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A DAY IN THE LIGHT

The New York Times's radical around-the-clock experiment in lighting design

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Photography by David Joseph

To test the groundbreaking scheme for its new headquarters, the New York Times has launched an elaborate building study: a 24-hour experiment in lighting design.

A DAY IN THE LIGHT

By Martin C. Pedersen

2:30

The most ambitious lighting experiment in American commercial real estate is currently being conducted in the parking lot of the New York Times's printing plant in Queens. Sitting in the northwest corner of the lot is a gray flat-roofed structure that hardly resembles world-class architecture or cutting-edge research. But inside that building is a glimpse into the not-so-distant future: a luminous 4,300-square-foot office mock-up—a prototype for the Times's new Manhattan headquarters, by Renzo Piano. The design for the 51-story tower, featuring a shimmering 800-foot glass curtain wall, promises to bathe notoriously cranky reporters and editors in natural light. Here in Queens, interior architects and designers are testing workstations, private offices, a glass facade sheathed in Piano's sun-shielding ceramic rods, and one of the architect's other signature touches for the building, a set of stairs in the southwest corner of the space that will link the paper's 28 floors and create a transparent stage show for its Midtown neighbors.

The mock-up is the culmination of a meticulous, near maniacal two-year effort by the newspaper and

Top: The mock-up, with the Times printing plant in the background. Left: At 2:30 p.m. the sun has shifted to the west, causing the shades on that side of the mock-up to close. There is still enough daylight, however, for the overhead lights to be off. Above: Fifty minutes later, the sunlight becomes more direct and the shades lower still further. Note: the two lit fixtures near the curtain wall should be off, since there is enough natural light in the space.

THIS MIGHT BE THE MOST STUDIED BUILDING IN THE COUNTRY. PREVIOUS MOCK-UPS INCLUDED A TWO-STORY STRUCTURE BUILT IN ITALY AND LATER SHIPPED TO NEW YORK.

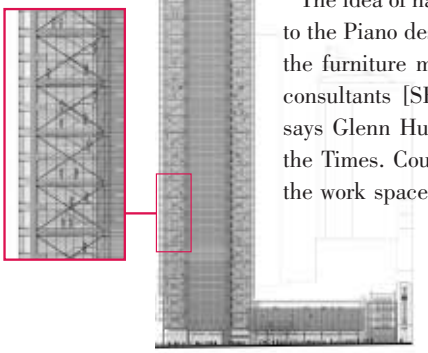
its consulting designers to thoroughly trouble-shoot any and all building issues prior to construction. "The Queens facility really serves four purposes," says David Thurm, vice president of real estate development for the Times. "It's a furniture mock-up, an extensive lighting experiment, a constructability review, and a tool for talking to employees and getting their input."

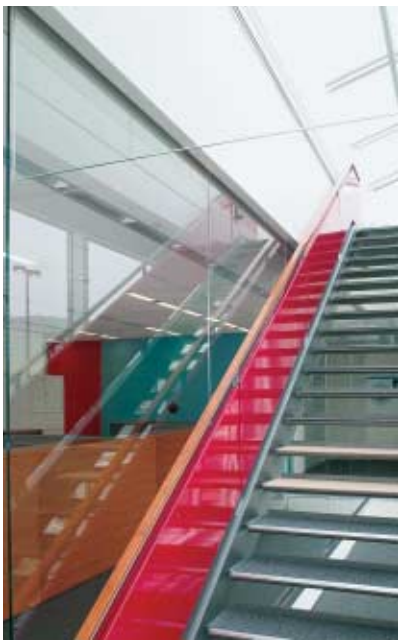
This might be the most analyzed, tested, and studied building scheme in the country. The Times has already commissioned previous mock-ups for furniture (in the basement of its current 43rd Street headquarters), the ceramic facade (including a two-story structure built in Italy and later shipped to New York), floors, under-floor air, and lighting, among other things. Countless studies have been completed, even an extensive one on ice and snow formation on the ceramic rods. "They have a lot of different systems going into this building, and for each one they have a research team looking into cost, performance, and impact on the tenants," says Eleanor Lee, a scientist with the Lawrence Berkeley National Laboratories (LBNL) who is overseeing the lighting experiment. "It's a whole array of technologies they're looking into to make sure that everything goes well."

