MINNESOTA DEPARTMENT OF HEALTH'S RADON RESISTANT NEW CONSTRUCTION EFFECTIVENESS STUDY

Joshua J. Kerber, MS
Environmental Research Scientist
Minnesota Department of Health, Division of Environmental Health, Indoor Air Unit
joshua.kerber@state.mn.us

Joshua Miller, MS, MBA
Information Technology Specialist
Office of MN.IT Services
Formerly with MDH Indoor Air Unit

Abstract

This study assessed the effectiveness of Radon Resistant New Construction (RRNC) practices as installed by licensed residential contractors in Minnesota homes. Since June 2009 all new Minnesota homes have been required by either the state energy or building code to have passive RRNC features installed to reduce indoor radon levels. These passive features have been found to have varying levels of effectiveness, largely dependent on the installation practices. The primary goals of this study were to evaluate: 1. The radon concentrations in an estimated 800 Minnesota homes with 'as-built' passive RRNC features; 2. The change in radon concentrations when 100 of these passive RRNC homes are converted to active RRNC; and 3. The radon concentrations in 100 'as-built' active RRNC homes with features consistent with the MDH Gold Standard. Results from this study showed a decrease in the number of new homes built with elevated radon concentrations and a very successful radon reduction rate for those homes that were activated.

Introduction

According to the World Health Organization, exposure to radon gas has been attributed to an increase in lung cancer in humans (Zeeb & Shannoun, 2009). As a public health entity, the Minnesota Department of Health (MDH) has an established outreach and education program regarding radon in Minnesota homes. A primary prevention strategy for reducing the public's exposure to radon gas is to build new homes with radon resistant construction features, also known as radon resistant new construction (RRNC). These construction features include an air-permeable layer of gravel below the poured concrete floor, a soil-gas retarder, a radon vent stack running from the sub-slab zone up through the roof, and slab sealing.

RRNC features have been shown to reduce indoor radon concentrations in homes by a varying degree. In its 'Building Radon Out' publication, the US Environmental Protection Agency (USEPA) reports passive RRNC reduces radon by an average of about 50%, while an active system provides even further reduction (USEPA, 2001). In its 'Consumer's Guide to Radon Reduction', the USEPA reports passive sub-slab suction typically reduces radon by 30-70%, but adds it is not as effective as sub-slab suction, which typically reduces radon by 50-99% (USEPA, 2013).

To evaluate whether these reduction figures are accurate for Minnesota, MDH reviewed studies that measured radon reductions in passive RRNC. Overall, the studies indicated USEPA's reduction figures are slightly high for passive RRNC. A more accurate reduction range appears to be about 20 – 60%. Reviewed studies all show radon reduction in this range (Arvela, 2011; Burkhart, 1991; Dewey, 1994; Groves-Kirkby, 2006; LaFollette, 2001; Scivyer, 2001). There is less research on active RRNC with reductions in active systems ranging from 70-93% (Burkhart; Dewey; Groves-Kirkby). Some of these studies may not have been considered in the USEPA analysis, especially Arvela et al., the largest RRNC study conducted to date. The Arvela et al. study is most comparable to Minnesota, due to RRNC building requirements and climate similarities, and showed a radon reduction of between 21-57%.

From this literature review, MDH concluded that passive RRNC can achieve, on average, a 40% reduction while active RRNC can achieve at least an 80% reduction. Considering the average radon concentration in Minnesota homes is 4.2 pCi/L, this suggests passive RRNC homes should achieve a reduction to about 2.5 pCi/L, while active RRNC homes should achieve a reduction to about 0.8 pCi/L.

The 0.8 pCi/L outcome in homes with active RRNC is given further credibility by two data sets. First, Steck (2008, 2012) found an average radon level of 0.8 pCi/L in 123 homes that had been mitigated with active soil depressurization (ASD). Second, unpublished MDH data collected from 84 Minnesota radon mitigation contractors between 2007 to 2014 has shown an average concentration of 1.1 pCi/L (median=0.8 pCi/L) was achieved after mitigating 10,896 existing homes that did not have RRNC features.

Angell's (2012) meta-analysis of RRNC studies concluded that, when installed to recognized standards, RRNC may reduce indoor radon levels by about fifty percent. Additionally, he called for further research to address the effectiveness of RRNC in a random survey of homes. This MDH research project begins to address this research need by assessing the effectiveness of RRNC practices, as installed by licensed residential contractors in Minnesota. Since June 2009 all new Minnesota homes have been required by the state energy or building code to have passive RRNC features installed to reduce the radon levels (MN Revisor, 2014). These passive features have been found to have varying levels of effectiveness, largely dependent on the installation practices.

