

Table 1.2. Summary of airborne benzene concentrations from petroleum based solvent products containing trace levels of benzene

General Industry, Job Category or Usage	# Detects / # Samples	Detection Limit (ppm)	Sample Type	Sample Duration	Measured Airborne Concentration of Benzene (ppm)	
					Arithmetic Mean (std. dev.)	Range (min/max)
Paints / Paint Solvents						
Bus maintenance shop (spray)	2 / 2	0.002	A	409 min	0.008 (0.002)	0.006 - 0.009
Iron foundry cleaning (spray)	4 / 4	0.004	P	446-451 min	0.01 (0.002)	0.007 - 0.011
Iron foundry cleaning (spray)	5 / 5	0.004	A	442-469 min	0.01 (0.003)	0.007 - 0.015
Automotive assembly plant ¹	NR / 132	0.1	P	variable	0.34 (0.47)	ND - 2.8
Aircraft maintenance ²	0 / 18	0.03	P	8-Hour TWA	<0.03 (0.00)	<0.03
Construction (roll, brush, spray)	25 / 39	0.01-1.72	P	10-hr TWA ¹⁵	0.1 (0.2)	<0.01 - 0.62
Printing Solvents / Silk Screening Inks						
Various printing ³	6 / 8	0.01	P	87-138 min	0.84 (0.87)	ND - 2.2
Various printing ³	11 / 15	0.01	A	76-136 min	0.46 (0.64)	ND - 2.4
Silk screen - sign printing ⁴	0 / 2	0.02	P	60 min	<0.02 (0.00)	<0.02
Silk screen - garments ⁵	2 / 2	0.004	P	360 min	0.03 (0.00)	0.03
Silk screen - garments ⁵	2 / 2	0.004	A	360 min	0.01 (0.00)	0.01
Offset duplicating ⁵	1 / 7	0.2	P, A	8-Hour TWA	0.12 (0.05)	<0.2-0.24
Offset Printing - operator	1 / 40	0.02	P, A	133-158	0.01 (0.002)	<0.02 - 0.02
Sheet fed printing - operator ⁵	4 / 4	0.1	P	180-250 min	0.99 (0.72)	0.31-1.81
Rotogravure printing ⁶	NR / 86	0.01	A	60 min	0.13 (0.15)	0.02-0.71
Printmaking - operator ⁷	NR / 90	0.0005 - 0.0015	P	180 min	0.0001 (0.002)	NR
Printmaking ⁷	NR / 18	0.0005 - 0.0015	A	180 min	0.001 (0.002)	NR
Printmaking - non-art floor ⁷	NR / 18	0.0005 - 0.0015	A	180 min	0.001 (0.002)	NR
Drywall Adhesives						
Plastering and drywall ⁸	0 (+4 Trace) / 6	0.0032	P	298-354 min	0.0035 (0.0015)	<0.003 - Trace
Plastering and drywall ⁸	1 (+4 Trace) / 6	0.0032	A	295-438 min	0.006 (0.005)	<0.003 - 0.016
Honing Cutting Oils and Solvents						
Hydraulics manufacturer ⁹	2 / 15	0.013	P	8-Hour TWA	0.008 (0.005)	<0.013 - 0.022
Hydraulics manufacturer ⁹	0 / 7	0.013	A	8-Hour TWA	<0.013 (0.000)	<0.013
Mineral Spirits						
Spray cleaning - locomotive ¹⁰	0 / 7	0.002-0.006	P	60 min	<0.006 (0.000)	<0.006
Spray cleaning - locomotive ¹⁰	0 / 12	0.002-0.006	A	60 min	<0.006 (0.000)	<0.006
Parts degreasing ¹²	1 / 2	0.03	P	60 min	0.23 (0.30)	<0.03 - 0.44
Parts degreasing - over tank ¹²	2 / 2	0.03	A	60 min	0.29 (0.37)	0.033 - 0.55
Jet Fuel - Aircraft Maintenance						
Jet fuelers ²	NR / 62	0.03	P	8-Hour TWA	0.08 (0.3)	<0.03 - 1.7
Sheet metal workers ²	NR / 36	0.03	P	8-Hour TWA	0.05 (0.3)	<0.03 - 1.6
Flight line crew ²	NR / 60	0.03	P	8-Hour TWA	0.02 (0.04)	<0.03 - 0.2
Fuel handling ²	NR / 16	0.001	P	360-480 min	0.006 (0.008)	0.002 - 0.034
Maintenance ²	NR / 63	0.001	P	360-480 min	0.007 (0.014)	0.002 - 0.066
Flightline ²	NR / 8	0.001	P	360-480 min	0.004 (0.005)	0.002 - 0.018
Jet engine test cell	NR / 6	NR	P	8-Hour TWA	0.002 (0.0001)	NR
Jet engine mechanic	NR / 5	NR	P	8-Hour TWA	0.003 (0.0001)	NR
C-5 fuels maintenance	NR / 7	NR	P	8-Hour TWA	0.009 (0.008)	NR
Base fuel distribution	NR / 9	NR	P	8-Hour TWA	0.008 (0.005)	NR
AFP shops (indoor air)	NR / 5	0.00001	A	NR	0.001 (0.001)	NR
Aircraft cold-start exhaust	NR / 23	0.00001	A	NR	0.013 (0.023)	NR

