BIG SHOP OF HORRORS

Burning, wind-lashing, and drenching are all in a day's work in the cavernous test chambers of insurer FM Global. The objective: Unmask the secrets of disasters, the better to avert them. By Stuart F. Brown

A cluster of buildings in rural Rhode Island plays host to every catastrophe known to man: hurricanes, hailstorms, fiery infernos, dust explosions, you name it. In fact, none of those mishaps are caused by nature. They are all made by a company called FM Global, a $2.8-billion-a-year mutual insurer of commercial and industrial properties. Founded in 1835 by an industrialist who believed that owners of well-protected properties should be rewarded with lower rates, FM Global preaches a philosophy of "loss prevention" to its clients, which include more than a third of the companies on the FORTUNE 1,000.

Last year FM Global opened a $78 million research campus in West Glocester, where it can replicate all those disasters and then some. The campus replaces an earlier, smaller lab at the site; its centerpiece is the "large-burn lab," a cavernous indoor space the size of two football fields where full-scale warehouse fires are replicated to devise better ways of preventing them.

International Paper Co. in Stamford, Conn., is one client that has long benefited from FM Global's application of science and engineering to the reduction of risk. About 20 years ago the paper industry suffered a devastating series of warehouse fires that couldn't easily be explained.

"We lost several buildings, and without the work that FM did, we still wouldn't know why we were burning down warehouses," says Rodney Marchand, IP's property risk manager. To unravel the mystery, FM Global's engineers staged a paper warehouse fire under carefully instrumented conditions. What they observed was startling: The tall air space between the ceiling and the tops of 30-foot stacks of huge paper rolls was acting like a chimney. It drew hot combustion gases upward in a roiling flow so powerful that it deflected the spray of water from overhead sprinklers to

HOT TIMES IN THE LARGE-BURN LAB

What's the best way to stop an industrial fire that threatens to incinerate your plant? In FM Global's cavernous lab, engineers explore a machine-fire scenario. The liquid storage tank at the base of the fire contains mineral oil—flammable stuff commonly used in hydraulic systems and as an industrial lubricant. The engineers first rupture the tank, as might happen in a major mishap, letting the fluid flow into a "containment vessel" around it. Then they ignite the mess. Think of a fire in the moat surrounding a castle, and you get the idea. The heat released by this fire was roughly equivalent to a three-bedroom-house fire at its peak. Tests like this help engineers calculate how much fire-suppression gear is prudent.

