ADM37-13
IEBC: 106.2.6 (New), Chapter 16

Proposed Change as Submitted

THIS CHANGE WILL BE HEARD BY THE EXISTING BUILDING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMMITTEE.

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Add new text to the International Existing Building Code as follows:

IEBC 106.2.6 Certifications and plans where painted surfaces are disturbed. Where a Group E, I-4, R-2, R-3 or R-4 occupancy was completed prior to 1978 and repair, alteration or addition being performed will result in the disturbance of painted surfaces, the contractor shall provide to the code official one of the following:

1. Copies of EPA or state renovation firm certification, renovator certification and a plan for compliance for renovations in accordance with 40 CFR 745 requirements for renovations.
2. Documentation from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that shows that the disturbed paint contains lead that is below specified levels.

Add the following standard to IEBC Chapter 16:

EPA	U.S. Environmental Protection Agency
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures – July 1, 2012

Reason: Section 106 covers construction documents, and the specific provisions include fire protection drawings, means of egress, exterior wall envelope and site plans. This code change proposal, 106.2.6, adds a simple requirement that permit applicants include, with the other construction documents, evidence of compliance with health-protective requirements to protect children from lead poisoning during additions, alterations, and repairs to pre-1978 homes.

The purpose of this proposed code language is to incorporate protection from lead-based paint into the Code through the requirement for construction documents. Once the Code requires permit applicants to demonstrate up front their knowledge of, and plans to follow, the federal and state renovation rule requirements, the code official will be positioned to provide important oversight and leadership in preventing lead poisoning without even leaving the office. This oversight will help level the playing field between contractors who are complying with the rule and noncompliant entities who are under-pricing and undercutting their competitors. By merely asking an applicant for the missing documents, the code official can influence entities not following the law into compliance before the work even starts. In a few cases, these entities may be unaware of the regulations. Although these regulations have been in effect since April 2010, and have been adopted by 12 states, reported non-compliance is affecting the compliant contractor and continuing the problem of lead poisoning in the US.

The proposed "plan that indicates compliance with the federal disclosure and work practice requirements" can take different forms depending on what documents the builder is already using. Some builders who work on pre-1978 homes are already using a form to track their upfront assessments and another form for recordkeeping. Anyone working in pre-1978 homes should have an EPA or state certification for their firm, along with at least one individual renovator certification that the renovator received at the end of the required one-day training course. dispersal of lead before, during, and after work performed on a pre-1978 home. These requirements are already in effect in federal and state regulation.

The plan and certifications would only be needed for a structure likely to contain lead-based paint: a pre-1978 home. As noted under the exception, the requirement is waived if paint testing proves that the paint is not lead-based paint. A rebuttable presumption of lead's presence allows the builder to demonstrate that lead is not present and obtain exemption from the requirements. EPA-approved tests include lead-based paint inspection or risk assessment, test kit used by a certified renovator, and collection of a lead-based paint chips for laboratory analysis.

Renovation of painted surfaces is a significant source of lead dust that poisons children. The dangers associated with lead poisoning are well-known: serious health effects, detrimental effects on cognitive and behavioral development, with serious personal and social consequences that may persist throughout their lifetime.

Multiple studies have demonstrated that lead dust is the major source of lead poisoning for young children. There is no safe level of lead exposure for children; lead affects intelligence even at very low levels.[1,2,5,8,9] Indeed, the rate of IQ loss per 1 microgram of lead per deciliter of blood (µg/dL) is greatest at lead levels below 10 µg/dL. As a child's BLL increases from 1 to 10 µg/dL, experts estimate a child may lose anywhere from 3.9 to 7.4 IQ points, but from 10 to 30 µg/dL the decrement is 2.5 to 3.0 IQ points. Low-level chronic exposure may have an even greater effect on IQ than a single instance of very high BLL.[10]

Research indicates that a five-point negative shift in IQ at the population level would increase the number of children with an "extremely low" IQ by 57%, substantially increasing the cost of special education programs.[3] Considering the costs to the special education system alone, one study conservatively estimated that it costs $38,000 over three years to educate a child with lead poisoning.[11] Low-level exposure to lead has also been linked to factors other than IQ that can further impact educational outcomes. EBLLs are associated with Attention Deficit Hyperactivity Disorder (ADHD) and antisocial behavior, which in turn increase the likelihood of conduct disorder, criminal activity, and drug abuse.[1,4] Each 1 µg/dL reduction in the average preschool blood lead level saves $13.4 billion from the direct and indirect costs of crime.[1]

Several recent studies have explored the specific effects of lead on educational outcomes. These studies show a strong relationship between slightly elevated blood lead levels in young children and decreased scores on end-of-grade tests in elementary school. While similar educational effects were documented for higher blood levels decades ago,[12] the recent studies confirm that the connection between blood lead and poor educational outcomes remains true for blood levels as low as 3-4 µg/dL. A more recent study of 57,000 North Carolina children found that children with a BLL as low as 4 µg/dL at three years of age were significantly more likely to be classified as learning-disabled than children with a BLL of 1 µg/dL.[6]

The consequences of lead exposure are clear. This code change proposal seeks to reduce the risk – and level the playing field among contractors working on pre-1978 properties.

The EPA 40 CFR 745 standard is available at http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol32/xml/CFR-2012-title40-vol32-part745.xml.

References

1. Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. Environ. Health Perspect. 2009;117(7):1162–1167.
2. Jusko TA, Henderson CR, Lanphear BP, Cory-Slechta DA, Parsons PJ, Canfield RL. Blood lead concentrations. Environ. Health Perspect. 2008;116(2):243–248.
3. Mazumdar M, Bellinger DC, Gregas M, Abanilla K, Bacic J, Needleman HL. Low-level environmental lead exposure in childhood and adult intellectual function: a follow-up study. Environ Health. 2011;10:24.
4. Chandramouli K, Steer CD, Ellis M, Emond AM. Effects of early childhood lead exposure on academic performance and behaviour of school age children. Arch. Dis. Child. 2009;94(11):844–848.
5. Miranda ML, Kim D, Galeano MA, Paul CJ, Hull AP, Morgan SP. The relationship between early childhood blood lead levels and performance on end-of-grade tests. Environ. Health Perspect. 2007;115(8):1242–1247.
6. Miranda ML, Maxson P, Kim D. Early childhood lead exposure and exceptionality designations for students. Int J Child Health Hum Dev. 2010;3(1):77–84.
7. Advisory Committee on Childhood Lead Poisoning Prevention. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. 2012:1–68. Available at: http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_030712.pdf. Accessed March 6, 2012.
8. Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. Environ. Health Perspect. 2005;113(7):894–899.
9. Canfield RL, Henderson CRJ, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 microg per deciliter. N. Engl. J. Med. 2003;348(16):1517–1526.16.
10. Lanphear BP, Dietrich K, Auinger P, Cox C. Cognitive deficits associated with blood lead concentrations. Public Health Rep. 2000;115(6):521–529.17.
11. Korfmacher KS. Long-term costs of lead poisoning: How much can New York save by stopping lead? Rochester, NY: University of Rochester; 2003.
12. Needleman HL, Leviton A, Bellinger D. Lead-associated intellectual deficit. N Engl J Med. 1982; 306(6):367.

Cost Impact: This code change proposal will not increase the cost of construction.

Staff analysis: A review of the standard proposed for inclusion in the code, NFPA 914 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

106.2.6 (NEW)-ADM (IEBC)-MORLEY

Committee Action Hearing Results

Committee Action: **Disapproved**

HEARD BY THE IEBC COMMITTEE

Committee Reason: The proposal was disapproved for several reasons. First, the committee felt that technical requirements should not be located in Chapter 1. Secondly, there was discomfort with having to enforce federal regulations as a local building official. This would expand the building official's role inappropriately. Finally, there was concern with what would be expected in terms of accepting and approving a plan as required by this proposal. There was also concern with the accuracy of the lead tests available.

For staff analysis of the content of EPA 40 CFR 745-July 1, 2012 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/ProposedStandards.pdf.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mark Henshall, representing US Environmental Protection Agency, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

IEBC 106.2.6 Certifications ~~and plans~~ where painted surfaces are disturbed. Where a Group ~~E, I-4,~~ R-2, R-3 or R-4 occupancies was completed prior to 1978 and repair, alteration or additions being performed will result in the disturbance of painted surfaces, the contractor shall provide to the code official ~~one of the following:~~

~~1.~~ a copy of a current Renovation Repair and Painting firm certification issued by either EPA per 40 CFR 745.89 or by a state program authorized by EPA per 40 CFR 745 Subpart Q. ~~Copies of EPA or state renovation firm certification, renovator certification and a plan for compliance for renovations in accordance with 40 CFR 745 requirements for renovations.~~

~~2. Documentation from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that shows that the disturbed paint contains lead that is below specified levels.~~

Add the following standard to IEBC Chapter 16:

EPA	U.S. Environmental Protection Agency
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures – July 1, 2012

Commenter's Reason: Section 106 covers construction documents, and the specific provisions include fire protection drawings, means of egress, exterior wall envelope and site plans. This code change proposal adds a requirement that permit applicants include, with the other construction documents, evidence of compliance with the firm certification requirements of EPA's or an authorized states Renovation, Repair and Painting Regulation program. The local building code official would have no other responsibility than to request a copy of a current Renovation Repair and Painting firm certification.

EPA's 2008 Lead-Based Paint Renovation, Repair and Painting (RRP) Rule aims to protect the public from lead-based paint hazards associated with renovation, repair and painting activities. These activities can create hazardous lead dust when surfaces with lead paint, are disturbed. The rule requires workers to be certified and trained in the use of lead-safe work practices, and requires renovation, repair and painting firms to be EPA-certified. This training and adherence to lead-safe work practices will help ensure residents are not exposed to hazardous levels of lead contaminated dust.

The original proposal required "a plan for compliance for renovations in accordance with 40 CFR 745 requirements for renovations." Questions were raised as to what constituted a plan and what would be expected in terms of the code official approving such a plan. In addition, the original proposal could be interpreted to mean that local building officials were being asked to enforce a federal regulation. This modification to the original proposal has addressed these concerns. Because this proposal is not a technical requirement, it is appropriate to include in Chapter 1.

ADM37-13

Final Action: AS AM AMPC____ D

PM3-13
202

Proposed Change as Submitted

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Revise as follows:

SECTION 202
DEFINITIONS

INFESTATION. The presence, within or contiguous to, a structure or premises of: insects including cockroaches, fleas, and bedbugs; pest rodents including rats and mice; vermin; or other pests. Visible pest residue or debris constitutes an infestation unless there is clear evidence that the pest is no longer present.

Reason: The current definition of infestation would appear to exclude rodents other than rats. However, rodents carry disease and, in the case of mice, may trigger an asthma attack. The proposal applies the term to all rodents.

Cockroaches, fleas and bedbugs are public health problems; the proposal specifies these insects to make clear that they are included.

The proposal clarifies that visible evidence of pest residues is a sufficient basis for action by a code official. The code official does not have to see a live pest. Many of the pests of most concern are nocturnal and their residue is the only evidence available during daylight.

Cost Impact: The proposal will not increase the cost of maintenance since this is a definition not a requirement.

202-INFESTATION-PM-MORLEY

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee felt the proposed revisions to the definition were ambiguous, in that the list of insects was incomplete. Further, they agreed that "visible" residue or debris did not necessarily indicate an infestation.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

INFESTATION. The presence, within or contiguous to, a structure or premises of insects, rodents~~rats~~, vermin, or other pests.

Commenter's Reason: The current definition of infestation appears to exclude rodents other than rats. However, rodents other than rats carry disease and, in the case of mice, may trigger an asthma attack. Mouse allergen has long been recognized as an important cause of occupational allergy and asthma, but only recently has it been implicated in asthma and allergic diseases in community settings. Recent studies have established that mouse allergen is detectable in most US homes, with strikingly high levels in some inner cities. In addition, about 25% of inner city children with asthma have evidence of IgE sensitization to mouse. Several studies have shown that the combination of sensitization and exposure to higher levels of mouse allergen is associated with substantial asthma morbidity, including hospitalizations.

(source: Matsui EC, Role of mouse allergens in allergic disease, Current Allergy Reports, 2009 Sep;9(5):370-5. http://www.ncbi.nlm.nih.gov/pubmed/19671380)

By approving this modest word change, the code official will be able to apply the term “infestation” to all pest rodents.

Public Comment 2:

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

INFESTATION. The presence, within or contiguous to, a structure or premises of insects, rats, vermin, or other pests; and the appearance of fresh pest droppings, residue or debris after pest elimination and cleaning have occurred.

Commenter’s Reason: The comment clarifies that new evidence of pest residues is a sufficient basis for action by a code official. The code official does not have to see a live pest. Many of the pests of most concern are nocturnal and their residue is the only evidence available during daylight.

PM3-13

Final Action: AS AM AMPC____ D

PM6-13
304.2.1 (New), 305.3.1 (New), Chapter 8

Proposed Change as Submitted

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Add new text as follows:

304.2.1 Disturbance of existing painted surfaces. In any Group E, I-4, R-2, R-3, R-4 occupancies completed prior to 1978, where repairs disturb painted surfaces, the work shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

> **Exception:** Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

305.3.1 Disturbance of existing painted surfaces. In any Group E, I-4, R-2, R-3, R-4 occupancies completed prior to 1978, where repairs disturb painted surfaces, the work shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

> **Exception:** Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

Add new standard to Chapter 8 as follows:

EPA U.S. Environmental Protection Agency

40 CFR 745– July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Reason: The purpose of this proposed code language for the surfaces of the structure is to incorporate measures that reflect current knowledge about working with paint that may contain lead-based paint and thereby prevent lead poisoning. The code already requires repair of paint in poor condition. This new subsection would further require compliance with federal regulations to promote the safe repair of deteriorated paint that is likely to contain lead. These regulations have been in effect since April 2010. This change would only affect structures likely to contain lead-based paint.

Multiple studies have demonstrated that lead dust, which is caused by deteriorated lead-based paint and some methods of paint repair, is the major source of lead exposure for young children. The dangers associated with exposure to lead based paint hazards are well-known: lead is associated with a range of serious health effects on children, including detrimental effects on cognitive and behavioral development with serious personal and social consequences that may persist throughout their lifetime. More than 36 million pre-1978 US housing units contain lead-based paint.

Sections 304.2 and 305.3 fail to specifically require, on older structures that are likely to contain lead-based paint, the use of precautionary practices in order to prevent the dispersal of lead before, during, and after the repair work, in the course of complying with the code requirement to repair peeling, flaking and chipping paint. The proposal improves the current Code by adding to each section a health-protective requirement to perform the repair safely around lead-based paint, a subject currently acknowledged in the Commentary but not in the Code. The addition of the proposed new language will protect children from lead poisoning by specifying the use of federally – or state - approved lead safe work practices in making the required repairs. The lead-safe work practices are required by EPA effective April 22, 2010, for most renovation, repair and painting work in all pre-1978 homes.
The federal renovation rule and this proposal are based on a rebuttable presumption of lead's presence, which allows the property owner to demonstrate that lead is not present to be exempt from the requirements. The proposed new language includes these exceptions: structures built after lead was banned from paint used in residential structures (1977 US; earlier in some US cities; 1909 France, Belgium, Austria), and structures where the deteriorated paint has been documented to not contain lead (such as by a lead-based paint inspection or risk assessment, by the use of a test kit by a certified renovator, or through completion of another government-approved test method or ANSI standard).

The EPA 40 CFR 745 standard is available at http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol32/xml/CFR-2012-title40-vol32-part745.xml.

Cost Impact: This change will not increase the cost of maintenance since these federal and state requirements are already in place.

Staff analysis: A review of the standard proposed for inclusion in the code, EPA 40 CFR 745 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

304.2.1 (NEW)-PM-MORLEY

Committee Action Hearing Results

For staff analysis of the content of EPA 40 CFR745 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf

Committee Action: **Disapproved**

Committee Reason: The committee was concerned that code officials would not have the qualifications or certifications to determine compliance with these lead based paint work practices. Further, as written the proposal expands the scope of the proposed CFR standard in that the standard excludes schools and adult day care facilities. The committee suggests aligning the proposed code text with the standard scope. Lastly, there was some concern that the standard was not promulgated using a consensus process.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment :

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

304.2.1 Disturbance of existing painted surfaces in buildings constructed before 1978. In Group E day care, Group I-4 child day care, Group R-2, R-3, R-4 occupancies, there shall not be visible dust, debris or residue remaining in the work area after completion of repairs that disturb painted surfaces.

Exception: Where documentation from an approved test in accordance with 40 CFR 745.82(a) proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

305.3.1 Disturbance of existing painted surfaces in buildings constructed before 1978. In Group E day care, Group I-4 child day care, Group R-2, R-3, R-4 occupancies, there shall not be visible dust, debris or residue remaining in the work area after completion of repairs that disturb painted surfaces.

Exception: Where documentation from an approved test in accordance with 40 CFR 745.82(a) proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

Add new standard to Chapter 8 as follows:

EPA U.S. Environmental Protection Agency

40 CFR 745– July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Commenter's Reason: Based on the Committee decision, we have reduced this code change from a requirement for full compliance with the federal regulation to the essential but simple performance standard that will protect the occupant's and worker's children from exposure to harmful lead. It is consistent with the federal regulation in that clean-up is required at the end of renovation work. This requirement can be enforced by the code official with a visual inspection: no testing or special information is needed.

We have also clarified the Group I and E occupancies.

The exemption applies if the project meets one of these standards at 40 CFR 745.82(a):

1. a written determination has been made by a certified inspector or risk assessor that the components affected by the renovation are free of paint or other surface coatings that contain lead;
2. a certified renovator, using an EPA recognized test kit, has tested each component affected by the renovation and determined that the components are free of paint or other surface coatings that contain lead;
3. a certified renovator has collected a paint chip sample from each painted component affected by the renovation and a laboratory recognized by EPA has determined that the samples are free of paint or other surface coatings that contain lead.

Cost Impact: This change will not increase the cost of maintenance since federal and state renovation programs require a visual check for dust, debris or residue.

PM6-13

Final Action: AS AM AMPC____ D

PM9-13
305.3

Proposed Change as Submitted

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Revise as follows:

305.3 Interior surfaces. All interior surfaces, including windows and doors, shall be maintained in good, clean and sanitary condition. Peeling, chipping, flaking or abraded paint shall be repaired, removed or covered. Cracked or loose plaster, decayed wood and other defective surface conditions shall be corrected. Surfaces such as but not limited to wood, textiles, paint, cellulose insulation, and paper, including paper-faced gypsum board, shall have no signs of chronic or persistent excessive moisture. Material discolored or deteriorated by mold or mildew shall be cleaned, dried and repaired and the underlying cause shall be corrected. If the material has decayed or failed beyond repair, it shall be removed and replaced and the and the underlying cause shall be corrected.

Exception: Porous materials that do not contain organic material, such as clean unpainted bricks and concrete.

Reason: Mold typically grows in buildings affected by water damage. According to the Institute of Medicine of the National Academies' *Damp Indoor Spaces and Health* (2004), mold and damp indoor environments are associated with asthma symptoms in sensitized persons, coughing, wheezing, and upper respiratory tract symptoms. *See www.nap.edu/books/0309091934/html/*

In December 2007, the National Center for Healthy Housing (NCHH) and the U.S. Centers for Disease Control and Prevention (CDC) convened an Expert Panel consistent with National Institute of Health guidelines to assess the effectiveness of various interventions to make homes healthier and safer. NCHH and CDC published the report of the experts in January 2009. See www.nchh.org/LinkClick.aspx?fileticket=2lvaEDNBIdU%3d&tabid=229 for the full report.

The Expert Panel reviewed five peer-reviewed research studies on the issue of mold and allergens and concluded that "when implemented together, eliminating moisture intrusion and leaks and removal of moldy items were found to be effective in reducing asthma triggers and reducing exposures." Other provisions of the IPMC address eliminating moisture intrusion. But no provisions require action on building materials with chronic moisture issues including those materials that have failed beyond repair.

This proposal implements the Expert Panel's recommendation while providing flexibility in response to actual conditions – repair for reparable material, replacement for failed material. To ensure the health of the building's occupants, mitigation of moisture problems must be a part of the code.

Cost Impact: This code change proposal will increase the cost of maintenance.

305.3-PM-MORLEY

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee disapproved this proposal for the following reasons; no benchmarks were provided for a code official to determine excessive levels of moisture, discoloration, decay, mold, mildew, etc.; test methods should be provided that determine these levels; the code official should not be responsible for making these determinations.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment :

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

305.3 Interior surfaces. All interior surfaces, including windows and doors, shall be maintained in good, clean and sanitary condition. Peeling, chipping, flaking or abraded paint shall be repaired, removed or covered. Cracked or loose plaster, decayed wood and other defective surface conditions shall be corrected. Carpet, paper-faced gypsum board, and other porous material that is discolored or deteriorated by persistent moisture shall be cleaned, dried and repaired, and the underlying cause of the moisture shall be corrected. If deteriorated material has decayed or failed beyond repair, it shall be removed and replaced.

Commenter's Reason: Visual evidence of a moisture problem does not require special testing. To ensure the health of the building's occupants, mitigation of moisture problems must be a part of the code.

PM9-13

Final Action: AS AM AMPC____ D

PM16-13
705 (New)

Proposed Change as Submitted

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Add new text as follows:

SECTION 705
CARBON MONOXIDE ALARMS

705.1 General. Carbon monoxide alarms shall be installed in accordance with Section 1103.9 of the *International Fire Code* in Group R occupancies and in dwellings not regulated as Group R occupancies.

Reason: Carbon monoxide (CO) is an odorless, tasteless, invisible gas that kills more than 300 people in homes each year. Thousands more are admitted to the hospital with carbon monoxide poisoning. This is a serious issue that affects people nationwide is all regions of the country.

The International Residential Code requires CO alarms for residences with fuel-fired appliances or attached garages. This change would make the IPMC consistent with the IRC.

This proposal expands on the requirement to specifically include portable fuel burning space heaters since these devices may not be considered an appliance, since these devices may be introduced by the property owner after construction.

The following states have required CO alarms in existing residences: Alaska, California, Colorado, Illinois, Massachusetts, Michigan, Minnesota, Montana, New Jersey, New York, North Carolina, Oklahoma, Oregon, Rhode Island, Vermont and Wisconsin. Deaths from CO are spread throughout the country as residents unwittingly use dangerous methods to stay warm in unusually cold weather.

Cost Impact: Yes, this code change proposal will increase the cost of property maintenance. A carbon monoxide alarm typically costs approximately $25.

705 (NEW)-PM-MORLEY

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee felt that this mandate would be too broad as it would affect a large majority of existing buildings. The expense for building owners and the enforceability requirements for code officials would be too great.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment :

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

705.1 General. Carbon monoxide alarms shall be installed in accordance with Section 1103.9 of the *International Fire Code* in Group R occupancies. ~~*and in dwellings not regulated as Group R occupancies.*~~

Commenter's Reason: While not needed in jurisdictions that have adopted the International Fire Code, the requirement is needed where the IFC is not in effect.

PM16-13

Final Action: AS AM AMPC____ D

EB8-13
602.3 (NEW)

Proposed Change as Submitted

Proponent: Rebecca Morley, National Center for Healthy Housing

Add new text as follows:

602.3 Moisture and Mold. Surfaces such as but not limited to wood, textiles, paint, cellulose insulation, and paper, including paper-faced gypsum board, shall have no signs of excessive moisture after the material has been repaired. Materials that are discolored or deteriorated by mold or mildew shall be cleaned, dried and repaired and the underlying cause shall be determined and corrected. If the material is structurally unsound it shall be removed and replaced and the underlying cause shall be determined and corrected.

Reason: Mold typically grows in buildings affected by water damage. According to the Institute of Medicine of the National Academies' *Damp Indoor Spaces and Health* (2004), mold and damp indoor environments are associated with asthma symptoms in sensitized persons, coughing, wheezing, and upper respiratory tract symptoms. *See www.nap.edu/books/0309091934/html/*

In December 2007, the National Center for Healthy Housing (NCHH) and the U.S. Centers for Disease Control and Prevention (CDC) convened an Expert Panel consistent with National Institute of Health guidelines to assess the effectiveness of various interventions to make homes healthier and safer. NCHH and CDC published the report of the experts in January 2009. See www.nchh.org/LinkClick.aspx?fileticket=2lvaEDNBIdU%3d&tabid=229 for the full report.

The Expert Panel reviewed five peer-reviewed research studies on the issue of mold and allergens and concluded that "when implemented together, eliminating moisture intrusion and leaks and removal of moldy items were found to be effective in reducing asthma triggers and reducing exposures." Other provisions of the IPMC address eliminating moisture intrusion. But no provisions require action on building materials with chronic moisture issues including those materials that have failed beyond repair.

This proposal implements the Expert Panel's recommendation while providing flexibility in response to actual conditions – repair for reparable material, replacement for failed material. To ensure the health of the building's occupants, mitigation of moisture problems must be a part of the code.

Cost Impact: This code change proposal will increase the cost of maintenance.

602.1-EB-MORLEY.doc

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The term "excessive" was felt unenforceable. There was concern with what would be considered "clean." These types of provisions were felt more appropriate for the IPMC. If the requirements were felt appropriate for the IEBC they would be better located in Chapter 3.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION 602
BUILDING ELEMENTS AND MATERIALS

602.1 Existing building materials. Materials already in use in a building in compliance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use unless determined by the *code official* to render the building or structure unsafe or *dangerous* as defined in Chapter 2.Carpet, paper-faced gypsum board, and other porous material that is discolored or deteriorated by persistent moisture shall be dried and repaired, and the underlying cause of the moisture shall be corrected. If deteriorated material has decayed or failed beyond repair, it shall be removed and replaced.

~~**602.3 Moisture and Mold.** Surfaces such as but not limited to wood, textiles, paint, cellulose insulation, and paper, including paper-faced gypsum board, shall have no signs of excessive moisture after the material has been repaired. Materials that are discolored or deteriorated by mold or mildew shall be cleaned, dried and repaired and the underlying cause shall be determined and corrected. If the material is structurally unsound it shall be removed and replaced and the underlying cause shall be determined and corrected.~~

Commenter's Reason: Elimination of moisture problems in building materials is important to ensuring the health of the building's occupants. Requiring attention to these problems when a building undergoes repair work should be a part of the code. The trigger is the repair work.

`We addressed the committee's concerns by deleting the words "cleaned" and "excessive."

EB8-13

Final Action: AS AM AMPC____ D

EB16-13
705 (NEW)

Proposed Change as Submitted

Proponent: Rebecca Morley, National Center for Healthy Housing

Add new text as follows:

SECTION 705
CARBON MONOXIDE ALARMS

705.1 General. Carbon monoxide alarms shall be installed in existing Group I or R occupancies in accordance with Section 1103.9 of the *International Fire Code.*

Reason: **Carbon monoxide (CO) is an odorless, tasteless, invisible gas that kills more than 300 people in homes each year. Thousands more are admitted to the hospital with carbon monoxide poisoning. This is a serious issue that affects people nationwide is all regions of the country. The International Residential Code requires CO alarms for residences with fuel-fired appliances or attached garages. This change would make the IEBC consistent with the IRC.**

The following states have required CO alarms in existing residences: Alaska, California, Colorado, Illinois, Massachusetts, Michigan, Minnesota, Montana, New Jersey, New York, North Carolina, Oklahoma, Oregon, Rhode Island, Vermont and Wisconsin. Deaths from CO are spread throughout the country as residents unwittingly use dangerous methods to stay warm in unusually cold weather.

Cost Impact: Yes, this code change proposal will increase the cost of property maintenance. A carbon monoxide alarm typically costs approximately $25.

705 (NEW)-EB-MORLEY.doc

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: This proposal requiring CO in Group I and R occupancies was felt to be excessive with Level 1 Alteration requirements. There was also concern that this particular requirement to add CO alarms retroactively may not be applicable in all states. Note that it was pointed out that if Chapter 11 of the IFC is adopted these requirements would be applicable regardless of whether an alteration is undertaken.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jane Malone, National Center for Healthy Housing, requests Approval as Submitted.

Commenter's Reason: While not needed in jurisdictions that have adopted the *International Fire Code*, the requirement is needed for Level 1 Alterations where the IFC is not in effect.

EB16-13

Final Action: AS AM AMPC____ D

EB63-13
602.1.1 (New), 702.1.1 (New), 1202.2.1 (New), Chapter 16

Proposed Change as Submitted

Proponent: Rebecca Morley, National Center for Healthy Housing

Add new text as follows:

SECTION 602
BUILDING ELEMENTS AND MATERIALS

602.1 Existing building materials. Materials already in use in a building in compliance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use unless determined by the *code official* to render the building or structure unsafe or *dangerous* as defined in Chapter 2.

