IPC

2024 GROUP A PROPOSED CHANGES TO THE I-CODES

Committee Action Hearings (CAH #2)
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ICC
INTERNATIONAL CODE COUNCIL®

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P1-24

IPC: SECTION 202

Proposed Change as Submitted

Proponents: Guy McMann, Jefferson County Colorado, CAPMO (gmcmann@jeffco.us)

2024 International Plumbing Code

Revise as follows:

BATHROOM GROUP. A group of fixtures consisting of a water closet, urinal, lavatory, bathtub or shower, including or excluding a bidet, an *emergency floor drain* or both. Such fixtures are located together on the same floor level.

Reason: There doesn't seem to be a technical reason to not include a urinal in a wet vented bathroom group. Currently, the fixture can't be included and is dealt with separately.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

Decrease in cost will be realized by not having to plumb the fixture separately .The estimated cost savings for a typical urinal installation is $100 to $250

Estimated Immediate Cost Impact Justification (methodology and variables):

.Material (pipe and fittings) $15 to $100 and the labor is $60 to $120 depending on the salary of the installer.

P1-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: A bathroom group of fixtures is meant to be used by a single occupant. Adding another fixture such as a urinal makes the group a multiple occupant use which could overload the wet vent system.. (14-0)

P1-24

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202

Proponents: Guy McMann, Jefferson County Colorado, CAPMO (gmcmann@jeffco.us) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

BATHROOM GROUP. A group of fixtures consisting of a water closet, ~~urinal,~~ lavatory, bathtub or shower, including or excluding a urinal or bidet, an *emergency floor drain* or both. Such fixtures are located together on the same floor level.

Reason: The committee was concerned of the placement of the word "urinal" so it is relocated to ad it as an option.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Decrease in cost will be realized by not having to plumb the fixture separately. The estimated cost savings for a typical urinsl installation is $100 to $250.

Estimated Immediate Cost Impact Justification (methodology and variables):

Material (pipe and fittings) $15 to $100 and the labor is $60 to $120 depending on the salary of the installer.

Comment (CAH2)# 73

P4-24 Part I

IPC: 305.4

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

305.4 Freezing. Water, soil and waste pipes shall not be installed outside of ~~a~~ the building~~, in attics or crawl spaces, concealed in outside walls, or in any other place subjected to freezing temperatures unless adequate provision is made to protect such pipes from freezing by insulation or heat or both~~ thermal envelope. Exterior water supply system piping shall be installed not less than 6 inches (152 mm) below the frost line and not less than 12 inches (305 mm) below grade.

Reason: The current code text is misleading to many including owners, contractors, and even design professional. Providing "heat, insulation, or both" give them the impression that there is a choice when the reality is the piping must remain in a space that has adequate heat to prevent freezing. Insulation can serve 1 of 2 purposes, it is used to prevent the loss of heat from a space or it is used to prevent the infiltration of heat into a space. The current text technically informs users that they could just provide insulation. More importantly, without direction that the piping must remain inside the thermal envelope, we have seen installations where heat and insulation were provided yet water lines still froze. In this situation, there was a bathroom that cantilevered over a portion of a an attached garage. The portion below the bathroom was provided with adequate space for insulation and was provided with a "heat run" into that space. It was discovered later after 2 consecutive years of freezing that the entire space had been filled with insulation, leaving no way for the heat to reach the pipe to keep them from freezing. Insulation along the perimeter and the bottom portion of the space would have kept the pipes within the building thermal envelope where they would not have frozen.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal just simplifies the language in the code and will not negatively or positively affect cost of construction.

P4-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proposed language needs to be improved for clarity. The proponent asked for disapproval. (13-0)

P4-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: 305.4

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

305.4 Freezing. Water, soil and waste pipes shall not be installed outside of the building thermal envelope<u>, unless protected with heat and insulation</u>. Exterior water supply system piping shall be installed not less than 6 inches (152 mm) below the frost line and not less than 12 inches (305 mm) below grade.

Reason: The current code text is misleading to many including owners, contractors, and even design professional. Providing "heat, insulation, or both" give them the impression that there is a choice when the reality is the piping must remain in a space that has adequate heat to prevent freezing. Insulation can serve 1 of 2 purposes, it is used to prevent the loss of heat from a space or it is used to prevent the infiltration of heat into a space. The current text technically informs users that they could just provide insulation. More importantly, without direction that the piping must remain inside the thermal envelope, we have seen installations where heat and insulation were provided yet water lines still froze. In this situation, there was a bathroom that cantilevered over a portion of a an attached garage. The portion below the bathroom was provided with adequate space for insulation and was provided with a "heat run" into that space. It was discovered later after 2 consecutive years of freezing that the entire space had been filled with insulation, leaving no way for the heat to reach the pipe to keep them from freezing. Insulation along the perimeter and the bottom portion of the space would have kept the pipes within the building thermal envelope where they would not have frozen.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal just simplifies the language in the code and will not negatively or positively affect cost of construction.

Comment (CAH2)# 384

P4-24 Part II

IRC: P2603.5

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Residential Code

Revise as follows:

P2603.5 Freezing. In localities having a winter design temperature of 32°F (0°C) or lower as shown in Table R301.2 of this code, a water, soil or waste pipe shall not be installed outside of ~~a~~ the *building*~~, in exterior walls, in *attics* or *crawl spaces*, or in any other place subjected to freezing temperature unless adequate provision is made to protect it from freezing by insulation or heat or both~~ thermal envelope. Water service pipe shall be installed not less than 12 inches (305 mm) deep and not less than 6 inches (152 mm) below the frost line.

Reason: The current code text is misleading to many including owners, contractors, and even design professional. Providing "heat, insulation, or both" give them the impression that there is a choice when the reality is the piping must remain in a space that has adequate heat to prevent freezing. Insulation can serve 1 of 2 purposes, it is used to prevent the loss of heat from a space or it is used to prevent the infiltration of heat into a space. The current text technically informs users that they could just provide insulation. More importantly, without direction that the piping must remain inside the thermal envelope, we have seen installations where heat and insulation were provided yet water lines still froze. In this situation, there was a bathroom that cantilevered over a portion of a an attached garage. The portion below the bathroom was provided with adequate space for insulation and was provided with a "heat run" into that space. It was discovered later after 2 consecutive years of freezing that the entire space had been filled with insulation, leaving no way for the heat to reach the pipe to keep them from freezing. Insulation along the perimeter and the bottom portion of the space would have kept the pipes within the building thermal envelope where they would not have frozen.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal just simplifies the language in the code and will not negatively or positively affect cost of construction.

P4-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proposal is overly restrictive for where piping can be located to prevent freezing. (10-0)

P4-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: P2603.5

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

P2603.5 Freezing. In localities having a winter design temperature of 32°F (0°C) or lower as shown in Table R301.2 of this code, a water, soil or waste pipe shall not be installed outside of the *building* thermal envelope, unless protected with heat and insulation. Exterior ~~W~~water ~~service~~ supply system ~~pipe~~ piping shall be installed not less than 12 inches (305 mm) deep and not less than 6 inches (152 mm) below the frost line.

Reason: The current code text is misleading to many including owners, contractors, and even design professional. Providing "heat, insulation, or both" give them the impression that there is a choice when the reality is the piping must remain in a space that has adequate heat to prevent freezing. Insulation can serve 1 of 2 purposes, it is used to prevent the loss of heat from a space or it is used to prevent the infiltration of heat into a space. The current text technically informs users that they could just provide insulation. More importantly, without direction that the piping must remain inside the thermal envelope, we have seen installations where heat and insulation were provided yet water lines still froze. In this situation, there was a bathroom that cantilevered over a portion of a an attached garage. The portion below the bathroom was provided with adequate space for insulation and was provided with a "heat run" into that space. It was discovered later after 2 consecutive years of freezing that the entire space had been filled with insulation, leaving no way for the heat to reach the pipe to keep them from freezing. Insulation along the perimeter and the bottom portion of the space would have kept the pipes within the building thermal envelope where they would not have frozen.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal just simplifies the language in the code and will not negatively or positively affect cost of construction.

Comment (CAH2)# 389

P7-24

IPC: 306.2.4

Proposed Change as Submitted

Proponents: Guy McMann, Jefferson County Colorado, CAPMO (gmcmann@jeffco.us)

2024 International Plumbing Code

Revise as follows:

306.2.4 Tracer wire. For plastic sewer piping, an insulated copper tracer wire or other *approved* conductor shall be installed adjacent to and over the full length of the piping. Access shall be provided to the tracer wire or the tracer wire shall terminate at the cleanout between the *building drain* and *building sewer*. The tracer wire size shall be not less than ~~14~~ 18 American Wire Gauge (2.5 mm^2), shall be green in color and the insulation type shall be listed for direct burial.

Reason: Its overkill to require a 14-gauge wire when a 18 gauge wire will do the same job and is less expensive. This is consistent with what's required in the IFGC. The American Public Works Association provides color guidance for sewer pipe including blue for potable water and yellow for gas.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

This will decrease the cost of construction requiring a smaller gauge wire that is less expensive than a 14 gauge wire. "The cost savings is $15 for 100 feet of tracer wire..

Estimated Immediate Cost Impact Justification (methodology and variables):

.
There is not a difference in labor to install. The current price of 18 gauge wire is $0.09 per foot and for 14 gauge wire, $0.11 per foot.

P7-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There has been no testing to show that the smaller wire has the necessary durability for the application. The green color could be hard to find in grass cover. (10-4)

P7-24

Individual Consideration Agenda

Comment 1:

IPC: 306.2.4

Proponents: Guy McMann, Jefferson County Colorado, CAPMO (gmcmann@jeffco.us) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

306.2.4 Tracer wire. For plastic sewer piping, an insulated copper tracer wire or other *approved* conductor shall be installed adjacent to and over the full length of the piping. Access shall be provided to the tracer wire or the tracer wire shall terminate at the cleanout between the *building drain* and *building sewer*. The tracer wire size shall be not less than 18 American Wire Gauge (~~2.5~~ 1.02 mm^2), shall be green in color and the insulation type shall be listed for direct burial.

Reason:

- No testing is needed as the wire is required to be rated for direct burial.
- The color green will not be an issue because both ends of the wire terminate at the cleanout where it can be energized, The wire stars at the cleanout, follows the pipe to its end point and is turned around and follows the pipe back to the cleanout location. There was misunderstanding as how the wire was to be installed. The cleanout will be obvious to locate and the wire will be quite visible, regardless of weeds or grass, The color green is from a nations standard.
- Changing the the gauge will align with the IFGC.
- The correct metric should be an editorial addition. by staff.
- A spool of 18 gauge will cost less than a spool of14 gauge wire obviously.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The cost will decrease will depend on how the wire is purchased.

Estimated Immediate Cost Impact Justification (methodology and variables):

A spool of 18 gauge wire will cost less than a spool of 14 gauge due ti being a thicker wire.

Comment (CAH2)# 119

P10-24

IPC: SECTION 202 (New), 308.7, 308.7.1

Proposed Change as Submitted

Proponents: James Walls, Cast Iron Soil Pipe Institute, Cast Iron Soil Pipe Institute (jwalls@cispi.org)

2024 International Plumbing Code

Add new definition as follows:

JOINT RESTRAINT. A restraint assembly to resist axial movement at a joint in a piping system.

Revise as follows:

308.7 ~~Anchorage~~ Joint restraint. ~~Anchorage~~ Joint restraint shall be provided to restrain drainage piping from axial movement.

308.7.1 Location. For ~~pipe sizes~~ *horizontal pipes* 4 inches (102 mm) and larger that convey drainage ~~greater than 4 inches (102 mm),~~ joint restraints shall be provided ~~for drain pipes~~ at all changes in direction. ~~and~~ Joint restraints shall be provided for *horizontal pipes* 4 inches (102 mm) and larger that convey drainage at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as specified by the coupling manufacturer shall be utilized.

Reason: There has been a great deal of confusion between sway bracing, joint restraint, and the current code term “anchorage.” This proposal replaces the current term anchorage and replaces it with what the code is prescribing, which is joint restraint. This proposal provides a clear distinction for the users of the code as well as what is required of each. These items are specifically for drainage piping systems and the current proposal is reflective of that fact. Additionally, the language has been made consistent with related section 308.6, utilizing the language “*horizontal pipes* that convey drainage” The addition of further clarification as to change of direction as well as separating and clarifying the two distinct applications of joint restraint locations has been made. This clarifies the distinction between the two items and the requirements to accomplish each to the code official, installer, and other users of this code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is is a clarification and has no cost impact on the cost of construction.

P10-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: This proposal changes from "greater than 4 inch" to "4 inch and greater". This doesn't agree with cast iron piping installation instructions. (14-0)

P10-24

Individual Consideration Agenda

Comment 1:

IPC: 308.8 (New), 308.1 (New)

Proponents: James Walls, Cast Iron Soil Pipe Institute, Cast Iron Soil Pipe Institute (jwalls@cispi.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Add new text as follows:

308.8 Anchorage. Anchorage shall be provided to restrain drainage piping from axial movement.

308.1 Location. For pipe sizes greater than 4 inches (102 mm), restraint shall be provided for drain pipes at all changes in direction.

Reason: There has been a great deal of confusion between sway bracing, joint restraint, and anchorage. This proposal relocates the current term anchorage and section 308.7 and 308.7.1 it with what the code is prescribing, which is joint restraint. This proposal provides a clear distinction for the users of the code as well as what is required of each. These items are specifically for drainage piping systems and the current proposal is reflective of that fact. The addition of further clarification as to change of direction as well as separating and clarifying the two distinct applications of joint restraint locations has been made. This clarifies the distinction between the items and the requirements to accomplish each to the code official, installer, and other users of this code. This modification is to satisfy the request of the committee to retain anchorage in the code as well as correct the pipe size of these items to maintain current code requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no additional cost of construction with being editorial in nature.

Comment (CAH2)# 548

P19-24 Part I

IPC: TABLE 403.1; IBC: TABLE 2902.1

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Jeff Grove, Chair, Building Code Action Committee (BCAC) (bcac@iccsafe.org)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IBC EGRESS CODE COMMITTEE. PART III WILL BE HEARD BY THE ISPSC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

TABLE 403.1 MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 403.1.1 and 403.2)
Portions of table not shown remain unchanged.

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMALE			
1	Assembly	Coliseums, arenas, skating rinks~~, pools~~ and tennis courts for indoor sporting events and activities ~~f~~	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
		Indoor and outdoor swimming pools, spas and aquatic recreation facilities f	1 per 200	1 per 100 for the first 400 and 1 per 133 for the remanainder exceeding 400	1 per 400	1 per 300	-	1 per 1,000	1 service sink
		Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities ~~f~~	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink

a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by the *International Building Code*.

b. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.

c. A single-user toilet facility with one water closet and one lavatory serving not more than two adjacent care recipient sleeping units shall be permitted provided that each patient sleeping unit has direct access to the toilet room and provision for privacy for the toilet room user is provided.

d. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.

e. For business and mercantile classifications with an occupant load of 15 or fewer, service sinks shall not be required.

f. ~~The required number and type of plumbing fixtures for indoor and outdoor public swimming pools shall be in accordance with Section 609 of the International Swimming Pool and Spa Code.~~ Plumbing fixture requirements are reduced or eliminated for certain Class C swimming pools. See the International Swimming Pool and Spa Code, Section 321.

2024 International Building Code

Revise as follows:

[P] TABLE 2902.1 MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 2902.1.1 and 2902.2)
Portions of table not shown remain unchanged.

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMALE			
1	Assembly	Coliseums, arenas, skating rinks, pools and tennis courts for indoor sporting events and activities [f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
		Indoor and outdoor swimming pools, spas and aquatic recreation facilities [f]	1 per 200	1 per 100 for the first 400 and 1 per 133 for the remaninder exceeding 400	1 per 400	1 per 300	-	1 per 1,000	1 service sink
		Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities[f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink

a. The fixtures shown are based on one fixture being the minimum required for the number of *persons* indicated or any fraction of the number of *persons* indicated. The number of occupants shall be determined by this code.

b. Toilet *facilities* for employees shall be separate from *facilities* for inmates or care recipients.

c. A single-occupant toilet room with one water closet and one lavatory serving not more than two adjacent patient *sleeping units* shall be permitted, provided that each patient sleeping unit has direct access to the toilet room and provisions for privacy for the toilet room user are provided.

d. The *occupant load* for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of *facilities* required.

e. For business and mercantile classifications with an *occupant load* of 15 or fewer, a service sink shall not be required.

f. ~~The required number and type of plumbing fixtures for indoor and outdoor swimming pools shall be in accordance with Section 609 of the International Swimming Pool and Spa Code.~~ Plumbing fixture requirements are reduced or eliminated for certain Class C swimming pools. See the International Swimming Pool and Spa Code, Section 321.

Reason: Background

The *2024 International Swimming Pool and Spa Code* does not have any restroom fixture requirements for class A, B, or C pools. For Class D pools, the fixture count is deferred to the *2024 International Plumbing Code.* But that code does not divide pools by class, and requires a large number of plumbing fixtures for indoor pools, but none for outdoor pools. The number of plumbing fixtures is an important public health concern as bathrooms being too far away or long lines for the bathroom will encourage some people to urinate in the pool. This is true regardless of the class of the pool and regardless of its location indoors and outdoors. That said, the number of fixtures required for indoor pools has been found to be excessive. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. Therefore we have an obvious need to reduce the fixture requirement for indoor pools, but apply the same requirement for outdoor pools, and make the requirements cover all pools according to their class.

Occupant loads assigned under existing codes

In the *2024 International Building Code*, the current occupant load factors for pools are 50 gross in the pool and 15 gross on the deck. We have found that both requirements are unrealistic for most pools today. Pools today are shallower, many have no deep end at all. As a result, people comfortably congregate in them more closely than they used to. When the deck area and pool area are equal, these factors are equivalent to ignoring the deck area and assigning one user per 12 square feet of water, or assigning one user per 24 square feet of deck and water surface area per occupant.

The *2024 International Swimming Pool and Spa Code* recommends that a *bather load* (this is not the same thing as *occupant load*) be assigned based on various factors that vary from 20 gross to 8 gross. Confusingly, the load factors get smaller as the deck area gets bigger. The result is that the *bather load* stops increasing with deck area once the deck area is equal to twice the pool area. In this case, the maximum bather load is 8 square feet of water surface area per bather, or, equivalently, 24 square feet of deck and water surface per bather. When the deck area is equal to the water surface area, again the math comes out to 24 square feet of deck and water surface area per bather.

