

STUDY GUIDE: COMPARISON OF GENERAL PUBLIC AND REAL ESTATE RADON MEASUREMENTS
(Citizen's Guide to Radon/Device Protocols and Home Buyer's and Seller's Guide to Radon/Home Protocols)

GUIDANCE	<i>CITIZENS GUIDE/DEVICE PROTOCOLS</i> (General Public)	<i>BUYERS-SELLERS GUIDE/HOME PROTOCOLS</i> (Real Estate)
TEST LOCATION	<p><u>Lowest lived-in level</u> such as ...regularly used room, e.g.: living room, playroom den, bedroom...but not kitchen, laundry room, closet, or bathroom</p> <p>Also where device will not be disturbed & not near draft nor excessive heat or humidity</p> <p>≥ 20" above floor; ≥3' windows & outdoor openings ≥ 12" exterior wall; ≥4" from other objects; and if suspended, from 6' to 8' above the floor</p>	<p><u>Lowest level of the home that could be used regularly meaning the lowest level that is going to be used as living whether finished or unfinished</u></p> <p>Same</p> <p>Same</p> <p>Same</p>
PRETEST CONDITIONS	<p>If 2 or 3 day test, closed building conditions 12 hours before test begins are <u>required</u>.</p> <p>If 4 to 6 days, <u>recommended</u> prior to measurements</p>	<p>Same</p> <p>Same</p>
INITIAL TEST	<p>Short term (≤ 90 days; <u>should</u> be made under closed building conditions)</p> <p>If a 2 or 3 day test, <u>should</u> avoid testing during unusually severe storms or unusually high winds.</p>	<p><u>Should</u> be made under closed building conditions and should avoid testing during unusually severe storms or unusually high winds.</p> <p>Three Testing Options:</p> <p>1. Sequential Testing: 2 similar devices deployed in same location for same the duration of time ... first test results not reported until second test results and average of both reported.</p> <p>2. Simultaneous Testing: 2 similar devices deployed 4" apart for same duration</p> <ul style="list-style-type: none"> • if both tests are either ≥ 4pCi/L or if both test results are < 4 pCi/L, report the test results <ul style="list-style-type: none"> ○ then calculate RPD. When both test results are: <ul style="list-style-type: none"> ▪ < 4, if RPD >67%, investigate source of error ▪ ≥ 4, if RPD >36%, investigate source of error • if one ≥ 4 pCi/l and one <4pCi/l and the higher result is: <ul style="list-style-type: none"> ≤ 2X the lower result, report both results and their average > 2X the lower result, report both results, the average, <u>and must recommend retesting</u>. <p>3. Single Test with Continuous Monitor: Requires continuous monitor that integrates and records data hourly. ... periodic results are averaged and reported to the client - 4 hour ramp-up is deducted but must have a minimum of 44 consecutive hours of test results</p>
FOLLOW UP TEST	<p>... if initial test <4pCi/L follow-up test is probably not needed except in future</p> <p>... if initial test ≥4 pCi/L, do follow-up test in same location as initial test follows:</p> <p>... if initial test ≥8 pCi/L,</p> <ul style="list-style-type: none"> • do a short-term follow-up (under closed building conditions) <p>... if initial test < 8 pCi/L,</p> <ul style="list-style-type: none"> • do a long-term follow-up 	
MITIGATION DECISION	<p>Always based upon 2 tests ... average of initial and follow-up short-term tests or the long term follow-up test</p>	<p>Based upon average of 2 short-term tests <u>or</u> . . . 1 average produced by continuous monitor</p>

Study Guide: Highlights of Measurement Devices . . .

