

December 13, 2021

Ms. Briana Tschaekofske
Buffalo-Hanover-Montrose Schools
214 – 1st Avenue NE
Buffalo, MN 55313



**RE: Hanover Elementary
2021 Short-Term Radon Testing Results
IEA Project #202110839**

Dear Ms. Tschaekofske:

IEA placed 75 Air Chek Pro Chek short-term radon test kits in the Hanover Elementary building for the purpose of evaluating radon levels.

The radon samples were placed and retrieved by the following Minnesota Department of Health (MDH) licensed Radon Measurement Professional:

Measurement Professional	License Number	Signature
Abe Dickinson	RMEA-00270	

Conditions of air intakes were good and the ventilation system was operating in good condition at the time of placement and retrieval.

INTRODUCTION

Radon is a colorless, odorless, tasteless, radioactive gas that occurs naturally in soil, rocks, and underground water supplies and in the ambient air. According to the U.S. Environmental Protection Agency (EPA) and other scientific organizations, naturally occurring radon gas has been associated with an increased risk of developing lung cancer. The chances of developing lung cancer from radon exposure are dependent on several factors, including individual susceptibility and, perhaps more importantly, the dose and duration of exposure. Radon testing in schools is highly recommended by the Minnesota Department of Health (MDH) and EPA.

IEA placed 75 Air Chek Pro Chek short-term radon test kits in frequently occupied areas in the Hanover Elementary building for the purpose of sampling for radon in accordance with the MDH's *Guidance for Radon Testing in Minnesota Schools (2018)* and ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB 2014 with 1/21 revisions). A total of 75 radon test kits were placed from November 16, 2021, to November 19, 2021, for a total short-term sampling period of three (3) days. One (1) test kit was missing at the time of pick-up.

The radon test kits were analyzed by AirChek, Inc., MDH license #RL-00003, located at 1936 Butler Bridge Road, Mills River, North Carolina 28759. The sampling and analysis methodologies are provided in Appendix A.

INSTITUTE FOR ENVIRONMENTAL ASSESSMENT, INC.
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9201 West Broadway, #600
Brooklyn Park, MN 55445
763-315-7900 / FAX 763-315-7920
800-233-9513

MANKATO
610 North Riverfront Drive
Mankato, MN 56001
507-345-8818 / FAX 507-345-5301
800-233-9513

ROCHESTER
210 Woodlake Drive SE
Rochester, MN 55904
507-281-6664 / FAX 507-281-6695
800-233-9513

BRAINERD
601 NW 5th Street, Ste. #4
Brainerd, MN 56401
218-454-0703 / FAX 218-454-0703
800-233-9513

MARSHALL
1420 East College Drive
Marshall, MN 56258
507-476-3599 / FAX 507-537-6985
800-233-9513

VIRGINIA
5525 Emerald Avenue
Mountain Iron, MN 55768
218-410-9521
800-233-9513

IEA followed ANSI/AARST MALB 2014 with 1/21 revisions for quality assurance measurements by including duplicate kits, control kits (blanks), and spiked kits.

Client communications and commitments were delivered to the client on the following dates:

- July 9, 2021 - Client Advisories and Authorizations
- November 16, 2021 - Facilitating Staff Commitments
- November 10 and November 16, 2021 - Occupant Notices

EVALUATION CRITERIA

The MDH and the EPA have established a recommended action level in frequently occupied areas of 4.0 picocuries per liter (pCi/L) for an annual average. Testing was conducted during school days when the building is significantly occupied. The HVAC system was set as it normally is during school days. Testing was conducted during the heating season when the average outdoor temperature is less than 65°F, as recommended by the MDH, when the ventilation system was operating normally, and windows and doors were closed. Consequently, sampling under these “closed” conditions is when the radon risk is most likely to occur.

