

**Improving Productivity  
with Light Controls**

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Technical white paper  
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## Improving Productivity with Light Controls

*Executive summary: A literature review shows that total light control affects worker productivity, although the exact impact is hard to establish in a commercial environment. It's reasonable to postulate that productivity improves at least 5% when workers can control their own visual environment, although productivity gains as small as 1% still make lighting control systems an excellent investment, with a payback period of seven months or less.*

### Defining Productivity

In a factory or other industrial setting, “productivity” is commonly calculated as a measurement of output per worker; in retail, the measurement is generally related to sales per worker. But productivity is much harder to define in non-industrial spaces such as corporate headquarters.

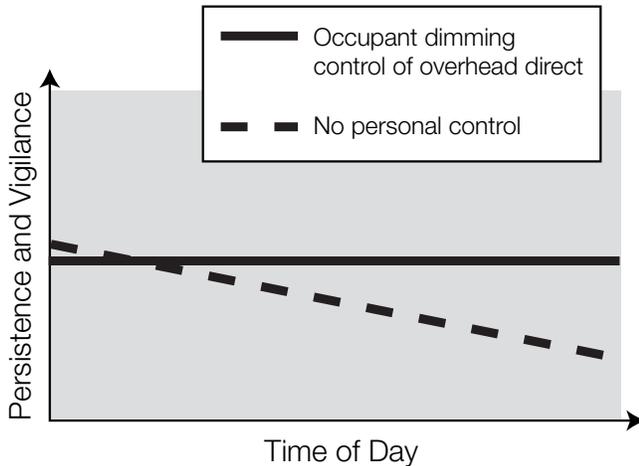
In this environment, productivity encompasses a much wider range of variables. Some things are measurable—for example, how quickly and accurately tasks are completed. But productivity is affected by numerous things that are not so easily quantified—for example, employee motivation, vigilance, persistence, distractibility, corporate culture, sense of well-being and other imponderables.

Into this complex calculation, we insert the proposition that **lighting controls improve worker productivity**. This includes control over any aspect of the visual environment, including dimming controls for electric lights as well as shade controls for daylight.

There is ample support for both elements of this proposition.

## Researching the Lighting/Productivity Link

In research directly tied to lighting control, the Light Right Consortium conducted a field study on the effects of office dimming, concluding that “the presence of personal control had a measurable impact on the motivation of office workers to perform on tasks.”<sup>1</sup>



“Normally, the persistence and vigilance of office workers will decline over the course of a workday. However, the presence of personal control of their lighting increased subject motivation allowing workers to sustain their performance—they persisted longer on difficult tasks and were more accurate on a task requiring sustained attention.”

In another study, “Lighting Quality and Office Work: A Field Simulation Study,” Peter Boyce reports that “people with dimming control reported higher ratings of lighting quality, overall environmental satisfaction, and *self-rated productivity*.” (Emphasis added.)<sup>2</sup>

Boyce goes on to add that “people with dimming control showed more *sustained motivation* and *improved performance* on a measure of attention.” (Emphasis added.) Improved productivity extends to workers’ control over the daylight in their visual environment.

Consider this research sponsored by the California Energy Commission,<sup>3</sup> where “researchers found a significant correlation between access to outdoor views and worker performance. In the desktop study, workers *performed 10-25% better on tests* when they had the best possible view.” (Emphasis added.)

And, in research reported in *Environmental News*,<sup>4</sup> absenteeism in a new Lockheed-Martin Corporation facility was found to drop 15% directly as a result of *controlling the visual environment through daylighting*.

These studies show that the quality of light affects the visual environment of a commercial enterprise; that people are more comfortable if they can control their visual environment; and there is a direct relationship between comfort and productivity.

Researchers have yet to put an exact number on the productivity gains; the Light Right Consortium came closest when they found that workers are 6% more comfortable when they have individual control over their lighting environment. However, it is possible to make some guesses about how much productivity improves as a result of enhanced lighting control.

### Picture This

Imagine this scenario: Your work area is near a window. On bright days, the combination of daylight and office light is overwhelming, making it difficult to perform even the most fundamental tasks like working on a computer.

Without the ability to adjust the lights, workers are more likely to leave over-bright spaces in favor of someplace more comfortable. Where will they go? Often to visit another co-worker—to complain about the light and the glare. Now you've got two people not working.

Typical distractions of this nature usually last around 20 minutes—that's 2.5% of the work day for each worker involved. If it happens just one more time, you're up to 5% of the work day lost because workers cannot control the lighting in their work space.

