FIRE RESCUE

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Rural Fire Command

by

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It's Burning, Now What?

Your fire control options

RFI
RURAL FIREFIGHTING INSTITUTE

Training America's Rural Fire & Emergency Responders

A Message the Author, Larry Davis

In October 2002, I started writing the monthly "Rural Fire Command" column for *FireRescue Magazine*. Since that time, the RFC column has been carried in just about every subsequent issue of the magazine.

As time has passed, several readers have contacted me about obtaining back issues of the column. Some expressed an interest in acquiring the articles in Powerpoint format for use in training programs.

This led to, my adaptation of the RFC columns to the PowerPoint format. These PowerPoint programs are being made available through the combined efforts of *FireRescue Magazine* and the Rural Firefighting Institute.

It's Burning, Now What?

Before we get started with this month's topic, we need to look at the three elements that affect how people generally solve problems:

1. Facts—the pieces of data that are objectibe and verifiable;
2. Emotions—the feelings people experience (I.e., fear, anger, joy, etc.); and
3. Politics—the relationships between individuals and groups.

So far in this series we've discussed facts that help put the fire problems and the problems facing rural fire departments into perspective. Based on what we've already explained, we know that rural firefighters often face greater challenges in delivering fire control/suppression services to their communities than their big city peers.

As we continue our discussions, we'll move into areas that will probably trigger some emotions. We'll also delve into the political aspects of the fire business. In regard to fire business politics, I've just read an e-mail saying that the NFPA Standard 1901, *Standard for Automotive Fire Apparatus,* technical committee proposes an appendix item that requires departments to rehab any fire apparatus built before 1979 in order to meet NFPA 1912, *Standard on Fire Apparatus Refurbishing* or to remove the apparatus from service.

The reason for this requirement? Of course it concerns firefighter safety, not selling new apparatus or generating work for companies that rehab apparatus! And how would this proposal affect rural fire departments? At best, it could cause departments to remove numerous apparatus from service. At worst, it could cost departments a ton of money to refurb or replace apparatus that really work just fine, as long as drivers operate them safely and the apparatus don't present any real safety problems.

Of course, for those who want new fire trucks or for those who sell and rehab apparatus, this proposal is just great. This issue will no doubt become and emotional and political hot potato. Based on our discussions in the last three installments, I can’t see how this proposal will make the rural fire problem any better.

Your Response Times

At the conclusion of last month's installment, I asked you to consider your department's best- and worst-case response times to every structure within your response district. Most likely, your best response time should only be a few minutes if members happen to be in the station and the fire is close by. The worst-case scenarios can take firefighters more than 20 - 30 minutes to arrive on scene, depending on the time, weather, and response distance.

In addition to the times identified in last month's column (Rural Fire Command, "No Time to Burn," December 2002), in his text. *Nine Steps from Ignition to Extinguishment, 2nd Edition* (FIREPRO Institute, 994; Putney, VT; $19.95) Rex Wilson describes *reflex time* as the elapsed time from the *ignition point* to the *attack point*. Based on the data we covered in November's column ("Dollars & Sense," November 2002), we know that in 84% of fire fatalities, the fires burned from 10 - 40 minutes or more before the notification point is reached.

If we take a hypothetical situation involving a house fire 10 miles from the station in which:

- Free burning time, permitted burn time, and transmission time = 10 - 40 minutes;
- Alarm handling time time = 2 minutes
- Turn-out time = 2 minutes
- Travel time = 20 minutes (to travel 10 miles @ 30 mph average); and
- Set-up time = 2 minutes; therefore

Therefore, *reflex time* = 36 - 76 minutes.

Because we know that flashover in the compartment of origin can occur in as few as 2 minutes, and because most people keep their interior doors open, unless luck and the grace of God are on the occupant's side, we'll probably find a well-involved structure fire on arrival. And, unless we see residents waving at us when we pull up to the scene, we'll have to remove them in body bags.

What Now?

Have you ever felt like the chief in the photo above? He's pondering what went wrong and what to tell the news media. His department responded with all of the resources they had and did the best they could, yet in front of him lies the smoldering ruins of a structure—an obvious failure

We in the fire service have been conditioned (I call it brainwashed) to try to explain why a structure burned down. Chances are the chief will say there wasn't enough water. The chief may not realize that the *only* organization within the rural community with the tools, equipment, and expertise to move water to fires is the fire department.

So guess who the property owner or the fire insurance company sues for failing to get enough water to the fire? Of course, the fire department, and maybe even the fire chief.

