

Condé Nast Building

By Woytek Kujawski

Photo courtesy of Fox & Fowle Architects

Standing on the edge of Times Square in the heart of Manhattan, this 48-storey building claims to be the largest "green" speculative office tower in the world: Does this building signal the beginning of a new era in high-rise design or can it be considered "green" at all?



Condé Nast is located on the most public place in the world – Times Square in New York City. The building site connects several great and diverse urban spaces including Times Square, Bryant Park, and the midtown business district. Four Times Square's (4TS) architectural design combines the pop culture of Times Square with the district's corporate standards. The result is a building that reflects the dynamic environment of Times Square by utilizing metal and glass cladding on north side, while the textured masonry treatment on the eastern façade reflects the serious, corporate context of 42nd Street.

The project's alternate name – "Crossroads of the World" – is reflected by the design of the roof. The massive "high-technology" style structure houses four 20 metre-high signs and a communication tower.

Is it green?

Sara Hart wrote in *Architecture Magazine* two years ago that "The future home of publishing giant Condé Nast is believed to be the first comprehensively green skyscraper in the U.S." Her comments raises some questions about the criteria by which we assess 4TS as well as all other buildings to be "green."

Working definitions of the characteristics that make a building "green" have been developed in several countries. These efforts have lead to the establishment of several well-known programs including

4 Times Square

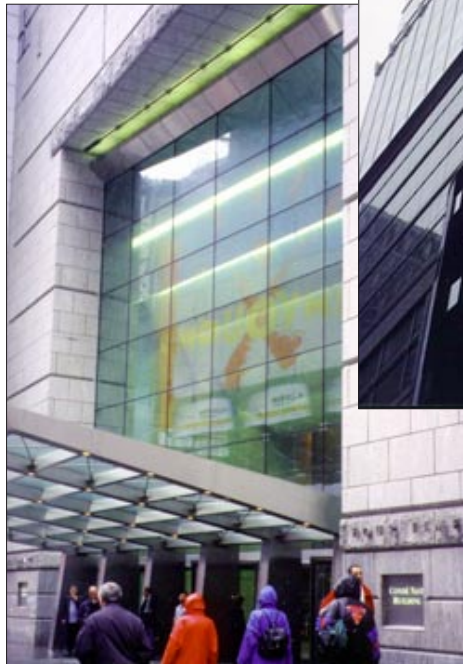
BREEAM, LEED and GBC. All programs vary in the range of environmental issues – from pure Resource Consumption through to IAQ, the Life-Cycle Cost of Building or Integration with existing cultural and historical character of the area.

British Steel Design (Summer '99 issue) declares that 4TS is in fact a green building because it achieves a high level of performance in energy efficiency and indoor ecology, it utilizes sustainable materials and it incorporates responsible construction, operation and maintenance procedures.

The “green” claim can be also justified by the comparison with other equally or even more eco-friendly office buildings like Commerzbank in Frankfurt, or Ruhrkohle Headquarters in Essen (both in Germany). Both have very comprehensive sets of environmental features, but they were built for the owner’s occupancy and not for speculation. Thus the cost – resulting in approximately \$US 5060 /m² or about 2.3-2.5 times more than the 4TS Building (US \$ 1990/m²) – was not the most important issue.

From the beginning of the project the client as well as the designers and engineers had to ask an essential question: How environmentally sustainable can a 48-story urban high-rise office building be? Such “monsters” have traditionally been considered anything but “green.” On the other hand, these high-rise office buildings can be justified by its consolidation of space and energy services, mass transit access, minimum envelope area, ease of inter-communication and material distribution, self-contained amenities, and its efficient use of precious and extremely expensive land?

Right: View from Times Square (photo by author)



Left: 42nd Street corporate entrance

Below: Ground floor on Times Square

(photos by author)



Continued on page 6.

Design and Construction Team:

Design Architect:
Fox & Fowle Architects

Construction Manager and Project Managers:
Tishman Construction Corporation

Mechanical Engineer:
Cosentini Associates

Structural Engineer:
Cantor Seinuk Group

The Core Team was supplemented by the following specialists
Asher Derman, Cermak Peterka Peterson, Eley Associates, Kriss + Cathcart, Pamela Lippe, Steven Winter Associates.

The design team benefitted from advice by:
Rocky Mountain Institute, National Resources Defense Council, Consolidated Edison, NYSERDA (New York State Energy Research and Development Authority)

As in most issues relating to ecological design, it is a difficult question to answer. But architects can agree on the fact that urban high-rise architecture is having an ever-increasing impact on our built and natural environment. When the economy is booming, so goes the construction of these tall edifices. But there is more square footage of office space contained within these structures than in any other building form.

The project’s construction manager has confirmed that the enhanced environmental responsibility in high-rise construction does not have to significantly increase the cost of a project. And that fact has already been confirmed with other “green” buildings providing that the proper design process is followed.

In our view, the 4TS building covers almost all aspects of the design and construction of “advanced buildings” and also represents the successful implementation of the Integrated Design Approach similar to one promoted in ABN through the Canadian C-2000 Program.

General technical features

The following provides a thumbnail description of basic architectural, structural, mechanical systems and other features of interest:

Architectural:

- The centre core and 2.7 m ceilings allow for good daylight penetration to interior 2-bay spaces while maintaining space-planning flexibility. The height is an achievement if seen from the NYC context where standard practice is 2.4-2.55 m.
- The building is designed to use approximately 40% less energy

than comparable buildings (ASHRAE 90.1) and has a high level of indoor environmental quality.

