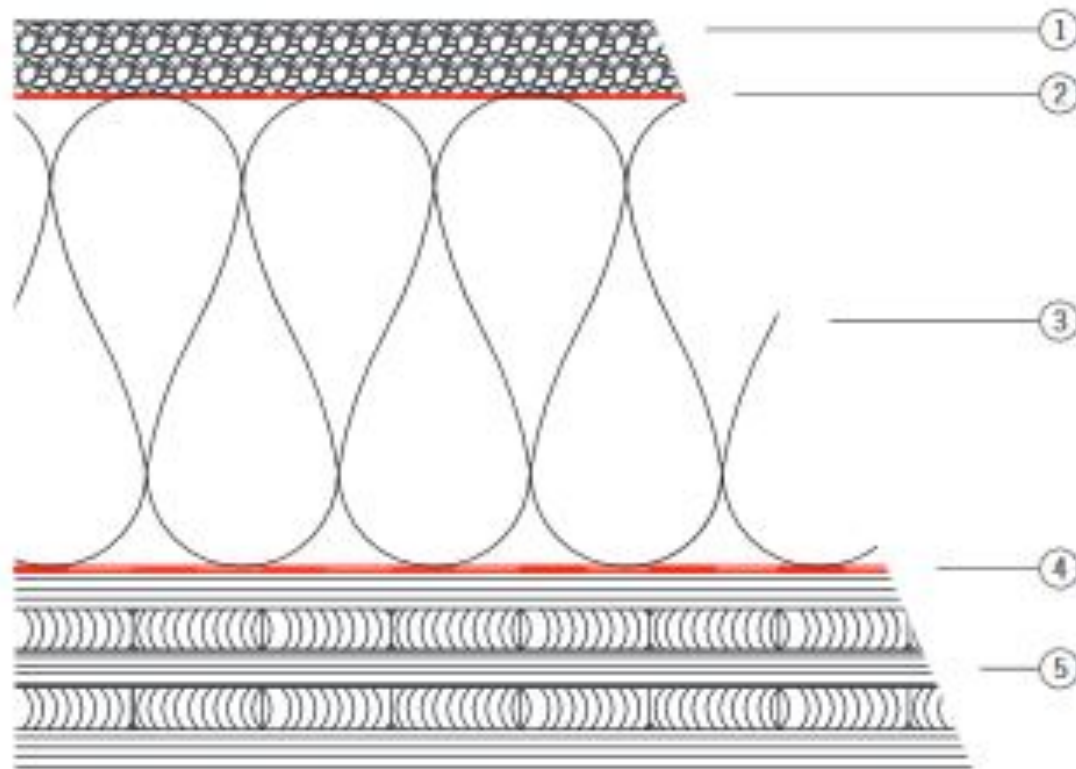
PIIRETE SOOJAPIDAVUS, PUITSEIN CLT BAASIL, $U=0,12$



