The design for the Headquarters of Sustainability

United Nations, Manhattan, New York  |  SADD P5 Presentation  |  Raghuveer Ramesh
Top - Principal organs of the United Nations

- International Court of Justice
- General Assembly
- Security Council
- Economic & Social Council
- Secretariat
- Environmental Council

THE HAGUE
MANHATTAN
Problem Statement

To generate a master plan that solves the existing problems around the plot and provides a better quality environment.

Besides designing the Environmental Council, also provide open space park in the plot which the people of New York could enjoy.

To design the UN Headquarters of Sustainability, or UN Environmental Council, in the existing United Nations Headquarters plot in New York City.
1. Located along the waterfront, the site is relatively quieter than what life in Manhattan is usually like. While the center could be called as the commercial town, the waterfronts are certainly inclined towards relaxing zones.

2. The site is at the end of the Central Business District. For New Yorkers especially, the site would be the ultimate point to finish their day before they leave.

3. Two very important roads in close proximity to our site are the 42nd Street - one of the few two way main roads that boast of some of the most famous architecture and ultimately culminating at the Times Square. The other is the very important highway - the FDR Drive, that runs just below the site along the waterfront.
1. The UN Plot already comprises of a series of very famous landmark buildings designed by prominent architects like Le Corbusier and Oscar Niemeyer. It is also one of the one amongst the famous tourist attractions in New York City.

2. Existing is a large park for the tourists, that also has a series of sculptures gifted by many countries to the United Nations. The park has an added value because of the scarcity of open spaces around the district.

3. Another exciting character of the site is that, it is present along a waterfront that provides a great view of the East River, Brooklyn and Queens.
Current issues with the site

1. Discontinuous Waterfront
2. Lack of open spaces
3. Security problems posed by the FDR running just below the UN plot.
The government is trying to create a continuous waterfront all along the perimeter. In most cases, the waterfronts are the only direct connection between man and nature.

The UN Headquaters interrupts otherwise what is a good continuous waterfront. The access is cut off between the 38th to 58th streets because of the presence of this plot and the FDR Drive. It has become difficult to achieve this continuity majorly because of security reasons and unsuccessful talks with private property owners in these areas.
The public open spaces Plan clearly describes the scarce amount of spaces the people of Manhattan can use to relax during the day. The very few that exist are in the form of plazas outside the tall skyscrapers, a small number of public parks with greenery and the waterfront parks along the East River.

The public open spaces Plan clearly describes the scarce amount of spaces the people of Manhattan can use to relax during the day. The very few that exist are in the form of plazas outside the tall skyscrapers, a small number of public parks with greenery and the waterfront parks along the East River.
The highway (FDR Drive) running below the United Nations causes a huge security problem because of the possibility of a car bomb blast when the UN is in session. Ever since the 9/11 attacks, the United States has taken extra measure to ensure full security. Because of this, the FDR Drive is shut off and the traffic is diverted into the city. This in turn creates congestion inside the city.
Generating values for the design through research and analysis
Goal NY 2020

Expand public access to the waterfront and waterways on public and private property for all New Yorkers and tourists alike.

Manhattan has always been an inward-looking city. It is strange that an island city like this does not consider its waterfront as an essential part of the city’s natural relaxation point. One of the most important reasons why the use of waterfront is scarce is because of the FDR Drive that runs along the perimeter of the city. This naturally makes the design of the urban plan look into Central Park.

One of the ways to make the city breathe towards the waterfront is by creating a direct link and redesigning the FDR Drive that would no longer be a hindrance to the New Yorkers or the tourists in using the waterfront.
Parks & Public space

Ensure that all New Yorkers live within a 10 minute walk of a park.

There are a few parks located around the 10-minute radius of the United Nations. But considering the population of the Midtown East distinct and the actually size of the parks it is obvious that the ratio is very poor. It makes it our responsibility to solve this issue and provide some quality to the existing natural environment.
The massive amount of construction in Manhattan has led to a state with no or very little of the ecology in the city to co-exist. The creation of an unsustainable world means we should try and rejuvenate some amount of the ecology at least.
Photographs of typical office interiors in New York. It is clear that there is no contact with nature.

