

## **OZONE LEVELS AND THEIR EFFECTS**

### **Data from IOA**

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**ppm** = Parts per million volume air concentration

#### **0.001 ppm**

Lowest value detectable by hypersensitive humans. Too low to measure accurately with elaborate electronic equipment.

#### **0.003 ppm**

Threshold of odor perception in laboratory environment, 50 per cent confidence level.

#### **0.003 ppm to 0.010 ppm**

The threshold of odor perception by the average person in clean air. Readily detectable by most normal persons. These concentrations can be measured with fair accuracy. Ozone levels measured in typical residences and offices equipped with a properly operating electronic air cleaner when outdoor ozone level is low. Infiltrating outdoor ozone could cause higher indoor concentrations.

#### **0.020 ppm**

Threshold of odor perception in laboratory environment, 90 per cent confidence level.

#### **0.001 to 0.125 ppm**

Typical ozone concentrations found in the natural atmosphere. These levels of concentration vary with altitude, atmospheric conditions and locale.

#### **0.020 to 0.040 ppm**

Representative average total oxidant concentrations in some major cities in 1964. Approximately 95 per cent or greater of these oxidants are generally accepted to be ozone.

#### **0.040 ppm**

CSA maximum limit for devices for household use. Measured as sustained concentration in test room.

#### **0.050 ppm**

Maximum allowable ozone concentration recommended by ASHRAE in an air conditioned and ventilated space.

#### **0.050 ppm**

Maximum ozone concentration produced by electronic air cleaners and similar residential devices according to the proposed amendment of the Federal Food, Drug and Cosmetic Act.

**0.064 ppm**

Proposed national ambient air quality standards for photochemical oxidants (maximum 1 hour concentration not to be exceeded more than once per year).

**0.100 ppm**

The maximum allowable ozone concentration in industrial working areas: permissible human exposure - 8 hours per day, 6 days a week.

**0.100 ppm**

Continuous maximum ozone concentration allowable (per U.S. Navy\_ in confined quarters such as atomic submarines).

**0.100 ppm**

Maximum allowable limit for industrial, public, or occupied spaces in England, Japan, France, the Netherlands and Germany.

**0.15 to 0.51 ppm**

Typical peak concentrations in American cities.

**0.200 ppm**

Prolonged exposure of humans under occupational and experimental conditions produced no apparent ill effects. The threshold level at which nasal and throat irritation will result appears to be about 0.300 ppm.

**0.300 ppm**

The ozone level at which some species of plant life began to show signs of ozone effects. Foliage injury appears as dark stipples, light flecks, dead patches and general discoloration. The stomata (pores) of adult leaves are the first areas to show signs of damage.

**0.500 ppm**

The ozone level at which Los Angeles, California, declares its Smog Alert No. 1. Can cause nausea and headaches in some individuals. Extended exposure could cause lung edema (an abnormal accumulation of serous fluid in connective tissue or serous cavity). Enhances the susceptibility to respiratory infections.

**1.00 to 2.00 ppm**

Los Angeles, California, declares its Smog Alert No. 2 at 1.00 ppm ozone concentration and Smog Alert No. 3 at 1.500 ppm. When this range of ozone concentration was inhaled by human volunteers for 2 hours, it caused symptoms which could be tolerated without incapacitation with the symptoms subsiding after a few days. The symptoms were headache, pain in the chest, and dryness of the respiratory tract.

**1.40 to 5.60 ppm**

The pinto bean exposed to 1.4 to 5.0 ppm ozone concentrations for 70 minutes showed some signs of severe injury to mature leaves.

**5.00 to 25.00 ppm**

Experimentation showed that a 3 hour exposure at 12 ppm was lethal for Guinea pigs. Welders who were exposed to 9 ppm concentration plus other air pollutants developed pulmonary edema. Chest X-rays were normal in 2 to 3 weeks, but 9 months later they still complained of fatigue and exertional dyspnea (labored respiration).

**25.00 ppm and up**

Ozone concentrations that are immediately hazardous to human life are unknown but on the basis of animal experimentation, and exposure at 50 ppm concentration for 60 minutes would probably be fatal.