UN
private
authority
security
Urban Context

NY

people openness
Position
Lifting
Composition
Form
Urban Response / Concept
[og]
Urban Farm
Canteen / Delegates Lounge
Offices & Meeting Rooms
Council Chamber
Lobbies
Library
Auditorium
Visitor Entrance
Entrance, Exhibition, Shop & Product Space
Security, Bike Storage & Facility Management
Urban Farm Tower
Restaurant
Event Space
Auditorium
Market

Given Brief
Added Brief

Layout / Brief
Maintenance and Security Pavilion

Restaurant Storage and Access

Turning Circles for Heavy Duty Vehicles

Connection to Existing UN Building

Staff Entrance

Urban Farm Logistics Point

Basement / Logistics
Visitor Entrance Experiences
Visitor Entrance Route

[24]
#01 Public & Secured

The ground plan is made completely accessible by creating outdoor spaces and a route through them in between the different building elements.

At the same time the secured circulation occurs on the first floor level above which still allows visual interaction and a sense of open- and togetherness.

#02 Council Security

When the council is in session a few times a year, the area around the main building can be easily closed off thanks to the water barrier around the building, so that only 3 controlled access points remain.

#03 Staff Only

Whilst the ground floor is generally completely accessible to the public, there are still a few corners that are secured at all times for staff only access to the buildings.

#04 Access Categories

routes for different groups of people:
- green: staff
- red: tourists and visitors
- blue: public
Interior
Form
Terraces are cut into the southern sides of the building.

Skin
Vertical Metal Louvers unifying tower into one sculpture.

Envelope
Stepped Tower
Tower shaped responds to orientation of sun and city

Responsive Form
Expression of floor levels

Horizontal Expression
Creation of terraces to highlight entrances and create external circulation areas

Carving Out

Tower Form Development
Gradient
Increase in ‘Cut’ sizes towards southern tip of the building

Double Height
Combination of stepped terraces to connect office levels

Structural Grid
Alignment of ‘Cuts’ with structural concrete column grid

Composition
Shifting of ‘Cuts’ to cause dynamic eye movement

Tower Form Development
Archaeology Museum of Vitoria, Spain / Francisco Mangado, 2009
Ceiling
40 x 40 mm silver fir strips
Black acoustic Mat
40 mm sound insulation
Supporting Timber framework
350 mm service space

Terrace
180 x 20 mm silver fir boards
PVC supports
Bitumen waterproofing
Prefabricated concrete element

Sunblinds
Individually operable black fabric roller blinds

Glass Handrail
extruded aluminium profile & laminated, toughened glass 2 x 6 mm

Aluminium Sheeting
6 mm matt bronze-waxed
Floor
180 x 20 mm timber floor boards
55 mm heating screed
Separating Membrane
30 mm thermal insulation
20 mm sound insulation
320 mm reinforced concrete slab

Glazing
Aluminium profile with double glazing:
6 mm float glass • 16 mm cavity • 8 mm laminated safety glass

Louvers
4 / 185 mm aluminium sheeting
matt bronze waxed

Steel Profile
300 / 200 / 10 mm

Critical Facade Detail B
Louvers
4 / 185 mm aluminium sheeting matt bronze waxed

Glass Handrail
Extruded aluminium profile & laminated, toughened glass 2 x 6 mm

Aluminium Sheeting
6 mm matt bronze waxed

Exterior 'Void' Wall
25/25 mm Ash battens
40/60 mm counter battens
Water Proof Membrane
25 mm plywood
2 x 60 mm softboard insulation
Damp Proof Membrane
25 mm plywood
2 x 12.5 plasterboard

Aluminium Sheeting
6 mm matt bronze waxed

Structural Column
400/400 mm reinforced concrete
Core
Stiffness and stability are provided by a large double core in the northern corner of the building. This core is made up of 300mm concrete walls and includes 4 escalators, toilets, storage and 2 fire escape stairs.

Concrete Columns
The tower is supported by reinforced concrete columns with a maximum span of 11.5 meters and column capitals for the centre columns.

Floorplates
The floorslabs are constructed out of reinforced and prestressed concrete with a thicker edge beam around the building perimeter.

Terraces
The south facing sides of the building feature large terraces that are ‘cut’ into the building volume to allow for light to reach into the centre of the floors.

Roof Columns
The large urban farm roof is supported by composite concrete filled rectangular steel sections with a height of 22 meters and a maximum distance of 25 meters between columns.

Roof Spaceframe
The roof is constructed out of a lightweight steel spaceframe structure with a 2.8 meter grid and 1.6 meter depth spanning a maximum of 25 meters.
Tower Edge Beam
depth ratio = 1/20 span
max span = 11.5 m
design depth = 600 mm

Tower Columns
size ratio = 1/10 height
height = 4 m
design dim. = 400 x 400 mm

Tower Floor (3kPa imposed Load)
depth ratio = 1/36 span*
max span = 11.5 m
design depth = 320 mm

Core
Wide stability Core with integrated utility spaces, storage, toilets and 2 fire escapes

* Prestressed / Cement and Concrete Association of Australia 2003
Shading
Vertical Louvers and Terraces act as passive buffer zone on south side of building

Light
Terrace ‘cuts’ on south side of building bring indirect light into the centre of the floors

Ventilation
Two duct systems catering to different climatic conditions due to orientation of indoor spaces

