IRC — Plumbing

2018 GROUP A PUBLIC COMMENT AGENDA

OCTOBER 24 - 31, 2018
GREATER RICHMOND CONVENTION CENTER
RICHMOND, VA

ICC
INTERNATIONAL CODE COUNCIL®

2018 Public Comment Agenda

First Printing

Publication Date: August 2018

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PRINTED IN THE USA

RP3-18

IRC: P2705.1, P2708.6, P2713.4, SECTION P2726, P2726.1, P2726.2, P2726.2.1, P2726.2.2, P2726.3, P2726.4, P2726.4.1, P2726.4.2, P2726.4.3, P2726.5, P2726.6

Proposed Change as Submitted

Proponent: Jake Pauls, representing Jake Pauls Consulting Services (bldguse@aol.com)

2018 International Residential Code

Revise as follows

P2705.1 General. The installation of fixtures shall conform to the following:

1. Floor-outlet or floor-mounted fixtures shall be secured to the drainage connection and to the floor, where so designed, by screws, bolts, washers, nuts and similar fasteners of copper, copper alloy or other corrosion-resistant material.
2. Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
3. Where fixtures come in contact with walls and floors, the contact area shall be water tight.
4. Plumbing fixtures shall be usable including safety of users of showers, bathtubs and bathtub-shower combinations in accordance with R301.1, R306, R307, R308, R311, R320, P2701, P2708, P2713, and P2726.
5. Water closets, lavatories and bidets. A water closet, lavatory or bidet shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition or vanity or closer than 30 inches (762 mm) center-to-center between adjacent fixtures. There shall be a clearance of not less than 21 inches (533 mm) in front of a water closet, lavatory or bidet to any wall, fixture or door.
6. The location of piping, fixtures or equipment shall not interfere with the operation of windows or doors.
7. In flood hazard areas as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R322.1.6.
8. Integral fixture-fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on site, shall meet the design requirements of ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

Add new text as follows

P2708.6 Grab Bars and Stanchions for Showers and Bathtub-Shower Combinations. Showers and bathtub-shower combinations shall provide stanchions or similar vertically-oriented, handholds typically not attached to walls, and grab bars in accordance with P2726.

P2713.4 Grab Bars and Stanchions for Bathtubs and Bathtub-Shower Combinations. Bathtubs and bathtub-shower combinations shall provide grab bars or stanchions in accordance with P2726.

SECTION P2726 GRAB BARS FOR BATHTUBS AND SHOWERS.

P2726.1 General. Grab Bars and Stanchions for Bathtubs, Bathtub-Shower Combinations, and Showers. Bathtubs, bathtub-shower combinations, and showers not required to be accessible shall be provided with grab bars or stanchions complying with P2726.1 through P2726.6. Dimensions specified are to the centerline of the grab bar or stanchion.

P2726.2 Grab Bars or Stanchions for Bathtubs and Bathtub-Showers. Grab bars or stanchions complying with P2726.2.1 and P2726.2.2 shall be provided at bathtubs and bathtub-shower combinations.

P2726.2.1 Vertical Grab bar or Stanchion. A vertical grab bar or stanchion shall be provided and shall comply with the following criteria.

1. Approach. The grab bar or stanchion shall be located so that it is usable without any obstruction. An unobstructed clear floor space 21 inches (533 mm) wide minimum and 21 inches (533 mm) deep minimum, measured from the outer side of the bathtub, shall be provided and shall be located within 12 inches (305 mm) of the grab bar or stanchion.
2. Length. The grab bar or stanchion shall be 36 inches (914 mm) long minimum.
3. Position. The grab bar or stanchion shall be positioned in accordance with the following criteria:

   3.1. The lower end of the grab bar or stanchion shall be 24 inches (610 mm) minimum and 27 inches maximum above the finished floor.
   3.2. Grab bars located inside a combination bathtub-shower compartment shall have their centerline 6 inches (152 mm) minimum, measured horizontally, to the shower curtain rod and 8 inches (200 mm) maximum, measured horizontally from the outer side of the bathtub.
   3.3. Grab bars and stanchions shall be permitted within 6 inches (152 mm) outside of the outer side of the bathtub complying with P2726.2.1.1

P2726.2.2 Horizontal Grab Bar. A 24-inch (610 mm) long minimum grab bar shall be provided on the long, non-entry side of bathtubs and bathtub-shower combinations. The grab bar shall be installed in a horizontal position and shall be centered, plus or minus two inches, along the length of the tub. The horizontal grab bar shall be located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the tub rim.

Exception: A diagonal grab bar or, with 24 inches (610 mm) minimum length is permitted if installed with its higher end 12 inches (305mm) maximum from the control wall. The higher end of the grab bar shall be 25 inches (635 mm) minimum and 27 inches (685 mm) maximum above the tub rim. The lower end shall be located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the tub rim.

P2726.3 Vertical Grab Bar or Stanchion for Showers. A vertical grab bar or stanchion shall be provided for showers. The vertical grab bar or stanchion shall be located either interior to or outside the shower compartment, within 3 inches (76 mm) of the compartment access and egress opening. The grab bar or stanchion shall be 24 inches (610 mm) long minimum with its lower end 39 inches (991 mm) maximum above the finished floor.

P2726.4 Other Details. Grab bars and stanchions shall comply with P2726.4

P2726.4.1 Cross Section. Grab bars and stanchions shall be circular in cross section having an outside diameter of 1.25 inches (32 mm) minimum and 2 inches (51 mm) maximum.

P2726.4.2 Spacing. The space between the grab bar or stanchion and adjacent surfaces plus water controls shall be 1.5 inches (32 mm) minimum.

P2726.4.3 Surface Hazards. Grab bars, stanchions and adjacent surfaces shall be free of sharp or abrasive elements. Edges shall be rounded with a minimum radius of 0.25 inch (6 mm).

P2726.5 Structural Characteristics. Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 pounds (1112 N) is applied an any point on the grab bar, stanchion, fasteners, mounting device or supporting structure. Grab bars and stanchions shall not rotate within their fittings.

P2726.6 Design and Installation for Water. Grab bars, stanchions, fasteners, mounting device or supporting structure shall be designed and installed in accordance with P2701.1, with suitable materials, to withstand effects of water, including corrosion and other deterioration through their service life.

Reason:

"Reason Statement" or Justification for Grab Bars and Stanchions

for Bathtubs, Bathtub-Shower Combinations and Showers

Complying with New Requirements in IRC, especially Section P2726

Proposed by Jake Pauls, BArch, CPE, HonDSc

Introduction

Points of Control. Grab bars, handrails and stanchions are important building components providing—*in combination with our hands and our feet*—what are called (in ergonomics) "points of control" to maintain balance and aid in ambulation and other movement activities that are crucial to utilizing means of egress for safety generally (in both normal and emergency conditions) and which pose dangers of injurious falls, the leading source of injuries in most countries, including the USA.

A brief digression to explain "stanchions." You see them routinely on transportation vehicles such as subway trains and city buses. They are the ***vertical*** assemblies of graspable tubing that are fixed between ceilings, horizontal handrails just above head height, seats, floors, etc. usually located between seating and passageways or aisles. The term, stanchions is used in ADA requirements for transportation vehicles and for this context Wikipedia has the following description: "On board most buses and trams/subways, vertical supports to provide stability when passengers are standing. They are located throughout most city buses and are connected to seats, floor, roof, etc." This term is used in contexts similar to those for the "poles" referred to in NFPA's recent adoption of new requirements for grab bars or poles for new bathtubs, bathtub-shower combinations and showers.

Examples of Points of Control in Specific Contexts. The starred, central cell of Table 1. shows the equity, with points of control—***shown in bold italics***—achieved with now-proposed grab bars, handrails and stanchions being required, in Section 1003, in the same way that handrails are required for stairs in the rest of the IBC.

Table 1. Minimum Number of Points of Control Provided

with New (★) or Currently Imposed Rules or Practices

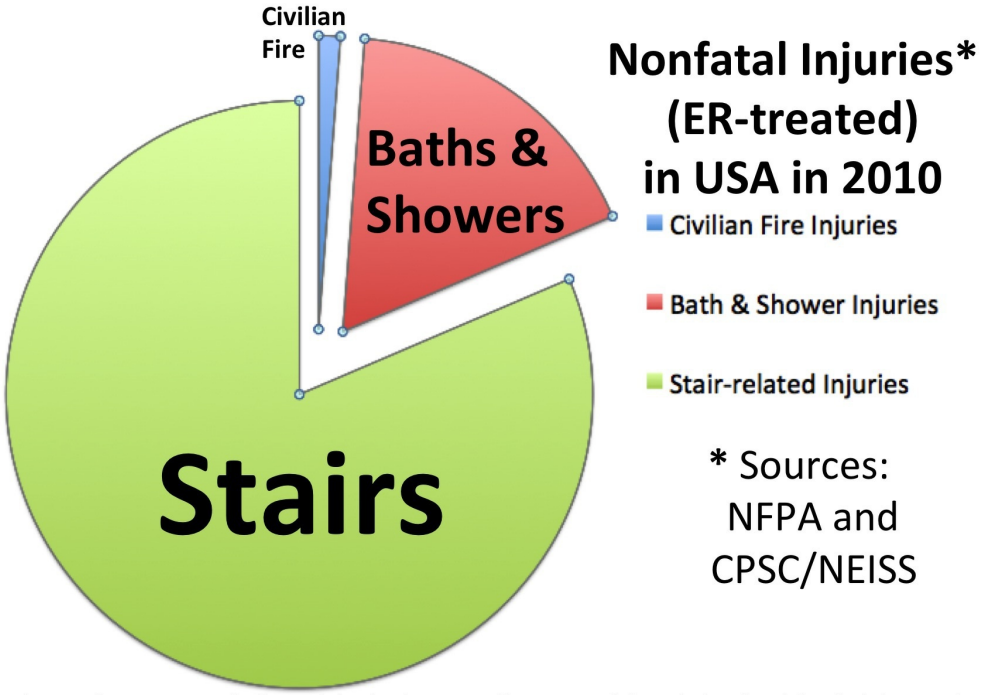
Number of Points of Control Via Hands or Feet	≤1	1	2	3	3-4
Standard walker for older adult with altered gait.					✔
Occupational settings with risk of worker falls from heights. Also, stairs where users can use two handrails simultaneously, one on each side.				✔	
Stairs where users have only a single handrail. ***Grab bar(s) usable for bathtub/shower entry/egress.***			✔ ★		
Bathtubs/showers with slip resistant underfoot surfaces when wet.		✔			
Bathtubs/showers without slip resistant underfoot surfaces when wet, the common condition currently.	✔				

