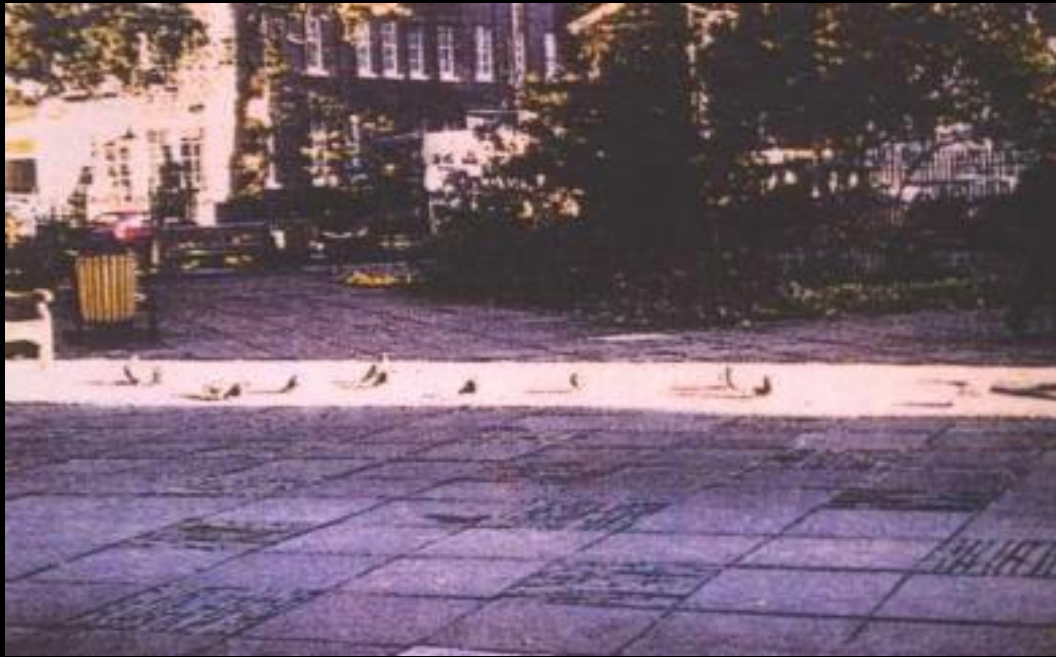


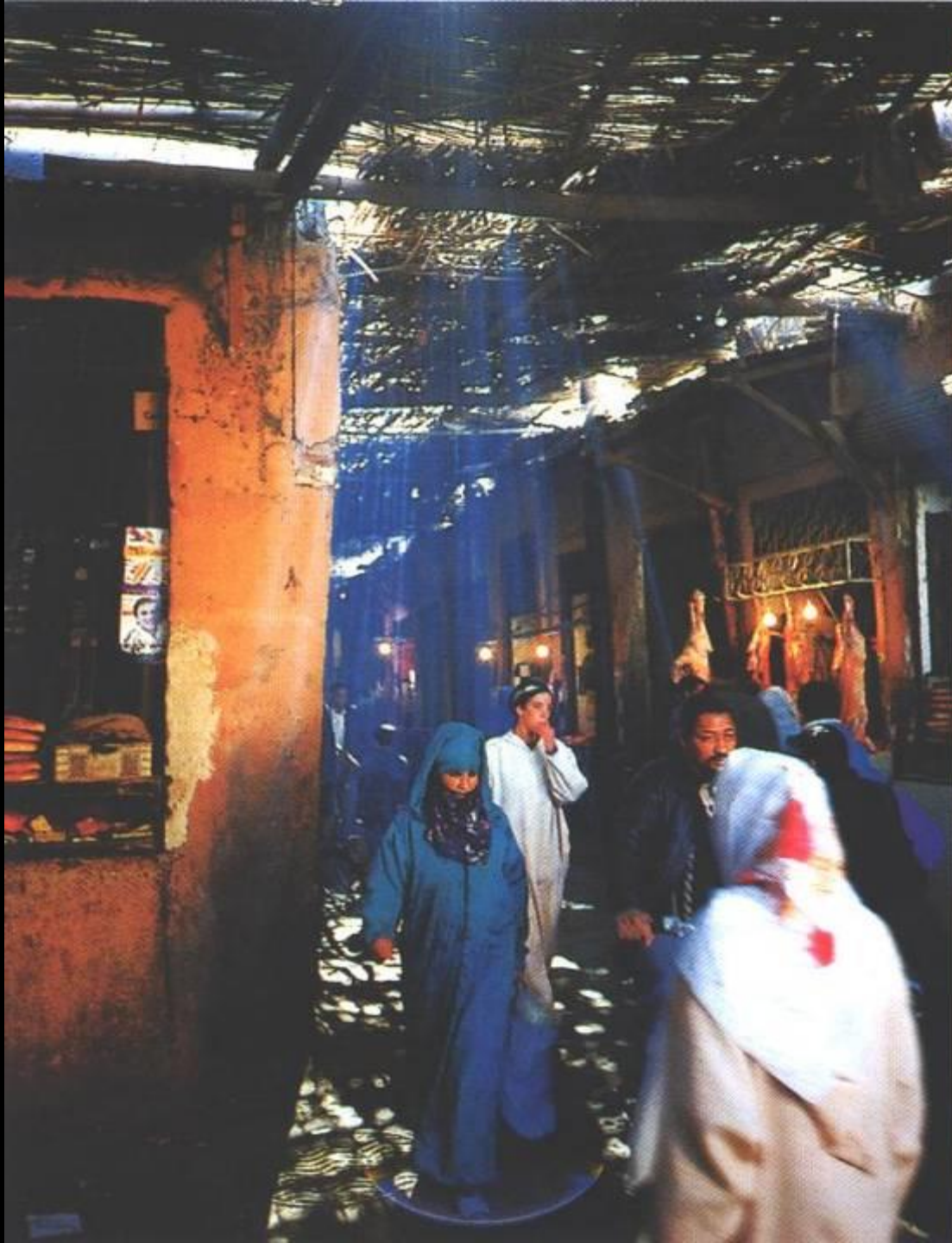
Importância da geometria da Insolação

Ambiente Construído



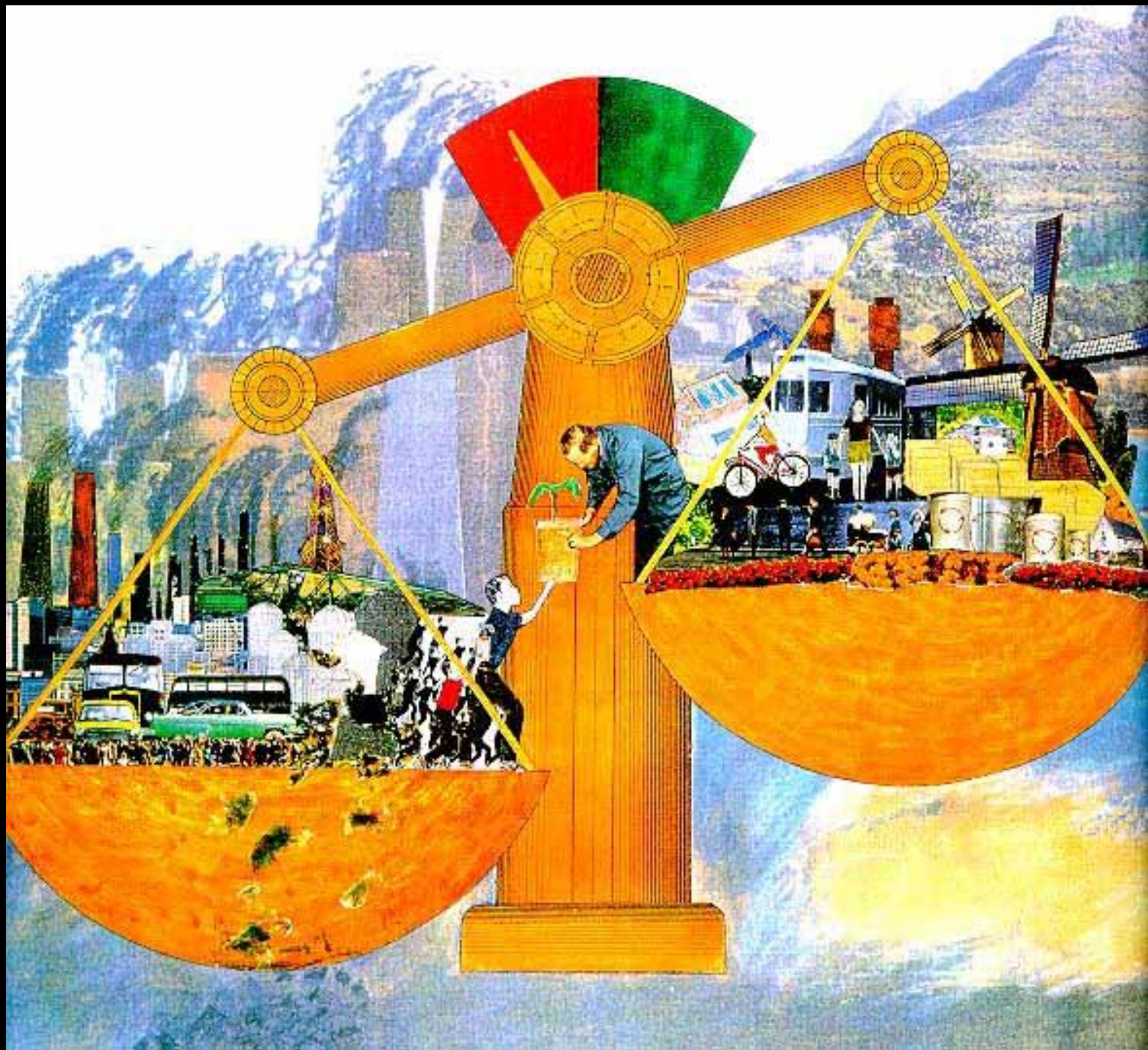
A busca pelo conforto...



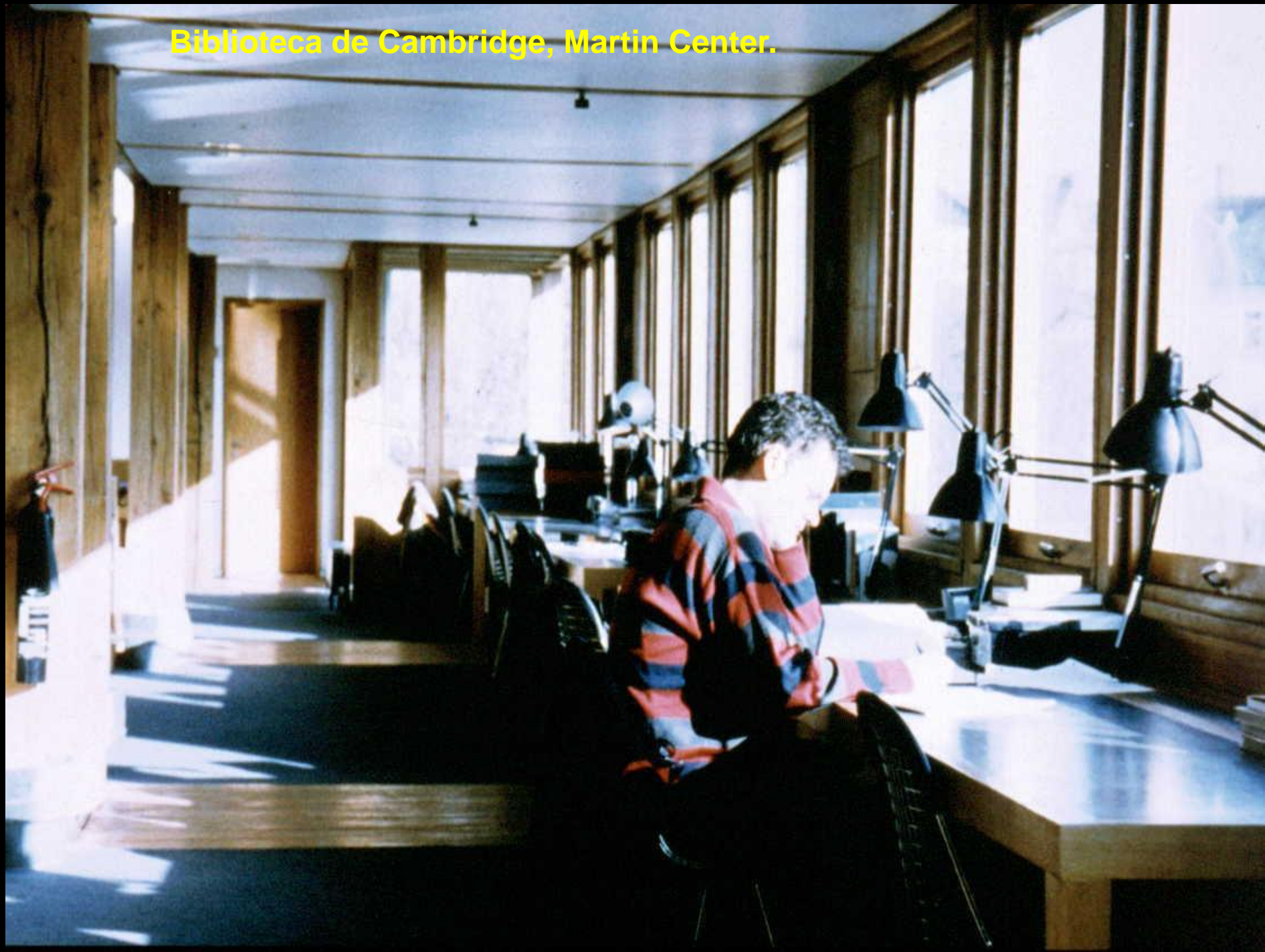


**Mercado
Marrocos**





Biblioteca de Cambridge, Martin Center.



OBJETIVOS

1

Busca de qualidade ambiental dentro dos edifícios e nos espaços abertos

2

Eficiência energética (máximo de qualidade ambiental com o mínimo de consumo de energia)

3

Redução do impacto ambiental dos edifícios e das cidades

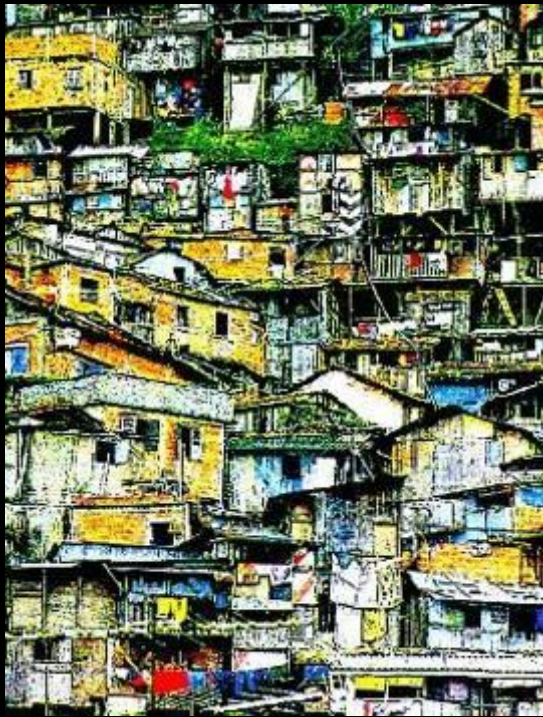
O IMPACTO AMBIENTAL DAS CIDADES

PERCENTUAL DA POPULAÇÃO MUNDIAL EM CIDADES

1900 - 10%

2000 - 50%

2050 - 75% (total: 10 bilhões)



Rio de Janeiro



- Bombaim



- São Paulo

2015 - previsão de 33 “megacidades” com mais de 8 milhões de habitantes e mais de 500 cidades com mais de 1 milhão de habitantes

Vitruvius, Leonardo da Vinci, Thomas Jefferson, Ebenezer Howard, Le Corbusier, Frank Lloyd Wright, Buckminster Fuller – Propuseram cidades ideais que deveriam ser criadas por sociedades ideais.....



MODELOS URBANOS INSUSTENTÁVEIS



Los Angeles, California



Phoenix,
Arizona

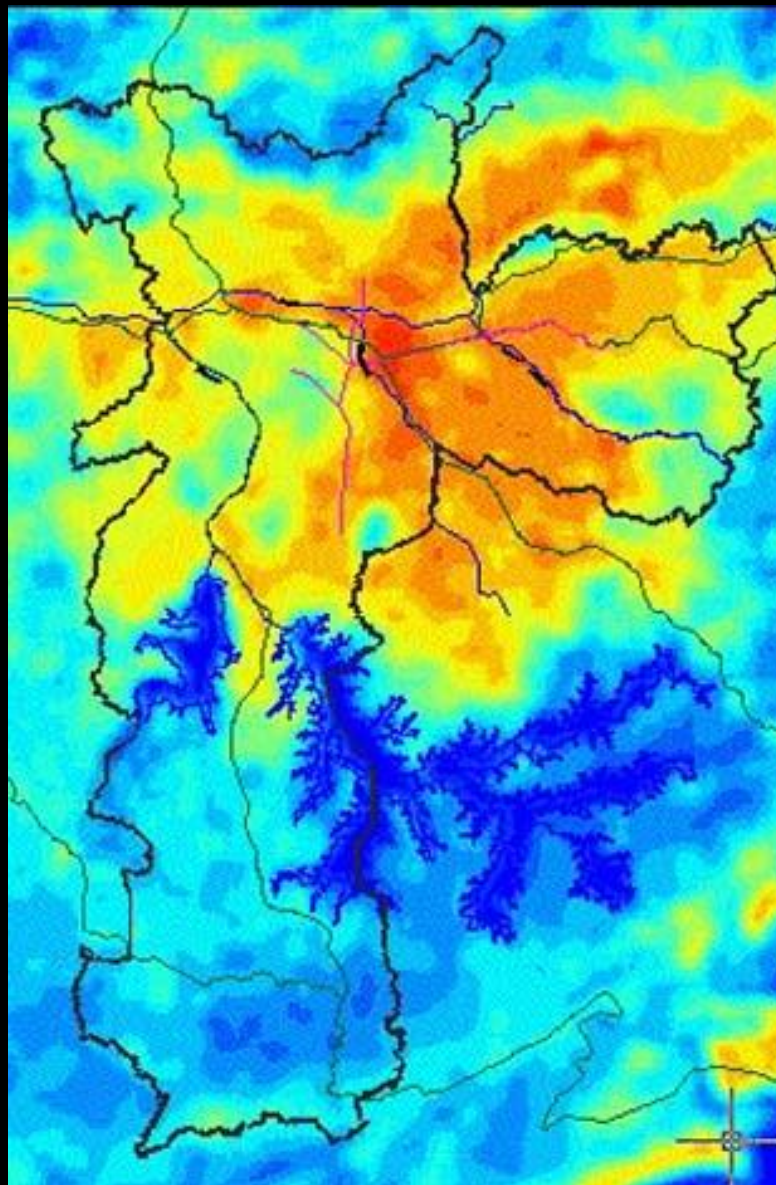


São Paulo



Mancha urbana da região metropolitana de São Paulo

São Paulo ~18 milhões de habitantes em 1600 Km²



Mapa de clima da região metropolitana de São Paulo

DENSIDADE CONSTRUÍDA

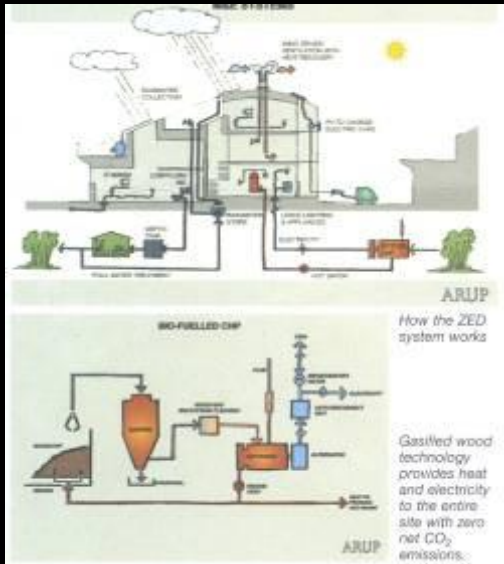




Bairro Solar
Freiburg, Alemanha
Arq. Rolf Disch

Bedzed

100Km de Londres

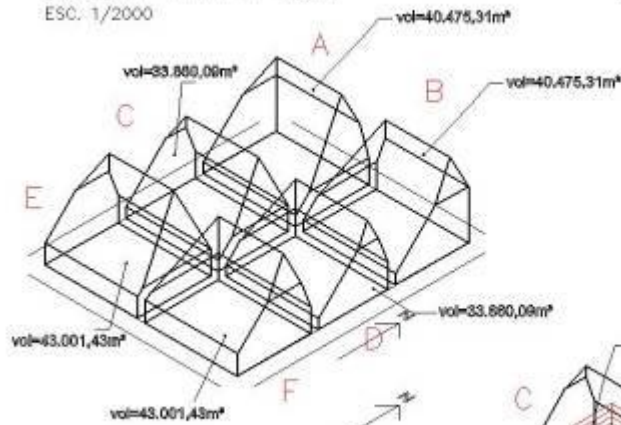


ion for
g



QUADRA 120m X 100m

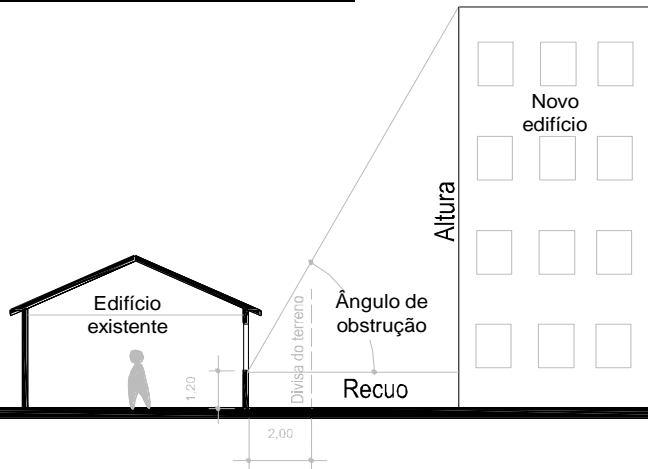
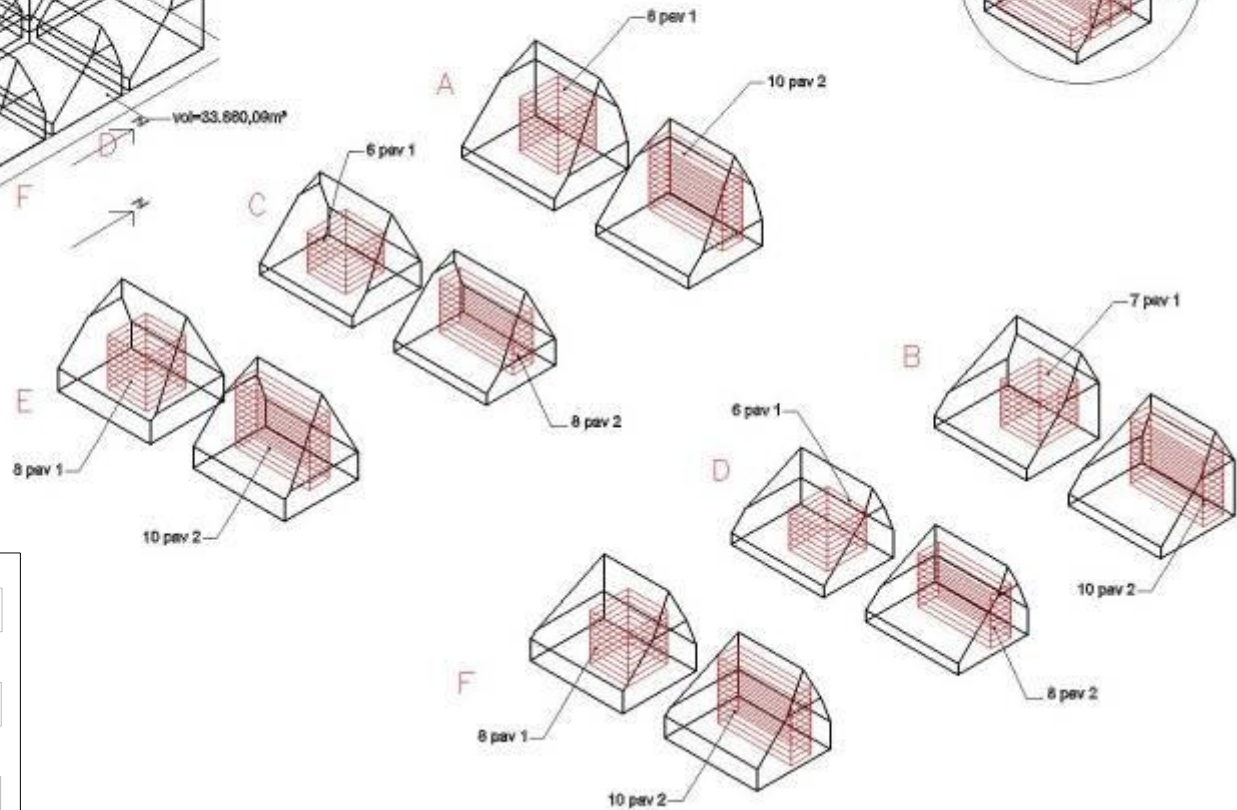
ESC. 1/2000



Pav 1 - 20m x 20m
A = 400,00m²

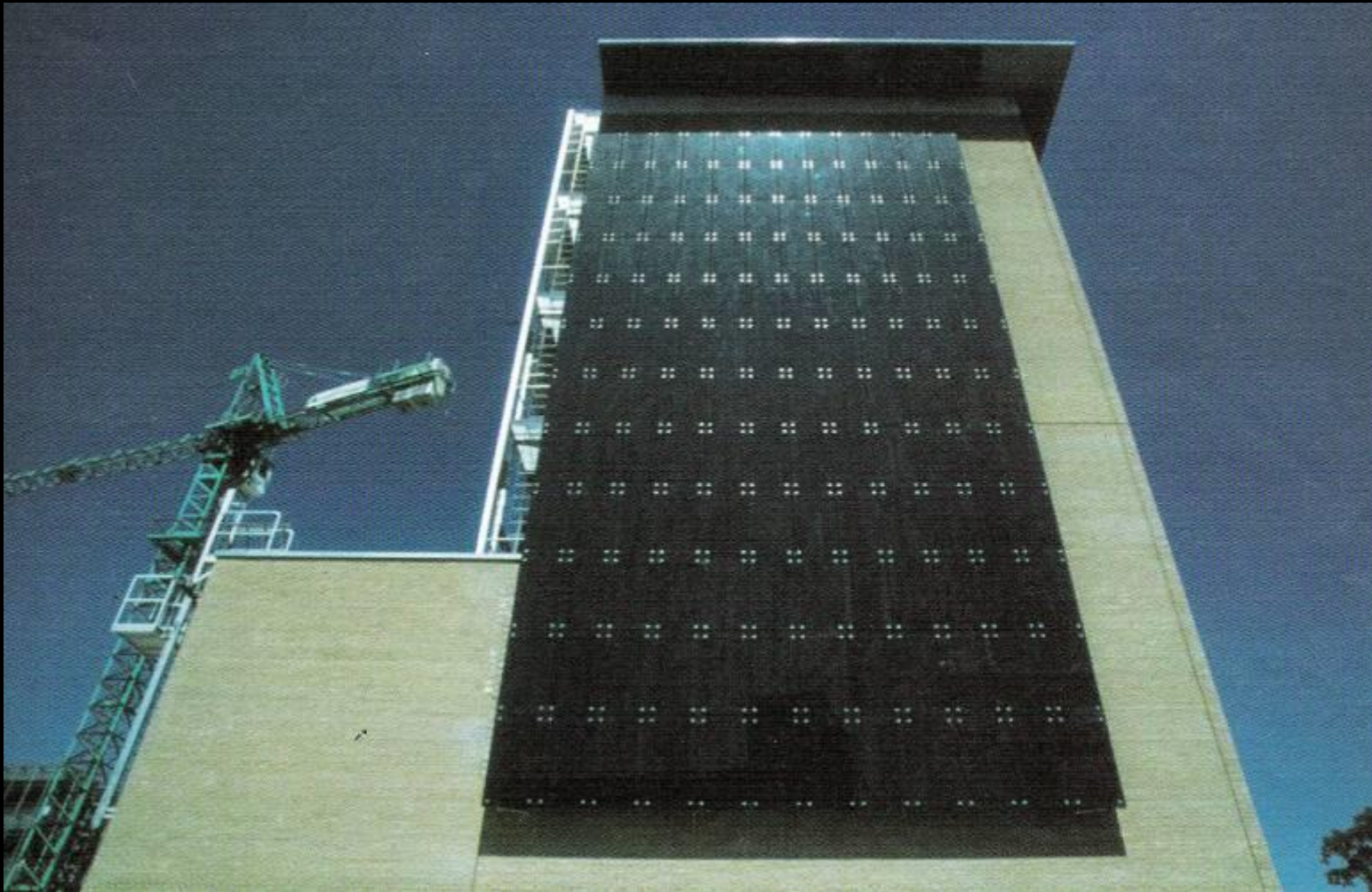


Pav 2 - 38m x 10,60m
A = 399,00m²



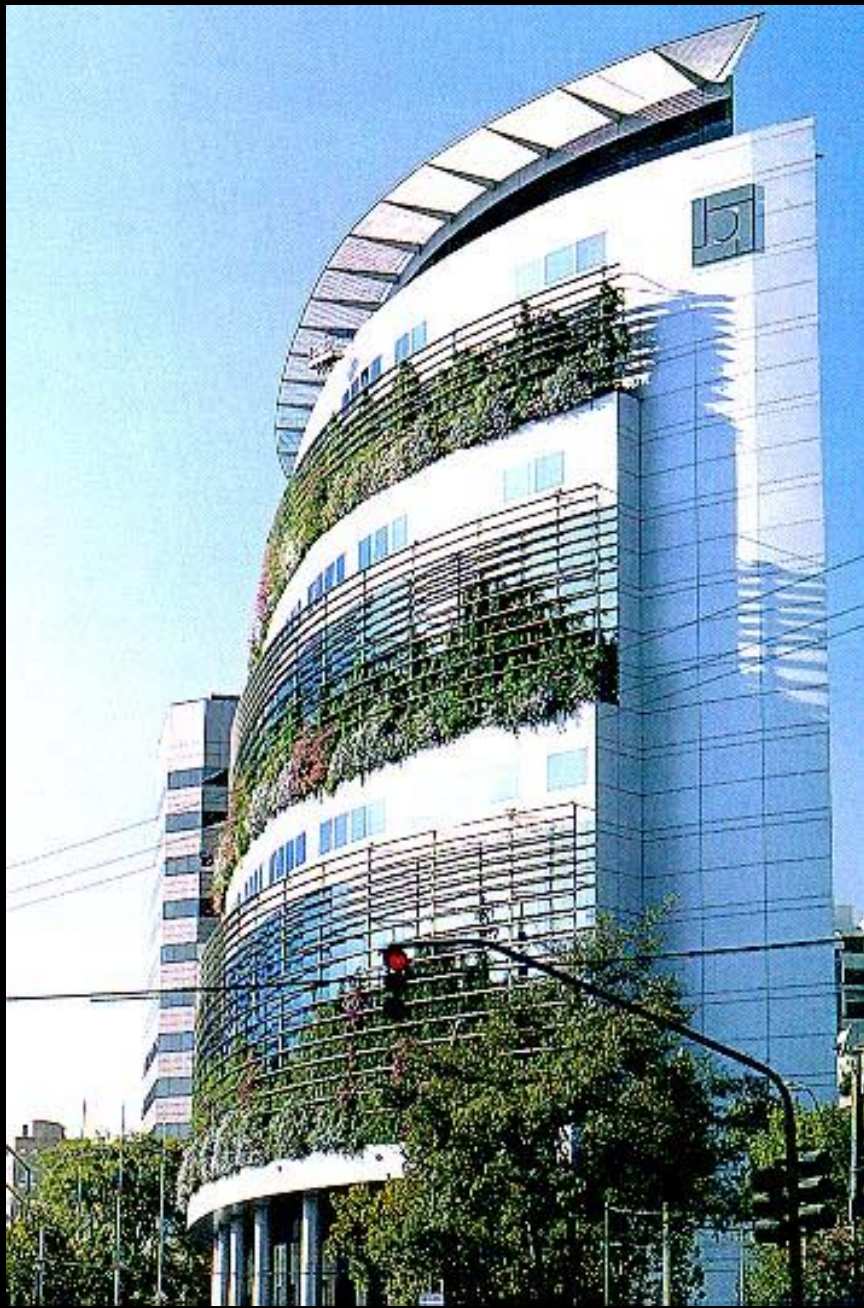
Acesso solar em áreas urbanas
Mestrado Rafael Brandão



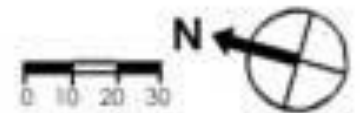




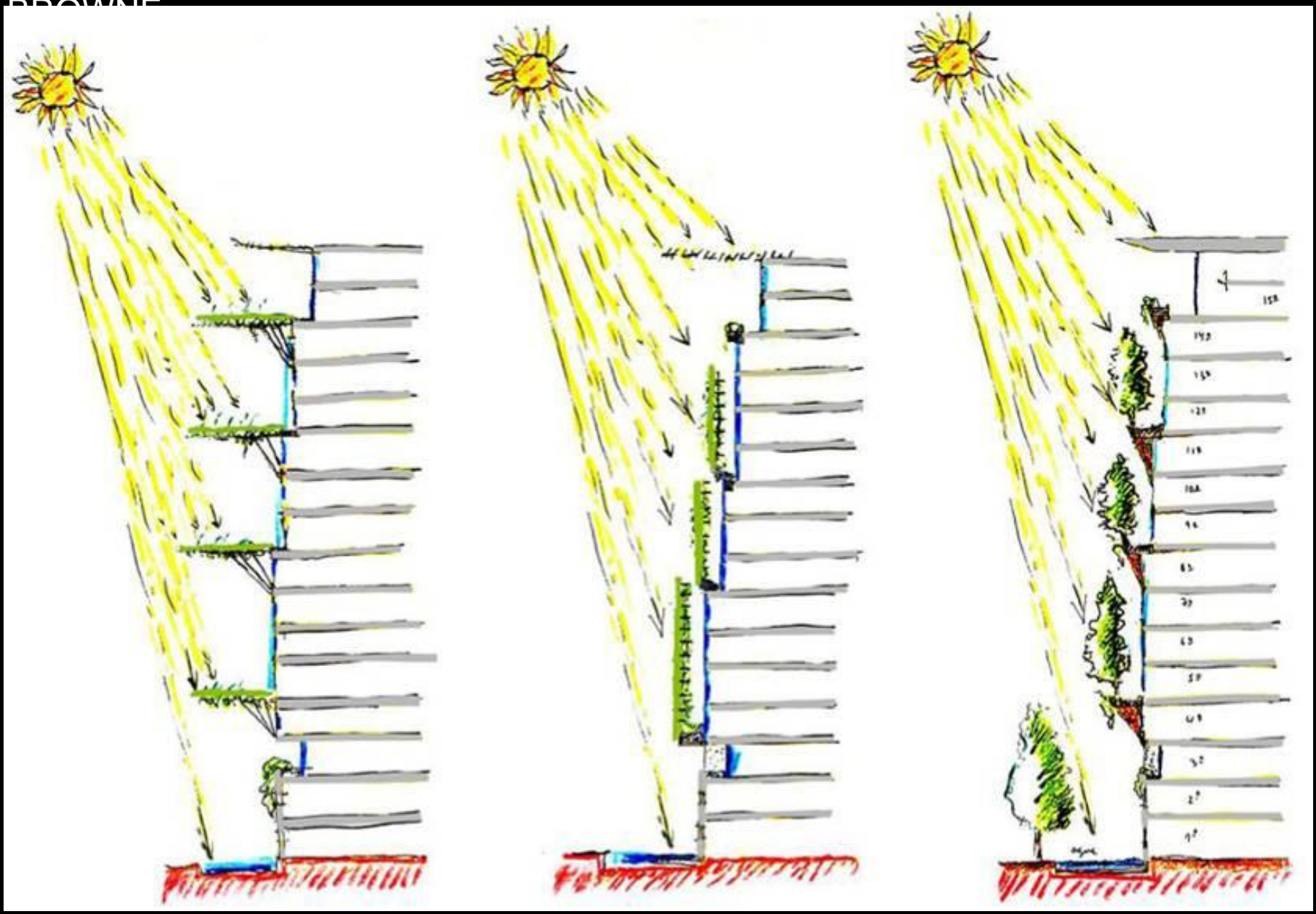




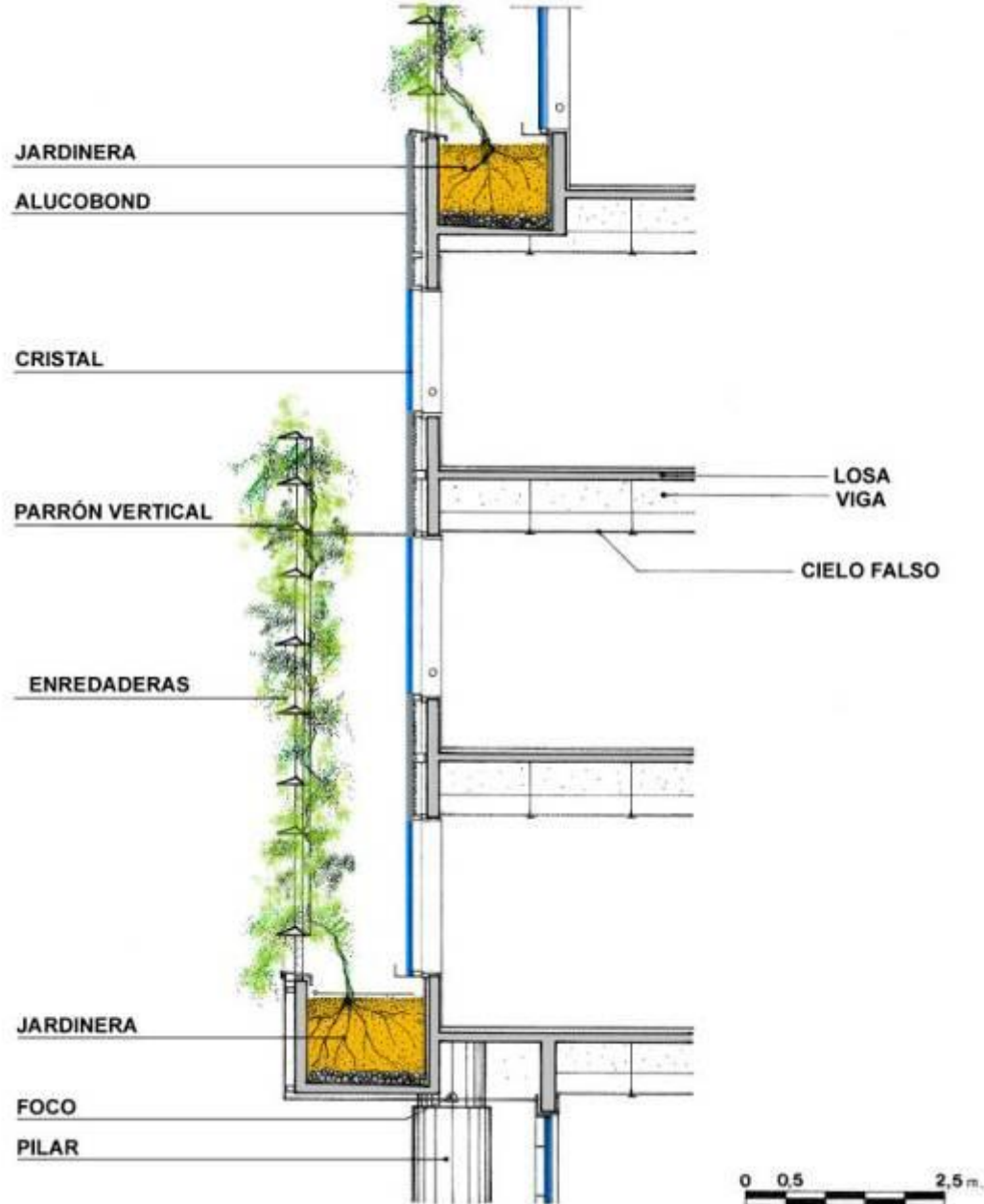
EDIFICIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



