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Reaching for the sky

San Francisco engineering team applies Fluke Tools to high rise commercial maintenance

Technology at Work

Steve Hanus' IUOE team, L–R: Charles Booth Jr., Steve Hanus, Riko Cus, Steve Goodwin, Rob Edelenbos, Gabe Buckley, Kevin Halligan.

Activity inside the tallest buildings on San Francisco's skyline begins long before the sun comes up—if, that is, things ever stop moving in the first place. The buildings' tenants probably know at some level that their building is largely automated, but they still take their morning coffee, computer connections, and air conditioning largely for granted. Little do they know what lies beneath.

That's the job of the modern building engineer and the International Union of Operating Engineers (IUOE) that trains them. Building engineers are responsible for the operation, maintenance, renovation and repair of all mechanical systems within a facility, from boilers and steam systems to other types of heating, ventilating and air conditioning systems; building automation systems; diesel engines, turbines, generators; pumps, piping and compressed gas systems; refrigeration and electrical systems and numerous other functions.

These engineers ensure building equipment operates safely, economically and within established limits by monitoring attached meters, gauges, and computerized controls and making repairs. In many buildings, there may be only one engineer responsible for the entire operation.

The San Francisco IUOE Local 39 in particular is the launching point for northern California and Nevada engineers who make high rise building operations their business. One such west-coast engineering team is headed by Steve Hanus, a 25-year building maintenance veteran who oversees high rise operations in Los Angeles, the Bay Area and Seattle and has instructed courses at the IUOE.

Throughout that time, he's not only seen buildings progress toward automation driven by digital systems, he's been a part of it. To keep up, he's had to continually update his skills through the IUOE and learn how to use increasingly sophisticated tools. Luckily, the test tools have improved with the rest of technology. "The technology really has changed," Hanus says, compared to the tools of his early days: "a mercury thermometer," he laughs.

Riko Cus uses the Fluke 179 to check surface temperatures as part of regular monitoring procedures.

One Bush Street

Hanus's team includes Rob Edelenbos, Chief Engineer of One Bush Plaza. Edelenbos has a crew of two other engineers, all trained through Local 39. He got his start as an apprentice with Hanus in the mid 1980s and has been working with him ever since on a number of high rise buildings. He came to One Bush about four years ago.

Edelenbos describes One Bush as a typical commercial high rise. At 320,000 square feet, it stands 19 stories and houses about 12 tenants. The building has been a part of San Francisco's skyline since 1959. Because of its age, it has been through numerous generational upgrades. Today the building is part digital as a result of its most recent upgrade in 2001. It is also part pneumatic. Edelenbos's crew must not only run monthly predictive maintenance testing on the digital and pneumatic sides, they also must maintain the interface between the two. If the hybrid system is not properly calibrated, none of the controlled devices it serves, including the pump, chiller, air handler, fan coil, or VAV box, will work.

Much of his technological knowledge comes from "lots of hands on experience," Edelenbos says. "And reading. You have to do a lot of reading."

To monitor all of that technology, he carries a Fluke Digital Multimeter (DMM), which he most commonly uses for calibrating system controls. It comes with a temperature sensor attachment which he uses to test the air and water temperatures in the HVAC system. Hanus says the entire team often uses a Fluke MegOhmMeter to test the insulation resistance on their A/C system motors. The Fluke DMM, ScopeMeter® test tool and clamp meter are all part of their regular tool supply for trouble shooting and maintenance.

While the team's predictive maintenance methods eliminate most failures, they can't catch everything. The air handler control could still fail, for example, resulting in widely swinging temperature variances. "We use the Fluke DMM for that kind of call," Edelenbos says. "It's with one of us at all times." He also uses a clamp meter to check current loads during regular maintenance and troubleshooting calls.

Still, the most common calls are usually routine. "Tenants often overload their circuits," he says, popping the breakers. Troubleshooting that kind of call is pretty straightforward, but the DMM is useful after the system is restored to check for any high current loads.

