

Capitol Area East End Office Complex: A New California Standard

Project Description

The East End Complex is a group of five office buildings being constructed for the State of California to house the Department of Health Services and the Department of Education. When complete, the project will include almost 1.5 million square feet of office space and 750,000 square feet of parking structure space. The State of California is using this project to showcase a variety of sustainable features and evaluate the results.

A number of innovative sustainable building strategies were considered for the East End Complex and a number were selected for different buildings so that a full range of options could be evaluated under working conditions for State office buildings.

Materials were selected for durability, recycled content, and low or zero air emissions. Finishes, furnishings, and other materials were chosen to enhance indoor air quality. One building, Block 225, will have raised floors with under-floor ventilation and wiring systems.

This energy-efficient project will feature significant use of on-site photovoltaic (PV) electricity generation. Before construction began, project managers sought to reduce the quantity of material disposed from the site preparation. Specific information about some of the sustainable features is included below.

Location: Sacramento, California

The Capitol Area East End Office Complex project lies east and south of Capitol Park. Blocks 171–174 are bounded by 15th Street to the west, 17th Street to the east, L Street to the north, and N Street to the south. Block 225 is located between 14th and 15th Streets to the west and east, and N and O Streets to the north and south. Block 224 fronts P Street between 13th and 14th Streets.

The Design-Build Method

The Capitol Area East End Complex was developed using a modified design-build method called “bridging.” With this method, teams of contractors and architects—called “design-builders”—submit proposals after development of the underlying design criteria of the project. These underlying design criteria become the platform on which the design-builders fashion their proposals.



*Aerial view of the East End Office Complex.
Photo courtesy of Department of General Services.*

Construction and Demolition Waste Prevention

Before construction could begin on the site, project managers had to remove a 1930s-era eight-unit apartment building on 15th Street between Capitol and N streets. Rather than demolishing the structure, the State moved the building to a new location at 17th and N streets.

This resulted in the diversion of significant material from the landfill and helped to preserve needed housing in the central city area. Two Home Depot stores under construction received 60,000 cubic yards of soil excavated from the East End site for use as fill dirt. Another 104 tons of steel

recovered from the demolition of other on-site structures was reused as foundation re-bar in the project.



Apartments on the move.

Waste prevention efforts extended beyond the structural phase of site preparation. Ten historic California Fan Palm trees, each approximately 60 feet tall, were removed from the site and replanted in Capitol Park. While the quantity of waste diverted (around 25 tons) was small in proportion to the overall diversion, the historic and aesthetic value of these 80-year-old trees was significant.

Overall, the project has diverted 97 percent of on-site waste products from the landfill by recycling. This translates to more than a quarter of a million tons of diverted materials—more than is disposed by the City of Stockton in an entire year! While this type of diversion results in enormous disposal fee savings for the builder, it also significantly enhances the City of Sacramento's ability to meet its 50 percent waste diversion requirements under the Integrated Waste Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989 as amended [IWMA]).



Transplanted historic palms

Energy Efficiency

The project was designed to exceed 1998 Title 24 energy efficiency standards by 30 percent. This

will be achieved by a broad spectrum of strategies, including the following:

High Efficiency Windows and Daylighting

High efficiency glazing of the building's windows will reduce solar heat gain and reduce cooling load. The windows contain spectrally selective, low emissivity (Low-E) glass. These windows are designed to allow most of the visible light to penetrate the building while blocking most of the heat gain from infrared frequencies. Open workstations (cubicles) will be placed along the perimeter of the buildings to facilitate the use of daylight and maximize light penetration into the buildings. Additionally, cubicle and interior offices will include windows to take advantage of the available natural light.

Lighting

The East End Complex will feature highly efficient T-8 fluorescent lamps along with automatic lighting controls such as motion and



Preliminary soil excavation

daylight sensors, dimmers, and time of day controls. Photocells will control outdoor lighting. Interior lighting will be indirect to reduce glare, and the design will provide more light at the interior of the building and less near the windows. Additionally, light interior colors are intended to increase daylight reflection and decrease the need for electric lighting.



