Vinyl Resins
(Thermal Decomposition)

Mr. R. E. Gulick
Mellon Institute
4400 Fifth Avenue
Pittsburgh 13, Pennsylvania

April 10, 1957

Mr. K. V. McCullough
Mr. R. A. Calsibet

Polyvinyl Chloride Degradati n
Dr. Joseph Bigos - U. S. St el

Dear Mr. Gulick:

This question has been raised repeatedly over the years, and it has not limited the use of polyvinyl chloride in floor and wall coverings as well as for upholstery, etc.

A report was issued in January, 1951, by the United States Department of the Interior, Bureau of Mines, Report of Investigations 4777, on the "Thermal Decomposition Products and Burning Characteristics of Some Synthetic Low-Density Cellular Materials." This study included cellular polyvinyl chloride and soft cellular polyvinyl chloride.

In summary this report states that for all materials carbon monoxide appeared as a principal gaseous product of toxicological significance, together with hydrogen chloride in the case of polyvinyl chloride materials.

It has been our opinion that the maximum hazard is from CO which is present when most any organic material is burned. The CO is insidious in that it possesses no warning power, while HCl fumes are irritating and have good warning powers. Therefore, there is an additional factor of safety present with the polyvinyl chloride materials upon combustion.

Polyvinyl chloride will not support combustion, but if it is heated to a sufficient degree, of course it will burn.

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It would seem that they should not be greatly concerned regarding the thin coating of polyvinyl chloride on steel. Based upon a weight basis, these would be in proportion to a small quantity of the resin, certainly nothing like that amount in a floor covering or upholstery material.

We have not seen the report referred to by Mr. Burke and written by Mr. Alan Shriescheim.

Very truly yours,

MEDICAL DIRECTOR

Thomas W. Hale, M. D.
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MEMORANDUM

SUBJECT: UNITED STATES STEEL CORPORATION
DATE: MARCH 28, 1957
AUTHOR: R. E. GULICK

DR. JOSEPH BIGGS AND MR. BRYAN BURKE OF SUBJECT COMPANY CALLED TO DISCUSS VINYL FINISHES FOR SHEET STEEL WITH MESSRS. ANNONIO, LUKES, AND THE WRITER. BOTH DR. BIGGS AND MR. BURKE ARE DIRECTLY CONNECTED WITH THE PROGRAM AT THE IRVIN WORKS FOR COATING SHEET STEEL AND ARE WITH THE COATINGS GROUP OF U. S. STEEL'S RESEARCH LABORATORY IN MONROEVILLE. DR. BIGGS IS HEAD OF THIS GROUP.

U. S. STEEL CORPORATION HAS BEEN PROMOTING THE DEVELOPMENT OF FACTORY COATED SHEET STEEL WHICH COULD BE POSTFORMED INTO OFFICE FURNITURE, RADIO, AND TELEVISION CABINETS, ETC. TO DATE, THEY HAVE DEPENDED UPON COATINGS MANUFACTURERS TO SUPPLY PACKAGED COATING SYSTEMS BUT THE RESULTS HAVE BEEN UNSATISFACTORY AND SOMEWHAT INCONSISTENT. SUBJECT COMPANY HAS NOT DONE ANY COATING FORMULATION WORK ON THIS PROJECT. DUE TO THE UNSATISFACTORY RESULTS OBTAINED IN WORKING THROUGH COATINGS SUPPLIERS, U. S. STEEL HAS NOW DECIDED TO DO BASIC DEVELOPMENT WORK ON THE PROJECT. THEY WOULD THUS EVENTUALLY HOPE TO BE IN A POSITION TO WRITE FORMULATION SPECIFICATIONS RATHER THAN DEPEND UPON THE PERFORMANCE SPECIFICATIONS NOW USED. BY WRITING FORMULATION SPECIFICATIONS, THEY COULD EXECUTE A TIGHTER CONTROL ON MATERIALS USED AND HAVE A BETTER UNDERSTANDING OF THE PROBLEMS ENCOUNTERED. DR. BIGGS EXPRESSED A DESIRE TO WORK CLOSELY WITH US ON THIS PROJECT.

THE INFORMATION GIVEN IN RELEASE 21 ENTITLED "NEW PRIMERS FOR VINYL DISPERSION FINISHES" WAS DISCUSSED IN DETAIL. SEVERAL STRIPS OF U. S. STEEL'S PRESENT EXPERIMENTAL COATING SYSTEMS WERE STEAM PROCESSED. ONE SYSTEM GAVE GOOD RESULTS IN THIS TEST. AN ADDITIONAL SERIES OF PANELS WERE PUT ON TEST IN THE HUMIDITY BOX. EXTRA PANELS WERE LEFT FOR OUR FURTHER GENERAL EVALUATION. DR. BIGGS REQUESTED THAT WE CHECK THESE PANELS IN ANY OF OUR STANDARD TESTS WE FEEL WOULD BE APPLICABLE. U. S. STEEL IS PLANNING EXTERIOR EXPOSURE TESTS IN TEXAS AND FLORIDA.

DURING THE COURSE OF THE DISCUSSION, MR. BURKE POINTED OUT THAT ONE OF THE OBSTACLES U. S. STEEL HAS MET IN PROMOTING VINYL COATED STEEL HAS BEEN THE PROBLEM OF TOXICITY. HE MENTIONED A PAPER RECENTLY PUBLISHED GIVING THE PERCENTAGE OF HYDROCHLORIC ACID FUMES WHICH WOULD BE RELEASED TO A GIVEN VOLUME OF AIR BY A GIVEN AMOUNT OF POLYVINYL CHLORIDE ON DEGRADATION OF THE POLYVINYL CHLORIDE. THIS PAPER WAS WRITTEN BY MR. ALAN SHRIESCHEIM OF THE BUREAU OF STANDARDS. HE IS NOW WITH ESSO RESEARCH.

IT IS THE AUTHOR'S OPINION THAT A CONSIDERABLE VOLUME OF VINYL RESIN COULD BE MARKETED BY VIRTUE OF THIS OPERATION AND THAT WE SHOULD COOPERATE WITH U. S. STEEL CORPORATION IN FURTHER DEVELOPMENT. DR. BIGGS IS FRIENDLY TOWARDS BAKELITE BECAUSE OF HIS CLOSE PRIOR ASSOCIATION WITH US AT MELLON INSTITUTE AND DEFINITELY DESIRES OUR COOPERATION. THE WRITER ALSO BELIEVES WE SHOULD TAKE POSITIVE STEPS TO HELP ELIMINATE POOR PUBLICITY SUCH AS THAT IN THE ABOVE NOTED PAPER.

R E Gulick

REG/EJ
CC: MR. K. V. MCCULLOUGH
MR. R. A. CALBICK
DR. W. K. ARBECK
MR. H. L. LARSON
DR. T. W. HALE (MAY WE HAVE YOUR COMMENTS ON THE LAST PARAGRAPH)
MR. W. M. MCKNIGHT

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SENTENCE

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