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"Protocols for Radon and Radon Decay Product Measurements in Homes"

Section 1: Introduction

This document presents the U.S. Environmental Protection Agency's (EPA) technical guidance for measuring radon concentrations in residences. It contains protocols for measuring radon for the purpose of deciding on the need for remedial action, as presented in the 1992 *Citizen's Guide to Radon* (EPA 402-K-92-001; U.S. EPA 1992a), and in the *Home Buyer's and Seller's Guide to Radon* (EPA 402-R-93-003; U.S. EPA 1993).

The guidance for determining the need for mitigation is different in several key aspects from previously issued recommendations, and this document supersedes a previous report (EPA 520/1-86-014-1) published in February, 1987 (U.S. EPA 1987). The technical basis for these policy changes is supplied in the *Technical Support Document for the 1992 Citizen's Guide to Radon* (EPA 400-R-92-011; U.S. EPA 1992g), and the revised policies are described in *Section 2* of this report.

Section 3 of this report describes the Agency's recommended protocols for measuring radon for a real estate transaction. This guidance elaborates on Agency recommendations published in the *Home Buyer's and Seller's Guide to Radon* (EPA 402-R-93-003; U.S. EPA 1993). The radon testing guidelines in the *Home Buyer's Guide* were developed specifically to deal with the time-sensitive nature of home purchases and sales and the potential for radon device interference. The guidelines are somewhat different from those in other EPA publications, such as the 1992 *Citizen's Guide to Radon* (EPA 402-K-92-001; U.S. EPA 1992a), which provide radon testing and reduction information for non-real estate situations. Therefore, *Sections 2* and *3* of this document will have different guidance for different situations.

This report is limited to discussions of Agency guidance regarding detector placement, measurement duration, multiple measurements, and the interpretation of measurement results. EPA has also issued a technical report describing measurement techniques, titled *Indoor Radon and Radon Decay Product Measurement Device Protocols* (EPA 520-402-R-92-004) and published in 1992 (U.S. EPA 1992c). That report provides technical information for measuring radon concentrations with continuous radon monitors, alpha track detectors, electret ion chambers, charcoal canisters, unfiltered alpha track detectors, and grab radon techniques; it also provides guidance for measuring radon decay product concentrations with continuous working level monitors, radon progeny integrating sampling units, and grab radon decay product techniques. A list of EPA documents providing guidance on radon measurements appears below:

EPA Documents* Providing Guidance on Radon Measurements

- *A Citizen's Guide to Radon* (U.S. EPA 1992a) EPA 402-K-92-001
- *Consumer's Guide to Radon Reduction* (U.S. EPA 1992b) EPA 402-K-92-003
- *Indoor Radon and Radon Decay Product Measurement Device Protocols* (U.S. EPA 1992c) EPA 520-402-R-92-004
- *Radon Mitigation Standards* EPA 402-R-93-078, October 1993, Revised April 1994
- *Home Buyer's and Seller's Guide to Radon* (U.S. EPA 1993) EPA 402-R-93-003
- *Radon Measurements in Schools* EPA 402-R-92-014
- *Protocols for Radon and Radon Decay Product Measurements in Homes* EPA 402-R-92-003

This report provides guidelines that are primarily intended to aid State radiation control programs, other organizations conducting indoor radon measurements, and homeowners who want detailed information on radon measurements. The guidelines herein can be adopted as part of a State program or can be provided by States to interested individuals as recommendations. Adherence to these guidelines was a requirement for participation in EPA's former National Radon Proficiency Program (RPP). The method designations that were used in EPA's former RPP listed in Exhibit 1-2. A two-letter code for each method has been adopted, although ATDs (AT), RPISUs (RP), and EICs/ECs (ES or EL) may still be referred to by their traditional acronyms.

EPA recognizes that radon concentrations in buildings may vary over

time (Arvela et.al. 1988, Dudney et.al. 1990, Fleischer and Turner 1984, Furrer et.al. 1991, Gesell 1983, Harley 1991, Hess 1985, Martz et.al. 1991, Nyberg and Bernhardt 1983, Perritt et.al. 1990, Ronca-Battista and Magno 1988, Steck 1992, Stranden et.al. 1979, Wilkening and Wicke 1986, Wilson et.al. 1991). Furthermore, concentrations at different locations in the same house often vary by a factor of two or more (Arvela et.al. 1988, Furrer et.al. 1991, George et.al. 1984, Hess 1985, Keller et.al. 1984, Put and deMeijer 1988, Steck 1992). EPA has carefully evaluated these findings, as well as other factors (EPA 400-R-92-011; U.S. EPA 1992g), and has developed policies for ensuring that the most representative and useful information is supplied by the measurement results. These guidelines may be evaluated periodically and refined to reflect the increasing knowledge of, and experience with, indoor radon.

EPA recommends that initial measurements be short-term tests and performed under closed-building conditions. An initial short-term test, which lasts for two to 90 days, ensures that residents are informed quickly should a home contain very high radon levels. Long-term tests, which are conducted for longer than 90 days, give a better estimate of the year-round average radon level. The closer the long-term test is to 365 days, the more representative it will be of annual average radon levels.

Exhibit 1-2

Radon and Radon Decay Product Measurement Method Abbreviations

METHOD CATEGORY	Abbreviations	
	Common	RPP Method
Continuous Radon Monitors	CRM	CR
Alpha Track Detectors	ATD	AT
Electret Ion Chambers Short Term Long Term	EIC/EC	 ES EL
Activated Charcoal Adsorption Devices (formerly called charcoal canisters)	CC	AC
Charcoal Liquid Scintillation	CLS	LS
Three-day Integrating Evacuated Scintillation Cells		SC

Pump/Collapsible Bag Devices (24 hour sample)		PB
Grab Radon Sampling Scintillation Cells Activated Charcoal Pump-Collapsible Bag		 GS GC GB
Unfiltered Track Detectors	UTD	UT
Continuous Working Level Monitors	CWLM	CW
Radon Progeny Integrating Sampling Units	RPISU	RP
Grab Sampling - Working Level		GW

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