

**SIX YEARS OF NEW JERSEY DEP - RADON QC CONTRACT COLLABORATION -
A MODEL FOR AARST RADON CHAMBERS NATIONWIDE
IN THE POST-EPA/RMP ERA**

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ABSTRACT

In expectation of the pending privatization of radon calibration services in lieu of the respective EPA program, considerable interest is paid this "growth sector", as is proven by the AARST directory business listings. Yet Eric Geiger (1987-91) spearheaded an alternate effort with Radon QC and NJ-DEP/PA-DER, which we have continued (1991-1995) in Illinois and now in Colorado.

The New Jersey Department of Environmental Protection (NJDEP) imposes rigorous qualification criteria for its Radon Measurement Proficiency (RMP) Program upon its applicants, which include the capability of the chamber(s), standard operating procedures, quality assurance program, primary and secondary monitors calibration schedule, potential conflicts of interest of the operator(s), their qualifications, NJRMPP performance reporting and record keeping, as well as chamber mapping for homogeneity of exposure, flow monitoring for air velocity, and gamma surveys. The State has been conducting inspections of chambers on location and, upon our suggestion, is now accepting video records in addition to hard-copy documentation for approval. We have found the NJ State's QA/QC measures to be a great contribution to radon chamber work.

From a large number of radon proficiency tests for all types of radon gas and progeny measurement devices for NJ radon measurement services, which will be elaborated upon in the paper, we have learned that a cooperative program can be of great service to all. Though the paperwork and procedural steps may benefit from improvements before adapting the New Jersey Program for national purposes, important lessons can be learned:

- A) Minimal cost to the sponsor of the program - payroll and communications
- B) Market driven costs to the participants - every facility sets their own fee schedule
- C) Chamber locations become less important than their service capability and desire, supported by competitive delivery services as FedEx, UPS, Airborne, US Mail.
- D) Service opportunities to the radon community are in continued, great demand.

INTRODUCTION

When Eric Geiger founded Radon QC in 1987 in Palmer, PA, he located the triple radon chambers half-way between Harrisburg, PA and Trenton, NJ, so as to demonstrate his primary objective. Radon QC was to serve the burgeoning radon concerns of these two states, as well as the radon programs of the PA-DER and the NJ-DEP, who at that time had created the strongest state radon programs in the Nation. Indeed, Eric qualified as a radon chamber under the NJ radon measurement proficiency program in 1990, and he carried out chamber work for both states, as well as for many other states and interests.

We owe it to Mr. Jed Harrison of the USEPA that we heard at the EPA-AARST radon conference in Philadelphia early in 1991 that Radon QC was to close down. We were able to keep the facility with all of its amenities operational, first in Northbrook, IL and, since late 1993 in Lakewood, CO. We re-qualified as a radon proficiency testing facility under the NJRMPP in both locations. The present effort by the EPA, AARST and panels

of reviewers to come up with an RCQ (radon chamber qualification) proficiency program on a national scale under the auspices of and in private support of the EPA Radon Program has stimulated this present effort of reviewing the experience of the NJDEP-Radon QC collaboration during the past six years, so as to derive insights that may be imparted upon the new, extended industry-government cooperative that appears to be in the making.

ACKNOWLEDGMENTS

We wish to acknowledge the support of the NJDEP to make this joint paper possible, including Chief Stern, Mr. DiBalsi, Dr. Lipoti, Ms. Sandra Tomezik and Dr. Mohammed S. Rahman. Neither they nor the NJDEP are in any way responsible for the views presented in the following. It is hoped that the spirit of cooperation demonstrated here may set a good example for the efforts put forward by the Federal radon program and by the radon industry and its professional organization. Mr. Sam Poppell, EPA RMP Program Manager, and Prof. Jon Broadway, Auburn University, have provided draft materials and discussion which have helped shaped this paper. Yet the views and conclusions given are the authors' only.

THE NEW JERSEY RMP PROGRAM

The New Jersey Register of November 19, 1990 published New Jersey's rules for the certification of radon testers and mitigators (N.J.A.C. 7:28-27.9(a)ii(1-5)). At about the same time, the New Jersey DEP - Bureau of Environmental Radiation established their Radon Measurement Proficiency Program (RMPP) for the use of radon calibration chambers, measurement businesses and laboratories. They made available application forms for the RMP program and set forth rigorous steps to be followed both by the radon chambers and by the applicants to be qualified under the program.