An active RRNC home has better air flow due to clean aggregate under the entire slab, compared to a properly installed ASD system, which is connected to a suction pit or drain tile system. Hence, it is reasonable to infer an active RRNC should yield a lower reduction than an ASD home to below 0.8 pCi/L, and possibly as low as 0.3 pCi/L. To study this hypothesis, MDH measured radon levels in new homes constructed with RRNC features in Minnesota. Both passive and active RRNC homes were tested and radon levels were compared.

The primary goals of this study were to evaluate: the radon concentrations in an estimated 1,000 Minnesota homes with 'as-built' passive RRNC features as compared to MDH data in existing homes not built with RRNC features; the change in radon concentrations when 100 of these

passive RRNC homes were converted to active RRNC; and the radon concentrations in 100 'as-built' active RRNC homes with features consistent with the MDH Gold Standard.

Methodology

The MDH study evaluated two methods for the protection against exposure to radon in new construction. The first, and most common method, involves building homes with passive RRNC features, then testing the home for radon and finally activating any passive systems if the radon is elevated. The second method involves installing a fan to activate the RRNC system in all new homes from the beginning of construction and eliminating the need for any pre-activation radon testing.

Participant Recruitment

Radon concentrations were assessed in 13 of the 14 Minnesota counties that had the largest number of new homes built from January 2010 to September 2012. Due to the difficulties of obtaining the property records from every MN county, including time constraints and costs, as well as the variability of building code enforcement in greater Minnesota, MDH decided to focus on 13 of the largest counties with the most building permits reported. This information was gathered from the US Census Bureau's Construction Permits website (US Census Bureau, 2015). Only the homes with a permit issued after June 1, 2009 are required by Minnesota law to have a passive RRNC system. Because some builders take longer than seven months to build a home or have model homes built prior to June 1, 2009, the beginning date of January 1, 2010 was selected.

Each county property tax records department shown in Table (1) was contacted and electronic property tax records were obtained for all new homes built from January 1, 2010 to September 30, 2012. Because of the difficulty in obtaining tax records for St. Louis County, they were eliminated from the study.

County Name	**Number of Letters Sent**	**USEPA Zone Designation**
Anoka	1,438	Zone 2
Carver	1,002	Zone 1
Chisago	39	Zone 2
Dakota	832	Zone 1
Hennepin	1,851	Zone 1
Isanti	47	Zone 2
Olmsted	548	Zone 1
Ramsey	224	Zone 1
Scott	846	Zone 1
Sherburne	148	Zone 1
Stearns	305	Zone 1
Washington	1,111	Zone 1
Wright	171	Zone 1
Totals	**8,562**	

Table (1): Participating counties, the number of homeowner recruitment letters sent by MDH to new home owners and the USEPA's Zone designation.

The homeowner recruitment letters and surveys were sent to 8,562 new home owners in November 2012. Most of the letters were sent around the Twin Cities metropolitan area as this was where the majority of the newly built homes are located. However, some homeowners outside the metro area also received letters. Figure (1) shows the locations of the homes receiving the MDH letters. An example letter and survey is shown in the Appendix. These letters introduced the homeowner to the difference between passive and active RRNC features, offered the opportunity to receive a free radon test kit, and described the potential for some homes to receive a free radon mitigation fan.

