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## The Economics of Residential Fire Sprinkler Systems

Every decision a fire chief makes costs somebody something. On the fire ground, a decision to write off a building is actually an economic decision. It could be based on the relationship between the cost of losing a building compared to the cost of a human life. That type of decision is easy to defend. Not so easy to defend are the decisions a chief makes in requiring built-in fire protection that costs thousands of dollars and might not be called upon to work for years.

Typical of this dilemma is the current discussion surrounding the use of residential fire sprinkler systems. As in most controversies, various positions are being defended by proponents and opponents of the concept. Everyone seems to agree on the first premise: sprinklers do put out fires.

On the second premise – economic viability – there is much debate. Some say residential sprinklers should be used to save lives and property as a moral act; others say the systems just cost too much.

How does this difference of opinion affect a fire department manager's policy decision? Not unlike most dilemmas, the solution to this one probably falls in the middle ground. Somewhere among the facts and figures on costs and benefits of installing residential sprinkler systems lies an answer.

The purpose of this article is to discuss some of the elements that must be evaluated by those of us in the fire protection field. It will explore the various costs and benefits, but without evaluating the comparative merits at this time. The objective is to lead readers beyond simply agreeing or disagreeing with the systems. This article will detail how to analyze the sprinkler issue when developing policy.

Typically, when adversaries discuss residential systems, they focus on the obvious: the cost of installation. Residential sprinkler systems have obvious fire control advantages, but they also cost money to install. But this point of view is too narrow, a micro-view.

Instead, let's try a more generalized view that recognizes the context of the systems. Whereas a single residential system is meaningless as a fire defense system, an entire community or area can be evaluated from an economic perspective. This is the macro-view we are seeking.

A few years ago, a television advertisement went something like this: *"You can pay me now, or you can pay me later, but sooner or later you're gonna pay me!"* We in the fire service have a corollary statement: You can pay for fire defenses up-front, at one time, or you can pay for them forever. That is the basic difference between providing automatic fire protection systems or depending on manual systems that require notification, activation, response and physical fire fighting.

Granted, the detractors of built-in fire protection have legitimate concerns regarding costs. It is not only reasonable, but desirable that advocates of in-place systems be able to identify costs and benefits in advance. Those we ask to cooperate in installing systems have a legitimate complaint if we are not knowledgeable about the financial impact of our policy decisions. Likewise, those who reject installation of built-in fire protection on the basis of installation costs alone are not being reasonable either.



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Four dimensions to the economics of residential fire protection systems are:

- Direct Costs;
- Indirect Costs;
- Cost Avoidance, and
- Cost Comparisons

Each of these dimensions requires some study to understand.

## **Direct Costs**

Direct costs of installing residential systems are the easiest concept to understand. It is the actual cost of planning, installing and inspecting a system. Each element has direct measurable costs. For example, a person can take a set of building plans and have a sprinkler system designed. The designer will send her a bill. The same person can contract out for the system's installation; the installer will send her a bill. Then, the local fire authority will conduct plan checks and conduct an on-site inspection. Each step has a cost to evaluate.

In listening to testimony on direct costs of sprinkler systems under proposed sprinkler ordinances, one hears quotations that range from expensive to ludicrous. In order to speak intelligently about direct costs, we must evaluate other factors as well. For example, will the system be installed in a freestanding, custom-designed and built home...or in a home in a large subdivision? Are the systems being installed by qualified plumbers...or by a sprinkler company accustomed to bidding only on commercial installations?

Clearly, many factors affect direct costs. Systems being bid by someone who is familiar with the concept – either a sprinkler contractor specializing in residential applications or a qualified plumbing contractor – probably can be installed for approximately one percent of the construction value of the home.

In tract homes, if the contract can be spread over many residences, the cost becomes approximately \$100 per head. In multi-family or other high-density housing, costs run about 50 to 60 cents per square foot.

## **Indirect Costs**

Indirect costs are more difficult to measure. These include the costs of maintaining a system after installation and the costs of providing insurance. Unfortunately, the bulk of the insurance industry has not kept pace with technological changes in the field, making indirect costs a frequent argument against residential systems. This is despite research by Allstate Insurance that established a favorable loss ratio ranging from 4-1 to 10-1. Some local agents have cited even higher rates for sprinklered homes.

