

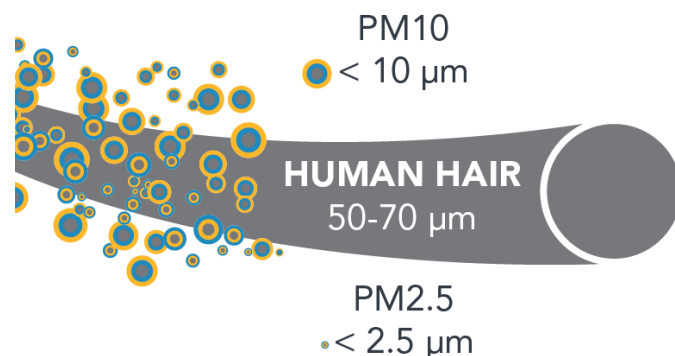
Indoor Particulate Matter

What is Particulate Matter (PM)?

Particulate matter (PM), also called particle pollution, is a complex mixture of solid and/or liquid particles suspended in air. These particles may include, but are not limited to: dust, dirt, soot, smoke, and drops of liquid. Particles can vary in size, shape, and composition. Particles that are 10 micrometers in diameter or smaller, including PM₁₀, PM_{2.5} and ultra-fine particles (UFPs), are inhalable. This can lead to airway irritation and other possible health effects over time .

Potential Sources of Indoor PM:

- Any exhaust from combustion products: woodstoves, pellet stove, gas stoves, kerosene heaters, gas space heaters, oil furnaces, fireplaces, flues, and chimneys
- Tobacco smoke and electronic cigarettes
- Candles, incense, electric oil diffusers/pad diffusers and air fresheners
- Vacuum cleaners without HEPA filtration
- Laser printers and copiers
- Household cleaning products
- Indoor construction without appropriate containment measures
- 3D printers, laser cutters, and soldering
- Biological sources: pollens, mold spores, dust mites and cockroaches
- Outdoors: cars, trucks, construction sites



Particle Size Comparison

Source:

<https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>

Air Quality Standard for Particulate Matter:

At present, there are no established levels for PM in indoor air. The outdoor PM standard is listed in the following table:

PM	Primary/Secondary*	Averaging Time	Level	Form
PM _{2.5}	Primary	1 year	12.0 µg/m ³	Annual mean, averaged over 3 years
	Secondary	1 year	15.0 µg/m ³	Annual mean, averaged over 3 years
	Primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years
PM ₁₀	Primary and secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years

Source: National Ambient Air Quality Standards (NAAQS) Table.

** Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.*

Please visit <https://www.epa.gov/pm-pollution/setting-and-reviewing-standards-control-particulate-matter-pm-pollution> if you would like to learn more about PM Standards.

Tips for Reducing Exposure to Indoor PM:

- Smoking and vaping is not permitted in University buildings or on University Property in accordance with the University's Tobacco-Free Policy: <https://www.umass.edu/tobaccofree/about-policy>.
- Equipment capable of generating particles should be kept and used in a well-ventilated area or with appropriate local exhaust. Ensure equipment is maintained, including any necessary cleaning, in compliance with manufacturer's recommendations. This is especially important for combustion devices as the use of improper fuels or feed rates can exacerbate particle pollution and increase fire risk. A persistent yellow-tipped flame is generally an indication of maladjustment of fuel to oxygen ratio and increased pollutant emissions. For additional information on specific items:
 - EH&S Soldering SOP: <https://ehs.umass.edu/soldering-sop>
 - EH&S 3D Printers SOP: <https://ehs.umass.edu/3d-printers-sop>
 - EH&S Proper Ventilation Guidelines: <https://ehs.umass.edu/proper-ventilation-guidelines>

- Use clean and efficient combustion products. Woodstoves should be certified as meeting EPA emission standards and properly sized. Please check EPA Clean Cookstoves website (<https://www.epa.gov/indoor-air-quality-iaq/clean-cookstoves>) and Burn Wise website (<https://www.epa.gov/burnwise>).
- Air cleaners with HEPA filters can help remove some PM_{2.5} and PM₁₀ from air. Please see the EH&S air purifier fact sheet (<https://ehs.umass.edu/air-purifiers>) for more information.
- Air fresheners and cleaning products can also contribute to indoor PM pollution. Please see the EH&S air freshener fact sheet (<https://ehs.umass.edu/air-fresheners-and-indoor-air-quality>) for more information regarding selecting and using air fresheners.
- Outdoor particles may enter indoor spaces and contribute to indoor PM levels. Please check AirNow (<https://www.airnow.gov/>) for the Air Quality Index (AQI) in the area. The AQI gives an indication of the PM levels outdoors.
- Elevated pollen levels may cause allergic reactions including hay fever, itchy eyes, runny nose, and irritated airways. Please check the pollen counts through Pollen.com (<https://www.pollen.com/allergy-weather-forecast.asp>) or The Weather Channel (<https://weather.com/activities/health/allergies/?from=secondarynav>) to see local pollen levels. The American Academy of Allergy Asthma & Immunology (AAAAI) (<https://aaaai.org/nab/index.cfm>) provides pollen counts as well, but there is currently no available information for Massachusetts.
- Regular housekeeping is important to minimize indoor PM levels. Please check the EH&S fact sheet for regular housekeeping for maintaining good indoor air quality (<https://ehs.umass.edu/housekeeping-maintain-good-air-quality>) for tips for keeping dust levels low and controlling some sources of indoor PM.
- Indoor activities, such as construction, can generate PM pollution. Individuals who perform construction work on campus are educated on appropriate dust mitigation techniques and strategies, which can include the use of containment (plastic sheeting), exhaust fans, wet cutting and sanding methods, or source containment with HEPA filtered collectors.
- Contact EH&S at 413-545-2682 if you have any questions or concerns regarding indoor air quality.

References and Additional Resources:

1. EPA, Indoor Particulate Matter: <https://www.epa.gov/indoor-air-quality-iaq/indoor-particulate-matter>
2. EPA, Sources of Combustion Products: An Introduction to Indoor Air Quality: <https://www.epa.gov/indoor-air-quality-iaq/sources-combustion-products-introduction-indoor-air-quality>
3. CDC, Particle Pollution: https://www.cdc.gov/air/particulate_matter.html

4. Board on Population Health and Public Health Practice; Health and Medicine Division; National Academies of Sciences, Engineering, and Medicine. Health Risks of Indoor Exposure to Particulate Matter: Workshop Summary. Washington (DC): National Academies Press (US); 2016 Sep 26. 2, Sources of Indoor Particulate Matter. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK390370/>
5. California Air Resources Board, Inhalable Particulate Matter and Health (PM2.5 and PM10): <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>