The idea of harvesting the abundant natural light intrinsic to the Piano design was an early and obvious idea. "During the furniture mock-up in fall 2002 we asked our lighting consultants [SBLD Studio] to analyze lighting controls," says Glenn Hughes, director of construction real estate at the Times. Could dimming systems improve the quality of the work space by allowing each department to set its own light levels? Was this economically viable? Could they in turn realize

Left to right: At 3:45 p.m. the sun continues to set, creating glare conditions that the shades reacts to. At 5:18, the sun is setting on the horizon; the intensity of the direct sunlight causes the shades to close completely, and artificial lights go on to make up for the loss of natural light. At 5:46, roughly dusk, the sun disappears beyond the horizon and the shades go up.

A rendering of the south elevation of the building (below). The Times will occupy the first 28 floors; the staircase linking the different departments is located at the southwest corner of the building (marked with red box). The stairs in the mock-up (right) were built to test materials, treads, handrails, and steps.





Renderings courtesy Fox & Fowle Architects

The first furniture mock-up in 2002 helped narrow the competing manufacturers from six to three. The finalists (above) are shown in the mock-up's three private offices: Knoll (1), Unifor (2); and Vitra (3). "One of the main things we've tested in the furniture mock-up is the height of partitions," (right) says Rocco Giannetti, a senior associate at Gensler. "We settled on 48 inches, because it allows for privacy but still maintains the open plan seating arrangement."

AT LIGHTFAIR THE TEAM MET MANUFACTURERS WHO DONATED PRODUCT, TIME, AND EXPERTISE. "THEY'RE TREATING THIS AS A LABORATORY FOR THEIR OWN PURPOSES," THURM SAYS.

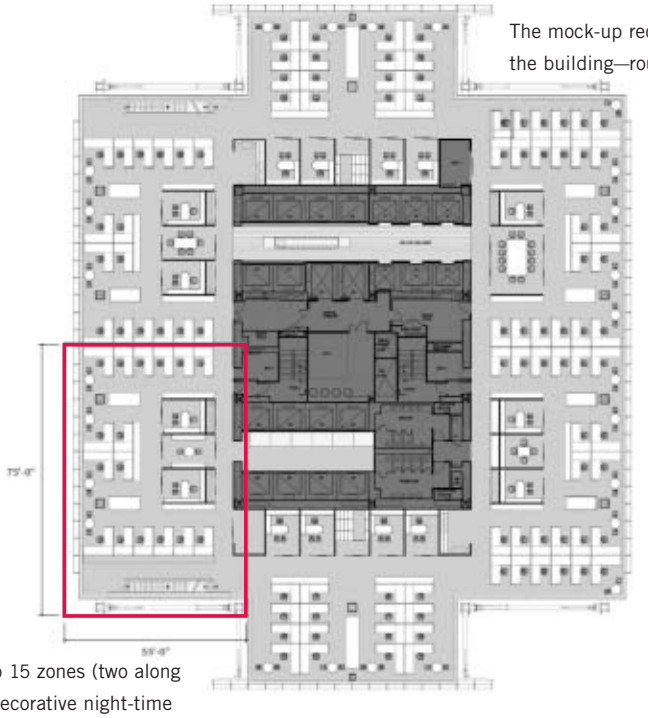
substantial energy savings by reducing the artificial light in areas where it wasn't needed—near the windows, for example? What they quickly learned was that the more sophisticated dimming systems in the United States seemed prohibitively expensive. "We were worried about the cost," he says. "We were not prepared to get into a budget-busting situation."

Later that fall Thurm happened to find a paper on daylighting written by Steve Selkowitz, a leading expert in the field and head of building technologies at LBNL. "We called him and had a fabulous conversation," Thurm says. This resulted in a January meeting at the California lab between SBLD Studio; Gensler, the interior architects; Flack and Kurtz, the engineers; and a corporate team led by Michael Golden, vice chairman of the New York Times Company.

"About a month earlier we'd had some brief moments of enlightenment," Hughes recalls. "While trying to make up our minds about which dimming system we wanted, I said I thought we had the wrong question in front of us. We needed to talk about what kind of shade system we were going to purchase and then we would be able to understand the lighting system we needed. When we went out to Lawrence Berkeley, that is exactly the

The Times has conducted several tests for the building's facade. "At one point," Thurm says, "to demystify the curtain wall for potential bidders we hired four different firms to engineer and build prototypes." In the latest iteration (below) the ceramic rods are held in place by an aluminum frame.

