

Case Study: Commissioning

Commissioning 'skeptic' now believes

Hillsboro School District Director of Facilities Loren Rogers admits he was skeptical about the value of commissioning.

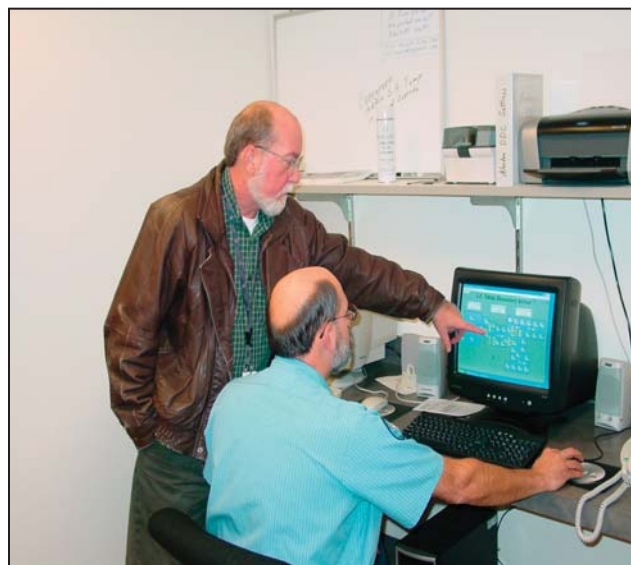
"Five years ago, I wasn't sold on it," said Rogers. "Now, I wouldn't do a project without it."

Commissioning is the process of ensuring that energy-using systems in new buildings are designed, installed, tested for full functionality, and capable of being operated and maintained according to the owner's operational needs. (Retro-commissioning refers to that process being performed on systems in an existing building.)

An independent agent (not the contractor or a sub-contractor), serves as the commissioning agent and is normally involved in the commissioning or retro-commissioning project from start to finish.

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**-Loren Rogers
Director of Facilities Management
Hillsboro School District**



Hillsboro School District Safety and Energy Coordinator Colin Croas (left) works with Lead HVAC Jim Peterson to monitor the control systems at one of the districts three high schools

"In any building project, especially those involving schools which are complex structures, the contractor and various subs can each do their jobs, but the end results may not be satisfactory," said Energy Analyst Bruce Alford with the Oregon Department of Energy who works on the Department's Schools Team. "It can take months to remedy the problems. A commissioning agent looks at the project as a whole, tests systems and ensures that everything works together as designed."

Just ask Rogers about his experience. Since 1998, Hillsboro



625 Marion St. NE
Salem, OR 97301-3737

(503) 378-4040

Toll-free
1-800-221-8035

Fax
(503) 373-7806

Web site
www.energy.state.or.us



Oregon Department of Energy Analyst Bruce Alford (left) with the Schools Team discusses a school audit with Hillsboro School District Lead HVAC Jim Peterson (center) and Safety and Energy Coordinator Colin Croas.

School District has built two new high schools and four elementary schools to accommodate a dramatic increase in students. In addition, the district did some major remodeling on Hillsboro High School. The new construction and remodeling work were not commissioned and required considerable efforts by the district facilities team to rectify in subsequent years.

“It was a headache,” said Rogers. “Jim (Peterson, the district’s HVAC lead) spent one year of diligent work on Hillsboro High alone.”

SB 1149 funding

When SB 1149 Public Purpose Funds became available for Hillsboro School District and others within Portland General Electric and Pacific Power service territories to complete energy efficiency measures, the funds came with a caveat: projects of \$50,000 or more required commissioning.

“There was a reason for this,” said Alford.

“Commissioning works, but districts might be tempted to save the expense of commissioning if they weren’t required to do it. We see commissioning as an insurance policy. Why spend \$50,000 on an energy project if it doesn’t work in the end?”

Rogers and his facilities staff agree. They saw the result of commissioning a recent project that was a stark contrast to their previous experience. The project involved using SB 1149 funds to replace original pneumatic control systems at several district schools.

“Pneumatic controls are mechanical and are frequently out of calibration,” added Rogers. “You can’t pinpoint problems and it is hard to keep occupants comfortable. They are ineffective and replacement parts are often hard to get.”

Digital Controls

Rogers, along with District Safety and Energy Coordinator Colin Croas, District HVAC Lead Jim Peterson, and others decided that new digital controls, a much more effective technology, would provide the most energy savings for the \$1 million of SB 1149 funds.

“The digital controls save energy and reduce the number of maintenance calls,” said Croas. “Adjustments can be made for several facilities remotely from a single location.”

The district began replacing control systems in six schools in the summer of 2004, one in the summer of 2005 and is currently working on another. The district hired a commissioning agent for the digital control projects as required.

The digital controls brought excellent results. Teachers and students were happy and made far fewer complaint calls to school custodians. The facilities team could assure occupants of a standard temperature range (68°F to 72°F).

The new controls also revealed some problems in the HVAC system.

“For example, we discovered that some of the fan motors were not running,” said Croas. “And, there were numerous breaks in the ducts that dumped conditioned air into non-classroom areas.”

