APPENDIX B
Forms, Logs, and Checklists

Exploratory Study of Basement Moisture During Operation of ASD Radon Control Systems

Contractor Report to EPA

December 6, 2007

The following documents were used during the project to gather information, report on conditions, or to document house visits.

- □ Participant Application Checklist
- □ Phone Interview Form
- □ Walk-through Checklist
- □ Building Moisture Log
- □ Temporary Use Permit
- □ Sensor Wiring Datalogger Log
- □ Event & Activity Log
- □ House Visit Log (PA03)
- □ Grab Sample / Radon Sniffing Form
- □ Mitigation Cycling Log (PA03)
- □ Ventilation Log
- □ PFE Form

Moisture Study
Participant Application Checklist

Name _____ Date _____

Address _____ Surveyor _____

_____

Home Phone: _____

Other Phone: _____

Critical Criteria

1	Do you own the home that you occupy?	☐ Yes	☐ No	Comments: _____
2	Is the home a single-family dwelling?	☐ Yes	☐ No	Comments: _____
3	Is the home detached from other dwellings?	☐ Yes	☐ No	Comments: _____
4	Is there a basement beneath the entire house?	☐ Yes	☐ No	Comments: _____
5	Are all of the basement walls surrounded by soil?	☐ Yes	☐ No	Comments: _____
6	Do you expect to move in the next 18 months?	☐ Yes	☐ No	Comments: _____
7	Is there a dampness problem in the basement?	☐ Yes	☐ No	Comments: _____
8	Describe the dampness in the basement: _____			
9a	Apparent source of the dampness _____			
9b	When does the dampness occur? _____			
10	Does the basement flood or have liquid water entry?	☐ Yes	☐ No	Comments: _____
11	Is the basement occupied?	☐ Yes	☐ No	Comments: _____
12	Is the basement finished?	☐ Yes	☐ No	Comments: _____
13	Is there floor covering on the basement floor? (If yes, list)	☐ Yes	☐ No	List: _____
14	Are there stairs between the upstairs and the basement?	☐ Yes	☐ No	Comments: _____
14a	Is there a door between the basement and the upstairs?	☐ Yes	☐ No	Comments: _____
15	What is the construction of the basement exterior walls (poured, hollow block, filled block, etc.)? _____			
16	What is the age of your home? _____			Comments: _____

Negotiable Criteria

17	Are there moldy, musty, or earthy odors in the basement?	☐ Yes	☐ No	Comments: _____
18	Have you measured the radon levels in your home and basement?	☐ Yes	☐ No	☐ Don't Know
18a	If so, do you know the levels? _____			
19	Is a radon control system installed in your home?	☐ Yes	☐ No	Comments: _____
20	Is there a forced air furnace, air conditioner, or ducting in the basement (if yes, circle all that apply)?	☐ Yes	☐ No	Comments: _____
21	Is there gravel below the basement floor?	☐ Yes	☐ No	☐ Don't Know
22	Is there a sump to collect water in the basement?	☐ Yes	☐ No	Comments: _____
23	Other Comments: _____			

Phone Interview

Occupant Name _____
Date _____

Intro to Project

- Partnership with PADEP, USEPA, and Auburn Univ. to study moisture reduction in basements using standard radon control systems
- Study length 12 - 18 months
- No cost to occupants
- Intensive monitoring of moisture, radon, temp, weather and others with installed instrumentation
- 3-day set-up of instrumentation, most in basement some outside and upstairs
- Will require putting small temporary holes in walls and floor of basement; running cables, hanging instruments
- Periodic visits to home by PADEP staff member (max: 1 to 2 times per week) to check instruments, conduct other tests and measurements
- Occupants will be asked to keep a diary of activities and unusual conditions
- Installation of an active soil depressurization (ASD) radon control system (2-3 days) to reduce indoor radon and moisture levels. Requires installing 3-4" PVC pipe through floors/walls and routing to a small fan in the attic or garage
- System will be turned on and off on a schedule ranging from 12 hrs to 2 or 3 weeks during the project
- At conclusion of project, all instrumentation will be removed, holes will be repaired
- Control system will remain with the house (unless occupants prefer it to be removed)

