

# Daylighting, Views, Health, and Wellness: The Role of Extruded Aluminum Building Components

*First in a Series of White Papers on Extruded Aluminum in the Built Environment*

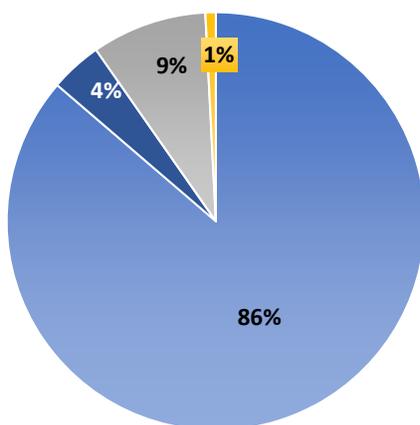
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A high performance green building must include many diverse attributes: site selection, water use, material selection, energy efficiency, and indoor environmental quality (IEQ). The design team must find the right balance between all of these aspects, being careful to not sacrifice one area for another. Consider: productivity costs are over **100 times larger** than energy costs in a typical workplace, so a design decision that harms the IEQ, functionality, or occupant health by even a small fraction of a percent will offset any small energy savings by much larger negative impacts and increased costs in the full use of the building.

Fortunately, improving daylighting and views using high performance aluminum extrusion-based windows, louvers, and light shelves is an example of how energy efficiency, occupant health, and well-being can all be achieved together.

## Total Use of Building Costs

- Productive Salaries & Benefits
- Unproductive Salaries & Benefits (absenteeism, presenteeism)
- Rent
- Energy



*"The Economics of Biophilia: Why Designing with Nature in Mind Makes Financial Sense": Terrapin Bright Green LLC, 2012.*

## Daylighting

Even with high efficiency LED lighting, lighting still accounts for a major portion of building energy loads. Daylight harvesting offers a key efficiency measure for reducing this energy load. In fact, LED lighting has made daylight responsive controls more effective, controllable, reliable, and cost effective.



*Edith Green Wendell Wyatt Federal Building in Portland, OR USA*

*Image: Nic Lehoux Architectural Photography*

As a result, building codes such as the International Energy Conservation Code, ASHRAE 90.1, and California Title 24 continue to push requirements for daylighting and daylight responsive controls into more space types and deeper into spaces while still demonstrating optimum cost effectiveness and energy savings. Ideal applications include top-lighting in big box retail, warehouses, and manufacturing spaces and side-lighting in classrooms, offices, patient rooms, conference rooms, breakrooms, library reading areas, and more.

From a pure energy standpoint, a building with an increased amount of window area can outperform the same building with less glazing if it incorporates daylighting—aluminum framing with the newest advanced thermal barriers and high performance low-e glazing. Extruded aluminum light shelves can facilitate “throwing” light into areas deeper in the building, while extruded louvers (often dynamically controlled) can help balance daylighting with reduced glare and sun loading. However, energy efficiency is only one aspect of a green building...

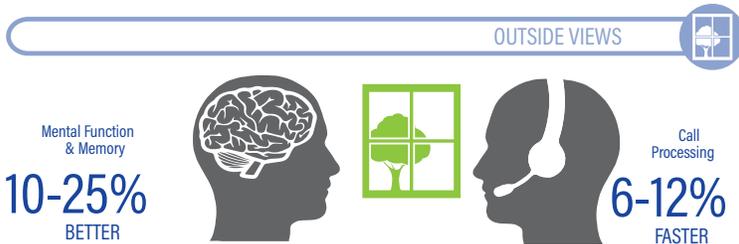
## Wellness

“Imagine sitting at your desk all day in an office with no windows. Or your child trying to learn in a classroom with no natural daylight. Or your mother recovering from an illness in a hospital bed with no view...”

Clearly, there are benefits to having access to quality daylight and views beyond just the energy savings from lighting controls. And the data is there to prove it.

There is a large body of work demonstrating the importance of providing quality views to the health and well-being of building occupants.

**In office settings, spaces with improved views and/or daylight see benefits such as:**



- Increased *real estate value, rental rates*
- 20% increase in employee *cognitive performance*
- 39 additional work hours per year in employee *productivity*
- 15% *decreased absenteeism* in office workers
- *Decreased employee turnover*
- *Improved sleep habits*

**In school settings, improved daylighting and views offer:**

- 21% increase in *student test scores*
- 20-26% increase in student *learning rates* in Math and English
- Improved *student behavior*.
- Increased *teacher retention*.
- Increased *attendance* (both student and teacher)

## DAYLIGHT



## OUTSIDE VIEWS



**In healthcare settings, views and daylighting offer significantly improved health outcomes and reduced healthcare costs:**

- Reduced *post-op recovery time* by ½ day
- Reduced length of mental health *hospital stay* by 2.6 days
- 22% reduced development of surgical *post-op delirium*
- 22% less *pain medication* in post-spinal surgery patients
- *Reduced depression, improved sleep*
- *Improved hospital staff performance, reduced medical errors*
- *Decreased hospital staff sick days*