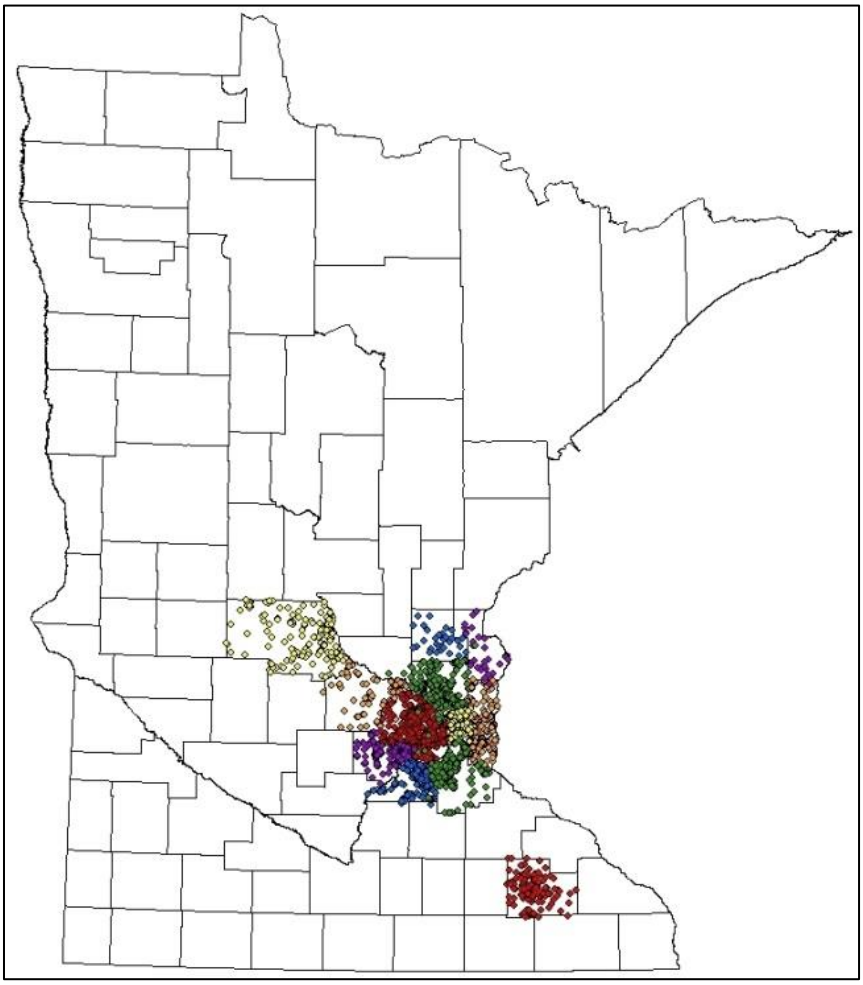

Figure (1): Locations of homes receiving the homeowner recruitment letters.

Participating property owners were invited to complete the enclosed survey, sign the informed consent form, and return it to MDH to receive their free radon test kit. Testing was to be completed as soon as possible, preferably before the end of the heating season (November through March). The majority of the pre-activation test kits (94%) used were placed during the heating season.

Approximately 500 of the recruitment letters were returned to MDH marked as "return to sender," which meant about 8,000 letters received by new home owners. MDH received 1,144 completed surveys (response rate of 14.3%) with 1,125 homeowners requesting a radon test kit to participate in the study.

Passive RRNC Activation and Testing

Radon fans, at no cost to the owner, were offered to 100 homes with elevated radon levels that met the basic eligibility criteria. In order to be eligible for a free fan, participants needed to return a completed survey, have a passive system in their home, indicate they will hire a contractor to install the fan, or install it themselves, and sign the informed consent section of the survey. These fans were allocated to each county based on the ratio of permits reported in the county versus the total number of permits in the study area. For example, Hennepin County reported having 1,851 new homes built out of a total of 8,562 homes in the study area. Because Hennepin County had 21.6% of the permits reported, 22 fans were originally allocated for the county.

The first homes to report elevated radon results were offered fans until the county allotment had been distributed. A radon fan, U-tube pressure gauge, and a follow-up test kit were sent as a package to these first homeowners. The homeowners agreed to either hire a professional to install the mitigation fan or to install it themselves, and then conduct a follow-up radon test with the kit provided. The radon mitigation fans used were selected based on Minnesota Building Code requirements for moving 50 cubic feet of air per minute (CFM) at 1/2 inch of water column. In most cases, fan model RP140 from RadonAway[1] was used. If post-activation radon testing continued to show elevated radon levels, a consultation with the homeowner was conducted. Consultations may have led to a site visit, a fan swap-out, or both. If the fan needed to be swapped for a larger model, an RP145 from RadonAway was used.

Testing Homes Built with Active RRNC

Another approach to reducing radon in homes is to install an active RRNC system from the very beginning of home construction. This approach includes all of the RRNC features as discussed earlier, but also includes a radon mitigation fan installed in the attic on the passive vent riser. Some home builders have decided to bypass the initial radon testing process and simply install a small, low-powered radon fan without conducting any initial radon testing. The radon fans used for this approach were the same fans used to activate passive RRNC. The recruitment of these houses was handled the same way as the passive only houses discussed above, and the homes were identified by homeowner answers on their completed survey.

