

PVC SAFETY GROUP

Crystal City Marriott Hotel
Arlington, VIRGINIA

Tuesday, January 16, 1979
10:00 A.M.

S U M M A R Y

- 1) The PVC Fire Safety Committee identified specific programs to pursue with an immediate objective to develop an authoritative article on the medical aspects of combustion inhalation.
- 2) Industry will file reports on relief discharges with Keller & Heckman for general review.
- 3) Two members have filed legal challenges to the California Air Pollution Control Board (CAPCB) Vinyl Chloride Regulation; SPI's amicus curiae filing to be made shortly.
- 4) It is expected that FDA will withdraw its 1975 proposed rule and introduce a rule to recognize prior sanction of PVC for packaging. The time on this action is unpredictable.
- 5) The PVC Communications Committee activities approved at a reduced budget for 1979.
- 6) An overall budget of \$200,000 for 1979 was approved. First half to be invoiced immediately with a mid-year review to confirm needs for the second half.
- 7) Approval was given to organize an EDC Subcommittee to respond to OSHA Information Request.
- 8) A Nominating Committee was appointed to select a slate of officers for 1979/80 year.
- 9) The next meeting of the Steering Committee was set for March 30 at the SPI office. Tentative date for a meeting of the full Committee set for May 22 in Washington, D.C.

ATTENDEES:

D. C. Nuechterlein - CHAIRMAN - Dow Chemical USA, 2020 Dow Center, Midland, MI 48640
R. J. Abramowitz - Hooker Chemical, River Road, Burlington, NJ 08016
A. Ross Adams - Air Products & Chemicals, P. O. Box 538, Allentown, PA 18105
John T. Barr - Air Products & Chemicals, P. O. Box 538, Allentown, PA 18105
Rodney P. Becker - Diamond Shamrock, 1100 Superior Avenue, Cleveland, OHIO 44114
William C. Becker - B. F. Goodrich Chemical Co., 611 Oak Tree Blvd. Cleveland, OH 44114
Scott W. Bowen - Beveridge, Fairbanks & Diamond, One Farragut Sq. S. Washington, D.C.
R. B. Downey - B. F. Goodrich Chemical Co., 6100 Oak Tree Blvd. Cleveland, OHIO 44131
John E. Ertel - The Pantasote Co. of N.Y., 26 Jefferson Street, Passaic, NJ 07055
John C. Floros - Great American Chemical, 650 ater Street, Fitchburg, Mass 01420
Gary Ford - Stauffer Chemical, Westport, Ct. 06880
D. H. Francis - Goodyear Tire & Rubber Co., 1144 E. Market Street, Akron, Ohio 44313
Roy T. Gottesman - Tenneco Chemicals, Inc. Park 80 Plaza West One, Saddle Brook, NJ.
Joseph E. Hadley, Jr., - Keller & Heckman, 1150 17th Street, N.W. Washington, D.C. 20004
Charles L. Harrington - Shintech Inc. 3800 Buffalo Speedway, Houston, TX 77098
Robert W. Hill - Diamond Shamrock, 1100 Superior Avenue. Cleveland, OHIO 44114
T. W. Ito - Goodyear Tire & Rubber Co., 1144 E. Market St. Akron, OHIO 44316
D. L. Kent - B. F. Goodrich Chemical Div., 6100 Oak Tree Blvd. Cleveland, OHIO 44131
R. W. Laundrie - General Tire & Rubber Co., One General Street, Akron, Ohio 44329
John R. Lawrence - SPI, 355 Lexington Avenue, New York, NY 10017
Russell A. Park - Firestone Plastics Co., P.. Box 99, Pottstown, PA 19464
P. E. Roggi - Stauffer Chemical Co., Westport, CT 06880
William Rupp - Tenneco Chemicals, P. O. Box 365, Turner Place, Piscataway, NJ 08854
Robert C. Sandor - Air Products & Chemicals, P. O. Box 538, Allentown, PA 18105
Steven W. Schaefer - Diamond Shamrock Co., 1100 Superior Avenue, Cleveland, OHIO 44114
Donald K. Spencer - Shell Chemical Co. One Shell Plaza, Box 2463, Houston, TX 77001
Matthew M. Swetonic - Hill & Knowlton, Inc. 633 Third Avenue, New York, NY 10017
T. R. Torkelson - Dow Chemical Co., 2030 Dow Center, Midland, MI 48640
R. N. Wheeler, Jr. Union Carbide Corp., P. O. Box 8004, S. Charleston, W. VA 25303

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- 1 - Mr. Kent reported on the activities of the PVC Fire Safety Committee reinforcing the details provided in his written report (copy attached). He called particular attention to the paper on "The Role of Flame Retardant Additives in PVC", at the March 1978 meeting of the Joint Conference on Fire Retardants, (see copy attached). In summary he stated:

- 1) The fire safety problem is not nearly as straight forward as the VCM situation.
- 2) There is a need for a PVC Fire Safety Committee.
- 3) The existing charter and scope of activities needs to be reviewed and made more effective.
- 4) There is a need to do the following:
 - Appointment of a chairman
 - An authoritative article on medical aspects of combustion inhalation.
 - Improved liaison with the Toxicity and Communications Committee.

Chairman Nuechterlein recommended that Dan Kent continue as chairman of this activity.

- 2 - Health Committee - see attached report. No financial needs involved except to support publication of MacMahon/Downs papers in the Journal of Occupational Medicine if required.
- 3 - EPA Activities - Mr. Laundrie reviewed activities of the Manufacturing Technology Committee covering its meetings with the EPA Engineering Division in December. At that time it was indicated that Ms. Susan Wyatt was to meet with the EPA Enforcement Division to develop finer interpretations on what constitutes a presentable relief valve discharge.

