U.S. General Services Administration San Francisco Federal Building

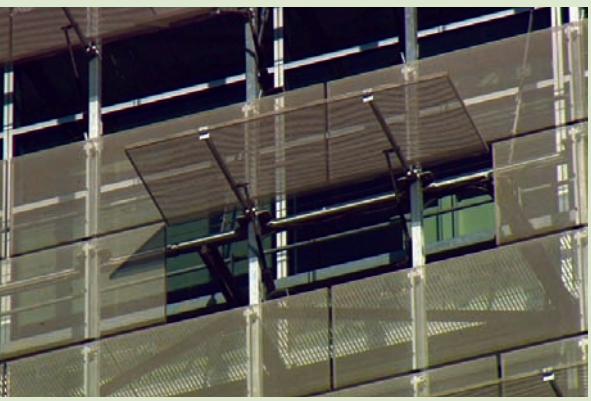
San Francisco, California

Building Type:	**Office high-rise**
Recognition Status:	**Pursuing LEED for New Construction v2.2 Silver**
Completion Date:	**2007**
Gross Square Footage:	**605,000 sq. ft. (56,200 sq. m.); 18 stories**
Total Project Cost:	**US$144 million**
Energy Cost Savings:	**US$500,000/yr projected**
Site Energy Use:	**37 kBtu/sq. ft./yr (120 kWh/sq. m./yr) projected**
Site Energy Use (floors 6-18):	**28 kBtu/sq. ft./yr (88 kWh/sq. m./yr) projected**
DOE Climate Zone:	**Zone 3 (3200 HDD, 70 CDD)**

Exterior building façade
© Rocky Mountain Institute

PROJECT OVERVIEW

The San Francisco Federal Building was designed to meet the "highest possible standards of performance and aesthetic integrity." Three major objectives target this goal. First, the 60-foot-wide, 354-foot-long, 234-foot-high tower (18m x 108m x 71m), with its translucent, undulating skin and progressive urban design strategies, is intended to serve as a new urban landmark for the City of San Francisco. Second, the building interior was designed to be a model workplace. Natural ventilation, innovative common spaces, and flexible floor plans foster health, productivity, and creativity. Third, the building was envisioned as a benchmark for the intelligent use of natural resources. Significant energy savings were achieved through the collaborative work of an expert design team. The Lawrence Berkeley National Laboratory modeled natural ventilation; Pritzker Prize-winning architect, Thom Mayne, and his firm Morphosis generated the architectural and urban design concepts; Horton Lees Brogden designed the natural and artificial lighting; and Ove Arup provided structural and MEP (mechanical, electrical, and plumbing) engineering. The building includes an 18-story office tower with three-story elevator atrium-lobbies and an outdoor "sky garden;" a low-rise public office, daycare, and café wing; and a large public plaza.



Living skin facilitates natural ventilation
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THE BOTTOM LINE

The General Services Administration (GSA), the federal government's land ownership and property management arm, will operate the San Francisco Federal Building for its entire lifespan. Fiscal responsibility over long-term ownership provided a strong incentive for the inclusion of high-performance building features. Seventy percent of the building is naturally ventilated, which saved approximately US$11 million in construction costs. The natural ventilation system is also projected to save half a million dollars every year and reduce cooling operating costs by 86 percent. In addition to decreasing construction and operation costs, natural ventilation, daylighting, and other building amenities are expected to increase worker productivity and result in even greater long-term cost savings. Open office plans help foster employee interaction while allowing the flexibility to inexpensively accommodate changes in departmental workspace needs. The Federal Building is representative of the attitude that green design strategies are integral to creating high-quality, aesthetically prominent, and cost-effective buildings.

"What's driving us is our fundamental mission to create superior workplaces for the federal worker at the best value for the taxpayer."

— Kevin Kampschroer
Director of Expert Services
Public Building Service, GSA

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A "LIVING SKIN" ILLUMINATES AND VENTILATES

Instead of using the term "building envelope," which implies visual opacity and material impermeability, the Federal Building design team envisioned the building's perimeter as a living skin. The building's walls interact with and adjust to exterior conditions, admitting light and air. Awning windows in the northwest and southeast glass curtain walls facilitate cross ventilation of the tower, naturally ventilating 70 percent of the building. The southeast façade features a perforated metal scrim that shades the glass curtain wall and limits unwanted solar heat gain. At the same time, the southeast-facing metal scrim radiates absorbed heat into the air space between the metal and glass walls. As this warm air rises, it pulls cool air through the building from the shady northwest façade, assisting prevailing northwest breezes to passively ventilate the office spaces. Additionally, the building stair cores are placed at the ends of the tower (northeast and southwest) to limit the negative lighting and heat-gain effects of extreme morning and evening sun angles. In addition to passive and occupant-controlled strategies, the building employs a monitoring system that operates floor-level vents in the building walls. The system maintains comfortable daytime temperatures and can cool the building's thermal mass at night to offset daytime heat gain.

Federal Building, tower behind / © Steve Rhodes

With average daily temperatures ranging from 49 to 65 degrees (9 to 18 degrees Celsius) in San Francisco, natural ventilation can condition the building for nine months of the year. From mid-April to mid-October, the natural ventilation system will cool the building. In March and November, the building will maintain sufficiently warm interior temperatures with the windows closed. In December, January, and February, linear steam-source convectors incorporated into the window-wall mullion system will maintain thermal comfort.

