EMERGENCY RESPONSE PLANNING GUIDELINE (ERPG)
Public Comment Draft

ACRYLONITRILE
(2026)

NEW ERPG-3: 100 ppm (163 mg/m^3)
ERPG-2: 35 ppm (76 mg/m^3)
ERPG-1: 10 ppm (22 mg/m^3)

ERPG™ Maximum Airborne Concentration Levels

ERPG 1
MILD

The maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor.

ERPG 2
SERIOUS

The maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take action.

ERPG 3
SEVERE

The maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

AIHA® | GUIDELINE FOUNDATION

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I. Recommended ERPGs and Supporting Rationales

ERPG-3: 100 ppm (163 mg/m^3)

100 ppm is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects. There are no suitable human lethality data. The 4-hr LC_{50} in rats in whole body exposure is 333 ppm (DuPont, 1968), while the 4-hr LC_{50} in rats in nose only exposure is 946 ppm. This suggests that nose only exposure underestimates the lethality of acrylonitrile. The 1-hr LC50 in rats ranged from 1911 ppm (Turner and Fairhurst, 1989) to ~2000 ppm (Dudley and Neal, 1942) The highest nonlethal level for 1 hr exposure in rats was 1270 ppm (Dudley and Neal, 1942) and the BMCL05 for this data was 1024.4 ppm (NRC, 2014). Although one dog died after a four hour exposure to 65 ppm, three other dogs exposed to 65 ppm and four dogs exposed to 100 ppm for four hours survived. One of three monkeys exposed to 75 ppm for 7-hr died on study. The data in rats suggest an ERPG-3 level of 100-125 ppm. While the dog is the most sensitive species and would appear to overestimate the lethality of acrylonitrile. The pharmacokinetics in rats are closer to what is observed in man. Using the conservative $BMCL_{05}$ of 1024.4 ppm in rats, a level of 100 ppm was selected for ERPG-3, which should protect almost everyone in the general population.

ERPG-2: 35 ppm (76 mg/m³)

35 ppm is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms that could impair their ability to take protective action. This limit is selected based on reversible human effects observed at estimated concentrations of 16-100 ppm for 20 to 45 minutes.(Wilson et al., 1948) In the animal studies, even the most sensitive species - the dog - showed only slight salivation when exposed to 30 ppm for 4 hr, (Dudley and Neal, 1942) whereas levels of 100-200 ppm for 1-2 hr produced serious signs of toxicity. (DuPont ,1942) Rats showed a marked response: immediate stimulation of respiration, followed by rapid, shallow breathing, irritation of mucous membranes, nasal exudates and eye watering, and flushing or reddening of the skin, nose, ears and feet. The lowest marked/or highest transitory response in rats at 30 minutes was 665 ppm with a range of 665 to 2445 ppm (mid-point 1555 ppm), at 1 hour it was also 665 ppm, at 2 hours it was 305 ppm, at 4 hours 130 ppm and at 8 hours 135 ppm. (Dudley and Neal, 1942) These symptoms could be considered as an inability to escape, although no such specific test was conducted.

ERPG-1: 10 ppm (22 mg/m³)

10 ppm is the maximum airborne concentrations below which nearly all individuals could be exposed for up to 1 hr without experiencing other than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor. The most reliable estimates of the odor threshold data for acrylonitrile indicate that the odor threshold is about 20 ppm, and is reported to produce an objectionable (faintly pungent) odor. (DuPont, 2007) Human volunteers exposed to acrylonitrile vapors at 2.3 to 4.6 ppm for 8 hours showed no deleterious effects. (Jakubowski et al., 1987) Symptoms observed in workers involved in cleaning operations in polymer plants with estimated acrylonitrile exposure to be about 16-100 ppm for 20-45 minutes. The most frequent symptoms reported included dull headache; fullness in the chest; irritation of all mucous membranes including the eyes, nose, and throat; and a feeling of apprehension and nervous irritability. (Wilson et al., 1948)

II. History of Acrylonitrile ERPGs

First Published in 1997: ERPG-1=10 ppm; ERPG-2=35 ppm; ERPG-3=75 ppm.

Updated and republished in 2007: ERPG values unchanged.

Updated and republished in 2026: ERPG-1=10 ppm, ERPG-2=35 ppm, ERPG-3=100 ppm.

The literature search used to develop the current document was conducted in April 2026.