REDACTED

REDACTED

- 4 - California, CAPCB - Mr. Hadley reported that both Stauffer and B. F. Goodrich have filed briefs in California with respect to the California Air Pollution Control Board's rule on vinyl chloride emissions. He further indicated that the SPI amicus curiae brief has been prepared and is being reviewed by these companies. It is expected that it will be filed shortly.

Mr. Gary Ford reported that the State has conceded that the CAPCB vinyl chloride rule is not a standard but rather a goal to be implemented in the future. This is felt to be an important concessions.

- 5 - FDA Activities - Mr. Hadley reviewed FDA's activities relative to its 1975 proposed rule on PVC packaging materials. The data supplied by Ethyl and others relative to PVC's retention of low levels of residual vinyl chloride is being carefully reviewed by FDA staff.

There appears to be a good possibility that FDA may withdraw its 1975 proposed rule and introduce a rule that would recognize prior sanction of PVC for packaging with certain restrictions on residual monomer levels. The timing on this action is unpredictable at this time.

A vote of thanks was given to Ethyl Corporation for providing the principal data to encourage FDA continuing favorable consideration of this matter.

- 6 - Mr. Downey reviewed the conclusions of the January 10 meeting of the Communications Committee and submitted the Hill & Knowlton communications and activities budget recommendations (copy attached). Approval was noted to operate on a budget not to exceed \$6,500 per month with a mid-year review to consider specific needs for the balance of the year. In addition, approval was voted to publish the PVC Position Papers, the revision of the PVC Q&A booklets and the talk on "PVC and Food Packaging Safety", at an estimated cost of \$6,500.
- 7 - The January 4, 1979 audit of the PVC Safety Group's funds for the first half of 1978/79 was distributed. After some discussion, it was agreed that, on the basis of the 1978 expenditures of approximately \$337,000, the Group would attempt to operate on a \$200,000 budget for 1979.

The assessments for this budget is to be split into two equal assessments with a midyear review of budgetary needs to determine whether adjustments should be made. The assessments are to be based on the January 1, 1979 reported capacities as solicited in the December 11, 1978 SPI survey. Efforts are to be made to involve ICI America, Georgia Pacific, and Keysor-Century in the Group's activities.

- 8 - Mr. Becker suggested that consideration be given to the formation of a subcommittee to review comments that members may be submitting to OSHA relative to developing rules for the regulation of EDC. Interest in participating was expressed by the following companies:

Dow Chemical	- B. F. Goodrich
Ethyl Corporation	- PPG Industries
Shell Chemical	- Stauffer Chemical

It was agreed that comments being considered for submission to OSHA by its March 18 due date, be sent to Mr. Hadley for review and that a meeting of company representatives would be called.

- 9 - Mr. Gary Ford indicated that he would be attending the MCA Solid Waste Committee meeting considering R. regulations. Mr. Nuechterlein requested Mr. Ford report back to the PVC Safety Group on this activity.
- 10 - Mr. Nuechterlein appointed Messrs. John Ertel, Spencer and Abramowitz as the Nominating Committee. Their assignment is as follows:

- 1) The appointment of three member companies to the Steering Committee to replace B.F. Goodrich, Air Products and Tenneco going off the Steering Committee as of May 31, 1979. These representatives are to serve for a three year term.
- 2) Recommend for nominating individuals to serve as Chairman, Vice Chairman and Treasurer from member companies serving on the Steering Committee. The companies continuing on the Steering Committee are as follows:

Term ending May 31, 1980 -
Ethyl - Shell - Pantasote

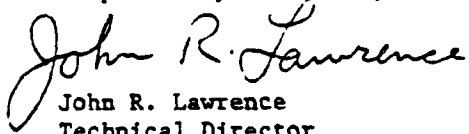
Term ending May 31, 1981 -
Dow - Diamond - Firestone.

It was noted in accordance with the bylaws, that there is no reason why the companies going off the Steering Committee cannot be reelected to serve for an additional three years.

However, it is always important to consider bringing in new participants to the Steering Committee.

- 11 - The next meeting of the Steering Committee was set for March 30 at the SPI office in New York. A tentative date for a meeting of the full committee was set for May 22, if a meeting is deemed necessary.
- 12 - The meeting adjourned at 2:35 p.m.

Respectfully submitted,


John R. Lawrence
Technical Director

Attachments

March 16, 1979

PVC FIRE SAFETY COMMITTEE

Report to PVC Fire Safety Group
Meeting on ~~1/16/78~~ 1/16/79
Crystal City Marriott
Arlington, Virginia

I am a bit surprised, but not unpleasantly so to find myself preparing a report on behalf of the PVC Fire Safety Committee. About one year ago, it was decided that because of time constraints, I would not continue as Chairman of the committee and action was to be taken to find a replacement. To date, a new chairman has not been selected. Because of this, the committee per se was not as active as it might have been, but nevertheless we do have a report to present.

I would like to use this occasion to report on "activities", to discuss problems that should have been addressed on a committee basis and to call attention to some items currently "on the table". I will also exercise the prerogative of expressing some ideas and concerns.

Activities

In June 1977 we arranged for leaders in fire research to describe to the committee current concerns and programs relating to the toxicity of combustion products of PVC and other polymers. This was done in a meeting in Washington, D.C. Speakers included:

Dr. Victor Esch, Chief of Surgery, District of
Columbia Fire Department
Dr. Merritt Birky, Chief Toxicology Section,
United States Bureau of Standards
Dr. Irving Einhorn, Director Flammability Research
Center, University of Utah
Mr. J. Blair, Manager Standards, E.I. DuPont

An abstracted version of the SPI response appeared in the December, 1978, issue along with a letter from Dr. Victor Esch, Chief Surgeon, Washington, D.C., Fire Department. Dr. Esch is an outspoken critic of PVC. There is a strong appearance that Dr. Esch's comments about the SPI response were solicited for publication since his letter seems to strictly debate points in the abstracted SPI response rather than discussing the original article. By this technique, it appears that Dr. Esch was used to shield RN from having to acknowledge that, much of their article was poor journalism. Also, it negated any possibility of allowing the reader a fair chance to see another side of the issue.

