

Statement of Professional Interest Regarding the State Plumbing Code (248 CMR 10.00)

Boston Society of Architects Codes Committee
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The American Institute of Architects – Massachusetts Chapter
Attn: John Nunnari, Executive Director
290 Congress Street Suite 200
Boston, MA 02210

Dear Executive Director Nunnari,

As a practicing architect, a former member and chair of the American Institute of Architects' (AIA) National Codes & Standards Committee, and presently a co-chair of the Boston Society of Architects' (BSA) Codes Committee, I submit to you the following narrative in support of the Commonwealth of Massachusetts' Board of Building Regulations and Standards' (BBRS) and Board of State Examiners of Plumbers and Gas Fitters' mutual consideration for replacing the content of 248 CMR 10.00 Uniform State Plumbing Code with a model plumbing code; the International Code Council's (ICC) *International Plumbing Code (IPC)* or the International Association of Plumbing and Mechanical Officials' (IAPMO) *Uniform Plumbing Code (UPC)*. This analysis identifies perceived deficiencies in the existing plumbing code, corresponding solutions as presented in each model plumbing code, and acknowledges the value for amending said model codes to maintain key portions of the existing State Plumbing Code. This is an opportunity to strengthen alignment with the Massachusetts State Building Code - 780 CMR (and by extension the *International Building Code (IBC)* and the *International Residential Code (IRC)*), address issues of clarity, and improve the Design Professional's ease of use; it is not an exhaustive technical comparison of the three plumbing code documents. Furthermore, upon considering logistical factors beyond the physical content of the two (2) model plumbing codes, a recommendation is made for the adoption and promulgation of the *International Plumbing Code*.

The AIA *Directory of Public Policies and Position Statements*¹ as amended by the Board of Directors in May 2019 contain "statements of belief to policy-makers, the public, and the construction industry on issues of public policy affecting the membership, the profession of architecture, or the American Institute of Architects" and go on to "elaborate... or apply them to specific conditions." Citing Part II: The Practice, with emphasis added:

- A. **Public Policy: Construction Industry Regulation:** Regulation of the construction industry shapes the built environment. As industry leaders and stakeholders, architects must participate in the development and application of appropriate regulations and standards intended to protect the health, safety, and welfare of the public.

Supporting Position Statements

1. The AIA supports **regulation by a single set of comprehensive, coordinated, and contemporary building codes and standards** that establish sound threshold values of health, safety, and the protection of the public welfare throughout the United States and abroad. To that end, **the AIA espouses the development and adoption of model building codes** that:

¹ http://content.aia.org/sites/default/files/2019-05/Directory_of_Public_Policies_and_Position_Statements.pdf

- Include participation by architects and the public in a consensus process;
- Are the product of informed education and research;
- Are without favoritism or bias to any special interest;
- Include provision for a prompt appeals procedure for all that might be aggrieved;
- Are cost-effective in relation to public benefit; and
- Promote building code provisions that set performance rather than prescriptive criteria.

Insofar as ICC and IAPMO engage in consensus-based code development processes, and all other criteria described by the AIA Position Statement are satisfied, migration to either the IPC or the UPC is preferable to a home-grown code.

Both the IPC and UPC require amendment to align their Reference Standards with those adopted and promulgated in the Commonwealth. These include at a minimum:

- References to the *International Fuel Gas Code (IFGC)* in the IPC, or Chapter 12 of the UPC replaced with 248 CMR for gas-fired appliances and 527 CMR 1.05 Section 11.5 for heating oil-fired appliances as otherwise described in 780 CMR Section 101.4.1.
 - Insofar as the aforementioned Massachusetts provisions adopt by reference National Fire Protection Association (**NFPA**) 54: National Fuel Gas Code, NFPA 58: Liquefied Petroleum Gas Code, NFPA 85: Boiler and Combustion Systems Hazards Code, and NFPA 86: Standard for Ovens and Furnaces, and these standards derive from a comparable consensus-based development process as those previously described, no recommendation is made at this time to reconsider the regulation of fuel gas appliances within the Commonwealth.
- References to the *International Property Maintenance Code (IPMC)* in the IPC replaced with 780 CMR and within the jurisdiction of the building official as otherwise described in 780 CMR Section 101.4.4.
- References to the *International Swimming Pool and Spa Code (ISPSHC)* in the IPC and the *Uniform Swimming Pool, Spa, and Hot Tub Code (USPSHTC)* in the UPC replaced with 105 CMR 435, the State Sanitary Code Chapter V: Sanitary Standards for Swimming Pools.
 - Though beyond the scope of this document, there is an anomaly in the PDF version² of the 780 CMR Chapter 1 – Scope and Administration – Amendments pertaining to the regulation of swimming pool design. Page 1 of 23 includes preliminary content identifying “the new ninth edition code is based on modified versions of the following **2015 International Codes as published by the International Code Council (ICC)**” including the *International Swimming Pool and Spa Code*. Further scrutiny of Chapter 1, specifically the subsections of Section 101.4 Referenced Codes show no further indication of the adoption or promulgation of this model code.
- References to ICC A117.1 *Accessible and Usable Buildings and Facilities* replaced with the 521 CMR Architectural Access Board regulations.