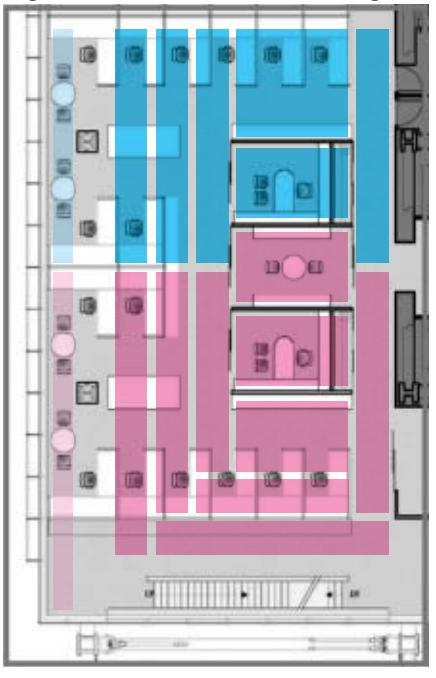
"EVERY MINUTE WE SAMPLE WHAT'S GOING ON IN THE SPACE, AND WE DO IT TWENTY-FOUR HOURS A DAY," LEE SAYS.



The mock-up recreates the southwest corner of the building—roughly one-sixth of one floor.

LIGHTING ZONES

The space is divided into 15 zones (two along the curtain wall are for decorative night-time lighting of the facade). The blue section operates on Lutron shades and lighting controls. The red uses a MechoShade system and Siemens dimming controls; this half of the mock up is larger to accommodate more intense sunlight.



SHADES

On the Lutron side, the shades respond to ambient light in the space. This is a "closed loop" system. The MechoShade system reacts to the position of the sun and sky conditions outside. This is an "open loop" system.

Floorplan courtesy Gensler

message they gave us. We started out telling them about the low-iron Star Fire glass, and they said, 'Oh, that's the highest transmittance of any type of curtain wall. You've got to manage your facade.'"

Thurm told Selkowitz that they were looking to rent space in Manhattan for a second furniture mock-up (the first one had narrowed the manufacturers to Knoll, Vitra, and Unifor). There they would also test lighting controls. "Steve said, 'Gee, this mock-up you're about to build—it's too bad you couldn't build it outside because that would be a perfect way to test what we've been talking about,'" Thurm recalls. "It was one of those 'aha' moments. Later in the conversation Steve says, 'It's really too bad it's already January because there's a NYSERDA [New York State Energy Research Development Authority] grant we could apply for, but the deadline is April and we'll never make it.' And we said, 'Hold that thought…'"

In very short order—less than a week—the Times had committed to the freestanding mock-up. In mid-June LBNL was awarded a $250,000 daylighting grant. (All of the NYSERDA money went into research; the Times paid an undisclosed seven-figure-plus amount for construction.) The interior architects produced the design and construction documents for the mock-up. "We also worked with Fox & Fowle [the local architecture firm collaborating with the Renzo Piano Building Workshop] to get the curtain-wall information and the level of detail required for that," says Edward Wood, the principal in charge at Gensler. "This whole job has been about understanding the architecture, understanding the interior, and exploring how they relate to one another."

The mock-up was also an opportunity to explore construction issues. "We worked hard with Turner, our construction manager, to do full debriefings, and we had the architects sit in on those conversations," Thurm says. "What about the stairs? What made them expensive? We get a huge benefit by having already built them because that one stair is going to be replicated many times over."

Armed with recommendations from Selkowitz, the Times team attended Lightfair last year and met

with a number of manufacturers eager to participate in the lighting experiment; all donated product, time, and expertise. "To their great credit, they're treating this as a laboratory for their own purposes," Thurm says. Testing complex products often leads to simplification—and market acceptance. "Obviously it works better for us if these systems are truly commercial products," he adds. "If it looks like they have legs in the marketplace, then they'll be supported and that will be reflected in the price."

In order to measure all sun angles, the lighting experiment began on December 21 (the shortest day of the year) and will end on June 21 (the longest). "Solstice to solstice," Thurm says. "Sounds very pagan." The ultimate goal is the seamless integration of the dimming-control systems, which regulate the artificial lights, and the mechanized shades. "You want to provide a homogeneous light level throughout the space, regardless of the conditions outside," says Attila Uysal of SBLD Studio, who designed the two schemes for the mock-up.

The mock-up recreates the southwest corner of the building, which will experience the most sun exposure. It is divided roughly in half; each side operates with different dimming-control systems and shades. The southwest wall (by the stairs) and half of the western facade is the MechoShade side; here Siemens dimming controls operate on the DALI (Digital Addressable Lighting Interface) system, a state-of-the-art computer protocol popular in Europe that allows light sources to be individually controlled. Because lighting zones can be changed without rewiring, this provides great flexibility. The shades on this half of the mock-up don't respond to the light in the space but react to the position of the sun and prevailing sky conditions using a rooftop measurement device called a radiometer. "The computer already knows the position of the sun," explains Jan Berman, president of MechoShade. "That's a predictable event programmed into the software. The radiometer determines whether it's a sunny, cloudy, or bright condition, and then the shades move up or down accordingly."

