

## Appendix D

### PERSPECTIVE

In order to discuss CO levels, it is necessary to put these levels in perspective. The following chart is shows increasing concentrations of CO.

(Modified from Donnay, 2001 and [www.coheadquarters.com](http://www.coheadquarters.com))

**1 ppm - One part per million = 0.001%** - this level is a natural/normal level found in human tissues

**0.5 - 5 ppm** - Level of CO found in U.S. homes.

**5 - 15 ppm** - CO levels near properly adjusted gas stoves

**9 ppm** - US EPA's national ambient air quality standard 8-hour Time Weighted Average (TWA) limit for CO exposure outdoors (rarely ever exceeded now in U.S. cities).

**9 ppm** - American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) recommended indoor CO limit.

**10 ppm** - World Health Organization (WHO) 8-hour TWA limit for CO exposure.

**25 ppm** - American Conference of Governmental Industrial Hygienists (ACGIH) recommended 8-hour TWA limit for occupational CO exposure

**26 ppm** - WHO 1-hour TWA limit for CO exposure.

**35 ppm** - US EPA's national ambient air quality standard 1-hour TWA limit for CO exposure.

**35 ppm** - US NIOSH recommended 8-hour TWA limit for occupational CO exposure

**35 ppm** - US OSHA maximum acceptable level for commercial buildings

**35 ppm** - Level above which fire fighters may be required to use self-contained breathing apparatus.

**35 - 50 ppm** - US OSHA 8-hour TWA legal limit for occupational CO exposure

**50 ppm** = 0.005% CO

**52 ppm** - WHO 30 minute TWA limit for CO exposure

**70 ppm** - Lowest CO level at which US CPSC and UL/CSA allow home CO alarms to alarm, but only after 1 - 4 hours of exposure.

**87 ppm** - WHO 15 minute TWA limit for CO exposure

**100 ppm** = 0.01% CO

**100 ppm** - Level at which a fire department may order the evacuation of a building

**100 - 1,000 ppm** = 0.01%-0.1% CO

**100 - 1,000 ppm** - Range of CO found in exhaust of gasoline-powered motor vehicles with hot (working) catalytic converters.

**200 ppm** - Limit that should never be exceeded (CDC 1988)

**200 ppm** - Level at which US NIOSH recommends immediate evacuations of any building - level above which US CPSC and UL approved home CO alarms must sound after 30-60 min.

**200 - 300 ppm** - Range of CO in exhaled (diluted) cigarette smoke

**400 ppm** - Level above which CPSC and UL approved home CO alarms must sound after 5-15 min.

**500 ppm** = 0.05% CO - Roughly the level of CO thought to be lethal in humans exposed over a period of many hours

**1,000 ppm** = 0.1% CO

**1,000 ppm** - Level of CO commonly considered rapidly lethal in humans (approx. 62% COHb at equilibration).

**1,000 - 5,000 ppm** - Level of CO in exhaust gases from "well-tuned" diesel engines.

**1,200 ppm** = 0.12% CO

**1,200 ppm** - Level of CO declared by US NIOSH to be immediately dangerous to life and health (potentially lethal within minutes, certainly within a few hours).

**10,000 - 100,000 ppm = 1% - 10% CO**

**10,000 - 100,000 ppm** - Range of CO found in exhaust of gasoline-powered vehicles without catalytic converters or with converters that are cold or otherwise not working.