

INDOOR AIR QUALITY TESTING SERVICES - ADDENDUM #1



COVINGTON MIDDLE SCHOOL

606 SOUTH LEXINGTON AVENUE
COVINGTON, VIRGINIA 24426

ECS PROJECT NO. 47:20796

FOR: ALLEGHANY HIGHLANDS SCHOOL BOARD

REVISED: APRIL 8, 2025





Revised: April 8, 2025

Alleghany Highlands School Board
100 Central Circle
Low Moor, Virginia 24457

ECS Project No. 47:20796

Reference: Indoor Air Quality Testing Services - Addendum #1, Covington Middle School, 606 South Lexington Avenue, Covington, Virginia

To Whom it May Concern:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide Alleghany Highlands School Board with the results of the above referenced Indoor Air Quality Testing Services - Addendum #1 performed at Covington Middle School located at 606 South Lexington Avenue in Covington, Virginia. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 47:37601-EP and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide Alleghany Highlands School Board with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

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EXECUTIVE SUMMARY AND CONSLUSIONS

The subject property is improved with the Covington Middle School building located at 606 South Lexington Avenue, in Covington, Virginia. ECS was requested to revisit the facility on two separate occasions after the faculty and students re-occupied the building, to collect carbon monoxide (CO), carbon dioxide (CO₂), temperature, and relative humidity (RH) readings in areas located throughout the building. ECS visited the site on March 24, 2025 and March 31, 2025.

Based on our understanding of the building, observations, and readings collected, ECS presents the following conclusions:

1. ECS detected elevated concentrations of CO₂ during both sampling events; however, ECS did not detect elevations of CO. Additionally, other comfort parameters (temperature and relative humidity) were also noted to be within normal ranges. Based on interpretations from ASHRAE, OSHA and NIOSH, poor outdoor air ventilation would most likely be attributable to or the likely cause of the elevated CO₂ readings reported in the school, including the indication that outdoor air ventilation rate is less than 15 cubic feet per minute (cfm) per person;
2. Although elevations in CO₂ cannot be linked to any direct health concern (at the levels reported), elevations in CO₂ concentrations can be used as an indicator of occupant odors (odorous bioeffluents) and by inference other building related pollutants including volatile organic compounds (VOCs) which would be more likely to occur in this building environment and which would be expected to negatively impact building indoor air quality. Provision of adequate fresh outside air is a key element in maintaining good indoor quality in the school. As good practice it is our understanding that the school is looking at ways to increase over all air circulation and increase outdoor air ventilation to the school.
3. It is unknown where the urine-like odor, that has been reported on numerous occasions, is originating from. However, as noted, we did not observe any urine-like odors in classroom 305 or 306, or in any other classrooms in the school during our survey.

The executive summary is an integral portion of this report; however, ECS recommends the report be read in its entirety.

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1.0 SITE DESCRIPTION

The subject site consists of Covington Middle School, a multi-story school building located at 606 South Lexington Avenue in Covington, Virginia. Based on the information available, the building consists of 95,459 square feet of space. The building is comprised of the original building that was reportedly constructed in 1939, with major additions in 1962, and building additions and renovations in 1990.

ECS previously completed and provided Indoor Air Quality Testing Services at the school facility following complaints of unusual odors from certain areas of the building and that some occupants reportedly developed adverse symptoms that they believed may have been associated with indoor air quality of the site (Reference ECS Report No. 47:20796 dated March 3, 2025). ECS completed the original testing services when the students and faculty were not occupying the building.

ECS was requested to return to the site and collect additional carbon monoxide (CO), carbon dioxide (CO₂), temperature, and relative humidity (RH) readings from the interior and exterior portions of the building following the return of the faculty and students. ECS returned to the facility on March 24, 2025 and again on March 29, 2025. The results from the site visits completed on those dates are discussed below.

