

Handling 12,

ComEd, an electric transmission and distribution company in the United States, is currently engaged in a major substation fire protection program. An important piece of this program is installing Hilti firestop products in cable penetrations at many of its larger substations. Seen as a proactive step, installing firestops will limit fire or smoke damage to a controlled area, which in turn improves reliability by minimizing potential outages times.

by **Manfred Schiefer** (text) and **Dan White** (photos)

Entering the substation, the lights are turned on and the neon tubes give off a ghostly, pale light along the long row of dull, gray-colored switchgear cabinets.

The first floor holds switching equipment and the basement, also called a cable space, contains power and control cables. At the desk station electrical maps, a phone, and

various phone numbers are found. One of the numbers is for ComEd's control center. Jim Ford, LTT General Manager Specialty Construction Division, goes to the phone and



000 volts

dials this number to reports our visit to the ComEd office because they must be notified who is entering, the purpose, and duration.

Next, the team gathers for a job safety briefing. It is important that everyone knows who is doing what, what the critical steps are and what safety-relevant issues they should be thinking about. Because we will be working in the cable space, we discuss confined space entry and emergency exit procedures. After

the briefing, the hatches are opened, air quality is monitored, and the air and rescue equipment is put in place.

“Down in the hole, Bill,” says David, as he steps onto the rung of a ladder and looks up once again. He wants to make certain that Bill knows he’s going down. “Going down, Bill,” follows Tom, who briefly looks up before descending into the hole. “Going down:” one after another, the workers descend



Descending into a substation with special equipment.

Construction



John R. Bettler, head of the Fire Protection Engineering Group at ComEd: “Effective fire protection is like insurance for us.”



into the lower regions of the electrical substation until all but one is in the basement. Bill has to stay above ground to record who enters and exits, observe the air meters and, in case of an emergency, call for help.

Once down in the cable space, you realize the difficulties in applying firestops in a substation and why ComEd demands the incredible attention to safety. The base-

ment is filled with cables. From every wall of the station’s basement, power cables energized at 12,000 volts enter the station and rise up through core-drilled holes into the switchgear upstairs. Also, control cable pans hang from the ceiling, carrying hundred of cables used for metering, power and control of the electric equipment.

In addition to the cables, the ceiling is low and the floor is constructed

of tamped gravel. “A lot of times the basement is below the ground water level,” says Jim Ford, “The power lines enter the substation through the basement walls, so the buildings are never completely watertight.” This can make the work areas slippery.

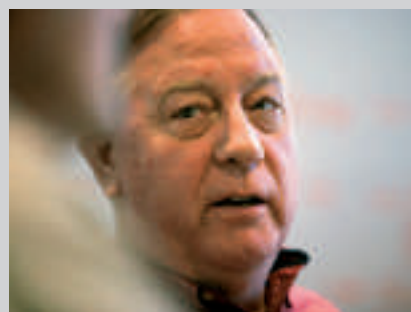
All of the penetrations from the basement to the first floor need to be sealed. The firestop material is installed from the cablespace to

maintain clearance from exposed electrical parts in the switchgear. In this way, the penetrations can be sealed without having to take the equipment out of service. ComEd and Luse worked closely with Hilti engineers to develop seals that would work for this application. These new designs and work practices amounted to huge savings in time and expense.

ComEd, based in Chicago, Illinois, is a subsidiary of Exelon, one of the largest energy producers in the USA. ComEd distributes electricity to 3.7 million end-users in Illinois. To do this, they must maintain more than 78,000 miles of power lines and operate hundreds of transformer substations.

A fire in a substation can greatly impact a utility’s financial situation, reliability and customer satisfaction. Steps taken to mitigate or reduce the damage can have a big impact. “Effective fire protection is like insurance for us,” says John R. Bettler, head of the Fire Protection Engineering Group at ComEd. “It helps us to attain our primary goal – to make sure that our customers’ lights never go out.” These fire protection upgrades make sense, because they will limit losses and down time in the event of a fire.

Safety first



Complacency is the greatest risk. Andy Grein of ComEd and Jim Ford of the installation specialists LTT.