Closing the Loop With Marble

In 1997, the crews began making seismic safety renovations to the historic **Library and Courts Building**. These renovations required the removal of more than 30,000 square feet of marble flooring from the book stack tower. The marble was placed on pallets and stored at the Department of General Services warehouse on R Street until the summer of 2001, when the East End Complex's stone subcontractors transported the material to their shops for cutting and refinishing.

The marble was later incorporated into the design of each main lobby in all five **East End office buildings**. This reuse represents a diversion of more than 265 tons of material from the landfill and creates the opportunity for a new generation of Californians to enjoy this beautiful and historic flooring.



Marble from the Library and Courts Building (upper left) is being reused in the East End Complex lobbies.

Mechanical Systems

The East End project will make use of high efficiency electrical motors in all its mechanical systems. Pumps and fans will use adjustable frequency drives for maximum energy efficiency.

The roofs of the East End project buildings are covered with white single-ply membrane roofing. Cool roof coatings reflect much of the sun's energy, resulting in lower roof surface temperatures and less heat transfer to the building. Light-colored "cool roofs" are typically 50 to 60 degrees cooler on hot days compared to traditional roofs. This results in cooling cost reductions of up to 40 percent, according to the California Energy Commission. Lower roof temperatures can result in significantly longer roof life.

Distributed Energy Generation

At this time, a significant effort is underway to reduce the peak load requirements of State

buildings. Part of the strategy is to incorporate distributed energy systems (that is, on-site power generation) into new building projects. Sacramento, with its sunny summers, is an ideal location for photovoltaic electrical generation. To maximize this opportunity, photovoltaic panels will be used to shade vehicles on the parking structure roofs of Blocks 224 and 173. PV panels are also built into the exterior skin of the Block 225 mechanical penthouse.

Altogether, the 5,000 PV panels on this project will be capable of producing up to 200,000 kilowatt hours—providing enough electricity for 22 homes and reducing carbon dioxide emissions by approximately 200 tons per year.

Recycled Content

Many of the products used in the building meet aggressive State requirements for recycled content. For example, the carpet contains 53 percent



Playground equipment in the East End Complex day care facility made from recycled-content materials rests on a rubber surface made from recycled tires.

recycled content; acoustical ceiling tiles, 79 percent. Recycled-content products are visible in features such as signage and park furnishings, and in hidden areas such as structural and reinforcing steel. The Block 225 building used more than 27,000 cubic yards of concrete containing 25 to 40 percent fly ash.

The inclusion of fly ash represents a significant use of recycled content, and it results in a significant increase in durability. Throughout construction, even while seeking high levels of recycled content, project managers strove to maintain high product performance, indoor air quality (IAQ) standards, and competitive pricing.

The East End project will include more than 300,000 square feet of rubberized asphalt concrete (5.5 lane miles) in adjacent streets and tire-derived playground mats in the child-care center. In all, this represents the recycling of 11,000 tires from the California waste stream.

Indoor Air Quality

Low-VOC Products

Interior materials (including carpet, paint, and other finishes) have been selected with an

emphasis on reducing volatile organic compounds (VOC) and dust. The structures contain low or formaldehyde-free building and plumbing insulation. Formaldehyde-free ceiling tiles were also selected for use in the project.

To ensure the accuracy of air quality claims made by vendors, products with testing data more than four or five years old were retested at an independent laboratory. In pursuit of improved indoor air quality for this project, the State developed a new IAQ testing standard and protocol. The standard is now used on projects throughout California.



White membrane roofing.



Photovoltaic panels on the Block 225 building.

Commissioning

Extensive pre-occupancy commissioning has been conducted during the construction phase of this project. Additional testing will continue at a number of representative locations after the building is occupied. Indoor VOC levels as well as the performance of mechanical systems (HVAC) will be assessed and adjusted accordingly to ensure a healthy indoor environment.

Dust Control

Throughout the construction phase, preventative measures were taken to reduce contamination of materials that might contribute to indoor air pollution. Ductwork delivered to the job site was sealed until installation to keep out dust and other potential irritants. Other mechanical equipment delivered to the site was also covered with plastic until it could be installed. After the slab floors were sealed before the installation of the raised floor, sticky mats were placed at entry points to minimize tracking of dirt and dust into rooms. Finally, higher-efficiency air filters (85 percent above the standard) were specified to control particulates in the air supply during occupancy.