Within 248 CMR 10.03 Definitions, please refer to three (3) issues of concern:

1. **Content:** The words defined in the State Plumbing Code require housekeeping for numerous reasons; the examples provided are illustrative of the concerns, not an exhaustive study of all such definitions.
 - a. **Obsolete Definitions:** Word that do not appear in the body of 248 CMR 10 in any location beyond the definition, possibly as a result of former revisions (i.e. *Durham System*).
 - b. **Incomplete Definitions:** Words whose definitions create ambiguity (i.e. *Diameter* insofar as there is no distinction between whether the commercially designated nominal dimension pertains to the interior or exterior measurement).
 - c. **Superfluous Definitions:** Words that are either beyond the scope of a plumbing code (i.e. *Fire Line*), those whereby an ordinary meaning is sufficient (i.e. *Genetics*) or those whereby distinction is potentially unnecessary (i.e. *Bathroom (Residential)* vs. *Bathroom (Half-bath)*).
 - d. Disparities between the State Plumbing Code definitions and those appearing in either the IPC or the UPC are guaranteed. The State will require further study to decide where to add, delete, or amend definitions in the new model code.

² <https://www.mass.gov/doc/780-cmr-ninth-edition-base-code-chapter-1-scope-and-administration-amendments/download>

- i. In many cases, equivalent definitions between the codes already exist (i.e. MA's *Fixture Unit* to the IPC's *Drainage Fixture Unit*).
 - ii. New definitions or pointers may be important for Design Professionals where the model code utilizes differing language (i.e. 248 CMR 10.16(2) regarding bow venting is tantamount to the IPC Section 916 regarding Island Fixture Venting).
2. **Formatting:** The State Plumbing Code provides definitions in Sections 10.03, 10.18 (2), 10.19 (1), and 10.20 (2) rather than in a single, consolidated location.
 - a. Both the IPC and the UPC provide all definitions in one (1) location, respectively in Chapter 2 of each.
3. **Design Professional's Use:** The State Plumbing Code assigns no hierarchy of significance to the definitions provided within the body of the code provisions; there is no means for recognizing when or if a given word is assigned a specific meaning at any time. A Design Professional must theoretically verify all words within a given code provision for alignment with Section 10.03 first, prior to relying upon conventional definitions or their own interpretation.
 - a. The IPC, as with all codes within the ICC library, use a system of italicizing keywords throughout the document to signal the Design Professional when to apply a specific definition from Chapter 2.
 - b. This shortcoming also pervades the UPC.

Within primarily 248 CMR 10.06 Materials and to a lesser extent elsewhere in the State Plumbing Code, the identification of Reference Standards varies drastically in regard to proper citation and year of publication, thus complicating the Design Professional's Use. Please consider the following examples wherein emphasis is added for clarity, and rhetorical questions posed in response:

- 248 CMR 10.06 (2)(e)(2) [Cleanouts] "Shall **meet the latest Standards.**"
 - To what Standard shall this conform? No Standards Developing Organization (SDO) is cited.
- 248 CMR 10.06 (2)(g)(4) "Copper alloy tubing "Heavy" weight **conforming to ASTM Standard**, color coded aqua and incised..."
 - To what ASTM Standard shall this conform? According to the ASTM International website³ they publish over 12,500 standards globally.
- 248 CMR 10.06 (2)(m)(6)(b) "The coupling housings and fittings are cast of malleable galvanized iron **as described in ASTM A-47** or all products that **meet the requirements of ASTM A-269.**"
 - While these two citations of Referenced Standards are better than the prior examples, what year of publication is intended or shall the Design Professional always assume it the most recent?
- Both the IPC and the UPC cite Reference Standards specifically within each section pertaining to a plumbing component or assembly with no examples of incomplete citations found. Furthermore, each provide the year of publication for said Reference Standards within a dedicated chapter (15 in the IPC and 17 in the UPC).