For Class D pools only, the *2024 ISPSC* does assign an occupant load. It requires a much larger load, with the load factor varying from 10 gross to 8 gross, this time with deck area considered at 15 gross (this changed in 2015 to harmonize it with IBC Table 1004.5. Previously it was 50 gross). These occupant loads are aggressively larger, but only if the jurisdiction has adopted the *ISPSC.* This increased load might be reasonable for heavily used wave pools and leisure rivers, but other Class D pools can only be used by a few users at a time, for instance floating lily pad walks, climbing walls, water slides, etc, so that increase does not make much sense in these cases.

The *Model Aquatic Health Code* assigns occupant load factors ranging from 10 to 20 square feet for water surface area, but only one occupant per 50 square feet on the deck. This is roughly a mirror image of the current *International Building Code.*

Justification of changes occupant loads in IBC Table 1004.5 and ISPSC 608.1

· **Swimming pool areas with water depth exceeding 5 ft** – users do not lounge or congregate in these areas because keeping one's head above water requires constant effort. They are doing activities such as lap swimming, diving, synchronized swimming, and water polo. The highest density of these activities is water polo, with a pool area as small as 20 meters by 10 meters being used by two teams of seven players each. The result is one occupant per 150 square feet.

· **Spa areas –** The *Model Aquatic Health Code* and *Florida Building Code* both assign 1 occupant or bather per 10 square feet. It would not be conservative for the *International Building Code* to ignore this guidance.

· **Catch pools –** The slides are supervised and people are not permitted to go down the slide unless the area is clear.

· **All other swimming pool areas and decks –** Currently these areas are treated very differently. We have observed users congregating in pools tighter than one per 50 square feet. As for the deck, it is reasonable to think that people congregate in deck areas similar to unconcentrated assembly seating or airport terminal waiting areas (which both get a load factor of 15), however, most of these people "reserve" a movable chair for themselves with a towel or purse and then proceed to the pool. Increasing this factor to 24 accounts for the fact that some people stay in this area, but most reserve a space in the area before moving on to another area. Assigning the same factor to both areas is logical when you consider the increased number of tanning ledges that are being installed recently. Such areas are basically used the same as deck, mainly used by people standing or in lounge chairs, yet the load factor is different. The load factor should be the same.

· **Class D-1, D-4, and D-6 pool deep areas –** These bodies of water do not tend to have deep areas, and even when they do, ropes are placed to discourage users from using them. The occupant load factors for shallow areas and decks have been left alone so that the egress requirements for these types of pools will not change. However, in past versions of the code the Class D minimum fixture count was not based on this very high number of occupants. In the 2018 code, a Leisure River with 7500 square feet of water and 7500 square feet of deck would have 1,438 occupants but only require 2 water closets for females. We are proposing that the occupant count would remain 1,438, but that number brought to the proposed revision of Table 2902 computes to 7 water closets for females. That is roughly similar to what the current code would call for on an indoor class A, B, or C pool, and that is too high. So this proposal adds a clause to Section 608 of the *ISPSC* that Table 608 should not be used for fixture count, rather Table 1004.5 of the *IBC* should be used. This way changing a pool from Class C to Class D will have no impact on the minimum fixture count, but it would have an impact on egress and other occupant count related items. The minimum fixture count for the Leisure River mentioned above would be 4 water closets for females.

· **Other Class D pools –** This includes catch pools, activity pools, and vortex pools. These pools are meant to be used by distinct groups of supervised users one at a time. Letting them default back to one occupant per 24 square feet rather than one per 8 square feet is still conservative.

Summary of changes occupant loads resulting from this proposal

The changes to 1004.5 under this proposed change would give:

Class A, B, or C Pool, 5' deep or less, with

deck area *less than* pool area

Slightly *more* occupants

deck area *equal* to pool area

The *same* number occupants

deck area *more than* pool area

Slightly *fewer* occupants

Catch Pools

~ 100x *fewer* occupants

Wave Pools, Leisure Rivers, Interactive Water Features, 5' deep or less

The *same* (very large) number of occupants

Activity Pools, Vortex Pools, Pool areas greater than 5' deep

3x *fewer* occupants

Spa Pools

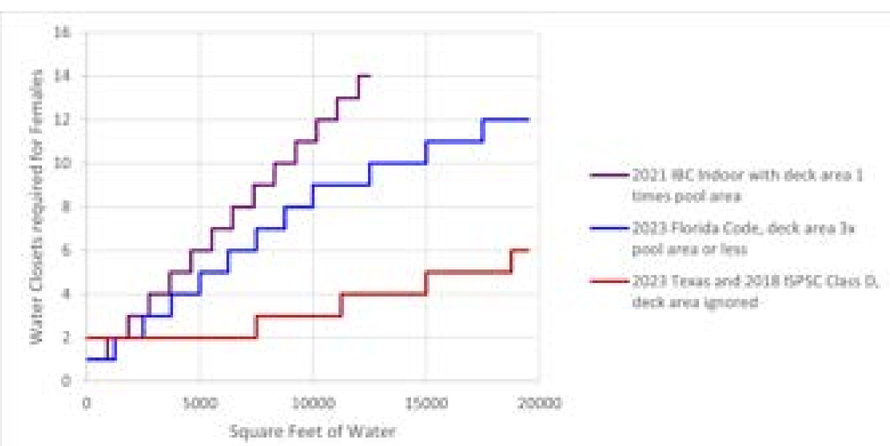
5x *more* occupants

Minimum Fixture Count in 2018 I-codes

The *International Swimming Pool and Spa Code 2018* assigned a minimum fixture count to all Class D pools. This fixture count overruled Table 2902 in the *IBC*. In this code year, the result was a Class D pool would be assigned many more occupants than a Class A, B, or C pool. But if it was indoors, it would be assigned many fewer minimum restroom fixtures than a similar Class A, B, or C pool. If it was outdoors, it would be assigned the same small number of fixtures, even though a Class A, B, or C pool would not have any minimum number of fixtures. In the 2021 code cycle, section 609 of the *International Swimming Pool and Spa Code* was truncated, leaving only a minimum number of showers, not of toilets or lavatories, for outdoor pools and Class D pools.

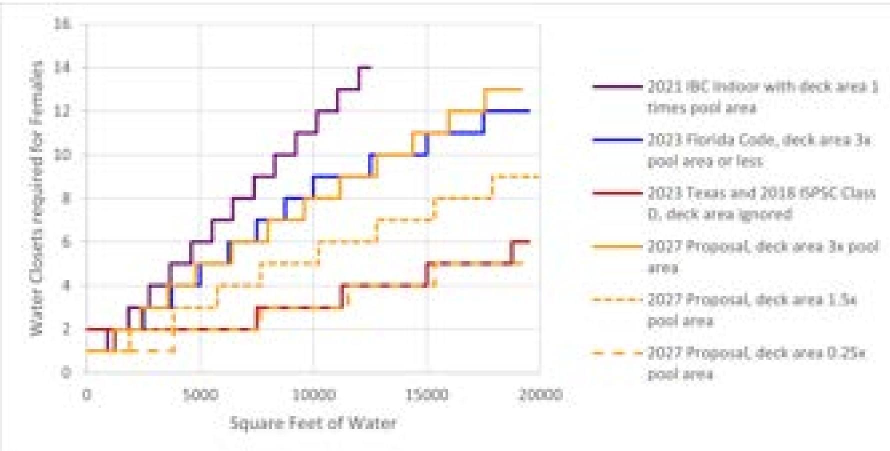
Minimum Fixture Count in current codes

The *International Building Code* assigns fixtures to occupants, of indoor pools, and assigns occupants both to the deck area and the pool water area. No fixtures are assigned to occupants of outdoor pools. In effect, fixtures are assigned both to areas of the deck and areas of the pool. The other state-level codes surveyed in this effort are for Florida and Texas. In Texas, the deck area is ignored entirely. In Florida, it is ignored for all deck area less than 3x of the pool area, which practically includes all pool decks. But in the current *IBC,* for indoor pools only, the deck area becomes a much more important factor than the pool area. The number of fixtures required by this code is already significantly more than Florida would require even when the deck is only 1x of the pool area. The reason is because the occupants of a pool and pool deck are treated the same as the occupants of a stadium or arena in terms of their need to use the bathroom. Meanwhile Texas, ignoring the pool area, their code gives a result that is much lower for the same pool. But Texas didn't make this up, rather, their table comes from section 609 of the 2018 ISPSC.



Justification of new row in IBC Table 2902.1

The intent of adding a new row, rather than using the existing rows for coliseums and arenas, is to reduce the number of fixtures required. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. The calculation results in the new orange lines shown in the graph below, with the existing codes still shown for reference. The new code proposal will agree closely with the Florida Code when the deck is 3x the pool area, and agree closely with the Texas code when only minimal deck is provided.



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

For indoor pools and Class D pools plumbing fixture requirement will be about the same. Indoor pool plumbing fixture requirements will be reduced. Outdoor pool plumbing fixture requirements will be increased. Overall, the number of plumbing fixtures will be slightly decreased.

P19-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The committee is favor of the proposal but the proposal needs modified to add an entry for number of required showers. (9-5)

P19-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: TABLE 403.1; IBC: [P] TABLE 2902.1

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

TABLE 403.1 MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 403.1.1 and 403.2)

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMAL			
1	Assembly	Coliseums, arenas, skating rinks and tennis courts for indoor sporting events and activities	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
		Indoor and outdoor swimming pools, spas and aquatic recreation facilities [f]	1 per 200	1 per 100 for the first 400 and 1 per 133 for the remanainder exceeding 400	1 per 400	1 per 300	1 shower per 300 males / 1 shower per 300 females	1 per 1,000	1 service sink
		Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink

a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by the *International Building Code*.

b. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.

c. A single-user toilet facility with one water closet and one lavatory serving not more than two adjacent care recipient sleeping units shall be permitted provided that each patient sleeping unit has direct access to the toilet room and provision for privacy for the toilet room user is provided.

d. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.

e. For business and mercantile classifications with an occupant load of 15 or fewer, service sinks shall not be required.

f. Plumbing fixture requirements are reduced or eliminated for certain Class C swimming pools. See the International Swimming Pool and Spa Code, Section 321.

2024 International Building Code

[P] TABLE 2902.1 MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 2902.1.1 and 2902.2)

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMALE			
1	Assembly	Coliseums, arenas, skating rinks, pools and tennis courts for indoor sporting events and activities [f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
		Indoor and outdoor swimming pools, spas and aquatic recreation facilities [f]	1 per 200	1 per 100 for the first 400 and 1 per 133 for the remanainder exceeding 400	1 per 400	1 per 300	1 shower per 300 males/1 shower per 300 females	1 per 1,000	1 service sink
		Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities[f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink

a. The fixtures shown are based on one fixture being the minimum required for the number of *persons* indicated or any fraction of the number of *persons* indicated. The number of occupants shall be determined by this code.

b. Toilet *facilities* for employees shall be separate from *facilities* for inmates or care recipients.

c. A single-occupant toilet room with one water closet and one lavatory serving not more than two adjacent patient *sleeping units* shall be permitted, provided that each patient sleeping unit has direct access to the toilet room and provisions for privacy for the toilet room user are provided.

d. The *occupant load* for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of *facilities* required.

e. For business and mercantile classifications with an *occupant load* of 15 or fewer, a service sink shall not be required.

f. Plumbing fixture requirements are reduced or eliminated for certain Class C swimming pools. See the International Swimming Pool and Spa Code, Section 321.

Reason: When addressing cleansing showers, the ISPSC sends the user to the IPC and IBC Tables. However, we were remiss in putting the number of showers required and this comment rectifies that by adding in the shower/bathtub column the number required, as “1 per 300 female and 1 per 300 male.”

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This comment does not increase the cost of construction as the original proposal's cost impact already accounted for the costs.

Comment (CAH2)# 170

NOTE: P19-24 PART II DID NOT RECEIVE A COMMENT (CAH2) AND IS REPRODUCED FOR INFORMATIONAL PURPOSES ONLY

P19-24 Part II

IBC: TABLE 1004.5, 1004.9 (New); IFC: [BE] TABLE 1004.5, 1004.9 (New)

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Jeff Grove, Chair, Building Code Action Committee (BCAC) (bcac@iccsafe.org)

2024 International Building Code

Revise as follows:

TABLE 1004.5 MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR[a]
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Baggage claim	20 gross
Baggage handling	300 gross
Concourse	100 gross
Waiting areas	15 gross
Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Exhibit gallery and museum	30 net
Assembly with fixed seats	See Section 1004.6
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	150 gross
Concentrated business use areas	See Section 1004.8
Courtrooms—other than fixed seating areas	40 net
Day care	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise rooms	50 gross
Group H-5 fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Information technology equipment facilities	300 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mall buildings—covered and open	See Section 402.8.2
Mercantile	60 gross
Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks~~, swimming pools~~	
Rink ~~and pool~~	50 gross
~~Decks~~ Skating rink decks	15 gross
Stages and platforms	15 net
Swimming pools	

Swimming pool areas with water depth exceeding 5 feet	150 gross
Spa areas	10 gross
Catch pool areas	See Section 1004.9
All other swimming pool areas and decks	24 gross
Warehouses	500 gross

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2.

a. Floor area in square feet per occupant.

Add new text as follows:

1004.9 Catch Pools . The *occupant load* of catch pools and designated sections of pools used as a terminus for a water slide flume shall be sum of the maximum number of users that can ride each slide that terminates in that pool or pool area at one time.

2024 International Fire Code

Revise as follows:

[BE] TABLE 1004.5 MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR[a]
Accessory storage areas, mechanical equipment room	300 gross
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Baggage claim	20 gross
Baggage handling	300 gross
Concourse	100 gross
Waiting areas	15 gross
Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Exhibit gallery and museum	30 net
Assembly with fixed seats	See Section 1004.6
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	150 gross
Concentrated business use areas	See Section 1004.8
Courtrooms—other than fixed seating areas	40 net
Day care	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise rooms	50 gross
Group H-5 fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Information technology equipment facilities	300 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mall buildings—covered and open	See Section 402.8.2 of the International Building Code
Mercantile	60 gross
Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools	

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR
Rink ~~and pool~~	50 gross
~~Decks~~ Skating rink decks	15 gross
Stages and platforms	15 net
Swimming pools	
Swimming pool areas with water depth exceeding 5 feet	150 gross
Spa areas	10 gross
Catch pool areas	See Section 1004.9
All other swimming pool areas and decks	24 gross
Warehouses	500 gross

For SI: 1 square foot = 0.0929 m^2, 1 foot = 304.8 mm.

a. Floor area in square feet per occupant.

Add new text as follows:

1004.9 Catch Pools. The *occupant load* of catch pools and designated sections of pools used as a terminus for a water slide flume shall be sum of the maximum number of users that can ride each slide that terminates in that pool or pool area at one time.

Reason: Background

The *2024 International Swimming Pool and Spa Code* does not have any restroom fixture requirements for class A, B, or C pools. For Class D pools, the fixture count is deferred to the *2024 International Plumbing Code.* But that code does not divide pools by class, and requires a large number of plumbing fixtures for indoor pools, but none for outdoor pools. The number of plumbing fixtures is an important public health concern as bathrooms being too far away or long lines for the bathroom will encourage some people to urinate in the pool. This is true regardless of the class of the pool and regardless of its location indoors and outdoors. That said, the number of fixtures required for indoor pools has been found to be excessive. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. Therefore we have an obvious need to reduce the fixture requirement for indoor pools, but apply the same requirement for outdoor pools, and make the requirements cover all pools according to their class.

Occupant loads assigned under existing codes

In the *2024 International Building Code*, the current occupant load factors for pools are 50 gross in the pool and 15 gross on the deck. We have found that both requirements are unrealistic for most pools today. Pools today are shallower, many have no deep end at all. As a result, people comfortably congregate in them more closely than they used to. When the deck area and pool area are equal, these factors are equivalent to ignoring the deck area and assigning one user per 12 square feet of water, or assigning one user per 24 square feet of deck and water surface area per occupant.

The *2024 International Swimming Pool and Spa Code* recommends that a *bather load* (this is not the same thing as *occupant load*) be assigned based on various factors that vary from 20 gross to 8 gross. Confusingly, the load factors get smaller as the deck area gets bigger. The result is that the *bather load* stops increasing with deck area once the deck area is equal to twice the pool area. In this case, the maximum bather load is 8 square feet of water surface area per bather, or, equivalently, 24 square feet of deck and water surface per bather. When the deck area is equal to the water surface area, again the math comes out to 24 square feet of deck and water surface area per bather.

For Class D pools only, the *2024 ISPSC* does assign an occupant load. It requires a much larger load, with the load factor varying from 10 gross to 8 gross, this time with deck area considered at 15 gross (this changed in 2015 to harmonize it with IBC Table 1004.5. Previously it was 50 gross). These occupant loads are aggressively larger, but only if the jurisdiction has adopted the *ISPSC.* This increased load might be reasonable for heavily used wave pools and leisure rivers, but other Class D pools can only be used by a few users at a time, for instance floating lily pad walks, climbing walls, water slides, etc, so that increase does not make much sense in these cases.

The *Model Aquatic Health Code* assigns occupant load factors ranging from 10 to 20 square feet for water surface area, but only one occupant per 50 square feet on the deck. This is roughly a mirror image of the current *International Building Code.*

Justification of changes occupant loads in IBC Table 1004.5 and ISPSC 608.1

· **Swimming pool areas with water depth exceeding 5 ft** – users do not lounge or congregate in these areas because keeping one's head above water requires constant effort. They are doing activities such as lap swimming, diving, synchronized swimming, and water polo. The highest density of these activities is water polo, with a pool area as small as 20 meters by 10 meters being used by two teams of seven players each. The result is one occupant per 150 square feet.

· **Spa areas –** The *Model Aquatic Health Code* and *Florida Building Code* both assign 1 occupant or bather per 10 square feet. It would not be conservative for the *International Building Code* to ignore this guidance.

· **Catch pools –** The slides are supervised and people are not permitted to go down the slide unless the area is clear.