Test Kit Quality Assurance and Quality Control (QA/QC)

The radon test kits used were provided by Air Chek.[2] Each shipment of 100 test kits sent from Air Chek to MDH was put through the MDH Quality Assurance and Quality Control (QA/QC)

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(1) RadonAway®, Ward Hill, MA. http://www.radonaway.com/
(2) Air Chek, Inc., Fletcher, NC. NRPP Device Code 8200. http://www.radon.com/

system. Five test kits from each box of 100 kits were sent to the Bowser-Morner[3] reference chamber to be spiked. Spikes were sent to the chamber in batches of 100 and conducted monthly through the heating season. Each batch of spikes showed very good accuracy with none of the spiked samples falling out of the control limits agreed upon by MDH and Air Chek.

In addition, one test kit from each box of 100 was held by MDH and submitted to Air Chek as a blank to identify any potential compromised test kits due to increased moisture in the charcoal or radon leaking through the packaging. All of the blanks submitted showed radon lower than Air Chek's lowest limit of detection and moisture levels below 4%, the threshold agreed upon between MDH and Air Chek to determine if the kits were taking on too much moisture. Finally, MDH monitored the radon and humidity levels in the test kit storage location to ensure quality was not compromised.

Discussion of Results

Based on the completed surveys, participants reported newly constructed homes built by 261 different builders in 132 different cities. The number of participants in a given city ranged from 1 to 97, and the number of homes built by a specific builder ranged from 1 to 90. Approximately 18% of respondents did not fill out the builder's information on the survey. In addition, the survey did not ask what type of home the respondents lived in, so it is unknown whether the responses came from single family homes or two-, three-, or four-unit townhomes. The foundation type was also not reported.

Table (2) shows the responses to the questions asked on the MDH Radon Study Survey & Informed Consent form. A total of 1,144 surveys were returned with the vast majority of respondents requesting a radon test kit.

Question	Yes	No	Don't Know	Left Blank	Total
I am the current homeowner	1,132	2	--	10	1,144
There is a passive vent pipe installed	737	35	362	10	1,144
There is a fan installed on the radon system	50	599	485	10	1,144
Requested MDH test kit to test the home	1,125	5	4	10	1,144
Requested to be eligible for a free radon fan	1,014	45	74	11	1,144

Table (2): Summary of answers to "MDH Radon Study Survey & Informed Consent" form.

MDH distributed 1,125 radon kits to study participants and 894 homeowners tested their homes (79.5% usage rate) with 842 valid test results returned (74.8% valid test rate): 805 passive homes and 37 active homes. The remaining 231 homeowners either did not use their test kit, or it was not received by the lab for analysis. Five of the returned radon results were removed from the study because the homes were either built prior to the inception of the RRNC code or were outside the study area. A total of 47 test kits returned an invalid result due to missing information, testing for too long of a time period, or delay in shipping the kit back to the lab.

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(3) Bowser-Morner Radon Reference Chamber, Dayton, OH. http://www.bowser-morner.com/

Table (3) summarizes the radon results of passive systems tested in each of the participating counties along with the number of homes with elevated radon and the median radon results for each county. The right side of Table (3) is a summary of all radon tests reported in existing housing to MDH by radon labs through 2010. According to MDH, an estimated 40% of existing homes in Minnesota will have a radon level at or above 4.0 pCi/L (MDH Website, 2015). The dataset shows 37% of existing radon tests conducted in the 13 participating counties had elevated radon levels, with a median result of 3.1 pCi/L. However, among the 805 passive systems tested, only 164 homes (or 20%) had elevated radon levels, with a median result of 1.9 pCi/L. The maximum result found in all passive homes was 38.2 pCi/L.

Passive Homes Tested (2012-2013)					**Existing Tests in MDH Database (1988-2010)**			
County	**Homes tested**	**≥4 pCi/L**	**% ≥ 4pCi/L**	**Median (pCi/L)**	**Total Tests**	**≥4 pCi/L**	**% ≥ 4pCi/L**	**Median (pCi/L)**
Anoka	87	4	5%	1.10	5,827	1,199	21%	1.90
Carver	108	20	19%	2.05	7,031	2,605	37%	3.10
Chisago	7	0	0%	1.90	1,467	402	27%	2.30
Dakota	84	21	25%	1.95	13,190	4,896	37%	3.10
Hennepin	192	34	18%	2.00	49,875	19,000	38%	3.20
Isanti	2	0	0%	1.35	630	101	16%	1.80
Olmsted	62	31	50%	3.80	7,291	3,707	51%	4.00
Ramsey	32	9	28%	1.80	17,641	5,189	29%	2.60
Scott	70	18	26%	2.25	2,150	1,037	48%	3.80
Sherburne	6	3	50%	4.05	4,487	1,985	44%	3.50
Stearns	30	9	30%	2.65	7,970	3,590	45%	3.50
Washington	112	12	11%	1.30	9,699	3,297	34%	2.78
Wright	13	3	23%	2.30	6,469	2,944	46%	3.60
TOTALS	**805**	**164**	**20%**	**1.90**	**133,727**	**49,952**	**37%**	**3.10**

