



Shovel ready: (from left) Philip Gaylor, senior environmental health and safety (EHS) engineer; John L. Kanakry, senior manager, loss control/business continuity; and Jeff Dupaul, senior facilities manager



Up ON THE Roof

When the weight of weeks' worth of winter snow threatens to collapse the roof of a critical health care products manufacturing facility, a couple of quick-thinking Covidien employees used some good old-fashioned Yankee ingenuity to avoid what could have been very deep trouble indeed.

LIKE MANY INDUSTRIAL FACILITIES

in the northeast United States last winter, Covidien's manufacturing plant in Chicopee, Mass., USA, had a problem. A white one. As the promise of a new year gave way to February doldrums, the gentle flurries that glistened as a carpet of snow turned angry as 10-foot (3-meter) drifts.

"The snow started innocently enough," said Jeff Dupaul, senior facilities manager at the plant, which manufactures essential medical equipment, including disposable defibrillator pads for Automated External Defibrillators (AEDs), snap and tab electrodes for electrocardiogram (EKG) machines, chemo kits, ultrasound and other hydroconductive gels, and IVA seals. "On Jan. 7, 2011, we ordered snow removal for an unimpressive 4 inches (102 mm) of the white stuff. Two days later, it was for two more. Hardly worth the effort. We had no trouble keeping pace and thought we were ready for a typical New England winter."

But by mid-month, everything had changed. It became painfully clear that January 2011 was anything but typical.

The snow kept falling. And falling. Each dawn revealed a new winter wonderland that gave no hint of the concerted snow-removal effort of just a few hours prior. "We had crews out clearing after each snowfall, which was practically every day. The snow just wouldn't stop," Dupaul said, leafing through a bunch of papers. "I have a giant stack of receipts here for snow removal—14 inches (356 mm) on Jan. 12, four more on the eighteenth. Another five on the twenty-first. And on and on."

The snow fell unabated for a month. The evening news was rife with stories of roof collapses, with the toll highest among flat-topped industrial buildings—manufacturing plants and warehouses—just like Covidien's.

"Although we were initially confident, with each passing day we worried a little more about whether our 375,000 square-foot (34,839 square-meter) facility could support the snow load," Dupaul said. "Our building has roofs that vary in height and construction because the facility has been added onto many times over the years. There's one area that we refer to as the 'swimming pool' because it is sunken and does not get much sun. This area collects more snow than other parts of the roof and was our greatest concern."

"The media coverage of area roof collapses was chilling. If it happened at Covidien it would be a disaster, because we manufacture critical equipment that isn't made elsewhere," Dupaul said. In addition to producing medical products under its own brand name, the Chicopee facility also does a sizable original equipment manufacturer (OEM) business for other companies. Due to the sensitive nature of its products, and the controlled conditions required to produce them, Covidien cannot replace the output from this facility in the event of a major loss. "Any disruption in our manufacturing process would mean a significant business continuity loss for us and giant headaches for our customers," Dupaul said.



Dupaul on dry ground; the roof in early January; and a critical part of the “unnamed gizmo.”



“With no January thaw, rooftop snow never had a chance to melt and the load grew.”

JEFF DUPAUL
senior facilities manager



ARE THOSE SPRINKLER HEADS LOWER THAN USUAL?

Despite the threats posed by the constant snow, Covidien executives were confident their facility could withstand the onslaught. “I’ve been with the company for eight years. There were some roof issues before I got here so we carefully reviewed the engineering records from that time, which showed due diligence. A major roof-reinforcement project had been completed in association with FM Global several years ago to address those issues and as a result we’ve had no problems with snow load while I’ve been here,” Dupaul said. “Because we had no recent problems, and we didn’t see any signs of fatigue at this point, we were pretty confident that this winter would be like others and our facility would be fine.”

Mother Nature had a different idea. With no January thaw, the rooftop snow never had a chance to melt and the load grew and grew. “On Feb. 3, we noticed signs of roof fatigue for the first time,” Dupaul said. “It looked like some of the sprinkler heads in one portion of the plant were hanging a little lower than usual, but the difference was subtle. We weren’t sure. Just to be on the safe side, we called in our FM Global engineer at the time, George Bourisk. He came to our facility and took careful measurements. While he noted some fatigue and dipping in a few areas, his careful calculations indicated that the roof should be able to sustain the accumulating snow load.”

Because a picture was worth a thousand words, Dupaul took the engineer up to the roof, where the snow was as high as his chest. “He was floored. He redid his calculations. Twice. As an engineer, he held strongly to the belief that math doesn’t lie. He was convinced that the roof would be up to the challenge even though the snow banks were impressive.”

A SINKING FEELING

Despite this optimism, Dupaul and his associate Philip Gaylor, senior environmental, health and safety (EHS) engineer, fretted. “Even though the math clearly showed that our roof was strong enough to withstand the growing stress, a visual inspection led me to believe this simply couldn’t be so,” Dupaul said. “I couldn’t sleep at night, tossing and turning as I worried about what a roof collapse would mean to the facility and to the nearly 300 workers there who I need to keep safe.”