602.1.1 Disturbance of existing painted surfaces. In any Group E, I-4, R-2, R-3, R-4 occupancies completed prior to 1978, where repairs disturb painted surfaces, the work shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION 702
BUILDING ELEMENTS AND MATERIALS

702.1 Interior finishes. All newly installed interior wall and ceiling finishes shall comply with Chapter 8 of the *International Building Code*.

702.1.1 Disturbance of existing painted surfaces. In any Group E, I-4, R-2, R-3, R-4 occupancies completed prior to 1978, where alterations disturb painted surfaces, the work shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION 1202
REPAIRS

1202.1 General. Repairs to any portion of an *historic building* or structure shall be permitted with original or like materials and original methods of construction, subject to the provisions of this chapter. Hazardous materials, such as asbestos and lead-based paint, shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

1202.2.1 Disturbance of existing painted surfaces. In any Group E, I-4, R-2, R-3, R-4 occupancies, where repairs disturb painted surfaces, the work shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

Add the following standard to Chapter 16:

EPA U.S. Environmental Protection Agency

40 CFR 745 - July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Reason: The purpose of this proposed code language is to incorporate protection from lead-based paint into the Code's requirements. These requirements are already law in every state through the Environmental Protection Agency's Renovation Repair and Painting Rule, which governs work with paint that may contain lead-based paint in order to prevent childhood lead poisoning. These regulations have been in effect since April 2010, and have been adopted by 12 states.

Renovation of painted surfaces is a significant sources of lead dust that poisons children. The dangers associated with lead poisoning are well-known: serious health effects, detrimental effects on cognitive and behavioral development, with serious personal and social consequences that may persist throughout their lifetime.

Multiple studies have demonstrated that lead dust is the major source of lead poisoning for young children. There is no safe level of lead exposure for children; lead affects intelligence even at very low levels.[1,2,5,8,9] Indeed, the rate of IQ loss per 1 microgram of lead per deciliter of blood (µg/dL) is greatest at lead levels below 10 µg/dL. As a child's BLL increases from 1 to 10 µg/dL, experts estimate a child may lose anywhere from 3.9 to 7.4 IQ points, but from 10 to 30 µg/dL the decrement is 2.5 to 3.0 IQ points. Low-level chronic exposure may have an even greater effect on IQ than a single instance of very high BLL.[10]

Research indicates that a five-point negative shift in IQ at the population level would increase the number of children with an "extremely low" IQ by 57%, substantially increasing the cost of special education programs.[3] Considering the costs to the special education system alone, one study conservatively estimated that it costs $38,000 over three years to educate a child with lead poisoning.[11] Low-level exposure to lead has also been linked to factors other than IQ that can further impact educational outcomes. EBLLs are associated with Attention Deficit Hyperactivity Disorder (ADHD) and antisocial behavior, which in turn increase the likelihood of conduct disorder, criminal activity, and drug abuse.[1,4] Each 1 µg/dL reduction in the average preschool blood lead level saves $13.4 billion from the direct and indirect costs of crime.[1]

Several recent studies have explored the specific effects of lead on educational outcomes. These studies show a strong relationship between slightly elevated blood lead levels in young children and decreased scores on end-of-grade tests in elementary school. While similar educational effects were documented for higher blood levels decades ago,[12] the recent studies confirm that the connection between blood lead and poor educational outcomes remains true for blood levels as low as 3-4 µg/dL. A more recent study of 57,000 North Carolina children found that children with a BLL as low as 4 µg/dL at three years of age were significantly more likely to be classified as learning-disabled than children with a BLL of 1 µg/dL.[6]

The consequences of lead exposure are clear. This code change proposal seeks to reduce the risk.

The additions to Sections 602, 702, and 1202 add health-protective requirements to protect children from lead poisoning by preventing the dispersal of lead before, during, and after work performed on a pre-1978 home. The information distribution, certification, and lead safe practices requirements are already in effect in federal and state regulation.

This change would only affect structures likely to contain lead-based paint: pre-1978 homes. As noted under the exception, the requirement is waived if paint testing proves that the paint is not lead-based paint. A rebuttable presumption of lead's presence allows the builder to demonstrate that lead is not present and obtain exemption from the requirements. EPA-approved tests include lead-based paint inspection or risk assessment, test kit used by a certified renovator, and collection of a lead-based paint chips for laboratory analysis.

The EPA 40 CFR 745 standard is available at http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol32/xml/CFR-2012-title40-vol32-part745.xml.

References

1. Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. Environ. Health Perspect. 2009;117(7):1162–1167.
2. Jusko TA, Henderson CR, Lanphear BP, Cory-Slechta DA, Parsons PJ, Canfield RL. Blood lead concentrations. Environ. Health Perspect. 2008;116(2):243–248.
3. Mazumdar M, Bellinger DC, Gregas M, Abanilla K, Bacic J, Needleman HL. Low-level environmental lead exposure in childhood and adult intellectual function: a follow-up study. Environ Health. 2011;10:24.
4. Chandramouli K, Steer CD, Ellis M, Emond AM. Effects of early childhood lead exposure on academic performance and behaviour of school age children. Arch. Dis. Child. 2009;94(11):844–848.
5. Miranda ML, Kim D, Galeano MA, Paul CJ, Hull AP, Morgan SP. The relationship between early childhood blood lead levels and performance on end-of-grade tests. Environ. Health Perspect. 2007;115(8):1242–1247.
6. Miranda ML, Maxson P, Kim D. Early childhood lead exposure and exceptionality designations for students. Int J Child Health Hum Dev. 2010;3(1):77–84.
7. Advisory Committee on Childhood Lead Poisoning Prevention. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. 2012:1–68. Available at: http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_030712.pdf. Accessed March 6, 2012.
8. Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. Environ. Health Perspect. 2005;113(7):894–899.
9. Canfield RL, Henderson CRJ, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 microg per deciliter. N. Engl. J. Med. 2003;348(16):1517–1526.16.
10. Lanphear BP, Dietrich K, Auinger P, Cox C. Cognitive deficits associated with blood lead concentrations. Public Health Rep. 2000;115(6):521–529.17.
11. Korfmacher KS. Long-term costs of lead poisoning: How much can New York save by stopping lead? Rochester, NY: University of Rochester; 2003.
12. Needleman HL, Leviton A, Bellinger D. Lead-associated intellectual deficit. N Engl J Med. 1982; 306(6):367.

Cost Impact: This code change proposal will not increase the cost of additions, alterations or repairs since these federal/state requirements are already in effect.

Staff analysis: A review of the standard proposed for inclusion in the code, 40 CFR 745 -July 1, 2012 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

Committee Action Hearing Results

For staff analysis of the content of EPA 40 CFR 745-July 1, 2012 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/ProposedStandards.pdf

Committee Action: **Disapproved**

Committee Reason: This proposal was disapproved based upon the previous action taken on ADM37-13 by the IEBC Committee.

Assembly Action **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION 602
BUILDING ELEMENTS AND MATERIALS

602.1 Existing building materials. Materials already in use in a building in compliance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use unless determined by the *code official* to render the building or structure unsafe or *dangerous* as defined in Chapter 2.

602.1.1 Disturbance of existing painted surfaces. In any Group E day care, Group I-4 child day care, R-2, R-3, R-4 occupancies completed prior to 1978, where repairs disturb painted surfaces, the work shall ~~comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.~~ leave behind no visible dust, debris or residue .

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) ~~(1) or (2) that proves~~ that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION 702
BUILDING ELEMENTS AND MATERIALS

702.1 Interior finishes. All newly installed interior wall and ceiling finishes shall comply with Chapter 8 of the *International Building Code*.

702.1.1 Disturbance of existing painted surfaces. In any Group E day care, Group I-4 child day care, R-2, R-3, R-4 occupancies completed prior to 1978, where alterations disturb painted surfaces, the work shall ~~comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.~~leave behind no visible dust, debris or residue .

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) ~~(1) or (2) that proves~~ that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION 1202
REPAIRS

1202.1 General. Repairs to any portion of an *historic building* or structure shall be permitted with original or like materials and original methods of construction, subject to the provisions of this chapter. Hazardous materials, such as asbestos and lead-based paint, shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

1202.2.1 Disturbance of existing painted surfaces. In any Group E day care, Group I-4 child day care, R-2, R-3, R-4 occupancies completed prior to 1978, where repairs disturb painted surfaces, the work shall ~~comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations~~ leave behind no visible dust, debris or residue .

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) ~~(1) or (2) that proves~~ that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

Add the following standard to Chapter 16:

EPA	U.S. Environmental Protection Agency

40 CFR 745 - July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Commenter's Reason: Based on the Committee decision, we have reduced this code change from a requirement for full compliance with the federal regulation to the essential but simple performance standard that will protect the occupant's and worker's children from exposure to harmful lead. It is consistent with the federal regulation in that clean-up is required at the end of renovation work. This requirement can be enforced by the code official with a visual inspection: no testing or special information is needed.

We have also clarified the Group I and E occupancies.

The exemption applies if the project meets one of these standards at 40 CFR 745.82(a):

(1) a written determination has been made by a certified inspector or risk assessor that the components affected by the renovation are free of paint or other surface coatings that contain lead;
(2) a certified renovator, using an EPA recognized test kit, has tested each component affected by the renovation and determined that the components are free of paint or other surface coatings that contain lead;
(3) a certified renovator has collected a paint chip sample from each painted component affected by the renovation and a laboratory recognized by EPA has determined that the samples are free of paint or other surface coatings that contain lead.

EB63-13

Final Action: AS AM AMPC____ D

RB8-13

R106.1.4 (New), R702.8 (New), R703.13 (New); Chapter 44, AJ301.1.1.1 (New), AJ701 (New)

Proposed Change as Submitted

Proponent: Rebecca Morley, representing National Center for Healthy Housing

Add new text as follows:

IRC SECTION R106
CONSTRUCTION DOCUMENTS

R106.1.4 Certifications and plans where painted surfaces are disturbed. Where a dwelling was completed prior to 1978 and repair, alteration or addition being performed will result in the disturbance of painted surfaces, the contractor shall provide to the code official one of the following:

1. Copies of EPA or state renovation firm certification, renovator certification and a plan for compliance in accordance with 40 CFR 745 requirements for renovations.
2. Documentation from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that shows that the disturbed paint contains lead that is below specified levels.

IRC SECTION R702
INTERIOR COVERINGS

R702.8 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

IRC SECTION R703
EXTERIOR COVERING

R703.13 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

CHAPTER 44
REFERENCED STANDARDS

EPA
U.S. Environmental Protection Agency

40 CFR 745-July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

SECTION AJ301
REPAIRS

AJ301.1.1.1 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION AJ701
REFERENCED STANDARDS

EPA
U.S. Environmental Protection Agency

40 CFR 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Reason: This code change proposal is to incorporate protection from lead-based paint by specifying (1) that additions, alterations, and repairs to pre-1978 homes comply with federal health-protective requirements to protect children from lead poisoning and (2) that permit applicants include, with the other construction documents, evidence of compliance.

The purpose of this proposed code language is to incorporate protection from lead-based paint into the Code through the requirement for construction documents. Once the Code requires permit applicants to demonstrate up front their knowledge of, and plans to follow, the federal and state renovation rule requirements, the code official will be positioned to provide important oversight and leadership in preventing lead poisoning without even leaving the office. This oversight will help level the playing field between contractors who are complying with the rule and noncompliant entities who are under-pricing and undercutting their competitors. By merely asking an applicant for the missing documents, the code official can influence entities not following the law into compliance before the work even starts. In a few cases, these entities may be unaware of the regulations. Although these regulations have been in effect since April 2010, and have been adopted by 12 states, reported non-compliance is affecting the compliant contractor and continuing the problem of lead poisoning in the US.

The proposed "plan for compliance in accordance with 40 CFR 745 requirements for renovations" with the federal disclosure and work practice requirements" can take different forms depending on what documents the builder is already using. Some builders who work on pre-1978 homes are already using a form to track their upfront assessments and another form for recordkeeping. Anyone working in pre-1978 homes should have an EPA or state certification for their firm, along with at least one individual renovator certification that the renovator received at the end of the required one-day training course. These requirements are already in effect in federal and state regulation.

The plan and certifications would only be needed for a structure likely to contain lead-based paint: a pre-1978 home. As noted under the exception, the requirement is waived if paint testing proves that the paint is not lead-based paint. A rebuttable presumption of lead's presence allows the builder to demonstrate that lead is not present and obtain exemption from the requirements. EPA-approved tests include lead-based paint inspection or risk assessment, test kit used by a certified renovator, and collection of a lead-based paint chips for laboratory analysis.

Renovation of painted surfaces is a significant source of lead dust that poisons children. The dangers associated with lead poisoning are well-known: serious health effects, detrimental effects on cognitive and behavioral development, with serious personal and social consequences that may persist throughout their lifetime.

Multiple studies have demonstrated that lead dust is the major source of lead poisoning for young children. There is no safe level of lead exposure for children; lead affects intelligence even at very low levels.[1,2,5,8,9] Indeed, the rate of IQ loss per 1 microgram of lead per deciliter of blood (µg/dL) is greatest at lead levels below 10 µg/dL. As a child's BLL increases from 1 to 10 µg/dL, experts estimate a child may lose anywhere from 3.9 to 7.4 IQ points, but from 10 to 30 µg/dL the decrement is 2.5 to 3.0 IQ points. Low-level chronic exposure may have an even greater effect on IQ than a single instance of very high BLL.[10]

Research indicates that a five-point negative shift in IQ at the population level would increase the number of children with an "extremely low" IQ by 57%, substantially increasing the cost of special education programs.[3] Considering the costs to the special education system alone, one study conservatively estimated that it costs $38,000 over three years to educate a child with lead poisoning.[11] Low-level exposure to lead has also been linked to factors other than IQ that can further impact educational outcomes. EBLLs are associated with Attention Deficit Hyperactivity Disorder (ADHD) and antisocial behavior, which in turn increase the likelihood of conduct disorder, criminal activity, and drug abuse.[1,4] Each 1 µg/dL reduction in the average preschool blood lead level saves $13.4 billion from the direct and indirect costs of crime.[1]

Several recent studies have explored the specific effects of lead on educational outcomes. These studies show a strong relationship between slightly elevated blood lead levels in young children and decreased scores on end-of-grade tests in elementary school. While similar educational effects were documented for higher blood levels decades ago,[12] the recent studies confirm that the connection between blood lead and poor educational outcomes remains true for blood levels as low as 3-4 µg/dL. A more recent study of 57,000 North Carolina children found that children with a BLL as low as 4 µg/dL at three years of age were significantly more likely to be classified as learning-disabled than children with a BLL of 1 µg/dL.[6]

The consequences of lead exposure are clear. This code change proposal seeks to reduce the risk of lead exposure during and after work performed on a pre-1978 home – and level the playing field among contractors working on pre-1978 properties.

The EPA 40 CFR 745 standard is available at http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol32/xml/CFR-2012-title40-vol32-part745.xml.

References:

1. Gould E. Childhood lead poisoning: conservative estimates of the social and economic benefits of lead hazard control. Environ. Health Perspect. 2009;117(7):1162–1167.
2. Jusko TA, Henderson CR, Lanphear BP, Cory-Slechta DA, Parsons PJ, Canfield RL. Blood lead concentrations. Environ. Health Perspect. 2008;116(2):243–248.
3. Mazumdar M, Bellinger DC, Gregas M, Abanilla K, Bacic J, Needleman HL. Low-level environmental lead exposure in childhood and adult intellectual function: a follow-up study. Environ Health. 2011;10:24.
4. Chandramouli K, Steer CD, Ellis M, Emond AM. Effects of early childhood lead exposure on academic performance and behaviour of school age children. Arch. Dis. Child. 2009;94(11):844–848.
5. Miranda ML, Kim D, Galeano MA, Paul CJ, Hull AP, Morgan SP. The relationship between early childhood blood lead levels and performance on end-of-grade tests. Environ. Health Perspect. 2007;115(8):1242–1247.
6. Miranda ML, Maxson P, Kim D. Early childhood lead exposure and exceptionality designations for students. Int J Child Health Hum Dev. 2010;3(1):77–84.
7. Advisory Committee on Childhood Lead Poisoning Prevention. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. 2012:1–68. Available at: http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_030712.pdf. Accessed March 6, 2012.
8. Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. Environ. Health Perspect. 2005;113(7):894–899.
9. Canfield RL, Henderson CRJ, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 microg per deciliter. N. Engl. J. Med. 2003;348(16):1517–1526.16.
10. Lanphear BP, Dietrich K, Auinger P, Cox C. Cognitive deficits associated with blood lead concentrations. Public Health Rep. 2000;115(6):521–529.17.
11. Korfmacher KS. Long-term costs of lead poisoning: How much can New York save by stopping lead? Rochester, NY: University of Rochester; 2003.
12. Needleman HL, Leviton A, Bellinger D. Lead-associated intellectual deficit. N Engl J Med. 1982; 306(6):367.

Cost Impact: This code change proposal will not increase the cost of construction.

Staff analysis: A review of the standard proposed for inclusion in the code, EPA 40 CFR 745-July 1, 2012, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

R106.1.4 (NEW)-RB-MORLEY

Committee Action Hearing Results

Committee Action: **Disapproved**

For staff analysis of the content of U.S. EPA 40 CFR 745 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf

Committee Reason: The committee disapproved this proposed code change because they felt that the requirements dealing with lead are federal and should remain in that domain. All federal requirements do not belong in the code.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Mark Henshall, representing US Environmental Protection Agency, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION R106
CONSTRUCTION DOCUMENTS

R106.1.4 Certifications and plans where painted surfaces are disturbed. Where a dwelling was completed prior to 1978 and repair, alteration or addition being performed will result in the disturbance of painted surfaces, the contractor shall provide to the code official ~~one of the following:~~

1. a copy of a current Renovation Repair and Painting firm certification issued by either EPA in accordance with 40 CFR 745.89 or by a state program authorized by EPA in accordance with 40 CFR 745 Subpart Q. Copies of EPA or state renovation firm certification, renovator certification and a plan for compliance in accordance with 40 CFR 745 requirements for renovations.
2. Documentation from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that shows that the disturbed paint contains lead that is below specified levels.

SECTION R702
INTERIOR COVERINGS

R702.8 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

SECTION R703
EXTERIOR COVERING

R703.13 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall comply with the information distribution, certification and work practice requirements of 40 CFR 745 for renovations.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a)(1) or (2) that proves that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

CHAPTER 44
REFERENCED STANDARDS

EPA
U.S. Environmental Protection Agency

40 CFR 745-July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures – July 1, 2012

Commenter's Reason: This code change proposal is to incorporate protection from lead-based paint by specifying that permit applicants include, with the other construction documents, evidence of compliance with the firm certification requirements of EPA's or an authorized states Renovation, Repair and Painting Regulation. The local building code official would have no other responsibility than to request a copy of a current Renovation Repair and Painting firm certification

EPA's Lead-Based Paint Renovation, Repair and Painting (RRP) Rule aims to protect the public from lead-based paint hazards associated with renovation, repair and painting activities. These activities can create hazardous lead dust when surfaces with lead paint, are disturbed. The rule requires workers to be certified and trained in the use of lead-safe work practices, and requires renovation, repair and painting firms to be EPA-certified. This training and adherence to lead-safe work practices will help ensure residents are not exposed to hazardous levels of lead contaminated dust.

The original proposal required "a plan for compliance for renovations in accordance with 40 CFR 745 requirements for renovations." Questions were raised as to what constituted a plan and what would be expected in terms of the code official approving such a plan. In addition, the original proposal could be interpreted to mean that local building officials were being asked to enforce a federal regulation. This modification to the original proposal has addressed these concerns.

Public Comment 2:

Jane Malone, National Center for Healthy Housing, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

Add new text as follows:

R702.8 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall not leave behind visible dust, debris or residue.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

R703.13 Disturbance of existing painted surfaces. On any dwelling completed prior to 1978, repairs, alteration and additions where painted surfaces are disturbed shall not leave behind visible dust, debris or residue.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

CHAPTER 44
REFERENCED STANDARDS

EPA

U.S. Environmental Protection Agency

40 CFR 745-July 1, 2012 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

SECTION AJ301
REPAIRS

AJ301.1.1.1 Disturbance of existing painted surfaces. In any dwelling completed prior to 1978, repairs, alterations and additions where painted surfaces are disturbed shall leave behind no visible dust, debris or residue.

Exception: Where documentation is provided from an approved test in accordance with 40 CFR 745.82(a) that the disturbed paint contains lead levels below specified levels, the work is not required to comply with this section.

Commenter's Reason: Based on the Committee decision, we have reduced this code change from a requirement for full compliance with the federal regulation to the essential but simple performance standard that will protect occupant's and worker's children from exposure to harmful lead. It is consistent with the federal regulation in that clean-up is required at the end of renovation work. This requirement can be enforced by the code official with a visual inspection: no testing or special information is needed.

The exemption applies if the project meets one of these standards at 40 CFR 745.82(a):

1. a written determination has been made by a certified inspector or risk assessor that the components affected by the renovation are free of paint or other surface coatings that contain lead;
2. a certified renovator, using an EPA recognized test kit, has tested each component affected by the renovation and determined that the components are free of paint or other surface coatings that contain lead;
3. a certified renovator has collected a paint chip sample from each painted component affected by the renovation and a laboratory recognized by EPA has determined that the samples are free of paint or other surface coatings that contain lead.

RB8-13

Final Action: AS AM AMPC____ D

RB201-13
R324 (New), R202, Chapter 44

Proposed Change as Submitted

Proponent: David P. Kapturowski representing the American Association of Radon Scientist & Technologists

Add new text as follows:

SECTION R324
RADON REDUCTION

R324.1 General. This Section applies to radon control methods for buildings and structures within EPA Radon Zones 1 & 2, as defined in Section R324.42. *Rough-Ins* or complete *Active Soil Depressurization* (ASD) systems shall be installed as necessary to reduce soil gas entry and vapor intrusion so as to establish indoor radon levels below the *National Radon Action Level* (NRAL).

R324.2 Mitigation system required. A *mitigation system Rough-In* shall be installed in *dwellings* located in *radon* potential zones 1 and 2 in accordance with Section R324.8. The *radon* potential zones shall be determined in accordance with Section R324.42.

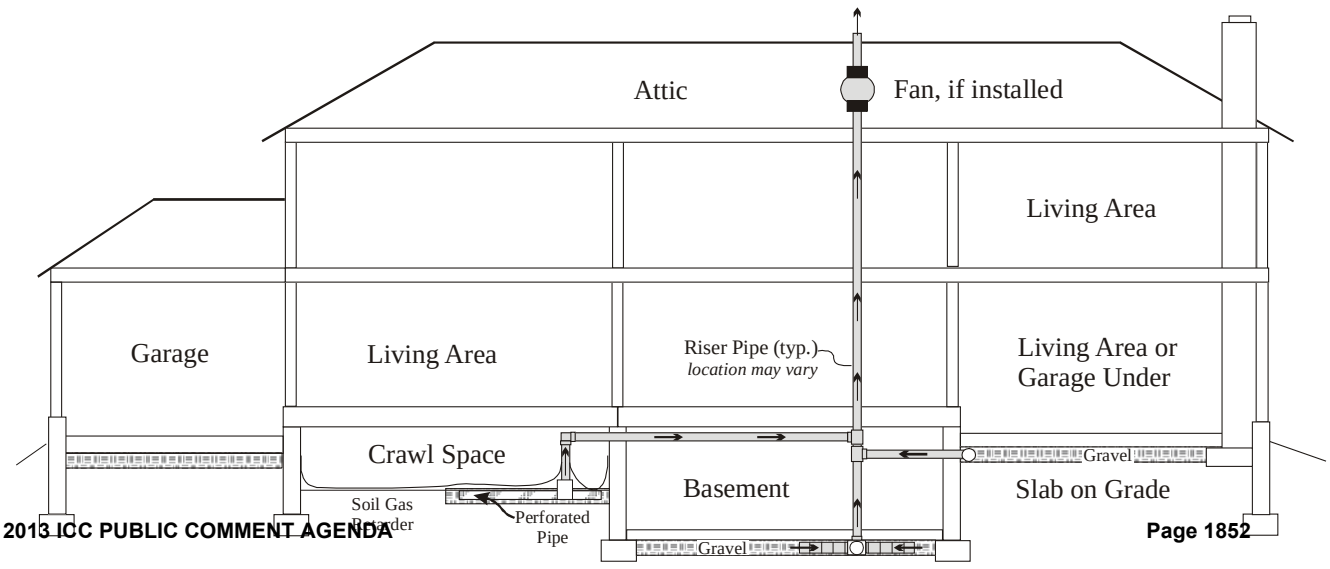
Exception: Where the foundation system does not have any enclosed area of soil contact and where prior to occupancy, testing in accordance with Section R324.41 indicates that the building has a *radon* level below the *National Action Level* (*NAL*).

R324.3 Design. The design of *radon mitigation systems* shall comply with Section R324 and, for buildings having a total foundation area of greater than 2500 square feet [232 sq. m], shall be performed by a *mitigator* who is *certified* or *licensed* to design such systems. Designs of *radon mitigation systems* for foundation types other than those specified herein shall be performed by a *mitigator* who is *certified* or *licensed* to design such systems.

R324.4 Foundation area. The foundation area shall be calculated from the inside perimeter dimensions of the foundation walls.

R324.5 Mitigation system rough-in required. The *Rough-In* installation of a *mitigation system* shall be required for all foundations and *combination foundations* types, including *crawl space*, basement, slab-on-grade and slab-on-grade garage located below a living area. The installation shall be in accordance with Sections R324.6 through R324.28. Figure R324.5 illustrates the four foundation types.

FIGURE R324.5
FOUNDATION TYPES



R324.6 Soil gas collection plenums. Foundation areas shall be constructed so as to create sealed *soil gas collection plenums* in accordance with Sections R324.7 through R324.9.6.

R324.7 Submembrane soil gas collection plenums in crawl spaces with earthen floors. For each *suction point*, a *soil gas collector* shall be installed in accordance with Sections R324.7.1 through R324.7.7 and Section R324.9.

R324.7.1 Soil gas collector. One *soil gas collector* for each *suction point* in accordance with Section R324.7.1.1 shall be installed in accordance with Section R324.7.1.1, R324.7.1.2 or R324.7.1.3.

R324.7.1.1 Pipe soil gas collector. The *soil gas collector* shall consist of a perforated pipe with a nominal diameter of not less than 4 inches [102 mm]. The pipe shall be not less than 10 feet [3048 mm] in length. Such piping shall be placed in a trench backfilled with clean aggregate meeting the criteria of Section R324.8.1.1.1 such that the pipe is completely surrounded by not less than 4 inches [102 mm] of aggregate.

R324.7.1.1.2 Geotextile soil gas collector. The *soil gas collector* shall consist of a strip of geotextile drain matting not less than 10 feet [3048 mm] in length and having a cross sectional area of not less than 12 square inches [7742 sq. mm]. The strip of matting shall be placed on top of the soil or in a trench.

R324.7.1.1.3 Gravel soil gas collector. A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be in accordance with Size Number 4, 5, 56, or 6 as classified by ASTM C33.

R324.7.2 Suction points. One *suction point* shall be provided for each *soil gas collector*. *Suction points* shall be installed in accordance with Section R324.7.2.1, R324.7.2.2 or R324.7.2.3, as applicable for the type of plenum installed.

R324.7.2.1 Suction point for pipe soil gas collector. The *suction point* for a pipe *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The perforated pipe plenum shall be inserted into both of the horizontal openings of the pipe fitting or device. One opening of the fitting or device shall be oriented in a vertical “up” position. Alternatively, the sub-membrane area and the other foundation types shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.1.1.3 and served by one or more *suction points*.

R324.7.2.2 Suction point for geotextile soil gas collector. The *suction point* for a geotextile *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be connected to the matting in a manner to facilitate airflow from the collector. One opening of the fitting or device shall be oriented in a vertical “up” position.

R324.7.2.3 Suction point for gravel soil gas collector. The *suction point* for a *gravel soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be provided with not less than 5 feet [1524 mm] of perforated pipe extending from each opening of the fitting or device into the *gravel* layer. Such perforated pipe shall provide not less than 1 square inch [645 sq. mm] of open perforation area per lineal foot of pipe.

R324.7.3 Suction points not permitted. *Suction points* are not permitted on sump lids

R324.7.4 Fasten suction points. *Suction point* fittings and devices shall be fixed in place to prevent dislocation.

R324.7.5 Seal top of the soil gas collection plenum. A *soil gas retarder* shall cover the top of the *soil gas collection plenum* and all exposed soil. The installation of the *soil gas retarder* shall be in accordance with Sections R324.7.5.1 through R324.7.5.4.

R324.7.5.1 Sheeting. The *soil gas retarder* membrane shall meet ASTM E1745 Class A, B or C.