- The exterior custom curtain wall system uses structural glazing and incorporates 88.9 mm of CW-90, foil faced insulation, in lieu of standard 38 mm. Effective vapour barrier design is critical because of the high RH targets for indoor air.
- A panelized system incorporating low "E" glass, aluminum, stone and photovoltaic panels provide the enclosure for the building.
- Windows are oversized for deep penetration of daylight and use the latest low-E technology on double glazing with a U center-of-glass factor of 0.30, a shading coefficient of 0.30, and a visible transmittance of 0.40. The combination of two very high visible light transmittance glasses – Vircon vE-1-2M and a Guardian Glass AG-40.
- Exterior wall insulation is 114 mm thick in lieu of the standard 50 mm and maintains an R factor of 20.
- Multiple trash chutes are being provided for automated recycling of daily waste.
- New technology utilizing more efficient alternating current in lieu of direct current for elevator drives is incorporated.

Structural:

- The system is a steel frame with metal deck and concrete fill. Shear walls for the lower portio are steel encased in concrete. A hat truss at the top of the building transfers wind loading to the exterior columns.
- Composite steel and concrete construction is utilized in a structural system that incorporates a "hat truss" concept. The concept maximizes its efficiency and reduces the use of steel by reducing its amount needed for

bracing.

HVAC:

- Fresh air is supplied to all interior spaces through a HEPA filtration system at a rate 50% greater than the current code (ASHRAE Standard 62/89).
- Relative humidity is intended to be a minimum of 30%.
- Each floor has individual air handling units with local control by the tenant to ensure minimum use of the system. Each unit has an associated variable volume box set for a minimum ventilation of 34 m³/hr. (20CFM) per person. Each box has a capacity to go 100% open and supply 13,592 m³/hr (8000 CFM). To monitor proper IAQ the monitoring system on each floor takes reading of the occupied spaces, return air and the outside air to each mechanical room.
- Sensors provide constant monitoring and control for contaminants and particulates content in interior air. If a floor went into alarm due to air quality within the space, the BMS would through manual control mode be able to exhaust 100% of the air on the floor and two outside variable volume boxes would go 100% open to make up approx.70% of the air and maintain negative pressure until the floor's alarm mode
- A dedicated exhaust shaft is provided to allow direct exhaust from all smoke fume and heat producing spaces. An oversized outside airshaft is provided to allow periodic purging of interior air from each individual floor.
- Materials specified contain a high percentage of recycled content and low to no VOCs.
- Multiple gas-fired absorption boilers provide hot water for perimeter heating and condenser

water which is pumped to two air-handling units on each floor. 42.5m³/h (25 CFM) of fresh air with 85% filtration provided to all spaces.

- CFC- and HCFC-free natural gas-fired absorption chillers are utilized for heating and cooling in lieu of electric systems.
- All pumps, fans and motors have variable-speed drives with direct digital monitoring and control to optimize efficiency of all HVAC equipment.

Power:

- To supplement grid power, two 200 KW fuel cells fueled by natural gas provide 24-hour electrical power to the building, with additional power provided by photovoltaic panels mounted on part of the façade spandrel panels..
- Solar energy is generated through photovoltaic spandrel panels on the south and east sides of the tower from 35th to 48th floors. The PVs, manufactured by Energy Photovoltaics Inc., have an efficiency rating of 6%. They are typical in type and custom made in size only to fit the spandrel panels.

Design process

The development process started around 1995 when Douglas Durst, President of Durst Organization decided to build an entirely new ecologically responsible office building. However, the developer and its team were surprised, to discover that there was, according to Durst himself, "no example to follow and no place to find the answers." Even with large body of literature and lots of interest in the topic, there was very little practical information for such large-scale projects.

The architect, Dan Kaplan, Fox &

Base data

Owner:

The Durst Organization

Project Address:

4 Times Square, New York

Project Status:

Completed

Project Size

135,314 m² gross area
42 typical floors
4 retail floors
3 mechanical floors—
basement, 4th & 49th

Area per Floor

ground to 7th fl.: 4115 m²
10th up: 3121 m²
Int Low rise: 2824 m²
Int High rise: 2518 m²
High rise: 2276 m²

Total Construction Costs:

US\$270 million

Contract Award: spring 1995

Construction Start: fall 1996

Occupancy:

January 2000

BOMA A-Class: Most prestigious buildings competing for premier office users with rents above average for the area.

Buildings have high quality standard finishes, state of the art systems, exceptional accessibility and a definite market presence.

The uniqueness of the 4TS is underlined also by a contrast with BOMA definition of the speculative building. "Speculative properties usually will conform to popular design conventions, ... but without the use of exceptional materials or construction methods. The design and construction of these properties emphasizes functionality, in contrast with aesthetics or image.

Fowle, feels that even though there are lots of good tools and resources available today, there are very few people who can apply them.

The vertical nature of the building and economic constraints, particularly those coming from the developer/tenant dynamics, had the greatest impact on the application of environmentally responsible or "green" design. Specifically, the contractual division of the work into the "Core & Shell" (Base Building) under the developer and the "Tenant Work" (Tenant Fit-up / Improvements) under the Tenant, causes coordination and design problems.

In New York City this division is so extreme that projects generally proceed with separate teams of design and construction firms, separate schedules and separate budgets.

According to a Buildings Classification system established by the Building Owners and Managers Association (BOMA), office space is grouped into three classes in accordance with one of two alternative bases: metropolitan and international. These classes represent a subjective quality rating of buildings which indicates the competitive ability of each building to attract similar types of tenants. A combination of factors including rent, building finishes, system standards and efficiency, building amenities, location/accessibility and market perception are used as relative measures. The metropolitan base is for use within an office space market and its Class A describes the 4 TS.