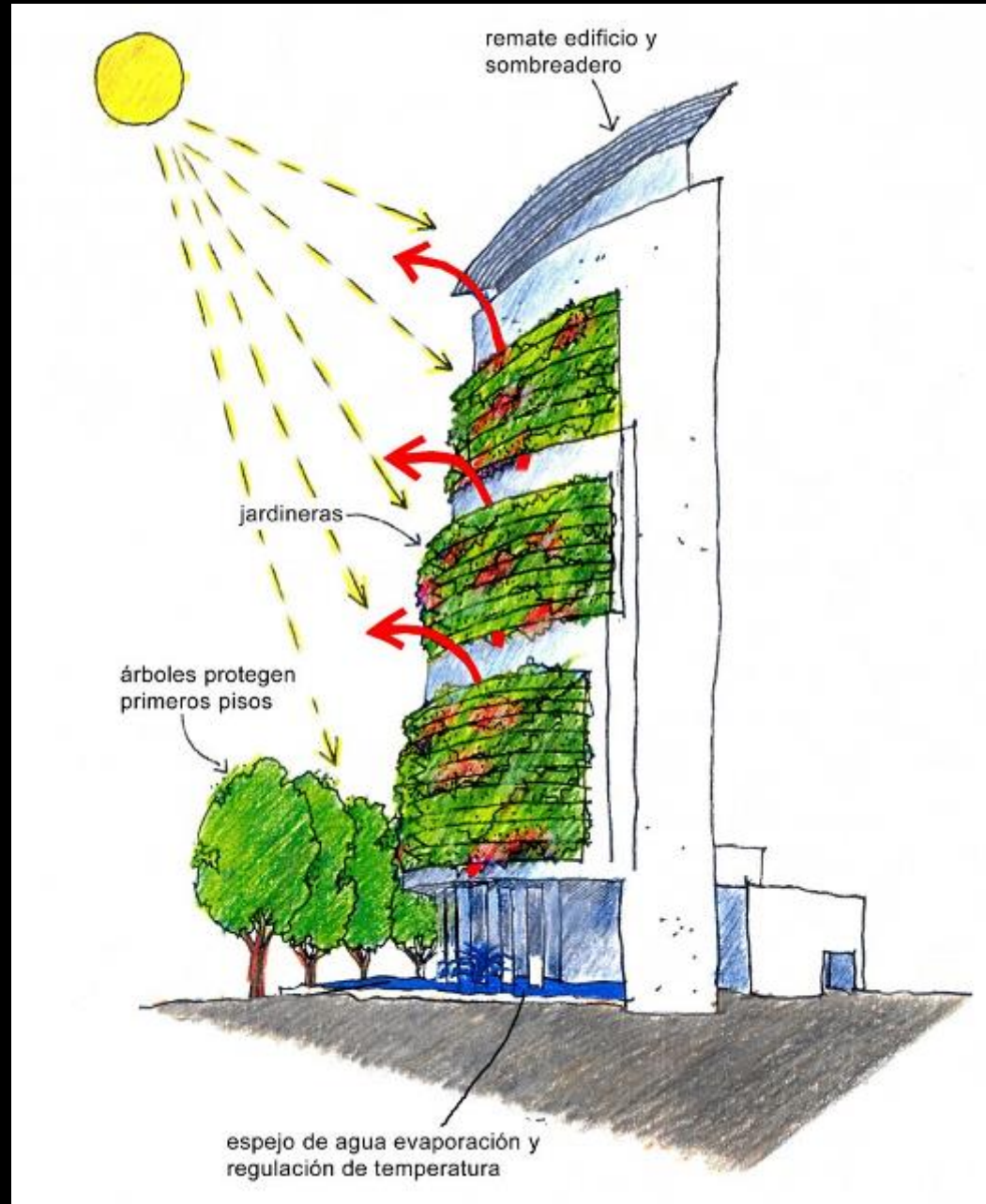
EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



EDIFICIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE



Inverno



Verão

EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE

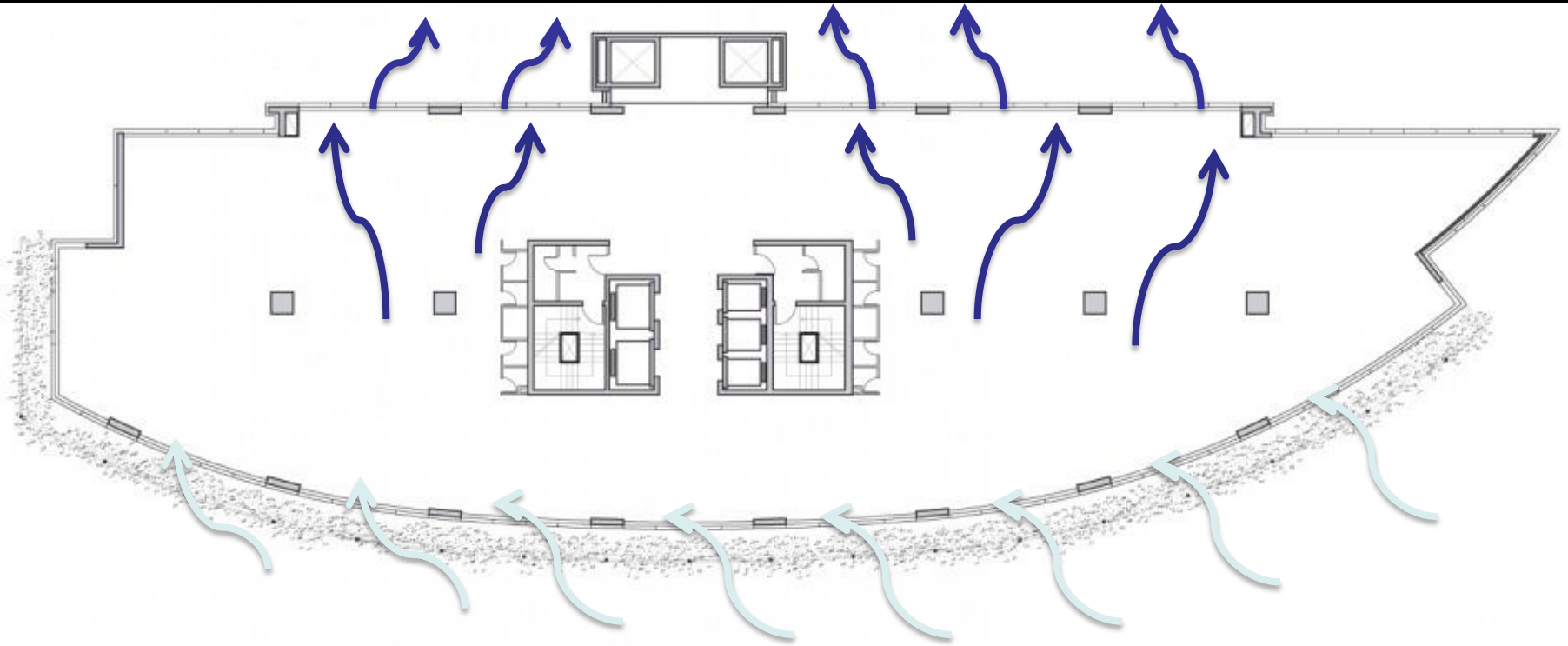


Primavera



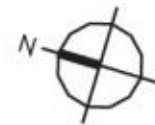
Verão

EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



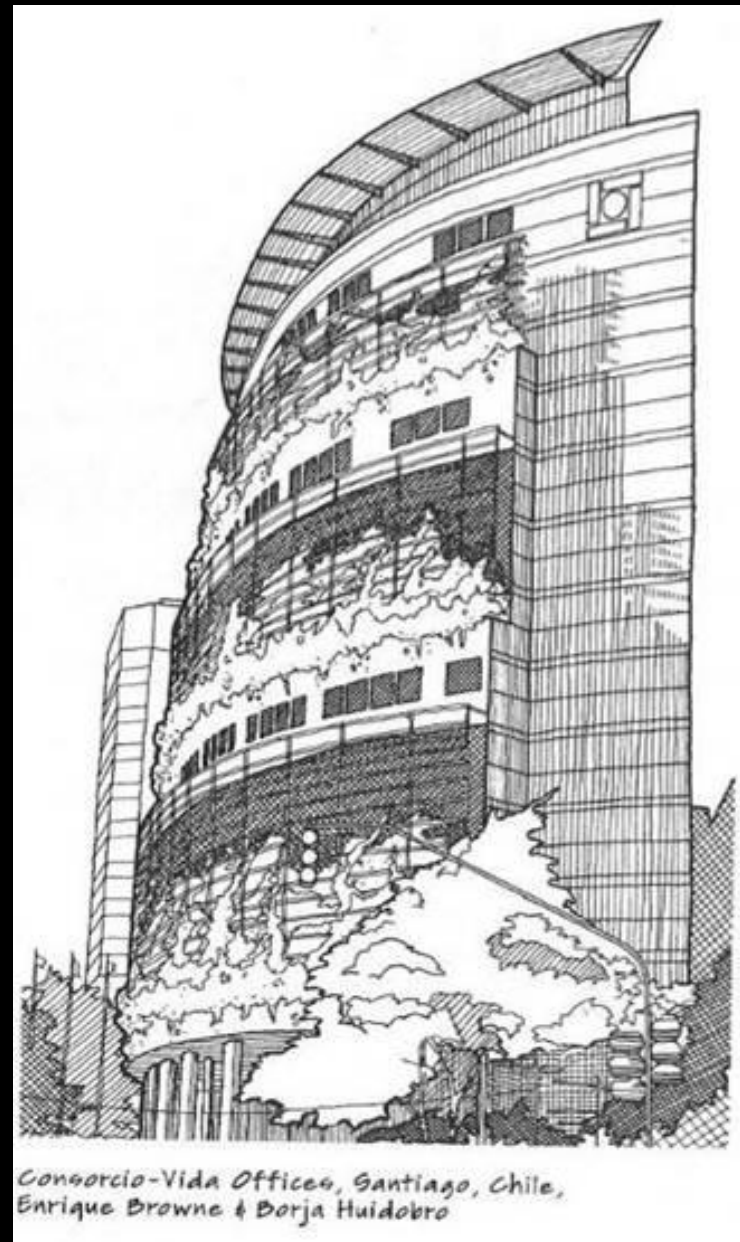
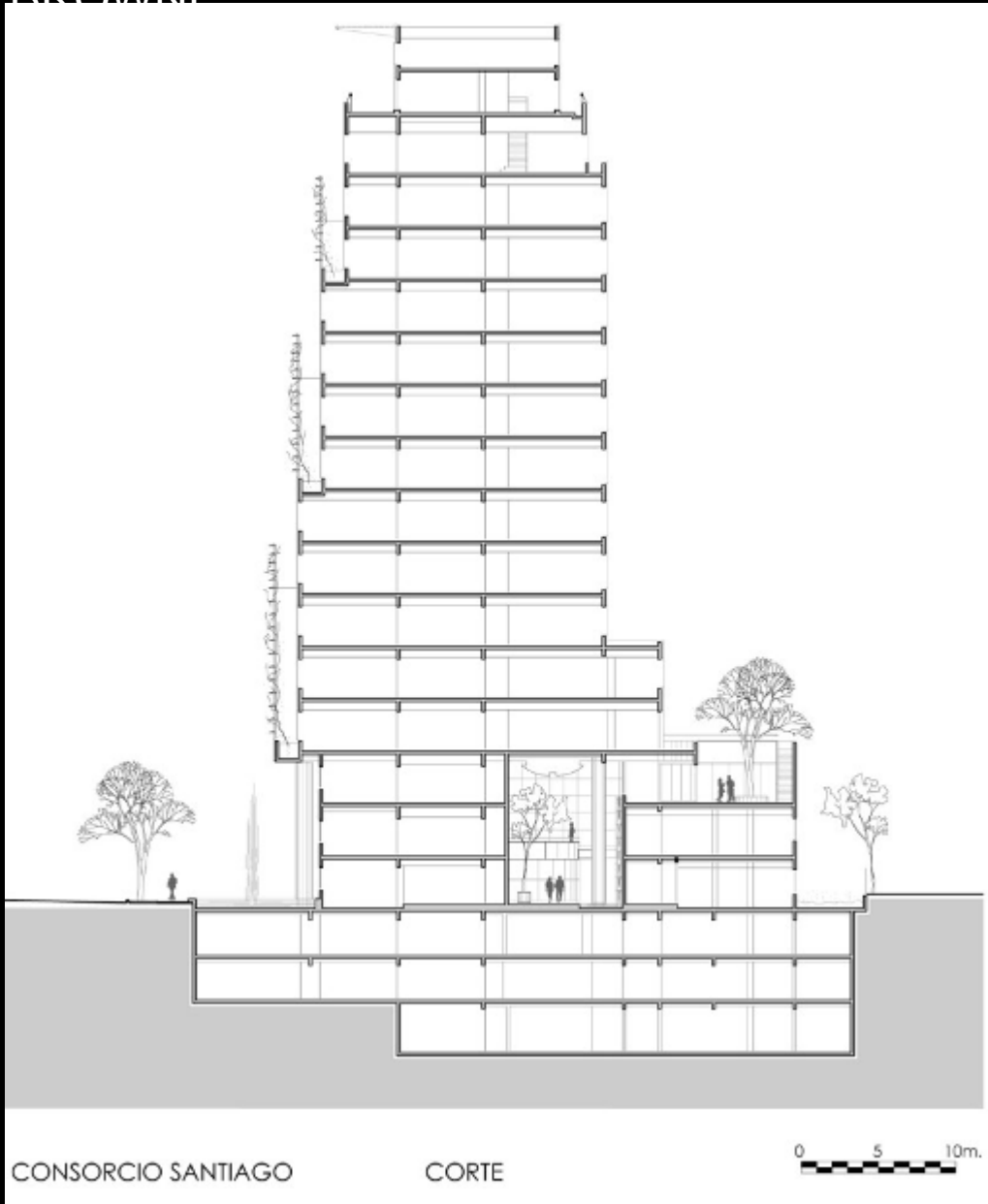
CONSORCIO SANTIAGO

PLANTA NIVELES 5 - 6 - 7 - 8

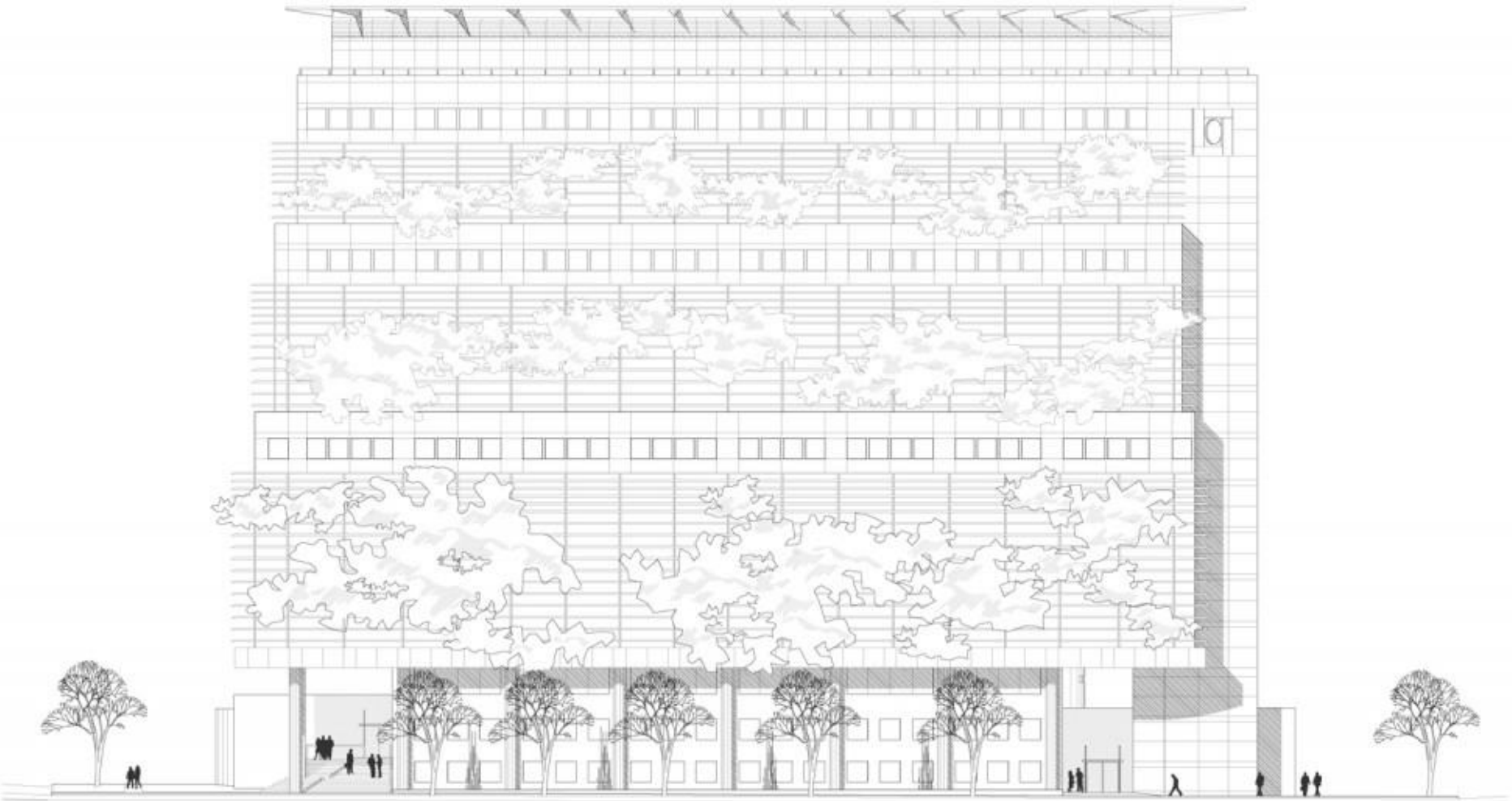


0 1 5 m.

EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



CONSORCIO SANTIAGO

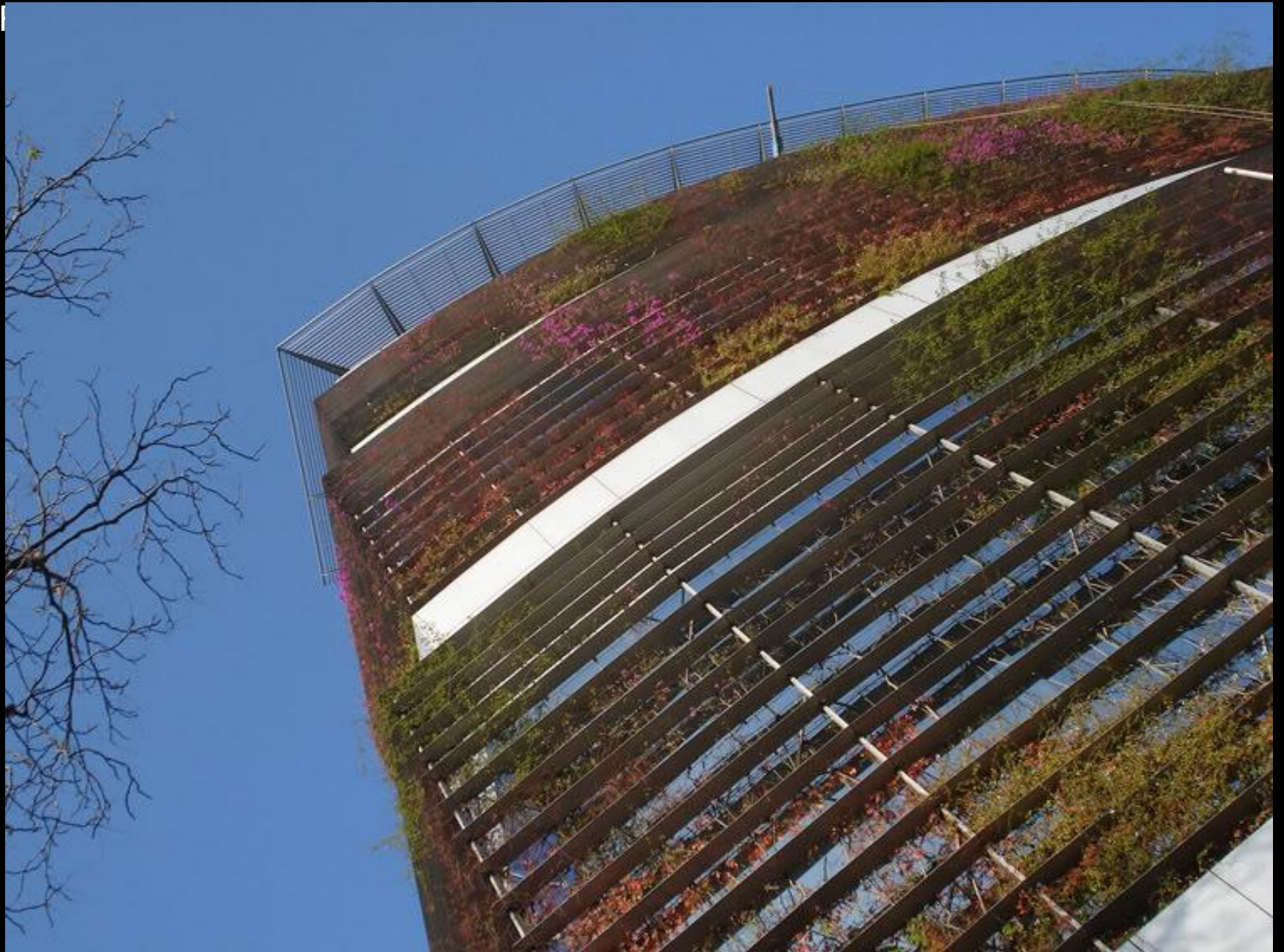
ELEVACION PONIENTE



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BROWNE



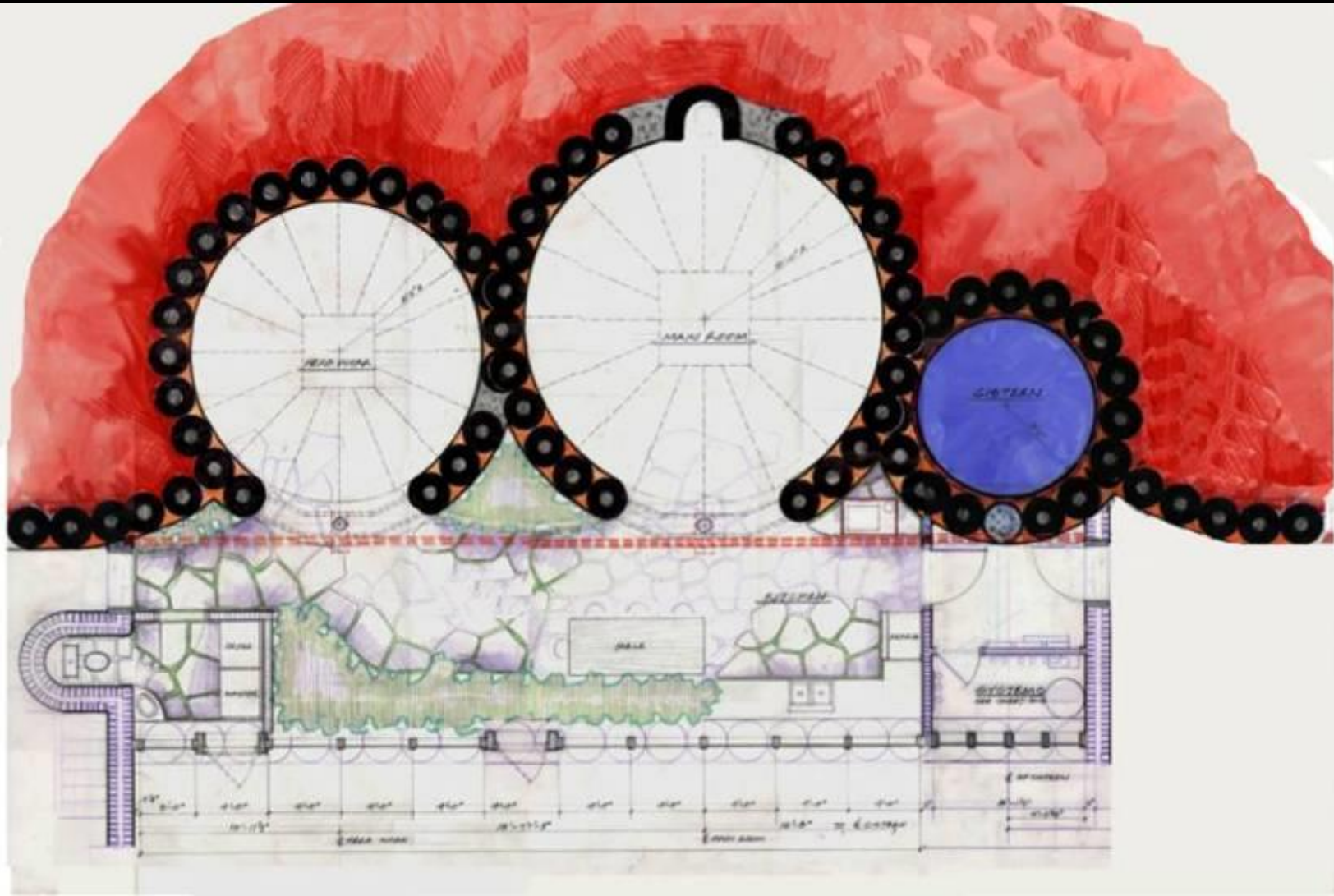
EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE BI



EDIFÍCIO CONSÓRCIO EM SANTIAGO, CHILE – ENRIQUE

E





EARTHSHIP
FOR



SOLAR SURVIVAL
ARCHITECTURE



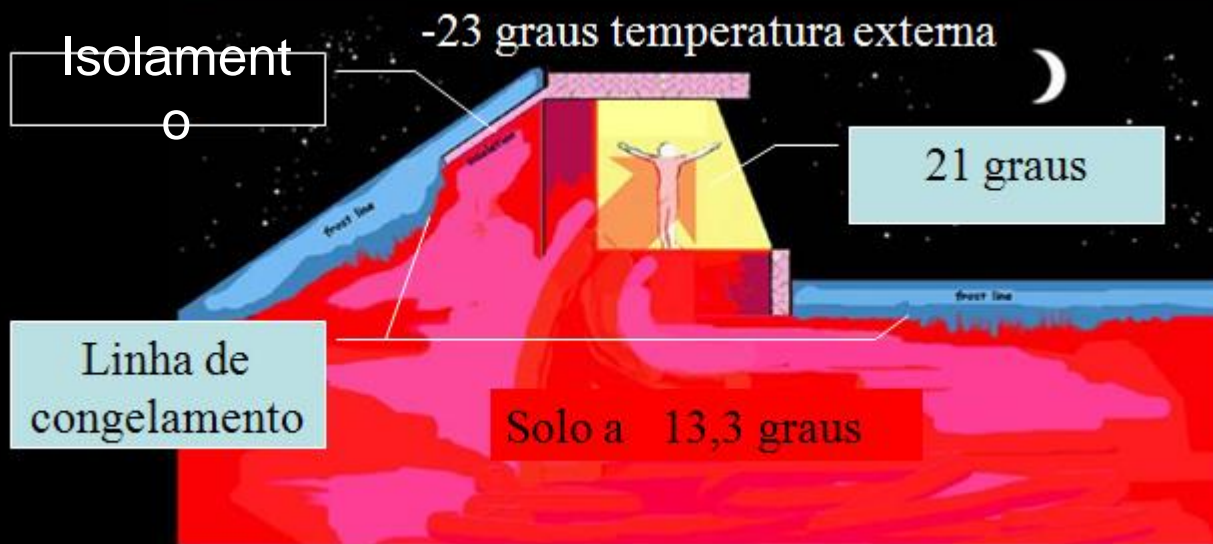




ARMAZENAMENTO DE CALOR

Armazenamento de Calor

A casa funciona como uma bateria. No caso do acúmulo de calor, ele é projetado para absorver, através dos materiais e da espessura de suas paredes, calor recebido durante o dia e refrigeração suficiente para obter uma temperatura independente da temperatura do ambiente externo ao longo da noite.



CONCETTO

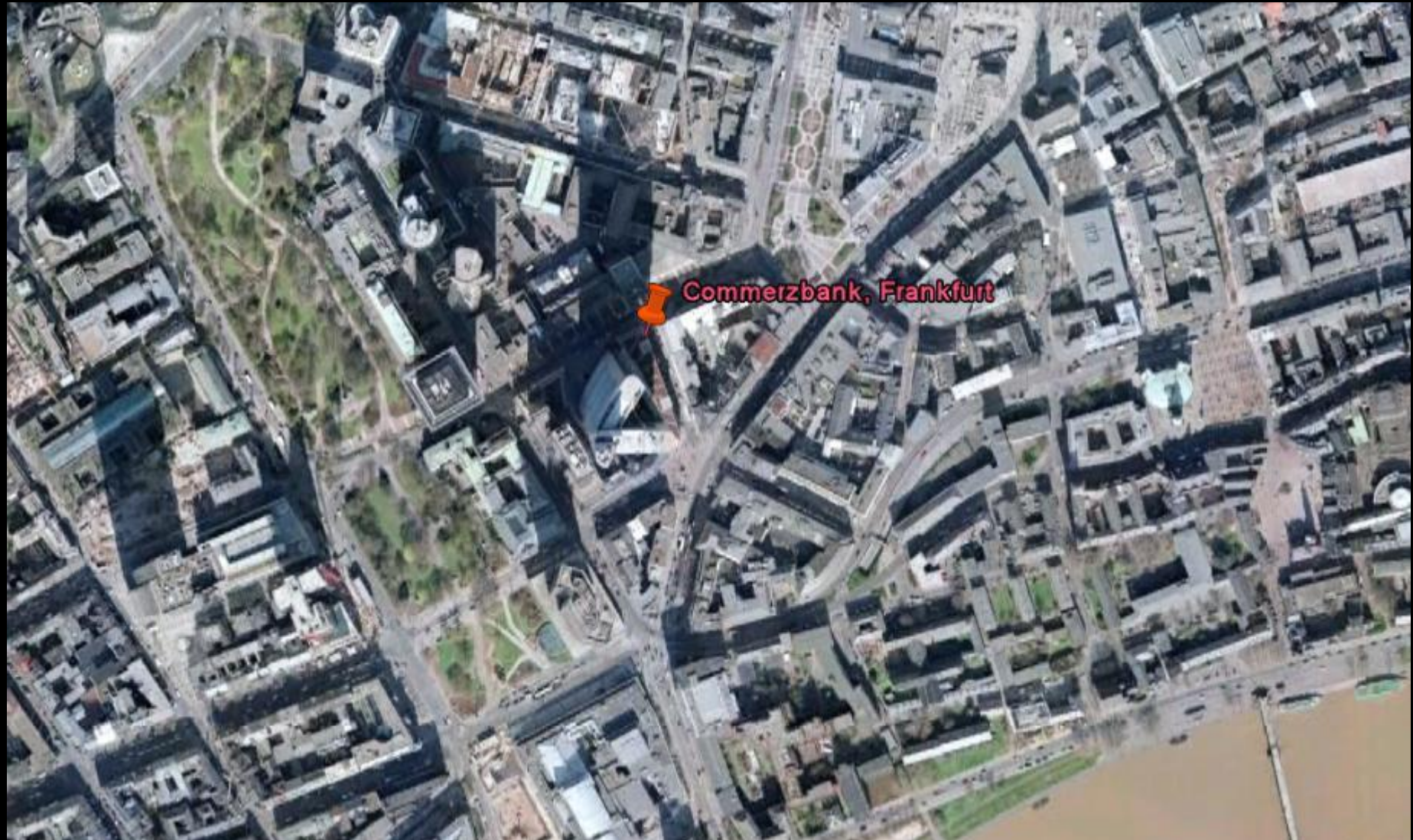


INFORMAÇÕES GERAIS

- . Localização: Frankfurt, Alemanha
- . Arquiteto: Norman Foster and Partners
- . Construção: 1994-1997
- . Área Total: 120.000 m²
- . Pavimentos: 56
- . Altura: 258 m
- . Uso: Escritórios, Residências e Restaurantes
- . Primeira torre ecológica de escritórios do mundo

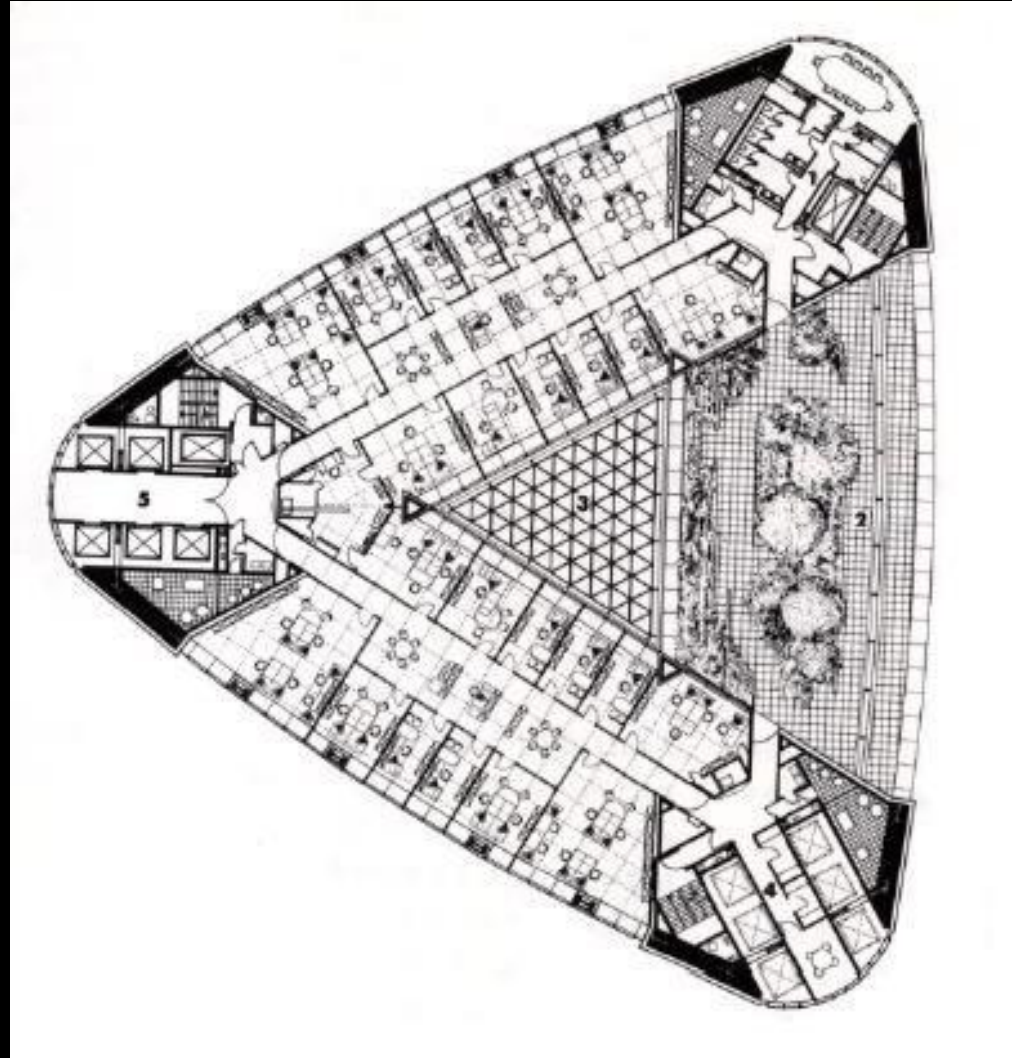


IMPLANTAÇÃO



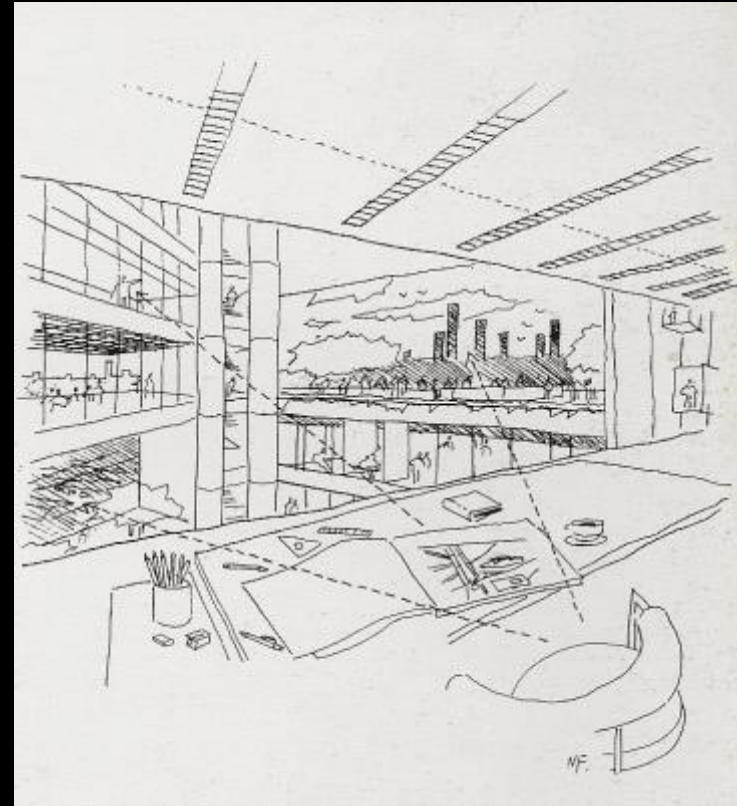
PAVIMENTO TIPO

- . Planta triangular (60m de lado), com três pétalas, que formam os andares de escritórios
- . O centro do edifício é aberto e dá para o átrio central
- . O átrio central é livre de estruturas
- . Nos cantos ficam núcleos de serviço e circulação