PUITSEIN CLT BAASIL, $U=0,12$



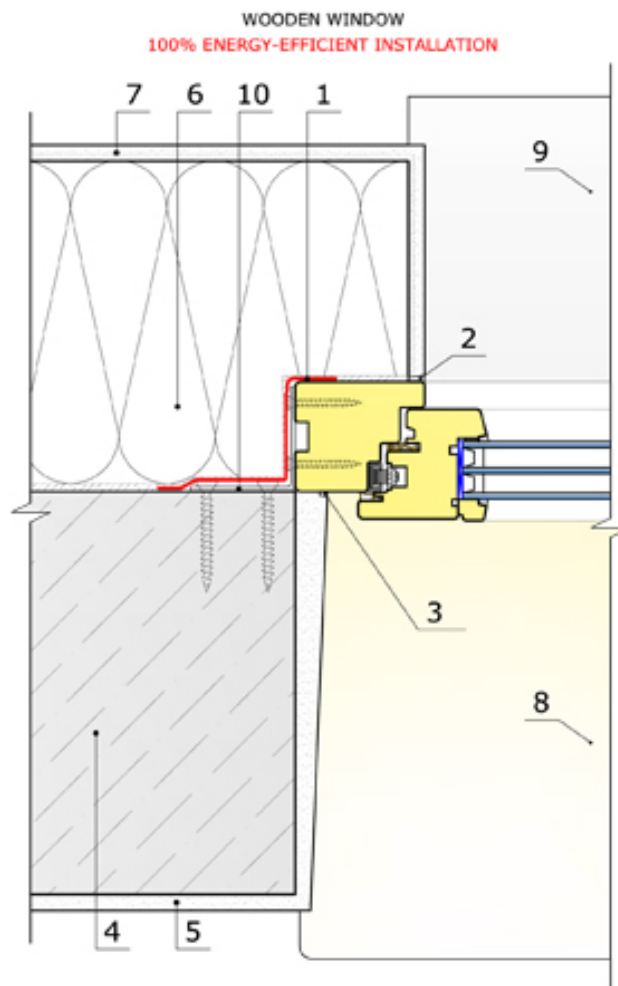
KATUSLAGI CLT BAASIL $U=0,10$



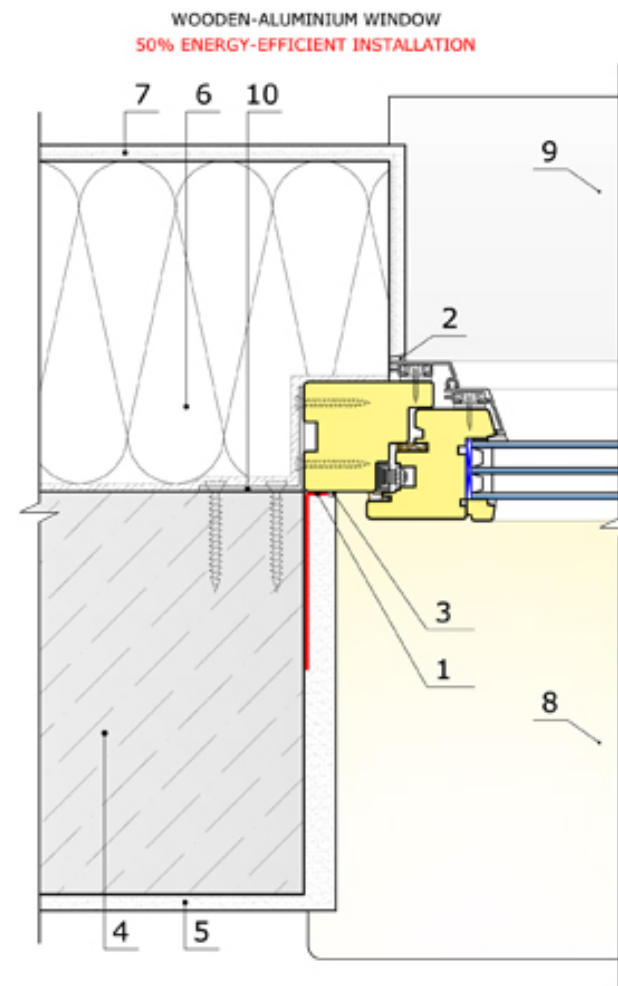
EFEKTIIVNE AKNAPAIGALDUS- SOOJUSTUSE KAETUD LENG

