

IPMC



cdpACCESS

## 2015 GROUP A PROPOSED CHANGES TO THE I-CODES MEMPHIS COMMITTEE ACTION HEARINGS

April 19–28, 2015  
Memphis Cook Convention Center  
Memphis, Tennessee

First Printing

Publication Date: March 2015

Copyright © 2015

By

International Code Council, Inc.

ALL RIGHTS RESERVED. This 2015-2017 Code Development Cycle, Group A (2015) Proposed Changes to the 2015 *International Codes* is a copyrighted work owned by the International Code Council, Inc. Without advanced written permission from the copyright owner, no part of this book may be reproduced, distributed, or transmitted in any form or by any means, including, without limitations, electronic, optical or mechanical means (by way of example and not limitation, photocopying, or recording by or in an information storage retrieval system). For information on permission to copy material exceeding fair use, please contact: Publications, 4051 West Flossmoor Road, Country Club Hills, IL 60478 (Phone 1-888-422-7233).

Trademarks: "International Code Council," the "International Code Council" logo are trademarks of the International Code Council, Inc.

PRINTED IN THE U.S.A.

# 2015 GROUP A – PROPOSED CHANGES TO THE INTERNATIONAL PROPERTY MAINTENANCE/ZONING CODE

## PROPERTY MAINTENANCE/ZONING CODE COMMITTEE

**Richard G. Lambert, CBO, Chair**  
Building Inspector/Code Enforcement Officer  
City of Saco  
Saco, ME

**Sean P. Farrell, CBO, CZA, Vice Chair**  
**Rep:** Virginia Building and Code Officials  
Association  
Code Compliance Supervisor  
Prince William County  
Prince William, VA

**Tana Bryant, CCEA, CCEO**  
**Rep:** American Association of Code  
Enforcement  
Sr. Code Enforcement Officer  
City of Anniston  
Anniston, AL

**Ted Bush, CBO**  
Plans Examiner  
The City of Helena Montana  
Helena, MT

**Thomas D. Culp, Ph.D.**  
President  
Birch Point Consulting LLC  
La Crosse, WI

**Joseph F. Day III, BCO**  
Land Use Administrator  
New Castle County  
New Castle, DE

**Michael Garrity**  
Owner  
Michael Garrity Home Inspections  
Cortlandt, NY

**Christopher McWhite**  
Plans Examiner  
City of Lowell  
Lowell, MA

**Teresa Gerber**  
Building Inspector I  
Chesterfield County  
Chesterfield, VA

**Steve Mills, CBO**  
Director of Building & Codes  
City of Hendersonville  
Hendersonville, TN

**Laura Rouse-Devore, CCEO**  
**Rep:** American Association of Code  
Enforcement  
Deputy Building Official  
City of Taylor, TX  
Taylor, TX

**James P. Snyder**  
Quality Manager  
C & C Millwright  
Greeneville, TN

**Staff Secretariat:**  
**Larry Franks, P.E., CBO**  
Senior Staff Engineer  
International Code Council  
Eastern Regional Office  
Birmingham, AL

## **TENTATIVE ORDER OF DISCUSSION 2015 PROPOSED CHANGES TO THE INTERNATIONAL PROPERTY MAINTENANCE CODE**

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some PM code change proposals may not be included on this list, as they are being heard by another committee.

PM1-15  
PM2-15  
PM3-15  
PM4-15  
PM5-15  
PM6-15  
PM7-15  
PM8-15  
PM9-15

# PM 1-15

## 301.4 (New), [A] 110.1, 202 (New),

**Proponent:** Tom Leatherbee, Oklahoma Floodplain Managers Association, representing Oklahoma Floodplain Managers Association (tleatherbee@cityofdelcity.org); Rebecca Quinn, RCQuinn Consulting, Inc., representing on behalf of Federal Emergency Management Agency (rcquinn@earthlink.net); Gregory Wilson (gregory.wilson2@fema.dhs.gov)

## 2015 International Property Maintenance Code

**Add new text as follows:**

**301.4 Structures located in flood hazard areas.** For structures located in flood hazard areas as defined in the International Building Code, all costs of all repairs and improvements necessary to bring the exterior and interior of a structure, excluding exterior property, into compliance with the minimum standards of this code shall be included when determining substantial improvement, including all costs related to correcting cited violations.

**Revise as follows:**

**[A] 110.1 General.** The *code official* shall order the *owner* or owner's authorized agent of any *premises* upon which is located any structure, which in the *code official's* or owner's authorized agent judgment after review is (1) so deteriorated or dilapidated or has become so out of repair as to be dangerous, unsafe, insanitary or otherwise unfit for human habitation or occupancy, and such that it is unreasonable to repair the structure, to demolish and remove such structure; or (2) if such structure is capable of being made safe by repairs, to repair and make safe and sanitary, or to board up and hold for future repair or to demolish and remove at the owner's option; or (3) where there has been a cessation of normal construction of any structure for a period of more than two years, the code official shall order the owner or owner's authorized agent to demolish and remove such structure, or board up until future repair; or (4) where structures, if located in flood hazard areas established in the International Building Code, are determined to have incurred substantial damage, the code official shall order the owner to demolish and remove such structure, or board up until future repair. Boarding the building up for future repair shall not extend beyond one year, unless *approved* by the building official.

**Add new definition as follows:**

### SECTION 202 DEFINITIONS

**SUBSTANTIAL DAMAGE.** Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure as of the date the code official issues an order pursuant to this code.

### SECTION 202 DEFINITIONS

**SUBSTANTIAL IMPROVEMENT.** Any repair, reconstruction, rehabilitation, alteration, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, as defined in the International Building Code or the International Existing Building Code, any repairs are considered substantial improvement regardless of the actual repair work performed. For the purpose of this code, the term does not include any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

**Reason:** The broad scope and intent of the IPMC can create difficulties for code officials attempting to apply the code to dilapidated structures in flood hazard areas that when those structures are determined to not comply with IPMC provisions intended to ensure public health, safety and welfare. The flood provisions of the IBC, IRC, and IEBC apply to buildings in flood hazard areas if the code official determines that proposed improvements are "substantial improvement" and if the code official determines buildings have incurred "substantial damage. Both terms are defined in the IBC and IEBC and require comparison of costs to market value of the building. Substantial damage may be triggered by damage of any cause. Most damage results from sudden events, such as fire, tornado, earthquake, or flood. When applied to structures that have been neglected and become dilapidated and unsafe over time, the basic substantial damage and substantial improvement requirements can be undermined by an existing provision in the IBC/IEBC definition of substantial improvement that allows exclusion of costs to correct identified code violations. Once a structure has been cited under the IPMC, it's conceivable that most if not all costs to correct cited conditions could be excluded.

Another aspect of the IBC/IEBC definition for substantial damage is problematic when applied to buildings that have been neglected and become dilapidated and unsafe over time, and that is the determination of market value of the building. When a building is damaged by a

sudden event, it is relatively straightforward to determine the market value "before the damage occurred." It is not straightforward when the damage has occurred over time – what date should be used to determine the market value "before the damage occurred"?

This proposal has two objectives: (1) to specify, for substantial damage, the date of the market value is the date the code official issues an order pursuant to the IPMC; and (2) to remove the provision that allows excluding costs to correct cited violations from the substantial improvement determination when an owner proposes repairing a building pursuant to an order issued pursuant to the IPMC.

Section 110.1 is modified by including structures determined to have incurred substantial damage in the list of conditions that warrant an order of demolition or boarding up until future repair. If future repair is pursued by the owner, the substantial damage determination means the repairs would have to bring the building into compliance with the flood provisions in the IBC or IRC, as applicable. One result of this change is that many more owners are likely to consider demolition, in which case replacement structures would have to comply with all requirements of the IBC/IRC, resulting in all the benefits associated with compliance (resistance to all loads, improved fire safety, energy efficiency, etc.).

Section 202 is modified by adding definitions for Substantial Damage and Substantial Improvement; however, both definitions differ from those in the IBC and IEBC. The proposed definition of Substantial Damage makes clear that the market value of the structure is the date of the code official's order pursuant to the IPMC, avoiding an ambiguity. Without this clarification, an owner may claim the market value should be the value of the building before maintenance starting being neglected, which could be many years in the past (and typically not easy to determine). The proposal to specify the market value as of the date of an order is likely be a higher market value (thus raising the 50% threshold) than the market value as of the date an application for a permit to perform repairs is received (which may be a year or more after the citation is issued), as recommended in FEMA guidance in Section 4.5 of FEMA's Substantial Improvement/ Substantial Damage Desk Reference (FEMA P-758).

The proposed definition of Substantial Improvement removes the provision that allows exclusion of certain costs, thus requiring the costs of all work to be included in the calculation.

Section 301 is modified by adding a new section with plain language that makes it clear all interior and exterior costs are included when Substantial Improvement is determined, and emphasizes that all costs of all repairs and improvements necessary to correct existing cited violations must be included.

Without these amendments, dilapidated and unsafe buildings in flood hazard areas might not trigger the substantial improvement and substantial damage requirements, and thus could be repaired and remain vulnerable to future flooding. In many communities, many buildings that are cited under the IPMC are low income housing. If allowed to remain at-risk of flooding, people who have few resources to recover loss of personal property will remain exposed to flooding.

The combined result of these amendments is to strengthen the applicability of the IPMC as it relates to structures in flood hazard areas by identifying substantial damage as a trigger for a demolition order, removing ambiguity with regard to determining market value for substantial damage determinations, and eliminating an enforcement problem created by the exclusion of some repair costs from the substantial improvement calculation.