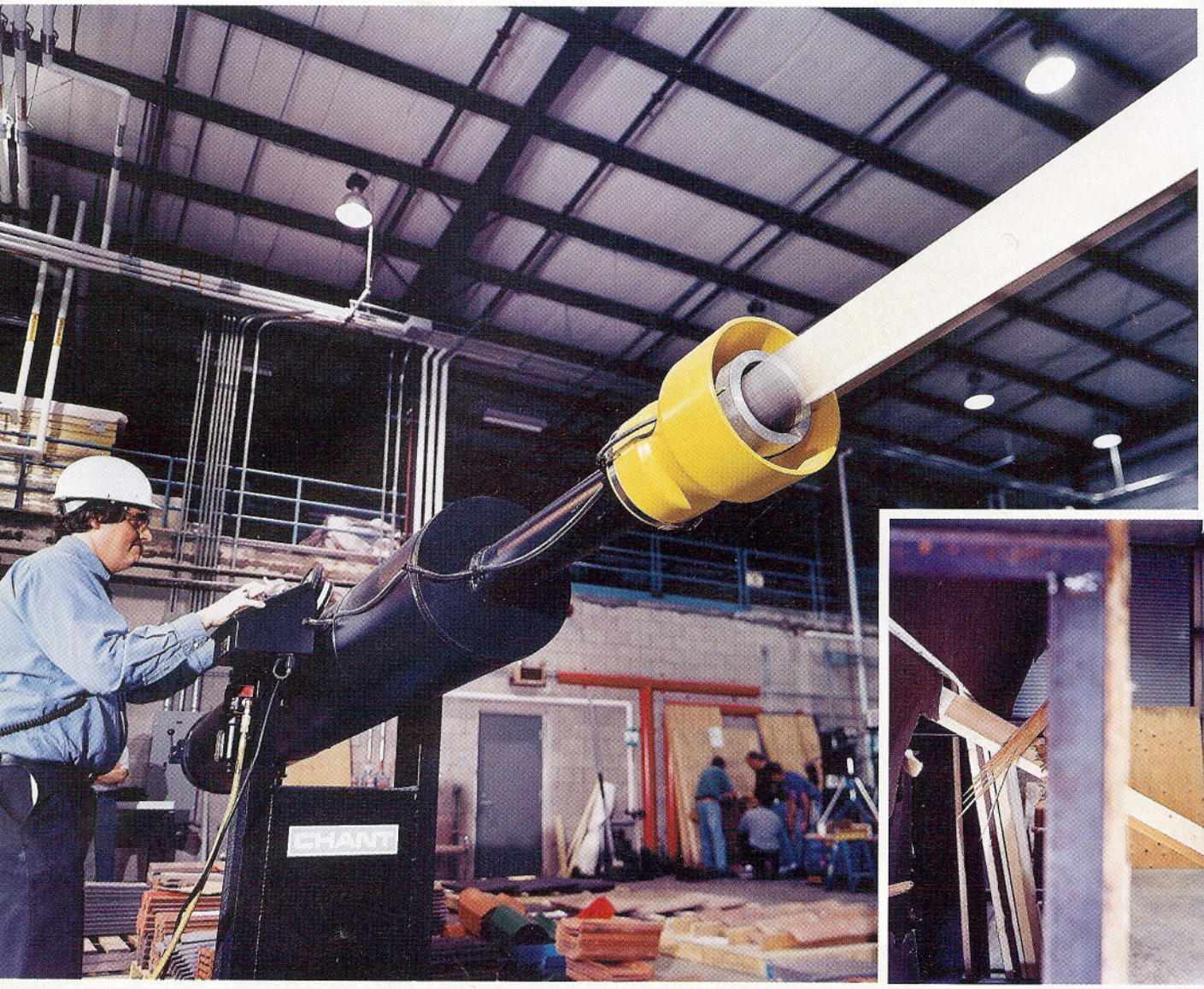
PHOTOGRAPHS BY BERND AUERS

the edges of the building, where the water did little to quench the fire. The simple cure FM Global devised: a new type of sprinkler that produces larger water droplets heavy enough to rain where they're needed.

The large-burn lab features a movable ceiling that lets engineers replicate conditions in buildings as tall as eight stories. During a recent visit by FORTUNE, FM Global's fire experts torched eight pallets of cardboard boxes containing 8,000 polystyrene plastic cups. As a squad of company firefighters stood by—just in case—flames 50 feet tall were soon blasting upward at 45 miles per hour as the cups and their cartons went up in a plume of acrid smoke. A huge stainless-steel "fire products collector" overhead sucked up the outpouring of heat and smoky stuff for analysis and for scrubbing to remove the contaminants. Sensors reported temperatures approaching 2,000° F and a peak energy release of 17 megawatts—roughly the equivalent of burning down a three-bedroom house. Similar blazes can occur in warehouses where flammable goods are stored. The message was clear: Just look at how much energy this stuff releases once it gets going. Design your sprinkler system accordingly.

Research fires such as this one do much more than satisfy pyromaniacal fantasies visitors might harbor. FM Global's work has shown that pallets of aerosol containers for flammable products like spray paint can become veritable multiple rocket launchers when they burn. This is not merely of academic interest; in the 1970s, Kmart lost a building in Philadelphia to an aerosol-can fire

INHALING AN INFERNO
Suspended like a giant rocket nozzle over FM Global's large-burn lab is the world's largest "fire-products collector," also known as a fire calorimeter. Made from heat-resistant stainless steel, the collector here is positioned above a test platform and can whisk away the energy and smoke from fires lasting as long as 30 minutes. The system is equipped with sensors that measure heat, exhaust velocity, and smoke density at the rate of 240,000 cubic feet per minute—roughly the equivalent of all the air in an ordinary supermarket. After the gases are sucked up, a big electrostatic precipitator—a type of scrubbing equipment—cleanses the exhaust before releasing it into the atmosphere.



that quickly spread as if the place were under attack by incendiary bombs. After studying the hazard, FM Global issued the commonsensical recommendation that aerosol cans be stored in an area segregated by a floor-to-ceiling chain-link fence, with ample sprinkler protection.