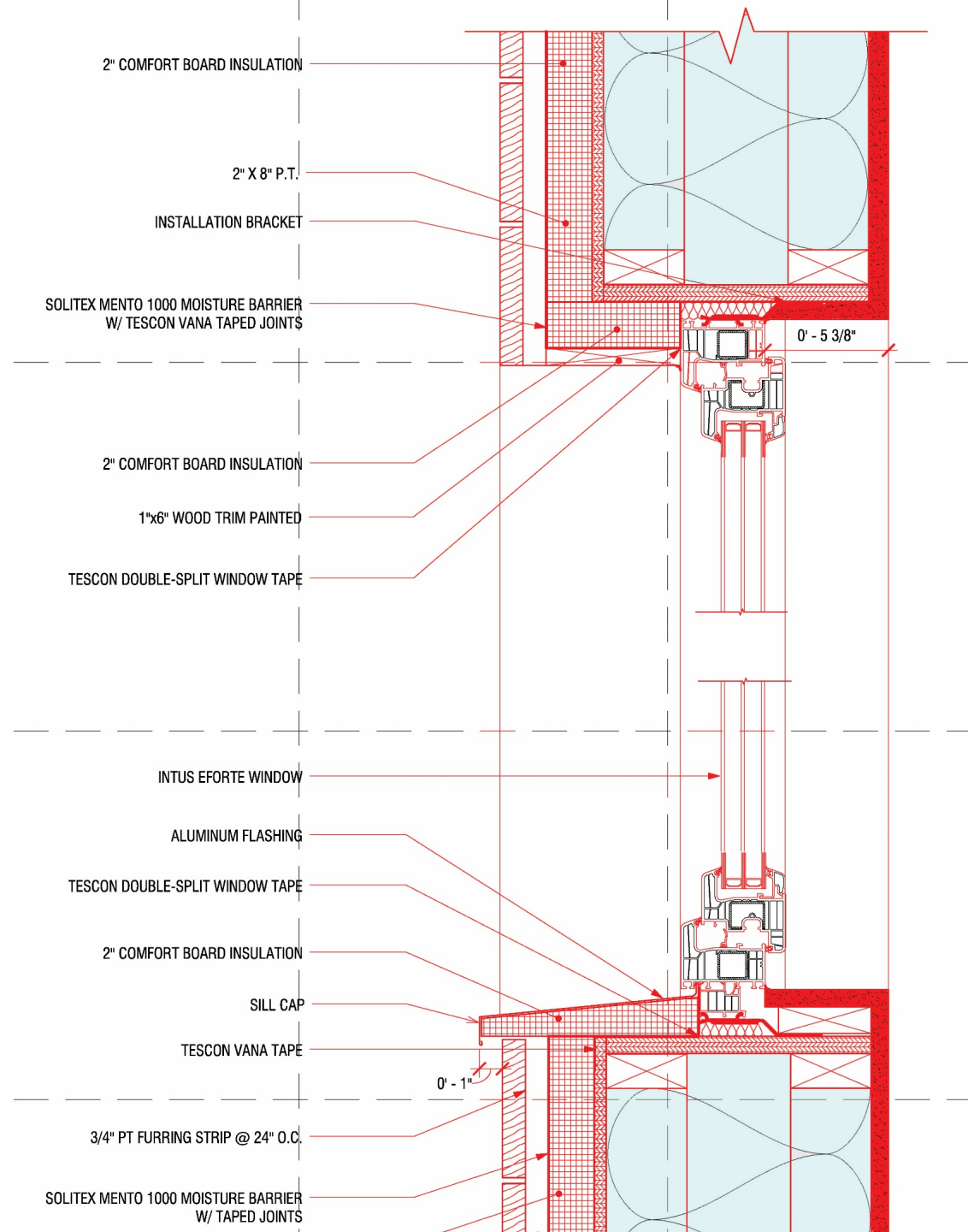
Drawing 4

INSTALLATION DRAWINGS OF ENERGY-EFFICIENT **WOODEN** AND **WOODEN-ALUMINIUM WINDOW**



- 1 vapour barrier tape
- 2 silicon mastics or self-expanding installation sealant
- 3 joint backup strip
- 4 wall structure
- 5 interior finishing
- 6 façade insulation
- 7 external finishing
- 8 window sill
- 9 window water sheet
- 10 assembly angle fitting