A study conducted by Carnegie Mellon University, USA on 11 office buildings in California, showed that there was at least a 25-50% reduction in reported in sick building syndromes for occupants located within 15ft of a window or green space.
Approach to the site

Analyze the importance of an axis and help generate better usage of the Dag Hammarskjold Plaza.
Master Plan
Master Plan development

Current Situation
The FRD Drive lies just below the UN Headquarters along the East River waterfront.

Pushing out the highway
Removing the FDR Drive from the UN Plot and placing it in the water ensures the FDR is no longer a threat to security.

Green belt above the new FDR Drive
With this addition, not only do we ensure the security of the UN plot but also create an opportunity to fix the missing link in the waterfront and provide the New Yorkers and tourists with yet another attraction.

Move it underwater
The repositioning of the FDR Drive still does not ensure a continuous waterfront because, the United Nations still has to be a secure site.
Masterplan

Section - A

The linear park with FDR Drive below

Connection to FDR Drive

FDR Drive underwater path entry/exit

New waterfront

Masterplan

Section - A

The linear park

FDR Drive

Connection to FDR Drive
Redefining the East River waterfront
Zoning the site

Analyzing the importance of axis, surroundings and sizes.

Creating the square

The General Assembly is a very important piece of architecture and like most historic and famous buildings, it is necessary to design a forecourt from where the building can be enjoyed.

References

St. Peters square, Rome
Center Pompidou, Paris
Zoning the site
Analyzing the importance of axis, surroundings and sizes.

June 21st
9AM, 12PM and 3PM

September 21st
9AM, 12PM and 3PM

December 21st
9AM, 12PM and 3PM

Sun Study
Three dates in the year was chosen and an images was developed for each of the 3 dates that showed the position of shadows created by the surroundings on the site at 3 different times (9am, 12pm and 3pm). From the 3 images it is clear that for most part of it (with the exception of 3pm in extreme winter conditions) the position of the square will be naturally lit and not be present in the shade.
Zoning the site
Analyzing the importance of axis, surroundings and sizes.

After the location of the square was decided, the size was to be determined. After a strong conclusion that the area lacked open spaces, it was important to provide as big a square as possible. For this purpose, the building footprint is greatly reduced and its borders are aligned with the size of the existing New York block.
Zoning the site
Analyzing the importance of axis, surroundings and sizes.

Providing a waterfront
As explained in the zoning of the masterplan, it is important to provide a waterfront. In this case, the division allows the square and a part of the building to be designed to enjoy a waterfront.
Manhattan, New York

The big apple as it is popularly known, the residents also call it “going to the city”. The first thing one would notice about Manhattan are the people who are always on the move.
The UN Square
Giving the people in New York a new kind of a park.

The photographs below describe the quality of life in fast moving New York. The culture is to be always on the move and people find even the simplest of places to relax. For example we see stairs or railing being used to relax a bit or have a quick lunch.

A series of photographs that describe the quality of life I would like to introduce

A series of photographs that describe the New York Lifestyle

A series of photographs that describe the New York Lifestyle
I decided to have one single entrance for the visitors and the employees of the Environmental Council. The position of the security checkpoint is axially aligned to the Dag Hammarskjold plaza.

This would be the zone to build the environmental council office building.

For the majestic structure that it is, the side entrance can now be removed and a grand front entrance can be added.

Located between the environmental council and the General Assembly, the space is intended to be a forecourt to the Assembly building. Apart from that, I would like to divide it into smaller zones with each containing a theme of its own.

The square gradually flows into the waterfront which is at a height difference of 10mts.

This part of the site shall be detached from the square and the private garden with a waterfront could continue to exist for the rest of the United Nations complex.
The UN Square

Concepts

The square is pretty big in size and it was necessary to fragment it into smaller zones based on the analysis from choosing the important parts of the site and the qualities that come along with them, the routing for the square was also determined. With the entrance, waterfront, the General Assembly and the Environmental Council forming the 4 sides of the park - the movement should not be contained, but at the same time it is to be made sure that it is not chaotic.

One of the conclusions from the research was to design a square where the people of New York could relax. A theme in the form with solid blocks that are made of different levels, make it a playful ambience and yet an informal arrangement where each and everyone could choose to relax in his/her own way.