R324.7.5.2 Seams. The seams between adjacent membrane sheets shall be overlapped not less than 12 inches [305 mm] and shall be sealed by one of the following methods:

1. A tape recommended by the membrane manufacturer.
2. Caulk complying with ASTM C920 class 25 or greater.
3. An equivalent method.

R324.7.5.3 Repairs. Tears or punctures in the membrane shall be sealed by one or more of the following methods:

1. A tape recommended by the membrane manufacturer.
2. An additional sheet of the membrane material that covers and overlaps the tear or puncture not less than 12 inches [305 mm] on all sides and that is sealed with a caulk complying with ASTM C920 class 25 or greater.
3. An equivalent method.

R324.7.5.4 Penetrations. Openings in the *soil gas retarder* membrane for piping, utilities, structural supports or similar penetrations shall be sealed.

R324.7.6 Seal sides of the soil gas collection plenum. The *soil gas retarder* membrane shall turn up onto foundation walls not less than 6 inches [152 mm] and shall be continuously sealed to the wall along the full perimeter with a caulk complying with ASTM C920 class 25 or higher or equivalent method.

R324.7.7 Membrane label required. *Soil gas retarder* membranes shall be marked in a conspicuous place with a label to identify that the membrane is a component of a *radon* reduction system. The label lettering shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color in contrast to the color of the background on which the lettering is applied.

R324.8 Subslab soil gas collection plenums for concrete floors. The floors of basement, concrete crawlspace and slab-on-grade foundation systems shall be provided with a *soil gas collection plenum* installed in accordance with Sections R324.8.1 through R324.9.6.

R324.8.1 Soil gas collector. A *soil gas collector* shall be installed in accordance with Section R324.8.1.1, R324.8.1.2 or R324.8.1.3.

R324.8.1.1 Gravel. A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be in accordance with Size Number 4, 5, 56, or 6 as classified by ASTM C33.

R324.8.1.2 Geotextile. A layer of geotextile drainage matting shall be placed over a uniform layer of either soil or sand. The geotextile drainage matting shall be designed to allow the lateral flow of *soil gases* to the system's *suction point* fitting. The *geotextile matting* shall have a cross-sectional area of not less than 12 square inches [7742 sq. mm] and shall be placed, at a minimum, along the entire inside perimeter of the foundation at a distance of 12 inches [305 mm] to 18 inches [457 mm] from the foundation wall to the edge of the drainage matting. Deviation from the 12 inch [305 mm] to 18 inch [457 mm] distance to the foundation wall shall be allowed to avoid obstacles such as plumbing and other utilities.

R324.8.1.3 Pipe loop. A loop of not less than 4 inch [102 mm] diameter perforated pipe shall be placed along the entire inside perimeter of the foundation at a distance of 12 inches [305 mm] to 18 inches [457 mm] from the centerline of the pipe to the foundation walls. Such piping shall be placed in a trench

backfilled with clean aggregate meeting the criteria of Section R324.8.1.1 and surrounding the pipe on at least 2 sides. The cross-sectional area of the aggregate and pipe *soil gas collector* shall be not less than 50 square inches [32,258 sq. mm]. The piping shall form a continuous loop and pipe sections shall be joined with a connector device or method recommended by the manufacturer. Deviation from the 12 inch [305 mm] to 18 inch [457 mm] distance to the foundation wall shall be allowed to avoid obstacles such as plumbing and other utilities.

R324.8.2 Suction points. One *suction point* shall be provided for each *soil gas collector*. Not less than one *suction point* shall be provided for each foundation type. Alternatively, each *soil gas collector* shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.3 and served by one or more *suction points*. *Suction points* shall be installed in accordance with Sections R324.8.2.1, R324.8.2.2 or R324.8.2.3 as applicable for the type of *soil gas collector* installed.

R324.8.2.1 Gravel layer soil gas collector. A *suction point* for a *gravel* type *soil gas collector* shall consist of a pipe fitting or other device having not less than two openings oriented so as to create multiple horizontal intake openings within the *gravel* layer. The horizontal openings shall be provided with not less than 5 feet [1534 mm] of perforated pipe extending from each opening of the fitting or device into the *gravel* layer. Said perforated pipe shall provide a not less than 1 square inch [645 sq. mm] of open perforation area per lineal foot of pipe. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.2.2 Geotextile layer soil gas collector. A *suction point* for a geotextile type *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two oriented so as to create multiple horizontal intake openings connected to the geotextile mat in a manner to maintain airflow capacity from the plenum. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.2.3 Pipe loop soil gas collector. A *suction point* for a *pipe loop* type collector shall consist of a pipe tee fitting or pipe saddle device installed in the loop piping. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.3 Multiple soil gas collection plenums. Where interior footings divide a *soil gas collector* into two or more areas, each such area shall be provided with the required *suction points* and joined with *mitigation system* piping in accordance with Section R324.10. Alternatively, each area so created by the interior footings shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.1.3 and served by one or more *suction points*.

R324.8.4 Suction points not permitted. *Suction points* are not permitted on sump lids.

R324.8.5 Fasten suction points. *Suction point* fittings and piping shall be fastened in place to prevent dislocation during placement of the gas permeable layer, *soil gas retarder* and concrete.

R324.8.6 Seal top of the soil gas plenum. The *soil gas collector* and all exposed soil shall be covered with a *soil gas retarder* installed in accordance with Section R324.8.6.1.

R324.8.6.1 Sheeting. Polyethylene sheeting of not less than 6 *mils* [0.152 mm] in thickness, or cross-laminated polyethylene sheeting of not less than 3 *mils* [0.076 mm] in thickness shall be installed on top of the *soil gas collector* and shall completely cover the area under the concrete floor and shall be sealed in accordance with Sections R324.8.6.1.1 through R324.8.6.1.3. Where sheet foam board insulation is installed on top of the *soil gas collector*, the polyethylene sheeting shall be installed below the foam board insulation.

R324.11.8.1.1 Seams. Seams between adjacent polyethylene sheets shall be overlapped not less than 12 inches [305 mm] and sealed with a caulk complying with ASTM C920 class 25 or higher, or equivalent method.

R324.11.8.1.2 Repairs. Tears or punctures in the polyethylene sheeting shall be sealed or an additional sheet of polyethylene shall cover the tear or puncture with an overlap of not less than 12 inches [305 mm] on all sides. Such additional sheet shall be sealed and fixed in place to prevent displacement during slab casting.

R324.11.8.1.3 Penetrations. Openings in the *soil gas retarder* membrane for piping, utilities, structural posts and similar penetrations shall be sealed.

R324.8.7 Concrete floors. The concrete floor shall be cast directly upon the *soil gas retarder* or upon the sheet foam board insulation where it is installed on top of the *soil gas retarder*.

R324.8.8 Penetrations. Penetrations through the concrete slab and *soil gas retarder* shall be sealed with a caulk complying with ASTM C920 class 25 or higher, or equivalent method.

R324.8.9 Block-outs. Where openings are cast or constructed in the concrete slab under plumbing fixtures, the openings shall be filled with expanding foam or a non-shrink grout or an approved equivalent method. Exposed openings shall be sealed with non-shrink grout or an approved equivalent method.

R324.8.10 Seal sides of the soil gas collection plenum. The intersection of floors and foundation walls shall be sealed with a caulk complying with ASTM C920 class 25 or higher or an approved equivalent method. Sealing shall be performed in accordance with Section R324.8.10.1, R324.8.10.2 or R324.8.10.3.

R324.8.10.1 Seal floor to wall. The intersection of floors and foundation walls shall be sealed.

R324.8.10.2 Seal soil gas retarder to footing or wall. Where foundation walls are solid concrete, the *soil gas retarder* shall be sealed to the footing or to the foundation wall.

R324.8.10.3 Seal soil gas retarder to wall. Where foundation walls are masonry block, the *soil gas retarder* shall be sealed to the foundation wall.

R324.9 General sealing of soil gas collection plenums. Sealing of potential *soil gas* pathways shall be in accordance with Sections R324.9.1 through R324.9.6.

R324.9.1 Sumps in floors. Sumps in interior floors shall have a rigid lid and the lid shall be sealed with a gasket or silicone caulk and mechanically fastened in a manner to facilitate removal for maintenance. Pipe and wiring penetrations through the lid shall be sealed. The intersection of the floor and sump basin shall be sealed with a caulk complying with ASTM C920 class 25 or higher or equivalent method.

R324.9.2 Hollow masonry unit walls. The top course of hollow block masonry walls shall be made of solid masonry units or the top course shall be fully grouted. The top course under the full width of door and window openings shall be made of solid masonry units or the hollow masonry units shall be fully grouted. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be made of solid masonry units or the top course shall be fully grouted**.** Other penetrations through foundation walls shall be sealed**.**

R324.9.3 Floor drains. Floor drains and condensate drains shall not allow *soil gas* entry.

R324.9.4 Air ducts. Air ducts located below concrete slabs shall be sealed to prevent *radon* entry and constructed in accordance with Chapter 16.

R324.9.5 Foundation drains. Gravity foundation drainage systems shall include a *check valve* or other mechanical means to isolate the *soil gas collection plenum* from any exterior drain piping. Access shall be provided for maintenance.

R324.9.6 Access openings. Access openings in the floor provided for drain maintenance shall not allow *soil gas* entry.

R324.10 Mitigation system piping. The *mitigation system* piping that extends from the *soil gas* plenum to the point of discharge shall be rigid, non-perforated pipe in accordance with Sections R324.11 through R324.19.

R324.11 Pipe size. *Mitigation system* pipe shall be not less than 3 inch [76 mm] nominal inside diameter.

R324.12 ABS piping. ABS pipe shall comply with ASTM D2661, F628 or F1488. The pipe wall thickness shall be Schedule 40.

R324.13 PVC piping. PVC pipe shall comply with ASTM D2665, F891, or F1488. The pipe wall thickness shall be Schedule 40.

> **Exception:** Rigid, non-perforated PVC pipe meeting ASTM D2949 shall be an alternative to the material specified herein, where installed vertically within enclosed wall cavities.

R324.14 Slope. Above ground piping shall have a slope of not less than 1/8 inch [3.2 mm] per foot [305 mm]. Piping shall slope downwards towards the *suction point*. Piping arrangements that could allow water to collect are prohibited.

R324.15 Joints. Plastic pipe joints shall be solvent welded in accordance with Sections R324.15.1 and R324.15.2. Where disassembly of piping is required such as for removal of a fan, the joints shall be made with flexible couplings complying with ASTM D5926 or ASTM C1173 or an approved equivalent method.

R324.15.1 ABS plastic pipe joints. ABS plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2235.

R324.15.2 PVC plastic pipe joints. The joint surfaces for PVC plastic pipe and fittings to be solvent welded shall be prepared with a primer conforming to ASTM F 656. PVC plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2564.

R324.16 Support. Above ground piping shall be supported by the structure of the building using hangers or strapping designed for piping support. Supports for horizontal piping shall be installed at intervals of not more than 4 feet [1219 mm] and supports for vertical piping shall be installed at intervals of not more than 10 feet [3048 mm].

R324.17 Protection against physical damage. Where pipes penetrate top or bottom plates of stud walls and the nearest edge of the hole is within 1 ½ inches [38 mm] of the face of the member, the pipe shall be protected by steel shield plates. Such shield plates shall have a thickness of not less than 0.0575 inches [1.463 mm] (No. 16 gage). Such plates shall cover the area of the pipe where the plate is bored, and shall extend not less than 2 inches [51 mm] above bottom plates and not less than 2 inches [51 mm] below top plates.

R324.18 Insulation required. In spaces where *mitigation system* piping is subject to freezing temperatures and in spaces where the exterior of *mitigation system* piping is subject to the formation of condensation, such piping shall be provided with insulation having an external vapor barrier and an R-value of not less than 1.8.

R324.19 Labels required (piping). *Mitigation system* piping shall be marked prior to the closing of wall cavities with not less than one label at each floor level and at intervals not more than 10 feet [3048 mm] along the developed length of the piping. The label shall identify that the item is a component of a *radon* reduction system. The label lettering shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color in contrast to the color of the background on which the lettering is applied.

R324.20 Mitigation system termination. The discharge point of a *mitigation system* shall be to the outdoors and shall be directed vertically upward.

R324.21 Elevation and vertical walls. The point of discharge of a *mitigation system* shall comply with all of the following:

1. It shall be not less than 1 foot [305 mm] above the roof at the point penetrated.
2. It shall be not less than 10 feet [3048 mm] above grade nearest the point of discharge.
3. It shall be not less than 10 feet [3048 mm] horizontally from a vertical wall that extends above the roof penetrated.

R324.22 Windows and doors. The discharge point of a *mitigation system* shall be not less than 2 feet [610 mm] above or not less than 10 feet [3048 mm] from windows, doors or other gravity intake openings into the structure or an adjacent structure excluding attic ventilation openings. The 10 foot [3048 mm] distance shall be measured around intervening obstacles.

R324.23 Equipment air intake. The discharge point of a *mitigation system* shall be not less than 3 feet [914 mm] above or 10 feet [3048 mm] away from mechanical air intake openings such as those for evaporative coolers, make-up air, and heat energy recovery ventilators. The 10 foot [3048 mm] distance shall be measured around intervening obstacles.

R324.24 Provision for Active Soil Depressurization (ASD) fan. A space having a vertical height of not less than 48 inches [1219 mm] and a diameter of not less than 21 inches [533 mm] shall be provided in the area where the *ASD fan* will be installed if required. The space provided for the *ASD fan* shall be located according to Section 901.8. The *ASD* pipe shall be centered in this space.

R324.25 Electrical. A receptacle outlet supplied by branch circuit conductors shall be located within 6 feet [1.8 m] of an interior *ASD fan* location

R324.25.1 Label. The over-current device for the branch circuit supplying the *ASD fan* shall be labeled to indicate that it supplies the *radon* fan.

R324.25.2 Disconnect required. Where the fan is not cord and plug connected, a means of electrical disconnect shall be provided for and in sight of the *ASD fan*. The electrical disconnect shall be labeled as to its purpose.

R324.26 Fan access. Limited *access* shall be provided for each *ASD fan* location to allow installation of *ASD fans* and replacement of same. *Access* entry shall be located not more than 20 feet [6096 mm] from the *ASD fan* location.

R324.27 Radon test kit required. A minimum of one long term *radon*-in-air test kit from a *certified* and/or *licensed* laboratory shall be provided for the occupants of each *dwelling* unit.

R324.28 Completion of ASD system. Prior to occupancy, the *ASD* system shall be completed and activated in accordance with Sections R324.30 through R324.41.

Exception: Where prior to occupancy, testing in accordance with Section R324.41 indicates that the building has a *radon* level below the *National Action Level* (*NAL*) and the *Rough-In* piping is labeled in accordance with Section R324.29.

R324.29 Labels required, system Rough-in. *Mitigation system* piping shall be marked with not less than one label in a conspicuous location. An additional label shall be placed on or within 12 inches [305 mm] of the electrical service panel. The labels shall state the following: **"**This radon system is nonfunctional because the system has NOT been activated with a radon fan. The building should be tested for radon at least every 2 years or as recommended by the state or USEPA." The label lettering

shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color that is in contrast to the color of the background on which the lettering is applied.

R324.30 Fan selection. Fans installed in the *ASD* system shall be recommended by the manufacturer for *radon* mitigation. Such fans shall be designed and sealed by the manufacturer to minimize leakage of water or *soil gas* from the fan housing and shall be sized in accordance with Table R324.33 or as specified by a *certified* or *licensed radon mitigator*.

TABLE R324.30
FAN SIZING

PIPE SIZE Nominal (I.D.)	**TOTAL FOUNDATION AREA**		
	Less Than 1600 sq. feet	**1600 to 2500 sq. feet**	**Greater than 2500 sq. feet**
	Less Than 149 sq. meters	**149 to 232 sq. meters**	**Greater than 232 sq. meters**
(3 inch) [76 mm]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 *cfm* @ 0.5 *in. WC* [85m^3/*hr* @ 125 *Pa*]	Use Radon Fan Type: **RF2** RF2 Minimum rating:[a] 75 *cfm* @ 1.0 *in. WC* [127m^3/*hr* @ 250 *Pa*]	*Radon* fan to be sized by *certified* and/or *licensed radon mitigator*
(4 inch) [102 mm]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 *cfm* @ 0.5 *in. WC* [85m^3/*hr* @ 125 *Pa*]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 *cfm* @ 0.5 *in. WC* [85m^3/*hr* @ 125 *Pa*]	*Radon* fan to be sized by *certified* and/or *licensed radon mitigator*

a. Radon Fan Types RF1 & RF2 minimum flow and pressure ratings are manufacturer specifications.

R324.31 Orientation. *ASD* inline fans shall be installed only on vertical *ASD* piping.

R324.32 Installation. *ASD fans* shall be installed in accordance with the manufacturer's instructions.

R324.33 Flexible connectors required. *ASD fans* shall be connected to the *ASD* piping using flexible unshielded couplings complying with ASTM D5926 or ASTM C1173 or an equivalent method. Connections shall be air and water-tight.

R324.34 Fan start-up. *ASD fans* shall be electrically energized upon installation on the *ASD* system piping.

R324.35 Fan location. *ASD fans* shall be installed only outdoors, in attics or in garages that are not beneath conditioned spaces. *ASD fans* shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in a basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. *ASD fans* shall not be mounted in a location where pipe that is positively pressurized by the fan is located inside of conditioned or occupiable space.

R324.36 System monitor required. Each *ASD* system shall be provided with a system negative pressure monitor, such as, but not limited to, manometer type pressure gauges, to indicate system operation. The system monitor shall be located indoors in an area where the monitor is readily observable by the occupants.

R324.37 Startup marking. *ASD* system monitors shall be clearly marked to indicate the pressure that existed when the system was initially activated. The monitor device shall have a durable label on or in close proximity to it that describes how to interpret the monitor and what to do if the monitor indicates that system performance has degraded.

R324.38 Automatic reset. Pressure activated electrical *ASD* system monitors, whether visual or audible, shall be supplied by un-switched electrical branch circuits and shall be designed to reset automatically when power is restored after power supply failure. Battery operated monitoring devices shall not be used except where they are equipped with a low power warning feature.

R324.39 Labels required (system and sump). System description labels made of durable material shall be placed on or within 12 inches [30 cm] of the electric service panel and also on the *ASD* system or other prominent location. The lettering on the label shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color in contrast to the color of the background on which the lettering is applied. The label shall state the following: "Radon Reduction System;" the installer's name, phone number, and applicable certification identification; date of installation, an advisory stating that the building should be tested for *radon* at least every 2 years or as required or recommended by state or federal agencies. and shall include notice of additional *radon* resources at www.epa.gov/radon and the *radon* hotline 1-800-SOS-RADON (767-7236).

R324.39.1 Label sump basins. Sump basin covers shall be identified with a durable label that reads as follows: "Component of a Radon Reduction System. Do not tamper with or disconnect." or approved equivalent wording. The lettering on the label shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color in contrast to the color of the background on which the lettering is applied.

R324.40 Documentation package. The occupants of the *dwelling* shall be provided with a documentation package that includes the following:

1. A description of system operation, such as shown in Exhibit 1 "Understanding a Radon Reduction System".
2. All *radon* test data for the property.
3. The annual energy consumption of the installed *ASD fan*(s), whether estimated or actual, and the projected monetary cost of such energy.

R324.41 Radon testing prior to occupancy. A *radon* test shall be performed prior to occupancy and shall be performed by a *certified* or *licensed* measurement professional. Testing shall be performed in accordance with applicable state protocols or requirements; or if there are no state protocols or requirements, with accepted Federal protocols or "Protocols for Radon Measurements in Homes", AARST Consortium on National Radon Standards. Where testing results are greater than the *NAL*, a *certified* and/or *licensed mitigator* shall be required to perform *diagnostic tests* and remediation action. Further *radon* testing shall be required until *radon* concentrations below the *NAL* are achieved.

R324.42 EPA established zones. The *radon* potential of a building site shall be estimated from Figure R324.42 or from Table R324.42. Where state or local jurisdictions have published *radon* potential data, such data shall supersede the information in Figure R324.42 and Table R324.42.

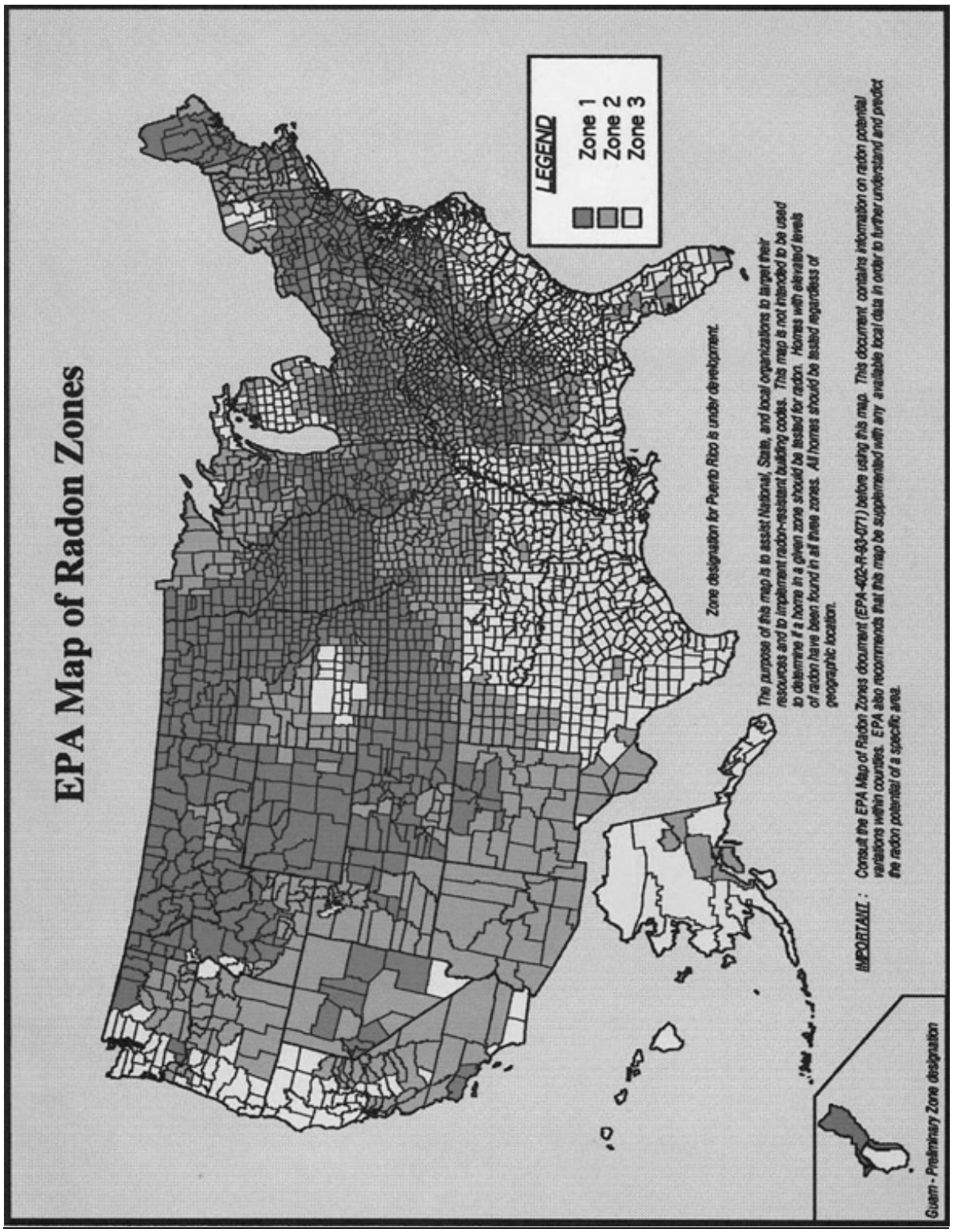


FIGURE R324.42
RADON POTENTIAL ZONES MAP

TABLE R324.42 EPA RADON ZONE 1 and 2 COUNTIES BY STATE

Alabama

Zone 1
Calhoun
Clay
Cleburne
Colbert
Coosa
Franklin
Jackson
Lauderdale
Lawrence
Limestone
Madison
Morgan
Talladega

Zone 2
Autauga
Barbour
Bibb
Blount
Bullock
Cherokee
Chilton
Cullman
Dallas
DeKalb
Elmore
Etowah
Fayette
Greene
Hale
Jefferson
Lamar
Lee
Lowndes
Macon
Marion
Marshall
Montgomery
Perry
Pickens
Randolph
Russell
Shelby
St Clair
Sumter
Tuscaloosa
Walker
Winston

Alaska

Zone 2
Anchorage Municipality
Dillingham Census Area
Fairbanks North Star Borough
Kenai Peninsula Borough
Matanuska-Susitna Borough
Southeast Fairbanks Census Area

Arizona

Zone 2
Apache
Cochise
Coconino
Gila
Graham
Greenlee
La Paz
Maricopa
Mohave
Navajo
Pima
Pinal
Santa Cruz
Yavapai
Yuma

Arkansas

Zone 2
Baxter
Benton
Boone
Carroll
Fulton
Garland
Independence
Izard
Marion
Montgomery
Randolph
Searcy
Sharp
Stone

California

Zone 1
Santa Barbara
Ventura

Zone 2
Alameda
Alpine
Amador
Calaveras
Contra Costa
El Dorado
Fresno
Inyo
Kern
Los Angeles
Madera
Mariposa
Mono
Monterey
Nevada
Placer
Plumas
Riverside
San Benito
San Bernardino
San Francisco
San Luis Obispo
San Mateo
Santa Clara
Santa Cruz
Sierra
Tulare
Tuolumne
Yuba

Colorado

Zone 1
Adams
Arapahoe
Baca
Bent
Boulder
Broomfield
Chaffee
Cheyenne
Clear Creek
Crowley
Custer
Delta
Denver
Dolores
Douglas
El Paso
Elbert
Fremont
Garfield
Gilpin
Grand
Gunnison
Huerfano
Jackson
Jefferson
Kiowa
Kit Carson
La Plata
Larimer
Las Animas
Lincoln
Logan
Mesa
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Phillips
Pitkin
Prowers
Pueblo
Rio Blanco
San Miguel
Sedgwick
Summit
Teller
Washington
Weld
Yuma

Zone 2
Alamosa
Archuleta
Conejos
Costilla
Eagle
Hinsdale
Lake
Mineral
Rio Grande
Routt
Saguache
San Juan

Connecticut

Zone 1
Fairfield
Middlesex
New Haven
New London

Zone 2
Litchfield
Tolland
Windham

Delaware

Zone 2
New Castle

Florida

Zone 2
Alachua
Citrus
Columbia
Hillsborough
Leon
Marion
Miami-Dade
Polk
Union

Georgia

Zone 1
Cobb
DeKalb
Fulton
Gwinnett

Zone 2
Banks
Barrow
Bartow
Butts
Carroll
Catoosa
Cherokee
Clarke
Clayton
Coweta
Dawson
Douglas
Elbert
Fannin
Fayette
Floyd
Forsyth
Franklin
Gilmer
Greene
Habersham
Hall
Haralson
Harris
Hart
Heard
Henry
Jackson
Jasper
Lamar
Lumpkin
Madison
Meriwether
Monroe
Morgan
Newton
Oconee
Oglethorpe
Paulding
Pickens
Pike
Rabun
Richmond
Rockdale
Spalding
Stephens
Talbot
Towns
Troup
Union
Upson
Walker
Walton
White
Whitfield

Hawaii

------None-----

Idaho

Zone 1
Benewah
Blaine
Boise
Bonner
Boundary

Butte
Camas
Clark
Clearwater
Custer
Elmore
Fremont
Gooding
Idaho
Kootenai
Latah
Lemhi
Shoshone
Valley

Zone 2
Ada
Bannock
Bear Lake
Bingham
Bonneville
Canyon
Caribou
Cassia
Franklin
Jefferson
Jerome
Lincoln
Madison
Minidoka
Oneida
Owyhee
Payette
Power
Teton
Twin Falls

Illinois

Zone 1
Adams
Boone
Brown
Bureau
Calhoun
Carroll
Cass
Champaign
Coles
De Witt
DeKalb
Douglas
Edgar
Ford
Fulton
Greene
Grundy
Hancock
Henderson
Henry
Iroquois
Jersey
Jo Daviess
Kane
Kendall
Knox
LaSalle
Lee
Livingston
Logan
Macon
Marshall
Mason
McDonough
McLean
Menard
Mercer
Morgan
Moultrie
Ogle
Peoria
Piatt
Pike
Putnam
Rock Island
Sangamon
Schuyler
Scott
Stark
Stephenson
Tazewell
Vermilion
Warren
Whiteside
Winnebago
Woodford