On the other side of the mock-up the dimming controls and mechanized shades are made by Lutron. Their integrated scheme uses a 0-to-10-volt system where groups of lights are adjusted in predetermined zones. Less flexible than DALI, it's still more advanced than anything used in the United States, where less than two percent of office space has dimming capabilities (and that's largely confined to conference rooms and high-end executive suites). In contrast to MechoShade, Lutron's shades are controlled by ceiling-mounted sensors, which react to the light inside the space.

LBNL and the manufacturers have placed 107 sensors in the mock-up to measure light conditions on a minute-by-minute basis. This data is fed via a special Times Web site to a computer at LBNL, where scientists in turn send information back to the manufacturers on the performance of their equipment. "Every minute we sample what's going on in the space, and we do it twenty-four hours a day," Lee says. "Then we have a second set of information. We go out to the site and do human-factors surveys. If you get a majority of people saying they don't like something, that is probably even more important than the measurements you're taking."

Although the directional orientation of the Queens facility is identical to the future home of the Times, the mock-up represents just one-sixth of the future building's floorplate. LBNL is using daylighting software called Radiance to adjust for the other sides of the building and the surrounding environment. Developed by the lab about ten years ago, the modeling program has since become popular with architecture firms and game designers (and can be downloaded for free on the LBNL Web site). "Using the mock-up data you construct a computer simulation," Lee explains. "Then you take the field data and ask, 'Are the field numbers and computer simulation aligned?' You have to calibrate them because you can only model to a limited degree of accuracy. Then you take that calibrated model to the Manhattan site and model the exterior surroundings—no trivial task—and go about predicting the light conditions for the different floors."

In March LBNL provided the Times with preliminary numbers showing some significant energy savings, but the full range of questions they need answered won't be available until all the data is collected. "By the end of the mock-up period we'd like to know which systems are working best," Hughes says. "It's not about picking manufacturers yet but understanding what the requirements are and being able to write those down so they can be put into the marketplace for bid. Ultimately we need to know which shade systems are operating without glare, how much energy we're saving by harvesting daylight, how much direct penetration of daylight we want."

Groundbreaking for the new building, which will be located on Eighth Avenue between 40th and 41st Streets, is imminent. In the meantime the Times is not only bringing employees out to Queens to test the space but also conducting tours of the mock-up for real estate developers and builders to promote the glories and long-term economic benefits of natural light. "For the past year David Thurm and I have been out there telling the world that daylighting needs to come at a reasonable price, and that we're prepared to help provide some of the solutions to make that happen," Selkowitz says. "In this business the classic term is *market transformation*."

"One of the principles of innovation is that you share your information," Thurm says. "Daylighting should be universal. And if manufacturers can figure out a way to bring the price down, then I think builders will say, 'Of course we have to do this!'" **www.metropolismag.com**

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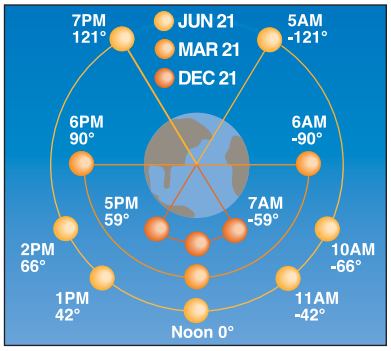
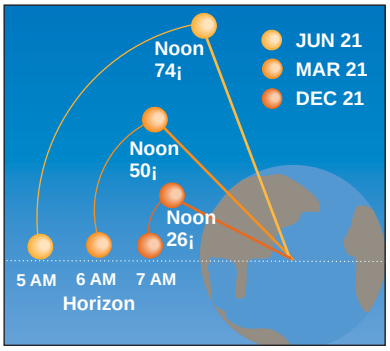
WindowManagement™ with AAC SolarTrac™