III. References

American Conference of Governmental Industrial Hygienists: Seventh Edition. 2017. Documentation of the Threshold Limit Values: Acrylonitrile. Cincinnati, Ohio.

American Industrial Hygiene Association. 2013. Odor Thresholds for Chemicals with Established Occupational Health Standards. Fairfax, VA.

Bader, M.; Wrbitzky, R. 2004. Follow up biomonitoring after accidental exposure to acrylonitrile long dash implications for protein adducts as a dose monitor for short-term exposures. *Toxicology Letters, 162*(2-3), 125-131.

Beliles, R.P., HJ. Paulin, N.G. Makris, and RJ. Weir. 1984. "Three-Generation Reproductive Study of Rats Receiving Acrylonitrile in Drinking Water. Prepared by Litton Bionetics, Inc., Kensington, Md. (Summarized in the Health Assessment Document for Acrylonitrile, EPA, PB84-149152).

Bio/dynamics Inc. 1980: "A Twenty-Four Month Oral Toxicity/Carcinogenicity Study of Acrylonitrile Administered by Intubation to Spartan Rats." Vols.1-2 of Final Report, 1980c. (Summarized in the Health Assessment Document for Acrylonitrile, EPA, PB84-149152).

Brieger, H., F. Rieders, and W.A. Hodes. 1952. Acrylonitrile: Spectrophotometric Determination, Acute Toxicity, and Mechanism of Action. *AMA Arch. Ind. Hyg. Med.*, 6, 128-140.

Council on Scientific Affairs, Advisory Panel on Reproductive Hazards in the Workplace. 1985. Effects of Toxic Chemicals on the Reproductive System. *JAMA* 253(23), 343, 1-3437.

Delzell, E., and RR. Monson. 1982. Mortality Among Rubber Workers: VI. Men with Potential Exposure to Acrylonitrile. *J. Occup. Med.*, 24(10), 767-769.

Dudley, H.C., and P.A. Neal. 1942. Toxicology of Acrylonitrile Vinyl Cyanide. (IA. Study of the Acute Toxicity. *J. Ind. Hyg. Toxicol.*, 24(2):27-3.

DuPont Company. 1942. "Toxicity of Vinyl Cyanide (Medical Research Project No. MR-97). [Unpublished Information.] E.I. du Pont de Nemours & Co., Haskell Laboratory, Elkton Road, PO. Box 50, Newark DE 19713.

DuPont Company. 1968. "Acute Inhalation Toxicity inRats" (Haskell Laboratory Report No. 226-68).[Unpublished Information.] E.I. du Pont de Nemours & Co., Haskell Laboratory, Elkton Road, PO. Box 50, Newark, DE 19713.

DuPont MSDS. 2007. Acrylonitrile. E.I. du Pont de Nemours & Co., Haskell Laboratory, Elkton Road, PO. Box 50, Newark DE 19713.

El Hadri, L., B. Chanas, and B.I. Ghanyem. 2005. Comparative metabolism of methacrylonitrile and acrylonitrile to cyanide using cytochrome P 4502E1 and microsomal epoxide hydrolase-null mice. *Toxicology and Applied Pharmacology*, 205(2), 116-125.

U.S. Environmental Protection Agency, Office of Research and Development. 1983. Health Assessment Document for Acrylonitrile – Final Report (EPA-600/8-82-007F). Research Triangle Park, NC.

U.S. Environmental Protection Agency. 1991. Integrated risk information system. IRIS: Full summary for acrylonitrile. USEPA.

U.S. Environmental Protection Agency. 2000. Air Toxics. Acrylonitrile Hazard Summary. Washington, DC.

Ghanayem, B. I., A. Nyska, J.K. Haseman, and J.R. Bucher. 2002. Acrylonitrile is a multisite carcinogen in male and female B6C3F1 mice. *Toxicological Sciences*, 68(1), 59-68.

Guirguis, S.S., MB. Cohen, and G.S. Rajhans. 1984. A Review of Health Risks in Acrylonitrile Industry. G. *Ital. Med. Lav.*, *6*, 87-93.

Humiston, CG, J.F., LO Frauson, JF Quast, and JM Norris. 1975. "A 90-Day Oral Toxicity Study Incorporating Acrylonitrile in the Drinking Water of Rats." Unpublished report prepared by the Toxicology Research Laboratory, Health and Environmental Sciences, Dow Chemical, USA, Midland, Mich.