Zone 2
Bond
Christian
Clark
Clay
Clinton
Cook
Crawford
Cumberland
DuPage
Edwards
Effingham
Fayette
Franklin
Gallatin
Hamilton
Hardin
Jackson
Jasper
Jefferson
Johnson
Kankakee
Lake
Lawrence
Macoupin
Madison
Marion
McHenry
Monroe
Montgomery
Perry
Pope
Randolph
Richland
Saline
Shelby
St Clair
Union
Wabash
Washington
Wayne
White
Will
Williamson

Indiana

Zone 1
Adams
Allen
Bartholomew
Benton
Blackford
Boone
Carroll
Cass
Clark
Clinton
Decatur
DeKalb
Delaware
Elkhart
Fayette
Fountain
Fulton
Grant
Hamilton
Hancock
Harrison
Hendricks
Henry
Howard
Huntington
Jay
Jennings
Johnson
Kosciusko
LaGrange
Lawrence
Madison
Marion
Marshall
Miami
Monroe
Montgomery
Noble
Orange
Putnam
Randolph
Rush
Scott
Shelby
St Joseph
Steuben
Tippecanoe
Tipton
Union
Vermillion
Wabash
Warren
Washington
Wayne
Wells
White
Whitley

Zone 2
Brown
Clay
Crawford
Daviess
Dearborn
Dubois
Floyd
Franklin
Gibson
Greene
Jackson
Jasper
Jefferson
Knox
Lake
LaPorte
Martin
Morgan
Newton
Ohio
Owen
Parke
Perry
Pike
Porter
Posey
Pulaski
Ripley
Spencer
Starke
Sullivan
Switzerland
Vanderburgh
Vigo
Warrick

Iowa

Zone 1
Adair
Adams
Allamakee
Appanoose
Audubon
Benton
Black Hawk
Boone
Bremer
Buchanan
Buena Vista
Butler
Calhoun
Carroll
Cass
Cedar
Cerro Gordo
Cherokee
Chickasaw
Clarke
Clay
Clayton
Clinton
Crawford
Dallas
Davis
Decatur
Delaware
Des Moines
Dickinson
Dubuque
Emmet
Fayette
Floyd
Franklin
Fremont
Greene
Grundy
Guthrie
Hamilton
Hancock
Hardin
Harrison
Henry
Howard
Humboldt
Ida
Iowa
Jackson
Jasper
Jefferson
Johnson
Jones
Keokuk
Kossuth
Lee
Linn
Louisa
Lucas
Lyon
Madison
Mahaska
Marion
Marshall
Mills
Mitchell
Monona
Monroe
Montgomery
Muscatine
O'Brien
Osceola
Page
Palo Alto
Plymouth
Pocahontas
Polk
Pottawattamie
Poweshiek
Ringgold
Sac
Scott
Shelby
Sioux
Story
Tama
Taylor
Union
Van Buren
Wapello
Warren
Washington

Wayne
Webster
Winnebago
Winneshiek
Woodbury
Worth
Wright

Kansas

Zone 1
Atchison
Barton
Brown
Cheyenne
Clay
Cloud
Decatur
Dickinson
Douglas
Ellis
Ellsworth
Finney
Ford
Geary
Gove
Graham
Grant
Gray
Greeley
Hamilton
Haskell
Hodgeman
Jackson
Jewell
Johnson
Kearny
Kingman
Kiowa
Lane
Leavenworth
Lincoln
Logan
Marion
Marshall
McPherson
Meade
Mitchell
Nemaha
Ness
Norton
Osborne
Ottawa
Pawnee
Phillips
Pottawatomie
Pratt
Rawlins
Republic
Rice
Riley
Rooks
Rush
Russell
Saline
Scott
Sheridan
Sherman
Smith
Stanton
Thomas
Trego
Wallace
Washington
Wichita
Wyandotte

Zone 2
Allen
Anderson
Barber
Bourbon
Butler
Chase
Chautauqua
Cherokee
Clark
Coffey
Comanche
Cowley
Crawford
Doniphan
Edwards
Elk
Franklin
Greenwood
Harper
Harvey
Jefferson
Labette
Linn
Lyon
Miami
Montgomery
Morris
Morton
Neosho
Osage
Reno
Sedgwick
Seward
Shawnee
Stafford
Stevens
Sumner
Wabaunsee
Wilson
Woodson

Kentucky

Zone 1
Adair
Allen
Barren
Bourbon
Boyle
Bullitt
Casey
Clark
Cumberland
Fayette
Franklin
Green
Harrison
Hart
Jefferson
Jessamine
Lincoln
Marion
Mercer
Metcalfe
Monroe
Nelson
Pendleton
Pulaski
Robertson
Russell
Scott
Taylor
Warren
Woodford

Zone 2
Anderson
Bath
Bell
Boone
Boyd
Bracken
Breathitt
Breckinridge
Butler
Caldwell
Campbell
Carroll
Carter
Christian
Clay
Clinton
Crittenden
Daviess
Edmonson
Elliott
Estill
Fleming
Floyd
Gallatin
Garrard
Grant
Grayson
Greenup
Hancock
Hardin
Harlan
Henderson
Henry
Hopkins
Jackson
Johnson
Kenton
Knott
Knox
Larue
Laurel
Lawrence
Lee
Leslie
Letcher
Lewis
Livingston
Logan
Lyon
Madison
Magoffin
Martin
Mason
McCreary
McLean
Meade
Menifee
Montgomery
Morgan
Muhlenberg
Nicholas
Ohio
Oldham
Owen
Owsley
Perry
Pike
Powell
Rockcastle
Rowan
Shelby
Simpson
Spencer
Todd
Trigg
Trimble
Union
Washington
Wayne
Webster
Whitley
Wolfe

Louisiana

-------None-------

Maine

Zone 1
Androscoggin
Aroostook
Cumberland
Franklin
Hancock
Kennebec
Lincoln
Oxford
Penobscot
Piscataquis
Somerset
York

Zone 2
Knox
Sagadahoc
Waldo
Washington

Maryland

Zone 1
Baltimore
Calvert
Carroll
Frederick
Harford
Howard
Montgomery
Washington

Zone 2
Allegany
Anne
Arundel
Baltimore
City
Cecil
Charles
Garrett
Prince
George's
Somerset

Massachusetts

Zone 1
Essex
Middlesex
Worcester

Zone 2
Barnstable
Berkshire
Bristol
Dukes
Franklin
Hampden
Hampshire
Nantucket
Norfolk
Plymouth

Michigan

Zone 1
Branch
Calhoun
Cass
Hillsdale
Jackson
Kalamazoo
Lenawee
St Joseph
Washtenaw

Zone 2
Alcona
Alger
Alpena
Antrim
Baraga
Barry

Charlevoix
Clinton
Dickinson
Eaton
Emmet
Genesee
Gogebic
Houghton
Ingham
Ionia
Iron
Kent
Keweenaw
Lapeer
Leelanau
Livingston
Marquette
Menominee
Monroe
Montcalm
Montmorency
Oakland
Otsego
Presque Isle
Sanilac
Shiawassee

Minnesota

Zone 1

Becker
Big Stone
Blue Earth
Brown
Carver
Chippewa
Clay
Cottonwood
Dakota
Dodge
Douglas
Faribault
Count
Fillmore
Freeborn
Goodhue
Grant
Hennepin
Houston
Hubbard
Jackson
Kanabec
Kandiyohi
Kittson
Lac qui Parle
Le Sueur
Lincoln
Lyon
Mahnomen
Marshall
Martin
McLeod
Meeker
Mower
Murray
Nicollet
Nobles
Norman
Olmsted
Otter Tail
Pennington
Pipestone
Polk
Pope
Ramsey
Red Lake
Redwood
Renville
Rice
Rock
Roseau
Scott
Sherburne
Sibley
Stearns
Steele
Stevens
Swift
Todd
Traverse
Wabasha
Wadena
Waseca
Washington
Watonwan
Wilkin
Winona
Wright
Yellow Medicine

Zone 2

Aitkin
Anoka
Beltrami
Benton
Carlton
Cass
Chisago
Clearwater
Cook
Crow Wing
Isanti
Itasca
Koochiching
Lake
Lake of the Woods
Mille Lacs
Morrison
Pine
St Louis

Mississippi

Zone 2

Alcorn
Chickasaw
Clay
Lee
Lowndes
Noxubee
Pontotoc
Rankin
Union
Washington

Missouri

Zone 1

Andrew
Atchison
Buchanan
Cass
Clay
Clinton
Holt
Iron
Jackson
Nodaway
Platte

Zone 2

Adair
Audrain
Barry
Barton
Bates
Benton
Bollinger
Boone
Caldwell
Callaway
Camden
Cape Girardeau
Carroll
Carter
Cedar
Chariton
Christian
Clark
Cole
Cooper
Crawford
Dade
Dallas
Daviess
DeKalb
Dent
Douglas
Franklin
Gasconade
Gentry
Greene
Grundy
Harrison
Henry
Hickory
Howard
Howell
Jasper
Jefferson
Johnson
Knox
Laclede
Lafayette
Lawrence
Lewis
Lincoln
Linn
Livingston
Macon
Madison
Maries
Marion
McDonald
Mercer
Miller
Moniteau
Monroe
Montgomery
Morgan
Newton
Oregon
Osage
Ozark
Perry
Pettis
Phelps
Pike
Polk
Pulaski
Putnam
Ralls
Randolph
Ray
Reynolds
Ripley
Saline
Schuyler
Scotland
Shannon
Shelby
St Charles
St Clair
St Francois
St Louis city
St Louis
Ste Genevieve
Stone
Sullivan
Taney
Texas
Vernon
Warren
Washington
Wayne
Webster
Worth
Wright

Montana

Zone 1

Beaverhead
Big Horn
Blaine
Broadwater
Carbon
Carter
Cascade
Chouteau
Custer
Daniels
Dawson
Deer Lodge
Fallon
Fergus
Flathead
Gallatin
Garfield
Glacier
Granite
Hill
Jefferson
Judith Basin
Lake
Lewis and Clark
Liberty
Lincoln
Madison
McCone
Meagher
Mineral
Missoula
Park
Phillips
Pondera
Powder River
Powell
Prairie
Ravalli
Richland
Roosevelt
Rosebud
Sanders
Sheridan
Silver Bow
Stillwater
Teton
Toole
Valley
Wibaux

Zone 2

Golden Valley
Musselshell
Petroleum
Sweet Grass
Treasure
Wheatland
Yellowstone

Nebraska

Zone 1

Adams
Boone
Boyd
Burt
Butler
Cass
Cedar
Clay
Colfax
Cuming
Dakota
Dixon

Dodge
Douglas
Fillmore
Franklin
Frontier
Furnas
Gage
Gosper
Greeley
Hamilton
Harlan
Hayes
Hitchcock
Jefferson
Johnson
Kearney
Knox
Lancaster
Madison
Nance
Nemaha
Nuckolls
Otoe
Pawnee
Phelps
Pierce
Platte
Polk
Red Willow
Richardson
Saline
Sarpy
Saunders
Seward
Stanton
Thayer
Thurston
Washington
Wayne
Webster
York

Zone 2

Antelope
Banner
Box Butte
Buffalo
Chase
Cheyenne
Custer
Dawes
Dawson
Deuel
Dundy
Hall
Howard
Keith
Keya Paha
Kimball
Merrick
Morrill
Perkins
Scotts Bluff
Sheridan
Sherman
Sioux
Valley

Nevada

Zone 1

Carson City
Douglas
Eureka
Lander
Lincoln
Lyon
Mineral
Pershing
White Pine

Zone 2

Churchill
Elko
Esmeralda
Humboldt
Nye
Storey
Washoe

New Hampshire

Zone 1

Carroll

Zone 2

Belknap
Cheshire
Coos
Grafton
Hillsborough
Merrimack
Rockingham
Strafford
Sullivan

New Jersey

Zone 1

Hunterdon
Mercer
Monmouth
Morris
Somerset
Sussex
Warren

Zone 2

Bergen
Burlington
Camden
Cumberland
Essex
Gloucester
Hudson
Middlesex
Passaic
Salem
Union

New Mexico

Zone 1

Bernalillo
Colfax
Mora
Rio Arriba
San Miguel
Santa Fe
Taos

Zone 2

Catron
Chaves
Cibola
Curry
De Baca
Dona Ana
Eddy
Grant
Guadalupe
Harding
Hidalgo
Lea
Lincoln
Los Alamos
Luna
McKinley
Otero
Quay
Roosevelt
San Juan
Sandoval
Sierra
Socorro
Torrance
Union
Valencia

New York

Zone 1

Albany
Allegany
Broome
Cattaraugus
Cayuga
Chautauqua
Chemung
Chenango
Columbia
Cortland
Delaware
Dutchess
Erie
Genesee
Greene
Livingston
Madison
Onondaga
Ontario
Orange
Otsego
Putnam
Rensselaer
Schoharie
Schuyler
Seneca
Steuben
Sullivan
Tioga
Tompkins
Ulster
Washington
Wyoming
Yates

Zone 2

Clinton
Jefferson
Lewis
Monroe
Montgomery
Niagara
Oneida
Orleans
Oswego
Saratoga
Schenectady
St Lawrence
Wayne

North Carolina

Zone 1

Alleghany
Buncombe
Cherokee
Henderson
Mitchell
Rockingham
Transylvania
Watauga

Zone 2

Alexander
Ashe
Avery
Burke
Caldwell
Caswell
Catawba
Clay
Cleveland
Forsyth
Franklin
Gaston
Graham
Haywood
Iredell
Jackson
Lincoln
Macon
Madison
McDowell
Polk
Rutherford
Stokes
Surry
Swain
Vance
Wake
Warren
Wilkes
Yadkin
Yancey

North Dakota

Zone 1

Adams
Barnes
Benson
Billings
Bottineau
Bowman
Burke
Burleigh
Cass
Cavalier
Dickey
Divide
Dunn
Eddy
Emmons
Foster
Golden
Valley
Grand Forks
Grant
Griggs
Hettinger
Kidder
LaMoure
Logan
McHenry
McIntosh
McKenzie
McLean
Mercer
Morton
Mountrail
Nelson
Oliver
Pembina
Pierce
Ramsey
Ransom
Renville
Richland
Rolette
Sargent
Sheridan
Sioux
Slope
Stark
Steele
Stutsman
Towner
Traill
Walsh
Ward
Wells
Williams

Ohio

Zone 1

Adams
Allen
Ashland
Auglaize

Belmont
Butler
Carroll
Champaign
Clark
Clinton
Columbiana
Coshocton
Crawford
Darke
Delaware
Fairfield
Fayette
Franklin
Greene
Guernsey
Hamilton
Hancock
Hardin
Harrison
Holmes
Huron
Jefferson
Knox
Licking
Logan
Madison
Marion
Mercer
Miami
Montgomery
Morrow
Muskingum
Perry
Pickaway
Pike
Preble
Richland
Ross
Seneca
Shelby
Stark
Summit
Tuscarawas
Union
Van Wert
Warren
Wayne
Wyandot

Zone 2
Ashtabula
Athens
Brown
Clermont
Cuyahoga
Defiance
Erie
Fulton
Gallia
Geauga
Henry
Highland
Hocking
Jackson
Lake
Lawrence
Lorain
Lucas
Mahoning
Medina
Meigs
Monroe
Morgan
Noble
Ottawa
Paulding
Portage
Putnam
Sandusky
Scioto
Trumbull
Vinton
Washington
Williams
Wood

Oklahoma

Zone 2
Adair
Beaver
Cherokee
Cimarron
Delaware
Ellis
Mayes
Sequoyah
Texas

Oregon

Zone 2
Baker
Clatsop
Columbia
Crook
Gilliam
Grant
Harney
Hood River
Jefferson
Klamath
Lake
Malheur
Morrow
Multnomah
Sherman
Umatilla
Union
Wasco
Washington
Wheeler
Yamhill

Pennsylvania

Zone 1
Adams
Allegheny
Armstrong
Beaver
Bedford
Berks
Blair
Bradford
Bucks
Butler
Cameron
Carbon
Centre
Chester
Clarion
Clearfield
Clinton
Columbia
Cumberland
Dauphin
Delaware
Franklin
Fulton
Huntingdon
Indiana
Juniata
Lackawanna
Lancaster
Lebanon
Lehigh
Luzerne
Lycoming
Mifflin
Monroe
Montgomery
Montour
Northampton
Northumberland
Perry
Schuylkill
Snyder
Sullivan
Susquehanna
Tioga
Union
Venango
Westmoreland
Wyoming
York

Zone 2
Cambria
Crawford
Elk
Erie
Fayette
Forest
Greene
Jefferson
Lawrence
McKean
Mercer
Pike
Potter
Somerset
Warren
Washington
Wayne

Rhode Island

Zone 1
Kent
Washington

Zone 2
Newport
Providence

South Carolina

Zone 1
Greenville

Zone 2
Abbeville
Anderson
Cherokee
Laurens
Oconee
Pickens
Spartanburg
York

South Dakota

Zone 1
Aurora
Beadle
Bon Homme
Brookings
Brown
Brule
Buffalo
Campbell
Charles Mix
Clark
Clay
Codington
Corson
Davison
Day
Deuel
Douglas
Edmunds
Faulk
Grant
Hamlin
Hand
Hanson
Hughes
Hutchinson
Hyde
Jerauld
Kingsbury
Lake
Lincoln
Lyman
Marshall
McCook
McPherson
Miner
Minnehaha
Moody
Perkins
Potter
Roberts
Sanborn
Spink
Stanley
Sully
Turner
Union
Walworth
Yankton

Zone 2
Bennett
Butte
Custer
Dewey
Fall River
Gregory
Haakon
Harding
Jackson
Jones
Lawrence
Meade
Mellette
Pennington
Shannon
Todd
Tripp
Ziebach

Tennessee

Zone 1
Anderson
Bedford
Blount
Bradley
Claiborne
Davidson
Giles
Grainger
Greene
Hamblen
Hancock
Hawkins
Hickman
Humphreys
Jackson
Jefferson
Knox
Lawrence
Lewis
Lincoln
Loudon
Macon
Madison
Marshall
McMinn
Meigs
Monroe
Moore
Perry

Roane
Rutherford
Smith
Sullivan
Trousdale
Union
Washington
Wayne
Williamson
Wilson

Zone 2
Benton
Cannon
Carter
Cheatham
Chester
Clay
Cocke
Coffee
Decatur
DeKalb
Dickson
Fentress
Hamilton
Hardin
Henderson
Houston
Johnson
Marion
McNairy
Montgomery
Overton
Pickett
Polk
Putnam
Robertson
Sevier
Stewart
Sumner
Unicoi
Van Buren
Warren
White

Texas

Zone 2
Armstrong
Bailey
Brewster
Carson
Castro
Crosby
Culberson
Dallam
Deaf Smith
Donley
Floyd
Garza
Gray
Hale
Hansford
Hartley
Hemphill
Hockley
Hudspeth
Hutchinson
Jeff Davis
Lamb
Lipscomb
Llano
Lubbock
Lynn
Mason
Moore
Ochiltree
Oldham
Parmer
Potter
Presidio
Randall
Reeves
Roberts
Sherman
Swisher
Terrell

Utah

Zone 1
Carbon
Duchesne
Grand
Piute
Sanpete
Sevier
Uintah

Zone 2
Beaver
Box Elder
Cache
Daggett
Davis
Emery
Garfield
Iron
Juab
Kane
Millard
Morgan
Rich
Salt Lake
San Juan
Summit
Tooele
Utah
Wasatch
Washington
Wayne
Weber

Vermont

Zone 2
Addison
Bennington
Caledonia
Essex
Franklin
Lamoille
Orange
Orleans
Rutland
Washington
Windham
Windsor

Virginia

Zone 1
Alleghany
Amelia
Appomattox
Augusta
Bath
Bland
Botetourt
Brunswick
Buckingham
Campbell
Chesterfield
Clarke
Craig
Cumberland
Dinwiddie
Fairfax
Fluvanna
Frederick
Giles
Goochland
Henry
Highland
Lee
Louisa
Montgomery
Nottoway
Orange
Page
Patrick
Pittsylvania
Powhatan
Pulaski
Roanoke
Rockbridge
Rockingham
Russell
Scott
Shenandoah
Smyth
Spotsylvania
Stafford
Tazewell
Warren
Washington
Wythe

Zone 2
Albemarle
Amherst
Arlington
Bedford
Buchanan
Carroll
Charlotte
Culpeper
Dickenson
Fauquier
Floyd
Franklin
Grayson
Greene
Halifax
Loudoun
Lunenburg
Madison
Mecklenburg
Nelson
Prince
Edward
Prince
William
Rappahannock
Wise

Washington

Zone 1
Clark
Ferry
Okanogan
Pend Oreille
Skamania
Spokane
Stevens

Zone 2
Adams
Asotin
Benton
Columbia
Douglas
Franklin
Garfield
Grant
Kittitas
Klickitat
Lincoln
Walla Walla
Whitman
Yakima

West Virginia

Zone 1
Berkeley
Brooke
Grant
Greenbrier
Hampshire
Hancock
Hardy
Jefferson
Marshall
Mercer
Mineral
Monongalia
Monroe
Morgan
Ohio
Pendleton
Pocahontas
Preston
Summers
Wetzel

Zone 2
Barbour
Braxton
Cabell
Calhoun
Clay
Doddridge
Fayette
Gilmer
Harrison
Jackson
Lewis
Lincoln
Marion
Mason
Nicholas
Pleasants
Putnam
Raleigh
Randolph
Ritchie
Roane
Taylor
Tucker
Tyler
Upshur
Wayne
Webster
Wirt
Wood

Wisconsin

Zone 1
Buffalo
Crawford
Dane
Dodge
Door
Fond du Lac
Grant
Green
Green Lake
Iowa
Jefferson
Lafayette
Langlade
Marathon
Menominee
Pepin
Pierce
Portage
Richland
Rock
Shawano
St Croix
Vernon
Walworth
Washington
Waukesha
Waupaca
Wood

Zone 2
Adams
Ashland
Barron
Bayfield

Brown
Burnett
Calumet
Chippewa
Clark
Columbia
Douglas
Dunn
Eau Claire
Florence
Forest
Iron
Jackson
Juneau
Kenosha
Kewaunee
La Crosse
Lincoln
Manitowoc
Marinette
Marquette
Milwaukee
Monroe
Oconto
Oneida
Outagamie
Ozaukee
Polk
Price
Racine
Rusk
Sauk
Sawyer
Sheboygan
Taylor
Trempealeau
Vilas
Washburn
Waushara
Winnebago

Wyoming

Zone 1
Albany
Big Horn
Campbell
Carbon
Converse
Crook
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Sheridan
Sublette
Sweetwater
Teton
Uinta
Washakie

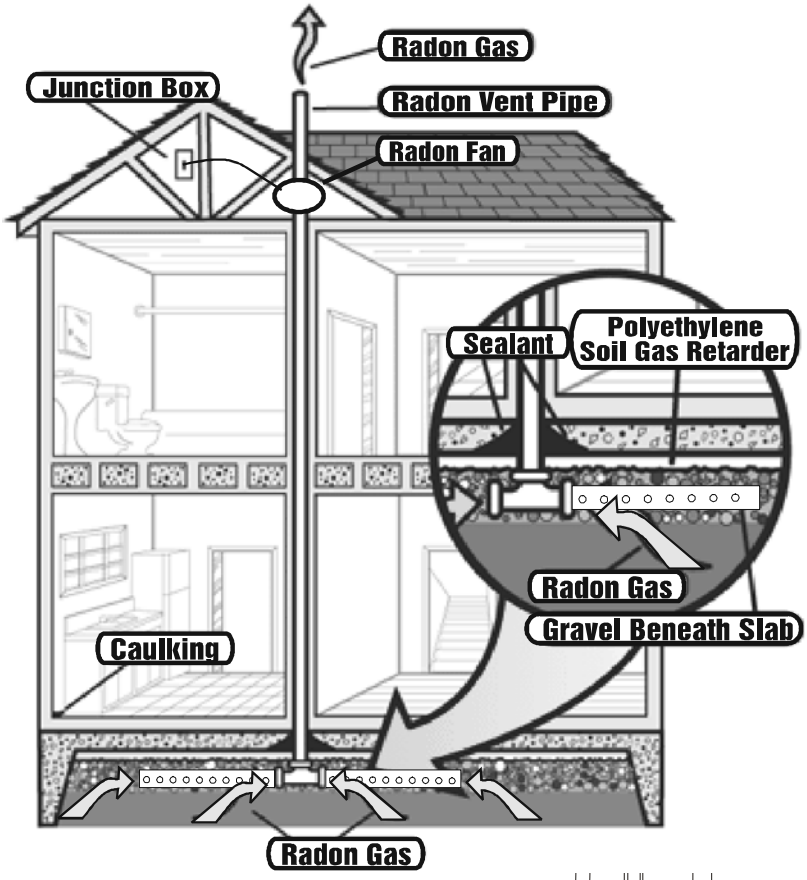
Zone 2
Platte
Weston

R324.46

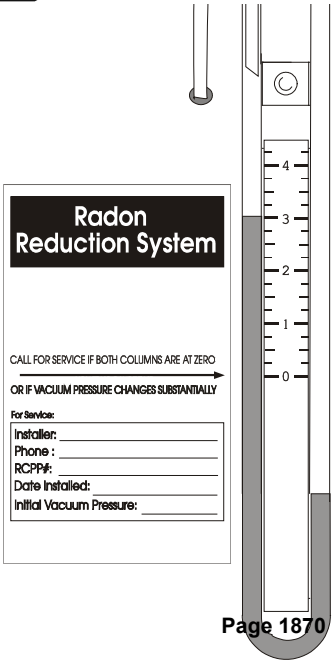
Exhibit 1 - Understanding a Radon Reduction System (Occupants)

General: *Radon* is a radioactive gas that has been found in homes all over the United States. It comes from the natural breakdown of uranium in soil, rock and water and gets into the air you breathe. The *radon* potential of any specific building lot is dependent on whether there is sufficient *radon* source material in the ground below the home and sufficient upward air movement for the *radon* to be near your home's foundation. *Radon* typically moves up through the ground to the air above and into your home through gaps and other holes in the foundation. The primary health concern associated with *radon* is lung cancer. The Environmental Protection Agency (EPA) estimates that 21,000 people die in the US each year from *radon*-induced lung cancer.

Radon Reduction System: Your new home was constructed with an *Active Subslab Depressurization* (*ASD*) System to protect your family's health. The *ASD* system is designed to limit *radon* entry into your home by keeping the soil under your home at a lower pressure than the air in your home. In doing so, *radon* and other *soil gases* from below your home are exhausted above your roof through a specially designed *radon* fan. An *ASD* system is recognized by the EPA as the Best Available Technology for *radon* control because it keeps much of the *radon* from entering your home. The system is designed to run 24 hours a day, 7 days a week. The electrical power required to run the fan, which is the only active component in the system, will typically cost 5 to 25 cents per day depending upon the type of fan and your electrical utility rates. Cost to operate this fan would be less than operating a normal light bulb.



System Maintenance: Your *ASD* System is designed to provide many years of service under normal conditions without significant maintenance. As the occupant of this home, you need to routinely check the system pressure gauge or other system monitor to verify that the fan is operating correctly. There are various labeled components of your *radon* system such as pipe, crawlspace membrane, fan, system pressure monitor and sump basin. DO NOT ALTER OR DISCONNECT any of these components. If the sump basin is opened for required maintenance or repair, restore to the original condition immediately after completing work. You also need to be aware that foundation settling, renovations or additions to your home can change your indoor *radon* concentrations. A *certified/licensed radon mitigator* can provide guidance when changes are to be made to the *dwelling* or provide a routine check-up on the operation of the system.



Understanding the System Pressure Gauge: The pressure gauge shown on the right is typical of a gauge used to monitor the pressure developed in the piping system by the *radon* fan. Your fan pressure

should be checked regularly to ensure the fan system continues to operate properly. This gauge measures pressure in Inches Water Column (*in. WC*). This gauge does NOT measure *radon*.

Call for service if the measure changes substantially (20% or more) or if the gauge reads zero pressure (both columns equal).

Your *ASD* system may have an audible alarm to alert you to call for service in the event of a problem.

Radon Testing: Your builder left behind a long term test kit for you to use to test your home after you move in. The way you and your family live in your new home, how you set heating and cooling controls or use your clothes dryer and other exhaust fans can affect indoor *radon* levels. It is recommended that you test for a minimum of 3 months or preferably longer to determine your actual *radon* exposure in the home. Be sure to check the warranty your builder provides to make certain you complete your testing before the end of the new home warranty period.
Follow the instructions provided by the test laboratory to open, activate and place the test kit to test your *radon* levels.

The USEPA recommends that you retest your home at least every 2 years or if major renovations or additions are made to the *dwelling*.

Other sources of radon: *Radon* can also be found in the water from private wells. Testing can determine if your well contains significant amounts of *radon*.

