WORKING EDGE

We took the comprehensive design studio brief—an eco-tech high-rise in Uptown Charlotte—as a research opportunity speculate on the current ecological possibilities of concrete as an alternative to steel and glass.
**Setting up a design experiment:**

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<th>Client:</th>
<th>Design Interest:</th>
<th>Typology:</th>
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<td>UN Department of Economic &amp; Social Affairs</td>
<td><strong>Concrete</strong></td>
<td><strong>Exo-skeleton Urban Office Highrise</strong></td>
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**ASPIRATIONS**

**Sustainability**
The UN DESA leads the world's 2030 challenge which translates into a deep commitment to sustainable development.

**Social Space**
As an international NGO, DESA should set world standards for public space.

**Institutional Presence**
DESA's importance should be reflected in strong aesthetics and iconic presence.

**21st Century Workplace**
DESA should set the example in work environment solutions and innovation.

**Longevity**
A legacy building that serves for at least 100 years.

**PROPERTIES**

- **Structural**
- **Space Enclosing**
- **Thermal Mass**
- **Strong Aesthetics**
- **Durability**
- **Maleability**

**GOALS**

**Low-energy**
Climate specific strategies: Maximize daylighting and cross-ventilation potential in all floors.

**Spatial Diversity**
Create framework for a diversity of enclosed and semi-enclosed work areas.

**Performance**
Maximize thermal resistance, shading, and on site energy generation.

**Public Space**
Provide public transportation support and abundant open public space.

**Architectural Statement**
Striking aesthetic power in Uptown Charlotte.
1. Light Rail Platform for LINX Blue Line
2. Light Rail Concourse for commuters and primary access to Tower
3. Escalators to Tower Lobby provide access to building via security desk
4. Primary Ramp to Rail Concourse provides street and courtyard access to public transport
5. Soft Ground Courtyard Area 73% of site is returned to the public and largely soft-scape
6. Ramp to Terrace two primary ramps provide access to soft-scape terraces
7. Tree Grove vegetation within the courtyard helps create a microclimate cooling the space
8. Water Feature a running water feature helps regulate humidity within the courtyard
9. Soft Ground Terrace negotiates the change in grade from Brevard St. to the Light Rail Platform
10. Ramp to Public Roof Terrace primary ramp providing access to the public roof terrace
11. Soft Ground Public Seating Area provides space for the public and tower workers with seating spaces
12. Shopping Arcade shopping arcade facing Brevard St.
13. Public Roof Terrace overlooks Historic buildings located on Brevard St.
14. Courtyard Roof perforated concrete shells provide shading to south-facing courtyard
15. Solar Panels located on Courtyard Roof provide 10% reduction in building EUI

COURTYARD AND URBAN CONTEXT SECTION
Three-dimensional quality of facade, while being an aesthetic counterpoint to the typical smooth-glazing facade, also distributes radiation over larger surface and casts shadows onto itself, lowering air temperatures outside.

Double-height green spaces enhance cross ventilation and provide natural respite and fresh air to workers inside.

Operable glass partitions in the concrete wall enable cross ventilation.

Multiple rough openings geometries in the concrete create diverse lighting conditions as well as block most solar radiation.

250 to 300 sq ft rooms of variable shape, size, & character provide diverse, personalized work settings on every floor.

Communicating stairs on every floor enable constant social and professional interaction between floors and encourage mobility while reducing elevator use.

Clear views of the city provide a window to the outside conditions of the city.

10' ceiling heights and a crystalline atrium structure North side enable constant daylight of most of the office floor plate, reducing cost and heat from artificial lights.

Orientation of light return to parallel to the North curtain wall enable environmental controls to be synchronized to light conditions outside.

Typical open floor space still provides with much needed work areas for employees, as well as a personal "bays" within the office.

TYPICAL TOWER FLOORS SECTION

DAYLIGHT AUTONOMY

Above 500 lux 82%
500 lux 59%
250 lux 50%
50 lux 35%
0 lux 0%
Hydronic concrete ceiling
20% more energy efficient than air-based systems.

Curved glass partition
Operable glass allows cross ventilation from the south.

Interior operable partition
Doors and operable windows enable cross ventilation and allow light and views to enter the open floor plan from the south.

Concrete exoskeleton
Double wall serving as structure and room enclosure. Sculptural quality spread radiation and casts shadows that lower the temperature along the facade.

Raised floor and structural concrete thermal break
Thermal break stops energy loss from inside building and keeps outside conditions at bay.

Ventilation system
Only air-based system needed, reducing need for ducts and size of plenum space.
**SOUTH CONCRETE WALL | 80% OPAQUE**
Our Southern facade provides shading and thermal mass helping lower the internal heat gain within the building.

**HYDORNIC CONCRETE CEILINGS | 20% MORE EFFICIENT**
We use radiant heating/cooling to maintain a constant temperature in our building with a hydronic concrete system.

**DAYLIGHT OPTIMIZATION | 81% DAYLIGHT AUTONOMY**
Building narrow footprints enables daylighting of entire floorplate throughout the year.

**NATURAL SPACE VENTILATION | 35% OF YEAR**
At only 50 ft, the depth of our building footprint allows for cross-ventilation through the building during 30% of the year significantly lowering our energy use intensity.

**PHOTOVOLTAICS | 70,000 SF**
862 kWh / yr ~ -10 EUI
The concrete roof providing shade over the public courtyard at the base of the site is covered with photovoltaic panels capable of offsetting energy use intensely by 10 Btus/ryr.

**COOLING OPERATION**
- Hydronic concrete slab set to absorption mode which removes heat from space
- Large mass of concrete structure absorbs peak heat gains in the afternoon

**HEATING OPERATION**
- Low Southern light illuminates space helping to warm space inside
- Constant soft North light

**FINAL EUI**
19.5 kBtu/sf/yr

[Diagram showing cross-ventilation operation with hydronic concrete slab set to minimal activity and constant soft North light]