· **All other swimming pool areas and decks –** Currently these areas are treated very differently. We have observed users congregating in pools tighter than one per 50 square feet. As for the deck, it is reasonable to think that people congregate in deck areas similar to unconcentrated assembly seating or airport terminal waiting areas (which both get a load factor of 15), however, most of these people "reserve" a movable chair for themselves with a towel or purse and then proceed to the pool. Increasing this factor to 24 accounts for the fact that some people stay in this area, but most reserve a space in the area before moving on to another area. Assigning the same factor to both areas is logical when you consider the increased number of tanning ledges that are being installed recently. Such areas are basically used the same as deck, mainly used by people standing or in lounge chairs, yet the load factor is different. The load factor should be the same.

· **Class D-1, D-4, and D-6 pool deep areas –** These bodies of water do not tend to have deep areas, and even when they do, ropes are placed to discourage users from using them. The occupant load factors for shallow areas and decks have been left alone so that the egress requirements for these types of pools will not change. However, in past versions of the code the Class D minimum fixture count was not based on this very high number of occupants. In the 2018 code, a Leisure River with 7500 square feet of water and 7500 square feet of deck would have 1,438 occupants but only require 2 water closets for females. We are proposing that the occupant count would remain 1,438, but that number brought to the proposed revision of Table 2902 computes to 7 water closets for females. That is roughly similar to what the current code would call for on an indoor class A, B, or C pool, and that is too high. So this proposal adds a clause to Section 608 of the *ISPSC* that Table 608 should not be used for fixture count, rather Table 1004.5 of the *IBC* should be used. This way changing a pool from Class C to Class D will have no impact on the minimum fixture count, but it would have an impact on egress and other occupant count related items. The minimum fixture count for the Leisure River mentioned above would be 4 water closets for females.

· **Other Class D pools –** This includes catch pools, activity pools, and vortex pools. These pools are meant to be used by distinct groups of supervised users one at a time. Letting them default back to one occupant per 24 square feet rather than one per 8 square feet is still conservative.

Summary of changes occupant loads resulting from this proposal

The changes to 1004.5 under this proposed change would give:

Class A, B, or C Pool, 5' deep or less, with

deck area *less than* pool area

Slightly *more* occupants

deck area *equal* to pool area

The *same* number occupants

deck area *more than* pool area

Slightly *fewer* occupants

Catch Pools

~ 100x *fewer* occupants

Wave Pools, Leisure Rivers, Interactive Water Features, 5' deep or less

The *same* (very large) number of occupants

Activity Pools, Vortex Pools, Pool areas greater than 5' deep

3x *fewer* occupants

Spa Pools

5x *more* occupants

Minimum Fixture Count in 2018 I-codes

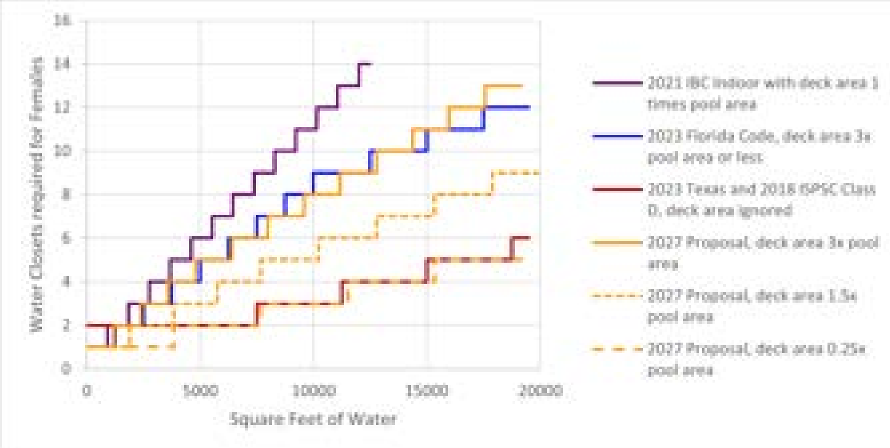
The *International Swimming Pool and Spa Code 2018* assigned a minimum fixture count to all Class D pools. This fixture count overruled Table 2902 in the *IBC.* In this code year, the result was a Class D pool would be assigned many more occupants than a Class A, B, or C pool. But if it was indoors, it would be assigned many fewer minimum restroom fixtures than a similar Class A, B, or C pool. If it was outdoors, it would be assigned the same small number of fixtures, even though a Class A, B, or C pool would not have any minimum number of fixtures. In the 2021 code cycle, section 609 of the *International Swimming Pool and Spa Code* was truncated, leaving only a minimum number of showers, not of toilets or lavatories, for outdoor pools and Class D pools.

Minimum Fixture Count in current codes

The *International Building Code* assigns fixtures to occupants, of indoor pools, and assigns occupants both to the deck area and the pool water area. No fixtures are assigned to occupants of outdoor pools. In effect, fixtures are assigned both to areas of the deck and areas of the pool. The other state-level codes surveyed in this effort are for Florida and Texas. In Texas, the deck area is ignored entirely. In Florida, it is ignored for all deck area less than 3x of the pool area, which practically includes all pool decks. But in the current *IBC,* for indoor pools only, the deck area becomes a much more important factor than the pool area. The number of fixtures required by this code is already significantly more than Florida would require even when the deck is only 1x of the pool area. The reason is because the occupants of a pool and pool deck are treated the same as the occupants of a stadium or arena in terms of their need to use the bathroom. Meanwhile Texas, ignoring the pool area, their code gives a result that is much lower for the same pool. But Texas didn't make this up, rather, their table comes from section 609 of the 2018 ISPSC.

Justification of new row in IBC Table 2902.1

The intent of adding a new row, rather than using the existing rows for coliseums and arenas, is to reduce the number of fixtures required. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. The calculation results in the new orange lines shown in the graph below, with the existing codes still shown for reference. The new code proposal will agree closely with the Florida Code when the deck is 3x the pool area, and agree closely with the Texas code when only minimal deck is provided.



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

For indoor pools and Class D pools plumbing fixture requirement will be about the same. Indoor pool plumbing fixture requirements will be reduced. Outdoor pool plumbing fixture requirements will be increased. Overall, the number of plumbing fixtures will be slightly decreased.

P19-24 Part II

Public Hearing Results (CAH1)

Committee Action: **As Submitted**

Committee Reason: The calculation of occupant load by pool type will improve accuracy for determining egress for these types of facilities. (Vote: 13-0)

P19-24 Part II

P19-24 Part III

ISPSC: SECTION 202 (New), 202 (New), SECTION 321 (New), 321.1 (New), 321.2 (New), 321.2.1 (New), 321.2.1.1 (New), 321.2.1.2 (New), 321.3 (New), 321.3.1 (New), 321.4 (New), 321.4.1 (New), 321.4.2 (New), 321.5 (New), 321,6 (New), 321.7 (New), 321.8 (New), 321.9 (New), SECTION 410, 410.1, SECTION 608, 608.1, TABLE 608.1, 608.2, SECTION 609, 609.1, 609.2, 609.2.1, 609.2.2, 609.3, 609.3.1, 609.3.2, 609.3.3, 609.4, 609.4.1, 609.4.2, 609.5, 609.6, 609.7, 609.8, 609.9

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Jeff Grove, Chair, Building Code Action Committee (BCAC) (bcac@iccsafe.org)

2024 International Swimming Pool and Spa Code

Add new definition as follows:

SHOWER. A device that sprays water on the body.

Cleansing. A shower located within a hygiene facility using warm water and soap. The purpose of showers is to remove contaminants including perianal fecal material, sweat, skin cells, personal care products, and dirt before bathers enter the aquatic venue.

Rinse. A shower typically located in the pool deck area with ambient temperature water. The main purpose is to remove dirt, sand, or organic material prior to entering the aquatic venue to reduce the introduction of contaminants and the formation of disinfection byproduct.

Add new text as follows:

SECTION 321
DRESSING AND SANITARY FACILITIES

321.1 General. Dressing and sanitary facilities for public pools, public spas and aquatic recreation facilities shall be provided in accordance with the minimum requirements of the *International Building Code*, the *International Plumbing Code* and Sections 321.2 through 321.9. These facilities shall be located within a 300 foot path of travel from the pool area.

321.2 Number of fixtures. The minimum number of required water closets, urinals, lavatories, and drinking fountains fixtures shall be provided in accordance with the minimum requirements of the *International Building Code* and the *International Plumbing Code*.
Exception: For Class C swimming pools, fixtures dedicated to the pool area shall not be required where all dwelling units meet all of the following requirements:

1. The dwelling units have private facilities.
2. The dwelling units are within a 300 feet path of travel from the pool area.
3. The dwelling units are not more than one story above or below the pool area.

For Class C swimming pools where some but not all dwelling units meet the requirements of this exception, the minimum occupant load used to calculate the minimum fixture requirements shall be reduced by a factor equal to the number of dwelling units meeting these requirements, divided by the total number of dwelling units served by the pools.

321.2.1 Dressing facilties and rinsing showers. Dressing facilities and the number of rinse showers shall be provided in accordance with Sections 321.2.1.1 and 321.2.1.2.

321.2.1.1 Dressing Facilities. Public pools, public spas and aquatic recreation facilities shall have dressing facilities.
Exception: This section shall not apply to Class C pools.

321.2.1.2 Rinse shower. In addition to the requirement for cleansing showers in the International Plumbing Code and International Building Code, not less than one rinse shower shall be provided on the deck of, or at the entrance of, each pool.

321.3 Water heater and mixing valve. Bather access to water heaters and thermostatically controlled mixing valves for showers shall be prohibited.

321.3.1 Temperature. At each cleansing showerhead, hot or tempered water shall be provided as required by the *International Plumbing Code*. **Exception:** Water supplied to rinse showers shall not be required to be heated

321.4 Soap dispensers. . Soap dispensers shall be in accordance with Sections 329.4.1 and 329.4.2.

321.4.1 Liquid or powdered soap. Soap dispensers shall be provided at each lavatory and cleansing shower. Soap dispensers shall dispense liquid or powdered soap. Reusable cake soap shall be prohibited. Soap dispensers and soap shall not be provided at rinse showers.

321.4.2 Metal or plastic dispenser. Soap dispensers shall be made of metal or plastic. Glass materials shall be prohibited.

321.5 Toilet tissue holder. A toilet tissue holder shall be provided at each water closet

321.6 Mirrors. Where provided, mirrors shall be shatter resistant

321.7 Sanitary napkin receptacles. Sanitary napkin receptacles shall be provided in each water closet compartment for females and in the cleansing area of the showers for female use only.

321.8 Sanitary napkin dispensers. A sanitary napkin dispenser shall be provided in each toilet facility for females.

321.9 Infant care. Baby-changing tables shall be provided in toilet facilities

SECTION 410
SANITARY FACILITIES

Revise as follows:

410.1 ~~Toilet facilities~~ General. ~~Class A and B pools~~ Public pools and public spas shall be provided with ~~toilet facilities~~ dressing and sanitary facilities ~~having the required number of plumbing fixtures~~ in accordance with Section 321.~~the *International Building Code* or the *International Plumbing Code*.~~

SECTION 608
NUMBER OF OCCUPANTS

Revise as follows:

608.1 Occupant load. The occupant load for the Class D-1, D-4, and D-6 pools ~~or spas~~ in the facility shall be calculated in accordance with Table 608.1~~.~~ , however the occupant load used for the minimum fixture count shall be calculated in accordance with Table 1004.5 of the International Building Code. The occupant load for all other pools shall be calculated in accordance with Table 1004.5 of the International Building Code.
~~The occupant load shall be the combined total of the number of users based on the pool or spa water surface area and the deck area surrounding the pool or spa. The deck area occupant load shall be based on the occupant load calculated where a deck is provided or based on an assumed 4-foot-wide (1219 mm) deck surrounding the entire perimeter of the pool or spa, whichever is greater.~~

TABLE 608.1 INCREASED OCCUPANT LOAD FOR CLASS D-1, D-4, AND D-6 POOLS

SHALLOW OR WADING ZERO DEPTH AREAS	DEEP AREA ~~(NOT INCLUDING THE DIVING AREA)~~	~~DIVING AREA (PER EACH DIVING BOARD)~~	DRY DECK AREA	
Vessel water surface area	8 sq. ft per user	~~10 sq. ft. per user~~	300 sq. ft. per user	—
Deck area	—	—	—	1 user per 15 sq. ft.

For SI: 1 square foot = 0.0929 m^2.

Delete without substitution:

~~**608.2 Facility capacity.** For multiple pools and spas in a single aquatic recreation facility, the total facility occupant capacity shall not be limited by the number of occupants calculated in accordance with Section 608.1.~~

SECTION 609 DRESSING AND SANITARY FACILITIES

Revise as follows:

609.1 General. Dressing and sanitary facilities shall be provided in accordance with the minimum requirements of Section 321. ~~the *International Building Code* and *International Plumbing Code* and Sections 609.2 through 609.9.~~

Delete without substitution:

~~**609.2 Number of fixtures.** The minimum number of required water closets, urinals, lavatory, and drinking fountain fixtures shall be provided as required by the *International Building Code* and *International Plumbing Code* and the dressing facilities and number of cleansing and rinse showers shall be provided in accordance with Sections 609.2.1, 609.2.2, and 609.3.1.~~

~~**609.2.1 Water area less than 7500 square feet.** Facilities that have less than 7500 gross square feet (697 m^2) of water area available for bather access shall have dressing facilities and not less than one cleansing shower for males and one cleansing shower for females.~~

~~**Exception:** This requirement shall not apply to Class C semipublic pools.~~

~~**609.2.2 Water area 7500 square feet or more.** Facilities that have 7500 gross square feet (697 m^2) or more of water area available for bather access shall have dressing facilities and not less than one cleansing shower for males, and one cleansing shower for females for every 7500 square feet (697 m^2) or portion thereof. Where the result of the fixture calculation is a portion of a whole number, the result shall be rounded up to the nearest whole number.~~

~~**609.3 Showers.** Showers shall be in accordance with Sections 609.3.1 through 609.3.3.~~

~~**609.3.1 Rinse shower.** In addition to the requirement for cleansing showers in Sections 609.2.1 and 609.2.2, not less than one rinse showershall be provided on the deck of or at the entrance of each pool.~~

~~**609.3.2 Water heater and mixing valve.** Bather access to water heaters and thermostatically controlled mixing valves for showers shall be prohibited.~~

~~**609.3.3 Temperature.** At each cleansing showerhead, the heated shower water temperature shall be not less than 90°F (32°C) and not greater than 120°F (49°C). Water supplied to rinse showers shall not be required to be heated.~~

~~**609.4 Soap dispensers.** Soap dispensers shall be in accordance with Sections 609.4.1 and 609.4.2.~~

~~**609.4.1 Liquid or powder.** Soap dispensers shall be provided at each lavatory and cleansing shower. Soap dispensers shall dispense liquid or powdered soap. Reusable cake soap is prohibited. Soap dispensers and soap shall not be provided at rinse showers.~~

~~**609.4.2 Metal or plastic.** Soap dispensers shall be made of metal or plastic. Glass materials shall be prohibited.~~

~~**609.5 Toilet tissue holder.** A toilet paper holder shall be provided at each water closet.~~

~~**609.6 Lavatory mirror.** Where mirrors are provided, they shall be shatter resistant.~~

~~**609.7 Sanitary napkin receptacles.** Sanitary napkin receptacles shall be provided in each water closet compartment for females and in the cleansing area of the showers for female use only.~~

~~**609.8 Sanitary napkin dispensers.** A sanitary napkin dispenser shall be provided in each toilet facility for females.~~

~~**609.9 Infant care.** Baby-changing tables shall be provided in toilet facilities having two or more water closets.~~

Reason: Background

The *2024 International Swimming Pool and Spa Code* does not have any restroom fixture requirements for class A, B, or C pools. For Class D pools, the fixture count is deferred to the *2024 International Plumbing Code.* But that code does not divide pools by class, and requires a large number of plumbing fixtures for indoor pools, but none for outdoor pools. The number of plumbing fixtures is an important public health concern as bathrooms being too far away or long lines for the bathroom will encourage some people to urinate in the pool. This is true regardless of the class of the pool and regardless of its location indoors and outdoors. That said, the number of fixtures required for indoor pools has been found to be excessive. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. Therefore we have an obvious need to reduce the fixture requirement for indoor pools, but apply the same requirement for outdoor pools, and make the requirements cover all pools according to their class.

Occupant loads assigned under existing codes

In the *2024 International Building Code*, the current occupant load factors for pools are 50 gross in the pool and 15 gross on the deck. We have found that both requirements are unrealistic for most pools today. Pools today are shallower, many have no deep end at all. As a result, people comfortably congregate in them more closely than they used to. When the deck area and pool area are equal, these factors are equivalent to ignoring the deck area and assigning one user per 12 square feet of water, or assigning one user per 24 square feet of deck and water surface area per occupant.

The *2024 International Swimming Pool and Spa Code* recommends that a *bather load* (this is not the same thing as *occupant load*) be assigned based on various factors that vary from 20 gross to 8 gross. Confusingly, the load factors get smaller as the deck area gets bigger. The result is that the *bather load* stops increasing with deck area once the deck area is equal to twice the pool area. In this case, the maximum bather load is 8 square feet of water surface area per bather, or, equivalently, 24 square feet of deck and water surface per bather. When the deck area is equal to the water surface area, again the math comes out to 24 square feet of deck and water surface area per bather.

For Class D pools only, the *2024 ISPSC* does assign an occupant load. It requires a much larger load, with the load factor varying from 10 gross to 8 gross, this time with deck area considered at 15 gross (this changed in 2015 to harmonize it with IBC Table 1004.5. Previously it was 50 gross). These occupant loads are aggressively larger, but only if the jurisdiction has adopted the *ISPSC.* This increased load might be reasonable for heavily used wave pools and leisure rivers, but other Class D pools can only be used by a few users at a time, for instance floating lily pad walks, climbing walls, water slides, etc, so that increase does not make much sense in these cases.

The *Model Aquatic Health Code* assigns occupant load factors ranging from 10 to 20 square feet for water surface area, but only one occupant per 50 square feet on the deck. This is roughly a mirror image of the current *International Building Code.*

Justification of changes occupant loads in IBC Table 1004.5 and ISPSC 608.1

· **Swimming pool areas with water depth exceeding 5 ft** – users do not lounge or congregate in these areas because keeping one's head above water requires constant effort. They are doing activities such as lap swimming, diving, synchronized swimming, and water polo. The highest density of these activities is water polo, with a pool area as small as 20 meters by 10 meters being used by two teams of seven players each. The result is one occupant per 150 square feet.

