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December 21, 1984

Note the attached article from Newsday, which discusses the combustion toxicity issue.

Of particular interest is the quote from Yves Alarie in the last column:

> "I don't think testing for toxicity itself is going to reduce the number of fire deaths," Alarie said. "We have to attack the problem from many different aspects -- case of ignition, flame spread, heat release, smoke release that impairs visibility. It's part of a total picture."

To the best of my knowledge, this is the first time that Alarie has acknowledged the validity of a fire hazard index approach. Perhaps you'll find this quote of use in your combustibility work.

NCJ/gfs/VS0475M

Attachment

cc: M. M. O'Mara

More SVC/VCM discovery documents for you. Pitch or keep.

Bob H

Part III

DISCOVERY

Tuesday Newsday December 4, 1984

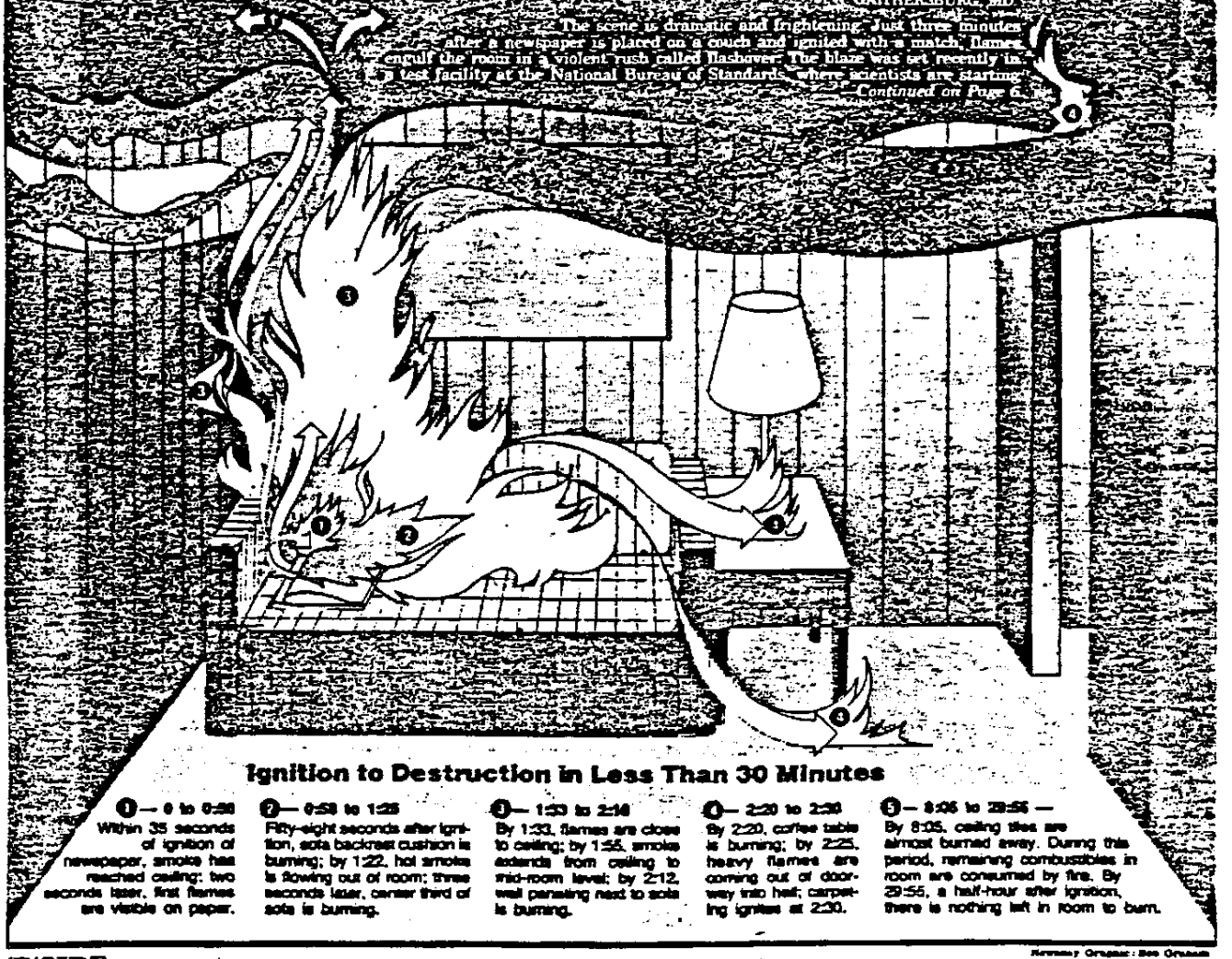
On the Track of Fire's Killer Fumes

By Earl Lane Newsday Washington Bureau

GAITHERSBURG, MD.