A real-life example illustrates the difficulties that will be easier to address if this proposal is approved. A code official was faced with ordering demolition of a dilapidated apartment complex that had been damaged by flooding and left unrepaired for several years (see Figure). The code official, pursuant to the IBC and the community's floodplain management regulations, determined that the structures were substantially damaged. The code official concurrently issued a demolition order pursuant to Section 110 of the IPMC, as the structures were unsafe, insanitary, and unreasonable to repair. This demolition order cited specific exterior and interior conditions in making these determinations. Subsequent application for a remodel permit was denied because the work proposed was determined to be substantial improvement, and the applicant did not propose bringing the building into compliance with the flood requirements. On appeal, the property owner challenged the substantial damage/substantial improvement determinations because virtually all of the proposed repairs would be to correct cited violations of the IPMC, and thus the applicant claimed those costs should be excluded from the determination.

Had the code official's order to demolish or bring the building into compliance been overturned, the apartment buildings could have been repaired in a manner that left them at continued risk for flooding, contrary to the intent of IBC 1612 and local flood damage prevention regulations. These specific buildings, as a result of a somewhat unrelated proceeding, were eventually demolished and the land redeveloped with commercial buildings that incorporate significant flood mitigation measures.



Figure. Interior Condition at Kristie Manor Apartments at time of Demolition Order and Substantial Damage Declaration. The buildings had flooded multiple times, each time experiencing further deterioration. Note the high water mark and mold. Had the apartment buildings been repaired without bringing it into compliance with the flood requirements, the structures and occupants would have remained at risk for this sort of damaging and life-threatening flooding due to their location in a floodway.

**Bibliography:** Substantial Improvement/Substantial Damage Desk Reference, FEMA P-758. Federal Emergency Management Agency. 2010. <http://www.fema.gov/library/viewRecord.do?id=4160>

**Cost Impact:** Will not increase the cost of construction

The effect on costs will vary on a case-by-case basis. There are scenarios where demolishing and rebuilding fully compliant will likely be less expensive than retrofitting or elevating an existing building to bring it into compliance with the flood requirements. Long-term maintenance and operations cost would also be less, and the cost of NFIP flood insurance will be considerably lower. Costs may increase in other scenarios, especially when Substantial Improvement is triggered because costs to correct existing cited violations are not subtracted, although the cost of NFIP flood insurance will be considerably lower than if the building remains at risk to flooding.

PM 1-15 : 301.4 (New)-  
LEATHERBEE4956

## PM 2-15

202, 302.5, 302.5.1 (New), 302.5.2 (New), 309.1, 309.2, 309.5, B101 (New), B101.1 (New), B101.2 (New), B101.3 (New), B101.4 (New)

**Proponent:** Jonathan Wilson, National Center for Healthy Housing, representing National Center for Healthy Housing (jwilson@nchh.org)

### 2015 International Property Maintenance Code

Revise as follows:

#### SECTION 202 DEFINITIONS

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

Add new definitions as follows:

**INSECT.** All species of classes of Arachnida and Insecta (Hexapoda) of the phylum Arthropoda including flies, mosquitoes, bed bugs, crickets, cockroaches, moths, bees, wasps, hornets, fleas, lice, beetles, weevils, gnats, ants, termites, mites, ticks, spiders, and scorpions.

**PEST.** Noxious insect, rodent, or other vermin.

**RODENT.** A member of the order Rodentia, including but not limited to field and wood mice, wood rats, squirrels, woodchucks, gophers, Norway rats (*Rattus norvegicus*), roof rats (*Rattus rattus*), and house mice (*Mus musculus*).

**SANITARY.** A condition that is free of infestation, pest residues, rotting material, uncontained sewage or animal waste, and accumulation of rubbish or garbage.

Revise as follows:

**302.5 Rodent harborage.** Structures and exterior property shall be kept free from rodent harborage and infestation. There shall be no accumulation of trash, paper, boxes, firewood, lumber, scrap metal, food, or other materials that support rodent harborage in or around any dwelling or premises. Stored materials shall be placed in boxes or stacked in stable piles elevated at least six inches (152 mm) above the ground or floor and at least six inches (152 mm) from the walls. There shall be no accumulation of stagnant water in or around any dwelling or premises. Where rodents are found, they shall be promptly exterminated/eliminated by approved processes that will not be injurious to human health. After pest elimination, proper precautions shall be taken to eliminate rodent/remove food and water sources or harborage and to prevent reinfestation.

Add new text as follows:

**302.5.1 Rodent prevention.** There shall be no trees, shrubs, or other plantings in the soil within six inches (152 mm) of any dwelling.

**302.5.2 Rodent exclusion.** There shall be no holes or open joints in exterior walls, foundations, slabs, floors, or roofs that equal or exceed one-quarter inch (6 mm). The areas surrounding windows, doors, pipes, drains, wires, conduits, vents, and other openings that penetrate exterior walls shall be sealed.

Revise as follows:

**309.1 Infestation.** Structures shall be kept free from insect and rodent infestation. Infestations~~Structures in which insects or rodents are found~~ shall be promptly exterminated/eliminated by approved processes that will not be injurious to human health. After pest elimination, proper precautions shall be taken to prevent reinfestation.

**309.2 Owner.** The owner of any structure shall be responsible for pest elimination within the structure prior to renting or leasing the structure. The owner shall maintain the building and premises to keep pests from entering the building and dwelling units; inspect and monitor for pests; and investigate occupant reports of unsafe or unhealthy conditions; provide written responses to occupant reports; and make needed repairs in a timely manner

**309.5 Occupant.** The occupant of any structure shall be responsible for the continued rodent and pest-free condition of the structure. The occupant shall inspect and monitor for pests; report infestations to the owner; and cooperate with the owner's requests to ensure pest-free conditions.



**Exception:** Where the *infestations* are caused by defects in the structure, the *owner* shall be responsible for pest elimination.

**Add new text as follows:**

## APPENDIX APPENDIX B INTEGRATED PEST MANAGEMENT

### SECTION B101 General

**B101.1 General.** Integrated pest management (IPM) methods shall be used to maintain every dwelling free of infestation, openings that allow pest entry, conditions that harbor pests or provide them with food or water, and visible pest residue or debris.

**B101.2 Integrated pest management defined.** A systematic strategy for managing pests that consists of prevention, exclusion, monitoring, and suppression of pests. Where chemical pesticides are necessary, a preference is given to materials and methods that maximize safety and reduce environmental health risk. Methods to manage pests include eliminating their harborage places; removing or making inaccessible their food and water sources; routine inspection and monitoring; identification of evidence found; treatment that is scaled to and designed for the infestation; and using pesticides with the lowest toxicity in a manner with the least exposure to residents and the environment.

**B101.3 Pest management professional.** In multi-family housing, a pest management professional who is certified or trained in integrated pest management shall develop and manage the pest elimination program.

**B101.4 Pesticide use.** Only pesticides that are registered for use with the U.S. Environmental Protection Agency and the state's regulatory agencies may be used. Foggers and organic phosphates shall only be used by firms and individuals licensed by the state to apply these pesticides.

**Reason:** This proposal is designed to address a number of problems regarding the IPMC's existing pest-related provisions and to add an optional appendix regarding integrated pest management for jurisdictions seeking to eliminate pests more effectively and consistently. The primary objective of the proposal is to make the requirements clearer and easier to comply with for owners and operators as well as code officials who are not pest management professionals.

#### **1. Proposed changes to terminology and definitions:**

- **Extermination v. elimination:** The 2009 edition of the IPMC replaced the outdated term "extermination" with the outcome-focused term "pest elimination" and dropped descriptions of pest elimination such as "fumigation" and "poison spraying." However, sections 302.5 on rodent harborage and 309.1 on infestation retained the word "exterminated." The term is not defined. This proposal corrects that inconsistency by using "eliminated" instead.
- **Infestation and honey bees or crickets:** The term "infestation" is currently defined as "The presence, within or contiguous to, a structure or premises of insects, rats, vermin or other pests." It has a number of serious problems:
  - It is not a sentence. It essentially says, "The presence a structure or premises of pests." We propose deleting the commas before and after "within or contiguous" to make it grammatically correct.
  - It would call for the elimination of beneficial insects, such as honey bees and crickets outside, because they are insects under a common meaning of the term. We propose to add the word "noxious" to narrow the scope to those insects which are harmful to living things (the meaning of noxious<sup>1</sup>) and exclude beneficial or innocuous insects. We considered other terms, but, since noxious is already used in section 302.4 regarding weeds and section 403.4 regarding process ventilation, we wanted to avoid creating a new term for code officials to interpret. We put the word before "presence" to make clear that where an insect or animal is present makes a difference. A squirrel inside a home would be a noxious presence but outside it would not be one.
  - By adding the word "noxious," we think it is appropriate to replace "rats" with "rodents". Rodents such as squirrels are fine outside a structure, but if inside they are an infestation that needs to be eliminated. In addition, the term "rodents" is used 11 times in the code including in the definition of "pest elimination."
- **Define basic terms used throughout the code:** The code does not define four pest-related terms

(insect, rodent, pest, and sanitary) despite their use many places in the code. Without definitions for these terms, property owners, managers, and occupants may have very different understandings of what the code requires. As a result, their disputes may limit the effectiveness of the code and undermine its intent of protecting health and safety. It also burdens code officials who are called upon to intervene with their own interpretation.