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					Arithmetic Mean (std. dev.)	Range (min/max)
Jet Fuel - Aircraft Maintenance						
Fuel tank maintenance	NR / 9	0.00001	A	NR	0.018 (0.023)	NR
Mechanics ¹³	6 / 6	0.001	P	8-Hour TWA	0.012 (0.009)	0.003 - 0.028
Utilitymen ¹³	3 / 3	0.001	P	8-Hour TWA	0.006 (0.004)	0.001 - 0.01
Fuelers ¹³	19 / 19	0.001	P	8-Hour TWA	0.008 (0.003)	0.005 - 0.013
Maintenance ¹³	2 / 2	0.001	P	8-Hour TWA	0.031 (0.001)	0.03 - 0.032
Fuel maintenance ¹⁴	114 / 114	0.0003	P	240 min	0.08 ¹⁶	0.002 - 2.1
Fuel handlers ¹⁴	38 / 38	0.0003	P	240 min	0.002 ¹⁶	0.0004 - 0.59
No contact with JP-8 ¹⁴	139 / 140	0.0003	P	240 min	0.0009 ¹⁶	<0.0003 - 0.02

Adapted from Williams et al. (2008)

- This study was a compilation of historical IH data from 8 assembly plants. The authors used 1/100th of the 1990 TLV as the LOD for samples reported as less than detectable. Activities include spray painting and spray booth cleaning, degreasing, adhesive and sealer application.
- Author reported 0.0 ppm for all sample results. Detection limit reported on this table was calculated based on NIOSH Method 1501 detection limits
- Benzene content of solvents not reported, but authors recommended a purchase specification limit of 1% benzene. Areas include composing rooms, preparation rooms, and press rooms.
- Benzene content of cleaning solvent was reported as <0.1%
- Benzene weight content was not reported
- Values calculated based on data reported in Table I (in air room) and Table II (average room)
- Mainly silk screening. Benzene content of kerosene cleaner was 0.09%
- Four area and four personal sample concentrations were reported as 'trace.' Trace concentration (0.006 ppm) assumed to be average of DL and MQC (0.009 ppm)
- Benzene content of new and used cutting oil, honing stone solvent, and #2 fuel oil ranged from <0.25-33 ppm
- Benzene content of mineral spirits was <10 ppm
- Benzene content of solvent ranged from <0.00026 to 0.0008% (w/w). Facilities sampled include auto repair, transmission repair, newspaper press.
- Benzene contents of the original and spiked solvents were 0.0009 and 0.0058%, respectively
- Benzene content of Jet Fuel A ranged from ND-4000 µg/L
- Mean benzene content of 14 bulk samples of JP-8 was 0.0051% (range 0.0002 - 0.0123%)
- TWA calculated from task samples ranging in duration from 20-420 minutes.
- Value is a median

EF = Exceedance Fraction

TLV = American Conference of Governmental Industrial Hygienists Threshold Limit Value

PEL = U.S. Occupational Safety and Health Administration Permissible Exposure Level