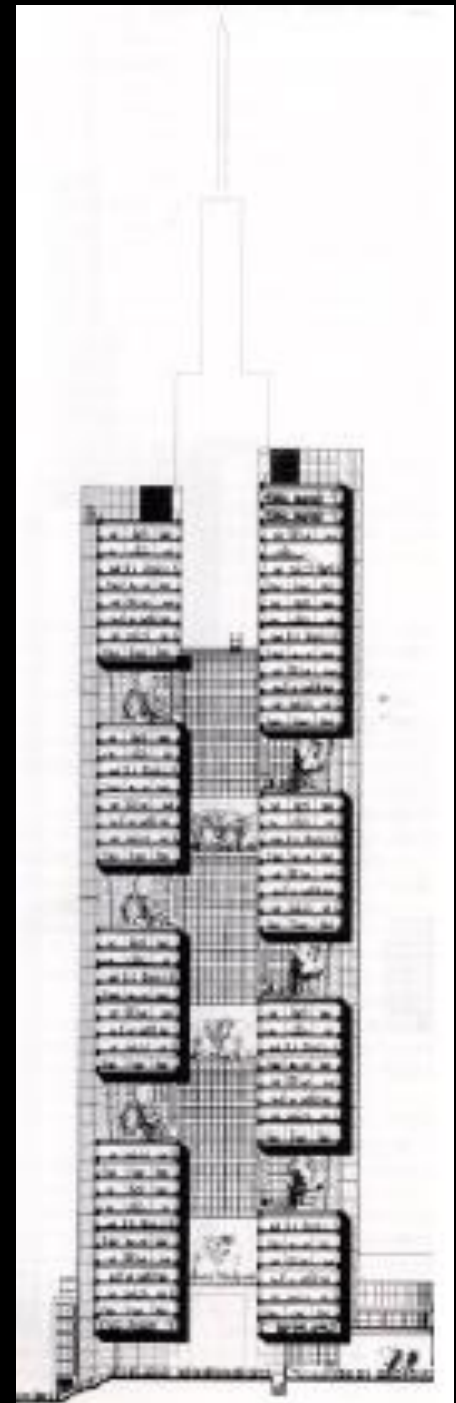
POPULAÇÃO X EDIFÍCIO

O projeto visa uma maior ligação da população local com o edifício



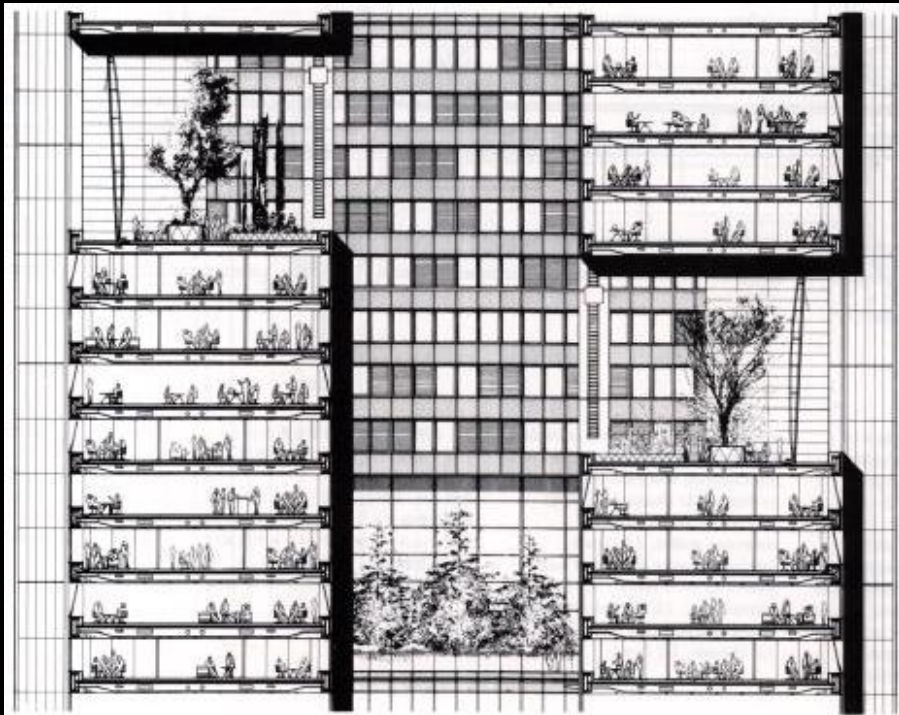
ILUMINAÇÃO

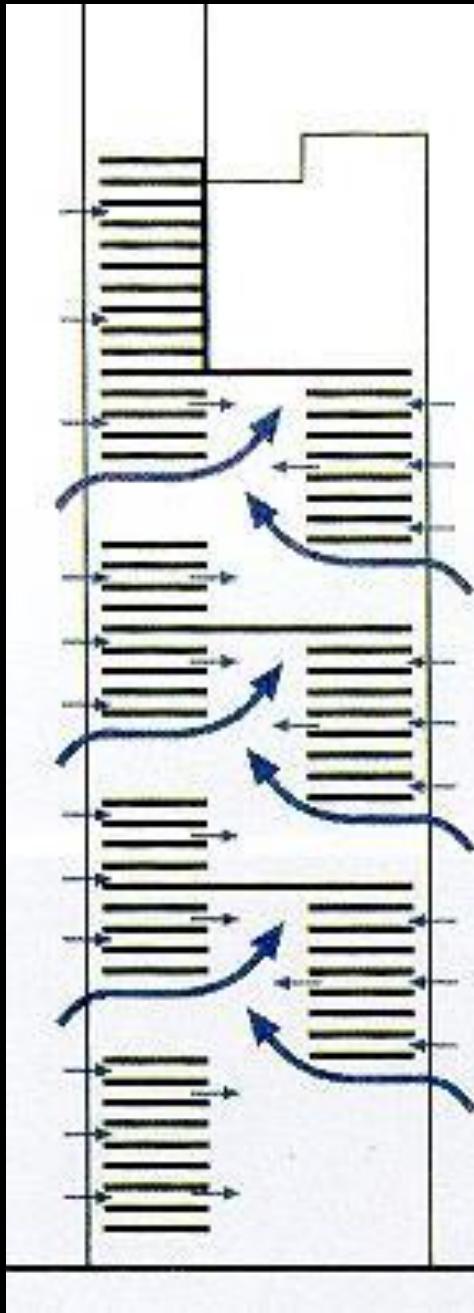
- . Leis rigorosas na Alemanha para os ambientes de trabalho a fim de criar uma arquitetura sustentável
- . Todos os escritórios devem possuir janelas para proporcionar iluminação natural e uma vista para o exterior
- . Sistema de janelas com controle do ocupante do escritório, o que diminui o consumo de energia pela metade
- . Pelo fato de apresentarem fachadas interiores e exteriores, as interiores necessitaram de ampla fonte de luz, de acordo com a lei alemã. Isso é alcançado o dia todo com os jardins rotacionados
- . O edifício é iluminado a noite por um sistema de luzes amarelas, projetado por Thomas Ende



JARDINS INTERNOS: 'SKY-GARDENS'

- . Ocupam quatro andares em cada face da torre
- . Em 9 níveis diferentes o átrio abre um de seus 3 lados





Os jardins funcionam como chaminés de ventilação natural para os escritórios voltados para o átrio central, além de permitir a entrada de luz natural. Funcionam como praças de relaxamento para as pessoas que trabalham no local. Cada um deles tem vegetação típica da América do Norte, da Ásia ou do Mediterrâneo, conforme a sua orientação.















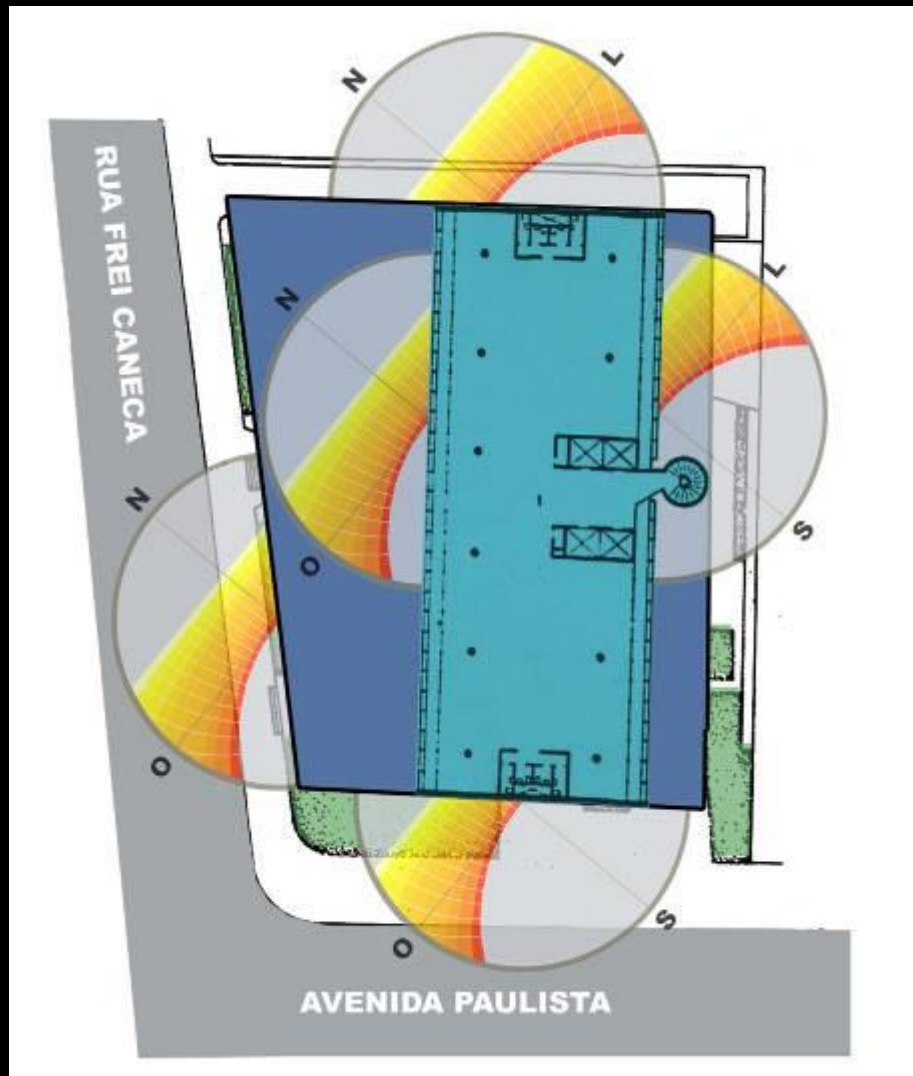
Banco Sul Americano
Arq. Rino Levi











Estudo de insolação das Fachadas (desenho Dominique Fretin)

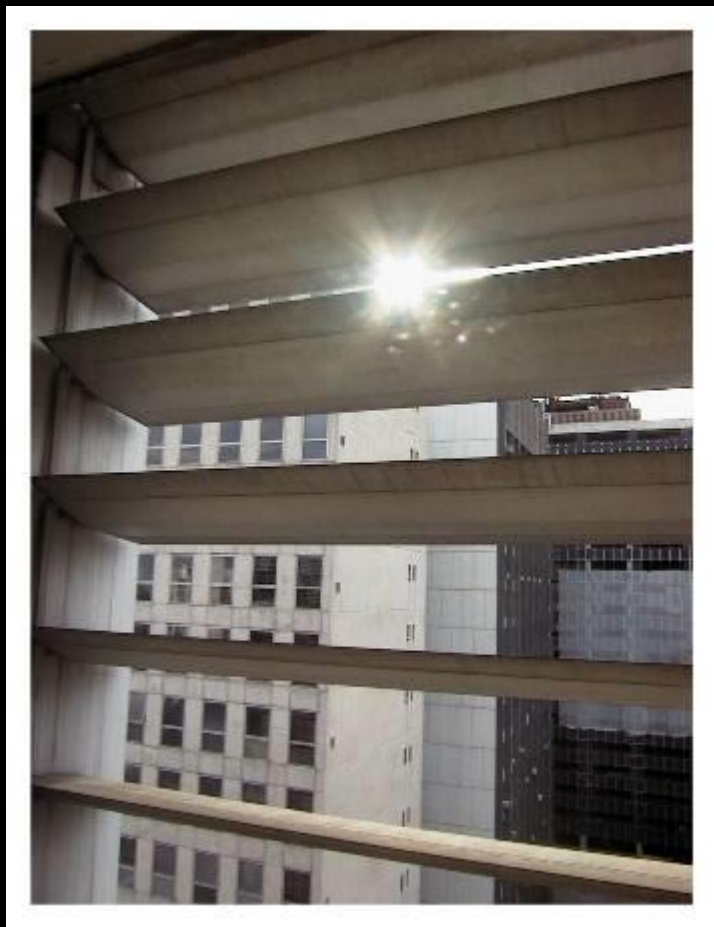


Foto do brise da fachada
Noroeste

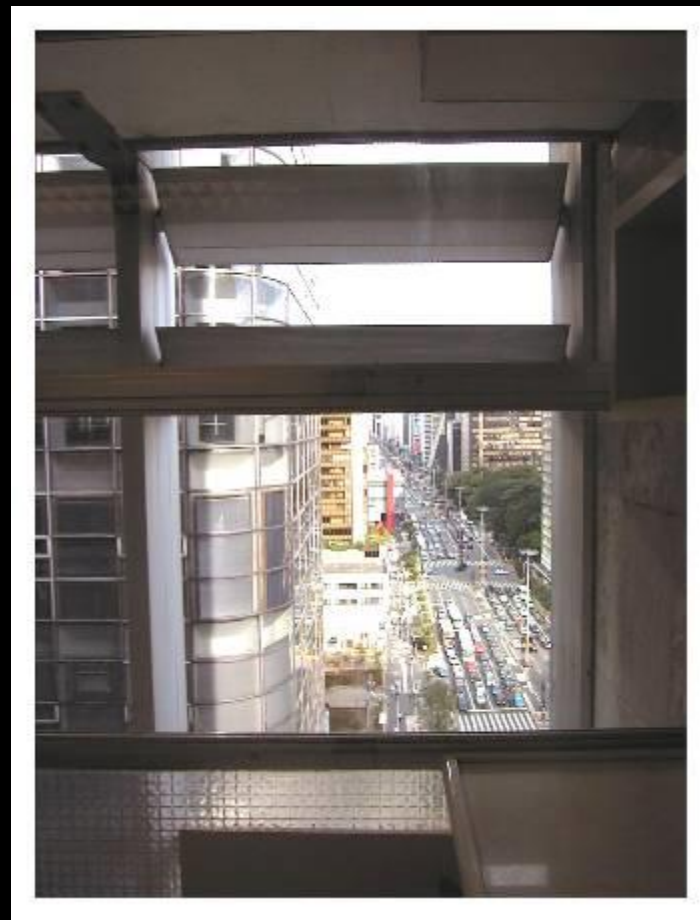


Foto do brise da fachada
Sudeste

PAREDE
NO

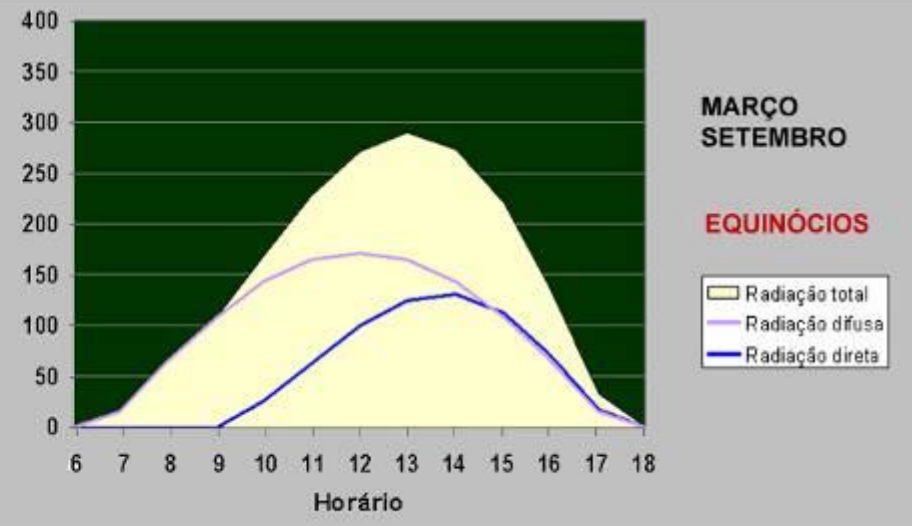
		RADIÇÃO INCIDENTE W/ m2		
		mês de março / setembro EQUINÓCIOS		
		FORA DA ATMOSFERA	SOLO	
	TOTAL	direta	difusa	total
6	0	0	0	0
7	321	0	60	60
8	621	0	118	118
9	878	0	165	165
10	1.075	0	202	202
11	1.199	22	226	248
12	1.241	73	234	307
13	1.199	114	226	340
14	1.075	134	202	336
15	878	128	165	293
16	621	98	118	216
17	321	51	60	111
18	0	4	0	4

TOTAIS DIÁRIOS

626	1.776	2.402
-----	-------	-------

RADIÇÃO SOLAR INCIDENTE EM PAREDES VERTICAIS ORIENTADAS PARA O NOROESTE

Latitude 23°30' Sul São Paulo



PAREDE
SO

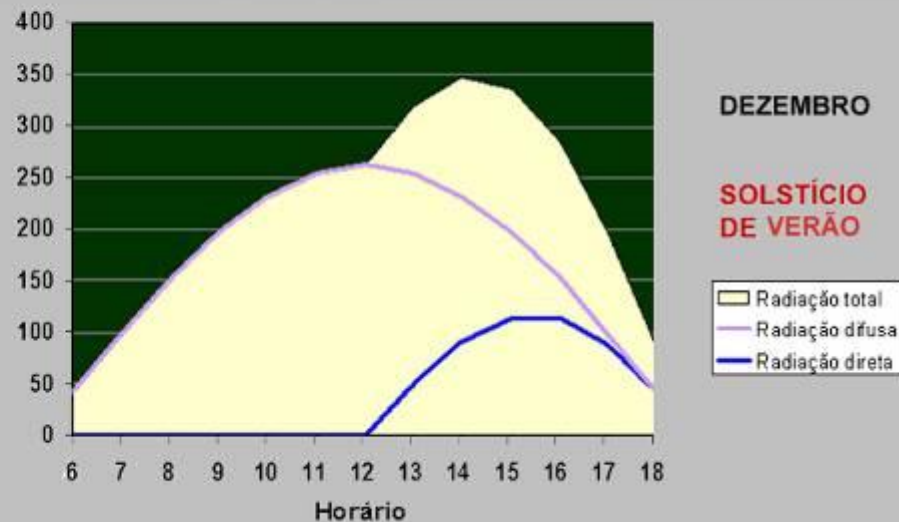
	RADIÇÃO INCIDENTE W/ m2				
	mês de dezembro VERÃO				
	FORA DA ATMOSFERA	SOLO			
TOTAL	direta	difusa	total		
6	214	0	41	41	
7	509	0	98	98	
8	784	0	151	151	
9	1.019	0	196	196	
10	1.200	0	232	232	
11	1.314	0	254	254	
12	1.353	0	262	262	
13	1.314	48	254	302	
14	1.200	90	232	322	
15	1.019	114	196	310	
16	784	113	151	264	
17	509	87	98	185	
18	214	41	41	82	

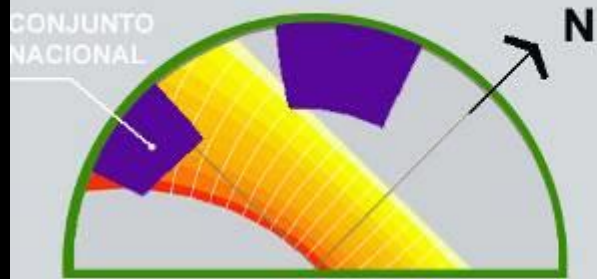
TOTAIS DIÁRIOS

494	2.206	2.700
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RADIÇÃO SOLAR INCIDENTE EM PAREDES VERTICAIS ORIENTADAS PARA O SUDOESTE

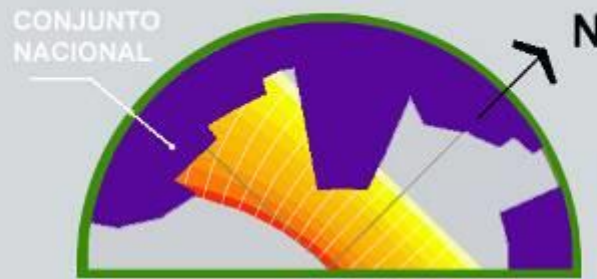
Latitude 23°30' Sul São Paulo





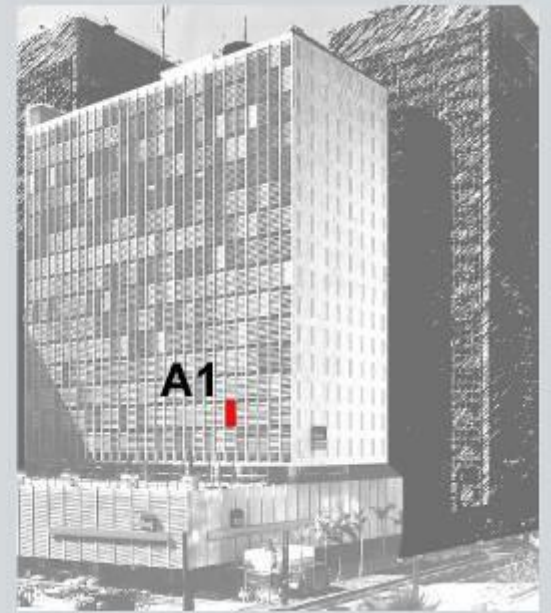
1960

GRÁFICO DE MÁSCARAS
 Banco Sul-Americano
 Fachada Noroeste



2004

JANELA A1



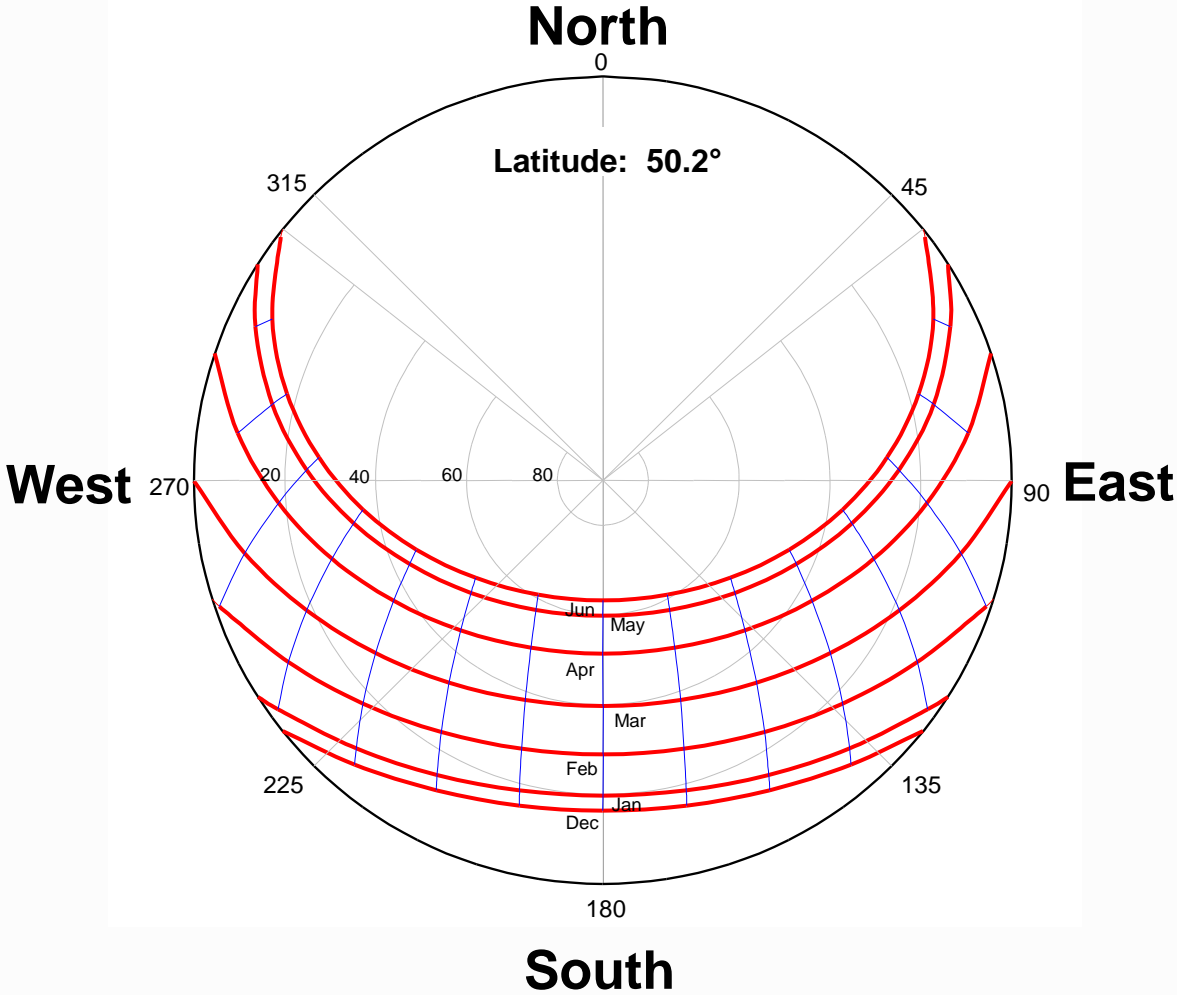
National Assembly for Wales

Architect: Richard Rogers Partnership

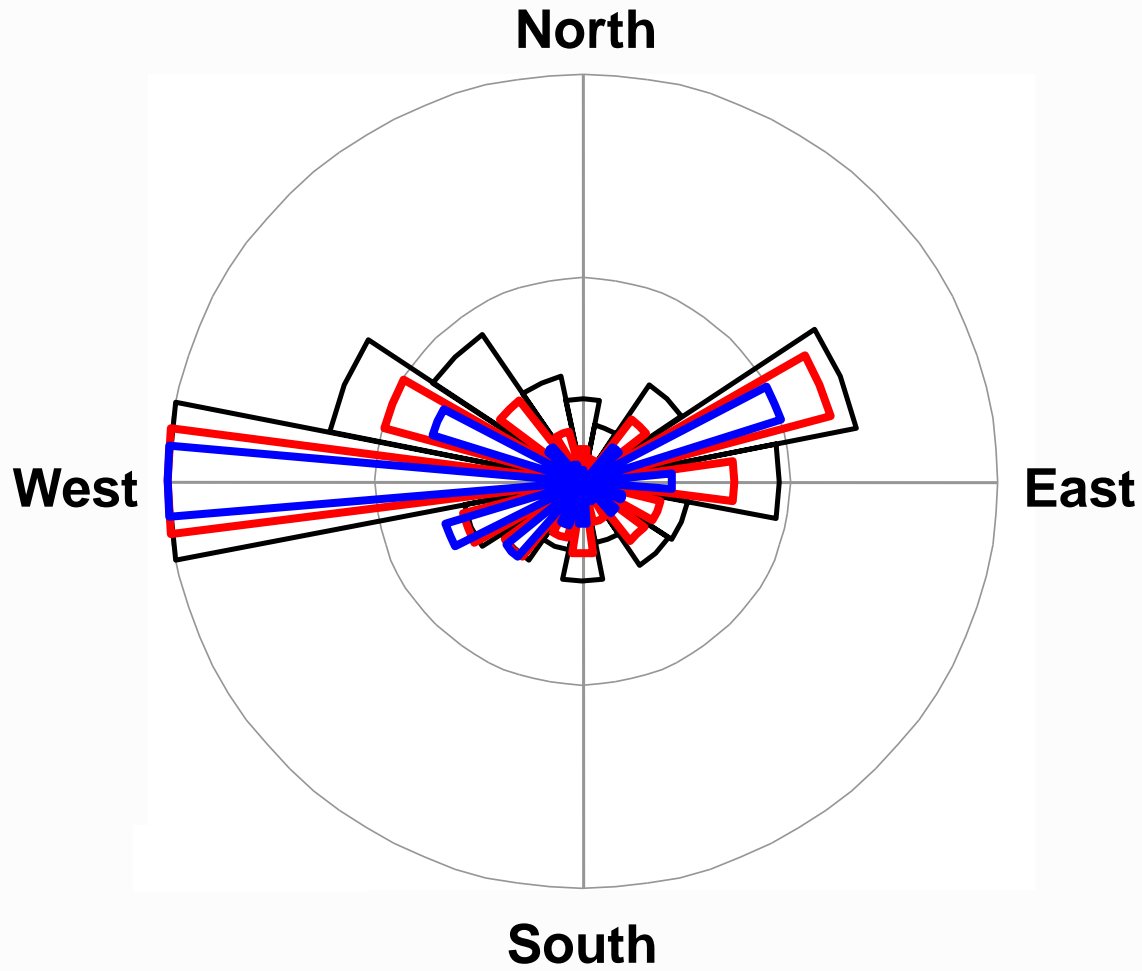


BDSP Partnership

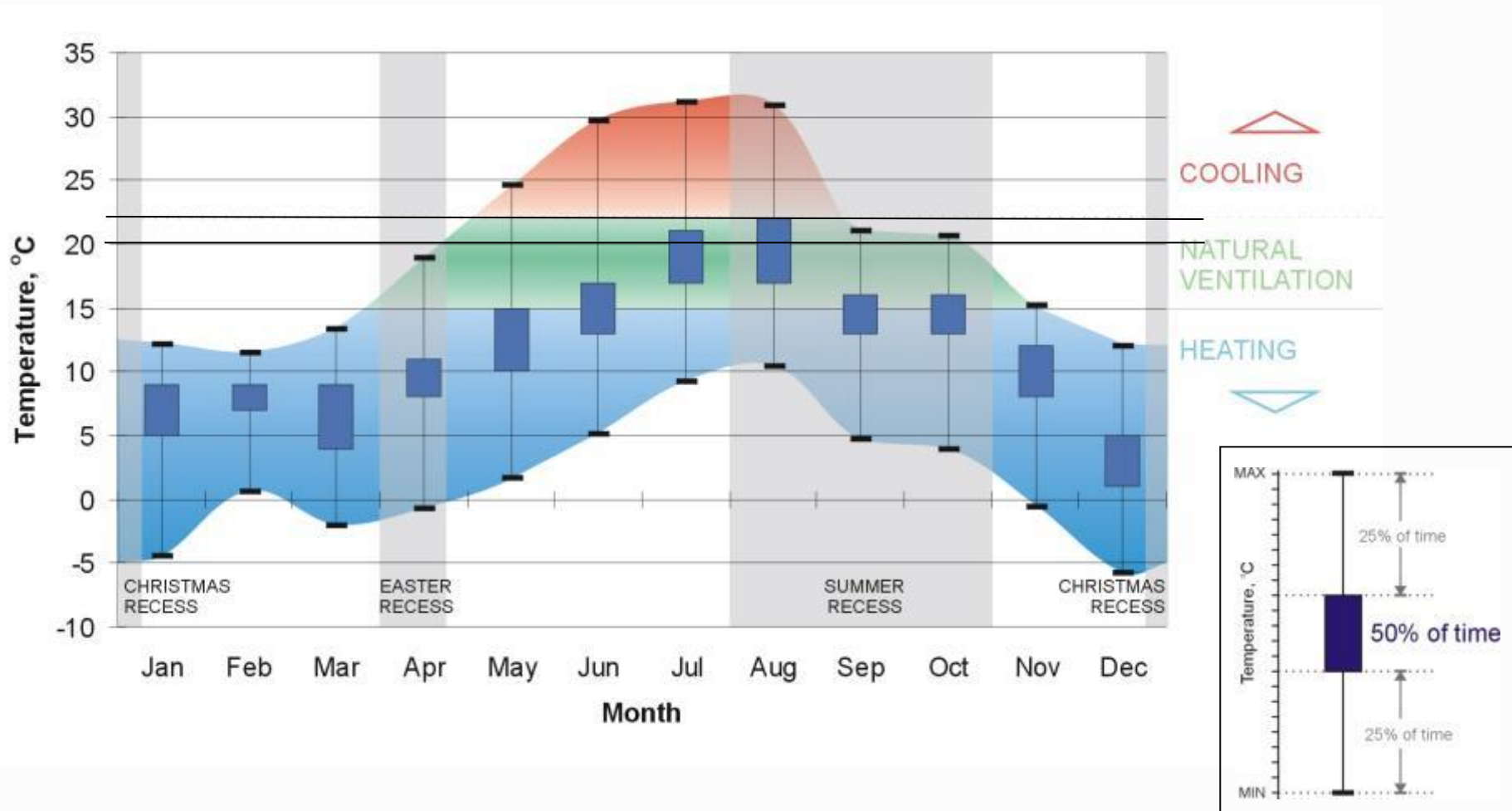
Sun Path Diagram



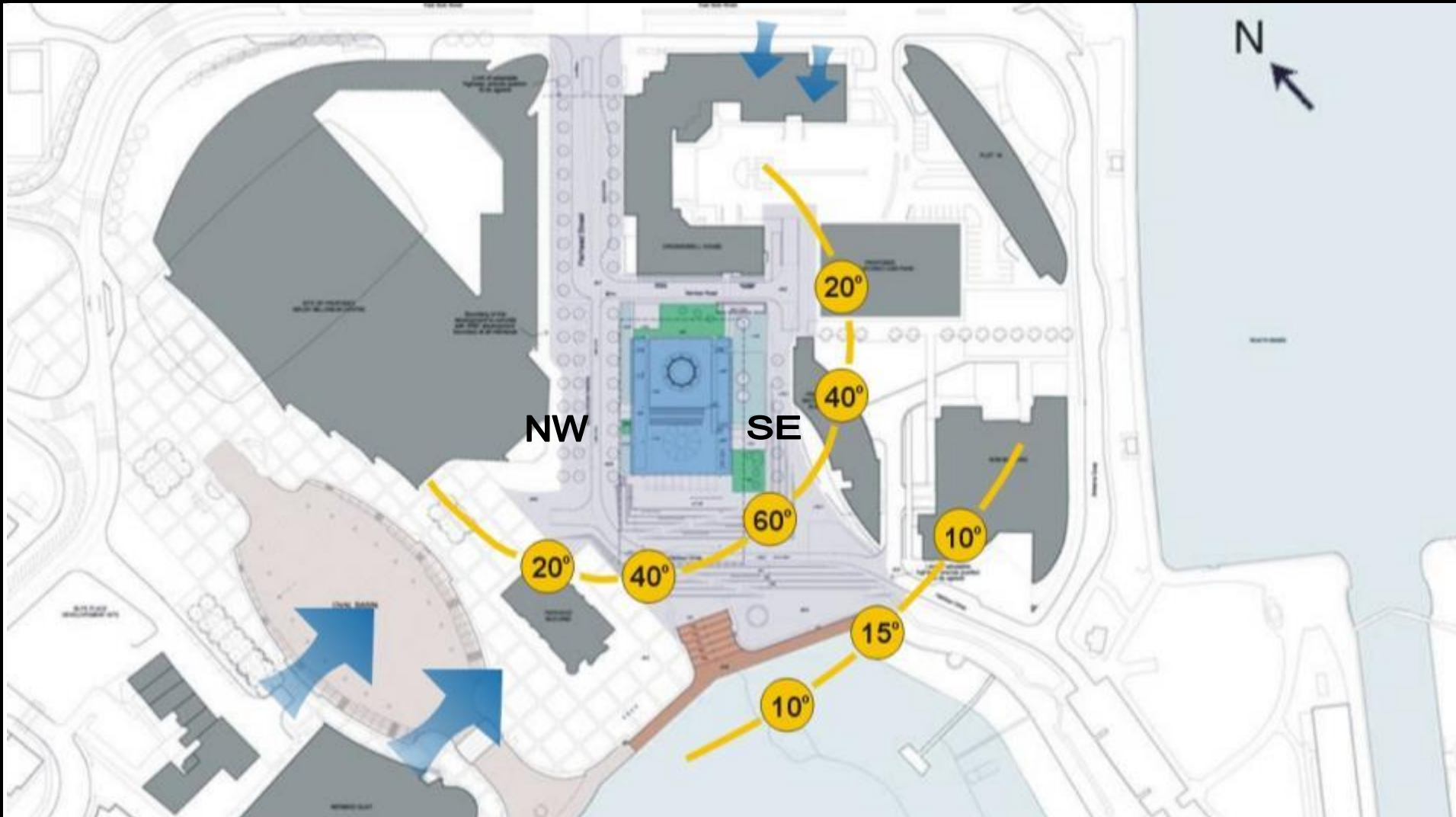
Wind Rose



Air Temperature – 1995 Profile



NAW Site, Cardiff Bay



A Unique Building

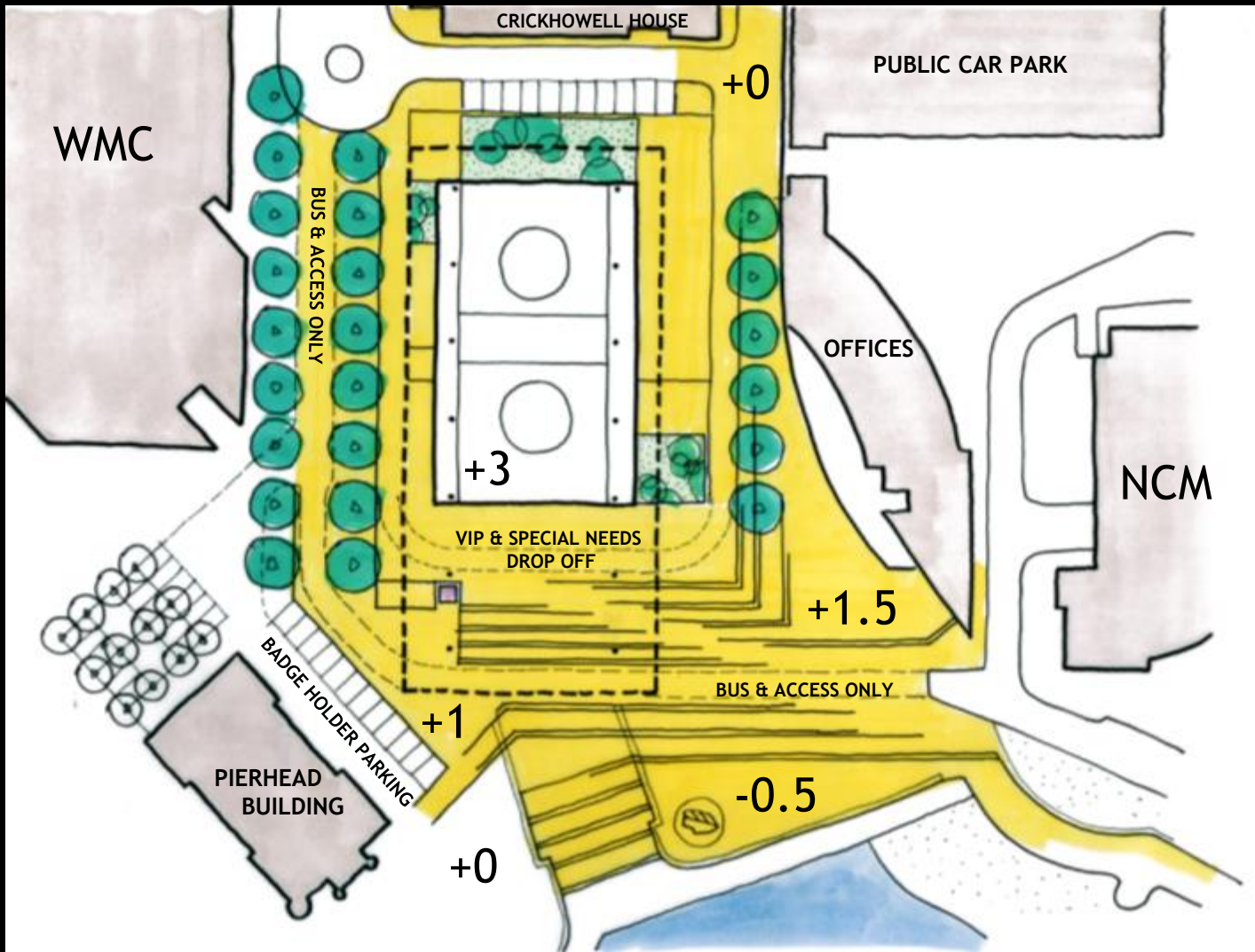


Unique Site
Unique Brief
Unique Response

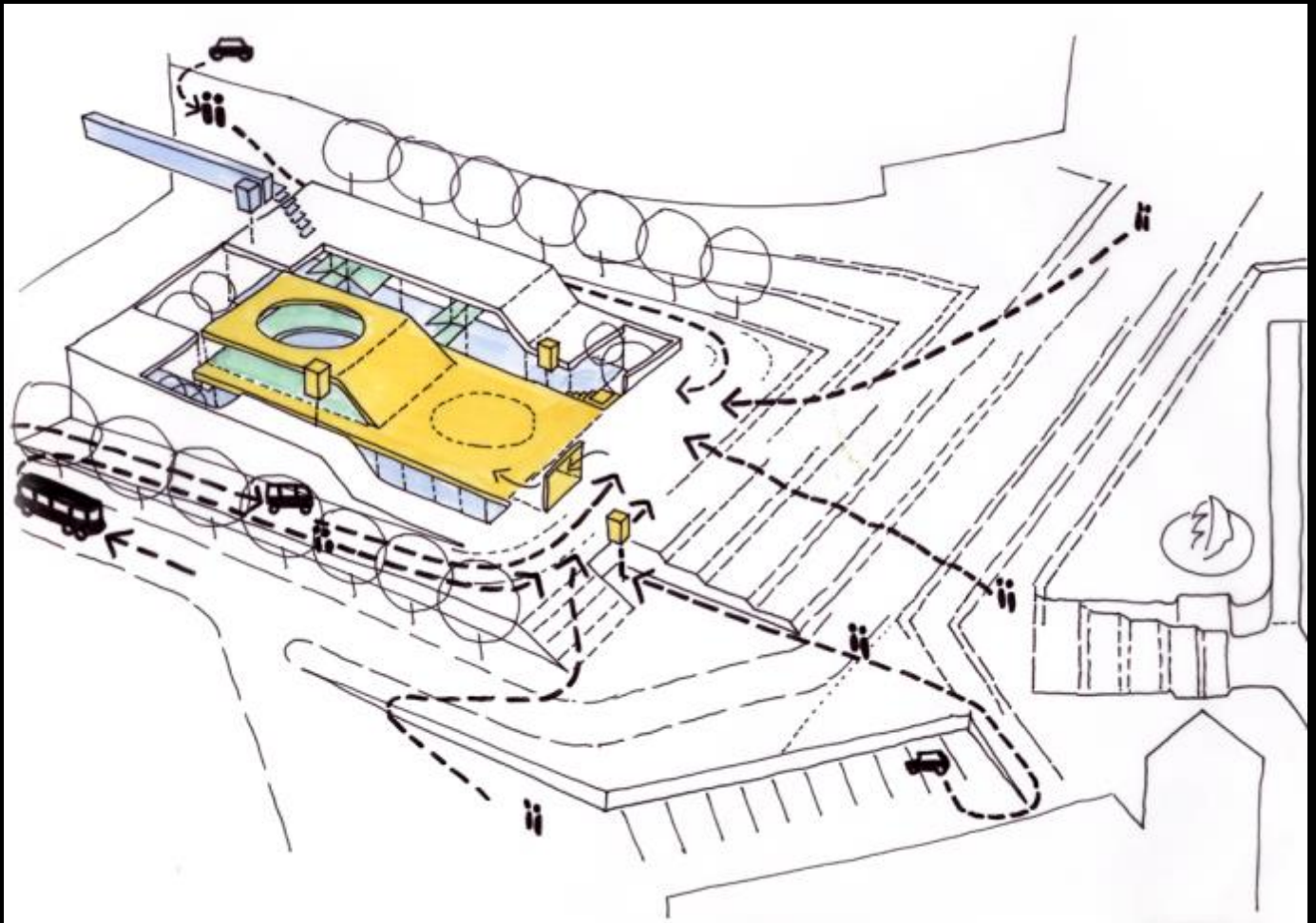
SE Elevation – View across NAW towards WMC



