Measuring Radon Levels from Concrete

Bill Brodhead
WPB Enterprises Inc
www.WPB-Radon.com

High-sensitivity, small Radon Monitors can measure Flux

Mortite
putty
works
better than
gaskets

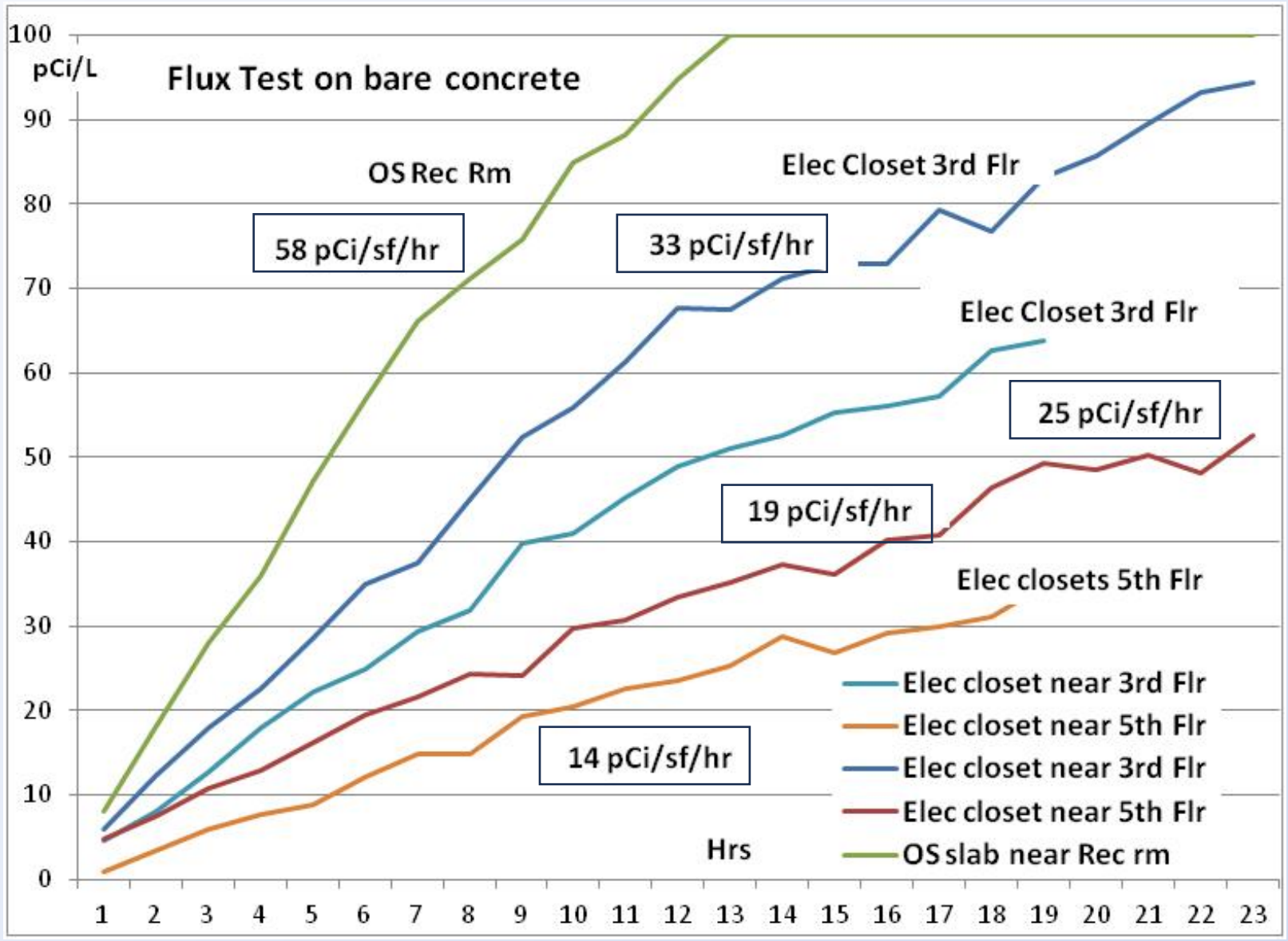
Place Radon Monitors in a
Metal bucket that is
absolutely air-tight.

Larger Slab Area & Less Volume
equals Greater Sensitivity

EcoQube
or
AranetRN

with a 3 Liter bowl
are easiest to use

Florida flux measurements need 4 to 8 hours of exposure



Ingrowth greater than
10 pCi/sf/hr
is needed to cause
significant indoor radon
in
very low ACH

33 pCi/sf/hr Flux
changed
7 to 27 pCi/L (20)
over 4 hours

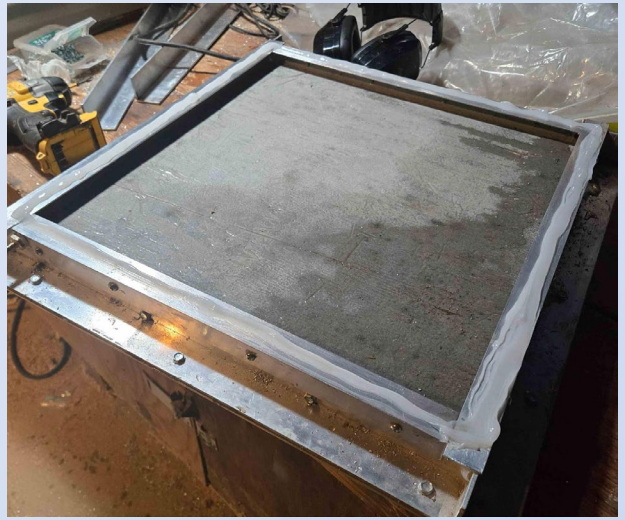
14 pCi/sf/hr Flux
changed
2 to 18 pCi/L (16)
over 8 hours

A concrete slab was constructed with a sealed chamber under it.

An airflow of 1 LPM of 1350 pCi/L of radon provided the slab flux

Aluminum frame box with ¾” plywood to create an air space

After the Concrete set, the ¾” plywood was removed from the bottom



The ¾” space was covered with galvanized sheet metal. Inlet and outlet ports were installed

Radon flux was reasonably consistent

1350 pCi/L flow under the slab

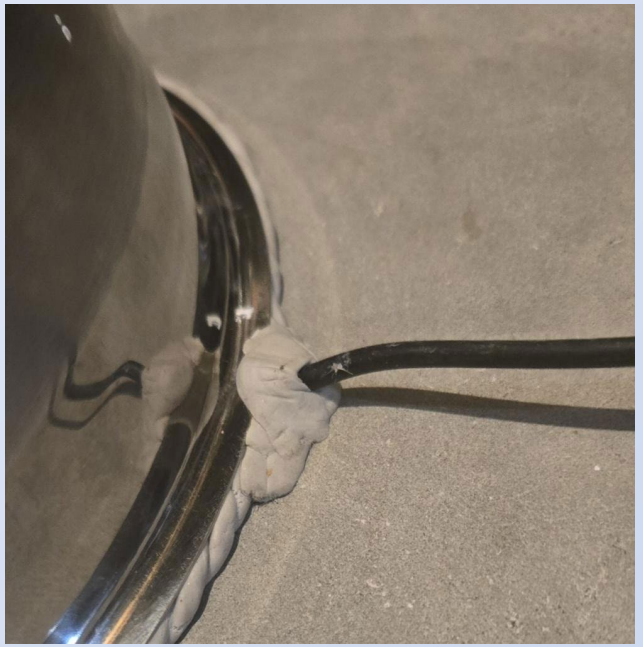
Consistent Flux of about 23 pCi/SqFt/Hour out of the slab

Radon Monitor inside a Flux Bucket

Twist three strands of Mortite into a rope.
Hand compress onto edge

Leave space for Elec cord and compressed air

Compress Mortite to obtain a perfect seal



Use extra Mortite for sealing around the opening and cord

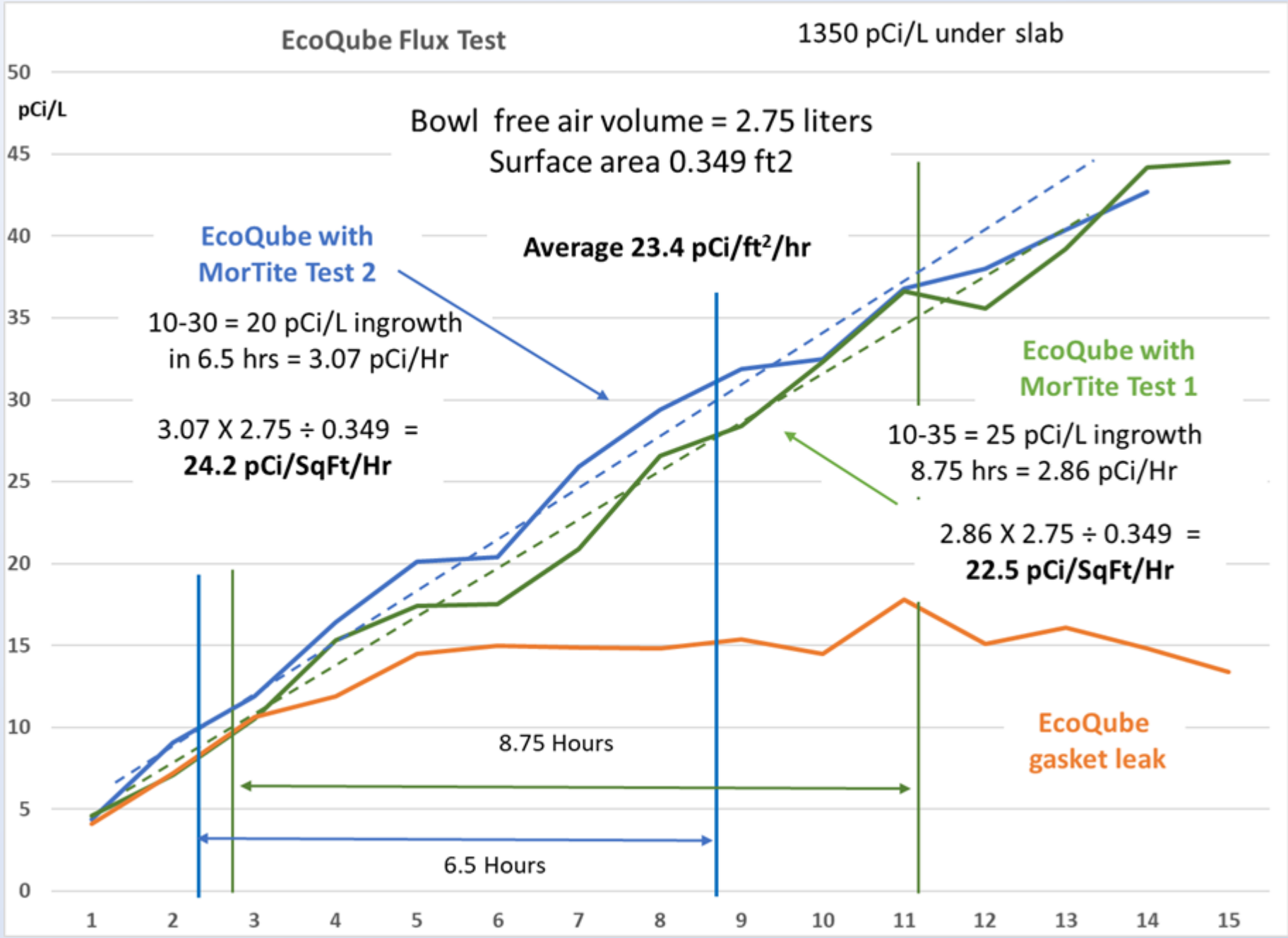
EcoQube
2 Flux Test avg

23.4 pCi/SF/Hr

Sealing the edge
is critical

Change in Radon
÷ Hours
X Volume
÷ by slab area
= **pCi/ft²/Hr**

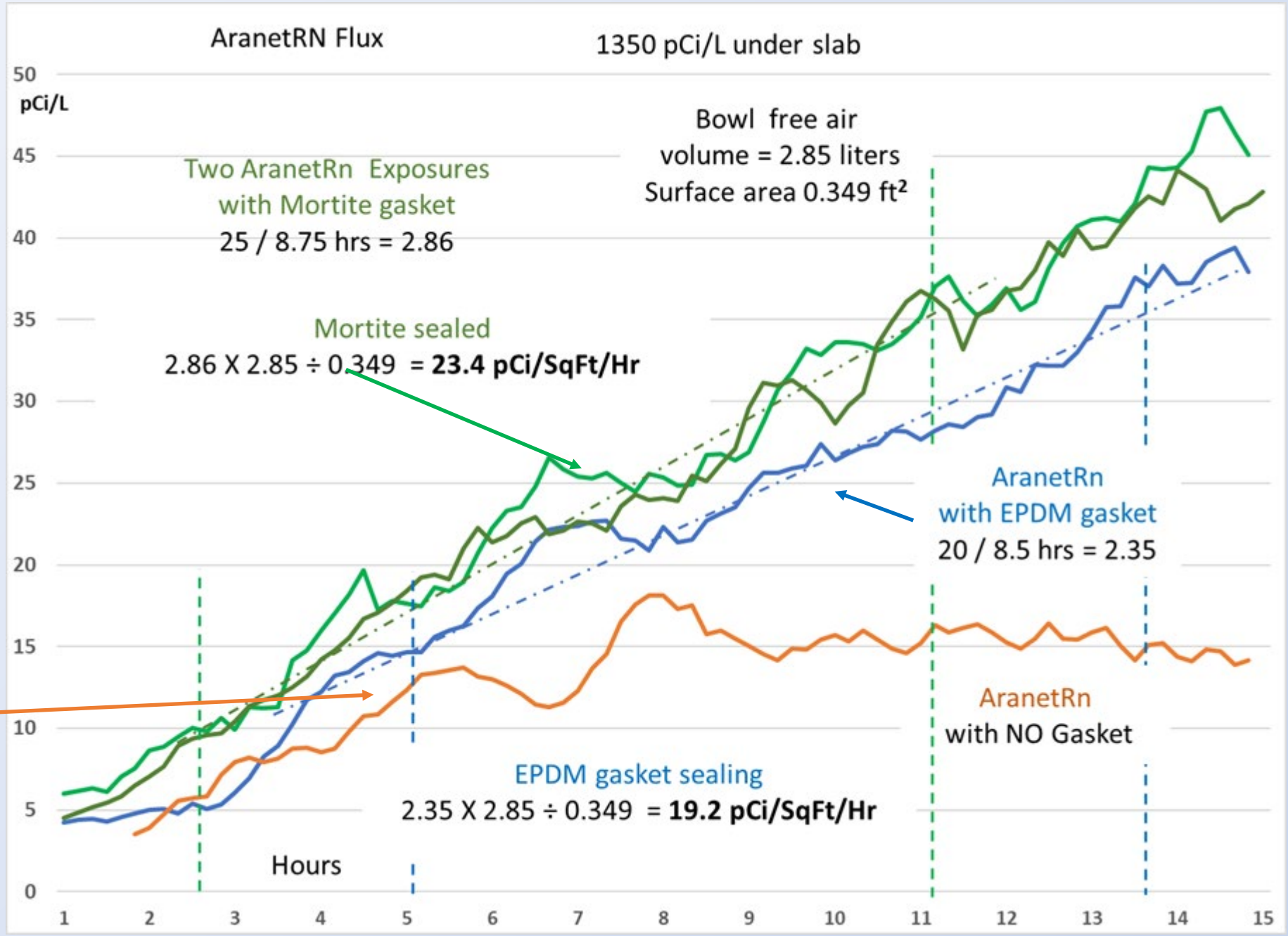
7% difference



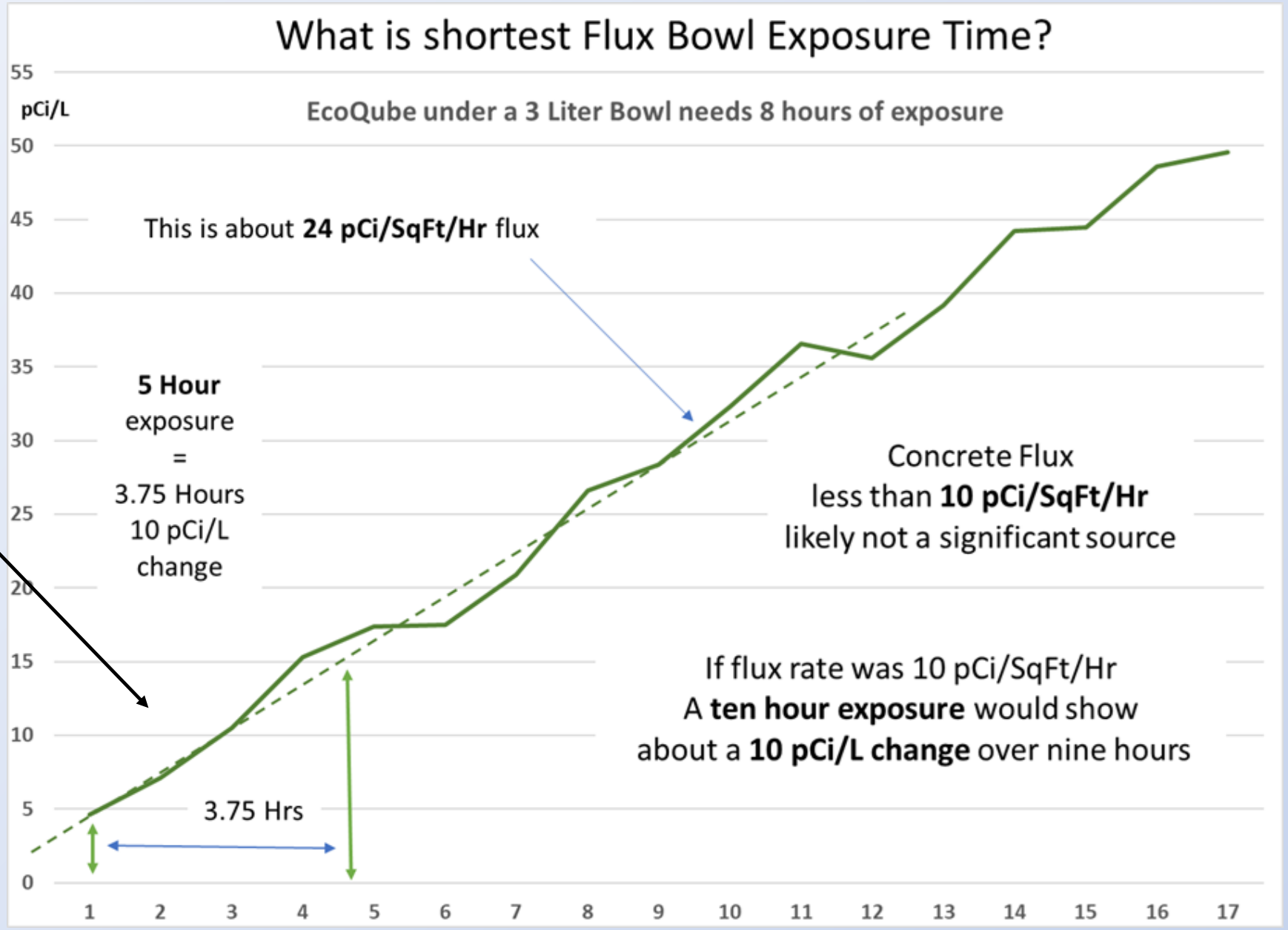
AranetRn Flux Test average 23.4 pCi/SF/Hr

Mortite gave best sealing

Note that the unsealed bowl flattens out after 3 hours



If Flux is greater than
20 pCi/sf/hr
a 5-hour exposure is possible



8 Hour - E-PERM® Radon Flux Monitor

Expose 2nd EPerm flux monitors at the same time and subtract open-air results from flux results

Two Eperm flux test averaged
21.34 pCi/sf/hr
9% Lower than
3 Liter bowl average
23.5 pCi/sf/hr

Electret lost
70 to 88 volts in 8 hrs

EPerms can easily
measure less than
10 pCi/sf/hr

Use Rad Elec Excel spreadsheet to calculate the Flux

Electret Serial #	Location	Start Date (YYYY-MM-DD)	Start Time (HH:mm)	End Date (YYYY-MM-DD)	End Time (HH:mm)	Total Days Exposure	Initial Voltage	Final Voltage	EIC Config	Individual pCi/sf/hr	True value pCi/sf/hr
SPC860	Flux 2	2025-10-09	08:06	2025-10-09	16:45	0.360	761	673	HST	**26.278**	**20.989**
SPC792	Ambient	2025-10-09	08:06	2025-10-09	16:45	0.360	763	745	HST	**5.288**	
		Flux Monitor									
SPC792	Flux 4	2025-10-12	14:26	2025-10-12	21:56	0.313	711	640	HST	**28.612**	**21.692**
SPC860	Ambient	2025-10-12	14:26	2025-10-12	21:56	0.313	658	641	HST	**6.920**	

CT007 Radon Sniffer Flux Setup

Radon Sniffer sensitivity maximized by increasing footprint and decreasing volume

Two barbed fittings were installed after tapping two holes in cast iron pan

Washers maintain 1/8” air space

4 strands of Mortite installed on the bottom side

Square Foot area

0.63 SF

1.8 X greater than 3 Liter

10 3/4” round by 1/8” = 0.15 liters

CT007 with filter 0.32 liter

Total Volume 0.47 Liters

6.4 X less than 3 Liter

11.5 X more sensitive

CT007 Radon Sniffer Flux Set-Up

The concrete floor must be flat

Start Radon Sniffer in low radon air.

Keep cell phone in Bluetooth range

Compress Mortite gasket onto the slab

Run sniffer for up to one hour

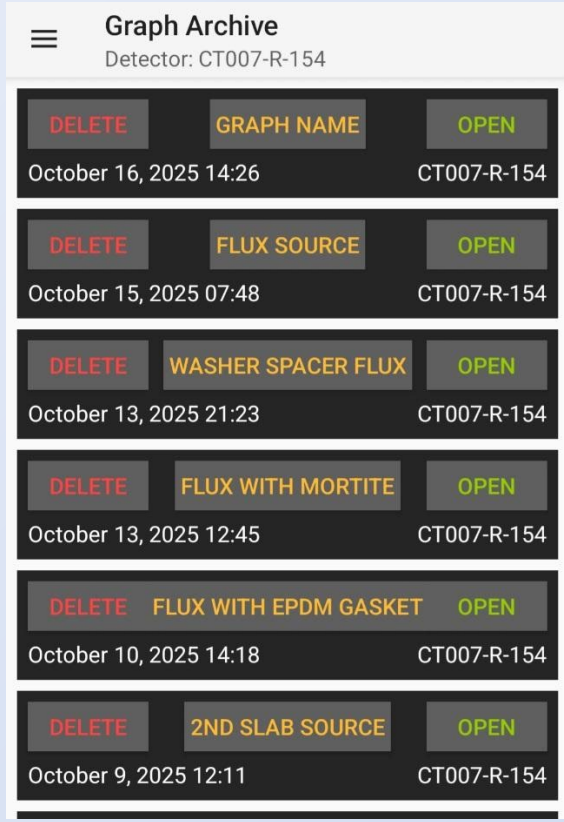
Radon Sniffer Flux Calculations

Press disconnect to create an Excel file that can be downloaded

or

Manipulate the slider bar to define radon level and time.