- "Insect" is used eight times. Sometimes the use means all insects such as for screens and doors, and other times more narrowly in conjunction with the term "infestation." The proposal defines it as the classes of Arachnida and Insecta in the phylum Arthropoda and gives common examples. While technically spiders (a member of Arachnida) are not insects, they are commonly considered insects.
- "Rodent" is used 13 times. The proposal defines it as members of the order Rodentia and gives common examples.
- "Pest" is used 11 times. The proposal defines it as "noxious insect, rodent, or other vermin." This definition is also important because federal law defines the term more broadly to include weeds, mold, and bacteria. In the structural setting, the common understanding of pests does not include these items. We recognize that the word "noxious" is somewhat redundant but think the clarity helps.
- "Sanitary" is used 29 times. The proposal defines it as "a condition that is free of infestation, pest residues, rotting material, uncontained sewage or animal waste, and accumulation of rubbish or garbage." This definition captures our understanding of what the term means based on a review of the 29 uses. Each of these conditions can cause diseases or attract pests that undermine the occupant's health.
- **Harborage and exclusion:**
  - The term "harborage" is used four times in the code: in the definition of "pest elimination" and in section 302.5 regarding rodent harborage. However, the term is not defined and the section dealing with rodent harborage says the harborage must be eliminated but does not explain what it is or give any examples. Rather than create a definition, the proposal adds a description that gives examples of materials that can be harborage; explains that stored materials need to be 6" from the floor or walls to limit harborage; and says that there should not be an accumulation of stagnant water. Rodents need a ready source of water to survive, especially mice. Many experts call for 18", but we thought that was excessive.
  - The proposal adds two new sections under the rodent harborage section. Section 302.5.1 calls for plantings to be 6" from a dwelling to make it more difficult for rodents to access the dwelling since they do not want to be visible while seeking an opening to the structure. Section 302.5.2 calls for exterior openings to be less than 1/4" since mice can go through holes or cracks bigger than that amount.

## **2. Proposed clarification of owner and occupant responsibilities:**

The proposal more clearly defines the relative responsibilities of the owner and the occupant in the rental setting. It requires the occupant to inspect and monitor for pests, report infestations to the owner, and cooperate with the owner's requests to ensure pest-free conditions. The owner would be required to maintain the exterior of the building, inspect and monitor for pests, investigate complaints, and provide feedback to occupants on the resolution of their complaints.

In a single-occupant or single-tenant structure, existing section 309.3 makes the occupant/tenant fully responsible.

By removing these ambiguities in the current code, code officials should be able to resolve disputes more easily and reduce the need to defend interpretations.

## **3. Proposed optional requirements in an appendix for integrated pest management:**

The proposal adds an appendix that jurisdictions may elect to adopt if they want to require integrated pest management (IPM). This pest elimination has been shown to be more consistently effective, especially when someone with asthma may be in the structure. It uses a systematic strategy to prevent, exclude, monitor, and suppress pests. It also promotes the use of the least toxic pesticide in a manner with the least exposure to residents and the environment.

Proposed new section B101.2 would require that a pest management professional trained in IPM conduct the pest elimination in multi-family housing. In these situations, pest elimination is particularly difficult because of the shared control. The National Pest Management Association, which represents most of the country's firms, certifies firms who adopt and implement IPM under its GreenPro certification program.<sup>2</sup>

Proposed new section B101.4 would remind owners and operators that only pesticides approved by the state and federal government may be used. In addition, it would require a state-licensed firm to apply foggers and organophosphates because these pesticide applications are liable to be misused by an individual and result in dangerous exposures.

**Bibliography:**

<sup>1</sup> Noxious, Merriam-Webster Dictionary, Encyclopedia Britannica Company, accessed January 7, 2015 at <http://www.merriam-webster.com/dictionary/noxious>.

<sup>2</sup> GreenPro, National Pest Management Association, accessed January 7, 2015 at <http://www.certifiedgreenpro.org/>.

**Cost Impact:** Will not increase the cost of construction

The proposal will not increase the cost of construction. The requirement in the optional appendix to use an IPM-trained pest management professional to control pests may increase the labor rates charged by the firm, but these costs should be offset by the savings from more effective pest control.

---

PM 2-15 : 302.5-WILSON5124

# PM 3-15

202, 302.7, 304.1, 304.4, 304.11, 305.1, 305.2, 306.1

**Proponent:** David Bonowitz, David Bonowitz, S.E., representing Existing Buildings Subcommittee, National Council of Structural Engineers Associations (dbonowitz@att.net)

## 2015 International Property Maintenance Code

### SECTION 202 DEFINITIONS

#### Delete without substitution:

~~**DETACHED.** When a structural element is physically disconnected from another and that connection is necessary to provide a positive connection.~~

~~**EQUIPMENT SUPPORT.** Those structural members or assemblies of members or manufactured elements, including braces, frames, lugs, snuggers, hangers or saddles, that transmit gravity load, lateral load and operating load between the equipment and the structure.~~

#### Revise as follows:

**302.7 Accessory structures.** Accessory structures, including *detached* garages, fences and walls, shall be maintained ~~structurally sound and~~ in good repair.

**304.1 General.** The exterior of a structure shall be maintained in good repair, ~~structurally sound~~ and sanitary so as not to pose a threat to the public health, safety or welfare.

**304.4 Structural members.** Structural members shall be maintained free from *deterioration*, ~~and shall be capable of safely supporting the imposed dead and live loads.~~

**304.10 Stairways, decks, porches and balconies.** Every exterior stairway, deck, porch and balcony, and all appurtenances attached thereto, shall be maintained ~~structurally sound~~, in good repair, with proper anchorage ~~and capable of supporting the imposed loads.~~

**304.11 Chimneys and towers.** Chimneys, cooling towers, smoke stacks, and similar appurtenances shall be maintained ~~structurally safe and sound~~, and in good repair. Exposed surfaces of metal or wood shall be protected from the elements and against decay or rust by periodic application of weathercoating materials, such as paint or similar surface treatment.

**305.1 General.** The interior of a structure and equipment therein shall be maintained in good repair, ~~structurally sound~~ and in a sanitary condition. *Occupants* shall keep that part of the structure that they occupy or control in a clean and sanitary condition. Every *owner* of a structure containing a *rooming house*, *housekeeping units*, a hotel, a dormitory, two or more *dwelling units* or two or more nonresidential occupancies, shall maintain, in a clean and sanitary condition, the shared or public areas of the structure and *exterior property*.

**305.2 Structural members.** Structural members shall be maintained ~~structurally sound, and be capable of supporting the imposed loads~~ free from deterioration.

**306.1 General.** The components of a structure and equipment therein shall be maintained in good repair, ~~structurally sound~~ and in a sanitary condition.

**Reason:** This proposal clarifies the scope of the IPMC with respect to structural maintenance, structural assessment, and structural repair. Sections 101.2 and 102.2 establish the scope and applicability of the IPMC as related to "light, ventilation, space, heating, sanitation, protection from the elements, ... fire and other hazards," but not structural damage or capacity loss. The IPMC Chapters clarify this further, as they cover weather effects and deterioration from various causes (Chapter 3), light and ventilation (4), plumbing (5), mechanical and electrical systems (6), and fire safety (7), but not structural assessment or adequacy. Thus, identification and remedy of structural capacity loss is outside the scope of the IPMC. Rather, structural capacity loss is already addressed fully by the IEBC in terms of intentional alteration, repair of damage, and attention to dangerous conditions.

This is appropriate. Indeed, if you have a structural problem, it's actually too late for maintenance of the types covered by the IPMC. Yes, structural elements can deteriorate, and do need maintenance, but (with the possible exception of mortared masonry), that maintenance is provided indirectly through weather tightness, drainage, pest control, etc. -- that is, by providing IPMC-compliant maintenance of roofing, flashing, drains, fireproofing, and sealants. The structural elements themselves, properly built and sealed, are the most durable parts of a building. If you have a structural deterioration problem, it is not because you failed to maintain the steel, concrete, masonry, or wood, but because you deferred maintenance on other NON-structural building components. Further, repair of any such structural damage, unlike MEP

or roofing maintenance, usually requires engineering and is not done by a contractor alone.

This proposal therefore clarifies and removes various references to structural elements, loads, and capacities, as follows. (Note: The IPMC uses the term "structure" to mean anything built or constructed, not necessarily just the structural load-carrying members and systems. In most cases, "structure" in the IPMC means the same thing as "building," as defined in the IBC. This proposal accepts the IPMC's use of "structure," despite the possible confusion with "structural member," and does not make any changes that would affect this usage.)

Sections 304.4 and 305.2, as modified by this proposal, provide all that is necessary in the IPMC: Protect the structure from deterioration. But once that deterioration has advanced to the point of capacity loss (because the maintenance was not provided), it becomes damage and is subject to provisions for repair through the IEBC, not maintenance through the IPMC. This is consistent with IPMC Sections 101.3 and 102.3. Section 101.3 charges that "Existing structures and premises that do not comply with these provisions shall be altered or repaired ... ." Section 102.3 then clarifies that "Repairs ... or alterations ... shall be done in accordance with [the IBC or IEBC]."

The term "detached" is unnecessary because it is defined in the IPMC only in terms of structural elements and used only in provisions for unsafe buildings or, inconsistently, as "detached garage." Unsafe structures are already covered by the IEBC, where the definition of dangerous includes consideration of detachment of both structural and nonstructural components, but without the need to define this common English word.

The term "equipment support" refers to structural members and fasteners already covered by the IBC and IEBC. Further, neither this term nor its variants are used anywhere in the IPMC apart from this definition.

The phrase "structurally sound" (or similar) is deleted because it is undefined and unenforceable and has been removed from the IBC and IEBC for that reason over the last few cycles. More important, the IPMC uses this phrase in general charging language where it is unnecessary. Where the point is just to say that certain conditions must be maintained per the IPMC, it is enough to say, as the code does, that they be maintained "in good repair," which includes whatever is intended by "structurally sound." The details of how to do that are then provided in separate provisions for roofing, sealants, pest control, etc.