Together, Gaylor and Dupaul decided they had to do something, anything, to get rid of all this snow, at least on the most vulnerable areas of the roof. “For a split-second we considered hiring a crane,” says Dupaul, “but the cost (US\$175,000) was prohibitive. There was no budget for this type of snow-removal effort because we’d never needed it before. So we had to devise a plan that was as inexpensive as it was effective.”

“There were obstacles other than cost limiting our snow-removal options,” Gaylor explained. “Not only did we have mismatched roof heights and 10-foot (3-meter) snowdrifts everywhere you looked, but we also had two miles (3.2 kilometers) of gas line buried under the rooftop snow, and many portions of the roof were covered in stone ballast, which meant we couldn’t use snow blowers for clearing.”

Hand-shoveling also was not an option. “As a company dedicated to loss prevention, we did not want to hire an outside contractor to send untrained laborers up on our massive, snow-covered rooftop to shovel manually. Too risky. And, of course we didn’t want to risk the safety of any of our own employees to do that either,” Gaylor said.

INSPIRATION/PERSPIRATION

“Even though we didn’t know for sure that our roof would collapse—especially because FM Global’s calculations said otherwise—we knew we had to do something to quiet the gut feeling both Jeff and I had. But we were winging it. Fortunately, corporate management allowed us the freedom to try a few of our ideas even though they weren’t completely convinced anything really needed to be done.”

Their brainstorm was to build their own, relatively inexpensive custom snow-removal device in Covidien’s machine shop. The duo constructed a portable manifold—basically a metal frame with a pipe drilled with several holes. It was connected to a steam line made from 1,200 feet (366 meter) of heavy-duty steam hose and manipulated via a control apparatus with mixing valves they had also built. The cost? Less than US\$8,000 in material.

Gaylor explained the way this heretofore unnamed gizmo worked. “To melt the snow, we’d position the manifold in a key area, and run 100 psi steam/315-degree water, heated by an until-then unused boiler in the main facility, through 500 to 600 feet (152 to 182 meter) of hose. The manifold easily melted a channel through snow and ice that was 4 to 5 feet (1.2 to 1.5 meter) deep.



The run-off flowed into a clean-cut roof drain. Steam coming from the pipe holes provided additional melting to attack the massive snow banks, one at a time.

“We could only have some of the manifold’s holes open at a time, which limited our melting capacity,” he continued. “Once a trough was created, we moved in the warm hoses to keep the channel open. After a sizable area was cleared, we picked up the manifold and positioned it elsewhere. With steam we knocked down about 600 feet (183 meter) of snow drifts.”

Far from high tech, Covidien’s snow-removal solution was elegant in its simplicity, but demanded constant attention. “Our device worked great. The only problem was that it needed to be moved. Often. That meant a lot of sweat equity for Phil and me,” Dupaul said.

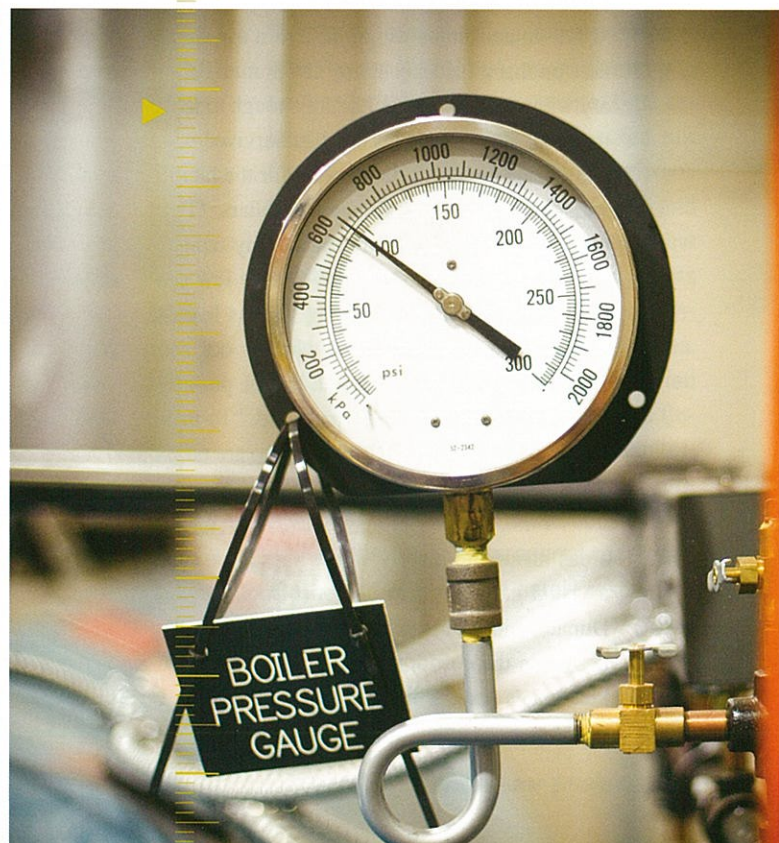
“And, to legally run the boiler that fed it we needed to have a state-licensed boiler operator on site whenever it was in use, which was practically 24/7,” Gaylor added. That meant that either Gaylor or Dupaul—especially Dupaul—was on the job around the clock.