Table (3): Radon test results from passive homes tested and county test results in the existing MDH database.

It is difficult to compare passive results with the existing tests in the MDH database due to the very small sample size in some counties (Chisago, Isanti, Sherburne and Wright). However, the counties with more passive system results do show a decrease in the median radon results. Each of the counties with at least 30 passive systems tested showed lower median radon concentrations as compared to the existing county medians in the MDH database, one by more than 50%.

Homes with passive systems in the Twin Cities metropolitan area counties (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington) had consistently lower median radon levels, by 39%, compared to tests results of the general housing stock (1988-2010). In contrast, Olmsted and Stearns counties, which are located outside the metro area, showed smaller average differences in median radon levels of 5% and 24%, respectively. It is not clear why the radon difference percentages in these counties were lower than the metro area counties.

Once the passive systems were activated, a sharp reduction in the radon levels was observed. A total of 71 homes returned a valid test result after system activation. Table (4) shows the county activation results along with the median and average reduction. Overall, the median radon reduction for homes with an active system was 94.2%, the average radon reduction was 89.0%, and the highest radon reduction was 98.9%. The median post-activation concentration was 0.3 pCi/L. The maximum result found in all homes with active systems was 4.8 pCi/L.

In 67 of 71 homes where a system was activated, the radon levels were reduced to below 4.0 pCi/L with the smaller radon fan (RP140, RadonAway). However, there were four cases where system activation alone was not successful in reducing radon levels below 4.0 pCi/L. Two of these homes were shipped a larger fan, but no further radon testing has been reported and MDH follow-up with the homeowner has been unsuccessful to date. In the other two homes, radon levels were reduced after consulting with the homeowner and replacing the existing fan with a slightly larger model (RP145, RadonAway). One of these homes also lacked all of the construction details required by the building code: specifically, there was no slab sealing or gravel layer under the slab. The other home had a very large basement footprint of approximately 8,000 square feet. When the small fan was switched for the larger fan, the radon levels were reduced below 4.0 pCi/L.

Passive Homes Activated					
County	**Homes Activated**	**Median Passive Result (pCi/L)**	**Median Active Result (pCi/L)**	**Median Reduction**	**Average Reduction**
Anoka	3	4.7	0.3	92.9%	92.2%
Carver	8	5	0.3	93.4%	86.0%
Chisago	0	--	--	--	--
Dakota	10	6.75	0.4	93.9%	87.9%
Hennepin	18	6.45	0.3	94.7%	86.7%
Isanti	0	--	--	--	--
Olmsted	8	14.15	0.65	94.0%	87.9%
Ramsey	3	5.9	0.3	94.9%	95.9%
Scott	9	6.8	0.3	95.0%	91.7%
Sherburne	2	11.8	0.3	97.4%	97.4%
Stearns	3	5.4	0.7	80.6%	83.4%
Washington	6	8.9	0.3	94.6%	93.6%
Wright	1	4.2	0.3	92.9%	92.9%
TOTALS	71	6.60	0.3	94.2%	89.0%

Table (4): Number of activated systems per county and the median and average radon reduction after system activation.

A total of 126 homes were offered a free radon mitigation fan. Only 105 of these homes were shipped a fan package. To date, 71 of these homes have reported installing the radon fan and having a valid post-activation radon test result. Follow-up with the remaining home owners has

been unsuccessful, so it is not known if the radon fans were received or installed. Radon test kits shipped with these fans were never returned for the lab for analysis. Although specific data was not collected, some homeowners did report to MDH that they opted to purchase and install their own radon fan.