The Problems To Be Solved with A New Requirement for Grab bars, handrails and stanchions. The central and most important point of this code change proposal is to respond to the relatively high risk of injurious falls when entering and exiting bathing/showering facilities, *in all new settings where they occur.* Such risks exceed those for stairs on an exposure-adjusted basis. That is, the time during which one is stepping into or out of a bathtub or shower is more risky than a similar stepping behavior on a stair. The former result in about 25 percent of the injuries as do falls on stairs. This is based on about 300,000 US hospital emergency room visits per year for bathtubs and showers versus about 1.2 million US hospital emergency room visits per year for stairs, using comparably serious injury data for 2010 (discussed by Lawrence, *et al., 2015* in the journal *Injury Prevention).* The societal cost of these injuries, plus about two and a half times additional, medically treated injuries, was (for 2010) about 20 billion dollars for US bathtubs and showers and about 93 billion dollars for US stairs with the greatest risk for both being in homes, where bathing/showering is a near daily activity for most people in the US (Lawrence, *et al,* 2015). (See also the annex to this justification for details of injuries documented by the US Consumer Product Safety Commission, CPSC.)

Table 1 depicts the current inequity as well as the increased equity that will be achieved when bathtubs and showers are subject to the same principle about availability of points of control (usable by ones hands or feet) that are crucial to our stability in utilizing those portions of the means of egress that entail elevation differences, changes of slope, and changes in slip resistance. The current—*at best*—one point of control provided with typical bathtubs and showers (i.e., one foot in a stable placement on a slip-resistant surface) would be augmented by one point of control available reliably to one hand. This achieves equity of safety with stairs where we can count on one foot planted on a tread and one hand on a handrail. For some situations, involving bathtubs used for immersion bathing (with occupants seated or lying on the bottom of the tub) two points of control, utilizing grab bars, handrails or stanchions—one for each hand—are needed for this equity and, more practically, to accomplish the relatively difficult stand-to-sit and sit-to-stand transfers within the tub.

Size of the Problem with Bathtubs and Showers Compared to Other Large Problems. Figure 1, a pie chart, shows the approximate scales of the nonfatal injury problem for three dangers to building occupants. In the US, the traditional danger of fire-related injuries is far smaller than that from bathing/showering and even smaller in relation to stair-related injuries. Right now, in the I-Codes, the segment for bathing/showering is not addressed while many, many pages of the I-Codes deal with fire-related injury prevention. Again, the proposal for grab bars and other points of control to be provided equitably, will provide a major improvement to injury prevention that, heretofore, has been largely ignored in code development and in practice except in some hotel properties where no more than half of the grab bars, handrails or stanchions to be required under the new proposal are provided for bathtubs.

Figure 1. Comparing three dangers resulting in injuries in buildings



There is an inverse relationship between these epidemiological insights and the extent of coverage of the great dangers of stairs and baths/showers in building codes and housing codes plus leading healthy homes literature.

International Codes, Scientific/Technical/Policy/Managerial Perspectives

Precedent Set by NFPA Codes. The foregoing is the philosophical and epidemiological foundation for the proposed addition of requirements for grab bars, handrails and stanchions in Section 1003 of the IBC and, in future or elsewhere, in the I-Codes generally. There is also the precedent taken in NFPA 101 and NFPA 5000 in their 2018 editions where grab bars (alternatively poles which are given the more-technical name "stanchions" in this IBC proposal) were proposed and almost completely adopted (with the exception of health care, discussed below) for new bathtubs and showers in buildings regulated by these codes. The new requirements were mostly noncontroversial and it is hoped that the same will be true with the proposals now submitted to the I-Codes. The justification for the new requirements far outweigh the opposition to them as the ergonomic, biomechanics, epidemiological, etiological and economic aspects have been carefully considered and addressed to the satisfaction of many people who know building codes and safety standards well and whose votes on the many committees considering the issue attest to the multiple justifications for this new feature of building codes and safety standards.

Parallel Code Development Activity in Canada. A proposal, comparable to what NFPA has adopted, is being addressed by a Grab Bar Task Group for the National Building Code of Canada and, when its next cycle commences, will also be proposed for action by the ICC A117 Committee for a new section, on mainstreamed grab bar, handrail and stanchion features for the A117.1 standard. Leaders in the standards and codes field, conversant with the value of grab bars, handrails and stanchions have been discussing such mainstreaming since early 2016, at an international meeting of experts on bathing/showering safety held in Toronto and partly available for study in a free streaming video that is available with several other streaming videos addressing points of control, grab bars, cost-benefit issues, etc., that are all listed in the Bibliography provided with this proposal. So a lot of the groundwork has been laid and different perspectives have been elicited and discussed.

Survey of Existing Facilities. Centered on hotels, health care facilities**, airport airline club shower facilities*, and homes, the proponent for this code change has been conducting a personal, opportunity-based survey of bathing/showering facilities worldwide, including the following countries where his work on building use and safety has taken him in recent years or his work is followed by other professionals, including public health authorities.

- Canada**
- USA* **

- UK*
- Sweden**
- Finland
- Netherlands
- Italy
- Singapore*
- Australia**
- New Zealand
- Japan

The survey is documented in many hours of video and thousands of photographs plus many measurements, in residential occupancies, of three-, four-, five-piece bathrooms ranging in size from a few square meters (20 square feet) to spaces big enough to park an automobile, occasionally with tubs and showers almost that big. Generally, the more compact the bathroom, the easier it is to provide the needed points of control—and with very substantial cost savings.

Hotels Surveyed. They were operated by Marriott, Sheraton, Intercontinental, Holiday Inn, Best Western, Hyatt, Hilton in almost of the countries listed above. In some of them, meetings were held with hotel managers and those responsible for risk management.

Detailed Justifications for Specific New Sections in IRC

P2705.1 already has the heart of the proposal in its item 4, "Plumbing fixtures shall be usable." The proposal simply fleshes this out with sufficient detail to implement this objective.

P2708. The new text, for the Section for Showers, clarifies, for Showers, that stanchions (sometimes termed "poles," as in NFPA's requirements) are equivalent to required grab bars of the conventional sort. It directs IRC users to a new P2726 for requirements.

P2713. 4. The new text, for the section on Bathtubs, directs users to a new P2726 for requirements.

P2726.1. This new text introduces the detailed requirements and clarifies that dimensions (taken at right angles to the grab bar or stanchion) are to the centerline of the device.

P2726.2. These detailed requirements, here for vertical points of control, are based on research findings and recommendations described below and are roughly similar to what NFPA adopted for the 2018 edition of NFPA 101 and NFPA 5000. They are also being considered currently for the National Building Code of Canada.

In these detailed requirements for the vertical points of control, the first things is to establish where within the plan of the bathroom, they will adequately serve users. This is based on Section R307of the IRC which, along with Figure R307.1, sets the required minimum 21-inch (533 mm) clearances in front of fixtures (toilet, lavatory and tub), the areas through which bathers need to move reasonably unobstructed to access the tub and to exit the tub. The required points of control have to be within 12 inches (905 mm), measured horizontally, of these clear areas.

The dimensions shown here, plus the general superiority of vertical grab bars for ambulatory transfers, are based on extensive Canadian research over the last two decades as well as a meeting of US and Canadian experts in early 2016 that is partially available—for its presentations of Principle Investigators—on free steaming video (with links also provided in the Bibliography). An example of a vertical pole that is recognized as at least equivalent to the conventional vertical grab bar is shown in Figure 2, above, along with relevant discussion that supports the superiority of a properly installed stanchion which can be more easily positioned where the tub is most likely to be accessed. These dimensions are generally similar to what NFPA adopted for its 2018 editions of NFPA 101 and NFPA 5000. They are stated slightly

differently in the IBC proposal to take better account of bathtubs that do not have walls on one to three sides. As in the NFPA-adopted requirements, P2726.2.1.3(2) addresses the often-missed issue of a wall-mounted conventional, vertical grab bar interfering with the shower curtain getting a good seal on the end wall.