The phrase "capable of supporting loads" (or similar) is deleted because this is an engineering determination, not a maintenance task. Those implementing the IPMC should not be made responsible for checking structural adequacy. (If anything, they should be responsible for ensuring that the structure is not intentionally over-loaded or cut away, but it is unclear if the IPMC intends to address such actions. In any case, the judgment of whether an over-loaded or cut structural member is still adequate is again an engineering task, not a maintenance task.)

If approved, a coordinated proposal will be made in Group B to address related issues in Chapter 1.

**Cost Impact:** Will not increase the cost of construction

The proposal merely clarifies the scope of the IPMC with respect to the IEBC, removing duplication and potentially confusing overlaps.

---

PM 3-15 : 302.7-BONOWITZ5227

# PM 4-15

## 304.1.1, 305.1.1, 306.1.1

**Proponent:** David Bonowitz, David Bonowitz, S.E., representing Existing Buildings Subcommittee, National Council of Structural Engineers Associations (dbonowitz@att.net)

### 2015 International Property Maintenance Code

Revise as follows:

#### 304.1.1 Unsafe conditions. The following

~~Unsafe conditions shall be determined as unsafe and shall be repaired or replaced to comply in compliance with the International Building Code or the International Existing Building Code, as required for existing buildings:~~

- ~~1. The nominal strength of any structural member is exceeded by nominal loads, the load effects or the required strength;~~
- ~~2. The anchorage of the floor or roof to walls or columns, and of walls and columns to foundations is not capable of resisting all nominal loads or load effects;~~
- ~~3. Structures or components thereof that have reached their limit state;~~
- ~~4. Siding and masonry joints including joints between the building envelope and the perimeter of windows, doors and skylights are not maintained, weather resistant or water tight;~~
- ~~5. Structural members that have evidence of deterioration or that are not capable of safely supporting all nominal loads and load effects;~~
- ~~6. Foundation systems that are not firmly supported by footings, are not plumb and free from open cracks and breaks, are not properly anchored or are not capable of supporting all nominal loads and resisting all load effects;~~
- ~~7. Exterior walls that are not anchored to supporting and supported elements or are not plumb and free of holes, cracks or breaks and loose or rotting materials, are not properly anchored or are not capable of supporting all nominal loads and resisting all load effects;~~
- ~~8. Roofing or roofing components that have defects that admit rain, roof surfaces with inadequate drainage, or any portion of the roof framing that is not in good repair with signs of deterioration, fatigue or without proper anchorage and incapable of supporting all nominal loads and resisting all load effects;~~
- ~~9. Flooring and flooring components with defects that affect serviceability or flooring components that show signs of deterioration or fatigue, are not properly anchored or are incapable of supporting all nominal loads and resisting all load effects;~~
- ~~10. Veneer, cornices, belt courses, corbels, trim, wall facings and similar decorative features not properly anchored or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects;~~
- ~~11. Overhang extensions or projections including, but not limited to, trash chutes, canopies, marquees, signs, awnings, fire escapes, standpipes and exhaust ducts not properly anchored or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects;~~
- ~~12. Exterior stairs, decks, porches, balconies and all similar appurtenances attached thereto, including guards and handrails, are not structurally sound, not properly anchored or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects; or~~
- ~~13. Chimneys, cooling towers, smokestacks and similar appurtenances not structurally sound or not properly anchored, or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects.~~

#### Exceptions:

1. Where substantiated otherwise by an *approved* method.
2. Demolition of unsafe conditions shall be permitted where *approved* by the *code official*.

**305.1.1 Unsafe conditions.** The following ~~Unsafe~~ conditions shall be determined as unsafe and shall be repaired or replaced to comply in compliance with the ~~International Building Code~~ or the *International Existing Building Code*, as required for existing buildings:

1. The nominal strength of any structural member is exceeded by nominal loads, the load effects or the required strength;
2. The anchorage of the floor or roof to walls or columns, and of walls and columns to foundations is not capable of resisting all nominal loads or load effects;
3. Structures or components thereof that have reached their limit state;

4. ~~Structural members are incapable of supporting nominal loads and load effects;~~
5. ~~Stairs, landings, balconies and all similar walking surfaces, including *guards* and handrails, are not structurally sound, not properly *anchored* or are *anchored* with connections not capable of supporting all nominal loads and resisting all load effects;~~
6. ~~Foundation systems that are not firmly supported by footings are not plumb and free from open cracks and breaks, are not properly *anchored* or are not capable of supporting all nominal loads and resisting all load effects.~~

**Exceptions:**

1. Where substantiated otherwise by an *approved* method.
2. Demolition of unsafe conditions shall be permitted when *approved* by the *code official*.

**306.1.1 Unsafe conditions.** ~~Where any of the following conditions cause the component or system to be beyond its limit state, the component or system shall be determined as unsafe~~

~~Unsafe components and systems shall be repaired or replaced to comply in compliance with the *International Building Code* or the *International Existing Building Code*, as required for existing buildings:~~

1. ~~Soils that have been subjected to any of the following conditions:~~
  - 1.1. ~~Collapse of footing or foundation system;~~
  - 1.2. ~~Damage to footing, foundation, concrete or other structural element due to soil expansion;~~
  - 1.3. ~~Adverse effects to the design strength of footing, foundation, concrete or other structural element due to a chemical reaction from the soil;~~
  - 1.4. ~~Inadequate soil as determined by a geotechnical investigation;~~
  - 1.5. ~~Where the allowable bearing capacity of the soil is in doubt; or~~
  - 1.6. ~~Adverse effects to the footing, foundation, concrete or other structural element due to the ground water table.~~
2. ~~Concrete that has been subjected to any of the following conditions:~~
  - 2.1. ~~*Deterioration*;~~
  - 2.2. ~~*Ultimate deformation*;~~
  - 2.3. ~~Fractures;~~
  - 2.4. ~~Fissures;~~
  - 2.5. ~~Spalling;~~
  - 2.6. ~~Exposed reinforcement; or~~
  - 2.7. ~~*Detached*, dislodged or failing connections.~~
3. ~~Aluminum that has been subjected to any of the following conditions:~~
  - 3.1. ~~*Deterioration*;~~
  - 3.2. ~~Corrosion;~~
  - 3.3. ~~Elastic deformation;~~
  - 3.4. ~~*Ultimate deformation*;~~
  - 3.5. ~~Stress or strain cracks;~~
  - 3.6. ~~Joint fatigue; or~~
  - 3.7. ~~*Detached*, dislodged or failing connections.~~
4. ~~Masonry that has been subjected to any of the following conditions:~~
  - 4.1. ~~*Deterioration*;~~
  - 4.2. ~~*Ultimate deformation*;~~
  - 4.3. ~~Fractures in masonry or mortar joints;~~
  - 4.4. ~~Fissures in masonry or mortar joints;~~
  - 4.5. ~~Spalling;~~
  - 4.6. ~~Exposed reinforcement; or~~
  - 4.7. ~~*Detached*, dislodged or failing connections.~~
5. ~~Steel that has been subjected to any of the following conditions:~~
  - 5.1. ~~*Deterioration*;~~
  - 5.2. ~~Elastic deformation;~~
  - 5.3. ~~*Ultimate deformation*;~~
  - 5.4. ~~Metal fatigue; or~~
  - 5.5. ~~*Detached*, dislodged or failing connections.~~

6- ~~Wood that has been subjected to any of the following conditions:~~

- ~~6.1. Ultimate deformation;~~
- ~~6.2. Deterioration;~~
- ~~6.3. Damage from insects, rodents and other vermin;~~
- ~~6.4. Fire damage beyond charring;~~
- ~~6.5. Significant splits and checks;~~
- ~~6.6. Horizontal shear cracks;~~
- ~~6.7. Vertical shear cracks;~~
- ~~6.8. Inadequate support;~~
- ~~6.9. Detached, dislodged or failing connections; or~~
- ~~6.10. Excessive cutting and notching.~~

**Exceptions:**

- 1. Where substantiated otherwise by an *approved* method.
- 2. Demolition of unsafe conditions shall be permitted where *approved* by the *code official*.

**Reason:** This proposal corrects errors and removes duplication in the IPMC of provisions already covered more appropriately in the IBC and IEBC.

Unsafe conditions are rare and represent extreme situations. As such, they are outside the general scope (see Section 101.2) and intent (101.3) of the IPMC. Rather, they are more properly addressed by the IBC and IEBC, which already define unsafe conditions to include "inadequate maintenance" and provide remedial administrative procedures (IBC Section 116, IEBC Section 115). In fact, the IPMC relies on the IEBC definitions of unsafe and dangerous, as it does not provide its own definitions in Chapter 2.

Thus, unsafe conditions need only be mentioned in the IPMC to note that they are unacceptable and must be eliminated, which is what this proposal would say. Otherwise, the current listings of specific unsafe conditions are duplicative, often unenforceable, outside the scope of a maintenance code, and in many cases just wrong.

Consider the many references in these three sections to structural elements and their resistance to "nominal loads" and "all load effects." Nominal loads include full Wind and Earthquake loads. Applying these provisions as currently written would cause every building more than about 20 years old to be labeled dangerous and unsafe even in the absence of deterioration or damage. Further, by referencing structural loads and capacities, simple implementation of the IPMC would require regular assessment by a structural engineer, which is certainly beyond the code's intent.

Consider the many references to structural "soundness." This term is undefined and unenforceable. Provisions requiring structurally sound conditions were removed from the IBC and IEBC for this reason over the last several code cycles.

Consider the several references to a component's "limit state." These references are inappropriate because, as defined in the IBC, there are multiple possible limit states. Merely exceeding a serviceability limit state (especially as contemplated by Section 306.1.1) almost never makes a building or component unsafe.

