

Daylighting Facts and Figures

Education/Student Performance

A study conducted by the Heschong Mahone Group for Pacific Gas & Electric Company tested 21,000 students in three states and found that those in classrooms with the most daylighting progressed 20% faster on math tests and 26% faster on reading tests in one year than those with the least daylighting.

Heschong Mahone Group "Daylighting in Schools" Report at www.h-m-g.com, 1999

In October 2003, a study was conducted to validate and replicate the results of the 1999 Heschong Mahone Group Study. It found that of the many variables studied (including classroom type, HVAC type, operable windows, etc.), only daylighting showed a strong and consistent correlation to improved learning.

"Integrated Energy Systems: Productivity and Building Science" Report prepared for the California Energy Commission Public Interest Energy Research Program by the New Building Institute, Inc., October 2003

A study by photobiologist Dr. John Nash Ott, Ph.D. reported that "hyperactive children with confirmed learning disabilities calmed down completely and rapidly overcame their learning and reading problems while in the full spectrum lighting environment. (Full spectrum lighting most closely mimics and produces the effects of natural daylight.)

School planning and Management, February 2002

A study of 90 school children in Sweden shows that lack of daylight can disrupt their chronobiology (internal body clocks) and result in significant psychological and physiological impairment. The study followed the health and behavior of children in classrooms with and without windows for an entire academic year, measuring the children's production of cortisol (a stress hormone governed by the body's biological clock). It concluded that work in classrooms without daylight may upset the basic hormone pattern and may in turn influence children's ability to concentrate and cooperate and also eventually impact annual body growth and sick leave.

National Renewable Energy Laboratory Report, "Daylighting in Schools: Improving Student Performance and Health at a Price Schools Can Afford," 2000

An energy-efficient school district with approximately 4,000 students can save as much as \$100,000 per year in energy costs. Over a 10-year period, the savings can reach \$1 million. Spending less on operating costs enables school districts to redirect dollars to more critical educational needs, such as hiring additional teachers, purchasing new computers and instructional materials or paying for necessary capital improvements.

US Department of Energy's Office of Building Technology, State and Community Programs Report, "Energy-Smart Building Choices: How School Administrators & Board Members Are Improving Learning and Saving Money," 2002

Retail Sales

According to Minnesota-based consultancy Design Services Group, a typical retailer now spends about \$300,000 on lighting – about 10% of total store construction costs, up from 8% a few years ago. Armed with data that shows the right lighting can increase sales, retailers such as Albertson's, Kroger, Safeway, Wal-Mart and Whole Foods Market are using illumination tricks to make merchandise more attractive. Whole Foods uses natural light in most of its 171 stores. Wal-Mart builds all of its supercenters to exploit natural lighting. While energy savings are an important draw, the company reports that the improved lighting increases sales.

Business 2.0, September 2005

A 1999 Pacific Gas & Electric Company (PG&E) daylighting study analyzed a retail chain of 108 stores where two-thirds of the stores were lit with skylights and one-third was not. All other things being equal, the study found that the daylighted stores had 40% higher sales than those without.

Heschong Mahone Group HMG "Skylighting and Retail Sales" Report at www.h-m-g.com, 1999

In relation to the original PG&E study, the link between high consumer activity and skylighting occurs despite the fact that many of the customers interviewed state that they were unaware of the presence of skylights. Rather, the customers responded that they frequent the skylit stores because of non-specific positive environmental feelings, such as the stores feel cleaner, more spacious, more open or brighter.

Houston Business Journal, September 22, 2000

The vice president of store development and real estate for Lund Food Holdings Inc., operator of the Lunds and Byerly's grocery and specialty foods chains in Minnesota, reports "light is power in our stores when it comes to featuring unique items and creating impulse sales." New and remodeled stores for the chain are utilizing more daylighting because it helps to create a warm and comfortable feeling inside the store. "Whether in a supermarket or apparel boutique, a well-placed lighting design incorporating daylight gets shoppers to slow down and relax. Then they reward you by staying longer and buying more.

Display & Design Ideas, May 2002

Researchers with North Carolina State University's Department of Textiles report that inconsistencies in store lighting affect how colors in items such as clothing appear to shoppers, causing colors to look different in the store than when the customer gets home. This leads to unhappy customers and, consequently, a negative impact on sales. The best way to inspect the true color of an item is to view it under natural light.