The presence of different levels would also help in creating that environment that unfolds in levels. That helps in generating that element of surprise for the visitors of the park.

The UN Square

Concepts
The UN Square

**01 The seating blocks**
The whole theme of the square is to have these kind of blocks that rise and dip in levels. It not only creates different informal seating and relaxing options, but helps in creating that element of surprise by cutting vision at different points.

**02 Approach to the General Assembly**
Two water fountains flank each side of the grand steps that lead up towards the General Assembly. A couple of trees in the center of the stairway help create a more natural quality.

**03 The square**
Like said before, the main theme is for people to relax and enjoy the view of the General Assembly. On the otherside of the square will be the Environmental Council - a lush green building.
The UN Square
04 The Link

It was important to create a gradation between the UN Environmental council building and the square. This link is designed as a semi open space covered with a pergola like structure. Below it is the lawn that is like a continuation of the green from the building. People get the required shade as well to relax on a hot sunny day.

References
AT&T Performing Arts Center Margot and Bill Winspear Opera House, Dallas, USA
The UN Square
The theme of the square is also used to create the waterfront. The square gradually dips in height in the form of the concrete steps. It also acts like an amphitheatre with the East River as a backdrop.
The UN Square
Goals

To design a building that portrays itself as a billboard for sustainability

Creating a workplace that is conducive as a very healthy environment and one that provides a closer relationship with nature

Ensure the building integrates well with the surroundings and within itself. To create a strong continuity with the concept design of the UN Park
Massing study
Evolution of the form for the building design

Right from the beginning, the concept for the form has been to play with difference in levels. The reason for that was to suit my theme of organising spaces around the greens. The first few models involved organizing the different functions in various levels. By P1, I had a form that had its specialities organized around a set of patios. Further refinement led to the parts of the waterfront change. Working drawings helped define the shapes of specific spaces.
Massing development
Evolution of the form for the building design

01 The UN Park
The headquarters of Sustainability was going to form the façade of one whole side of the park. It was important that the building’s massing had some sort of relation with the style of the park.
Massing development
Evolution of the form for the building design

02 Design continuity
Going along the undulating blocks concept, the building has blocks springing up from the ground at different points and heights. The experience of levels and unfolding spaces was also continued into the building so as to make the boundary seamless.
Solids and Voids
The spaces in between the blocks had to be sheltered. Glass patios were introduced in contrast to the solid volumes. These patios would later go on to form the pillars of the building’s energy concept.
Refining the volumes
The glass patios are developed further with regard to functioning, structural design, climate concepts and spatial experiences. The programs and functioning of the building is worked out and volumes turn into floor slabs and facades that house various facilities.
Massing development
Evolution of the form for the building design

Finally the building is fine tuned, checked for integration as a whole. The semi open louvered space around the building provides a gradual gradation from the public park into the building.
Image of the building

Making a statement
Design Precedents

1. Museum of Fantasy, Buchheim collection
   The elevation portrays fluid transitions leading from one part to another.

2. Kanagawa Institute of Technology Workshop
   The building's sense of transparency is the closest one could get to creating a seamless boundary between the outside and the inside.

3. Grand Rapids Art Museum
   The use of concrete in the building is monumental in a civic sense, yet intimate and warm in experience.

Key values - building
The underlying building concept
- undulating solids and voids

Basic concept:
Undulating landscape at human scale and the same rhythm in building block scale.

Design wise, a strong horizontal band dominates the facade; building blocks rise, spaced at intervals, rise over this line.

Basic Facade form
Using a black box approach, investigation of different styles of facades for different parts of the building were carried out. As my design process has been based on an inside-out approach, it was intuitively designed that auditoriums would form solid volumes while the patios would be the clear glass volumes.

To continue working on the lines of creating a solid and void image for the building, it was necessary to try alternatives that achieved lesser transparency in the office parts but still provide excellent working conditions for the interiors.

