Method number:	1021
Version:	1.0
Validated analytes:	Toluene (Appendix A)
Procedure:	Collect air samples instantaneously by opening a 50-mL evacuated canister. Analysis is performed by gas chromatography using a canister autosampler.
Sampling volume:	50 mL
Status of method:	Fully validated method. This method has been subjected to the established evaluation procedures of the Methods Development Team.

September 2017

Michael Simmons
Philip Smith

Methods Development Team
Industrial Hygiene Chemistry Division
OSHA Salt Lake Technical Center
Sandy UT 84070-6406

1. General Discussion

For assistance with accessibility problems in using figures and illustrations presented in this method, please contact OSHA Salt Lake Technical Center (SLTC) at (801) 233-4900. These procedures were designed and tested for internal use by OSHA personnel. Mention of any company name or commercial product does not constitute endorsement by OSHA.

1.1 Background

In 2003 OSHA issued PV2120, *Volatile Organic Compounds in Air*[1], *a* partially validated canister based whole air sampling method. PV2120 specifies use of a 400-mL evacuated fused silica-lined stainless steel canister with recommended sampling times from 8 hours to less than a minute. This newer method specifies a smaller 50-mL evacuated canister for instantaneous personal sampling of substances with ceiling and peak exposure values. The 50-mL evacuated canister can also be used for area sampling and IDLH (Immediately Dangerous to Life or Health) screening.

This method differs from a typical OSHA sampling and analytical method in that analytical procedures for approved analytes are described in appendices following Section 4. This format will allow for easy addition of analytes validated for use with the 50-mL evacuated canister.

2. Sampling Procedure

All safety practices that apply to the work area being sampled should be followed. Attach any sampling equipment to the worker in such a manner that it will not interfere with their work performance or safety.

2.1 Apparatus

Entech Instruments, Inc. Silonite coated steel 50-mL 15 Minute HDS Personal Monitor with Micro-QT2 valve (catalog no. 01-HDS-PM15M) evacuated to 200 mTorr or less.

Entech Instruments, Inc. Filtered Grab Sampler (catalog no. 39-HDS-F01).

Entech Instruments, Inc. Vacuum Gauge (30.0 inHg) with female Micro-QT valve (catalog no. 29-70010QT).

A vacuum pump such as an Entech Instruments, Inc. 3100A Canister Cleaner with female Micro-QT valve.

2.2 Reagents

None required

2.3 Technique

Remove all canisters from their plastic cylindrical container. Save all containers and caps for return shipping. Use a vacuum gauge with a female Micro-QT valve to measure and record the vacuum of all canisters, including the canister to be used as a blank. Do not use any canister if it has lost vacuum or has a significantly different vacuum than the average measured vacuum of all canisters (± 2 inHg).

[1] Hearty, P. Volatile Organic Compounds in Air (OSHA Method PV2120). United States Department of Labor, Occupational Safety and Health Administration Web site. https://www.osha.gov/dts/sltc/methods/partial/pv2120/pv2120.html (accessed January 2017).

Personal sampling must be performed within 9 inches of the breathing zone. Before sampling carefully describe the sampling process to the worker.

Place the Filtered Grab Sampler over the canister's Micro-QT2 valve, but do not snap it into place. With the canister placed in the palm of one hand, and thumb on the Grab Sampler, hold the canister within the breathing zone of the worker. Press down on the Grab Sampler to snap it into place, opening the canister's sampling valve. Wait two seconds then remove the canister from the breathing zone and immediately remove the Filtered Grab Sampler from the canister valve. **Do not use this sampling technique if it will distract the worker and interfere with their performance or safety.**

Perform area sampling by placing the canister in the area to be sampled. Sample using the Grab Sampler as described above.

Submit at least one blank sample with each set of samples. Handle the blank in the same manner as the other samples except open in a low background area.

Record any potential interference on Form OSHA-91A.

Place all canisters back into a plastic cylindrical container and seal with a Form OSHA-21.

Submit samples to the laboratory for analysis as soon as possible after sampling.

3. Analytical Procedure

For detailed instructions on analysis see the Appendices for specific instructions. When appropriate, analysis of analytes can be combined. General analytical recommendations are listed below.

3.1 Apparatus

A gas chromatography (GC) instrument.

An appropriate detector such as a flame ionization detector (FID), electron capture detector (ECD), or a detector based on mass spectrometry (MS).

A capillary column capable of separating the analytes and any potential interferences.

A canister autosampler capable of pressurizing each canister with 5-10 psi nitrogen, an oven, and a heated injection loop or preconcentrator.

3.2 Reagents and standards

Use reagents and standards of sufficient purity for preparing calibration standards.

3.3 Standard preparation

Prepare calibration standards in 50-mL canisters by gas dilution or by injecting microliter amounts of analyte into a canister and quickly capping. Standards should be prepared in terms of parts per million (ppm) referenced to 25 °C and 760 mmHg.

4. Validation

See Appendices for analyte specific validation data.

4.1 Sample volume variability

The sample volume variability, used in the precision of the overall method calculation, was determined as follows:

Eighteen 50-mL canisters were evacuated to 10 mTorr and weighed. The canisters were then filled with room air (temp = 22.1 °C, atm pressure = 655.2 mmHg, RH = 16.8%) and weighed a second time. The difference in weight (filled – evacuated) in mg was divided by the density of air (1.03 g/L), calculated from the environmental conditions listed above, giving the volume of air in each canister. Results are listed below in Table 4.1.

Table 4.1
Canister Volume

Canister #	filled – evacuated weight (mg)	air volume (mL)
1	52.80	51.26
2	52.22	50.70
3	51.87	50.36
4	51.99	50.48
5	51.87	50.36
6	52.92	51.38
7	51.87	50.36
8	51.76	50.25
9	51.87	50.36
10	51.99	50.48
11	51.52	50.02
12	51.76	50.25
13	52.22	50.70
14	51.41	49.91
15	51.76	50.25
16	51.64	50.14
17	51.64	50.14
18	51.40	49.90

The mean sample volume of the eighteen 50-mL canisters was 50.41 mL with a standard deviation of 0.40 mL. The sampling volume variability (V_S) of 0.8% was calculated using:

$$Vs = \frac{\sigma}{C} \times 100$$

Where:

σ is standard deviation (0.40 mL)
C is the reference volume (50.00 mL)