Within 248 CMR 10.10 Plumbing Fixtures, please refer to three (3) issues of concern:

1. **Design Professional's Use:** The State Plumbing Code Table 1 "Minimum Facilities for Building Occupancy" derives the basis for establishing occupancy in 248 CMR 10.10 (18)(2) whereby, "when determining the number of plumbing fixtures [for a Building Occupancy Other than Residential] **after the population has been established by the authority having jurisdiction**, should a fraction occur, round up to next fixture." The subjective nature of the calculation relies upon the mutual agreement of the Design Professional and the Building Official, without direct correlation to the Design Occupant Load established within 780 CMR Chapter 10. The manner of deriving the population may differ from Professional to Professional, and the Building Officials may exercise discretion differently from jurisdiction to jurisdiction.
 - a. The determination of the number of occupants for plumbing fixtures is based upon the Design Occupant Load calculated in the IBC for applications in the IPC, and the same holds for the UPC.
 - b. Insofar as IBC Table 1004.1.2 "Maximum Floor Area Allowances per Occupant" provides an empirical method for calculating a Design Occupant Load in relation to means of egress sizing, the aforementioned subjectivity is eliminated. Where IBC Section 1004.2 enables the Design Professional to increase the

³ <https://www.astm.org/ABOUT/overview.html>

Design Occupant Load within specific parameters, no language articulates criteria for permitting a reduction to the calculated Design Occupant Load.

- c. In response to concerns described by members of the BSA Codes Committee associated with changes to the calculated minimum number of plumbing fixtures for an occupancy, consider the following examples⁴:

Occupancy: A-1 Theatre 500 People (250 M 250 F)	248 CMR 10	IPC 2015	UPC 2015
Requirement of Toilets (Water Closets)	Male: 1 per 60 Female: 1 per 30	Male: 1 per 125 Female: 1 per 65	Male: 3 for 201-400 Female: 6 for 201-300
Fixture Calculation	Male: 4.17 (5) Female: 8.33 (9)	Male: 2 Female: 3.85 (4)	Male: 3 Female: 6
Total Number of Fixtures	16 – The Most	(6) – The Least	9

Occupancy: A-1 Theatre 500 People (250 M 250 F)	248 CMR 10	IPC 2015	UPC 2015
Requirement of Lavatories	Each Sex: 1 per 100	1 per 200	Male: 2 for 201-400 Female: 4 for 201-300
Fixture Calculation	Male: 2.5 (3) Female: 2.5 (3)	Male: 1.25 (2) Female: 1.25 (2)	Male: 2 Female: 4
Total Number of Fixtures	6 – The Most	(4) – The Least	6 – The Most

Occupancy: M Retail Store 150 People (75 M 75 F)	248 CMR 10	IPC 2015	UPC 2015
Requirement of Toilets (Water Closets)	Male: 1 per 20 Female: 1 per 20	1 per 500	Male: 1 for 1-100 Female: 1 for 1-100
Fixture Calculation	Male: 3.75 (4) Female: 3.75 (4)	Male: 0.15 (1) Female: 0.15 (1)	Male: 1 Female: 1
Total Number of Fixtures	(8) – The Most	(2) – The Least	2 – The Least

Occupancy: M Retail Store 150 People (75 M 75 F)	248 CMR 10	IPC 2015	UPC 2015
Requirement of Lavatories	Each Sex: 1 per 40	1 per 750	Male: 1 for 1-200 Female: 1 for 1-200
Fixture Calculation	Male: 1.88 (2) Female: 1.88 (2)	Male: 0.1 (1) Female: 0.1 (1)	Male: 1 Female: 1
Total Number of Fixtures	(4) – The Most	(2) – The Least	2 – The Least