Although fire is the biggest destroyer of commercial properties, severe weather wreaks its share of havoc too. FM Global's pneumatic debris cannon is a great tool for teaching hurricane-country clients why it's dumb to try to save a few bucks when boarding up a building in the path of an approaching megastorm. A two-by-four fired endwise at half-inch-thick plywood pierces the sheet like a diver's spear skewering a fish. Repeat the experiment with three-quarter-inch plywood, which costs a few dollars more per sheet, and the stud just bounces off. Any further questions about which grade of plywood will best protect your store or factory?

Hurricanes stress roofing materials to the limit and beyond. FM Global has a custom-built wind machine, powered by a V-10 Ford truck engine, that can generate a fierce 160-mph blast

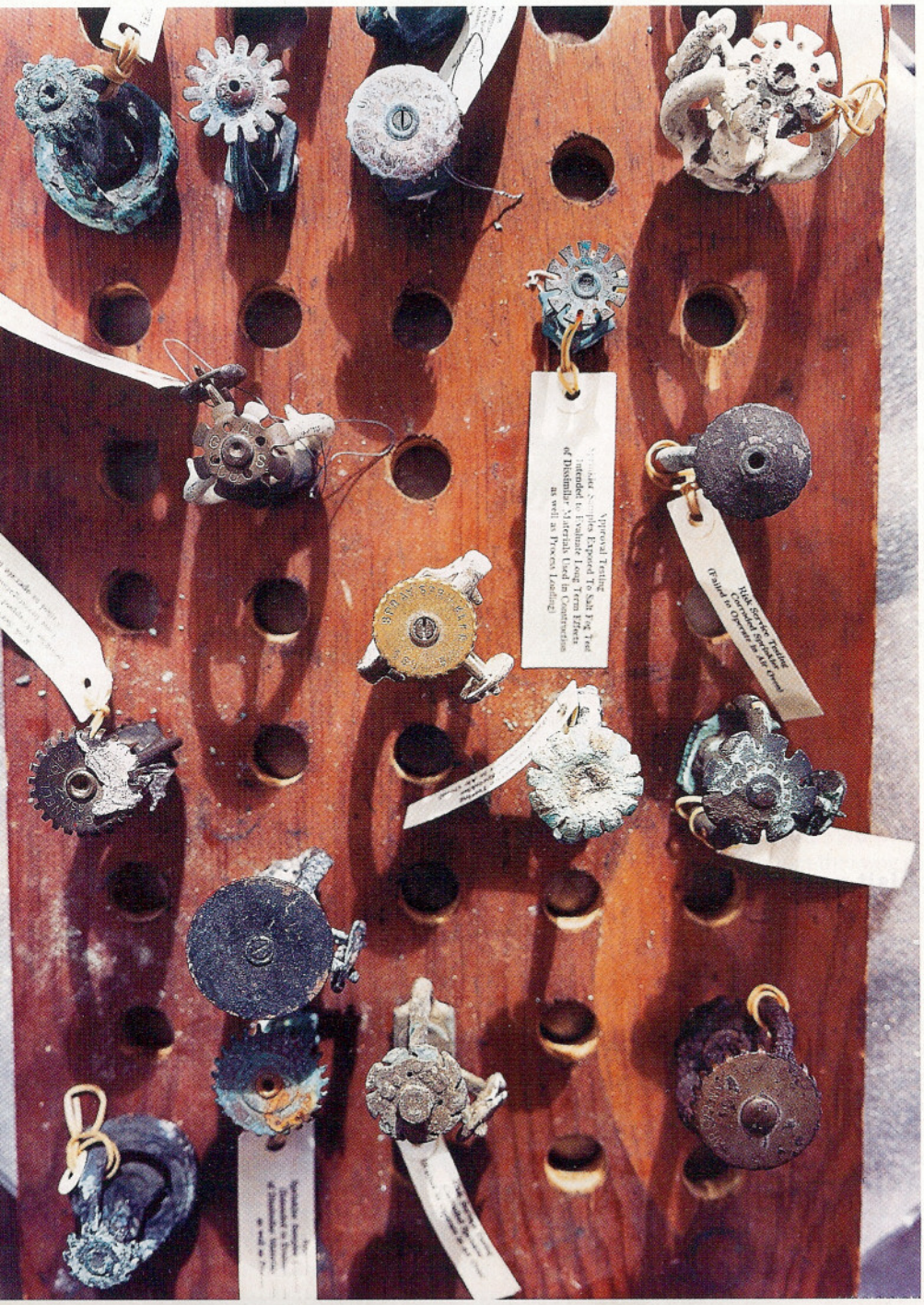
TOSS ME THAT TWO-BY-FOUR