B) Longer range, an outgrowth of our discussions while developing the response, was recognition of a need for a well-researched technical article on smoke inhalation written by a well-respected doctor for publication in a well respected medical journal (such as JAMA). It is very difficult to counter medically related anti-plastics arguments from doctors such as Esch without countering medical expertise of our own. The concept for such a project was discussed with Dr. Torkelson and he agrees. Dr. Torkelson believes that the article should discuss similarities and differences in the nature of plastic smoke and other smoke and in medical management of victims. We need the experience of experts as to whether differences exist and whether they are of practical significance. All plastics should probably be included in the project.

The Fire Safety Committee does not have the medical expertise needed to coordinate such a project. Guidance and instructions are needed.

Paper on Role of Flame Retardant Additives in PVC

A paper entitled, "The Role of Flame Retardant Additives in PVC" was prepared by a sub-committee of the PVC Fire Safety Committee for presentation March 14, 1978, at the Joint Conference on Fire Retardants. This conference was sponsored by SPE and the Flame Retardant Chemical Association. The speech was given on behalf of the PVC Safety Group by Gene Cox of Conoco with technical support during the question/answer session given by Alan Ambrose of BFG. The conference was seen as a way of introducing our committee to others in the petrochemical industry.

Ohio Board of Building Standards

The Board held a hearing in December, 1977 to consider a proposal to include PVC and CPVC for cold and hot water in the Ohio Building Code. This was opposed, on the basis of combustibility by the American Iron & Steel Institute and the Copper Development Association which took up most of the meeting to present their case. Since there was no time left for rebuttal, the hearing was continued until April 14, 1978.

Considerable time was spent, by A. Scarano PPI and BFG Chemical representatives in preparing a two-hour presentation, which was subsequently presented to the Board on April 14th. In June, 1978 the Board approved PVC and CPVC.

The point of this discussion is obvious. PVC may be facing the same issue in other states. We ought to be able to anticipate and react to these situations with consistency and with all the information we have. There should be more strength in committee action.

Building Officials Conference of America

At the Annual Meeting in Milwaukee (Spring, 1978) Robert Taylor, under the guise of the Smoke Removal and Control Association, in a special program, spent 30 minutes attacking PVC specifically. He raised the question of benzene as a combustion product, misled the group relative to toxicity studies being conducted in the country, and misled the group on the interpretation and significance of the Harvard School of Public Health Study. Because the building code people are not necessarily experts in the area of combustion toxicology, I am afraid that the many who were present at the Annual Meeting have now accepted this misinformation.

The PVC Industry should be better organized to respond to situations such as the above!

Phosgene as a Combustion Product

Phosgene as a combustion product from PVC has been the subject of intense controversy for some time. A preprint of a conference program sponsored by NBS reported that phosgene has been identified in two experiments where PVC was thermally degraded. We know from past experience that any reference to phosgene is viewed traumatically.

As soon as we learned of this information we did two things (1) met with the NBS representatives to review the method used and to raise a question (based on scientific reasons) that the results were correct; and (2) offered to duplicate the experiments along with others to more precisely determine whether phosgene is in fact a combustion product from the burning of PVC.

As an industry, we should develop appropriate plans to handle any customer, media, or regulatory questions which may result from the NBS release.

A copy of page 19 of the NBS report is attached. See Appendix A.

Potential Problems on the Table But Not Addressed by the PVC Fire Safety Committee

- The Hartford Courant, Nov. 9, 1978-News article copy attached, See Appendix B. PVC gets more than its fair share of "misinformed" blame.
- Popular Mechanics-See Appendix C. Article unfairly attacks plastics in general and PVC in particular. This magazine has a circulation of 1,670,000. Back issues are read for months in barber shops, etc.
- Salt Lake City Tribune-See Appendix D.

Summary

- 1) The fire safety problem is not nearly as straight forward as the VCM situation. (It is complex-open ended).
- 2) The need for a PVC Fire Safety Committee is valid.
- 3) The existing structure is still groping but it can be made to work.
- 4) Certain specific needs can be identified.
 - (a) Chairman
 - (b) A well researched article on product of combustion inhalation. Authored by a well respected medical expert published in a well respected medical journal.
 - (c) Better interfacing with the Toxicity and Communications Committee

Daniel L. Kent
Chairman
PVC Fire Safety Sub Committee
PVC Safety Committee
January 3, 1979

Poly(vinylchloride) Study

Toxicity studies on PVC decomposition indicated that hydrogen chloride did not explain the entire toxicity problem. In addition, various reports implicated phosgene as a possible toxicant during the thermal degradation of PVC. As a result of these factors, a study was undertaken to determine if phosgene is produced during the thermal degradation of PVC.

Three types of experiments were planned:

1. thermally degrading PVC in a small furnace in a chamber,
2. electrical over-loading of wire with PVC insulation in a chamber and
3. electrical arcing between wires coated with PVC.

The first 2 experiments have been performed. Phosgene has been identified in both experiments. Analysis of this data is in progress so as to assess its toxicological significance. The experiment involving an electrical arc has not been completed.

Associated Grants

"Fire Casualty Studies"

Walter Berl, Johns Hopkins University, Applied Physics Laboratory

"Toxicity of Plastic Combustion Products"

Yves Alarie, University of Pittsburgh

"Evaluation of Toxicity of Combustion Products"

Zoltan Annau, Johns Hopkins University

"Toxicological Evaluation of Material Combustion Products"

G. Hartzell, W. Galster, M. Hughes, University of Utah

"Evaluation of the Combustion Toxicology of Several Polymeric Materials"

J. Wesley Clayton, University of Arizona

Danger Cited in Burning Plastic

By
DAVID H. RHINELANDER
NEW HAVEN — Firefighters and the public face significant danger of severe lung damage from burning plastics, a fire expert said Wednesday.