Figure 2. Demonstration set up of both conventional grab bars (nominally meeting the length and location criteria of proposed IRC requirements and a stanchion plus a horizontally-fixed section—like a handrail—of the same tubing used for the stanchion (both completely meeting the length, location and structural strength requirements of proposed IRC requirements (which are consistent with IBC, ICC A117.1 and NFPA requirements)

Besides aesthetic advantages, the stanchion and the full-tub-length bars /tubeing are clearly superior in placement flexibility—as they do not require walls for attachment—and better performance for a wider range of users and uses including here, especially for the stanchion, serving a use that is not addressed in P2726 for stand-to-sit and sit-to-stand transfers for toilet users that might be a bonus benefit used more frequently than would be uses related to bathing and showering. This is especially the case in small, residential-use bathrooms such as serving hotel guest rooms, where (for space and plumbing efficiency reasons) often have bathtubs and toilets in close proximity. This is addressed further in the Cost Impact section of the justification.

Note that the straight tubing based stanchion and the horizontal bar/tubing are not held by mere compression fit; they are held by adhesive that is permanent and waterproof. The lower part of the stanchion was tested at sustained loads of 300 pounds of horizontal, shearing force without any indication of failure. Its fixing plate shear area exceeds the shear area of conventional grab bar screws by a factor of six and unlike the case for conventional grab bar screws there is no issue with water intrusion and corrosion as well as deterioration of the structural backing for the screws. (See the section below describing field observations of serious deterioration of conventional grab bars fixing details that are often not designed for water intrusion.) Here it should be noted that automobiles, today, utilize high-performance adhesives where, in the past, screws were the norm but these, and the necessary perforations in parts, performed poorly from a corrosion perspective. Water pumps as well as body panels and headlamp plus taillight assemblies are examples of how modern automobiles are built with waterproof, automotive-grade adhesives. Examples of greater use of modern adhesives are also found increasingly in building construction.

Here it must be emphasized that grab bars and stanchions have to be structurally installed; some of the products available in the marketplace, e.g., suction-cup grab bars—that have a temporary and precarious adhesion to smooth tiles—and compression-fit (via a jackscrew mechanism) temporary transfer poles do not meet the structural requirements imposed in the proposed new requirements, the same structural performance requirements applied—withstanding loads of 250 pounds—currently applicable to conventional grab bars in the IBC. In Figure 2, below, the photograph shows a demonstration bathtub-shower combination with a redundant set of both conventional (vertical and diagonal) grab bars and (vertical and horizontal, straight lengths of tubing fixed at their ends)—they easily meet the 250-pound structural load criterion.

P2726.2.2 Horizontal Grab Bar. As with the vertical grab bar, described above (for P27262.1), the dimensions and need for this second grab bar are based on Canadian research identified in the Bibliography and is addressed in the video of the presentation by Dr. Nancy Edwards, Principal Investigator of the early Canadian work which also addressed the option of a diagonal grab bar provided via the exception to 2726.2. Note that the base requirement covers installations where the bathtub is not enclosed on one or more sides with a wall. Such horizontal grab bars are intended for use by persons using the tub for immersion bathing which requires stand-to-sit and sit-to-stand transfers that utilize a horizontal or diagonal grab bar (and might also utilize a vertical grab bar or pole addressed by 27.2.1). 2726.2.2 permits horizontal handrails, which could be the same tubing used for the stanchion, to be used in a horizontal orientation. These could be longer (e.g., full tub length) than conventional, horizontal grab bars which need a parallel wall for support, unlike the horizontal tubing fixed between end walls only.

P2726.2.3. Vertical Grab Bar or Stanchion for Showers. Because of the variety of dedicated showers, especially in plan shape and size, this requirement is stated in a relatively flexible fashion relying more on a performance approach than specific dimensions, other than the minimum length and lower end position that takes into account various statures of users as well as the possibility there might be a seat in the shower. The inclusion of a stanchion takes into account the structural differences between bathtubs and free-standing showers; the latter would be good candidates for a stanchion positioned between the ceiling and the floor just outside the shower entrance.

2726.4. Other Details. Generally the requirements referenced here are based mostly on current requirements of ICC A117.1-2017 and with a new provision that addresses often-seen issues of water damage to conventional grab bars that range from the cosmetic to the catastrophic.

27.26.4.1 Cross Section. This is the same as ICC A117.1-2017 without an exception for noncircular sections which are rarely seen within bathrooms.

P2726.4.2. Spacing. This is based on a simplified version of ICC A117.1-2017.

P2726.4.3. Surface Hazards. This expands on a requirement, P2701.1.

P2726.5. Structural Characteristics. This is based on current requirements of ICC A117.1

2726.6. Design and Installation for Water. This last section is new and it addresses a serious problem with a non-trivial number of grab bars that have been seen in hotels, especially in the USA and Canada. Many are not designed, installed and maintained to address deterioration and corrosion problems with conventional, wall-mounted grab bars due to easy water intrusion and entrapment between conventional grab bar mounting plates and the covers fastened over them. Often, when water is entrapped here, there is no way for it to drain out, particularly from the lower portion of the enclosed space.

Problems Found in the Field with Conventional Grab Bars

Here follows some detail on what has been observed in the field on two large problems addressed in 2726.6 as well as in 2726.2.1.3(2).

During the course of his opportunity-based survey of grab bars provided for bathrooms in hotel guest rooms the proponent of this code change has found two problems with many installations.

The first, affecting over 50 percent of the surveyed bathtub-shower combinations, comes from placement of vertical grab bars underneath—and within a few inches horizontally of the end bracket for shower curtains. This makes sealing the shower curtain against the end wall of the bathtub-shower combination very difficult so that the danger of water getting outside the bathtub, on the adjacent floor is heightened unreasonably and needlessly. The proposed section

1003.8.2.1.3(3) addresses this problem as follows: “If attached to a wall, a grab bar or handrail shall be located inside the bathtub or combination bathtub-shower compartment and shall be no closer than 6 inches (152 mm), measured horizontally to the shower curtain rod.”

A much more worrying problem is found with a smaller percentage of conventional, wall-mounted grab bar installations, specifically grab bars which have cover plates over the screw plate onto which the tube of the grab bar is welded. There is invariably a space between the hole in the cover plate through which the tubing (grasped) portion of the grab bar passes and the tubing itself. Water can easily enter here and get trapped by the cover plate thus creating a pool of water and debris (hair, shampoo residue, etc.) from the showering process.

Aside from the hygiene problem here, there is a greatly heightened risk of two structural problems. One is water intrusion into the wall, around the fixing screws—typically two or three for each end of the grab bar, causing deterioration of the backing material so the screws become loose enough to be extractable with ones fingers. The second problem is equally worrisome especially as the quality of the steel used in (off-shore) grab bars is relatively poor in terms of corrosion of the screws and, less often, the mounting plates. The worst case seen recently had the heads of all the screws holding a grab bar so corroded that their heads were completely deteriorated and the grab bar could be pulled away from the walls with little force by one hand—clearly far, far less than the stipulated load of 250 pounds that codes in the US stipulate for structural strength.

The proponent has many photographs of these problems as well as a few videos showing how loose the grab bars have become due to corrosion as well as backing deterioration from water. One such photograph is provided in Figure 3, below; it is not the worst situation seen in the field.

Figure 3. Corrosion behind grab bar cover plate

Clearly such examples need to be addressed in several ways including stronger inspection by authorities and improved management of facilities. Improved design and manufacture of conventional grab bars would help too but, until that occurs, this proposal offers the stanchion options as well as mounting locations that keep the important “points of control” in relatively dry locations, for example at the exterior of a shower enclosure, but still near enough to the entrance to be usable from both outside and inside the enclosure. Proposed Section 2726.2.3 contains the provision, for the grab bar or stanchion to be located either interior to or outside of the shower compartment. . . .

Annexes

Annex 1: Representative sample of narratives of actual bathtub/shower-related injuries that led to US hospital emergency department visits, and for about one in ten of such visits led to hospital admission, **Annex 2,** (plus an additional 30 percent who went directly to hospital admission without an ED visit) in 2010. These are collected and published by the US Consumer Product Safety Commission (CPSC) National Electronic Injury Surveillance System (NEISS) and many more can be downloaded from the CPSC/NEISS Web site, https://www.cpsc.gov/Research--Statistics/NEISS-Injury-Data. Accessed January 8, 2018.

Annex 1: US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries

in 2010 – <u>ER released w/wo treatment</u>

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.

53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.

18 YOF SPRAINED HER LOWER BACK BY FALLING IN THE SHOWER AT SCHOOL.

02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.

18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.

80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.

86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.

71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.

68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.

47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.

02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.

22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.

23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.

40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.

21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.

48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.

04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR

10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO

80 YOF FELL IN SHOWER AT HOME HIT HEAD. DX/ HEAD INJURY

94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR. DX/ FACIAL FX

55 YOM SLL LEG HEMATOMA

72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.

22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.

26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN

90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION

30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK

51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC

60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX

44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME. DX/ ABDOMINAL CONTUSION

04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE

51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.

33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION

23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.

62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK

63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS

54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE

02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC

25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST

84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY

85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY

06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.

28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.

26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION

36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.

28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.

26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN

50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX

83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM

71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY

89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY

69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.

08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.

40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST. DX/ RIB FX

17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN

23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN

83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION

02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC

74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD

85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP

58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY

13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.

06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION

78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD

08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN

51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION

51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION

83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN

31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION

24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC

48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY

11 YOM SLIPPED IN SHOWER AND INJURED LEG. DX/ LEFT LEG CONTUSION

30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP

18 MOM FELL IN TUB DX: LACERATION TO FACE

46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK

30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME. DX// RIGHT HAND LAC

70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST

31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.