Record pCi/L/minute ingrowth



22 to 45 pCi/l = 23 pCi/L ingrowth
divided by 49 minutes or 0.816 hrs
= 28.16 pCi/hr

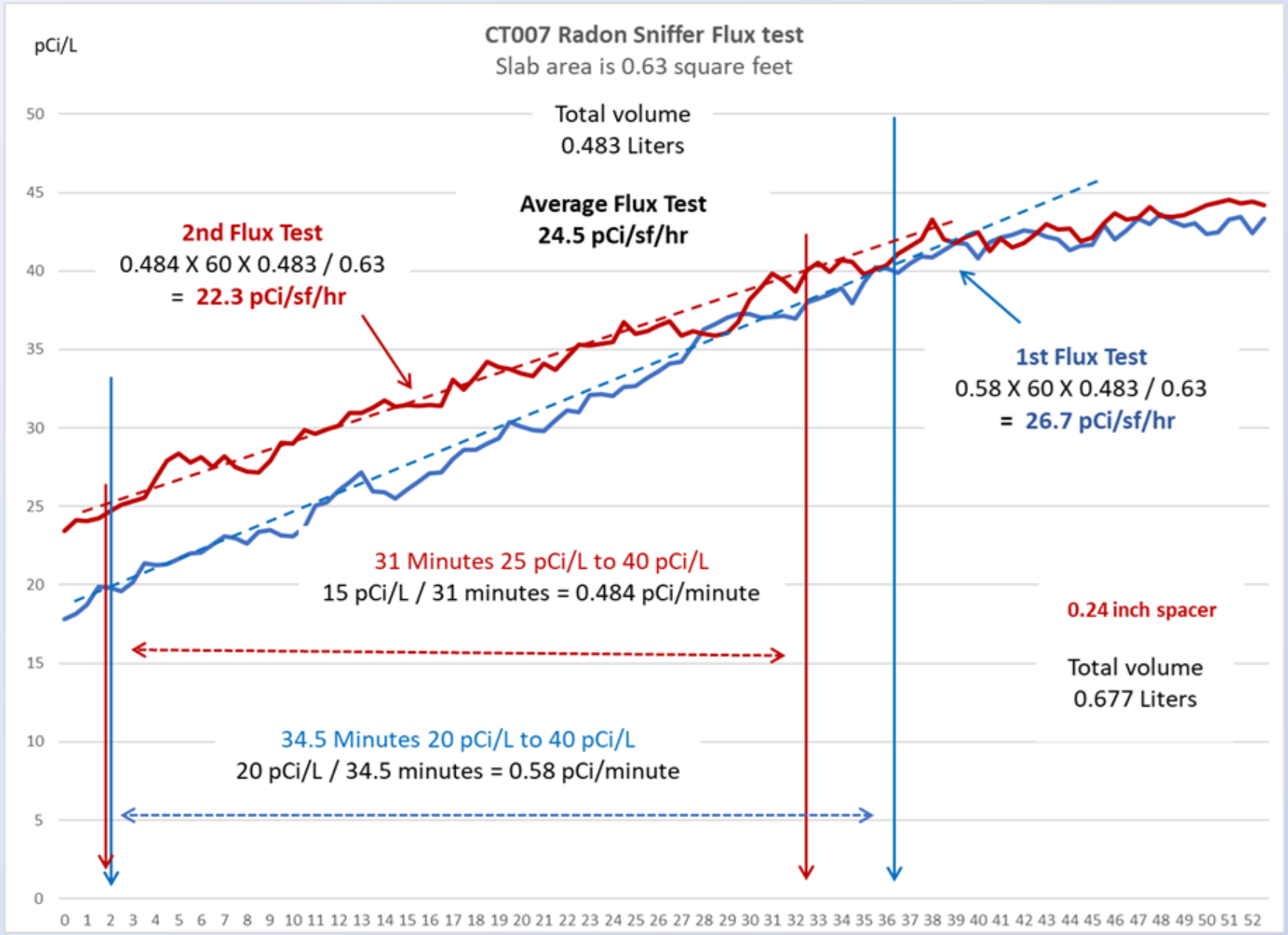
28.16 X 0.483 Liters ÷ .63 Sq Ft = **21.6 pCi/sf/hr**

8% lower than average of 3-liter bowl flux

Download data log into a spreadsheet for more accurate readings

CT007
Average Flux Rate
24.5 pCi/sf/hr
5% higher
than the **3-liter bowl**
average results

Results in
Less than 1 hour



Can Florida's "Radon from Concrete" problem happen elsewhere?