· **Spa areas –** The *Model Aquatic Health Code* and *Florida Building Code* both assign 1 occupant or bather per 10 square feet. It would not be conservative for the *International Building Code* to ignore this guidance.

· **Catch pools –** The slides are supervised and people are not permitted to go down the slide unless the area is clear.

· **All other swimming pool areas and decks –** Currently these areas are treated very differently. We have observed users congregating in pools tighter than one per 50 square feet. As for the deck, it is reasonable to think that people congregate in deck areas similar to unconcentrated assembly seating or airport terminal waiting areas (which both get a load factor of 15), however, most of these people "reserve" a movable chair for themselves with a towel or purse and then proceed to the pool. Increasing this factor to 24 accounts for the fact that some people stay in this area, but most reserve a space in the area before moving on to another area. Assigning the same factor to both areas is logical when you consider the increased number of tanning ledges that are being installed recently. Such areas are basically used the same as deck, mainly used by people standing or in lounge chairs, yet the load factor is different. The load factor should be the same.

· **Class D-1, D-4, and D-6 pool deep areas –** These bodies of water do not tend to have deep areas, and even when they do, ropes are placed to discourage users from using them. The occupant load factors for shallow areas and decks have been left alone so that the egress requirements for these types of pools will not change. However, in past versions of the code the Class D minimum fixture count was not based on this very high number of occupants. In the 2018 code, a Leisure River with 7500 square feet of water and 7500 square feet of deck would have 1,438 occupants but only require 2 water closets for females. We are proposing that the occupant count would remain 1,438, but that number brought to the proposed revision of Table 2902 computes to 7 water closets for females. That is roughly similar to what the current code would call for on an indoor class A, B, or C pool, and that is too high. So this proposal adds a clause to Section 608 of the *ISPSC* that Table 608 should not be used for fixture count, rather Table 1004.5 of the *IBC* should be used. This way changing a pool from Class C to Class D will have no impact on the minimum fixture count, but it would have an impact on egress and other occupant count related items. The minimum fixture count for the Leisure River mentioned above would be 4 water closets for females.

· **Other Class D pools –** This includes catch pools, activity pools, and vortex pools. These pools are meant to be used by distinct groups of supervised users one at a time. Letting them default back to one occupant per 24 square feet rather than one per 8 square feet is still conservative.

Summary of changes occupant loads resulting from this proposal

The changes to 1004.5 under this proposed change would give:

Class A, B, or C Pool, 5' deep or less, with

deck area *less than* pool area

Slightly *more* occupants

deck area *equal* to pool area

The *same* number occupants

deck area *more than* pool area

Slightly *fewer* occupants

Catch Pools

~ 100x *fewer* occupants

Wave Pools, Leisure Rivers, Interactive Water Features, 5' deep or less

The *same* (very large) number of occupants

Activity Pools, Vortex Pools, Pool areas greater than 5' deep

3x *fewer* occupants

Spa Pools

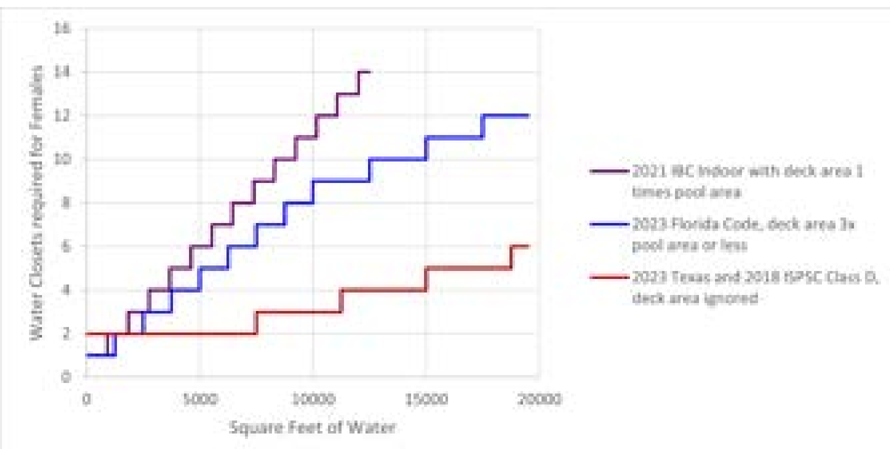
5x *more* occupants

Minimum Fixture Count in 2018 I-codes

The *International Swimming Pool and Spa Code 2018* assigned a minimum fixture count to all Class D pools. This fixture count overruled Table 2902 in the *IBC.* In this code year, the result was a Class D pool would be assigned many more occupants than a Class A, B, or C pool. But if it was indoors, it would be assigned many fewer minimum restroom fixtures than a similar Class A, B, or C pool. If it was outdoors, it would be assigned the same small number of fixtures, even though a Class A, B, or C pool would not have any minimum number of fixtures. In the 2021 code cycle, section 609 of the *International Swimming Pool and Spa Code* was truncated, leaving only a minimum number of showers, not of toilets or lavatories, for outdoor pools and Class D pools.

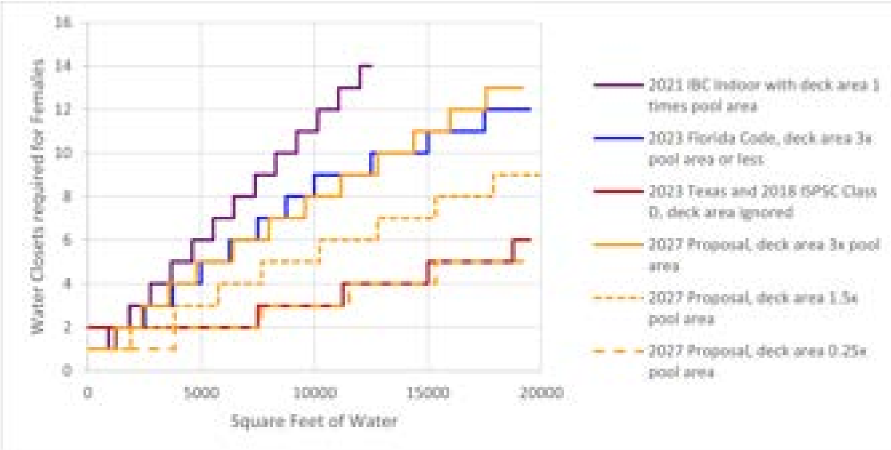
Minimum Fixture Count in current codes

The *International Building Code* assigns fixtures to occupants, of indoor pools, and assigns occupants both to the deck area and the pool water area. No fixtures are assigned to occupants of outdoor pools. In effect, fixtures are assigned both to areas of the deck and areas of the pool. The other state-level codes surveyed in this effort are for Florida and Texas. In Texas, the deck area is ignored entirely. In Florida, it is ignored for all deck area less than 3x of the pool area, which practically includes all pool decks. But in the current *IBC,* for indoor pools only, the deck area becomes a much more important factor than the pool area. The number of fixtures required by this code is already significantly more than Florida would require even when the deck is only 1x of the pool area. The reason is because the occupants of a pool and pool deck are treated the same as the occupants of a stadium or arena in terms of their need to use the bathroom. Meanwhile Texas, ignoring the pool area, their code gives a result that is much lower for the same pool. But Texas didn't make this up, rather, their table comes from section 609 of the 2018 ISPSC.



Justification of new row in IBC Table 2902.1

The intent of adding a new row, rather than using the existing rows for coliseums and arenas, is to reduce the number of fixtures required. The occupants of a pool and deck area will all use the bathroom on their own relaxed schedule. They will not all go at the same time as they might at a coliseum or arena. The calculation results in the new orange lines shown in the graph below, with the existing codes still shown for reference. The new code proposal will agree closely with the Florida Code when the deck is 3x the pool area, and agree closely with the Texas code when only minimal deck is provided.



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

For indoor pools and Class D pools plumbing fixture requirement will be about the same. Indoor pool plumbing fixture requirements will be reduced. Outdoor pool plumbing fixture requirements will be increased. Overall, the number of plumbing fixtures will be slightly decreased.

P19-24 Part III

Public Hearing Results (CAH1)

Committee Action: **As Modified by Committee**

Committee Modification:
321.2 Number of fixtures.
The minimum number of required water closets, urinals, lavatories, and drinking fountains fixtures shall be provided in accordance with the minimum requirements of the *International Building Code* and the *International Plumbing Code*.

Exception: For Class C swimming pools, fixtures dedicated to the pool area shall not be required where all sleeping or dwelling units meet all of the following requirements:

1. The sleeping or dwelling units have private facilities.
2. The sleeping or dwelling units are within a 300 feet path of travel from the pool area.
3. The sleeping or dwelling units are not more than one story above or below the pool area.

For Class C swimming pools where some but not all sleeping or dwelling units meet the requirements of this exception, the minimum occupant load used to calculate the minimum fixture requirements shall be reduced by a factor equal to the number of sleeping or dwelling units meeting these requirements, divided by the total number of sleeping or dwelling units served by the pools.

Committee Reason: For the modification: The language needed to include hotel and motel occupancies. (11-0)
For the proposal as modified: This proposal achieves the goal of the pool industry to have better clarity for which types of showers are needed for different pools. The Committee would welcome further input from opponents at CAH#2 to improve the proposals. The Committee suggested that the opponents can work with PHTA. (11-0)

Individual Consideration Agenda

Comment 1:

ISPSC: 321.2

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Swimming Pool and Spa Code

Revise as follows:

321.2 Number of fixtures. The minimum number of required water closets, urinals, lavatories, and drinking fountains fixtures shall be provided in accordance with the minimum requirements of the *International Building Code* and the *International Plumbing Code*.

Exception: For Class C swimming pools, fixtures dedicated to the pool area shall not be required where all sleeping or dwelling units meet all of the following requirements:

1. The sleeping or dwelling units have private facilities.
2. The sleeping or dwelling units are within a 300 feet path of travel from the pool area.
3. The sleeping or dwelling units are not more than ~~one story~~ three stories above or below the pool area, or more than three stories where serviced by an elevator.

For Class C swimming pools where some but not all dwelling units meet the requirements of this exception, the minimum occupant load used to calculate the minimum fixture requirements shall be reduced by a factor equal to the number of dwelling units meeting these requirements, divided by the total number of dwelling units served by the pools.

Reason: Class C pools are associated with buildings that already have private toilet facilities for the people who dwell or sleep in those buildings. Where those buildings are 3 stories or less are served by an elevator and the travel distance is not more than 300 feet, past experience has shown that this arrangement is adequate for serving the needs of pools users.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The original proposal limited the travel distance to 300 feet. This comment simply clarifies that the path of travel could involve an elevator where buildings are 3 stories or less. The comment does not require any additional materials or labor and thus there is no cost impact.

Comment (CAH2)# 331

Comment 2:

ISPSC: SECTION 202, 321.3.1

Proponents: Misty Guard, Regulosity LLC, Regulosity LLC (misty.guard@regulosity.com); Jennifer Hatfield, J. Hatfield & Associates, Pool & Hot Tub Alliance (jen@jhatfieldandassociates.com) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Swimming Pool and Spa Code

Revise as follows:

SHOWER. A device that sprays water on the body.

Cleansing.
A shower located within a hygiene facility using ~~warm~~ water and soap. The purpose of showers is to remove contaminants including perianal fecal material, sweat, skin cells, personal care products, and dirt before bathers enter the aquatic venue.

Rinse. A shower typically located in the pool deck area ~~with ambient temperature water~~. The main purpose is to remove dirt, sand, or organic material prior to entering the aquatic venue to reduce the introduction of contaminants and the formation of disinfection byproduct.

321.3.1 Temperature. At each cleansing shower~~head~~, hot or tempered water shall be provided as required by the *International Plumbing Code*. Where hot and cold water is supplied to a rinse shower, the temperature of the water supply shall only be controlled by a thermostatic mixing valve, a limiting device, or a water heater as required by the International Plumbing Code.

~~**Exception:** Water supplied to rinse showers shall not be required to be heated~~

Reason: This proposal clarifies the language in the ISPSC. These modifications align with existing IPC requirements that cleansing and rinse showers currently comply with, if provided with hot and cold water. Rinse showers are specific to the ISPSC. The modification includes water temperature safety device requirements from the IPC to ensure the water temperature requirements for rinse showers in the ISPSC meet shower water temperature safety requirements in the IPC.

Bibliography: None

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There will be no increase in the cost of construction. This proposal clarifies the language in the ISPSC. These modifications align with existing IPC requirements that cleansing and rinse showers currently comply with, if provided with hot and cold water.

Comment (CAH2)# 589

P26-24

IPC: 403.3; IBC: [P] 2902.3

Proposed Change as Submitted

Proponents: Andrew Klein, A S Klein Engineering, PLLC, Self Storage Association (andrew@asklein.com)

2024 International Plumbing Code

Revise as follows:

403.3 Employee and public toilet facilities. For structures and tenant spaces intended for public utilization, customers, patrons and visitors shall be provided with *public* toilet facilities. Employees associated with structures and tenant spaces shall be provided with toilet facilities. The number of plumbing fixtures located within the required toilet facilities shall be provided in accordance with Section 403 for all users. Employee toilet facilities shall be either separate or combined employee and *public* toilet facilities. **Exception:** *Public* toilet facilities shall not be required for:

1. Parking garages and self-service storage facilities operated without ~~parking~~ attendants.
2. Structures and tenant spaces intended for quick transactions, including takeout, pickup and drop-off, having a public access area less than or equal to 300 square feet (28 m^2).

2024 International Building Code

Revise as follows:

[P] 2902.3 Employee and public toilet facilities. For *structures* and tenant spaces intended for public utilization, customers, patrons and visitors shall be provided with public toilet *facilities*. Employees associated with *structures* and tenant spaces shall be provided with toilet *facilities*. The number of plumbing fixtures located within the required toilet *facilities* shall be provided in accordance with Section 2902 for all users. Employee toilet *facilities* shall be either separate or combined employee and public toilet *facilities*. **Exception:** Public toilet *facilities* shall not be required for:

1. Parking garages and self-service storage facilities operated without ~~parking~~ attendants.
2. *Structures* and tenant spaces intended for quick transactions, including takeout, pickup and drop-off, having a public access area less than or equal to 300 square feet (28 m^2).

Reason: Self-service storage facilities are low occupancy. Facilities operating without attendants are often exempted from the restroom requirements by local building code officials for the same reason unattended parking garages are exempted. Codifying this helps maintain continuity in the Code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

- $20,000 to - $25,000 per restroom not required.

Estimated Immediate Cost Impact Justification (methodology and variables):

A single-unit restroom costs about $20,000 - $25,000.

Restroom privacy and sensible construction - Page 5 of 5 - Construction Specifier (www.constructionspecifier.com/restroom-privacy-and-sensible-construction/5/), accessed 1/26/2024

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The Committee can't justify allowing deletion of facilities where employees are present. (14-0)

Individual Consideration Agenda

Comment 1:

Proponents: Andrew Klein, A S Klein Engineering, PLLC, Self Storage Association (andrew@asklein.com) requests As Submitted

Reason: Self-service storage facilities are low occupancy. Facilities operating without attendants are often exempted from the restroom requirements by local building code officials for the same reason unattended parking garages are exempted. Unattended restrooms present a security concern. Codifying this helps maintain continuity in the Code and helps avoid unsafe conditions.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 569

P30-24

IPC: 405.3.4 (New), 405.3.4, 405.3.5, CHAPTER 15, IAPMO Chapter 15 (New)

Proposed Change as Submitted

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Bradley Corp. (jbengineer@aol.com)

2024 International Plumbing Code

Add new text as follows:

405.3.4 Premanufactured water closet and urinal partitions.. Premanufactured partitions for water closets or urinals shall comply with IAPMO Z124.10.

Revise as follows:

~~405.3.4~~405.3.5 Water closet privacy ~~compartment~~. Each water closet utilized by the public or employees shall occupy a separate compartment with walls or partitions and a door enclosing the fixtures to ensure privacy. Premanufactured partitions for water closets located in separate gender toilet or bathing rooms shall comply with the Type B privacy requirements of IAPMO Z124.10. Water closets located in all gender toilet rooms shall be enclosed by premanufactured partitions complying with the Type A privacy requirements of IAPMO Z124.10 or the water closet shall be located in separate room with a lockable door. **Exceptions:**

1. Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.
2. Toilet facilities located in child day care facilities and containing two or more water closets shall be permitted to have one water closet without an enclosing compartment.
3. This provision is not applicable to toilet areas located within Group I-3 housing areas.

~~405.3.5~~405.3.6 Urinal ~~partitions~~ privacy. Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. Premanufactured partitions for urinals located in separate gender toilet or bathing rooms shall comply with the Type C privacy requirements of IAPMO Z124.10. The horizontal dimension between walls ~~or partitions~~ at each urinal shall be not less than 30 inches (762 mm). The walls ~~or partitions~~ shall ~~begin at a height not greater than 12 inches (305 mm) from and~~ extend not less than 60 inches (1524 mm) above the finished floor surface. The walls ~~or partitions~~ shall extend from the wall surface at each side of the urinal not less than 18 inches (457 mm) or to a point not less than 6 inches (152 mm) beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater. Urinals located in all gender toilet rooms shall be enclosed by premanufactured partitions complying with the Type A privacy requirements of IAPMO Z124.10 or the urinals shall be located in a separate room. **Exceptions:**

1. Urinal partitions shall not be required in a single occupant or family/assisted-use toilet room with a lockable door.
2. Toilet facilities located in child day care facilities and containing two or more urinals shall be permitted to have one urinal without partitions.

CHAPTER 15
REFERENCED STANDARDS

Add new standard(s) as follows:

IAPMO

IAPMO Group
4755 E. Philadelphia Street
Ontario, CA 91761 USA

Z124.10-22	Standard for Water Closets and Urinal Partitions

Reason: IAPMO Z124.10 is a new standard that regulates water closet and urinal partitions. The standard was published in 2022. The standard specified three different privacy ratings. In addition, there are tests for the quality of the partition. The tests include load, coating, surface examination, subsurface, colorfastness, stain resistance, wear and cleanability, chemical resistance, and stress test to name a few.

Type A privacy partitions are intended for all gender toilet rooms and provide the highest level of privacy. The standard states the following privacy requirements, "The bottom edge of the partition including the door shall be located less than or equal to 100 mm (4 in) off the finished floor. The top edge of the partition including the door shall be located greater than or equal to 2.13 m (84 in) above the finished floor. The full height of the door to the partitions on both sides shall prevent any visual observation from the outside of the partition enclosure. Doors shall be lockable from the inside of the partition enclosure. The door locking device shall be readily distinguishable as locked from the outside of the partition enclosure." Furthermore, the standard requires a visual indication that the compartment is occupied when the partition door lock is activated.