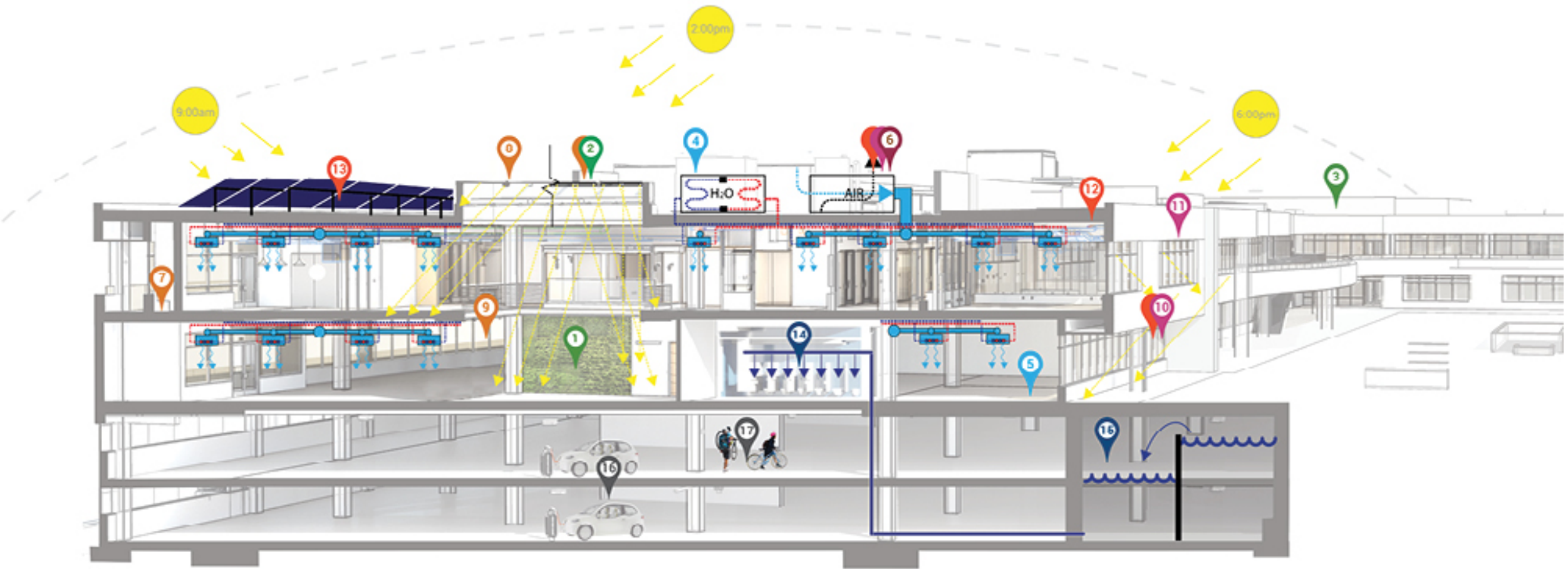


EFEKTIIVSED TEHNOSÜSTEEMID, SISEKLIIMA, ÕHUSTAMINE