Dr. Victor H. Esch, chief fire and police surgeon of Washington, D.C., said highly toxic gases are given off from the plastics used in piping, electric wire insulation, floor and ceiling tiles, auto, bus and aircraft insulation

and trim, and hundreds of other applications.

Four buses have burned in Washington recently after fire started in their rear brakes and ignited the polyvinyl chloride wheelhouse lining and spread to the bus interiors, he said. Both passengers and firemen suffered lung damage from the "bad smoke" of these bus fires, said Esch, a clinical assistant professor of surgery at Georgetown University medical school.

Since 1970, more than 280 Washington firefighters have been treated for lung and heart problems caused by the fumes from burning or smoldering PVC, he told the annual meeting of the Connecticut Thoracic Society. The society is the medical section of the state Christmas Seal/Lung Association.

PVC, when burned or heated until it melts, releases hydrogen chloride gas. Thin white clouds of this gas are common in many fires.

he said, and those who inhale it develop severe chest pain, headaches, shortness of breath and may go on to develop pneumonia.

Esch said repeated exposure may cause lung cancer years after the contamination. Several cancers show up clinically only after a lapse time of several years, he noted.

PVC gives off 75 different chemical compounds when it burns, he said, but the plastics industry has been "very remiss" in getting out warnings about PVC and other plastics, he said.

Building codes should prohibit plastic pipes and plastic-insulated electrical wiring in high-rise buildings, he said. "The codes don't because the building trades say it's a matter of economics. They won't admit the dangers and won't accept my view that there is no safe minimum concentration of plastic in a fire," he said.

Esch described an office building fire in Washington three years ago that burned only the electrical panel in the sub-basement. Fumes from the PVC wire insulation knocked down firemen, building occupants and even passing pedestrians, he said.

Dr. Kaye H. Kilburn, another speaker at the day-long conference, warned that fiberglass insulation may be as dangerous as the asbestos it is replacing.

Kilburn, a professor of medicine at Mount Sinai medical school in New York City, said the tiny fibers of asbestos and fiberglass are similar in structure.

Asbestos, implicated in a number of types of lung and other cancers being found in construction and shipyard workers up to 30 years after exposure, does not react chemically in the body, he said. The fibers become imbedded in the lungs or lining of various parts of the body and the irritation eventually causes cancer, he said.

The Groton shipyard of the Electric Boat division of General Dynamics stopped using asbestos in submarine construction in 1974 and stopped overhauling older asbestos-containing submarines a year ago.

But Kilburn said workers exposed to the fiberglass now used in the yard should all wear respirators, should all stop smoking and should insist on a thorough daily cleanup of the work area to protect their health.

Fire Dangers

Plastics that burn in fires can cause lung damage to firefighters and the public, fire experts said Wednesday.

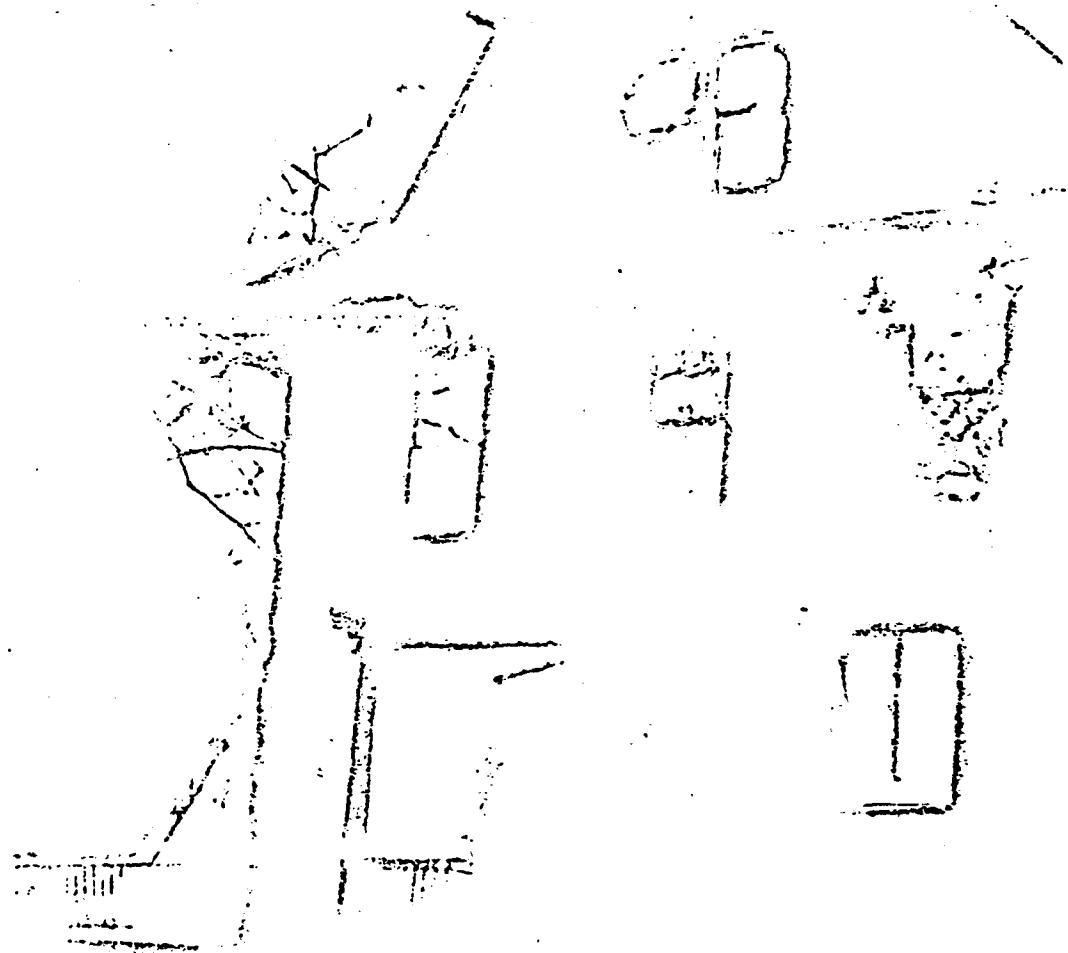
Poisonous gases are given off when plastics burn, said Dr. Victor H. Esch, chief fire and police surgeon of Washington D.C. When plastics used in piping, electric wiring insulation, floor and ceiling tiles, autos, bus and aircraft insulation and hundreds of other products burn, those breathing in the gases can become ill.

