

The Experts Talk Sprinklers

Shelly Reese

In the world of fire protection, sprinkler systems have a reputation a bit like your father's Oldsmobile: reliable but unexciting. The sprinkler, which was introduced more than 100 years ago, has developed incrementally, and advancements have been more evolutionary than revolutionary.

However, progress has been steady. To discuss recent advancements—and the challenges that lie ahead for the industry—we asked a group of experts for their insights. What follows are excerpts from our conversations with them.

Kerry Bell, associate managing engineer at Underwriters Laboratories, Inc. (UL), in Northbrook, Illinois, has been involved in UL's fire suppression and research activities since 1976. He's a member of several NFPA 13, *Installation of Sprinkler Systems*, committees, including the Discharge Criteria and Technical Correlating Committees.

James Golinveaux is senior vice president of engineering at Central Sprinkler Corporation and a principal member of NFPA's Sprinkler System Discharge Criteria Committee. He's been involved in the fire sprinkler industry for 17 years, 9½ of which he spent working for an installation contractor before joining Central, where he's worked for the past 8 years.

Joseph Hankins, Jr., an engineering specialist in the standards division of Norwood, Massachusetts-based Factory Mutual Research Corp. (FM), has worked for Factory Mutual for 30 years and is a member of the NFPA 13 Technical Correlating and Design Discharge committees.

Brian Hoening is vice president of engineering for Globe Fire Sprinkler Corp. in Standish, Michigan. During his 25 years in the fire protection business, Hoening has worked for both UL and Central Sprinkler. He joined Globe in 1988 and is active on NFPA 13D, *Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, and 13R, *Sprinkler Systems in Residential Occupancies up to Four Stories in Height*.¹

Roland Huggins is director of technical services for the American Fire Sprinkler Association, Inc., in Dallas. As a fire protection engineer, he's been involved with sprinklers for 14 years and is a member of NFPA 13's Technical Correlating and

Discharge Committees.

Dan Madrzykowski is leader of large fire research for the National Institute of Standards & Technology in Gaithersburg, Maryland. He's chairman of the NFPA committee on residential sprinkler systems and of the NFPA 13 Technical Correlating Committee's task group on new technology.

Thomas Multer is director of Product Development at Reliable Automatic Sprinkler Company and an alternate member of the Sprinkler System Discharge Criteria Committee. He previously spent 21 years in contracting, design, sales, and management at sprinkler contracting companies and has been with Reliable for the last 6 years.

John O'Neill is a supervisory fire protection engineer with Gage-Babcock & Associates, an international engineering and consulting firm specializing in fire protection, safety, and security. Past chairman of the NFPA 13 Residential Committee, O'Neill now chairs the Technical Correlating Committee, which has jurisdiction for NFPA 13, 13D, 13R and 16, *Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*.

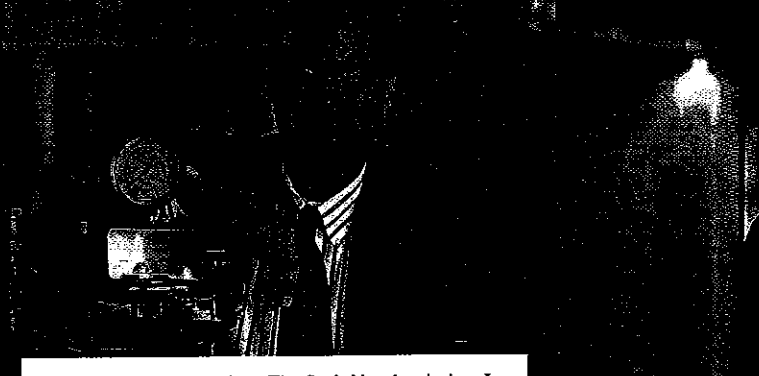
Donald Pounder is an engineering section manager at Grinnell Corp. in Cranston, Rhode Island. He's been heavily involved in the development of sprinklers, valves, and fire protection products during his 18 years at Grinnell and is a member of NFPA's Sprinkler Discharge Committee.

Peter Thomas is director of Product Engineering and Standards for Viking Corp in Hastings, Michigan. Thomas, who joined Viking in 1987, serves on NFPA 13's Correlating and Installation Criteria committees; on NFPA 15 Water Spray Systems Committee; on NFPA 230, Protection of Storage; and on the NFPA 909, *Protection of Cultural Resources*, and NFPA 914, *Fire Protection in Historic Structures* committees.