International Agency for Research on Cancer. (2025) Talc and acrylonitrile IARC monographs on the identification of carcinogenic hazards to humans. Vol 136.

Jakubowski, M, I. Linhart, G. Pielas, and J. Kopecky. 1987. 2-cyanoethylmercapturic acid (CEMA) in the urine as a possible indicator of exposure to acrylonitrile. *Brit. J. Ind. Med.*, *44*, 834-840. [As cited in Sakurai 2000]

Johannsen, F. R. and G.J. Levinskas. 2002. Chronic toxicity and oncogenic dose-response effects of lifetime oral acrylonitrile exposure to Fischer 344 rats. *Toxicology Letters, 132*(3), 221-247.

Johannsen, F. R. and G.J. Levinskas. 2002b Comparative chronic toxicity and carcinogenicity of acrylonitrile by drinking water and oral intubation to Spartan registered sign Sprague-Dawley rats. *Toxicology Letters*, *132*(3), 197-219.

Knobloch, K., S. Szendzikowski, T. Czajkowska, and B. Krysiak. 1971. Experimental Studies upon Acute and Subacute Toxicity of Acrylonitrile. *Med. Pracy.*, *12*(3), 257-269.

Lambotte-Vandepaer, M. and M. Duverger-van Bogaert. 1984. Genotoxic Properties of Acrylonitrile. *Mutat. Res.*, *134*, 49-59.

Maltoni, C., A. Ciliberti, and V. Di Maio. 1977. Carcinogenicity Bioassays on Rats of Acrylonitrile Administered by Inhalation and by Ingestion. *Med. Lavoro, 608*(6), 401-411.

Marsh, G. M., M.J. Gula, A.O. Youk, and L.C. Schall. 1999. Mortality among chemical plant workers exposed to acrylonitrile and other substances. *American Journal of Industrial Medicine, 36*(4), 423-436.

Milvy, P. and M. Wolff. 1977. Mutagenic Studies with Acrylonitrile. *Mutat. Res., 48*, 271-278.

McOmie, W.A. 1949. Comparative Toxicity of Methacrylonitrile and Acrylonitrile. *J. Ind. Hyg Toxicol., 31*(2), 113-116.

Murray, FJ., B.A. Schwetz, K.D. Nitschke, J.A. John, J.M. Norris, and PJ. Gehring. 1978. Teratogenicity of Acrylonitrile Given to Rats by Gavage or by Inhalation. Fd. *Cosmet. Toxicol., 16*, 547-551.

Nemec, Mark D. 2005. An inhalation two-generation reproductive toxicity study of acrylonitrile in rats. WIL Research Laboratories Study #486001; Sponsor: The Acrylonitrile Group, Inc., 1250 Connecticut Avenue, N.W., Washington DC by WIL Research Laboratories, LLC*, 1407 George Road, Ashland, OH 44805 9281.

National Research Council. 1986. Criteria and Methods for Preparing Emergency Exposure Guidance Level (EEGL), Short-Term Public Emergency Guidance Level (SPEGL), and Continuous Exposure Guidance Level (CEGL) Documents. Washington, D.C.:National Academy Press, 1986.

National Research Council (NRC). 2014. Interim Acute Exposure GuidelineLevels (AEGLs) Volume 17 (2014). https://www.epa.gov/aegl (accessed 4/26/2026)

NTP [National Toxicology Program]. 2021. Report on Carcinogens, Fifteenth Edition: Acrylonitrile. U.S. Department of Health and Human Services, National Institutes of Health: National Institute of Environmental Health Sciences. Research Triangle Park, NC.

O'Berg, M.T. 1980. Epidemiologic Study of Workers Exposed to Acrylonitrile. *J. Occup. Med., 22*(4), 245-252.

O'Berg, M.T., J.L. Chen, C.A. Burke, J. Walrath, and S. Pell. 1985. Epidemiologic Study of Workers Exposed to Acrylonitrile: An Update. *J. Occup. Med.*, 27(11), 835-840.

US Occupational Safety and Health Standards.1991. "Acrylonitrile". Code of Federal Regulations Title 29, Subpart Z. Regulation1910.1045, Occupational Safety & Health Administration 200 Constitution Avenue, NW. Washington, DC 20210.