Green design is more than the application of a new technology here and there. It requires all parties to work together, analogous to the way that trades worked closely with each other in 19th Century projects. This presents special challenges when applied to modern speculative buildings.

In the case of 4TS, the integrated

design approach required extremely close co-ordination and extensive communication among all design team members, clients, contractors, various consultants, suppliers and technicians from related industries.

The architectural firm Fox & Fowle Architects – based in New York and known for its previous environmental designs – was chosen to provide architectural services. Robert Fox, talked about the process and said, "Our group was working together in an unprecedented way. Never before, have I felt this sense of teamwork and pulling together on a project. We were not wasting time in different directions, we had one purpose, one goal – the environmentally responsible building."

Although the firm is large and experienced, it had limited knowledge of the DOE-2 software. Architects quickly found simulation to be an invaluable tool because of the ability to generate data required for major architectural decisions.

A series of analyses were used as a primary basis for the selection of all HVAC and lighting systems, and exterior cladding materials and techniques. This same technology and the inherent building data are being offered to tenants for their use in determining the most efficient lighting and lighting control systems, the impact of daylight penetration on energy usage, and the most effective floor-by-floor HVAC distribution, control and exhaust systems.

Fox said that he couldn't imagine doing this kind of project without the simulation software and added that with this technique, the architects can actually demonstrate to their clients how much money they will be saving.

Simulations

The developer and designers were aware that the prediction of energy performance would be a key factor

in guiding the design process and in identifying which design measures would be most effective.

In buildings of a more modest size, one simulation specialist might be called upon to make a series of simulations of performance.

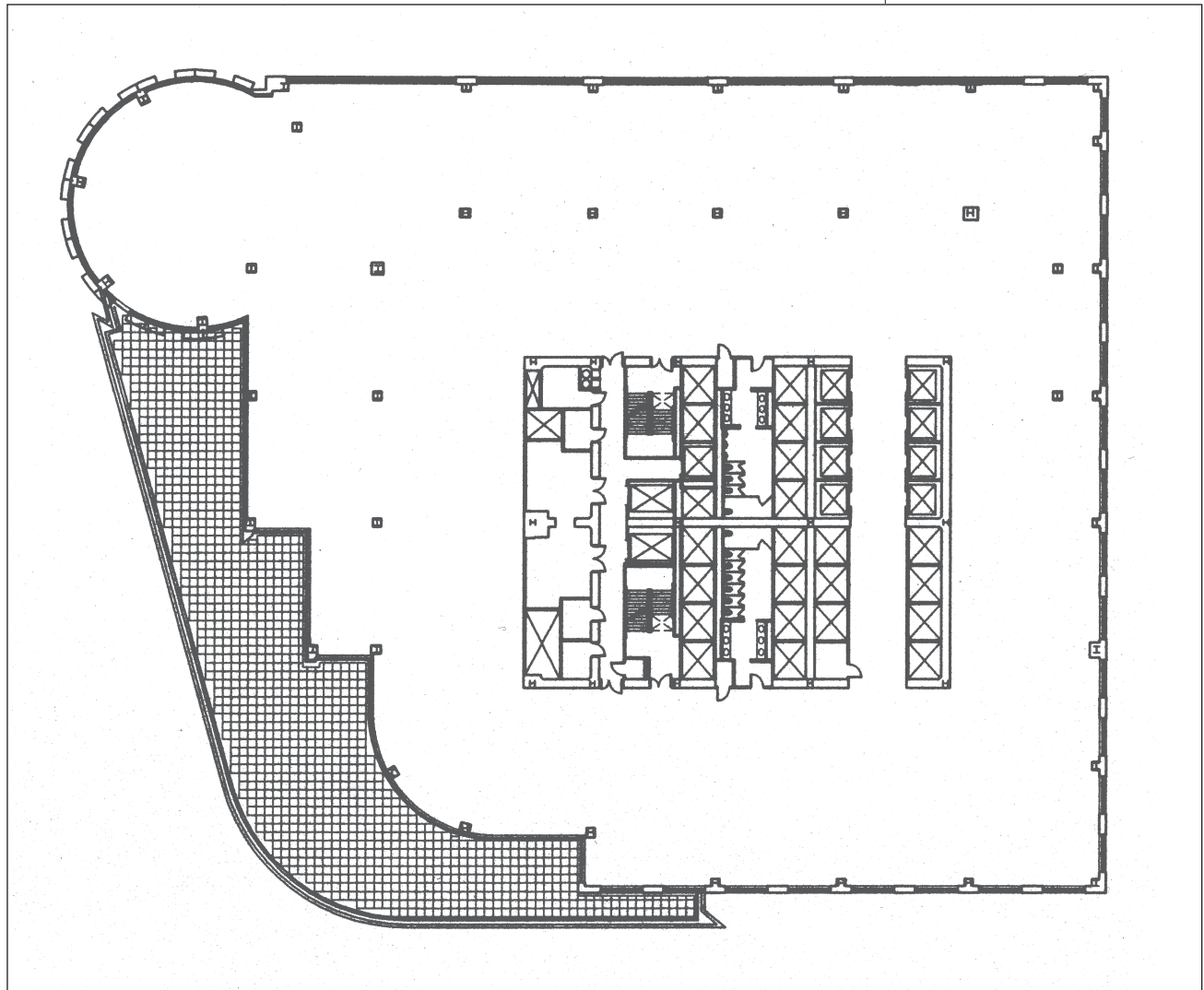
In this case, the massive size of 4TS, and the need to fast-track construction, meant that simulation tasks had to be apportioned between different simulators who predicted performance for separate parts of the building.

The initial whole-building simulations were carried out by Charles Eley and Cosentini Associates on DOE-2 software. Their task was mainly to establish some energy performance targets for the building.