The building's "living skin" has generated remarkable energy and financial savings. The GSA requires its new buildings to use less than 55 kBtu of energy per square foot (170 kWh per square meter), in an effort to reduce their 69 kBtu-per-square-foot (220 kWh-per-square-meter) portfolio average. The San Francisco Federal Building is projected to use only 37 kBtu per square foot (120 kWh per square meter)! This energy savings translates to US$500,000 per year in operational savings. Also, elimination of a mechanical cooling system in the building's tower saved US$11 million dollars in construction costs. These savings justified investment in the southeast façade's perforated metal scrim. The metal "second skin" is not only vital to the building's energy efficiency, but also defines the exterior aesthetic.

"In our careers we're going to produce two-, three-dozen buildings and we don't make that much affect on the world. But, if it's seen as a prototype that spins off more ideas like it, then your realize it has huge, huge potential."

— Thom Mayne, Principal, Morphosis

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Thermal mass moderates temperatures / © Rocky Mountain Institute

FLEXIBLE AND OPEN INTERIORS FOSTER HEALTH AND CREATIVITY

The project team designed the Federal Building to exemplify innovative and high-quality office space. To accommodate changes in office space needs, design flexibility was a major goal. Rather than full-height walls, workstations are separated by 52-inch (132-cm.) modular partitions. These low walls are easily modified, allow for easy communication and collaboration between employees, and do not obstruct the passive ventilation airflow. Flexibility is also facilitated by underfloor communication and electrical service throughout the building. This underfloor system also incorporates low-energy increased-health mechanical ventilation in areas, such as the low-rise wing, where natural ventilation was not possible.

There are no corner or window offices in the Federal Building. Instead, access to fresh air, daylight, and views is "democratized" and provided to all the open office spaces. Meeting rooms and enclosed offices are located in blocks within the building interior. Their translucent and transparent walls allow daylight from the open office spaces to penetrate. Also, the central office walls do not reach the ceiling to allow airflow and to help facilitate effective passive ventilation.

In the 18-story tower, the distance from floor to floor is 13 feet (4.0 meters). High ceilings help facilitate natural ventilation and deep daylight penetration, and create spacious-feeling office space. Four-fifths of the building is illuminated naturally, supported by task lighting and overhead lighting controlled by photo sensors. Daylighting is projected to decrease lighting energy costs by 26 percent while increasing the overall quality of light in the building.

The designer's attention to health and productivity is demonstrated through the design of spaces throughout the building. Elevators in the tower only stop on every third floor and open onto "sky lobbies." From the sky lobbies, workers walk up or down stairs to reach their offices. These intermittent elevator stops encourage interaction between employees on different floors and provide workers with a modest amount of exercise. Additionally, a "sky garden" on the 11th floor provides a lush natural retreat, where employees can meet for conversation, brainstorming, and inspiration. The garden, which fills a three-story void in the middle of the tower, provides city views and is visible from bridges on the 12th and 13th floors. The sky garden, sky lobbies, and office spaces create an excellent workplace that encourages productivity, health, and creativity.

"The Federal Government is going to own and operate that building for at least 75 years. We've been able to show them concretely that they're saving upwards of half-a-million dollars a year in energy costs. It's a huge savings to the taxpayer."

— Tim Christ, Project Architect, Morphosis

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URBAN DESIGN PROMOTES ENVIRONMENTAL AND CULTURAL SUSTAINABILITY

Architect Thom Mayne generated planning and design concepts for the Federal Building that contribute to the urban environment both culturally and environmentally. Although the zoning code required the building to step down toward the street from a maximum 240-foot (73-meter) height at the center of the block, the project team successfully petitioned the city to allow the tower to maintain its full height along its entire length. This facilitated a smaller building footprint, leaving room for a 37,000-square-foot (3,400-square-meter) south-facing public plaza, which helps address the city's widely recognized lack of open space. At the same time, siting of the narrow tower to run from southwest to northeast aggressively captures prevailing winds and solar exposure, facilitating the building's overall resource efficiency.

The low-rise wing of the Federal Building addresses concerns that the building would be "a fortress" among much smaller two- and three-story buildings in the ethnically diverse neighborhood. The high-rise tower is pushed to the back of the site while the low-rise building maintains a pedestrian-scale streetscape. The low-rise wing matches the height of the 1905 Beaux Arts U.S. Court of Appeals across the street and contains a cafeteria on the corner of Mission and Seventh Streets, which creates an active publicly accessible destination. The Federal Building is distinctive, but it does not dominate its urban neighbors. Instead, it contributes culturally to the city while leveraging naturally available resources so as to minimally impact municipal resources.

The San Francisco Federal Building is a new urban landmark for San Francisco
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PROJECT TEAM

Lead Design Architect:
Morphosis

Executive Architect:
Smith Group, Inc.

Structural, Mechanical, and Electrical Engineer:
Ove Arup

Civil Engineer:
Brian Kangas Foulk

Landscape Architect:
J.J.R. in association with Richard Haag Associates, Inc.

Geotechnical Consultant:
Geomatrix

Lighting Designer:
Horton Lees Brogden Lighting Design

Acoustical Engineer:
Thornburn Associates

Curtainwall Consultant:
Curtain Wall Design & Consulting, Inc.

Natural Ventilation Modeling:
Lawrence Berkeley National Laboratory

Contractors:
The Dick Corporation and The Morganti Group

SOURCES

David E. Leites, Property Development Division, GSA Pacific Rim Region

"Morphosis SFB Zumtobel Award Press Release," Morphosis, July 5, 2007

"Morphosis: San Francisco Federal Building" Submission to: AIA Technology in Architectural Practice, BIM Awards Competition, April 11, 2005

Pritzker Prize Profile http://www.pritzkerprize.com/full_new_site/164/pritzker2005/sanfranciscofederalbuilding.htm