Quast, J.F., C.G. Humiston, B.A. Schwetz, L.A. Frauson, C. E. Wade, and J.M. Norris. 1975. A Six-Month Oral Toxicity Study Incorporating Acrylonitrile in the Drinking Water of Purebred Beagle Dogs." Unpublished report prepared by the Toxicology Research Laboratory, Health and Environmental Research, Dow Chemical, USA, Midland, Mich.

Quast, J.F., D.J. Schuetz, M.F. Balmer, T.S.Gushow, C.N. Park, and M.J. McKenna. 1980. "A Two-Year Toxicity and Oncogenicity Study with Acrylonitrile Following Inhalation Exposure of Rats." Unpublished report prepared by the Toxicology Research Laboratory, Health and Environmental Sciences, Dow Chemical, USA, Midland, Mich.

Quast, J. F. 2002. Two-year toxicity and oncogenicity study with acrylonitrile incorporated in the drinking water of rats. *Toxicology Letters*, *132*(3), 153-196.

Radimer, G.F., J.H. Davis, and A.B. Ackerman. 1974. Fumigant-Induced Toxic Epidermal Necrolysis. *Arch. Dermatol.*, *11*(0), 103-104.

Roudabush, RL., CJ. Terhaar, D.W. Fassett, and S.P. Dziuba. 1965. Comparative Acute Effects of Some Chemicals on the Skin of Rabbits and Guinea Pigs. *Toxicol. Appl. Pharmacol.*, *7*, 559-565.

Saillenfait, A. M. and Sabate, J. P. 2000. Comparative developmental toxicities of aliphatic nitriles: In vivo and in vitro observations. *Toxicology and Applied Pharmacology, 163*(2), 149-163.

Sakurai, H, M. Onodera, T. Utsunomiya, H. Minakuchi, H, Iwai, and H. Mutsumura. 1978. Health effects of acrylonitrile in acrylic fibre factories. *Brit. J. Ind. Med.*, 35, 219-225.

Sakurai, H. 2000. Carcinogenicity and other health effects of acrylonitrile with reference to occupational exposure limit. *Industrial Health*., *38*, 165-180.

Smyth, H.F., Jr., C.S. Weil, J.S. West, and C.P. Carpenter. 1969. An exploration of joint toxic action twenty-seven industrial chemicals intubated in rats in all possible pairs. *Toxicol. Appl. Pharmcol, 14*, 340-347.

Starr, T. B.; C. Gause, A.O. Youk, R. Stone, G.M. Marsh, and J.J. Collins. 2004. A risk assessment for occupational acrylonitrile exposure using epidemiology data. *Risk Analysis*, 24(3), 587-601.

Swaen, G. M. H., L.J.N. Bloemen, J. Twisk, T. Scheffers, J.J.M. Slangen, J.J. Collins, and W.F.J.P ten Berge. 2004. Mortality update of workers exposed to acrylonitrile in the Netherlands. *Journal of Occupational and Environmental Medicine, 46*(7), 691-698.

Sweeney, L. M., M.L. Gargas, D.E. Strother, and G.L. Kedderis. 2003. Physiologically based pharmacokinetic model parameter estimation and sensitivity and variability analyses for acrylonitrile disposition in humans. *Toxicological Sciences, 71*(1), 27-40.

Turner, R.M., and S. Fairhurst. 1989. Toxicology of Substances in Relation to Major Hazards. Acrylonitrile. Health and Safety Executive, Library and Information Services, Baynards House, 1 Chepstow Place, Westbourne Grove, LONDON W2 4TF. pp. 1-10.

Werner, J.B., and J.T. Carter.1981. Mortality of United Kingdom Acrylonitrile Polymerization Workers. *Bz J. Ind. Med*., *38*, 247-253.

Wilson, R.H. (1944) Health Hazards Encountered in the Manufacture of Synthetic Rubber. *JAMA*, *124*(11), 701-703.

Wilson, R.H., G.V. Hough, and W.E. McCodck. 1948. Medical problems encountered in the manufacture of American-made rubber. *Ind . Med*., *I7*(6), 199-207.

Willhite, C.C., M. Marin-Padilla, V.H. Ferm and R.P. Smith. 1981. Teratogenic effects of aliphatic nitriles. *Teratology*, *23*, 317-323.

WIL Research Laboratories. 2005. “Acute Inhalation Toxicity Study of Acrylonitrile in Albino Rats” (WIL-542001).