Raleigh News & Observer, December 24, 2001

Employee Recruitment and Retention

The Container Store, a national storage and organization products retailer, was placed for the third consecutive year on Fortune Magazine's list of the "100 Best Companies to Work For" (ranked as number two in 2002). The retailer's physical work environment, which includes daylighting, has been noted as a contributing factor. "Our store design serves to take away the stress typically associated with the workplace. Happy employees equal better customer service," reported Container Store executives.

Display & Design Ideas, August 2002

WRQ, a software development company in Seattle is well aware of the competition it faces when attracting and retaining its high-tech employees. Part of WRQ's strategic human resources plan includes offering recruits a facility with amenities such as ample daylight, good air quality and temperature controls.

betterbricks.com, 2001



Winners of the Business Week/Architectural Record Awards, which recognize projects in which architecture is used to find solutions for businesses, had a common feature – inventive use of daylight. This included offices for The Gap, Inc., in San Bruno, CA, in which daylighting is used to reinforce the corporation’s support of healthy living and a commitment to offering its employees a visually comfortable work environment, which has a positive impact on productivity. The entire complex is designed so that any office area is at most 22 feet from a source of natural light. During the designing of the building, the company did an extensive cost-benefit analysis to measure the amount of savings the daylighting and other “green” features would provide. They were interested in a payback of under 10 years and came out far lower than that.

Environmental Design & Construction, January 2001

According to Business Week, “Today’s small companies seek an environment that communicates an image of success and creativity, that wows potential clients, reassures investors, attracts hard-to-find recruits and helps employees forget how hard they’re working.” One of the “design tips that won’t bust your budget” is allowing more natural light into cubicle work areas.

Business Week, November 6, 2000

When conducting a site search for its new call center in Massachusetts, high-tech outsourcer Cerida Corp. specifically looked for buildings with plenty of natural light and interesting design, believing that these features help enable the company to attract and keep bright and creative agents who generate leads and sell and service the business customers better.

Call Center, June 2001

Worker Productivity

Employers can boost productivity by 7.1% annually by improving indoor air quality, increasing daylight and controlling office temperatures, according to a 2003 student study of green building by the Massachusetts Technology Collaborative, the state’s development agency for renewable energy.

Salt Lake Tribune, Feb. 19, 2006

A 2003 study of office worker productivity conducted by the California Energy Commission found exposure to daylight was consistently linked with higher levels of concentration and better short-term memory.

Wall Street Journal, Oct. 19, 2004

Daylight illumination levels were significant and positive in predicting better performance on a test of mental function and attention. The Backwards Numbers test is widely accepted in psychological research as a valid test of mental function and attention spans. An increase in daylight illumination levels from one to 20 foot candles resulted in a 13% improvement in the ability to instantly recall strings of numbers.

“Integrated Energy Systems: Productivity and Building Science” Report prepared for the California Energy Commission Public Interest Energy Research Program by the New Building Institute, Inc., October 2003

According to the Peter Kiewit Institute of Information Science, Technology and Engineering at the University of Nebraska, poor lighting in the workplace can lead to excessive sick days, worker discontent, high staff turnover rates and poor quality work. Natural light, however, makes workers feel and work better, prevents eye strain, helps people retain what they have learned and boosts productivity.

Chicago Tribune, June 5, 2002

The U.S. Green Building Council's Sustainable Building Technical Manual reports that worker productivity can be increased by up to 15% by implementing smart daylighting. Because salaries of building occupants far exceed the construction or operating costs of a building, any sustainable design features that positively impact productivity, however modestly, will pay back the investment over time.

Environmental Design & Construction, January 2001 and July 2002

According to the Rocky Mountain Institute, productivity gains of 6% to 16% including decreased absenteeism and improved quality of work have been reported from energy-efficient building design. Since companies spend an average of 70 times as much money (per square foot per year) on employee salaries as on energy, an increase of just 1% in productivity can result in savings that exceed the company's entire energy bill.

