



# Building Operator Certification™



BOC™ is a nationally recognized professional development program for building operators offering improved job skills and more comfortable, efficient facilities.

## CASE STUDY SERIES

### Ft. Lewis Army Base, Ft. Lewis, Washington

Ft. Lewis Army Base, located south of Seattle near Tacoma, WA, has a daily workforce of 29,100 civilian and military personnel, the size of a small city. The base has 22 million square feet of building space occupying some 87,000 acres. Akin to a small city, the base is comprised of a variety of building types including offices, housing, schools, retail, healthcare, water treatment, warehouses, hangers and utilities. The Base's Public Works Department is responsible for planning, developing, operating and maintaining the building infrastructure.

A successful partnership among the Northwest Energy Efficiency Council, Ft. Lewis Army Base, and the U.S. Department of Energy, Federal Energy Management Program was instrumental in organizing and conducting an on-site BOC training at Ft. Lewis in 2003. The Ft. Lewis



<b>Facility Square Footage:</b>	<i>22 million, including 5 million square feet of family housing</i>
<b>Attendees Interviewed for Case Study:</b>	<i>Jim Flannery, Mechanical Lead; Al Johnson, Electrician Foreman; John Sly, Planner Estimator</i>
<b>BOC Graduates:</b>	<i>Level I</i>
<b>BOC Sponsors:</b>	<i>Federal Energy Management Program and Tacoma Power</i>
<b>Number of Staff:</b>	<i>HVAC Mechanical Shop (34), Interior Electric Shop (22)</i>
<b>Resources Affected:</b>	<i>Electricity, natural gas, fuel oil, water</i>

challenging target, especially with so many older, energy-inefficient facilities on the base, featuring the likes of concrete block construction, single-pane windows and small heat piping that requires long reheating cycles. The base has undergone extensive en-

ergy efficiency improvements in recent years, with financial and other assistance from Bonneville Power Administration and a local utility, Tacoma Power. One of the challenges for Flannery, Johnson and Sly is to operate and maintain the new equipment while also continuing to upgrade older equipment – lighting, motors, boilers, HVAC and mechanical systems and windows. Installation of light-emitting diode (LED) traffic lights is one of this year's ventures.

Public Works Department hosted an on-site BOC Level I course series for twenty-five Maintenance and Repair Division electrical and mechanical staff and other Public Works staff including engineers, planners and estimators. "Expanding professional horizons" was the intent of holding the training, explained Charles Howell, energy program coordinator for the Public Works Department's planning division. Five other Fort Lewis public works employees had completed an earlier BOC series in nearby Renton, WA, and, finding it highly worthwhile, one of them encouraged a BOC "home schooling" for colleagues. Fort Lewis and the U.S. Department of Energy's Federal Energy Management Program split the cost of the on-base training.

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#### **Increasing Efficiency above ASHRAE Standard**

The base is engaged in a number of substantial renovation projects. The base's Leadership in Energy and Environmental Design (LEED™) requirements make it necessary to push for even greater efficiencies closer to 50% above the ASHRAE standard. LEED™ is a voluntary standard promulgated by the U.S. Green Building Council (USGBC). ASHRAE Standard 90.1/1999 and current revisions are minimum energy efficiency requirements for non-residential buildings. Most LEED™ certified buildings exceed ASHRAE Standard requirements by as much as 25% to 30%.

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### Operational Challenges

#### **Old, Inefficient Facilities:**

Fort Lewis and other federal facilities operate under a 1999 presidential executive order – Executive Order 13123 – to cut energy use 35 percent by 2010, compared to 1985. That's a

To date, they have successfully achieved a 20-30% increase in efficiency compared to ASHRAE standard. "The efficiencies we are gaining will require a better trained and sophisticated M&R staff to maintain this level of efficiency," said Howell. "BOC has been truly helpful in that regard."

### **Lack of Integrated Controls System**

Until recently, the base operated without an integrated controls system for monitoring the operation of HVAC, mechanical and lighting systems. Monitoring had to be performed at each building individually across the base. With some 1,000 buildings, this posed a challenge for the public works staff. Development of an integrated controls system for 10 percent of the base's facilities is now underway with funding from an energy savings performance contract (ESPC). Once completed, it will allow building managers to baseline energy consumption and optimize operation of energy intensive equipment such as lighting, and heating and ventilation equipment for the base.