2. Content:

- a. The State Plumbing Code Table 1 is out of alignment with the Use and Occupancy Classifications described in 780 CMR Chapter 3. Examples include, but may not be limited to:
- i. A restaurant per 780 CMR Chapter 3 is considered an Assembly Group A-2 occupancy; the State Plumbing Code Table 1 mistakenly classifies the same as an Assembly Group A-3 occupancy.
 - ii. A house of worship per 780 CMR Chapter 3 is considered an Assembly Group A-3 occupancy; the State Plumbing Code Table 1 mistakenly classifies the same as an Assembly Group A-4 occupancy.
 - iii. A pool / fitness center per 780 CMR Chapter 3 is considered either an Assembly Group A-3 or an A-4 occupancy depending on the circumstances; the State Plumbing Code Table 1 mistakenly classifies the same as an Assembly Group A-5 occupancy.

⁴ The sample tables as provided establish an equivalent design occupant load as considered by the State Plumbing Code, the IPC, and the UPC, without recognition of a necessary down-sampling of the State Plumbing Code population insofar as there is no prescriptive basis for such calculation.

- iv. A medical / health care building per 780 CMR Chapter 3 is considered within the Institutional Group I occupancies based on the nature of the facility; the State Plumbing Code Table 1 mistakenly classifies the same as a Business Group B occupancy without the requisite subtlety.
 - v. Both IPC Table 403.1 and UPC Table 422.1 are strongly in alignment with the State Building Code.
 - b. Though subject to debate, the provisions of 248 CMR 10.10 and Table 1 pose cases of unnecessarily stringent prescriptive requirements, some without consideration for specialized circumstances related to the building's use, and potentially leading to a greater need for Design Professional's to seek consideration via the Board of State Examiners of Plumbers and Gas Fitters. Examples include:
 - i. Employee (Industrial Factory / Warehouse and Similar Usage) requires 1 urinal per 40 male occupants, a prescriptive number compared to all other occupancies in Table 1 whereby urinals are regulated as an allowable percentage of replacements for male-designated toilets.
 - 1. No inconsistency exists in IPC Table 403.1.
 - 2. UPC Table 422.1 is perhaps more laborious than the State Plumbing Code insofar as there are more examples of mandatory urinal requirements, and these are further refined by Footnote 4.
 - ii. Employee (Industrial Factory / Warehouse and Similar Usage) requires 1 bath or shower per 15 occupants regardless of the nature of the actual operations of the facility.
 - 1. IPC Table 403.1 clarifies the requirement as pertaining to emergency showers and eyewash stations conforming to ANSI/ISEA Z358.1.
 - 2. UPC Table 422.1 is more closely aligned with the State Plumbing Code but conditions the requirement as pertaining to occupants "exposed to excessive heat or to skin contamination with poisonous, infectious or irritating material."
 - iii. Service sinks are not required in (Nightclubs, Pubs), Restaurants, (Hall, Museum, Libraries, etc.), Houses of Worship, Stadiums, (Pool / Fitness Centers), or Detention Facilities.
 - 1. Both IPC Table 403.1 and UPC Table 422.1 feature few occupancies that omit a service sink requirement.
 - c. Ultimately some degree of amending either model code is required. Existing requirements in the State Plumbing Code such as those pertaining to privacy shielding at urinals, greater allowances for drinking water stations without a drain, and specialized fixtures (i.e. sacraria) are desirable.
3. Formatting:
- a. The State Plumbing Code Table 1 is inconsistently organized according to alphabetical order pertaining to the Use Group. It is disruptive to a Design Professional to proceed from A-1 through A-5, to jointly E and I-3, to the R occupancies, back to E, to F, to I, to M, back to B, again back to M, and concluding with A.
 - i. Both the IPC and the UPC follow alphabetically in order from the A Groups through the S Groups.

Tangential to the issues pertaining to the calculation of minimum required plumbing fixtures for new occupancies, there is ambiguity and subjective regulation with regard to the same for work affecting existing buildings. This arises from a nuanced internal conflict between 780 CMR and 248 CMR 10.00. From an administrative perspective, 248 CMR 10.00, the IPC, and the UPC all provide equivalent language to the effect that, "plumbing systems lawfully in existence at the time of the adoption of [said] code shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and hazard to life, health or property is not created by such plumbing system⁵." Where the model plumbing codes themselves are effectively silent regarding further implications for new work affecting existing facilities by deference of regulation to the Building Code (IBC Chapter 34: *International Existing Building Code (IEBC)*), 780 CMR 34.00 amends Section 101.2(3) whereby "requirements... for plumbing... shall be replaced by the requirements of the Massachusetts specialty codes, as indicated in 780 CMR 1.00..." The cascading effect is the loss of clear provisions for the Design Professional affecting:

- Level 2 Alterations (2015 IEBC Section 810.1), "where the occupant load of the story is increased by more than 20 percent, plumbing fixtures for the story shall be provided in quantities specified in the *International Plumbing Code* based on the increased occupant load;"

⁵ This excerpt is from the 2015 IPC Section 102.2. See also 2015 UPC Section 102.2.