The rest of the modelling was based on a typical floor and then extrapolated to the entire building. While not precise, the extrapolation in a building with so many typical floors is close enough for the result to be considered appropriate in the performance assessment. The building's envelope construction and interior loads were consistent with the

Below:

The plan shows one of the lower floors with a terrace. Typical floors are similar, sans terrace. Courtesy Fox & Fowle



Continued on page 10.

Table 1.
Operating energy costs and performance on a delivered and source energy basis, assuming maximum use of daylighting. The energy use figures are at the building line. They fully account for the kWh required for cooling (since the chiller is gas-fired) but do not fully account for the cost of producing electricity.
Note that these projections are based on tenants installing the energy-efficient light fixtures and controls assumed in the simulations, which is not necessarily the case.

building specifications and drawing at the time of the first and subsequent partial simulations, but there was no final simulation of the whole building.

To support the design process, Steven Winter Associates was asked to assist in optimizing the curtain wall design – including spandrel panel glazings, mullions and insulation – and integrate the vision glazing selection with lighting and daylighting strategies. Adrian Tuluca of SWA provided most of the details about simulations and glazing, and ran DOE-2, ALGOR and CFD2000 for fluids and air movement on ASHRAE and Code-Compliant versions.

The occupancy density was set at 25.5m² per person for office floors and 27.8 m² per person for retail floors.

ASHRAE 90.1/IES 90.1-1989 schedules were used throughout the building for office and retail occupancies, lighting, equipment, DHW, infiltration, fans, heating and cooling temperatures and outside air. DOE simulations permitted for the study of the elimination of the perimeter hot water radiators and their replacement by hot water coils at the air handlers on each floor.

DOE-2 simulations and three-dimensional heat flow analyses were performed to improve the curtain wall design. Energy cost saving of more than 30% over a typical good design was demonstrated; even higher

savings were achieved over construction that complied with the New York State Energy Code

Estimated energy consumption

The simulation that was performed refers to a typical floor (floor 24) with about 2845 m² area. Further, the data does not include either the contribution of PV and fuel cells, with which the savings would be even greater, nor the effect of CO₂ sensors, which are installed but not yet operating.. Without daylight dimming and with an average 0.09W/ m² light level, simulation results indicated a consumption of 231 kWh/m²*yr and a cost of \$19.60/ m². If the lighting at perimeter will be off (or if daylight is assumed at perimeter) one gets 221 kWh/m²*yr or \$18 /m² .

Energy Use at Source

These calculations account for the fact that electricity is produced and transported with an efficiency of about 33%. Without daylight dimming and with an average 9W/ m² light level, one gets 395 kWh/m²*yr. If we factor that lighting at perimeter will be off (or if daylight is assumed at perimeter) one gets 395 kWh/m²*yr. The \$/m² costs are the same as those calculated at site (see above).

Comparison with ASHRAE /IES90.1-1989

The ASHRAE 90.1 building uses

Building	Annual operating energy, kWh/m ² per year				Annual operating cost	
	Site energy	%	Source energy	%	U.S. \$ per m ²	U.S. \$ per ft ²
Four Times Square	221	44.9%	395	43.2%	\$19.00	\$1.70
ASHRAE, gas chiller and boiler variant	246	38.7%	481	30.1%	\$23.00	\$2.10
N.Y. State Code	401	0.0%	695	0.0%	\$30.00	\$2.80

on-site 246 kWh/m²*yr or \$22.5/ m².
At source, the ASHRAE 90.1 building uses 481 kWh/m²*yr.

The New York State compliant building uses on-site 401 kWh/m²*yr or \$29.8/m². At source, the New York State building uses 695 kWh/m²*yr.

Thus, in terms of kWh/m²/yr, the building with a daylight contribution on site is 13% more energy-efficient than an ASHRAE building and 45% more energy-efficient than a NYS building. At source, the building with daylight contribution is 18% more energy-efficient than an ASHRAE building and 43% more energy-efficient than a NYS building.

In terms of \$/m², the building with daylight contribution is 20% more efficient than an ASHRAE building and 39% more energy-efficient than a NYS building (See note above on fuel cells and PV).

We assume the envelope to include the daylight dimming (or lights off) effect. Thus, in terms of at source, the improvement over an ASHRAE building is as follows:

Envelope effect:	5%
Efficient lighting:	12%
More efficient central plant:	1%
TOTAL:	18%

Curtain wall performance

Glass selection could be performed using the DOE-2.1 program, but the mullion and insulation selection required a different analysis that would take into account the three-dimensional flow of heat through the aluminum members and around the insulation and glass. Aluminum has a conductance approximately 4,500 times higher than glass fiber, thus heat can easily short-circuit the insulation placed between the horizontal and vertical aluminum mullions.