62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN

67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION

45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD. DX/ HEAD INJURY

04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC

43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION

15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC

73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUMPED L RIBS ON THE TUB. C/O RIB PAIN.

87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION22 YOM FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX

40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN

34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN

70 YOF SLIPPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST

89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION

44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION

36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE

56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC

88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION

51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN

23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION

59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX

46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE

78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION

29YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN

31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANK DX/ FLANK CONTUSION

72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.

19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK

08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC

62 YOM SLIPPED / FELL IN THE SHOWER. DX: RIB CONTUSION

09 YOF FELL IN TUB AND HIT LIP. DX/ LIP LAC

56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN

75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.

62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT

04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC

34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN

25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION

Annex 2: US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Then Admitted to Hospital

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION

69 YOM WAS WASHING HIMSELF IN SHOWER, FELL ONTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING. DX - MULTIPLE RIB FXS

56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURiNG HER RT ARM- DX- MECHANICAL FALL W/ FRACTURE RT SHOULDER

78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY

47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC

62 YOM HAD A SYNCOPAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA- DX- LACERATION TO FACE(EYE)

78 YOF PRESENT TO ER FROM HOME WHEN SHE WAS TAKING A BATH AND COLLAPSED - DX- CARDIAC ARREST, RESUSCITAED

43 YOM PRESENT TO ER AFTER HE WAS IN THE BATHTUB AND SLIP AND FELL GETTING OUT HITTING HEAD ON FLOOR- DX- BLUNT HEAD TRAUMA

81 YOM PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA- DX- BLUNT HEAD TRAUMA

41 YOM FELL OUT OF SHOWER AT ASSISTED LIVING HOME YESTERDAY ONTO RT SIDE C/O RT HIP & RT LEG PAIN. DX - RT HIP FRACTURE

80 YOF TRYING TO GET OUT OF BATHTUB ACCIDENTLY FELL INJURED LOWER BACK; BACK CONTUSION AND AMBULATORY DYSFUNCTION

92 YOM PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP-DX- FRACTURE RT LOWER TRUNK (HIP)

88 YOF PRESENT TO ER AFTER A FAL IN BATH TUB AT SNF INJURING LT HIP- DX - FRACTURE LT LOWER TRUNK (HIP)

88 YOF WAS GETTING OUT OF SHOWER, FELT DIZZY & FELL STRIKING BACK OF HEAD ON FLOOR INJURING LT ARM. DX - SKIN TEAR LACERATION

88 YOF GETTING OUT OF BATHTUB THIS MORNING FELL TRIED TO BRACE HERSELF INJURED SHOULDER; SHOULDER FRACTURE

71 YOF WAS FOUND DOWN BY SON IN BATHTUB AT HOME, HAS INJURY TO LT EYE & FOREHEAD, IS REPETITIVE. DX - BLUNT HEAD TRAUMA, +ETOH

86 YOF LOST BALANCE WHEN SHE TURNED AROUND & FELL INTO BATHTUB C/O LOW BACK PAIN. DX - LOW BACK PAIN, POSS FX VS CONTUSION

80 YOF HUSBAND DID NOT WANT HER SMOKING IN HOUSE, WENT TO BATHROOM STOOD ON THE TOILET, OPENED WINDOW, SLIPPED BETWN TOILET/TUB; PELVIC FX

44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY. DX - SCALP LACERATION

37 YOF SUSTAINED A MECHANICAL FALL IN SHOWER ONTO RT UPPER EXTREMITY, C/O RT SHOULDER PAIN. DX - RT DISTAL CLAVICLE FX

37 YOM HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB. DX - SPINAL CONTUSION

84 YOF HAD SYNCOPAL EPISODE IN SHOWER AND FELL. DX: L 10TH RIB FX, INABILITY TO AMBULATE.

87 YOF FELL IN SHOWER. DX: RHABDOMYOLYSIS.

93 YOF FELL IN SHOWER AT ASSISTED LIVING. DX: L DISTAL HUMERUS FX.

79 YOM FELL IN SHOWER. DX: A FIB W/RAPID VENTRICULAR RESP, SYNCOPE, SDH, SAH, ELEVATED INR.

84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE

90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: R KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.

82 YOF WITH NO INJ FROM FALL IN TUB

85 YOM WITH NO IN, FELL IN BATHTUB, ADMITTED FOR OTHER REASONS

52 YOM W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB. DX: RHABDOMYOLYSIS STATUS POST FALL, NASAL FX.

95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION

71 YOF SLIPPED AND FELL IN SHOWER. DX: SYNCOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO

79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE

87 YOF WITH RIB FRACTURE FROM FALL IN TUB

79 YOM WITH LOWER BACK STRAIN FROM FALL IN SHOWER

81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP

97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGGITATION.

70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP, SUSTAINED CHI, BACK CONTUSIONS

88 YOF FELL AGAINST BATHTUB AND WALL AT ASSISTED LIVING. DX: BACK/SHOUL PX, SYNCOPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FX'S.

88 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.

41YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED

83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.

94 YOM FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION

79 YOM FELL ON SIDE OF BATHTUB. DX: SYNCOPE, CHEST WALL CONT.

55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FX'S.

86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED

95 YOF TRIPPED OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX; AVULSION TO FACE/ MALIGNANT HYPERTENSION

53 YOF SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES

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Bibliography

Approximately 50 internationally-produced scientific and technical references, on bathing/showering safety, were compiled by the proponent, in 2016, for an American Public Health Association (APHA) draft policy highlighting, especially two Canadian research studies that also are addressed in video presentations by Principal Investigators (Dr. Nancy Edwards, Dr. Alison Novak) for the research and posted, for free streaming viewing at, https://vimeo.com/164239941 Accessed January 8, 2018. Additional videos covering technical aspects of bathing and showering safety (including cost impact and benefit issues*) are found at the following links (all of which are available, with descriptions, at www.bldguse.com, the proponent's Professional Practice Website, Accessed January 8, 2018.).

- https://vimeo.com/237294479
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- https://vimeo.com/197742277
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- https://vimeo.com/173883358
- https://vimeo.com/175101448 *
- https://vimeo.com/117572176

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Cost Impact: The code change proposal will increase the cost of construction

Cost Impact

The code change proposal will increase the cost of residential construction, but that increased cost pales in comparison to the benefits of enhanced usability and reduction of fall injuries, the majority of which occur in residential settings, especially homes.

The additional material in the form of conventional grab bars or poles plus their fixings is about 50 dollars per grab bar or pole (using *retail* prices for the components confirmed as recently as 2017) and with a conventional three-fixture bathroom with a bathtub there would be a need for two such grab bars or poles or one of each. Labor to install these would be about one hour for each. Thus an overall, installed cost is on the order of $200 per bathroom. The service life would be on the order of two or more decades.

Against this added cost of an installed single grab bar or two per bathroom there are the ongoing benefits of enhanced normal (non-injury) uses which, for a typical US household for a 20-year period, for example, number about 7,000 per person or on the order of 20,000 per household. Those enhanced uses, with grab bars, have an economic value that is larger than the benefit of averted injuries from falls.

Currently without grab bars, our bathtubs and showers are the site of injuries serious enough to require professional medical attention at a rate, annually (using 2010 data) of about 1 million per 110 billion uses or about one in 110,000 uses. Every one of those non-injury uses has a value. By comparison, for stairs this ratio is about one professionally treated fall injury for every million flight uses in home settings and one such injury for every ten million flight uses in public settings where, under the IBC and more-detailed inspection procedures, stairs are nearly one order of magnitude safer than those nominally constructed under the IRC. See the video presentation by Jake Pauls to the April 2017 meeting, "The Impact of Building Codes and Standards in Public Health and Safety," held in Melbourne, Australia, in connection with the 15th World Congress on Public Health. The streaming video containing this presentation, which includes the "Injury Pyramids" used for the above stair safety calculation, is available freely at https://vimeo.com/239276202 (as listed in the first part of the Bibliography accompanying this proposal) accessed Jan 8, 2018.

The injuries-averted benefit, over twenty years, has a value, in 2010 dollars, about 6.5 times greater than the installation cost, based on the very reasonable assumption that half the falls are averted with the specified grab bars or poles. For the vertical poles that also enhance and make safer the use of toilets that, being adjacent to a bathtub, can serve stand-to-sit and sit-to-stand transfers for toileting, this benefit increases by about 35 percent to nearly 9 times greater than the installation cost. These projections are based on the injury economic data provided by the 2015 paper in the respected journal, *Injury Prevention,* by Lawrence, Spicer and Miller (see Bibliography for details).

The bottom line is that the benefits of both enhanced normal uses, in the tens of thousands per household over a 20-year period, combined with the benefit of averted injuries, is on the order of at least 20 or more times the cost of providing the grab bars, especially if they take the form of vertical poles serving bathtub-shower combination users as well as toilet users in a three-piece bathroom provision that is very common in homes and hotels, for

example. For hotels, while the lavatory sink(s) may be in a separate space, the toilet and bathtub-shower combination are usually close together so that a single pole can serve transfers for both. Thus the cost impact of grab bar or pole installations is very small in relation to the benefits and that cost of installation is very small in relation to the overall price of a dwelling unit or hotel guest room for example.