## **Results of BOC Training**

### **Culture Change**

Improving energy efficiency can't be done with equipment alone. People, their practices, and the decisions they make also play an important role. Jim Flannery, Mechanical Lead, describes BOC training as part of a larger cultural evolution toward energy efficiency at Fort Lewis. After trying to maintain HVAC and mechanical systems equipment that was "so old and outdated we had a whole storeroom full of obsolete parts ... I threw it all away. I said, 'No, put the energy-efficient equipment in. It's got to last.'" He is instituting procedures within his team that call for replacing aged circulating pumps with newer energy-efficient models that are smaller, easier to handle and help reduce utility bills. Asked how he applies BOC training, Flannery said, "Mostly I am interested in efficient equipment and operating controls that will provide the needed service to attain our goals for saving Army energy."

### **Improved Indoor Environmental Quality**

BOC graduate John Sly, a pipe fitter by background who currently serves as a planner-estimator, said he left BOC with "good awareness of areas that you don't normally work on." As a tradesperson he was already familiar with many aspects of building systems, but he said he gained new insights into indoor air quality from BOC classes. Sly thinks about carpets and their fumes in developing selection criteria for work packages. This enhanced awareness enables Sly and others to be more proactive about addressing IAQ problems by both identifying potential sources of pollutants, and more closely tracking occupant complaints about air quality. IAQ is not new to Ft. Lewis. Howell recalls a "big problem" with mold arose in family housing a couple of years ago and needed resolution before a private contractor would take over.

### **Emphasis on Efficiency in Pre-Construction**

When designing, planning and estimating projects, John Sly applies concepts he learned in the BOC classes. "When involved in design/pre-construction meetings, I put more em-

### **A 2002 independent evaluation found the BOC program saves the average building on an annual basis**

- 0.5 kilowatt hours of electricity per square foot
- 1.95 million BTU of fossil fuels per 1000 square feet
- 0.162 gallons of water per square foot

*BOC graduates work in all fields of industry, ranging from municipalities to Fortune 500 companies.*

phasis on energy conservation techniques and push for better building commissioning and re-commissioning processes," he says. One example of his attentiveness to conservation is purchasing high-efficiency motors. He also has more of a knowledge base to use in reviewing the validity of vendor-proposed energy measures, such as lighting.

### **Enhanced Perception**

Johnson, an electrician foreman, and Flannery, mechanical systems lead, both had considerable general building knowledge before BOC. Yet they found the indoor air quality course a learning experience. Building staff work in teams comprised of expertise in electrical, plumbing and HVAC to serve the needs of facilities on the base. "BOC helps you see how the systems you work on overlap with others, and how it ties in with energy efficiency."

### **Partnership with FEMP**

*BOC is administered by the Northwest Energy Efficiency Council (NEEC), a non-profit association of the energy efficiency industry. NEEC works in partnership with the Seattle (Western) Regional Office of USDOE/EERE/FEMP, to provide Federal agency technicians with O&M training and certification through BOC, in compliance with Executive Order 13123, that requires trained Federal Energy Management professionals. For more information on the Regional BOC/FEMP activities, contact Arun Jhaveri, Regional Technology Manager at FEMP/Seattle, by calling 206-553-2152 or by E-Mail [arun.jhaveri@ee.doe.gov](mailto:arun.jhaveri@ee.doe.gov)*

### **BOC National Partners**

*Midwest Energy Efficiency Alliance, Northeast Energy Efficiency Partnerships, Northwest Energy Efficiency Alliance, Sacramento Municipal Utility District, and Wisconsin Focus on Energy.*

### **About BOC™**

*BOC™ is a nationally recognized professional development program for building operators offering improved job skills and more comfortable, efficient facilities. Training topics include building systems overview, energy conservation techniques, HVAC systems and controls, lighting and electrical, IAQ, and environmental health & safety regulations. Operators who successfully complete training are awarded the BOC™ designation. Since 1997, over 100 Federal sector building operators have earned BOC Level I certification. For more information, visit the BOC web site at [www.theBOC.info](http://www.theBOC.info).*