MDH has created a voluntary designation that includes the installation of active RRNC features, branded the Gold Standard for Radon Resistant New Construction (MDH, 2015). In order to become a Gold Standard builder, a building contractor needs to commit to offering an active radon system as part of the completed home. To date, MDH has recruited 115 builders that either offer the active system as an additional option or include it in the final building construction.

The second part of the project looked at the radon-reduction performance of homes built with active RRNC as part of the MDH Gold Standard RRNC Program. Table (5) shows the summary of these 'as-built' active RRNC homes, 37 homes tested as part of this study. Because the dataset is small compared to the passive homes shown before, it is difficult to make any comparisons from county to county. However, it is important to note active RRNC homes showed low radon levels in nearly every home tested.

'As-built' Active RRNC Homes			
County	**Homes Built**	**Median Result (pCi/L)**	**Average Result (pCi/L)**
Anoka	0	--	--
Carver	6	1.7	2.0
Chisago	0	--	--
Dakota	3	0.3	0.7
Hennepin	13	0.7	0.8
Isanti	0	--	--
Olmsted	5	0.3	0.6
Ramsey	2	0.6	0.6
Scott	4	0.8	0.9
Sherburne	0	--	--
Stearns	0	--	--
Washington	4	1.1	1.4
Wright	0	--	--
TOTALS	37	0.6	1.0

Table (5): Number of 'as-built' active RRNC homes tested and the median and average radon levels.

Of the 37 'as-built' active RRNC homes tested, the median radon test result was 0.6 pCi/L and the maximum radon level measured was 4.3 pCi/L. Only one 'as-built' active RRNC homes had radon levels above 4 pCi/L. Because MDH did not provide any on-site system inspections, it is

not known why the home had elevated levels of radon. Follow-up with the homeowner has also been unsuccessful to date.

Conclusion

The MDH RRNC study evaluated the likelihood of: homeowners to test for radon when educated about the passive radon system installed in their home; their likelihood of activating the system if necessary, and completing the post-activation radon test. In addition, we assessed the effectiveness of builder-installed passive RRNC systems in different parts of the state, by different builders and where code competency and enforcement may vary. Finally, we evaluated the effectiveness of converting passive RRNC systems to active systems.

Approximately 8,000 homeowner recruitment letters were received by owners of new Minnesota homes. The response rate to these letters was 14.3% and the test kit usage and valid test result rates from the participants was over 70%. More than 800 radon tests results from 'as-built' passive RRNC homes in 13 Minnesota counties showed a reduction in the median radon levels of 39% as compared to the existing tests in the MDH database. Individual county median radon reductions where a minimum of 30 systems were tested varied between 5%-53%. These reductions are consistent with previously cited literature.

Limitations of this study

Due to many confounding factors, only the most populated areas of state were included in this study. Results may not be representative of the entire state for several reasons. For instance, there are sparsely populated areas of the state that may have little or no building code enforcement or only select codes are enforced. In addition, other changes have been made to the Minnesota building and energy codes over the past 15 years, including air sealing and additional ventilation requirements. This study did not look specifically at these code changes.

Additionally, some of the participating homeowners may not have a thorough understanding of the construction practices and materials used in their home. Many new homes are built by contractors in the hope of selling the home, and therefore the buyer of the home was not involved in the construction process. In addition, we cannot guarantee the answers given on the survey were completely accurate as MDH did not visit most of these 'as-built' houses to inspect the RRNC features that may have been included. MDH also did not visit any of the houses during the construction process to inspect the RRNC features nor was house or foundation type reported. Due to not inspecting the RRNC systems, it is not known why some passive systems may have failed.

All of the radon testing was short-term (3-7 days) and conducted by the occupant of the home. We assume the tests were conducted correctly if a valid test result was reported by the laboratory. The assumption is homeowners read and followed the instructions provided by the test device manufacturer. However, because a trained person did not place the test devices, it is impossible to know if the test location selected was valid or if closed-house conditions were maintained. The latter is part of the reason for testing during the heating season in Minnesota.

A further limitation of this study is the lack of successful follow-up with participants. Many attempts were made to contact participants who had invalid test results due to incomplete test kit data both for the initial passive testing round and also the passive to activation round. Some of the homeowners notified the laboratory of the correct information and a valid test result was reported. However, follow-up with homeowners who were offered a radon mitigation fan versus those who accepted the offer was lower than MDH anticipated. Most follow-up letters and emails from MDH went unanswered, and therefore no further action occurred. Some of these homeowners may have moved, became disinterested or disheartened by either not being offered a radon fan originally or not successfully filling out test kit information. It is not known what percentage of non-respondents installed their own radon fans and chose to not participate further, or which homeowners did not receive follow-up notices from MDH due to email or postal issues.