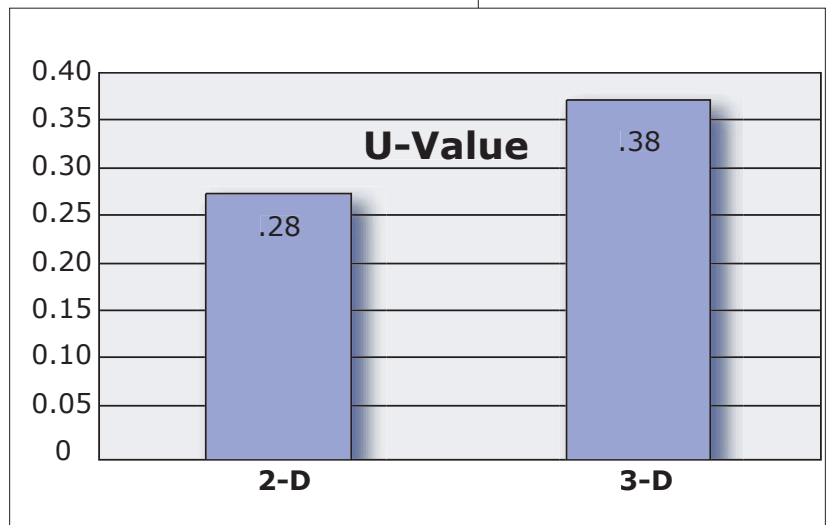
These heat flows reduce the effectiveness of materials with high R-values and create cold surfaces. The 3-D analysis identified the location of important thermal break points and revealed areas of potential moisture condensation on and within the wall, as well as measures likely to decrease such risk. It demonstrated that it was better not to provide interior insulation in the steel stud furring, because it decreases the temperature of the bottom surfaces of the horizontal aluminum members, making moisture condensation more probable. New silicone-glazed details provided by the architect minimized the area of exposed aluminum. Addition of insulation at the spandrel glass increased the performance further.

Three-dimensional analysis uncovered greater heat loss of the wall assembly than the two-dimensional one performed by the wall manufacturer, which helped engineers to properly size the heating system.

One should note that 3D analysis provides more insight into heat transfer and characterizes the overall U-value more accurately than 2D analysis (see graph below). The study conducted by SWA for NYSERDA indicated that this type of analysis is actually needed when metal curtain walls are analysed.

Below:

2-D and 3-D simulations of effective U-value of the curtain wall assembly. (courtesy of Stephen Winters Associates)



Continued on page 12.

Below:

Curtain wall, showing integrated PV panels. Courtesy Kiss+Cathcart



Fenestration U-factor

The vision glass is Guardian AG 40, with U center-of-glass 0.30. The aluminum used for mullions has a very high conductivity: 201.88 W/m K. For a typical 1.52m x 3.13m wide high vision glass panel – including mullions and horizontal members – the combined U-factor is approximately 0.46. The overall U-factor significantly affects energy use, but does not have as much impact on moisture condensation. In all, good glass results in much less moisture condensation than poor glass even though at the edges the difference between good glass and poor glass is minor.

Construction

Building a high-rise according to budget and schedule in New York is a task that calls for a high level of skill. Not only are sites restricted in area, but there are formidable scheduling and delivery issues

to overcome. When issues of environmental sensitivity are added, the result is a challenge that some might not care to face.

Guidelines:

In the case of 4TS, the team made a commitment to a construction process that would represent best practice in terms of environmental sensitivity. Guidelines included application of the following techniques to be utilized during the construction period:

- A waste management plan for demolition of existing buildings on the site salvaging and recycling as much material as possible.
- A waste management plan for construction to ensure the use of recyclable and non-toxic

packaging materials, and ease of recycled waste collection.

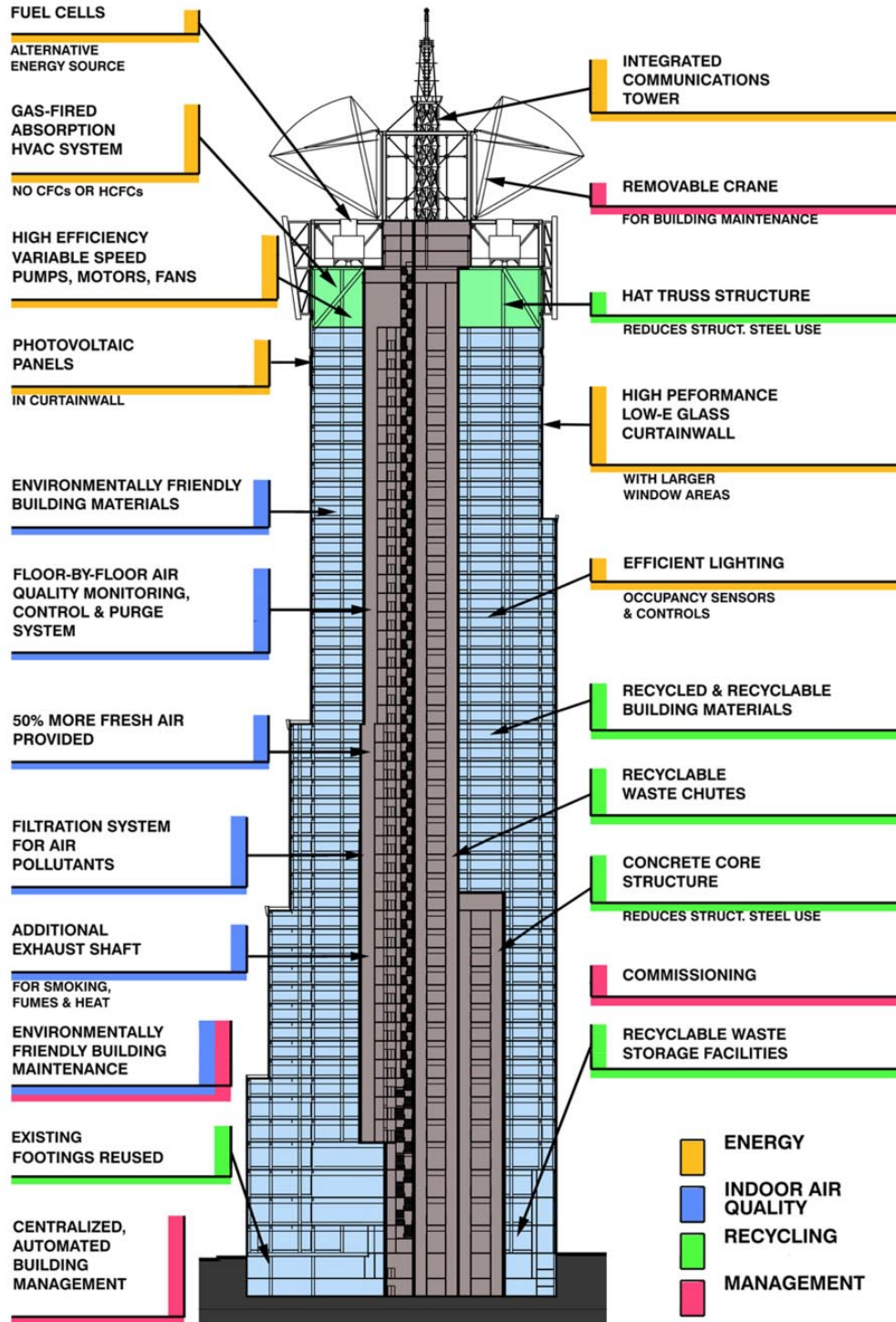
- Scheduling and control procedures to ensure efficient on-time deliveries to minimize vehicular idling/waiting time and traffic congestion.
- Avoidance of toxic or hazardous materials or construction techniques that might be harmful to construction workers' health and/or the environment.
- Procedures to ensure that dangerous or potentially damaging materials be handled only by skilled tradesmen and be properly secured at all times.
- Prequalification of all materials and products in terms of environmentally responsible manufacturing.
- Use of modular, pre-fabricated or pre-assembled systems to minimize construction waste.
- Education of field staff and subcontractors, and careful review of their procedures to ensure quality management and compliance with the above.