MDH recommends follow-up testing for sampling results that are above the action level. Please refer to the following table for MDH guidelines:

RESULTS (pCi/L)	RECOMMENDED ACTION
LESS THAN 4	Re-test after changes to foundation or HVAC and every 5 years
GREATER THAN 4	Conduct CRM short-term testing during winter months
LESS THAN 4 (<u>DURING OCCUPANCY</u>) AFTER CRM TESTING	Repeat CRM testing if not conducted during winter or if conducted during abnormal ventilation. Otherwise consider re-testing after changes to foundation or HVAC and every 5 years
GREATER THAN 4 (<u>DURING OCCUPANCY</u>) AFTER CRM TESTING	Reduce radon in rooms to less than 4 through radon mitigation. Conduct CRM testing to verify radon reduction.

CRM: Continuous Radon Monitor

RESULTS & DISCUSSION

The laboratory report, which includes a map of the building with sampling locations marked, is provided in Appendix B. Following are summary results for the building.

Hanover Elementary

274 LaBeauxe Avenue NE
 Hanover MN 55341

A total of 75 test kits were placed at Hanover Elementary. One (1) kit in Room 106 was missing when the test kits were collected. The results for the remaining 74 test kits indicated that radon levels were below the action level of 4 pCi/L. See Table 1 for a summary of the results:

TABLE 1: Hanover Elementary RANGE OF RESULTS				
	0.0 – 1.9 pCi/L	2.0 – 2.9 pCi/L	3.0 – 3.9 pCi/L	≥ 4 pCi/L
Number of Tests	66	3	5	0
All below action level				

pCi/L: picocuries per liter

CONCLUSIONS & RECOMMENDATIONS

The radon levels in the sampled locations were below the EPA action level of 4 pCi/L. It is recommended to take action and address results of radon concentrations greater than half the action level (2-4 pCi/L).

Guidelines 1-4 should be considered for locations with radon concentrations between 2-4 pCi/L during this first round of testing. If radon levels continue to indicate concentrations between 2-4, guideline 5 should be considered:

1. If the initial test results are greater than 4 pCi/L, conduct Continuous Radon Monitoring short-term testing during the winter months.
2. If the average radon levels from the CRM are below 4 pCi/L **during occupancy**, then consider re-testing after changes to the building foundation or HVAC system and every 5 years.
3. If the average radon levels from the CRM are above 4 pCi/L **during occupancy**, then the building HVAC system settings (e.g., start time, night set-back temperature) should be adjusted to allow for improved airflow (and thereby reduce radon infiltration into the building). Follow-up CRM testing should be conducted to verify radon reduction. The operation of HVAC system should continue under adjusted settings to keep radon levels within an acceptable range. Documentation should be kept with HVAC operation instructions for building staff and the district staff to make sure that settings are maintained in the future.
4. If the follow-up average radon levels from the CRM are still above 4 pCi/L **during occupancy** (after the HVAC adjustments have been made), then the district should contact a professional radon mitigation contractor for assistance. IEA recommends using a contact with experience specific to schools.
5. Mitigation is not complete until retests provide evidence of the initial status of system effectiveness. A short-term radon measurement should be conducted no sooner than 24 hours after a mitigation system is operational and within 30 days after installation of the systems. The test should be repeated as soon as possible, or within one year under conditions that reasonably represent:
 - Average building operating conditions exist that are normally present during the greatest amount of significantly occupied time.
 - Building operating conditions exist that are most likely to characterize a radon hazard.

The EPA has established recommended guidelines for permissible radon concentrations in schools. The following are general recommendations for frequently occupied areas of schools:

- The building should be retested at least every 5 years and in conjunction with any sale of the building.
- Rooms that were not tested because they were not occupied, should be tested if they become occupied in the future.

In addition, retesting should be conducted when any of the following circumstances occur:

- A new addition is constructed, or a significant renovation occurs
- A ground contact area not previously tested is occupied
- Heating or cooling systems are significantly altered, resulting in changes to air pressures or distribution
- Ventilation is significantly altered by extensive weatherization, changes to mechanical systems, or comparable procedures

- Significant openings to soil occur due to:
 - Ground water or slab surface water control systems (e.g., sumps, perimeter drain tile, shower/tub retrofits, etc.)
 - Natural settlement causing major cracks to develop
 - Earthquakes, construction blasting, or formation of sink holes nearby
 - A mitigation system is altered, modified or repaired
- Rooms should be retested during the winter heating season (i.e., under “closed” conditions) which is typically “worst case” conditions.

