

Lighting, Productivity, and Worker Satisfaction

For many years there was an assumption that improved lighting quality benefited users of the space and in turn, provided a valuable return on investment. Recently, professional research and case studies have provided credible evidence to substantiate this. Following are excerpts from some of the information available on this topic.

Daylighting and Productivity

[www.lrc.rip.edu / Lighting Research Center]

Lighting is all around us, and practically everyone uses it in one form or another. Lighting has become such a normal part of our lives few people think about it. The lighting industry has become adept at manufacturing economical lamps and fixtures that many of their products, like lighting itself, have become simply a commodity. But good lighting is far more than that. Properly designing and applied lighting is comfortable, energy-efficient, can enhance health and productivity, can elevate moods, improves safety and security, and even increase property values.

Loss Control Solutions

[www.ergodmx.com / Ergo Dynamix]

Another strategy for improving workplace lighting that also reduces operating costs is to increase use of natural light by installing skylights and making other modifications to facilities. This greatly reduces the amount of light required from electric lighting sources. Another advantage of using daylight is that it illuminates walls and ceilings to create a more natural-appearing work space. The Lockheed plant in Seattle, WA saved \$500,000 per year in energy costs during a lighting upgrade in an engineering and development facility. The upgrade, however, also resulted in a 15% increase in productivity and a 15% decrease in absenteeism, as reported in Solar Today. The latter economic benefit is attributable, in part, to an increase in the quality of lighting.

Integrated Lighting

[www.betterbrick.com / Better Bricks]

Good lighting requires more than an electrical layout. It must balance the specific needs and schedules of the occupants with a building's use of daylight and interaction with the building's mechanical systems. This is designated as "advanced" because it goes beyond business-as-usual lighting design. Quality electric lighting varies by task and source, and creates an attractive and effective environment while using the minimum amount of energy necessary.

Factory Boosts Productivity

[www.nlb.org / National Lighting Bureau]

Superior Die Set Corporation, Oak Creek, Wisconsin, calculated its savings at about \$45,000 annually as a result of improved productivity and reduced downtime resulting from a \$3,000 lighting system upgrade that also cut lighting operating and maintenance costs by 45%. The company also experiences improvements in security and a lower absenteeism rate.

Similarly, American Hardware Supply, Butler Pennsylvania, cut its lighting operating and maintenance costs by 25% by implementing changes to its lighting system that reduced accident costs by \$1,000 per year and improved productivity by \$35,000 a year. After new lighting was installed, the company recorded fewer accidents and found that its employees worked faster while making fewer mistakes. The company also credited the new lighting with improving its image with visiting customers, which in turn led to an increase in sales of about \$50,000.

Employee morale improved because employees were able to perform their work faster and better, liked the improved appearance of the space, and appreciated management's investment in their comfort and safety.

Overall, lighting benefits carried a value of just under \$88,000 per year; O&M cost savings added another \$14,746 to the total, bring it to \$102,546 annually. Given the company's investment of \$176,806, simple payback was achieved in 1.7 years; simple return investment (SROI) came to 58% per year.

Daylighting Benefits

[www.h-m-g.com / Heschong Mahone Group]

- Improve employee morale
- Reduce absenteeism
- Reduce errors
- Improve product quality
- Increase productivity

According to John McHugh, PE, LC, and Technical Director with the energy consulting and research firm, Heschong Mahone Group, Inc., America could reduce its peak load electrical demand by 24,000 megawatts just by daylighting existing buildings that make sense to daylight using top lighting or skylights. The savings is equal to twenty four 1,000 megawatt nuclear power plants or forty eight 500 megawatt coal fired power plants, all at 1/20th the cost of solar photovoltaic panel arrays.

By cutting demand for energy production, daylighting reduces greenhouse gasses and the pollution of water and air - the by-products of generating electricity. A study initiated by the Pacific Gas and Electric Company showed that students with the most daylighting in their classrooms progressed 20% faster on math tests and 26% faster on reading tests in one year than those with the least.

In the retail setting, daylighting dramatically increased sales - one study showed a 40% increase in sales in daylighted stores when compared to identical non daylighted stores. In study after study, daylighting is correlated to dramatic improvements in human performance in retail, workplace and educational facilities.

The Heschong Mahone Group provides professional consulting services in the field of building energy efficiency. They specialize in applying their knowledge of building design, construction technology policy development and program design to the problem of making buildings more efficient. To quote them, "It works. Research has discovered that people thrive in naturally lit environments. Studies have shown that daylighting has a direct impact on well-being, productivity and overall sense of satisfaction - shoppers linger longer, and buy more; students do better on tests; workers are more productive and absent less often."

In 2003, the Heschong Mahone Group completed a second suite of major human performance studies on behalf of the California Energy Commission's Public Interest Energy Research (PIER) program. These include: a study of how skylighting effects the sales at a second chain retailer; how physical comfort conditions in classrooms are associated with student learning at Fresno Unified School District; and how windows and how physical comfort conditions are related to office worker performance at Sacramento Municipal Utility District offices. These new productive studies consider the impact of daylight on human performance, along with other aspects of the indoor environment.

Daylighting

[www.financeexplore.com / Finance Explore, Exploring Financial Matters]

Reduce cooling costs, lighting and operating costs (be accomplished without significant increase in climates all year around), construction costs in new construction.

Because seeing is believing, project centers known as "living labs" have been created to examine the actual effectiveness of daylighting. These include the State of Wisconsin Administration Building in Milwaukee and the Hoffman Corp headquarters in Appleton, Wisconsin. "We use the term 'cool-daylighting' to emphasize that daylighting isn't just big windows," says Abby Vogen, project director at Energy Center of Wisconsin. "It is the orientation of the building, glazing, energy-efficient lighting fixtures, mechanical systems, and how all these components are impacted by natural lighting."

Results of the experiment conducted in the Energy Center of Wisconsin at the Energy Resource Station in Iowa to see if cooling energy could be saved using daylighting design were considerable. Comparison of two rooms (one standard and the other high-performance) yielded 32% savings on annual lighting costs and total overall annual energy savings of 22%.



Industrial Lighting Demonstration Center