RP3-18

Public Hearing Results

Committee Action: Disapproved

Committee Reason: Although this is a legitimate concern, to require these in every home is overkill. Stanchions might interfere with shower doors, clearances at water closets and other fixtures. Although this proposal is focused for areas in and around bathing fixtures, this topic is more aligned to be placed in building part of the code (Chapter 3). Perhaps the first step towards a future possible requirement for these bars is to require blocking to be installed for proper attachment of the indicated bar arrangements. Requirements for bar mounting blocking in manufactured plumbing fixtures (such as fiberglass shower and bathtub enclosures) needs to be addressed in the product standards for those products such as CSA B45.5/IAPMO Z124. (Vote:10-0)

Assembly Action: None

RP3-18

Individual Consideration Agenda

Public Comment 1:

Proponent: Jake Pauls, representing Jake Pauls Consulting Services (bldguse@aol.com)requests As Modified by This Public Comment.

Modify as follows:

2018 International Residential Code

P2705.1 General. The installation of fixtures shall conform to the following:

1. Floor-outlet or floor-mounted fixtures shall be secured to the drainage connection and to the floor, where so designed, by screws, bolts, washers, nuts and similar fasteners of copper, copper alloy or other corrosion-resistant material.
2. Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
3. Where fixtures come in contact with walls and floors, the contact area shall be water tight.
4. Plumbing fixtures shall be usable~~ including safety of users~~. Usability of showers, bathtubs and bathtub-shower combinations shall include safety of access to, bathing plus showering in~~ accordance with R301.1, R306, R307, R308, R311, R320, P2701, P2708, P2713, and P2726~~, and egress from the facility achieved with provision of grab bars and stanchions in accordance with either R307 or the International Building Code, 2021, Section 1209.
5. Water closets, lavatories and bidets. A water closet, lavatory or bidet shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition or vanity or closer than 30 inches (762 mm) center-to-center between adjacent fixtures. There shall be a clearance of not less than 21 inches (533 mm) in front of a water closet, lavatory or bidet to any wall, fixture or door.
6. The location of piping, fixtures or equipment shall not interfere with the operation of windows or doors.
7. In flood hazard areas as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R322.1.6.
8. Integral fixture-fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on site, shall meet the design requirements of ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

P2708.6 Grab Bars and Stanchions for Showers and Bathtub-Shower Combinations. Showers and bathtub-shower combinations shall ~~provide stanchions or similar vertically-oriented, handholds typically not attached to walls, and grab bars in accordance with P2726~~be provided with grab bars and stanchions in accordance with either R307 or the International Building Code, 2021, Section 1209.

P2713.4 Grab Bars and Stanchions for Bathtubs and Bathtub-Shower Combinations. Bathtubs and bathtub-shower combinations shall ~~provide~~ be provided with grab bars or stanchions in accordance ~~with P2726~~grab bars and stanchions in accordance with either R307 or the International Building Code, 2021, Section 1209.

Commenter's Reason: (1) While there was much that was confusing, if not also mistaken, in the Columbus hearing of the IRC-P Committee, I have tried to apply what was constructively suggested by way of a fix to my proposal. That is to work toward a change that might only be fully implemented in 2019 in the Group B process. This will build upon technical requirements, first proposed for, a new Section 2726, to be proposed for Chapter 3, Planning, of the IRC.

(2) While building toward action in the Group B process in 2019, I am also building on what can be done in Group A during 2018. This relies on a separate public comment I have submitted for the addition of new requirements for bath/shower safety within Section 1209 of the IBC which refers, for scoping, to Chapter 29 which includes some bathroom scoping, requiring one bathub or shower, for each one and two-family dwelling (Table 2902.1). Thus, within IBC Section 1209, Toilet and Bathroom requirements, I have submitted a public comment to relocate what was originally proposed for the Egress Chapter to Chapter 12 with some revisions based on the Egress Committee's comments in Columbus.This takes care of bath/shower safety in all contexts, i.e., including IBC buildings. Based on what was done in an earlier adoption, by NFPA 101 and NFPA 5000, 2018 editions, I provide exceptions for certain occupancies in Institutional Groups I-2 and I-3.

(3) For the IRC plumbing chapter, I have greatly simplified the originally proposed requirements in RP3-18, based on comments from the IRC Plumbing Commitee as well as comments from the IBC Egress Committee to recognize what can be done in Group A deliberations this year and what remains to be done in Group B deliberations next year. Thus requirements in both the IBC and the IRC are referenced in the public comment on RP3-18, my original proposal.

(4) Turning to a point-by-point response to the IRC hearing commenters and Committee members, the Committee Reason statement for disapproval of RP3-18 was very disappointing with the boldly inappropriate statement (from industry testimony) that "to require these (grab bars and stanchions) in every home is overkill." It is disappointing not just because an uninformed and factually incorrect statement was repeated; it reflects badly on ICC and its "safety" mission statement implied in its Web URL.

(5) To claim that the modest proposal to seek some kind of equity with what is nominally required—without great protest from industry—was "overkill" is akin to the automobile industry and its regulators to claim that it is overkill for every automobile to have functioning brakes and steering systems — as if drivers were supposed to have the ability to drive safely lacking such basic prevention and mitigation systems not only provided in a basic fashion but with all the improvements made in recent decades with these automotive systems we have all come to take for granted; they function well and reliably.

(6) The ridiculous comment about "overkill" is far more apt when describing the toll of injuries—another topic that both audience testifiers and at least one committee member revealed major misconceptions. In my proposal substantiation I provided the annual toll, for the year 2010, of one million medically treated injuries that year for bath and shower-related injuries in the US. (See the section of the justification under the heading, **"The Problems To Be Solved with A New Requirement for Grab bars, handrails and stanchions."** The annual societal injury cost of these injuries came to tens of billions of dollars for the US, again, for the year 2010. In the same section, I also noted that the risk per unit of time for exposure to the most dangerous aspects of showering and bathing—the transfers into and out of the facilities—exceeded the risk of stair-related fall injuries for comparable units of exposure—a few steps on a stair.

(7) Turning to something also noted in the Committee Reason statement but discussed very confusingly in the testimony and Committee remarks, we agree somewhat that Chapter 27 of the IRC is not the best place to have the detailed requirements for grab bars and stanchions needed to bring bathtubs and showers into parity with home stairs (for four or more steps in a flight) to have at least one handrail—and a inferior one at that due to the industry demands for oversized, hard-to-grip railings in homes. it was a strategic move on my part, as the proponent, to use the opportunity, in Group A hearings to open the debate about grab bars, etc. At least that offered an opportunity for some of the misinformation, within the committees and others, to come out to be corrected while there was time to get set up for Group B hearings in 2019.

(8) However, even here the inconsistency in arguments pose a problem. For example, it is inconsistent and very unhelpful for one of the acknowledged leaders among plumbing professionals to argue both that I needed to collaborate with the plumbing industry—who this leader claimed had been working on slipping and grab bar issues for decades—but also to be told that the plumbing section of the IRC, Chapter 27, was the wrong place to deal with grab bars, etc. They claimed it should be left to other professionals to work this into Chapter 3 of the IRC dealing with spatial planning. How can this be? And how can I be blamed, as I was for not working with the plumbing industry standards committees—as if I, with 15 committee memberships already in the US alone, was delinquent for not working closely with the plumbing industry that has done a dreadful job with providing slip-resistant bathtubs and shower pans, let alone doing nothing about grab bars, etc., despite reportedly working on these matters intensively for decades?

(9) Those industry professionals knew months before the hearings that I had submitted proposal RP3-18 but they did nothing to contact me. They knew, or should have known, from my proposal justification available early in 2018, that I had produced several videos that dealt authoritatively and effectively with issues of slipping in industry-provided slippery bathtubs and showers and I have championed both conventional and unconventional points of control for baths and showers based on extensive research evidence. Why did they not contact me before, or even after the hearings in Columbus about the committee meetings that I, according to them, should be attending to meet with industry authorities? Moreover, why was I accused of not working with ICC/ANSI A117 about grab bars when I brought key leaders of that Committee together to discuss points of control and bath/shower slipping issues a few years ago in my role as the longest serving individual member of A117?

(10) Turning to other aspects of the hearing as reflected in the Committee Reason for disapproval, BLOCKING was noted as the "first step towards a future possible requirement for these bars." This statement makes as much sense as providing all new cars with brake drums and brake fluid connections with the engine but not providing the brake pedal and connection to the power braking and ABS system in the engine compartment. Alternatively provide power steering but no steering wheel. Of course blocking alone is an nonsensical, ineffective way to stop falls in baths and showers as if we are to be comforted by the hidden blocking somewhere behind the tile surface of the bath/shower enclosure. Notably, blocking requirements for walls are ineffective if, as is increasingly the case, there are no walls around the bathtub or the shower walls are flimsy plastic where any post-installation holes in the enclosure destroy the water protection provided to the surrounding structure. Blocking alone has never saved anyone from a loss of balance becoming a serious fall. Experts on bath/shower-related falls agree there is nothing as effective as universal provision of grab bars or equivalent devices ***before*** a bath or shower is first used.

(11) Finally, it is without any evidence of a major problem for someone to claim that "stanchions might interfere with shower doors, clearances at water closets and other fixtures." I have had a stanchion installed in my 5 by 7-foot bathroom for a long time, mounted above the middle of the access-side, tub wall. It has never interfered with other bathroom functions. I have also stayed in many hotel guest rooms worldwide (averaging over 100 hotel nights annually) where, increasingly, hotels are replacing bathtubs with dedicated showers (with and without doors) in their predominantly glass, full-length or half-length panels. In no case I have examined would a functionally placed stanchion interfere with a door or with access to/from the shower or to/from the water closet that is very commonly placed adjacent to the shower. I have shot photos of almost all of these guest room bathrooms. Some mock up a stanchion doing double duty for shower access/egress as well as toilet use which for 75-year knees like mine poses increasing difficulty and danger without the vertically oriented stanchion within easy and effective reach.