## SYSTEMS



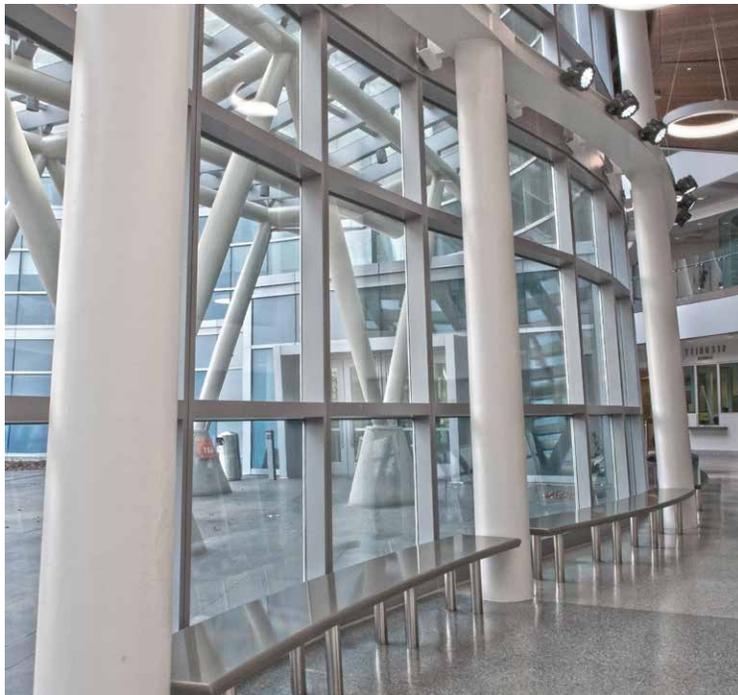
Data suggest that we now spend close to 90% of our time indoors, so it should not be surprising that human connection to the outdoors through daylighting and views is so important. In addition to the human aspect, the financial ramifications from proper design of views are significant whether it relates to lost time, productivity, healthcare costs, or real estate values.

For these reasons, modern green building standards including the LEED rating system, International Green Construction Code, WELL Building Standard, and the PBS-P100 (Facility Standards for the Public Buildings Service) specifically have requirements for quality views beyond just daylighting energy savings.

### ***The Role of High Performance Windows and Framing***

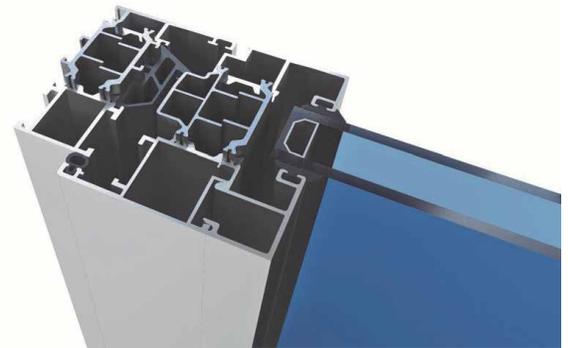
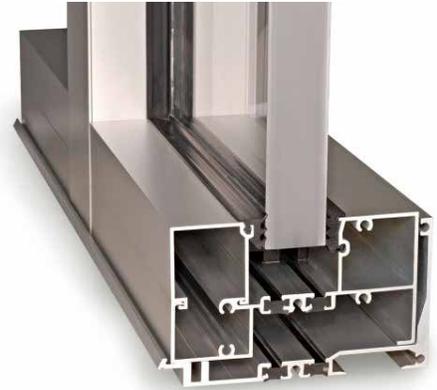
Aluminum framing offers proven advantages in designing for daylighting and views while also offering lasting performance, energy efficiency, and sustainable material selection.

- Superior structural performance allows narrow sightlines and long spans to maximize daylight opening and views.
- Superior durability to ensure long lasting performance.
- Fully recyclable with very favorable life cycle analysis that offers material selection credits under LEED and other green programs.
- New advanced thermal barrier technologies such as dual cavity pour-and-debridge and wide thermal strut systems.



*The LEED® Platinum Certified Salt Lake City Public Safety Building's lobby and main floors feature 32,000 square feet of Wausau Window and Wall Systems INvision™ Thermal Unitized Curtainwall. The system incorporates polyamide thermal barriers that enhance system thermal performance, condensation resistance and energy efficiency.*

*Image: Wausau Window and Wall Systems and Wayne Gillman Photography*



*Dual-cavity pour and debridge (top) and wide thermal strut (bottom) thermally broken frames. Photos courtesy of Azon and Technoform*

### ***Conclusion***

Aluminum extrusion-based building elements – window framing, light shelves, louvers – play an important role in facilitating external views and increased use of daylight, while still enhancing energy efficiency. Aluminum's light weight, reflectivity, finish options and formability permits an almost unlimited range of geometries and aesthetics making extrusions a valued contributor to healthy buildings.

## For Additional Information: A Partial List of References

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