To our knowledge, Radon QC was the first chamber to work with the NJDEP.

Any change in a chamber's approved set-up or location will require re-certification, and we have gone through two such procedures due to the moves to Illinois and to Colorado. To become qualified as a NJRMPP Calibration Facility is not an easy nor a rapid process. One may expect 6-12 months until the desired "Letter of Agreement", signed by the representative of the State, will be in hand. We give some excerpts in the following.

The NJDEP accepts responsibility for informing radon testing companies that the radon chamber in question meets NJDEP's requirements. They will help resolve any conflicts between a chamber and a participant. And they will conduct unannounced routine inspections of custody records, calibration records, and check source checks between chamber intervals.

The contract radon chamber is responsible for the timely execution of radon monitor exposures and their movement and record keeping and reporting involving the applicant, the chamber and the NJDEP. Semi-annual uniformity checks and intercomparison data with EPA or DOE-EML must be provided. In addition, NJDEP devices are to be exposed several times per year. The SOP and QA/QC procedures submitted and accepted by NJDEP must be followed at all times. Each measurement device used in operating the chamber must have passed a recent EPA-RMP test. Background radiation readings must be provided, and scheduling, reporting and retesting deadlines must be closely observed. A summary of NJDEP application, client and analyst reporting and chamber overall record forms is given in Figure 1. Please note that the chamber analyst's report allows room for "Comments". Use of this space is made quite profusely, and it is suggested that any future National program should also provide for more information provision in addition to the MVi,TVi and IRE.

A fee schedule must be provided the NJDEP, and change notices must be filed for any anticipated changes at least two weeks prior to implementation. The participating radon chamber must also certify that it has no interest, financial or otherwise, in any radon measurement or mitigation business which is doing business in the State of New

Jersey.

To our knowledge, there have been three radon chambers interested in and contracted with by the NJDEP. The other currently listed radon chamber is Bowser-Morner in Dayton, OH. The Atlanta, GA facility of Radon Reduction & Testing was also active for a good part of the report period, and is presently engaged in re-certification.

Let us take a brief look at the NJRMPP outline laid down in 1991, which a radon chamber must follow. The objective of the program is to provide a means of implementing a consistent radon measurement test for different radon measurement devices. Specific requirements are divided into Technical, Procedural and Evaluation of Test Results. (Proof of fulfillment of the technical requirements must be made during the application process).

The radon chamber must allow radon/ progeny concentration control within a range of 1-100 pCi/l or 0.005 - 0.5 WL with an accuracy of +/-10%, at the 95% confidence level, at 25 pCi/l or 0.125 WL. Equilibrium ratios from 20 to 60 % must be achievable. Air velocities inside the chamber must be slow and within prescribed tolerances. Temperatures must be between 50-80 degrees F and humidities between 20 and 80% RH, controllable upon demand. Both passive and active devices must be accommodated for calibration in close approximation of their respective operating parameters in the field. The uniformity of the radon/ progeny levels must be ascertained quarterly within 5% over the volume of the operating chamber space by "chamber mapping". The same holds for gamma background radiation.

The monitoring of the radon chamber for radon gas and progeny levels must be continuous. The devices being used must be calibrated quarterly and checked at all times using check sources. Traceable (NIST) sources shall be used both for radon gas and progeny. A conditioning period of at least 6 hours is required prior to use.

Procedural rules govern the exposure of instruments requiring operators and that cannot be mailed for the test. They include continuous monitors and their programming and grab samplers, though some of these may be in need of updating due to changed EPA rules. Short-term devices (2 days to one month) shall be exposed according to the applicant's instructions, and long-term devices (1 month to 1 year) may be exposed in elevated radon concentrations for at least seven days.

The evaluation of test results on the basis of the individual relative error (IRE) between the measured and target value is identical with the well-known EPA procedure. So are pass/fail and retest procedures. Also the participation methods are identical with those offered in national EPA testing. Different are comment space and communications between clients and the testing facility with the goal to clear up problems in a cooperative manner and to make the greatest use of insights and observations that may otherwise be lost.

Needless to say - adhering to the requirements of the NJDEP will make any chamber facility enormously better and more useful than it was before.