Consider the many references to deterioration. Deterioration is indeed a sign that maintenance is needed, but it is not a reason to label a building or component unsafe. Similarly, corrosion, elastic deformation, spalling, and cracks (especially as listed in Section 306.1.1) are often normal and are not of themselves reason to label a building or component unsafe. (The IEBC definition of unsafe includes "inadequate maintenance," meaning "not enough to maintain health, safety, and welfare," not merely non-compliant or imperfect maintenance.)

Despite the deletion of these long lists, the proposal results in no loss of substance. As noted, unsafe conditions are already defined and addressed in the IEBC. More specifically, each of the items proposed for deletion is already covered elsewhere in the IPMC. Considering the list in Section 304.1.1:

- Items 1, 2, 3, 5, 6, and 7 address structural elements and thus are already covered by the IEBC and IBC definition of dangerous.
- Item 4 is addressed in Section 304.6.
- Item 8 is addressed in Section 304.7.
- Item 9 does not even belong in Section 304 but is addressed in Section 305.4
- Item 10 is addressed in Section 304.8.
- Item 11 is addressed in Section 304.9.
- Item 12 is addressed in Section 304.10.
- Item 13 is addressed in Section 304.11.

Considering the list in Section 305.1.1: Items 1 through 6 address structural elements and thus are already covered by the IBC and IEBC definition of dangerous. Item 5 is additionally addressed by Section 305.4.

Considering the list in Section 306.1.1: Items 1 through 6 address components in terms of their structural materials and properties and thus are already covered by the IBC and IEBC definition of dangerous.

Finally, in addition to removing the inappropriate lists, the proposal requires compliance only with the IEBC, not the IBC, because the IPMC by definition relates to existing buildings, and the IBC no longer has existing building provisions for repair or removal of unsafe conditions.

If approved, a coordinated proposal will be made in Group B to address further duplication and overlap in IPMC Section 108.



**Cost Impact:** Will not increase the cost of construction

The proposal merely removes duplicate provisions already found in other applicable codes.

---

PM 4-15 : 304.1.1-BONOWITZ5207

## PM 5-15

### 505.4, 505.5 (New), 505.6 (New), 505.7 (New), 505.8 (New)

**Proponent:** Ronald George, Plumb-Tech Design & Consulting, [www.Plumb-TechLLC.com](http://www.Plumb-TechLLC.com), [www.ScaldPrevention.org](http://www.ScaldPrevention.org), representing Self; Plumb-Tech Design & Consulting Services LLC; [www.ScaldPrevention.org](http://www.ScaldPrevention.org) (Ron@Plumb-TechLLC.com)

## 2015 International Property Maintenance Code

Revise as follows:

**505.4 Water heating facilities.** Water heating facilities shall be properly installed, maintained and capable of providing an adequate amount of hot or tempered water to be drawn at every required sink, lavatory, bathtub, shower and laundry facility ~~at a minimum temperature of 110°F (43°C).~~ A gas-burning water heater shall not be located in any *bathroom, toilet room, bedroom* or other occupied room normally kept closed, unless adequate combustion air is provided. An *approved* combination temperature and pressure-relief valve and relief valve discharge pipe shall be properly installed and maintained on water heaters.

Add new text as follows:

### 505.5 Maximum Hot Water Temperatures

1. The maximum hot water temperature flowing from any kitchen sink faucet shall be 130 degrees Fahrenheit.
2. The maximum hot water temperature flowing from a lavatory faucet, shower head, bathtub filler faucet bathtub/shower combination, or whirlpool bathtub filler faucet shall be 120 degrees Fahrenheit (48.8 degrees Celcius).
3. The maximum temperature flowing from a bidet faucet shall be 110 degrees Fahrenheit (43 degrees Celcius)
4. The burner control thermostat on the water heater shall not be used to control the hot water distribution temperature for conformance to the above hot water temperature limit requirements.

### 505.6 Minimum Hot or Tempered Water Temperatures

1. The water temperature flowing from a lavatory shall be capable of reaching a minimum of at least 85 degrees Fahrenheit.
2. The water temperature flowing from a kitchen sink shall be capable off reaching a minimum of at least 120 degrees F.
3. The water temperature flowing from a shower, tub/shower, bathtub or whirlpool bathtub shall be capable of reaching a minimum of at least 110 degrees F.
4. The water temperature flowing from a shower, tub/shower, bathtub or whirlpool bathtub shall be capable of reaching a minimum of at least 110 degrees F.

**505.7 Water Heater Replacement - Capacity** When a water heater is replaced, it shall be replaced with a water heater of the same delivery capacity in gallons per hour. When Calculating gallons per hour the temperature rise shall be based on the same temperature rise as the prior heater. If no temperature rise is known, the temperature rise shall be based on a 100 degree rise.

**Exception:** Where the water heater manufacturer's sizing calculations or other published water heater sizing calculations show the first hour delivery capacity of the selected water heater is adequate for the installation.

**505.8 Water Heater Replacement or system temperature changes** When a water heater is added, replaced, serviced or adjusted or if a temperature actuated mixing vale serving the hot water distribution system is adjusted, the distribution system temperatures checked to verify the temperaturres do not exceed the limits prescribed in section 505.5 to minimize the risk of scalding.

The existing domestic hot water system shall be checked to verify if the existing shower valve and/or combination tub/shower valve has a code compliant pressure or temperature compensating type, anti-scald shower valve with a maximum temperature limit-stop adjujstment conforming to ASSE 1016/ASME A112.1016/CSA B125.16, Performance requirements for automatic compensating valves for individual showers and tub/shower combinations. After the water heater has been installed and the thermostat has been adjusted to the recommended temperature and allowed to heat up until the burner shuts off, or after a thermostatic mixing valve is adjusted to a new temperature.

check and adjust the maximum temperature limit-stop on every shower and tub/shower combination valve to limit the hot water temperature to a maximum of 120 Fahrenheit for scald protection. Also, adjust the outlet temperature of each point-of-use, in-line temperature limiting valve serving bathtubs, whirlpool bathtubs, or lavatories in accordance with the manufacturer's installation instructions to limit the hot water temperature to a maximum of 120 Fahrenheit for scald protection.

The thermostat on the water heater shall not be used to control the hot water distribution temperature for scald protection.

If a non-code compliant shower or tub/shower valve is present, one of more of the following methods shall be provided in the domestic hot water system to minimize the risk of scalding:

1. Replace non-code compliant shower or tub/shower valves with a code compliant shower valve conforming to ASSE 1016/ASME A112.1016/CSA B125.16, Performance requirements for automatic compensating valves for individual showers and tub/shower combinations shall be installed with the temperature limit stop adjusted in accordance with the manufacturers installation instructions to limit the hot water temperature to a maximum of 120 degrees Fahrenheit to minimize the risk of scalding. or
2. Provide a Master Temperature Actuated Mixing Valve conforming to ASSE 1017 Temperature Actuated Mixing Valve for Hot Water Distribution Systems at the water heater to limit the hot water temperature to a maximum of 120 degrees Fahrenheit to minimize the risk of scalding.or
3. Provide a water temperature limiting valve at or near each fixture outlet used for bathing or showering in accordance with the requirements of ASSE 1070 Water Temperature Limiting Devices located near the non-code compliant bathtub/shower or bathtub fixtures to limit the hot water temperature to a maximum of 120 degrees Fahrenheit to minimize the risk of scalding. or
4. Provide a Temperature Actuated, Flow Reduction (TAFR) valve conforming to ASSE 1062 Temperature Actuated, Flow Reduction (TAFR) Valves for Individual Supply Fittings at the shower head and at the tub fillerspout where a combination tub/shower fixture is installed and for any other fixtures used for bathing or showering to limit the hot water temperature to a maximum of 120 degrees Fahrenheit to minimize the risk of scalding

**Add new standard(s) as follows:**

ASSE 1016-2011/ASME A112.1016-2011/CSA B125.16-2011 Automatic Compensating Valves for Individual Shower & Tub/Shower Combinations

ASSE 1017-2010 Temperature Actuated Mixing Valves for Hot Water Distribution Systems

ASSE 1062-2006 Temperature Actuated, Flow Reduction (TAFR) Valves for Individual Supply Fittings

ASSE 1070-2004 Water Temperature Limiting Devices

**Reason:** There is currently no provisions in the code to require unsafe existing plumbing installations to where scalding is a hazard.

Hundreds of people are scalded each year where non-code compliant (Two-handle) shower valves are installed. This code change is intended to address this and other hot water scald hazards in existing installations.

**What are safe hot water temperatures?**

By Ron George

President, Ron George Design & Consulting Services

Plumbing Engineer Magazine Aug 2009

I am often asked, "What is a safe hot water temperature for domestic hot water?" If you read the model codes, it states the maximum hot water temperature for a shower or bathtub is 120 degrees Fahrenheit. If you read the warning labels on the side of most water heaters the maximum hot water temperature is 120 degrees Fahrenheit on some labels and 125 degrees Fahrenheit on other labels. The 125 degree limit probably allows for some temperature loss before the hot water gets to the fixtures. Most water heater literature and warning labels mention the availability of thermostatic mixing valves or automatic temperature compensating valves and they recommend their use. If you look at many of the industry standards for shower mixing valves, they state the valves must have limit stops that are adjustable to limit the maximum hot water temperature to 120 degrees Fahrenheit. The testing in the standards gives test criteria for testing the shower valves to these limits.

I have served on the working groups for several plumbing industry standards committees for temperature actuated mixing valves and shower valves and it is generally agreed that 120 degrees is the maximum, safe hot water temperature. I also have served on hot water system design standards committees where the participants had agreed that maximum domestic hot water temperature from plumbing fixtures used for bathing and washing purposes should be 120 degrees Fahrenheit. There were a few exceptions for bidets, sitz baths and whirlpool tubs that had temperatures lower than 120 degrees Fahrenheit for the recommended maximum temperatures to prevent scalding. It also should be

noted that some other uses like commercial dishwashers and laundries may need temperatures higher than 120 degrees Fahrenheit. There were two temperatures discussed for each fixture during the design standard meetings. One was the "use temperature" and the other was "the maximum temperature" to prevent scalding.

