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October 21, 2016

Mr. Michael Lane
Office of Court Management/Facilities Management
Environmental Coordinator
Lowell District Court
41 Hurd Street
Lowell, Massachusetts 01852

RE: 50 State Street, Springfield, MA – Indoor Air Quality Services
TRC Project 265951

Mr. Lane,

On October 7, 2016, TRC conducted a limited indoor air quality (IAQ) investigation at Springfield Hall of Justice located at 50 State Street in Springfield, Massachusetts. The investigation was limited to representative locations as indicated by the on-site representative. The IAQ investigation included: visual and olfactory observations; baseline IAQ parameter measurements of temperature (T), relative humidity (RH), carbon dioxide (CO_2), carbon monoxide (CO); and direct-reading measurements of airborne particulate and volatile organic compounds (VOCs). This report presents TRC's observations, results of the IAQ monitoring, conclusions and recommendations.

The purpose of the investigation was to perform a brief IAQ screening to address building occupants concerns regarding the air quality.

OBSERVATIONS

Observations of readily accessible occupied spaces including interior finish materials and fan coil units were made to the 1st floor Criminal Office, and 4th floor Registry of Probate office spaces. Interior finish materials consist of gypsum board walls, carpet, vinyl cove base and suspended ceiling tiles. Water stains could be observed in various locations on the fiberglass insulation of the fan coil unit pipes; however, the insulation was dry at the time of TRC's assessment.

Some of the ceiling tiles inside the Registry of Probate office appeared to have been replaced; however, no water stains were present during TRC's assessment. Visible dust deposits were observed on supply air diffusers in the Criminal Office area.

There were no visible signs of suspect mold growth on any of the observed interior finish materials and no musty odors were noted.

SAMPLING AND ANALYTICAL METHODS

TRC utilized a visual/olfactory inspection of the space coupled with real time measurements to conduct the investigation.

Baseline Indoor Air Quality Parameter Monitoring
Monitoring of baseline IAQ Parameters was conducted in the selected building areas. Real-time monitor readings for CO, CO_2, T, and RH were collected using a TSI Q-Trak™ IAQ Monitor Model 7565. This instrument uses: an electrochemical cell to monitor CO; a nondispersive infrared sensor to monitor CO_2; and thermistors and thin-film capacitor sensors to measure temperature and relative humidity, respectively. The instrument is calibrated prior to use in the field using standard CO and CO_2 calibration gas and is serviced annually.

Direct-reading spot measurements of airborne particulate as PM_{10} was conducted using a TSI Incorporated DustTrak Model 8520 Aerosol Monitor. The instrument measures PM_{10} and $PM_{2.5}$ by drawing air through 10-micron or 2.5-micron size-selecting inlets, respectively, and passing the sampled air through a light-scattering laser photometer. The instrument is calibrated annually by the manufacturer in accordance with International Organization for Standardization (ISO) standard 12103-2, and is zeroed in the field prior to use in accordance with manufacturer recommendations.

Direct-reading measurements of VOCs were performed using a RAE Systems Inc. ppbRAE VOC Monitor (Model PGM-7240). The instrument is a photoionization detector that detects VOCs by ionization of the molecules using radiation from an internal 10.6 eV ultraviolet lamp. The instrument response to a particular VOC depends on the ionization energy of the VOC relative to the energy of the ultraviolet lamp. The instrument cannot distinguish among several VOCs in the sampled air, but provides a cumulative response. The ppbRAE is sensitive to a few parts per billion (ppb) of the standard isobutylene gas and its accuracy is the larger of ±20 ppb or 10% of the reading. The instrument was calibrated prior to use in the field using standard isobutylene calibration gas.

BACKGROUND INFORMATION

CO_2 Indoor CO_2 measurements provide a useful indicator of whether a space is provided with adequate make-up (outdoor) air for the number of occupants present, since CO_2 levels may build up when there is insufficient outdoor make-up air. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 62-2013, *Ventilation for Acceptable Indoor Air Quality*, recommends the difference between indoor and outdoor CO_2 concentrations be maintained at 700 parts per million (ppm) or less. Maintaining a difference of no more than 700 ppm equates to approximately 15 cubic feet per minute of outdoor supply air per occupant. Outdoor concentrations of CO_2 typically range from 350 – 450 ppm.

