September 8, 2020

Mr. Joseph A. Correia III
Director of Environmental Services
Fall River Public Schools
290 Rock Street
Fall River, MA 02720

Dear Mr. Correia:

JEES of Charlton, Massachusetts was asked to provide the Fall River Public School (FRPS) with a summary of the results for the indoor air quality (IAQ) testing JEES performed in 14 Fall River Public Schools. JEES completed the field portion of the IAQ testing from August 20, 2020 to August 28, 2020. This IAQ testing was based upon JEES' proposal sent to you dated August 17, 2020.

Provided below is a summary of what testing was done, and an explanation of what the data was compared to. There is a summary of the results for the following schools: Lord, Letorneau, Silvia, Viveiros, Talbot, Green and Durfee High School.

1.0 BACKGROUND & SCOPE OF WORK

Per our phone conversations, JEES understands that some members of the FRPS faculty and staff have emphatically expressed concerns with potentially poor IAQ in the schools. These members wanted IAQ testing in the schools before returning to the school buildings.

Since there are numerous parameters to test for, JEES and you discussed what would be the more realistic IAQ parameters to test for and to what extent. The testing and JEES' inspection will be used to provide an overview of each school's general IAQ.

After the discussions along with JEES' over 40 years of cumulative experience regarding IAQ, the scope of work was finalized. For each school, JEES tested classroom per floor along with one hallway per school. In each school, the selected locations were monitored for fine dust (particulate matter less than ten microns or PM-10), total volatile organic compounds (TVOC) and mold spores. These parameters represent some of the most common IAQ contaminants.

Once the sampling was completed, JEES recorded the time weighted average (TWA) for each school for PM-10 and TVOC. The TWA represents what the average value was over the time period that monitoring took place, typically two to three hours. This value was then compared to an applicable IAQ standard.

For mold spores, JEES measured the amount and types of each mold spore detected. This data was compared to the outside air sample results along with general guidelines.

2.0 DATA EXPLANATION

Provided below is a discussion of each parameter measured and how the data was interpreted.

A. PM-10: For PM-10, JEES used a portable, real-time air sampling device that records PM-10 data points several times a minute. Over the time monitoring period, JEES noted any brief periods of high PM-10 levels in our field notes along with any pertinent observations. The important data point was the TWA for the school.

Dust particles PM-10 or smaller are the size that can affect both the upper and lower respiratory system. PM-10 can be generated from any number of sources such as carpeting, paper, books, outdoor vegetation, sweeping and foot traffic to name a few sources. The Environmental Protection Agency (EPA) has a TWA PM-10 limit of 150 micrograms per cubic meter of air ($\mu g/m^3$). This was the standard used for each school.

B. TVOC: TVOC are a common IAQ contaminant. TVOC represent all volatile organic compounds in the air. Some of the more commonly known TVOC include formaldehyde, benzene, acetone, isopropanol (rubbing alcohol) and toluene.

Elevated levels of TVOC have been correlated with an increase in occupant's reports of headaches, fatigue, dizziness, nausea, skin irritation, eye irritation and fatigue.

Similar to PM-10 data collection, JEES used a portable real-time sampling device that recorded several times a minute. Once again, JEES noted any periods of elevated TVOC levels along with any noted sources of TVOC. The most relevant data point was the TWA value. The TWA value was compared to the calibration compound isobutylene. Isobutylene is near the middle of the size of the common TVOC detected.

There are no specific limits for TVOC in indoor air. To be conservative, JEES compared the TWA values to the LEED (Leadership in Energy and Environmental Design) limit of 500 micrograms per cubic meter of air. Depending upon the compound being measured, this equates to roughly 500 parts per billion (ppb). The instrument used converts the response of all chemical detected to isobutylene. LEED is the program used for developing "green buildings" and is considered the benchmark for good IAQ.

