Robert L. Preger Intelligent Workplace

Size 6,500 sq ft

Location Carnegie Mellon University, Pittsburgh, PA

Owner Center for Building Performance and Diagnostics (CBPD), Carnegie-Mellon University

Completion Date 1997

Building Overview

Carnegie Mellon University's laboratory demonstrates innovations in office technologies and provides training facilities in building performance assessment. Read more about the IW in *The Cornerstone* [http://gbapgh.org/Publications_cornerstone_spring_00.pdf]

Green Highlights

Construction designed on top of three existing floors at Carnegie Mellon University. Flexible interior spaces designed for future university changes without creating waste. Radiant heating controls and low VOC fixtures.

Sustainable Sites: New construction within an existing building, Margaret Morrison Hall, Carnegie Mellon University

Energy & Atmosphere

- Outdoor spaces provide direct connection to the natural environment
- Continuous monitoring of energy, thermal comfort and weather
- Modular wiring for flexible power and data connectivity
- Open loop dimming of indirect, electronic T5 fluorescent lighting
- Waterflow mullions for mean radiant temperature control
- Dessicant dehumidification and heat recovery for 100% outside air

Indoor Environmental Quality

- Spatially flexible interiors allows for reconfigurability without waste
- Daylighting with dynamic shading and light reduction devices
- Off-site out-gassing of upholstered furniture
- Individual temperature and air control

Materials & Resources

- Low and no VOC adhesives, sealants, coatings and equipment
- Spatially flexible interiors allows for reconfigurability without waste
- Prefabricated, reconfigurable, modular structural and enclosure components from recycled steel

Team

- Center for Building Performance and Diagnostics, CMU [http://www.arc.cmu.edu/cbpd/index.html]
- Bohlin Cywinski Jackson [http://www.bcj.com/]
- Pierre Zoelly, AIA
- Ray Engineering
- Hornfeck Engineering
- R.M Gensert & Associates
- TEDCO Construction Corporation [http://www.tedco.com/index2.htm]

Green Building Alliance®

Read more about the Intelligent Workplace from the National Science Foundation at http://www.nsf.gov/pubs/2002/nsf01168/nsf01168u.pdf.

The Intelligent Workplace

The staff of the Center for Building Performance and Diagnostics (CBPD) serves as human guinea pigs in the institution's quest for identifying and evaluating advanced building systems and their integration for total building performance. The 7,000 square-foot Intelligent Workplace (IW™), was designed and built in 1997 by a team of architects and engineers under the auspices of the Advanced Building Systems Integration Consortium, a university-government-industry alliance of organizations dedicated to improving the quality of the modern workplace. The IW constantly evolves in its role as a living laboratory.

The Structure

The IW was built to maximize speed of construction, to provide spatial adaptability with individual access to the natural environment, and to provide design/engineering interfaces with the various building systems. Key structural features include:

- Prefabricated trusses and columns that are bolted rather than welded.
- Reconfigurable, column-free interiors composed of modular components.
- Open-web, deep trusses, open pathways, and full access to building systems and mechanics.
- An internalized structure wrapped by enclosure to eliminate thermal bridging, minimize dimensional change, and increase longevity.
- Recycled building materials, wherever possible.

The Enclosure

The facility's enclosure strives to maximize natural conditioning and individual access to the natural environment, minimize environmental load with a layered façade, and maximize overall building integrity and material sustainability. Key enclosure features include:

• Ample daylighting.
• Natural and constant-volume mechanical ventilation.
• Dynamic shading and light redirection.
• Strategic load balancing.
• Operable windows.
• Photovoltaic DC power generation.

Interior Systems

Architects and engineers designed the IW's interior systems to provide its inhabitants with a healthy, spatially flexible, individually conditioned, and individually connected environment that promotes appropriate social interaction. Key features include:

- Ability to completely reconfigure.
- Modular, stackable storage wall systems.
- Floor-based modular work surfaces.
- Ergonomic chairs and furniture.
- Acoustic control for diverse office configurations.
- Modular cooling for changing densities and functions.
- Individual control of air, light, temperature, and ergonomics.
- Flexible grid/density/closure HVAC.
- Flexible grid/density/closure data, power, voice, and video connectivity.
- Raised floor-based connectivity to allow furniture to be reconfigure.

HVAC Systems

The Intelligent Workplace HVAC system was built for ultimate thermal comfort, air quality, and resource effectiveness by maximizing the use of natural conditioning to thermally neutralize the enclosure. Engineers specified split thermal and ventilation systems based on a micro-zone concept that offers user-based controls and split ambient and task conditioning. Key features include:

- Re-locatable, modular, floor-based HVAC integrated with structure.
- Natural cooling and ventilation with stack assist/roof top ventilators.
- Dynamic shading, insulation, and load balancing.
- Modular water-based cooling.
- Radiant façades and ceilings.
- Displacement ventilation.
- Desiccant cooling, including heat recovery for 100-percent outside air.
- PEM air speed, direct on, temperature control, and local air filtration.
- Coolwave on/off controls.
- High-efficiency generation, distribution, and terminal units.

Lighting

Studies have shown that daylighting boosts productivity and employee morale. Consequently, the design team behind the Intelligent Workplace incorporated as much natural lighting as possible into the facilities overall scheme, which also includes split task and ambient lighting. Key features include:

- Building massing and orientation for access to daylight.
- Diffusing shades for glare control.

- Distributed sensors and controls for electric lighting interface.
- Ambient up-lighting with individually dimmable ballasts, high-efficiency reflectors, lamps, and ballasts.
- Daylight and occupancy sensors.
- High-efficiency, re-locatable task lights with daylight spectrum lamps.

Controls

Those working in the IW have control over all environmental and technical infrastructures within the facility, which also offers central intelligence for environmental and technological resource management and measurements.

Users can control air quantity, quality, temperature, and direction; radiant temperature; ambient light levels; and task light level and location, among other factors.

Central intelligence features assist facility managers in tracking such measures as thermal comfort, air quality, visual quality, power quality, and energy conservation using data mining and organizational feedback.

Connectivity

A modern, intelligent workplace needs to be connected, stay connected, and evolve with changing technologies. The Robert L. Preger Intelligent Workplace is no exception.

The office features special satellite closets for accessible, just-in-time connectivity; user-based reconfigurabilty of outlets for data, power, and voice; dynamically located service “pubs” and conference “hubs”; and strategic interfacing with other building systems. Key features include:

- Harnessed roll-out wiring for power, merged data, voice, and video.
- Ten outlets per workstation that pop up for access and are re-locatable without unplugging.
- A fixed infrastructure that layers network cabling within an open truss structure in cable trays with a second layer for tethers above the truss within floor supports.
- Leaves 70 percent of floor surface unobstructed for port location.

SOURCE: *Building,* July 2002

Read more about the Intelligent Workplace in *Buildings* at
http://www.buildings.com/Articles/detail.asp?ArticleID=942