2.0 PURPOSE

The purpose of the follow up testing was to perform an assessment of general baseline indoor air quality (IAQ) parameters to identify factors that could lead to poor indoor air quality. The assessments included screening school class rooms and common areas for CO and CO₂. Additionally, ECS collected general temperature and relative humidity readings to identify baseline atmospheric characteristics inside the building.

ECS performed the scope of work following standard industry practice(s) and methods specified by guidelines and industry standards for general indoor air quality.

3.0 TEMPERATURE, RELATIVE HUMIDITY, CARBON MONOXIDE, AND CARBON DIOXIDE

Temperature and Relative Humidity (RH):

The key to understanding humidity is that warmer air can contain greater quantities of moisture than cooler air. Relative humidity is defined as the ratio of the amount of moisture contained in the air to the maximum amount of moisture the air can contain at that temperature. The dew point temperature is defined as the temperature at which the amount of moisture in the air reaches saturation. The dew point is a more accurate indication of the actual amount of moisture in the air, because it is independent of temperature. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) has published a standard for ventilated buildings. *ANSI/ASHRAE Standard 62.1-2019, Ventilation for Acceptable Air Quality* specifies that indoor humidity should be maintained below 60 degrees Fahrenheit (°F) dew point temperature. The EPA recommends that indoor relative humidity be maintained below 60%, ideally 30-50%, to prevent mold growth. The

OSHA Technical Manual, Section III, Chapter 2 for Indoor Air Quality Investigations specifies a thermal comfort range of 68°F to 76°F and a relative humidity range of 20% to 60% to maximize comfort for all occupants.

Carbon Monoxide and Carbon Dioxide:

ECS walked through the school and collected CO and CO₂ readings. Carbon monoxide is a colorless, odorless gas that may cause mild effects at lower levels that are often mistaken for the flu, including headaches and nausea. At high levels, CO gas can be lethal. It is found indoors as a result of combustion devices not properly vented to the outdoors, such as engines, natural gas appliances, furnaces, and wood stoves or fireplaces. The US Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) for CO is 9 ppm as an eight hour average. ASHRAE has adopted this level as a standard for indoor air quality, not to be exceeded at any time. The OSHA permissible exposure limit (PEL) for carbon monoxide is 50 ppm as an eight hour TWA. Concentrations exceeding 1,200 ppm are immediately dangerous to life and health.

Carbon dioxide (CO₂) is a common compound emitted from human respiration and combustion sources. Elevated levels within a building typically indicate inadequate ventilation or lack of proper outdoor air exchange rates. When elevated carbon dioxide levels occur within the building environment, while not an immediate health hazard, these conditions may be indicative of the buildup of a variety of indoor contaminants that can cause discomfort in some individuals. The OSHA Technical Manual for IAQ assessments references a NIOSH report that states that levels greater than 1,000 parts per million (ppm) indicate inadequate ventilation rates. While the elevated CO₂ levels do not necessarily indicate harmful conditions, CO₂ levels below 1,000 ppm promote conditions that maximize comfort for most occupants. For reference purposes, the OSHA Permissible Exposure Limit (PEL) for CO₂ is 5,000 ppm as an eight hour time-weighted average (TWA).

The following table summarizes the indoor air temperature, relative humidity, carbon monoxide, and carbon dioxide readings collected by ECS during this assessment.