More Info: For more information on *radon*, *radon* testing or *radon* removal: **www.epa.gov/radon**

NOTE: Exhibit 1 may be reprinted without license.

Add definitions as follows:

R202
DEFINITIONS

ACCESS (limited). For the purposes of Section R324, the point of entry to fan location that allows service personnel to reach an *ASD fan* or intended fan location for the purpose of installing or replacing an *ASD fan*. Such access does not require walkways, service platforms, level working spaces, receptacle and lighting outlets or clear and unobstructed passageways with continuous solid flooring such as are typically required for appliances that require periodic maintenance, servicing and inspection.

ACTIVE SOIL DEPRESSURIZATION (ASD). A family of *radon mitigation systems* involving fan-powered soil depressurization, including but not limited to *sub-slab depressurization* and *sub-membrane depressurization*.

ASD FAN. A particular type of fan that is designed and rated by the manufacturer for continuous duty and for use in an *ASD* system.

CERTIFIED. For the purposes of Section R324, a designation applied to individuals or companies that have met qualification requirements or are authorized by the state to provide *radon* laboratory, measurement or mitigation services. Programs providing national certifications for *radon* laboratories, measurement and mitigation professionals are those of the National Radon Proficiency Program (NRPP) and the National Radon Safety Board (NRSB). Also see LICENSED.

CHECK VALVE. A mechanical device that will allow water to flow in one direction while preventing airflow in the opposite direction.

DEPRESSURIZATION. A negative pressure induced in one area relative to another.

DIAGNOSTIC TESTS. For the purposes of Section R324, procedures, including Communication Tests and other tests, used to identify or characterize conditions under, beside and within buildings that could contribute to *radon* entry or elevated *radon* levels or that could provide information regarding the performance of a *radon mitigation system*.

GEOTEXTILE MATTING. A product suitable for soil contact, that provides a void space laterally through the material to allow air movement. The void space is created through a matrix of woven mesh, "egg crate" support of a fabric enclosure or similar means. Also referred to as "Vent Strip".

LICENSED. For the purposes of Section R324, a designation applied to individuals and/or companies that are qualified and specifically authorized as *radon* laboratories, measurement and/or mitigation professionals within certain states or jurisdictions that regulate *radon* services. Also see CERTIFIED.

MITIGATOR. For the purposes of Section R324, a *certified/licensed* individual who designs, installs or directly supervises the installation of the *radon ASD mitigation systems*.

MITIGATION SYSTEM. For the purposes of Section R324, any system or steps designed to reduce *radon* concentrations in the indoor air of a building.

NATIONAL RADON ACTION LEVEL (NRAL). The indoor *radon* concentration at which mitigation is recommended. The *NAL* is defined as the US Environmental Protection Agency's Action Level of 4 *pCi/L* [148 Bq/m^3].

PIPE LOOP. A continuous length of perforated pipe extending around the inside perimeter of the foundation.

RADON. A naturally occurring, chemically inert, radioactive element (Rn-222) which exists as a gas.

ROUGH-IN. For the purposes of Section R324, the installation of all parts and materials of an *ASD* system that must be completed prior to the placement of concrete, prior to the closure of building cavities and prior to the installation of finish materials. Such parts and materials are gas permeable layers, *soil gas retarders*, plenums, membranes, piping, *suction points*, discharge points and wiring.

SOIL GAS. The gas mixture present in soil, which could contain *radon* and water vapor.

SOIL GAS COLLECTION PLENUM. A constructed enclosure for collecting *radon* and other *soil gases* from under a foundation.

SOIL GAS COLLECTOR. A gas permeable conduit constructed of *gravel*, perforated pipe or *geotextile matting* for collecting *radon* and other *soil gases* from within a *soil gas collection plenum* and connecting the plenum to the *ASD* pipe system.

SOIL GAS RETARDER. A continuous membrane or other comparable material laid over a *soil gas* plenum or earthen floor area that is used to retard the flow of *soil gases* into a building.

SUB-MEMBRANE DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure in the space under a *soil gas retarder* membrane than above it by use of an *ASD fan* drawing air from beneath the membrane.

SUB-SLAB DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure under a floor slab than above it. An *ASD fan* is installed in the *radon* system piping that draws air from below the floor slab.

SUCTION POINT. For the purposes of Section R324, the location where the *soil gas collector* is connected to the *ASD* system piping.

Add standards to Chapter 44 as follows:

ASTM

D5926-11 "Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems "

E1745-11 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs"

Reason: 21,000 Americans die each year from radon-induced lung cancer. The primary source of exposure to radon for the general public is the home. Geographical areas of the highest radon potential in the United States are located in EPA radon zones 1 & 2. Application of the methods contained in this proposed code change will ensure all new homes built in radon zones 1 & 2 will be tested to be below the EPA Action Level of 4 pCi/L prior to occupancy.

The code change proposal presented herein was developed as an ANSI consensus standard by the AARST Radon Standards Consortium. This standard, AARST/ANSI #CCAH *"Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses,"* was produced by a committee of (27) representing radon professionals, home inspectors, home builders, architects, code officials, consumer advocates and state and federal government.

There is no requirement in the Residential Code to apply radon reduction methods to new construction and thereby prevent elevated radon concentrations in newly built homes. Appendix F of the IRC (Radon Control Methods) is inadequate, 20 years old and not a mandatory part of the building code unless voluntarily adopted by a local jurisdiction.

This proposal adds requirements to homes in the high risk radon counties. Like snow and wind load, seismic and flood-resistance provisions, this proposal targets requirements to the areas with the greatest likelihood of exposure. The EPA estimates that 1 out of 15 of all homes in the US has elevated indoor radon levels. The incidence of elevated radon may be greater than 7 out of 10 homes in some high radon areas. Nonrandomized industry data shows a significant number of homes across the United States have tested high for elevated indoor radon concentrations. Builders of new homes will continue to add to the existing inventory of homes with elevated radon without changes in the residential code that address this important life/safety issue.

Radon Test Results Data by State

STATE	STATENAME	TOTAL # TESTS	AVG (pCi/L)	% > EPA Action Level of 4 pCi/L
AL	ALABAMA	11,629	3.8	21.9
AK	ALASKA	432	2.2	13.0
AZ	ARIZONA	7,495	2.1	11.9
AR	ARKANSAS	1,243	2.5	13.7
CA	CALIFORNIA	16,960	2.1	9.1
CO	COLORADO	88,346	6.5	49.0
CT	CONNECTICUT	41,292	3.4	23.9
DE	DELAWARE	5,539	2.5	17.4
FL	FLORIDA	40,039	1.8	10.2
GA	GEORGIA	27,222	2.6	18.9
HI	HAWAII	94	0.4	2.1
ID	IDAHO	16,138	7.1	40.4
IL	ILLINOIS	84,366	5.1	41.0
IN	INDIANA	18,031	4.7	37.2
IA	IOWA	96,260	6.2	49.3
KS	KANSAS	34,288	5.2	44.0
KY	KENTUCKY	47,575	7.4	43.6
LA	LOUISIANA	786	0.9	3.1
ME	MAINE	5,494	5.9	38.3
MD	MARYLAND	55,949	5.4	33.4
MA	MASSACHUSETTS	29,850	3.8	25.6
MI	MICHIGAN	164,678	3.4	25.4
MN	MINNESOTA	135,419	4.7	42.2
MS	MISSISSIPPI	700	1.2	5.6
MO	MISSOURI	27,771	4.2	31.6
MT	MONTANA	18,082	7.2	46.3
NE	NEBRASKA	27,481	5.7	51.6
NV	NEVADA	1,952	3.0	19.3
NH	NEW HAMPSHIRE	35,974	5.5	34.0
NJ	NEW JERSEY	41,092	4.3	24.1
NM	NEW MEXICO	8,165	3.9	30.2
NY	NEW YORK	66,713	4.8	23.9
NC	NORTH CAROLINA	79,384	3.8	27.5
ND	NORTH DAKOTA	10,887	6.0	50.5

STATE	STATENAME	TOTAL # TESTS	AVG (pCi/L)	% > EPA Action Level of 4 pCi/L
OH	OHIO	102,352	7.9	49.0
OK	OKLAHOMA	1,356	2.3	9.7
OR	OREGON	13,675	3.5	25.4
PA	PENNSYLVANIA	149,543	8.3	44.3
RI	RHODE ISLAND	8,667	4.2	31.0
SC	SOUTH CAROLINA	38,971	2.7	18.7
SD	SOUTH DAKOTA	4,081	9.8	59.2
TN	TENNESSEE	40,632	4.6	31.8
TX	TEXAS	5,821	2.4	8.7
UT	UTAH	14,636	4.5	33.6
VT	VERMONT	3,231	3.7	23.4
VA	VIRGINIA	62,577	3.5	25.4
WA	WASHINGTON	22,199	7.0	39.3
DC	WASHINGTON DC	6,948	1.6	8.8
WV	WEST VIRGINIA	14,976	6.0	35.0
WI	WISCONSIN	72,694	5.6	41.8
WY	WYOMING	25,090	5.2	39.6
TOTALS		**1,834,775**		

Source: AARST radon industry test data; published 10/29/2012.

Cost Impact: This change proposal will slightly increase the cost of construction. Most homes can be built with only a mitigation system rough-in. If the home tests high for elevated radon then the system can be upgraded with a fan to reduce the indoor radon levels.

Cost of mitigation system rough-in (passive) =$296*

Cost of fan driven mitigation system = $707* (total cost, not in addition to $296)

Source: Annual Builder Practices Report 2011, NAHB Research Center, Inc.

The cost savings for reduced health care resulting from a healthier indoor environment has not been calculated.

Analysis: A review of the standards proposed for inclusion in the code, [ASTM D5926-11 and ASTM E1745-11] with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

R324 (NEW)-RB-KAPTUROWSKI

Committee Action Hearing Results

For staff analysis of the content of ASTM D5926 and ASTM E1745 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf

Committee Action: **Disapproved**

Committee Reason: The committee disapproved this code change proposal because they felt that information related to radon gas should remain in the appendix, and because what may sometimes be needed should not always be required. This can be done independently at the local level. There are other ways to mitigate radon. An educational brochure seems to be included in the proposal, which is not appropriate for the code. It is not clear why a certified third party is required. The proposal requires a performance standard on top of prescriptive requirements with no guarantee that the performance requirements will be met. This committee and building and building code professionals are not industrial hygienists and should not be expected to enforce health related requirements.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

David Kapturowski, Spruce Environmental Technologies, Inc, representing American Association of Radon Scientists and Technologists (AARST), requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

SECTION R324
RADON REDUCTION

R324.1 General. This Section applies to *radon* control methods for buildings and structures within EPA *radon* zones 1 & 2, as defined in Section R324.42. *Rough-Ins* or complete *Active Soil Depressurization (ASD)* systems shall be installed as necessary to reduce soil gas entry and vapor intrusion so as to establish indoor *radon* levels below the *National Radon Action Level (NRAL*).

R324.2 Mitigation system required. A *mitigation system Rough-In* shall be installed in dwellings located in *radon* potential zones 1 and 2 in accordance with Section R324.5. The *radon* potential zones shall be determined in accordance with Section R324.42.

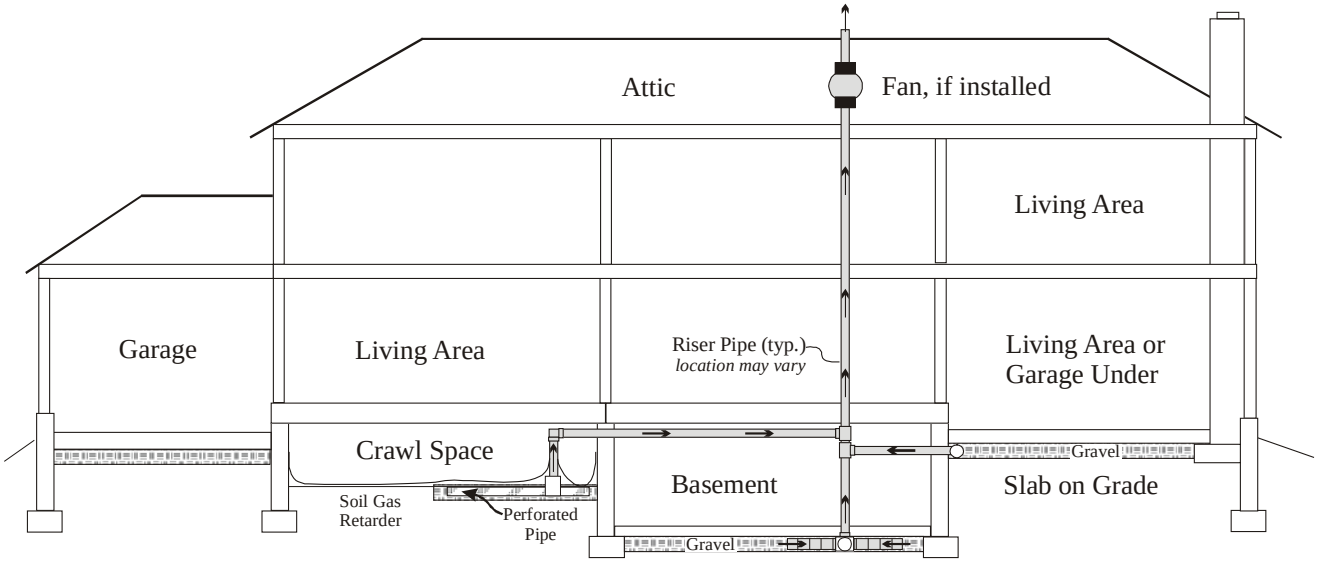
Exception: Where prior to occupancy, testing in accordance with Section R324.41 indicates that the building has a *radon* level below the *National Radon Action Level* (*NRAL*).

R324.3 Design. The design of *radon mitigation systems* shall comply with Section R324 and for buildings having a total foundation area of greater than 2500 square feet [232 sq. m], shall be performed by a *mitigator* who is *certified* or *licensed* to design such systems. Designs of *radon mitigation systems* for foundation types other than those specified herein shall be performed by a *mitigator* who is *certified* or *licensed* to design such systems.

R324.4 Foundation area. The foundation area shall be calculated from the inside perimeter dimensions of the foundation walls.

R324.5 Mitigation system rough-in required. The *Rough-In* installation of a *mitigation system* shall be required for all foundations and combination foundations types, including crawl space, basement, slab-on-grade and slab-on-grade garage located below a living area. The installation shall be in accordance with Sections R324.6 through R324.28. Figure R324.5 illustrates the four foundation types.

FIGURE R324.5
FOUNDATION TYPES



R324.6 Soil gas collection plenums. Foundation areas shall be constructed so as to create sealed *soil gas collection plenums* in accordance with Sections R324.7 through R324.9.6.

R324.7 Submembrane soil gas collection plenums in crawl spaces with earthen floors. For each *suction point*, a *soil gas collector* shall be installed in accordance with Sections R324.7.1 through R324.7.7 and Section R324.9.

R324.7.1 Soil gas collector. One *soil gas collector* for each *suction point* (R324.7.2) shall be installed in accordance with Section R324.7.1.1, R324.7.1.2 or R324.7.1.3.

R324.7.1.1 Pipe soil gas collector. The *soil gas collector* shall consist of a perforated pipe with a nominal diameter of not less than 4 inches [102 mm]. The pipe shall be not less than 10 feet [3048 mm] in length. Such piping shall be placed in a trench backfilled with clean aggregate meeting the criteria of Section R324.8.1.1.1 such that the pipe is completely surrounded by not less than 4 inches [102 mm] of aggregate.

R324.7.1.1.2 Geotextile soil gas collector. The *soil gas collector* shall consist of a strip of geotextile drain matting not less than 10 feet [3048 mm] in length and having a cross sectional area of not less than 12 square inches [7742 sq. mm]. The strip of matting shall be placed on top of the soil or in a trench.

R324.7.1.1.3 Gravel soil gas collector. A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be in accordance with Size Number 4, 5, 56, or 6 as classified by ASTM C33.

R324.7.2 Suction points. One *suction point* shall be provided for each *soil gas collector*. *Suction points* shall be installed in accordance with Section R324.7.2.1, R324.7.2.2 or R324.7.2.3, as applicable for the type of plenum installed.

R324.7.2.1 Suction point for pipe soil gas collector. The *suction point* for a pipe *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The perforated pipe plenum shall be inserted into both of the horizontal openings of the pipe fitting or device. One opening of the fitting or device shall be oriented in a vertical "up" position. Alternatively, the sub-membrane area and the other foundation types shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.1.1.3 and served by one or more *suction points*.

R324.7.2.2 Suction point for geotextile soil gas collector. The *suction point* for a geotextile *soil gas collector* shall consist of a pipe fitting or other device having not less three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be connected to the matting in a manner that facilitates airflow from the collector. One opening of the fitting or device shall be oriented in a vertical "up" position.

R324.7.2.3 Suction point for gravel soil gas collector. The *suction point* for a gravel *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be provided with not less than 5 feet [1524 mm] of perforated pipe extending from each opening of the fitting or device into the gravel layer. Such perforated pipe shall provide not less than 1 square inch [645 sq. mm] of open perforation area per lineal foot of pipe.

R324.7.3 Suction points not permitted. *Suction points* shall not be permitted on sump lids

R324.7.4 Fasten suction points. *Suction point* fittings and devices shall be fixed in place to prevent dislocation.

R324.7.5 Seal top of the soil gas collection plenum. A *soil gas retarder* shall cover the top of the *soil gas collection plenum* and all exposed soil. The installation of the *soil gas retarder* shall be in accordance with Sections R324.7.5.1 through R324.7.5.4.

R324.7.5.1 Sheeting. The *soil gas retarder* membrane shall comply with ASTM E1745 Class A, B or C.

R324.7.5.2 Seams. The seams between adjacent membrane sheets shall be overlapped not less than 12 inches [305 mm] and shall be sealed by one of the following methods:

1. A tape recommended by the membrane manufacturer.
2. Caulk complying with ASTM C920 class 25 or greater.
3. An equivalent method.

R324.7.5.3 Repairs. Tears or punctures in the membrane shall be sealed by one or more of the following methods:

1. A tape recommended by the membrane manufacturer.
2. An additional sheet of the membrane material that covers and overlaps the tear or puncture not less than 12 inches [305 mm] on all sides and that is sealed with a caulk complying with ASTM C920 class 25 or greater.
3. An equivalent method.

R324.7.5.4 Penetrations. Openings in the *soil gas retarder* membrane for piping, utilities, structural supports or similar penetrations shall be sealed.

R324.7.6 Seal sides of the soil gas collection plenum. The *soil gas retarder* membrane shall turn up onto foundation walls not less than 6 inches [152 mm] and shall be continuously sealed to the wall along the full perimeter with a caulk complying with ASTM C920 class 25 or higher or equivalent method.

R324.7.7 Label required (membranes). *Soil gas retarder* membranes shall be marked in a conspicuous place with a label to identify that the membrane is a component of a *radon* reduction system. The label lettering shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color in contrast to the color of the background on which the lettering is applied.

R324.8.1 Subslab soil gas collection plenums for concrete floors. The floors of basement, concrete crawlspace and slab-on-grade foundation systems shall be provided with a *soil gas collection plenum* installed in accordance with Sections R324.8.1.1 through R324.9.6.

R324.8.1.1 Soil gas collector. A *soil gas collector* shall be installed in accordance with Section R324.8.1.1.1, R324.8.1.1.2 or R324.8.1.1.3.

R324.8.1.1.1 Gravel. A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be in accordance with Size Number 4, 5, 56, or 6 as classified by ASTM C33.

R324.8.1.1.2 Geotextile. A layer of geotextile drainage matting shall be placed over a uniform layer of either soil or sand. The geotextile drainage matting shall be designed to allow the lateral flow of *soil gases* to the system's *suction point* fitting. The *geotextile matting* shall have a cross-sectional area of not less than 12 square inches [7742 sq. mm] and shall be placed, at a minimum, along the entire inside perimeter of the foundation at a distance of 12 inches [305 mm] to 18 inches [457 mm] from the foundation wall to the edge of the drainage matting. Deviation from the 12 inch [305 mm] to 18 inch [457 mm] distance to the foundation wall shall be allowed to avoid obstacles such as plumbing and other utilities.

R324.8.1.1.3 Pipe loop. A loop of not less than 4 inch [102 mm] diameter perforated pipe shall be placed along the entire inside perimeter of the foundation at a distance of 12 inches [305 mm] to 18 inches [457 mm] from the centerline of the pipe to the foundation walls. Such piping shall be placed in a trench backfilled with clean aggregate meeting the criteria of Section R324.8.1.1.1 and surrounding the pipe on at least 2 sides. The cross-sectional area of the aggregate and pipe *soil gas collector* shall be at least 50 square inches [32,258 sq. mm]. The piping shall form a continuous loop and pipe sections shall be joined with a connector device or method recommended by the manufacturer. Deviation from the 12 inch [305 mm] to 18 inch [457 mm] distance to the foundation wall shall be allowed to avoid obstacles such as plumbing and other utilities.

R324.8.2 Suction points. One *suction point* shall be provided for each *soil gas collector*. Not less than one *suction point* shall be provided for each foundation type. Alternatively, each *soil gas collector* shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.3 and served by one or more *suction points*. *Suction points* shall be installed in accordance with Sections R324.8.2.1, R324.8.2.2 or R324.8.2.3 as applicable for the type of *soil gas collector* installed.

R324.8.2.1 Gravel layer soil gas collector. A *suction point* for a *gravel* type *soil gas collector* shall consist of a pipe fitting or other device having not less than two openings oriented so as to create multiple horizontal intake openings within the gravel layer. The horizontal openings shall be provided with not less than 5 feet [1534 mm] of perforated pipe extending from each opening of the fitting or device into the gravel layer. Said perforated pipe shall provide a minimum of 1 square inch [645 sq. mm] of open perforation area in each lineal foot of pipe. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.2.2 Geotextile layer soil gas collector. A *suction point* for a geotextile type *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two oriented so as to create multiple horizontal intake openings connected to the geotextile mat in a manner that maintains airflow capacity from the plenum. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.2.3 Pipe loop soil gas collector. A *suction point* for a *pipe loop* type collector shall consist of a pipe tee fitting or pipe saddle device installed in the loop piping. *Suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris.

R324.8.3 Multiple soil gas collection plenums. Where interior footings divide a *soil gas collector* into two or more areas, each such area shall be provided with the required *suction points* and joined with *mitigation system* piping in accordance with Section R324.10. Alternatively, each area so created by the interior footings shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section R324.8.1.1.3 and served by one or more *suction points*.

R324.8.4 Suction points not permitted. *Suction points* shall not be permitted on sump lids.

R324.8.5 Fasten suction points. *Suction point* fittings and piping shall be fastened in place to prevent dislocation during placement of the gas permeable layer, *soil gas retarder* and concrete.

R324.8.6 Seal top of the soil gas plenum. The *soil gas collector* and all exposed soil shall be covered with a *soil gas retarder* that is installed in accordance with Section R324.8.6.1.

R324.8.6.1 Sheeting. Polyethylene sheeting of not less than 6 *mils* [0.152 mm] in thickness, or cross-laminated polyethylene sheeting of not less than 3 *mils* [0.076 mm] in thickness shall be installed on top of the *soil gas collector* and shall completely cover the area under the

concrete floor and shall be sealed in accordance with Sections R324.8.6.1.1 through R324.8.6.1.3. Where sheet foam board insulation is installed on top of the *soil gas collector*, the polyethylene sheeting shall be installed below the foam board insulation.

R324.8.6.1.1 Seams. Seams between adjacent polyethylene sheets shall be overlapped not less than 12 inches [305 mm] and sealed with a caulk complying with ASTM C920 class 25 or higher, or equivalent method.

R324.8.6.1.2 Repairs. Tears or punctures in the polyethylene sheeting shall be sealed or an additional sheet of polyethylene shall cover the tear or puncture with an overlap of not less than 12 inches [305 mm] on all sides. Such additional sheet shall be sealed and fixed in place to prevent displacement during slab casting.

R324.8.6.1.3 Penetrations. Openings in the *soil gas retarder* membrane for piping, utilities, structural posts and similar penetrations shall be sealed.

R324.8.7 Concrete floors. The concrete floor shall be cast directly upon the *soil gas retarder* or upon the sheet foam board insulation where it is installed on top of the *soil gas retarder*.

R324.8.8 Penetrations. Penetrations through the concrete slab and *soil gas retarder* shall be sealed with a caulk complying with ASTM C920 class 25 or higher, or equivalent method.

R324.8.9 Block-outs. Where openings are cast or constructed in the concrete slab under plumbing fixtures, the openings shall be filled with expanding foam or a non-shrink grout or an approved equivalent method. Exposed openings shall be sealed with non-shrink grout or an approved equivalent method.

R324.8.10 Seal sides of the soil gas collection plenum. The intersection of floors and foundation walls shall be sealed with a caulk complying with ASTM C920 class 25 or higher or an approved equivalent method. Sealing shall be performed in accordance with Section R324.8.10.1, R324.8.10.2 or R324.8.10.3.

R324.8.10.1 Seal floor to wall. The intersection of floors and foundation walls shall be sealed.

R324.8.10.2 Seal soil gas retarder to footing or wall. Where foundation walls are solid concrete, the *soil gas retarder* shall be sealed to the footing or to the foundation wall.

R324.8.10.3 Seal soil gas retarder to wall. Where foundation walls are masonry block, the *soil gas retarder* shall be sealed to the foundation wall.

R324.9 General sealing of soil gas collection plenums. Sealing of potential *soil gas* pathways shall be in accordance with Sections R324.9.1 through R324.9.6.

R324.9.1 Sumps in floors. Sumps in interior floors shall have a rigid lid and the lid shall be sealed with a gasket or silicone caulk and mechanically fastened in a manner that facilitates removal for maintenance. Pipe and wiring penetrations through the lid shall be sealed. The intersection of the floor and sump basin shall be sealed with a caulk complying with ASTM C920 class 25 or higher or equivalent method.

R324.9.2 Hollow masonry unit walls. The top course of hollow block masonry walls shall be made of solid masonry units or shall be fully grouted. The top course under the full width of door and window openings shall be made of solid masonry units or the hollow masonry units shall be fully grouted. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be made of solid masonry units or the top course shall be fully grouted**.** Other penetrations through foundation walls shall be sealed**.**

R324.9.3 Floor drains. Floor drains and condensate drains shall not allow *soil gas* entry.

R324.9.4 Air ducts. Air ducts located below concrete slabs shall be sealed to prevent *radon* entry and constructed in accordance with Chapter 16.

R324.9.5 Foundation drains. Gravity foundation drainage systems shall include a *check valve* or other mechanical means to isolate the *soil gas collection plenum* from any exterior drain piping. Access shall be provided for maintenance.

R324.9.6 Access openings. Access openings in the floor provided for drain maintenance shall not allow *soil gas* entry.

R324.10 Mitigation system piping. The *mitigation system* piping that extends from the *soil gas* plenum to the point of discharge shall be rigid, non-perforated pipe in accordance with Sections R324.11 through R324.19.

R324.11 Pipe size. *Mitigation system* pipe shall be not less than 3 inch [76 mm] nominal inside diameter.

R324.12 ABS piping. ABS pipe shall comply with ASTM D2661, F628 or F1488. The pipe wall thickness shall be Schedule 40.

R324.13 PVC piping. PVC pipe shall comply with ASTM D2665, F891, or F1488. The pipe wall thickness shall be Schedule 40.

Exception: Rigid, non-perforated PVC pipe complying with ASTM D2949 shall be an alternative to the material specified herein, where installed vertically within enclosed wall cavities.

R324.14 Slope. Above ground piping shall have a slope of not less than 1/8 inch [3.2 mm] per foot [305 mm]. Piping shall slope downwards towards the *suction point*. Piping arrangements that allow water to collect shall be prohibited.

R324.15 Joints. Plastic pipe joints shall be solvent welded in accordance with Sections R324.15.1 and R324.15.2. Where disassembly of piping is required such as for removal of a fan, the joints shall be made with flexible couplings complying with ASTM D5926 or ASTM C1173 or an approved equivalent method.

R324.15.1 ABS plastic pipe joints. ABS plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2235.

R324.15.2 PVC plastic pipe joints. The joint surfaces for PVC plastic pipe and fittings to be solvent welded shall be prepared with a primer conforming to ASTM F 656. PVC plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2564.

R324.16 Support. Above ground piping shall be supported by the structure of the building using hangers or strapping designed for piping support. Supports for horizontal piping shall be installed at intervals not exceeding 4 feet [1219 mm] and supports for vertical piping shall be installed at intervals not exceeding 10 feet [3048 mm].