William P. Thomas, Jr., is manager of engineering research at National Loss Control Services Co. (NATLSCO), the Long Grove, Illinois-based engineering and consulting arm of Kemper National Insurance Cos. Past chair of the former General Storage and Rack Storage Committees, which are now part of NFPA 13, he's an alternate on NFPA's Sprinkler Design Committee.



Kerry Bell, Underwriters Laboratories, Inc.



Roland Huggins, American Fire Sprinkler Association, Inc.

What do you consider to be the single biggest improvement in sprinklers in recent years?

Bell: There's a much higher level of use specificity. Many of the new sprinklers being developed are designed to effectively fight fires in specific fire hazards and to make more efficient use of water. New sprinklers have been developed in the last several years for storage fire risks and for use in sloped-ceiling configurations, attics, and other combustible concealed spaces. Less recently, but in the last 20 years, sprinklers have also been designed for use in residential occupancies.

We expect this trend to continue into other areas. We're moving away from the old technology of standard sprinklers, where a sprinkler was treated as a commodity that could be installed to handle any type of fire risk.

O'Neill: The single biggest development—the fast-response link—occurred 20 years ago, but it continues to make an improvement in systems. The fast-response link allowed the development of the usable residential system and showed us that sprinklers can improve the life-safety function. In addition, manufacturers have been very creative in applying the fast-response link and unique deflector design. By merging these technologies, they've extended the coverage sprinklers can provide. That means a single sprinkler can cover a bigger area, allowing for fewer heads and bigger cost savings. The fast-response link has also helped to develop new sprinklers for storage hazards.

Huggins: Ours isn't a rapidly changing industry. Once we made the jump to early-suppression, fast-response sprinklers (ESFRs), we moved from the control mode to the suppression mode. That was a quantum leap, but it happened a good decade ago. And aside from that, we're not an industry of quantum leaps. We're one of steady improvements.

The most significant recent change has been the move to bigger orifices. Today's sprinklers, which have the big 3/4-inch orifice, provide far superior fire control than older sprinklers with the standard 1/2-inch orifice, even at the same density.

Golinveaux: Residential sprinklers are the single biggest improvement because they've brought life safety and fire protection to the home.

Why are these changes so significant?

Golinveaux: We've had sprinklers for warehouses and office buildings, and we're always working on better sprinklers to protect what's already being protected. But residential sprinklers have opened up new mar-

kets to provide life safety at low cost to the occupant or owner. And the result will be that eventually, people won't be able to afford to build a single-family home *without* automatic sprinklers. The industry should get to the point where it's more economical to provide sprinklers than all other things it would have to provide for fire protection—smoke and heat vents, fire-rated walls, egress, building separation, height requirements, and construction materials.

Multer: ESFR sprinklers allow storage of different commodities in different arrays in warehouses without having to upgrade the sprinkler system, and they eliminate rack sprinklers in the majority of applications, which gives the building owner a lot more flexibility in using the space.

Bell: Specialization is ultimately going to enhance the level of protection for various fire risks. Some of the specialized products that have been developed in the last few years can be installed at a lower cost than the older products.

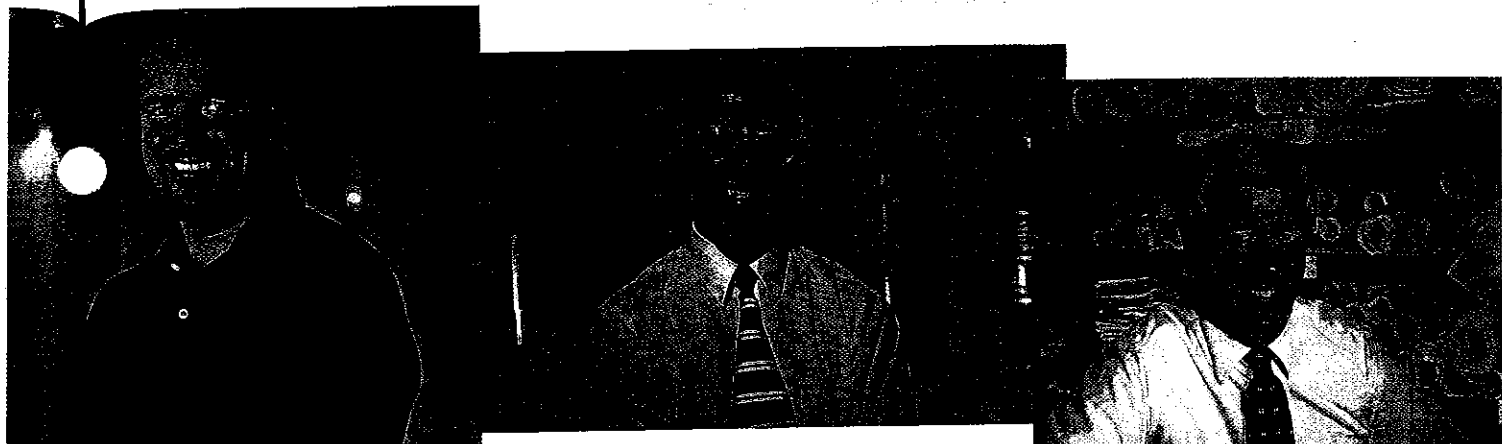
W. Thomas: More and more fires will be put out by one, two, or three sprinklers. That means less fire, smoke, and water damage. And more systems will be installed because corporations are more willing to spend money for the smaller costs of the systems.