(12) I am looking for some intelligence from those returning to this topic in Richmond and in hearings next year when the proposal for grab bars to be addressed in IRC Section 307 comes up. In the interim, if not for Richmond, please read the lengthy justification, with its many, many scientific references before we once again address this critically important public health issue. Also please view the free streaming videos at my Web site to see how to solve the slipping problems not only within bathtubs and showers but on the adjacent bathroom floor. It turns out the the most important thing plumbers deal with—water—is not your enemy when bathing and showering; it can indeed by your friend and a much more reliable one at that than were the statements of professionals who testified in Columbus on RP3-18.

(13) **Postscript about Reason Statement.** I am leaving my original proposal Reason Statement untouched from what was submitted in January. This means that “poles” are still referred to in some places where, now, the preferred standard term is “stanchions,” for which a definition has been proposed for NFPA codes, as follows: “A fixed, generally upright bar or pole used as a support when grasped by a hand.” Stanchions have a long history in transportation vehicles, dating back likely earlier than conventional grab bars.

Bibliography: The originally submitted Bibliography provided with my proposal is still effective for this comment.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The cost impact provided with the original proposal stands for this public comment as there was no criticism from testifiers or the Committee about this in the original proposal.

RP3-18

RP10-18

IRC: P2905.3

Proposed Change as Submitted

Proponent: Anthony Floyd, City of Scottsdale, representing City of Scottsdale (afloyd@scottsdaleaz.gov)

2018 International Residential Code

Add new text as follows

P2905.3 Hot water supply to fixtures. The developed length of hot water piping, from the source of hot water to the fixtures that require hot water, shall not exceed 50 feet (15 240 mm). Water heaters and recirculating system piping shall be considered to be sources of hot or tempered water.

Reason: This change adds a new section to limit the hot water supply line length from the source of hot water to the fixtures that require hot or tempered water. This provision is replicated from existing IPC Section 607.2.
Hot water supply lines greater than 50 feet waste water (proportional to pipe size) while occupants wait for hot water to reach fixtures for bathing, washing and culinary purposes. Even though hot water supply lines are insulated, the hot water remaining in the lines between demand periods cools down. Limiting the length and consequent volume of heated water in the supply lines reduce the amount of wasted water and occupant waiting time.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
Cost is based on proximity of hot water source to point of use.

RP10-18

Public Hearing Results

Committee Action: As Modified

Committee Modification: P2905.3 Hot water supply to fixtures. The developed length of hot water piping, from the source of hot water to the fixtures that require hot water, shall not exceed ~~50~~ 100 feet ~~(15 240 mm)~~. Water heaters and recirculating system piping shall be considered to be sources of hot ~~or tempered~~ water.

Committee Reason: For the Modification: 100 feet is a more feasible threshold than 50 feet.
For the Proposal: Sustainability goals are important. The code needs to provide clear direction that the fixtures cannot be too far away from the hot water source. (Vote:6-4)

Assembly Action: None

RP10-18

Individual Consideration Agenda

Public Comment 1:

Proponent: Anthony Floyd, City of Scottsdale, representing City of Scottsdale (afloyd@scottsdaleaz.gov)requests As Modified by This Public Comment.

Further modify as follows:

2018 International Residential Code

P2905.3 Hot water supply to fixtures. The developed length of hot water piping, from the source of hot water to the fixtures that require hot water, shall not exceed 75 ~~100~~ feet . Water heaters and recirculating system piping shall be considered to be sources of hot water.

Commenter's Reason: The 100 foot maximum length approved by the committee is twice the maximum length of 50 feet that exists in the IPC for commercial buildings. This modification reduces the maximum length to 75 feet as a reasonable limit for the average size single family home of 2600 square feet.
This change provides a simplified approach to reducing water that is wasted while waiting for hot water, conserve energy and provide convenience for homeowners. The modification provides clear direction for designers and builders in considering the location of the hot water source with respect to plumbing fixtures.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
Cost is based on the floor plan layout and proximity of hot water source to point of use.

Public Comment 2:

Proponent: DONALD SURRENA, NATIONAL ASSOCIATION OF HOME BUILDERS, representing National Association of Home Builders (dsurrena@nahb.org)requests Disapprove.

Commenter's Reason: Modification was 100 feet, but from where? This will be a compliance problem for inspection and plan review. There is no guidance for how to measure or exactly what to measure. Is it 100 ft. for each branch or is it cumulative 100 ft. for all branches?

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This will only complicate the inspection and plan review, which may increase the departmental cost of review and inspection.

RP10-18

RP13-18

IRC: P3110, P3110.1, P3110.2, P3110.2.1, P3110.3, P3110.3.1, P3110.3.2, P3110.3.3

Proposed Change as Submitted

Proponent: Jane Malone, American Association of Radon Scientists and Technologists, representing American Association of Radon Scientists and Technologists, National Policy Director

2018 International Residential Code

Add new text as follows

SECTION P3110 SOIL GAS VENT PIPING

P3110.1 Scope. The provisions of this section shall govern the materials, construction, and installation of soil gas vent pipe and connectors.

P3110.2 Soil gas vent pipe. A gas-tight pipe of 3-inch [76 mm] nominal size or larger shall be extended from below the slab or crawl space through the interior of the building and exit the roof. The pipe shall be centered in a cylindrical space which is located in the attic below the roof, is not adjacent to an eave or wall, and has a vertical height of not less than 48 inches [122 cm] and diameter of not less than 21 inches [53 cm]. Materials used shall comply with Section P3002.

P3110.2.1 Soil gas vent pipe termination. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof in a location not less than 10 feet [3048 mm] away from any window, air intake, or other opening into the conditioned spaces of the building that is less than 2 feet [610 mm] below the exhaust point. The vent pipe shall terminate not less than 10 feet [3048 mm] from window or other opening in adjoining or adjacent buildings.

P3110.3 Soil gas vent pipe connector. A tee fitting or equivalent method shall be installed to secure the soil gas vent pipe to the perforated piping or geotextile matting from which soil gas is collected.

P3110.3.1 Crawl spaces. In a building with a crawl space, a soil gas vent pipe connector shall be installed with not less than 10 feet [3048 mm] of perforated pipe or geotextile matting connected to each of the two horizontal openings of the connector. The connector and pipe or geotextile matting shall be located below a soil gas membrane complying with ASTM Class A, B, or C.

P3110.3.2 Slab-on-grade and basements. In buildings with a basement or slab-on-grade, a soil gas vent pipe connector of 4-inch [102 mm] nominal diameter shall be installed with not less than 4 feet [1219 mm]of perforated pipe or geotextile matting connected to each of the two horizontal openings of the connector.

P3110.3.3 Drain tile systems. Where an interior drain tile system is present, the two horizontal openings of the soil gas vent pipe connector shall be connected to the drain tile system.

Reason: Chapter 31 governs the piping, tubing and fittings for vents in one- and two-family dwellings. Soil gas vents are commonly installed by plumbers yet there is no information about soil gas vents in Chapter 31 or elsewhere in the plumbing sections of the IRC. Sections 401 through 701 of *ANSI AARST CCAH-2013, Reducing Radon in New Construction of One and Two Family Dwellings* describe the pipe-related (and other) requirements for soil gas vents. This proposed code change concisely adds the standard's requirements for such vents, which will ensure that plumbers have the correct information within the IRC plumbing chapter on vents. This change does not add a requirement to provide a soil gas vent but rather delivers the specification for how to provide one when a building project requires one.

Bibliography: [ANSI AARST CCAH-2013, Reducing Radon in New Construction of One and Two Family Dwellings] [AARST Consortium on Radon Standards] [2013] [http://aarst-nrpp.com/wp/america-national-radon-standards/]

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The provisions are not required for every home. They only apply to homes where the builder or buyer includes soil gas vent pipe.

RP13-18

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: This doesn't belong in the plumbing chapters because it is not plumbing. These requirements would increase the cost of construction. (Vote:10-0)

Assembly Action: **None**

RP13-18

Individual Consideration Agenda

Public Comment 1:

Proponent: Jane Malone, representing American Association of Radon Scientists and Technologists, American Lung Association, Cancer Survivors Against Radon (CanSAR), Citizens for Radioactive Radon Reduction, National Center for Healthy Housing (jmalone@aarst.org)requests As Modified by This Public Comment.

Modify as follows:

2018 International Residential Code

SECTION P3110 SOIL GAS VENT PIPING

P3110.1 Scope. The ~~provisions of this section shall govern the materials, construction, and~~ installation of soil gas vent pipe and connectors shall be in accordance with the requirements of Sections P3110.2 through P3110.3.3.

P3110.2 Soil gas vent pipe. A gas-tight pipe of 3-inch [76 mm] nominal size or larger shall be extended from below the slab or crawl space through the interior of the building and exit the roof~~. The~~ , with a slope not less than 1/8 inch per foot (10.mm/m). In the attic, the pipe shall be centered in a cylindrical space ~~which is located in the attic below the roof, is not adjacent to an eave or wall, and~~ that has a vertical height of not less than ~~48~~ 36 inches [~~122~~ 91 cm] and diameter of not less than 21 inches [53 cm]. Materials used shall comply with Section P3002.1(1).