R324.17 Protection against physical damage. Where pipes penetrate top or bottom plates of stud walls and the nearest edge of the hole is within 1 ½ inches [38 mm] of the face of the member, the pipe shall be protected by steel shield plates. Such shield plates shall have a thickness of not less than 0.0575 inches [1.463 mm] (No. 16 gage). Such plates shall cover the area of the pipe where the plate is bored, and shall extend not less than 2 inches [51 mm] above bottom plates and not less than 2 inches [51 mm] below top plates.

R324.18 Insulation required. In spaces where *mitigation system* piping is subject to freezing temperatures and in spaces where the exterior of *mitigation system* piping is subject to the formation of condensation, such piping shall be provided with insulation having an external vapor barrier and an R-value of not less than 1.8.

R324.19 Piping labels required. *Mitigation system* piping shall be marked prior to the closing of wall cavities with not less than one label at each floor level and at intervals not greater than 10 feet [3048 mm] along the developed length of the piping. The label shall identify that the item is a component of a *radon* reduction system. The label lettering height shall be not less than 1/4 inch [6.35 mm] and shall be of a color in contrast to the color of the background on which the lettering is applied.

R324.20 Mitigation system termination. The discharge point of a *mitigation system* shall be to the outdoors and shall be directed vertically upward.

R324.21 Elevation and vertical walls. The point of discharge of a *mitigation system* shall comply with all of the following:

1. It shall be not less than 1 foot [305 mm] above the roof at the point penetrated.
2. It shall be not less than 10 feet [3048 mm] above grade nearest the point of discharge.
3. It shall be not less than 10 feet [3048 mm] horizontally from a vertical wall that extends above the roof penetrated.

R324.22 Windows and doors. The discharge point of a *mitigation system* shall be not less than 2 feet [610 mm] above or not less than 10 feet [3048 mm] from windows, doors or other gravity intake openings into the structure or an adjacent structure excluding attic ventilation openings. The 10 foot [3048 mm] distance shall be measured around intervening obstacles.

R324.23 Equipment air intake. The discharge point of a *mitigation system* shall be not less than 3 feet [914 mm] above or 10 feet [3048 mm] away from mechanical air intake openings such as those for evaporative coolers, make-up air, and heat energy recovery ventilators. The 10 foot [3048 mm] distance shall be measured around intervening obstacles.

R324.24 Provision for Active Soil Depressurization (ASD) fan. A space having a vertical height of not less than 48 inches [1219 mm] and a diameter of not less than 21 inches [533 mm] shall be provided in the area where a required *ASD fan* is installed. The space provided for the *ASD fan* shall be located in accordance with Section R324.35. The *ASD* pipe shall be centered in this space.

R324.25 Electrical. A receptacle outlet supplied by branch circuit conductors shall be located within 6 feet [1.8 m] of an interior *ASD fan* location

R324.25.1 Label. The over-current device for the branch circuit supplying the *ASD fan* shall be labeled to indicate that it supplies the *radon* fan.

R324.25.2 Disconnect required. Where the fan is not cord and plug connected, a means of electrical disconnect shall be provided for and in sight of the *ASD fan*. The electrical disconnect shall be labeled to indicate its purpose.

R324.26 Fan access. Limited *access* shall be provided for each *ASD fan* location to allow installation and replacement of *the fan*. *Access* entry shall be located not greater than 20 feet [6096 mm] from the *ASD fan* location.

R324.27 Radon test kit required. A minimum of one long term *radon*-in-air test kit from a *certified* or *licensed* laboratory shall be provided for the occupants of each dwelling unit.

R324.28 Completion of ASD system. Prior to occupancy, the *ASD* system shall be completed by a *certified* or *licensed radon mitigator* and activated in accordance with Sections R324.30 through R324.40.

Exception: Where prior to occupancy, testing in accordance with Section R324.41 indicates that the building has a *radon* level below the *National Radon Action Level* (*NRAL*) and the *Rough-In* piping is labeled in accordance with Section R324.29.

R324.29 Labels required, system *Rough-In*. *Mitigation system* piping shall be marked with not less than one label in a conspicuous location. An additional label shall be placed on or within 12 inches [305 mm] of the electrical service panel. The labels shall state the following: **"**This radon system is nonfunctional because the system has NOT been activated with a radon fan. The building should be tested for radon at least every 2 years or as recommended by the state or USEPA." The label lettering shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color that is in contrast to the color of the background on which the lettering is applied.

R324.30 Fan selection. Fans installed in the *ASD* system shall be recommended by the manufacturer for *radon* mitigation. Such fans shall be designed and sealed by the manufacturer to minimize leakage of water or s*oil gas* from the fan housing and shall be sized in accordance with Table R324.33 or as specified by a *certified* or *licensed radon mitigator*.

TABLE R324.30
FAN SIZING

PIPE SIZE Nominal (I.D.)	**TOTAL FOUNDATION AREA**		
	Less Than 1600 sq. feet	**1600 to 2500 sq. feet**	**Greater than 2500 sq. feet**
	Less Than 149 sq. meters	**149 to 232 sq. meters**	**Greater than 232 sq. meters**
(3 inch) [76 mm]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 cfm @ 0.5 in. WC [85m^3/hr @ 125 Pa]	Use Radon Fan Type: **RF2** RF2 Minimum rating:[a] 75 cfm @ 1.0 in. WC [127m^3/hr @ 250 Pa]	*Radon* fan to be sized by *certified* and/or *licensed radon mitigator*
(4 inch) [102 mm]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 cfm @ 0.5 in. WC [85m^3/hr @ 125 Pa]	Use Radon Fan Type: **RF1** RF1 Minimum rating:[a] 50 cfm @ 0.5 in. WC [85m^3/hr @ 125 Pa]	*Radon* fan to be sized by *certified* and/or *licensed radon mitigator*

a. Radon Fan Types RF1 & RF2 minimum flow and pressure ratings are manufacturer specifications.

R324.31 Orientation. *ASD* inline fans shall be installed only on vertical *ASD* piping.

R324.32 Installation. *ASD fans* shall be installed in accordance with the manufacturer's instructions.

R324.33 Flexible connectors required. *ASD fans* shall be connected to the *ASD* piping using flexible unshielded couplings complying with ASTM D5926 or ASTM C1173 or an equivalent method. Connections shall be air and water-tight.

R324.34 Fan start-up. *ASD fans* shall be electrically energized upon installation on the *ASD* system piping.

R324.35 Fan location. *ASD fans* shall be installed only outdoors, in attics or in garages that are not beneath conditioned spaces. *ASD fans* shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. *ASD fans* shall not be mounted in any location where pipe that is positively pressurized by the fan is located inside of conditioned or occupiable space.

R324.36 System monitor required. Each *ASD* system shall be provided with a system negative pressure monitor such as, but not limited to, a manometer type pressure gauge to indicate system operation. The system monitor shall be located indoors in an area where the monitor is readily observable by the occupants.

R324.37 Startup marking. *ASD* system monitors shall be clearly marked to indicate the pressure that existed when the system was initially activated. The monitor device shall have a durable label on or in close proximity to it that describes how to interpret the monitor and what to do if the monitor indicates that system performance has degraded.

R324.38 Automatic reset. Pressure activated electrical *ASD* system monitors, whether visual or audible, shall be supplied by un-switched electrical branch circuits and shall be designed to reset automatically when power is restored after power supply failure. Battery operated monitoring devices shall not be used except where they are equipped with a low power warning feature.

R324.39 Labels required (system and sump). System description labels made of durable material shall be placed on or within 12 inches [30 cm] of the electric service panel and also on the *ASD* system or other prominent location. The lettering on the label shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color that is in contrast with the color of the background on which the lettering is applied. The label shall state the following: "Radon Reduction System;" the installer's name, phone number, and applicable certification identification; date of installation, an advisory stating that the building should be tested for *radon* at least every 2 years or as required or recommended by state or federal agencies. and shall include notice of additional *radon* resources at www.epa.gov/radon and the *radon* hotline 1-800-SOS-RADON (767-7236).

R324.39.1 Label sump basins. Sump basin covers shall be identified with a durable label that reads as follows: "Component of a Radon Reduction System. Do not tamper with or disconnect." or equivalent wording. The lettering on the label shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color that is in contrast with the color of the background on which the lettering is applied.

R324.40 Documentation package. The occupants of the dwelling shall be provided with a documentation package that includes the following:

1. A description of system operation.
2. All *radon* test data for the property performed by a *licensed or certified* measurement professional.
3. The annual energy consumption of the installed *ASD fan*(s), whether estimated or actual, and the projected monetary cost of such energy.

R324.41 Radon testing prior to occupancy. A *radon* test shall be performed prior to occupancy and shall be performed by a *certified* or *licensed* measurement professional. Testing shall be performed in accordance with applicable state protocols or requirements; or if there are no state protocols or requirements, with accepted Federal protocols or "Protocols for Radon Measurements in Homes", AARST Consortium on National Radon Standards. Where testing results are greater than the *NRAL*, a *certified* and/or *licensed mitigator* shall be required to perform *diagnostic tests* and remediation action. Further *radon* testing shall be required until *radon* concentrations below the *NRAL* are achieved.

R324.42 EPA established zones. The *radon* potential of a building site shall be estimated from Figure R324.42 or from Table R324.42 except that, where state or local jurisdictions have published *radon* potential data, such data shall supersede the information in Figure R324.42 and Table R324.42.

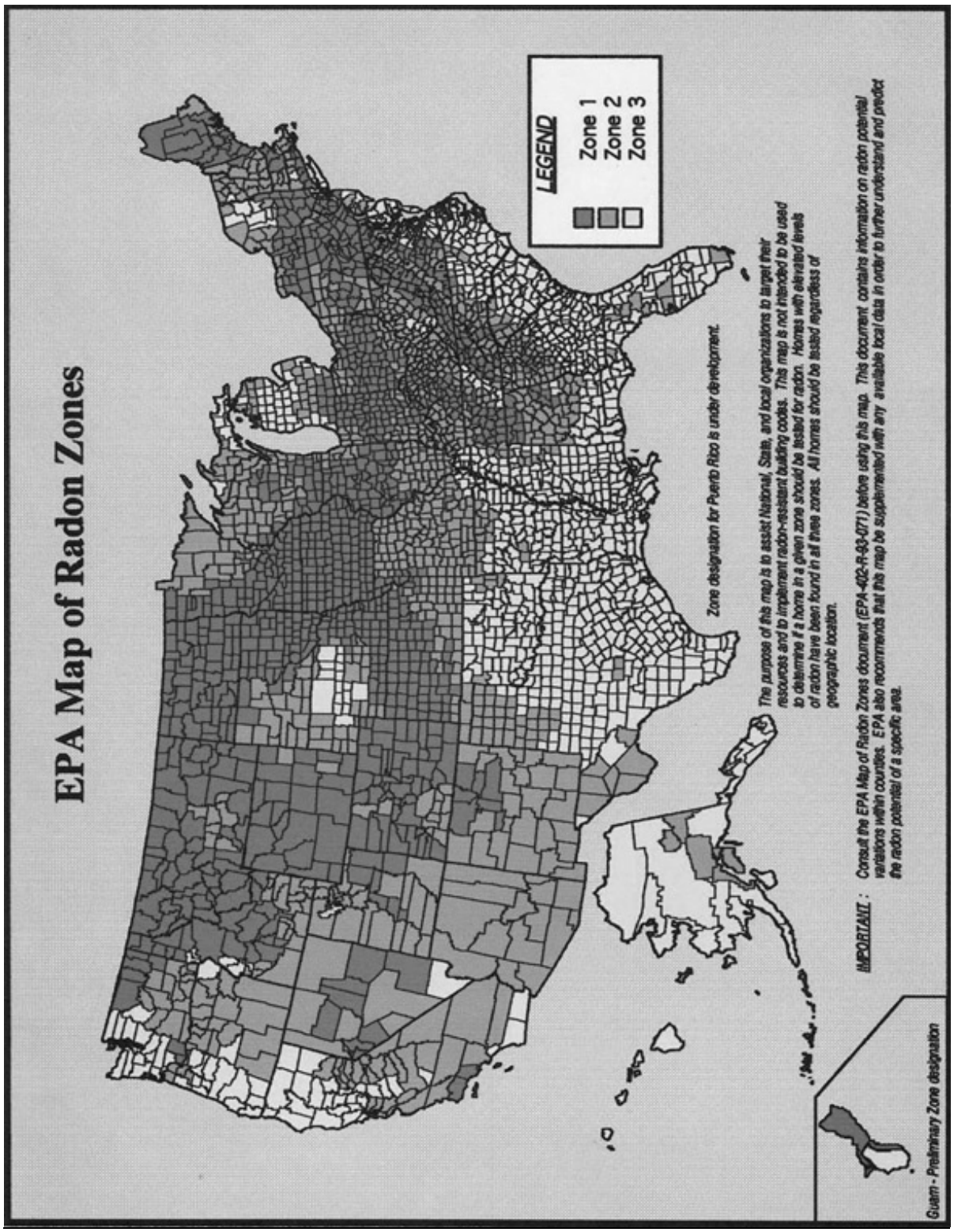


FIGURE R324.42
RADON POTENTIAL ZONES MAP

TABLE R324.42 EPA RADON ZONE 1 and 2 COUNTIES BY STATE

Alabama

Zone 1
Calhoun
Clay
Cleburne
Colbert
Coosa
Franklin
Jackson
Lauderdale
Lawrence
Limestone
Madison
Morgan
Talladega

Zone 2
Autauga
Barbour
Bibb
Blount
Bullock
Cherokee
Chilton
Cullman
Dallas
DeKalb
Elmore
Etowah
Fayette
Greene
Hale
Jefferson
Lamar
Lee
Lowndes
Macon
Marion
Marshall
Montgomery
Perry
Pickens
Randolph
Russell
Shelby
St Clair
Sumter
Tuscaloosa
Walker
Winston

Alaska

Zone 2
Anchorage Municipality
Dillingham Census Area
Fairbanks North Star Borough
Kenai Peninsula Borough
Matanuska-Susitna Borough
Southeast Fairbanks Census Area

Arizona

Zone 2
Apache
Cochise
Coconino
Gila
Graham
Greenlee
La Paz
Maricopa
Mohave
Navajo
Pima
Pinal
Santa Cruz
Yavapai
Yuma

Arkansas

Zone 2
Baxter
Benton
Boone
Carroll
Fulton
Garland
Independence
Izard
Marion
Montgomery
Randolph
Searcy
Sharp
Stone

California

Zone 1
Santa Barbara
Ventura

Zone 2
Alameda
Alpine
Amador
Calaveras
Contra Costa
El Dorado
Fresno
Inyo
Kern
Los Angeles
Madera
Mariposa
Mono
Monterey
Nevada
Placer
Plumas
Riverside
San Benito
San Bernardino
San Francisco
San Luis Obispo
San Mateo
Santa Clara
Santa Cruz
Sierra
Tulare
Tuolumne
Yuba

Colorado

Zone 1
Adams
Arapahoe
Baca
Bent
Boulder
Broomfield
Chaffee
Cheyenne
Clear Creek
Crowley
Custer
Delta
Denver
Dolores
Douglas
El Paso
Elbert
Fremont
Garfield
Gilpin
Grand
Gunnison
Huerfano
Jackson
Jefferson
Kiowa
Kit Carson
La Plata
Larimer
Las Animas
Lincoln
Logan
Mesa
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Phillips
Pitkin
Prowers
Pueblo
Rio Blanco
San Miguel
Sedgwick
Summit
Teller
Washington
Weld
Yuma

Zone 2
Alamosa
Archuleta
Conejos
Costilla
Eagle
Hinsdale
Lake
Mineral
Rio Grande
Routt
Saguache
San Juan

Connecticut

Zone 1
Fairfield
Middlesex
New Haven
New London

Zone 2
Litchfield
Tolland
Windham

Delaware

Zone 2
New Castle

Florida

Zone 2
Alachua
Citrus
Columbia
Hillsborough
Leon
Marion
Miami-Dade
Polk
Union

Georgia

Zone 1
Cobb
DeKalb
Fulton
Gwinnett

Zone 2
Banks
Barrow
Bartow
Butts
Carroll
Catoosa
Cherokee
Clarke
Clayton
Coweta
Dawson
Douglas
Elbert
Fannin
Fayette
Floyd
Forsyth
Franklin
Gilmer
Greene
Habersham
Hall
Haralson
Harris
Hart
Heard
Henry
Jackson
Jasper
Lamar
Lumpkin
Madison
Meriwether
Monroe
Morgan
Newton
Oconee
Oglethorpe
Paulding
Pickens
Pike
Rabun
Richmond
Rockdale
Spalding
Stephens
Talbot
Towns
Troup
Union
Upson
Walker
Walton
White
Whitfield

Hawaii

------None-----

Idaho

Zone 1

Benewah
Blaine
Boise
Bonner
Boundary
Butte
Camas
Clark
Clearwater
Custer
Elmore
Fremont
Gooding
Idaho
Kootenai
Latah
Lemhi
Shoshone
Valley

Zone 2

Ada
Bannock
Bear Lake
Bingham
Bonneville
Canyon
Caribou
Cassia
Franklin
Jefferson
Jerome
Lincoln
Madison
Minidoka
Oneida
Owyhee
Payette
Power
Teton
Twin Falls

Illinois

Zone 1

Adams
Boone
Brown
Bureau
Calhoun
Carroll
Cass
Champaign
Coles
De Witt
DeKalb
Douglas
Edgar
Ford
Fulton
Greene
Grundy
Hancock
Henderson
Henry
Iroquois
Jersey
Jo Daviess
Kane
Kendall
Knox
LaSalle
Lee
Livingston
Logan
Macon
Marshall
Mason
McDonough
McLean
Menard
Mercer
Morgan
Moultrie
Ogle
Peoria
Piatt
Pike
Putnam
Rock Island
Sangamon
Schuyler
Scott
Stark
Stephenson
Tazewell
Vermilion
Warren
Whiteside
Winnebago
Woodford

Zone 2

Bond
Christian
Clark
Clay
Clinton
Cook
Crawford
Cumberland
DuPage
Edwards
Effingham
Fayette
Franklin
Gallatin
Hamilton
Hardin
Jackson
Jasper
Jefferson
Johnson
Kankakee
Lake
Lawrence
Macoupin
Madison
Marion
McHenry
Monroe
Montgomery
Perry
Pope
Randolph
Richland
Saline
Shelby
St Clair
Union
Wabash
Washington
Wayne
White
Will
Williamson

Indiana

Zone 1

Adams
Allen
Bartholomew
Benton
Blackford
Boone
Carroll
Cass
Clark
Clinton
Decatur
DeKalb
Delaware
Elkhart
Fayette
Fountain
Fulton
Grant
Hamilton
Hancock
Harrison
Hendricks
Henry
Howard
Huntington
Jay
Jennings
Johnson
Kosciusko
LaGrange
Lawrence
Madison
Marion
Marshall
Miami
Monroe
Montgomery
Noble
Orange
Putnam
Randolph
Rush
Scott
Shelby
St Joseph
Steuben
Tippecanoe
Tipton
Union
Vermillion
Wabash
Warren
Washington
Wayne
Wells
White
Whitley

Zone 2

Brown
Clay
Crawford
Daviess
Dearborn
Dubois
Floyd
Franklin
Gibson
Greene
Jackson
Jasper
Jefferson
Knox
Lake
LaPorte
Martin
Morgan
Newton
Ohio
Owen
Parke
Perry
Pike
Porter
Posey
Pulaski
Ripley
Spencer
Starke
Sullivan
Switzerland
Vanderburgh
Vigo
Warrick

Iowa

Zone 1

Adair
Adams
Allamakee
Appanoose
Audubon
Benton
Black Hawk
Boone
Bremer
Buchanan
Buena Vista
Butler
Calhoun
Carroll
Cass
Cedar
Cerro Gordo
Cherokee
Chickasaw
Clarke
Clay
Clayton
Clinton
Crawford
Dallas
Davis
Decatur
Delaware
Des Moines
Dickinson
Dubuque
Emmet
Fayette
Floyd
Franklin
Fremont
Greene
Grundy
Guthrie
Hamilton
Hancock
Hardin
Harrison
Henry
Howard
Humboldt
Ida
Iowa
Jackson
Jasper
Jefferson
Johnson
Jones
Keokuk
Kossuth
Lee
Linn
Louisa
Lucas
Lyon
Madison
Mahaska
Marion
Marshall
Mills
Mitchell
Monona
Monroe
Montgomery
Muscatine
O'Brien
Osceola
Page
Palo Alto
Plymouth
Pocahontas
Polk
Pottawattamie
Poweshiek
Ringgold
Sac
Scott
Shelby
Sioux
Story
Tama
Taylor
Union
Van Buren
Wapello
Warren
Washington
Wayne
Webster
Winnebago
Winneshiek
Woodbury
Worth
Wright

Kansas

Zone 1

Atchison
Barton
Brown
Cheyenne
Clay
Cloud
Decatur
Dickinson
Douglas
Ellis
Ellsworth
Finney
Ford
Geary
Gove
Graham
Grant
Gray
Greeley
Hamilton
Haskell
Hodgeman
Jackson
Jewell
Johnson
Kearny
Kingman
Kiowa
Lane
Leavenworth
Lincoln
Logan
Marion
Marshall
McPherson
Meade
Mitchell
Nemaha
Ness
Norton
Osborne
Ottawa
Pawnee
Phillips
Pottawatomie
Pratt
Rawlins
Republic
Rice
Riley
Rooks
Rush
Russell
Saline
Scott
Sheridan
Sherman
Smith
Stanton
Thomas
Trego
Wallace
Washington
Wichita
Wyandotte

Zone 2

Allen
Anderson
Barber
Bourbon
Butler
Chase
Chautauqua
Cherokee
Clark
Coffey
Comanche
Cowley
Crawford
Doniphan
Edwards
Elk
Franklin
Greenwood
Harper
Harvey
Jefferson
Labette
Linn
Lyon
Miami
Montgomery
Morris
Morton
Neosho
Osage
Reno
Sedgwick
Seward
Shawnee
Stafford
Stevens
Sumner
Wabaunsee
Wilson
Woodson

Kentucky

Zone 1

Adair
Allen
Barren
Bourbon
Boyle
Bullitt
Casey
Clark
Cumberland
Fayette
Franklin
Green
Harrison
Hart
Jefferson
Jessamine
Lincoln
Marion
Mercer
Metcalfe
Monroe
Nelson
Pendleton
Pulaski
Robertson
Russell
Scott
Taylor
Warren
Woodford

Zone 2

Anderson
Bath
Bell
Boone
Boyd
Bracken
Breathitt
Breckinridge
Butler
Caldwell
Campbell
Carroll
Carter
Christian
Clay
Clinton
Crittenden
Daviess
Edmonson
Elliott
Estill
Fleming
Floyd
Gallatin
Garrard
Grant
Grayson
Greenup
Hancock
Hardin
Harlan
Henderson
Henry
Hopkins
Jackson
Johnson
Kenton
Knott
Knox
Larue
Laurel
Lawrence
Lee
Leslie
Letcher
Lewis
Livingston
Logan
Lyon
Madison
Magoffin
Martin
Mason
McCreary
McLean
Meade
Menifee
Montgomery
Morgan
Muhlenberg
Nicholas
Ohio
Oldham
Owen
Owsley
Perry
Pike
Powell
Rockcastle
Rowan
Shelby
Simpson
Spencer
Todd
Trigg
Trimble
Union
Washington
Wayne
Webster
Whitley
Wolfe

Louisiana

-------None------

Maine

Zone 1

Androscoggin
Aroostook
Cumberland
Franklin
Hancock
Kennebec
Lincoln
Oxford
Penobscot
Piscataquis
Somerset
York

Zone 2

Knox
Sagadahoc
Waldo
Washington

Maryland

Zone 1

Baltimore
Calvert
Carroll
Frederick
Harford
Howard
Montgomery
Washington

Zone 2

Allegany
Anne Arundel
Baltimore City
Cecil
Charles
Garrett
Prince George's
Somerset

Massachusetts

Zone 1

Essex
Middlesex
Worcester

Zone 2

Barnstable
Berkshire
Bristol
Dukes
Franklin
Hampden
Hampshire
Nantucket
Norfolk
Plymouth

Michigan

Zone 1

Branch
Calhoun
Cass
Hillsdale
Jackson
Kalamazoo
Lenawee
St Joseph
Washtenaw

Zone 2

Alcona
Alger
Alpena
Antrim
Baraga
Barry
Charlevoix
Clinton
Dickinson
Eaton
Emmet
Genesee
Gogebic
Houghton
Ingham
Ionia
Iron
Kent
Keweenaw
Lapeer
Leelanau
Livingston
Marquette
Menominee
Monroe
Montcalm
Montmorency
Oakland
Otsego
Presque Isle
Sanilac
Shiawassee

Minnesota

Zone 1
Becker
Big Stone
Blue Earth
Brown
Carver
Chippewa
Clay
Cottonwood
Dakota
Dodge
Douglas
Faribault Count
Fillmore
Freeborn
Goodhue
Grant
Hennepin
Houston
Hubbard
Jackson
Kanabec
Kandiyohi
Kittson
Lac qui Parle
Le Sueur
Lincoln
Lyon
Mahnomen
Marshall
Martin
McLeod
Meeker
Mower
Murray
Nicollet
Nobles
Norman
Olmsted
Otter Tail
Pennington
Pipestone
Polk
Pope
Ramsey
Red Lake
Redwood
Renville
Rice
Rock
Roseau
Scott
Sherburne
Sibley
Stearns
Steele
Stevens
Swift
Todd
Traverse
Wabasha
Wadena
Waseca
Washington
Watonwan
Wilkin
Winona
Wright
Yellow Medicine

Zone 2
Aitkin
Anoka
Beltrami
Benton
Carlton
Cass
Chisago
Clearwater
Cook
Crow Wing
Isanti
Itasca
Koochiching
Lake
Lake of the Woods
Mille Lacs
Morrison
Pine
St Louis

Mississippi

Zone 2
Alcorn
Chickasaw
Clay
Lee
Lowndes
Noxubee
Pontotoc
Rankin
Union
Washington

Missouri

Zone 1
Andrew
Atchison
Buchanan
Cass
Clay
Clinton
Holt
Iron
Jackson
Nodaway
Platte

Zone 2
Adair
Audrain
Barry
Barton
Bates
Benton
Bollinger
Boone
Caldwell
Callaway
Camden
Cape Girardeau
Carroll
Carter
Cedar
Chariton
Christian
Clark
Cole
Cooper
Crawford
Dade
Dallas
Daviess
DeKalb
Dent
Douglas
Franklin
Gasconade
Gentry
Greene
Grundy
Harrison
Henry
Hickory
Howard
Howell
Jasper
Jefferson
Johnson
Knox
Laclede
Lafayette
Lawrence
Lewis
Lincoln
Linn
Livingston
Macon
Madison
Maries
Marion
McDonald
Mercer
Miller
Moniteau
Monroe
Montgomery
Morgan
Newton
Oregon
Osage
Ozark
Perry
Pettis
Phelps
Pike
Polk
Pulaski
Putnam
Ralls
Randolph
Ray
Reynolds
Ripley
Saline
Schuyler
Scotland
Shannon
Shelby
St Charles
St Clair
St Francois
St Louis city
St Louis
Ste Genevieve
Stone
Sullivan
Taney
Texas
Vernon
Warren
Washington
Wayne
Webster
Worth
Wright

Montana

Zone 1
Beaverhead
Big Horn
Blaine
Broadwater
Carbon
Carter
Cascade
Chouteau
Custer
Daniels
Dawson
Deer Lodge
Fallon
Fergus
Flathead
Gallatin
Garfield
Glacier
Granite
Hill
Jefferson
Judith Basin
Lake
Lewis and Clark
Liberty
Lincoln
Madison
McCone
Meagher
Mineral
Missoula
Park
Phillips
Pondera
Powder River
Powell
Prairie
Ravalli
Richland
Roosevelt
Rosebud
Sanders
Sheridan
Silver Bow
Stillwater
Teton
Toole
Valley
Wibaux

Zone 2
Golden Valley
Musselshell
Petroleum
Sweet Grass
Treasure
Wheatland
Yellowstone

Nebraska

Zone 1
Adams
Boone
Boyd
Burt
Butler
Cass
Cedar
Clay
Colfax
Cuming
Dakota
Dixon
Dodge
Douglas
Fillmore
Franklin
Frontier
Furnas
Gage
Gosper
Greeley
Hamilton
Harlan
Hayes
Hitchcock
Jefferson
Johnson
Kearney
Knox
Lancaster
Madison
Nance
Nemaha
Nuckolls
Otoe
Pawnee
Phelps
Pierce
Platte
Polk
Red Willow
Richardson
Saline
Sarpy
Saunders
Seward
Stanton
Thayer
Thurston
Washington
Wayne
Webster
York