Type B privacy partitions are standard water closet partitions found in separate gender toilet rooms. The standard states the following for privacy, "The bottom edge of the partition including the door shall be located within 406 mm (16 in) of the finished floor. The top edge of the partition including the door shall be located greater than or equal to 1.75 m (69 in) above the finished floor. The door to the partitions shall have a maximum of 13 mm (½ in) gap between the edge of the door and the wall of the partition. Doors shall be lockable from the inside of the partition enclosure."

Type C privacy partitions are urinal partitions. The standard specifies the following requirements, "The bottom of the urinal partition shall be located a maximum of 406 mm (16 in) above the finished floor. The top of the urinal partition shall be a minimum of 1.5 m (60 in) above the finished floor. The urinal partition shall extend a minimum of 457 mm (18 in) from the wall."

With the increase in the number of all gender toilet rooms, it is important to have proper privacy requirements to assure both privacy and security. This proposed change will require water closets and urinals in all gender toilet rooms to be enclosed in Type A privacy partitions or be located in a separate room. This will provide the highest level of privacy and security.

Type B privacy partitions are standard water closet partitions found in men's and ladies' rooms today. However, the gap between partition sections or between the door and frame have been reduced to ½ inch. Currently, there is no regulation on the gap in partitions nor are there any regulations for the quality of the partitions.

Type C privacy partitions are urinal partitions currently found in men's rooms. Type C partitions are only intended for separate gender toilet rooms. In all gender toilet rooms, urinals are located similar to water closets to ensure privacy.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0.12 to $6.04 per partition, dependent on partition production volume.

Estimated Immediate Cost Impact Justification (methodology and variables):

This change could increase the cost of construction. It should be noted that manufacturers are prohibited by Federal Law to discuss prices. That being stated, one can review the cost of listing a product on-line. Compliance with the standard will add a cost to manufacturers for the testing and listing of partitions. In an attempt to find out the listing costs, one can check the ICC-ES website. The questions of what a cost of a listing is results in the following answer: Fees may vary. Contact us for a Statement of Work and/or an initial estimate. Similarly, IAPMO R&T does not publish fees. One can only request a quote for a listing. A Google search for the cost of a UL listing identified the cost as ranging between $5,000 and $50,000. Intertek advertises an annual listing fee of $6,040 for a single sanitary product, which is what a partition would likely be classified as. Hence, the exact dollar amount for a listing is unknown. That listing cost may or may not be added to the cost of the product. If it is added to the cost of the product, that additional cost will add to the cost of construction. However, manufacturers do not indicate if listing costs increase the cost of the product (construction). Hence, the impact is unknown. If one assumes the Intertek price for a listing and further assumes that the manufacturer sells 50,000 partitions a year, the increase cost of construction per partition could be assumed to be $0.12. If they only sell 1,000 partitions, the increased cost per partition would be $6.04.

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There is ambiguity about the fire testing requirements in the standard. The cost of testing for the listing of the products will be onerous. This language puts the requirements for Type C units in the code. So what happens if the standard changes? Would the code need to change to math the standard? (8-7)

Individual Consideration Agenda

Comment 1:

IPC: 405.3.4

Proponents: Tim Earl, GBH International, Self (tearl@gbhint.com) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Plumbing Code

Revise as follows:

405.3.4 Premanufactured water closet and urinal partitions. Premanufactured partitions for water closets or urinals shall comply with IAPMO Z124.10. High-density polyethylene (HDPE) and polypropylene (PP) partitions shall also comply with Section 803.9 of the *International Building Code.*

Reason: The committee disapproved this proposal in part due to "ambiguity about the fire testing requirements in the standard." This comment addresses that.

Section 803.9 of the IBC contains fire test requirements for HDPE and PP used as interior finish. Toilet room partitions are included in the IBC definition of interior finish. Therefore, they must comply with Section 803.9 of the IBC. The test referenced in 803.9 is necessary to obtain meaningful performance data from these materials, whose melting and dripping behavior can produce misleadingly positive results in other fire tests.

Since IAPMO Z124.10 contains a different fire test, users may erroneously believe that no other fire testing is required of partitions. The addition of this specific reference to 803.9 for HDPE and PP will ensure that the proper testing is not overlooked.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Since this is simply a pointer to the applicable section of the IBC, there is no impact on cost.

Comment (CAH2)# 61

Comment 2:

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Bradley Corp. (jbengineer@aol.com) requests As Submitted

Reason: The Committee stated that there is ambiguity regarding the fire testing requirements. That is not correct. The IAPMO Z124.10 standard has fire testing similar to other IAPMO Z124 products. These tests are based on plumbing requirements. Other products requiring IAPMO A124 fire tests includes shower enclosures, Section 421.1 references CSA B45.5/IAPMO Z124, lavatories, Section 419.1 references CSA B45.5/IAPMO Z124, laundry trays, Section 418.1 references CSA B45.5/IAPMO Z124, sinks, Section 422.1 references CSA B45.5/IAPMO Z124, urinals, Section 424.1 references CSA B45.5/IAPMO Z124, and water closets, Section 425.1 references CSA B45.5/IAPMO Z124. The Building Code has separate requirements for certain building materials. Any fire test requirement is specified in the Building Code, not the Plumbing Code. The Codes always work together. The majority of partitions regulated by IAPMO Z124.10 do not have any additional fire testing required by the Building Code.
Another reason given for disapproval was that the cost of listing is onerous. Section 303.4 requires all plumbing products that must comply with a standard to be third party listed. If it is considered onerous for partitions, it should be considered onerous for every plumbing product. However, plumbing manufacturers recognize and accept that a part of doing business requires their products to be listed by a third-party agency. Bradley has all of its plumbing products listed. While some may consider it onerous, it is the cost of doing business in the profession.
When the first IPC was published in 1995, listing by a third-party agency was not required. The code officials proposed a change to a later edition to require all plumbing products to be listed by a third-party agency. None of the plumbing manufacturers objected to this change since it was already standard practice in the profession. Therefore, it should not be considered any more onerous for a premanufactured partition to be listed than any other plumbing product.
The final reason given for disapproval was regarding the dimensions for a urinal partition. Type C urinal partitions regulated by IAPMO Z124.10 have dimensional requirements that currently match what is listed in the code. If for some reason the dimensions in IAPMO Z124.10 are modified, there would not be a need to propose any changes for consistency. The dimensions listed in the Plumbing Code are for walls or partitions that are not premanufactured. Hence, the dimensions do not have to match, but in all likelihood, they probably always will. This is not a technical reason for disapproving of the proposed change.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 241

P31-24

IPC: 405.4.3

Proposed Change as Submitted

Proponents: Justin Cassamassino, ASME, A112 Main Committee (cassamassinoj@asme.org)

2024 International Plumbing Code

Revise as follows:

405.4.3 Securing wall-hung water closet bowls and urinals. Wall-hung water closet bowls and urinals shall be supported by a concealed metal carrier that is attached to the building structural members so that strain is not transmitted to the fixture connector or any other part of the plumbing system. The carrier shall conform to ASME A112.6.1M or ASME A112.6.2.

Reason: The ASME A112.6.1 and ASME A112.6.2 standards includes requirements for floor-affixed supports that can be used to secure off the floor water closets and as well as urinals.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarification of which fixtures the standards includes, supports already used for urinals and water closets.

P31-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Urinals do not need carriers as users are not sitting on urinals like they do for wall hung water closets. (11-3)

P31-24

Individual Consideration Agenda

Comment 1:

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Self (jbengineer@aol.com) requests As Submitted

Reason: The reason given for rejection is that urinals do not need carriers since the user is not sitting on the urinal. This statement is inaccurate. The use of carriers is not based on someone sitting on a fixture. The carrier facilitates the proper installation of the fixture. When a fixture, such as a water closet, has a load based on a person sitting on the fixture, additional load testing is required by the standard. For a urinal carrier that are no such load tests, but that are tests for proper connection and support of the urinal.

The urinal fixture standard, ASME A112.19.2/CSA B45.1 states that a carrier is required for a wall-hung urinal. This is consistent with the language in the proposed change.

It should be recognized that I am a member of ASME A112 Committee, however, I am NOT authorized to submit this comment on behalf of the Committee.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 652

P33-24

IPC: SECTION 202 (New), SECTION 202, 410.4

Proposed Change as Submitted

Proponents: Eirene Knott, BRR Architecture, Metropolitan Kansas City Chapter of the ICC (eirene.knott@brrarch.com)

2024 International Plumbing Code

Add new definition as follows:

BOTTLE FILLING STATION. A plumbing fixture that is manually controlled by the user for the purpose of dispensing potable drinking water into water bottles or containers not less than 10 inches (254 mm) in height. Such fixture is connected to both the potable water distribution system and sanitary drainage system of the premises. See also *water dispenser.*

Revise as follows:

WATER DISPENSER. A plumbing fixture that is manually controlled by the user for the purpose of dispensing potable drinking water into a receptacle such as a cup, glass or bottle. Such fixture is connected to the potable water distribution system of the premises. Such fixtures include bottle filling stations.

410.4 Substitution. Where restaurants provide drinking water in a container free of charge, drinking fountains shall not be required in those restaurants. In other *occupancies* ~~where three or more drinking fountains are required, *water dispensers*~~ bottle filling stations not combined with a drinking fountain shall be permitted to be substituted for not more than 50 percent of the required number of drinking fountains. Bottle filling stations combined with a drinking fountain shall be permitted to be substituted for all drinking fountains.

Reason: When Covid hit the country in 2020, every single drinking fountain in the country was no longer available. Since the IPC has been designed to make sure that the general public has access to free drinking water at all times, this created a problem. What I'm trying to do with this code change is allow the use of a bottle filling station to be used in lieu of a drinking fountain in all occupancy groups. If a bottle filling station is associated with a drinking fountain, then those can be substituted directly for a drinking fountain. If the bottle filling station does not also contain a drinking fountain, then the substitution ratio is fifty percent.

Just during the 2023 year, Michigan, Illinois, Vermont, Maine and Delaware passed legislation to require for bottle filling stations in educational occupancies. Both Maine and Vermont have language that specifically states "sanitary reasons" for the use of the bottle filler. Many states allow for the use of a combination drinking fountain/bottle filling station as an option for the required drinking fountain. In addition, the State of Washington allows for the bottle filling station and/or combination of a drinking fountain/bottle filling station for each drinking fountain required. Their point is to eliminate public waste with all the plastic bottles. Pennsylvania also has legislation encouraging the reduction in the use of plastics by allowing substitution of the bottle filling station for the required drinking fountains.

The State of Massachusetts recently enacted a ban on the purchase of single use plastic bottles for state agencies. The National Park Service began phasing out the sale of single use plastic bottles in 2022.

In September 2023, the United Nations published the "Zero Draft of the Plastics Treaty", which a portion addresses the plastics pollution concern.

Do we want plumbing fixtures to be dictated by state or even national requirements or by the building and/or plumbing code? The IPC needs to be the leader here and allow for the substitution of bottle filling stations for drinking fountains.

I have modified the definition of water dispenser to include a bottle filling station, as a bottle filling station meets these requirements. In addition, I have provided a definition of a bottle filling station to account for the minimum requirements needed to provide for a bottle or similar container. A bottle filling station would comply with the requirements of UL 399 as noted in IPC 410.1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0 to $1100

Estimated Immediate Cost Impact Justification (methodology and variables):

I opted to reflect the increase as the cost of a bottle filling station may be more than that of a drinking fountain. However, a decrease may actually occur.
There may be minimal cost impact due to the legislative requirements in many states.

Based upon pricing available online, a typical hi-lo drinking fountain runs between $1000 and $2200 depending on the aesthetics of the fountain.

A single bottle filling stating ranges from $590 to $1100 depending on aesthetics and whether or not the filling station also includes a drinking fountain.

A dual hi-lo drinking fountain combined with a bottle filling station can range from $1400 to $1900.

Based on these numbers, no increase may occur. If a dual hi-lo drinking fountain is installed and a bottle filling station is installed in addition to the drinking fountain, then an increase of up to $1100 could occur.

However, if a combination hi-lo drinking fountain combined with a bottle filling station is installed, a decrease may occur depending on the aesthetics of the units provided.

Estimated Life Cycle Cost Impact:

N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

N/A

P33-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proposal needs rework as the proponent tried tro present multiple modifications (all ruled out of order) where they attempted to fix the proposal. (11-3)

P33-24

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202, 410.4

Proponents: Eirene Knott, BRR Architecture, BRR Architecture (eirene.knott@brrarch.com); Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

BOTTLE FILLING STATION. A plumbing fixture that is ~~manually~~ controlled by the user for the purpose of dispensing potable drinking water into water bottles or containers not less than 10 inches (254 mm) in height. Such fixture is connected to both the potable water distribution system and sanitary drainage system of the premises. See also *water dispenser.*

WATER DISPENSER. A plumbing fixture that is manually controlled by the user for the purpose of dispensing potable drinking water into a receptacle such as a cup, glass or bottle. Such fixture is connected to the potable water distribution system of the premises. Such fixtures include bottle filling stations.

Revise as follows:

410.4 Substitution. Where restaurants provide drinking water in a container free of charge, drinking fountains shall not be required in those restaurants. In other *occupancies* <u>water dispensers or</u> bottle filling stations not combined with a drinking fountain shall be permitted to be substituted for not more than 50 percent of the required number of drinking fountains. Bottle filling stations combined with a drinking fountain shall be permitted to be substituted for all drinking fountains.

Reason: This proposed modification incorporates floor modifications that were attempted to be brought up for discussion at the Orlando Hearings. Manually has be removed from the definition of bottle filling station. Water dispenser was added to the permitted substitution at the 50 percent level.

Cost Impact: Increase

Estimated Immediate Cost Impact:

See original proposal for impact.

Estimated Immediate Cost Impact Justification (methodology and variables):

See original proposal for cost estimate

Estimated Life Cycle Cost Impact:

N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

N/A

Comment (CAH2)# 268

NOTE: P42-24 PART I DID NOT RECEIVE A COMMENT (CAH2) AND IS REPRODUCED FOR INFORMATIONAL PURPOSES ONLY

P42-24 Part I

IPC: 413.1, ASME Chapter 15 (New)

Proposed Change as Submitted

Proponents: Justin Cassamassino, ASME, A112 Main Committee (cassamassinoj@asme.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

413.1 Approval. Floor drains shall conform to ASME A112.3.1~~,~~ or ASME A112.6.3 ~~or CSA B79~~. Trench drains shall comply with ASME ~~A112.6.3~~ A112.6.8/CSA B79.8.

Add new standard(s) as follows:

ASME

American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990

A112.6.8/CSA B79.8–2022 Trench Drains

Reason: The ASME A112.6.3 was harmonized with CSA B79 such that the CSA B79 designation is not used. The updated standard designation will be proposed in Group B Administrative standard updates. Trench drains are now covered under ASME A112.6.8/CSA B79.3.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarification as to which standard is applicable to which product. Drains were already using the ASME standards for certification.

Staff Analysis: A review of the standard proposed for inclusion in the code, SME A112.6.8/CSA B79.8-2022 T*rench Drains*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P42-24 Part I

Public Hearing Results (CAH1)

Errata: This proposal includes published errata Errata: The proponent's name was missing from the proposal. See the Consolidated Monograph Updates document; https://www.iccsafe.org/wp-content/uploads/2024-Group-A-Consolidated-Monograph-Updates.pdf

Committee Action: **As Submitted**

Committee Reason: The Committee agreed with the published reason statement. (14-0)

P42-24 Part II

IRC: TABLE P2701.1, P2719.1, ASME Chapter 44 (New)

Proposed Change as Submitted

Proponents: Justin Cassamassino, ASME, A112 Main Committee (cassamassinoj@asme.org)

2024 International Residential Code

Revise as follows:

TABLE P2701.1 PLUMBING FIXTURES, FAUCETS AND FIXTURE FITTINGS

Portions of table not shown remain unchanged.

MATERIAL	STANDARD
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	ASME A112.1.3
Bathtub/whirlpool pressure-sealed doors	ASME A112.19.15
Diverters for faucets with hose spray, anti-syphon type, residential application	ASME A112.18.1/CSA B125.1
Enameled cast-iron plumbing fixtures	ASME A112.19.1/CSA B45.2
Floor drains	ASME A112.6.3
Framing-affixed supports for off-the-floor water closets with concealed tanks	ASME A112.6.2
Hose connection vacuum breaker	ASSE 1052
Hot water dispensers, household storage type, electrical	ASSE 1023
Household disposers	ASSE 1008
Hydraulic performance for water closets and urinals	ASME A112.19.2/CSA B45.1
Individual automatic compensating valves for individual fixture fittings	ASME A112.18.1/CSA B125.1
Individual shower control valves anti-scald	ASSE 1016/ASME A112.1016/CSA B125.16
Macerating toilet systems and related components	ASME A112.3.4/CSA B45.9
Nonvitreous ceramic plumbing fixtures	ASME A112.19.2/CSA B45.1
Plastic bathtub units	CSA B45.5/IAPMO Z124; ASME A112.19.2/CSA B45.1
Plastic lavatories	CSA B45.5/IAPMO Z124
Plastic shower receptors and shower stalls	CSA B45.5/IAPMO Z124
Plastic sinks	CSA B45.5/IAPMO Z124
Plastic water closet bowls and tanks	CSA B45.5/IAPMO Z124
Plumbing fixture fittings	ASME A112.18.1/CSA B125.1
Plumbing fixture waste fittings	ASME A112.18.2/CSA B125.2; ASTM F409
Porcelain-enameled formed steel plumbing fixtures	ASME A112.19.1/CSA B45.2
Pressurized flushing devices for plumbing fixtures	ASSE 1016/ASME 112.1016/CSA B125.16; CSA B125.3
Specification for copper sheet and strip for building construction	ASTM B370
Stainless steel plumbing fixtures	ASME A112.19.3/CSA B45.4
Suction fittings for use in whirlpool bathtub appliances	ASME A112.19.7/CSA B45.10
Temperature-actuated, flow reduction valves to individual fixture fittings	ASSE 1062
Thermoplastic accessible and replaceable plastic tube and tubular fittings	ASTM F409
Trench drains	~~ASME A112.6.3~~ ASME A112.6.8/CSA B79.8
Trim for water closet bowls, tanks and urinals	ASME A112.19.5/CSA B45.15
Vacuum breaker wall hydrant-frost-resistant, automatic-draining type	ASSE 1019
Vitreous china plumbing fixtures	ASME A112.19.2/CSA B45.1
Wall-mounted and pedestal-mounted, adjustable and pivoting lavatory and sink carrier systems	ASME A112.19.12
Water closet flush tank fill valves	ASSE 1002/ASME A112.1002/CSA B125.12; CSA B125.3
Whirlpool bathtub appliances	ASME A112.19.7/CSA B45.10

P2719.1 Floor and trench drains. *Floor drains* shall comply to ASME A112.6.3. Trench drains shall comply to ASME A112.6.8/CSA B79.8. *Floor drains* shall have waste outlets not less than 2 inches (51 mm) in diameter and a removable strainer. *Floor drains* shall be constructed so that the drain can be cleaned. Access shall be provided to the drain inlet. *Floor drains* shall not be located under or have their access restricted by permanently installed appliances.

