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 the testing performed, and an explanation of what the data was compared to. There is a summary of the results for the following schools: Spencer Borden, Tansey, Morton, Doran, Kuss, Fonseca and Stone 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 testing parameters and to what extent the rooms in the schools should be tested. The testing and JEES' inspection of the school will be used to provide an overview of each schools general IAQ.

After the discussions and based upon JEES' over 40 years of cumulative IAQ experience, the scope of work was finalized. For each school, JEES tested one 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 spores collected. 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 JEES' 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. LEED is the program used for developing "green buildings" and is considered the benchmark for good IAQ. 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.

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

For mold spores, the ambient air sample result for the Kuss School was 43,000 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 96 ct/m^3, which is still below 1% of the ambient air sample result. None of the samples indicated mold spore amplification was occurring.

B. Spencer Borden School: The TWA for PM-10 at the Spencer Borden School was 4 $\mu g/m^3$, which below 3% of the EPA PM-10. The TVOC TWA was 5 ppb or 1% of the LEED limit. Neither TWA value indicated any issues with these parameters.

For mold spores, the ambient air sample result for the Spencer Borden School was 45,000 ct/m^3. All three air samples from inside the school were below 4,000 ct/m^3 or 9% of the ambient air sample result.

The sample from the hallway by Room 205 did have a higher than typically level of penicillium/aspergillus spores with 2,400 ct/m^3. Penicillium and aspergillus spores are potent allergens and certain species have been associated with respiratory ailments. The main source of these spores appeared to air coming in from the outside as the doors to the school were propped open for over 15 minutes to allow children and staff for a summer program to enter and exit the school. The ambient air sample had 4,100 ct/m^3 of penicillium/aspergillus spores present.

Based upon the mold spore concentration for the hallway by Room 205, you had the janitorial staff reclean the area. JEES retested on September 2, 2020. The repeat testing results were much lower with only 190 ct/m^3 penicillium/aspergillus spores present. This represents a reduction of 92% and this amount of penicillium/aspergillus is within the typical range for a New England building this time of year. The data and JEES' observations confirm the premise that the primary source of the mold spores was the outside.

C. Morton School: The TWA for PM-10 at the Morton School was 6 µg/m^3. This result was 4% of the EPA PM-10 limit. This TWA was slightly higher than some of the other schools and was likely affected by the waxing of the second floor that had just finished that morning. The waxing of the floor was reflected in the TVOC data with a TVOC TWA of 53 ppb. This was one of the highest TWA values for TVOC. Wax solution often contains compounds that are volatile and quickly become present in the air after the wax solution is applied. Even with the waxing, the TVOC TWA was 53 ppb, or 11% of the LEED limit.

For mold spores, the ambient air sample result for the Morton School was only 7,600 ct/m^3. This result is much lower than the other schools and reflected the fact that there was minimal vegetation near the school. Even with the low ambient air sample results, all four air samples from inside the school were much lower than the ambient air sample result The highest result was 105 ct/m^3, which is only 2% of the ambient air sample result. None of the samples indicated mold spore amplification was occurring.

D. Doran School: The TWA for PM-10 at the Doran School was 8 µg/m^3. This result was 6% of the EPA PM-10 limit. The primary source of PM-10 appeared to be dust on the boxes of school supplies being moved into classrooms when JEES was conducting the PM-10 monitoring. The TVOC TWA was 7 ppb or less than 2% of the LEED limit. The primary source of TVOC in the school was the alcohol in the hand sanitizer located throughout the school that was being used by staff. Neither the PM-10 TWA nor the TVOC TWA were near the recommended limit.

For mold spores, the ambient air sample result for the Doran School was 27,000 ct/m^3. All four air samples from inside the school were much lower than the ambient air sample result The highest result was 1,646 ct/m^3, from Room 236. This result is just 6% of the ambient air sample result. Room 236 had a fair amount of vegetation by the exterior wall and mold spores from this vegetation were likely drawn in by the unit ventilator. The sample from Room 236 had nearly the same spore types present as the ambient air sample result, but at lower levels. None of the samples from inside the school indicated mold spore amplification was occurring.

E. Tansey School: The TWA for PM-10 at the Tansey School was 4 µg/m^3, which was one of the lower PM-10 TWAs for all the schools and is less than 3% of the EPA's TWA for PM-10. The TVOC TWA for the Tansey School was 6 ppb or just over 1% of the LEED limit. Neither TWA value indicated any issues.