Do you think that focusing on making solutions more economical might shift attention away from making them more effective?

Hankins: Reducing costs is certainly an important and valuable thing. But it's dangerous to make reducing costs your primary goal. You may save small dollars on the original costs but erode safety factors against unforeseen occurrences or limit future flexibility in terms of the system that's being put into the building.

There can be win-win situations, but often there's pressure to cut the margins of safety to absolutely minimize the designs. You have to be careful. It's great that we can provide more cost-effective solutions, but cost-effective and cheap aren't the same thing. Nobody buys sprinklers because they want to. They buy them because someone makes them. It's like car insurance: People are tempted to go out and find what the state requires, then get the minimum because they don't plan to have an accident. But if they do have an accident, they wish they'd paid a little more and gotten something better.

Multer: I agree. It should be a motto we put on our wall. Some people are looking at ways of putting in fewer sprinklers which could, in some cases, save money, but also could fail to provide the same level of protection.



James Golinveaux, Central Sprinkler Corp.

William P. Thomas, Jr., National Loss Control Services Co. (NATLSCO)

John O'Neill, Gage-Babcock & Associates

Hoening: I don't think any of us wants to see a lessening of protection, so when we look at cost savings, we do it within the goal of providing equivalent or better protection than we have now. One example is the extended-coverage, ordinary-hazard area. Instead of having a sprinkler every 10 feet, we can now have one every 20 feet. It requires a larger-size pipe, so it's not a full 50 percent cost reduction, but there are some savings in terms of material and labor.

Sales are the bottom line for manufacturers. If you can't sell and make a profit from a product, it's not something you're going to manufacture. But, at the same time, we think we're developing a better product and giving more protection to the community.

As for safety, we've run more full-scale testing in the last 10 years than we did in the previous 50 years, and that's probably true of all the manufacturers in this business.

O'Neill: My experience is that the participants who help fund these advancements take a long-term view of reduced costs and better protection. They're not separate objectives.

W. Thomas: In some ways, it's just the opposite: Reduced costs and better protection go hand-in-hand because the competition to develop economical systems leads to increased research.

On the other hand, I worry about the lower pressures approval agencies are allowing. They're requiring fewer safety features. When you do that, it doesn't take as much for obstructions or a change in occupancy or a change in the configuration to negate the system. And the cost difference of building in more safety factors isn't so large that it would justify the risk involved.

What applications—residential, commercial, industrial, storage, etc.—benefit most from these advancements?

P. Thomas: The fast-response sprinkler was developed from the residential sprinkler and into the suppression-type sprinklers like the ESFR. It allowed extended coverage both in light- and ordinary-hazard occupancies so the development of fast-response sprinkler technology was transferred into many different occupancies.

Pounder: The water mist-type systems are finding new applications. People call almost every day with the need to protect a new application, whether it's a fiberboard manufacturing plant, power generation equipment, cable tunnels, or cruise ships. Applications are really opening up.

Huggins: General storage. Industry has always been heavily protected. They've always recognized the need for a lot of fire protection, so the

advancement in devices seems to have centered on warehouses. That sector is having the most advancement in applications.

Golinveaux: Beyond residential, one of the areas benefiting significantly is insurance. In today's environment—with automated storage facilities, major distribution centers, and big box stores—a fire that's not quickly controlled and suppressed by automatic sprinklers isn't acceptable. We know how to control those fires. Now we need to advance quick suppression so that business interruption and smoke damage are held to the absolute minimum.

Where do you see the next big innovation coming?

Multer: Probably the market that could grow the most is the residential market. Like it or not, we're probably going to see multipurpose systems in homes. There's a hesitance among sprinkler contractors who feel it's going to be a system installed by plumbers. It might be the opposite—that more sprinkler contractors end up doing the plumbing.


