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Title:	<b>United Nations Secretariat: Renovation of a Modernist Icon</b>
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Subjects:	Building Case Study Conservation/Restoration/Maintenance Façade Design History, Theory & Criticism Sustainability/Green/Energy
Keywords:	Embodied Energy Façade Preservation Renovation Sustainability
Publication Date:	2015
Original Publication:	Global Interchanges: Resurgence of the Skyscraper City
Paper Type:	<ol style="list-style-type: none"><li>1. Book chapter/Part chapter</li><li>2. Journal paper</li><li>3. <b>Conference proceeding</b></li><li>4. Unpublished conference paper</li><li>5. Magazine article</li><li>6. Unpublished</li></ol>

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# United Nations Secretariat: Renovation of a Modernist Icon



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Michael Alderstein was UN Assistant Secretary-General and Executive Director of the UN Capital Master Plan from 2007 until its completion last month. Part of the \$2 billion project to renovate the UN Headquarters in New York was the 39 story glass-and-steel Secretariat Building, built in 1950. Its renovation was honored by the CTBUH in the 2014 Best Tall Building competition with a Finalist Award. Mr. Alderstein a New York native, was Chief Historical Architect of the National Park Service and later Vice President of The New York Botanical Garden. He is a Fellow of the American Institute of Architects.

## Abstract

*Michael Adlerstein shares his insights into how the United Nations Secretariat Building, an aging icon of Mid-century Modernism, was renovated to meet the security, efficiency and sustainability requirements of the 21st century, while at the same time preserving the architectural character of the building and restoring, with a completely refurbished curtain wall, the towers' compromised exterior to its original appearance. He outlines why the building was made recycled and pleads to include the preservation of existing skyscrapers in the resurgence of the skyscraper city.*

**Keywords:** Embodied energy, façade, preservation, renovation, sustainability

## Heading

The skyscraper of the newly renovated United Nations Headquarters, the Secretariat Building, with a mere 39 floors, may not be the most impressive skyscraper in terms of height. It is, however, the prototype for all modern curtain wall office towers (see Figure 1).

Of the buildings that compose the 17-acre United Nations Headquarters complex on the eastern edge of Midtown Manhattan, the glass-and-steel Secretariat tower is arguably the most visible representation of post-war optimism and resiliency. It also embodies a mid-century Modernist merging of technology and form, as expressed in the remarkably slim north-south facing profiles and the crystalline east-west elevations.

The United Nations Headquarters was not created by a single genius, but by a collaborative team. The original designers, who included Wallace Harrison, Le Corbusier, and Oscar Niemeyer, brought their experience to the table, listened to each other, and developed innovative ideas for a new inter-governmental organization.

"United Nations" is a term coined by President Roosevelt and Prime Minister Churchill to refer to the Allies during World War II. The United Nations was born from the ashes of that war, and the conviction that the institution was needed to avoid World War III.

The first meeting of the United Nations General Assembly took place in London in 1946. One of the first decisions taken was that the United Nations' permanent headquarters would be in the United States. This decision started a heated competition in America as to which city would be selected. Predictably, New York City was very aggressive for the honour.



Figure 1. The UN Secretariat Building in front of the Midtown Manhattan skyline, 1964 (Source: United Nations)



Figure 2. The Board of Design, with Le Corbusier (second from left), Wallace Harrison (fifth from left) and Oscar Niemeyer (sixth from left), 1947 (Source: United Nations)



Figure 3. Rendering of the UN Headquarters, drawn by Hugh Ferriss for the Board of Design, 1947 (Source: United Nations)

The Permanent Headquarters Committee, chaired by Colombia, narrowed down the search to Boston, Philadelphia, San Francisco and New York.

Philadelphia had assembled a ten square mile parcel in the suburbs, and was so confident of its bid that it started consideration of legislation to condemn the land. As consensus for Philadelphia was

growing in the General Assembly, Secretary-General Trygve Lie was contacted by Mayor O'Dwyer of New York.

The mayor had been called by real estate developer William Zeckendorf, the owner of a 17 acre parcel on First Avenue which had previously been the site of slaughterhouses and other industry. Zeckendorf, had been assembling the parcel for years for a large

residential development known as X City, designed by Wally Harrison.

Harrison, through his wife, was related to the Rockefeller family and knew that Zeckendorf was ready and willing to abandon his project. Through Harrison, Zeckendorf contacted Rockefeller and created a coalition with the mayor and New York's "master builder" Robert Moses to advance the proposal for the First Avenue site.

Rockefeller, who had just completed Rockefeller Center with Harrison, was a strong advocate. In a few days, the New Yorkers prevailed to retain the title of world capital, disappointing Philadelphia.