595 Market Street

Less than two blocks away stands 595 Market Street, under the maintenance of Steve Goodwin, another chief engineer on Hanus' team. Goodwin describes his building as similar to One Bush, but it's newer and has more floors. Built in 1979, this one is 430,000 square feet and 31 stories high, with one more story for machinery. With more than 50 tenants, it houses everything from stock brokers, lawyers and insurance companies to dentists and travel agents. Because of the high tenancy there is considerable foot traffic. In both buildings an energy management display monitor offers a visual tool to let them know what is happening throughout the building. "It tells me what's happening with large pieces of equipment," Goodwin says, such as if there are any balance deviations among the phases.

595 Market has a cogeneration plant on line that supplies electrical utility needs beyond what is provided by Pacific Gas and Electric (PGE). Chillers, pumps, electrical distribution bus (a steel structure array of switches used to route power out of a substation) and a central fan system are located on one floor. Pumps range is size from five to 100 horsepower. In addition, each floor has its own electrical rooms and circuit panels.

Like his team members, Goodwin's engineering experience began at the IUOE. He graduated from the same local apprenticeship program in 1977. He went to work as an engineer at hospitals in the Burlingame, Cal. Area and worked there seven years before shifting to high rise work. He met Steve Hanus while contracting to various buildings focusing on air and water balancing.

Goodwin says one of the most common maintenance issues at 595 Market is checking for current drops. "On predictive maintenance we determine a base level from the current readings, then periodically test

Kevin Halligan uses the Fluke Ti30 Thermal Imager to quickly check for hotspots on key equipment.

again." How often he runs those depends on the equipment involved. Critical life safety machinery gets more frequent maintenance. Quarterly, Goodwin says his crew checks equipment such as life safety fans that supply air to the stairwells and exhaust fans letting air out of the stairwell to control pressurization. They also check fire pumps, generators and emergency lighting as part of the critical life safety equipment maintenance.

He uses his Fluke MegOhmMeter Insulation Resistance Tester, that also measures voltage and reads connections with its Lo-Ohms function, to check for any current drop. He also checks neutrals to see whether voltage is grounded to the earth. This is another part of the team's regular maintenance. "We use the MegOhmMeter for baseline predictive maintenance," he says.

Most high rises function similarly, with the only variable being the physical location of the equipment, Hanus says.

When a breaker pops, Goodwin uses his Fluke tools to take a current draw, seeing what the load is on a particular circuit. With this information, he says, he can help a tenant balance out their power distribution. "The amp portion of the Fluke meter comes in handy," he says. He appreciates that the multimeter handles so many daily tasks so well, even after seeing a lot of abuse. "It's pretty hardy," he says.

For power quality issues, the team gets a power quality monitor from the utility. "If we get a call from a tenant and their computers are having issues," he says, "we can use a DMM to check it out." If the problem warrants it, they turn to power quality tools for long term monitoring and harmonics measurement. Power quality can be a debilitating issue for computer users, but is an even greater problem in a building with large data centers, Hanus says, where critical computer work is done 24 hours a day.

Always learning

All three engineers look to their training at the IUOE 39 as one of their greatest strengths. "When I first started, digital controls didn't even exist," says Hanus. Knowing how to work with new building technologies and the tools that measure and troubleshoot them is the only way to succeed, he says. "If engineers don't know how to use their tools," he says, "their building is going to have to contract out (to secure proper maintenance or repair). That costs them money," he says.

"Some engineers have had less exposure to the tools you use in a high rise," Hanus says. He and his team have learned to use tools like the MegOhmMeter and the power quality analyzer through training at the IUOE and experience on the job.

Using these tools has helped reduce troubleshooting instances, the team agrees. For instance, just by using clamp meters and volt meters to check for hot spots, they can eliminate the risk of a power outage before it happens. By using predictive maintenance techniques and identifying problematic trends in advance, "you can schedule a repair when it's convenient," Hanus says, "rather than an emergency repair that disrupts the tenants and the whole building system."

Throughout, Hanus and team focus on operating efficiency and lowering operational costs. "We're never out of work," he says. "Having the right tools and the right training is essential."

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Fluke Corporation
PO Box 9090, Everett, WA USA 98206

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or Fax (425) 446-5116
In Europe/M-East/Africa (31 40) 2 675 200 or
Fax (31 40) 2 675 222
In Canada (800) 36-FLUKE or Fax (905) 890-6866
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