There is a light at the end of the tunnel. Sentry Insurance, a small company in Arizona, recently began to offer significant reductions for homes protected by sprinklers. In some cases, the premium reductions are as high as 50 percent of the basic premium. It does not take long to amortize a system that costs



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\$1,000 if a \$600-per-year insurance premium can be cut in half (A future article in *The International Fire Chief* will provide additional information on the Sentry program as a front-runner in tackling indirect costs.)

The cost factor of life safety is not even considered in this context. While loss of life definitely has economic impact, insurance companies do not include it in their considerations of homeowner insurance, so it does not have a clear value in assessing residential fire sprinkler systems. A study by The Johns Hopkins University on this issue strongly suggests a success factor for sprinklers, but this is not yet translated generally into an economic benefit.

## **Cost Avoidance**

Cost avoidance has two different components.

The first of these is reflected in the emergence of the concept of “trade-offs” for sprinkler systems. Fire chiefs Dave Hilton of Cobb County, Georgia, and Bob Edwards of Scottsdale, Arizona, have developed this concept effectively. A trade-off program allows developers and contractors relief from some costly requirements if properties are protected by sprinkler systems.

The possible trade-offs are too many and too extensive to be discussed here. In general, however, trade-offs deal with a wide range of items, such as scaling down water supply requirements, modifying fire-resistive requirements for doors and between occupancies, and modifying access requirements.

In a recent Scottsdale, Arizona, hearing on a proposed ordinance requiring sprinklers, savings achieved through trade-offs were far greater than direct costs of systems installation. Division Chief Bob Hennessey of Orange County, California, has been using the same approach for “selling” the idea of residential fire sprinkler systems. Such savings can run to hundreds of thousands of dollars.

Another aspect of cost avoidance focuses on location and distribution of manual fire fighting resources. Installation of sprinkler systems in an entire area often can result in fewer required fire stations and fewer required fire-fighting personnel to protect the area. Such savings can run into the millions of dollars over a decade of service. Chief Tom Campbell of Salinas, California, advocates systems installation based on reducing the cost impact on the taxpayer. It also was an important factor in the decision package we used in San Clemente when I was fire chief there.

## **Cost Comparisons**

The residential fire sprinkler market has opened up a new discussion of materials and products that can be evaluated by cost comparison. For example, a building in Fullerton, California, that was completed recently has a sprinkler system installed. A companion building is about to be built immediately adjacent to the first and is also to be equipped with sprinklers. The developer and contractor were encouraged to use new materials that were recently approved but are still new in the market. The developer has agreed to provide a complete cost analysis of this installation so that the two installations can be evaluated from two dimensions: the cost of installation and the level of protection. If costs can be kept



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down while protection remains constant, that information can prove valuable in making similar policy decisions in the future.

The economics of residential fire protection systems are anything but simple. In fact, economic factors are now in a state of flux because the various branches of the fire protection field have not agreed on how to approach the economic analysis.

The different dimensions of sprinkler systems can be compared in a way that is not unlike a simple equation. Changing the value of one dimension of the formula or equation changes the outcome. In other words, if a fire department is unwilling to consider trade-offs, then cost avoidance is not part of the formula. If local ordinances restrict the use of modern materials and technology, then costs will remain fixed to older technology.

When debating the merits of residential fire sprinkler systems we must consider all dimensions of the question simultaneously. Costs of installation must be compared to reductions created by cost avoidance and cost comparisons.

Recently, the National Bureau of Standards produced *A Benefit-Cost Model of Residential Fire Sprinkler Systems*. It explores the benefits that accrue to a property owner from sprinklering a building. Another study was conducted by New York State's Office of Fire Prevention and Control. That report, prepared by Building Technology, In., of Silver Spring, Maryland, explored the economic impact of retroactive implementation of building and fire codes. Both studies deal with the same basic issue: who gets the benefit and who pays the costs of built-in fire protection?

It often appears that we are looking for a Rosetta stone that will decipher all the complex economic factors involved in residential fire protection. We have not found such a stone; yet we are making progress in getting residential sprinkler systems installed as part of many communities' fire defenses.

This article has addressed elements that should be considered when evaluating passage of a sprinkler ordinance or the waiving of certain requirements when sprinklers are present. Each fire official must decide how far to explore each of these areas in evaluating the economics of a particular policy decision.

The more we know about all of the cost elements of residential sprinkler systems, the better will be our success in gaining acceptance and adoption of them in our communities.