Zeckendorf sold his land for \$8.5 million (which would be \$92 million today), paid for with funds provided by Mr. Rockefeller. Harrison hastily redrew the X City designs and wrote "General Assembly" over the "Opera House."

The re-use of the X City plans, beautifully rendered by Hugh Ferris, was very influential with the UN selection committee, and also established the design character of the future headquarters.

In the context of today's land use decision-making, it is remarkable how quickly the United Nations reached agreement on the site, and then created and approved a completed design. Within weeks an international design team was selected and assembled by the United Nations, the "Board of Design", under Harrison as Director.

Although the team was assembled as a group of equals, Le Corbusier was recognized by his peers as the senior partner. The challenger was the youthful but highly talented Oscar Niemeyer of Brazil (see Figure 2).

As documented in George Dudley's book "A Workshop for Peace," the team prepared dozens of concepts drawing and models, eventually selecting a compromise between Le Corbusier's Scheme 23, with the General Assembly in the middle of the site and the Conference Building linking it with the Secretariat Building, and Oscar Niemeyer's Scheme 32 with the Conference Building facing the river. The final plan, Scheme 42G,



Figure 4. The curtain wall before the renovation - a patchwork in greenish hue, 2001 (Source: United Nations)



Figure 5. The curtain wall mock-up in front of the Secretariat Building, 2009 (Source: United Nations)

was accepted by the Secretary-General, and legend has it that Le Corbusier was offered the opportunity to prepare the construction documents but refused to take the necessary licensing steps required by New York State. Wally Harrison prepared the construction documents and managed the construction of the United Nations Headquarters. The result is one of the few examples of 20th century architecture, Modern architecture, which is today recognized all over the world (see Figure 3).

Construction began in 1949, with the Secretariat Building ready for occupancy in 1951, followed by the General Assembly and Conference buildings, which were completed in 1952.

At the time it was built, the complex was considered to be a highly innovative facility, employing the best of the new technologies. The modernist planning idea of organizing discrete but interconnected buildings in a poetic manner, and the open spaces between the UN's chambers, were ideas ahead of their time. The technology was cutting-edge. The very high-tech glass curtain wall of the Secretariat Building was one of the first of its kind on such a grand scale, later followed by thousands of buildings. The Headquarters was the first custom-built facility with simultaneous interpretation. This was a big deal. Until then, diplomatic meetings would require enormous delays for consecutive interpretations of each speech. The use of river water to naturally cool the chiller plant equipment was also ahead of its time. But by the first decade of the 21st century, the United Nations Headquarters facility had noticeably aged and needed more than a facelift.

The goals of the United Nations Capital Master Plan project were to renovate the compound by upgrading and modernizing its infrastructure; to restore the character-defining historic spaces; to respect and apply the New York City building, safety and fire codes; and to make the Headquarters more secure, energy efficient, and sustainable.

Building a more sustainable United Nations Headquarters was one of the top priorities of the Secretary-General, Mr. Ban Ki-moon. During his entire tenure, the Secretary-General has sought to galvanize the global public and especially world leaders, to understand and reduce mankind's impact on the earth's climate. He directed the project to lead the world by example and to identify ways to reduce the Headquarters' own carbon footprint, to become more environmentally responsible.

The Capital Master Plan provided a once-in-a-generation opportunity, through design, to adopt modern and efficient technologies to reduce power usage and water consumption, and subsequently the Headquarters' carbon footprint. There were other important drivers to the Capital Master Plan as well.

One was to improve the functionality of a facility designed when the 50 founding Member States expected the United Nations to peak at a membership of 70 to 80 countries, considerably less than the 193 Members it has today, and all while preserving the iconic 1950s feel of the original premises.

Both safety and security had to be emphasized as well: to make the

Headquarters not only consistent with the local and national building codes and also secure from blast, given the current security environment. The Headquarters was designed in accordance with the New York City fire code at the time, which dated from the 1930's. Much had changed over the years, but the United Nations Headquarters remained largely unaltered. Consequently, much of the complex lacked sprinklers, fire and smoke detection devices, and modern building management systems.

Unfortunately, United Nations staff and buildings have in recent years been the target of several terrorist attacks in Baghdad, Algiers, Kabul, and elsewhere. The Capital Master Plan consequently required major improvements to the security infrastructure to provide greater protection to the UN's staff, delegates, and visitors.

For the Secretariat Building, this unique renovation project meant a virtual redesign in place. Key design strategies for increasing performance included the extensive redevelopment of the base building core and systems. This comprised new elevator systems and mechanical infrastructure, new fire protection systems and code upgrades, ADA compliance and asbestos abatement. It also required installing a better, more efficient envelope for insulation and blast protection. Additional improvements included a new communications system and technology infrastructure hub, as well as enhanced floor plate utilization through the introduction of a new planning diagram.