Site Plan



Public Access Schematic



Public Area
Public Galleries
Members Area

View towards Pierhead Building



Materials and Texture

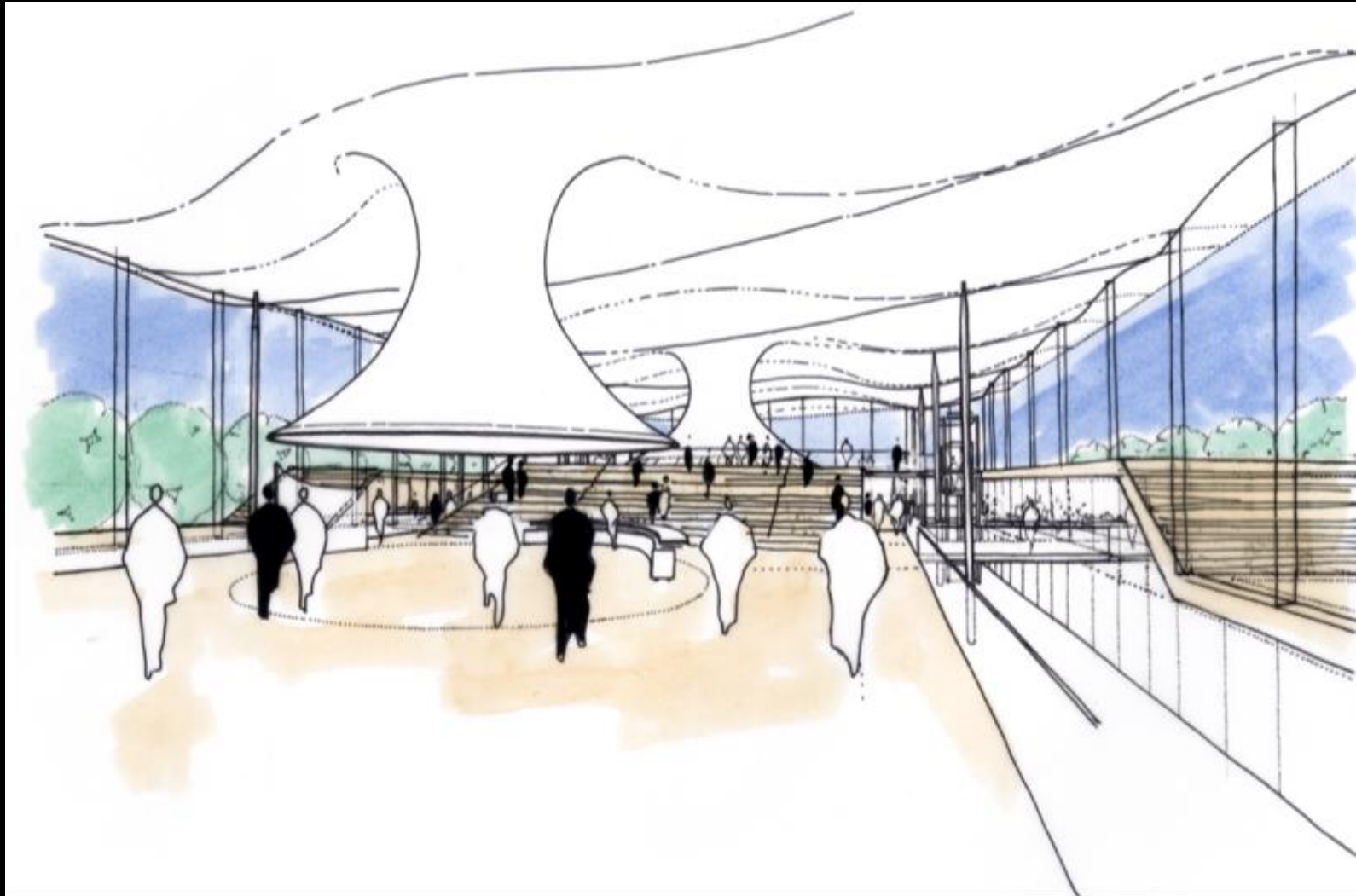
Beautiful
Indigenous
Sustainable
Durable



View towards Front Entrance

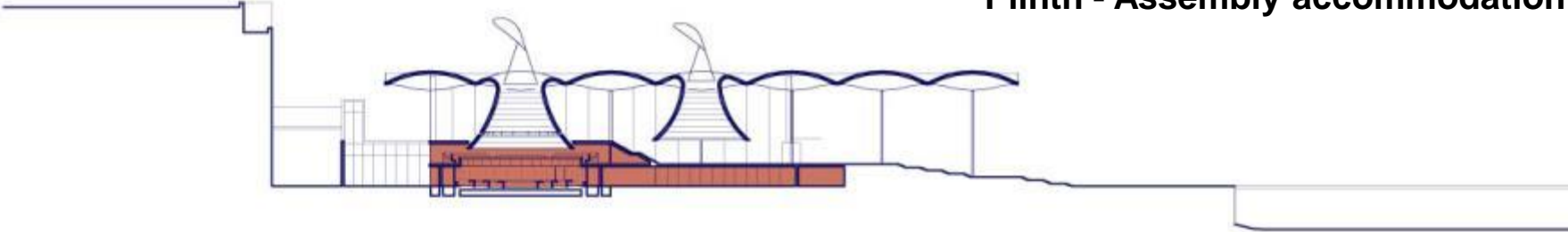


View of the Public Facilities from the Front Entrance

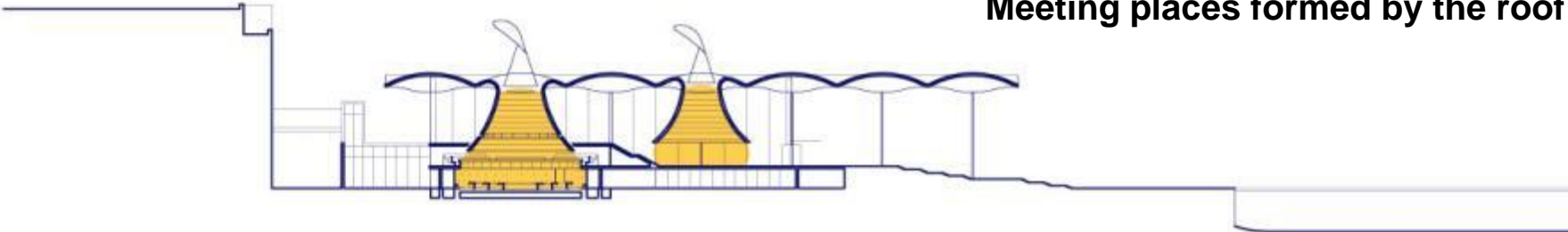




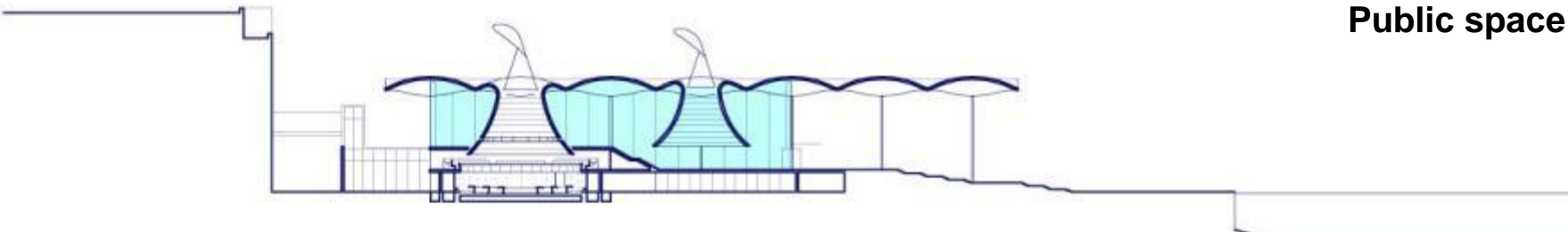
Plinth - Assembly accommodation



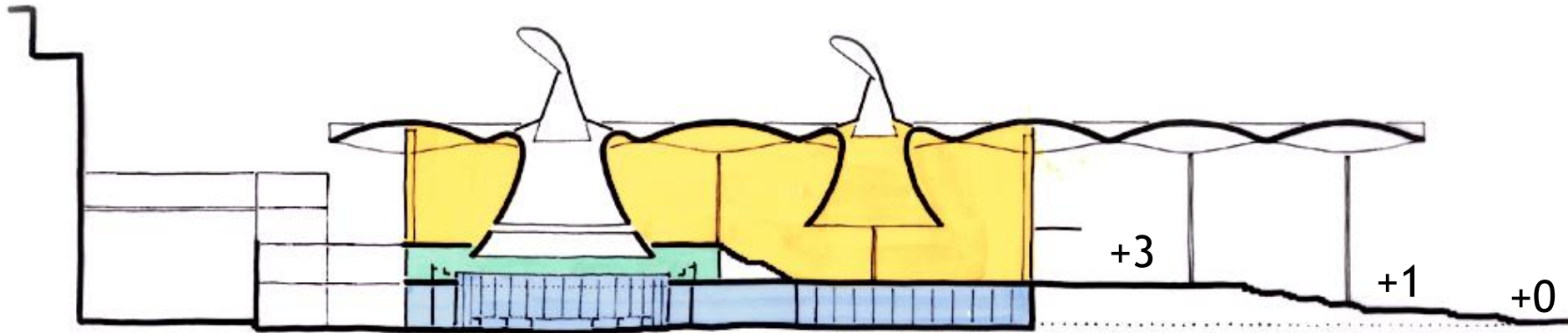
Meeting places formed by the roof



Public space



Long Section

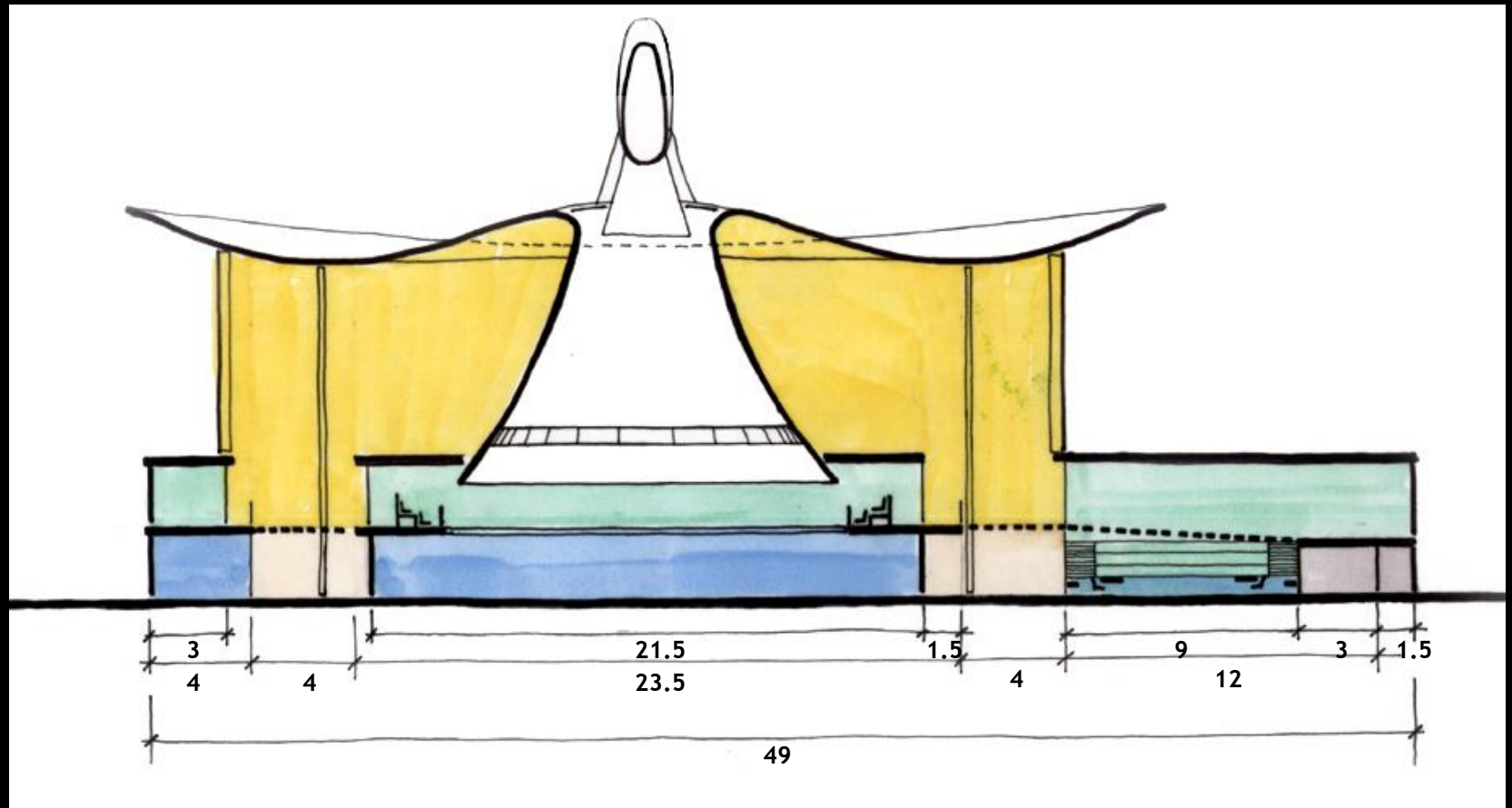


Public Area

Public Galleries

Members Area

Cross Section



Public Area

Public Galleries

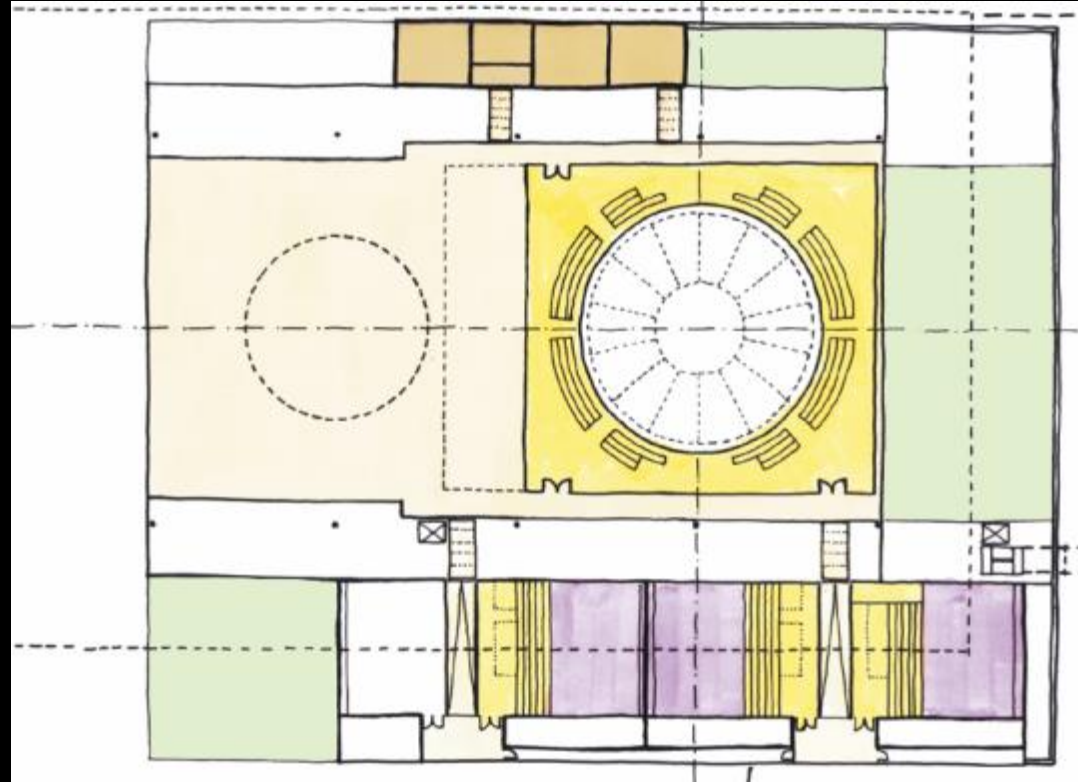


Members Area

Members Gallery

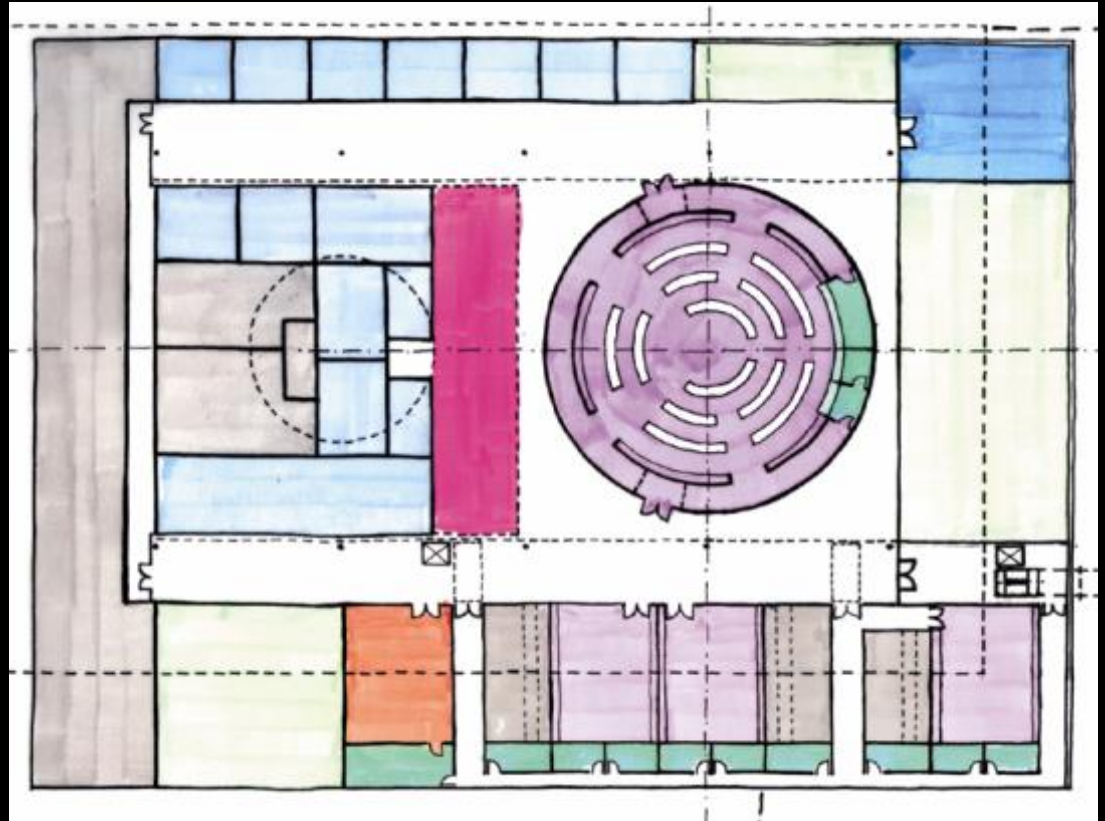
Plinth Level Plan

-  Committee Rooms
-  Courtyards
-  Public Area
-  Public Galleries
-  Public WC's

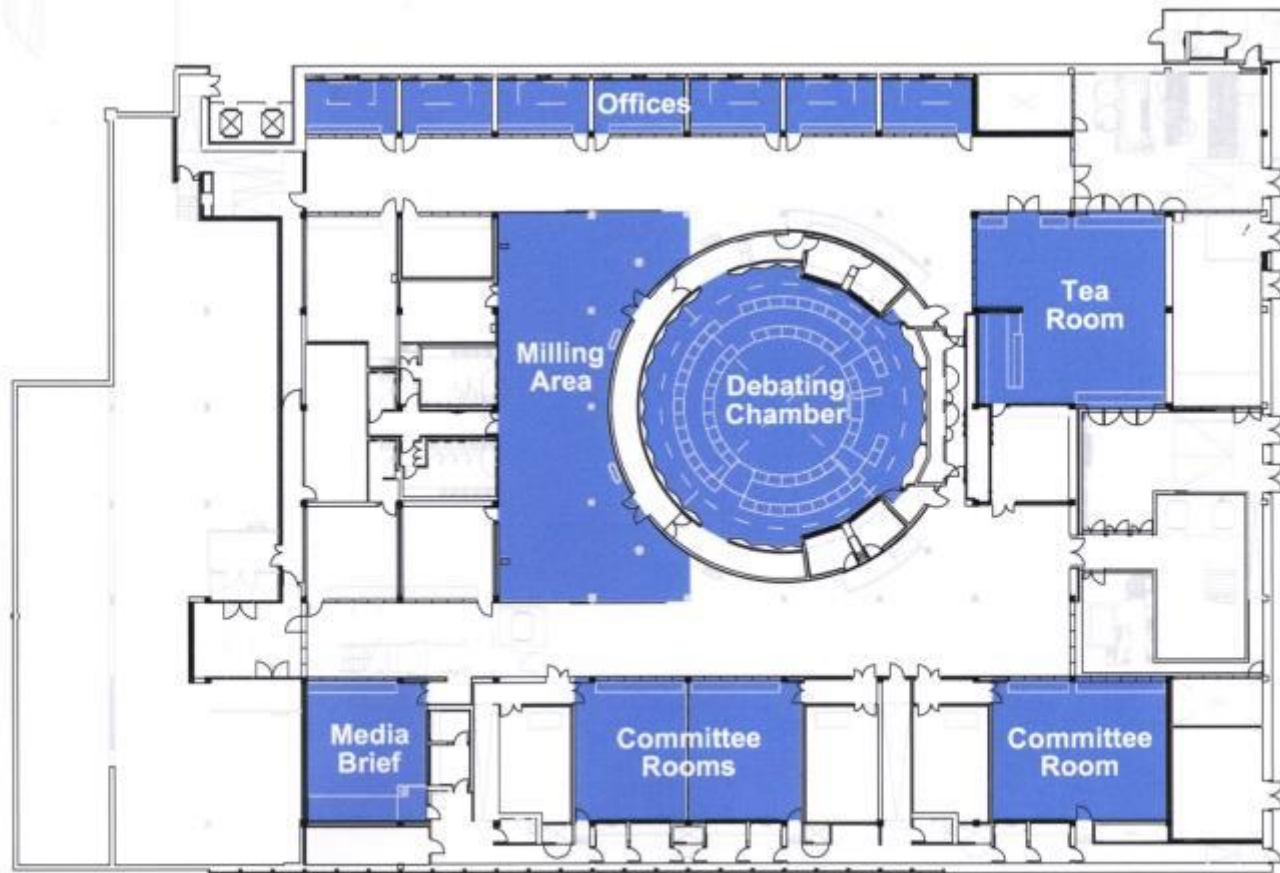


Ground Level Plan

- Committee Rooms
- Debating Chamber
- Members' Info Point
- Translation / Technical Rooms
- Members' Tea Room
- Support
- Press Briefing Room
- External Courtyards
- Plant / Store



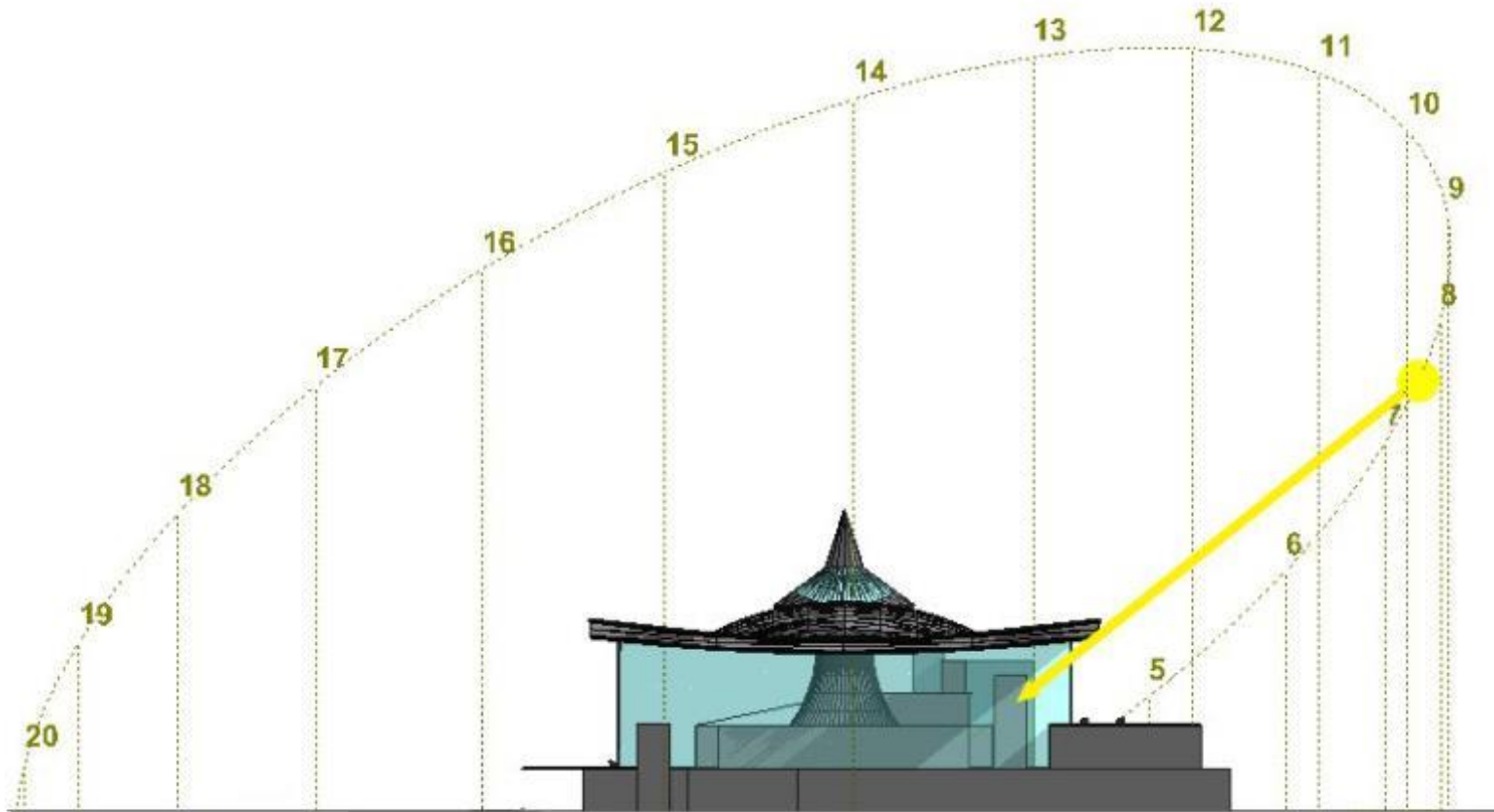
Ground Floor Plan



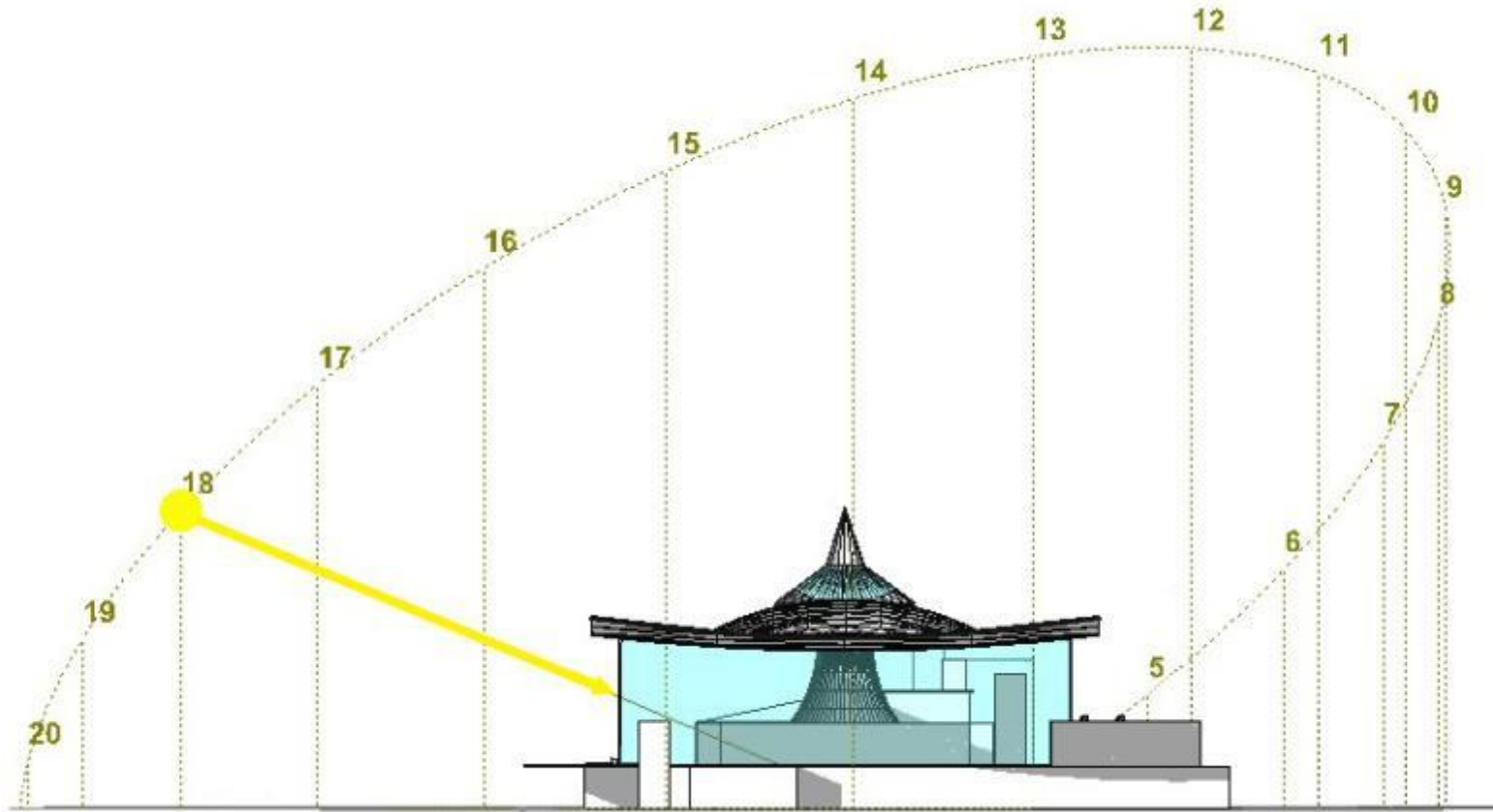
The Main Hall



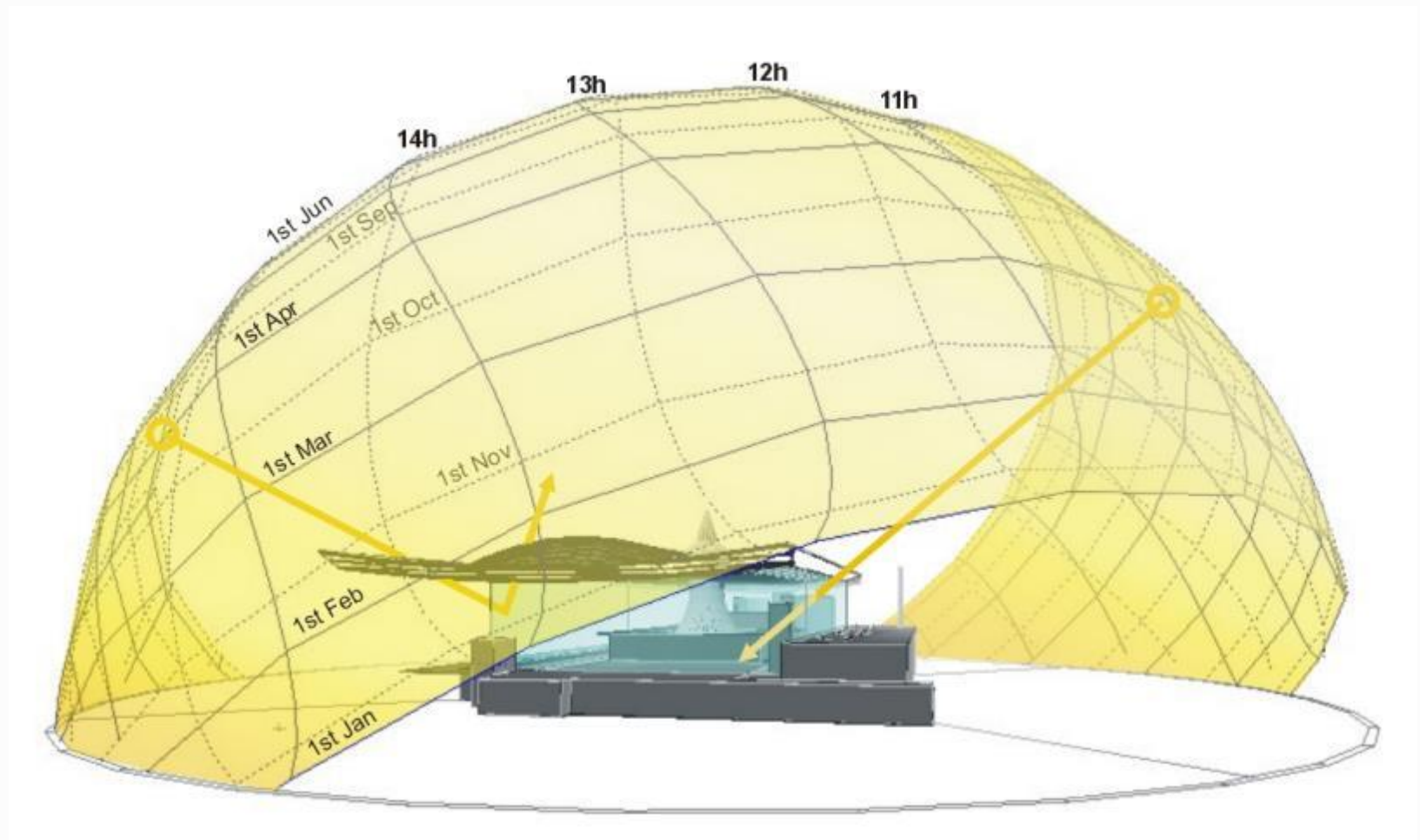
Main Hall – Sun Path Diagram (Summer 7:30)