The chief should point out that the owner, who elected to have a home miles from the fire station and the closest water supply, did something stupid to cause a fire and then delayed reporting the fire while trying to extinguish it. By the time the fire department arrived, the fire was beyond the fire department's control. And since the owner probably has fire insurance, he'll most likely end up with a bigger and better home than the one he lost.

This is one of those issues that is political in nature. Generally, our society rewards fire victims for doing something stupid to cause a fire. This is a classic case of how society rewards negative behavior. Although the initial blow appears devastating, in the long run the owner who loses a home will end up with a better one. This is one of those things that just is, and, in the whole scheme of things, one that will change only when fire insurance no longer rewards people for doing stupid things to cause fires.

It’s The Agent

Which of the remaining Big 5—agent, hardware, people, and standard operating procedures (SOPs)—remains most important after time? The agent, of course—specifically, water or some water-based agent. Manual fire control/suppression is like warfare.

If I show up to a battle with 1,000 soldiers equipped with the best weapons, their fighting capability is a function of how much ammunition they have.

In firefighting, it’s not the fire trucks, the firefighters, or the SOPs that extinguish the fire—it’s the agent, applied at the required application rate, at the right place, and at the right time.

How do we determine what amount of water we need to apply to a given fire? We’ll discuss a couple of methods in future columns. However, Iowa State University had developed the most recognized, simplest, and easiest to use method.

*It's not fire trucks, firefighters, or SOPs that extinguish fire — **it's the agent**, applied at the **required application rate, at the right place, and at the right time.***

Rural firefighters from the Winfield VFD (MD) mount an assault on a barn fire with portable master streams to deliver the rate of application required by the fire.

Iowa State's Work

To prove the theory of using water as a cooling and smothering agent, in the 1950s Iowa State University's Fire Service Extension pioneered the development of a method for calculating the application rates required for varying sizes of structure fires. This work documented that the amount of oxygen available to a fire was critical to fire control, and that if responders could determine the volume of the compartment in which the fire was located, they could also determine the amount of water required to fill the compartment with steam. This would exclude the oxygen and remove the heat-producing potential.

Iowa State University also determined that 1 gallon of water could produce 200 cubic feet of steam and should absorb all of the heat that 200 cubic feet of air produces when combined with ordinary fuels.

Following numerous fire tests in acquired structures, Iowa State determined that fire control was best achieved when firefighters delivered the rate of flow in 30 seconds.

The final version of what's become known as the Iowa State Rate-of-Flow Formula, shown below, is a vital tool in determining fireground water supply needs and for prefire decision-making.

To determine the rate-of-flow (gpm) needed to fill a fully-involved compartment or structure with steam in 30 seconds:

1) Determine the length, width, and average height (in feet) of the compartment or structure;
2) Multiply these values; and
3) Divide the answer from step 2 by 100.

Iowa State Rate-of-Flow Formula

$$ROF = \frac{L \times W \times H}{100}$$

In future columns we'll discuss the Iowa State Rate-of-Flow Formula and other methods in more detail. For right now, our major concern is the single-family dwelling fire.

Fire Control/Suppression Options

Historically, we learned to apply water to a fire—even when the rate of flow or rate of application was insufficient to control the fire. However, if the rate of application is insufficient to control the fire, the agent is simply wasted since the rate of flow is not cumulative. As a structure fire develops, it grows more severe and produces more heat each second that it burns.

Whether or not firefighters apply any agent, every fire will go out when there is no more fuel to burn. One nice thing about our business is that whether we do it right or not, all fires will eventually self-terminate.

Have you ever seen a department break its neck to get to the fire and then look busy while the building burned down? Although firefighters thought they were gradually controlling the fire, the fire was simply sonsuming fuel faster than they could increase the rate of application.

We can best achieve fire control before the fire reaches the peak in its life cycle. We must use a rate of flow sufficient to control a fire within 1 to 2 minutes of application.