The Massachusetts Department of Public Health (MA DPH) uses a guideline of 800 ppm of CO_2 for publicly occupied buildings.[1]

CO. CO is a combustion product that may be present in buildings with boilers, fuel-burning engines, parking garages, or busy side streets near the outdoor air intakes. CO is a colorless, odorless gas that can cause fatigue or drowsiness, nausea, headache, and difficulty breathing when present at elevated levels. The U.S. EPA National Ambient Air Quality Standard (NAAQS) for CO is 9 ppm (8-hour average).

Temperature and RH. Occupants are generally tolerant of temperatures between 68° and 82 °F. ASHRAE Standard 55-2013 *Thermal Environmental Conditions for Human Occupancy* recommends temperatures be generally maintained between 75° and 82 °F during warmer summer operative conditions and 68° and 78° F in cooler winter operative conditions.

ASHRAE does not specify lower limits for relative humidity; however, ASHRAE does recognize that low relative humidity may cause discomfort. Relative humidity below 30% may cause specific physiological effects (such as dry and sore nose and throat, bleeding nose, sinus and tracheal irritation, dry scratchy eyes, inability to wear contact lenses, and dry flaking skin), that can lead to occupant discomfort and dissatisfaction with the indoor environment. The U.S. EPA recommends that RH be maintained below 60% to prevent mold growth on indoor surfaces and building materials.

Airborne particulate in indoor environments originates from various sources within the building including building materials and furnishings, occupant activities, and construction and renovation activities, as well as from the outdoor air. High concentrations of airborne dust may cause irritation of the eyes, skin and respiratory tract.

The US EPA has established a NAAQS for PM_{10} and $PM_{2.5}$ (particles with aerodynamic diameters less than or equal to 10 and 2.5 micrometers, respectively) of 0.150 and 0.035 milligrams per cubic meter of air (mg/m^3) as a maximum 24-hour TWA concentration. This primary standard applies to ambient air quality and is intended to protect the health of the general public, including sensitive populations such as asthmatics, children, elderly, and individuals with heart disease or chronic obstructive pulmonary disease. The NAAQS value of 0.150 mg/m^3 for PM_{10} and 0.035 mg/m^3 for $PM_{2.5}$ may be used as guidelines for evaluating indoor air quality.

VOC measurements were performed to determine if unusually high cumulative concentrations of this group of air contaminants existed. VOCs have many sources including the evaporation of paint solvents and cleaning products being used in the building, and off-gassing from building materials and furnishings. Exposures to elevated concentrations of VOCs may cause symptoms such as headaches, dizziness, and eye, nose and respiratory tract irritation.

[1] MA DPH "Carbon Dioxide and Its Use in Evaluating Adequacy of Ventilation in Buildings", http://mass.gov/Eeohhs2/docs/dph/environmental/iaq/appendices/carbon_dioxide.doc

In general, indoor VOC concentrations should be similar to or less than outdoor concentrations, unless there is a significant source of VOCs in the building. In TRC's experience, outdoor VOC concentrations, as measured by the ppbRAE instrument, are frequently less than 20 parts per billion parts per air (ppb).

SAMPLING RESULTS/INTERPRETATION

Table 1. Indoor Air Quality Measurement Results
Springfield Hall of Justice, 50 State Street, Springfield, Massachusetts
October 7, 2016, 12:42 p.m. to 2:05 p.m.