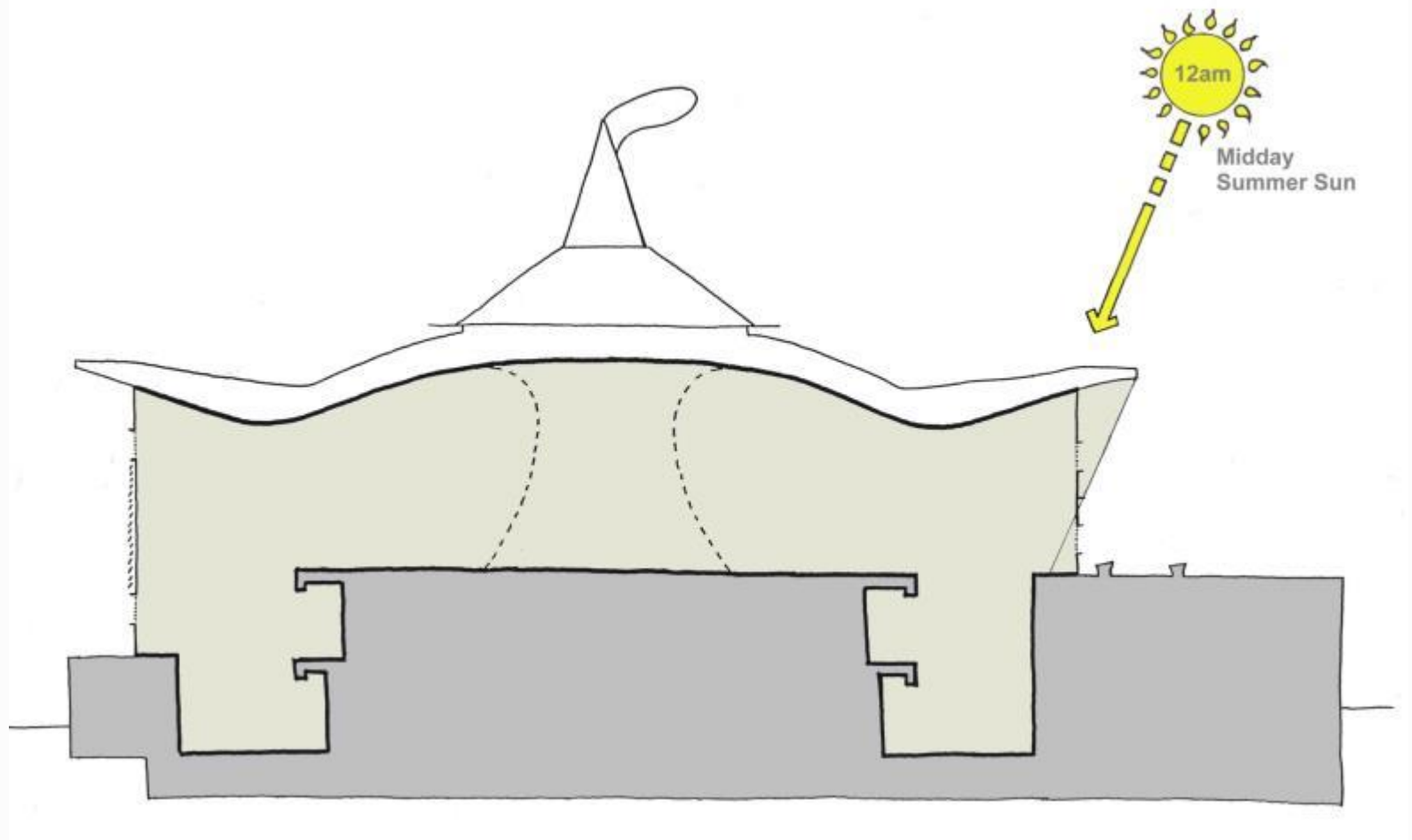
Main Hall – Sun Path Diagram (Summer – 18:00)



Main Hall – Sun Path Diagram (Complete Solar Envelope)



Main Hall – Shading Concept SE Facade



National Assembly for Wales

BDSP Partnership



06:00



07:00



08:00



09:00



10:00



11:00



12:00



13:00



14:00



15:00



16:00



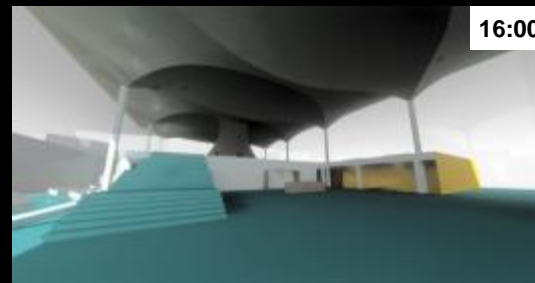
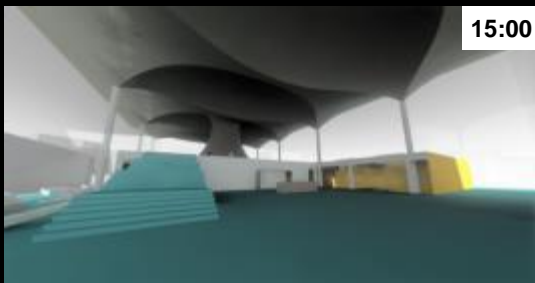
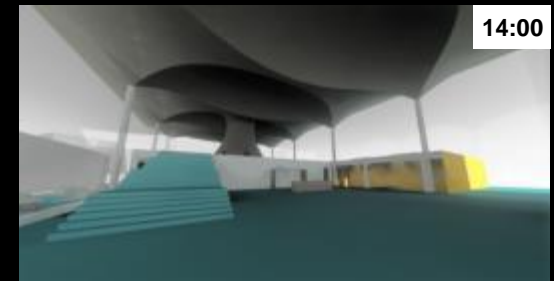
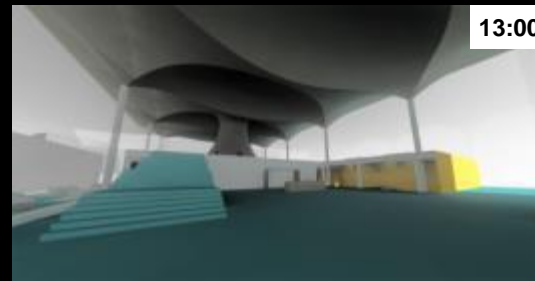
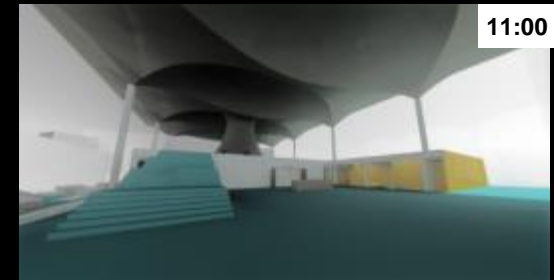
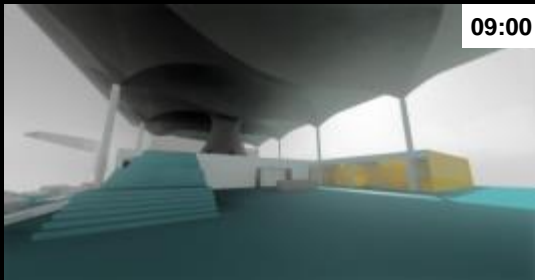
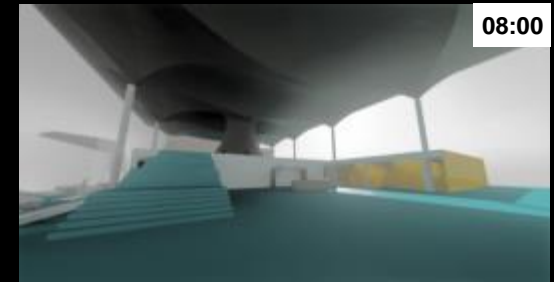
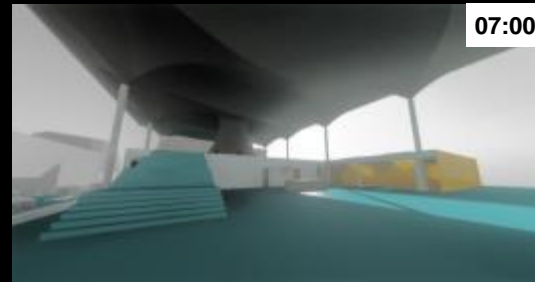
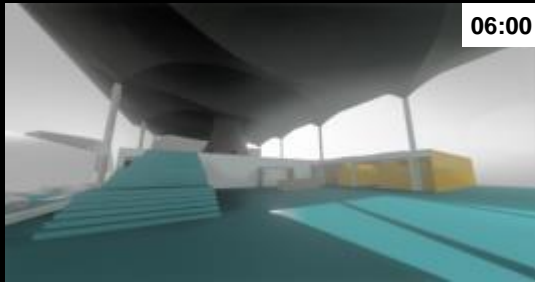
17:00



18:00



19:00





09:00



10:00



11:00



12:00



13:00



14:00



15:00



16:00

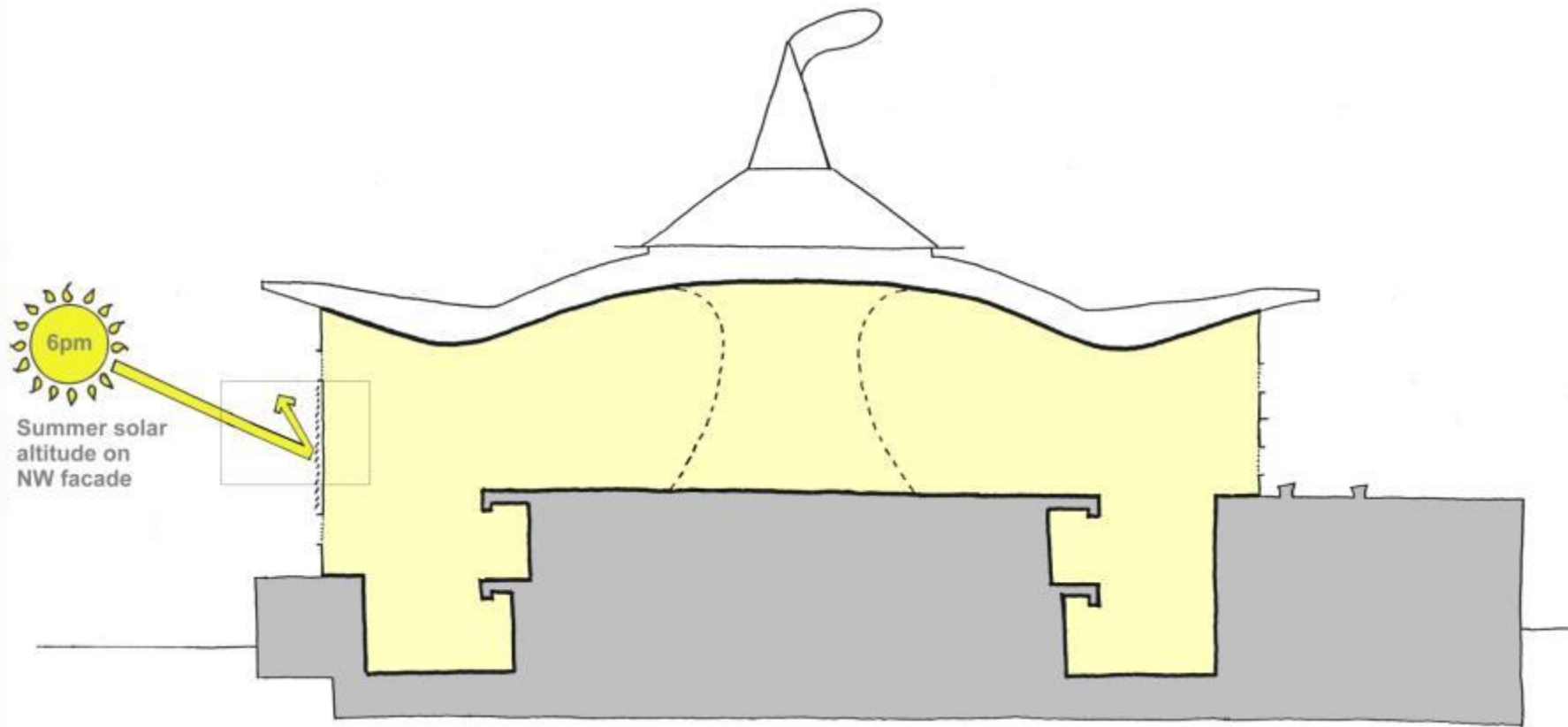


17:00

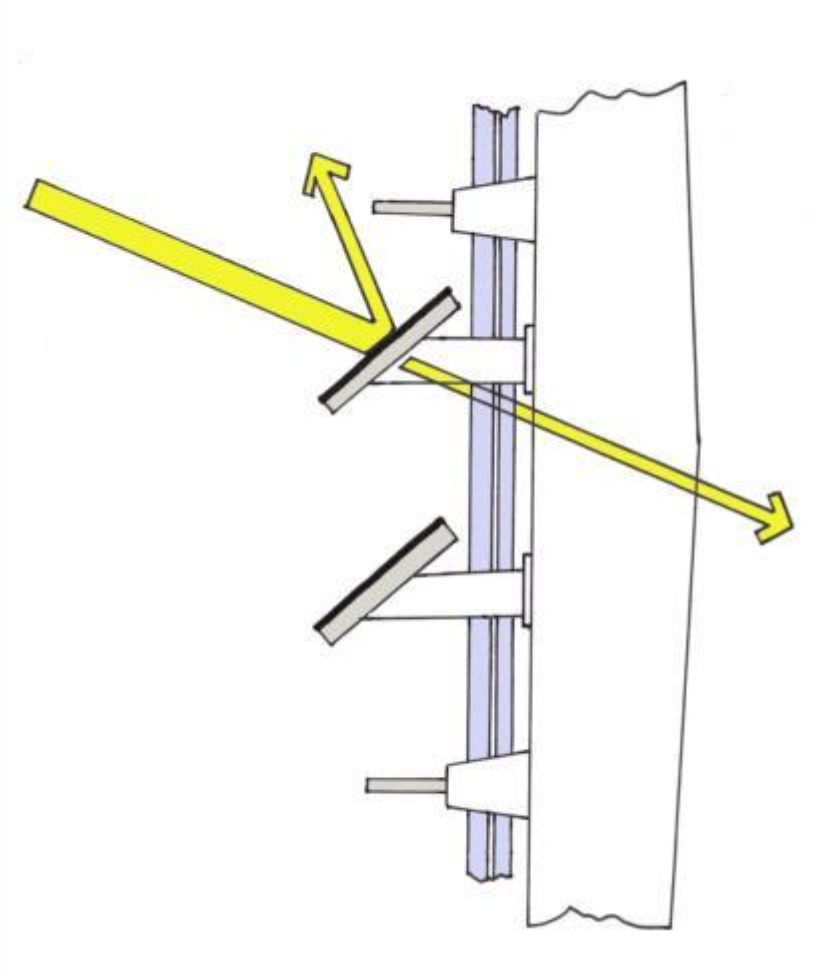


18:00

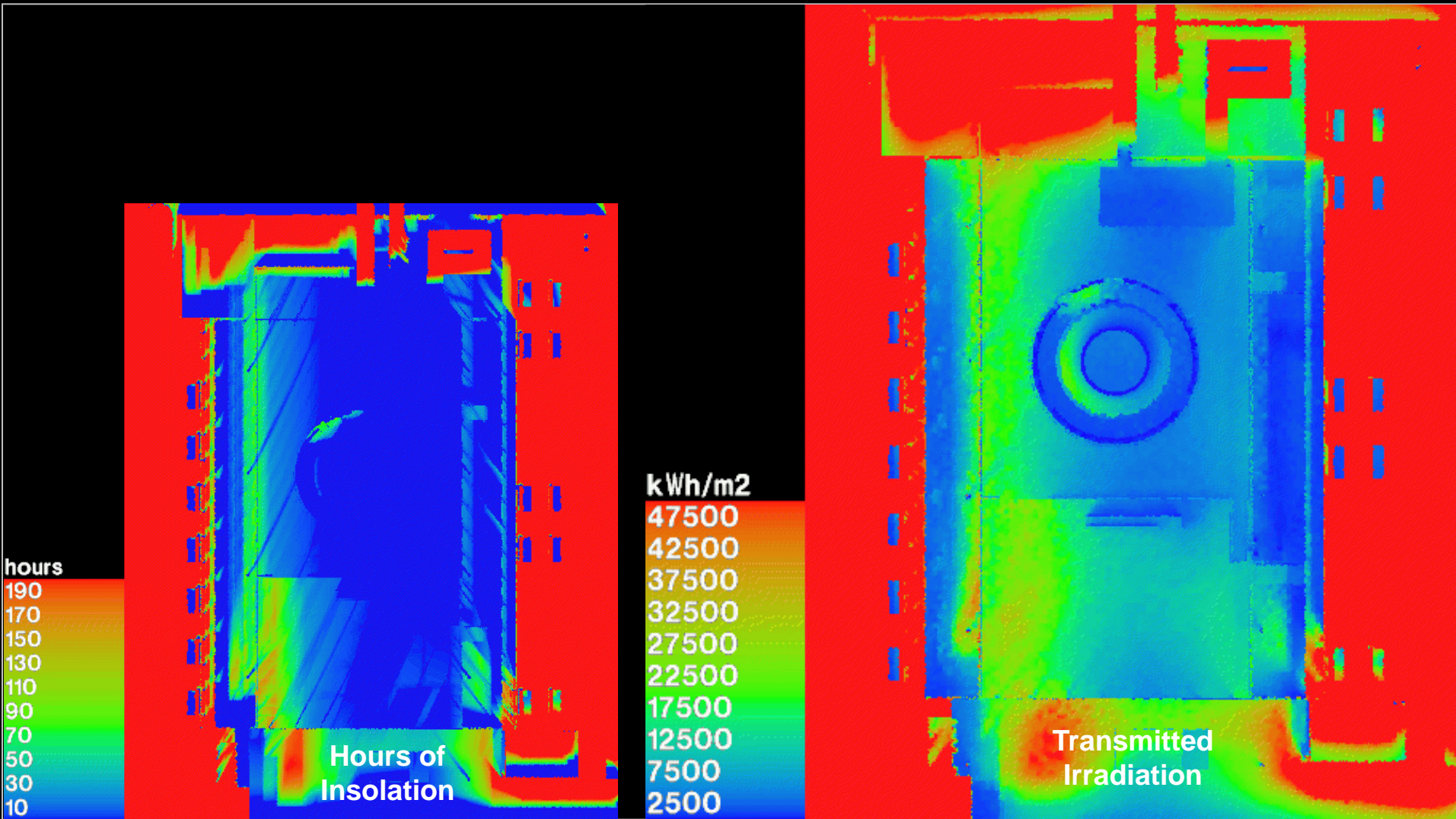
Main Hall – Shading Concept NW Facade



Main Hall – NW Façade; Brise Soleil Concept



Main Hall – Modelling



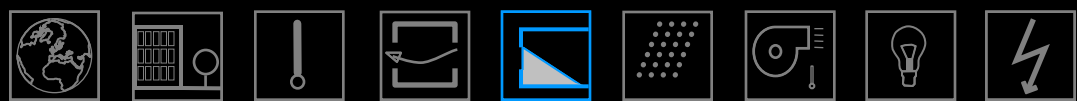
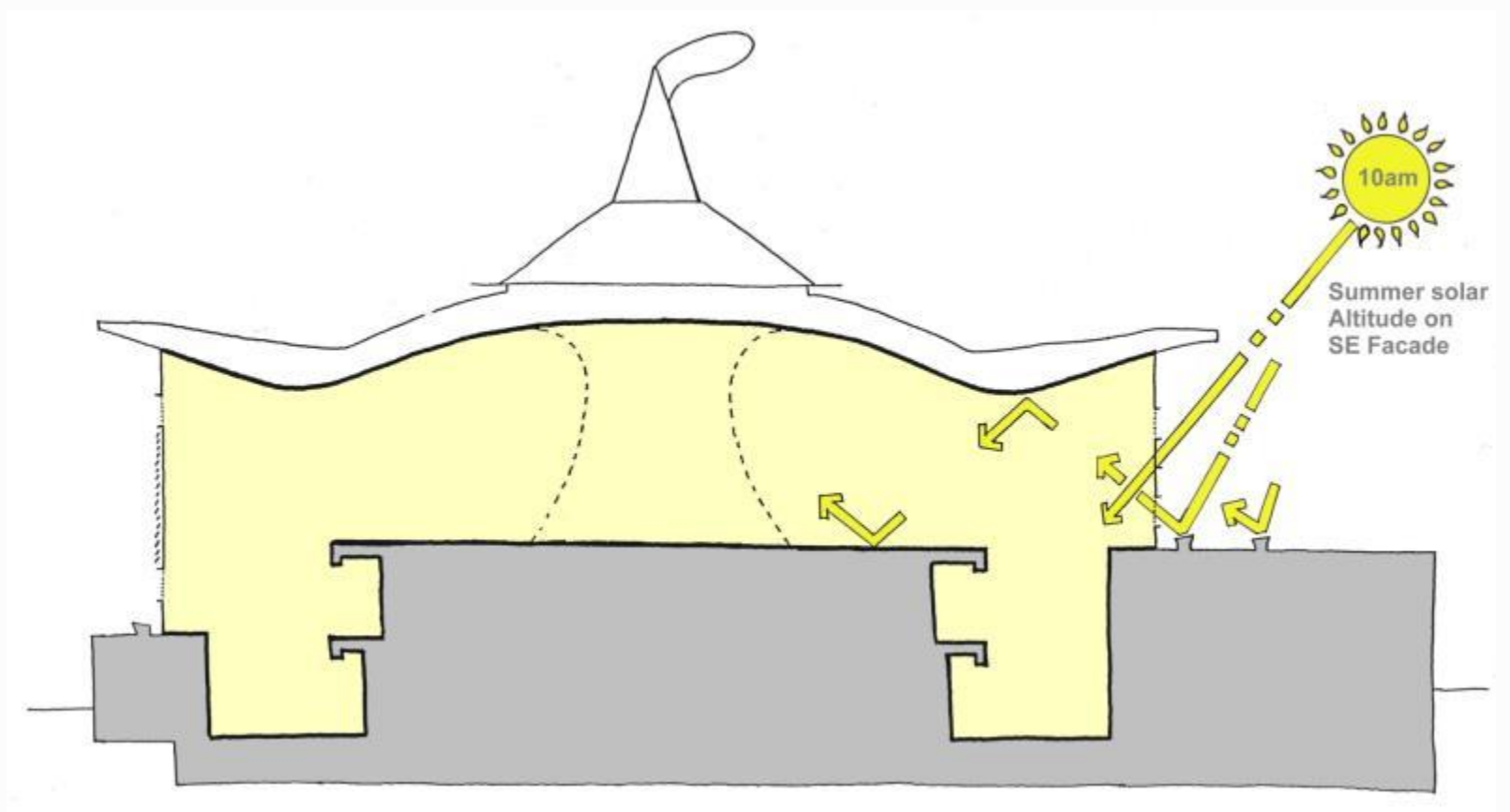




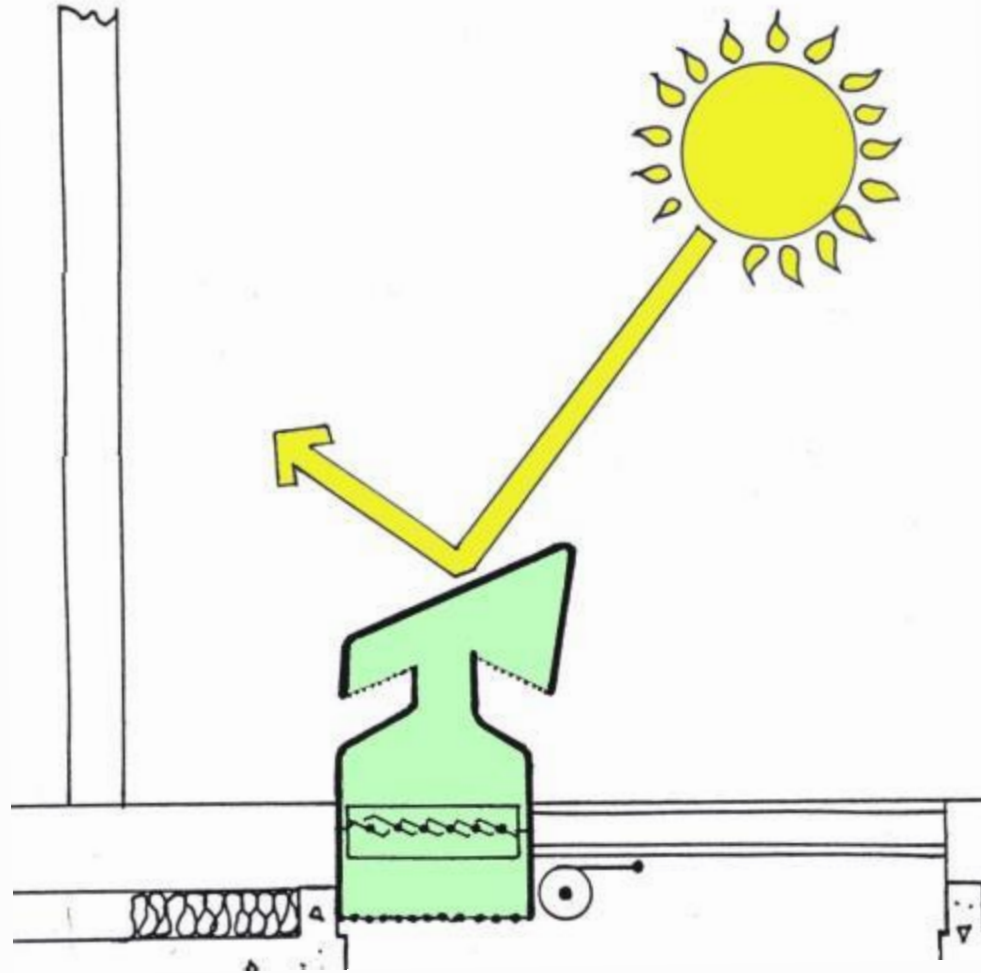
Main Hall – 2nd Floor (Exhibition Space)



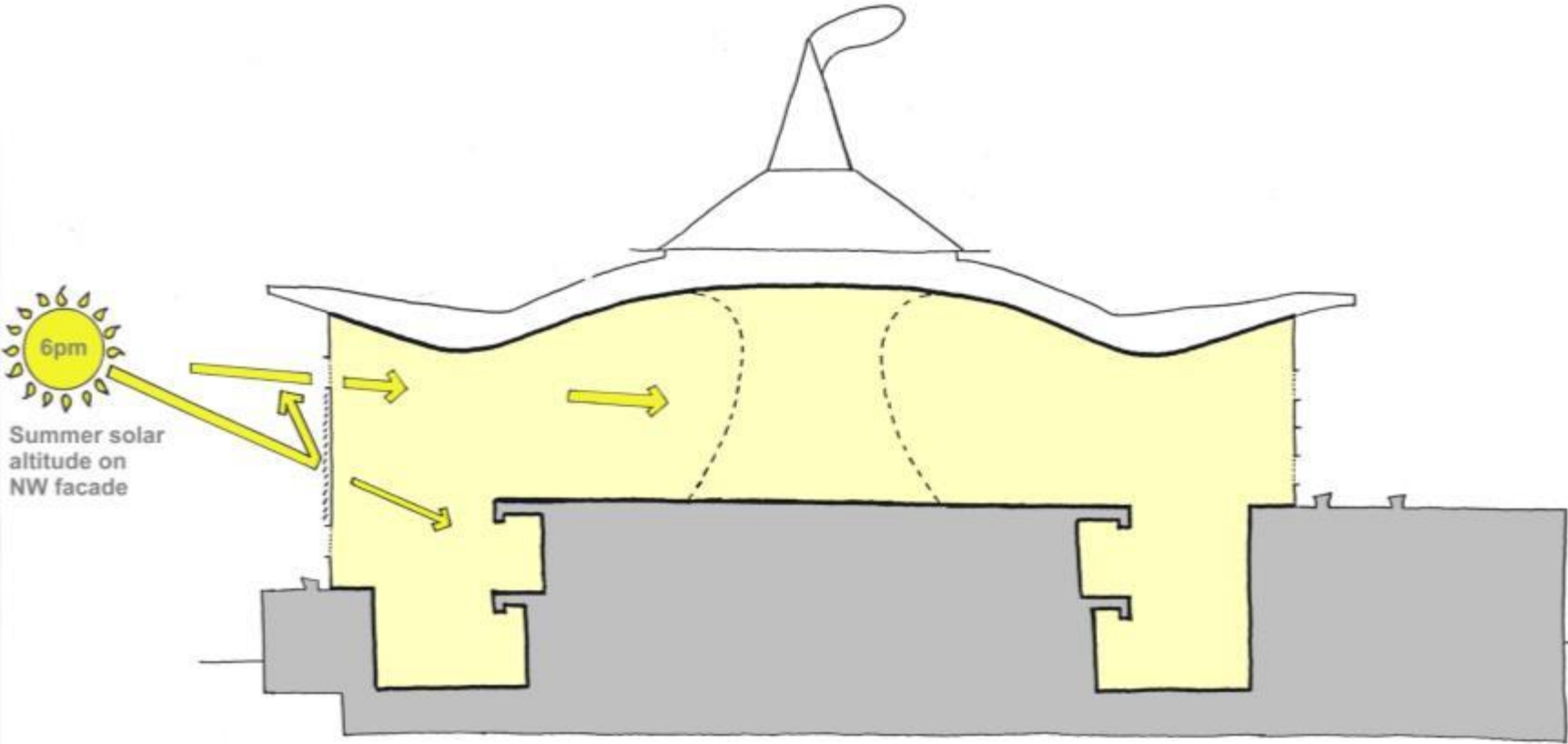
Main Hall – Daylighting Concept SE facade



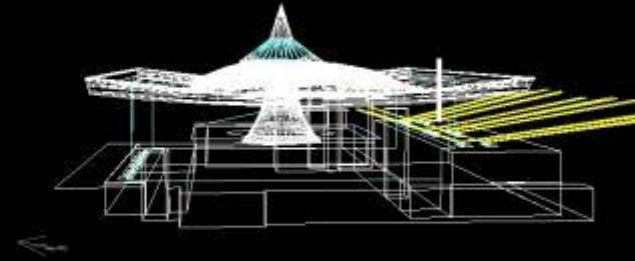
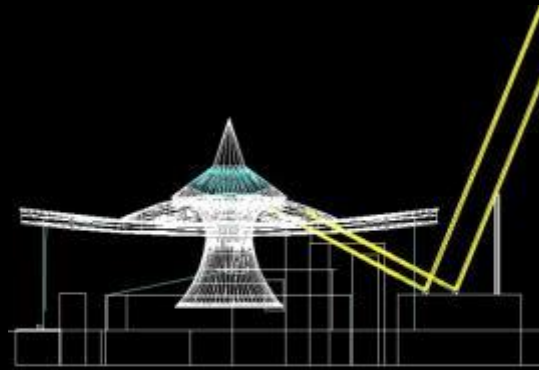
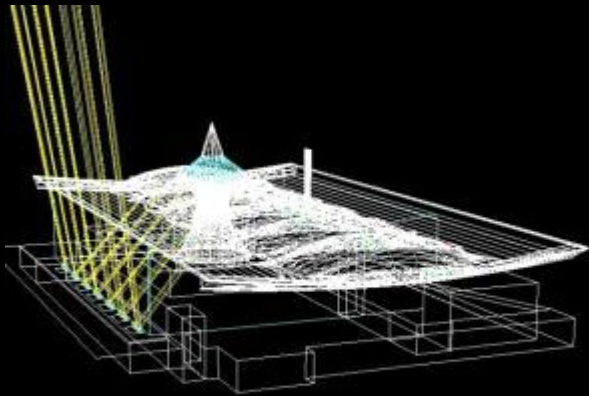
Main Hall – Rooflight Concept



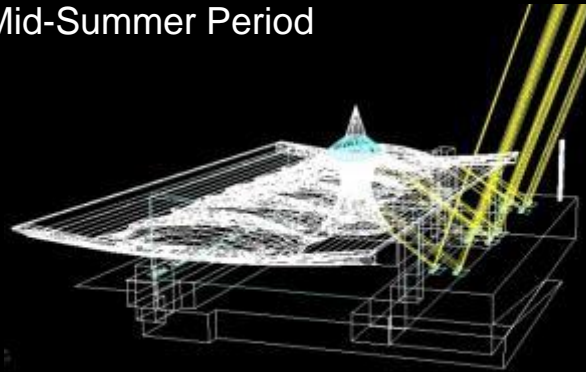
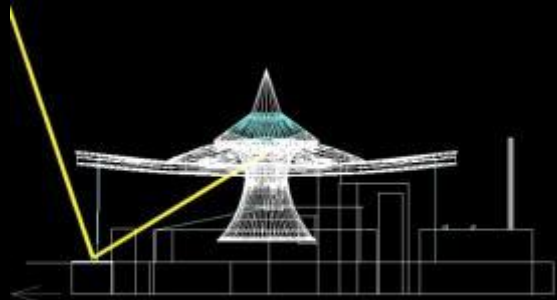
Main Hall – Daylighting Concept NW facade



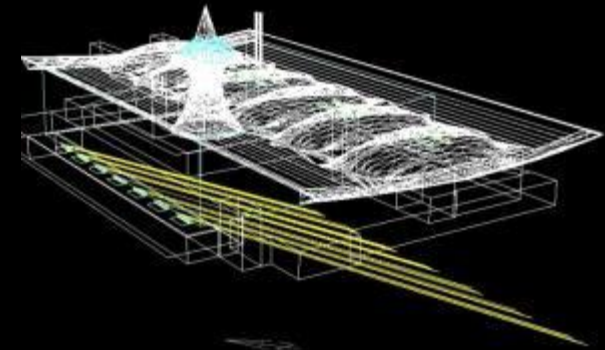
Main Hall – Modelling, Reflected Sun Rays (clear sky)



Mid-Summer Period



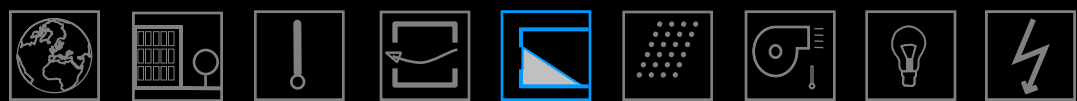
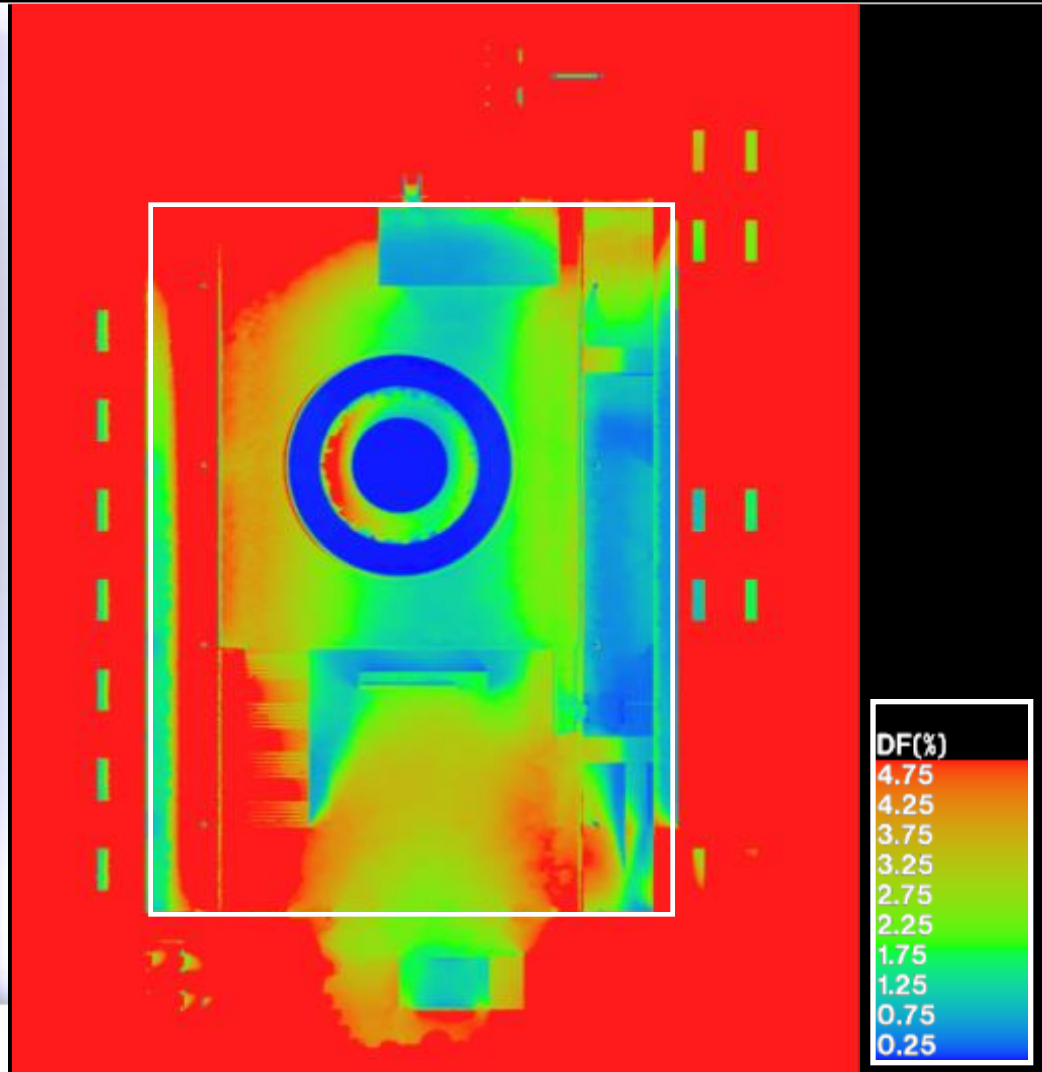
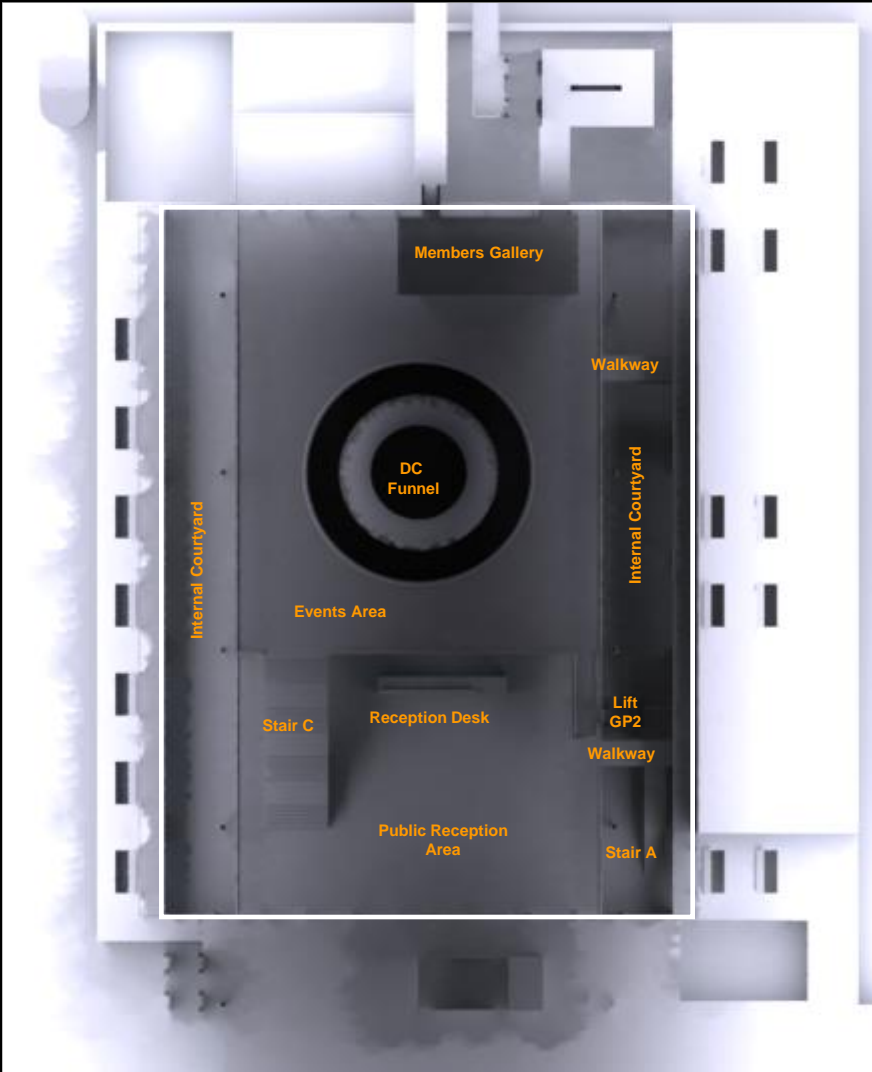
Mid-Winter Period