- Level 3 Alterations (Section 901.2) where, “in addition to the provisions of this chapter, work [inclusive of plumbing alterations] shall conform with all of the requirements of Chapters 7 and 8;”
- Change of Use (Section 1010), “where the occupancy of an *existing building* is changed such that the new occupancy is subject to increased or different plumbing fixture requirements or to increased water supply requirements in accordance with the *International Plumbing Code*, the new occupancy shall comply with the intent of the respective *International Plumbing Code*,” and,
- Additions (Section 1101.2) where said work, “shall not create or extend any nonconformity in the *existing building* to which the *addition* is being made with regard to... plumbing... systems.”

The counterpoint as described in 248 CMR 10.04 (2)(b)(4)(a) with emphasis added; “deviations from the provisions of 248 CMR may be permitted in existing buildings or premises where plumbing installations are to be altered, repaired, or renovated. **The deviations shall be negotiated by the Permit Holder and the Inspector prior to the installation.** The deviations may be allowed provided that the deviations are found to be necessary and conform to the scope and intent of 248 CMR 10.00.” The mechanism for establishing consistent, reliable administration again relies upon the ability of the Design Professional to articulate their opinion poised against the discretion of the Authority Having Jurisdiction (**AHJ**). Transitioning to a model plumbing code facilitates the removal of the existing amendment that deletes the IEBC provisions, provides reasonable considerations for alterations to existing facilities that do not significantly increase the occupant load or increase demand, and eliminates another area where subjectivity may supersede clarity.

Within 248 CMR 10.17 Storm Drains, there appears to be an omission. Despite clear language for the design of horizontal storm drains, vertical storm drain conductors, and outside leaders, there is no information regarding the sizing or installation of horizontal gutters.

- Gutter design is described in IPC Table 1106.6 and in UPC Table 1103.3 albeit with rainfall rate information described separately in Appendix D.

The adoption of a model code should not preclude the migration of important content appearing in the State Code that would otherwise be lost. Four (4) criteria identified are:

1. Scoping & Administration: Chapter 1 of the model codes is typically deleted by the AHJ or substantially amended. 248 CMR Section 10.01 Scope and Jurisdiction, 10.02 Basic Principles, and 10.04 Testing and Safety describe most of this content already.
2. Gender-Neutral Language: 248 CMR includes a definition for and provisions pertaining to the design of gender-neutral facilities. The model codes largely avoid directly addressing this subject, though recent changes thereto may do so indirectly⁶. Increasingly AHJs are challenged to reconsider longstanding design philosophies pertaining to gender as they relate to building design, and local amendments ensue. As a subject of strong opinions and social debate, the recommendation is for amending language as necessary that both upholds human dignity alongside the design intent of the model code.
3. General Provisions: Some content within the State Plumbing Code is out of alignment with one or both of the model codes under consideration. State consideration with consultation by plumbing engineers, licensed plumbers, and other subject matter experts must weigh the value of preserving existing prescriptive requirements against the differing requirement set by the model code. Examples include but are not limited to:
 - a. Hot Water: 248 CMR 10.02 and Section 210.0 of the UPC set the temperature for hot water as 120°F or above, while Chapter 2 of the IPC sets the temperature at 110°F or above.
 - b. Peppermint Test: 248 CMR 10.04 prescribes conditions for conducting a Peppermint Test on a Drainage and Vent System (DVS); there does not appear to equivalent language in either model code.
 - c. Fixture Values and Trap Sizing: A side-by-side comparison of 248 CMR 10.08 Table 1 and Table 10.15 with IPC Table 709.1 and UPC Table 702.1 illustrates the lack of universal agreement in setting prescriptive criteria.
 - d. Storm Drainage: 248 CMR 10.17 bases storm drainage design on a maximum rainfall rate of 4 inches per hour, whereas IPC Figure 1106.1 is based on a 100-year hourly rainfall map with considerably lower values. UPC Appendix D is comparable to the IPC.

