

UNDERWRITERS LABORATORIES INC. CERTIFICATION REQUIREMENT DECISION

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Product Category (CCN): AGGZ, OETX
Standard Number: UL 867
Edition Date: October 9, 2000
Edition Number: 4
Section / Paragraph Reference: 37.4.6
Subject: Definition of Steady State at Hours 7- 8

DECISION:

37.4.6 The emission of ozone is to be monitored for 24 hours to determine the concentration.

Exception: : The monitoring of ozone can be stopped after 8 hours if the measured chamber ozone concentration has reached steady-state. For the purpose of this measurement steady state is defined as:

a) Negative or zero slope for the plot of chamber ozone concentration vs. time ([C(t)] vs. t), during hour 7 to 8 of monitoring, and fluctuation not greater than ± 10 percent or 2 ppb around the mean, whichever is greater during the same time period.

b) Positive slope for the plot of chamber ozone concentration vs. time([C(t)] vs. t), during hour 7 to 8 of monitoring, mean ozone concentration less than 20 ppb, and fluctuation not greater than ± 2 ppb around the mean, during the same time period, or

c) Positive slope for the plot of chamber ozone concentration vs. time ([C(t)] vs. t), during hour 7 to 8 of monitoring, mean ozone concentration greater than or equal to 20 ppb and less than 38 ppb, a normalized slope (slope divided by hourly mean) for hour 7- 8 less than or equal to 0.0153 (ppb/hr)/mean ppb, and fluctuation not greater than ± 10 percent around the mean during the same time period.

RATIONALE FOR DECISION:

Throughout the ozone test development process, the steady state reference of paragraph 37.4.6 assumed steady state to be defined as: 1) no positive slope for the plot of concentration versus time for Hour 7 to 8, and 2) a fluctuation of less than 10% Relative Standard Deviation (RSD) during any 15 minute period for Hour 7 to 8.

In practice, however, the specified laboratory measurement precision (+ 2%) is such that it is inevitable that there will be random variation about the mean (i.e. some positive slope). Additionally, % RSD is equal to $100 \times \text{Standard Deviation} / \text{Mean}$, so it increases as the mean ozone level decreases. At low ozone concentrations, the ratio of standard deviation and mean may result in disproportionate increase in RSD. That could result in a very low-emitting device to failing to achieve steady state, leading to extended test times without any clear benefit.

This clarification establishes criteria for determining steady state that is consistent with the original intent, addresses the identified concerns and assures that variance about the mean will not result in a maximum ozone concentration that exceeds 0.050 ppm.

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