3.1 March 24, 2025 Readings: Temperature, Relative Humidity, Carbon Monoxide, and Carbon Dioxide

Location	Relative Humidity (%)	Temperature (°F)	Carbon Monoxide (ppm)	Carbon Dioxide (ppm)
Exterior:				
Exterior (Arrival)	60.8	45.7	0.0	407
Exterior (Departure)	61.3	23.3	0.6	419
First Floor:				
Cafeteria	46.7	69.9	0.0	1443
Kitchen	48.6	68.8	0.0	1028
Kitchen Service Line	-	69.4	0.1	1192
Band Room	42.6	70.7	0.0	1190
Boiler Room (Original Building)	38.0	-	0.5	1630
Main Office	37.3	70.7	0.0	1230
Hallway - 1st Floor (Outside Main Office)	-	69.9	0.0	1165
Teachers Lounge	-	70.2	0.0	1434
Room 104	-	71.5	0.0	1907
Foyer	-	69.7	0.0	962
Auditorium	37.0	71.1	0.0	637
Gymnasium	51.8	71.4	0.0	1451
Room 105	-	71.6	0.0	442
Room 106	52.9	-	0.4	431
Room 107	46.7	-	0.1	1901
Room 108	52.4	-	0.1	2005
Boiler Room	28.7	72	0.0	679
Room 109	42.3	69.7	0.0	1010
Room 110	-	70.2	0.2	918
Room 111	43.7	-	0.2	1261
Room 112	37.3	-	0.1	1133
Room 113	38.2	-	0.0	978
Room 114	-	71.6	0.0	1835
Second Floor:				
Library	43	71.6	0.0	1434
Library Office (Clinic)	-	70.9	0.0	1321
Room 200A	45.5	-	0.4	1870
Room 201	46.2	-	0.0	2169
Room 202	54.2	-	0.0	2113

Room 203	56.1	-	0.0	2391
Room 204	54.3	-	0.2	3207
Video Room (Room 206)	49.0	-	0.0	1904
Room 207	54.3	-	0.2	1859
2nd Floor Hallway (Original Building)	46.7	71.0	0.0	1307
Room 208	-	71.3	0.0	1783
Room 209	-	71.3	0.1	1876
Room 210	-	71.2	0.1	1775
Room 211	-	70.7	0.0	1551
Room 212	-	70.7	0.0	1532
Storage (ISS Room)	44.4	-	0.2	1389
Room 213	-	70.8	0.0	1504
Room 214	-	71.3	0.0	1834
2nd Floor Hallway ("New" Building)	-	71.7	0.1	1914
Third Floor:				
Room 301	50.8	70.8	0.2	2631
Room 302	-	71.3	0.0	2480
Room 303	-	70.6	0.3	2778
Room 304	-	70.6	0.2	3157
Room 305	55	-	0.0	3093
Room 306	-	70.9	0.2	2691
Room 307	-	71.4	0.0	2873
3rd Floor Hallway	-	70.6	0.1	2715

Note: ECS collected general temperature and relative humidity readings from throughout the building. Temperature and RH readings were not collected from all of the rooms entered.

3.1.1 March 24, 2025 - Findings

Relative humidity within the building was not observed to be elevated and the temperature readings collected throughout the building appeared to be within a typical range for this building type.

Elevated CO readings were not noted in the school during this site visit. The school was operating normally with faculty and students. Elevated CO₂ readings, greater than 1,000 ppm were noted throughout the school; however, readings greater than the OSHA PEL of 5,000 ppm were not noted.

During the site visit it was reported to ECS by a teacher that Classroom 305 smelled like cat urine upon their arrival to the room that morning. ECS personnel did not observe any urine-like odors in that classroom (or other classrooms) while on site.

Additionally, following our initial site visit, it was noted to ECS that an HVAC unit on the roof was not working while we were testing and the unit had to be re-set in order for it to function. Due to this issue ECS was requested to re-visit the site to collect CO and CO2 readings. ECS revisited the site on March 31, 2025 and the readings collected from that day are discussed below.