THIS CHAMBER'S EXPERIENCE IN WORKING WITH THE NJRMPP

As a NJRMPP proficiency testing facility, Radon QC has always endeavored to help avoid some of the hardships unavoidable in a huge, impersonal program such as the EPA RMP. With the continued evolution and specialization of radon detection devices, and to an extent their automatic evaluation, participants in the program occasionally have become overwhelmed by the complexity of the matter. In such cases we have put ourselves in the shoes of the applicant, and have helped with clarification and understanding so as to bring about resolution of a problem. This is possible without jeopardizing the purported objective of the program - consistency of measurement. Even though out of hundreds of testing episodes, only a handful may have required some guidance - it is these few experiences that one remembers as having been of greatest value to all concerned, and probably to the NJ radon test consumer as well.

In providing radon concentrations in a chamber, one can either control the radon levels closely or allow the radon to "run" in keeping with barometric and other overriding parameters, thus simulating a "natural" flow of concentrations. While accumulating devices such as electrets or alpha-track devices will be rather indifferent toward such diurnal fluctuations, charcoal canisters and LS devices may show some sensitivity and memory effects, which may be considerably enhanced by humidity increases. Thus, the chamber is in a position to "test" the limitations of some of these adsorptive devices, which sometimes are being deployed by testers beyond their design specifications. Careful communications can help clarify errors or misunderstandings, and can put a device application back on track that otherwise might have ended up in a disappointing failure without any light at the end of the tunnel.

Automated electret readers sometimes confuse their short- and long-term programs, and come up with disappointing results. LS laboratories may use the wrong scintillation cocktail, and despite excellent blank and standard sample reads come up with highly precise, yet terribly inaccurate radon reports. The same experience applies to some alpha track results due to complex processing steps which sometimes defy even the most thoughtful controls. With electrets, we have experienced spurious voltage losses in shipping, so that we now prefer to do control readings before and after exposure, to give the client an extra measure of confidence. This helps avoid failing an applicant because of a random loss of, say 13 volts between Hackensack and Colorado, which recently happened.

We receive most of our client devices either through Federal Express, UPS, Airborne or the US Mail. We attempt to return devices in keeping with client instructions and at their expense, as shipping is outside of our quote. In all these years, we have never lost a shipment, regardless whether we used Priority second day mail or the highest priced express service.

Usually, passive device exposures require either several different exposure durations or different radon concentrations or humidities, or all of the above. Here, Eric Geiger's vision comes to play of providing us with three chambers and therefore three radon concentrations. We specialize in putting client's devices into different radon environments and make them all come out ready for shipping on the same day, preferably a Monday, but never a day inconvenient for the NJ client.

The NJDEP has shown great patience and collaborative attitude during all our efforts. They are very adaptable when caught in a bind. For example, for re-instating Radon QC after the move to Colorado, they required a re-inspection of our facility. Upon our suggestion, the NJDEP agreed to accept a video recording of a tour of the Radon QC facility in lieu of a field visit. We subsequently video-taped our chamber mapping and other episodes and sent the tapes to Trenton, and then visited the State's facility for a discussion and further elaboration on the recorded information.

We understand that, at this time, the NJDEP requires video records of all chamber applicants as part of the evaluation and approval process. - We have suggested to the EPA to accept similar procedures for the future EPA-RCQ evaluation process so as to conserve government travel expenses.

Nobody particularly likes compliance with rules and regulations imposed by government agencies. Most radon interests have suffered through "rounds and rounds" of RMP requirements and activities. One of the best performers in dealing with the EPA RMP Program and a nationally known instructor and consultant once confided that participating in the RMP was like playing "Russian Roulette". No matter how good you thought you were, you better enter as often as you could afford, to increase your chances of passing at least once !

Our experience with the NJDEP has been different. The program is not anonymous. You are dealing with real people. You are still doing blind tests, to be sure, but you will find guidance if you need it. The NJDEP gives the impression that their existence is not a purpose in itself. They need our success as their reason for being, and they act accordingly. At least, this has been our impression. Some of you New Jersey fee payers may not agree, or you may agree that your success is their success, literally. Would this not make a fine model for the EPA program, though?