Per Minnesota Statutes, section 123B.571, school districts are required to report radon test results at a school board meeting and report results to the MDH. IEA is able to assist with presenting results to the school board, and the MDH reporting. The MDH ‘School Radon Testing Form’ is located in Appendix E.

For more information regarding radon, see the EPA’s A Citizen’s Guide to Radon at <http://www.epa.gov/radon>. MDH can be contacted at health.indoorair@state.mn.us or 651-201-4601.

GENERAL COMMENTS

The analysis and opinions expressed in this report are based upon data obtained from radon sampling in the district and are representative of the locations and time period sampled. This report does not reflect variations in conditions that may occur across the site, property, or facility. Actual conditions may vary and may not become evident without further assessment.

The report is prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted environmental, health and safety practices. Other than as provided in the preceding sentence and in our Proposal #9803 dated July 2, 2021, regarding radon sampling services at the district locations, including the General Conditions attached thereto, no warranties are extended or made.

IEA appreciates the opportunity to submit this analysis to the district. Should you require additional radon testing or have any questions regarding radon or any other environmental, health, or safety-related concerns, please do not hesitate to contact our office.

Sincerely,

IEA, Inc.



Mary Ferrian, CSP
EHS Division Manager

MF/wb 121321

Enc.

Appendix A

Methodology and Quality Control Measurements

Sampling Methodology

IEA placed Air Chek, Inc. Pro Chek activated charcoal radon test kits designed specifically for the detection of gamma emissions caused by the decay of Radon-222 and its daughter products. The kit is made of a padded envelope which contains activated charcoal. The kit is placed during normal occupancy HVAC operations and sealed with vinyl tape after 72 to 96 hours of indoor exposure. Individual kits are uniquely identified with a number and corresponding bar code.

Upon receipt at the analytical laboratory, the kits are logged in using the unique numbers assigned to each kit. The kits are placed on a gamma detector to count the gamma emissions from the decay of radon adsorbed by the charcoal. A calibration factor determined in part by the exposure time and decay time is used to calculate the radon concentration. A correction factor is also applied for weight gain from any moisture absorbed by the charcoal during the sampling period.

Any unusual conditions are noted on the processing form and shown on the exposure report.

MDH and ANSI/AARST MALB 2014 Quality Control Measurements

IEA followed ANSI/AARST MALB 2014 with 1/21 revisions and MDH recommendations for quality assurance measurements to ensure the accuracy of test results. Quality assurance measurements include side-by-side test kits (duplicates) and unexposed control test kits (blanks).

Duplicates are pairs of test kits placed 4-8 inches apart for the same test period. Duplicates are stored, placed, retrieved, and shipped to the laboratory for analysis in the same manner as the other test kits so that the laboratory cannot distinguish them. Since duplicates are placed side-by-side, the measured values for radon should be the same. The average of all duplicates' relative percent difference (RPD) should not exceed 25%. If they do, an investigation to identify the cause may be warranted and could include repeating the measurements. Duplicate averages are listed in Table 1 below.

Location	Test 1 (pCi/L)	Test 2 (pCi/L)	Average (pCi/L)
108	< 0.3	< 0.3	< 0.3
20	0.5	< 0.3	0.4
401	< 0.3	< 0.3	< 0.3
405	< 0.3	< 0.3	< 0.3
Conference Room	3.3	3.0	3.2
Kitchen	< 0.3	< 0.3	< 0.3
Staff Room	0.7	0.8	0.8

Blanks can be used to determine whether the manufacturing, shipping, storage, or processing of the detector has "contaminated" your measurements. Blanks are opened and immediately re-sealed to keep room air from infiltrating the test kit. Blanks are labeled and shipped in the same manner as the exposed test kits so that the laboratory cannot distinguish them. Since blanks are not exposed to radon, their measurement value should be below the lower limit of detection. Field blanks are listed in the laboratory report as FStorage Room A, FStorage Room B, etc. Office blanks are listed in the laboratory report as OStorage Room A, OStorage Room B, etc. Lab-Transit Blanks are listed in Table 2 below.