The scene is dramatic and frightening. Just three minutes after a newspaper is placed on a couch and ignited with a match, flames engulf the room in a violent rush called flashover. The blaze was set recently in a test facility at the National Bureau of Standards, where scientists are starting

Continued on Page 6



Newsday Graphic: Bob Grossan

INSIDE

Predicting The Fatal Path Of Fire and Fumes

—Continued from Page 1

to understand — and even simulate on a computer — the dynamics of a fire.

While a house fire seems, by its very nature, a chaotic and unpredictable event, the researchers are developing mathematical models to predict the spread of fire and smoke. They are able, for example, to predict the moment of flashover for a fire in a room whose dimensions and contents are known.

One of the most striking findings is that a single piece of furniture may contain enough energy potential to raise the temperature of a room to the flashover point. As the test with the burning couch demonstrated, a fire need not spread gradually throughout a room. Once a critical temperature is reached, instantaneous combustion occurs, and the entire room starts to burn. Flashover usually occurs within three minutes for a couch fire in a typical recreation room, says Jack Snell, director of the Bureau's Center for Fire Research. "Most people intuitively have no idea how rapidly these fires spread," he said.

The researchers have created computer models that show the development of a fire graphically on a video display terminal. The hope is to be able one day to give architects a tool to examine the fire characteristics of their buildings as they design them. In effect, an architect would be able to "set a fire" in his proposed building on a computer screen and watch its predicted effects.

Most important, from the standpoint of avoiding death and injury, the models might help builders predict how long it would take smoke and toxic fumes to spread through a building.

Current studies suggest that 80 percent of fire deaths are caused by toxic smoke and fumes. In the MGM Grand Hotel fire in Las Vegas in 1980, 81 of the 84 victims died from inhaling toxic smoke and gases. Sixty-one of the victims were nowhere near the fire. Some were 20 stories or more away but were killed by toxic gases spread through the hotel's ventilation system and other conduits. The same was true of a jail fire in Mississippi in 1982. The fire was confined to the polyurethane lining of one cell, but the spreading fumes killed 27 prisoners and injured 61.

The researchers at the National Bureau of Standards have constructed suites of test rooms to study the spread of smoke and gases during a home fire. "We can predict the effects of a room fire as a generator of gases into the rest of a building," Snell said. "We can do that now for a building of up to six compartments. In a year or so, we should be able to do it for a multi-compartment story." The researchers will soon be changing the layout of their test facility to resemble that of a two-story town house. It now resembles the floor plan of a single-family ranch home.

While scientists have a better understanding of how fires grow and how smoke and gases disperse, they are still arguing over the effects of toxic gases and the best ways to measure those effects.

Many fire safety experts argue that some materials — notably plastics — are much more dangerous when burned than others. They cite such incidents as the Mississippi jail fire and cases in which passengers have survived aircraft crashes, only to be overcome by the toxic fumes from burning plastics in the airplane interiors.

BUT RESEARCHERS have struggled with how to measure smoke toxicity and how to relate their findings to the real world. On such questions, the debate is as heated as any three-alarm fire. It has taken on political importance, and the toxicity testing issue may reach a flashover point of its own soon.

New York, spurred by the Stouffer's hotel fire in Westchester County in December, 1980, has taken a lead in efforts to test the smoke toxicity of building materials as a part of building code regulations. Gail Shaffer, New York's secretary of state, has recommended to the state's Building Code Council that certain building materials and furnishings be subjected to toxicity tests and the results filed with the state. A decision could come early next year. California also is moving aggressively on smoke toxicity, as are several other jurisdictions.

"Five years ago, most laymen and fire fighters couldn't pronounce 'toxicity,'" said Gordon Vickery, a former head of the U.S. Fire Administration and a former fire chief in Seattle. "Now it is the hottest subject around."

Vickery heads the Foundation for Fire Safety in Arlington, Va. His organization is leading the charge against the increasing use of synthetic materials in buildings. While carbon monoxide in smoke has long been considered the major killer in fires, Vickery is convinced that hydrogen cyanide — a product when plastics are burned — often is the overlooked killer.

Not surprisingly, the Society for the Plastics Industry — a trade association — strongly disagrees. The plastics society has argued for better fire prevention, including use of smoke detectors and fast sprinkler systems, as the best way to combat fire deaths. The society also notes that fire deaths have declined even as the use of plastics in buildings has climbed sharply during the past two decades.

Spokesmen for the society note that Vickery's Foundation for Fire Safety is financed largely by the metals industry, which has been hurt by the increasing use of plastic conduits and pipes in housing. Vickery acknowledges that his group has received $1.75 million from the metals industry during the past three years. But he said, "No one has dictated one single thing we should be doing with our money." Vickery said that fire deaths are too numerous and that the dangers from burning plastics cannot be ignored.

