

This document contains questions from a concerned GSD student, following the 'formaldehyde incident'* (details below) in June 2018, along with responses from Kevin Cahill, Director of Facilities Management, GSD Building Services department, and Mark Collins, Designated Safety Officer for the GSD, EH&S Associate Director of Facilities and Life Safety.

1. WHAT DOES AN AIR QUALITY CHECK (Indoor Air Quality) ENTAIL?

A typical Indoor Air Quality (IAQ) will involve an evaluation of the area or room(s), conversations with occupants in the area of the complaint, a review of the HVAC equipment and area sampling commonly with the 3M EVM7.

The 3M EVM7 is a tool that can simultaneously measure particulates, CO, CO₂, VOC, Temperature and Relative Humidity concentrations. This monitoring provides a basic assessment of the HVAC system and operations.

2. HOW OFTEN DOES EH&S PERFORM AN AIR QUALITY ASSESSMENT AROUND THE LASER CUTTERS?

Recently we have done the following:

On May 10, 2017 and on June 22, 2018, EH&S monitored for formaldehyde with the Environmental Sensor Co.'s Z-300 Formaldehyde meter, a hand held instrument that measures formaldehyde concentration in a range of 0-30 ppm at a resolution of 0.01 ppm. The Z-300 Formaldehyde uses two filters to eliminate many of the common interferences.

In 2016, Triumvirate Environmental conducted sampling for volatile organic chemicals, particles (dust), CO₂, CO on January 29, 2016 and again on April 28, 2016. VOC were collected in specially prepared canisters and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). This process allows one to sample for 97 different VOCs.

Based on the report from Triumvirate Environmental, no significant quantities of VOC were detected; all VOC levels were below the OSHA action levels, OSHA PEL and NIOSH REL.

Over the years we have performed IAQ evaluation numerous times without actionable results.

3. DOES EH&S MONITOR THE AIR QUALITY IN OTHER AREAS OF GUND? IF SO WHY AND HOW OFTEN?

EH&S has conducted monitoring in the past due to construction activities, indoor air quality concerns and general sampling for VOC in the immediate proximity of the spray booths and snorkels. A wide range of sampling has been conducted from 2004 – 2018.

4. HAS THE GSD INFORMED STUDENTS OF THE EXISTENCE AND OPERATIONS OF EH&S PRIOR TO THIS AIR QUALITY CHECK? IF SO, WHEN? THROUGH WHICH CHANNELS?

We have no records or knowledge of formal student-wide communications about Harvard's EH&S existence or operations. GSD staff and some FabLab TAs have been actively working with EH&S for many years.

5. WHY DOESN'T THE GSD HAVE A DESIGNATED LAB SAFETY ADVISOR WITHIN THE EH&S?

Lab Safety Advisors are for the research laboratories across the campus – Designated Safety Officers provide support to all of the schools across the University. The Designated Safety Officer for the Graduate School of Design (GSD) is Mark Collins, the EH&S Associated Director of Facilities and Life Safety.

The LSA and DSO are the primary contacts for the Schools/Departments, they collaborate with a wide range of experts within EH&S and consultants.

6. DOES THE GSD HAVE ITS OWN INTERNAL HEALTH AND SAFETY DIVISION TO TEST THESE CONDITIONS? OR DOES IT RELY ON THIRD PARTY INTERVENTION.

Each school assigns the responsibility of an Environmental Safety Compliance Officer (ESCO) to a member of their senior leadership team; it often is the Director or Associate of Facilities, Dean of Physical Resources, etc.

Harvard's Environmental Health & Safety department provides support, guidance and resources to assist the schools/department with compliance with Federal EPA, OSHA, Massachusetts regulatory agencies, as well as, local fire, board of health and building/inspectional services.

7. WHICH OFFICES HAVE STUDENTS PREVIOUSLY CONTACTED REGARDING OVERALL HEALTH & SAFETY CONCERNS? DO THESE OFFICES RESPOND TO THESE CONCERNS INTERNALLY, OR RELAY THEM TO ANOTHER PARTY?

Students have contacted Building Services and Student Services. We also get concerns from faculty and staff. Concerns are assessed and investigated by Building Services and/or EH&S and/or outside vendors.

8. HAS THE LASER CUTTER AREA BEEN TESTED FOR FORMALDEHYDE PRIOR TO THE 2017-2018 ACADEMIC SCHOOL YEAR? IF SO, FOR HOW MANY YEARS?

See question 2. Formaldehyde-specific testing has not been performed prior to April 2017.

9. HAVE THE TRAYS BEEN TESTED FOR FORMALDEHYDE PRIOR TO 2017 – 2018 ACADEMIC SCHOOL YEARS? IF SO, FOR HOW MANY YEARS ?

Indoor air quality has been conducted in the trays for several years – VOCs and particles were the primary target of the sampling. Formaldehyde-specific testing has not been performed prior to April 2017.

