Advanced Windows Testbed

Berkeley Lab Building 71T

Very low or net zero energy buildings will require significant reductions in perimeter zone cooling and heating loads and judicious use of daylighting to offset HVAC and lighting energy use. Measuring the performance of advanced façade solutions in occupied buildings presents enormous challenges since energy use reductions cannot be measured directly.

The **advanced windows testbed** enables investigations of system-level interactions between innovative façade systems and impacted lighting and HVAC systems using outdoor tests in three full-scale, side-by-side instrumented test chambers.

Each chamber is thermally isolated so that window heat flow measurements can be made on a comparative basis. The chambers are designed to emulate typical private offices so that daylighting, comfort, and human factors studies can be conducted as well.

Exterior and interior window attachments can be rotated every three to five days using hoist systems, enabling a maximum of eight different test conditions to be evaluated over a solstice-to-solstice period.

Scientists collaborate with industry to evaluate prototype systems, working out control system designs for dynamic, intelligent façade systems or characterizing the luminous environment resulting from innovative daylighting systems.

Performance data are used to assess market-readiness and quantify energy and non-energy benefits of new technologies prior to release in the commercial market.

CAPABILITIES

Three exterior test cells, 10x15x11 ft each

- Interchangeable south facing façade, 10x11 ft opening
- Interchangeable exterior or interior shading devices
- Thermally-isolated construction with adiabatic guard between test cells
- Dedicated air handler per test cell

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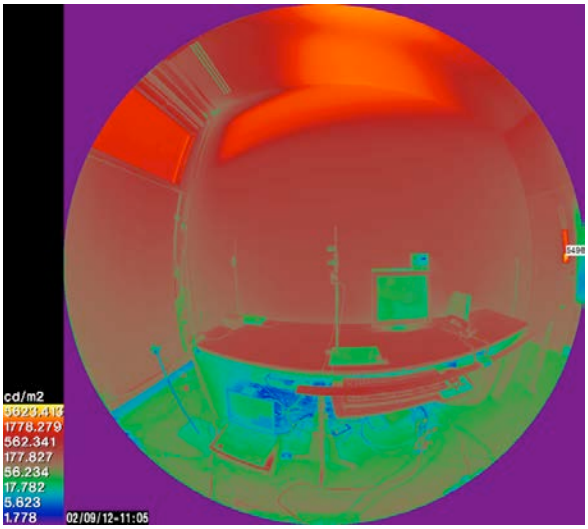

INSTRUMENTATION

- Power metering: HVAC, lighting, and equipment at device level
- Net window heat flow measurement: chilled water flow and inlet/ outlet temperature, electric resistance heating, indoor temperature control to 1°C, hourly accuracy to ±20-60 W
- Photometric capture throughout room with time-lapsed HDR imaging
- Weather: direct normal irradiance, global irradiance, wind speed and direction, temperature
- Outdoor video monitoring of exterior facade (diagnostics, particularly for dynamic facades)
- Robust LabView data acquisition system, remote data access, can integrate experiment specific instrumentation with existing instrumentation

IMMEDIATE OUTCOMES

- Comparative performance data on lighting and HVAC energy use of emerging technologies
- Detailed assessment of visual comfort and thermal comfort
- Sensor and controls testbed for automated dynamic façade technologies via building control virtual testbed (BCVTB) with real-time remote access to system performance data
- Occupant feedback on comfort, satisfaction and acceptance of emerging technologies
- Next generation product development, feedback on system performance enabling design optimization, reduce risk of innovation prior to product launch
- Validation of simulation tools over variable sun and sky conditions, extension of findings to diverse climates, envelope types, HVAC systems, and whole building performance.

PARTNERS

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CONTACT

Eleanor Lee, eslee@lbl.gov, 510-486-4997