Additional Information

- Verify questionable data

- Home Construction
- Approximate size
- Number of stories

- Elaborate on dampness problem in basement

- Basement Details
- Occupancy patterns and activities
- Pets
- Storage
- Wall and floor finishes

- Name of builder

- Days/Hours of access to home

- Radon testing

- Walk-through schedule

WALK-THROUGH CHECKLIST
PENNSYLVANIA HOUSES

Name:_____ House ID _____

Address: _____ Date _____
_____ Time _____
_____

Technician(s): _____

Occupant Information

1. Occupants
   a. Number of occupants _____ [no. of children _____]
   b. Number of smokers _____ [type of smoking & frequency _____]

2. General Indoor Environmental Quality:
   a. Complaints about the air (stuffiness, odors, respiratory problems, watery eyes, etc.):

   b. Any indications of mold, moisture problems, humidity, or condensation:

   c. Do the windows fog during the heating season:

   d.. Has home experienced flooding, water leaks, or sewage backup from inside or outside that caused standing water damage:

3. Number of plants in the home:

4. Other:
   a. Photographs of the house during construction.

   b. Unique features of the house.

   c. Hours during which house is available for visitations.
      - Alternative phone numbers:

   d. Consent to drill inspection holes and install instrumentation

EPerm Radon Measurements

1. Test No. 1
   Sampling dates _____
   Sampling location _____
   Radon concentration (pCi/l) _____

2. Test No. 2
   Sampling dates _____
   Sampling location _____
   Radon concentration (pCi/l) _____

Temperature / RH Measurements

First Floor Location: _____ Temp _____ RH _____
Basement Location: _____ Temp _____ RH _____
Outdoor Location: _____ _____Temp _____ RH _____

BASIC HOUSE INFORMATION

1. Year house built _____ [remodeling date _____]

2. Domestic water source:
   - ☐ municipal surface
   - ☐ municipal well
   - ☐ private on-site well
   - ☐ other: _____

3. Building construction [complete drawings of site, floor plans, and elevations]

   Superstructure
   a. Number of stories above grade: _____
   b. Construction type and materials: _____
   c. Estimated leakiness of shell: ☐ tight ☐ moderate ☐ leaky
   d. Other features: _____

   Substructure
   - ☐ Full basement (basement extends beneath entire house)
   - ☐ Full crawlspace (crawlspace extends beneath entire house)
   - ☐ Full on-grade (floor extends beneath entire house)
   - ☐ House elevated above ground on piers
   - ☐ Combination basement and crawlspace
   - ☐ Combination basement and on-grade
   - ☐ Combination on-grade and crawlspace
   - ☐ Combination on-grade, basement, and crawlspace
   - ☐ Other -- specify: _____

4. Mechanical and combustion appliances (type, fuel, location)
   a. exhaust fans _____
   b. clothes dryer (vent location)_____
   c. clothes washer _____
   c. forced air furnace _____
   d. domestic hot water heater _____
   e. air conditioning _____
   f. woodstove/fireplace _____
   g. whole house/attic fans _____

5. Existing radon control measures
   Type and description: _____
   _____
   Date installed: _____

6. Other moisture producing equipment (humidifier, steam room, etc.): _____

7. Signs of mold or moisture damage indoors: _____

8. Condition of gutters and downspouts: _____

9. Drainage and grading around house: _____

10. Signs of water damage on outside of building: _____

11. Location for instrumentation: _____

BASEMENTS

1. Usage: [occupied, unoccupied] _____

2. Access to basement: [door, hatch, etc.] _____

3. Depth of basement floor below grade _____

4. Accessibility to floors and walls: _____
   a. Storage or other items in basement: _____

5. Basement Walls:
   a. Foundation materials
      ☐ hollow block [filled ____] ☐ poured concrete
      ☐ solid block ☐ field stone
      ☐ other: _____