Madrzykowski: Computer models are now being developed that enable us to get a very high resolution so we can study the inside of a building in much more detail. They allow us to predict not only the first sprinkler head's activation, but the activation of other sprinkler heads, too, so that we can predict with some degree of confidence the activation of the other sprinklers.

Instead of running a number of physical tests for \$30,000 or \$40,000, we might be able to run models for \$10,000 or \$20,000, then run a couple of physical tests. With the right tools, we can do a lot more exploration and potentially get new technologies to market sooner.


Do you consider modeling a tremendous breakthrough?

O'Neill: I'm not sure it's a *breakthrough*, but it's an area worth giving a lot of attention. We're doing significant work that will enable us to better predict fire behavior in the absence of doing full-scale fire tests. It's a developing tool—one that's significantly challenging because the variables are extensive.

Golinveaux: I support it and believe that maybe in 5 to 10 years, it will be an active part of the sprinkler industry. In the meantime, it's relegated to laboratory environments. Fire modeling makes generic assumptions about fire growth, but in the real world, we see differences in fire behavior from one day to the next, even in fires we believe we have control over. Fire is a living beast and to model it at this point is



Dan Madrzykowski, U.S. National Institute of Standards & Technology



Thomas Multer, Reliable Automatic Sprinkler Company



Donald Pounder, Grinnell Corp.

a great stride, but it's very early. I don't believe we understand enough about real-life mixed commodities to model them. Maybe we understand plastic or cardboard, but when you get a toy inside a foam package inside a cardboard box inside another box, and the toy itself may be made of gel or styrofoam, then that's a real-world challenge I don't know we'll be capable of modeling within the next five years.

Are there additional developments on the horizon?

Hankins: In the early stages of the development process, you make great strides with minimal effort. But, as time goes on, the strides get shorter, and the effort gets harder. Most progress in developing new technology is going to be narrowly focused, and we're not going to see such striking gains.

In 1987, we could protect storage up to 25 feet high with ceiling sprinklers. Since then, the technology has advanced to the point where we can protect storage up to 40 feet high without in-rack sprinklers. I don't think we're going to move much beyond that.

P. Thomas: I think we have to develop economical protection for 50-foot and greater building heights. We also have to take a look at what we're doing with sprinkler obstructions. There will have to be new products where obstructions don't hinder sprinkler performance as much as they have in the past. You're probably within five years of some of these developments.

Pounder: Where storage sprinklers are concerned, I think we'll continue to see developments in larger orifice sprinklers, lower-pressure sprinklers, and sprinklers that perform better under field conditions. One problem is obstructions to flow in certain field operations. We're looking for solutions to potential flow obstruction problems.

There's some uncertainty in the residential sprinkler area right now because the UL residential fire test (UL 1626) is undergoing major revisions by both UL and FM. There's a possibility that the test will change, so we—and, I think, all manufacturers—are watching to see what they are. After that's been settled, you'll see more opportunity for new products.

Madrzykowski: We're working on enabling technologies, trying to develop a particle tracking system, and developing better user interfaces to improve modeling performance.

Hoening: If we could find a relatively cheap way to make an on-off sprinkler, that would be a major breakthrough. The ones on the market now sell for \$50 to \$75. The goal is to develop a \$10 sprinkler and make water damage as obsolete as fire damage, but we're not sure the technology or combination of technologies is out there to achieve it.

Also, current codes on home sprinklers don't require an alarm, so if nobody's home and something sets off a sprinkler, it can flow for hours. We'd like to see the codes require alarms on residential systems.

O'Neill: I see big innovations in protecting high-challenge and storage-type hazards. We're going to see more efficient protection, protection for more types of hazards, and further development of sprinklers that work in life-safety and commercial areas where decorative finishes are important.

Bell: There will be continued research into the protection needed for storage-type applications. The data available are limited, and the fire risks are changing very rapidly because of product construction changes and how they're packaged. A recent example in the retail industry: Many retailers are displaying packaged products in rack storage configurations rather than individual products placed on shelves.

So you're saying you have to keep up with everybody else's technology?

Bell: Exactly, and that's a moving target. Further research in these areas will help keep us on the leading edge of what's going on in the world—and that's a challenge.

What other challenges does the industry face?

Pounder: In the 1950s, a sprinkler cost a little over \$2. They actually cost less now than they did 40 years ago. So the challenge for manufacturers is keeping costs down while developing new, effective products.

Multer: Speaking as a manufacturer, there's a cost issue on the product. We're essentially selling product today for less than it sold for when I came into the business more than 26 years ago. The pricing doesn't reflect the cost of new product design, approvals, and manufacturing quality controls. We're offering life and property protection that lasts 50 years for the price of a tube of toothpaste.

