

**Case Study: Barometer of Change**  
**NOAA Satellite Operations Facility Suitland, MD**

Protecting the environment is mission critical.

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Photographs from the national oceanic and atmospheric Administration's (NOAA) satellites—views of the earth and its weather patterns from above—pervade our media-rich culture. With this established public face, NOAA officials saw little need for a signature building by a big name architect. If it provided the tools they needed to control their satellites, a ho-hum building would do just fine, thank you. But the U.S. General Services Administration (GSA), which procures and manages facilities for most federal agencies, had other plans, and enrolled the project in its Design Excellence Program. One area in which the two agencies did agree was that the building should be green: GSA had just begun mandating a minimum LEED Silver rating when the project was announced, and NOAA sees itself as an environmental agency. "Our mission is environmental stewardship," says Paul Pegnato, NOAA's project manager for the facility. "Our building projects that stewardship."

Led by Thom Mayne (now a Pritzker Prize laureate), the joint venture of Morphosis and Einhorn Yaffee Prescott (EYP) developed a scheme based on several underlying goals. The first goal was to conceal as much of the building's required program space so as to lessen the visual impact of its volume on the site, which abuts residential neighborhoods in a Washington, D.C., suburb. The second was to put the majority of the employees on a single floor plate, to avoid the risk of departments getting broken up on separate floors. And the third was to provide an elegant, integrated solution that would accommodate the satellites, the people, and the technology that connects them.

These goals led to the unexpected design solution that features satellite dishes on the roof of a windowless rectangular box, dubbed "the bar," that houses the control rooms, while most of the employees work below grade in a cavernous, disk-shaped zone punctuated by light wells and skylights. A vegetated roof on the shallow dome over the main work space merges seamlessly into the landscape on the north, making most of the building's volume disappear from view. A glazed wall on the south, where the natural grade is lower due to the slope of the site, introduces light and views. Parking and mechanical rooms are farther below grade, underneath the main work space.

While Morphosis led the overall design, EYP took the lead on the green strategies. EYP project architect Doug Gehley (now with SmithGroup) says beyond the requirement for LEED Silver certification, little direction came from the agencies regarding environmental priorities. "The client left it wide open," he says. "Our goal was to sit in the meetings and watch for opportunities in the design as it started to develop." Once environmental opportunities were identified, teams that included designers from both Morphosis and EYP, and client representatives from NOAA and GSA, developed the solutions.

The mechanical engineers were charged with developing three designs for the building's systems. Of these, a system based on under-floor air delivery was chosen as the most effective way to provide comfort and fresh air to the occupants in a space with ceilings up to 28 feet high. Displacement ventilation with under-floor air provides other efficiency gains—including reducing the need to chill air for cooling—because it isn't being mixed with air that has already been in the space. Fan energy is reduced because the air is delivered at low speed and pressure. These benefits, combined with high-performance chillers and other measures, provide a predicted energy cost savings of 28 percent over the ASHRAE 90.1-1999 baseline. The under-floor air

system also provides a level of individual control that would be tough for another system to match in an open floor plan.

The unexpected design features satellite dishes on the roof—dubbed “the bar”—of a windowless rectangular box.

Lighting the large, open work space was a challenge, according to Teal Brogden, senior principal at Horton Lees Brogden Lighting Design. One constraint was the mandate from GSA to have ambient lighting that provides at least 30 foot-candles of illumination on the work surfaces, even though individual task lighting was also available. “In some work situations we might take the ambient light levels down to 15 or 20 foot-candles,” says Brogden. At the same time, the glazed wall on the south and the large light-wells create bright zones that had to be balanced to avoid uncomfortable contrasts. Based on lighting models, tubular skylights were added to enhance the daylight distribution, but “filling the space with the number of skylights that it would take to light with daylight was not in the original budget,” notes Brogden. Instead, “daylight was meant to provide pools of visual interest and relief.”

Another element that wasn’t feasible because of lack of funding was operable shading devices on the vertical glass. Instead, the designers installed a fixed black scrim on the upper sections of the glazing to control glare, a solution that cuts down on the available daylight even when it is desired. GSA is considering removing that scrim, at least from the north and west sides, where it isn’t needed to control direct sunlight, but no final decision has yet been reached. “We had suggested that they wait through the summer before they decide,” says David Rindlaub, project architect with Morphosis. The risk of direct sunlight affecting workstations is mitigated somewhat by the high partitions in the systems furniture that GSA selected. While these partitions increase the amount of privacy in the individual cubicles, they also create a maze-like effect, and reduce the sense of spaciousness.