“Safety is paramount,” says ComEd Project Manager Andy Grein, “especially when we have installers working in an energized environment.” Before the specialists from Luse are allowed to go into the substation they must first complete a five-day training program. In addition to the dangers posed by the electricity and working in a confined space, the workers are also trained in CPR and other first

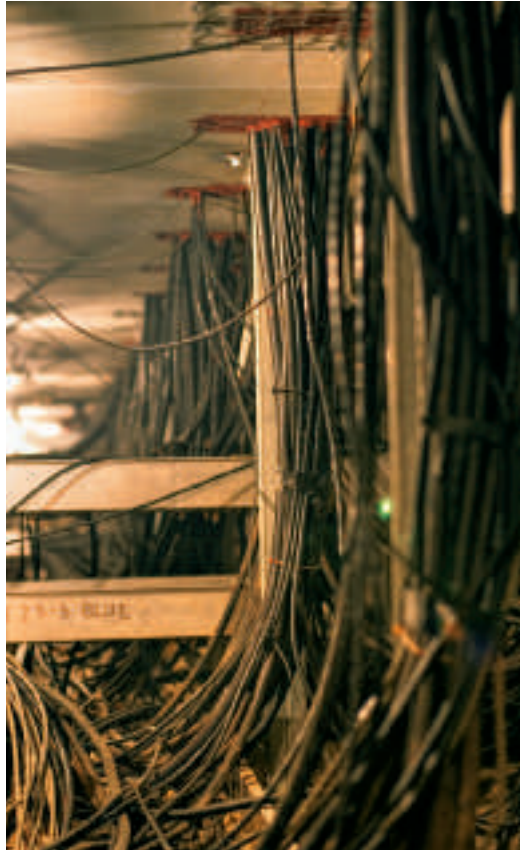
aid techniques so that they are prepared for any type of incident that might occur.

Although the workers acclimatize quickly to the dangerous environment, they must be careful to never become complacent. “This is the greatest risk,” says Jim Ford from LTT. “Having a feeling of familiarity with 12,000 volt cables can breed a relaxed attitude, which

increases the dangers significantly.” To fight this, the team has a safety meeting before work and also discusses safety procedures after lunch and again at the end of the day. “In 30,000 working hours we have not had an accident or a breakdown,” says Ford in pointing out the success of the safety program he developed.



Ceilings perforated like Swiss cheese. The numerous control, measuring and live power cables lead through hundreds of penetrations. Hilti engineers have developed tailor-made firestop designs for sealing the various field conditions encountered.



The task, however, is anything but simple. "The ceilings of transformer substations look like Swiss cheese," says Luse Project Manager Lance Simms. "In addition to the live power cables there are control cables everywhere, leading up to the switchgear cabinets." In order to seal the hundreds of penetrations found in one ComEd substation Hilti fire protection engineers developed many unique designs (engineering judgments) for sealing new field conditions as they were encountered. "The turn around time from Hilti, for producing these new firestop solutions is quite impressive," says Simms.

The hatches that allow access to the substation basements pose a particular challenge. ComEd needs to be able to open them at any time, yet they must provide a barrier to heat and smoke from the basement in the event of a fire. Hilti products are also used for this solution. The hatch is covered on

its underside with Hilti CP 675T firestop board, turning it into a heat shield. The board is surrounded by wrap strip that will expand and close off gaps in the event of a fire. With this barrier in place, the hatch is still light enough that it can be opened by ComEd field crews. "This is a true innovation for us," says Bettler.

The majority of the firestops provide a 3-hour fire rating, but in some field conditions only a smoke seal can be installed. Risk assessments are performed when needed to evaluate the seal design. Pre-walk downs of the sites by ComEd and Luse establish the basic designs. Additionally, ComEd supplies a field engineer who spends 2-3 days a week with the crews who can evaluate the seal requirements and the installation hazards if something new emerges. The field engineer also provides a quality review of all the installed seals.

ComEd has implemented an impressive firestop program. And as we leave the station after notifying the control center, it is easy to understand the rigor around safety. Driving away from the station, seeing all the well-lit homes, shopping centers, and commercial centers, it is easy to see the need. ■

Installation and inspection

The demands placed on the firestop designs used in ComEd facilities are much greater than those found in commercial construction. The considerable weight and mass of the bundled cables called for the development of unique firestop designs to meet the challenges of the large penetrants found in substations. Other issues, like cable vibration produced by the flow of electricity in high voltage cables created a concern that vibration may loosen the firestop materials.

Currently, ComEd plans on implementing an annual inspection program to review the conditions of the sealed basement areas and inspect for any damage. Initially, engineering will perform this review to make sure policies and procedures are being followed but over time this will be moved over to the maintenance workforce. "We are working on a monitoring program that immediately identifies possible changes to installed systems and minimizes possible damage," says Bettler.