P3110.2.1 Soil gas vent pipe termination. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof in a location not less than 10 feet [3048 mm] away from any window, air intake, or other opening into the conditioned spaces of the building that is less than 2 feet [610 mm] below the exhaust point. The vent pipe shall terminate not less than 10 feet [3048 mm] from any window or other opening in adjoining or adjacent buildings.

P3110.3 Soil gas vent pipe connector. A tee fitting or equivalent method shall be installed to secure the soil gas vent pipe to the vertical opening and to the perforated piping or geotextile matting from which soil gas is collected.

P3110.3.1 Crawl spaces. In a building with a crawl space, a soil gas vent pipe connector shall be installed with not less than 10 feet [3048 mm] of perforated pipe or geotextile matting connected to each of the two horizontal openings of the connector. The connector and perforated pipe or geotextile matting shall be located below a soil gas membrane ~~complying with ASTM Class A, B, or C.~~ constructed of polyethylene sheeting not less than 10 mil in thickness.

Commenter's Reason: This code change proposal as modified by public comment will help to ensure oversight by code officials and reduce problems caused by incorrectly installed radon pipe.
Vents are the subject of Chapter 31 of the IRC, yet there is no information about soil gas vents in Chapter 31 (or elsewhere in the plumbing sections of the IRC or elsewhere in the body of the IRC). The proposed code change would supply the standard requirements for such vents, in the same code section as other vents, to help ensure that code officials have the correct information in jurisdictions where radon features are being installed yet Appendix F is not in effect.

Under the proposed P3110.1 Scope, the comment amends the original proposal to clarify that the language that follows only applies where a radon system is installed voluntarily: "The installation of soil gas pipe shall be in accordance with" the subsequent requirements. The height of the attic space in proposed P31110.2 is corrected from 48 inches to 36 inches. The comment also fixes editorial issues and adds pipe slope, and replaces an incomplete ASTM reference with more general language.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction

The proposed new code section will increase the cost of construction where soil gas vent piping is provided. The additional cost would be $39-70 for materials (10-20 feet of 4” perforated pipe or matting ($10-20), 10-36 feet of 3” piping ($14-35) and one tee fitting ($15)) and a minimal labor cost component to install the pipe.

Public Comment 2:

Proponent: Michael Cudahy, representing self (mikec@cmservices.com)requests As Submitted.

Commenter's Reason: Having some information in the residential code on these life safety radon venting systems is a good inclusion, and we see no technical justification for rejection. It does no harm to the code, it improves awareness.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
If a radon system is required or not is not determined by this code language. Therefore, it will not alter costs of construction.

RP13-18

RP16-18

IRC: Appendix U (New)

Proposed Change as Submitted

Proponent: Ed Osann, representing Natural Resources Defense Council (eosann@nrdc.org)

2018 International Residential Code

Add new text as follows

AU101.1 Scope. This appendix shall apply to:

1. New buildings.
2. Additions to existing buildings.
3. Alterations to existing buildings.

SECTION AU102 DEFINITIONS

AU102.1 General. The following words and terms, for purposes of this appendix, shall have the meanings shown herein. Chapter 2 shall be referred to for general definitions.

Add new definition as follows

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, such as a change in current strength, pressure, temperature, or mechanical configuration.

AUTOMATIC IRRIGATION CONTROLLER. A timing device used to remotely control valves that operate an irrigation system.

REGENERATION. The maintenance process that restores a medium in a system so that it can continue to perform its water treatment function.

RUNOFF. Water that is not absorbed by the soil or landscape to which it is applied and flows from the landscape area.

SUBMETER. A meter installed subordinate to a utility service meter.

WATER SOFTENER. A pressurized water treatment device in which hard water is passed through a bed of cation exchange media (either inorganic or synthetic organic) for the purpose of exchanging calcium and magnesium ions for sodium or potassium ions, thus producing a softened water that is more desirable for laundering, bathing, and dishwashing.

AU103 PLUMBING FIXTURES AND FIXTURE FITTINGS

AU103.1 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for plumbing fixtures and fittings shall be in accordance with Table AU103.1.

TABLE AU103.1
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS[b]

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY
Lavatory faucet	1.5 gpm at 60 psi
Shower head[a]	2.0 gpm at 80 psi
Sink faucet[c]	1.8 gpm at 60 psi
Water closet	1.28 gallons per flushing cycle

For SI: 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa

a. A handheld shower spray shall be considered to be a shower head.

b. Consumption tolerances shall be determined from referenced standards.

c. Kitchen faucets shall be permitted to have a temporary increase in flow to not exceed 2.2 gpm provided that upon either the user's physical release of the increased flow activation mechanism or the user's closure of the faucet valve, the faucet reverts to the flow indicated in the table.

AU104 WATER SOFTENERS AND TREATMENT DEVICES

AU104.1 Water softeners. Water softeners shall be listed and labeled in accordance with NSF 44 and shall comply with Sections AU104.1.1 through AU104.1.3.

AU104.1.1 Demand-initiated regeneration. Water softeners shall be equipped with demand-initiated regeneration control systems. Such control systems shall automatically initiate the regeneration cycle after determining the depletion, or impending depletion, of softening capacity.

AU104.1.2 Water consumption. Water softeners shall have a maximum water consumption during regeneration of 4 gallons per 1,000 grains of hardness removed as measured in accordance with NSF 44.

AU104.1.3 Salt efficiency. Water softeners shall have a rated salt efficiency of not less than 4,000 grains of total hardness exchange per pound of salt, based on sodium chloride equivalency.

AU104.2 Reverse osmosis water treatment systems. Point-of-use reverse osmosis systems shall be equipped with an automatic shutoff valve that prevents the production of reject water when there is no demand for treated water.

AU105 AUTOMATIC IRRIGATION SYSTEMS

AU105.1 Automatic irrigation controllers. Where installed as part of a permanent landscape irrigation system, irrigation controllers shall regulate irrigation based on weather, climatological, or soil moisture status data. The controller shall have an integrated or separate sensor to suspend irrigation events during rainfall.

AU105.2 Misdirection and runoff prohibited. Automatic irrigation systems shall not direct water onto building exterior surfaces, foundations, exterior paved surfaces, or adjoining lots. Systems shall not generate runoff.

AU105.3 Landscape water measurement. A submeter shall be installed to separately record the volume of all water supplied to an outdoor landscape with an irrigated area of 5,000 square feet or greater served by an automatic irrigation system.

Exception: Where a utility service meter is installed to record the volume of all water supplied to the landscape through a service connection dedicated to irrigation.

Reason: This proposal adds a short, voluntary appendix to the IRC containing requirements that will enhance the water efficiency of dwellings subject to the code. The language of this appendix is NOT mandatory unless, and to the extent, specifically referenced in the adopting ordinance or regulation of the jurisdiction.
The purpose of the proposal is to offer enhanced water efficiency provisions applicable to one- and two-family homes in code language for consideration by jurisdictions using the IRC. The ICC offers enhanced or "stretch code" provisions for *large* buildings in the International Green Construction Code (IgCC), but the IgCC does NOT apply to low-rise residential buildings. The ICC also offers "green" building standards for residential buildings of all sizes in ICC 700, the *National*

Green Building Standard. However, ICC 700 is a points-based rating system, NOT code language, and the practices in its chapter on water efficiency are not mandatory. This new appendix will fill this gap, allowing jurisdictions that customarily use the IRC the opportunity to consider enhanced water efficiency requirements in familiar code format.

The proposal is intentionally brief, focusing on three areas of water consumption where enhanced performance criteria are well-known, and that together are responsible for the great majority of single-family residential water use in nearly all jurisdictions -- plumbing products, water softening, and landscape irrigation.

* Plumbing products: Requirements are based on performance levels established by the US EPA *WaterSense* Program for water closets, lavatory faucets, and showerheads, and by the 2016 California Green Building Standards Code (CalGreen) for kitchen faucets. These provisions are all found in IgCC 2015 as well, in Table 702.1, applicable to residential occupancies covered by that code.

* Water softeners and treatment devices: These requirements for water use and salt efficiency (an important consideration for maintaining water quality and the ability to beneficially recycle municipal wastewater) were all included in section 704 of IgCC 2015, and are adopted here for applicability to the one- and two-family homes covered by the IRC. Water consumption during regeneration and salt efficiency are considered "elective performance claims" under NSF 44, and must be verified by test procedures laid out in section 711 of that standard. The requirements for demand-initiated regeneration and salt efficiency have been mandatory requirements for all residential water softeners installed in California since 2002.

* Automatic irrigation systems: These requirements are also drawn from the IgCC, where landscape metering requirements are specified in section 701.2.1 and other irrigation system requirements are laid out in section 404.1.2. Although the IgCC requires separate metering for irrigated landscapes of all sizes, a less stringent requirement may be appropriate for single-family residences. This proposal limits the metering requirement to residential landscapes of 5,000 square feet or more, the threshold of applicability for landscape metering contained in the California Code of Regulations,Title 23, Chapter 2.7, also known as the Model Water Efficient Landscape Ordinance (MWELO). MWELO also requires that irrigation controllers in all newly permitted landscape installations in California be either weather-based or soil moisture sensor-based, as required in this proposal. Note that the requirements of section AU105 are only applicable to permanent irrigation systems with automatic controls, and have no applicability to hose-end sprinklers.