Date	Device ID	Type of Blank	Description	Radon Concentration
11/19/2021	9567221	Field	FStorage Room A	< 0.3
11/19/2021	9567220	Field	FStorage Room B	< 0.3
11/19/2021	9567219	Field	FStorage Room C	< 0.3
11/19/2021	9567225	Office	OStorage Room A	< 0.3
11/19/2021	9567226	Office	OStorage Room B	< 0.3
11/19/2021	9567227	Office	OStorage Room C	< 0.3
11/19/2021	11021531	Lab-Transit	LTStorage Room A	< 0.3
11/19/2021	11021532	Lab-Transit	LTStorage Room B	< 0.3
11/19/2021	11021533	Lab-Transit	LTStorage Room C	< 0.3

Spikes are test kits that have been exposed in a chamber to a known concentration of radon. Using spiked measurements can help evaluate the accuracy of a laboratory analysis and/or how accurately test kits supplied by a laboratory measure radon. Spiked test kits are labeled and shipped in the same manner as the exposed test kits so that the laboratory cannot distinguish them. Spiked results completed for our laboratory are included in the following pages. Spiked test kits are listed in Table 3 below.

Table 3: Spiked Detectors			
Date	Device ID	Measured Value (pCi/L)	Reference Value (pCi/L)
11/11/2021	11019101	30.4	36.0
11/11/2021	11019102	32.6	36.0
11/11/2021	11019103	32.8	36.0
11/11/2021	11019104	31.2	36.0
11/11/2021	11019105	32.0	36.0
11/11/2021	11019106	31.2	36.0

Appendix B

Laboratory Report and Map

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Kit Number	Start Date	Start Time	End Date	End Time	Temp.	Facility	Building	Room	Project ID	Floor	Result
9567219	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	FSTORAGE ROOM C	202110839 AD	1	< 0.3
9567220	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	FSTORAGE ROOM B	202110839 AD	1	< 0.3
9567221	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	FSTORAGE ROOM A	202110839 AD	1	< 0.3
9567222	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	202	202110839 AD	1	< 0.3
9567225	2021-11-16	10:00 am	2021-11-19	10:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	OSTORAGE ROOM A	202110839 AD	1	< 0.3
9567226	2021-11-16	10:00 am	2021-11-19	10:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	OSTORAGE ROOM B	202110839 AD	1	< 0.3
9567227	2021-11-16	10:00 am	2021-11-19	10:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	OSTORAGE ROOM C	202110839 AD	1	< 0.3
9567230	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	307	202110839 AD	1	< 0.3
9567231	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	209	202110839 AD	1	< 0.3
9567234	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	204	202110839 AD	1	0.7
9567235	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	203	202110839 AD	1	0.6
9567236	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	301	202110839 AD	1	< 0.3
9567237	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	201A	202110839 AD	1	< 0.3
9567238	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	201	202110839 AD	1	< 0.3
9567240	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	302	202110839 AD	1	< 0.3
9567241	2021-11-16	8:00 am	2021-11-19	8:00 am	68	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	10	202110839 AD	1	< 0.3
9567242	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D405-1	202110839 AD	1	< 0.3
9567243	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	308	202110839 AD	1	< 0.3
9567244	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	303	202110839 AD	1	< 0.3
9567245	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	404	202110839 AD	1	< 0.3
9567246	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D401-1	202110839 AD	1	< 0.3
9567247	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	306	202110839 AD	1	< 0.3
9567248	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	305	202110839 AD	1	< 0.3
9567249	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	406	202110839 AD	1	< 0.3
9567250	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	403	202110839 AD	1	< 0.3
9567251	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D401-2	202110839 AD	1	< 0.3
9567252	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	304	202110839 AD	1	< 0.3
9567253	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	407	202110839 AD	1	< 0.3
9567254	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	310	202110839 AD	1	< 0.3
9567255	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D405-2	202110839 AD	1	< 0.3
9567256	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	402	202110839 AD	1	< 0.3
9567257	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	107	202110839 AD	1	< 0.3
9567258	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	309	202110839 AD	1	< 0.3
9567259	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	105	202110839 AD	1	< 0.3
9567260	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	101	202110839 AD	1	< 0.3

