

Appendix A. Asbestos-Containing Materials Found in Buildings*

Subdivision	Generic name	Asbestos (%)	Dates of use	Binder/sizing
Surfacing material	sprayed- or troweled-on	1-95	1935-1970	sodium silicate, portland cement, organic binders.
Preformed thermal insulating products	batls, blocks, and pipe covering			
	85% magnesite	15	1926-1949	magnesium carbonate
	calcium silicate	6-8	1949-1971	calcium silicate
Textiles	cloth ^a			
	blankets (fire) ^a	100	1910-present	none
	felts:	90-95	1920-present	cotton/wool
	blue stripe	80	1920-present	cotton
	red stripe	90	1920-present	cotton
	green stripe	95	1920-present	cotton
	sheets	50-95	1920-present	cotton/wool
	cord/rope/yarn ^a	80-100	1920-present	cotton/wool
	tubing	80-85	1920-present	cotton/wool
	tape/strip	90	1920-present	cotton/wool
	curtains ^a			
	(theatre, welding)	60-65	1945-present	cotton
Cementitious concrete-like products	extrusion panels	8	1965-1977	portland cement
	corrugated	20-45	1930-present	portland cement
	flat	40-50	1930-present	portland cement
	flexible	30-50	1930-present	portland cement
	flexible perforated	30-50	1930-present	portland cement
	laminated	35-50	1930-present	portland cement
	(outer surface)			
	roof tiles	20-30	1930-present	portland cement
	clapboard and shingles			
	clapboard	12-15	1944-1945	portland cement
	siding shingles	12-14	unknown-present	portland cement
	roofing shingles	20-32	unknown-present	portland cement
Paper products	pipe	20-15	1935-present	portland cement
	corrugated			
	high temperature	90	1935-present	sodium silicate
	moderate temperature	35-70	1910-present	starch
	indented	98	1935-present	cotton and organic binder
Roofing felts	millboard	80-85	1925-present	starch, lime, clay
	smooth surface	10-15	1910-present	asphalt
	mineral surface	10-15	1910-present	asphalt
	shingles	1	1971-1974	asphalt
	pipeline	10	1920-present	asphalt

* The information in this Appendix is taken, with modification, from: Lory EE, Coin DC. February 1981. *Management Procedure for Assessment of Friable Asbestos Insulating Material*. Port Hueneme, CA: Civil Engineering Laboratory Naval Construction Battalion Center. The U.S. Navy prohibits the use of asbestos-containing materials when acceptable nonasbestos substitutes have been identified.

^aLaboratory aprons, gloves, cord, rope, fire blankets, and curtains may be common in schools.

Appendix A. (continued)

Subdivision	Generic name	Asbestos (%)	Dates of use	Binder/sizing
Asbestos-containing compounds	caulking putties	30	1930-present	linseed oil
	adhesive (cold applied)	5-25	1945-present	asphalt
	joint compound		1945-1975	asphalt
	roofing asphalt	5	unknown-present	asphalt
	mastics	5-25	1920-present	asphalt
	asphalt tile cement	13-25	1959-present	asphalt
	roof putty	10-25	unknown-present	asphalt
	plaster/stucco	2-10	unknown-present	portland cement
	speckles	3-5	1930-1975	starch, casein, synthetic resins
	sealants fire/water	50-55	1935-present	castor oil or polyisobutylene
	cement, insulation	20-100	1900-1973	clay
	cement, finishing	55	1920-1973	clay
	cement, magnesite	15	1926-1950	magnesium carbonate
		50	1930-present	portland cement
Asbestos ebony products				
Flooring tile and Sheet Goods	vinyl/asbestos tile	21	1950-present	poly(vinyl)chloride
	asphalt/asbestos tile	26-33	1920-present	asphalt
	sheet goods/resilient	30	1950-present	dry oils
Wallcovering	vinyl wallpaper	6-8	unknown-present	—
Paints and coatings	roof coating	4-7	1900-present	asphalt
	air tight	15	1940-present	asphalt

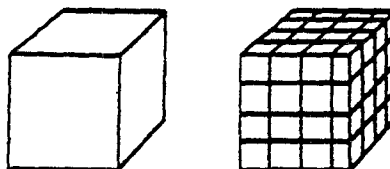
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Appendix B. Common Units Used in Measuring Airborne Asbestos Concentrations

Length

1 meter (m) = 39.37 inches or 3.28 feet
 100 centimeters (cm) = 1 meter
 1,000,000 micrometers (μm) = 1 meter

Volume



1 cubic m (m^3) = 35.3 cubic feet

1,000,000 cm^3 = 1 m^3

1,000 cm^3 = 1 liter

Weight (mass)

454 grams (g) = 1 pound

1,000,000,000 nanograms (ng) = 1 gram

Concentration (mass contained in a stated volume)

2 fibers per cm^3 (the current 8-hour OSHA industrial standard) means that 2 fibers are present in each cm^3 of air. Since there are 1,000,000 cm^3 in 1 m^3 , there would be 2,000,000 fibers in a m^3 .

If each fiber is chrysotile asbestos (density of $0.0026 \text{ ng}/\mu\text{m}^3$) and is just long and thick enough to be detected by the NIOSH procedure for determining compliance with the OSHA standard ($5 \mu\text{m}$ in length and $0.3 \mu\text{m}$ in diameter), it would weight 0.0092 ng:

$$\text{Mass} = \pi/4 (\text{diameter})^2 (\text{length}) (\text{density})$$

$$\pi/4 (0.3 \mu\text{m})^2 (5 \mu\text{m}) (0.0026 \text{ ng}/\mu\text{m}^3) = 0.0092 \text{ ng}$$

A total of 2,000,000 of these fibers would weigh about 1,800 ng.

Since the fibers in the above example are the smallest (shortest and thinnest) counted by the NIOSH procedure, fibers actually measured using this protocol are typically larger and thus weigh more. Comparison of fibers in this example with those actually measured is further complicated since nonasbestos as well as asbestos fibers are counted by the NIOSH protocol. As noted in the footnote to Figure 1, comparisons of total fibers counted with the mass of

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asbestos measured in air samples indicate that, on an average, about 30 fibers counted by the NIOSH procedures equal one nanogram of asbestos. This relationship applies to samples collected during the spray application of asbestos insulation. For these samples, each fiber counted weighs an average of 0.033 ng, or about 37 times more than those in the example, and 2,000,000 of them would weigh about 67,000 ng.

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