10. DID STUDENTS CONTACT THE FABRICATION LAB, BUILDING SERVICE OR OTHER DEPARTMENTS ABOUT EYE/NOSE/THROAT IRRITATIONS WHILE USING LASER CUTTERS IN THE PAST? IF SO, WAS FORMALDEHYDE TESTING COMPLETED ON THOSE OCCASIONS?

Various complaints of eye/nose/throat irritation by users of the Fab Lab have been noted over the years, in emails, verbal comments, and notes on the door to L40c. Formaldehyde--specific testing was not performed prior to April 2017.

11. WHERE CAN STUDENT ACCESS THE RESULTS OF ALL PAST AND PRESENT AIR QUALITY REPORTS?

Building Services has the one recent (2018) actionable report. We also have a synopsis of the history of testing in GSD that can be reviewed with the Director of Facilities

OTHER COMMENTS ON IAQ SCREENINGS

The 3M EVM7 is a tool that can simultaneously measure particulates, CO, CO₂, VOC, Temperature and Relative Humidity concentrations. This monitoring provides a basic assessment of the HVAC system and operations.

Temperature and Relative Humidity

The sense of thermal comfort (or discomfort) results from an interaction between temperature, relative humidity, air movement, clothing, activity level, and individual physiology. Temperature and relative humidity measurements are indicators of thermal comfort.

They may also provide indirect indications of HVAC condition and the potential for airborne contamination from biological or organic compounds.

Carbon Dioxide (CO₂) as an Indicator of Ventilation

CO₂ is a normal constituent of the atmosphere. Exhaled breath from building occupants is an important indoor CO₂ source. Indoor CO₂ concentrations can, under some test conditions, provide a good indication of the adequacy of ventilation. Comparison of peak CO₂ readings between rooms, between air handler zones, and at varying heights above the floor, may help to identify and diagnose various building ventilation deficiencies.

Peak CO₂ concentrations above 1000 ppm in the breathing zone indicate ventilation problems. Carbon dioxide concentrations below 1000 ppm generally indicate that ventilation is adequate to deal with the routine products of human occupancy.

Volatile Organic Compounds (VOCs)

Hundreds of organic (carbon-containing) chemicals are found in indoor air at trace levels. VOCs may present an IAQ problem when individual organics or mixtures exceed normal background concentrations.

Total Volatile Organic Compounds (TVOCs)

Several direct-reading instruments are available that provide a low sensitivity "total" reading for different types of organics. Such estimates are usually presented in parts per million and are calculated with the assumption that all chemicals detected are the same as the one used to calibrate the instrument. A photoionization detector is an example of a direct-reading instrument used as a screening tool for measuring TVOCs.

Airborne Dust (Particles)

Particles and fibers suspended in the air generally represent a harmless background but can become a nuisance or cause serious health problems under some conditions. Direct readouts of airborne dust are also available (such as using meters such as those equipped with a "scattered light" detector).

Carbon Monoxide (CO) Combustion Products

Combustion products are released by motor vehicle exhaust, tobacco smoke, and other sources, and contain airborne dust along with potentially harmful gases such as carbon monoxide and nitrogen oxides.

Any readings that are elevated above outdoor concentrations or background building levels may indicate a mixture of potentially irritating combustion products, especially if susceptible individuals are exposed.

Formaldehyde*

Formaldehyde is a VOC that has been studied extensively. Small amounts of formaldehyde are present in most indoor environments. Itching of the eyes, nose, or throat may indicate an elevated concentration. Sampling may be helpful when relatively new suspect materials are present.

A number of measurement methods are available. Sensitivity and sampling time are very important issues in selecting a method; however, many methods allow detection of concentrations well below 0.1 ppm.

Chemical Smoke

Chemical smoke is extremely sensitive to air currents. Investigators can learn about airflow patterns by observing the direction and speed of smoke movement. Chemical smoke has been utilized to observe the air flow of the spray booths and snorkels.

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* 'Formaldehyde incident': In early April 2017, Fablab staff detected measurable amounts of formaldehyde, a known carcinogen, in the air around the laser cutters in Gund Hall / FabLab, and requested a follow-up check from EH&S. In late April of 2017 (27/28th) EHS tested for Particulate, VOC, CO, CO₂, Temperature, and RH, but was not able to test for formaldehyde at that time. May 10th and 11th of 2017 EHS tested for formaldehyde and found measurable, but not actionable, levels. The following year in June 2018, Harvard EH&S detected actionable amounts of formaldehyde near a laser-cutter in operation, which was promptly taken off-line. This reading led to a formal complaint from OSHA, which was then closed a few days later, based on information provided by EH&S. A defective filter was identified as the cause, and the school has subsequently replaced all such filtration systems with more effective positive-exhaust systems. Additional follow-up actions included a plan to increase frequency of air-quality monitoring at the GSD; to hold an informational meeting with students; and to increase transparency in information-sharing, including a web page. See <https://www.gsd.harvard.edu/resources/environmental-health-and-safety/> .