   b. Exterior/interior insulation: _____

   c. Finish materials (frame, stucco, etc.): _____

   d. Interior load-bearing walls: _____

   e. Visible openings to soil _____
      _____

   f. Signs of moisture/mold: _____
      _____

   g. Windows: _____

6. Basement Floor:
   a. Materials
      ☐ poured concrete slab [aggregate layer _____]
      ☐ block, brick, stone: _____
      ☐ exposed soil
      ☐ other: _____

   b. Finish materials (paint, carpet, linoleum, etc.): _____

   c. Visible openings to soil _____
      _____

   e. Signs of moisture: _____
      _____

7. Tightness of floor between basement and first floor: ☐ tight ☐ moderate ☐ leaky

8. Fireplace structure: _____

9. Forced air HAC system or ductwork in basement: _____

10. Water Drainage:
    a. sump (pump: yes/no): _____
    b. footer drain [exterior, interior, location _____]
    c. perimeter (french) drain
    d. floor drains

11. Dehumidifier usage and information: _____

CRAWLSPACES

1. Usage: _____

2. Access to crawlspace (door, hatch, etc.): _____

3. Accessibility to floors and walls: _____

4. Depth below grade _____ft. [headroom _____in]

5. Crawlspace Walls:

   a. Foundation materials
      ☐ hollow block [filled ____]
      ☐ solid block
      ☐ poured concrete
      ☐ field stone
      ☐ other: _____

   b. Finish materials _____

   c. Support piers in crawlspace: _____

   d. Visible openings to soil _____
      _____

6. Crawlspace Floor:

   a. Materials
      ☐ poured concrete slab [aggregate layer _____]
      ☐ plastic sheet or other membrane: _____
      ☐ block, brick, stone: _____
      ☐ exposed soil
      ☐ other: _____

   b. Visible openings to soil _____
      _____

7. First Floor :
   a. Materials: _____
   b. Tightness of floor between crawlspace and first floor: ☐ tight ☐ moderate ☐ leaky

8. Forced air HAC system or ductwork in crawlspace _____-_____

9. Crawlspace vents [number _____, location _____]

ON- OR NEAR-GRADE FLOORS

1. Usage: _____

2. Accessibility to floor/walls from inside: _____
   outside: _____

3. Floor

   a. Materials
      ☐ poured concrete slab [aggregate layer _____]
      ☐ block, brick, stone: _____
      ☐ exposed soil
      ☐ other: _____

   b. Elevation of floor relative to surrounding soil: _____

   c. Insulation around perimeter of floor: _____

   d. Visible openings to soil _____
      _____

   e. Describe floor/wall interface: _____
      _____

4. Interior load-bearing walls: _____

5. Location of forced air HAC system ductwork: _____

6. Fireplace structure: _____

7. Water Drainage:
   a. footer drain [exterior, interior, location _____]
   b. floor drains

Building Moisture Log

Occupant Name: _____

Study House ID: _____

Visit Description: _____

Date: _____

Person(s) Performing Measurement and Assessment: _____

Measurement Instruments: _____

Test Location	Approx. Size	Measurement			Type of Material	Appearance of Surface	Possible Moisture Source(s)	Other Comments/ Observations
		Time	Type (Survey/Pin)	Reading				

TEMPORARY USE PERMIT

For purposes of this agreement:

1) An "occupant" is a person legally entitled to possession of the premises.

2) An "investigator" is an employee or representative of: the Southern Regional Radon Training Center (Auburn University) or the State of Pennsylvania under the sponsorship of the U.S. Environmental Protection Agency.

The occupant of the premises located at
_____,
grants permission to the investigator to enter such premises from (date) _____ to (date)_____, between the hours of _____ and _____, for the purpose of conducting research on the entry and accumulation of moisture and radon in dwellings, and on innovative methods to reduce indoor concentrations of these pollutants.