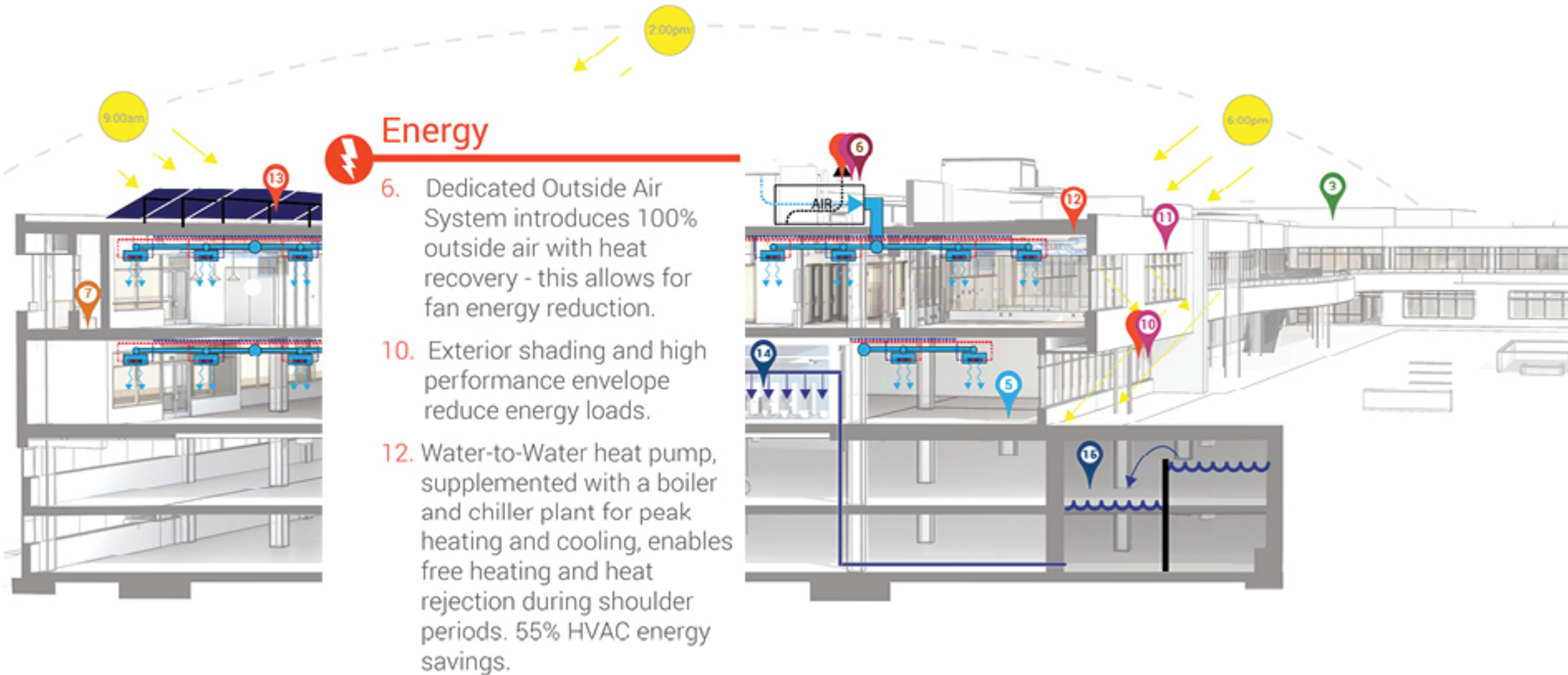
Centre Pompidou, 1977/ Richard Rogers, Renzo Piano