This hypothesis is all too reasonable. Basex, an information technology research firm, reports that interruptions consume 2.1 hours a day, or 28% of the workday, costing the American economy \$588 billion a year.<sup>5</sup> If we could claw back even a portion of this time, we will put billions of dollars of value back into productive work.

Returning to our scenario, we can now see how utterly reasonable it is to think that **productivity would improve at least 5% if people could control the visual environment in their own work space.**

When the sun gets bright, they can close the shades and dim the office lights. When they need to work on a computer, they could dim the overhead lights. When the sun goes down or behind clouds, they could raise the lights—or, even better, have a light control system do it for them. Total elapsed time: 1 second, versus 20 minutes.

Of course, not all employees work near windows. And not all employees will leave when the lights get too bright. Many will just soldier on, and deal with the eyestrain and headaches. What do you think *that* does to productivity?

But for the sake of the workers who persevere despite lack of control over poor lighting conditions, let's make an extremely conservative assertion that productivity improves just 1% when people can control their own lighting. Even with that pared-down expectation, it *still* makes economic sense to give workers control over their visual environment.

## Doing the Math

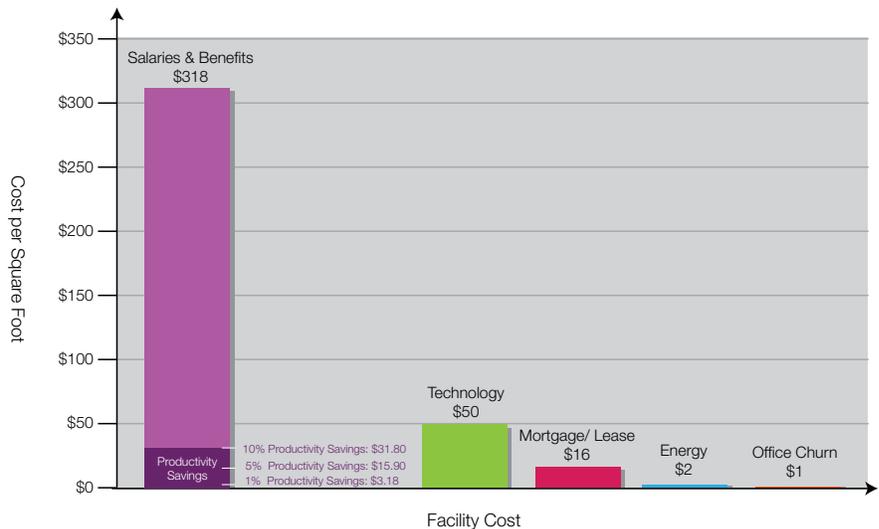
Let's say a typical employee costs \$107,000 per year in salary, benefits and overhead,<sup>6</sup> and occupies 100 square feet of office space.

Furthermore, let's say that it costs up to \$600 to put dimmable fluorescent ballasts in the overhead lights and automatic shades on the windows near that 100 square-foot space, and to control the whole system through a centralized total light control system.

Now, let's postulate that better light conditions improve productivity by a modest 1 percent. That means that the employer gets \$1,000 more work out of each worker per year—a net profit of \$400 the first year, and \$1,000 in every subsequent year.

Another way to look at productivity, is to use the following chart which has been reproduced from data provided by the Rocky Mountain Institute:

Typical Office Building Costs (Potential Productivity Savings) in cost / square foot / year



The graph above is a revised version of a well-known graph from the Rocky Mountain Institute showing the overwhelming scale of staff costs vs. facility costs in a typical office. The updated data was provided by Carnegie Mellon University's Center for Building Performance and Diagnostics.

Clearly, the bulk cost to run a commercial business is the people; let's focus on providing a comfortable visual environment which can result in productivity gains.

**This puts the payback on a lighting control system at an astonishing *seven months*.**

## **In Conclusion**

- Worker productivity and comfort increase with good lighting and the ability to control the visual environment
- Productivity can be increased at least 5% by giving building occupants control over their visual environment
- Increases in productivity can easily pay for a total light control system in seven months or less

## References

- 1 Light Right Consortium. Research Study on the Effects of Lighting on Office Workers. <http://www.lightright.org/research/index.htm>
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- 4 Environmental Building News, October 1, 2004. <http://www.scribd.com/doc/6423462/Productivity-and-Green-Buildings>
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- 6 US Department of Labor, Bureau of Labor Statistics. <http://www.bls.gov>

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