Journal of Property Management, January 200

Energy Savings

The U.S. Department of Energy's (DOE) Federal Energy Management Program reports that daylighting can significantly cut lighting energy use for lighting building interiors, sometimes by up to 75% or 80%. The DOE's Renewable Energy Laboratory's Thermal Test Facility in Golden, CO., was designed to provide natural lighting, allowing it to use 75% less energy for lighting than a building without daylighting features. Except for the central service area, the facility is entirely daylit, which has also decreased the energy load imposed on the building's mechanical cooling system. The DOE reports that for many commercial buildings, the total energy costs can be reduced by as much as one-third through the optimal use of daylighting strategies.

Federal Energy Management Program Newsletter, March/April 2002

According to the Lighting Research Center at Rensselaer Polytechnic Institute in Troy, N.Y., a sample calculation shows that energy costs saved per year can be approximately 25 cents per square foot of daylit floor area. This assumes that there are 260 working days per year, electricity costs 10 cents per kilowatt hour, the daylighting system turns off the lights five hours per day, and the connected lighting load is two watts per square foot.

Energy User News, August 2000

The Federal Energy Management Program reports that 25% to 50% energy savings can be achieved with advanced lighting equipment and that number can be cut in half again when daylighting is added to the project.

Consulting Specifying Engineer, December 2004

The Florida Energy Conservation Assistance Program reported that 29 Florida businesses that installed daylighting systems reduced daytime electric lighting consumption by an average of 93% while still achieving an average of 160 foot candles of light with a color rendering index of 98 in work areas.

Environmental Design & Construction, January 2001

The Utah State Department of Natural Resources office building in Salt Lake City utilizes daylighting as an integral part of an energy-efficient design that reduces lighting load by 50% and saves \$50,000 a year over a reference case building.

Environmental Design & Construction, January 2001

The savings in energy from daylighting are so demonstrably significant that the revised California building code, Title 24, requires every large-space big-box retailer, warehouse or low-rise facility with an area greater than 25,000 square feet directly under a roof with ceiling heights greater than 15 feet and a lighting power density greater than 0.5 watts per square foot to light at least 50% of the area with daylight.

Journal of Property Management, July 2004



Natural lighting for outdoor gear and clothing retailer REI helped the store realize a 26% reduction in energy usage.

Print, August 2005

Occupant Health and Safety

The use of daylight for illumination in non-residential buildings greatly reduces the risk of business disruption during power outages and greatly increases public health and safety during an emergency which may involve disruptions of the electricity supply. The incorporation of a large stock of buildings throughout the state with adequate daylighting increases the options for voluntary power reductions during peak emergencies.

"Integrated Energy Systems: Productivity and Building Science" Report prepared for the California Energy Commission Public Interest Energy Research Program by the New Building Institute, Inc., October 2003

A study by the U.S. Department of Energy found that employees who sit near windows have 20% fewer symptoms common to workers in "sick buildings." The conclusion: Give people light and spend less on health care.

Smart Business from ZDWire, August 14, 2000

Patients exposed to natural light and views of the outdoors are thought to recover faster, experience less anxiety and require less pain medication. Mortality rates are also believed to be lower in intensive care units with higher levels of natural light. The Joint Commission for the Accreditation of Healthcare Organizations is contemplating issuing new guidelines for hospital accreditation that would provide standards for exposure to natural light and window views.

Houston Business Journal, September 22, 2000

When Prince Street Technologies, a subsidiary of Interface Carpets, built a new 160,000-square-foot factory in Catersville, GA., it used extensive natural daylighting (including 32 skylights), which created an "enormous difference in attitude," according to corporate management. Additionally, the better lighting conditions were linked with improved worker safety. In the first three years after moving into the new facility, workers compensation cases dropped from 20 per year to under one per year, for savings worth an estimated \$100,000 to \$200,000 a year – more than the value of the energy savings.

The non-profit Center for Energy & Climate Solutions' Cool Companies website, www.cool-companies.org, 2002

The Centre for the Analysis and Dissemination of Demonstrated Energy Technologies in the Netherlands reports that a hospital in Canada found that cardiac patients who were in wards receiving direct sunlight were in the hospital for shorter periods, by as much as 11%.

