Study ties indoor air quality with firm performance: The greener the better – by Scott Frank and Anthony Montalto

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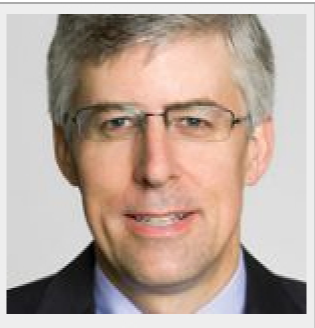
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A groundbreaking Harvard-led study proves what most design, construction and commercial real estate professionals have known all along: Healthier indoor air quality equates to better worker productivity and more satisfied employees.

Specifically, the study reveals that increasing ventilation rates from 20 cubic feet per minute (cfm) to 40 cfm per person and significantly lowering volatile organic compounds (VOC's) from typical levels can more than double an office worker's cognitive functions.

This is remarkable, as it bolsters considerably the argument for investing in green buildings. Moreover, based on the survey results, the greener the better.

The study was sponsored by the National Institute of Environmental Health Sciences (NIEHS), a section of the U.S. Department of Health and Human Services (HHS), and supported by a gift from United Technologies Corp. to the Center for Health and the Global Environment at the Harvard T.H. Chan School of Public Health. Dr. Joseph Allen led the research team.

The researchers sought to determine the difference in higher-order cognitive functions among workers in a traditional office setting as compared with those in a green building.

Twenty-four participants spent six days (9 a.m. to 5 p.m.) in an environmentally controlled office space. Participants were exposed on varying days to indoor environmental quality (IEQ) conditions characterized for the purposes of the study as: "Conventional," "green" and "green-plus."

Researchers subjected volunteers in the conventional building environment to higher concentrations of volatile organic compounds (VOCs) and lower outdoor air ventilation rates than those in the green building environment. The "green-plus" environment had even higher outdoor air ventilation rates than the green building environment.

The test results were startling. "On average, cognitive scores were 61% higher on the green building day and 101% higher on the two green-plus building days than on the conventional building day," the study reported.

Citing an extensive collection of supporting research, the study authors concluded that the higher cognitive scores in nine different criteria tested would translate into improved productivity and increased worker health and satisfaction. This includes a decrease in absenteeism due to illness.

"The largest effects were seen for crisis response, information usage, and strategy, all of which are indicators of higher-level cognitive function and decision-making," researchers reported. Scores were 97% higher for crisis response under green conditions compared with conventional, and 131% higher comparing green-plus with conventional. For information usage, scores in the green and green-plus conditions were, respectively, 172% and 299% higher than conventional. And for strategy, which tested participants' ability to plan, prioritize and sequence actions, the green and green-plus scores were 183% and 288% higher than conventional.

The striking differences between the conventional and green-plus settings could drive transformative change. "Cognitive function scores were significantly better in green-plus building conditions compared to the conventional building conditions for all functional domains. These findings have wide-ranging implications because this study was designed to reflect conditions that are commonly encountered every day in many indoor environments," the authors concluded.

For developers, owners and tenants of NYC office buildings, these differences are too dramatic to ignore. For green building advocates, it's a game changer as well. "The significant pivot in market demand towards the green workplace appears to be shifting beyond the initial aim for certification and energy savings," said Michael Algiere, managing director at JLL, Global Corporate Solutions. "We see clients being receptive, or even actively seeking to improve the measurable qualities of the indoor working environment, with air quality being a huge component."

Improved productivity and greater end-user satisfaction can specifically influence a company's success in at least three ways.

1. Costs. Higher productivity means that fewer people can do the same amount of work, saving on both space and work assets.

2. Recruiting and retention. A green environment is a differentiator for building owners and employers seeking to attract and keep the best employees. Turner Construction's "2014 Green Building Market Barometer" reported that 34% of executives from firms in green buildings found recruiting easier.

3. Employee health and well-being. The Lawrence Berkeley National Laboratory for the U.S. Department of Energy found that building retrofits that improved the indoor environment resulted in the reduction of communicable respiratory diseases by 9-20%, allergies and asthma by 18-25%, and non-specific health and discomfort effects by 20-50%.

While the Harvard study strongly supports the concept of investing in healthier indoor air quality, these adjustments don't come without a cost. In addition to the expense of installing the necessary technology to deliver the desired IAQ results, energy efficiency can suffer and temperature-regulation costs can rise—though innovative technologies are available that minimize the effects of these drawbacks.

Nonetheless, for developers and owners of new office buildings in New York City, implementing a design that cost-effectively ensures the highest reasonable ventilation rates, while reducing VOC's and CO2, is a goal worth pursuing. For existing buildings, the process can be more complex, but it is an equally sensible step to take.

You can access the research study here: http://ehp.niehs.nih.gov/15-10037/

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Bob Lund | Dec 6, 2016 Reply

I would like to offer up that there are central plant HVAC systems in which 100% outside air can be provided while reducing energy consumption by 70%. with a payback in less than half the life cycle of the equipment. If you are retrofitting a building's HVAC system, that payback becomes quite short.

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