Ventilation Calculations
- occupants / floor = 50
- typical floor area = 700 m²
- = 2,450 m³

New York Mechanical Code 2008 & ASHRAE:
- AC/h rate = 20 CFM/person
- AC/h rate min = 0.36
- = 1000 CFM
- = 0.47 m³/s
- = 1599 m³/h

AC/h rate design = 0.69
- Duct Area (m²) = Volume / Speed
- Comfort speed = 6.5 m/s (main duct)
- = 0.47 / 6.5
- = 0.072m²
- diameter (circular) = 300 mm

Indoor Climate Strategies

Heating & Cooling
Water-based heating and cooling systems integrated into the floor / ceiling construction
Recycling food waste into biogas

Biogas transformed into electricity

Rainwater Collection & Retention

Maximising Diffuse Daylight

Fresh air ventilation into offices

Air Filtration through park

Passive sunshading through vertical louvers

Passive Sunshading of high latitude sun through terraces

Local Climate Strategies
Aquaponic Urban Farm Strategy

- Plants grow without soil - only fed with nutrient-rich water
- Nutrient water is provided by fish, plant, and organic building waste is composted in an anaerobic digester that can produce fertilizer and bio gas
- Fish and farm produce is delivered by bike messengers to local businesses, hotels, markets, and commercial kitchens
- Urban farm acts as a bio reservoir, air filter, tourist attraction, and for education to local schools
- Collected rainwater is used within UN building

UNEC Aquaponic System
Farm design calculation:

Plants:
- No. of growing beds = 608
- Trays per bed = 15
- Plants per tray = 11
- @ 150 mm ctrs
  - total number of plants = 100,320

Fish Food:
- per 30 plants = 60g/m²/day
  - total amount of daily fish food needed: = 200.6 kg
- Tapila fish weight to food ratio = 2% per day
  - total amount of fish = 10,040 kg

Tanks:
- Fish tank size = 180 m³
  - (18 liters per 1 kg fish)
- Anaerobic Digester = 2 * Fish Tank = 360 m³

Aquaponics Precedent
Reliabilitation of Old Town Centre in Banyoles, Spain by MiAS Arquitectes, 2008

Stedelijk Museum Amsterdam by Benthem Crouwel Architects, 2012

Roof Column

400 x 400 / 6 mm RHS with concrete infill

Ground

70 mm stone paving
30 mm bed of mortar
350 mm compacted earth
450 mm reinforced concrete

Roof Structure / Public Space Materiality
Hydroponic Trays
- 80 x 40 mm PVC trays
- 35 mm planting pots at 150 mm spacing
- Metal framework with storage space
- 300 mm bacteria medium bed

Roof Cladding
- 50 mm metal framework
- 90 mm PUR block
- 10 mm facing laminate of GRP, coated & UV resistant

Spaceframe Structure
- Steel Tube Members:
  - Outer diameter: 88.9 mm
  - Thickness: 6 mm
  - Length: 2800 mm
  - Allowable comp.: > 160 MPa

Temporary Tensile Structures

Roof
- Wild grassland & small shrubs
- 200 mm substrate (320 kg/m²)
- Filter Sheet
- 100 mm drainage layer
- Root Barrier & Water Proof Membrane
- 25 mm ply
- 153 mm trapezoidal galvanized, coated steel sheeting

Urban Farm / Green Roof
Nordic Pavilion by Sverre Fehn, Venice 1962
Miami Art Museum by Herzog & de Meuron (in progress)

Crematorium Baumschulenweg / Schultes Frank Architekten, 1999

Vieux Port Pavilion, Marseille by Foster + Partners, 2013

Design for the Stavros Niarchos Foundation Cultural Center / Renzo Piano
Roof Column (CFTS)

CHS / Fe 570-HT Steel Grade
Eₜ (Young's M.) = 210,000 MPA
fₜ (strength) = 355 MPA
t (thickness) = 6 mm
d (depth) = 400 mm

Concrete M40
Eₙ = 35,000 MPA
fₙ = 40 MPA

Y (safety fac.) = 1.1
Yₚ = 1.5

Nₚᵢr - plastic resistance
Nₑᵣ - elastic resistance
Eᵢ - stiffness
Iₛ/c = second moment of area

l (slenderness ratio) < 2 (Eurocode 4)
l = (Nₚᵢr / Nₑᵣ)½

\[ \text{Nₚᵢr} = \frac{(Aₘ fₘ)}{Yₚ} + \frac{(Aₙ fₙ)}{Yₚ} \]
\[ \text{Nₑᵣ} = \frac{E_i A_i}{Yₚ} \]

\[ \text{Eᵢ} = \frac{E_i}{1 + 0.6E_i l^2} \]
\[ l = \frac{d}{l_ₑ} \]
\[ l_ₑ = \frac{d^2}{12} - \frac{l_ₑ}{12} (d - 2t)^2 \]

\[ \text{Eᵢ} = 447,999 \text{ kN/m}² \]
\[ \text{Nₑᵣ} = \left( \frac{\text{Nₚᵢr}}{\text{Nₑᵣ}} \right)^{1/2} \]

l (<2) = (Nₚᵢr / Nₑᵣ)½

(reinforcement excluded from calc.)
(w: 300mm = l: 2.5)

Column 'Forest'
Thank You