Zone 2
Antelope
Banner
Box Butte
Buffalo
Chase
Cheyenne
Custer
Dawes
Dawson
Deuel
Dundy
Hall
Howard
Keith
Keya Paha
Kimball
Merrick
Morrill
Perkins
Scotts Bluff
Sheridan
Sherman
Sioux
Valley

Nevada

Zone 1
Carson City
Douglas
Eureka
Lander
Lincoln
Lyon
Mineral
Pershing
White Pine

Zone 2
Churchill
Elko
Esmeralda
Humboldt
Nye
Storey
Washoe

New Hampshire

Zone 1
Carroll

Zone 2
Belknap
Cheshire

Coos
Grafton
Hillsborough
Merrimack
Rockingham
Strafford
Sullivan

New Jersey

Zone 1
Hunterdon
Mercer
Monmouth
Morris
Somerset
Sussex
Warren

Zone 2
Bergen
Burlington
Camden
Cumberland
Essex
Gloucester
Hudson
Middlesex
Passaic
Salem
Union

New Mexico

Zone 1
Bernalillo
Colfax
Mora
Rio Arriba
San Miguel
Santa Fe
Taos

Zone 2
Catron
Chaves
Cibola
Curry
De Baca
Dona Ana
Eddy
Grant
Guadalupe
Harding
Hidalgo
Lea
Lincoln
Los Alamos
Luna
McKinley
Otero
Quay
Roosevelt
San Juan
Sandoval
Sierra
Socorro
Torrance
Union
Valencia

New York

Zone 1
Albany
Allegany
Broome
Cattaraugus
Cayuga
Chautauqua
Chemung
Chenango
Columbia
Cortland
Delaware
Dutchess
Erie
Genesee
Greene
Livingston
Madison
Onondaga
Ontario
Orange
Otsego
Putnam
Rensselaer
Schoharie
Schuyler
Seneca
Steuben
Sullivan
Tioga
Tompkins
Ulster
Washington
Wyoming
Yates

Zone 2
Clinton
Jefferson
Lewis
Monroe
Montgomery
Niagara
Oneida
Orleans
Oswego
Saratoga
Schenectady
St Lawrence
Wayne

North Carolina

Zone 1
Alleghany
Buncombe
Cherokee
Henderson
Mitchell
Rockingham
Transylvania
Watauga

Zone 2
Alexander
Ashe
Avery
Burke
Caldwell
Caswell
Catawba
Clay
Cleveland
Forsyth
Franklin
Gaston
Graham
Haywood
Iredell
Jackson
Lincoln
Macon
Madison
McDowell
Polk
Rutherford
Stokes
Surry
Swain
Vance
Wake
Warren
Wilkes
Yadkin
Yancey

North Dakota

Zone 1
Adams
Barnes
Benson
Billings
Bottineau
Bowman
Burke
Burleigh
Cass
Cavalier
Dickey
Divide
Dunn
Eddy
Emmons
Foster
Golden Valley
Grand Forks
Grant
Griggs
Hettinger
Kidder
LaMoure
Logan
McHenry
McIntosh
McKenzie
McLean
Mercer
Morton
Mountrail
Nelson
Oliver
Pembina
Pierce
Ramsey
Ransom
Renville
Richland
Rolette
Sargent
Sheridan
Sioux
Slope
Stark
Steele
Stutsman
Towner
Traill
Walsh
Ward
Wells
Williams

Ohio

Zone 1
Adams
Allen
Ashland
Auglaize
Belmont
Butler
Carroll
Champaign
Clark
Clinton
Columbiana
Coshocton
Crawford
Darke
Delaware
Fairfield
Fayette
Franklin
Greene
Guernsey
Hamilton
Hancock
Hardin
Harrison
Holmes
Huron
Jefferson
Knox
Licking
Logan
Madison
Marion
Mercer
Miami
Montgomery
Morrow
Muskingum
Perry
Pickaway
Pike
Preble
Richland
Ross
Seneca
Shelby
Stark
Summit
Tuscarawas
Union
Van Wert
Warren
Wayne
Wyandot

Zone 2
Ashtabula
Athens
Brown
Clermont
Cuyahoga
Defiance
Erie
Fulton
Gallia
Geauga
Henry
Highland
Hocking
Jackson
Lake
Lawrence
Lorain
Lucas
Mahoning
Medina
Meigs
Monroe
Morgan
Noble
Ottawa
Paulding
Portage
Putnam
Sandusky
Scioto
Trumbull
Vinton
Washington
Williams
Wood

Oklahoma

Zone 2
Adair
Beaver
Cherokee
Cimarron
Delaware
Ellis
Mayes
Sequoyah
Texas

Oregon

Zone 2

Baker
Clatsop
Columbia
Crook
Gilliam
Grant
Harney
Hood River
Jefferson
Klamath
Lake
Malheur
Morrow
Multnomah
Sherman
Umatilla
Union
Wasco
Washington
Wheeler
Yamhill

Pennsylvania

Zone 1
Adams
Allegheny
Armstrong
Beaver
Bedford
Berks
Blair
Bradford
Bucks
Butler
Cameron
Carbon
Centre
Chester
Clarion
Clearfield
Clinton
Columbia
Cumberland
Dauphin
Delaware
Franklin
Fulton
Huntingdon
Indiana
Juniata
Lackawanna
Lancaster
Lebanon
Lehigh
Luzerne
Lycoming
Mifflin
Monroe
Montgomery
Montour
Northampton
Northumberland
Perry
Schuylkill
Snyder
Sullivan
Susquehanna
Tioga
Union
Venango
Westmoreland
Wyoming
York

Zone 2
Cambria
Crawford
Elk
Erie
Fayette
Forest
Greene
Jefferson
Lawrence
McKean
Mercer
Pike
Potter
Somerset
Warren
Washington
Wayne

Rhode Island

Zone 1
Kent
Washington

Zone 2
Newport
Providence

South Carolina

Zone 1
Greenville

Zone 2
Abbeville
Anderson
Cherokee
Laurens
Oconee
Pickens
Spartanburg
York

South Dakota

Zone 1
Aurora
Beadle
Bon Homme
Brookings
Brown
Brule
Buffalo
Campbell
Charles Mix
Clark
Clay
Codington
Corson
Davison
Day
Deuel
Douglas
Edmunds
Faulk
Grant
Hamlin
Hand
Hanson
Hughes
Hutchinson
Hyde
Jerauld
Kingsbury
Lake
Lincoln
Lyman
Marshall
McCook
McPherson
Miner
Minnehaha
Moody
Perkins
Potter
Roberts
Sanborn
Spink
Stanley
Sully
Turner
Union
Walworth
Yankton

Zone 2
Bennett
Butte
Custer
Dewey
Fall River
Gregory
Haakon
Harding
Jackson
Jones
Lawrence
Meade
Mellette
Pennington
Shannon
Todd
Tripp
Ziebach

Tennessee

Zone 1
Anderson
Bedford
Blount
Bradley
Claiborne
Davidson
Giles
Grainger
Greene
Hamblen
Hancock
Hawkins
Hickman
Humphreys
Jackson
Jefferson
Knox
Lawrence
Lewis
Lincoln
Loudon
Macon
Madison
Marshall
McMinn
Meigs
Monroe
Moore
Perry
Roane
Rutherford
Smith
Sullivan
Trousdale
Union
Washington
Wayne
Williamson
Wilson

Zone 2
Benton
Cannon
Carter
Cheatham
Chester
Clay
Cocke
Coffee
Decatur
DeKalb
Dickson
Fentress
Hamilton
Hardin
Henderson
Houston
Johnson
Marion
McNairy
Montgomery
Overton
Pickett
Polk
Putnam
Robertson
Sevier
Stewart
Sumner
Unicoi
Van Buren
Warren
White

Texas

Zone 2
Armstrong
Bailey
Brewster
Carson
Castro
Crosby
Culberson
Dallam
Deaf Smith
Donley
Floyd
Garza
Gray
Hale
Hansford
Hartley
Hemphill
Hockley
Hudspeth
Hutchinson
Jeff Davis
Lamb
Lipscomb
Llano
Lubbock
Lynn
Mason
Moore
Ochiltree
Oldham
Parmer
Potter
Presidio
Randall
Reeves
Roberts
Sherman
Swisher
Terrell

Utah

Zone 1
Carbon
Duchesne
Grand
Piute
Sanpete
Sevier
Uintah

Zone 2
Beaver
Box Elder
Cache
Daggett
Davis
Emery
Garfield
Iron
Juab
Kane
Millard
Morgan
Rich
Salt Lake
San Juan
Summit
Tooele
Utah
Wasatch
Washington
Wayne
Weber

Vermont

Zone 2
Addison
Bennington
Caledonia
Essex
Franklin
Lamoille
Orange
Orleans
Rutland
Washington
Windham
Windsor

Virginia

Zone 1
Alleghany
Amelia
Appomattox
Augusta
Bath
Bland
Botetourt
Brunswick
Buckingham
Campbell
Chesterfield
Clarke
Craig
Cumberland
Dinwiddie
Fairfax
Fluvanna
Frederick
Giles
Goochland
Henry
Highland
Lee
Louisa
Montgomery
Nottoway
Orange
Page
Patrick
Pittsylvania
Powhatan
Pulaski
Roanoke
Rockbridge
Rockingham
Russell
Scott
Shenandoah
Smyth
Spotsylvania
Stafford
Tazewell
Warren
Washington
Wythe

Zone 2
Albemarle
Amherst
Arlington
Bedford
Buchanan
Carroll
Charlotte
Culpeper
Dickenson
Fauquier
Floyd
Franklin
Grayson
Greene
Halifax
Loudoun
Lunenburg
Madison
Mecklenburg
Nelson
Prince Edward
Prince William
Rappahannock
Wise

Washington

Zone 1
Clark
Ferry
Okanogan
Pend Oreille
Skamania
Spokane
Stevens

Zone 2
Adams
Asotin
Benton
Columbia
Douglas
Franklin
Garfield
Grant
Kittitas
Klickitat
Lincoln
Walla Walla
Whitman
Yakima

West Virginia

Zone 1
Berkeley
Brooke
Grant
Greenbrier
Hampshire
Hancock
Hardy
Jefferson
Marshall
Mercer
Mineral
Monongalia
Monroe
Morgan
Ohio
Pendleton
Pocahontas
Preston
Summers
Wetzel

Zone 2
Barbour
Braxton
Cabell
Calhoun
Clay
Doddridge
Fayette
Gilmer
Harrison
Jackson
Lewis
Lincoln
Marion
Mason
Nicholas
Pleasants
Putnam
Raleigh
Randolph
Ritchie
Roane
Taylor
Tucker
Tyler
Upshur
Wayne
Webster
Wirt
Wood

Wisconsin

Zone 1
Buffalo
Crawford
Dane
Dodge
Door
Fond du Lac
Grant
Green
Green Lake
Iowa
Jefferson
Lafayette
Langlade
Marathon
Menominee
Pepin
Pierce
Portage
Richland
Rock
Shawano
St Croix
Vernon
Walworth
Washington
Waukesha
Waupaca
Wood

Zone 2
Adams
Ashland
Barron
Bayfield
Brown
Burnett
Calumet
Chippewa
Clark
Columbia
Douglas
Dunn
Eau Claire
Florence
Forest
Iron
Jackson
Juneau
Kenosha
Kewaunee
La Crosse
Lincoln
Manitowoc
Marinette
Marquette
Milwaukee
Monroe
Oconto
Oneida
Outagamie
Ozaukee
Polk
Price
Racine
Rusk
Sauk
Sawyer
Sheboygan
Taylor
Trempealeau
Vilas
Washburn
Waushara
Winnebago

Wyoming

Zone 1
Albany
Big Horn
Campbell
Carbon
Converse
Crook
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Sheridan
Sublette
Sweetwater
Teton
Uinta
Washakie

Zone 2
Platte
Weston

Add to Chapter 3 Bibliography

ASTM D5926-11 – "Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems "

ASTM E1745-11 – "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs"

Add new definitions as follows:

ACCESS (limited). For the purposes of Section R324, the point of entry to a fan location that allows service personnel to reach an *ASD fan* or intended fan location for the purpose of installing or replacing an *ASD fan*. Such access does not require walkways, service platforms, level working spaces, receptacle and lighting outlets or clear and unobstructed passageways with continuous solid flooring such as are typically required for appliances that require periodic maintenance, servicing and inspection.

ACTIVE SOIL DEPRESSURIZATION (ASD). A family of *radon mitigation systems* involving fan-powered soil depressurization, including but not limited to *sub-slab depressurization* and *sub-membrane depressurization*.

ASD FAN. A particular type of fan that is designed and rated by the manufacturer for continuous duty and for use in an *ASD* system.

CERTIFIED. For the purposes of Section R324, a designation applied to individuals or companies that have met qualification requirements or are authorized by the state to provide *radon* laboratory, measurement or mitigation services. Programs providing national certifications for *radon* laboratories, measurement and mitigation professionals shall be those of the National Radon Proficiency Program (NRPP) and the National Radon Safety Board (NRSB). Also see LICENSED.

CHECK VALVE. For the purposes of Section R324, a mechanical device that will allow water to flow in one direction while preventing airflow in the opposite direction.

DEPRESSURIZATION. A negative pressure induced in one area relative to another.

DIAGNOSTIC TESTS. For the purposes of Section R324, procedures, including Communication Tests and other tests, used to identify or characterize conditions under, beside and within buildings that could contribute to *radon* entry or elevated *radon* levels or that could provide information regarding the performance of a *radon mitigation system*.

GEOTEXTILE MATTING. A product suitable for soil contact, that provides a void space laterally through the material to allow air movement. The void space is created through a matrix of woven mesh, "egg crate" support of a fabric enclosure or similar means. Also referred to as "Vent Strip".

LICENSED. For the purposes of Section R324, a designation applied to individuals and/or companies that are qualified and specifically authorized as *radon* laboratories, measurement and/or mitigation professionals within certain states or jurisdictions that regulate *radon* services. Also see CERTIFIED.

MITIGATOR. For the purposes of Section R324, a *certified*/*licensed* individual who designs, installs or directly supervises the installation of the *radon ASD mitigation systems*.

MITIGATION SYSTEM. For the purposes of Section R324, any system or steps designed to reduce *radon* concentrations in the indoor air of a building.

NATIONAL RADON ACTION LEVEL (NRAL). The indoor *radon* concentration at which mitigation is recommended. The *NRAL* is defined as the US Environmental Protection Agency's Action Level of 4 *pCi/L* [148 Bq/m^3].

PIPE LOOP. For the purposes of Section R324, a continuous length of perforated pipe extending around the inside perimeter of the foundation.

RADON. A naturally occurring, chemically inert, radioactive element (Rn-222) which exists as a gas.

ROUGH-IN. For the purposes of Section R324, the installation of all parts and materials of an *ASD* system that must be completed prior to the placement of concrete, prior to the closure of building cavities and prior to the installation of finish materials. Such parts and materials are gas permeable layers, *soil gas retarders*, plenums, membranes, piping, *suction points*, discharge points and wiring.

SOIL GAS. The gas mixture present in soil, which could contain *radon* and water vapor.

SOIL GAS COLLECTION PLENUM. A constructed enclosure for collecting *radon* and other *soil gases* from under a foundation.

SOIL GAS COLLECTOR. A gas permeable conduit constructed of *gravel*, perforated pipe or *geotextile matting* for collecting *radon* and other *soil gases* from within a *soil gas collection plenum* and connecting the plenum to the *ASD* pipe system.

SOIL GAS RETARDER. A continuous membrane or other comparable material laid over a *soil gas* plenum or earthen floor area that is used to retard the flow of *soil gases* into a building.

SUB-MEMBRANE DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure in the space under a *soil gas retarder* membrane than above it by use of an *ASD fan* drawing air from beneath the membrane.

SUB-SLAB DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure under a floor slab than above it. An *ASD fan* is installed in the *radon* system piping that draws air from below the floor slab.

SUCTION POINT. For the purposes of Section R324, the location where the *soil gas collector* is connected to the *ASD* system piping.

Commenter's Reason: Exhibit 1 was deleted from the original proposal because the committee felt it was not appropriate for code. The Exception in R324.2 was modified to allow for alternate radon mitigation techniques and provides a performance only path. The Exception in R324.2 also provides the opportunity to not require a system where local conditions determine it is not necessary. In the prescriptive path where a complete Active Soil Depressurization system is installed the builder will not be required to test prior to occupancy.

This proposed section on radon reduction is consistent with the stated goals of the IRC as stated in **R103.1 Intent: "***The purpose of this code is to establish minimum requirements to safeguard the public safety, health and general welfare……".* The prescriptive requirements of this proposed section and the requirements for certified/licensed radon professionals relieves the building official from a need for detailed knowledge on testing and remediating this Class "A" carcinogen from the built environment and so they need not be an industrial hygienist or an expert on radon.

Radon is a Life/Safety issue which exists in residential construction because of the way homes are constructed and the soil underlying a dwelling's foundation. 21,000 Americans die each year from radon-induced lung cancer. The primary source of exposure to radon for the general public is the home. Geographical areas of the highest radon potential in the United States are located in EPA radon zones 1 and 2. If the radon system is not needed it does not need to be roughed-in or completed.

There is currently no requirement in the Residential Code to apply radon reduction methods to new construction and thereby prevent elevated radon concentrations in newly built homes unless voluntarily adopted by a local jurisdiction. Because of the lack of code requirement we have added 2.5 million new homes with elevated indoor radon to the country's housing inventory in the past 25 years.

The EPA estimates that 1 out of 15 of all homes in the US has elevated indoor radon levels. The incidence of elevated radon may be greater than 7 out of 10 homes in some high radon areas. Nonrandomized industry data shows a significant number of homes across the United States have tested high for elevated indoor radon concentrations. Builders of new homes will continue to add to the existing inventory of homes with elevated radon without changes in the residential code that address this important life/safety issue.

Radon Test Results Data by State

STATE	STATENAME	TOTAL # TESTS	AVG (pCi/L)	% > EPA Action Level of 4 pCi/L
AL	ALABAMA	11,629	3.8	21.9
AK	ALASKA	432	2.2	13.0
AZ	ARIZONA	7,495	2.1	11.9
AR	ARKANSAS	1,243	2.5	13.7
CA	CALIFORNIA	16,960	2.1	9.1
CO	COLORADO	88,346	6.5	49.0
CT	CONNECTICUT	41,292	3.4	23.9
DE	DELAWARE	5,539	2.5	17.4
FL	FLORIDA	40,039	1.8	10.2
GA	GEORGIA	27,222	2.6	18.9
HI	HAWAII	94	0.4	2.1
ID	IDAHO	16,138	7.1	40.4
IL	ILLINOIS	84,366	5.1	41.0
IN	INDIANA	18,031	4.7	37.2
IA	IOWA	96,260	6.2	49.3
KS	KANSAS	34,288	5.2	44.0
KY	KENTUCKY	47,575	7.4	43.6
LA	LOUISIANA	786	0.9	3.1
ME	MAINE	5,494	5.9	38.3
MD	MARYLAND	55,949	5.4	33.4
MA	MASSACHUSETTS	29,850	3.8	25.6
MI	MICHIGAN	164,678	3.4	25.4
MN	MINNESOTA	135,419	4.7	42.2
MS	MISSISSIPPI	700	1.2	5.6
MO	MISSOURI	27,771	4.2	31.6
MT	MONTANA	18,082	7.2	46.3
NE	NEBRASKA	27,481	5.7	51.6
NV	NEVADA	1,952	3.0	19.3
NH	NEW HAMPSHIRE	35,974	5.5	34.0
NJ	NEW JERSEY	41,092	4.3	24.1
NM	NEW MEXICO	8,165	3.9	30.2
NY	NEW YORK	66,713	4.8	23.9
NC	NORTH CAROLINA	79,384	3.8	27.5
ND	NORTH DAKOTA	10,887	6.0	50.5
OH	OHIO	102,352	7.9	49.0
OK	OKLAHOMA	1,356	2.3	9.7
OR	OREGON	13,675	3.5	25.4
PA	PENNSYLVANIA	149,543	8.3	44.3
RI	RHODE ISLAND	8,667	4.2	31.0
SC	SOUTH CAROLINA	38,971	2.7	18.7
SD	SOUTH DAKOTA	4,081	9.8	59.2
TN	TENNESSEE	40,632	4.6	31.8
TX	TEXAS	5,821	2.4	8.7
UT	UTAH	14,636	4.5	33.6
VT	VERMONT	3,231	3.7	23.4
VA	VIRGINIA	62,577	3.5	25.4
WA	WASHINGTON	22,199	7.0	39.3
DC	WASHINGTON DC	6,948	1.6	8.8
WV	WEST VIRGINIA	14,976	6.0	35.0
WI	WISCONSIN	72,694	5.6	41.8
WY	WYOMING	25,090	5.2	39.6
TOTALS		**1,834,775**		

Source: AARST radon industry test data; published 10/29/2012.

This change proposal will slightly increase the cost of construction. Most homes can be built with only a mitigation system Rough-In. If the home tests high for elevated radon then the system can be upgraded with a fan to reduce the indoor radon levels.

Cost of mitigation system Rough-In (passive) =$296*

Cost of fan driven mitigation system = $707* (total cost, not in addition to $296)

Source: Annual Builder Practices Report 2011, NAHB Research Center, Inc.

The cost savings for reduced health care resulting from a healthier indoor environment has not been calculated.

Public Comment 2:

Mathew Koch, Southern Radon Reduction, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

Add new text as follows:

SECTION R324
RADON

R324.1 *Radon* Testing. Where a building site indicates a potential for elevated indoor *radon* concentrations, as shown by the United States Environmental Protection Agency Zones 1 and 2 in Figure 324.1 or from the United States Environmental Protection Agency *radon* potential by county listing in Table 324.2, the *building official* shall determine whether to require a *radon* test be performed by a *licensed or certified radon* measurement professional prior to occupancy. Where state or local jurisdictions have published *radon* potential data, such data shall supersede the information in Figure 324.1 and Table 324.2.

Add new definitions as follows:

CERTIFIED. For the purposes of Section R324, a designation applied to individuals or companies that have met qualification requirements or are authorized by the state to provide *radon* laboratory, measurement or mitigation services. Programs providing national certifications for *radon* laboratories, measurement and mitigation professionals are those of the National Radon Proficiency Program and the National Radon Safety Board. Also see LICENSED.

LICENSED. For the purposes of Section R324, a designation applied to individuals and/or companies that are qualified and specifically authorized as *radon* laboratories, measurement or mitigation professionals within certain states or jurisdictions that regulate *radon* services. Also see CERTIFIED.

RADON. A naturally occurring, chemically inert, radioactive element (Rn-222) which exists as a gas.

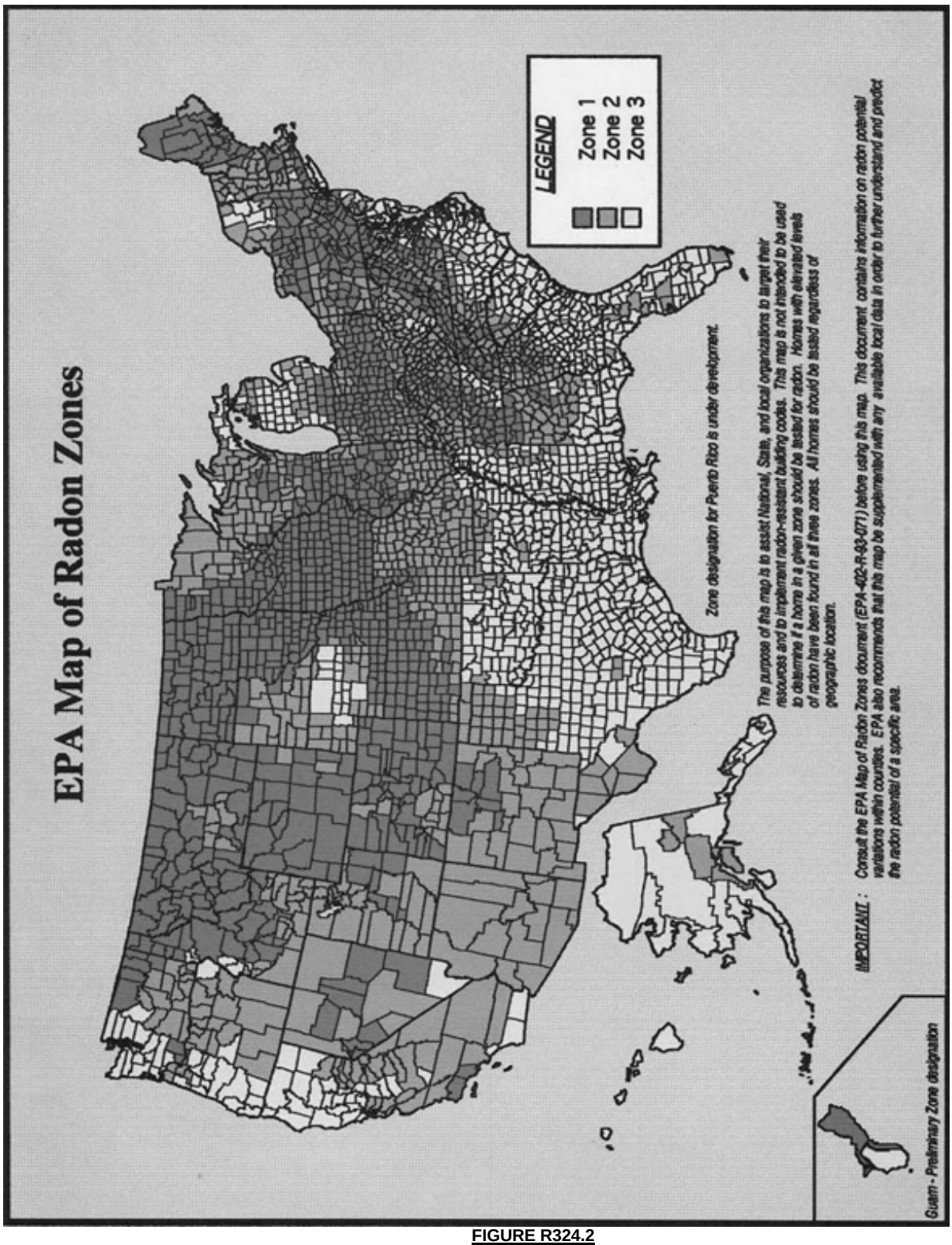


FIGURE R324.2
RADON POTENTIAL ZONES MAP

TABLE R324.2 EPA RADON ZONE 1 and 2 COUNTIES BY STATE

Alabama

Zone 1
Calhoun
Clay
Cleburne
Colbert
Coosa
Franklin
Jackson
Lauderdale
Lawrence
Limestone
Madison
Morgan
Talladega

Zone 2
Autauga
Barbour
Bibb
Blount
Bullock
Cherokee
Chilton
Cullman
Dallas
DeKalb
Elmore
Etowah
Fayette
Greene
Hale
Jefferson
Lamar
Lee
Lowndes
Macon
Marion
Marshall
Montgomery
Perry
Pickens
Randolph
Russell
Shelby
St Clair
Sumter
Tuscaloosa
Walker
Winston

Alaska

Zone 2
Anchorage Municipality
Dillingham Census Area
Fairbanks North Star Borough
Kenai Peninsula Borough
Matanuska-Susitna Borough
Southeast Fairbanks Census Area

Arizona

Zone 2
Apache
Cochise
Coconino
Gila
Graham
Greenlee
La Paz
Maricopa
Mohave
Navajo
Pima
Pinal
Santa Cruz
Yavapai
Yuma

Arkansas

Zone 2
Baxter
Benton
Boone
Carroll
Fulton
Garland
Independence
Izard
Marion
Montgomery
Randolph
Searcy
Sharp
Stone

California

Zone 1
Santa Barbara
Ventura

Zone 2
Alameda
Alpine
Amador
Calaveras
Contra Costa
El Dorado
Fresno
Inyo
Kern
Los Angeles
Madera
Mariposa
Mono
Monterey
Nevada
Placer
Plumas
Riverside
San Benito
San Bernardino
San Francisco
San Luis Obispo
San Mateo
Santa Clara
Santa Cruz
Sierra
Tulare
Tuolumne
Yuba

Colorado

Zone 1
Adams
Arapahoe
Baca
Bent
Boulder
Broomfield
Chaffee
Cheyenne
Clear Creek
Crowley
Custer
Delta
Denver
Dolores
Douglas
El Paso
Elbert
Fremont
Garfield
Gilpin
Grand
Gunnison
Huerfano
Jackson
Jefferson
Kiowa
Kit Carson
La Plata
Larimer
Las Animas
Lincoln
Logan
Mesa
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Phillips
Pitkin
Prowers
Pueblo
Rio Blanco
San Miguel
Sedgwick
Summit
Teller
Washington
Weld
Yuma

Zone 2
Alamosa
Archuleta
Conejos
Costilla
Eagle
Hinsdale
Lake
Mineral
Rio Grande
Routt
Saguache
San Juan