Since 1970 more than 280 Washington firefighters have been treated for lung and heart problems caused by fumes from burning polyvinyl chloride, a commonly used plastic also known as PVC, Esch said.

When PVC burns it gives off a white cloud of gas. Those breathing in this gas get chest pains, headaches, shortness of breath and may get other problems later, said Esch.

He said the plastics industry hasn't given out much information about the dangers of burning PVC. Story on Page 21.

The home inferno— now it's deadlier than ever



New materials smoldering longer times
plus phenomena like flashover and
flashover make any fire in your home
a serious threat to life

by Ed Fales

The idea of a fire breaking out in your home has never been a pleasant one. Unfortunately, the evidence mounting up now in reports from fire investigators, insurance companies and municipal officials points to an entirely new syndrome of fire in the home.

In brief, these fires, which can cause death in a number of ways, are deadlier than ever.

From these reports, the consensus describes the new fire syndrome as a new pattern of toxic or combustible

gases being generated, sometimes leading to an explosive inferno from which there can be no escape.

Day after day, newspapers are reporting: "House explodes as firemen arrive. Seven die. Puzzled firemen find family dead but no one was burned."

And so on. It happens, too, in apartments, and even one-story ranch style homes—and mobile homes, many of which now are known to be literal firetraps.

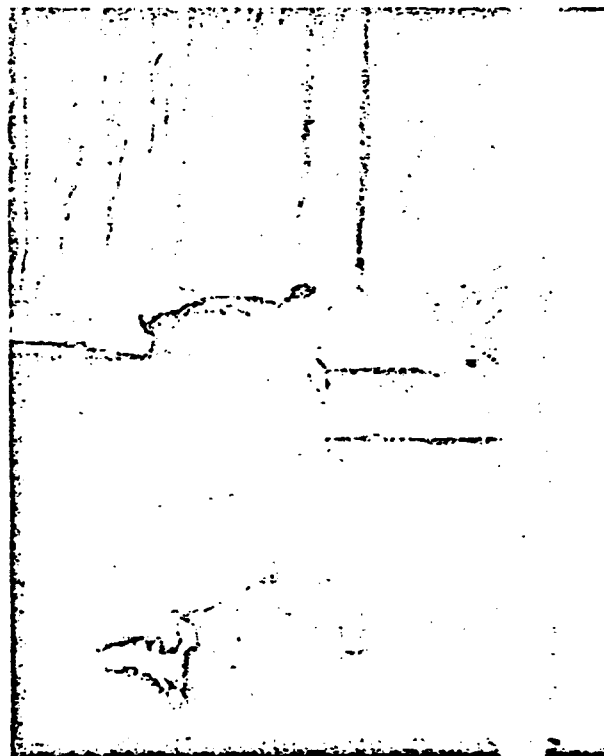
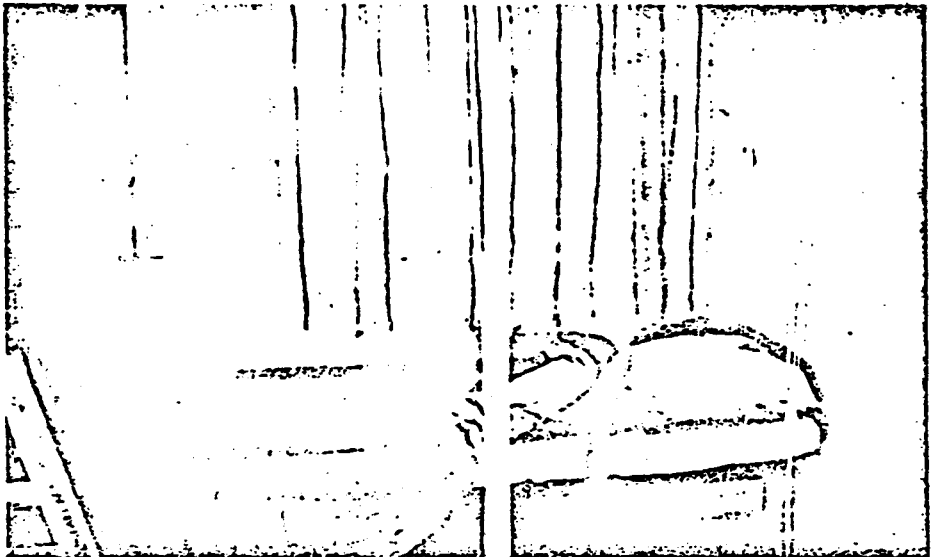
Fires weren't always like this.

You'd smell wood smoke. (Now there may be no wood, no smell at first.) You'd hear the crackle of flames. (Now there may be silence—right up until the booming phenomenon known as "flashover.") And before, there would be time to phone firemen, or use a garden hose or fire extinguisher. (Now, says the National Fire Protection Assn., you're lucky if you have 20 seconds in which to act.)

The trouble is: We fill our homes today with plastics and flammables

to holocaust—can claim human lives long before its telltale signs give any alarm.

