

Comments to the USGBC TSAC PVC Task Group

In reference to the USGBC TSAC PVC Draft Report dated December 17, 2004

From Deborah Wallace, Ph.D., author of *In The Mouth of the Dragon – Toxic Fires in the Age of Plastics*

The TSAC Analysis of PVC Fires and Their Impacts

The TSAC report uses only two databases, a medical one and an environmental one. Neither of these databases contains the data and scientific discourse needed to assess the impacts of PVC fires, particularly on health. Such publications as *Fire and Materials*, *Journal of Combustion Toxicology*, *Fire and Flammability*, and a host of governmental reports such as that by the government of Ireland which analyzed the Stardust Disco fire of 1984 (125 people dead) contain absolutely essential data and analyses. The TSAC analysis is an utter travesty because of the ignorance it exposes with respect to the thermochemistry of PVC pyrolysis and combustion, the multifatal fires in which PVC was a major contributor to the atmospheric toxicity, and the role of building design in determining the path and concentration of the products of thermal decomposition at different stages of the fire. These data, statistical analyses, and scientific discussions are widely available and known by those who have even merely put their toes into these waters, so to speak. Failure to include them shows either a willful averting of eyes or a woeful ignorance of the field. Such chemists of the PVC industry itself such as Michael O'Mara published papers showing the mass emission of HCl from PVC at 250°C and the emission of a myriad of organic compounds as the temperature rises toward ignition (600°C). Jeremy Stone wrote the keystone paper on the role of soot – its respirable size and the adsorption of HCl onto its surface—in the lung damage consequent on PVC fires. These papers were published in the 1960's-1970's and would not appear in the databases on which TSAC foolishly relies.

Other relevant publications include *Fire Engineering* and the journals of the fire service across the country.

The fires that TSAC uses to conclude that PVC is not a special problem in fires were viewed from their outdoor aspects only and were not fires in inhabited buildings. Numerous fires that occurred in various types of inhabited buildings (residences, workplaces, hotels, and places of public assembly such as nightclubs and restaurants) have been described in fire science literature. The enclosing of the space in which the fire occurs prevents the venting of the smoke and keeps the concentrations in the pyrolytic fumes and the smoke high. Furthermore, the design of the building determines where these plumes go and how concentrated they are at the various sites along the pathway. The smoke of the MGM Grand Hotel fire (1980) rose through the elevator shafts and plumbing pipe spaces and concentrated at the top of the building from which it diffused downward. This fire began as a PVC fire in the wire insulation behind a refrigerator display case on the groundfloor; PVC made major contribution to the smoke, as analysis of the metals in the soot from the respiratory tracts of the corpses showed (deposition of Merritt Birky in the litigation; Merritt Birky had been the chemist of the NIST Fire Research Center but later migrated to the National Transportation Safety Board). The design of the building is a crucial factor in the impact of PVC fires (and other fires), and NIST had sponsored much work on modeling fires that included building design among the model parameters. Additionally, reconstruction of many of these fires in hotels, restaurants, stores, and office buildings included a wide range of data such as soot analysis that showed the roles of the various combustible materials. TSAC failed to draw on this rich database. The NFPA does not have (and has never had) competent fire scientists or engineers to reconstruct the mass fatal fires for which it issues reports under contract to FEMA. But insurance companies such as Swiss Reinsurance have done better; Swiss Reinsurance has issued reports over the past 30 years on the role of PVC in mass fatal and very damaging fires in Europe because that company has to pay for rebuilding after the fire and for the liability in the case of injuries and deaths. Factory Mutual, the lab of the US insurance industry, wrote a series of reports on PVC in fires in the late 1970's-early 1980's. Tewarson was the head of that project and published in the fire science literature as well.

Another database of interest is the American Trial Lawyers Associations's computerized listing of suits filed and their outcomes. To gain access, however, one must be a member of the ATLA. That should be no problem for TSAC because they could easily enlist the help of to such a person. PVC has been a major

defective product with respect to liability suits. This is not just a matter of prejudice. The suits are rooted in the physicochemical properties of PVC. They range from meatpackers suing because they became asthmatic as a result of sealing PVC wrap to people injured in fires because of the extreme acidity of the smoke.

TSAC ignored many papers in the medical literature on inhalation of PVC smoke. *Thorax* published the case history of Gerry Bresnan, a firefighter whose lungs were damaged in the NY Telephone Fire because of the extreme acidity of the smoke. Another NY Telephone firefighter came down with cancer of the larynx, and his ENT specialist also published about the relationship between HCl exposure and laryngeal cancer. The FDNY's magazine *Firelines* has published at least two descriptions of the NY Telephone Fire (1975) which allude to the particular role of the PVC wire insulation and cable jacketing in the injuries and in the difficulty in controlling that fire (acidity of the smoke, incredible density of the smoke, generation of combustible gases so that secondary fires broke out). Fires such as the NY Telephone Fire have been written up in a variety of publications. They also are described in fire reports written by the chiefs who presided over the fire fight. Since about 1980, FEMA has received standardized fire reports from the major municipalities across the country. This is a rich database and includes listing of the materials and products involved in the fires.

TSAC did not report on all the PVC fires in the databases that they did use. *Environmental Science and Technology*, *Chemosphere*, and other environmental publications that should be part of the environmental and medical databases which TSAC says it used have reported on both lab experiments on burning PVC and fire occurrences over the past 30 years. The reports on fire occurrences have included dioxin sampling in the environment of the fire. For example: a paper reporting on the elevated dioxin body burden of rodents near a large PVC fire site (in comparison with rodents farther from the site) appeared in the Medline database but was never mentioned in the TSAC analysis. The lab experiments have reported on dioxin generation from burning PVC under various conditions. In the medical literature are famous papers such as that by Dyer and Esch (1976, *JAMA*) about firefighters and others who were exposed to smoke from burning PVC. There is a huge occupational health literature on such topics as polymer fume fever which was first discovered in Teflon factory workers but was found to occur in PVC factory workers as well. This is a flu-like illness from inhaling fumes from heated resin; it sometimes progresses to pulmonary fibrosis/emphysema because the acid destroys the elastic collagen in the lung. Indeed, large numbers of papers reporting on vinyl chloride monomer exposure in PVC factories and health consequences, on effects of PVC particles on lung function of PVC factory workers, and exposure to fumes from PVC are listed in Medline, but not part of the TSAC discussion or the Life Cycle Analysis.

Finally, in its discussion of the papers that it did acknowledge finding, the TSCA team showed bias in attributing credibility. The Markowitz papers were dismissed out of hand without foundation. Yet, the physical and mental sequelae described by Markowitz are entirely consistent with both the chemistry of PVC fumes and smoke and with the previous publications in the medical literature on PVC smoke exposure (literature ignored by TSCA).

In summary: TSCA ignored most of the data and scientific discussion that has been published on PVC combustion chemistry and on the health impacts of fires fueled by PVC over the past 30 years. Labeling PVC a green building material would be a gross travesty that would discredit the entire process of certification. It would totally omit the basic physicochemical properties of PVC which are especially dangerous in fires and problematic for such environmentally important issues as re-use, recycling, and durability under the expected range of environmental factors (temperature, humidity, air pollution, UV light, physical stresses such as shaking and torsion). The vast literature of polymer physics and chemistry was never part of this so-called analysis. A basic understanding of what PVC is and how it behaves when confronted with common physical and chemical environmental factors must underlie any sound, accurate, and verifiable model of the PVC Life Cycle.