July 27, 1966

Mr. M. W. Heddon
Sierra Engineering Company
123 East Montecito
Sierra Madre, California 91024

Dear Mr. Heddon:

Confirming my telephone conversation, the following discusses the toxicity and safe handling of Therminol FR-1.

In appropriate animal toxicity studies, the rat oral LD_{50} for this product has been found to be approximately 8650 mg/kg of body weight. When applied to the unbroken skin of rabbits, the lethal dose is approximately 1,000 mg/kg. We believe these data indicate that Therminol FR-1 is not particularly toxic if accidentally ingested. On the other hand, it is moderately toxic if there is prolonged and repeated skin contact.

Animals survive single 6-hour exposures to atmospheres saturated with vapors at ambient temperature. When the product is heated to increase volatilization, vapor concentration may cause systemic effects and death in animals depending on the temperature and duration of exposures. At vapor concentrations which are hazardous to humans after a short period, there will be immediate transient symptoms of irritation, possibly followed by nausea and headache if the exposure is continued.

No serious acute detrimental effects on personnel would be expected during the normal handling and recommended use of this fluid. This includes pouring or pumping the fluid from original containers to heat transfer systems at ambient temperatures. When used in a properly designed system, there should be no leaks or opportunity for escape of vapors at elevated temperatures. The only opening from the system to the atmosphere should be from the "hold" or reservoir tank, and obviously this should be vented to the outdoor atmosphere rather than within any building.

In summary, we conclude that the danger of acute short-term exposures to personnel is not as great as that which involves the possibility of systemic injury resulting from day-in and day-out chronic exposures - either by vapor inhalation or continuous skin exposure. Repeated and prolonged skin exposure may also result in drying and cracking of the skin because of the solvent action of the fluid.

If the above information does not answer your questions or if you believe I can be of any additional assistance, please let me know.

Very truly yours,

R. Emmet Kelly, M.D.
Medical Director

REK:mjb
cc: D. E. Eriksen - Monsanto, Los Angeles