Add new standard(s) as follows:

ASME

American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990

A112.6.8/CSA B79.8–2022 Trench Drains

Reason: The ASME A112.6.3 was harmonized with CSA B79 such that the CSA B79 designation is not used. The updated standard designation will be proposed in Group B Administrative standard updates. Trench drains are now covered under ASME A112.6.8/CSA B79.3.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarification as to which standard is applicable to which product. Drains were already using the ASME standards for certification.

Staff Analysis: A review of the standard proposed for inclusion in the code, SME A112.6.8/CSA B79.8-2022 T*rench Drains*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P42-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The staff analysis of new standard did not indicate that staff had reviewed the standard. (6-4)

P42-24 Part II

Individual Consideration Agenda

Comment 1:

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Submitted

Reason: For CAH1, there was an omission in the New Standards Analysis document that was posted online for the Committee to review. The standard ASME A112.6.8/CSA B79.8-2022 Trench Drains was not listed even though ICC had the standard by the submission deadline. Also, the standard was not posted online for the Committee review.

The New Standards Analysis document has been updated and the standard is now on the Committee standards viewing website.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 147

P44-24

IPC: 419.5

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Plumbing Code

Revise as follows:

419.5 Tempered water for public hand-washing facilities. ~~*Tempered water* shall be delivered from lavatories and group wash fixtures located in *public* toilet facilities provided for customers, patrons and visitors.~~ Tempered water shall be delivered from lavatories and group wash fixtures located in public toilet facilities provided for any occupancy with primary users being children, such as elementary schools, Sunday bible schools, and child daycare facilities or for any occupancy serving primarily elderly or other vulnerable occupants, and for any lavatories and group wash fixtures located in public use toilet facilities that are provided with a single delivered temperature faucet. *Tempered water* shall be delivered through an *approved* water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

Reason: Tempered water for public handwashing fixtures was the result of an overreach associated to trying to protect the users of bathtubs and showers from sudden changes in temperature. The protection for users of bathtubs and showers makes sense because the user is "captive" to the fixture when they use it. The same cannot be said for handwashing fixtures. This requirement was a massive overreach because the same risk level just isn't there. If a user of a handwashing fixture senses water is too hot or too cold, they can simply remove their hands from the stream of water. This proposal will still require protection for public facility users that would be most at risk, such as children and senior citizens in assisted care facilities.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

Between $200-$500 for each unit that would no longer be required to be installed.

Estimated Immediate Cost Impact Justification (methodology and variables):

$100-$200 per unit and between $100-$300 for labor depending on the local labor costs.

P44-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The term "vulnerable occupants" is open to broad interpretation, Also, the use of "such as" opens the door for inclusion of many other applications. (13-0)

P44-24

Individual Consideration Agenda

Comment 1:

IPC: 419.5

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

419.5 Tempered water for public hand-washing facilities. Tempered water shall be delivered from lavatories and group wash fixtures located in public toilet facilities provided for anyGroup E, Group I-1, Group I-2, Group I-3, or Group I-4 occupancy and occupancies that are referenced in sections 305.2 through 305.4 of the International Building Code, and for any lavatories and group wash fixtures located in public use toilet facilities that are provided with a single delivered temperature faucet not controlled by the user. *Tempered water* shall be delivered through an *approved* water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

Reason: Tempered water for public handwashing fixtures was the result of an overreach associated to trying to protect the users of bathtubs and showers from sudden changes in temperature. The protection for users of bathtubs and showers makes sense because the user is "captive" to the fixture when they use it. The same cannot be said for handwashing fixtures. This requirement was a massive overreach because the same risk level just isn't there. If a user of a handwashing fixture senses water is too hot or too cold, they can simply remove their hands from the stream of water. This proposal will still require protection for public facility users that would be most at risk by referencing the specific use groups as well as some special occupancies listed in section 308.5.2 though 308.5.3 of the IBC.

Bibliography: As suggested by members of the IPC Code Development Committee during CAH #1, the language was modified to reference the use groups rather than "vulnerable occupants".

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Between $200-$500 for each unit that would no longer be required to be installed.

Estimated Immediate Cost Impact Justification (methodology and variables):

$100-$200 per unit and between $100-$300 for labor depending on the local labor costs.

Comment (CAH2)# 392

P52-24 Part I

IPC: SECTION 202 (New), 501.10 (New), ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Add new definition as follows:

HEAT INTERFACE UNIT. A unit including one or more double wall heat exchangers and control devices for transferring heat from a primary to a secondary system. The primary system may be a hot water heating system. The secondary system is the domestic hot water system within the dwelling or other space.

Add new text as follows:

501.10 Heat Interface Unit. Installed heat interface units shall contain a proportional control valve that is third-party certified to ASSE 1379.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20xx	Proportional Flow Control Devices, with Protection from Cross Connection via Hydronic Water, for use in Potable Water Installation

Reason: The Heat Interface Unit helps improve water quality, water and energy efficiency, water and energy conservation, and system performance.

A Heat Interface Unit system eliminates more than 50% of the Domestic Hot Water (DHW) volume. This is accomplished by eliminating much of the hot water piping and all the recirculation line piping. Since much of the hot water piping has been eliminated with a Heat Interface Unit system there is a much higher turnover of fresh water in the domestic system. The domestic hot-water piping that remains in the building is only the in-suite piping on the other side of the Heat Interface Unit. These are short runs of smaller-diameter piping that have little volume of water and cool quickly after use to help minimize the time in the optimal-bacterial-growth temperature range.

When designed properly, a Heat Interface Unit system can realize up to 35% reduction of energy used in the building by eliminating a central DHW system with its recirculation piping and pumps, and just using the 4-pipe HVAC system to distribute hot water to the Heat Interface Units.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Section 608 would be a better location for this information. (12-1)

P52-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202, 501.10, 608.14.10 (New), ASSE Chapter 15

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

HEAT INTERFACE UNIT. ~~A unit including one or more double wall heat exchangers and control devices for transferring heat from a primary to a secondary system. The primary system may be a hot water heating system. The secondary system is the domestic hot water system within the dwelling or other space.~~ A prefabricated, water-heating device that utilizes a building's hydronic hot water system along with a double wall heat exchanger and a proportional flow control valve or other acceptable means of temperature control, to create domestic potable hot water for a dwelling unit.

501.10 Heat Interface Unit. ~~Installed heat interface units shall contain a proportional control valve that is third-party certified to ASSE 1379.~~ Heat interface units shall be sized and installed in accordance with the manufacturer's installation requirements. Heat interface units shall contain a means to control output temperature to the designed temperature and shall limit the water supplied to the potable hot water distribution system to a temperature of 140ºF (60ºC) or less.

Add new text as follows:

608.14.10 **Proportional flow control devices.** Where proportional flow control devices contain protection from cross-connection via hydronic water, such devices shall conform to ASSE 1379.

Revise as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20~~xx~~24	Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations

Reason: This comment revises the original proposal by moving the cross-connection requirements to Section 608 as discussed at the CAH#1. This comment also revises the definition of Heat Interface Unit as it was discussed in testimony that this definition is too broad and all encompassing. Requirements for design and installation are added to Section 501.10. Additional information is provided in the attached files for clarification.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Estimated Immediate Cost Impact Justification (methodology and variables):

This is an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **AquaPort™-White-Paper.pdf**
  https://www.cdpaccess.com/comment/440/32234/files/download/7900/
- **aquaport-manual.pdf**
  https://www.cdpaccess.com/comment/440/32234/files/download/7899/

Comment (CAH2)# 440

Comment 2:

IPC: SECTION 202, 501.10, ASSE Chapter 15

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The Standard ASSE 1379 is an published ANSI Standard which it was not at the CAH #1 Group A in April 2024.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 672

P52-24 Part II

IRC: SECTION 202 (New), P2805 (New), P2805.1 (New), ASSE Chapter 44 (New)

Proposed Change as Submitted

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com)

2024 International Residential Code

Add new definition as follows:

HEAT INTERFACE UNIT. A unit including one or more double wall heat exchangers and control elements for transferring heat from a primary to a secondary system. The primary system may be a hot water heating system. The secondary system is the domestic hot water system within the dwelling or other space.

Add new text as follows:

P2805
HEAT INTERFACE UNIT

P2805.1 Heat interface unit. Installed heat interface units shall contain proportional control valves that are third-party certified to ASSE 1379.

-

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20xx	Proportional Flow Control Devices, with Protection from Cross Connection via Hydronic Water, for use in Potable Water Installations

Reason: The Heat Interface Unit helps improve water quality, water and energy efficiency, water and energy conservation, and system performance.

A Heat Interface Unit system eliminates more than 50% of the Domestic Hot Water (DHW) volume. This is accomplished by eliminating much of the hot water piping and all the recirculation line piping. Since much of the hot water piping has been eliminated with a Heat Interface Unit system there is a much higher turnover of fresh water in the domestic system. The domestic hot-water piping that remains in the building is only the in-suite piping on the other side of the Heat Interface Unit. These are short runs of smaller-diameter piping that have little volume of water and cool quickly after use to help minimize the time in the optimal-bacterial-growth temperature range.

When designed properly, a Heat Interface Unit system can realize up to 35% reduction of energy used in the building by eliminating a central DHW system with its recirculation piping and pumps, and just using the 4-pipe HVAC system to distribute hot water to the Heat Interface Units.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Standard is not complete. Definition is too broad and confusing. What is or is not a Heat Interface unit? (10-0)

Individual Consideration Agenda

Comment 1:

IRC: SECTION 202, P2805, P2805.1, P2902.3.8 (New), ASSE Chapter 44

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

HEAT INTERFACE UNIT. ~~A unit including one or more double wall heat exchangers and control elements for transferring heat from a primary to a secondary system. The primary system may be a hot water heating system. The secondary system is the domestic hot water system within the dwelling or other space.~~
A prefabricated, water-heating device that utilizes a building's hydronic hot water system along with a double wall heat exchanger and a proportional flow control valve, or other acceptable means of temperature control, to create domestic potable hot water for a dwelling unit

P2805
HEAT INTERFACE UNIT

P2805.1 Heat interface unit. ~~Installed heat interface units shall contain proportional control valves that are third-party certified to ASSE 1379.~~ Heat interface units shall be sized and installed in accordance with the manufacturer's installation requirements. Heat interface units shall contain a means to control output temperature to the designed temperature, and shall limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.

Add new text as follows:

P2902.3.8 Proportional flow control devices. Where proportional flow control devices contain protection from cross-connection via hydronic water, such devices shall conform to ASSE 1379.

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20~~xx~~24 Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations

Reason: This comment revises the original proposal by moving the cross-connection requirements to Section P2902.3 as discussed at the CAH#1. This comment also revises the definition of Heat Interface Unit as it was discussed in testimony that this definition is too broad and all encompassing. Requirements for design and installation are added to Section P2805. Additional information is provided in the attached files for clarification.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Estimated Immediate Cost Impact Justification (methodology and variables):

This is an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **AquaPort™-White-Paper.pdf**
  https://www.cdpaccess.com/comment/443/32235/files/download/7904/
- **aquaport-manual.pdf**
  https://www.cdpaccess.com/comment/443/32235/files/download/7903/

Comment (CAH2)# 443

Comment 2:

IRC: SECTION 202, P2805, P2805.1, ASSE Chapter 44

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The Proposal was disapproved due to the ASSE 1379 Standard was not Published under ANI at the CAH #1 in April 2024. The Standard ASSE 1379 is now completed and published under the ANSI process.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 676

P53-24 Part I

IPC: SECTION 202 (New), 501.10 (New), ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Add new definition as follows:

INDIRECT-FIRED WATER HEATER. A water heater equipped with an internal or external heat exchanger used to transfer heat from an external source to heat potable water. The equipment either contains heated potable water or water supplied from an external source.

Add new text as follows:

501.10 Indirect-fired water heaters. Where indirect-fired water heaters contain proportional control valves, such valves shall be third-party certified to ASSE 1379.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20xx	Proportional Flow Control Devices, with Protection from Cross Connection via Hydronic Water, for use in Potable Water Installations

Reason: An indirect-fired water heater helps improve water quality, water and energy efficiency, water and energy conservation, and system performance.

An indirect-fired water heater system eliminates more than 50% of the Domestic Hot Water (DHW) volume. This is accomplished by eliminating much of the hot water piping and all the recirculation line piping. Since much of the hot water piping has been eliminated with an indirect-fired water heater system there is a much higher turnover of fresh water in the domestic system. The domestic hot-water piping that remains in the building is only the in-suite piping on the other side of the indirect-fired water heater. These are short runs of smaller-diameter piping that have little volume of water and cool quickly after use to help minimize the time in the optimal-bacterial-growth temperature range. When designed properly, an indirect-fired water heater system can realize up to 35% reduction of energy used in the building by eliminating a central DHW system with its recirculation piping and pumps, and just using the 4-pipe HVAC system to distribute hot water to the indirect-fired water heater.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Estimated Life Cycle Cost Impact:

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: ASSE 1379 is only in draft form and is not complete. These valves are part of an equipment package. Indirect "fired" seems to be an inappropriate term to be used in the definition. (13-0)

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202, 501.10, 608.14.10 (New), ASSE Chapter 15

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

INDIRECT~~-FIRED~~ WATER HEATER. ~~A water heater equipped with an internal or external heat exchanger used to transfer heat from an external source to heat potable water. The equipment either contains heated potable water or water supplied from an external source.~~
A prefabricated, water-heating device that utilizes a building's hydronic hot water system along with a double wall heat exchanger and a proportional flow control valve, or other acceptable means of temperature control, to create domestic potable hot water for a dwelling unit.

501.10 Indirect~~-fired~~ water heaters. ~~Where indirect-fired water heaters contain proportional control valves, such valves shall be third-party certified to ASSE 1379.~~
Indirect water heaters shall be sized and installed in accordance with the manufacturer's installation requirements. Indirect water heaters shall contain a means to control output temperature to the designed temperature, and shall limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.

Add new text as follows:

608.14.10 Proportional flow control devices. Where proportional flow control devices contain protection from cross-connection via hydronic water, such devices shall conform to ASSE 1379.

Revise as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

ASSE/IAPMO/ANSI/CAN 1379-2024 ~~1379-20xx~~	~~Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations~~ Performance Requirements for Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations

Reason: This comment revises the original proposal by moving the cross-connection requirements to Section 608 as discussed at the CAH#1. This comment also revises the definition of Indirect Water Heater as it was discussed in testimony that this definition is too broad and all encompassing. This also removes the word "fired" from the definition title as the committee expressed issues with this term. The US Department of Energy also describes Indirect Water Heaters on this site: Tankless Coil and Indirect Water Heaters | Department of Energy
Requirements for design and installation are added to Section 501.10. Additional information is provided in the attached files for clarification.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Estimated Immediate Cost Impact Justification (methodology and variables):

This is an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **aquaport-manual.pdf**
  https://www.cdpaccess.com/comment/442/32236/files/download/7902/
- **AquaPort™-White-Paper.pdf**
  https://www.cdpaccess.com/comment/442/32236/files/download/7901/

Comment (CAH2)# 442

Comment 2:

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The ANSI ASSE 1379 Standard is now completed and published.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 680

P53-24 Part II

IRC: SECTION 202 (New), SECTION P2805 (New), P2805.1 (New), ASSE Chapter 44 (New)

Proposed Change as Submitted

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com)

2024 International Residential Code

Add new definition as follows:

[MP] INDIRECT-FIRED WATER HEATER. A water heater equipped with an internal or external heat exchanger used to transfer heat from an external source to heat potable water. The equipment either contains heated potable water or water supplied from an external source.

Add new text as follows:

SECTION P2805
INDIRECT-FIRED WATER HEATERS

P2805.1 Indirect-fired water heaters. Where indirect-fired water heaters contain a proportional control valve, such valves shall be third-party certified to ASSE 1379.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1379-20xx	Proportional Flow Control Devices, with Protection from Cross Connection via Hydronic Water, for use in Potable Water Installation

Reason: An indirect-fired water heater helps improve water quality, water and energy efficiency, water and energy conservation, and system performance.

An indirect-fired water heater system eliminates more than 50% of the Domestic Hot Water (DHW) volume. This is accomplished by eliminating much of the hot water piping and all the recirculation line piping. Since much of the hot water piping has been eliminated with an indirect-fired water heater system there is a much higher turnover of fresh water in the domestic system. The domestic hot-water piping that remains in the building is only the in-suite piping on the other side of the indirect-fired water heater. These are short runs of smaller-diameter piping that have little volume of water and cool quickly after use to help minimize the time in the optimal-bacterial-growth temperature range. When designed properly, an indirect-fired water heater system can realize up to 35% reduction of energy used in the building by eliminating a central DHW system with its recirculation piping and pumps, and just using the 4-pipe HVAC system to distribute hot water to the indirect-fired water heater.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Standard is not complete. Definition is confusing. (10-0)

P53-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: SECTION 202, SECTION P2805, P2805.1, P2902.3.8 (New), ASSE Chapter 44

Proponents: David Nickelson, Uponor, Uponor (david.nickelson@uponor.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

[MP] INDIRECT~~-FIRED~~ WATER HEATER. ~~A water heater equipped with an internal or external heat exchanger used to transfer heat from an external source to heat potable water. The equipment either contains heated potable water or water supplied from an external source.~~
A prefabricated, water-heating device that utilizes a building's hydronic hot water system along with a double wall heat exchanger and a proportional flow control valve, or other acceptable means of temperature control, to create domestic potable hot water for a dwelling unit.

