

Commissioning in Public Buildings

a. **Description:** Establishment of programs to make commissioning a standard practice in public building construction. Commissioning is the process of ensuring that building systems are designed, installed, functionally tested, and capable of being operated and maintained according to the owner's operational needs. Commissioning also can restore existing buildings to high productivity through renovation, upgrade and tune-up of existing systems.

b. **Public Policy Rationale:** Commissioning can provide numerous benefits, including

- Lower utility bills and reduced energy consumption
- Precise tune-up of HVAC systems and controls
- Lower operation and maintenance cost
- Early detection of potential problems
- Fewer change orders
- Better building documentation
- Trained building operators
- Shortened occupancy transition period
- Healthy and comfortable work environment

c. **Examples of Implementation:** The Northwest Energy Efficiency Alliance's (NEEA) Commissioning in Public Building Project seeks to make commissioning a standard practice in the Pacific Northwest (Oregon, Washington, Idaho and Montana). The project, which was initiated in early 1998 and is scheduled to run through the year 2000, seeks to overcome market barriers to the practice of commissioning through the use of multiple intervention strategies, including: demonstration projects/case studies; technical assistance to public agencies; model commissioning policies; education and training; and financial assistance. The project is being coordinated across the four state region by the Oregon Office of Energy (OOE), which is the NEEA's prime contractor on the project. OOE subcontractors include state organizations in each of the other three states. Oversight and direction is also provided by the Northwest Building Commissioning Collaborative. For more information, click here:

<http://www.nwalliance.org/resources/reports/E99042.pdf>

d. **Political Feasibility:** There are no political barriers to the feasibility of implementing programs to promote commissioning. No action by state legislatures or regulatory agencies is required.

e) **Costs and Benefits:** According to the Oregon Office of Energy (OOE), commissioning has a wide array of benefits, including energy savings, fewer system deficiencies at building turnover, improved indoor air comfort, improved worker productivity, reduced liability related to indoor air quality, reduced operation and maintenance and equipment replacement costs. Studies on commissioning show that the process provides average energy savings of 15 to 30 percent. 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. Visit <http://www.energy.state.or.us/bus/comm/bldgcx.htm> for more information on the OOE commissioning program.

Savings From Commissioning		
Building Type	\$ Savings	Energy Savings
110,000 ft² office	\$.11/ft²/yr (\$12,276/yr)	279,000 kWh/yr
22,000 ft² office	\$.35/ft²/yr (\$7,630/yr)	130,800 kWh/yr
60,000 ft² high-tech manu.	\$.20/ft²/yr (\$12,000/yr)	336,000 kWh/yr

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. 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, the few studies that have been conducted on this topic provide an estimate of productivity losses in a typical office building where occupants complained of discomfort¹:

Comfort and Productivity	
Payroll costs	\$150/ft²/year
Productivity lost to complaint time	\$.10/ft²/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.

Commissioning costs can vary considerably from project to project. Actual costs depend on the size and complexity of the project, and the extent and rigor of the commissioning specified. There currently is no standard method of reporting the costs and savings associated with building commissioning. For many projects, commissioning costs were never separated from other project costs. For projects where these costs have been tracked separately, various methods have been used to report them.

The following table lists some of the most common methods. Typically commissioning accounts for a very small portion of overall construction and renovation budgets.

Estimated Commissioning Costs	
Commissioning Scope Estimated Cost	Range
Whole building (controls, electrical, mechanical) Commissioning from design through acceptance	0.5-1.5% of total construction cost
HVAC and automated controls system only	1.5-2.5% of mechanical contract
Electrical system only	1-1.5% of electrical contract
Various energy-efficiency measures	53,000 ft² avg. \$.08-\$.64* ft² 102,000 ft² avg. \$.13-\$.43** ft²

*\$.23 avg. cost for 16 buildings

**\$.28 avg. cost for 7 buildings

f) Interaction with other policies:

g) Quantifiable under SIPs:

h) Required Actions to Implement: