Stopping all indoor radon entry to measure Outdoor Radon entry & Outdoor Radon's influence on Indoor Radon Levels

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To measure outdoor radon's influence on indoor radon levels: All the typical radon entry routes listed below need to be minimized:

- 1) Basement sub-slab infiltration by depressurization
- 2) Garage sub-slab infiltration by depressurization
- 3) Front entrance sub-slab infiltration by depressurization
- 4) Coating of basement slab to stop radon flux
- 5) Determine poured foundation walls flux is minimal



HRV was considered. Intake air designed at ten feet above grade to minimize outdoor radon.

Outdoor radon was measured at ten feet & two feet above grade ~

Homeowner decided to first seal the slab.



Outdoor radon levels at two feet (Red line) were the same as at ten feet above grade (Blue line)





Slab Flux Testing was done with an EcoTracker under a 3 liter bowl





Sub-slab negative pressure can flush sub-slab radon from an open test hole.

Sniffer measurements need careful sequencing to minimize sampling a flushed hole.



Dashed lines are bare concrete flux Solid lines is flux with 2 coats of RadonSeal

Slab sealing with RadonSeal by homeowner did not reduce flux



Owner used Rust-Oleum Rock Solid garage paint The first coat of epoxy over RadonSeal had hajrline cracks



Flux test over cracks had no reduction in flux

Flux test over solid paint had excellent flux reduction

Owner then applied a second coat of epoxy



Dashed lines are Radon Seal Flux Solid lines on bottom are 2 coats of Epoxy

One coat of epoxy 0.1 to 6 pCi/sf/hr

Two coats of epoxy 0.1 pCi/sf/hr

Basement radon was 4.5 pCi/l

> Now 1.3 pCi/l



Eight months later Epoxy coating is still working!

One coat of Epoxy had hairline cracks that allowed radon flux.

Two coats stopped almost all radon flux.



4 EcoQubes in basement, 1st & 2nd floor & outdoors provide hourly radon levels to cloud

Basement is mostly below 2 pCi/l with spikes to 5 pCi/l 1st Floor is less.

Note that levels are rising in summer months

Eight months of outdoor Radon at 10 ft above grade

2/17/22 to 8/23/22 Radon in pCi/l 2nd Flr 1.64 1st Flr 1.75 Bas 2.24 Outside 2.54 Note: Higher in Summer

Delay in Peak Indoor Radon versus Outdoor Peak

Peak high to high or low to low had a delay of 3 to 7 hours in this time period

Typically 1 to 3 hours

Average wind speed per month versus average radon. Decreasing wind equals increasing average radon outdoors

Outdoor radon and basement radon track each other each month.

Homeowner remarked that basement radon was always higher in the summer

Study Conclusions:

- 1) Need to treat basement slab and all slabs adjoining the basement.
- 2) Radon coming out of or through a slab can be significant.
- 3) Two coats of epoxy paint can stop radon concrete flux.
- 4) Outdoor radon accumulates uniformly with elevation.
- 5) Outdoor radon levels are related to wind speed.
- 6) Outdoor radon levels are higher in the summer if there is a lower average wind speed.
- Peak high or low outdoor radon levels take about 1 to 3 hours to appear indoors.
- 8) Radon levels outdoors can average higher than indoor levels.