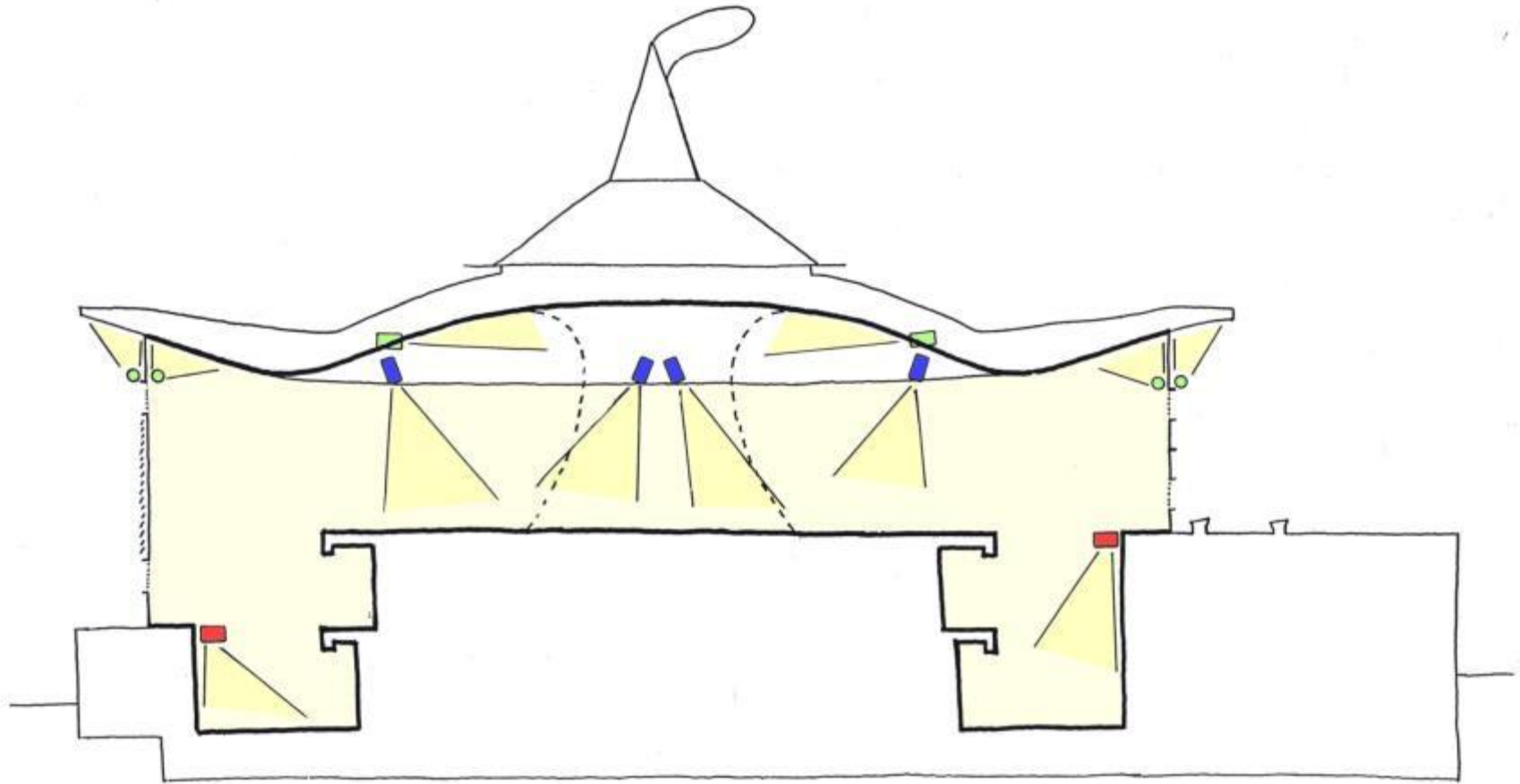
Main Hall – Image of Reflected Light from Office Roof Ventilators



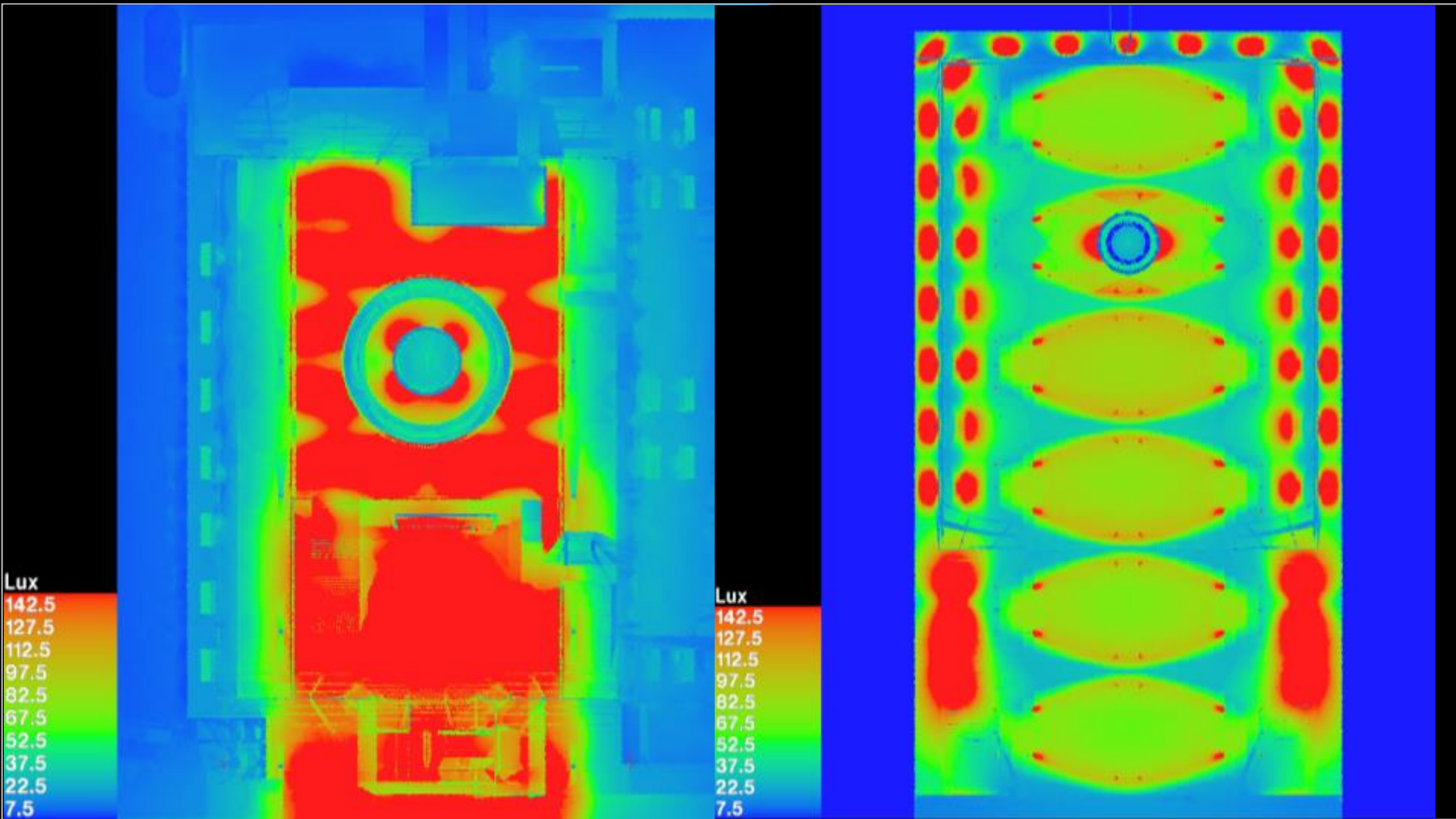
Main Hall – Daylight Modelling (Overcast Sky); Plans



Main Hall – Artificial Lighting Concept



Main Hall – Artificial Lighting Modelling / Simulations



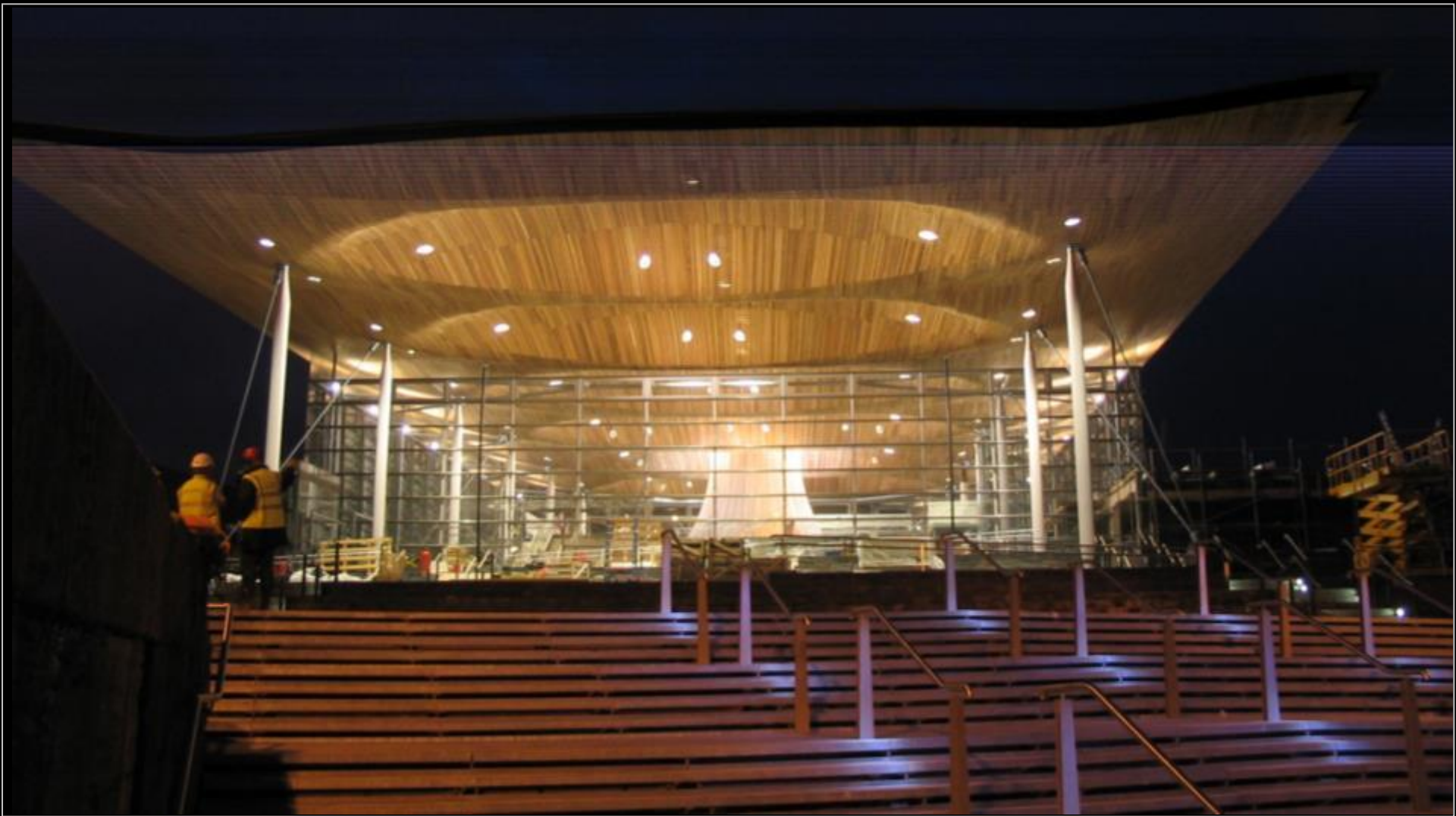
Floor Plan View

Reflected Ceiling View

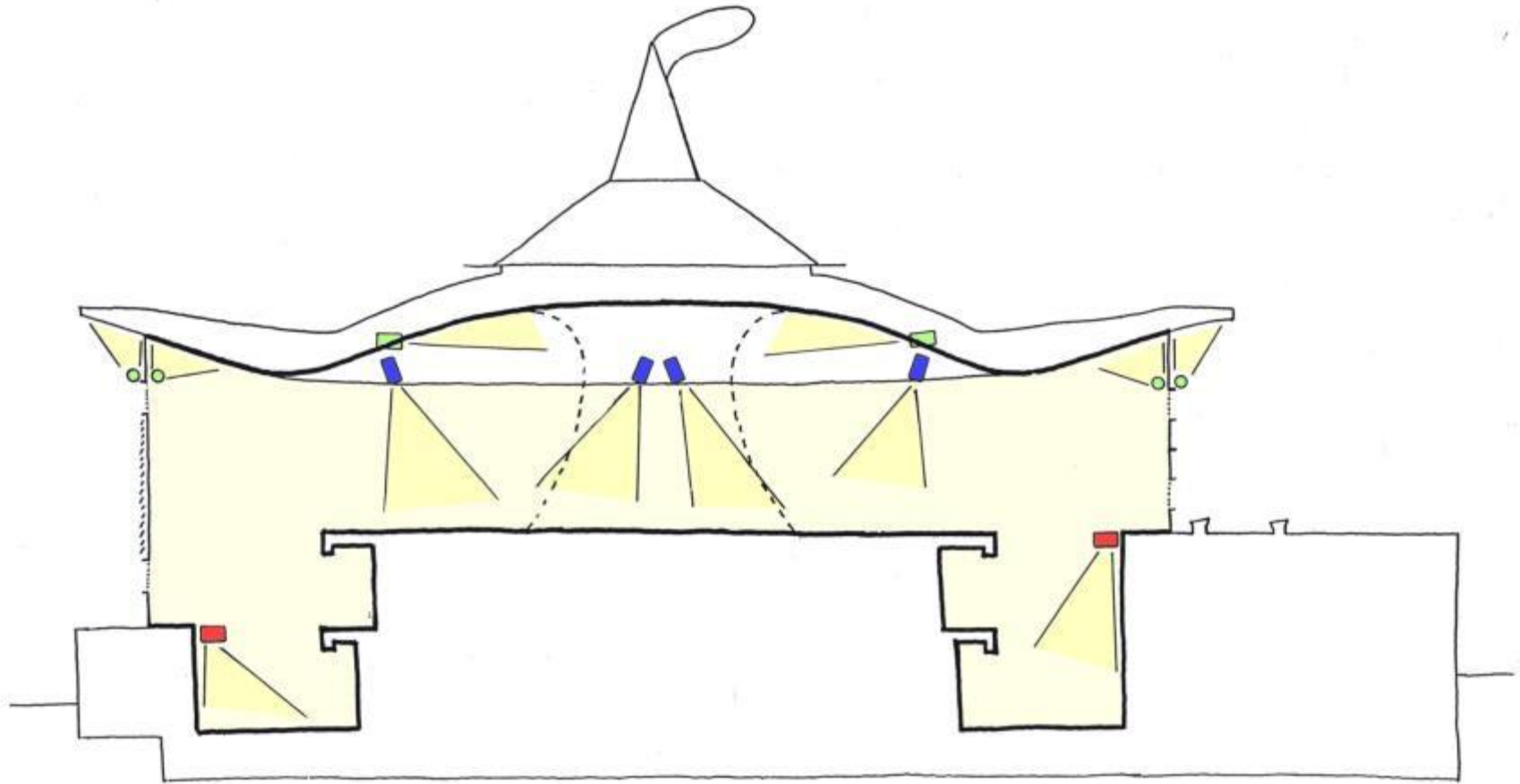


Technical Systems

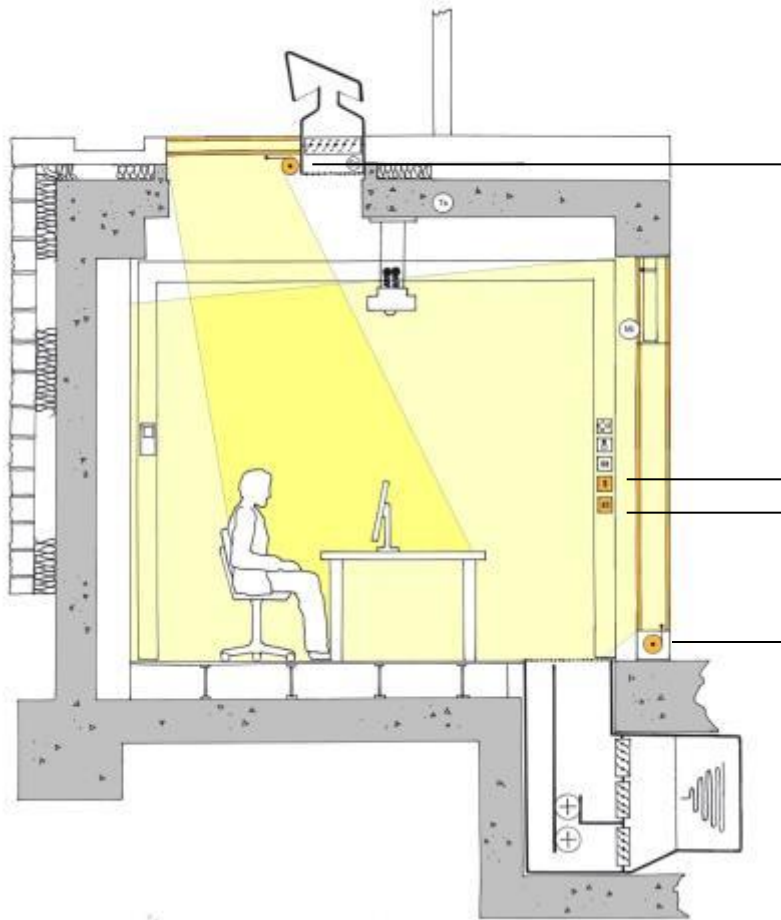
Main Hall – Artificial Lighting



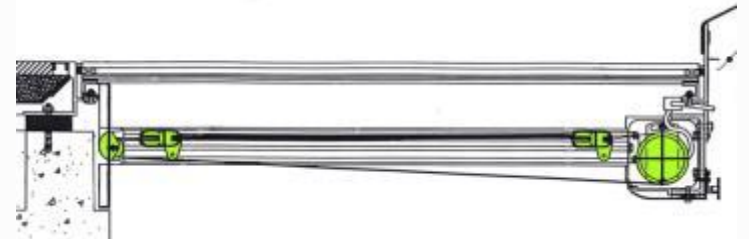
Main Hall – Artificial Lighting Concept



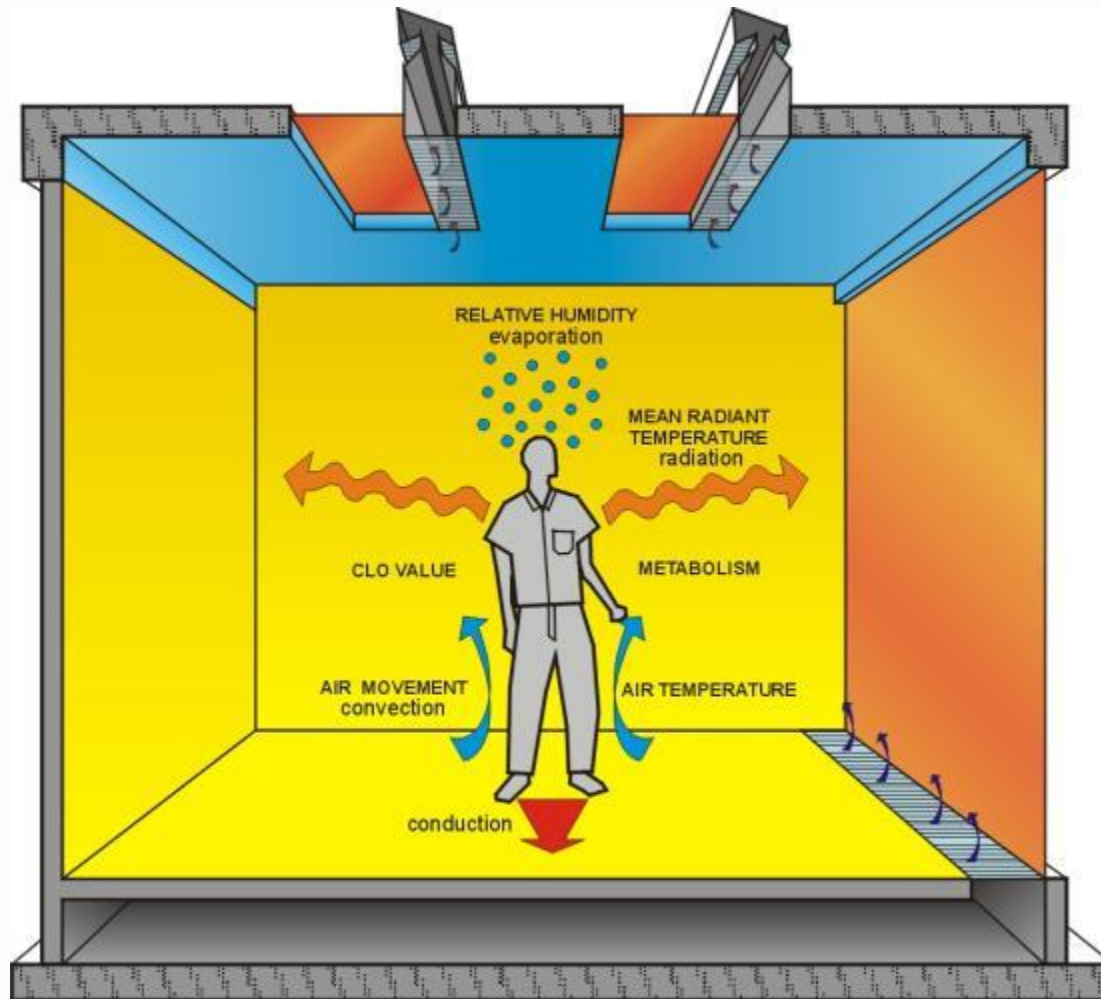
Office – Solar Shading / Daylight Control Arrangement / Concept



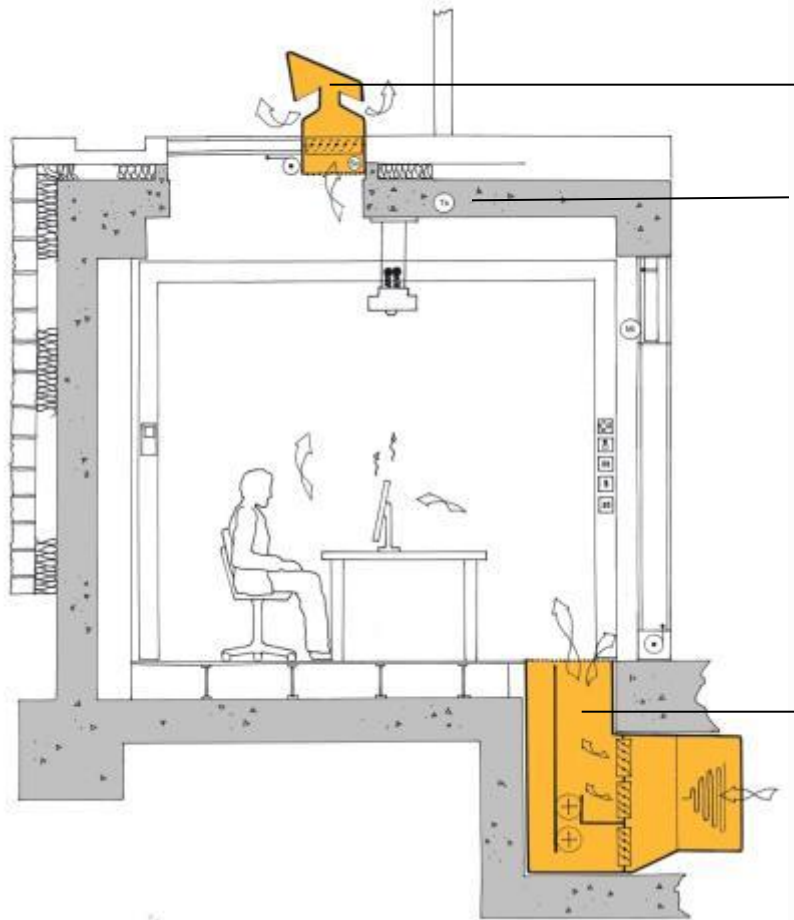
Rooflight Blind
Rooflight Blind Override Switch
Vertical Privacy Blind Control Switch
Vertical Privacy Blind



Thermal Zoning – Comfort



Office – Natural Ventilation Arrangement / Concept

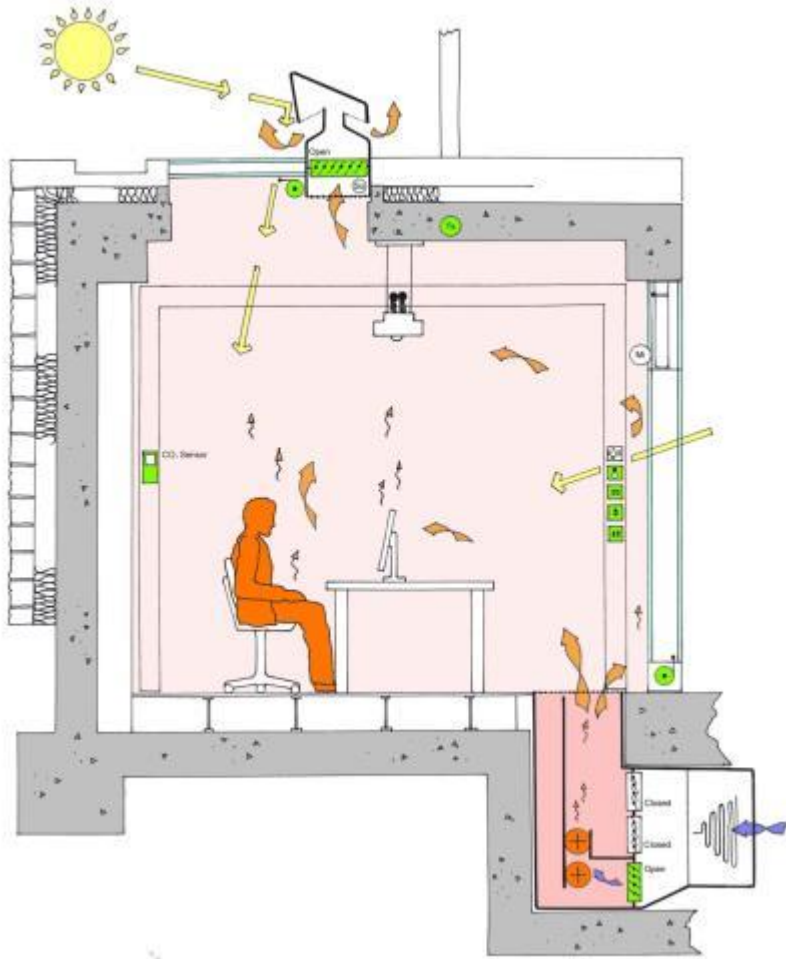


Roof Ventilator (including air damper)
Slab Temperature Sensor

Natural Ventilation Trench (including winter /
summer air dampers, attenuator and heater
elements).