Finally, the passive systems tested were never capped or otherwise made non-operational. This makes knowing the radon value in homes without the RRNC features in the same housing stock as those tested in this study impossible to measure. Due to the risk of increasing indoor radon levels and exposing participants to additional carcinogen concentrations during a time of non-system operation, this type of study design was not attempted. A study comparing capped versus un-capped RRNC systems in occupied homes is too resource-intensive and would not gain approval of our agency's Internal Review Board.

Need for future research

Additional research looking specifically at existing housing stock built under different building and energy codes would help identify which construction technique(s) have the largest impact on indoor radon levels. Because building codes change every few years, identifying and testing 'as-built' homes with these different codes may aid in future code development.

Identifying areas of the state where the radon levels have not been reduced with passive RRNC is also important. If specific areas are not showing a reduction in radon concentrations, a more detailed investigation into builder and code official education can be implemented. In addition, expanding this study and its lessons learned to incorporate the more than 30,000 homes built in Minnesota since this study ended will help improve the size of the dataset and the conclusions drawn.

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Appendix

Protecting, maintaining and improving the health of all Minnesotans

Date

Dear Resident,

In June 2009, the Minnesota state building code was changed to require radon reducing features in all new homes. Radon is a soil gas that causes an estimated 21,000 lung cancer deaths each year in the United States. The Minnesota Department of Health (MDH) is conducting a research study to determine how much the current building code may reduce radon levels.

MDH would like to offer you a free radon test kit that you can conduct yourself. In addition, for the first 100 homes with elevated radon, MDH will provide a free radon mitigation fan, which can be connected to your current system to further reduce the radon levels in your home.

More information regarding radon in Minnesota can be found at the MDH radon webpage: www.health.state.mn.us/radon

If you would like to participate in this study, complete the enclosed survey, sign the consent section and return to MDH at the address listed on the survey. If you have questions about this project contact Joshua Miller by phone or email listed below.

Sincerely,

Joshua Miller

Joshua Miller, Building Scientist
Joshua.Miller@state.mn.us
651-201-4621
Indoor Air Unit
Minnesota Department of Health
P.O. Box 64975
St. Paul, MN 55164-0975

2012 Radon Study Survey & Informed Consent

Address: _____

City: _____ MN Zip: _____

Return this completed form to:
Minnesota Department of Health
Indoor Air Unit
PO Box 64975
St. Paul, MN 55164-0975

Yes	No		I am the current property owner
Yes	No	Don't Know	There is a passive radon vent pipe running from under the basement floor and out the roof.
Yes	No	Don't Know	There is a fan installed on the radon system
_____			Is the builder of my home
Yes	No	Don't Know	I would like MDH to send me a free radon test kit so that I can test my own home. ($15 value)
_____(initial)			If I request a test kit from MDH, I will use the test kit to test the address listed above.
Yes	No	Don't Know	I would like to be eligible to receive a free radon fan ($150 value), if my home has an indoor radon level above 4.0 pCi/L.
_____(initial)			If I request a radon fan I understand that I will have to hire a contractor to install the fan at a cost to me of approximately $200 - $400.
_____(initial)			If I request a radon fan I agree to complete a second radon test, provided by MDH, after the fan has been installed and in the same location as the first test.

Data Privacy:
The data collected by the MDH is for research purposes and will allow for a better understanding of the indoor radon risk that may be found in newer Minnesota homes. This information is considered private and cannot be shared by MDH with other parties. You will not be identified in any public reports created by MDH. Your participation in this data submission is completely voluntary.

Risks and Benefits:
Through this study, you may identify that your home has elevated indoor radon levels, which is known to cause lung cancer. Elevated radon levels can be reduced in virtually every home with a properly installed radon reduction system that includes a fan. Through this study, you will receive free radon testing and the first 100 homes with elevated radon will receive a free radon mitigation fan. Depending on how the fan is installed and any defects in the construction of your home, it is possible that indoor radon levels will not be reduced. In rare cases, back-drafting from combustion appliances might occur; a safety check of your appliances should be conducted after installation of the fan.

If you have questions about this study or how the data will be stored and used by MDH, please contact Joshua Miller at 651-201-4621 or joshua.miller@state.mn.us

Print Name: _____ Sign: _____

Date: _____