It's generally agreed that 120 degrees Fahrenheit is the maximum safe hot water temperature that should be delivered from a fixture. Therefore hot water above 120 degrees Fahrenheit can be considered hazardous. Model codes address this in various plumbing code sections...

...The codes generally agree if there is a hazardous condition or a condition that is unsafe or a nuisance to life, health and property it should be corrected but in the existing building code and property maintenance code there is little guidance. It is also generally agreed that water above 120 degrees Fahrenheit at fixtures for bathing and washing with a few exceptions for lower temperatures can be considered dangerous and proper precautions should be taken to prevent the hot water from being a scalding hazard by using the proper safety devices.

When I hear about people setting their water heater to 120 degrees Fahrenheit to prevent scalding, I know they have good intentions, but most people do not know you cannot accurately control the hot water temperature leaving a water heater with the thermostat dial.

### **Maximum Hot Water Temperature to Prevent Scalding**

I have served on many industry committees dealing with hot water system code requirements, hot water system design standards and product standards related to domestic hot water systems devices for temperature control and scald prevention. There has been consensus in all of these committees that the maximum safe hot water delivery temperature for a shower or bathtub is 120 degrees Fahrenheit to prevent scalding with a few exceptions for lower temperatures for bidets and emergency eye wash fixtures. (See the attached Figure 1 - Hot Water Scald Burns – Time vs Temperature Relationship for Second and Third Degree Burns for Adults and Children)

There were discussions in a plumbing code ad-hoc committee on temperature limits for the hot water system where everyone agreed the maximum safe temperature was 120 F. The ASPE Hot water committee dealing with a proposed standard for temperature limits in hot water systems also agreed the maximum safe hot water temperature to prevent scalding is 120 Fahrenheit. Several ASSE working groups that I have served on dealing with hot water temperature controls have all have discussed the reaction time of bathers and they have taken into consideration that children, the elderly and people with disabilities usually take longer to get out of harm's way if the water suddenly gets hot and they agreed 120 Fahrenheit is the maximum safe hot water temperature that a valve should deliver. At 120 F it takes about 80 seconds to develop a second degree burn in a child and it takes about 8 minutes to develop a second degree burn in an adult. (See Figure 1) The 120 Degree F temperature limit gives bathers or users an adequate amount of time to get out of harm's way before an irreversible scald burn injury can occur. Each of these committees looked back to the data that was the result of burn studies done by Dr. Moritz and Dr. Henrique's at Harvard Medical College in the 1940s. The burn studies were done using baby pigs that had skin thicknesses similar to that of adult males. The studies exposed the pig's skin to various temperatures of hot water for various periods of time and the severity of the burns were studied and recorded. These were the studies used to develop the time and temperature exposure charts. There have been numerous white papers, seminars, and reports since then discussing the fact that burns can occur quicker than those recorded in the Moritz & Henrique's studies for adult males. The skin is thinner for children and the elderly and the amount of time to receive an irreversible 2nd degree burn injury is less because their skin is thinner. Many of the white papers use the Moritz and Dr. Henrique's original burn studies and they use a ratio of the skin thickness to come up with burn times for thinner skin of children and the elderly. Children, the elderly and handicapped are also slower to react because it takes them more time to realize what is happening and try to react to get out of harm's way. Someone once told me an apartment complex was not intended for children or the elderly. I said everyone grows old and children often come visit so we need to consider prevention of scalds to children, the elderly and people with disabilities more so than burns to adults because burns can occur quicker for those groups.

### **The PIEV Theory for Reaction Time**

There is a PIEV theory relates to reaction time. The PIEV theory is most commonly used to address braking distance in automobile accidents. It addresses the amount of time it takes a driver to sense a problem and decide to react, then the reaction time is added to the braking time for the total distance that a car travels before stopping. The PIEV theory can also apply to reaction times for a bather with respect to hot water scalds.

PIEV relates to the amount of time it takes a person to react to a hazard. PIEV means - Perception, Intellection, Emotion and Volition. It is usually referred to as the PIEV theory. Before we recognize and react to a hazard, four specific areas of activity need to be processed by the brain for the muscles to react. Those processes are:

1. **Perception** - We need to perceive or gain a Perception of a hazard. There can be delays in the perception with limitation in sight, sound, feeling, or any other of our senses.
2. **Intellection** - We go through a period called, Intellection or the act or process of using the intellect by thinking or reasoning. The bather must determine if the hazard is legitimate and deciding either move out of the way of the hazard or eliminate the hazard by adjusting the controls or in some cases where the bather may be sitting out of the reach of the controls the bather may choose to pull the shower curtain in front of them. If the adjustment of the controls is the choice one must decide which control to turn and try to remember which way to turn each control to adjust the temperature or turn the water off in order to eliminate the hazard. If a wrong choice is made during this process it could compound the situation by making the water even hotter. I travel a lot and I often find that shower controls can be very confusing with respect to how to adjust the controls. I still find two handle shower controls that do not meet code requirements. This is critically important when there is no temperature limit on the shower controls. For example if the shower has a two-handle shower valve and 160 degree hot water is supplied to the system, then turning of the cold water first could lead to instant scalding injuries. Turning down the hot water to 120 F or below creates a system where it could incubate Legionella Bacteria to very high levels.
3. **Emotion** - There is an Emotion or evaluation factor which is defined as a conscious mental reaction (as anger or fear) subjectively experienced as strong feeling usually directed toward a specific object and typically accompanied by physiological and behavioral changes in the body with respect to deciding or assessing how we want to react. A person with reduced mental capacity or someone that is just very old will take longer to process this information and ultimately decide to react.
4. **Volition** - There is the physical Volition or deciding/choosing to act and acting. In the case of braking distance it is when the choice is made

to move the foot from the gas pedal to the brake pedal and pressing on the brake pedal. This can be related to the time the bather chooses to adjust the control, and they move their hand to the shower control valve, plus the time to rotate or re-adjust the shower valve plus the time from the adjustment until the water temperature changes coming out of the shower head. Often it can take as much as 3-5 seconds to re-adjust the shower head and another few seconds until the water temperature changes coming out of the shower head. For ultra-low-flow (ULF) showers the delay from the time of the adjustment of the shower valve until the water temperature changes coming out of the shower head can be even longer. So burns can become more severe with ULF shower heads. This is one more area where water conservation measures can unintentionally make plumbing systems less safe.

As the temperature of the water increases this PIEV reaction time becomes more important. Using a bathtub/shower controller with a single handle would reduce the mental processing time and reduce the possibility of making an error when turning off the water. As Figure 1 shows the higher the temperatures get, the quicker the burns can occur. within seconds or less and the degree and severity of the burn can be affected by this reaction time.

As you can see by the chart in Figure 1, if the water is at 140 F it will take about 0.8 seconds for a child to receive a 2nd degree irreversible burn injury and it will take about 5.6 seconds for an adult male to receive an irreversible burn injury at 140 degrees F. Everyone else will fall somewhere in between. An adult will often find it very difficult to react to a sudden change in temperature within five (5) seconds. If the shower head is an Ultra-Low-Flow (ULF) shower head the delay can be several seconds longer before the water temperature is reduced because the mixed water temperature must evacuate or flush out the hot water in the pipe riser from the shower valve to the shower head. There is basically very little or no time to react at higher temperatures. For a typical adult that is alert and aware the PIEV theory shows it can take well over five (5) seconds to react to a sudden burst of hot water in a shower. For an elderly person or a small child that is confused it could take several minutes or more before they are able to react and adjust the controls or get out of harm's way. There has been a lot of information that suggests reducing the domestic hot water temperature to 120 F or less as it flows from the fixtures will minimize scalding and allow most people to react or get out of harm's way before a scald injury occurs.

Reducing the water temperature flowing from the fixture can be done in several ways by:

1. Reducing the hot water temperature at the fixture by adjusting the maximum temperature limit-stop on the shower valve. (The best way)
2. Using local mixing valves conforming to ASSE 1070 to reduce the hot water temperature flowing from a faucet.
3. Reducing the temperature at the source (Water Heater) with the use of a master mixing valve or temperature actuated mixing valve conforming to ASSE 1017.
4. For existing non code compliant shower or tub/shower installations, Two handle tub/shower valves without a maximum temperature limit adjustment) an ASSE 1062 valve could be used. An ASSE 1062 valve is a Temperature Actuated Flow Reduction (TAFR) valve. It looks like a chrome pipe coupling and it screws on between the shower head and the shower arm. Other models screw into a tub spout or onto a sink faucet in place of the aerator. If the water flowing from fixture exceeds about 117-120 degrees Fahrenheit the TAFR valve will shut the flow of water down to just a trickle so that scalding hot water does not spray onto the bather. It can be reset by adjusting the fixture control valve to a cold water setting and when the cold water reaches the valve it will reset and begin flowing again. This can be a bit of a nuisance in buildings where the hot water temperature is erratic, but it is an inexpensive way to provide protection against scald injuries in older buildings without code compliant shower valves.

### **Water Heater Thermostats Do Not Control the Water Heater Outlet Temperatures**

If you adjust the water heater thermostat for the burner or heating element on a water heater down to 120 degrees, it will not prevent scalding. Water heater thermostats cannot be relied upon to control the hot water temperature leaving a water heater. Water heater manufacturers recommend that installers set thermostats at 120 - 125 F, and most of them ship the water heaters at an even lower temperature setting. It is not possible to set a water heater thermostat at a given temperature and get a relatively constant temperature of hot water from a water heater. The thermostat can not accurately control the water heater outlet temperature with a water heater thermostat.