SECTION P2805
INDIRECT~~-FIRED~~ WATER HEATERS

P2805.1 Indirect~~-fired~~ water heaters. ~~Where indirect-fired water heaters contain a proportional control valve, such valves shall be third-party certified to ASSE 1379.~~
Indirect water heaters shall be sized and installed in accordance with the manufacturer's installation requirements. Indirect water heaters shall contain a means to control output temperature to the designed temperature and shall limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.

Add new text as follows:

P2902.3.8 **Proportional flow control devices.** Where proportional flow control devices contain protection from cross-connection via hydronic water, such devices shall conform to ASSE 1379

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

ASSE/IAPMO/ANSI/CAN 1379-2024 ~~1379-20xx~~	~~Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations~~ Performance Requirements for Proportional Flow Control Devices, with Protection from Cross-Connection via Hydronic Water, for use in Potable Water Installations

Reason: This comment revises the original proposal by moving the cross-connection requirements to Section P2902 as discussed at the CAH#1. This comment also revises the definition of Indirect Water Heater as it was discussed in testimony that this definition is too broad and all encompassing. This also removes the word "fired" from the definition title as the committee expressed issues with this term. The US Department of Energy also describes Indirect Water Heaters on this site:

Tankless Coil and Indirect Water Heaters | Department of Energy

Requirements for design and installation are added to Section P2805. Additional information is provided in the attached files for clarification.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The inclusion of an additional option does not in and of itself increase or decrease the overall cost impact of the code, because an option may or may not be chosen. The existing options are still relevant, and if chosen, have no cost impact on the actual code requirements.

Estimated Immediate Cost Impact Justification (methodology and variables):

This is an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **AquaPort™-White-Paper.pdf**
  https://www.cdpaccess.com/comment/444/32237/files/download/7906/
- **aquaport-manual.pdf**
  https://www.cdpaccess.com/comment/444/32237/files/download/7905/

Comment (CAH2)# 444

Comment 2:

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The ASSE 1379 Standard is now published under ANSI.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 683

P54-24 Part I

IPC: SECTION 202 (New), SECTION 502, 502.1, SECTION 506 (New), 506.1 (New), 506.2 (New), 506.3 (New), 506.3.1 (New), 506.3.2 (New), 506.4 (New), 506.5 (New), 506.5.1 (New), TABLE 506.5.1 (New), 506.5.2 (New), TABLE 506.5.2 (New), 506.5.3 (New), 506.5.4 (New)

Proposed Change as Submitted

Proponents: Jim Lutz, self (jdlutz@hotwaterresearch.net), Gary Klein (gary@garykleinassociates.com)

2024 International Plumbing Code

Add new definition as follows:

WATER HEATER, HEAT PUMP, AIR SOURCE. A water heating system, containing a heat pump and storage tank, where the heat pump uses ambient air as a heat source to heat water. There are two types:

1. Unitary systems where the heat pump and storage tank are a single assembly. The heat pump is generally mounted on top of the storage tank.
2. Split systems where the heat pump and storage tank are separate assemblies.

SECTION 502
INSTALLATION

Revise as follows:

502.1 General. Water heaters shall be installed in accordance with the manufacturer's instructions. Oil-fired water heaters shall conform to the requirements of this code and the *International Mechanical Code*. Electric water heaters shall conform to the requirements of this code and provisions of NFPA 70. Gas-fired water heaters shall conform to the requirements of the *International Fuel Gas Code.* Solar thermal water heating systems shall conform to the requirements of the *International Mechanical Code* and ICC 900/SRCC 300. Air source heat pump water heaters shall be installed in accordance with Section 506.

Add new text as follows:

SECTION 506
Heat Pump Water Heaters

506.1 Air-source heat pump water heaters (HPWH). Air-source heat pump water heaters (HPWH) shall comply with Sections 506.2. through 506.5.

506.2 Obstructions and clearances. Air intakes, exhaust outlets, filters, heating elements, wiring connections, condensate drains, temperature and pressure relief valves shall not be obstructed. Clearances shall be provided for maintenance and replacement in accordance with Section 502.5.

506.3 Seismic Supports. Seismic supports shall comply with Section 502.4. Restraints shall not obstruct components specified in Section 506.2.

506.3.1 Unitary HPWH. Seismic restraints for unitary HPWHs shall be located at points within the upper one-third and lower one-third of the vertical dimensions of the storage tank, and not on the heat pump portion.

506.3.2 Split System HPWH. For split systems, the seismic restraints for the storage tank shall be in accordance with Section 506.3.1.

The heat pump portion of the split system shall be installed in accordance with the manufacturer's instructions.

506.4 Condensate Drains. Condensate drain lines from air source HPWHs shall be in accordance with Section 314.2.

506.5 Ventilation. The ventilation requirements for air-source HPWH shall be in accordance with Sections 506.5.1 through 506.5.4. The minimum dimensions for the space volume where the HPWH is installed shall be 3.5 x 3.5 x 8 = 98 cubic feet.

506.5.1 Space volume method. Ventilation shall comply with the provisions Table 506.5.1.

TABLE 506.5.1 MINIMUM SPACE VOLUME FOR INSTALLING AIR-SOURCE HPW

Heat Pump Capacity (BTU/Hour)	**<1,000**	**≥1,000 and <2,000**	**≥2,000 and <3,000**	**≥3,000 and <4,000**	**≥4,000 and <5,000**	**≥5,000 and <6,000**	**≥6,000 and <7,000**	**≥7,000 and <8,000**	**≥8,000 and <9,000**	**≥9,000 and <10,000**	**≥10,000 and <11,000**	**≥11,000 and <12,000**	**≥12,000 and <13,000**	**≥13,000 and <14,000**	**≥14,000 and <15,000**	**≥15,000 and <16,000**	**≥16,000 and <17,000**	**≥17,000 and <18,000**
Space Volume (cubic feet)	175	350	525	700	875	1,050	1,225	1,400	1,575	1,750	1,925	2,100	2,275	2,450	2,625	2,800	2,975	3,150

For SI units: 1 cubic foot = 0.0283 m^3, 1000 British thermal units per hour = 0.293 kW

506.5.2 Passive ventilation method. Where the location of the HPWH is in a space smaller than required in Table 506.5.1, additional ventilation shall be provided in accordance with Table 506.5.2. Passive ventilation shall be into an adjacent space that shares the same pressure zone with the HPWH. The sum of the volume of the space where the HPWH is located and the volume in the adjacent space shall be not less than the space volume required for the capacity shown in Table 506.5.2. The net free area of the passive ventilation shall be equally distributed between high and low openings. These openings shall be in the top quarter and bottom quarter of the space where the HPWH is located.

TABLE 506.5.2 MINIMUM NET FREE AREA FOR INSTALLING AIR-SOURCE HPWH

Space Volume (cubic feet)	**Heat Pump Capacity (BTU/Hour)**																	
	<1,000	**≥1,000 and <2,000**	**≥2,000 and <3,000**	**≥3,000 and <4,000**	**≥4,000 and <5,000**	**≥5,000 and <6,000**	**≥6,000 and <7,000**	**≥7,000 and <8,000**	**≥8,000 and <9,000**	**≥9,000 and <10,000**	**≥10,000 and <11,000**	**≥11,000 and <12,000**	**≥12,000 and <13,000**	**≥13,000 and <14,000**	**≥14,000 and <15,000**	**≥15,000 and <16,000**	**≥16,000 and <17,000**	**≥17,000 and <18,000**
≥3,150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
≥2,975 and <3,150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80
≥2,800 and <2,975	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100
≥2,625 and <2,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120
≥2,450 and <2,625	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140
≥2,275 and <2,450	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160
≥2,100 and <2,275	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180
≥1,925 and <2,100	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200
≥1,750 and <1,925	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220

≥1,575 and <1,750	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240
≥1,400 and <1,575	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260
≥1,225 and <1,400	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260	280
≥1,050 and <1,225	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260	280	300
≥875 and <1,050	-	-	-	-	0	80	80	120	140	160	180	200	220	240	260	280	300	320
≥700 and <875	-	-	-	0	80	80	100	140	160	180	200	220	240	260	280	300	320	340
≥525 and <700	-	-	0	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360
≥350 and <525	-	0	120	160	200	240	280	320	360	400	440	480	520	560	600	640	680	720
≥175 and <350	0	120	180	240	300	360	420	480	540	600	660	720	780	840	900	960	1020	1080
≥100 and <175	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	1120	1190	1260
<100	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	1120	1190	1260

For SI units: 1 cubic foot = 0.0283 m3, 1000 British thermal units per hour = 0.293 kW

506.5.3 Ducted ventilation method. Where the location of the HPWH is in a space smaller than required in Table 506.5.1, and it is not possible to comply with the provisions for passive ventilation in accordance with Table 506.5.2, the HPWH shall be ducted in accordance with the manufacturer's instructions. Air intake and exhaust ducts shall come from and go to the same pressure zone. The termination of the ducts in the remote space shall be directed so that they draw from and exhaust to different parts of the pressure zone. It is permissible to install a combination of passive and ducted ventilation to meet the air flow requirements of the HPWH.

506.5.4 New construction. Ventilation shall comply with the provisions in Sections 506.5.1, 506.5.2 and 506.5.3 for the 18,000 BTU per Hour capacity column in Tables 506.5.1 and 506.5.2. **Exception:** For HPWHs larger than 18,000 BTU per hour, the minimum space volume shall be not less than 0.175 cubic feet per BTU per hour as rated by the manufacturer. Net free area and ducting shall be in accordance with the manufacturer's instructions.

Reason: The purpose of this proposal is to add an option to the plumbing code so that installers of heat pump water heaters (HPWH) have clear provisions in the chapterson Water Heaters regarding their proper installation. HPWH are water heaters, and most of the provisions regarding the installation of all water heaters apply. A key requirement that does not exist is that they need to be installed so that they operate in heat pump mode for the majority of their duty cycle.

For air source HPWH, the type of water heater discussed in this proposal, this means special attention must be paid to the air flow requirements. They need a source of "warm" air to extract energy and they need a sink for the cold air they discharge to be absorbed. The source and the sink need be matched. This can be challenging in cold climates.

To accommodate the energy exchange required by the source and the sink, the sizes of which depend on the capacity of the heat pump, there needs to be

1. A minimum volume of the space where the HPWH is installed. Energy exchange happens within that space.

2. Passive ventilation into an adjacent space if the space where the HPWH is located is not large enough. The volume of the two spaces must meet the minimum volume requirements for the HPWH's capacity. The two spaces must share a common pressure zone.

3. Ducted ventilation into an adjacent or remote space if the minimum volume or passive ventilation requirements cannot be me. The HPWH needs to be ducted to and from a location with the ability to support required energy exchange. When ducted, the remote terminals for the intake need to come from, and exhaust ducts to, the same pressure zone so that they do not adversely affect the performance of other mechanical systems.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

P54-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proposal is overly prescriptive and fails to coordinate with current manufacturer's instructions. This information should be located in the IMC. (14-0)

P54-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

WATER HEATER, HEAT PUMP, AIR SOURCE. A water heater that transfers thermal energy from one temperature level to another temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function. There are two types of air source heat pump water heaters: ~~A water heating system, containing a heat pump and storage tank, where the heat pump uses ambient air as a heat source to heat water. There are two types:~~

1. Unitary systems where the heat pump and storage tank are a single assembly. The heat pump is generally mounted on top of the storage tank.
2. Split systems where the heat pump and storage tank are separate assemblies.

Reason: The US Department of Energy (DOE) defines the various types of water heaters sold in the United States. It makes sense to align the definition in this code with the one provided by DOE.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed change is to the definition. This has no impact on the cost to install this type of water heater.

Comment 2:

IPC: 502.1

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

502.1 General. Water heaters shall be installed in accordance with the manufacturer's instructions. Oil-fired water heaters shall conform to the requirements of this code and the *International Mechanical Code*. Electric water heaters shall conform to the requirements of this code and provisions of NFPA 70. Gas-fired water heaters shall conform to the requirements of the *International Fuel Gas Code.* Solar thermal water heating systems shall conform to the requirements of the *International Mechanical Code* and ICC 900/SRCC 300. Electric air ~~Air~~ source heat pump water heaters shall be installed in accordance with Section 506.

Reason: The proposed change clarifies that the provisions apply to electric air source heat pump water heaters.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifying that the provisions apply to electric air source heat pump water heaters does not increase the cost to comply with the provisions in the section.

Comment (CAH2)# 594

Comment 3:

IPC: 506.1

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

506.1 Air-source heat pump water heaters (HPWH). Electric air~~Air~~ source heat pump water heaters (HPWH) shall comply with Sections 506.2. through 506.5.

Reason: The proposed change clarifies that the provisions apply to electric air source heat pump water heaters.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifying that the provisions apply to electric air source heat pump water heaters does not increase the cost to comply with the provisions in the section.

Comment (CAH2)# 596

Comment 4:

IPC: 506.2

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

506.2 Obstructions and clearances. Air intakes, exhaust outlets, filters, heating elements, wiring connections, condensate drains, temperature and pressure relief valves shall not be obstructed. Clearances shall be provided for maintenance and replacement in accordance with Section 502.5. Cold air discharged from HPWHs shall not blow on or otherwise affect the operation of the space conditioning thermostat.

Reason: I learned about this issue since the first Committee Action Hearing while in conversation with industry.

It is not appropriate for cold air discharged from the electric air source heat pump water heater to blow onto or otherwise affect the operation of the thermostat that regulates the indoor temperature of the building. In the winter, it will cause the space heating system to come on when the majority of the building is at the desired temperature. In the summer, it will cause the space cooling system to turn off when the majority of the building is not at the desired temperature. In the swing seasons, the thermostat will be confused.

The cold air can blow onto the thermostat. It can also cool the wall behind the thermostat. Either case can result in an inappropriate response from the space conditioning system.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Comment (CAH2)# 598

Comment 5:

IPC: 506.5, 506.5.1, 506.5.1.1 (New), 506.5.1.2 (New), 506.5.1.3 (New), TABLE 506.5.1, 506.5.2, 506.5.2.1 (New), 506.5.2.2 (New), 506.5.2.3 (New), TABLE 506.5.2, 506.5.3, 506.5.3.1 (New), 506.5.4, 506.5.4.1 (New), 506.5.4.2 (New), 506.5.4.3 (New)

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

506.5 Air flow for water heating ~~Ventilation~~. The ~~ventilation~~ airflow requirements for air-source HPWH shall be in accordance with Sections 506.5.1 through 506.5.4. Intake air shall come from, and exhaust air shall be discharged to the same pressure zone.Where installed inside a building, the ~~The~~ minimum dimensions for the location ~~spacevolume~~ where a unitary HPWH or the heat pump portion of a split system HPWH *i*s installed shall be 3.5 feet x 3.5 feet x 8 feet for each HPWH, ~~= 98 cubic feet~~, or the minimum dimensions required by the manufacturer, whichever is greater. Access and service space shall conform to the requirements of Section 306 of the *International Mechanical Code*.

506.5.1 Conditioned air ~~Space volume method~~. Air-source HPWH shall be *listed* and *labeled* for use with conditioned air. ~~Ventilation shall comply with the provisions Table 506.5.1~~.

Add new text as follows:

506.5.1.1 Direct Access. HPWH shall be installed in spaces where the energy supplied by the heating and cooling system is equal to or greater than the capacity of the heat pump portion of the HPWH.

506.5.1.2 Indirect access. Where installed in an enclosed space with inadequate heat rate, the energy supplied by the heating and cooling system for the sum of the enclosed space and the adjacent conditioned space shall be equal to or greater than the capacity of the heat pump portion of the HPWH. Where installed in an enclosed space that has only indirect access to conditioned air, HPWH shall be installed in accordance with Section 506.5.3 or 506.5.4 as applicable.

506.5.1.3 Available energy. The energy supplied by the heating and cooling system shall be determined in accordance with Section 312 of the *International Mechanical Code*. Where the installation does not conform with the provisions in Sections 506.5.1.1 or 506.5.1.2 backup heating shall be provided.

Delete without substitution:

~~TABLE 506.5.1 MINIMUM SPACE VOLUME FOR INSTALLING AIR-SOURCE HPW~~

~~Heat Pump Capacity (BTU/Hour)~~	~~<1,000~~	~~≥1,000 and <2,000~~	~~≥2,000 and <3,000~~	~~≥3,000 and <4,000~~	~~≥4,000 and <5,000~~	~~≥5,000 and <6,000~~	~~≥6,000 and <7,000~~	~~≥7,000 and <8,000~~	~~≥8,000 and <9,000~~	~~≥9,000 and <10,000~~	~~≥10,000 and <11,000~~	~~≥11,000 and <12,000~~	~~≥12,000 and <13,000~~	~~≥13,000 and <14,000~~	~~≥14,000 and <15,000~~	~~≥15,000 and <16,000~~	~~≥16,000 and <17,000~~	~~≥17,000 and <18,000~~
~~Space Volume (cubic feet)~~	~~175~~	~~350~~	~~525~~	~~700~~	~~875~~	~~1,050~~	~~1,225~~	~~1,400~~	~~1,575~~	~~1,750~~	~~1,925~~	~~2,100~~	~~2,275~~	~~2,450~~	~~2,625~~	~~2,800~~	~~2,975~~	~~3,150~~

~~For SI units: 1 cubic foot = 0.0283 m^3, 1000 British thermal units per hour = 0.293 kW~~

Revise as follows:

506.5.2 Unconditioned and outdoor air ~~Passive ventilation method~~. Where installed to utilize unconditioned or outdoor air, air-source unitary HPWH and split system HPWH shall be *listed* and *labeled* for use with outdoor air based on the climate zone where the HPWH is being installed. Unless the HPWH are *listed* and *labeled* for use with outdoor air, backup heating is required.~~Where the location of the HPWH is in a space smaller than required in Table 506.5.1, additional ventilation shall be provided in accordance with Table 506.5.2. Passive ventilation shall be into an adjacent space that shares the same pressure zone with the HPWH. The sum of the volume of the space where the HPWH is located and the volume in the adjacent space shall be not less than the space volume required for the capacity shown in Table 506.5.2. The net free area of the passive ventilation shall be equally distributed between high and low openings. These openings shall be in the top quarter and bottom quarter of the space where the HPWH is located.~~

Add new text as follows:

506.5.2.1 Direct access. The heat pump portion of the HPWH shall be provided with direct access to unconditioned or outdoor air and installed in accordance with manufacturer's instructions.