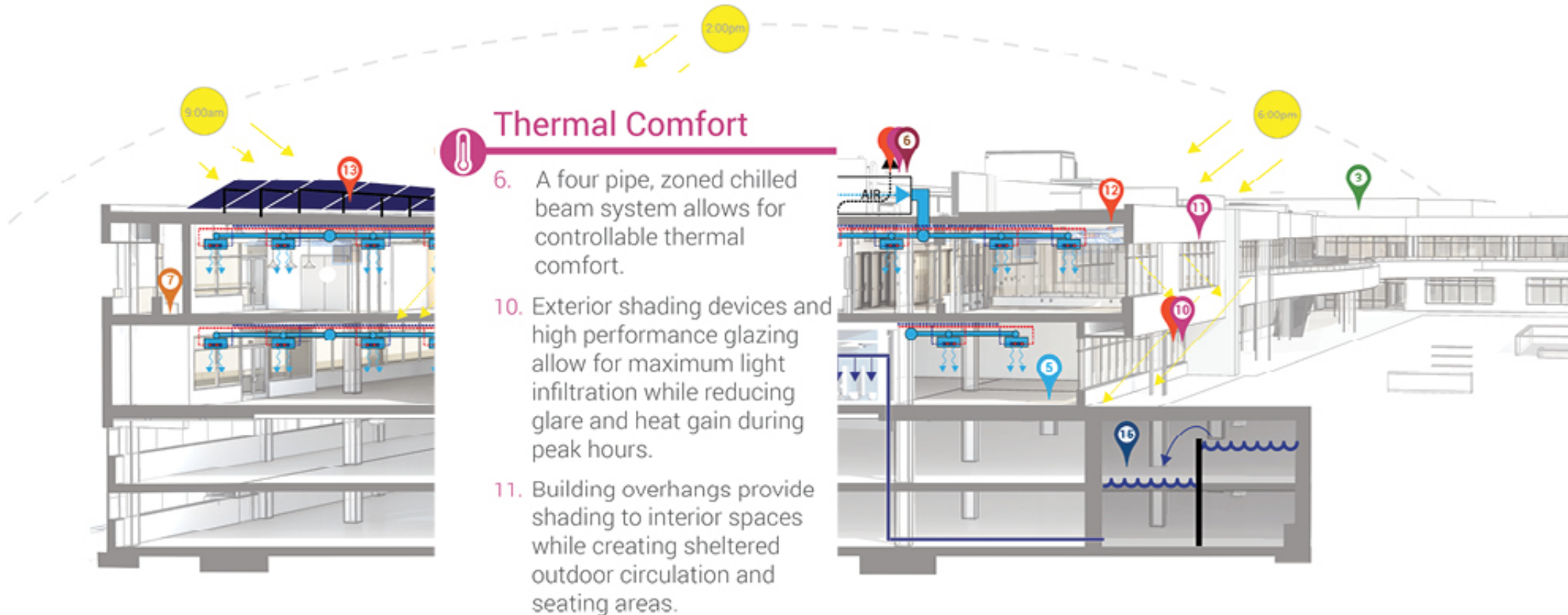
EFEKTIIVSED TEHNOSÜSTEEMID, SISEKLIIMA, ÕHUSTAMINE



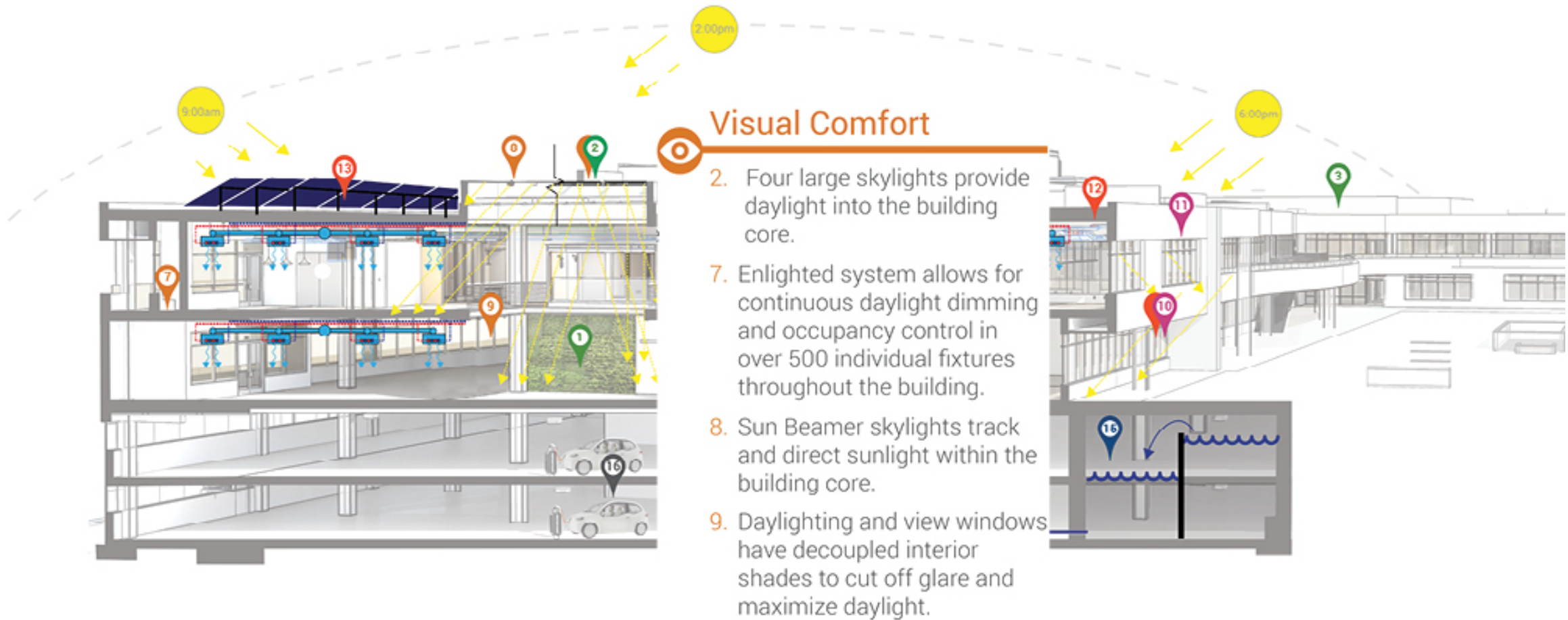
Energia



Soojuslik mugavus



Visuaalne mugavus



Ventilatsioon



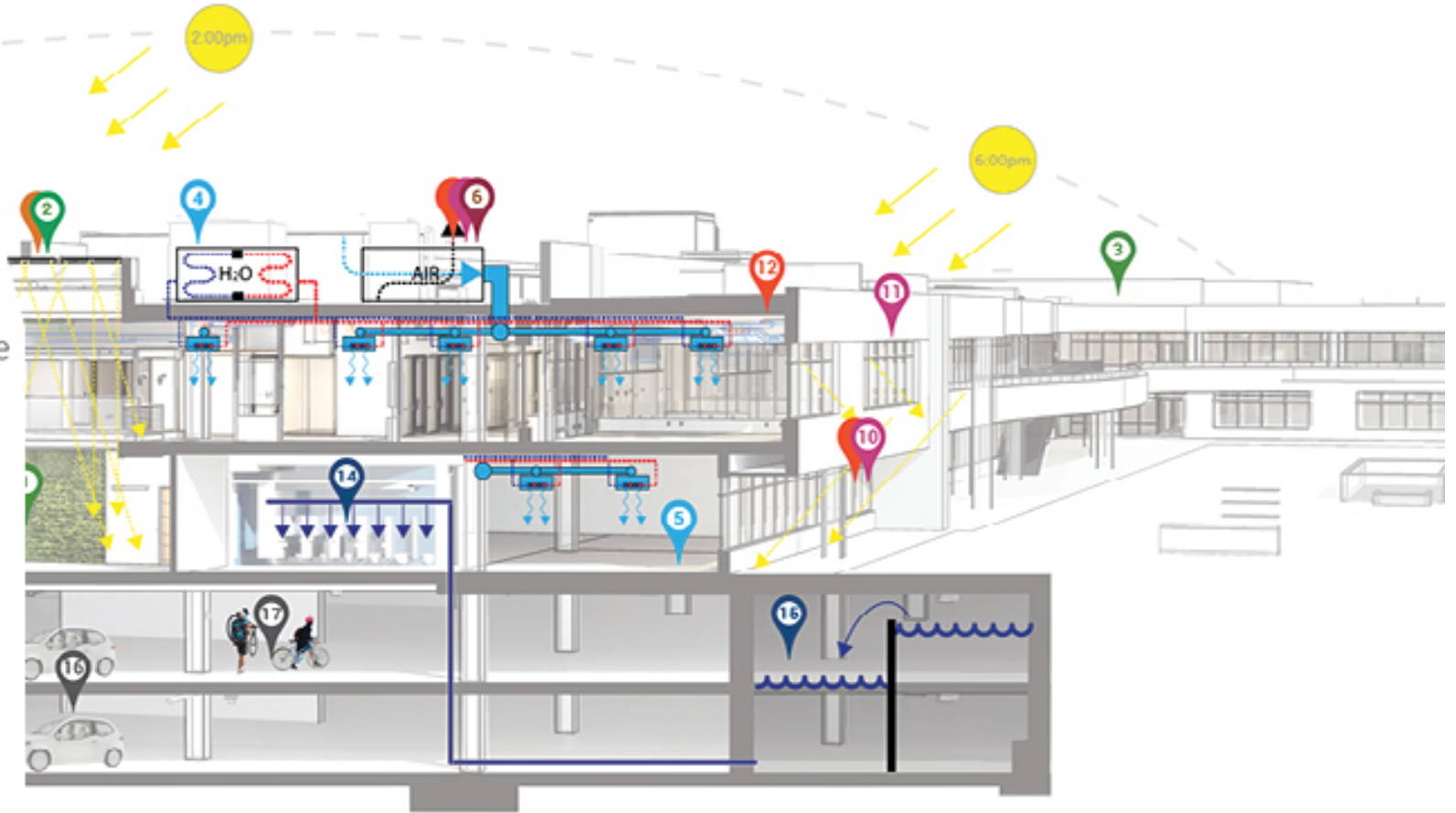
IAQ & Ventilation

4. Dedicated Outside Air System introduces 100% fresh and filtered outside air to the space - carbon filter slot is provided for future use. This system provides 2 times the ASHRAE 62 outside air.
5. Carpet and other healthy materials ensure good indoor air quality.