My experience has been that not many people know that water heater thermostats cannot control the outlet temperature of a water heater. This warrants an explanation of how a water heater thermostat works so everyone understands the dial on the water heater does not have the accuracy to control the outlet temperature of storage type heater.

Water heater thermostats do not provide precise temperature controls for hot water systems. For example: the thermostat dial calibration test of ANSI Z21.10.1-1998, which is the applicable standard for gas-fired water heaters, allows the temperature to vary 10 degrees above or below the thermostat setting. I have talked to water heater manufacturers that have indicated that the controls can vary as much as 15 to 18 degrees Fahrenheit above or below the set point of the thermostat. From my experience, I have recorded the temperature leaving the top portion of a water heater over a long period of time during intermittent uses and saw temperature swings over 40 degrees Fahrenheit leaving the water heater. The shower valve standards do not have this kind of temperature fluctuation included their testing for all types of shower valves. The significant temperature swings are because the thermostat is inserted into the lower portion of a water heater tank and turns the fuel supply to the heater on and off. Most new water heater thermostat dials have no way to know what the temperature in the tank is. There is rarely a fixed temperature indicated on the dial, however some manufacturers publish temperatures associated with various marks on the thermostat dial or in their literature even though the dial cannot not control the outlet temperature of the water heater, it only controls when the energy to the heater is turned "on" and "off" by sensing the cold water coming into the bottom of the heater.

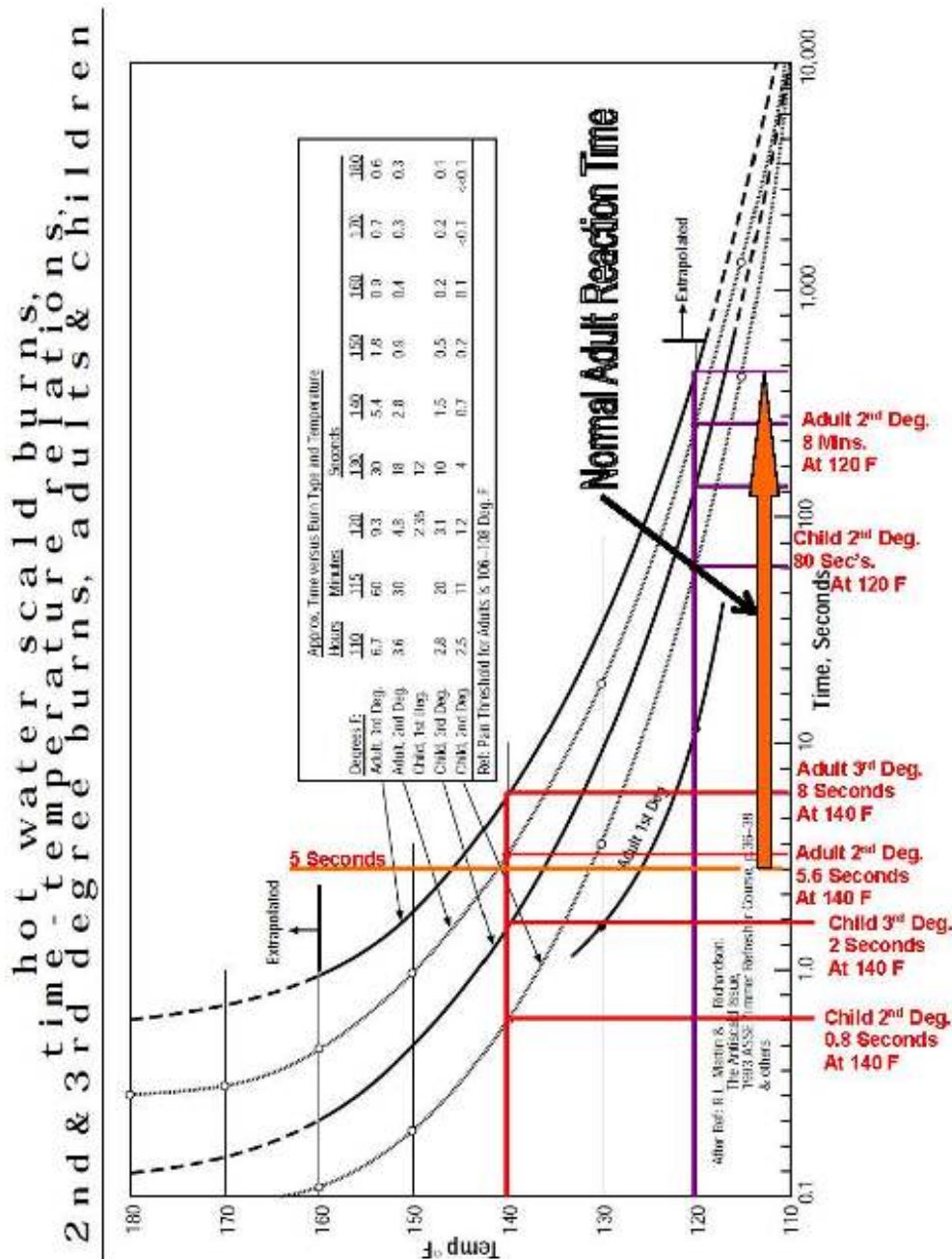
Generally, if the water heater thermostat dial is set at 120 degrees Fahrenheit, the burner would come on when the temperature at the thermostat reaches about 105 degrees Fahrenheit. The burner stays on until the water around the thermostat which is near the bottom of the heater reaches about 135 degrees Fahrenheit. (The "burner off" temperature is about 30 degrees higher than when the burner came "on" and generally about 15 degrees above the theoretical set point of the thermostat).

Most people don't realize that the maximum temperature limit test of the ANSI Z21.10.1 Gas Water Heater Standard allows the outlet water temperature of the water heater to rise significantly above the thermostat setting. This provision in the standard accounts for the phenomenon known as "stacking" or "thermal layering". The hot water is less dense and rises to the top of the hot water tank. Just like hot air rises and lifts a hot air balloon, hot water rises to the top of the tank and the cooler water drops to the bottom of the tank. Stacking or thermal layering

occurs when the hot water rises to the top of the heater due to recurring short duration heating cycles caused by a frequent number of small quantity hot water uses. Frequent short draws cause cold water to enter the bottom of the water heater where the thermostatic element senses the cold water from the turbulent flow stirring in the bottom of the heater. The cold water causes the water heater to cycle on. This phenomenon can occur in any type of storage water heater and generally is more significant in vertical heaters.

I have recorded temperatures as high as 150 to 166 degrees Fahrenheit at the top of water heaters that had the thermostats set between 120 to 125 degrees Fahrenheit. Temperatures over 151 degrees Fahrenheit are extremely high temperatures and can cause serious scald burns in only a two seconds of contact with the skin. (See Table 1 - Water Temperature Effects on Adult Skin) It should be noted that the time temperature relationships in Table 1 are based upon the thickness of the skin for adult males. Children and the elderly typically have a thinner layer of the skin or epidermis and the exposure times can be shorter or the same burns can occur in a given time at slightly lower temperatures.

Source: [http://www.plumbingengineer.com/aug\\_09](http://www.plumbingengineer.com/aug_09)



A Seminar and Technical Paper for the 25-28 Oct. 98 Annual ASPE Meeting at the Indianapolis Convention Center in Indianapolis, Indiana. Reprinted by Watts Regulator Company with permission of Dr. D. Bynum Jr.

**Figure 1 – Hot Water Scald Burns – Time vs Temperature Relationship for Second and Third Degree Burns for Adults and Children.**

(Notes By: Ron George, CPD, See: [www.ScaldPrevention.org](http://www.ScaldPrevention.org))

**Cost Impact:** Will increase the cost of construction

The cost impact is minimal. The health and safety impact is one of the most significant health and safety related code changes to existing buildings in years. This code change will save countless lives and prevent countless life altering, very painful scald injuries.

**Analysis:** A review of the standard proposed for inclusion in the code, ASSE 1016-2011/ASME A112.1016-2011/CSA B125.16-2011, ASSE 1017-2010, ASSE 1062-2006 and ASSE 1070-2004, 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 2, 2015.

---

PM 5-15 : 505.4-GEORGE5206

# PM 6-15

505.5 (New), 505.5.1 (New)

**Proponent:** David Bridges, City of Martinsville, VA, representing City of Martinsville, VA

## 2015 International Property Maintenance Code

Add new text as follows:

**505.5 Non-potable water reuse systems** Nonpotable water reuse systems and rainwater collection and conveyance systems shall be maintained in a safe and sanitary condition. Where such systems are not properly maintained, the systems shall be repaired to provide for safe and sanitary conditions, or the system shall be abandoned in accordance with Section 505.5.1.

**505.5.1 Abandonment of systems.** Where a nonpotable water reuse system or a rainwater collection and distribution system is not maintained or the owner ceases use of the system, the system shall be abandoned in accordance with Section 1301.10 of the *International Plumbing Code*.

**Reason:** As the newly developed, approved water reclamation systems are being added in the built environment, these systems need to be maintained so as to not cause hazards to structures or the public. The section is taken largely from chapter 13 of the 2015 IPC.

**Cost Impact:** Will not increase the cost of construction

This is a maintenance issue and should not have any impact on new construction.

---

PM 6-15 : 505.5 (New)-BRIDGES4801



## PM 7-15

### 602.6 (New)

**Proponent:** Jeff Hugo, National Fire Sprinkler Association, representing National Fire Sprinkler Association (hugo@nfsa.org)

## 2015 International Property Maintenance Code

**Add new text as follows:**

**602.6 Freeze Protection** All areas and spaces of the building containing fire protection system piping with water or other agents susceptible to freezing, shall be maintained at or above 40 degrees Fahrenheit, or protected from freezing by other approved methods in accordance with Section 704.1.1.