Fire Control Is Simple

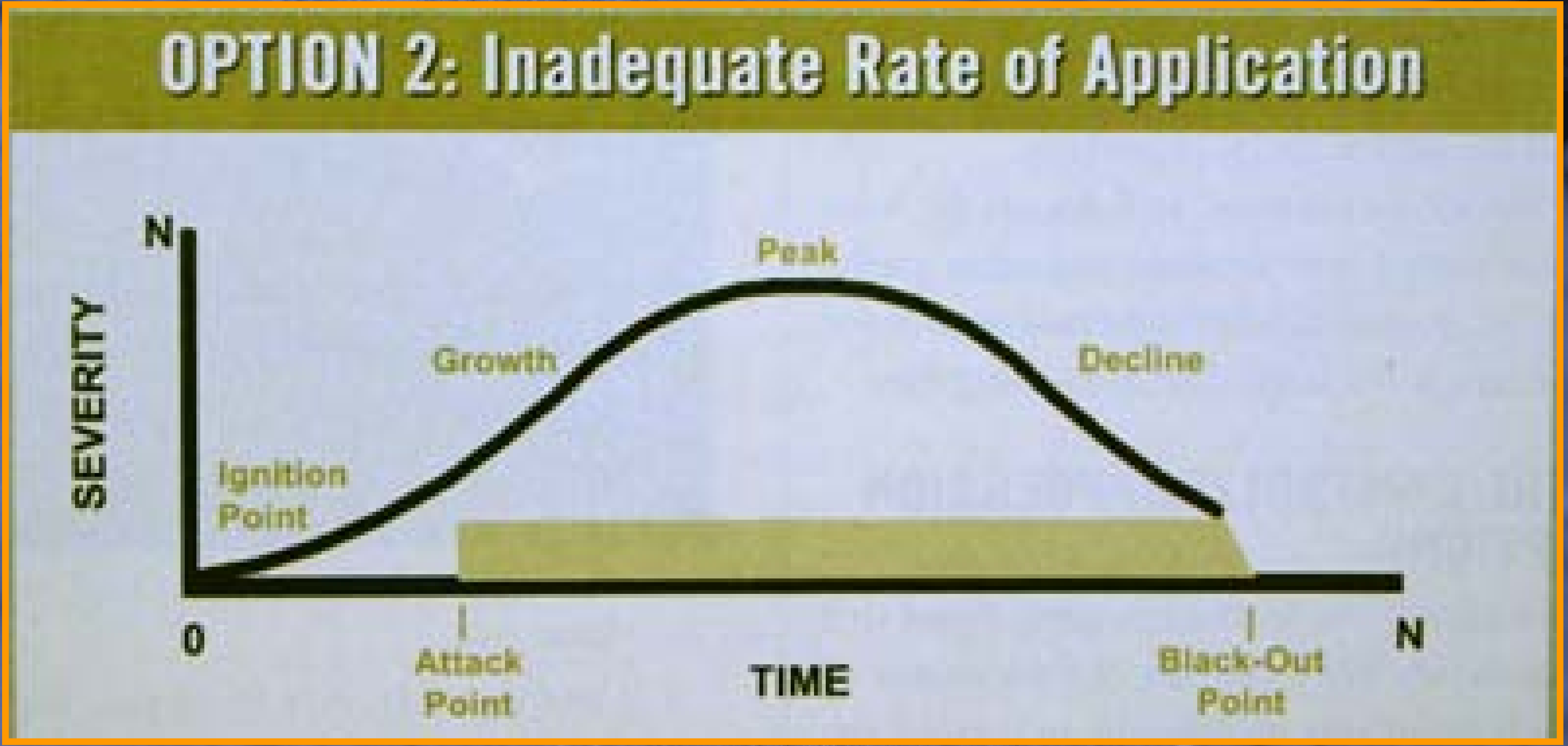
Simply put, to control a fire by cooling it, the water's rate of heat absorption must equal or exceed the fire's rate of heat production. When the quantity of heat the agent absorbs each minute equals or exceeds the amount of heat the fire produces each minute, we've got the fire under control. However, if the rate of heat absorption is less than the rate of heat production, we can't control the fire until it consumes enough fuel to drop the rate of heat production to a point equal to or less than the rate of heat absorption.

In a structure fire where the roof remains intact, steam production and the elimination of all flaming within 1 to 2 minutes indicates an adequate rate of application.