Hoening: Needless to say, continuing education is needed from all standpoints so that more fire protection systems, not just sprinklers, are installed. We need to get the lay person, as well as the owner, to feel that he or she has accomplished something in protecting his or her property, rather than having someone say, "I did it because the insurance company said I have to do it."

Golinveaux: I think there are much more severe fire loads out there than we're accustomed to that challenge us when determining fire loads. We tend to use one-word descriptions of fire types, like "mer-



Joseph Hankins, Jr., Factory Mutual Research Corp.

Brian T. Hoening, Globe Fire Sprinkler Corp.

Peter Thomas, The Viking Corp.

cantile," but some mercantile occupancies out there can store nasty stuff. Eventually, a challenge will be establishing sprinkler design guidelines based on real fire load, not just the one-word description of the occupancy.

Huggins: I see a couple of challenges. Getting sprinkler systems into residences, particularly one- and two-family residences, is a challenge. Right now, they're typically not put into homes unless there's legislation that says owners must have them.

Another problem revolves around the reliability of systems. We have to ensure reliable operation of the system, [but we have to do so] without the owners incurring unnecessary costs. Right now, building owners are looking at NFPA 25, *Water-Based Fire Protection Systems*, which governs systems maintenance and saying, "That's the contractors' retirement fund." They're not really looking at it as a means to ensure reliable operation of their system.

A third challenge is improving piping integrity and the life span of the system. We've had the luxury of ignoring problems caused by corrosion because sprinkler systems are stagnant. But we can't ignore it any longer because of MIC (microbiologically influenced corrosion). If MIC is in the water, it has to be treated. That's going to be part of the '99 version of NFPA 13. A second challenge is determining the life span of the system. Now that we have things like MIC entering the picture, we're just starting to think about the life span of the system. We've traditionally assumed a system will last as long as the building, and that's not a good assumption. The industry is moving toward thinner and thinner pipe. Why should we assume it will last as long as the building?

P. Thomas: The first thing that comes to my mind is domestic sprinklers and trying to get more installed in homes, not only in America but around the world because that's where the majority of fire deaths occur. Although they were developed in the late '70s and early '80s, the residential sprinkler market is still a very young market, and we need to be able to promote the systems and get them installed in more single- and multiple-family dwellings. I think a lot of that requires promotion. Mr. and Mrs. Joe Homeowner aren't aware that sprinkler protection for their homes is an option. We have to not only promote the systems but work on development and make sure the right products are available.

Second, there's much information about sprinkler performance that has yet to be tied together. There's a lot of fire test data on sprinkler performance that might not be available to NFPA technical committees for years after the tests have been conducted. If there was a central location for maintaining test data the interested parties

could fill protection gaps by further testing or extrapolation of existing test data.

How should the industry approach these challenges?

Huggins: By introducing MIC into the standard, we're saying, "Hey, you have to treat it." The next big step will be saying, "How do you treat it?" One goal of NFPA 13 is to try to answer that question. We don't have the answers yet, but just having it in the standard focuses attention on the issue. We've opened the door, now we've got to decide what to do about it.

Hankins: The people who pay for sprinklers generally don't want them and don't make the decision about what they buy. There needs to be a shift in attitude. The sprinklers have to be more attractive, and the people who get them have to be made more aware of just what they're getting for their money. There's a huge need to educate people. Most people think a sprinkler is a sprinkler. They only know about sprinklers from what they see in the movies. The misinformation is appalling.

W. Thomas: Management tends to do away with those things that aren't directly related to the manufacturing process. A lot of times, that means maintenance and housekeeping. We've got to show them that if they don't maintain a sprinkler system and they have a loss, they're not going to get the full amount of the loss from an insurance company, and they're going to lose customers.

That means educating them, but it's a hard sell. Management moves around a lot nowadays. They have to make an immediate impact. They're under tremendous pressure to make profits. If they don't, they're gone, and that affects how much they're willing to spend on sprinkler systems. Getting them to invest more and maintain sprinkler systems is hard because it doesn't affect the company immediately. It may never affect it at all.

Hoening: It's always hard for any one individual to make a difference. NFPA, the National Fire Sprinkler Association, and the American Fire Sprinkler Association are working together to educate people. They did radio spots extolling the benefits of residential sprinklers. More cooperative efforts like those would be helpful. As more people get involved, the word gets passed faster and farther.

Water's still water. We really haven't come up with anything that works much better. ♦

Shelly Reese is a Cincinnati-based freelancer and a frequent contributor to NFPA Journal.