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Kit Number	Start Date	Start Time	End Date	End Time	Temp.	Facility	Building	Room	Project ID	Floor	Result
9567261	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	L 3	202110839 AD	1	< 0.3
9567262	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D108-1	202110839 AD	1	< 0.3
9567263	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D108-2	202110839 AD	1	< 0.3
9567265	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	L 4	202110839 AD	1	< 0.3
9567266	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	311 NE	202110839 AD	1	< 0.3
9567267	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	311 SE	202110839 AD	1	< 0.3
9567268	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DKITCHEN-2	202110839 AD	1	< 0.3
9567269	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	200	202110839 AD	1	0.6
9567270	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	GYM S	202110839 AD	1	< 0.3
9567271	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	KITCHEN STORAGE	202110839 AD	1	< 0.3
9567272	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	103	202110839 AD	1	< 0.3
9567273	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	102	202110839 AD	1	< 0.3
9567274	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	104	202110839 AD	1	< 0.3
9567275	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	PE OFFICE	202110839 AD	1	< 0.3
9567276	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	GYM W	202110839 AD	1	0.8
9567277	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DKITCHEN-1	202110839 AD	1	< 0.3
9567278	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	58	202110839 AD	1	< 0.3
9567279	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	MUSIC	202110839 AD	1	< 0.3
9567280	2021-11-16	9:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	55	202110839 AD	1	0.5
9567281	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	59 NW	202110839 AD	1	< 0.3
9567282	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D20-1	202110839 AD	1	0.5
9567283	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	18	202110839 AD	1	0.8
9567284	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DSTAFF ROOM-1	202110839 AD	1	0.7
9567285	2021-11-16	8:00 am	2021-11-19	8:00 am	68	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	12	202110839 AD	1	< 0.3
9567286	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	HEALTH OFFICE	202110839 AD	1	3.1
9567287	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DSTAFF ROOM-2	202110839 AD	1	0.8
9567288	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	21	202110839 AD	1	0.9
9567289	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	MAIN OFFICE	202110839 AD	1	2.9
9567290	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DCONFERENCE ROOM-2	202110839 AD	1	3.0
9567291	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	NELISSA S DESK	202110839 AD	1	3.1
9567292	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	COPY ROOM	202110839 AD	1	2.8
9567293	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	OFFICE NEXT TO PRINCIPAL	202110839 AD	1	2.9
9567294	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	DCONFERENCE ROOM-1	202110839 AD	1	3.3
9567295	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	59 SE	202110839 AD	1	< 0.3
9567296	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	D20-2	202110839 AD	1	< 0.3