CADDET Energy Efficiency Newsletter, 2000

According to an early 1990s survey, almost 20% of the general public said they experienced symptoms of SAD. Studies have shown that the level of light found in daylit buildings can be effective in fighting the disorder.

Charleston Gazette, March 12, 2000

Product Value, Marketability and Tenant Satisfaction

California's Sustainable Building Task Force reports that buildings that spend an additional 2% for green measures reap a 20% return over the lifetime of the building.

Charleston Gazette, Mar. 3, 2006



In 2002, the Building Owners and Managers Association (BOMA) International, along with a group of sponsors including the New Building Institute, conducted a survey on workplace performance and tenant satisfaction. Building owners/managers reported that tenant demand for “green” concepts, including better lighting and energy efficiency, were a growing trend. Tenants surveyed revealed that quality of lighting and access to natural light have a high impact on how satisfied they were with their space. Over 50% of tenants reported that they were not satisfied with the energy efficiency of their space. The survey concluded that while environmental factors, including access to natural light, had the highest impact on tenant satisfaction, these factors were also the ones that fell into the “need to improve” category. Property owners and managers who help address their tenants concerns over lighting and other environmental factors are able to be more competitive today and more profitable in the long term.

Betterbricks.com, 2002

Energy-efficient building design can significantly increase the value of a property. Because these buildings cost less to operate and maintain, energy savings can go directly to the bottom line – the income of the property. Capitalizing this increased income can add \$5 to \$6 per square foot to the value of the building.

Environmental Design & Construction, May/June 2001

Green projects typically sell or lease faster and retain tenants better because they combine superior amenity and comfort with lower operating costs and more competitive terms. The resulting gain in occupancies, rents and residuals all enhance financial returns.

Journal of Property Management, January 2000

According to the Housing and Building Technology Division of the National Conference of States on Building Codes and Standards (NCSBCS), daylighting is one of the technologies that has the greatest impact on occupant comfort, health and productivity. Because people are willing to spend more for a comfortable building, owners can charge a premium.

Journal of Property Management, January 2000

According to the Rocky Mountain Institute, a great example of energy-efficient design is the Conde Nast Building in New York’s Times Square. By improving ventilation rates and daylighting, the building uses half the normal amount of energy yet came in at market median costs, making it a win-win for the developer, which was able to recruit premium tenants quickly at premium rents.

Buildings, February 2002

Residential Building Market

According to a NAHB member survey on green building in 2006, 87% believed green building was important for lowering lifecycle costs, such as energy efficiency, and productivity increases; 82% believe green building was important for staying ahead of their competition. The leading factors triggering firms to expand green building activities were: increases in energy costs and utility rebates (88%), consumer demand (88%) and competitive advantage (83%).

Nation’s Building News Online, March 20, 2006

Homes built today using green building technologies that lower energy bills have higher resale values.

National Association of Home Builders Green Building Media Fact Sheet



An international study entitled “Green Value” reveals a direct link between the market value of real estate and its environmental friendliness. The study, led by the Royal Institution of Chartered Surveyors and IO government and private sector organizations, finds that green buildings can earn higher rents and prices, attract tenants and buyers more quickly and cost less to operate.

Builder Magazine, March 2006

The NAHB Green Home Building Guidelines specifically recommend that tubular skylights be installed in rooms without windows.

National Association of Home Builders Green Building Media Fact Sheet

Within 10 years of the launch of Energy Star®, U.S. consumers had purchased more than a billion products qualified under the program. More than one-half of the largest U.S. homebuilders currently participate in Energy Star in some way, such as specifying products with the Energy Star rating. Nearly two-thirds of U.S. consumers recognize the Energy Star logo.

Builder Magazine, March 2006

According to the U.S. Green Building Council, energy savings are another selling point for skylights. Integrating daylight into home designs can slash interior lighting costs by up to 80% and reduce the need for mechanical cooling during peak rate hours.

Builder News, September 2005

In an effort to attract more female homebuyers, homebuilders are increasingly turning to features like skylights in the bathroom to increase natural light levels. Fortune 500 homebuilders KB home, for instance, has partnered with style-icon Martha Stewart to design 900 homes in the Atlanta area, all of which are designed with increased natural light in the bathroom, and plans to eventually take the program nationwide.

MSN Real Estate, April 5, 2006