

TABLE 4.—DOSE-RESPONSE ASSESSMENT VALUES FOR HAP REPORTED EMITTED BY THE INDUSTRIAL BOILER AND PROCESS HEATER SOURCE CATEGORY

Chemical name	CAS No.	Reference concentration ^a (mg/m ³)	Unit risk estimate ^b (1/(μg/m ³))
Acetaldehyde	75-07-0	9.0E-IRIS 03	2.2E-06 IRIS
Acrolein	107-02-8	2.0E-IRIS 05	
Arsenic compounds	7440-38-2	3.0E-CAL 05	4.3E-03 IRIS
Benzene	71-43-2	6.0E-CAL 02	7.8E-06 IRIS
Beryllium compounds	7440-41-7	2.0E-IRIS 05	2.4E-03 IRIS
Cadmium compounds	7440-43-9	2.0E-CAL 05	1.8E-03 IRIS
Chromium (VI) compounds	18540-29-9	1.0E-IRIS 04	1.2E-02 IRIS
Dibenzofuran	132-64-9		
Dibutylphthalate	84-74-2		
p-Dichlorobenzene	106-46-7	8.0E-IRIS 01	1.1E-05 CAL
Ethyl benzene	100-41-4	1.0E+0 IRIS 0	
Formaldehyde	50-00-0	9.8E-ATSDR 03	1.3E-05 IRIS
Hydrochloric acid	7647-01-0	2.0E-IRIS 02	
Hydrogen fluoride	7664-39-3	3.0E-P-CAL 02	
Lead compounds	7439-92-1	1.5E-EPA 03 ORD	1.2E-05 CAL
Manganese compounds	7439-96-5	5.0E-IRIS 05	
Mercury compounds	HG CMPDS	9.0E-CAL 05	
Methyl chloroform	71-55-6	1.0E+0 CAL 0	
Methyl ethyl ketone	78-93-3	1.0E+0 IRIS 0	
Methylene chloride	75-09-2	1.0E+0 ATSDR 0	4.7E-07 IRIS
Nickel compounds	7440-02-0	2.0E-ATSDR 04	
Nickel subsulfide	12035-72-2		4.8E-04 IRIS
PAHs (shown below as 7-PAH)			
Benzo (a) anthracene	56-55-3		1.1E-04 CAL
Benzo (b) fluoranthene	205-99-2		1.1E-04 CAL
Benzo (k) fluoranthene	207-08-9		1.1E-04 CAL
Benzo (a) pyrene	50-32-8		1.1E-03 CAL
Chrysene	218-01-9		1.1E-05 CAL
Dibenz (a,h) anthracene	53-70-3		1.2E-03 CAL
Indeno (1,2,3-cd) pyrene	193-39-5		1.4E-04 CAL
Phosphorus ^c			
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	4.0E-CAL 08	3.3E+01 EPA ORD
Toluene	108-88-3	4.0E-IRIS 01	
m-Xylene ^c	108-38-3		
o-Xylene ^c	95-47-6		
Xylenes (mixed)	1330-20-7	4.3E-ATSDR 01	

^a Reference Concentration: An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups which include children, asthmatics and the elderly) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from various types of human or animal data, with uncertainty factors generally applied to reflect limitations of the data used.

^b Unit Risk Estimate: The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 μg/m³ in air. The interpretation of the Unit Risk Estimate would be as follows: if the Unit Risk Estimate = 1.5 × 10⁻⁶ per μg/m³, 1.5 excess tumors are expected to develop per 1,000,000 people if exposed daily for a lifetime to 1 μg of the chemical in 1 cubic meter of air. Unit Risk Estimates are considered upper bound estimates, meaning they represent a plausible upper limit to the true value. (Note that this is usually not a true statistical confidence limit.) The true risk is likely to be less, but could be greater.

^c No dose-response assessment is available.

Sources:

IRIS = EPA Integrated Risk Information System (<http://www.epa.gov/iris/subst/index.html>).

ATSDR = U.S. Agency for Toxic Substances and Disease Registry (<http://www.atsdr.cdc.gov/mrls.html>).

CAL = California Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/air/hot_spots/index.html).

To establish an applicability cutoff under CAA section 112(d)(4), EPA would need to define ambient air exposure concentration limits for any threshold pollutants involved. There are several factors to consider when establishing such concentrations. First, we would need to ensure that the concentrations that would be established would protect public health with an ample margin of safety. As discussed above, the approach EPA commonly uses when evaluating the potential hazard of a threshold air pollutant is to calculate the pollutant's

hazard quotient, which is the exposure concentration divided by the RfC.

EPA's "Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures" suggests that the noncancer health effects associated with a mixture of pollutants ideally are assessed by considering the pollutants' common mechanisms of toxicity. The guidance also suggests, however, that when exposures to mixtures of pollutants are being evaluated, the risk assessor may calculate a HI. The recommended method is to calculate multiple hazard indices for each

exposure route of interest, and for a single specific toxic effect or toxicity to a single target organ. The default approach recommended by the guidance is to sum the hazard quotients for those pollutants that induce the same toxic effect or affect the same target organ. A mixture is then assessed by several HI, each representing one toxic effect or target organ. The guidance notes that the pollutants included in the HI calculation are any pollutants that show the effect being assessed, regardless of the critical effect upon which the RfC is based. The guidance cautions that if the