Like a tantrum-throwing god, a hurricane can seize an everyday object and make it a fearsome projectile. A two-by-four flying javelin-like toward your building at 40 mph is typical of the perils in a 125-mph blow. A debris cannon powered by compressed air replicates the effect in FM Global's natural-hazards lab. Here an eight-foot two-by-four leaves the barrel and handily pierces a half-inch-thick sheet of plywood. The same two-by-four simply bounces off a three-quarter inch plywood sheet. FM Global's message to the businesses it insures in Florida: When you board up your windows, don't skimp.

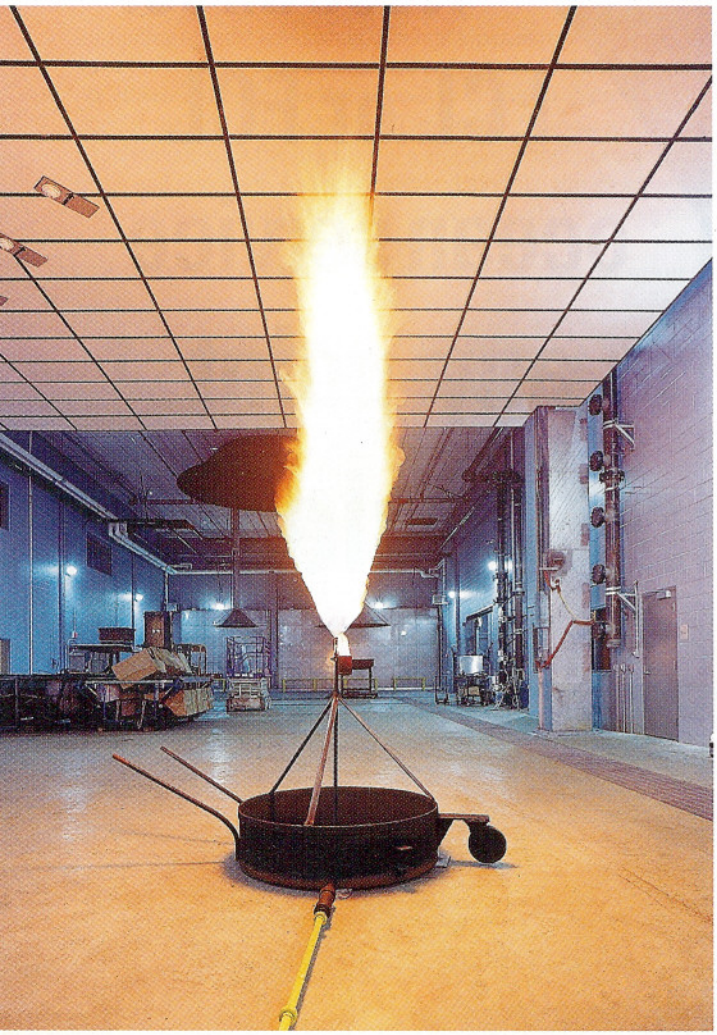
for finding out just how strong different types of roofs are. If you've got a building in Dade or Broward counties in Florida, for example, it needs shingles good for winds of 110 mph (60 mph will suffice for the rest of the country). During the "shingle uplift test," a technician aims the machine at a shingled panel of roofing material and revs it up. As the wind speed mounts, shingles begin to curl up and eventually depart the scene altogether. Roofing that's not up to snuff cannot hide from this machine.

