

Building Commissioning Savings

Energy Savings

Energy savings depend on the scope of the commissioning. The following table shows reported savings for certain types of buildings. When commissioning is done properly, the savings can be substantial.

Savings From Commissioning

Building Type	\$ Savings	Energy Savings
110,000 ft ² office	\$.11/ft ² /yr (\$12,276/yr)	279,000 kWh/yr
22,000 ft ² office	\$.35/ft ² /yr (\$7,630/yr)	130,800 kWh/yr
60,000 ft ² high-tech manu.	\$.20/ft ² /yr (\$12,000/yr)	336,000 kWh/yr

Fewer System Deficiencies at Building Turnover

All too often, building owners accept buildings at turnover whose systems may "work" but do not work optimally or as intended. During the rush to complete essential building elements prior to occupancy, owners frequently are forced to temporarily overlook incomplete or deficient systems. Many owners have neither the time nor the resources to deal with the burden of remedying deficiencies perceived as "less important." Some system deficiencies are never even noticed during closeout, because inspections and punchlists focus primarily on items that are critical to obtaining regulatory occupancy permits and opening the building.

Once the building is turned over to the owner, the overlooked deficiencies must be addressed. Getting contractors to return to the job after substantial completion and occupancy can be difficult, with the result that, again, "less important" deficiencies are never fully addressed. Deficiencies that were not identified before occupancy may come to the attention of facility staff by tenant complaints or through routine operations. Often facility staff spend their own time correcting items that still fall under the responsibility of the contractor. Other deficiencies may be significant enough that the facility staff attempt the difficult process of asking the contractor to return and make the corrections. Still other deficiencies go permanently undetected, to the detriment of building control, energy use, equipment reliability and tenant comfort.

The primary goal of commissioning is to prevent or mitigate all of these problems. By identifying deficiencies early and by using a systematic process for making corrections, the commissioning agent assists the construction team in providing building systems, prior to occupancy, with significantly fewer defects.

Improved Indoor Air Quality, Comfort and Productivity

Surveys indicate that comfort problems are common in many U.S. commercial buildings. A recent Occupational Safety and Health Administration report noted that 20 to 30 percent of commercial buildings suffer from indoor air quality problems. Building occupants complain of symptoms ranging from headaches and fatigue to severe allergic reactions. In the most severe cases, occupants have developed Legionnaire's disease, a potentially fatal bacterial illness. The National Institute of Occupational Safety and Health surveyed 350 buildings with deficient indoor air quality and found that more than half of the complaints stemmed from HVAC systems that were not maintained properly.

Although little research has been completed to document the link between comfort and productivity, common sense tells us that comfortable employees are more productive than uncomfortable employees. The few studies that have been conducted on this topic agree. Below is an estimate of productivity losses in a typical office building where occupants complained of discomfort¹:

Comfort and Productivity	
Payroll costs	\$150/ft ² /year
Productivity lost to complaint time	\$.10/ft ² /year

This example assumes that this typical building has one occupant per 200 ft² of space and an annual

payroll cost of \$30,000/person or \$150/ft² of office space. If one out of every five employees spends only 30 minutes a month complaining about the lighting or the temperature or both, the employer loses \$.10/ft² in annual productivity. For a 100,000 ft² building, this amounts to \$10,000 per year. Because uncomfortable employees probably spend more than just half an hour each month complaining about building comfort, the actual losses likely would be higher.

If comfort problems are severe enough to make employees ill, business owners sustain additional productivity losses to cover sick time. Building operation costs also increase, as operators respond to more tenant complaints.

Commissioning also improves the productivity of processes, especially in industrial facilities. By ensuring that equipment performs optimally and efficiently, commissioning can help reduce equipment downtime and improve production rates.