⁶ https://www.architectmagazine.com/practice/an-unexpected-ally-in-gender-neutral-restrooms-building-codes_o

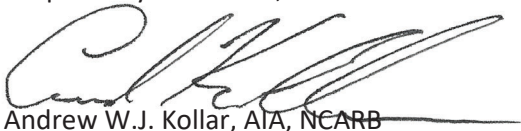
4. Highly Technical or Specialized Content: Some content within the State Plumbing Code is more detailed and thorough than that appearing in one or both of the model codes; it should be preserved except where there is a suitable alternative in the model code such as via a Referenced Standard. Examples include but are not limited to:
 - a. 248 CMR 10.13 Piping and Treatment of Hazardous Wastes;
 - b. 248 CMR 10.18 Hospital Fixtures;
 - c. 248 CMR 10.19 Plumbing Fixtures in Manufactured Homes and Construction Trailers;
 - d. 248 CMR 10.21 Boiler Blow-Off Tank; and,
 - e. 248 CMR 10.23 Vacuum Drainage Systems.

Lastly, please consider two (2) matters of logistical value:

1. Model Code Adoption: With the Commonwealth of Massachusetts being a smaller state, and the historical ties between all states in the New England region, it is not unreasonable to speculate that Design Professionals may seek reciprocity to practice in multiple jurisdictions. The more consistently the same codes are adopted and promulgated across these borders, the easier it is for a Design Professional to render a high Standard of Care in their practice. Proceeding otherwise is inherently antagonistic and discouraging to that goal. According to the ICC Adoption Map⁷ dated 19 December 2018, the IPC is in use or adopted in 35 states, the District of Columbia, Guam, and Puerto Rico. According to a May 2014 Model Code Adoption Map published by Innovation in Urban Water Systems⁸ there are comparably eight (8) states administering the UPC at either the state or local levels (AK, CA, HI, OR, MT, ND, SD, WA), and two (2) wherein either the IPC or UPC is administered at the local level (MO, NM). The remaining seven (7) states administer an “other” or home-grown code. Within the Commonwealth’s immediate sphere, the influence of IAPMO is primarily within Maine where their Internal Plumbing Code is largely based on the 2009 UPC and in New Jersey where their National Standard Plumbing Code (**NSPS**) is administered. To encourage Design Professionals to practice across state borders with our neighbors, and with nearly all states east of the Mississippi River not adopting an IAPMO model code, the IPC is a sounder investment.
2. Quality of Model Codes in the Public Domain: Design Professionals may access either the IPC or the UPC through their publisher’s website at no expense. Paid versions are available but not evaluated herein. The free-version of each model code have limitations, most notably an inability to copy text, or highlight text. Both include a table of contents in a separate navigation bar along the left side allowing users to advance to either a chapter or specific subsection. The ICC website will allow a keyword search (CTRL + F) of an IPC chapter, whereas the IAPMO website cannot. The IPC website bears no watermarks, whereas the UPC website features a distractingly large watermark on every page. As a Design Professional, the ICC’s free-version of the IPC online is easier to read, navigate, and use than the IAPMO equivalent for the UPC.

The transition from 248 CMR 10.00 Uniform State Plumbing Code to a model code is an important milestone the Commonwealth of Massachusetts is ready to achieve. This action benefits Design Professionals, and aligns with the policy positions of our professional organization, the American Institute of Architects. With each model code described in this narrative deserving of fair consideration, our recommendation is for the adoption and promulgation of the ICC International Plumbing Code with State amendments. The basis for this decision is the holistic nature of the ICC code-development process, the quality of the technical content, the accessibility of the publicly available online document, and the ease with which practitioners may translate their knowledge of this document across our region.

Respectfully submitted,



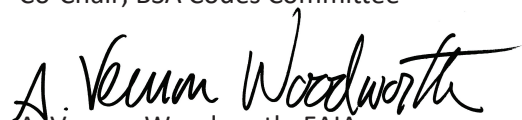
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⁷ https://www.iccsafe.org/wp-content/uploads/Code_Adoption_Maps.pdf, Page 5 of 16.

⁸ <https://sfwater.org/modules/showdocument.aspx?documentid=5609>