For mold spores, the ambient air sample result for the Tansey School was 11,000 ct/m^3. This result was lower than most of the ambient air sample results for the schools. This sample was taken from the courtyard and there is was minimal vegetation present.

The school only has one floor and therefore only two samples were taken. Both samples were well below the ambient air sample result. The highest result was from the hallway by Room 104 with 2,124 ct/m^3 or 9% of the ambient air sample result.

The sample from the hallway by Room 104 did have a higher than typically level of penicillium/aspergillus spores with 2,000 ct/m^3. Penicillium and aspergillus spores are potent allergens and certain species have been associated with respiratory ailments. The main source of these spores was not evident, as this spore type was not detected in the one ambient air sample result.

There is carpeting in this hallway and there was a lot of furniture present. The Tansey staff informed me that they were in the process of removing half of the school's furniture for social distancing reasons. The windows in several rooms were open and could have let in penicillium/aspergillus spores that may have been present in the ambient air earlier in the day.

Based upon the mold spore concentration for the hallway by Room 104, you had the janitorial staff reclean the area. JEES retested on September 2, 2020. The repeat testing results were much lower with only 110 ct/m^3 penicillium/aspergillus spores present. This represents a reduction of 94% and this amount of penicillium/aspergillus is within the typical range for a New England building this time of year.

F. Fonseca School: The TWA for PM-10 at the Fonseca School was 8 µg/m^3. This result was 6% of the EPA's TWA PM-10 limit. The primary source of PM-10 appeared to be dust on the boxes of school supplies being moved into classrooms when JEES was conducting the PM-10 monitoring. This also occurred in the Doran School. The TVOC TWA was 5 ppb or 1% of the LEED limit. The primary source of TVOC in the school was the solvents in the cleaning solutions being used to disinfect the school furniture. Neither the PM-10 TWA nor the TVOC TWA were near the recommended limit.

For mold spores, the ambient air sample result for the Fonseca School was very high with 110,000 ct/m^3. All three air samples from inside the school were much lower than the ambient air sample result The highest result was 319 ct/m^3, from Room 123. This result is just 1% of the ambient air sample result. Room 123 had some vegetation by the exterior wall and mold spores from this vegetation were likely drawn in by the unit ventilator. None of the samples from inside the school indicated mold spore amplification was occurring.

G. Stone School: The TWA for PM-10 at the Stone School was one of the highest for all the schools with 23 µg/m^3. This result is still only 16% of the EPA's TWA PM-10 limit. The primary source of PM-10 appeared to be dust from the basement level. On the day of testing, new boilers were being installed. The boiler contractors had the basement doors open to the outside air during the entire time of testing allowing unfiltered air to enter the building. The boiler contractors were also generating dust during the disassembly of the old boilers and assembly of the new boilers. Rust and metal debris from the older boilers would easily become airborne when being removed. JEES noted that the PM-10 levels were generally lower on the upper floors, which were less affected by the basement boiler activities.

The TVOC TWA was 5 ppb or exactly 1% of the LEED limit. The primary sources of TVOC in the school were the solvents in the cleaning solutions being used to disinfect the school furniture along with the rubbing alcohol for the hand sanitizer.

Neither the PM-10 TWA nor the TVOC TWA were near the recommended limit.

For mold spores, the ambient air sample result for the Stone School was high with 60,000 ct/m^3. All four air samples from inside the school were much lower than the ambient air sample result The highest result was 5,426 ct/m^3, from Room 202. This result is just 9% of the ambient air sample result.

All four air samples had higher than typical levels of basidiospores present. These spore types are very mild allergens. Basidiospores are common in the outside air in the late summer. Basidiospores thrive on decaying vegetation and during warm weather. Decaying vegetation included grass clippings, dying weeds and fine organic debris that accumulates after a wind event. All of these items were present behind the Stone School and were near the open basement doors being used by the boiler contractors. Hence, the primary source of these spores inside the school was the outside air.

None of the samples were elevated relative to the ambient air and there were no indications of mold contamination.

3.0 SCHOOL BY SCHOOL SUMMARY

None of the TWAs for PM-10 or TVOC indicated any issues for the seven schools tested.

For the two mold spore air samples that suggested there may be a mold spore amplification issue, JEES retested after FRPS custodial staff cleaned the areas were the samples were collected. The retest results did not detect any elevated levels of mold spores.

In summation, for the general IAQ parameters that where examined in the schools, no issues with poor IAQ were identified.

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

Sincerely,

Edward P. Nowak

Edward P. Nowak
Certified Indoor Environmental Consultant
President
JEES