CASE STUDY: THE CENTER FOR HEALTH AND HEALING, OREGON HEALTH & SCIENCE UNIVERSITY (OHSU)

Portland, OR

SUMMARY INFORMATION	
Occupancy	16-story medical office and wellness building
Size	400,000 square feet
Completed	Fall 2006
Owner	RIMCO, a partnership of doctors and OHSU
Developer	Gerding/Edlen Development
Architect	GBD Architects
Engineer	Interface Engineering, Inc
Awards and Ratings	LEED Platinum (goal)

Oregon Health & Science University (OHSU) is expanding its main campus into Portland's developing South Waterfront with a new 400,000-square-foot, 16-story medical office and wellness building. In addition to a two-story wellness center, the building will house several different types of university operations, including biomedical research, clinical space, outpatient surgery and educational space. Designed for occupancy in the fall of 2006, the medical offices will be built atop a three-level, below-grade parking structure. The project is aiming for LEED Platinum certification, the highest LEED standard; when completed, it would be the largest LEED Platinum certified building in the United States.

The developer's integrated design approach brought building team members together early on in the process, and was crucial to achieving creative and cost-effective green engineering solutions.

The environmentally-innovative engineering design was achieved for less than a conventional budget for mechanical and electrical systems.

The design includes such green measures as:

- Energy efficiency exceeding Oregon Energy Code and ASHRAE requirements by 61 percent.
- 100 percent onsite rainwater reuse system.
- 10 percent net reduction in budgeted HVAC and electrical capital costs ($3 million savings).
- Natural ventilation in stairwells.
- Radiant heating/cooling with thermal energy storage.
- Displacement ventilation systems in exam rooms.
- 300 kW output from five microturbines.
- Onsite sewage treatment, with treated effluent used for toilet flushing and irrigation.
- 60 kW solar photovoltaics integrated with the south-facing window overhangs.
- Measurement and verification system for analyzing future energy use.
- Site-built solar thermal system for water heating.

A developer-funded Central Utility Plant (CUP) provides electricity and thermal energy for several of the planned buildings in this area, saving energy that is normally wasted in the generation and transmission of electricity from remote sites.

COSTS AND SAVINGS

Construction Costs
Total: $145,000,000 (including land development and two-block underground parking garage)
Per square foot: $362.50
MEP systems: $27,000,000(10 percent less than $30,000,000 conventional design)

Greening Costs
Total: $1,800,000
Per square foot: 4.50
Photovoltaic system: $500,000
Energy-efficient upgrades: $1,300,000 (including solar air heater)

Projected Utility Use and Savings
Electricity: 21,543 BTU/sq.ft. /yr., $660,000/yr savings
Natural Gas: 28,573 BTU/sq.ft /yr.
Water: 5,500,000 gallons, $40,000/yr saving

Pollution Reductions
CO_2: 12 percent
NO_x: 38 percent
SO_x: 38 percent

STRATEGIES

Water
- 100 percent onsite rainwater reuse system; rainwater reclamation system keeps all rainwater on site.
- Onsite bioreactor for sewage treatment.
- Lower-water-using fixtures for sinks, toilets, urinals and showers.
- The cooling tower and landscape irrigation systems use non-potable water from rainwater, a small amount from ground water and a large volume of treated sewage (courtesy of the bioreactor).

Energy
The building will be 61 percent more energy efficient than Oregon Energy Code requirements and LEED/ASHRAE 90.1-1999 standards.
- Onsite Power:
    - A Central Utility Plant (CUP) provides electricity and thermal energy for several of the planned buildings in this area; it is powered by energy-efficient microturbines.
    - Building-integrated solar electric panels on the building's south-facing sunshades, with a total of 60 kW of photovoltaic modules.

    - A large 6,000-square-foot solar air heating system uses low-iron glass in front on the south-facing wall of the 15th and 16th stories.

- HVAC:
    - Individually tailored heating and cooling strategies to different portions of the building, and use of radiant heating/cooling and natural ventilation instead of traditional air conditioning and forced ventilation.
    - Solar model studies: a model of the OHSU building and the surrounding anticipated buildings were exposed to simulated sunlight at several times each day. Model studies resulted in designing long axis of the building almost east-west, an orientation ideal for taking advantage of passive solar heating in winter. Design also incorporated overhanging sunshades, with photovoltaics, to limit building heat gain from the side exposed to summer sun.

    - Right size HVAC system: the building's energy-efficient windows, extra wall insulation, concrete floors at ground level and other features provided a solid envelope to maintain a mild temperature range. An HVAC system with fewer safety factors for peak heating and cooling loads was selected.
    - Sensors and controls: inside meeting rooms, carbon dioxide sensors (CO_2 concentration is a sign of human occupants) reduce ventilation systems when the spaces are empty.
- Lighting Controls/Daylighting: the building team predicts a total reduction of lighting energy use by 45 percent over the ASHRAE 90.1-1999 standard, representing a 16 percent reduction in total electrical energy use.
    - Photoelectric sensors turn lights on and off according to the amount of natural daylight in a room. Daylighting is expected to save $20,000 per year in energy costs.
    - Occupancy sensors in stairwells switch lighting on and off to follow an occupant.
    - Perimeter offices with occupancy sensors have daylighting control, keeping room lighting off when there is sufficient natural light.
- Chilled Beams: for passive convective cooling, these typically provide 20 percent to 30 percent energy savings over conventional air conditioning systems (and allows the HVAC system to be a third the size of a conventional design).
- Integrated Energy Storage Systems: a hot-water storage tank contains heat from the microturbines; a warm-water tank uses energy from the solar thermal collector and heat recovered from the heat pump chiller; a cold-water storage tank uses all the cool water from the recovered rainwater and pumped groundwater.

Renewable Energy

- Building-integrated Photovoltaics:
    - The sunshades on the south facade keep the sun off the windows in the summer and lower the HVAC system requirements for cooling, while creating a free surface for solar electricity generating panels.
    - Annual output of 66,000 kWh.
- Solar air heater: the solar electricity generation panels on the 15th and 16th floors create a giant solar air heater, 190 feet long by 32 feet high, to preheat water for the building.

Indoor Environmental Quality

- Natural ventilation in stairwells.
- Displacement ventilation systems in exam rooms to increase patient comfort.
- MERV-13 filters throughout.
- Low VOC finishes throughout.

- Construction IAQ Management.

To receive a complimentary guide to the project and its engineering and design innovations, go to www.interfaceengineering.com.