DEATH IN SEVEN MINUTES



Here's how engineers tested the effects of a lighted cigarette on a foam-rubber cushion:

- 0.5 min.: Fire's a smoky spot: Anyone could snuff it out? "But that's not how foam-rubber mattresses burn," says an expert.
- 1 min.: Flames appear up to 10 inches high.
- 2 min.: Fire area now a foot wide; first smoke and gases touch ceiling.
- 3 min.: Flames are 3 feet high.
- 4 min.: Sudden tower of flame; thick oily, blinding smoke a foot below ceiling.
- 4.5 min.: Smoke 4 feet below ceiling. You can no longer stand and breathe safely. Your last chance to escape—by crawling.
- 5 min.: Flames go up the wall, light curtain. Smoke layer reaches bed.
- 6.5 min.: Flashover! Gas and soot explode, blowing out windows and door.

and fluids, some of which are toxic, others explosive. Experts say some plastics burn in weird new ways, much hotter and faster, emitting deadly fumes that if inhaled, can alter the senses and kill by asphyxiation. "Two breaths of some of these fumes and you're in serious trouble," firemen say.

Homes can seal in fumes

To make matters worse, many homes now are almost virtually sealed—for heating and cooling ef-

iciency. Fumes can't escape. Meanwhile we keep filling them with wonderful new devices and decorations not realizing that we're virtually priming a bomb.

Today's firemen are magnificent. They arrive in seconds, and readily risk their lives. But more often, houses and apartments are infernos even before firemen get there. And even if firemen can still get in, they can't see. "Smoke is often oily and thick," they say.

"We just have to pass our hands

over the beds and feel for people."

Officials didn't begin to piece together what was happening until one day in Washington, DC., three years ago.

At 10:30 a.m. firemen received an alarm. It came from Building 213 at the U.S. Navy Yard, where a common office copying-machine had overheated and caught fire.

It wasn't much of a fire. Firemen didn't even use masks. They doused the machine, had the fire out in a jiffy. Within 20 minutes they were

ents. Back at the firehouse, firemen began falling ill. Some described it as tightness in the chest. Others had splitting headaches, dizziness, vomiting.

Next day, an engine driver fainted. Then he came to, said he "felt fine," and dropped dead.

Shocked, two Washington physicians, Drs. Robert Dyer and Victor Esch, began a long, careful investigation. The finger pointed not at CO (carbon monoxide), the old familiar cause of fire death, but at a gas which develops whenever polyvinyl chloride (PVC), a common household plastic, burns. For was was hydrogen chloride (HCl), a real killer.

Before long the inquiry had also turned up other poisons: chlorine, phosgene, nitrogen dioxide, sulfur dioxide, ammonia.

As a service to doctors and firemen, the *Journal of the American Medical Assn.* recently devoted eight pages to fire dangers, including a five-page report from Drs. Dyer and Esch.

"Practically every structure today contains plastics capable of producing lung-damaging gases," the physicians warned. "The firefighter faces a great, new risk. . . ."

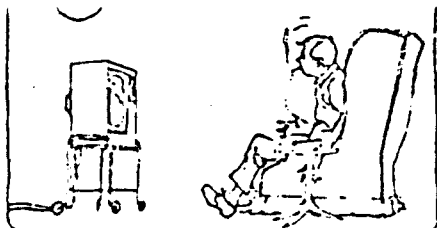
Dangerous slow burn

But what AMA didn't say was that the same risk now faces anyone whose house catches fire. Even "fire-retardant" furnishings like some drapes and rugs contribute new danger, for the very fact that they burn slowly, it's now being discovered, can lead to the emission of more gases.

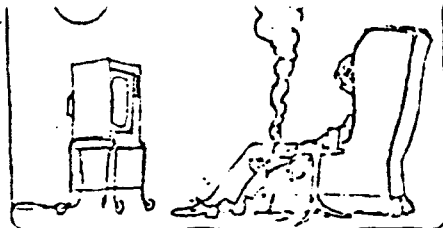
One trouble, the medical investigation found, is that some plastics have a combustion temperature two to five times higher than other household combustibles. And even the wiring (including telephone wiring) in your house can give off poisonous gas, for it may be coated with PVC insulation.

Here's what might happen if a fire starts in your main switch box: The plastic insulation emits white, mist-like HCl fumes that resemble steam. One or two breaths can derange you to the point where it is impossible for you to think your way out.

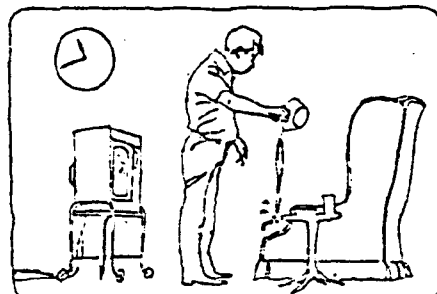
Newspapers every day report deaths from "smoke inhalation." The real cause is often fire gases. In California recently, a confused woman could have escaped her one-story house merely by opening an outside bedroom door and stepping out to her lawn. Instead she opened



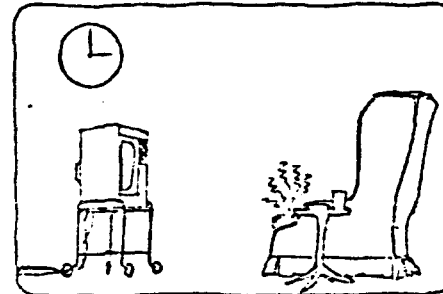
11:00 p.m.: Man watching TV show dozes off; his cigaret falls onto the plastic-base upholstery of his lounge chair.



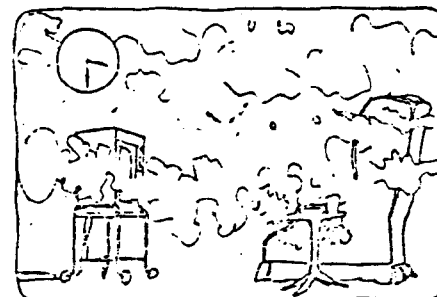
11:40: Material has been smoldering very gradually; only now does it begin to emit visible amounts of thin smoke.