Acoustics

6. Chilled beam system keeps HVAC noise to a minimum.



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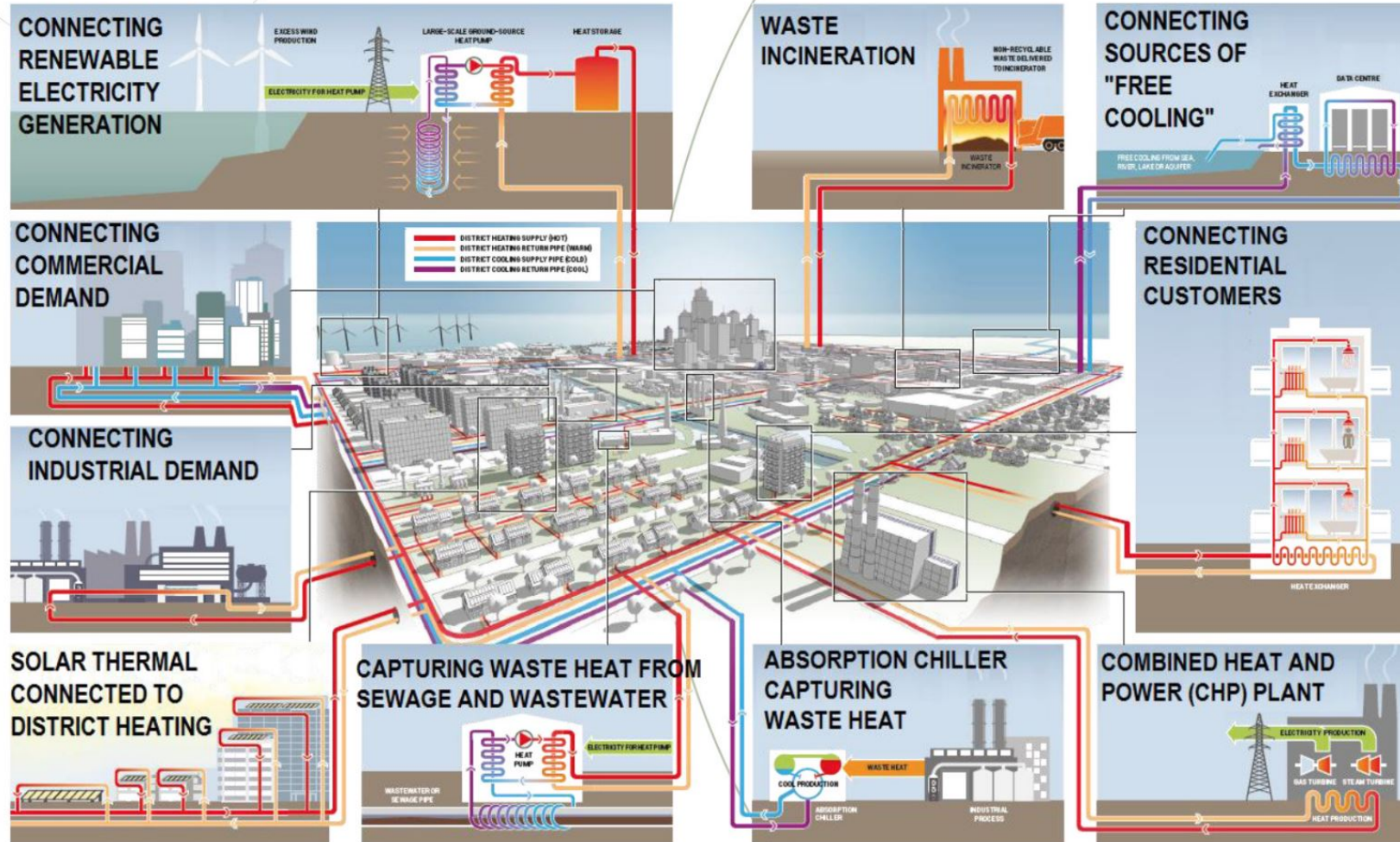


ENERGIAVARUSTUS



DISTRICT
ENERGY
IN CITIES

WHAT IS DISTRICT ENERGY?



LOKAALNE TAASTUVENERGIA



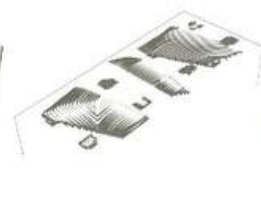
DIAGRAMS - SECOND MEMBRANE - ENERGY PRODUCTION SYSTEMS



VOIDED MASS



COMPOSITE SYSTEMS



REFLECTIVE SYSTEM



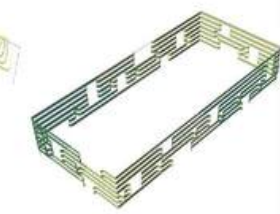
PHOTOVOLTIC
MEMBRANE



SOLAR HOT
WATER MEMBRANE



EPDM & ALGAE
MEMBRANE



ALGAE MEMBRANE
@ 25%, 60%, 80%

04 ENVELOPE SYSTEMS

Energia strategie