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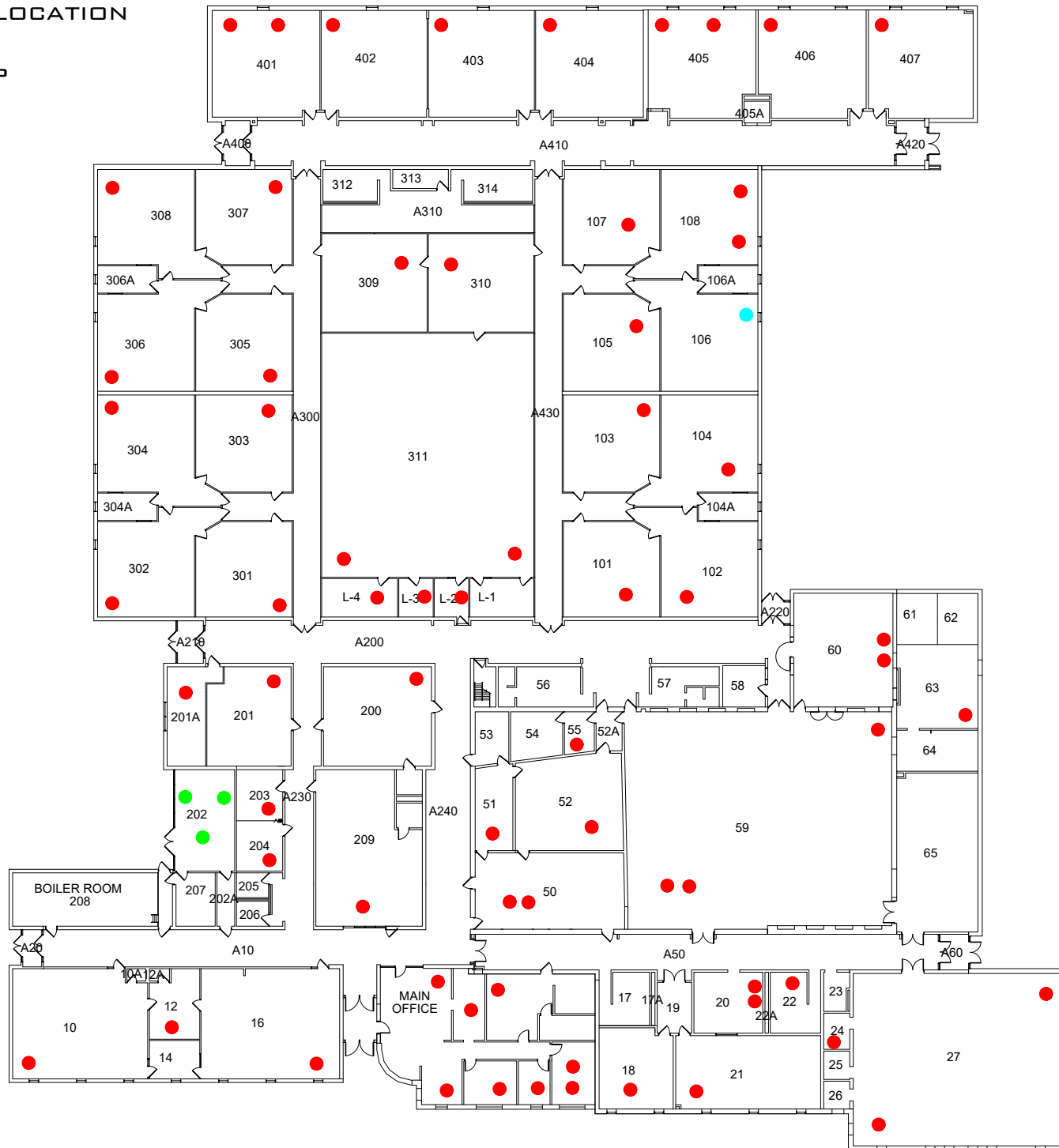
Kit Number	Start Date	Start Time	End Date	End Time	Temp.	Facility	Building	Room	Project ID	Floor	Result
9567297	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	L 2	202110839 AD	1	< 0.3
9567298	2021-11-16	8:00 am	2021-11-19	8:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	59 SW	202110839 AD	1	< 0.3
9567299	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	16	202110839 AD	1	0.6
9567300	2021-11-16	8:00 am	2021-11-19	8:00 am	69	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	PRINCIPAL OFFICE	202110839 AD	1	3.5
9567624	2021-11-16	9:00 am	2021-11-19	9:00 am	70	BUFFALO-HANOVER-MONTROSE SCHOOLS	HANOVER ELEMENTARY	106	202110839 AD	1	????

