



News Alert

An Update of the National 3D Printer Emissions Standard (ANSI/CAN/UL 2904) Requires Reporting of Two New Chemicals

Two new chemicals, tetrahydrofuran (THF) and tetradecamethylcycloheptasiloxane (TDMCHS or D7), have been added to the list of chemicals with required emissions criteria from operating 3D printers. Both chemicals are frequently found to emit from operating printers. [THF](#) is a possible human carcinogen and was recently added to California's Proposition 65 list. The cyclic siloxane ([TDMCHS or D7](#)) is a frequently found emission from 3D printers and adds to the total volatile organic compound (VOC) emission level.

As part of the ongoing maintenance ANSI requirements, [Chemical Insights Research Institute](#) (CIRI) of [UL Research Institutes](#) along with additional standard stakeholders updated the consensus standard (ANSI/CAN/UL 2904) Standard Method for Testing and Assessing Particle and Chemical Emissions from 3D Printers ([Standard](#)). These updates involve emissions from consumer-level material extrusion 3D printers which can produce ultrafine particles (UFPs)

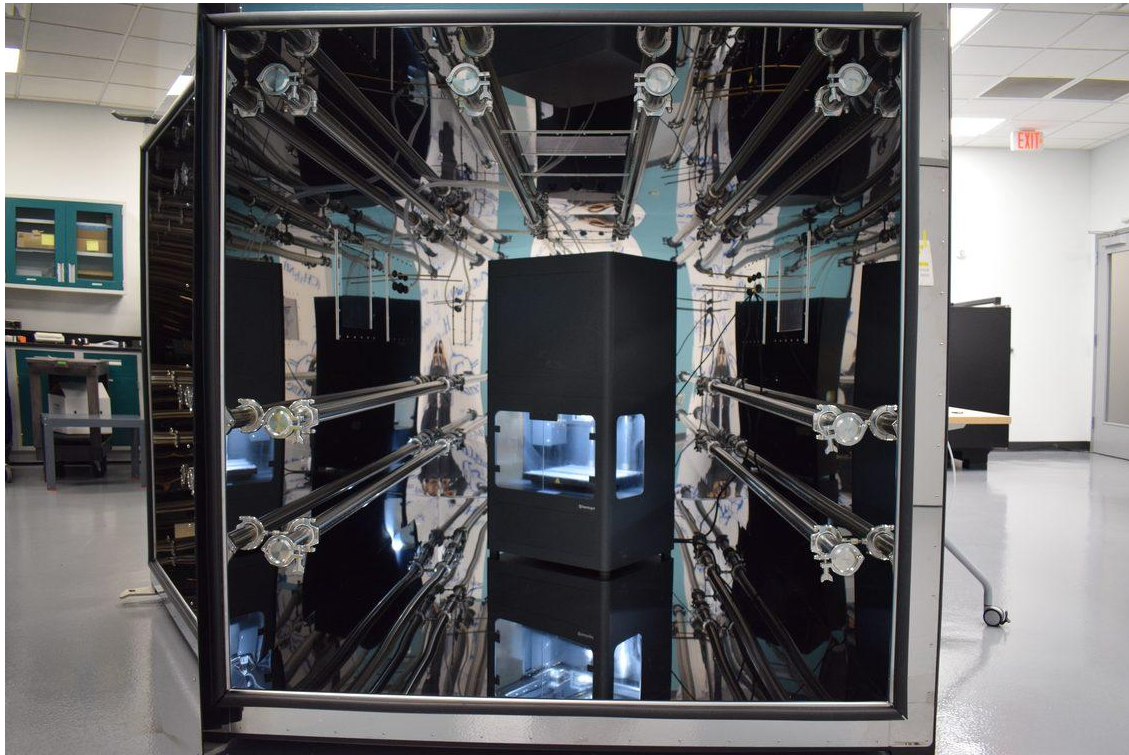
and VOCs. These updates are in response to feedback from stakeholders since the initial Standard publication in 2019.

The Standard applies to freestanding 3D printers that are typically found in schools, offices, libraries, homes, and other non-industrial indoor spaces. 3D printing produces ultrafine particles, that when inhaled, have the tendency to penetrate deep into the lungs and even the bloodstream. This can be associated with respiratory and cardiovascular diseases and could cause acute or chronic adverse health effects including irritation, respiratory symptoms, and cancer depending on particle chemical composition and the dose and exposure conditions. 3D printing also emits a variety of VOCs, many of which are associated with negative health impacts, depending on the technology and materials used. 3D printing emissions can negatively impact indoor air quality, which could raise health concerns, especially to vulnerable people, such as those with cardiovascular or respiratory disease and asthma.

Key standard updates include:

- Definitions of aldehydes and VOCs are clarified
- Instructions for print objects were updated
- Suggestions for additional particle characterizations are included
- Two new VOCs were added to the allowable emissions criteria list:
 - Tetradecamethylcycloheptasiloxane was added due to its high detect frequency from operating printers. Its maximum allowable emission rate is 25.0 mg hr⁻¹ and maximum allowable concentration is 1200 µg m⁻³.
 - Tetrahydrofuran was added because of its potential health concern as a carcinogen. Its maximum allowable emission rate is 31.2 mg hr⁻¹ and maximum allowable concentration is 1500 µg m⁻³.
- Two VOCs were removed from the allowable emissions criteria list:
 - 1,2,4-trimethylbenzene was removed since trimethylbenzene is listed
 - Diethylhexyl phthalate was removed because it is a semi-volatile organic compound that may require other detection methods

ANSI/CAN/UL 2904 2nd Ed. is now available for digital download or hard copy purchase through [UL Standards' sales website](#).



3D printer in CIRI's state-of-the-art emission measurement chamber

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