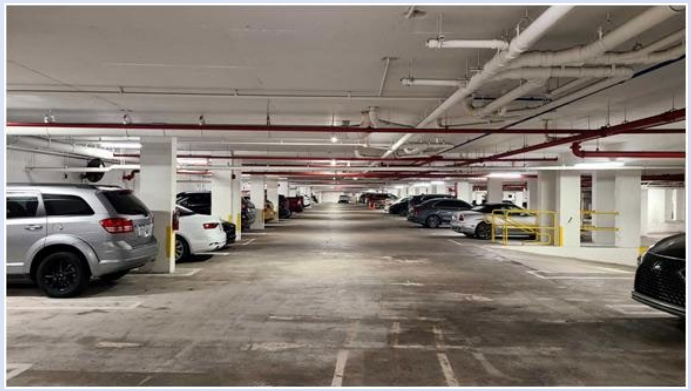
Typical Florida Condo

Multi-stories tall

Concrete floors and ceiling

Sometimes Concrete walls

Garages under the building are ventilated and have no radon



Primary Reasons

Hurricane-proof sliding doors and windows

Lots of Concrete
No Ventilation
0.05 ACH not 0.35 ACH

These same conditions can happen in basements

Elevated radon from concrete means:
These buildings need outdoor air.
But how much ?

Measure indoor temperature and humidity

Radon can be used as a Tracer Gas

Measure radon for 2 days.
Adjust outdoor intake fan to about 40 CFM = 0.20 ACH
Re-measure radon for 2 days

Divide 40 CFM by the factor change in radon – 1

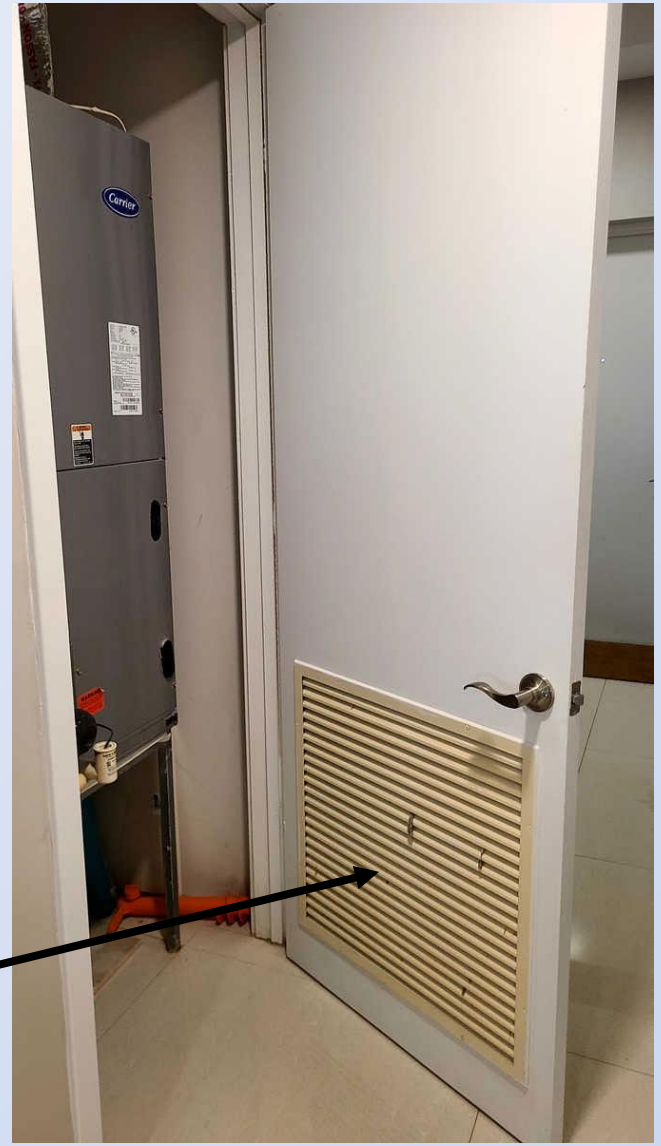
12 to 2 pCi/L = 6X change
40/5 = 8 CFM Natural

The issue with Condos is

Dry Vent
Range Hood Vent
Bathroom Vents
Are the only outdoor air inlets

Condo's typically have
an HVAC closet
with an air handler

HVAC Return Air is
a grill in
HVAC closet door



A 4” passive pipe into HVAC Closet could provide outdoor air

Type of door grill determined closet negative pressure

When the air handler was running, the closets were 10 to 53 pascals negative

Negative pressure moved 46 to 100 CFM in a 4” pipe

Unit #	AC to Room	Box to Room	CFM
K	-53 pascals	-33 pascals	100
L	-42 pascals	-18 pascals	75
M	-25 pascals	-16 pascals	68
N	-9.8 pascals	-7.5 pascals	46