After careful analysis of the different types, the design with horizontal louvers was chosen. Not only did it work well for climatic requirements (south facade), it also helped in emphasizing the horizontality of the structure.
UN Park elevation
- South Facade
Concept & Design

The building as a billboard for sustainability
A museum of lush green patios

The concept of the building is to try to incorporate an office into a lush green space that would not only help in improving the quality of the working environment but also the presence of the patios would ultimately work towards the sustainability of the complex. The theme is to make every user travel through patios that are filled with water and greenery to reach a certain function unit. It would be exemplary of rejuvenating ecology of the building and maintaining a close relationship with nature.
Program analysis

One of the most important goals of the project is to cater the building to different genres of users and yet ensure security.
Zoning
Organizing the programs around the green patios.

1. The Entrance Patio
2. Center Court
3. The Waterfront
01 Entrance Patio
First impression. An experience to show what it would be to work in a close relationship with nature.

The entrance patio will give the user or visitor his/her first impression of the Environmental Council and what it stands for. The space is filled with greenery, creating a fresh environment and pathways in the form of bridges and stairs that lead to different functions like the library or auditoriums through these dense jungle like spaces.
Center Court
Get immersed in the world of green in your daily arrival at work

The centre court is the link between the public and the private part of the building. All employees, diplomats and other users will have to use this lush green garden to reach their offices. It is an inspiration from the Institute of Forest and Nature by Behnisch and partners. The center court can also serve to purify the air and also heat it during winters and thus help in making the building more sustainable.

Below - Photographs of the Institute of Forest and Nature by Behnisch and Partners
Waterfront Patio
Employee’s relaxation point.

The waterfront patio is only for the employee’s and delegates of the United Nations. This private waterfront deck would be a place where the users of the building will be able to take time off and relax.
692nd Basement PLAN

Press Rooms

Existing Parking

New Parking

Council Chamber

2nd Basement PLAN

Veheicular Circulation
Circulation
Office Spaces
Common Facilities
Vertical Circulation
Services
Auditoriums (120 seats)

Brainstorming rooms

Library

Offices

Center Court

1st Floor PLAN

Circulation
Office Spaces
Common Facilities
Vertical Circulation
Services
Terrace gardens

Glass roof (gradient - tinted to frosted)

Library
Reading rooms

Louvered pavilion around the building

Water front offices

2nd Floor PLAN

Circulation
Office Spaces
Common Facilities
Vertical Circulation
Services
Longitudinal Sections

Section A

Entrance patio

Center court

Auditorium
(300 seats)

Library

Terrace gardens

Water front

Water front
doors

offices

Section B

Entrance patio

Center court
Circulation Diagram
3d Structural Framework

- Patios (Steel columns spanning trusses)
- Office Spaces around Center court (Simply supported column beam construction)
- Auditoriums and Library (Shear wall structure)
- Waterfront offices and Council Chamber (Composite structure)
- Corres
Structural system for the Waterfront Offices and Council Chamber

1. Offices
   The office structure is a simply supported, column-beam structure.

2. Waterfront Deck
   The 2-floor high open deck supports the offices above through slender columns that are braced by diagonal tension cables at places that require extra lateral support.

3. Council Chamber Lobby
   As the lobby is above the council chamber, it is necessary that the whole floor acts as the beam to avoid columns inside the chamber. At the same time, it is also necessary to transfer the load of the offices above to the foundation. For this purpose, the columns are converted into a truss structure.

4. Council Chamber
   A column-free space, the end columns become thicker in dimension to transfer the load to the foundation.
Storyboard

Working out the spatial experience

"The even progress of travel is illuminated by a series of sudden contrasts and so an impact is made on the eye, bringing the plan to life."
- Gordon Cullen, Concise Townscape
Storyboard

Working out the spatial experience

04 FIRST IMPRESSION OF THE ENTRANCE COURT

05 LOOKING TOWARDS THE WATERFRONT AND THE SEMI ENCLOSED RECREATION SPACE

06 VIEW OF BROOKLYN FROM THE WATERFRONT UNDER THE OFFICES ABOVE
Patio designs

the pillars of the building’s sustainability concept
**Entrance Patio**

First impression. An experience to show what it would be to work in a close relationship with nature.

- Create an experience similar to that of a museum; sophistication and simplicity are the norm.
- The space would predominantly be used as a transit zone and occasionally for purposes of exhibition and product display.
- Integrate with the UN Park outside by continuing to use spatial experiences through multiple levels.
Patio facade

Initial idea of a clear glass facade with the greenery of the patios seen from outside.