The occupant understands that the work is experimental in nature, that testing or installation of equipment may cause a temporary increase in moisture or radon concentrations and that the investigators cannot promise the success of any method to reduce indoor moisture or radon concentrations.

Any data developed from research conducted on the occupant's premises will be the property of the investigators and may be made available to the public in statistical form, without the occupant's name and address. Upon request, the investigators shall give the occupant a copy of the data. The investigators assume no responsibility to provide information at any particular time or in any specific manner. The occupant understands that the investigators make no warranty, express or implied, that the information provided to the occupant or developed by the research is accurate, complete, or useful.

Any system installed to control indoor pollutant levels will be at no cost to the occupant and will remain with the residence upon project completion. Installation is subject to prior approval by the occupant.

The occupant understands that the investigators will exercise reasonable care: (1) not to injure the occupant, the occupant's guests, the occupant's property, or the premises; and (2) not to interfere with the occupant's use of the premises except as necessary to undertake the actions provided in this agreement. The investigators will make a reasonable effort to repair damage to the premises caused by the testing or installation work.

The occupant shall indemnify, hold harmless and defend the investigators from any and all claims and suits for any reason whatsoever arising out of the actions permitted herein.

Dated this _____ day of _____, 20___

By _____

_____
Occupant(s)

_____
Investigator

Data Logger Description _____ House ID _____

SENSOR, WIRING, and DATALOGGER LOG

Data Logger Description & Serial Number _____ House ID _____
Multiplexer Description & Serial Number _____
Location _____

Channel No.	Sensor Description	Serial No.	Sensor Location	Wire No.	Date Installed	Installer Initials	
DATALOGGER							
P1							
P2							
P3							
P4							
1H							
1L							
2H							
2L							
3H							
3L							
4H							
4L							
5H							
5L							
6H							
6L							
7H							
7L							
8H							
8L							

Data Logger Description _____ House ID _____

Channel No.	Sensor Description	Serial No.	Sensor Location	Wire No.	Date Installed	Installer Initials	
MULTIPLEXER							
1H							
1L							
2H							
2L							
3H							
3L							
4H							
4L							
5H							
5L							
6H							
6L							
7H							
7L							
8H							
8L							
9H							
9L							
10H							
10L							
11H							
11L							

Data Logger Description _____ House ID _____

Channel No.	Sensor Description	Serial No.	Sensor Location	Wire No.	Date Installed	Installer Initials	
12H							
12L							
13H							
13L							
14H							
14L							
15H							
15L							
16H							
16L							
17H							
17L							
18H							
18L							
19H							
19L							
20H							
20L							
21H							
21L							
22H							
22L							
23H							
23L							
24H							
24L							

Data Logger Description _____ House ID _____

Channel No.	Sensor Description	Serial No.	Sensor Location	Wire No.	Date Installed	Installer Initials	
25H							
25L							
26H							
26L							
27H							
27L							
28H							
28L							
29H							
29L							
30H							
30L							
31H							
31L							
32H							
32L							

EVENT AND ACTIVITY LOG

HOUSE ID _____

OCCUPANT NAME _____

Examples of Important Events or Activities to Record:

- *Heavy Rain or Snow or Stormy Conditions*
- *Flooding*
- *Power Outages*
- *Fireplace Use*
- *Extended Use of Exhaust Fans*
- *Carpet or Rug Cleaning*
- *Many Open Windows or Doors*
- *Parties (or other large gathering of people)*

Questions or Problems? *Call Bob Lewis, PADEP, 783-4870, or Brad Turk, EBSI, 866-426-0723*

DATE	TIME	DESCRIPTION OF EVENTS OR ACTIVITIES

House Visit Log
EPA Moisture Study

House PA-03

Name_____
Address_____
Address_____
Phone_____ (hm)
Phone_____ (wk)