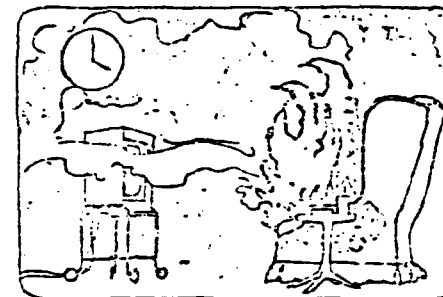
11:41: Man starts awake, gets water in a pan from the kitchen to douse the smoldering spot. Smoke gone, he goes to bed.



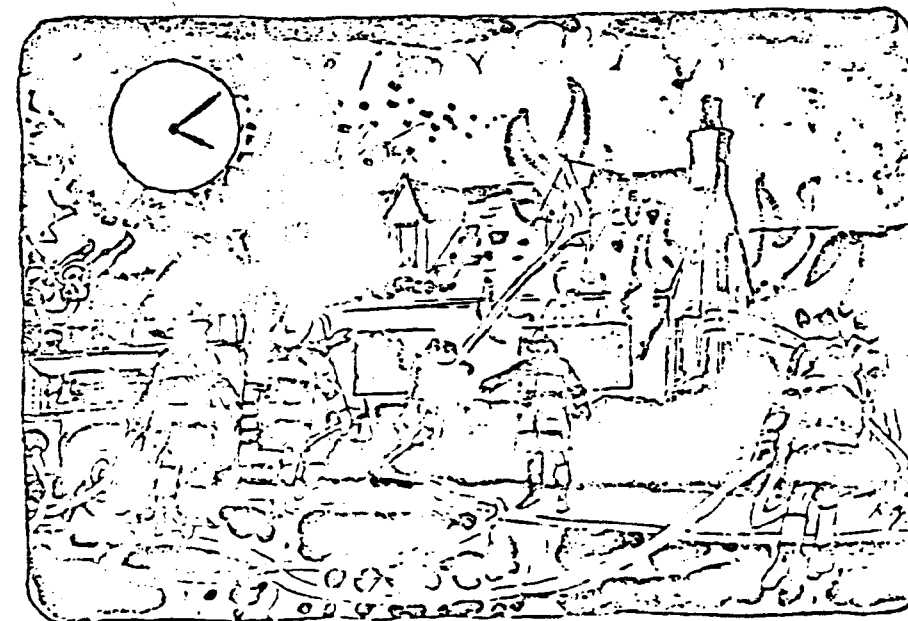
3:00 a.m.: Fire in plastic material, never really put out, burns slowly as a "cold fire" for hours, emitting gases.



3:30: Lots of gas and smoke now; toxic fumes have already affected sleepers' mental processes—perhaps even fatally.



4:00: As gases continue to fill the house, the first real flames now appear—live hours after the cigaret was dropped.



4:10: Firemen summoned by neighbors arrive just as flashover occurs and the fire explodes from the TV room into the rest of the house. Sorrowful friends and relatives are amazed that the family was not aroused soon enough to save it.

The danger can continue even after fires are out because of "heat sink." Hot concrete, for instance, can pour forth toxic HCl for about an hour.

Another danger, the AMA reported, is slowness to awaken. Most of us think we can jump right out of bed and escape. Instead, the AMA cited tests showing it can take a sleeper as much as 12 to 15 minutes to wake up and act.

Firemen say one primary pattern is the "bed-smoker's fire" (see photos on page 97). Another, nearly as common, is the "TV-chair" fire.

Here's how the latter happens, as in the illustrations at right:

The time, let's say, is 10:50 p.m. You're watching TV with friends. It's been a jovial evening. One friend puts down a glass, lights a cigaret.

But the TV show proves dull—and he dozes off.

Time, 11:02 p.m.: Someone says, "I see smoke!" A thin thread of blue from the sleeper's chair. "Hey, man, you're on fire!" But it's only his cigaret in the foam rubber cushion.

The cushion is smoldering. You get some water and douse it. Laughter. Friend apologizes. (You say, "Oh, it's just an old chair.")

At midnight, friends leave. You go to bed.

1:40 a.m. Alone in the dark, the plastic chair is still invisibly smoldering. It's what's called a "cold fire." (Chairs have actually been known to turn entirely to ash without flame.)

4:47 a.m. Sudden hammering on your door. A neighbor leaving for an early job has seen a flicker of flame. He shouts, runs to call firemen.

4:52 a.m. It suddenly dawns on you that you've heard noises and smell something strange. It seems to take forever to wake up. Then the awful fact finally penetrates: Your house is on fire.

You run to collect your family. But the door's not where it should be. You bang your face against a wall. You don't realize you've inhaled toxic fumes and aren't thinking right. But let's say somehow, at last, you collect your family and go out a window.

4:58 a.m. Just as firemen arrive, your TV room literally blows up. You've had a flashover, in which superheated gases and soot have exploded. Your house is gone, but you were lucky.

Lesson from Texas

One of the nation's best protected

It was the writer's privilege, some years ago, to develop the "Family Fire Drill" program, now widely advocated by fire departments and insurance companies, with the help of the National Fire Protection Assn. Now, with new help from NFPA, the National Safety Council and the National Fire Prevention and Control Administration (a new government agency), I recommend this new inferno-escape procedure:

1. Sleep with bedroom doors closed to keep out fire gases.

2. Install at least one smoke detector right now. They no longer cost a fortune. One major supplier is offering them at under \$17 retail. Get a reliable brand.

3. Put it in the right place—never a "dead air" space. A preferred place is in the hall entrance to your sleeping area or at the top of a stairwell outside your bedrooms.

4. Make an up-to-date home fire escape plan, remembering about those gases. Train everyone. How will you all get out if separated by a flaming hall? After you're out, where will you meet—so you know everyone's out?