01 Analyzing the situation

02 Because a complete glass facade without mullions was chosen, there would be moments at the corners, so both horizontal and vertical supports have to be introduced to counter these moments.

03 Work on size and proportions
Developing the horizontal louvers

**SUMMER**
- Peak sun angle is 78°
- Denser louvers at slab position
- Louvers at any height - does not affect lighting in the interior

**WINTER**
- Peak sun angle is 24°
- Denser louvers at slab position
- Louvers at any height - does not affect lighting in the interior
Office interiors

- The image describes the natural conditions in the interior of the waterfront offices. At no point during the year will there be any glare at the workstations.
Patio roof alternatives

01 Louvers
- Retracted light
- Control of light is easy
- Operable louvered roofs can be easier for climate control systems
- Advanced design can help in amplifying light and reducing glare
  - High density of the louvers can be a little too much going on in the roof visually.
  - Shadows formed on the floor should also be taken care of.

02 Space Frame
- Large span without columns
- Light weight
- Very industrial look
  - Complexity of the structure could however add aesthetic quality if rest of the elements around are carefully designed
- Difficult to control light
  - Shadows formed on the floor should also be taken care of.

03 Glass Roof
- Visually light
- Possibility of lighting only through North side
- Operable sloped roofs can be easier for climate control systems
- Easier to treat situations like snowfall and rainwater harvesting
  - Excessive light might be a problem.
  - Extra shading devices would be necessary

04 Waffle Slab
- Large span without columns
- Light wells provide nice quality of light
- Visually heavy
- Not convenient for climate control systems
Initial ideas of the roof were very complex, both in framework of the truss and directional design of the north lights.

As the design developed further, the roof became simpler and frosted glass was considered an alternative material for the south side tiling. This made the entire patio to remain a glass box and yet be climate controlled.

Design decision to use a north light truss

As the building is not oriented to the cardinal points, the truss was skewed to align to the north.

Idea of division of truss framework

Alternative idea of using pyramid structures and have the north side glazed

Design on a 7m grid

Concept

Design on a 10m grid
The entrance patio

- View of the patio from the entrance
The entrance patio

- The office lobby on the left and continuation of the exhibition and product display on the right
The entrance patio
- looking into the sculpture court from the product and exhibition display lounge
Center Court
Get immersed in the world of green in your daily arrival at work

- Create an experience of a world that we have long lost as a result of destruction of ecologies over time. It gives the employees a chance to enjoy a closer relationship with nature.

- Design interior gardens that balance temperature extremes; the garden also provides gorgeous views and usable space for employees.
Part of the building for detailing
Operable roof detail variants

01 Central Pivot

Frame Detail X

Developing a detail that did not need the use of actuators or pistons

02 Edge Pivot

03 Standard Roof Glazing

The need for a tie member is caused by the moments developed at the points with the column, but instead of using a beam, it is decided to use a tension cable system to span the ties, thus making the structure visually lightweight as well.

Option 1

Option 2

Need for weight and stability

Open

Overlap
Truss design for glazed roof

Glazed roof design

1. Double Glazed openable roof window with 160mm aluminium profile
2. Actuators, for opening roof glazing - connected to window through welded aluminium angle
3. 100mm Steel I-beam
4. Gutter section
   - Steel sheet, folded to profile
   - Water proofing layer
   - Insulation
   - 10mm folded Steel plate
5. 20mm thick Steel Tension cables, hinge joint
6. 300mm Steel I-beam, resting on 30mm circular Steel plate
7. 300mm hollow circular Steel column
8. 7.5mm dia. rain water pipe from gutter

Indoor Garden, Atrium

Gutter section detail
Inner Facade - sectional detail perspective
Inner facade detail
- Center Court