Building Commissioning

An extensive building commissioning process is being conducted to ensure that all building systems meet and maintain performance design criteria. The process will also ensure that comfort conditions, indoor air quality, water quality and other systems perform up to design specifications. Subsequent testing will be performed a minimum of every five years for the life of the building with the first full yearly cycle for energy purposes starting June 2000 to June 2001.

Lessons learned

Daniel Kaplan of Fox & Fowle Architects in his previously mentioned "Manhattan's Green Giant – a case study" described the problems the



This illustration shows a summary of the green features planned for the building before construction. Note that fuel cells are now located on the 4th floor.

FOX & FOWLE ARCHITECTS
ARCHITECTURE FOR THE ENVIRONMENT

Below:

Mechanical room on the 49th floor. Photo by author.



firm had faced in terms of "lessons learned". Four of those examples, taken from the case studies of the "design and build" process, edited and /or complemented by additional information, were the base for the description below.

1. Glass selection- day-lighting

Architects had little influence over the tenants' selection of daylighting strategy and no control over their interior layout. Since light shelves were discarded as an option (a significant projection beyond the building line would have violated NYC's code), very large windows were chosen (2.1 m high out of a 2.7 m ceiling height) and a very high visible light transmittance glass (0.4 and 0.66) with a good shading coefficient of 0.30. Approx. 25% of a

given floor could be effectively daylight with a payback of 14 months.

What is seen as a future opportunity is a light refracting glazing or thin film located at the "transom" zone of the window and integrated with a the curtain wall.

2. Central cooling plant

Natural gas-fired, low -emission absorption chiller/heaters were chosen and located on the roof of the building. Due to the source fuel profile in the North- East, natural gas was selected instead of electrical and steam driven chillers. The gas-fired plant was extremely efficient with a payback of approximately three years. It is important to note that at Four Times Square it is the tenant

who benefits directly from the lower operating cost of this system. However, it is the developer, who incurs the increased first costs, so it is not completely accurate to speak of "payback".

While the roof is not the optimal place in the building for the central plant from a schedule point of view, this- additional risk was borne by the owners because of their environmental commitment and the lower operating costs to their tenants. As a side benefit the added weight at the building top acts as a mass-damper, actually improving the structural performance of the building.

Future opportunities are closely related to emissions-based legislation or incentives which would insure that future installations take into account their impact on the environment and will not allow the most inefficient, lowest "first cost" systems.

3. On-site electrical generation – fuel cells and photovoltaics

With the objective of generating energy on-site without losses during transmission and to utilize alternative energy sources if financially possible, two solutions were provided: fuel cells and photovoltaics.

Fuel cells

Fuel cells generate electrical power through the combination of hydrogen and oxygen under controlled conditions. The process produces power without the by products of combustion, such as CO₂. In fact, the only emission is water. In the case of 4 TS, the source of hydrogen is natural gas.

With each fuel cell requiring approx. 65 m² of floor space, it was extremely difficult to find a location for them within the building as the outside option was not available; the building is built up

to property line. Eight 200kW fuel cells located on the roof were initially proposed with a yearly output of 12 million kWh. Payback could have been achieved in approximately 10 years depending on gas prices. However, running the electricity down to main bus would incur major costs and the building wouldn't have sufficient load for eight fuel cells operating 24 hours a day at 100% capacity "which is their most efficient mode of operation (in NYC the building-generated power cannot be sold "back" to the grid).

Two fuel cells located on the fourth floor with a special exhaust provide 200kW each, covering the building's base load during the late evening hours (elevators, signage, base building lighting etc.)

The fuel cell units require clearances 2.43 m all around and the units need a replacement of a 4,082 kg part every five years and that must be brought in line with standard service elevator capacities of about 2268 kg.

Ashok Gupta, Senior Energy Economist with the Natural Resources Defense Council, conducted a study of "Environmental Impacts of Energy Use in Buildings" which included a section on fuel cells. He has provided some numbers related to the environmental impact of the fuel cells installation in 4 TS: the benefit is substantial. The two 200 kW fuel cells installed in 4TS will produce over 3500 MWh per year. This will avoid the annual emission of over 3311 kg of NO_x and 2222 kg. of SO₂.

