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to: All Vinyl Institute Members  
from: Nora Jacobs   
subject: New Technical Paper Available

date: March 7, 1990

copies to: Roy Gottesman  
Pat Benkner

The Vinyl Institute Technical and Communications Committees have just completed work on the attached technical paper, "Effects of Vinyl Products on Indoor Air Quality."

This paper was developed to respond to specific, individual concerns that Institute members have encountered on the subject of PVC and indoor air pollution. In order not to create an issue where none currently exists, no broad scale promotion of the paper is planned. Institute members, however, can receive additional copies of the paper by contacting Ms. Pat Benkner at the VI office: (201) 890-9299.

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## Effects of Vinyl Products on Indoor Air Quality

PVC (polyvinyl chloride, or vinyl) has been produced commercially for over 50 years. Today, with nearly 32 billion pounds manufactured annually, it is the world's second-largest selling plastic material. Vinyl is used in countless applications ranging from automotive components to medical devices. A large proportion of the vinyl produced annually is used to fabricate articles commonly found in today's home: wallcoverings, resilient flooring, plumbing pipe, electrical conduit, wire and cable sheathing and insulation, house siding, window frames, upholstery fabric, toys, and packaging for food, toiletries, pharmaceutical products and household goods.

Along with many other construction and furnishing products, vinyl products used in the home or office have been alleged to contribute to the decline in indoor air quality. These concerns center on the potential volatilization of certain components of the vinyl composition such as vinyl chloride monomer and, in the case of flexible vinyl products, phthalate plasticizers. However, a review of current manufacturing practices, combined with an analysis of actual use conditions, reveals that rigid and flexible vinyl products are unlikely to contribute to the indoor air problem.

### Why Indoor Air Quality is an Issue

As homes and offices become more energy-efficient and resistant to heat and air conditioning loss, fresh air circulation decreases. This causes stagnant air, which can contain contaminants from aerosol sprays, dust, plant pollen, animal dander, paints, cleaners, etc. The resulting phenomenon is known as "indoor air pollution." In severe situations, scientists consider indoor air pollution to be a health threat.

### The Chemical Composition of Vinyl End Products

The compounds used to produce vinyl end-products typically are composed of inert, nonvolatile polyvinyl chloride resin and various ingredients such as pigments,

processing aids and additives used to improve various physical properties such as impact resistance or weatherability. Minute quantities of vinyl chloride monomer (VCM), a residue of the vinyl resin manufacturing process, may also be present. In some cases, DOP plasticizer (di-2-ethylhexyl phthalate) may be part of the composition as well. Although these components normally remain encapsulated within the polymer matrix, certain materials can migrate to the surface of the vinyl product and be released into the atmosphere. Recent studies have focused on the potential health risk associated with the possible migration and volatilization of residual vinyl chloride monomer and DOP plasticizer.

### Manufacturing Standards Reduce Health Risks

As a result of workplace practices designed specifically to reduce residual VCM to very low levels, the amount of VCM remaining in vinyl resin ("residual vinyl chloride monomer," or RVCN) is extremely low. Resin produced today typically contains less than 2 parts per million (ppm) RVCN. RVCN levels are even lower in products fabricated from the resin, thus presenting little health risk to the user of vinyl end-products.

### Additional Requirements Assure Product Safety

Vinyl applications designed to contain or convey products destined for human consumption (food, beverages, drug products, drinking water, etc.) are strictly monitored by federal regulatory agencies and agencies sanctioned by the U.S. government. The U.S. Food and Drug Administration (FDA) currently sanctions that all rigid and semi-rigid vinyl food contact applications contain only 10 parts per billion (ppb) residual vinyl chloride monomer. The National Sanitation Foundation (NSF) requires that vinyl pipe used to transport drinking water contain no more than 2 parts per million RVCN. Pipe manufacturers typically require resin that meets this 2 ppm limit, even though heat used to transform the resin into pipe dissipates some of the RVCN.

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