The combination of unusual form, high technology, and green measures made construction administration and commissioning a challenge. “There were some things that the contractor hadn’t done before,” notes Steve Baumgartner, who managed the commissioning process for EYP. In particular, keeping the under-floor plenum clean during construction was difficult. The technology challenge emerged when the engineers needed to commission the control room with actual electrical and thermal loads in place. “They wouldn’t move the equipment in until it was tested, but we couldn’t test without the loads in the spaces,” says Baumgartner. Ultimately they found ways to simulate the loads that the equipment was expected to produce.

Yet another challenge on this project was the relatively high level of turnover among members of the design team. EYP’s Gehley feels that this risk of turnover highlights the value of design firms that have enough depth in terms of green expertise and LEED-accredited professionals to carry a project forward when one person leaves.

While certification wasn’t completed by press time, there is optimism that the project will exceed GSA’s LEED Silver requirement and achieve Gold. It’s too soon to judge how well the satellite control systems will work out, since the high-tech, mission-critical functions are still being fine-tuned. The design surely succeeds in fulfilling the goal of creating a provocative, iconic form. “Some people had a hard time, because it wasn’t the conventional building they thought they were going to get,” says Gehley. Among those who struggled through the process was NOAA’s Pegnato, who still isn’t convinced of the value of the building’s drama. “Knowing what we know now, we could have tweaked the form to provide a bit higher level of function,” he suggests. But he has no reservations about the green agenda. “Relative to the green building, I would retain all aspects of the project.”

- Nadav Malin



Photo © Maxwell Mackenzie

#### KEY PARAMETERS

Suitland, Maryland (Middle Potomac watershed)

**PROJECT SIZE:** 208,000 ft<sup>2</sup> / 19,320 m<sup>2</sup>

**COMPLETED:** May 2006

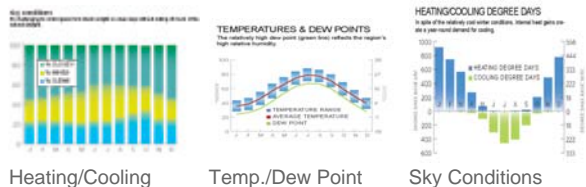
**COST:** \$54 Million

**ANNUAL ENERGY USE:** 60 kBtu/ft<sup>2</sup> (690 MJ/m<sup>2</sup>)—19% reduction from base case

**ANNUAL CARBON FOOTPRINT (PREDICTED):** 18 lbs. CO<sub>2</sub>/ft<sup>2</sup> (90 kg CO<sub>2</sub>/m<sup>2</sup>)

**PROGRAM:** Offices, satellite control rooms, computer rooms, conference rooms, exercise facility, cafe.

DATA [click to View larger](#)



#### NOAA TEAM

**OWNER:** General Services Administration

**ARCHITECT:** Baird Sampson Neuert Architects

**COMMISSIONING AGENT:** General Services Administration

**ENGINEER:** Einhorn Yaffee Prescott (MEP); Arup (structural, concept design); Cagley and Associates (structural); IBE Consulting Engineers (mechanical); EYP Mission Critical Facilities (electrical); A. Morton Thomas & Associates (civil)

**LANDSCAPE ARCHITECT:** EDAW

**LIGHTING:** Horton Lees Brogden

**ACOUSTICS:** Shen Milsom & Wilke

**SECURITY:** Ted Kesik

**GENERAL CONTRACTOR:** P.J. Dick

#### SOURCES

**METAL/GLASS CURTAINWALL:** PPG Sungate 100 low-e clear insulating glass

**LADDING:** Swisspearl Carat, open joint fiber cement board panel system over Bakor Air-Bloc 33 vapor-permeable air **BARRIER** : Focal Point Groove compact fluorescent with integrated custom acoustical panel. Acoustical panel uses Echo Eliminator Bonded Acoustical Pad

**LOW-SLOPE ROOFING** : Bakor 790-11 hot-fluid-applied rubberized asphalt membrane with 25% post-consumer recycled content is the waterproofing layer for green roof and non-green roof areas.

**CARPET:** Milliken Raffia Tex carpet tiles