Project engineers also stated that fuel cells should not be turned on and off, because it takes two hours and a lot of power to get them going. They should be turned on and let run for four and a half to five years producing very clean power, important for people using computers.)

The initial cost of one unit including installation and additional structural

reinforcements was approx. \$1.2 million, which, with the required replacements, could give the payback of more than 20 years(!)

Photovoltaics

Calculations have shown that only with integrated solutions like PVs embedded in part of the building's skin and not rooftop will PVs offer a reasonable payback. In this case the cost of the "replaced" area of the curtain wall is credited to the cost of the PV's. Additionally the rolling loads of window washing rigs would not allow for the roof paver integrated PV's

The chosen PV's were integrated into the spandrel panel- the area of a façade between the top of a window and the bottom of the one above. Photovoltaic panels were placed in a 18.2 m wide area at the center of the southern and eastern sides of the building on the upper 14 floors. A "thin-film" type of PVs was selected because the paybacks were far better than the crystalline type. These were laminated into tempered glass and structurally glazed into the facade. The peak output of the installation will be about 15 kW, roughly equaling the electricity required to run five or six suburban homes.

A limited area was due to the fact that the design team saw this as a demonstration of a rather untested application (on such a big scale). With PV's installed on all available spandrel panels, the yearly output would have been 1.3 million kWh or 50% of the base building load.

4. Indoor Air Quality

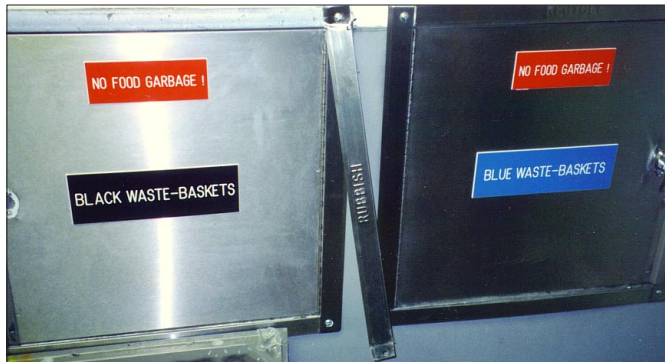
Operable windows are neither practical at this building height (wind loads can often be in excess of 2.87 kilopascals) nor are they desirable from an energy point of view. The developer could not force a smoke



Top:

Fuel cells on the 4th floor. Photo by author.

Fuel cells should not be turned on and off, because it takes two hours and a lot of power to get them going. They should be turned on and let run for approximately five years.



Above:
Solid waste separation bins on each floor.
Photo by author..

free building on tenants and their finishes and furnishings are not under the his control (although a set of environmental Tenant Guidelines was written illustrating ways in which the Tenant Fit-up can take advantage of the build-ing's infrastructure)

Outside air is ducted into the building at high elevations (24 m /80 feet and 215 m / 700 feet above the ground) avoiding as much street exhaust as possible. Outside air is filtered and monitored and is delivered to floors @ 0.0010 m³/s/m² (0.20 cfm / sf)with an additional 0.0000262 m³/s/m² (0.05 cfm) available at the tenants' discretion. There is additional capacity in system to purge any three given floors simultaneously with 100% outside air. A dedicated exhaust shaft is provided for smoking and copy rooms. A network of tubes in the plenum allows for centralized monitoring of air quality including tracer gas tests. The exterior wall is designed to allow for up to 30% relative humidity in winter without the risk of condensation.

As for further improvement it was indicated that with this design, the limit of the central air supply was reached.

Tenant Responsibilities

To ensure that the environmental objectives of design are maintained throughout the project and its life cycle, stringent procedures were put into the day to day operation of the building and

the comprehensive guidelines for the tenants have been developed with the rationale that "ecologically educated" tenants will follow suit.

Tenant Guidelines were prepared by the design team to help tenants take full advantage of the building's "green" infrastructure. The guidelines include:

- Suggestions as to how lighting loads can be reduced to 9 W/ m² from the conventional 13.5 to 18 W/m².
- Suggestions for more efficient lighting fixtures, fixture layouts, and reflective surfaces.
- Technological data on sensors for controlling lights based on daylight, occupancy and design light levels.
- Data relating to computer equipment that meets EPA Energy Star specifications.
- Suggestions as to how the plug load can be reduced to 9 W/ m² in lieu of the conventional 36 W/m².
- Benefit analysis for use of occupancy sensors in computer screens.
- A list of equipment and appliance top performers from the American Council for an Energy Efficient Economy (ACEEE).
- Resource information on furniture, carpeting materials and finishes relating to odor, fumes and VOC (Volatile Organic Compounds) emittance and the use of non-toxic sealants, adhesives, sealers and finishers.
- A listing of products for which healthier alternatives are available at comparable or near comparable cost. These include carpet and carpet padding, wall covering, paints/stains/finishes, adhesives/ caulking/sealants, vinyl base, ceiling tiles, fabric, systems furniture, strippers and insulation,
- Reference standards for all ventilation and IAQ.