1. Double Glazed vertical Sash window
2. Wall section
   - 19.5 x 100mm treated Larch weatherboarding
   - 50x30mm post and rail frame
   - Water-proofing layer
   - 5mm Plywood board
   - 50x160mm post and rail frame with Insulation
   - Water-proofing layer
   - 50x70mm post and rail frame
   - Gypsum fibre board
3. Floor section
   - Laminated wooden tiles supported by joists
   - Floor heating pipes 10mm dia.
   - Reflective metal sheet
   - 30mm Insulation
   - 360mm thick Concrete deck slab on steel sheet
4. Deck section
   - 50x200mm wooden deck boarding, varnished
   - 340/200mm Steel I-beam, anchored to beam
5. 300 ASB 249 Assymetric Slim Floor beam, fire coated
6. 240mm Steel I-beam, cropped
   - 30mm dia. steel tube balustrade, anchored
   - 200x30mm wooden railing
7. Exhaust duct, wooden boarding separated with gaps for ventilation
8. Double Glazed wooden Sliding door
9. Indoor garden section
   - Dense vegetation
   - Planting soil mix
   - Compacted structural soil mix
   - Filter Fabric
   - Haydite - high performance aggregate
   - 60mm Insulation
   - Waterproofing layer
   - 360mm thick Concrete deck slab on steel sheet
10. 400mm thick concrete shear wall
First Impression of the center court is intended on creating an experience of a world, long lost as a result of destruction of ecologies over time. It gives the employees a chance to enjoy a closer relationship with nature.
The center court

The interior gardens balance temperature extremes and are treated as relaxation gardens providing gorgeous views and usable space for employees.
The center court

Pergolas and water ponds provide good relaxation spots. These green working spaces create the feeling of being sheltered in nature.
Climate design

saving energy through sustainable concepts
Cold air from the outside is taken in through an Earth duct, where the air is automatically warmed to an extent. The air travels to the Air Handling Unit (powered by solar panels) to be conditioned to the right temperature. The offices and other functional spaces receive conditioned air from the AHU. The exhaust air is taken out of the rooms and let into the atrium. By virtue of the greenhouse effect created by the glazed patio, the exhaust air gets warmed further and rises to the top. Here the heat is recovered by a heat collector and fed into the AHU. The load of the AHU is reduced as the heat is recycled. The cycle follows.

For a secondary heating system, hot water through pipes is run under the floor. The heat stored underground in the aquifers is used to warm the hot water, thus ensuring minimal electrical energy being spent on heating the spaces.
Warm air from the outside is taken in through an Earth duct, where the air is automatically cooled to an extent. The air travels to the Air Handling Unit (powered by solar panels and heat collectors) to be conditioned to the right temperature. The offices and other functional spaces receive conditioned air from the AHU. The exhaust air is taken out of the rooms and let into the atrium. By virtue of the green house effect created by the glazed patios, the exhaust air gets warmed further and rises to the top. Here the heat is recovered by a heat collector and the energy is stored underground in the aquifers. The cycle continues.

For a secondary cooling system, cold water through pipes is run above the false ceiling. The water from aquifers are used to cool the cold water inside the pipes, thus ensuring minimal electrical energy is spent on cooling the spaces.
With extensive gable roofing systems, the rain water is collected through the gutters and fed into the soil used for planting in the patios. Acting as a cleansing biotope, the water is cleansed and is stored in the patio as an aesthetic feature. The excess water is collected, filtered and stored in the underground tank below the auditoriums. This water is later used for purposes like watering the plants, fire fighting and even natural air conditioning.

During summer, roof blinds impregnated with Phase Change Materials are drawn out to prevent excess heat from entering the building. During winters the PCMs absorb large quantities of heat and transmits them back into the building when the sun is down. During summers, the heat absorbed is transmitted back into the environment at night.

Regarding direct light for the offices, the cantilevered decks ensure shading at all times during summer but the glazed roofs however bring in a good amount of diffused light. During winters, light shelves are used to deflect glare from the low solar incidence angle and increase light penetration in the interiors.
Conclusions

The green patios are the pillars of the building’s sustainability concept. The climate scheme, choice of materials and other energy saving solutions are integrated within the design and not an after-thought.
Visualizations
UN Environmental Council

Night view of the entrance patio of the building from the UN Park.
UN Environmental Council

View of the building along with the UN Park water front from the new bridge on the masterplan.
UN Environmental Council

- View of the building along with the UN Park from one of the skyscrapes beside the site
The Green Lantern
Lighting the path forward