

R. Collé  
16 Jan. 1991

Comments on EPA's Radon Measurement Program

For the most part, these documents describe the detailed administrative procedures used by EPA for their voluntary Measurement Proficiency Program. The program is mainly directed to commercial radon measurement vendors, and has the intent of providing some degree of assurance to homeowners and to other purchasers of radon measurements (e.g., private companies, schools, government agencies) that the measurements they obtain are reliable and accurate. Assuring the quality of radon measurements by some type of proficiency program is very important, particularly because of the very rapid proliferation of vendors offering measurement services to the public, many of whom had little or no previous experience. A large segment of the radon measurement industry in fact could be described as a "Mom and Pop" cottage industry. The program does provide States and the public with information concerning the proficiency of hundreds of measurement firms and analytical laboratories across the country. The reliability of this information, however, is debatable.

EPA must be credited with taking the initiative in establishing this important program, and moreover for being instrumental in developing standardized measurement protocols. Their protocols for making "field" measurements are nearly universally used throughout the country for screening measurements of radon in buildings, thereby insuring that measurements made anywhere within the U.S. are at least using consistent and compatible procedures.

I believe however that this measurement proficiency program, as presently constituted and implemented, is seriously flawed and cannot withstand critical scrutiny. The main reason is that it is not a true and complete measurement quality assurance (MQA) program. The EPA program, for the most part, is merely an elaborate performance testing program -- and even that aspect has some serious limitations. Many papers have been written [cf., the attached paper by E.H. Eisenhower] on what constitutes measurement quality assurance (MQA), and the minimum requirements and critical elements of a MQA program. With the exception of a performance test, the EPA program satisfies none of the other requirements. The EPA program does not satisfy even the most generally accepted basic definition of a MQA program, viz.,

... those procedures that enable a measurer to assure, on a continuing basis, that the total measurement uncertainty relative to the national standard is quantified and sufficiently small to meet requirements.

This shortcoming is clearly demonstrated, for example, by the program's complete disregard for the role of measurement uncertainties. The results of performance tests, as required by EPA, are treated as if they were absolute numbers. This obviously does not provide any incentive to measurement vendors to evaluate their individual uncertainties, and probably discourages them from doing so. Without any knowledge of their uncertainties -- except for some incomplete and crude approximation of it, as gleaned from a one-shot performance test -- how can measurement vendors be expected to satisfy even the most basic MQA requirement? The absence of any consideration for the measurement uncertainties also plays a large role in the quality of the information provided to homeowners (see the attached Addendum).

Although the EPA program presumably requires (as stated in their documents) the development and implementation of individual MQA programs by the measurement vendors, there is no provision for evaluation, demonstration, or follow-up that any of these requirements are being met. The vendor's MQA then becomes empty paper exercises, rather than clear demonstrations that strict performance requirements are being met as in a true MQA.

I believe the fundamental problem of the EPA program was that it was established too hurriedly without the development of the necessary general operating criteria, and that it was done with scant outside input. The program has expanded much more rapidly than initially envisaged, and therefore had to undergo various "quick-fixes" without ever addressing the initial flaws. Successful MQA programs must have very specific criteria and procedures for the activities at each level and the links between them. That is, the operational criteria must be very detailed and specific on how the testing laboratory will be linked to the national standard; how the testing laboratory will operate, and all of the procedures it will follow; how the vendor laboratory will be linked to the testing laboratory; and how the vendor laboratory will operate. Few of these details are addressed in the EPA program, and none of them are actually evaluated for compliance. Successful MQA programs are also those that have been developed on the basis of consensus between all interested parties, and that provide for an unbiased independent audit of performance by the various parties. The EPA program was developed almost exclusively by EPA, is solely operated by EPA, and its performance is evaluated by EPA. As a result of this exclusion of all other interested parties, it is of little surprise that many participants in the EPA program feel that it is not successful.

## ADDENDUM

One of the more serious impacts of measurement vendors giving little consideration to their measurement uncertainties is that they report screening measurement results to homeowners (with EPA encouragement) as if they were perfectly accurate, absolute numbers. These results (often reported with three significant figures) are then blindly compared against the fiducial 4 pCi/L "action level" for homes. Unaware homeowners are, of necessity, seriously misled by this practice. It is poor science, and worse public policy. I addressed this topic in more detail in my comments of 21 Oct. 1990 to EPA on EPA's 1990 Citizen's Guide to Radon (attached). It would be much more useful (and valid) if measurement vendors reported an estimate of the annual-average radon concentration with an uncertainty interval rather than just the single numerical result of a short-term measurement. This would more clearly reveal the large uncertainties involved, and would also be much more valid for making meaningful remedial action decisions. EPA has argued that the public is not sufficiently sophisticated to understand results reported with uncertainties, and therefore discourages it. I have more faith in the intelligence of that segment of the general population that may be concerned with radon in their homes, and believe that they can not make informed decisions without the uncertainty information. A recent DOE Report [DOE/ER-0480P, Indoor Radon and Decay Products: Concentrations, Causes, and Control Strategies, p. 78] illustrates an improved way that measurement results with uncertainties could be reported to homeowners in a very understandable way.