Air Chek 1936 Butler Bridge Rd, Mills River, NC 28759-3892 Phone: (828) 684-0893 Fax: (828) 684-8498

● RADON DETECTOR LOCATION

● FIELD BLANK

● MISSING AT PICK-UP



Appendix C

Signed Non-Interference Agreement

NOTICE OF INSPECTION FOR ALL FACILITATING STAFF

A radon test is scheduled for:

Building: Hanover Elementary

Test Start Date: 11-16-2021

Test End Date: 11-19-2021

Please help to maintain the required test conditions throughout the building

1. All windows and exterior doors must be kept closed (aside from momentary entry or exit) for 12 hours before and during the test.
2. Heating and cooling systems must be set to normal occupied operating temperatures.
3. Test devices are not to be disturbed.

Further guidance on required building conditions are located on the next page.

Test devices are not dangerous in anyway. The type of devices used for this testing will include:

Short-term test kits. It is important that these devices are fully open and not covered. They will be analyzed by a laboratory.

Continuous radon monitors. These are electronic devices that record hourly radon readings.

Long-term test kits. It is important that these devices are not covered. They will be analyzed by a laboratory.

Declaration of Observed Compliance

Failure to reasonably maintain test conditions can lead to unnecessary expense, disruptions and unreliable data.

Disturbing test devices can also cause unreliable or invalid test results.

- Please report in a timely manner if required test conditions are not maintained.
- Please sign and return this form once the test is complete.

To the best of my knowledge, the required conditions were maintained during the test.

Yes

Name:

Richard Thompson

Signature:



Licensed Measurement Professional:

Abe Dickinson RMEA-00270

More Detailed Guidance for Staff

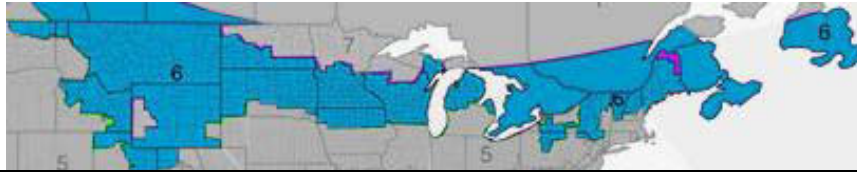
Required Closed-Building Conditions	
Windows	Keep Closed, Seal broken windows closed
External doors (except for normal entry or exit)	Keep Closed
Heating & Cooling Systems	Set to normal operating conditions
Bathroom fans	Operate normally
Fireplaces (including gas)	Do not operate
Auxiliary or temporary systems that bring air into the building	Do not operate (unless an integral part of HVAC or supplies make-up air for combustion appliances)
Exhaust systems (ex. from shops, laundries, kitchens)	Avoid excessive operation
Interior doors, Stairwells, Fire Doors	Operate Normally
Garage doors	Operate normally
Ceiling Fans, Portable Fans	Do not blow directly on the test device
Window AC Units	Operate in recirculation mode only
Window Fans	Do not operate. Seal shut or remove.
Humidifiers, Dehumidifiers, Portable Air Cleaners	Operate Normally
Central Vacuum Cleaner Systems	Operate Normally
Passive crawl space vents	Operate normally
Crawlspace exhaust systems for humidity control	Operate normally
Passive Vents for Combustion Make-Up Air	Leave Open
Combustion Appliance Vents	Operate Normally
Passive Solar Systems	Operate Normally
Attic Vent Fans	Operate Normally
Evaporative Cooling Systems	Do not operate
Required for Test Locations Within a Room	
Place detectors within the general breathing zone Locate detectors no less than:	3 feet from exterior doors, windows or other openings to the outdoors
	20 inches above the floor
	4 inches from other test devices and objects
	1 foot below the ceiling
Place detectors where they are not easily disturbed:	Select a place in an occupied area where the detectors are unlikely to be moved
Place detectors where they are not influenced by other factors:	Do not place devices in closets, crawlspaces, cupboards, sumps or nooks within building foundations
	Do not place devices in area with high air movement (ex. mechanical areas, furnace closets)
	Do not place devices in areas of high humidity (ex. kitchens, bathrooms, laundry rooms)
	Do not place devices near drafts from HVAC systems or fans
	Do not place test devices near heat sources (ex. appliances, radiators, fireplaces, direct sunlight)
	Do not place detectors on devices that produce radiation (ex. natural stone counters, pool tables, rock collections)