East End Project: Closing the Loop With Steel

American Demolition is contracted to demolish the existing structures on Blocks 171 through 174.

American Demolition hires **Capitol Waste** to receive and sort the materials.

Schnitzer Steel recycles the ferrous metal materials.

Cascade Steel Rolling Mills, a subsidiary of **Schnitzer Steel**, melts the recycled steel and produces reinforcement steel.

Fontana Steel purchases the reinforcing steel from **Cascade Steel Rolling Mills**.

Berkel Contractors, the foundation pile subcontractor, hires **Fontana Steel** to furnish and install the reinforcing steel.

Pre- and Post-Occupancy Flushing

Prior to occupancy—but after the interior finishes have been applied—the building will be flushed with 100 percent outside air for a period of 30 days, 24 hours a day, at maximum airflow. After the furniture has been installed, the building will again be flushed with 100 percent outside air prior to occupancy.

Post-Occupancy IAQ

To enhance IAQ after the building is occupied and in operation, janitor closets and copy rooms will

be separately vented to the exterior of the building. This will prevent the intrusion of nuisance odors and copy machine exhaust—which includes dust and high levels of ozone—into the work environment. Wherever airflows will reach high velocities (constriction points at junctions between the under-floor air plenum and ductwork), a sealant will be applied to the fireproofing materials coating the structural steel members.

To ensure adequate airflow, sensors throughout the buildings will monitor indoor air. The intake of outdoor air will be increased if levels of carbon dioxide exceed 800 parts per million.

Keeping the Dirt Outside

Recent studies have found that the bulk of dirt and dust found in commercial office buildings enters the building on the shoes of its occupants.

Compounding the seriousness of this pollution source is the potential toxicity of its components. Indoor dust commonly contains lead, asbestos, pesticides, volatile and nonvolatile organic compounds, bacteria, mold, and a variety of allergens (Alex Wilson, *Environmental Building News*, October 2001). To help mitigate this source of indoor pollution, the Block 225 building will have steel “track-off” grates at entryways to remove soil from the shoes of those entering the building.

Modular Office Furniture

The offices of the Capitol Area East End Complex are likely to be the first to use the new State of California Modular Office Furniture Specifications. These specifications set new international industry standards for recycled content and indoor air quality. The specifications also require the implementation of environmentally preferable standards in the manufacturing process.

Under-Floor Air Distribution

The Block 225 building will include over a quarter of a million square feet of office space with an under-floor air distribution (UFAD) system. The UFAD will provide enhanced ventilation, supplying conditioned air in the immediate vicinity of the occupants (rather than from the ceiling down).



An air diffuser lifts out to reveal the space beneath the raised floor.

In this system, the entire subfloor is pressurized, allowing greater individual control of ventilation in the cubicle work environment. The system also reduces future costs related to rerouting ventilation ducting as a result of reconfiguring office space. The under-floor space provides room for, and easier access to, information system cables and electrical supply. This design reduces the costs of making changes to these systems.

The State will be monitoring the performance of this building closely to evaluate the use of UFAD systems for future building projects.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, Flex Your Power and visit www.consumerenergycenter.org/flex/index.html



East End Complex workstation.

Water Conservation

The East End buildings will realize significant water savings through the use of low-water-consuming plumbing fixtures and flow restrictors. The project will also seek water savings through the use of low-flow (drip) and plant-segregated irrigation systems, with advanced controls linked to environmental sensors.

The landscaping system will conserve water through the use of urban-derived wood mulch, some of which will come from materials generated during the demolition phase.

For More Information/Web Sites

Design-Build Method

www.documents.dgs.ca.gov/EastEnd/AboutTheProject/DesignBuilder.pdf

East End Project Sustainable Features

www.eastend.dgs.ca.gov/GreenPage/default.htm#sustainable

Reference Specifications (IAQ)

www.eley.com/specs/spec_download.htm

Modular Office Furniture Specifications

www.ciwmb.ca.gov/GreenBuilding/Specs/Furniture/