A LOOK AT THE RADON CHAMBER QUALIFICATION (RCQ) PROFICIENCY PROGRAM DRAFT OF THE EPA FROM A NJRMPP PERSPECTIVE

In keeping with past EPA documents such as the RMP and RCP program descriptions and resulting applications, the National radon chamber program attempts to include everyone in becoming a national RCQ radon chamber testing facility, so as to spread the costs of the program over as large a number of participants as can possibly be motivated to apply. This commendable endeavor is probably anchored in the Constitution of the United States of America, and/or in the rules of the Bureau of the Budget which will not allow that the disbursement of Federal funds can be limited to any restricted segment of the population.

Yet there may be some food for thought in the above material from the State of New Jersey. There may be a way of getting a "skeleton program" going on the basis of existing, albeit qualified chambers that have proven over the years to be able to perform proficiency testing services for one of the most demanding radon interests in the World, - the New Jersey DEP Bureau of Environmental Radiation. The skeleton group need not be exclusive or final, but merely a beginning for anyone desirous to follow in due course. It is to be expected, though, that enormous funding may be saved if a sole source approach would be applied to begin with, rather than a totally open national chamber recruitment program.

The application and qualification program envisioned by the EPA RMP Program for the qualification of RCQ applicants bears all the marks of past national programs from better times, particularly involved program steps with week-long exposure periods attended by RCQ hopefuls in EPA chamber locations, and with years of processing for interim and final approval steps, followed by annual requalification exercises. All this must by necessity lead to expensive chamber work, as all the costs must be passed on to the radon testing and mitigation community. For anyone but a "pure" chamber aficionado, there may even be conflicts of interest involved. - It is difficult and expensive to qualify for a radon chamber facility, even under such ideal conditions as they have been provided by the NJDEP.

Radon QC hopes that the EPA RCQ Program may consider the experience of the NJDEP RMP program in furthering their own RCQ program development. If money were no object, then by all means we should knock at every door, travel to every hamlet, convert every person with a radon interest or understanding to be an RCQ facility, so as to be able to spread the program costs over many, many participants.

But would it not be more rational, expedient and economical to start from the top down, rather than from the bottom up ? - If this paper has been able to raise a reasonable doubt in this approach, then it has been worth doing it.

CONCLUSIONS

The State of New Jersey has created and administered their RMP program through the use of qualified radon chambers as a means of implementing consistent radon measurement testing on different devices. Their considerable experience and success may serve as a model for the forthcoming EPA RCQ program.

1. The NJDEP has not solicited radon chamber services from large numbers of program participants, but has accepted unsolicited applications from a few interested laboratories and has helped them to qualify under the strict rules set forth by the State. Their standards were and are by no means light, and it is sometimes wondered why anyone would wish to undergo the rigorous qualification procedure. But their door is open, and anyone who so desires can come in and apply at any time.

2. Radon chamber facilities operate around the year, 24 hours a day. Fees for services have gone down during the past 6 years, and the trend will continue downward. There are no free-standing radon chambers that can earn their cost as other, independent businesses do. Radon chambers need to be supported either by the public, by

wealthy holding companies, well-to-do owners, a hobbyist attitude, or some of the above.

3. Perhaps the most significant difference between the NJDEP's radon testing program and the National program is the encouragement of commenting and of exchange of ideas and experiences. One outgrowth of this "New Jersey Attitude" is this very paper itself, and the demonstration of the needs and rewards of a service emphasis even in a government program which is solidly anchored in State Documentation.

4. The NJDEP has demonstrated that a radon chamber program can be operated within the state environmental radiation program without significant expense. Perhaps it is toward this goal that they have developed an excellent rapport with their contract chambers, without whom their program would not work. But who cares - this is a free Country, and the EPA is free to follow in New Jersey's footsteps.

ATTACHMENT I
ANALYSIS REPORTING FORM

Date results must be received

Application for New Jersey Radon Measurement Proficiency Program

WARNING: Please do not attempt to complete this application without reading the line-by-line instructions.

Make a copy of this form for each device you wish to enroll. Incomplete applications and those with incorrectly placed or illegible information will not be accepted.

IF YOUR COMPANY DOES NOT ANALYZE DETECTORS OR MAKE DIRECT MEASUREMENT, DO NOT SUBMIT THIS APPLICATION

Please print or type

1. Select the measurement device (one only) for this application from the list below. Circle the abbreviation for that device.