Appendix D

Average Building Operating Conditions Comparison

Southern MN

Climate Zone 6 (includes Southern MN)



		Averages			During the Test
		24 Hour	Daytime	Daytime 9-Month	Prevailing During the Test
Operating Condition	Outdoor Temperature	45 °F	50 °F	N/A	34.5 °F
	Heating Conditions	75%	66%	88%	70 °F
	Cooling Conditions	-	16%	11%	NA
	Mixed Conditions	25%	16%	-	NA
Normal Operating Condition		<ul style="list-style-type: none"> • Heating conditions • No variance in outdoor air ventilation 			<ul style="list-style-type: none"> • Heating conditions • No variance in outdoor air ventilation
Condition less likely to inhibit characterization of a radon hazard		<ul style="list-style-type: none"> • Heating and air distribution systems active 			<ul style="list-style-type: none"> • Heating and air distribution systems active

Appendix E

MDH Reporting Form

School Radon Testing Reporting Form

According to Minnesota Statute 123B.571 subd. 3, a school district that has tested its school buildings for the presence of radon shall report the results of its tests to the Department of Health. Please use this form to submit information about the most recent round or cycle of testing conducted for each building.

Instructions

1. Complete one form for each building tested. In this case, a building is defined as an occupied facility with a unique address. This includes administrative buildings.
2. Include this form, raw data (e.g. laboratory report) and a building map.
3. Submit this form when all work is completed for a round of testing. This includes reporting to the school board, and follow-up testing and post-mitigation testing, if applicable.
4. Email information to health.indoorair@state.mn.us.

Contact Information

Name:	
Mailing Address:	
Phone:	Email:

Initial Radon Testing Information

School Building Name:	
School District & District Number:	
Building Address:	
Test Kit Manufacturer:	Device Name:
Date of Kit Retrieval (DD/MM/YY):	Length of Test (days):
How many rooms were tested?	
Does the test period include weekends? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Does the test period include school breaks or holidays? <input type="checkbox"/> Yes <input type="checkbox"/> No	

SCHOOL RADON TESTING REPORTING FORM

Were all frequently-occupied ground contact rooms tested? ¹ <input type="checkbox"/> Yes <input type="checkbox"/> No If no, did you attempt to test all frequently occupied ground contact rooms, meaning test kits were placed in all these rooms? <input type="checkbox"/> Yes <input type="checkbox"/> No
How many rooms had results ≥ 4 pCi/L?:
Were the results reported at a school board meeting? <input type="checkbox"/> Yes <input type="checkbox"/> No

Follow-up Testing, Mitigation, & Post-Mitigation Testing

If one or more rooms tested ≥ 4 pCi/L, please answer the questions below:

How many rooms had follow-up testing?:		
Number of rooms with follow-up results	≥ 4 pCi/L:	< 4 pCi/L:
Of the rooms that had test results ≥ 4 pCi/L, how many rooms were:		
mitigated by HVAC balancing or operational changes? :		
mitigated by installation of active soil depressurization?:		
addressed through other corrective measures? ² :		
What was the cost of the installation and/or HVAC service work, to mitigate radon? \$		
What is the known or anticipated annual operating cost of mitigation (estimate)? \$		
After radon mitigation, how many rooms were retested?:		
Post mitigation results (# of rooms)	≥ 4 pCi/L:	< 4 pCi/L:

¹ This includes classrooms, offices, break rooms, laboratories, cafeterias, libraries, auditoriums, gymnasiums, etc. It includes rooms on grade and rooms above unoccupied spaces that are in contact with the ground, such as rooms above storage rooms, crawl spaces, tunnels, and boiler rooms. If only a sample or portion of rooms were tested, then respond with 'no'.

² 'Other corrective measures' could include moving staff out of a room and making a room unoccupied or trying to seal radon entry points.