**Reason:** Several fire protection installation standards, including but not limited to; NFPA 13, NFPA 13R, NFPA 14 require the water filled piping to be at, or above 40 degrees Fahrenheit. The other approved methods can be limited use of frost-proof casings, insulation and listed heat trace tape. A professional engineer is also permitted to prove through heat loss calculations that the piping will not freeze when the area or space is maintained below 40 degrees.

The IPMC already has reference to NFPA 25 (704.1.1) which requires these spaces to be maintained. However, it is a good measure to bring this out into the body of the IPMC for code officials to be aware of the temperature of the spaces that the fire protection piping is installed.

**Cost Impact:** Will not increase the cost of construction  
Not a new technical requirement.

---

PM 7-15 : 602.6 (New)-HUGO4913

# PM 8-15

## 603.1

**Proponent:** David Bridges, City of Martinsville, VA, representing City of Martinsville, VA

### 2015 International Property Maintenance Code

**Revise as follows:**

**603.1 Mechanical equipment and appliances.** Mechanical equipment, appliances, fireplaces, solid fuel-burning appliances, cooking appliances and water heating appliances shall be properly installed and maintained in a safe working condition, and shall be capable of performing the intended function.

**Reason:** currently section 603.1 adequately covers all mechanical appliances, but not the associated fuel conveyance piping, fuel gas systems, fuel oil storage, hangers, supports, etc.... By adding "equipment" it clarify's that items associated with mechanical equipment are also covered by the IPMC.

**Cost Impact:** Will not increase the cost of construction

This is a clarification of items covered by the IPMC and will not add to the cost of construction.

---

PM 8-15 : 603.1-BRIDGES5611

# PM 9-15

## Appendix B (New), Chapter 8

**Proponent:** Jonathan Wilson, National Center for Healthy Housing, representing National Center for Healthy Housing (jwilson@nchh.org)

### 2015 International Property Maintenance Code

Add new text as follows:

#### APPENDIX B HEALTH STANDARDS

#### SECTIONB101 GENERAL

**B101.1 Scope.** The provisions of this chapter shall govern the minimum conditions and standards for the health of persons at residential premises.

**B101.2 Approved agency.** An approved agency is a government agency responsible for the health of a resident in a dwelling. In most jurisdictions, the approved agency is a health department.

**B101.3 Findings.** When a code official has evidence that a hazardous condition as described in section B102 is likely to exist, the code official is authorized to require the owner or occupant responsible for maintenance to remove the hazardous condition. The code official shall be permitted to rely on a report from an approved agency as evidence that the hazardous condition is likely to exist or that the condition has been removed and has been returned to compliance.

**B101.4 Testing or inspection.** The code official is authorized to require the property owner to conduct appropriate testing or inspection methods as evidence of compliance with this appendix. The code official may accept results from an approved agency or from an individual licensed in accordance with federal, state, or jurisdiction laws to conduct the testing or inspection. The testing or inspection results shall be deemed sufficient to establish whether a premises is in compliance with the requirements of this appendix. The property owner shall be responsible for the cost of testing or inspection.

#### SECTIONB102 HAZARDOUS CONDITIONS

**B102.1 Lead-based paint hazards.** Lead levels in dust or soil at or above federal regulatory limits pursuant to 40 CFR Section 745.65 is a hazardous condition, unless the jurisdiction has adopted more protective standards; in such a case, those more protective standards will apply.

**B102.2 Friable asbestos-containing material hazards.** Significantly damaged friable asbestos-containing material as defined by 40 CFR Part 763 is a hazardous condition unless the jurisdiction has adopted a more protective standard. Friable means that the material, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

**B102.3 Radon.** Radon present at levels at or above the level that the jurisdiction has designated as requiring reduction is a hazardous condition. If no designation has been made, then hazardous condition is four picocuries per liter of air (pCi/L) in the lowest habitable level of the dwelling.

**Add new standard(s) as follows:**

U.S. Environmental Protection Agency, 40 CFR 745.65 Lead-Based Paint Poisoning Prevention in Certain Residential Structures, 2012.

U.S. Environmental Protection Agency, 40 CFR 763 Asbestos-Containing Material in Schools, 1987

**Reason:** Three health hazards, lead, asbestos and radon, pose significant risk to many dwellings but go unmentioned in the IPMC. As a

result, residents are not adequately protected for three reasons:

1. Residents are unlikely to know they are at significant risk because the hazards are not visible or are masked in dust and debris. While many retail hardware stores carry low-cost test kits to allow residents to measure the hazard, unless they know of the danger, residents may not use them until the harm has been done.
2. They are only likely to be found in a structure that is poorly maintained, repaired, or renovated. However, once created, they are unlikely to be addressed through standard maintenance and housekeeping.
3. Many government agencies, such as health departments are capable of assessing the hazard but often lack the authority provided by a property maintenance code to efficiently address the risk.

This proposal gives the jurisdiction the language it needs to address these all-too-common hazards. The jurisdiction would elect to adopt a new optional Appendix B to the IPMC that defines these hazardous conditions and gives the code official the authority to act. As with all appendices, if the jurisdiction does not affirmatively adopt the appendix, it will have no effect.

The requirements are designed to be triggered by section 101.3 when a government agency (defined as an approved agency) responsible for the health of a resident in a dwelling provides the code official with a report showing that one of the three hazardous conditions is likely to exist. Based on the report, the code official would require the owner or occupant to eliminate the hazardous condition and conduct the necessary testing and inspection to confirm the property has returned to compliance. The testing and inspection may be conducted by the government agency making the initial finding or by an individual licensee in accordance with federal, state, or local laws to perform the work.

The code official would be entitled to rely on the analysis performed by the approved agency--most likely the state or local health department. The code official would not be expected to have any specialized knowledge of the hazard or the hazardous condition and would only be authorized and not mandated to act.

Section 102.1 describes lead-based paint hazards and refers to 40 CFR 745.65 unless the jurisdiction has adopted a more protective standard. These levels in the regulation define the amount of lead in dust or soil that is likely to poison a child in the dwelling. 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.<sup>1</sup> Lead affects a child's intelligence even at very low levels of exposure.

While there is no safe level of lead exposure for children, the U.S. Environmental Protection Agency (EPA) regulation provides levels that can be measured and reasonably achieved. The agency adopted this regulation in 2001 after extensive public notice and comment including conducting a cost-benefit analysis. The levels in that regulation are:

- Lead-based paint on an existing painted surface—0.5 percent by weight or 1.0 milligrams per square centimeter;
- Dust on floors—40 micrograms of lead per square foot of settled dust ( $\mu\text{g}/\text{ft}^2$ );
- Dust on interior window sills—250  $\mu\text{g}/\text{ft}^2$ ;
- Dust on window troughs (wells)—400  $\mu\text{g}/\text{ft}^2$ ;
- Bare soil in children's play areas—400 parts per million (ppm) of lead; and
- Bare soil in areas of the yard that are not children's play areas—1,200 ppm.

Many states have adopted these levels into their regulations to guide health departments and environmental agencies responsible for protecting children from lead-based paint hazards.

In most situations, lead-based paint hazards are the result of paint in a pre-1978 dwelling being deteriorated or being disturbed in a manner that generates dust contaminated with lead. Repairing the paint may limit making the hazardous condition worse, but it does not clean up the problem. Only through testing and inspection can one determine if the hazardous condition has been removed.

Section 102.2 describes asbestos hazards and references EPA's regulations at 40 CFR Part 763 unless the jurisdiction has adopted more protective standards. Those regulations protect people, especially children, from lung cancer, asbestosis, and mesothelioma. These regulations were adopted in 1987 after extensive public notice and comment and apply to asbestos-containing materials in schools. Many states have adopted regulations similar to these.

Asbestos-containing material is any material or product that contains more than one percent asbestos. It would only present a hazardous condition under this proposal if it was friable and was significantly damaged. Friable means that the material, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. A material is damaged if it has deteriorated or sustained physical injury such that the internal structure of the material is inadequate or, if applicable, which has delaminated such that its bond to the substrate (adhesion) is inadequate or which for any other reason lacks fiber cohesion or adhesion qualities. The damage is significant if it is extensive and severe.

If the asbestos is not significantly damaged, the hazardous condition would not exist. However, once significantly damaged, the asbestos is likely to have been released. Only through testing and inspection can one determine if the asbestos has been appropriately cleaned.

Section 102.3 describes radon, a naturally-occurring, odorless, tasteless, invisible gas over four picocuries per liter of air as a hazardous condition unless the jurisdiction has adopted a more protective level. At this level, radon poses a significant risk of lung cancer, second only to secondhand smoke, when it seeps into the home through cracks in the foundation from the soil.

EPA adopted this level in the 1980s, and three ANSI consensus standards by the American Association of Radon Scientists and Technologists (AARST) have adopted it. These consensus standards address how the levels should be measured, how the levels should be mitigated, and what testing and inspection is needed to confirm the hazardous condition has been eliminated.

**Bibliography:**

<sup>1</sup> CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in "Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention, Centers for Disease Control and Prevention, 2012, [www.cdc.gov/nceh/lead/acclpp/cdc\\_response\\_lead\\_exposure\\_recs.pdf](http://www.cdc.gov/nceh/lead/acclpp/cdc_response_lead_exposure_recs.pdf).

**Cost Impact:** Will not increase the cost of construction

The hazardous conditions described in the new optional Appendix B should not be present in a properly constructed and maintained home.

**Analysis:** A review of the standard proposed for inclusion in the code, 40 CFR 746.65 and 40CFR 763, 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 2, 2015.

**PM 9-15 : APPENDIX B (New)-  
WILSON5130**