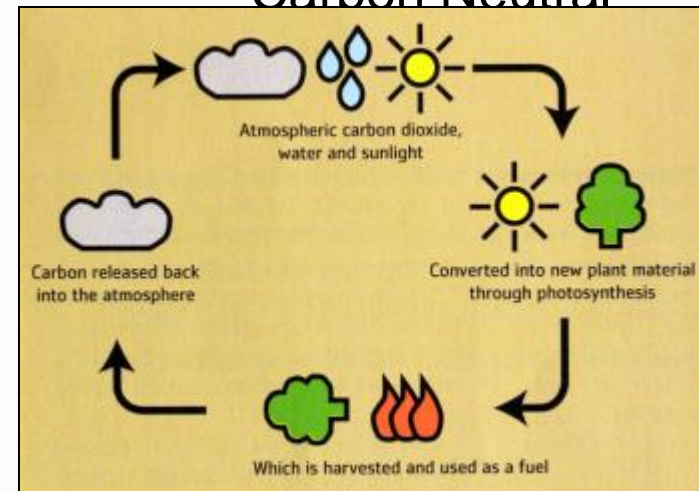


Offices – Mechanical Heating Concept



Heating Source – Wood Chip Boiler

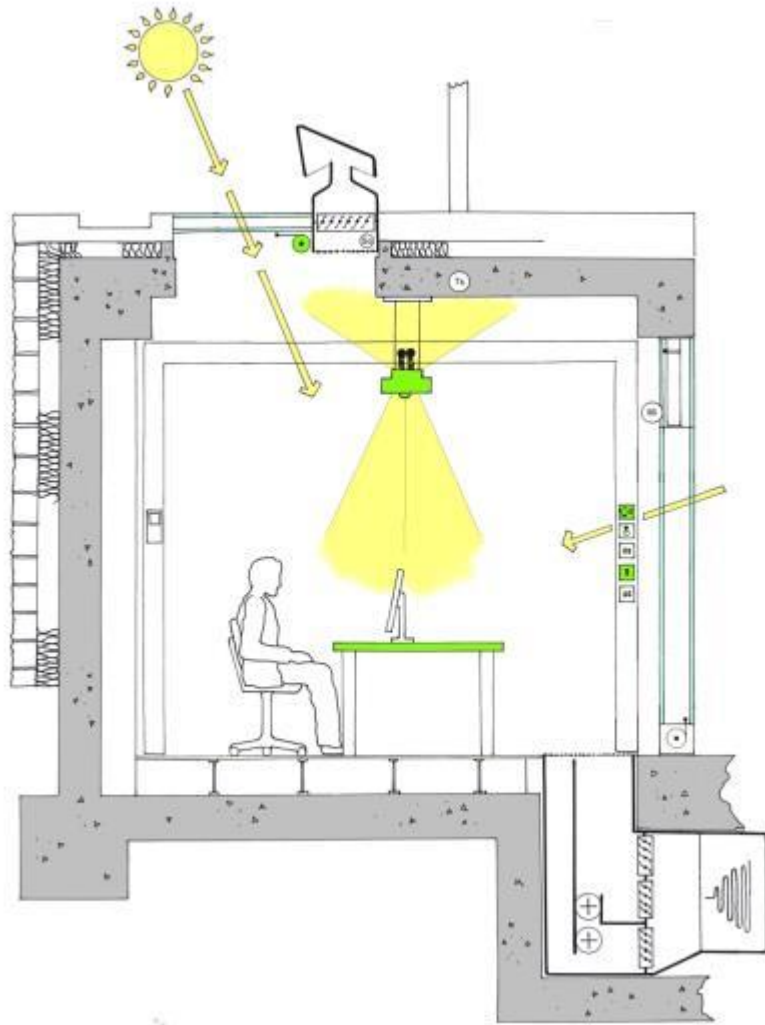
* Carbon Neutral



Office – Artificial Lighting Arrangement



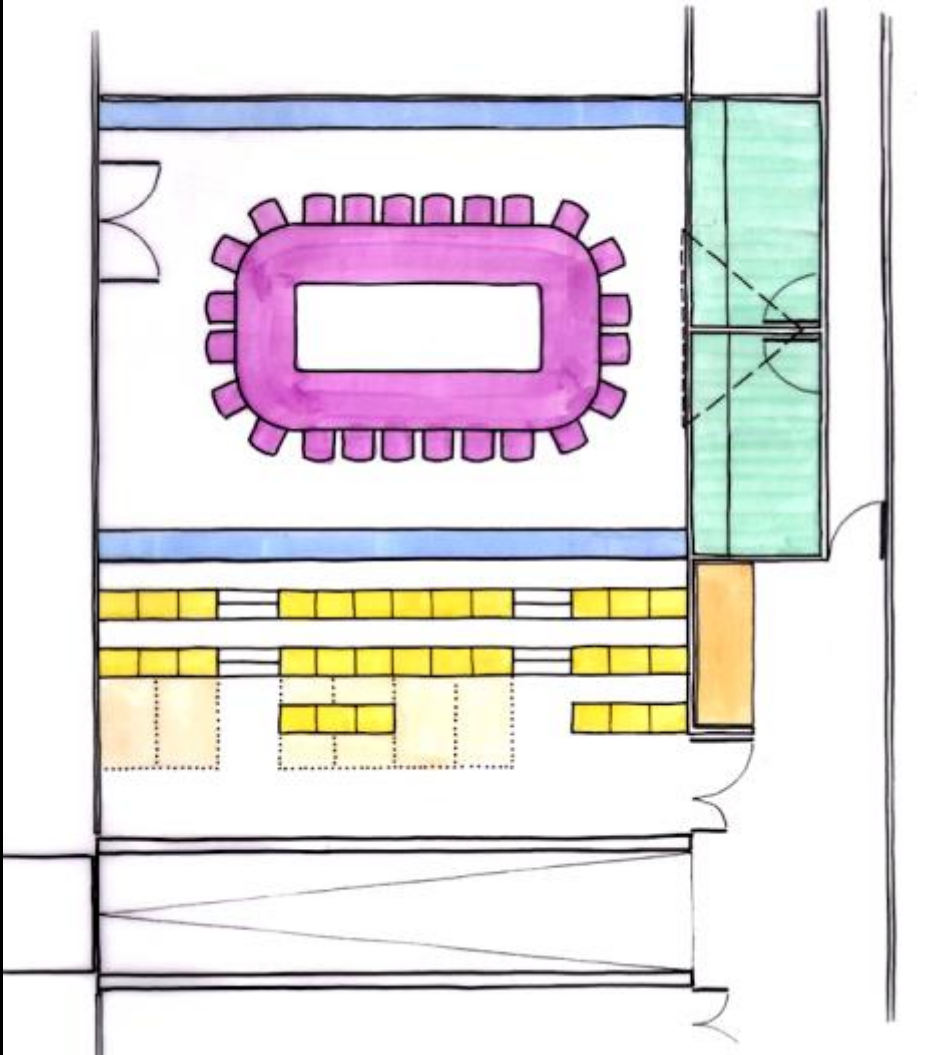
Office – Artificial Lighting Concept





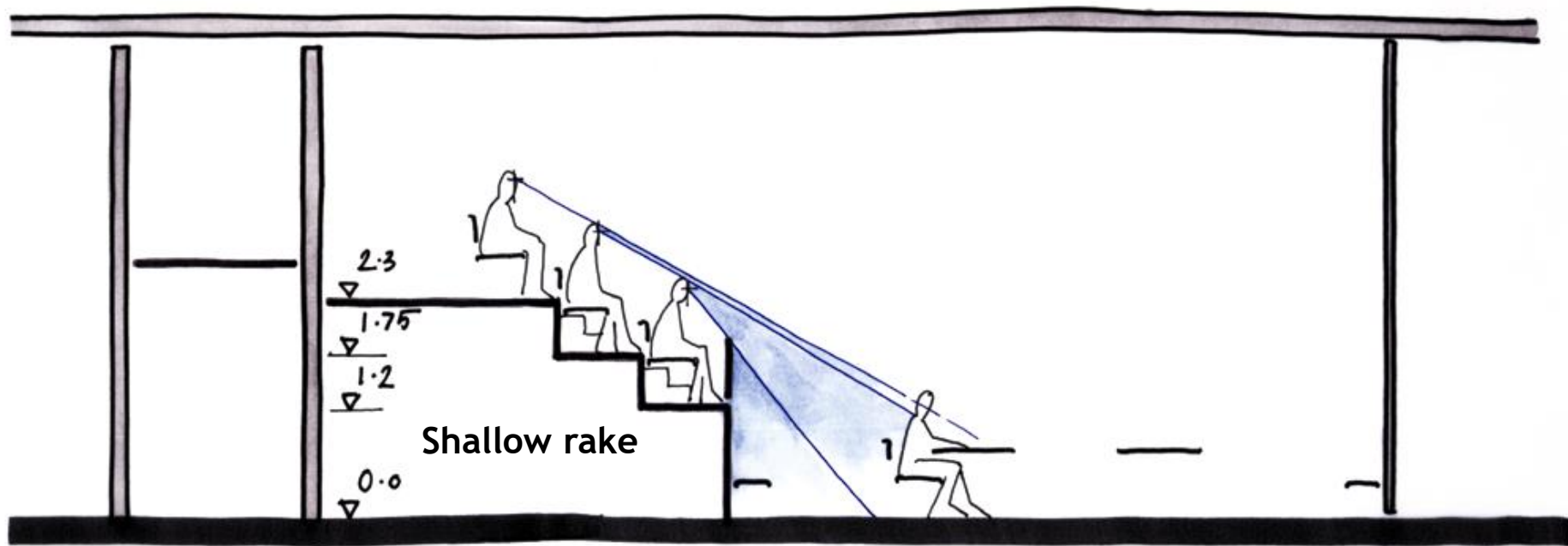
Committee Rooms

Committee Room- Option A

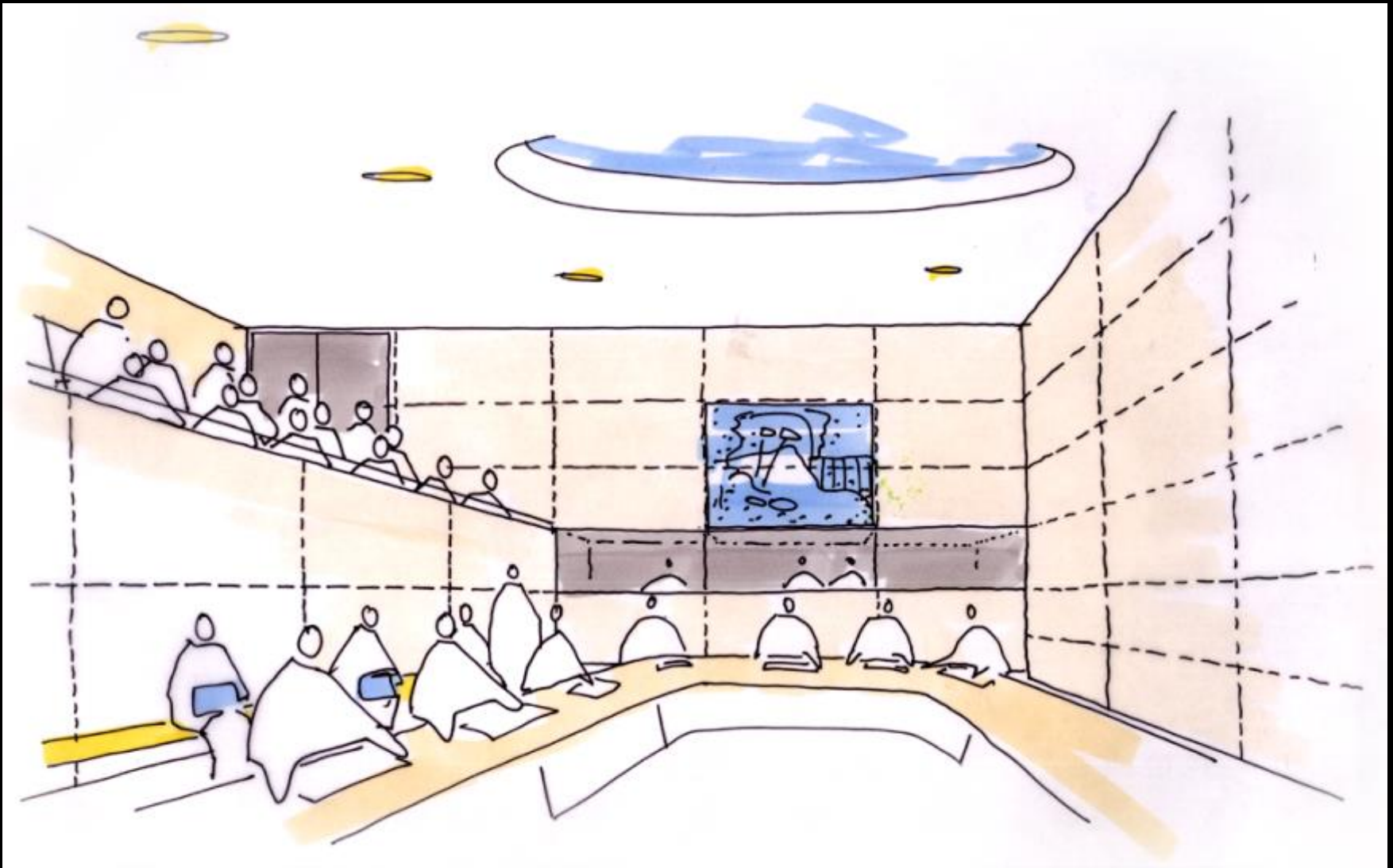


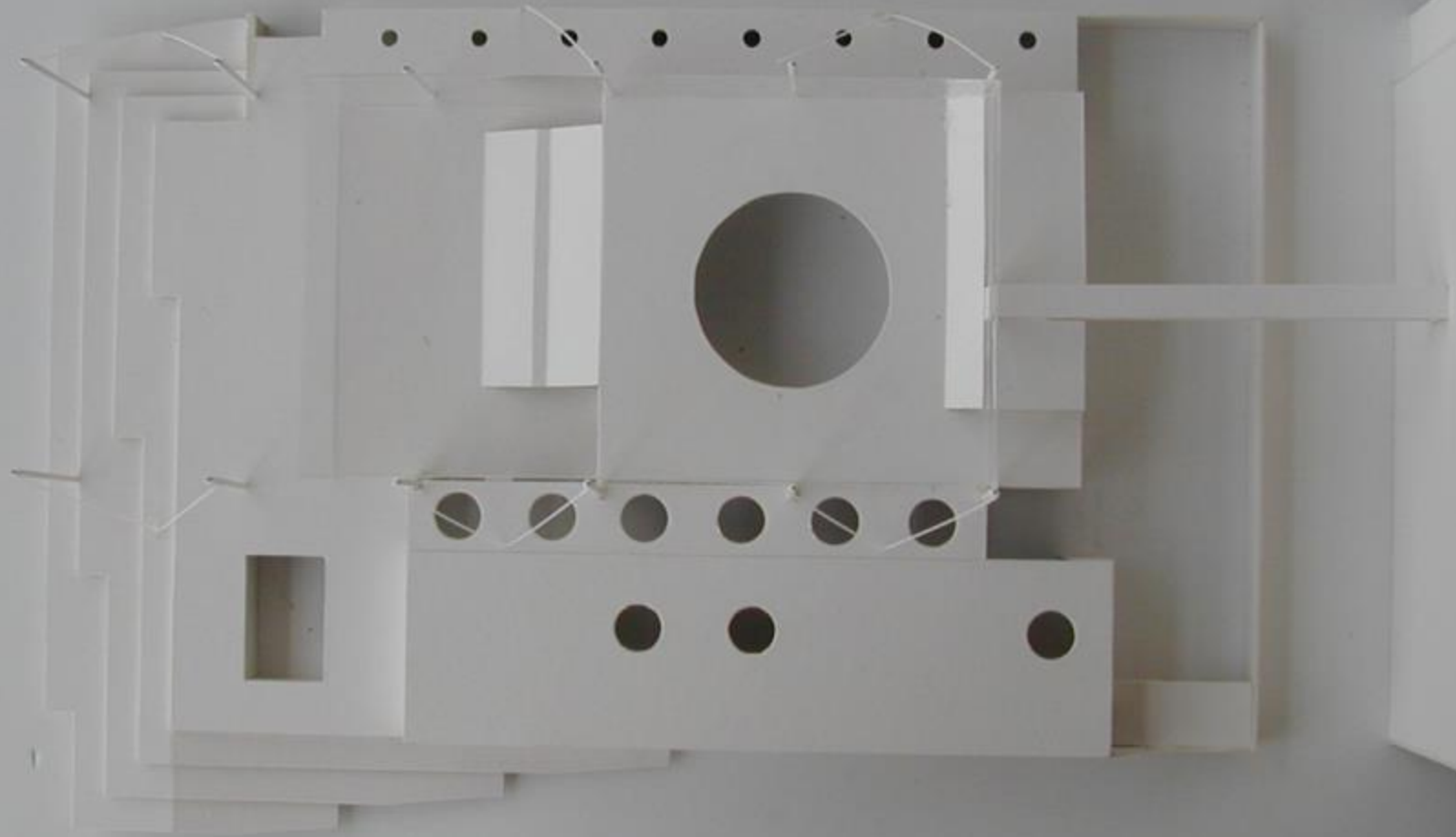
- Public Seats
- Wheelchair User Spaces
- Cloaks
- Committee Seats
- Support Staff
- Translator / Technical Room

Committee Room Sight-lines Ramped Access

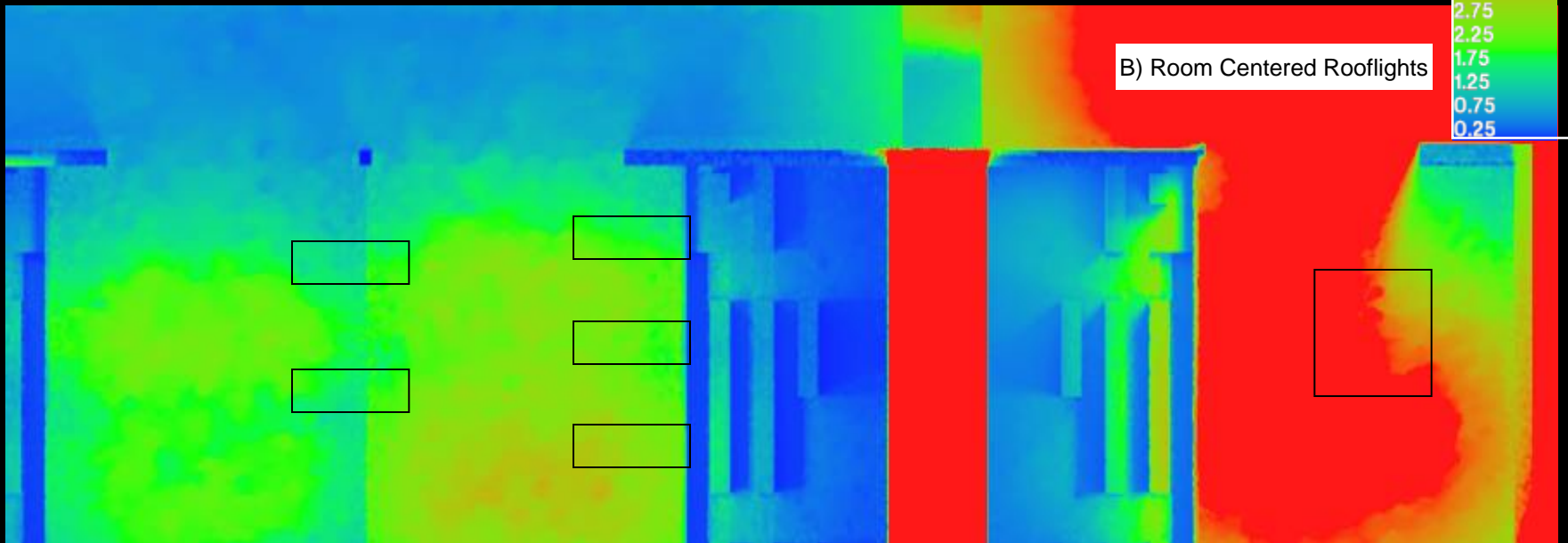
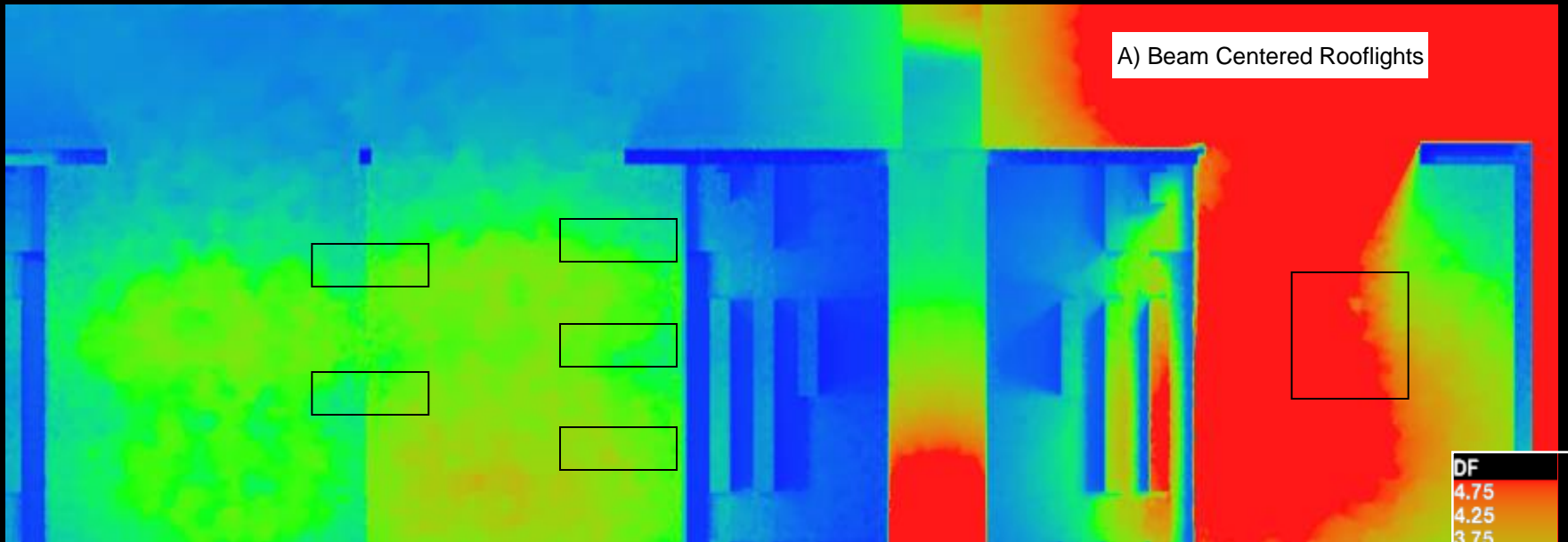


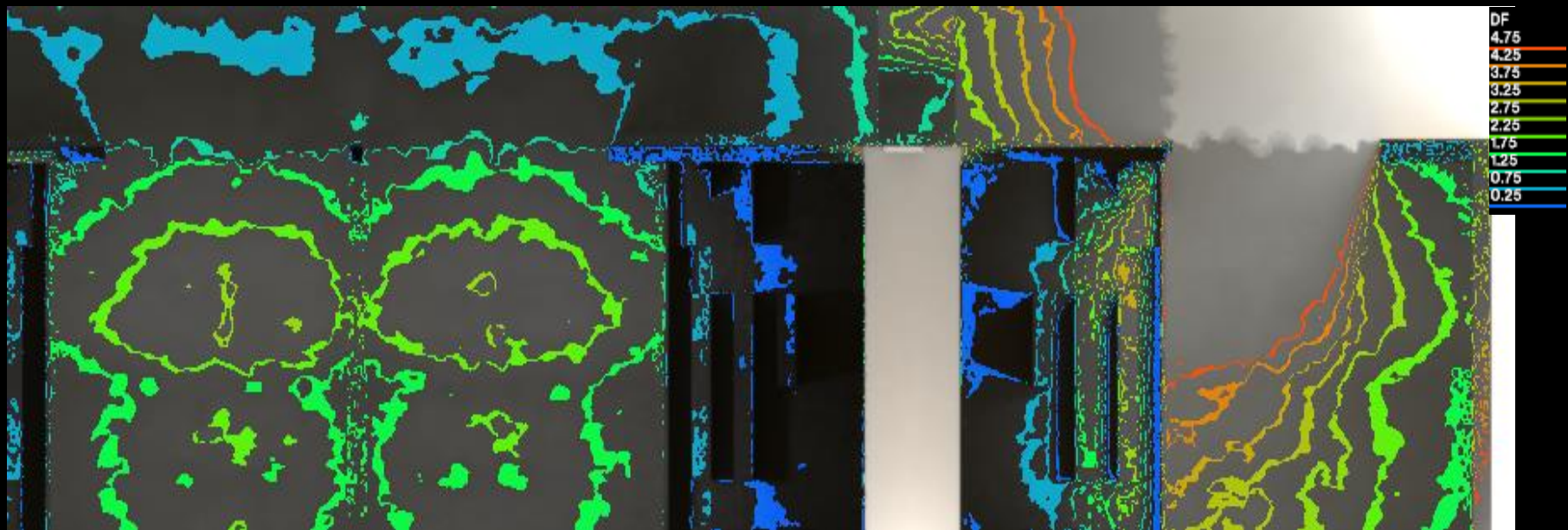
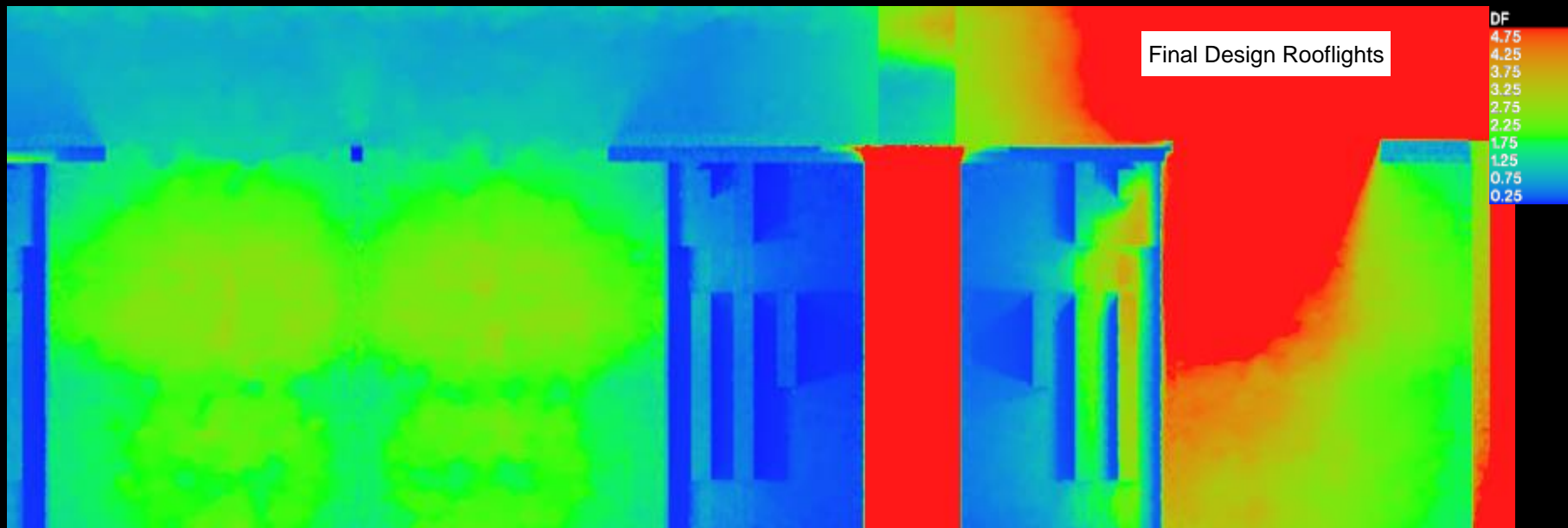
View of the Committee Room at the Lower Level



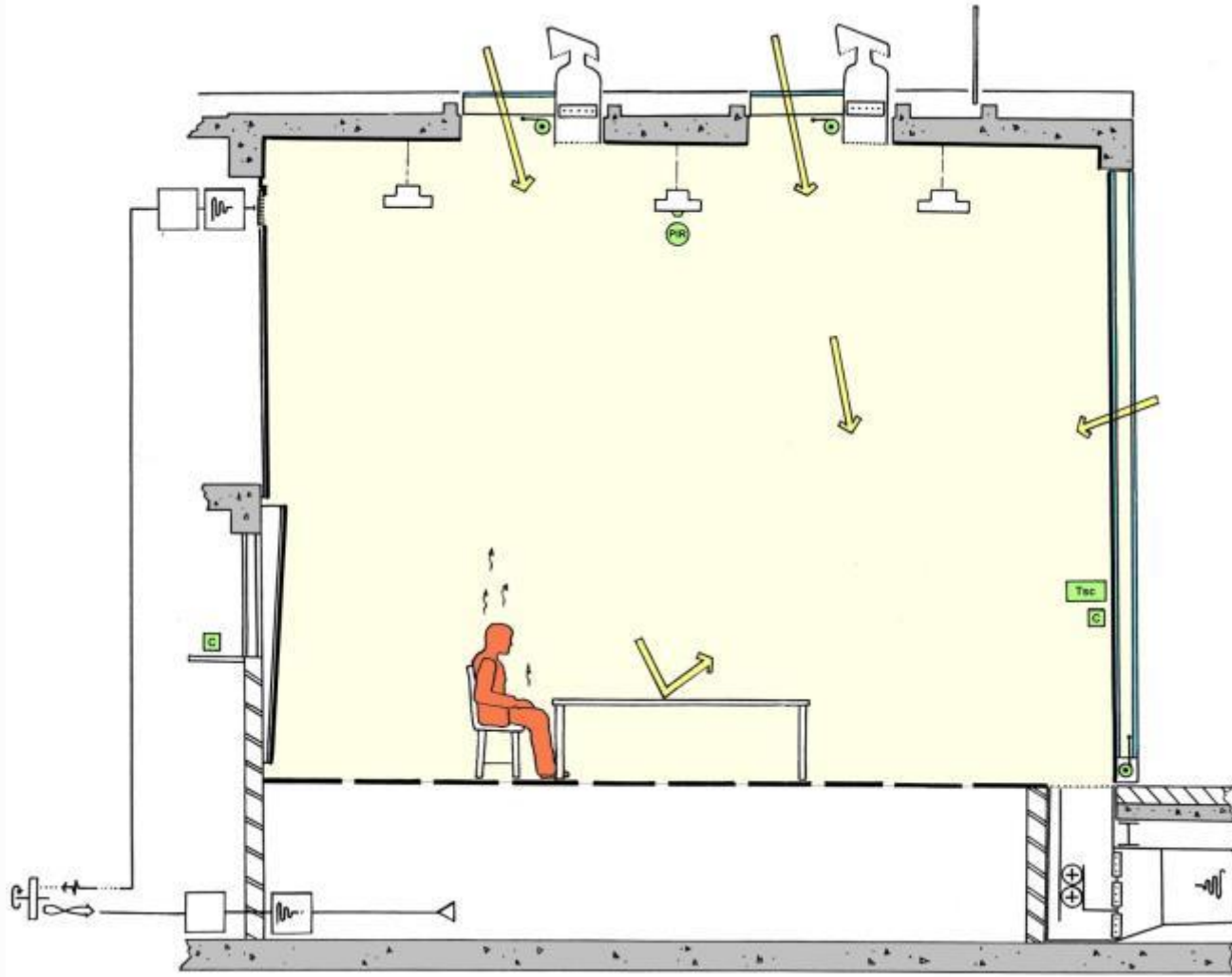




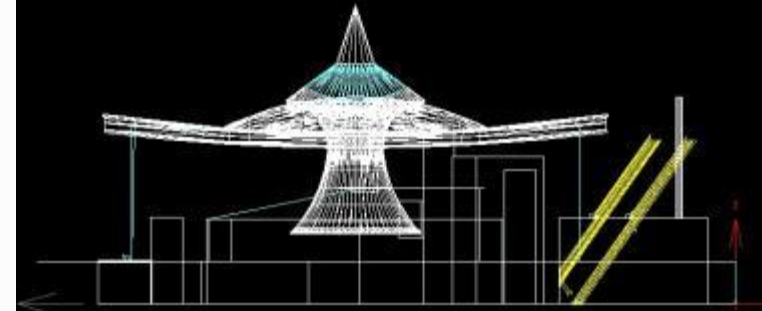
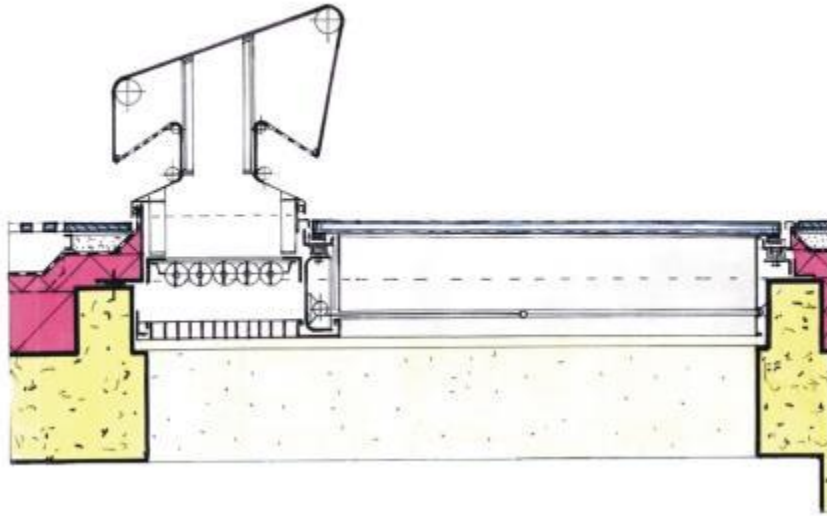




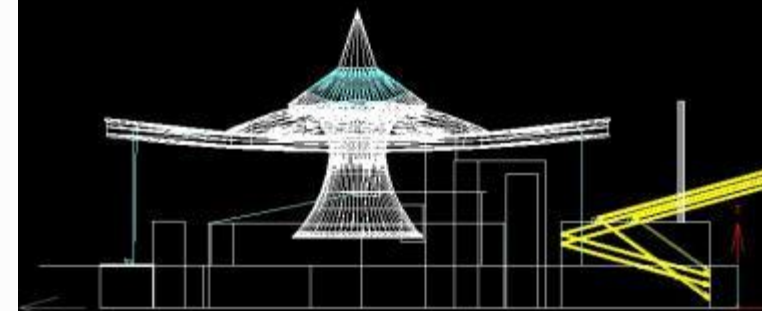
Committee Rooms - Concept



Committee Rooms – Rooflight



Mid-Summer Period



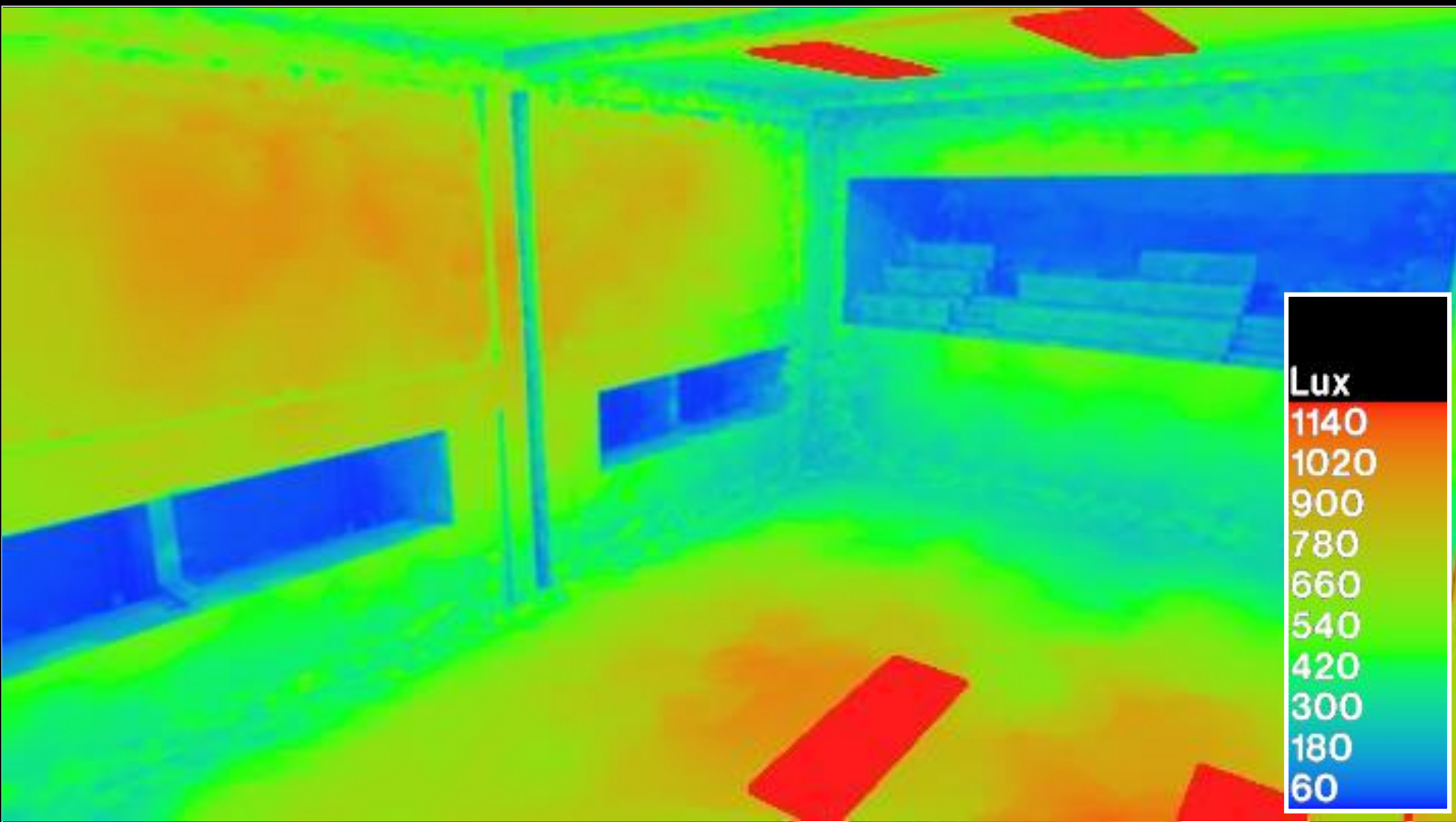
Mid-Winter Period



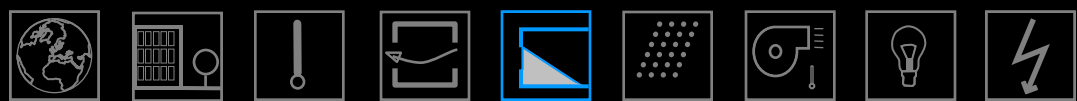
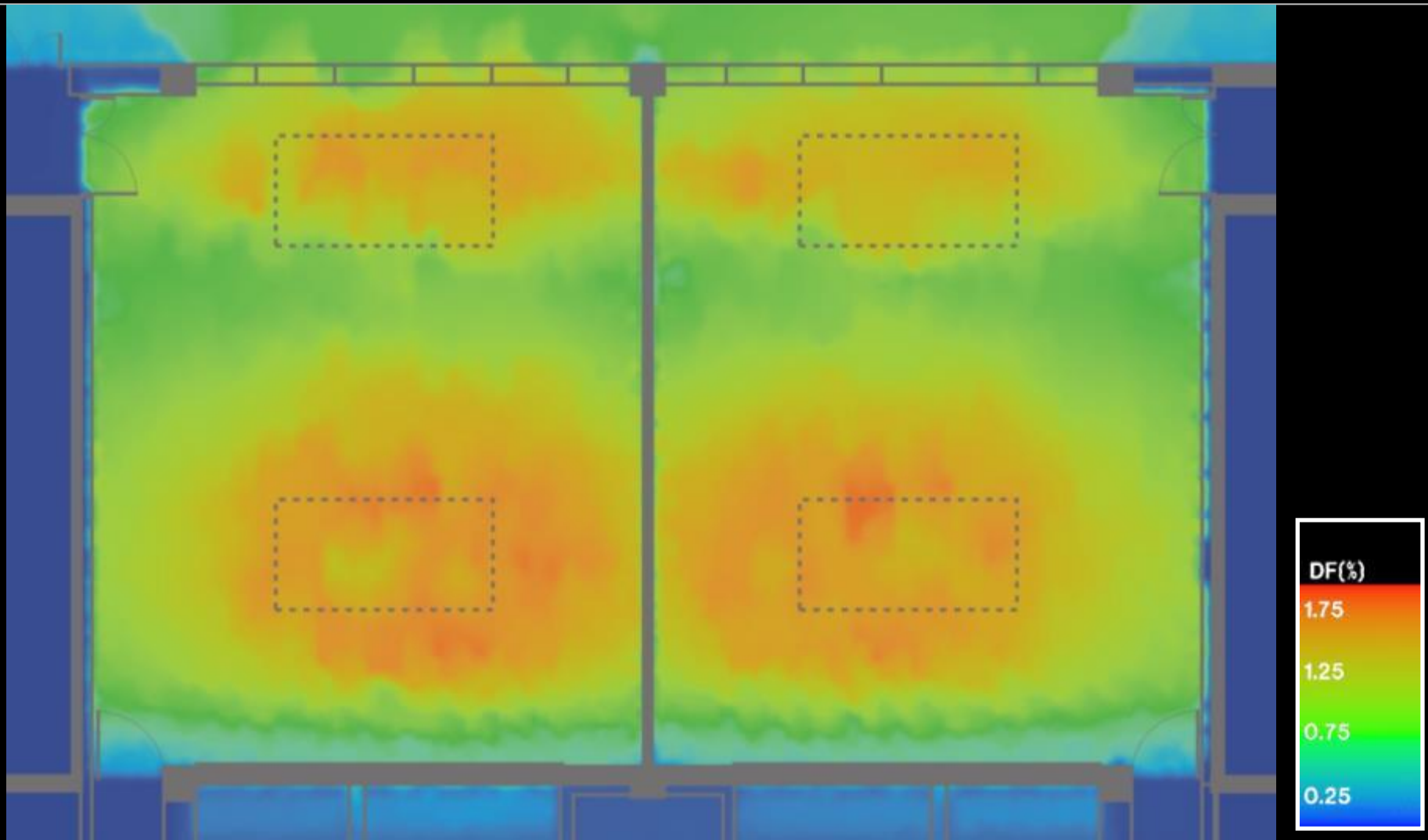
Solar Shading / Daylighting



Committee Rooms – Daylight Modelling (29th June 14:00 – Clear Sky)



Committee Rooms – Daylight Modelling (Overcast Day)



Committee Rooms

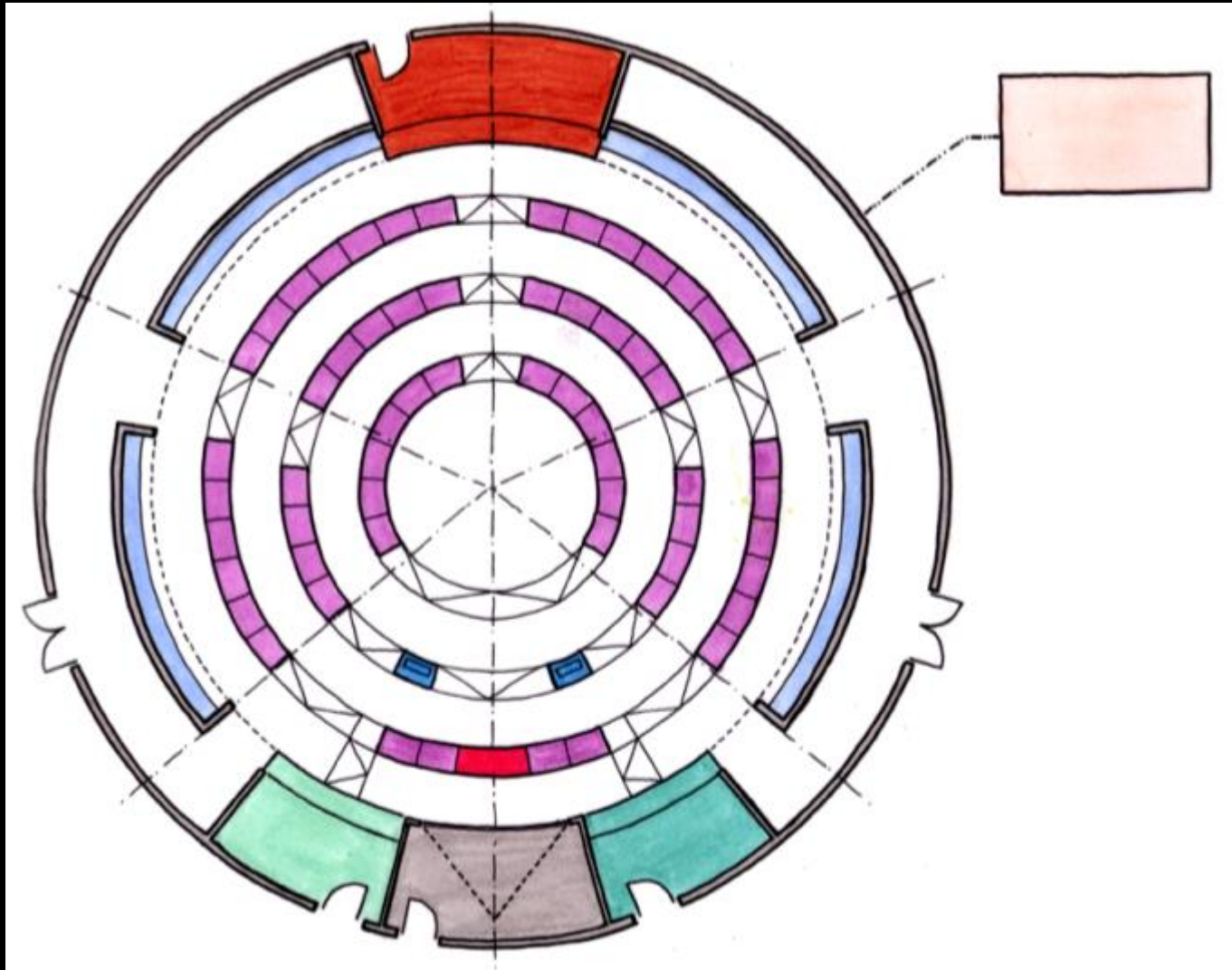


Architectural / Environmental Design

Debating Chamber

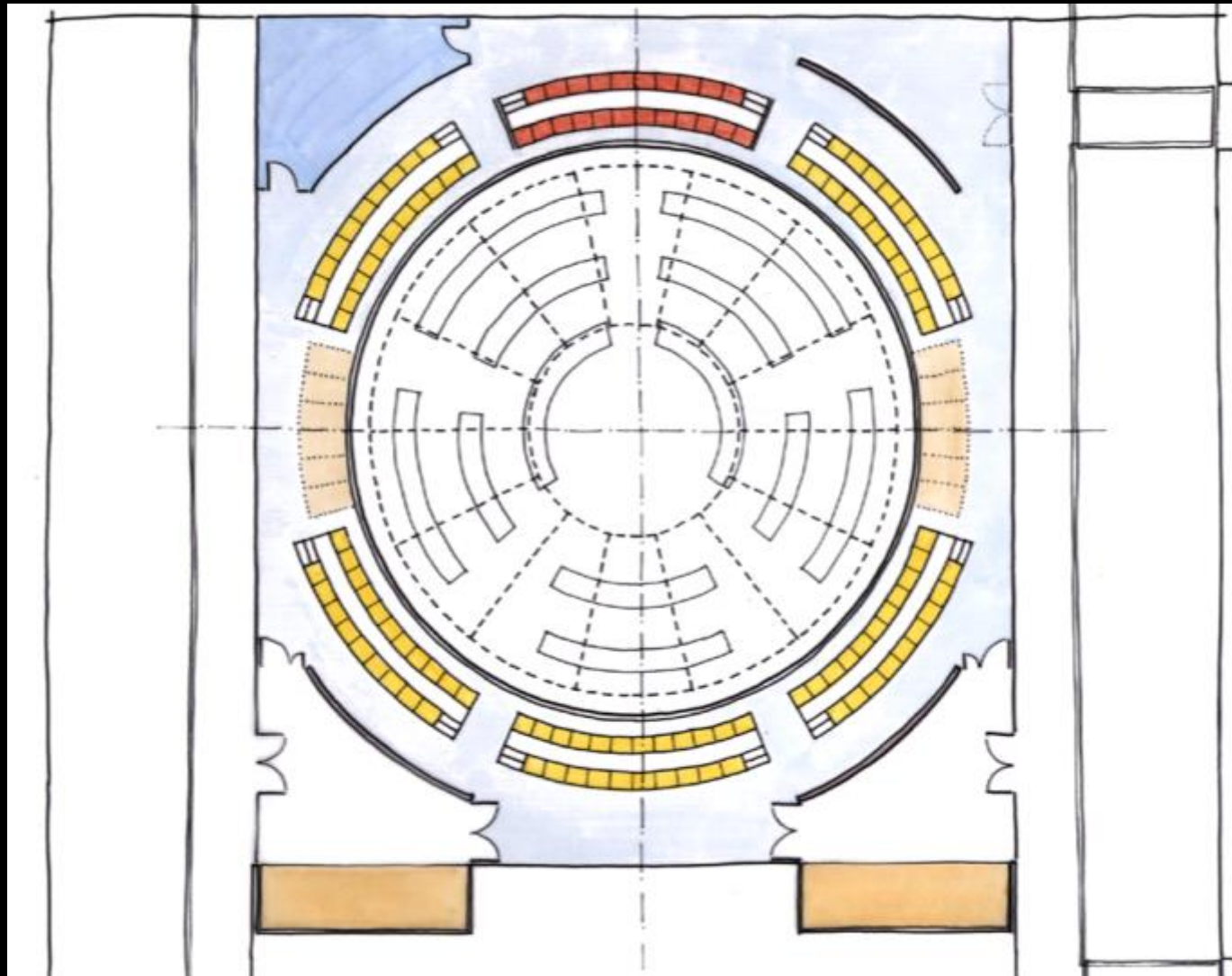


Plan of the Debating Chamber - 60 Members - Option 1



- Assembly Members
- Presiding Officer
- Support Staff
- Translator
- Back Projection
- Lectern
- Recorders
- Host Broadcaster
- Press Booth