- AC = Activated Charcoal Adsorption
- AT = Alpha-track Detectors
- LS = Charcoal Liquid Scintillation
- RP = RPIIU (Radon Progeny Integrating Sampling Unit)
- EL = EIC (Electret Ion Chamber) - Long term
- ES = EIC (Electret Ion Chamber) - Short term
- CR = Continuous Radon Monitors
- CU = Continuous Working Level Monitors
- GR = Grab-sampling -- Radon
- GW = Grab-sampling -- Working Level
- OT = Other EPA approved method

CIRCLE ONE METHOD ONLY

AC AT LS RP EL
CR CU GR GW ES
OT

2. Contact Name: Title _____ First _____ MI _____ Last _____
Alternate: Title _____ First _____ MI _____ Last _____

3. Company Name: _____

NJDEP Certification #: _____ (if known)

Dept./Div.: _____

4. Mailing Address: Street: _____ P.O. Box/RFD: _____
City: _____ State: _____ Zip: _____

5. Business Location: _____
(if included above write "SAME") City: _____ State: _____ Zip: _____
Give the physical location of (or directions for finding) your business, incl. a P.O. Box or RFD No.

6. Telephone (list no more than 2): (____) _____ (____) _____

7. Inventory List: Complete Part (a) OR Part (b); Do NOT complete both.

a. Mail-in device (Complete this section for AC, AT, LS, RP, ES or EL only)

Detector Brand: _____ Type/Model: _____

Exposure Time (Range in Days) Int Supplier Name: _____

to _____ Days Street: _____ PO Box/RFD: _____

City: _____ State: _____ Zip: _____

Measurement Business Name: _____

Address: _____

Method: AC, AT, LS, RP, ES, EL, CR, CW, GR, GW (Circle One)

NJDEP Certification Number (if known) _____

Date Received at Radon Chamber: / /

CHAMBER ENVIRONMENT

Air Velocity _____ m/sec

Concentration particulate _____ CN/cc (Condensation nuclei/cc)

EXPOSURE DATA Note: All times are in 24 hr (military) units.

Exposure	Time In	Time Out	Temp	Rel. Humidity
_____	Time _____ Date ____/____/____	Time _____ Date ____/____/____	_____ °F	_____ %
_____	Time _____ Date ____/____/____	Time _____ Date ____/____/____	_____ °F	_____ %
_____	Time _____ Date ____/____/____	Time _____ Date ____/____/____	_____ °F	_____ %
_____	Time _____ Date ____/____/____	Time _____ Date ____/____/____	_____ °F	_____ %

PARTICIPANT ANALYTICAL INFORMATION & MEASURED RESULTS

Participant Detector/Instrument Code	Chamber Detector Code	Device MFR's or Working Level	2730K only Air flow Stop	CHAMBER REL. HUM. DATA
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Background Radiation Reading: _____

Comments: _____

I hereby affirm that the information appearing on this Analysis Reporting Form was acquired in analyses performed by: _____ (Name of Participant)

Report # 7/3/95

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Figure 1

RADON QC
9656 WEST OHIO DRIVE
LAKEWOOD CO 80226

1995 NJ DEP Log - Tracking Record of Exposures

NJDEPP. Item 1 Control # / Applicant Name Date	Item 2 Control # / Applicant Name Date	LOGBOOK Item 3 Operator Name	Item 4 ID Check	Item 5 Device Type	Item 6 Serial #	Item 7 Time in d/h Operator	Item 8 Time out d/h Operator	Item 9 Chamber	Item 10 Chamber	Item 11 Chamber	Item 12 Chamber TVI	Item 13 Date Result rec'd by CH.	Item 14 Date Result rec'd to App.	Item 15 Date Result sep. NJDEPP	Item 16 Date job compl. filed
0/12/95 1		Bruno Sabets	done	CC 4" 2-day	16520 - 16520 (5)	0/12/ 12:15 BES	0/14/ 12:15 BES	yellow			30.3	0/20/95	0/21/95	7/3/95	7/3/95
0/12/95 2		Bruno Sabets	done	CC 4" 2-day	16525 - 16526 (5)	0/12/ 12:15 BES	0/14/ 12:15 BES	green			11.2	0/20/95	0/21/95	7/3/95	7/3/95