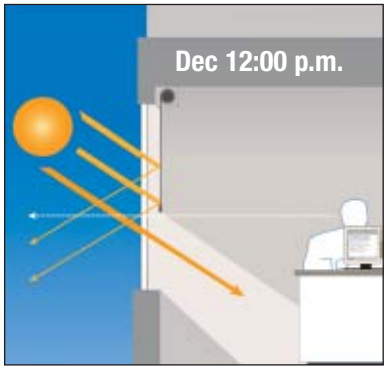
The New York Times Building Test Site

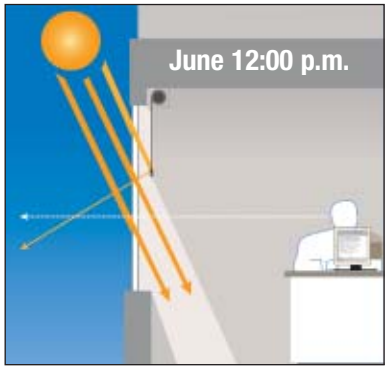
MechoShade's AAC SolarTrac™ System, is a software based control system, designed to automatically adjust the position of the shades incrementally on the window to maximize view and daylight while protecting people and work surfaces from direct sun and excessive brightness and glare. AAC SolarTrac can react to local climactic variables such as sunny or cloudy conditions.





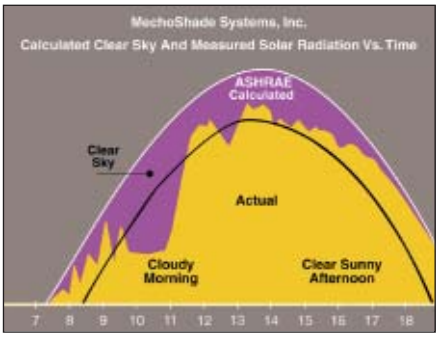
The AAC SolarTrac adjusts shades incrementally on the window in accordance with the solar profile angle and BTU load relative to each zone or orientation.





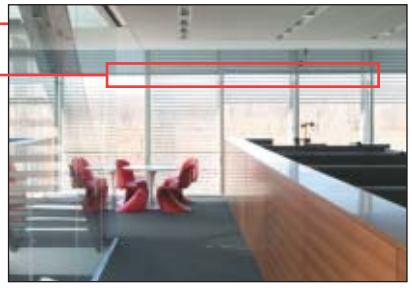
The position of the shades is determined for each zone based on the window geometry, orientation, glazing optical properties, allowable solar penetration, and real-time sky conditions, ie sunny or cloudy. The goal is to provide shading on the window when and where needed, while leaving as much of the window unshaded in order to maximize view and control glare. In other words.... total window management.

Sky Analysis



Through the use of three roof mounted solar sensors, AAC SolarTrac compares the actual measured solar radiation (sunshine) vs AHSRAE calculated clear sky radiation. The AAC SolarTrac uses this data to determine “clear” or “cloudy” sky conditions and operates accordingly. If it is determined to be sunny, then the shades move to their proper positions. If cloudy, they would typically be programmed to roll up. Time delays built into the program prevent excess shade movement on days with variable conditions.

2:15



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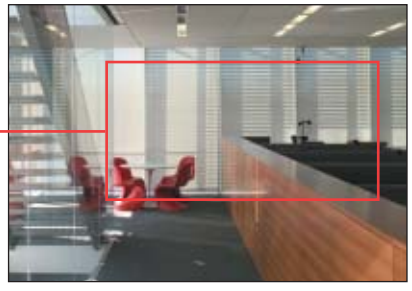
3:45



At **2:15 p.m.** the AAC SolarTrac has lowered the shades in reaction to the sun’s shift to the west elevation. The light dimming system senses enough daylight for the overhead lights to remain off.

At **2:40 p.m.** the sun moves further onto the West elevation, becoming more direct. The AAC SolarTrac lowers the shades to the next position, to control the solar penetration into the work area. The light dimming system continues to keep the lights off due to adequate natural light in the space.

At **3:45 p.m.** the AAC SolarTrac reacts to the solar gain and glare conditions created as the sun sets, by lowering the shades to the maximum down position. The light dimming system has activated some of the lights, while leaving others off, based on the light levels achieved in each area.

MechoShade®
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Kohn Pedersen Fox Associates – Architects
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The trend toward sustainable design and daylighting has opened new opportunities for the architect and designer. It has also brought to light new challenges, notably the impact of the solar ray to the designed environment.

With over 30 years experience, MechoShade® has established itself as the leading single-source manufacturer of complete integrated solar shading systems, controls and daylighting solutions. Our experience in motorized and manual shading is unsurpassed. We offer a wide variety of control solutions for both commercial and residential applications. From simple line voltage switches to networked, addressable, building-wide controls, MechoShade offers a variety of solutions including integration into 3rd party Lighting, BMS and A/V Systems. And with over 100 visually transparent shade cloths in various weaves, densities and colors, our manual and motorized systems can meet any performance and design requirement.

That's why no matter what the design aesthetic, from the most eclectic interiors to the most dramatic minimalist settings, you'll find MechoShade bringing sustainable design to light.

MechoShade®
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