Date/Arrival time: _____/_____

Download info:

Data Logger #	Download time	Time Difference PC vs Station	Initials
1	_____	_____	_____
2	_____	_____	_____

Pump info:

Pylon AB-5/PRD Serial #	Air Pump Serial #	Location	Flow Rate current (cc/min)	Flow Rate last week (cc/min)	Initials
429 /	9	Floor C1	_____	_____	_____
694 /	5 (258)	Wall W14	_____	_____	_____
441 / 372	6	ASD Exhaust	_____	_____	_____

Comments/Observations: _____
_____
_____
_____
_____
_____
_____
_____

Grab Samples

Residence: _____ Date:_____

Sample each unique building zone to determine if any building zones have relatively high indoor radon that would help identify a predominant area of radon entry. Sample under normal house conditions, i.e. no increased house depressurization.

House

Location	Cell S/N	Stop Time	Result
Basement			
First Floor			
Second Floor			
Garage			
Crawl Space			
Slab-on-grade			
Over Crawl Space			

To simulate maximum heating season depressurization, use fan to depressurize basement to about –10 Pa. This will encourage more rapid radon entry and swamp variable environmental effects (wind).

Test Holes

Location	Cell S/N	Stop Time	Result
F1			
F2			
F3			
F4			
F5			
F6			
F7			
F8			
F9			
F10			
W1			
W2			
W3			
W4			
W5			
W6			

Grab Samples, Cont.

Suspected Entry Points

Location	Cell S/N	Stop Time	Result

Miscellaneous

Location	Cell S/N	Stop Time	Result

If grab sample results are greater than room air samples and pressure field at that point is positive, then system performance should be boosted.

Mitigation Cycling Pattern Log

PA03

ON
- Fully Open 3 Valves
- Turn Fan On
- Close Sump Lid
- Record Date/Time

OFF
- Open Sump Lid
- Turn Fan Off
- Completely Close 3 Valves
- Record Date/Time

24-hour Cycling -- 4 Repetitions (8 days)

	On #1	Off #1	On #2	Off #2	On #3	Off #3	On #4	Off #4
Scheduled: Date								
Time								
Actual: Date								
Time								
Name								

3-day Cycling - 4 Repetitions (24 days)

	On #1	Off #1	On #2	Off #2	On #3	Off #3	On #4	Off #4
Scheduled: Date								
Time								
Actual: Date								
Time								
Name								

7-day Cycling - 4 Repetitions (56 days)

	On #1	Off #1	On #2	Off #2	On #3	Off #3	On #4	Off #4
Scheduled: Date								
Time								
Actual: Date								
Time								
Name								

Questions?

Bob Lewis & Matt Shields, PADEP: 783-4870

Brad Turk, EBSI: 1-866-426-0723

Ventilation Measurement Log

Technicians: _____

House Conditions & Notes: _____

_____

_____

House ID: _____

Test Set-up Date/Time: _____

ASD Condition (Off/On): _____

Test Stop Date/Time: _____

Tracer Sources

Heater ID	Vial ID	Location	Heater Temp Setting	Hobo Clock OK?	Hobo LED On?	Download		Comments
						Date / Time	File Name	

Samplers

Sampler Case ID	Sample Bag ID	Calib Sample?	Sample Location	Pump Flow OK?	Timer Clock OK?	Timer Program OK?	Sample Start Day / Date / Time	Sample Stop Time	Comments
							/		
							/		
							/		
							/		
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							/		
							/		

Pressure Field Extension Measurements

Technician(s): _____ House ID: _____

Date: _____

Description of House/Mitigation Conditions: _____

	HVAC On ΔP (Pa) or Smoke Movement Bsmt Ref		HVAC Off ΔP (Pa) or Smoke Movement Bsmt Ref	
Test Location/ID	**ASD On**	**ASD Off**	**ASD On**	**ASD Off**
Basement-1st Flr				
Basement-Outdoor				

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