5. If yours is a two-story house, install (neatly boxed) rope or metal fire ladders in bedrooms. If separated by a hall from a child or someone infirm, give him a bedroom with a porch or carport roof which can be reached from a window. Consider purchasing one of the new escape devices (see text on this page).

6. If you buy a new house, be sure

it has detectors. If you build a house, be sure your architect designs every bedroom with an escape route.

7. Have an absolute rule: No one in your house ever again smokes in bed (already a criminal offense in some states). And be sure no one makes it a habit to smoke, drink and fall asleep while watching TV. Next to the bed-smoker, this person is one of the greatest threats to a household.

8. Add smoke detectors as soon as possible in strategic places where rising smoke would go, such as hallway ceilings, over TV sets, up stairways. And remember that children sometimes start fires in their rooms, so have detectors there, too.

9. Install inexpensive "remote" horns (about \$12 and up) so a detector alarm in one room will be broadcast in all bedrooms. Some now broadcast up to 200 feet by radio, even farther over electric light wiring. We tested one such unit in our TV room. It set off two bedroom alarms upstairs—plus two in a neighbor's house 300 feet away!

10. Best of all, add one of the new automatic home-sprinkler systems now being developed. Compact new systems can be installed in the ceiling without spoiling your room decor. Firemen say you can now virtually fireproof any home with them. Cost: in a new or remodeled home, as low as \$50 a room; can also be installed in older homes, with obvious additional work. But they can help pay for themselves in lower insurance costs.

communities is Farmers Branch, Tex. (pop. 30,000), a Dallas suburb. May 2, 1975, worried by growing fire danger, Farmers Branch city fathers ordered an electronic smoke detector (ESD) program into effect. Whenever anyone moved into a house, a detector was to be installed.

There were a few protests. But these died out on the very first day of the program when fire gases killed a woman. Since then, Fire Marshal Jack Dyer estimates, ESDs have saved 10 lives. And as this is written, they have helped 13 others escape.

There's no doubt that smoke detectors, which can sense fire long before you do (see *Fire Alarm: New Home Appliance That May Save Your Life*, page 71, Dec. '76), save lives. Some states now require them in all new dwellings and apartments. And one small Pennsylvania city now actually buys them at wholesale for its citizens. In some communities there's talk of selling them for \$3 a month—added to residents' water bills.

Other safeguards may come, soon. One is home fire masks. Against the new dangers, firemen in some cities now are ordered to wear masks in

all fires. "In Farmers Branch," says Jack Dyer, "you'll see our men putting masks on while riding our trucks."

Masks and reserve air tanks now cost \$640 and up. But it's only a matter of time before home masks are available at lower cost.

New escape systems

"There is really no reason you should have to crawl out of a window and jump, or fall or try to fumble your way to a rope ladder," one researcher says. "From now on, our building codes should require all new homes and apartments to have ladders, or escape chutes like those in airliners. Or small window-balconies reachable through doors, with drop-down ladders or poles.

Already, several new products are making escape easier. One, is Reinhard Corp.'s "life ladder." Installed near a window, it looks like a downspout—but has rungs that flip out to make it a sturdy aluminum ladder. This can be used for up to 25-foot (three-story) heights. Another is the Booth balcony, with drop-down steps, which can be installed outside any window. Others include the

(Please turn to page 208)

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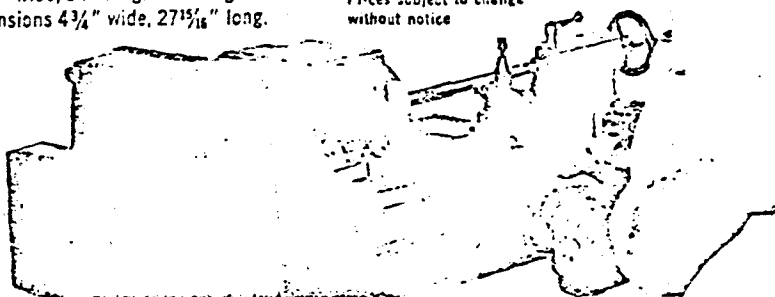
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THE HOME INFERNO

(Continued from page 93)

Resmatic controlled-descent harness developed by Dr. J. Nigel Ellis of Wilmington, Del., in which a wire reel lowers you at a constant 3-ft.-per-second maximum rate.

Smoke detectors vital

But your immediate objective, if you don't yet have them, is one or more smoke detectors. There are two types—ionization and photoelectric; some are wired into house circuits, others plug in or are powered by batteries.

Plug-in or battery ESDs are simple to hang from brackets near ceilings. Experts generally prefer permanent wiring connections, and some communities now permit you to make your own hookup if you know how. "If you can convince us, we give you a permit, and after the job's done we send an inspector to see it," says Farmers Branch Marshal Dyer.

What about heat detectors and fire extinguishers?

Heat detectors (HDs) are considered very reliable, and automatic heat-activated extinguishers over your furnace, workbench and car, experts say, provide great protection.

But HDs have not been designed to give you a quick alarm if fire breaks out somewhere else in the house. Thus, ESDs are being built into HD units: You get HD reliability plus ESD ability to sense smoke drifting in from other rooms.

Fire extinguishers are handy, and can deal adequately with many small daytime fires. "But if fire ever wakes you up at night," warns one expert, "don't waste time with an extinguisher. Get everybody out!"

If you are an apartment dweller, "Pull the little red alarm box and get the hell out," says another expert. "Time spent with an extinguisher is better spent waking people up!"

Experts say some modern condominiums and town houses are no safer than most single-family homes. In one town house fire recently, fire started in the usual first-floor garage. There was only one escape stairway for 100 units.

Luckily, it was a daytime fire and all got out. But its management has since ordered 40 "downspout type" escape ladders!

No matter what the initial cost, precautionary devices that wind up saving the lives you and your family in the event of the new-type home inferno must be judged one of the best investments you can ever make.

SPI-08833