Terms that are not otherwise defined in the IRC are included in a definitions section of the appendix. The definitions have been drawn variously from the IgCC, MWELO, the IAPMO Green Plumbing and Mechanical Code Supplement, and NSF 330.

It should be noted that when considering this voluntary appendix, adopting jurisdictions are free to adopt the appendix in its entirety, but may adopt any individual provision of their choosing that they find most relevant to local conditions and most practical for enforcement. Each element of the proposal stands on its own. The scope of the proposal has also been drafted in such a way as to highlight its applicability to project types (new buildings, additions to buildings, and alterations) and allow adopting jurisdictions full latitude to narrow the scope in that regard should they so choose.

Each successive year brings new evidence of the impacts of our changing climate, and significant among these impacts are greater extremes and frequency of both droughts and floods. The hydrological record of the last 100 years has become less useful as a predictor of water supply reliability. Few can doubt that efficient water use will become even more important in the decades ahead than it is today. Residential water use typically constitutes 60 to 65% of all publicly supplied drinking water, and the majority of residential use is found in single-family homes. For all these reasons, the IRC would be made more valuable to jurisdictions throughout the country if it included enhanced water efficiency criteria in clear code language for voluntary adoption.

Bibliography:

American Water Works Association/Raftelis Financial Consultants Inc., *2016 Water and Wastewater Rate Survey*

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National Association of Homebuilders, ICC/ASHRAE 700-2015, *National Green Building Standard*

NSF International, NSF/ANSI 44-2016, *Residential Cation Exchange Water Softeners*

NSF International, NSF/ANSI 330-2015, Glossary of Drinking Water Treatment Unit Terminology

International Association of Plumbing and Mechanical Officials, *2015 Green Plumbing & Mechanical Code Supplement*

California Department of Water Resources, *Model Water Efficient Landscape Ordinance*, California Code of Regulations, Title 23, Chapter 2.7, www.water.ca.gov/wateruseefficiency/landscapeordinance/docs/Title 23 extract - Official CCR pages.pdf

California Energy Commission, "Staff Analysis of Water Efficiency Standards for Showerheads," Docket Number 15-AARR-05, p. 13, August 7, 2015, http://docketpublic.energy.ca.gov/PublicDocuments/15-AAER-05/TN205654_20150807T151426_Staff_Analysis_Of_Water_Efficiency_Standards_For_Showerheads.pdf

California Energy Commission, "Staff Analysis of Lavatory Faucet Appliance Standards," Docket Number 15-AAER-05, July 24, 2015, http://docketpublic.energy.ca.gov/PublicDocuments/15-AAER-05/TN205513_20150724T152718_Staff_Analysis_of_Lavatory_Faucet_Appliance_Standards.pdf

California Legislative Information, California Health and Safety Code, §§ 116775-116795

US Environmental Protection Agency, *WaterSense* Program, www.epa.gov/watersense/technical-specifications

Cost Impact: The code change proposal will not increase or decrease the cost of construction

The proposal offers enhanced water efficiency specifications for voluntary adoption by jurisdictions using the IRC. As such, there is no general impact on users of the IRC.

The content of this voluntary appendix establishes enhanced efficiency criteria for plumbing products, water softeners, and certain landscape irrigation equipment.

Regarding plumbing products, products are widely available from multiple manufacturers. Based on US EPA *WaterSense* product listings, as of September 2017 there are over 3,100 models of tank-type toilets, over 15,000 models of lavatory faucets, and nearly 6,000 models of showerheads that meet the criteria in this proposal. Although prices for plumbing products vary widely, based on considerations of style, color, and trim, there is no price premium attached to higher water use efficiency *per se*. See, for example, the staff reports of the California Energy Commission on standards for lavatory faucets and showerheads that found no price premium for products performing at the level proposed in this voluntary appendix.

Regarding water softeners, costs vary widely, but much of this difference is due to capacity, rather than efficiency of performance. The key criteria in this proposal have been statewide requirements for residential water softeners in California since 2002. As such, compliant products are widely available from multiple manufacturers. By way of illustration, as of this writing, the least expensive residential cation exchange water softener now available from Lowes fully complies with all criteria in this proposal (http://pdf.lowes.com/installationguides/090259891214_install.pdf), as does the least expensive cation exchange water softener available from Home Depot (https://www.homedepot.com/b/Kitchen-Water-Filters-Water-Softeners/N-5yc1vZaq3y/Ntk-semanticsearch/Ntt-water+softener?NCNI-5).

Regarding irrigation controllers, prices also vary widely, with a major driver being the number of zones controlled by the controller. Some 800 models of irrigation controllers have been certified to the *WaterSense* specification for weather-based irrigation controllers, so supply and choice of compliant products are ample. Smart controllers are now required for all newly permitted landscape installations in California, ensuring continued competitive interest in this product area.The prevailing price differential between a timer-based controller and a smart controller meeting the criteria of this proposal has been around $100. But several products are on the market that cut this differential in half, and at least one weather-based irrigation controller is now on the market at a price comparable to a timer-based controller.

When products meet enhanced criteria for water efficiency, costs are typically recouped by savings on water and/or sewer charges over the life of the product. According to the *2016 Water and Wastewater Rate Survey*, over the last decade, water charges have annually increased by 5.34 % and wastewater charges have annually increased by 5.98 %, far exceeding the annual inflation rate of 2.07 % for that period. These trends are expected to continue, underscoring the cost-effectiveness of installation of water-efficient products.

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Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Even though this would be an "above code" appendix, there is concern that if a jurisdiction adopts, there could be drainage (sewer) problems with lesser flows being discharged. Discussions about lowering flow rates in the body of the code raised similar concerns. (Vote:6-4)

Assembly Action: **None**

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Individual Consideration Agenda

Public Comment 1:

Proponent: Craig Conner, representing self (craig.conner@mac.com)requests As Modified by This Public Comment.

Replace as follows:

2018 International Residential Code

APPENDIX **U**

Water Efficiency

AU101.1

Maximum flow and water consumption.

The maximum water consumption flow rates and quantities for plumbing fixtures and fitting shall be in accordance with Table AU101.1.

TABLE U101.1

MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY
Lavatory faucet	1.5 gpm at 60 psi
Shower head[a]	2.0 gpm at 80 psi
Sink faucet[c]	1.8 gpm at 60 psi
Water closet	1.28 gallons per flushing cycle

For SI: 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa

a. A handheld shower spray shall be considered to be a shower head.

b. Consumption tolerances shall be determined from referenced standards.

c. Kitchen faucets shall be permitted to have a temporary increase in flow to not exceed 2.2 gpm provided that upon either the user s physical release of the increased flow activation mechanism or the user's closure of the faucet valve, the faucet reverts to the flow indicated in the table

Commenter's Reason: The faucet flow rate, shower head flow rate, and water closet flush volumes in the table are broadly available with no incremental cost. This is a good option for any jurisdiction that has water availably issues, or water treatment volume issues. Using efficient fixtures and fittings is far less expensive than building new facilities or otherwise trying to supply water for new construction.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction

These fixtures and fittings are broadly available as a no cost option, therefore this change will not increase or decrease the cost of a new home.

For municipaltiies with water supply shortages, water pumping volume limitations or water treatment volumes issues this may limit their future costs. In addition water supply, water pumping and wastewater treatment are usually the largest municipal energy costs. This change may help moderate those costs.

Public Comment 2:

Proponent: Ed Osann, representing Natural Resources Defense Council (eosann@nrdc.org)requests As Submitted.

Commenter's Reason: State and local code officials would be better served if this proposal is adopted as submitted. The proposal consists of a brief voluntary appendix containing several water efficiency measures in code language, specifically for plumbing products, water softeners, and certain landscape irrigation equipment. Each of these measures has been previously approved by the ICC voting membership in the adoption of successive editions of the International Green Construction Code. However, the IgCC is applicable to large building projects, not the one- and two-family homes covered by the IRC. IAPMO offers a compendium of above-code water efficiency measures for voluntary code adoption applicable to single-family construction, but there is no parallel in the ICC family of codes. Thus this proposal fills a gap, for the benefit of state and local jurisdictions that customarily use the IRC. The technical committee offered no explanation for maintaining the availability of voluntary water efficiency code language for large projects covered by the IgCC, but their recommended denial of publication of similar voluntary provisions in the IRC.
In its reason statement, the committee speculated about drainage flows in sanitary collection systems, which is a utility-specific issue that jurisdictions considering adoption of the appendix can consider through local review and public comment. The provisions in the appendix are well known for reducing unnecessary or excessive water use, The US Geological Survey recently reported that residential water use in the US was 82 gallons per capita per day in 2015. The proposals in the appendix relating to plumbing fixtures could, on average, reduce per capita indoor water use by about 8 to 10 gallons per day, leaving ample discharges for sanitary collection and transport of waste. Nevertheless, as a voluntary appendix, state and local officials are free to adopt any portion of the appendix, alone or in combination. Some jurisdictions may choose to adopt only the landscape irrigation efficiency measures, which have no impact on sanitary collection systems at all. They should have that opportunity, by approval of the proposal as submitted.

Bibliography: Dieter, et al, *Estimated Use of Water in the United States in 2015*, Circular 1441, US Geological Survey, June 2018, p. 22..

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
The code change proposal will not increase or decrease the cost of construction . The proposal offers enhanced water efficiency specifications for voluntary adoption by jurisdictions using the IRC. As such, there is no general impact on users of the IRC.

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