

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

May 5, 1993

TO: Cyanide File (CAS # 57-12-5)

FROM: Gary Butterfield

SUBJECT: ITSL for Cyanide

ACGIH (1992) has a TLV for hydrogen cyanide. The documentation indicates that the TLV would prevent adverse effects of acute poisoning. There apparently was no consideration of long term, low level exposure's adverse effects mainly due to the general lack of chronic data being available.

The most recent comprehensive review document for cyanide is ATSDR 1991. Nearly all of the available inhalation studies were conducted with exposures to hydrogen cyanide. The majority of these studies were acute, animal exposures. The few long term, low level human exposures that were included in ATSDR were from occupational exposure. A March 16, 1993 CAS-on-line search covering the time period since the ATSDR document was published did not locate any new toxicity data usable for development of the ITSL.

In EPA's IRIS database no RfC is available for hydrogen cyanide or free cyanide. However, there is an RfD for hydrogen cyanide of 0.02 mg/kg and one for free cyanide of 0.02 mg/kg. EPA (1990) indicates it is inappropriate to use the RfD for extrapolation to inhalation exposure, due to the high detoxification metabolic ability in the liver which isn't effective if cyanide is inhaled. It is interesting that both of the RfD's for hydrogen cyanide and free cyanide are based on the same oral exposure study. The fact that EPA has the same RfD for both compounds from the same studies is an indication that the toxicity of both compounds are treated the same by EPA. ACGIH TLV's for cyanide includes coverage of potassium cyanide, sodium cyanide, and calcium cyanide (KCN, NaCN, and Ca(CN)₂), thus all of these cyanide compounds were considered to be of a similar toxicity hazard. In addition, ATSDR 1991 states that hydrogen cyanide gas is the most likely form of cyanide to occur in the airborne environment. NIOSH also has the same REL of 5 mg/m³ or 4.7 ppm for hydrogen cyanide and cyanide. The cyanide REL includes potassium cyanide and sodium cyanide. Thus NIOSH considers hydrogen cyanide, sodium cyanide and potassium cyanide to have similar toxicity. These issues indicate there is little reason to have different ITSL's for hydrogen cyanide and free cyanide. Therefore the ITSL for free cyanide (CAS # 57-12-5) will be established as equal to the ITSL that was developed for hydrogen cyanide (CAS # 74-90-8), and based on the NIOSH REL, which is the same concentration for both

hydrogen cyanide and free cyanide. This NIOSH REL of 5 mg/m³ is also supported by data from Blanc et al (1985) and El Ghawabi et al (1975). This would make the ITSL for free cyanide 50 ug/m³ with a 1 hour averaging time.

References:

- ACGIH. 1992. Documentation of TLV's and BEI's.
- ATSDR. 1991. Toxicological profile for cyanide - update draft.
- Blanc et al. 1985. Cyanide intoxication among silver reclaiming workers. J Am Med Assoc 253:367-371.
- El Ghawabi et al. 1975. Chronic cyanide exposure: a clinical, radioisotope, and laboratory study. Br J Ind Med 32:215-219.
- EPA. 1993. IRIS2.
- EPA. 1990. Summary review of health effects associated with hydrogen cyanide. EPA/600/8-90/002F.
- NIOSH. 1990. Pocket guide to chemical hazards.

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