Woytek Kujawski -is an architect and is principal of INPOL Consulting, working within energy and environmental issues in the building and transportation sectors. He has developed several relevant computer programs commissioned by federal government and is member of the Canadian Teams for GBC'98 and GBC 2000.
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- Data on various sources of indoor air pollution such as smoking lounges, toilet facilities, janitorial closets, cooking facilities, parking garages, and reprographic areas.
- Recommendations on how best to exhaust the contaminants from these spaces using the building's direct exhaust shaft.
- A New York City smoking policy requires tenants to connect smoking rooms to the general exhaust shaft in the building's core and tenants are encouraged to connect all private offices in which smoking is anticipated to that shaft.
- Recommendations relating to humidification levels, especially in winter months when low humidity can produce discomfort from dry skin and cause dust and other irritants to become airborne. Tenants encouraged to take advantage of the thermal qualities of the exterior wall, which allow the humidity to be maintained at a minimum of 30%.
- Data provided on the availability of materials with recycled content. These include carpet and carpet padding, ceramic or glass tile, ceiling tile, wallboard, accessories, insulation, wall coverings, steel framing studs, flooring / wainscoting, moldings/decorative elements, furniture, fabrics, recycling containers, and partitions.
- Tenants to be educated and encouraged to train their staff to utilize the recycling systems built into the project.
- Within the Tenant Work guidelines, tenants are encouraged to educate their design consultants, construction managers and the sub-contractors to follow guidelines set forth for the environmentally responsible construction of the overall project, including a program of

commissioning for verification of compliance with the DOE-2 energy simulation models offered to each tenant.

The team has reported that at the beginning, tenants have responded favourably and enthusiastically to these guidelines. However, the latest word from 4TS is that some tenants prefer to be left alone, rather than to be guided by the good, but rigid and not always well understood, guidelines.

Conclusions

It was said during the design process, that the lessons learned would reveal how the application of the "green", sustainable design relates to speculative office development now and in the future. Essentially, green buildings involve breaking old patterns, and this was and still is always difficult.

The 4TS Design Team – architects, developers, the construction manager – is committed to the further development of a green building agenda. They all agree that the experience is very positive in all aspects. There is no real downside to a green/sustainable building with a sound rationale and justification to everything that has been done like for example selection of materials, the maintenance of IAQ, the construction processes etc. It should be clear not long after the commissioning of the "green" building and the initial operational period that there is either a long-term benefit or a productivity bonus or rather both – where everybody gains by using sustainable design.

The 4TS building's performance is now watched carefully by professionals. The permanent monitoring of all base building systems and equipment, to which everybody looks forward, should give the team members and watchers a new level of understanding the

References:

"Lessons Learned Four Times Square" – *Earth Day New York*

"Short Profiles and interviews" (with Messrs. R.Fox, B.Fowle, D.Durst, J.Durst, D.Tishman)

David Kaplan, "Manhattan's Green Giant – A Case Study"

Bill Browning, "What is Green development?"

Sandra Mendler, "Be careful What You Ask For"

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Laura Zeicher, "The Ecology of Architecture"

Sara Hart – "Guess Who's Going Green?" – *Architecture Magazine*, Aug '98

Andre Chaszar, Buro Happold- "Sign of the Times" – *Steel Design*, Summer '99

Fox & Fowle Architects : *The Conde Nast Building @ Four Times Square*

The New York Times / Commercial Property / , "42nd Street and Broadway: Technology in the Front Seat at 4 Times Square"

Websites :

Durst Corporation
<http://www.durst.org/>

Kiss+Cathcart Architects <http://www.kisscathcart.com>

Fox & Fowle
<http://www.foxfowle.com>

Steven Winter Associates
<http://www.swinter.com>

Cosentini Associates
<http://cosentini.com>

4 TS Cont'd.

performance and the performance itself.

Advice from developer: "Enter the design process with a very open mind and commit time to do the research. You also need somebody you can really depend on, who has an understanding of what you want... And, start early..."

To end on an optimistic note, a quote from Robert Fox, Architect:

"I believe that in a very short period of time, not measured in decades but in years, building occupants will be sufficiently educated that they will demand green buildings. It is not going to be an option. People will say, 'I am not going to move in without proper indoor air quality. I am not going to pay that energy bill ... The market is going to force it.'"

As per latest (April, 2000) information on 4 Times Square: "No space is currently available. The building is 100% leased and 98% occupied."

News Cont'd.

management tool based on the ISO 14001 that provides guidance with regard to the activities, aspects and impacts that are found in buildings.

ISOsoft was an existing ISO 14001 product developed by Intelx Technologies, an international leader in the development of Windows-based applications for managing Environmental, Health and Safety, and Quality Systems. With Intelx, ECD Canada developed a building module for ISO 14001 implementation to help organizations to identify aspects, impacts, legislation and some objectives and targets related to best practices. The ISOsoft 14001 tool makes it possible to develop a system for ISO 14001 implementation and certification using in-house expertise, thereby reducing the need for consultants. This makes it suitable for small and medium sized enterprises, which are very cost conscious.

BREEAM, Green Leaf and ISO 14001 Building Module can provide a consistent and verifiable benchmark for environmental performance as well as, if desired, a gradual, long term migration to ISO 14001. A suite approach interfaces well with the learning curve associated with any new theme-based learning experience.

Awards List:

1999 Star of the Energy Efficiency Award / Alliance to Save Energy

1998 Commercial Project of the Year/New York Construction News

Special Thanks

This work about the 4TS wouldn't be possible without a full cooperation from the Fox & Fowle Architects especially Daniel Kaplan, Kirsten Sibilila and Michael Cala and consultants Doug Mass and Marvin Lewin -mechanical, electrical and simulations (Cosentini Associates), Greg Kiss and Nuria Widmann- PVs (Kiss+Cathcart), Adrian Tuluca-simulations (Steven Winter Associates), Eric Kolderup -simulations (Eley Associates) and Louis Esposito, the Durst Organization, who let me see the inner secrets of the building.

Much of the information about the process itself is based on "Lessons Learned Four Times Square" which, as Pamela Lippe, its executive director said in the Preface, "is designed to share insights, information and help identify some of the questions to ask", so in other words to guide, to give the detailed ideas how to approach the "green building" from the beginning.