In 1983, 8,920 people died in fires in the United States. In 1971, the death toll was about 9,000. Although the totals have been decreasing, fire safety experts point out that the United States continues to lead the industrialized world in the incidence of fire deaths. On the average, about 10 people a day die in fires in the United States — about 70 percent of them in residential fires.

Vickery recalls his experience as investigator of the MGM Grand Hotel fire in 1980. "I think those of us who investigated that fire made a pledge that we weren't going to let the public forget that strange things were happening and that there has been a hell of a change in the use of building materials." Investigators at the MGM Grand Hotel fire estimated that as much as 75 percent of the furnishings and decorative trim in the building were made from petroleum-based synthetics.

YVES ALARIE, a toxicologist at the University of Pittsburgh, said that his research shows that burning synthetic materials — such as polyvinyl chloride and other plastics — are, on average, six times more toxic than wood. "That's the average," Alarie said. "Some materials are 100 or even 1,000 times more toxic than wood." Alarie has developed a toxicity test that measures how much of a material must be burned before the fumes kill mice in a test chamber. On average, he said, when synthetics are burned in the test chamber, they tend to kill animals about twice as fast as wood does — in 10 to 13 minutes vs. about 22 minutes for wood. Alarie estimates that the gases from six ounces of burning polyvinyl chloride — a plastic commonly used in wire insulation, furniture, flooring and other household products — will kill the occupants of an average-size bedroom within 10 minutes.

New York State is proposing to use Alarie's toxicity testing method on such items as mattresses, bed pads, upholstery, interior wall, floor and ceiling finishes, electrical insulation and conduits and piping. Upon the recommendation of a study by Arthur D. Little Inc., the engineering research firm, the state chose Alarie's method over 13 other toxicity tests, including one developed at the National Bureau of Standards. The consultants' report found Alarie's test to be cheaper and more useful for a variety of samples than the bureau's method, the only other one to meet essential criteria for the state's purposes.

The plastics industry argues that toxicity tests are not standardized and say little about the complex interactions that can occur in the real world. "These small-scale tests cannot, under any circumstances, replicate an actual fire," said J.P. Carroll, director of safety for the Society for the Plastics Industry.

Alarie is unpersuaded by such arguments. "The knowledge we have gained about fires in the past 10 years is phenomenal," he said. "We know damn well that plastics do not burn like wood or cotton. They burn totally different. For some of them, the flame spread is absolutely frightening." Many fire officials report that building fires appear to be developing faster than in years past, with more smoke and toxic gases for fire fighters to contend with.

To find out which gases are responsible for a person's death, researchers must find out which gases the victim inhaled. Among the gases commonly found in fires are carbon monoxide, acrolein, hydrogen cyanide and hydrogen chloride. An elevated level of carboxyhemoglobin in the blood is an indicator that the victim inhaled carbon monoxide. In the past, such a finding routinely meant that carbon monoxide poisoning would be listed as the cause of death. But Merritt Birky, a former head of the Center for Fire Research's combustion toxicology program, has argued that fire victims also have high levels of [illegible] cyanide levels in their blood. It takes care[illegible]ssing of the blood after death to get an accurate cyanide reading.

THE FOUNDATION for Fire Safety and the Society for the Plastics Industry have conducted studies in an attempt to come up with reliable autopsy methods and results for fire victims. The foundation's study is a three-year effort involving medical examiners from 16 jurisdictions. The plastics society has given a grant to a researcher at St. John's University in Queens to develop an autopsy protocol for fire victims. That study, too, is still in progress. Vickery said that many local medical examiners already are paying closer attention to the effects of toxic gases on fire victims, including evidence of exposure to carbon monoxide and lung tissue.

Proponents on both sides of the toxicity issue tend to agree that there are not going to be any simple answers. "I don't think testing for toxicity itself is going to reduce the number of fire deaths," Alarie said. "We have to attack the problem from many different aspects — ease of ignition, flame spread, heat release, smoke release that impairs visibility. It's part of a total picture."

For example, many synthetic materials are slow to ignite and are even used as effective flame retardants. Polyvinyl chloride is used widely instead of cotton as an insulating material for electrical wires, in part because its ignition temperature is higher than cotton's. But once synthetics start to burn, they can burn much hotter than other materials and release copious amounts of gases, researchers say. The trade-offs must be balanced by builders and architects, Snell said. He said it is premature for states to regulate materials solely on the basis of toxicity test results. He said existing tests are not perfect and described them as "a Band-Aid, not a solution" to the problem of fire deaths.

Still, Vickery is clearly impatient with what he considers a tendency to eventually a problem where some action is warranted. He cites the effort to come up with mathematical models of fires. "What do you do? Create a model before you can fight the fire? We know enough about materials and how they react to take some definitive actions. That's what New York is trying to do." ■