3.2 March 31, 2025 Readings: Temperature, Relative Humidity, Carbon Monoxide, and Carbon Dioxide

Location	Relative Humidity (%)	Temperature (°F)	Carbon Monoxide (ppm)	Carbon Dioxide (ppm)
Exterior:				
Exterior (Arrival)	29.6	87.0	0.6	384
Exterior (Departure)	30.1	79.9	0.0	396
First Floor:				
Cafeteria	51.5	74.4	0.1	1065
Kitchen	49.0	75.1	0.0	702
Band Room	-	73.8	0.0	1083
Main Office	-	72.9	0.0	1421
Conference Room	40.3	-	0.3	1259
Teachers Lounge	-	74.3	0.1	1159
Room 104	-	73.6	0.0	1051
Auditorium	50.2	73.9	0.1	768
Gymnasium	48.2	72.0	0.0	1421
Room 105	-	73.0	0.2	1948
Room 106	-	72.8	0.0	1137
Room 107	-	72.4	0.1	995
Room 108	57.2	-	0.1	1404
Room 109	43.6	71.9	0.0	782
Room 110	-	73.7	0.0	920
Room 111	55.4	71.9	0.0	621
Room 112	-	72.6	0.1	557
Room 113	-	72.8	0.0	900
Room 114	-	74.4	0.2	1037
Second Floor:				
Library	50.3	-	0.1	1087
Room 200A	-	73.5	0.0	1245
Room 201	-	73.1	0.0	929
Room 202	-	73.6	0.0	812
Room 203	52.7	-	0.0	1474
Room 204	46.5	74.1	0.0	1527
Video Room (Room 206)	-	73.6	0.0	812
Room 207	-	73.1	0.0	763
2nd Floor Hallway (Original Building)	51.4	73.6	0.0	812
Room 208	56	73.1	0.1	1781

Room 209	54.8	-	0.1	1757
Room 210	50.0	-	0.0	970
Room 211	55.7	-	0.1	1437
Room 212	52.1	-	0.0	690
Storage (ISS Room)	53.1	74.3	0.1	1033
Room 213	52.1	-	0.0	932
Room 214	-	73.8	0.0	820
2nd Floor Stairwell (next to the men's bathroom)	-	74.2	0.1	895
Third Floor:				
Room 301	40.7	-	0.2	1090
Room 302	41.8	-	0.4	1532
Room 303	41.6	-	0.0	2240
Room 304	45.9	-	0.0	2350
Room 305	44.6	72.0	0.0	1626
Room 306	-	70.8	0.0	1119
Room 307	-	73.7	0.0	1237
3rd Floor Stairwell (next to 301)	45	-	0.3	1300

Note: ECS collected general temperature and relative humidity readings from throughout the building. Temperature and RH readings were not collected from all of the rooms entered.

3.2.1 March 31, 2025 - Findings

Relative humidity within the building was not observed to be elevated and the temperature readings collected throughout the building appeared to be within a typical range for this building type.

Elevated CO readings were not noted in the school during this site visit. The school was operating normally with faculty and students. Elevated CO₂ readings, greater than 1,000 ppm, were noted throughout the school; however, readings greater than the OSHA PEL of 5,000 ppm were not noted. Overall the readings collected on this day were noted to have decreased from the readings collected on March 24, 2025.

During our site visit it was reported to ECS that a cat urine-like odor was noted in Rooms 306. ECS personnel started collecting readings on the third floor upon arrival; However, we did not observe any urine-like odors in classroom 306 or in any other classrooms in the school.

4.0 CONCLUSIONS

1. Based on interpretations from ASHRAE OSHA and NIOSH, poor outdoor air ventilation would most likely be attributable to or the likely cause of the elevated CO₂ readings reported in the school, including the indication that outdoor air ventilation rate is less than 15 cfm per person;
2. Although elevations in CO₂ cannot be linked to any direct health concern (at the levels reported), elevations in CO₂ concentrations can be used as an indicator of occupant odors (odorous bioeffluents) and by inference other building related pollutants including volatile organic compounds (VOCs) which would be more likely to occur in this building environment and which would be expected to negatively impact building indoor air quality. Provision of adequate fresh outside air is a key element in maintaining good indoor quality in the school. As good practice it is our understanding that the school is looking at ways to increase overall air circulation and increase outdoor air ventilation to the school.
3. It is unknown where the urine-like odor, that has been reported on numerous occasions, is originating from. However, as noted, we did not observe any urine-like odors in classroom 305 or 306, or in any other classrooms in the school during our survey.

5.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.