C. Mold Spores: In each sampling location for a school, JEES collected an air sample for mold spores. The samples were collected at a height approximating a sitting student or teacher. A field blank was collected on each day of sampling as a quality control measure to make sure any positive results were not due to contamination introduced during sample collection and analysis. For comparison purposes, an ambient (outside) air sample was collected as well.

Exposure to fungal contamination can cause a variety of health effects ranging from headaches and fatigue to sinus infections and respiratory problems. An occupant's susceptibility to these ailments depends on a person's sensitivity to fungal spores and the state of their immune system.

The International Board of Industrial Hygienists (IBIH), American Conference of Governmental Industrial Hygienists (ACGIH) and the American Industrial Hygienist Association (AIHA) guidelines were used to interpret the mold spore air sampling data. These agencies suggest taking corrective action when the spore levels are much higher in an area of a building, which has had occupant complaints, verses an area of a building with no occupant complaints. Exact numbers for acceptable mold spore levels are not feasible due to seasonal and geographical variations. These guidelines state that ***in most cases*** the indoor air concentrations of molds should be lower than the ambient (outdoor) concentration of molds.

For this testing program, air sample results were quantified as total spore per cubic meter of air (ct/m^3). Each intact spore is counted as one spore and includes both metabolically active (viable) and metabolically inactive (non-viable) spores. This method cannot distinguish between fungal genuses that produce spores with nearly identical morphology such as aspergillus and penicillium, thus these two spore types are reported together.

3.0 SCHOOL BY SCHOOL SUMMARY

Provided below by school is a summary of the results collected with a brief discussion for each parameter.

A. Lord School: The TWA for PM-10 at the Lord School was 3 $\mu g/m^3$. This result was 2% of the EPA limit. The TVOC TWA was 3 ppb or less than 1% of the LEED limit. Both of these TWA are well below the recommended limit.

For mold spores, the ambient air sample result for the Lord School was 7,800 ct/m^3. All three air samples from inside the school were a tiny fraction of the ambient air sample result. The highest result was 129 ct/m^3 (from Room #111), which is 1% of the ambient air sample result. None of the samples indicated mold spore amplification was occurring.

B. Letorneau School: The TWA for PM-10 at the Letorneau School was 6 $\mu g/m^3$. This result was 4% of the EPA limit. The TVOC TWA was 5 ppb or 1% of the LEED limit. Both of these TWA are well below the recommended limit.

For mold spores, the ambient air sample result for the Letorneau School was 54,000 ct/m^3. All three air samples from inside the school were a tiny fraction of the ambient air sample result. The highest result was 878 ct/m^3 (from the hallway by #003), which is 2% of the ambient air sample result. None of the samples indicated mold spore amplification was occurring.

C. Silvia School: The TWA for PM-10 at the Silvia School was 6 $\mu g/m^3$. This result was 4% of the EPA limit. The TVOC TWA was 1,117 ppb which was over twice the LEED limit. JEES noted that the floors were being stripped. The chemical in the solution being used to strip the floors was picked up by the portable real-time sampling meter. The odor JEES smelled n the school was consistent with those related to chemical utilized to strip a floor. The TWA for PM-10 is well below the recommended limit.

For mold spores, the ambient air sample result for the Silvia School was 9,300 ct/m^3. Two of the three air samples from inside the school were a tiny fraction of the ambient air sample result.

The highest of these results was 338 ct/m^3 (from the hallway by the office), which is 3% of the ambient air sample result. Neither of these samples indicated mold spore amplification was occurring.

The result from Room #186 had 3,490 ct/m^3, which is 37% of the ambient air sample result. The higher levels in this room were driven by the presence penicillium and aspergillus with a result of 2,500 ct/m^3. Typically, this level would be considered elevated. However, penicillium and aspergillus spores were detected at higher levels in the ambient air result (3,200 ct/m^3). JEES noted that this room was opposite the entry to the courtyard. As the courtyard is outside, JEES believes that mold spores from the courtyard had infiltrated Room #186 via airflow when the door is open, thus skewing the penicillium and aspergillus spore levels. This premise is further corroborated by the lack of visual evidence of visible mold growth in Room #186.

