Building and fire codes have shifted during the last 30 years or so to an increasing reliance on fire sprinklers for the protection of lives and property from the ravages of fire—and away from a reliance on fire-resistant construction and compartmentation.

Much of this shift can be attributed to the economics involved—fire-resistant construction and sprinklers each add to building costs. Initially, the addition of sprinklers was met with resistance because of the added cost. However, proponents of sprinklers were able to favorably report on the performance of their

**Making the Case for Balanced Design—**

**Why Sprinklers Alone Are Not Enough**

*By Lee G. Jones*
product, so they also were able to advance the idea that by reducing the amount of fire-resistive construction and its associated costs, sprinklers would become more affordable.

No one will argue that when sprinklers perform as intended, they are invaluable to the protection of property and lives. Similarly, no one will argue that when the sprinklers fail to operate, they are worthless. What is a matter of debate is how reliable sprinkler systems really are. Virtually every claim extolling the efficacy of sprinklers includes the qualifier, “Properly installed and maintained.” Assuming these are the prevailing conditions, the sprinkler industry and its proponents have successfully made the case that sprinklers are somewhere between 96 percent and 99 percent effective.

But there are some major problems with accepting this premise at face value.

**Where’s the Proof?**

Maintenance of sprinkler systems is not always mandatory. Inspections may be done “in house,” depending on who’s requiring the maintenance—and such inspections are not foolproof.

We do not have reliable statistics on how frequently the nation’s sprinkler systems are inspected and maintained, or how many systems fail their inspections before maintenance is performed. Even when inspected, sprinklers do not always function as intended.

After a Brooklyn apartment building fire killed three firefighters, *The New York Times* reported on Dec. 20, 1998, “The Fire Department checks the sprinklers every five years, and last did so in 1996. The Housing Authority is supposed
to conduct monthly checks of the system.”

Also, a March 26, 1996, article in the *San Francisco Chronicle* reported that only 14 percent of the local 2,276 fire and safety violations—including sprinkler infractions—from the previous year had been corrected.

All the data that have been collected about the success or failure of sprinklers in the United States have been offered voluntarily and sporadically by the firefighting community, and is therefore incomplete. An August 2001 U.S. Government Accounting Office report, GAO-01-879, “Fire Safety - Comprehensive Information of Incidences in Federal Facilities Is Lacking,” states that there are insufficient fire incident data to make proper recommendations for federal fire safety measures: “The federal government has no comprehensive, centralized database regarding the incidence of fires in federal facilities or the causes of such fires. As a result of a lack of centralized data collection and reporting systems, relatively little assurance exists that the government has sufficient knowledge of the number and causes of fires in federal facilities to take appropriate action to protect federal employees from the threat of fire.

For example, the Omega fire sprinkler system that failed in numerous locations and in laboratory tests as early as 1990 was not recalled until 1998 and has
only recently been replaced at some major government facilities, such as the Smithsonian and the Library of Congress.”

The report also explains that the National Fire Protection Association, the body that publishes industry cited figures on fires, obtains its data from the National Fire Incident Reporting System, a national database through which local fire departments report annually on the numbers and types of fires that occur within their jurisdictions, including the causes of those fires. Reporting, however, is voluntary; according to the U.S. Fire Administration, this results in about one-half of all fires that occur each year being reported.

**More Problems With Sprinklers**

Several issues have come to light in recent years that suggest these systems are not without their weaknesses. The U.S. Consumer Product Safety Commission issued three press releases between August 1999 and October 2001 announcing its efforts to have 67 different models of sprinkler heads recalled, totaling more than 37 million sprinkler heads. The reported manufacture of these sprinkler heads dates from 1961 through 2001.