. . . and Device Protocols

	METHOD	MEASURES	DESCRIPTION	COMPARATIVE ADVANTAGES	COMPARATIVE DISADVANTAGES	PRE - DEPLOYMENT/ DEPLOYMENT	SENSITIVITY/ PRECISION/ CALIBRATION	DUPLICATES/ BLANKS/ SPIKES	CHECKS
Passive, Time-Integrating Radon Measurement Devices	Activated Charcoal Adsorption Device Short-term	Rn ~ gamma; Pb & Bi 214; not true time integrator	Adsorb-desorb radon; 2-3 day open-faced; 5-7 day diffusion barrier	Very low cost; Very simple to use; Passive (no power); Easy to mail	Can't read on-site; Temperature, Rh, & airflow sensitive; Not > 7 day measure.	No move-in/out; Retrieval critical to lab ASAP!	0.5 pCi/L; COV ≤ 10% @ 4pCi/L; every 12 months by analytical	10% or 50/month; 5% or 25/month; 3% or 6/month; minimum 3/year	1/day by analytical laboratory
	Charcoal Liquid Scintillation Short-term	Rn ~ alpha & beta; not true time integrator	Adsorb-desorb radon; 2-7 days	Very low cost; Very simple to use; Passive (no power); Easy to mail	Can't read on-site; Temperature, Rh, & airflow sensitive; Not > 7 day measure.	No move-in/out; Retrieval critical to lab ASAP!	few 10ths of pCi/L; COV ≤ 10% @ 4pCi/L; every 12 months by analytical	10% or 50/month; 5% or 25/month; 3% or 6/month; minimum 3/year	1/day by analytical laboratory
	Alpha Track Detectors Long-term	Rn ~ alpha	Track damage to plastic or film from alpha particles are counted	Low cost; Very simple to use; Passive (no power); Easy to mail	Can't read on-site; Temperature, Rh, & airflow sensitive; Need>100pCi/L days	No move-in/out; Retrieval critical, to lab ASAP Few months stor.	0.2 - 1.0 pCi/L/month/ depend on area counted/ every 12 months by analytical	10% or 50/month; 5% or 25/month; 3% or 6/month; minimum 3/year	1/day by analytical laboratory
	Unfiltered Track Detectors Short-term	Rn & RDPs (alpha)	Track damage to film from Rn & RPD alpha particles are counted	Measures both Rn & RDPs	High or low ER bias; Can't read on site; No US analytical lab; Not common	No move-in/out; Retrieval critical to lab ASAP; Few months stor.	(not cited) (not cited) every 12 months by analytical	10% or 50/month; 5% or 25/month; 3% or 6/month; minimum 3/year	1/day by analytical laboratory
	Electret Ion Chambers Short-term or Long-term	Rn (ions) ~ alpha, beta, & gamma	Ions reduce voltage of electret (never deploy if < 200 volts)	On-site readings; Multi. electret use; Simple to use; Passive (no power)	Gamma&temperature sensitive; Temperature, Rh, & airflow sensitive;	No move-in/out Deploy ASAP after reading	0.2 pCi/L @ 7 days; 0.3 pCi/L @ 3 months; COV ≤ 10% @ 4pCi/L; 12 mo.&gamma monitoring	10% or 50/month; 5% or 10/shipment; 3% or 6/month; minimum 3/year	5% set aside for volt drift
Radon Measurement Devices	Grab Radon Sampling Scintillation Cell & PMT Activated Charcoal Pump Collapsible Bag (CRM as sniffer)	Rn ~ alpha (gamma)	RDPs filtered from counting chamber	On-site readings; Can also measure RDPs at same time	Not for decision to mitigate; Reader is an analytical laboratory	No move-in/out; Must be filtered	0.1 pCi/L COV ≤ 10% @ 4pCi/L; every 12 months & 6 months cross-checks	10% or 50/month; 5% or 10/shipment; 3% or 6/month; minimum 3/year	use check source
	Continuous Radon Monitors Scintillation Cell & PMT Pulsed Ion Chamber, Silicon Detector	Rn ~ alpha or ion from alpha	RDPs filtered from counting chamber	On-site readings; Real time results	Reader is an analytical laboratory	No move-in/out; Timer & pump checks	≤ 1.0 pCi/L; COV ≤ 10% @ 4pCi/L; every 12 months & 6 months cross-checks	6 months side/side; no blanks; Sint Cell every 1000 hours check background by flushing cell	use check source
RDP Measurement Devices	Grab Sampling: RDP Scintillation cell & PMT	RDPs ~ alpha	RDPs captured on filter and alpha particles counted	On-site readings; Can also measure Rn at same time	Not for decision to mitigate; Reader is an analytical laboratory	No move-in/out; Filter & pump checks; run continuous	0.0005 WL; COV ≤ 10% @ 0.02 WL; every 12 months & 6 months cross-checks	6 months side/side; no blanks; Sint Cell check background every 1000 hours	use check source
	Continuous RDP Monitors Scintillation Disk & PMT Surface barrier	RDPs ~ alpha	RDPs captured on filter and alpha particles counted	On-site readings; Real time results	Reader is an analytical laboratory; Dust can bias measurements	No move-in/out; Filter & pump checks	≤ 0.01 WL; COV ≤ 10% @ 0.02 WL; every 12 months & 6 months cross-checks	6 months side/side; no blanks; every 168 hours	use check source
	Radon Progeny- Integrating Sampling- Unit	RDPs	Thermoluminescent, alpha track, or electret detector	On-site readings	Reader is an analytical laboratory; Not common	No move-in/out; Pump checks; run continuous	(not cited); COV<10% @ 0.02 WL; every 12 mo- &6 months cross-checks	10% or 50/month; depends on type; every 1000 hours	use check source