D. Viveiros School: The TWA for PM-10 at the Viveiros School was 47 µg/m^3. This result was 31% of the EPA limit, which, while still well below the EPA TWA limit of 150 µg/m^3, is higher than the other schools tested by JEES. In Room #332, JEES noted that the PM-10 levels were elevated (highest real time recorded level was 164 µg/m^3). This was the only classroom that was carpeted. JEES believes that dust which had settled onto the carpet was being kicked up during JEES' movements in the room. The levels dropped to below 25 µg/m^3 after movement was stopped, indicating sufficient ventilation to remove the particulates from the air. Vacuuming the carpet in this room with vacuums containing HEPA (High Efficiency Particulate Air) filtration should aid in keeping the PM-10 to recommended limits.

The TVOC TWA was 4 ppb or less than 1% of the LEED limit.

For mold spores, the ambient air sample result for the Viveiros School was 11,000 ct/m^3. All four air samples from inside the school were a tiny fraction of the ambient air sample result The highest result was 737 ct/m^3 (from the first floor hallway near the front of the school), which is below 7% of the ambient air sample result. None of the samples indicated mold spore amplification was occurring.

E. Talbot School: The TWA for PM-10 at the Talbot School was 10 µg/m^3. This result was 6% of the EPA limit. The TVOC TWA was 5 ppb or less than 1% of the LEED limit. Both of these TWA are well below the recommended limit.

For mold spores, the ambient air sample result for the Talbot School was 4,400 ct/m^3. On average, all four air samples from inside the school were 31% of the ambient air sample result. The highest result was 1,354 ct/m^3 (from the hallway by Room #26), which is still below 31% of the ambient air sample result. The levels in the school were not unexpected due to the amount of activity going on, inside and outside the school during the sampling period. Inside of the school, furniture was being moved to prepare for the school's re-opening. Outside of the school, laptops were being handed out to students. These activities also led to frequent opening and closing of the main doors exposing the school to the outside air. None of the samples indicated mold spore amplification was occurring.

F. Green School: The TWA for PM-10 at the Green School was 1 µg/m^3. This result less than 1% of the EPA limit. The TVOC TWA was 17 ppb or less than 4% of the LEED limit. Both of these TWA are well below the recommended limit.

For mold spores, the ambient air sample result for the Green School was 1,200 ct/m^3. The ambient results were kept low due to intermittent rainfall a few hours prior to sampling. Precipitation can remove mold spores from the air for up to 48 hours after the precipitation event. Even with the low ambient air sample results, all four air samples from inside the school were still less than 14% of the ambient air sample result. The highest result was 163 ct/m^3 which was still less than 14% of the ambient air result. None of the samples indicated mold spore amplification was occurring.

G. Durfee High School: The TWA for PM-10 at the Durfee High School was 1 µg/m^3. This result was less than 1% of the EPA limit. The TVOC TWA was 5 ppb or 1% of the LEED limit. Both of these TWA are well below the recommended limit.

For mold spores, JEES did not collect an ambient air sample due to steady rain during the sampling period. As JEES had collected six previous ambient air samples from the other six schools over a seven-day period (an average of 14,617 ct/m^3), JEES has sufficient data with which to compare the results from Durfee High School. All five air samples from inside the school were a tiny fraction of the average ambient air sample result when compared to the previous six ambient samples. The highest result was 288 ct/m^3 (from the Room #124 hallway), which is still below 1% of the average ambient air sample result. None of the samples indicated mold spore amplification was occurring.

If you need any other additional services in regards to this matter, please feel free to contact me.

Sincerely,

Kevin J. Kernen
Certified Indoor Environmental Consultant
Eastern Branch Manager
JEES