Connecticut

Zone 1
Fairfield
Middlesex
New Haven
New London

Zone 2
Litchfield
Tolland
Windham

Delaware

Zone 2
New Castle

Florida

Zone 2
Alachua
Citrus
Columbia
Hillsborough
Leon
Marion
Miami-Dade
Polk
Union

Georgia

Zone 1
Cobb
DeKalb
Fulton
Gwinnett

Zone 2
Banks
Barrow
Bartow
Butts
Carroll
Catoosa
Cherokee
Clarke
Clayton
Coweta
Dawson
Douglas
Elbert
Fannin
Fayette
Floyd
Forsyth
Franklin
Gilmer
Greene
Habersham
Hall
Haralson
Harris
Hart
Heard
Henry
Jackson
Jasper
Lamar
Lumpkin
Madison
Meriwether
Monroe
Morgan
Newton
Oconee
Oglethorpe
Paulding
Pickens
Pike
Rabun
Richmond
Rockdale
Spalding
Stephens
Talbot
Towns
Troup
Union
Upson
Walker
Walton
White
Whitfield

Hawaii

-----None-----

Idaho

Zone 1

Benewah
Blaine
Boise
Bonner
Boundary
Butte
Camas
Clark
Clearwater
Custer
Elmore
Fremont
Gooding
Idaho
Kootenai
Latah
Lemhi
Shoshone
Valley

Zone 2

Ada
Bannock
Bear Lake
Bingham
Bonneville
Canyon
Caribou
Cassia
Franklin
Jefferson
Jerome
Lincoln
Madison
Minidoka
Oneida
Owyhee
Payette
Power
Teton
Twin Falls

Illinois

Zone 1

Adams
Boone
Brown
Bureau
Calhoun
Carroll
Cass
Champaign
Coles
De Witt
DeKalb
Douglas
Edgar
Ford
Fulton
Greene
Grundy
Hancock
Henderson
Henry
Iroquois
Jersey
Jo Daviess
Kane
Kendall
Knox
LaSalle
Lee
Livingston
Logan
Macon
Marshall
Mason
McDonough
McLean
Menard
Mercer
Morgan
Moultrie
Ogle
Peoria
Piatt
Pike
Putnam
Rock Island
Sangamon
Schuyler
Scott
Stark
Stephenson
Tazewell
Vermilion
Warren
Whiteside
Winnebago
Woodford

Zone 2

Bond
Christian
Clark
Clay
Clinton
Cook
Crawford
Cumberland
DuPage
Edwards
Effingham
Fayette
Franklin
Gallatin
Hamilton
Hardin
Jackson
Jasper
Jefferson
Johnson
Kankakee
Lake
Lawrence
Macoupin
Madison
Marion
McHenry
Monroe
Montgomery
Perry
Pope
Randolph
Richland
Saline
Shelby
St Clair
Union
Wabash
Washington
Wayne
White
Will
Williamson

Indiana

Zone 1

Adams
Allen
Bartholomew
Benton
Blackford
Boone
Carroll
Cass
Clark
Clinton
Decatur
DeKalb
Delaware
Elkhart
Fayette
Fountain
Fulton
Grant
Hamilton
Hancock
Harrison
Hendricks
Henry
Howard
Huntington
Jay
Jennings
Johnson
Kosciusko
LaGrange
Lawrence
Madison
Marion
Marshall
Miami
Monroe
Montgomery
Noble
Orange
Putnam
Randolph
Rush
Scott
Shelby
St Joseph
Steuben
Tippecanoe
Tipton
Union
Vermillion
Wabash
Warren
Washington
Wayne
Wells
White
Whitley

Zone 2

Brown
Clay
Crawford
Daviess
Dearborn
Dubois
Floyd
Franklin
Gibson
Greene
Jackson
Jasper
Jefferson
Knox
Lake
LaPorte
Martin
Morgan
Newton
Ohio
Owen
Parke
Perry
Pike
Porter
Posey
Pulaski
Ripley
Spencer
Starke
Sullivan
Switzerland
Vanderburgh
Vigo
Warrick

Iowa

Zone 1

Adair
Adams
Allamakee
Appanoose
Audubon
Benton
Black Hawk
Boone
Bremer
Buchanan
Buena Vista
Butler
Calhoun
Carroll
Cass
Cedar
Cerro Gordo
Cherokee
Chickasaw
Clarke
Clay
Clayton
Clinton
Crawford
Dallas
Davis
Decatur
Delaware
Des Moines
Dickinson
Dubuque
Emmet
Fayette
Floyd
Franklin
Fremont
Greene
Grundy
Guthrie
Hamilton
Hancock
Hardin
Harrison
Henry
Howard
Humboldt
Ida
Iowa
Jackson
Jasper
Jefferson
Johnson
Jones
Keokuk
Kossuth
Lee
Linn
Louisa
Lucas
Lyon
Madison
Mahaska
Marion
Marshall
Mills
Mitchell
Monona
Monroe
Montgomery
Muscatine
O'Brien
Osceola
Page
Palo Alto
Plymouth
Pocahontas
Polk
Pottawattamie
Poweshiek
Ringgold
Sac
Scott
Shelby
Sioux
Story
Tama
Taylor
Union
Van Buren
Wapello
Warren
Washington
Wayne
Webster
Winnebago
Winneshiek
Woodbury
Worth
Wright

Kansas

Zone 1

Atchison
Barton
Brown
Cheyenne
Clay
Cloud
Decatur
Dickinson
Douglas
Ellis
Ellsworth
Finney
Ford
Geary
Gove
Graham
Grant
Gray
Greeley
Hamilton
Haskell
Hodgeman
Jackson
Jewell
Johnson
Kearny
Kingman
Kiowa
Lane
Leavenworth
Lincoln
Logan
Marion
Marshall
McPherson
Meade
Mitchell
Nemaha
Ness
Norton
Osborne
Ottawa
Pawnee
Phillips
Pottawatomie
Pratt
Rawlins
Republic
Rice
Riley
Rooks
Rush
Russell
Saline
Scott
Sheridan
Sherman
Smith
Stanton
Thomas
Trego
Wallace
Washington
Wichita
Wyandotte

Zone 2

Allen
Anderson
Barber
Bourbon
Butler
Chase
Chautauqua
Cherokee
Clark
Coffey
Comanche
Cowley
Crawford
Doniphan
Edwards
Elk
Franklin
Greenwood
Harper
Harvey
Jefferson
Labette
Linn
Lyon
Miami
Montgomery
Morris
Morton
Neosho
Osage
Reno
Sedgwick
Seward
Shawnee
Stafford
Stevens
Sumner
Wabaunsee
Wilson
Woodson

Kentucky

Zone 1

Adair
Allen
Barren
Bourbon
Boyle
Bullitt
Casey
Clark
Cumberland
Fayette
Franklin
Green
Harrison
Hart
Jefferson
Jessamine
Lincoln
Marion
Mercer
Metcalfe
Monroe
Nelson
Pendleton
Pulaski
Robertson
Russell
Scott
Taylor
Warren
Woodford

Zone 2

Anderson
Bath
Bell
Boone
Boyd
Bracken
Breathitt
Breckinridge
Butler
Caldwell
Campbell
Carroll
Carter
Christian
Clay
Clinton
Crittenden
Daviess
Edmonson
Elliott
Estill
Fleming
Floyd
Gallatin
Garrard
Grant
Grayson
Greenup
Hancock
Hardin
Harlan
Henderson
Henry
Hopkins
Jackson
Johnson
Kenton
Knott
Knox
Larue
Laurel
Lawrence
Lee
Leslie
Letcher
Lewis
Livingston
Logan
Lyon
Madison
Magoffin
Martin
Mason
McCreary
McLean
Meade
Menifee
Montgomery
Morgan
Muhlenberg
Nicholas
Ohio
Oldham
Owen
Owsley
Perry
Pike
Powell
Rockcastle
Rowan
Shelby
Simpson
Spencer
Todd
Trigg
Trimble
Union
Washington
Wayne
Webster
Whitley
Wolfe

Louisiana

-------None------

Maine

Zone 1

Androscoggin
Aroostook
Cumberland
Franklin
Hancock
Kennebec
Lincoln
Oxford
Penobscot
Piscataquis
Somerset
York

Zone 2

Knox
Sagadahoc
Waldo
Washington

Maryland

Zone 1

Baltimore
Calvert
Carroll
Frederick
Harford
Howard
Montgomery
Washington

Zone 2

Allegany
Anne Arundel
Baltimore City
Cecil
Charles
Garrett
Prince George's
Somerset

Massachusetts

Zone 1

Essex
Middlesex
Worcester

Zone 2

Barnstable
Berkshire
Bristol
Dukes
Franklin
Hampden
Hampshire
Nantucket
Norfolk
Plymouth

Michigan

Zone 1

Branch
Calhoun
Cass
Hillsdale
Jackson
Kalamazoo
Lenawee
St Joseph
Washtenaw

Zone 2

Alcona
Alger
Alpena
Antrim
Baraga
Barry
Charlevoix
Clinton
Dickinson
Eaton
Emmet
Genesee
Gogebic
Houghton
Ingham
Ionia
Iron
Kent
Keweenaw
Lapeer
Leelanau
Livingston
Marquette
Menominee
Monroe
Montcalm
Montmorency
Oakland
Otsego
Presque Isle
Sanilac
Shiawassee

Minnesota

Zone 1
Becker
Big Stone
Blue Earth
Brown
Carver
Chippewa
Clay
Cottonwood
Dakota
Dodge
Douglas
Faribault Count
Fillmore
Freeborn
Goodhue
Grant
Hennepin
Houston
Hubbard
Jackson
Kanabec
Kandiyohi
Kittson
Lac qui Parle
Le Sueur
Lincoln
Lyon
Mahnomen
Marshall
Martin
McLeod
Meeker
Mower
Murray
Nicollet
Nobles
Norman
Olmsted
Otter Tail
Pennington
Pipestone
Polk
Pope
Ramsey
Red Lake
Redwood
Renville
Rice
Rock
Roseau
Scott
Sherburne
Sibley
Stearns
Steele
Stevens
Swift
Todd
Traverse
Wabasha
Wadena
Waseca
Washington
Watonwan
Wilkin
Winona
Wright
Yellow Medicine

Zone 2
Aitkin
Anoka
Beltrami
Benton
Carlton
Cass
Chisago
Clearwater
Cook
Crow Wing
Isanti
Itasca
Koochiching
Lake
Lake of the Woods
Mille Lacs
Morrison
Pine
St Louis

Mississippi

Zone 2
Alcorn
Chickasaw
Clay
Lee
Lowndes
Noxubee
Pontotoc
Rankin
Union
Washington

Missouri

Zone 1
Andrew
Atchison
Buchanan
Cass
Clay
Clinton
Holt
Iron
Jackson
Nodaway
Platte

Zone 2
Adair
Audrain
Barry
Barton
Bates
Benton
Bollinger
Boone
Caldwell
Callaway
Camden
Cape Girardeau
Carroll
Carter
Cedar
Chariton
Christian
Clark
Cole
Cooper
Crawford
Dade
Dallas
Daviess
DeKalb
Dent
Douglas
Franklin
Gasconade
Gentry
Greene
Grundy
Harrison
Henry
Hickory
Howard
Howell
Jasper
Jefferson
Johnson
Knox
Laclede
Lafayette
Lawrence
Lewis
Lincoln
Linn
Livingston
Macon
Madison
Maries
Marion
McDonald
Mercer
Miller
Moniteau
Monroe
Montgomery
Morgan
Newton
Oregon
Osage
Ozark
Perry
Pettis
Phelps
Pike
Polk
Pulaski
Putnam
Ralls
Randolph
Ray
Reynolds
Ripley
Saline
Schuyler
Scotland
Shannon
Shelby
St Charles
St Clair
St Francois
St Louis city
St Louis
Ste Genevieve
Stone
Sullivan
Taney
Texas
Vernon
Warren
Washington
Wayne
Webster
Worth
Wright

Montana

Zone 1
Beaverhead
Big Horn
Blaine
Broadwater
Carbon
Carter
Cascade
Chouteau
Custer
Daniels
Dawson
Deer Lodge
Fallon
Fergus
Flathead
Gallatin
Garfield
Glacier
Granite
Hill
Jefferson
Judith Basin
Lake
Lewis and Clark
Liberty
Lincoln
Madison
McCone
Meagher
Mineral
Missoula
Park
Phillips
Pondera
Powder River
Powell
Prairie
Ravalli
Richland
Roosevelt
Rosebud
Sanders
Sheridan
Silver Bow
Stillwater
Teton
Toole
Valley
Wibaux

Zone 2
Golden Valley
Musselshell
Petroleum
Sweet Grass
Treasure
Wheatland
Yellowstone

Nebraska

Zone 1
Adams
Boone
Boyd
Burt
Butler
Cass
Cedar
Clay
Colfax
Cuming
Dakota
Dixon
Dodge
Douglas
Fillmore
Franklin
Frontier
Furnas
Gage
Gosper
Greeley
Hamilton
Harlan
Hayes
Hitchcock
Jefferson
Johnson
Kearney
Knox
Lancaster
Madison
Nance
Nemaha
Nuckolls
Otoe
Pawnee
Phelps
Pierce
Platte
Polk
Red Willow
Richardson
Saline
Sarpy
Saunders
Seward
Stanton
Thayer
Thurston
Washington
Wayne
Webster
York

Zone 2
Antelope
Banner
Box Butte
Buffalo
Chase
Cheyenne
Custer
Dawes
Dawson
Deuel
Dundy
Hall
Howard
Keith
Keya Paha
Kimball
Merrick
Morrill
Perkins
Scotts Bluff
Sheridan
Sherman
Sioux
Valley

Nevada

Zone 1
Carson City
Douglas
Eureka
Lander
Lincoln
Lyon
Mineral
Pershing
White Pine

Zone 2
Churchill
Elko
Esmeralda
Humboldt
Nye
Storey
Washoe

New Hampshire

Zone 1
Carroll

Zone 2
Belknap
Cheshire

Coos
Grafton
Hillsborough
Merrimack
Rockingham
Strafford
Sullivan

New Jersey

Zone 1
Hunterdon
Mercer
Monmouth
Morris
Somerset
Sussex
Warren

Zone 2
Bergen
Burlington
Camden
Cumberland
Essex
Gloucester
Hudson
Middlesex
Passaic
Salem
Union

New Mexico

Zone 1
Bernalillo
Colfax
Mora
Rio Arriba
San Miguel
Santa Fe
Taos

Zone 2
Catron
Chaves
Cibola
Curry
De Baca
Dona Ana
Eddy
Grant
Guadalupe
Harding
Hidalgo
Lea
Lincoln
Los Alamos
Luna
McKinley
Otero
Quay
Roosevelt
San Juan
Sandoval
Sierra
Socorro
Torrance
Union
Valencia

New York

Zone 1
Albany
Allegany
Broome
Cattaraugus
Cayuga
Chautauqua
Chemung
Chenango
Columbia
Cortland
Delaware
Dutchess
Erie
Genesee
Greene
Livingston
Madison
Onondaga
Ontario
Orange
Otsego
Putnam
Rensselaer
Schoharie
Schuyler
Seneca
Steuben
Sullivan
Tioga
Tompkins
Ulster
Washington
Wyoming
Yates

Zone 2
Clinton
Jefferson
Lewis
Monroe
Montgomery
Niagara
Oneida
Orleans
Oswego
Saratoga
Schenectady
St Lawrence
Wayne

North Carolina

Zone 1
Alleghany
Buncombe
Cherokee
Henderson
Mitchell
Rockingham
Transylvania
Watauga

Zone 2
Alexander
Ashe
Avery
Burke
Caldwell
Caswell
Catawba
Clay
Cleveland
Forsyth
Franklin
Gaston
Graham
Haywood
Iredell
Jackson
Lincoln
Macon
Madison
McDowell
Polk
Rutherford
Stokes
Surry
Swain
Vance
Wake
Warren
Wilkes
Yadkin
Yancey

North Dakota

Zone 1
Adams
Barnes
Benson
Billings
Bottineau
Bowman
Burke
Burleigh
Cass
Cavalier
Dickey
Divide
Dunn
Eddy
Emmons
Foster
Golden Valley
Grand Forks
Grant
Griggs
Hettinger
Kidder
LaMoure
Logan
McHenry
McIntosh
McKenzie
McLean
Mercer
Morton
Mountrail
Nelson
Oliver
Pembina
Pierce
Ramsey
Ransom
Renville
Richland
Rolette
Sargent
Sheridan
Sioux
Slope
Stark
Steele
Stutsman
Towner
Traill
Walsh
Ward
Wells
Williams

Ohio

Zone 1
Adams
Allen
Ashland
Auglaize
Belmont
Butler
Carroll
Champaign
Clark
Clinton
Columbiana
Coshocton
Crawford
Darke
Delaware
Fairfield
Fayette
Franklin
Greene
Guernsey
Hamilton
Hancock
Hardin
Harrison
Holmes
Huron
Jefferson
Knox
Licking
Logan
Madison
Marion
Mercer
Miami
Montgomery
Morrow
Muskingum
Perry
Pickaway
Pike
Preble
Richland
Ross
Seneca
Shelby
Stark
Summit
Tuscarawas
Union
Van Wert
Warren
Wayne
Wyandot

Zone 2
Ashtabula
Athens
Brown
Clermont
Cuyahoga
Defiance
Erie
Fulton
Gallia
Geauga
Henry
Highland
Hocking
Jackson
Lake
Lawrence
Lorain
Lucas
Mahoning
Medina
Meigs
Monroe
Morgan
Noble
Ottawa
Paulding
Portage
Putnam
Sandusky
Scioto
Trumbull
Vinton
Washington
Williams
Wood

Oklahoma

Zone 2
Adair
Beaver
Cherokee
Cimarron
Delaware
Ellis
Mayes
Sequoyah
Texas

Oregon

Zone 2

Baker
Clatsop
Columbia
Crook
Gilliam
Grant
Harney
Hood River
Jefferson
Klamath
Lake
Malheur
Morrow
Multnomah
Sherman
Umatilla
Union
Wasco
Washington
Wheeler
Yamhill

Pennsylvania

Zone 1
Adams
Allegheny
Armstrong
Beaver
Bedford
Berks
Blair
Bradford
Bucks
Butler
Cameron
Carbon
Centre
Chester
Clarion
Clearfield
Clinton
Columbia
Cumberland
Dauphin
Delaware
Franklin
Fulton
Huntingdon
Indiana
Juniata
Lackawanna
Lancaster
Lebanon
Lehigh
Luzerne
Lycoming
Mifflin
Monroe
Montgomery
Montour
Northampton
Northumberland
Perry
Schuylkill
Snyder
Sullivan
Susquehanna
Tioga
Union
Venango
Westmoreland
Wyoming
York

Zone 2
Cambria
Crawford
Elk
Erie
Fayette
Forest
Greene
Jefferson
Lawrence
McKean
Mercer
Pike
Potter
Somerset
Warren
Washington
Wayne

Rhode Island

Zone 1
Kent
Washington

Zone 2
Newport
Providence

South Carolina

Zone 1
Greenville

Zone 2
Abbeville
Anderson
Cherokee
Laurens
Oconee
Pickens
Spartanburg
York

South Dakota

Zone 1
Aurora
Beadle
Bon Homme
Brookings
Brown
Brule
Buffalo
Campbell
Charles Mix
Clark
Clay
Codington
Corson
Davison
Day
Deuel
Douglas
Edmunds
Faulk
Grant
Hamlin
Hand
Hanson
Hughes
Hutchinson
Hyde
Jerauld
Kingsbury
Lake
Lincoln
Lyman
Marshall
McCook
McPherson
Miner
Minnehaha
Moody
Perkins
Potter
Roberts
Sanborn
Spink
Stanley
Sully
Turner
Union
Walworth
Yankton

Zone 2
Bennett
Butte
Custer
Dewey
Fall River
Gregory
Haakon
Harding
Jackson
Jones
Lawrence
Meade
Mellette
Pennington
Shannon
Todd
Tripp
Ziebach

Tennessee

Zone 1
Anderson
Bedford
Blount
Bradley
Claiborne
Davidson
Giles
Grainger
Greene
Hamblen
Hancock
Hawkins
Hickman
Humphreys
Jackson
Jefferson
Knox
Lawrence
Lewis
Lincoln
Loudon
Macon
Madison
Marshall
McMinn
Meigs
Monroe
Moore
Perry
Roane
Rutherford
Smith
Sullivan
Trousdale
Union
Washington
Wayne
Williamson
Wilson

Zone 2
Benton
Cannon
Carter
Cheatham
Chester
Clay
Cocke
Coffee
Decatur
DeKalb
Dickson
Fentress
Hamilton
Hardin
Henderson
Houston
Johnson
Marion
McNairy
Montgomery
Overton
Pickett
Polk
Putnam
Robertson
Sevier
Stewart
Sumner
Unicoi
Van Buren
Warren
White

Texas

Zone 2
Armstrong
Bailey
Brewster
Carson
Castro
Crosby
Culberson
Dallam
Deaf Smith
Donley
Floyd
Garza
Gray
Hale
Hansford
Hartley
Hemphill
Hockley
Hudspeth
Hutchinson
Jeff Davis
Lamb
Lipscomb
Llano
Lubbock
Lynn
Mason
Moore
Ochiltree
Oldham
Parmer
Potter
Presidio
Randall
Reeves
Roberts
Sherman
Swisher
Terrell

Utah

Zone 1
Carbon
Duchesne
Grand
Piute
Sanpete
Sevier
Uintah

Zone 2
Beaver
Box Elder
Cache
Daggett
Davis
Emery
Garfield
Iron
Juab
Kane
Millard
Morgan
Rich
Salt Lake
San Juan
Summit
Tooele
Utah
Wasatch
Washington
Wayne
Weber

Vermont

Zone 2
Addison
Bennington
Caledonia
Essex
Franklin
Lamoille
Orange
Orleans
Rutland
Washington
Windham
Windsor

Virginia

Zone 1
Alleghany
Amelia
Appomattox
Augusta
Bath
Bland
Botetourt
Brunswick
Buckingham
Campbell
Chesterfield
Clarke
Craig
Cumberland
Dinwiddie
Fairfax
Fluvanna
Frederick
Giles
Goochland
Henry
Highland
Lee
Louisa
Montgomery
Nottoway
Orange
Page
Patrick
Pittsylvania
Powhatan
Pulaski
Roanoke
Rockbridge
Rockingham
Russell
Scott
Shenandoah
Smyth
Spotsylvania
Stafford
Tazewell
Warren
Washington
Wythe

Zone 2
Albemarle
Amherst
Arlington
Bedford
Buchanan
Carroll
Charlotte
Culpeper
Dickenson
Fauquier
Floyd
Franklin
Grayson
Greene
Halifax
Loudoun
Lunenburg
Madison
Mecklenburg
Nelson
Prince Edward
Prince William
Rappahannock
Wise

Washington

Zone 1
Clark
Ferry
Okanogan
Pend Oreille
Skamania
Spokane
Stevens

Zone 2
Adams
Asotin
Benton
Columbia
Douglas
Franklin
Garfield
Grant
Kittitas
Klickitat
Lincoln
Walla Walla
Whitman
Yakima

West Virginia

Zone 1
Berkeley
Brooke
Grant
Greenbrier
Hampshire
Hancock
Hardy
Jefferson
Marshall
Mercer
Mineral
Monongalia
Monroe
Morgan
Ohio
Pendleton
Pocahontas
Preston
Summers
Wetzel

Zone 2
Barbour
Braxton
Cabell
Calhoun
Clay
Doddridge
Fayette
Gilmer
Harrison
Jackson
Lewis
Lincoln
Marion
Mason
Nicholas
Pleasants
Putnam
Raleigh
Randolph
Ritchie
Roane
Taylor
Tucker
Tyler
Upshur
Wayne
Webster
Wirt
Wood

Wisconsin

Zone 1
Buffalo
Crawford
Dane
Dodge
Door
Fond du Lac
Grant
Green
Green Lake
Iowa
Jefferson
Lafayette
Langlade
Marathon
Menominee
Pepin
Pierce
Portage
Richland
Rock
Shawano
St Croix
Vernon
Walworth
Washington
Waukesha
Waupaca
Wood

Zone 2
Adams
Ashland
Barron
Bayfield
Brown
Burnett
Calumet
Chippewa
Clark
Columbia
Douglas
Dunn
Eau Claire
Florence
Forest
Iron
Jackson
Juneau
Kenosha
Kewaunee
La Crosse
Lincoln
Manitowoc
Marinette
Marquette
Milwaukee
Monroe
Oconto
Oneida
Outagamie
Ozaukee
Polk
Price
Racine
Rusk
Sauk
Sawyer
Sheboygan
Taylor
Trempealeau
Vilas
Washburn
Waushara
Winnebago

Wyoming

Zone 1
Albany
Big Horn
Campbell
Carbon
Converse
Crook
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Sheridan
Sublette
Sweetwater
Teton
Uinta
Washakie

Zone 2
Platte
Weston

-------end-------

Commenter's Reason: The EPA estimates that 1 out of 15 of all homes in the US has elevated indoor radon levels. The incidence of elevated radon may be greater than 7 out of 10 homes in some high radon areas. Nonrandomized industry data shows a significant number of homes across the United States have tested high for elevated indoor radon concentrations. Builders of new homes will continue to add to the existing inventory of homes with elevated radon without changes in the residential code to identify homes with excessive levels of this Class "A" carcinogen.

Radon Test Results Data by State

STATE	STATENAME	TOTAL # TESTS	AVG (pCi/L)	% > EPA Action Level of 4 pCi/L
AL	ALABAMA	11,629	3.8	21.9
AK	ALASKA	432	2.2	13.0
AZ	ARIZONA	7,495	2.1	11.9
AR	ARKANSAS	1,243	2.5	13.7
CA	CALIFORNIA	16,960	2.1	9.1
CO	COLORADO	88,346	6.5	49.0
CT	CONNECTICUT	41,292	3.4	23.9
DE	DELAWARE	5,539	2.5	17.4
FL	FLORIDA	40,039	1.8	10.2
GA	GEORGIA	27,222	2.6	18.9
HI	HAWAII	94	0.4	2.1
ID	IDAHO	16,138	7.1	40.4
IL	ILLINOIS	84,366	5.1	41.0
IN	INDIANA	18,031	4.7	37.2
IA	IOWA	96,260	6.2	49.3
KS	KANSAS	34,288	5.2	44.0
KY	KENTUCKY	47,575	7.4	43.6
LA	LOUISIANA	786	0.9	3.1
ME	MAINE	5,494	5.9	38.3
MD	MARYLAND	55,949	5.4	33.4
MA	MASSACHUSETTS	29,850	3.8	25.6
MI	MICHIGAN	164,678	3.4	25.4
MN	MINNESOTA	135,419	4.7	42.2
MS	MISSISSIPPI	700	1.2	5.6
MO	MISSOURI	27,771	4.2	31.6
MT	MONTANA	18,082	7.2	46.3
NE	NEBRASKA	27,481	5.7	51.6
NV	NEVADA	1,952	3.0	19.3
NH	NEW HAMPSHIRE	35,974	5.5	34.0
NJ	NEW JERSEY	41,092	4.3	24.1
NM	NEW MEXICO	8,165	3.9	30.2
NY	NEW YORK	66,713	4.8	23.9
NC	NORTH CAROLINA	79,384	3.8	27.5
ND	NORTH DAKOTA	10,887	6.0	50.5
OH	OHIO	102,352	7.9	49.0
OK	OKLAHOMA	1,356	2.3	9.7
OR	OREGON	13,675	3.5	25.4
PA	PENNSYLVANIA	149,543	8.3	44.3
RI	RHODE ISLAND	8,667	4.2	31.0
SC	SOUTH CAROLINA	38,971	2.7	18.7
SD	SOUTH DAKOTA	4,081	9.8	59.2
TN	TENNESSEE	40,632	4.6	31.8
TX	TEXAS	5,821	2.4	8.7
UT	UTAH	14,636	4.5	33.6
VT	VERMONT	3,231	3.7	23.4
VA	VIRGINIA	62,577	3.5	25.4
WA	WASHINGTON	22,199	7.0	39.3
DC	WASHINGTON DC	6,948	1.6	8.8
WV	WEST VIRGINIA	14,976	6.0	35.0
WI	WISCONSIN	72,694	5.6	41.8
WY	WYOMING	25,090	5.2	39.6
TOTALS		**1,834,775**		

Source: AARST radon industry test data; published 10/29/2012.

Cost Impact: This change proposal will slightly increase the cost of construction by adding a radon test if required by the building official.

Cost of radon test =$125

The cost savings for reduced health care resulting from a healthier indoor environment has not been calculated.

RB201-13

Final Action: AS AM AMPC____ D