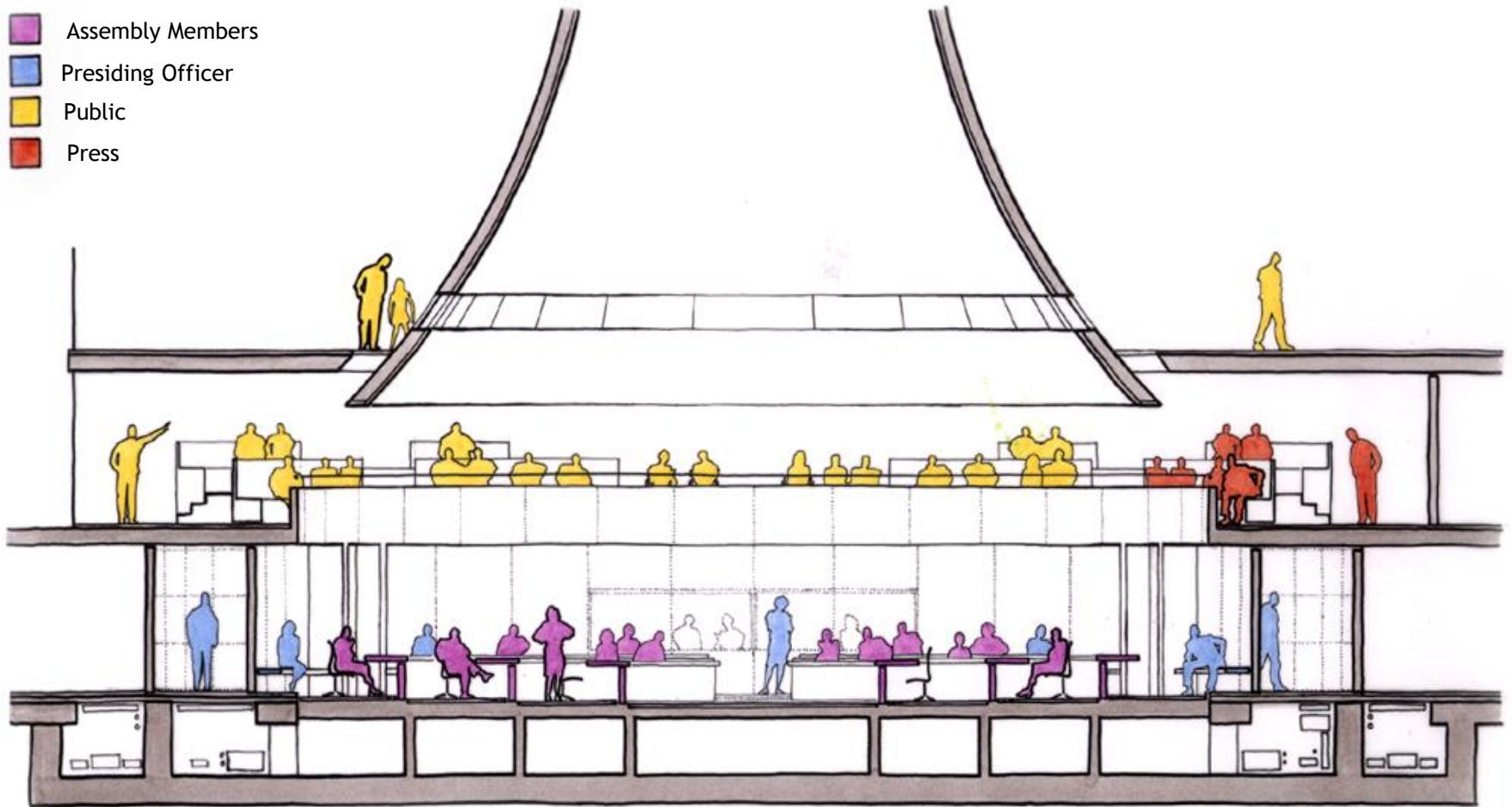
Plan of the Debating Chamber Public Gallery



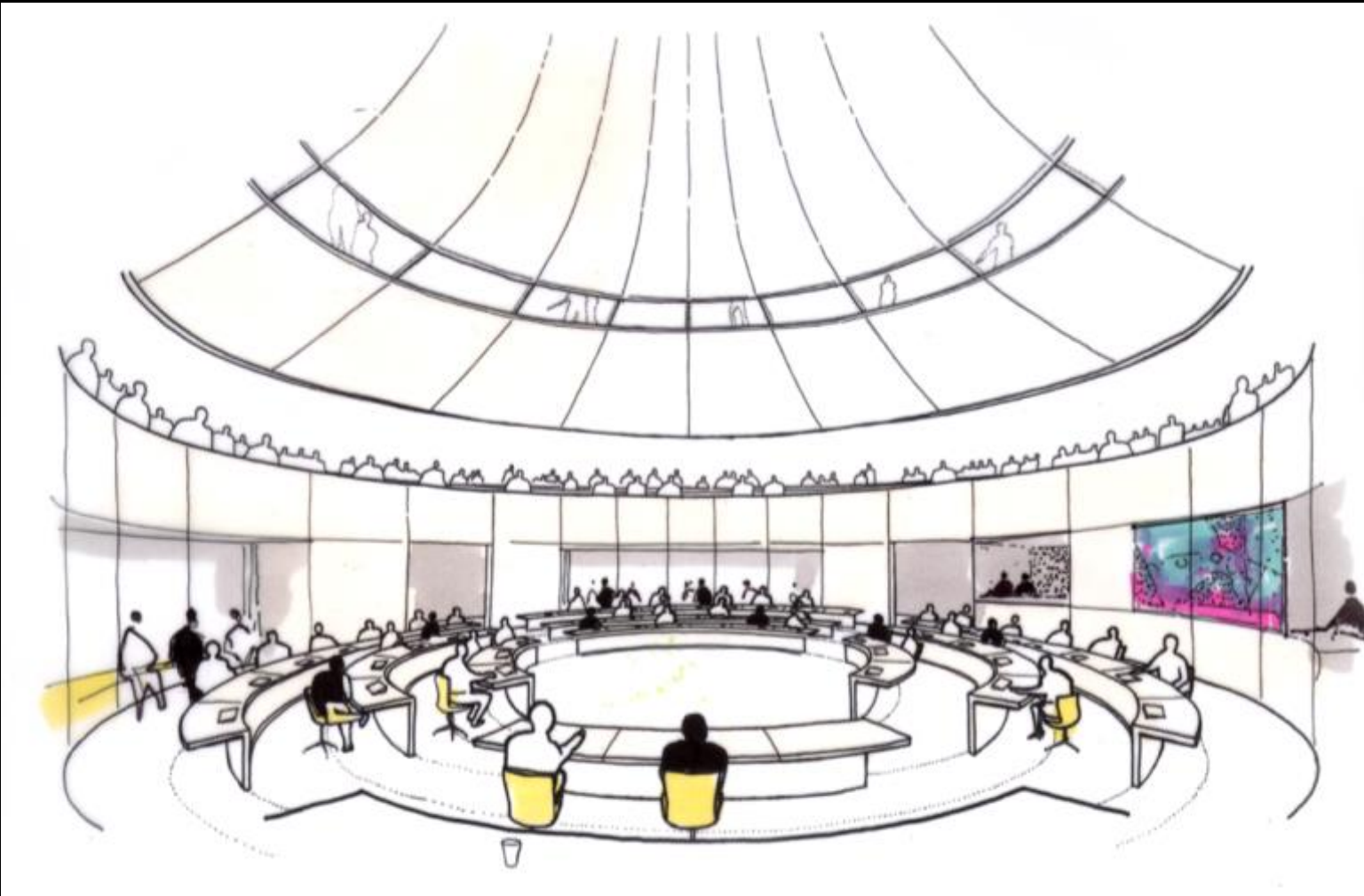
- Public Seats
- Wheelchair User Spaces
- Press Seats
- Press Phone-in Room
- Cloaks

Section of the Debating Chamber - 60 Members

- Assembly Members
- Presiding Officer
- Public
- Press



View of the Debating Chamber





05:00



06:00



07:00



08:00



09:00



10:00



11:00



12:00



13:00



14:00



15:00

21st June
Perspective 1
Shadow Sequence

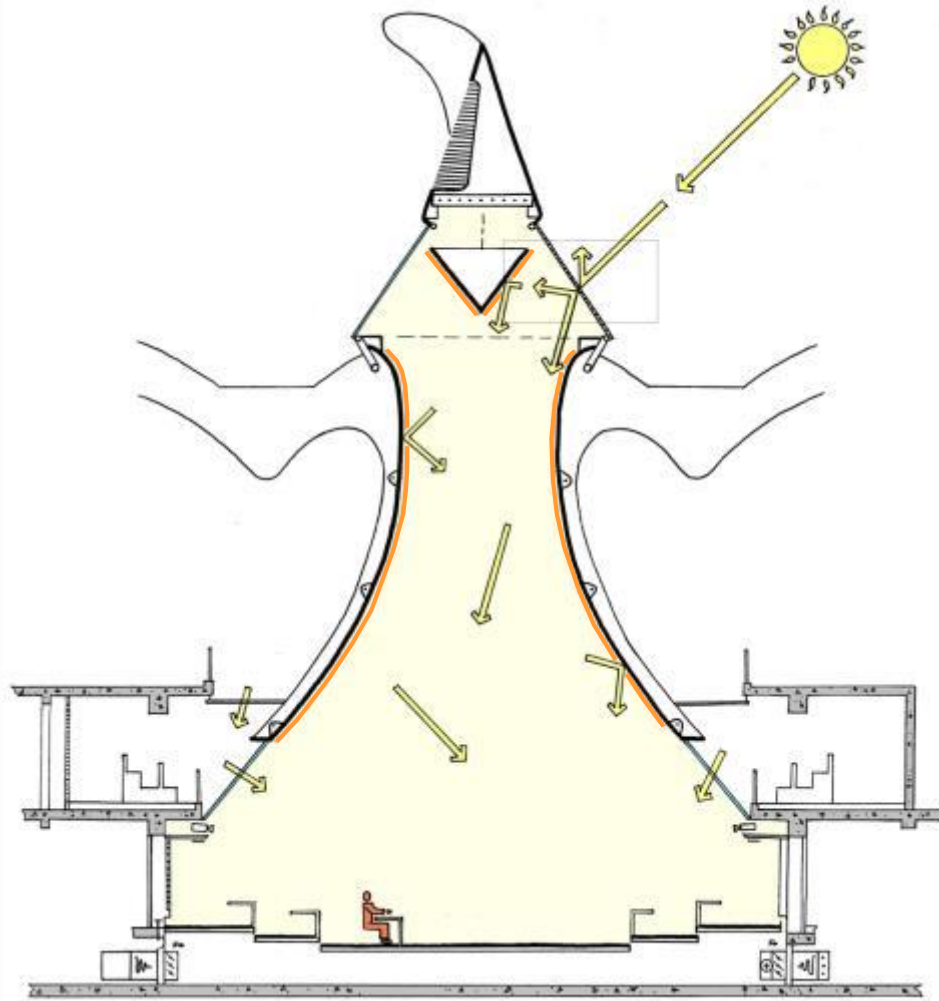


21st September
Perspective 1
Shadow Sequence



21st December
Perspective 1
Shadow Sequence

Debating Chamber - Concept

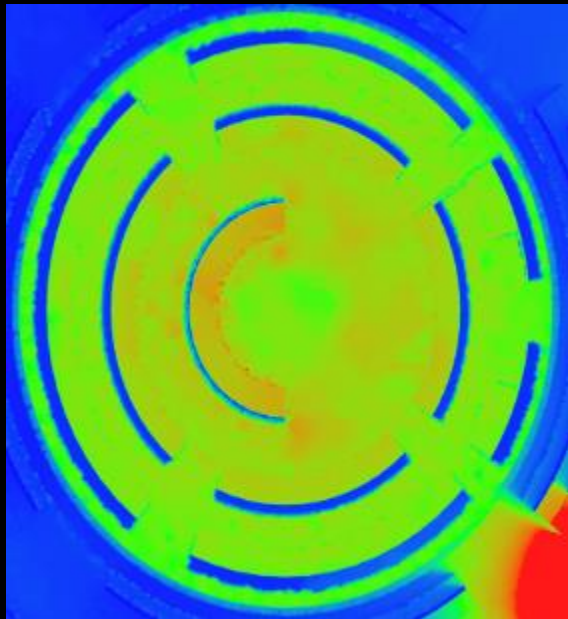


Debating Chamber - Funnel

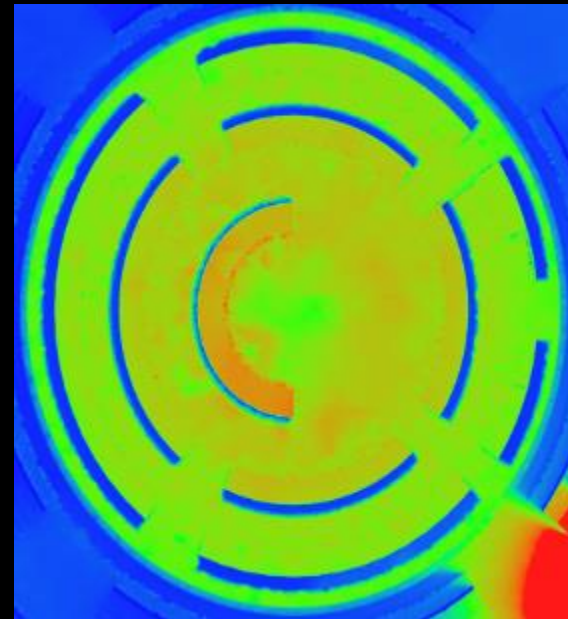


Daylighting

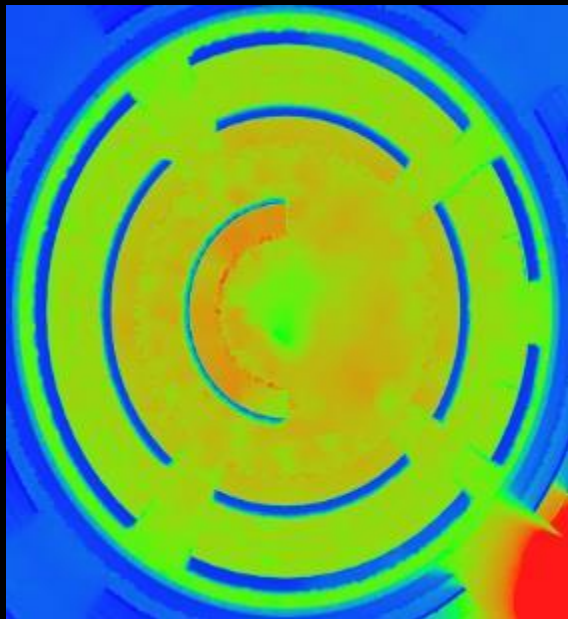




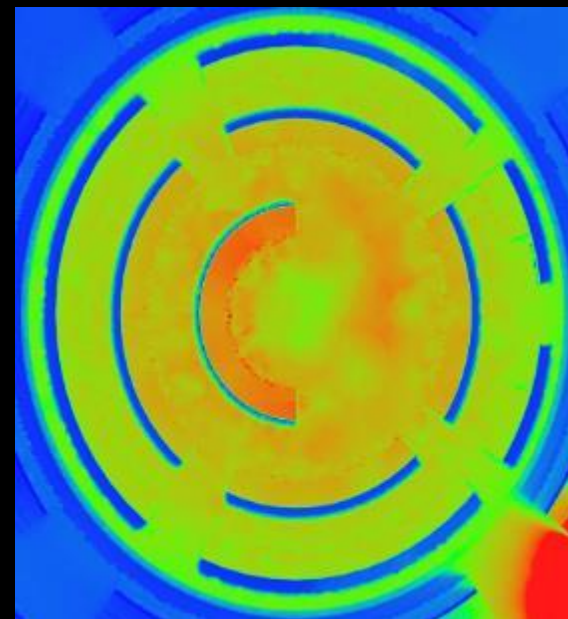
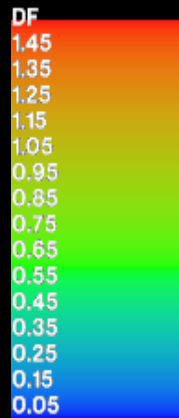
Reflectance 0.15
Cone Type 1



Reflectance 0.25
Cone Type 1



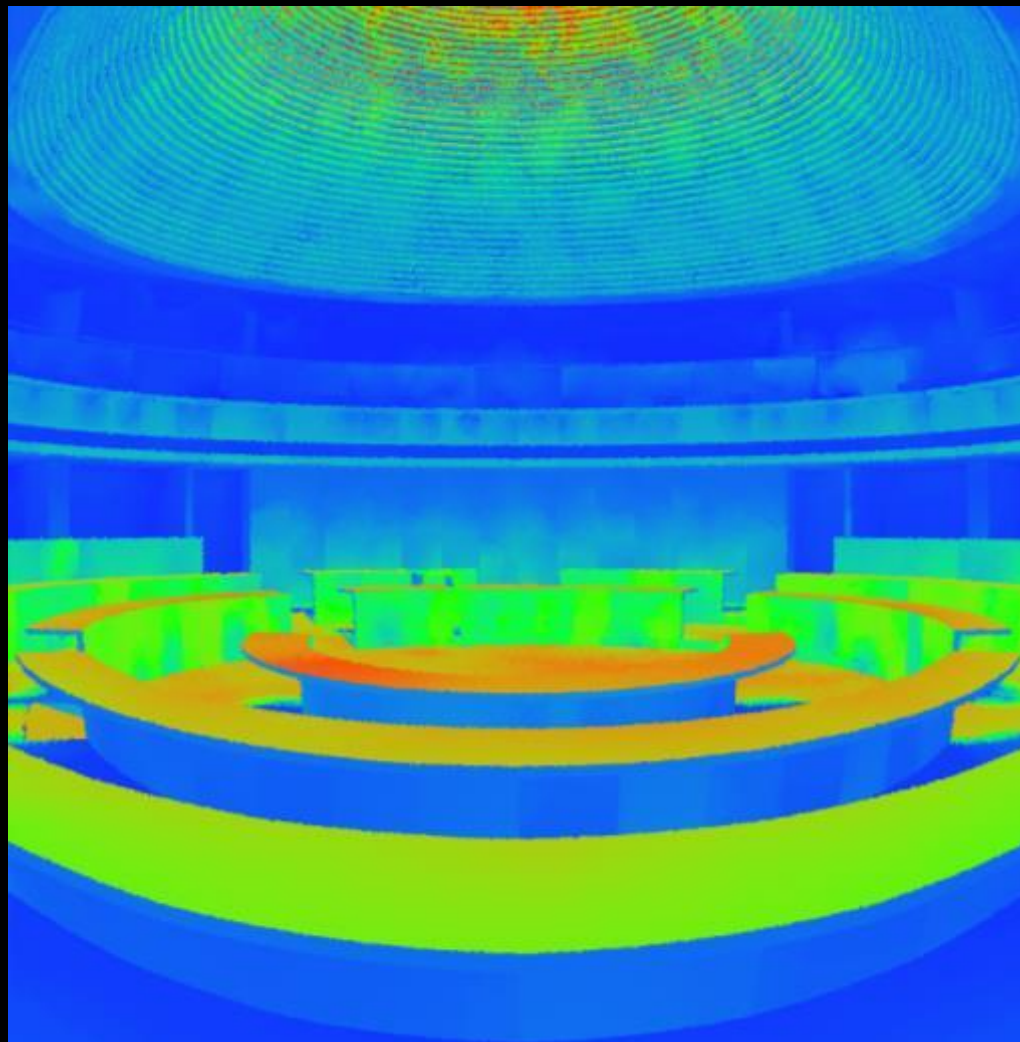
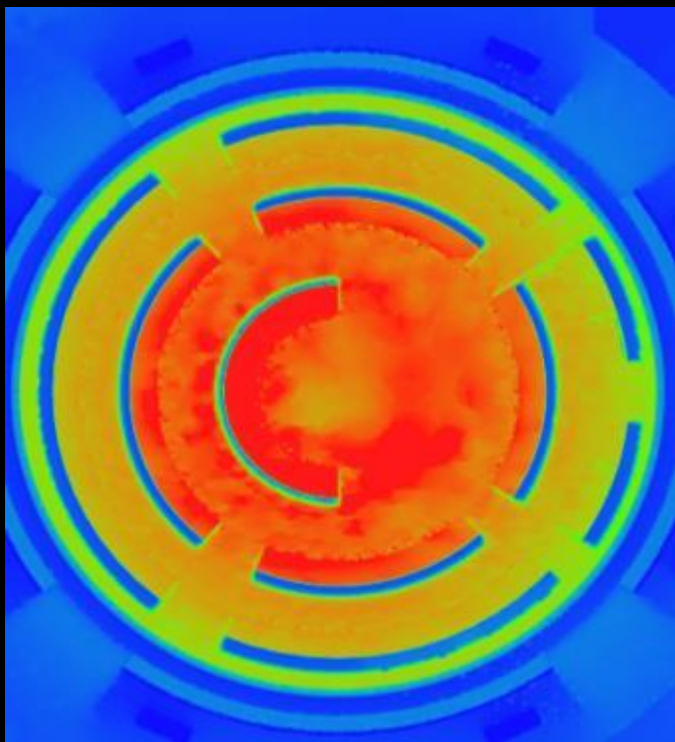
Reflectance 0.35
Cone Type 1



Reflectance 0.35
Cone Type 1
60° Reflector

Debating Chamber – Daylight Modelling; Plan (Working Plane) & 3D View

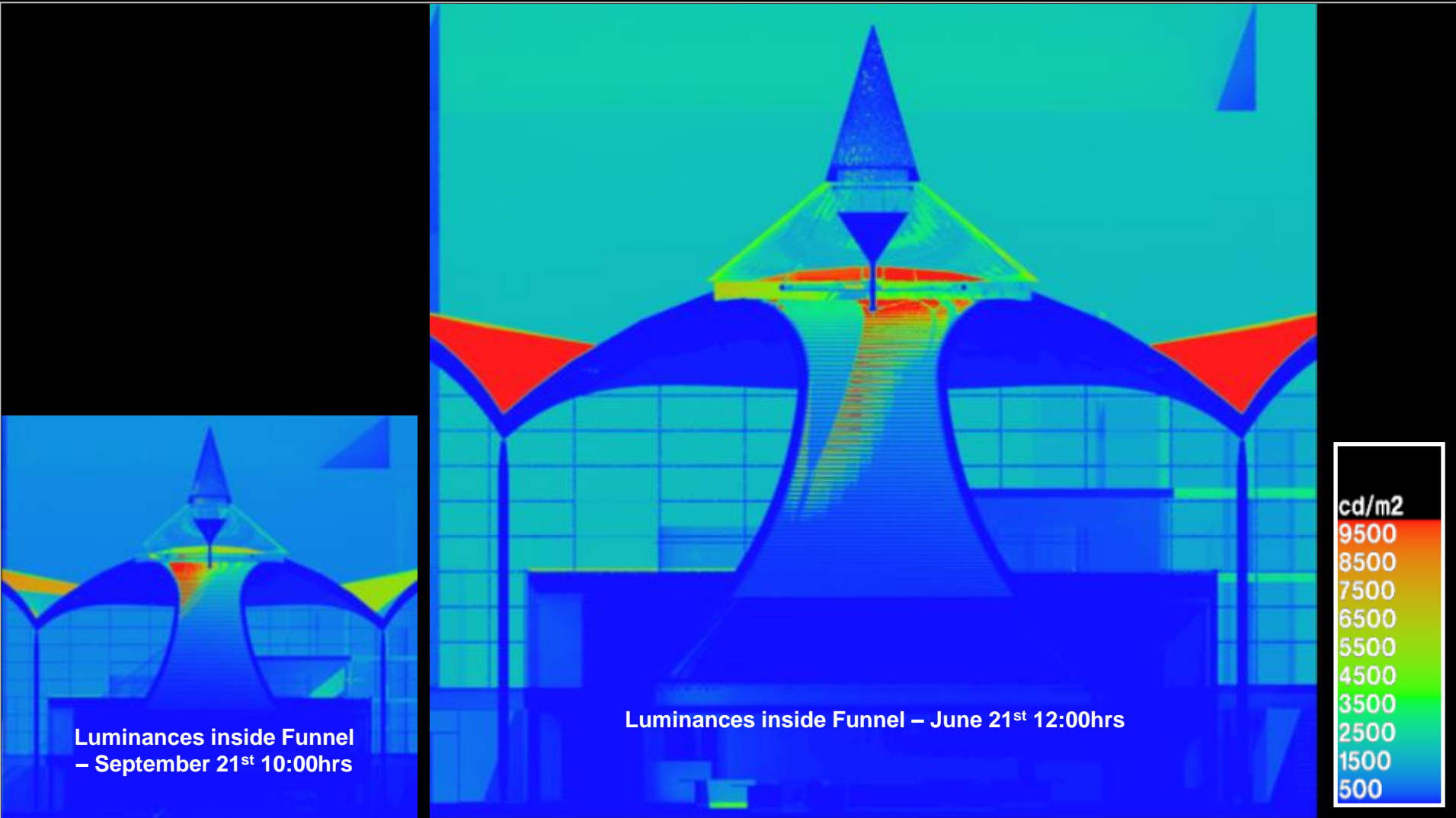
Reflectance varies
Cone Type 2
75° Reflector (Final Design)



Debating Chamber – Details



Debating Chamber – Daylight Modelling; Sections

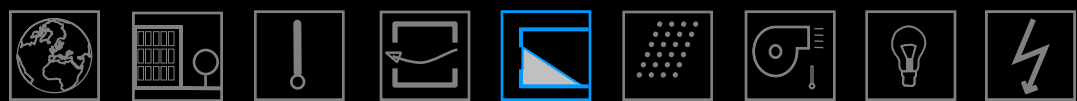
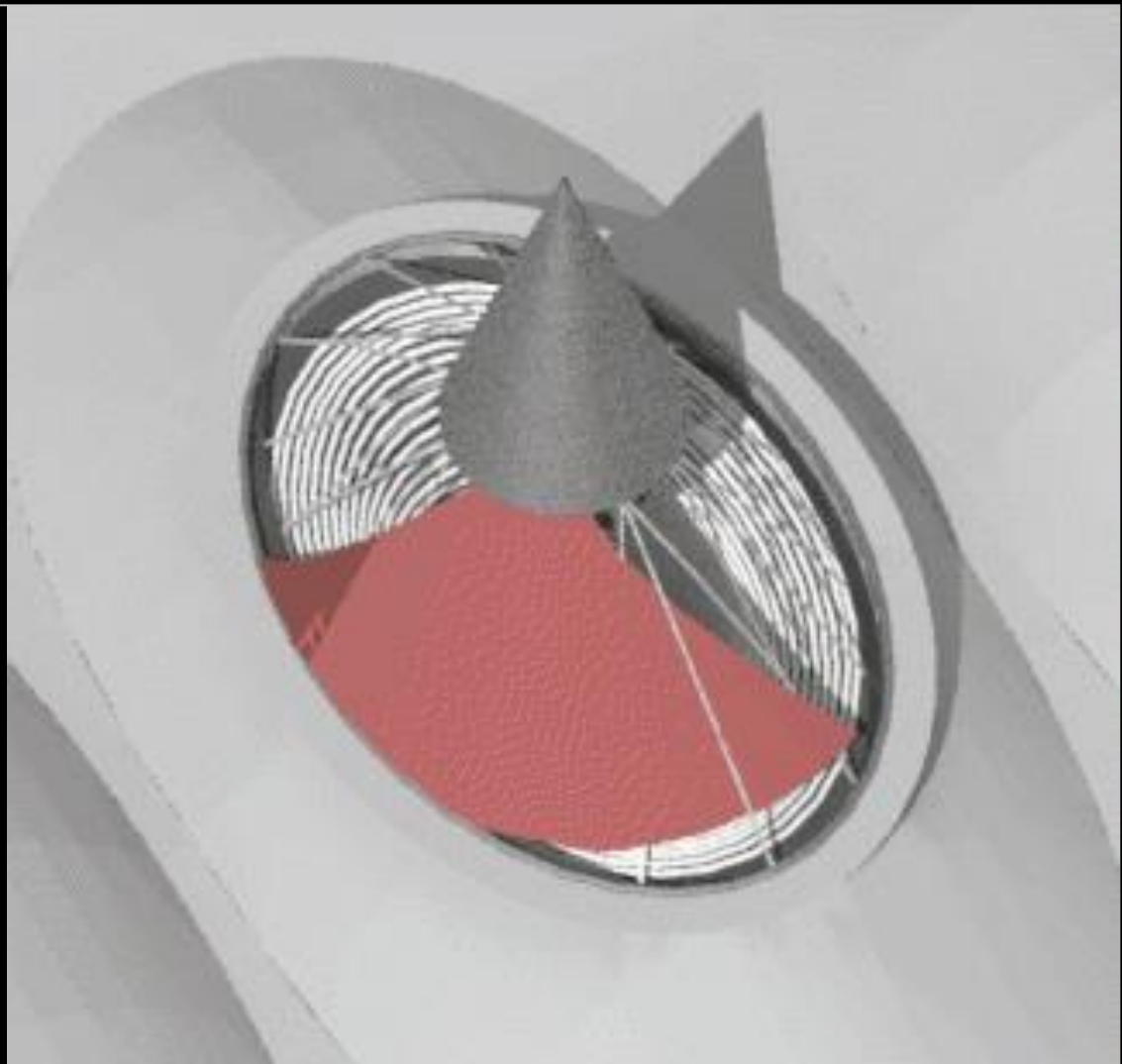
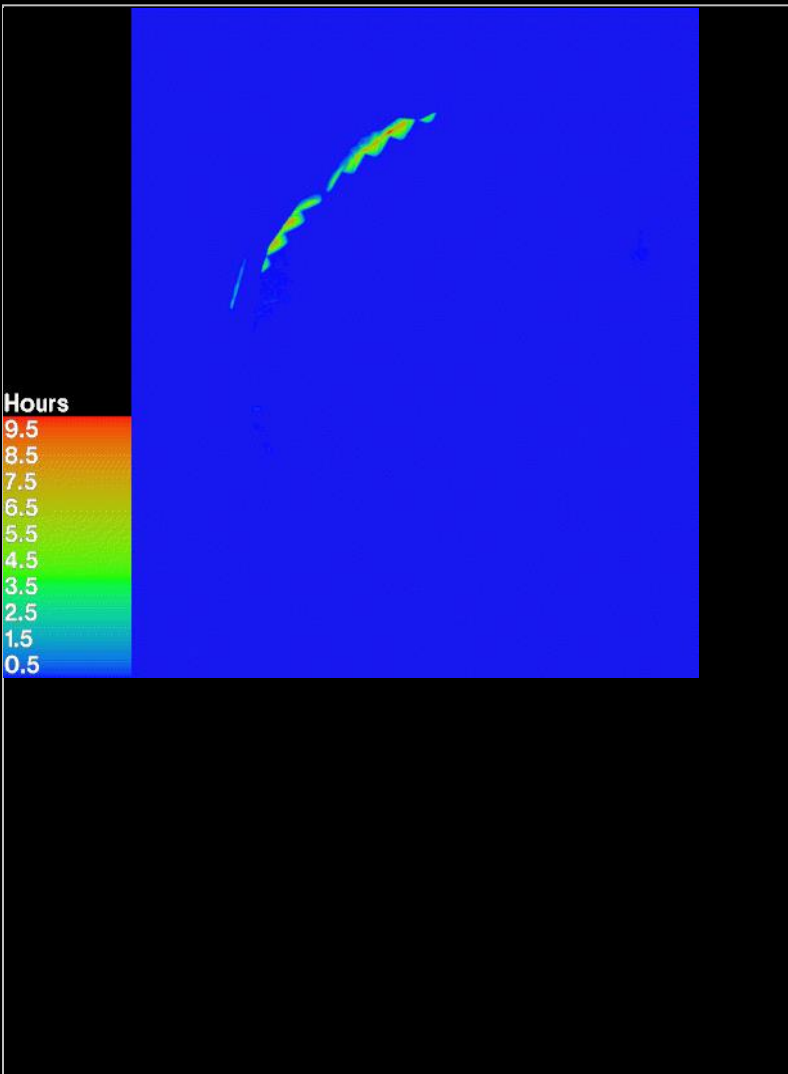


Luminances inside Funnel
– September 21st 10:00hrs

Luminances inside Funnel – June 21st 12:00hrs



Debating Chamber – Daylight Modelling, Control

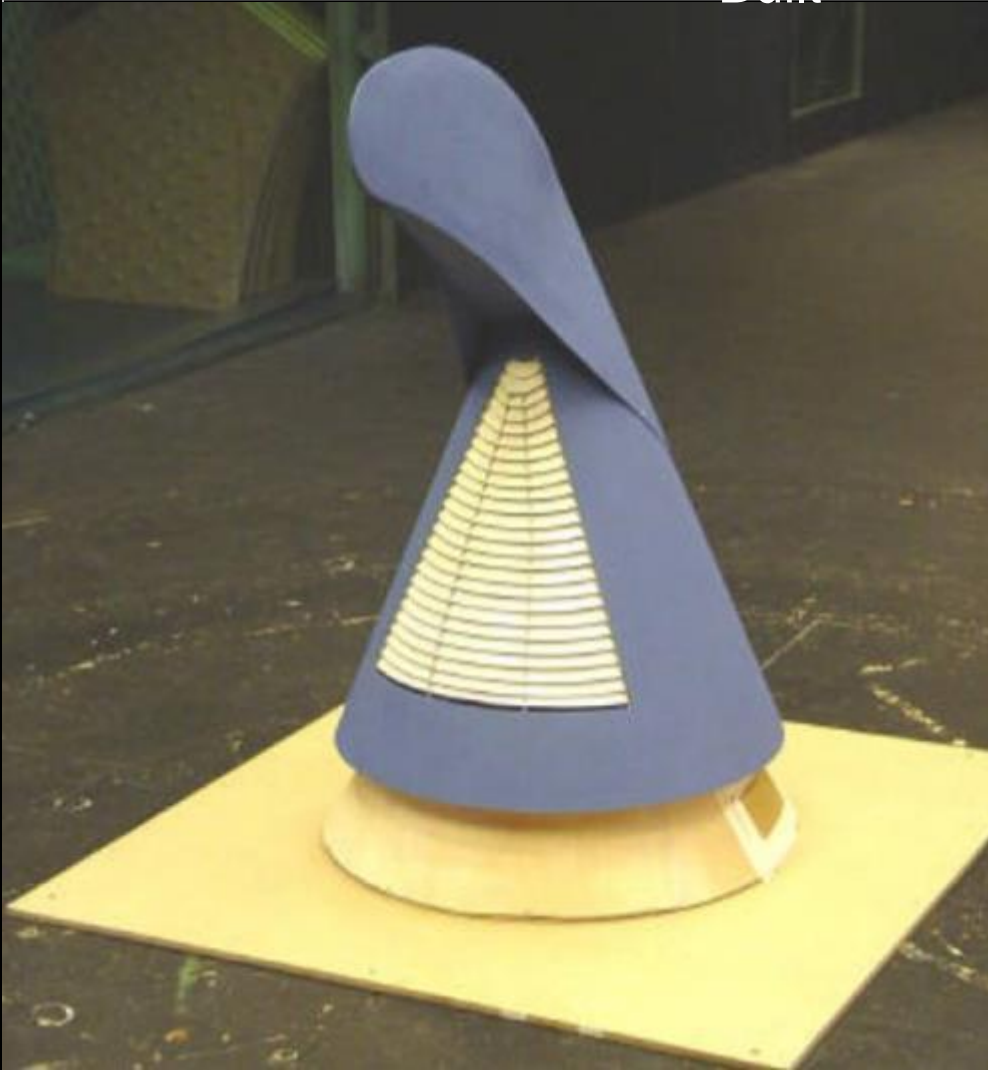




Debating Chamber – Artificial Lighting



Debating Chamber – Rotating Wind Cowl Model & As - Built

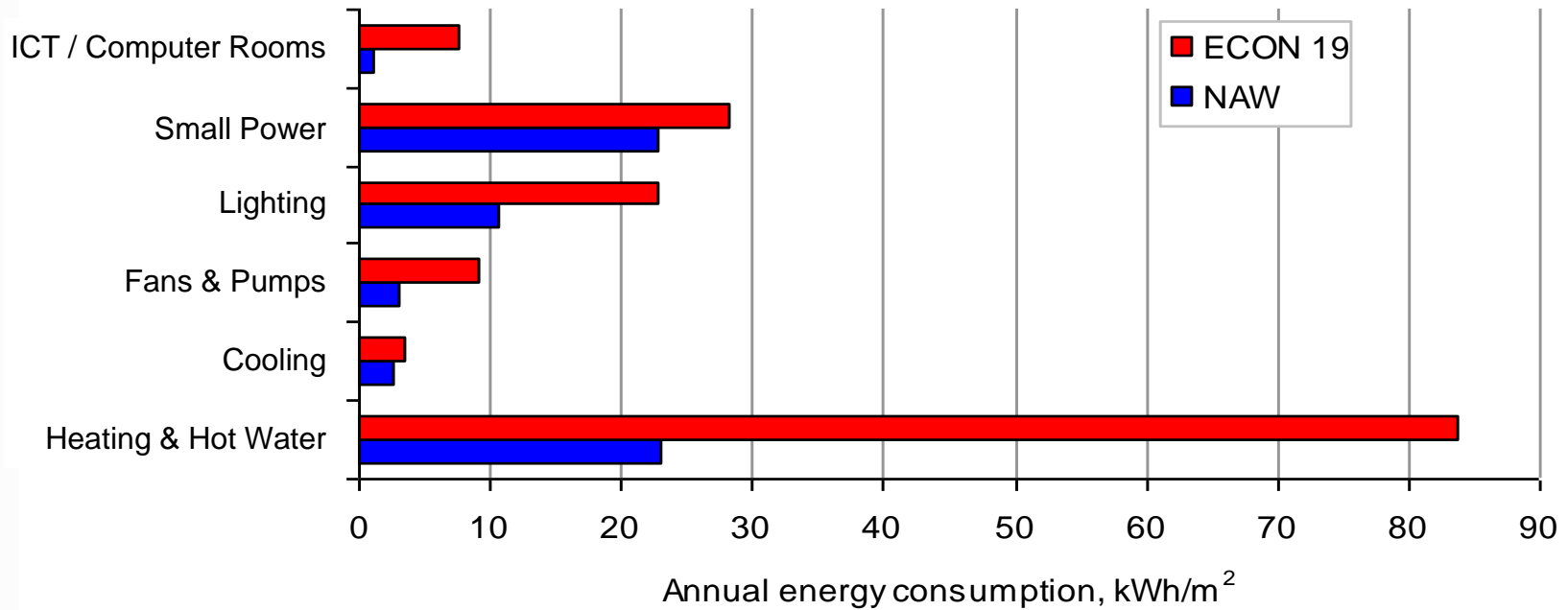








Predicted Energy Demands (Nov 03')



Detailed post-processor predicts that:

41% energy consumption of a good practice (hybrid) benchmark

28% of Carbon emissions

Performance **considerably** better than equivalent prestige HVAC

Total Energy Demands