A tip-off that FM Global is not your typical property insurer is the fact that the company has no actuaries, those number crunchers who calculate risks and premiums from statistical tables. Rather than just assume clients' risk in exchange for money paid in premiums, the company fields an army of 1,400 engineers who assess the properties of potential clients and help customers get rid of avoidable risks. The idea is that less risk saves everybody money.

Clients consult with FM Global's loss-prevention experts when putting up new buildings as well as when renovating older ones. One of these is the Hudson's Bay Co., a 334-year-old Canadian retailer



A GALLERY OF SPRINKLERS
Engineers gather more than 1,000 aging sprinklers a year from buildings belonging to FM Global–insured companies around the world. Studying the effects of corrosion and human stupidity are part of learning how to make fire-suppression hardware more reliable. The sprinkler head at top left is about a century old. The next one down on the left side was recovered during a fire investigation; painters had wrapped it in foil, then failed to remove the foil when the paint job was done, preventing it from spraying when a fire broke out. The one at top right failed a test after someone painted it. Part of FM Global's business is certifying the performance of "loss-prevention equipment," much as Underwriters Laboratories approves consumer and other products. The sprinkler head below bears both the UL and FM stamps.



FEELING THE HEAT
FM Global used this tongue of flame at the request of a heat-sensor manufacturer seeking certification of its products. Five of the sensors are mounted on a fireproof ceiling. The flame is fueled by heptane, a highly flammable liquid hydrocarbon. By measuring the responses of the sensors at increasing distances from the heat source, engineers gauge their sensitivity.

with more than 600 stores. "We have their engineers approve the structure of a building from the perspective of fire, flood, and earthquake protection," says Joe Hardy, risk manager at Hudson's Bay. "They help us with identification of risk. Who else out there has spent $78 million to do research on property conservation?"

Nobody, apparently. "There's nothing else of this scale in the insurance industry," says David Lucht, director of the Center for Firesafety Studies at Worcester Polytechnic Institute in Massachusetts. "It's astonishing to me that this is an insurance company, and not a government or a university. It is deeply rooted in FM Global's philosophy that engineering solves problems, and their research work is taken very seriously." F

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THE NAM / FORTUNE MANUFACTURING INDEX

Everything comes up roses

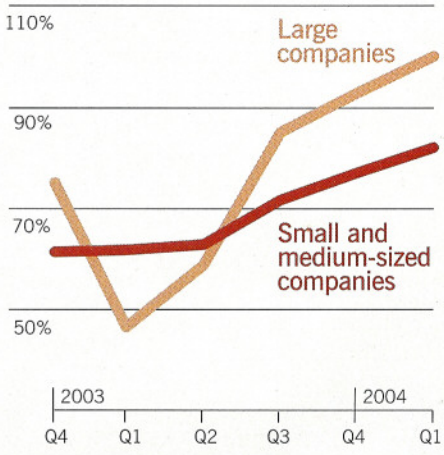
Manufacturers are taking a brighter view of the economy's prospects than they have in a while. According to the latest survey of 363 companies conducted in March by the National Association of Manufacturers and FORTUNE, they expect sales to increase sharply and pricing power to return. All that activity is expected to drive a new round of hiring, along with some moderate wage increases.

For the first time since the survey was conducted in 1997, 100% of the large manufacturers (those employing more than 1,000 workers) said they had a positive outlook. Business confidence had begun to improve in 2002 but then slumped in anticipation of the Iraq War. It has been increasing rapidly since the first quarter of 2003. Big companies expect sales to increase 5.9% over the next four quarters—the most bullish they've been since early in 2000. Small ones figure sales to rise 4.6%. Companies large and small plan to build inventory for the next 12 months—a rare occurrence.

As sales rise, manufacturers hope to claw their way out of deflation, with prices expected to increase between 1.1% and 1.7%. And hiring will bounce upward too. Large companies foresee increasing their headcounts by 1.5%—the fourth consecutive quarterly boost—while small ones could hike their payrolls by 1.9%. Add it up, and the manufacturing sector might generate 247,000 new jobs in 2004, giving the economy a welcome lift.

Outlook

Manufacturers with a positive business outlook



FORTUNE CHART