Measurement Location	Time	CO_2 (ppm)	CO (ppm)	T (^{0}F)	RH (%)	PM_{10} (mg/m^3)	$PM_{2.5}$ (mg/m^3)	VOC (ppb)
1st Floor								
Room 102	12:42	522	ND (< 3)	68.7	55.1	0.011	0.004	ND (<20)
Room 104	13:57	496	ND (< 3)	68.9	54.8	0.012	0.008	ND (<20)
Cubicle Criminal Main Office	12:47	508	ND (< 3)	70	54	0.009	0.006	ND (<20)
Conference room 108	12:49	503	ND (< 3)	70.5	53.4	0.005	0.004	ND (<20)
Criminal Office Cubicle 106	12:52	532	ND (< 3)	71.1	52.3	0.016	0.009	ND (<20)
Cashiers Cubicle Area	12:54	592	ND (< 3)	71.5	51.2	0.006	0.003	ND (<20)
Room 101	12:55	550	ND (< 3)	71.7	50.4	0.014	0.005	ND (<20)
4th Floor –Registry of Probate								
Room 431	12:57	539	ND (< 3)	74.1	49.3	0.002	0.002	45
Room 434	13:00	499	ND (< 3)	75	47.2	0.008	0.007	36
Cubicle Area Right	13:07	502	ND (< 3)	73.6	47.0	0.014	0.009	21
Cubicle Area Left	13:13	627	ND (< 3)	73.4	48.1	0.008	0.006	38

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Wait Room - Desks	12:05	572	ND (< 3)	73.7	48.3	0.009	0.004	26
Ambient Air								
Outdoors	13:17	408	ND (< 3)	64.4	58.4	0.020	0.010	ND (<20)
Standards		**ASHRAE <700 above ambient (< 1,108)**	**U.S. EPA NAAQS 9**	**ASHRAE Guideline Summer = 75-82^o F Fall & Winter = 68-78^o F**	**U.S. EPA < 60**	**NAAQS PM_{10} - 0.150 mg/m^3**	**NAAQS $PM_{2.5}$= 0.035 mg/m^3**	**General: Indoors Not >> Outdoors**

(ppm = parts per million, ^{o}F = degrees Fahrenheit, % = percent)

The baseline IAQ measurements taken in the representative areas indicate concentrations for CO and CO_2 to be in the acceptable ranges. The temperature readings were within the recommended comfort range at the observed relative humidity, and relative humidity readings were within acceptable ranges.

The airborne concentrations of PM_{10} measured at the indoor sampling locations ranged from 0.002 to 0.016 mg/m^3 and $PM_{2.5}$ concentrations ranged from 0.002 to 0.009 mg/m^3. The concurrent outdoor PM_{10} concentration was 0.020 mg/m^3 and the $PM_{2.5}$ concentration was 0.010 mg/m^3. These concentrations are below the reference values of 0.150 and 0.035 mg/m^3 for PM_{10} and $PM_{2.5}$, respectively.

The measured VOC concentrations ranged from non-detect (<20 ppb) to 45 ppb. The higher concentrations were measured in the Registry of Probate area and may have been caused by the presence of office equipment, food and/or cleaning products. The observed VOC concentrations are one or more orders of magnitude less than the occupational exposure limits that have been established for the common VOCs that are likely present in the building. The TRC representative did not detect any noticeable chemical odors at any of the sampling locations.

CONCLUSIONS AND RECOMMENDATIONS

During TRC's visit water stains could be observed in various locations on the fiberglass pipe insulation at the fan coil units; some of the ceiling tiles inside the Register of Probate office appeared to have been replaced, and the supply air diffusers in the Criminal Office areas had visible dust deposits. However, all the observed interior finish materials, as well as insulating materials at the fan coil units appeared to be dry during TRC's assessment, and no signs of mold growth nor musty odors were noted.

The baseline IAQ measurements taken in the representative areas indicate concentrations for CO and CO_2 to be within acceptable ranges.

The temperature readings were within the recommended comfort range at the observed relative humidity, and relative humidity readings were within acceptable ranges as well.

The airborne concentrations of PM_{10} and $PM_{2.5}$ measured at the indoor sampling locations are below the reference values of 0.150 and 0.035 mg/m^3 for PM_{10} and $PM_{2.5}$, respectively.

Based on these observations and measurements, TRC recommends the following:

1. Perform an assessment of all fan coil units and determine if cleaning is necessary or if pipe leaks are presents and the insulating materials or surrounding building materials are water damaged.
2. Perform repairs as needed and replace any water damaged materials.
3. Ensure that all ventilation systems in place are functional and work at specified parameters, and clean the supply air diffusers.

TRC appreciates the opportunity to provide you with IAQ services. If you have any questions or comments, please call TRC at (781) 933-2555.

Very Truly Yours,
TRC

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