



# Tech Info Library

## Laser Printers: Ozone Emissions (2/95)

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TOPIC -----

This article provides guidelines for reducing ozone emissions from laser printers, as well as suggestions for minimizing the effects of ozone in the workplace.

DISCUSSION -----

### Background

Ozone gas is emitted in detectable levels by almost all laser printers and photocopiers as a by-product of the electrophotographic process. In laser printers the primary source of ozone is the transfer corona wire, which produces an electrical charge to draw the toner powder from the print drum to the paper. Ozone is produced only when the printer is printing.

Manufacturers install special filters to ensure a safe level of ozone emissions. These filters are impregnated with activated carbon. Laser printers that operate without a transfer corona wire emit a negligible amount of ozone gas and do not require these filters. Underwriter Laboratories (UL) provides an ozone emission standard based on OSHA exposure limits.

In general, filter effectiveness can diminish in direct proportion to the number of pages printed. Therefore, filters should be replaced periodically. The ozone filter depends on a steady air flow over the filter to remove ozone. If the printer's fan starts to slow down due to age or mechanical problems, the reduced air flow could cause more ozone to escape. Dust accumulating on the filter's surface can also affect its performance. A properly maintained laser printer that is installed in a well-ventilated area should not expose users to an unsafe ozone level.

Ozone can be an irritant that can cause a range of symptoms including dry throat and nose, headache, and sore eyes. At very high concentrations ozone can have serious health effects such as nausea, vomiting, pulmonary congestion, and possible premature aging. Ozone is a highly unstable molecule that reverts quickly to oxygen. Ozone concentrations may rise to noticeable levels depending on the rate generated (amount and time) as well as the physical environment (room ventilation and location of workers).

Typically, ozone can be identified by its characteristic odor before it reaches the permissible exposure limit. However, as the concentration of ozone or the duration of exposure increases, a person's ability to smell it may decrease. The current OSHA permissible exposure limit for ozone is 0.1 parts of ozone per million parts of air averaged over an 8-hour work shift.

## Apple Printers

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Apple is committed to making products that meet or exceed the industry and government health and safety guidelines of every country where we do business. All Apple laser printers are within the limits of the UL guidelines when shipped from the factory to the customer.

The Personal LaserWriter, LaserWriter Pro, and LaserWriter Select series of printers have no transfer corona wire and therefore do not require ozone filters to meet the UL safety requirements. StyleWriter and ImageWriter printers are not laser printers and do not emit ozone.

The LaserWriter, LaserWriter Plus, and LaserWriter II printers have ozone filters designed to operate effectively up to 100,000 printed pages.

However, to ensure maximum effectiveness, Apple recommends service (checking the entire ozone emission control system) and an ozone filter replacement after 50,000 pages or at least once a year. You can print a startup page to determine your laser printer's page count. Dusty conditions or damage to the filter may necessitate more frequent filter replacement. This maintenance check and filter replacement can be done by any Authorized Apple Service Provider.

Proper installation of your laser printer helps to keep the ozone concentrations at a safe level. Choose a well ventilated area. In general, a correctly-designed air conditioning system provides adequate ventilation for printer use. Air circulation is especially important if there are multiple laser printers and/or photocopy machines in an area. A small, enclosed space such as a closet should not be used for printing. Placement in a common area is preferable to placement in an individual's work space. In addition, the fan exhaust should not blow directly in anyone's face.

The laser printer works best in relative humidity between 30 and 70 percent. Lower humidity can slow the natural breakdown of ozone in the air and can reduce the filter's effectiveness.

## Article Change History:

- 22 Feb 1995 - Added keyword; made minor technical updates.
- 03 Feb 1995 - Corrected transfer process explanation.
- 08 Nov 1994 - Reviewed for technical accuracy, revised formatting.

Support Information Services

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