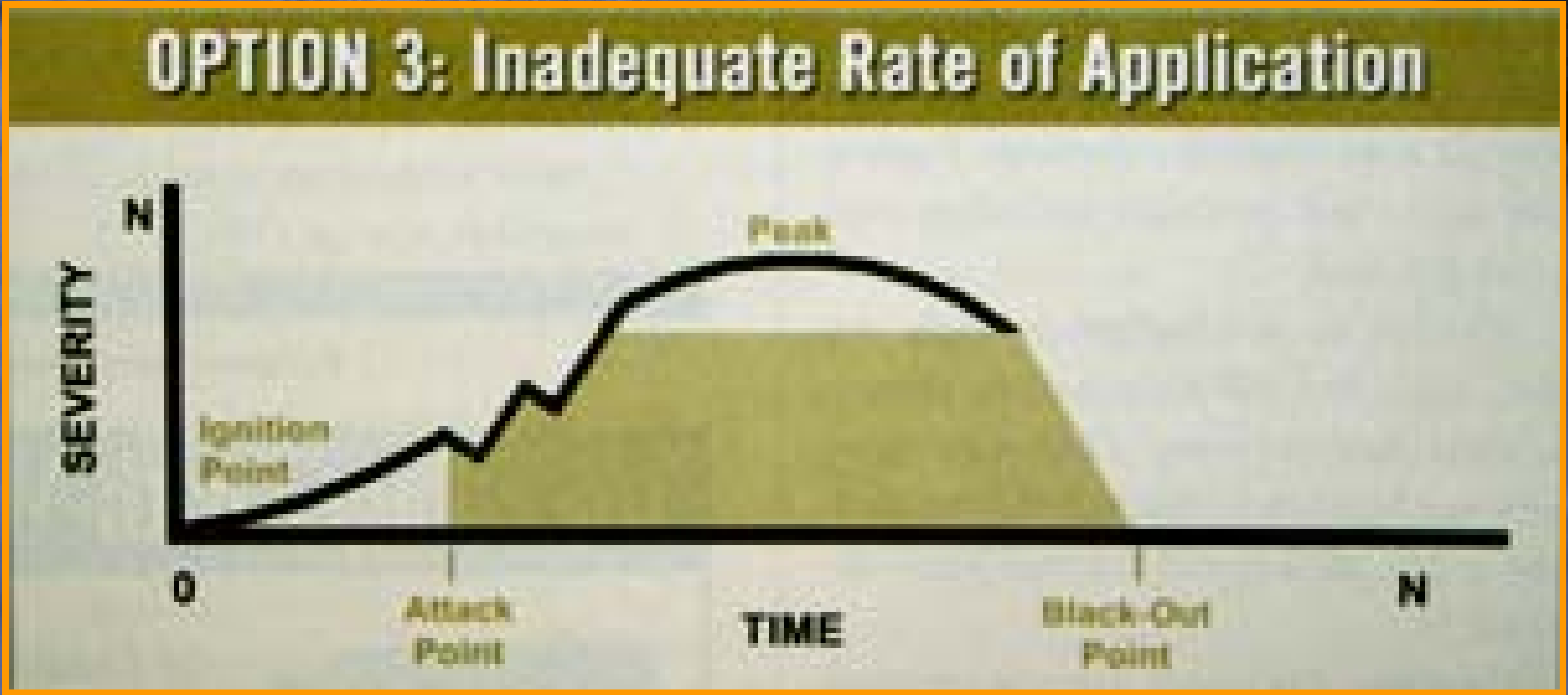
Four Basic Options

The rural fire department, as any other, has four basic fire attack options.

