SPRINKLERS AREN’T ENOUGH

Real Fire Safety Comes From Balanced Protection in Which Sprinklers Are Used in Conjunction With Other Proven Systems.

By Robert A. Wessel

The gypsum industry has been a long-time supplier of materials and systems designed to improve the fire safety of the buildings in which all live and work.

Fire safety has also been the concern for many years of ASTM Committee C-11 on Gypsum and Related Building Materials and Systems, which establishes standards for gypsum materials used in fire resistive construction. Many of the standards developed by C-11 have been referenced by the model building codes as well as many state and local codes. One of the primary purposes of standardization is to ensure the safety of product users.
The U.S. has one of the world’s highest fire death and property loss rates. Thus the author says it is “unreasonable to... (remove) backup systems from building codes... to help pay for automatic sprinklers.”

Such is the case with gypsum products, which are used to build fire resistive enclosures, compartments, and corridors, providing a wall and ceiling finish with low surface burning characteristics.

Any erosion of fire safety requirements is a concern to this committee and everyone interested in fire safety. Therefore, recent developments in the U.S. building and fire codegroups that appear to move in a direction counter to this effort affect both of the above groups. Reference is made specifically to sprinkler trade-offs, the practice of underwriting the cost of installing automatic sprinklers by trading-off other fire safety features, such as fire resistive construction.

Just what is happening? The United States has one of the highest fire death rates and property loss rates in the world. It seems unreasonable to increase risk by removing safeguards and backup systems from building codes in an effort to help pay for automatic sprinklers. The claim that sprinklers can help reduce fire losses has never been disputed, but these reductions should not be achieved by destroying...
the integrity of the building code.

**Balanced Protection**

People have a right to expect the most complete fire protection available. This protection is achieved when all facets of fire safety are combined into a well-rounded program. Such a program includes measures to prevent fires in the first place, to detect those fires that do occur, to suppress fires that are detected, to contain those fires not suppressed, and to provide an escape for the occupants of the building through passages designed to ensure safe egress. This combination of prevention, detection, suppression, containment, and evacuation is called balanced protection. If one of these systems fails for any reason, the others had better be present.

To control fires in large buildings it has been the practice to divide the building into fire compartments using fire resistive construction. It was recognized that other, supplementary, measures could be taken to further ensure the safety of building occupants. Automatic suppression systems were welcomed with open arms as one of these measures.

In the 1970s, the Gypsum Association was joined by other industries, including the sprinkler industry, in producing a film emphasizing the importance of balanced protection. Now, in order to help finance an automatic sprinkler system, other elements of balanced protection are being traded away. This means that if the sprinklers do not put out the fire, the other elements are not there as backups.

Sprinkler trade-off proponents frequently quote high percentages of successful performance by sprinklers. Yet an examination of these statistics reveals a number of reasons for classifying a building as unsprinklered even though it contains sprinklers: the fire started in an area that did not have sprinklers; the fire spread in a concealed space; the building use had been changed; there was no water supply; and the like.

The real point is this: The sprinklers did not do what sprinklers are supposed to do—put out the fire.

A recent article appearing in the *U.S. Fire Sprinkler Reporter* paints a very graphic picture of the causes of sprinkler failures, dividing these causes into “preven-

“Sprinklers can be used to reduce fire deaths, but they must be used in conjunction with other time tested systems if they are to achieve this goal.”

The author suggests “sprinklers do not always work” and cites a study in which 49 percent of failures were caused by lack of water, 23 percent by faulty design, 12 percent by the characteristics of the fire, and 9 percent by inadequate maintenance.”
table” and “unpreventable” failures. According to this article, there were 3,147 failures included in the study, 82.5 percent of them classified as preventable. Maintenance and service related deficiencies were responsible for 1,678 of these preventable failures, while the remaining preventable failures were caused by such factors as “partial protection, inadequate water supply, frozen system, slow operation, faulty building construction, and antiquated system.”

It is very distressing to recognize that a sprinkler system, which could fail, has been installed in the high-rise that can now be built without adequate areas of refuge. This is even more important now that the federal government has legislated provisions to make the upper floors accessible to persons in wheelchairs, which cannot be evacuated safely down a stairway.

The closest thing that the Gypsum Association has seen that gives an indication of types of failures was an article in the January/February 1987 issue of Fire Journal. This article gives a breakdown of the reasons for failure without addressing the question of how many total failures are involved. It was reported that 47 percent of “unsuccessful performances” were a result of human error—water was shut off in 34 percent of the incidents, inadequate maintenance was a factor in nine percent, and water distribution was obstructed in four percent. Another 23 percent of the unsuccessful incidents were a result of design limitations—only partial coverage in eight percent, the hazard exceeded the design in eight percent, faulty building construction existed in five percent, and antiquated systems were involved in two percent of these incidents.

An additional 12 percent of the unsuccessful performances are attributed to special characteristics of the fire, seven percent involved explosions, four percent involved a fire that began in a normally inaccessible place, and one percent resulted from a fire that began outside of the building and over-powered the system. The remaining failures are a result of “other reasons” of which 11 percent were identified as having an inadequate water supply. The sprinkler industry, therefore, should be well aware of the fact that automatic sprinkler systems do not always work.

On the other side of the coin is the track record of successful performances. The report of successful performance ranges from a high of 99.75 percent to a low of around 85 percent, depending on which study is used. The proponents of economic tradeoffs are always ready to talk about the 99.75 percent performance rate. This comes from a study conducted in Australia. The problems here are the differences between Australian and American codes. In the first place, Australia does not permit the trade-offs being promoted in the United States, and secondly, Australia requires by law a weekly inspection of the automatic sprinkler system. This is exactly the safety margin that is being eroded from U.S. building codes.

The statistics available are confusing at best. They are incomplete and not well-defined. The Gypsum Association has not yet found any source that will specifically define the parameters of what constitutes a successful sprinkler performance or what constitutes a failure.

Very few will challenge the fact that sprinklers can be a very valuable tool to add to the existing arsenal of fire safety provisions in building codes. Sprinklers can be used to reduce fire deaths, but they must be used in conjunction with other time tested systems if they are to achieve this goal. If these other systems are traded off, should the building then be completely evacuated whenever the sprinklers are deactivated for any reason?

Good fire protection can only become a reality when it is realized that a balance is required between the various methods of providing for detection, suppression, containment, control systems, rehearsed evacuation planning, and fire services. Each of these components of fire protection serves to enhance the performance of the others. Fires are caused by a variety of complex factors. It would be nice if simple solutions existed. They do not.

No single system should be asked to stand alone.

Reprinted by permission from the July 1988 ASTM Standardization News.

References