Also, there has been an increase in the occurrence of Microbial Induced Corrosion that can completely disable a sprinkler system. MIC first reveals itself as pinhole leaks in the supply pipes to the sprinklers. These pinholes are the result of several types of bacteria that have attacked and corroded through the interior of those pipes, rendering them incapable of delivering enough water for effective sprinkling, and providing enough loose material to clog the sprinkler heads. This is yet another reason why sprinkler systems need to be tested on a regular basis.
An investigation of an April 30, 1998, fire in a nursing home in Lamoni, Iowa, indicated the total failure of the sprinkler system. The system’s branch line was severely corroded and partially plugged due to MIC. According to Iowa State Fire Marshal Roy Marshall, further testing of sprinkler systems in healthcare facilities revealed that one-third of all systems had some degree of MIC.

**Human Error?**

To err is human, and sometimes it is the human element that is to blame for sprinkler system failures. People have been known to leave water valves closed, paint over sprinkler heads and put objects between the sprinkler and the potential burning target, increase the fuel load beyond the design capacity of the sprinklers, and move around walls that create unsprinklered areas incompatible with the designed dispersion pattern.

*The New York Times* article mentioned earlier explains: “Crucial valves in the sprinkler system at a Brooklyn apartment building where a fire killed three firefighters on Friday [Dec. 18, 1998] may have been closed for years, perhaps even since the building was built in 1983, city officials said yesterday. They said the sprinklers in a twin building were also improperly shut down.”

More recently, *The Baltimore Sun* ran an item on Feb. 4, 2001, with the following: “The folders on top of the cabinets in the
Howard County Circuit Court file room reach so high they almost brush the sprinklers—a clear violation of fire codes.”

Anecdotal evidence also shows that arsonists who fail to burn down targets due to the presence of sprinklers have later succeeded by disabling those systems. With the recent spate of terrorist attacks, this becomes an even more ominous threat.

**Too Much, Too Soon**

Even when the sprinkler system is working properly, a fire with a larger than expected fuel load can overwhelm it. On Aug. 23, 2001, the *Los Angeles Times* reported, “The Palomar Hotel fire in Hollywood was caused by an arsonist who spread 40 gallons of gasoline throughout the building . . . Fire officials said fire prevention equipment such as sprinklers were functioning but were overwhelmed by the speed and size of the fire.”

*Faulty Water Systems Blamed in Delta Hotel Fire,* explains that neither the standpipe nor sprinkler systems functioned due to lack of water in the system.

Clearly, relying solely on sprinklers for fire protection can result in unnecessary
death and destruction. Long before the sprinkler was invented, fires were contained using compartmentation and fire-resistant construction.

Fire-resistant construction consists of materials like plaster, gypsum board, masonry, steel doors and dampers, fire-resistant sealants, fire-resistant glass and many others. Fire-resistant construction is also used to protect the structural steel in steel buildings by preventing the steel from overheating and collapsing due to a fire. The premise of relying on such construction for fire protection is that when a fire occurs, the heat, flames and smoke will be confined to the place of origin long enough for the occupants to escape, for firefighters conduct searches and rescues, and for the fire to be extinguished manually, if need be.

The proponents of balanced design fully support the use of sprinklers as an element of fire protection. The Association of the Wall and Ceiling Industries—International and the members of its Fire Safety Task Group believe that good people with the best of intentions—building code officials, the firefighting community and the design community—have accepted a very compelling argument based on incomplete or carefully selected data. Thus, that acceptance of this argument has led to an overreliance on sprinklers instead of a balanced approach to protection against the loss of life and property. Overreliance on sprinklers will eventually result in catastrophic fires that could have been mitigated or prevented by using a balanced design of both sprinklers and fire-resistant construction.

About the Author
Lee G. Jones is AWCI’s director of technical services. Contributing to this article were the members of AWCI’s Fire Safety Task Group: Bill Carter of E.L. Crane & Sons, Inc.; Liam Coakley of C.J. Coakley Co., Inc.; Jim Hagen of Fireproof Coatings; Kevin Larson of Olympic Wall Systems; Ron Prescott of Haas Insulation; Amal Tamim of W.R. Grace and Kathleen Taraba of Rolling Plains Construction/One Source Firestop.