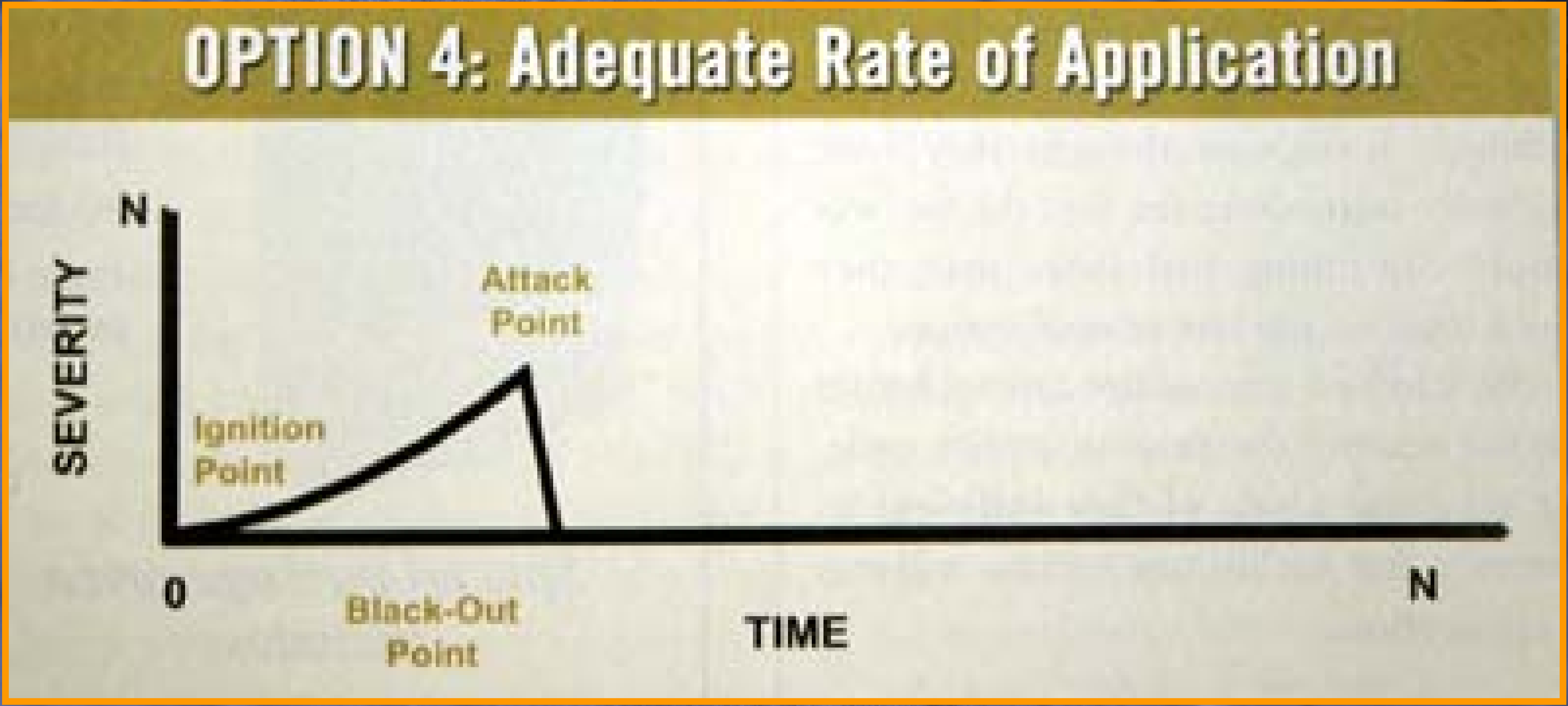
Option 1. **Do nothing offensively to control the fire.** In this case, the fire suppression forces may do nothing or may apply water to exposures to keep them from igniting. The fire self-terminates from a lack of fuel. The end result is about the same as if the fire suppression forces had never responded.



Option 2. **Attack the fire with a rate of application less than that required to control the fire.** In this case, the fire-suppression forces look busy while the fire burns down to the level at which their rate of application is adequate to extinguish the remaining fire.



Option 3. **Running a race with the fire.** Firefighters run a race with the fire in a no-win situation that results in fire control only after the fire has peaked and burned down to the fire-suppression force's level of capability. With this option, the rate of application increases—little by little, but less than the growth of the fire. Usually, by the time the rate of application is sufficient, the fire has burned for so long that little remains to save.



Option 4. **Deliver a sufficient agent application rate to control the fire within 1 to 2 minutes after beginning the application.** This option not only produces dramatic results, it minimizes fire severity and damage.

Weighing the Options

If fire-suppression forces choose ***Option 1***, they may impress the public with their heroic efforts, but will achieve only a little more than <u>if they had not responded at all</u>.

If they choose ***Option 2***, they'll look busy and get experience fighting fire, but <u>will not save much</u>.

Option 3 yields about the same results as ***Option 2***, except that it produces more stress and anxiety for those in command.

Option 4 doesn't require as much activity as the other options, but it produces the best results. Fire-suppression forces choosing ***Option 4*** will not have long-duration fires to brag about or the opportunity to fight fire for hours on end, but they will <u>control more fires</u> and <u>conserve more property</u>.

<u>Based on achievement</u>, ***Option 4*** is the only way to go.

In the Next Installment

In the next installment, we'll take a closer look at our firefighting water equirements. For right now, get your firefighters to determine the rates of flow for structures within your district using Iowa State University's *Rate-of-Flow formula.*

For Questions or comments on this or any of the Rural Fire Command articles, contact the author at ldavis@RFI411.org

About the Author

Larry Davis is a full member of the Society of Fire Protection Engineers, a Certified Fire Protection Specialist, and a Certified Fire Service Instructor II with more than 30 years experience as a fire service instructor. He is Vice President of GBW Associates, and Chairman of the Rural Firefighting Institute.

Davis has conducted more than 400 Rural Firefighting Tactics and Rural Water Supply Operations seminars throughout the United States and Canada. In addition, he has written numerous fire service texts, including *Rural Firefighting Operations*, books I, II, and III. Most recently, Davis co-wrote the *Rural Firefighting Handbook* and *Foam Firefighting Operations*, book I with Dominic Colletti.

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To obtain any or all of the other PowerPoint versions of the Rural Fire Command column, contact Larry Davis at:

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Visit the RFI website at www.rfi411.org to learn of the other training resources available by Larry Davis.

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