“I wore snow pants to work for 60 days in a row and was up on that rooftop for 33 days straight,” Dupaul recalled. “It was 15 or 20°F (-9 – -6°C) below zero up there. But I was extremely nervous about what Mother Nature had in store for us so I felt compelled to be there. I was on the roof 14 hours a day, every day, for weeks. And when I wasn’t on the roof, I was thinking about what was happening up there. The anxiety was overwhelming.”

One Sunday was particularly bad, Dupaul recalled. They noticed deflection that needed to be addressed so they pulled on their warmest clothes and headed to the roof for a marathon session of hand shoveling. “I hated every minute of it but I had to do it. I took the whole snow issue personally. The employees here are

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On the floor at Covidien.

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JASON RIES

FM Global account engineer

my friends. As the facilities manager, I know they depend on me. Who else are they going to call if their building—and by extension, their safety and their livelihood—is in jeopardy?”

FINALLY, A SUNNY DAY

“I felt an enormous weight lift from my shoulders on that gloriously sunny day in mid-February when I finally felt confident enough to leave the roof,” Dupaul said. They had survived what could have been a major disaster for the facility and all it cost was a few thousand dollars. “That, plus my time and Phil’s, and part of my sanity.”

With a new winter always just a few seasons away, Covidien is putting lessons learned to good use. “I don’t know whether our roof would have actually collapsed, but the possibility was certainly there,” Dupaul said. “To make sure it doesn’t happen this winter we are taking a few preventive measures to prepare.”

“First, we’re taking photographs of key areas inside the facility so we have a baseline, a visual gauge to help us notice roof fatigue,” Dupaul said. “This year we won’t have to stop people in the corridors to ask, ‘Do these sprinkler heads look a little lower than normal to

you?’ We’re also building a new manifold, tweaking the design based on last winter’s experience. The new version will be twice as long and made from stainless steel.”

Another critical change Covidien is making for the upcoming winter: starting sooner. “We won’t wait as long to get on top of our snow removal efforts,” Dupaul said. “We now have a system in place and we know what we’re doing. It might not be the most efficient solution for snow removal, but it is affordable, safe and effective—the three characteristics we designed for.”

Though Covidien’s corporate management initially wasn’t sure that the Chicopee plant needed such a concerted snow-removal effort, executives are proud of its efforts. “Our Chicopee plant has no outstanding FM Global recommendations. Everyone here takes loss prevention seriously,” said John L. Kanakry, senior manager, loss control/business continuity. “We are extremely proud of the initiative shown by both Jeff and Phil as it exemplifies this commitment.”

Covidien’s current FM Global account engineer, Jason Ries, echoed that sentiment. “Covidien is exceptional to work with because they truly get it. They believe wholeheartedly in loss prevention, through and through. That’s why it didn’t surprise me that their own people came up with such an ingenious solution to a potential problem. Preventing a disaster is always preferable to cleaning up after one. Thanks to this extraordinary commitment, it’s business as usual at Covidien.”

ABOUT COVIDIEN

Covidien is a US\$10 billion global health care products leader dedicated to innovation and long-term growth. Covidien creates innovative medical solutions for better patient outcomes and delivers value through clinical leadership and excellence.

CATCH THE DRIFT?


If your facility is in a cold weather location, piles of heavy snow pose real risk

Rooftop snow load is typically accounted for in the structural design of any industrial building to ensure adequate strength. For buildings with a roof that is at a consistent elevation (and without any extenuating issues that would call the strength of the supporting structure into question) the design is typically adequate. But, like Covidien's Chicopee, Mass., USA, plant, many facilities constructed in stages possess roofs of varying heights. That can spell trouble.

"Many of our clients operate facilities that were built in phases and, as a result, feature varying roof heights, or steps in roof elevation," said FM Global Account Engineer Jason Ries. "Each elevation difference brings with it the potential for a heavy snowdrift to accumulate at the roof step—something that may not have been accounted for in the original structural design. The weight of a snowdrift at a roof elevation difference can exceed that of the expected flat-roof snow loading. Collapse or partial collapse can occur as the extra weight stresses the structural steel, exposing the facility's contents to extensive water damage and freezing weather conditions, and causing interruption to valuable production operations."

WHAT CAN BE DONE?

"During site visits, FM Global field engineers identify and evaluate significant roof elevation differences and the risks they may pose to our clients' facilities and business operations," Ries said. "If a snow collapse risk is identified, the solution is typically to reinforce the structure to handle the increased weight of deep snowdrifts. Of course, structural reinforcement projects require thoughtful capital planning to budget for these enhancements. Until reinforcement projects can be executed, our clients can make good planning decisions to protect their facilities by developing and following a thoughtful emergency snow removal plan that features action points for site-specific conditions. This is essential for facilities with known weaknesses. Even for those facilities without identified structural strength concerns, such as Covidien in Chicopee, having snow monitoring and removal plans in place can ensure that when winter's bounty exceeds expectations, the facility is prepared to identify areas in peril and immediately respond to avoid collapse."



Jason Ries, FM Global
account engineer