These problems do not only concern building owners who occupy their buildings. They affect owners who rent building space as well. How long will tenants who are experiencing discomfort and low productivity remain tenants? Tenant turnover can be costly, according to the following estimated cost of losing a tenant in Class A office space.³

\$262,500

Rent loss due to vacancy

\$26,250

Improvements for new tenant

\$52,500-\$70,000

Leasing commission

\$13,125

Total cost of losing tenant

\$91,875-\$109,375

Cost of Losing a Tenant
Five-year lease value

Assuming an average office size of 3,500 ft², rented at \$15/ft² a year, a typical five-year lease has a value of \$262,500. If a tenant leaves, this space will remain vacant an average of six months, for a total rent loss of \$26,250. Improvements and build-outs to satisfy a new tenant usually run \$15 to \$20/ft², or \$52,500 to \$70,000 in this case. On top of all this, the building owner often pays a leasing commission of 5 percent of the five-year lease value, or \$13,125. Thus, the total cost of losing one tenant could run from \$91,875 to \$109,375, or 35 to 42 percent of the five-year lease value. If a building develops a reputation for being uncomfortable and unproductive, the vacancy period could last longer. Word of uncomfortable building conditions is likely to spread among business peers; market research shows that dissatisfied customers, in this case tenants, are likely to complain to 7 to 10 of their peers.

Building commissioning is one tool building owners can use to avoid the expenses and productivity losses associated with poor indoor air quality and employee discomfort. Because commissioning assures that HVAC and other building systems are installed and operating properly, proper commissioning can prevent these problems. In existing buildings, commissioning detects current and potential indoor air quality/comfort problems and helps identify solutions.

Liability Related to Indoor Air Quality

Sick building syndrome and the court cases associated with it continue to make headlines across the country. The government of Polk County, Florida recently won nearly \$26 million in damages for problems with its "sick" courthouse. Although this award was paid by the general contractor, many building owners also are feeling the sting of indoor air quality lawsuits brought by occupants who

complain of illnesses resulting from building air quality. And even when owners are on the receiving end of litigation settlements, they and their tenants still suffer the inconvenience of acquiring other work space for use during the repair process, not to mention the inconvenience of the litigation process itself, which can drag on for months and even years.

Building commissioning protects owners in more than one way. First, it provides documented verification of a building's performance and operation. Owners should request that the commissioning process include testing of outside-air flow rates, a primary factor affecting indoor air quality. If an existing building has deficiencies, the commissioning agent also records the repairs made. Commissioning should be repeated throughout the life of a building, and performance documentation should be updated regularly. This documentation provides owners with a record of building performance that can be used as evidence in the event of a lawsuit.

Commissioning also helps prevent many indoor air quality problems through its focus on training building operators in the proper maintenance of building systems. Properly run and maintained HVAC systems, with clean coils and air intakes and regularly changed filters, are less likely to contribute to indoor air quality problems. In addition, trained operators can spot potential air quality and ventilation problems before they develop.

Reduced Operation and Maintenance and Equipment Replacement Costs

Operation and maintenance and equipment replacement costs always will take up a portion of building budgets. However, more building owners and businesses are realizing that operation and maintenance departments can minimize life cycle costs by changing operation and maintenance practices. That is, proper operation and maintenance actually can save money compared to poor operation and maintenance, and many businesses are reinvesting their operation and maintenance savings in more efficient building systems. The commissioning process establishes sound operation and maintenance building practices and trains operators in carrying out these practices.

Commissioning also allows building owners to avoid premature equipment replacement costs. Commissioning verifies that equipment is installed and operating properly. Equipment that operates as intended lasts longer, works more reliably and needs fewer repairs during its lifetime. By promoting equipment reliability, commissioning reduces service, energy and maintenance costs. Equipment that operates properly uses less energy, requires fewer service calls and demands less "crisis maintenance" from onsite staff (or expensive outside contractors), allowing them to concentrate on their normal duties.

The Bottom Line

The bottom line is that commissioning improves a building's asset value. Properly functioning buildings with reliable equipment kept in good condition are worth more than their uncommissioned counterparts. Commissioned systems and equipment retain their value longer. There is a higher demand for comfortable, healthy working space that promotes productivity. And systems that function properly use less energy, experience less downtime and require less maintenance, which save building owners money.

¹ Presentation to National Electric Light and Power Association, 1989, by Cedric Trueman, Senior Technical Advisor for British Columbia Buildings Corp.

² E-Source calculation from BOMA and EPRI data.

³ ASHRAE presentation by David Zier of Melvin Mark Company