The Secretariat had been the first tall building to employ a suspended wall

system. Its primary elevations were enclosed by free-hanging glazed facades. Although now much greener, more sustainable, and safer against blast than the original, the new curtain wall was designed to look like it did in 1951—sleek and taut, with its double-hung aluminum windows, glazed spandrel panels, and aluminum-clad steel mullions appearing as one continuous transparent form. However, the replaced wall's appearance was significantly altered after nearly 60 years of patches, caulkings, insulating and blast coatings, resulting in a patchwork and greenish hue (see Figure 4).

To rectify this, the project team conducted extensive testing to replicate the visual appearance of the original building, including reflection patterns at different times of day. The work included spectral analysis of glass types to identify viable formulas, computer model simulation, and, ultimately, a full-scale mockup tested on in front of the Secretariat Building on the United Nations compound (see Figure 5).

The project team executed the demolition of the original curtain wall and the installation of the new state-of-the-art pressure-equalized system in sections, proceeding from bottom to top in each 10-story zone sandwiched between the louvered mechanical levels. Unlike the original curtain wall, which had been attached to the concrete floor slabs, the new system utilizes outrigger plates to connect the wall to the now reinforced building frame. To mimic the appearance of



Figure 8. Open plan offices in the renovated Secretariat Building before reoccupancy, 2012 (Source: United Nations)

the original double-hung windows, the team strategically offset some of the aluminum extrusions (see Figure 6).

The interiors strategy was about creating a 21st century workplace, while respecting the historic structure's Modernist origins. Previously, the majority of Secretariat offices had been completely enclosed with floor-to-ceiling walls and doors (see Figure 7). The new floor plan challenges this closed

culture with open-office layouts, in addition to achieving a number of objectives for improving occupant comfort and wayfinding. Significantly more light and air now enter the interior of the 900,000 ft<sup>2</sup> building. The open plan also affords much flexibility and efficient use of space in the growing organization (see Figure 8).

The early interior planning concepts provided the integrated team of architects



Figure 6. The new curtain wall being installed from the top of the Secretariat Building to the bottom, 2011 (Source: United Nations)



Figure 7. Floor-to-ceiling walls and doors for enclosed offices dominated the original layout of the floors in the Secretariat Building, 1951 (Source: United Nations)



Figure 9. The higher ceiling near the windows allows for maximum daylight and views on the open plan floors (before reoccupancy, 2012) (Source: United Nations)



Figure 10. The renovated curtain wall returned the facade of the Secretariat Building to its original hue and transparency, 2012 (Source: United Nations)

and engineers with a detailed roadmap when making improvements to the infrastructure. The Secretariat Building has a floor plate that is 287' long but less than 74' wide, which meant that the interior planners' work with maximizing space efficiencies was an intrinsic part of the building core reconfiguration strategy.

The sustainability approach for the Secretariat Building employed a number of the proposed initiatives, including installing energy-efficient lighting systems with room sensors, incorporating demand-control ventilation and a sophisticated building management system, and maximizing daylighting through an open-plan. The latter includes 78" tall furniture-work walls that extend from perimeter columns without blocking natural light. The ceiling is 8' tall but gradually steps up to 9'6" at the windows, allowing for a circulation path around the core, while supporting the equitable distribution of mechanical services (see Figure 9).

After years of debate and preparation which began in 1998, and following approval by the General Assembly in 2007, the construction and fit out of temporary office and conference space commenced in mid-2008. Swing space for altogether over 6,000 staff had to be prepared.

The renovation of the Secretariat Building started in 2010 when the more than 3,000 staff working in the tower began to relocate to swing space. A few hundred employees were moved each weekend into leased space on Madison Avenue, Third Avenue, 46th Street, 42nd Street, and in several other locations in the area or on the compound.

The renovation proceeded right on schedule, and after two years the Secretariat Building was reopened, and in July 2012 the restacking process could begin, again moving a few hundred people every weekend in a process which lasted until December 2012.

Not everybody who had moved out of the Secretariat Building moved back in, since the Secretary-General had decided on a new occupancy concept for the tower, one that would further underline its central headquarters function. The occupancy before the renovation had still reflected the United Nations of the 1950s. Departments in existence then had their offices with hundreds of staff in the building, while departments that only emerged when the Secretariat was mandated by the General Assembly to take on new roles had almost no presence in the Secretariat Building. Peacekeeping would be the most notable example in this respect, with the Department of Peacekeeping Operations spread out over a number of leased offices in various locations in East Midtown Manhattan. In the renovated Secretariat Building, now every department is present with its leadership and a limited number of staff, which makes communication between the Secretary-General and his senior managers easier.