The problems had to be fixed. The end result was that the HVAC systems could operate much more efficiently and effectively with the digital control systems. The facilities team was unanimous when they say that commissioning of the project was well worth the expense.

“We had an ODOE (Oregon Department of Energy)-approved commissioning agent involved in the project from design phase through construction and the test and balancing phase,” said Rogers. “Controls are very complex systems. The commissioning agent was invaluable.”

Funding for 10 years

The Hillsboro School District will continue using SB 1149 funds for improving the district’s 23 elementary schools, four high schools, four middle schools, two alternative high schools and one alternative middle school. The funds are available for 10 years at which time the Oregon Legislature may approve a continuation of the funding program.

Hillsboro gets approximately \$295,000 per year from SB 1149 or \$2.95 million over the 10-year period. The energy audits performed on 28 of the district’s buildings resulted in a list of energy efficiency measures with simple payback of less than 10 years amounting to \$3 million in savings.

The Hillsboro School District Board also contributed \$1.7 million in general funds towards energy projects.

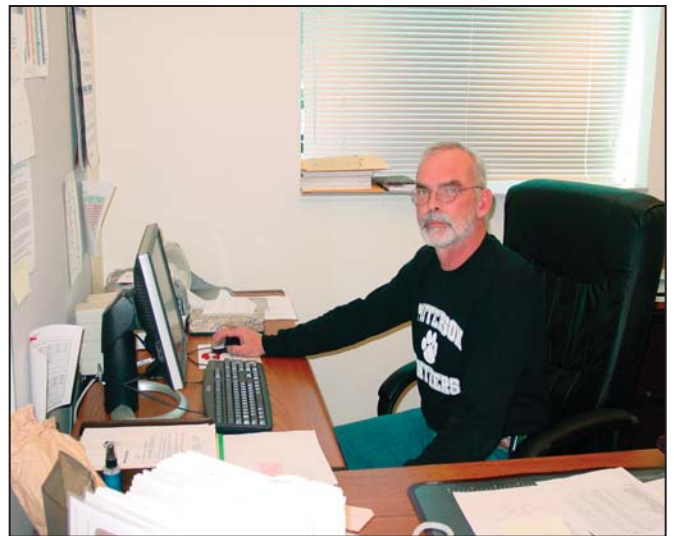
The Oregon Department of Energy assisted the district in using the Business Energy Tax Credit Pass-through Option. For its four completed energy projects with eligible costs of \$220,650, Hillsboro School District is partnering with Nike, Inc. Nike will give the school district a lump sum payment \$60,268. Nike will then accept the 35 percent tax credit of \$77,228 to file over a five-year period (10 percent the first two years and 5 percent for the last three years).

Loren Rogers and Hillsboro School District are currently planning other energy projects using SB 1149 funds. One thing he knows for certain—the projects will be commissioned.

Tax Credit Pass-through Option

The Business Energy Tax Credit Pass-through Option is available to schools, non-profit organizations and others without tax liability and for-profit businesses who choose to use it. The Oregon Department of Energy reviews applications and issues the pass-through tax credits to a business partner with a state tax liability.

Project owners are responsible for finding a pass-through partner, although the Department of Energy is available to assist. Interested project owners and/or partners who would like to participate should contact Barbara Bonnem, Pass-through Option Developer, by e-mail at barbara.bonnem@state.or.us for more information.



Hillsboro School District Director of Facilities Management Loren Rogers has seen first-hand that commissioning energy projects has value.

Commissioning

Commissioning is the process of ensuring that energy-using systems in buildings are designed, installed, functionally tested, and capable of being operated and maintained according to the owner's operational needs. Retro-commissioning can restore existing buildings to high productivity through renovation, upgrade and tune-up of existing systems.

Benefits of commissioning and retro-commissioning include:

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

Commissioning costs depend on the size and complexity of the project. Bruce Alford, an energy analyst with the Oregon Department of Energy who works with schools, noted that one Oregon school district recently had to spend an unbudgeted \$250,000 to try and remedy energy system problems in a newly constructed school. The project was not commissioned.

“Commissioning is an additional expense, but when commissioning is done properly, the savings far outweigh the costs,” said Alford.

For more information on commissioning schools, contact the Oregon Department of Energy at 1-800-221-8035 toll-free, (503) 378-4040 in Salem or visit the Web site: www.oregon.gov/energy

Problems found at Evergreen Middle School by Commissioning Agent	
Problem	Consequences if not corrected
Several return fans did not turn on and off with the supply fans (not interlocked).	Rooms will be hotter or colder than desired because the fan systems are not operating together.
Circulation pumps for space heating do not turn on when heat is needed.	Rooms will be cold.
Computer screen displays and values do not match actual events and conditions.	These discrepancies can cause operator error that may result in equipment damage or “fixes” that make temperature and comfort control worse.
Circulation pump will not engage when unit trips on freeze protection.	Possible freezing of heating coils due to lack of circulating hot water can cause expensive repairs.
Hot water is not circulating to the space heating units.	Rooms will be cold.
*This is a sampling of the nearly 40 problems that the commissioning agent found in just <i>one</i> school in the Hillsboro School District. The commissioning agent found similar numbers and issues to be resolved in energy projects at other schools in the Hillsboro School District.	