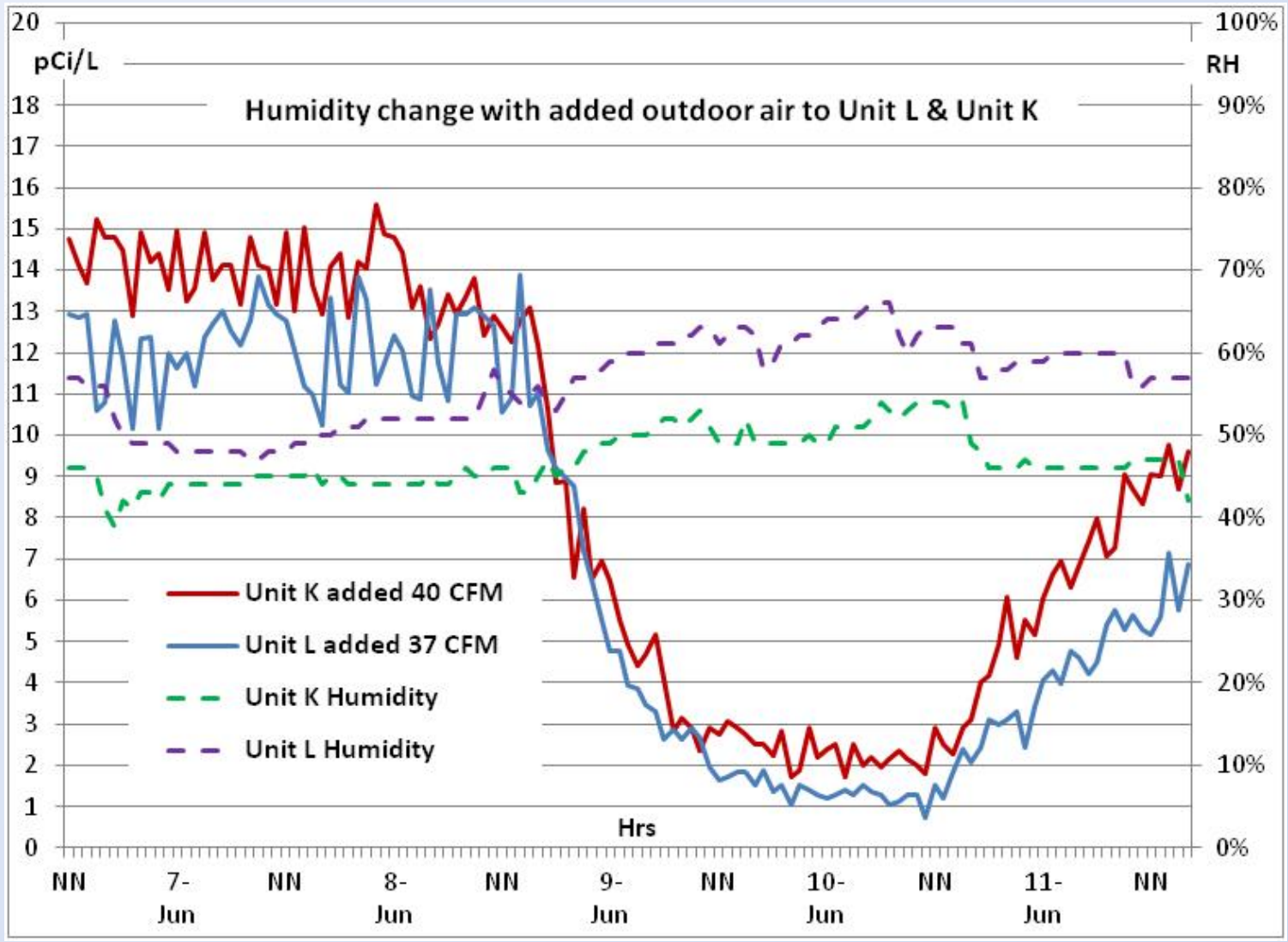
Bringing in outdoor air affects humidity

40 CFM added in Unit K
increased humidity
45% RH to **55% RH**

37 CFM added in Unit L
increased humidity
55% RH to **65%RH**

Radon Levels fell from
13 pCi/L to about 2 pCi/L

Natural ventilation was 8 CFM
8 CFM = 0.04 ACH
48 CFM = 0.25 ACH
68 CFM = 0.35 ACH



The solution to Concrete Radon Flux is increased ventilation
Three methods of adding Ventilation in Florida Condo's

Whole Building Ventilation

Commercial Roof Top Unit

100% conditioned supply air

Main duct from roof to each unit

Most expensive

Best air quality

Least interior work

Heat Recovery Ventilator

Can have humidity recovery

Uses closet space

Two duct runs to outdoors

Supply duct runs

Bi yearly maintenance

Most interior construction

Direct Fan Ventilation

Least costly

One duct to the outside

Simple timer or Hvac Sync

Possible Mold buildup

Takes up HVAC closet space

Study Conclusions:

1) **Residential concrete condominiums are too air-tight**

2) **Concrete floors and walls in air-tight homes cause elevated radon**

3) **Adding mechanical ventilation easily reduces radon from concrete**

4) **Untreated mechanical ventilation in Florida raises humidity**

5) **Passive radon venting can bring in a significant amount of air but only when the HVAC is operating**

6) **A critical component of Flux testing concrete is an air-tight sealed container**

7) **High-sensitivity, small-volume radon monitors make testing simple.**

8) **The flux test can be done in less than an hour with a sniffer**