After the Secretariat Building, the Conference Building, whose renovation had begun in 2010 as well, was completed and occupied in early 2013. Then the General Assembly Building was emptied in preparation for its renovation, which was completed on time in September 2014, marking the substantial completion of the Capital Master Plan. Throughout the

renovation, the compound never ceased to operate in its headquarters function.

The final cost of the project was \$2.2 billion, just 11 percent over the original budget approved 8 years ago. The completion of a multi-year, multi-billion project with only an 11 percent overrun can be considered a rare achievement.

Although the United Nations is sovereign and not subject to New York City building codes or other regulations, at the beginning of the project an agreement was reached between the UN and City authorities to voluntarily apply the New York City code to the Capital Master Plan.

The United Nations would not file for building permits or await certificates of occupancy, but the City agreed to review construction documents and conduct voluntary visits to review the work. A sensible procedure, since the Fire Department of New York City is the first responder to any emergency at the United Nations Headquarters.

United Nations Member States delegates have at times raised the question whether it would have been less expensive to completely demolish and rebuild the United Nations Headquarters. This is a reasonable question, and the answer is no. Even aside from the obvious loss of the historic and iconic cultural value of the buildings, it would not have been less expensive. And from an overall energy and environmental standpoint, it would have been a major waste of carbon. By far the most significant achievement of the Capital Master Plan in the area of material re-use is the avoidance of the expenditure of the embodied energy and other so-called 'embodied effects' of construction activity



Figure 11. The Secretariat Building, with the General Assembly Building in the foreground, the Conference Building on the left and the Library Building on the right towards the end of the renovation of the UN Headquarters compound towards under the Capital Master Plan, 2014 (Source: United Nations)

(with embodied energy of a material accounting for the energy used to extract, fabricate, deliver, install, demolish and dispose of a particular material).

In 2007, at the very beginning of the Capital Master Plan, Secretary-General Ban Ki-moon announced the potential for the United Nations Headquarters to "become a globally acclaimed model of efficient use of energy and resources," befitting an organization that has been taken the lead in warning of the increased dangers of global warming and in facilitating negotiations for a climate agreement under the UN Framework Convention on Climate Change.

The Office of the Capital Master Plan, mindful of the fact that a third of global greenhouse gas emissions are caused by the way buildings are constructed and managed, consequently designed the renovation of the United Nations Headquarters to meet the requirement for LEED Gold. Nor only has this standard been met, in the case of the Secretariat Building it has even been exceeded: The renovated Secretariat Building meets the standard for LEED Platinum.

Some of the successes of the Headquarters renovation include:

- A 50% increase in energy efficiency, as compared to conditions before the Capital Master Plan. This leads to a reduction of our greenhouse gas emissions of over 45%;



Figure 12. The renovated lobby of the Secretariat Building, one of spaces that define the architectural character of the UN Headquarters (Source: United Nations)

- The building is 40% more water efficient, compared to pre-CMP conditions;
- In the Secretariat Building, 90% of occupied spaces have daylighting and views, and a new daylight harvesting system was installed;
- Throughout the renovation, 95% of construction waste was diverted from landfill;
- 95% of the existing exterior walls, floors and roofs, and at least 50% of the interior elements were preserved instead of demolished, thereby avoiding the equivalent expenditure of years of operational energy;
- As many of the historic finishes and fixtures as possible were preserved and reused;
- Extensive use of renewable products was made throughout the compound. In the Secretariat Building, carpeting and ceiling tiles are renewable products;
- 50% of the newly installed wood is certified by the Forest Stewardship Council;
- Only low volatile organic compounds were used.

What distinguishes the Secretariat Building and elevates it above the General Assembly and Conference buildings to the higher LEED Platinum level are, among other aspects, the towers' energy efficiency thanks to its new state-of-the-art curtain wall, and the fact that daylight and views can be enjoyed throughout the office floors - two features typical for skyscrapers.

The renovation of the United Nations Headquarters demonstrates that even with this iconic complex of historic buildings, with conflicting budgetary, programmatic and security demands, a highly sustainable renovation, a very green project, can be executed while fully respecting the character defining features of the buildings. Not only has the Secretariat Building been thoroughly modernized and renovated without losing its unique features (see Figure 10). With its completely refurbished curtain wall, the tower has been returned to the original tint and transparency of its façade, which had been lost over time (see Figure 11). Thanks to the open plan office layout, the tower's promise to provide daylight and views for all its occupants has finally been fulfilled.

In New York and all over the world we are experiencing a resurgence of the skyscraper. It is important to include in this resurgence the preservation of the many old, existing skyscrapers - not only for the sake of preservation, but also for the sake of sustainability.

The Secretariat Building, a Finalist in the 2014 CTBUH Best Tall Building Award, shaped architecture in the 20th century, and it will remain relevant for the 21st century (see Figure 12).