

When Detection's Not Enough

by Dean K. Wilson, P.E.

***Question:* I work for a very large residential development firm. We build large tracts of semi-custom high-end homes. Lately, I've been hearing about a new requirement for residential sprinklers in one- and two-family dwellings. Since we build single family homes in a variety of states, I'm trying to understand what's going on with this new requirement and what advantages residential sprinklers may have to the smoke alarms already required. Can you help me?**

Smoke alarms, installed and maintained in accordance with the requirements contained in NFPA 72-2010, *National Fire Alarm and Signaling Code*[®] and its precedent documents, have long played an important role in alerting occupants to the presence of a hostile fire in the hope that they will have an opportunity to safely escape before they receive injuries or experience the loss of their lives. Thus, the provision of smoke alarms has become a standard and widely accepted practice among homebuilders, such as the company you represent.

At the same time, you must understand that smoke alarms, in themselves, do nothing to prevent the spread of fire, or to make the escape route safer during a fire. Depending on what's burning, a fire can still spread so rapidly that a residential occupancy may become untenable before occupants in all part of the dwelling can safely escape. Because time always stands as one of the most critical factors in escaping from a burning structure, any protective element that can extend the safe escape time has great merit.

The International Code Council, in the *International Building Code-2009* and *International Residential Code-2009*, introduced a requirement for residential sprinklers in all one- and two-family dwellings, effective January, 2011. Many builders organizations have opposed this requirement, citing the additional cost during this time of economic downturn. Before we consider the validity of the requirement or the opposition to it, let's look at the technology itself.

Automatic sprinkler protection has served large industrial complexes well for over a century. The efficacy and efficiency of properly designed, installed, and maintained automatic sprinkler protection remains unquestioned. In the late 1960s and early 1970s, following some horrendous fire loss experience, research began to determine if automatic sprinkler protection could become available—in a cost-effective manner—for residential occupancies. Out of this research, engineers created the Fast Response automatic sprinkler head. Some jurisdictions have required one- and two-family dwellings to have residential sprinklers for over 25 years.

To understand the relative value of Fast Response technology, as applied to residential sprinklers—Fast Response technology has also become available for use in other types of occupancies under special circumstances—you must first understand the relationship of time and fire development to the actuation of a standard sprinkler head.

As a very arbitrary rule-of-thumb, using ordinary-temperature-rated, standard automatic sprinkler heads in an occupancy, with a smooth ceiling height of no more than 10 to 12 feet above the floor. that contains a moderate load of ordinary combustible materials, the sprinkler head closest to the fire will operate in about two minutes when subjected to a body of fire roughly the size of a six-foot-tall person. Now this rule-of-thumb has many potential intervening variables that could invalidate it in any given application. But, it still gives people, who have never seen a sprinkler operate, a rough idea of the amount of fire and the time factor involved.

Such standard sprinkler heads have a Response Time Index (RTI) of greater than 80 meter-seconds^{1/2}. This value comes from a calculation following a test of a particular sprinkler head at a nationally recognized testing laboratory where an apparatus plunges the sprinkler head into a stream of hot air. In contrast, a Fast Response head, such as the one used in residential occupancies, must have an RTI less than 50 meter-seconds^{1/2}.

Given the same fire challenge, a Fast Response residential sprinkler head will operate significantly faster than a standard sprinkler head. Thus, once residential sprinklers operate, they begin to control the fire, hold the fire to the area of origin, maintain the relative safety of the escape route, and materially aid the occupants in their escape.

Of course, installing residential sprinklers does not replace the value of residential smoke alarms. The smoke alarms will often provide significantly earlier warning and grant the occupants more time to escape. At the same time, as a builder of homes, you must understand that the smoke alarms by themselves do nothing to prevent the further development and spread of the fire.

The best solution, in my opinion, exists in a combination of smoke alarms and residential sprinklers. Some will say the cost becomes excessive. However, adding residential sprinklers only increases the cost of new construction of a high-end home by a few thousand dollars. Even if the new dwelling is built in an area without a public water supply, the addition of an approved pressure tank to supply the residential sprinklers is well worth the slight additional cost. For more modest homes, the cost of providing residential sprinklers reduces accordingly.

I would urge you to become very familiar with the information provided by the National Fire Protection Association at <http://www.fire-sprinklerinitiative.org>. This site has a wealth of data, including videos of actual fire survivors. It also provides comprehensive information regarding the cost of residential sprinklers in new construction.

In providing an excellent level of fire protection, whether in a residential occupancy or a commercial occupancy, it should not become a question of “either sprinklers or fire alarm.” Rather, truly excellent fire protection comes from “both smoke alarms and residential sprinklers.”

IMSA member Dean K. Wilson, P.E., FSFPE, C.F.P.S., now retired on disability, formerly worked as a Senior Engineer in the Erie (PA) office of the fire protection engineering and code consulting firm, Hughes Associates, Inc. (www.haifire.com). The opinions expressed in this article are strictly his own. You may reach him by e-mail at deanwilson@roadrunner.com or by telephone at 814-397-5558.