506.5.2.2 Indirect access. Where installed in an enclosed space that has only indirect access to unconditioned air or outdoor air, HPWH shall be installed in accordance with Section 506.5.3 or 506.5.4 as applicable, or backup heating shall be provided.

506.5.2.3 Available energy. The energy supplied to unconditioned spaces shall be determined in accordance with Section 312 of the *International Mechanical Code*. Where the energy supplied to the unconditioned space is not equal to or greater than the capacity of the heat pump portion of the HPWH, backup heating shall be provided.

Delete without substitution:

~~TABLE 506.5.2 MINIMUM NET FREE AREA FOR INSTALLING AIR-SOURCE HPWH~~

~~Space Volume (cubic feet)~~	~~Heat Pump Capacity (BTU/Hour)~~																	
	~~<1,000~~	~~≥1,000 and <2,000~~	~~≥2,000 and <3,000~~	~~≥3,000 and <4,000~~	~~≥4,000 and <5,000~~	~~≥5,000 and <6,000~~	~~≥6,000 and <7,000~~	~~≥7,000 and <8,000~~	~~≥8,000 and <9,000~~	~~≥9,000 and <10,000~~	~~≥10,000 and <11,000~~	~~≥11,000 and <12,000~~	~~≥12,000 and <13,000~~	~~≥13,000 and <14,000~~	~~≥14,000 and <15,000~~	~~≥15,000 and <16,000~~	~~≥16,000 and <17,000~~	~~≥17,000 and <18,000~~
~~≥3,150~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~
~~≥2,975 and <3,150~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~
~~≥2,800 and <2,975~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~
~~≥2,625 and <2,800~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~
~~≥2,450 and <2,625~~	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~
~~≥2,275 and <2,450~~	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~
~~≥2,100 and <2,275~~	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~
~~≥1,925 and <2,100~~	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~
~~≥1,750 and <1,925~~	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~
~~≥1,575 and <1,750~~	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~
~~≥1,400 and <1,575~~	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~
~~≥1,225 and <1,400~~	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~
~~≥1,050 and <1,225~~	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~
~~≥875 and <1,050~~	-	-	-	-	~~0~~	~~80~~	~~80~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~
~~≥700 and <875~~	-	-	-	~~0~~	~~80~~	~~80~~	~~100~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~	~~340~~
~~≥525 and <700~~	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~	~~340~~	~~360~~
~~≥350 and <525~~	-	~~0~~	~~120~~	~~160~~	~~200~~	~~240~~	~~280~~	~~320~~	~~360~~	~~400~~	~~440~~	~~480~~	~~520~~	~~560~~	~~600~~	~~640~~	~~680~~	~~720~~

~~≥175 and <350~~	~~0~~	~~120~~	~~180~~	~~240~~	~~300~~	~~360~~	~~420~~	~~480~~	~~540~~	~~600~~	~~660~~	~~720~~	~~780~~	~~840~~	~~900~~	~~960~~	~~1020~~	~~1080~~
~~≥100 and <175~~	~~70~~	~~140~~	~~210~~	~~280~~	~~350~~	~~420~~	~~490~~	~~560~~	~~630~~	~~700~~	~~770~~	~~840~~	~~910~~	~~980~~	~~1050~~	~~1120~~	~~1190~~	~~1260~~
~~<100~~	~~70~~	~~140~~	~~210~~	~~280~~	~~350~~	~~420~~	~~490~~	~~560~~	~~630~~	~~700~~	~~770~~	~~840~~	~~910~~	~~980~~	~~1050~~	~~1120~~	~~1190~~	~~1260~~

~~For SI units: 1 cubic foot = 0.0283 m3, 1000 British thermal units per hour = 0.293 kW~~

Revise as follows:

506.5.3 Gravity airflow ~~Ducted ventilation method~~. Gravity airflow shall be sized to provide not less than 75 square inches of free area per 100 watts of compressor, fan, and control power, or the minimum total free area as determined by the manufacturer, whichever is greater, inclusive of all HPWH installed in the enclosed space.
~~Where the location of the HPWH is in a space smaller than required in Table 506.5.1, and it is not possible to comply with the provisions for passive ventilation in accordance with Table 506.5.2, the HPWH shall be ducted in accordance with the manufacturer's instructions. Air intake and exhaust ducts shall come from and go to the same pressure zone. The termination of the ducts in the remote space shall be directed so that they draw from and exhaust to different parts of the pressure zone. It is permissible to install a combination of passive and ducted ventilation to meet the air flow requirements of the HPWH.~~

Add new text as follows:

506.5.3.1 Louvers and openings. The enclosed space shall be connected to the adjacent space using fully louvered doors or two openings of equal area, one located within 12 inches from the enclosure top and one located within 12 inches from the enclosure bottom. Louvers and grilles shall be fixed in the open position. Louvered doors and openings shall be permitted to be combined to meet the free area.

Revise as follows:

506.5.4 Forced airflow ~~New construction~~. Forced airflow shall be sized to provide not less than 60 cfm per 100 watts of compressor, fan, and control power, or the minimum duct diameter as determined by the manufacturer, whichever is greater, inclusive of all HPWH installed in the enclosed space. ~~Ventilation shall comply with the provisions in Sections 506.5.1, 506.5.2 and 506.5.3 for the 18,000 BTU per Hour capacity column in Tables 506.5.1 and 506.5.2.~~

> ~~**Exception:** For HPWHs larger than 18,000 BTU per hour, the minimum space volume shall be not less than 0.175 cubic feet per BTU per hour as rated by the manufacturer. Net free area and ducting shall be in accordance with the manufacturer's instructions.~~

Add new text as follows:

506.5.4.1 Ducts. Ducts that transfer air between conditioned and unconditioned space shall be insulated to not less than R-6. Where duct termination points are close together, they shall be directed away from each other.

506.5.4.2 Combined gravity and forced airflow. Intake and exhaust air shall be permitted to be ducted, or to use gravity airflow for either the intake or the exhaust. The openings for gravity airflow shall not be less than half the area required in Section 506.5.3.

Add new text as follows:

506.5.4.3 Fan assist. Where the fan included with the HPWH cannot deliver the minimum airflow, a transfer fan or inline fan shall be installed to meet or exceed the minimum airflow.

Reason: Introduction
This public comment is intended to improve the original proposal to include the minimum installation requirements for electric air-source heat pump water heaters into the plumbing code.

Since submitting the proposal in January and listening to comments at the Committee Action Hearing in April, I have been communicating with manufacturers and others working with these water heaters to clarify, refine and simplify the installation requirements. The overall public comment proposes minor revisions to a few sections. Most of the sections included in the original proposal remain.

Based on the feedback from the CAH comments and ongoing discussions with industry, the focus of this public comment is on the ventilation provisions related to ensuring that there is enough sensible air flow for the air-source heat pump water heaters to operate as heat pumps. Air flow is everything, having enough air flow is critical to the real-world performance of air source heat pump water heaters.

The space volume provisions allowing the installation of air source heat pump water heaters in an enclosed space that only can access new energy via conduction through the surfaces of the enclosure should be removed. As discussed below, such enclosed spaces limit the amount of hot water that can be made each day in heat pump mode. Additionally, future make and model HPWHs will likely have more powerful compressors that can extract more heat from the surrounding air. Thus, if HPWHs are allowed to be installed in enclosed spaces, future makes and models will not be able to operate at their rated performance level when installed into the enclosed space designed for today's HPWHs.

The provisions that explain how to provide air via passive or ducted ventilation have been simplified.

- For passive ventilation, the minimum net free area is proposed to be 75 square inches per 100 watts of compressor, fan, and control power.
- For ducted ventilation, the minimum air flow rate is proposed to be 60 cubic feet per minute (CFM) per 100 watts of compressor, fan, and control power.
- The derivation of these values is discussed below.

Table of Contents

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **IPC-IRCP Reason Statement v1.docx**
  https://www.cdpaccess.com/comment/605/32899/files/download/8051/

Comment (CAH2)# 605

Comment 6:

IPC: 506.5, 506.5.5 (New)

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee

(AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

506.5 **Air flow for water heating** ~~**Ventilation.**~~ ~~The ventilation requirements for air-source HPWH shall be in accordance with Sections 506.5.1 through 506.5.4. The minimum dimensions for the space volume where the HPWH is installed shall be 3.5 x 3.5 x 8 = 98 cubic feet.~~
The airflow requirements for air-source HPWH shall be in accordance with Sections 506.5.1 through 506.5.5. Intake air shall come from, and exhaust air shall be discharged to the same pressure zone. Where installed inside a building, the minimum dimensions for the location where a unitary HPWH or the heat pump portion of a split system HPWH is installed shall be 3.5 feet x 3.5 feet x 8 feet for each HPWH, or the minimum dimensions required by the manufacturer, whichever is greater. Access and service space shall conform to the requirements of Section 306 of the *International Mechanical Code*.

Add new text as follows:

506.5.5 **New water heater installations.** Where the installation is not a replacement for an existing water heater, and the HPWH is installed in an enclosed space that has only indirect access to air in accordance with Sections 506.5.1 and 506.5.2 intake and exhaust airflow shall be provided for a HPWH with not less than 1,500 watts of compressor, fan, and control power in accordance with Sections 506.5.3 and 506.5.4.

Reason: This proposal specifies that, for new water heating installations, in locations with indirect access to a source of "warm" air, the airflow for the intake and exhaust shall be installed for a HPWH with the same heat rates as a typical electric resistance water heater (4,500 Watts, 240VAC. It does not specify that the HPWH that is being installed be that large. However, if the HPWH that is being installed is larger than 1500 watts, the airflow must match the needs for the larger heat pump.

Since about 45 percent of the country has an electric resistance water heater, they will be able to get the same recovery time with the HPWH. If the other 45 percent of the country that has gas water heaters installs the larger HPWH, it will only take twice as long as they are used to recover the daily hot water use, instead of the 7-8 times longer that current HPWH take.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Comment (CAH2)# 609

P54-24 Part II

IRC: SECTION 202 (New), CHAPTER 20, SECTION M2005, M2005.1, P2805 (New), P2805.1 (New), P2805.2 (New), P2805.3 (New), P2805.3.1 (New), P2805.3.2 (New), P2805.4 (New), P2805.5 (New), P2805.5.1 (New), TABLE 2805.5.1 (New), P2805.5.2 (New), TABLE 2805.5.2 (New), P2805.5.3 (New), P2805.5.4 (New)

Proposed Change as Submitted

Proponents: Jim Lutz, self (jdlutz@hotwaterresearch.net), Gary Klein (gary@garykleinassociates.com)

2024 International Residential Code

Add new definition as follows:

Water Heater, Heat Pump, Air Source. A water heating system, containing a heat pump and storage tank, where the heat pump uses ambient air as a heat source to heat water. There are two types:(1) Unitary systems where the heat pump and storage tank are a single assembly. The heat pump is generally mounted on top of the storage tank.(2) Split systems where the heat pump and storage tank are separate assemblies.

CHAPTER 20
BOILERS AND WATER HEATERS

SECTION M2005
WATER HEATERS

Revise as follows:

M2005.1 General. Water heaters shall be installed in accordance with Chapter 28, the manufacturer's instructions and the requirements of this code. Water heaters installed in an *attic* shall comply with the requirements of Section M1305.1.2. Gas-fired water heaters shall comply with the requirements in Chapter 24. Domestic electric water heaters shall comply with UL 174. Oiled-fired water heaters shall comply with UL 732. Solar thermal water heating systems shall comply with Chapter 23 and ICC 900/SRCC 300. Solid fuel-fired water heaters shall comply with UL 2523. Air source heat pump water heaters shall comply with the requirements in Section P2805.

Add new text as follows:

P2805
Heat Pump Water Heaters

P2805.1 Air-source HPWHs. Air-source heat pump water heaters (HPWH) shall comply with Section P2805.2. through Section P2805.5.

P2805.2 Obstructions and clearances. Air intakes, exhaust outlets, filters, heating elements, wiring connections, condensate drains, temperature and pressure relief valves shall not be obstructed. Clearances shall be provided for maintenance and replacement in accordance with Section M1305.

P2805.3 Seismic bracing. Seismic bracing shall comply with Section P2801.8. Restraints shall not obstruct components specified in Section P2805.2.

P2805.3.1 Unitary HPWH. For unitary HPWHs seismic restraints shall be located at points within the upper one-third and lower one-third of the vertical dimensions of the storage tank, and not on the heat pump portion.

P2805.3.2 **Split System HPWH.** For split systems the seismic restraints for the storage tank shall be in accordance with Section P2805.3.1. The heat pump portion of the split system shall be installed in accordance with the manufacturer's instructions.

P2805.4 **Condensate drains.** Condensate drain lines from air source HPWHs shall be in accordance with Section M1411.3.

P2805.5 **Ventilation.** The ventilation requirements for air-source HPWH shall be in accordance with Sections P2805.5.1 through P2805.5.4. The minimum dimensions for the space volume where the HPWH is installed shall be 3.5 x 3.5 x 8 = 98 cubic feet.

P2805.5.1 **Space volume method.** Ventilation shall comply with the provisions Table P2805.5.1.

TABLE 2805.5.1 MINIMUM SPACE VOLUME FOR INSTALLING AIR-SOURCE HPW

Heat Pump Capacity (BTU/Hour)	<1,000	≥1,000 and <2,000	≥2,000 and <3,000	≥3,000 and <4,000	≥4,000 and <5,000	≥5,000 and <6,000	≥6,000 and <7,000	≥7,000 and <8,000	≥8,000 and <9,000	≥9,000 and <10,000	≥10,000 and <11,000	≥11,000 and <12,000	≥12,000 and <13,000	≥13,000 and <14,000	≥14,000 and <15,000	≥15,000 and <16,000	≥16,000 and <17,000	≥17,000 and <18,000
Space Volume (cubic feet)	175	350	525	700	875	1,050	1,225	1,400	1,575	1,750	1,925	2,100	2,275	2,450	2,625	2,800	2,975	3,150

For SI units: 1 cubic foot = 0.0283 m^3, 1000 British thermal units per hour = 0.293 kW

P2805.5.2 **Passive ventilation method.** Where the location of the HPWH is in a space smaller than required in Table P2805.5.1, additional ventilation shall be provided in accordance with Table P2805.5.2. Passive ventilation shall be into an adjacent space that shares the same pressure zone with the HPWH. The sum of the volume of the space where the HPWH is located and the volume in the adjacent space shall be not less than the space volume required for the capacity shown in Table P2805.5.2. The net free area of the passive ventilation shall be equally distributed between high and low openings. These openings shall be in the top quarter and bottom quarter of the space where the HPWH is located.

TABLE 2805.5.2 MINIMUM NET FREE AREA FOR INSTALLING AIR-SOURCE HPWH

Space Volume (cubic feet)	Heat Pump Capacity (BTU/Hour)																	
	<1,000	≥1,000 and <2,000	≥2,000 and <3,000	≥3,000 and <4,000	≥4,000 and <5,000	≥5,000 and <6,000	≥6,000 and <7,000	≥7,000 and <8,000	≥8,000 and <9,000	≥9,000 and <10,000	≥10,000 and <11,000	≥11,000 and <12,000	≥12,000 and <13,000	≥13,000 and <14,000	≥14,000 and <15,000	≥15,000 and <16,000	≥16,000 and <17,000	≥17,000 and <18,000
≥3,150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
≥2,975 and <3,150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80
≥2,800 and <2,975	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100
≥2,625 and <2,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120
≥2,450 and <2,625	-	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140
≥2,275 and <2,450	-	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160
≥2,100 and <2,275	-	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180
≥1,925 and <2,100	-	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200
≥1,750 and <1,925	-	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220
≥1,575 and <1,750	-	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240

≥1,400 and <1,575	-	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260
≥1,225 and <1,400	-	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260	280
≥1,050 and <1,225	-	-	-	-	-	0	80	100	120	140	160	180	200	220	240	260	280	300
≥875 and <1,050	-	-	-	-	0	80	80	120	140	160	180	200	220	240	260	280	300	320
≥700 and <875	-	-	-	0	80	80	100	140	160	180	200	220	240	260	280	300	320	340
≥525 and <700	-	-	0	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360
≥350 and <525	-	0	120	160	200	240	280	320	360	400	440	480	520	560	600	640	680	720
≥175 and <350	0	120	180	240	300	360	420	480	540	600	660	720	780	840	900	960	1020	1080
≥100 and <175	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	1120	1190	1260
<100	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	1120	1190	1260

For SI units: 1 cubic foot = 0.0283 m3, 1000 British thermal units per hour = 0.293 kW

P2805.5.3 Ducted ventilation method. Where the location of the HPWH is in a space smaller than required in Table P2805.5.1, and it is not possible to comply with the provisions for passive ventilation in accordance with Table P2805.5.2, the HPWH shall be ducted in accordance with the manufacturer's instructions. Air intake and exhaust ducts shall come from and go to the same pressure zone. The termination of the ducts in the remote space shall be directed so that they draw from and exhaust to different parts of the pressure zone. It is permissible to install a combination of passive and ducted ventilation to meet the air flow requirements of the HPWH.

P2805.5.4 New construction. Ventilation shall comply with the provisions in Sections P2805.5.1, P2805.5.2 and P2805.5.3 for the 18,000 BTU per Hour capacity column in Tables P2805.5.1 and P2805.5.2. **Exception:** For HPWHs larger than 18,000 BTU per hour, the minimum space volume shall be not less than 0.175 cubic feet per BTU per hour as rated by the manufacturer. Net free area and ducting shall be in accordance with the manufacturer's instructions.

Reason: The purpose of this proposal is to add an option to the plumbing code so that installers of heat pump water heaters (HPWH) have clear provisions in the chapterson Water Heaters regarding their proper installation. HPWH are water heaters, and most of the provisions regarding the installation of all water heaters apply. A key requirement that does not exist is that they need to be installed so that they operate in heat pump mode for the majority of their duty cycle.

For air source HPWH, the type of water heater discussed in this proposal, this means special attention must be paid to the air flow requirements. They need a source of "warm" air to extract energy and they need a sink for the cold air they discharge to be absorbed. The source and the sink need be matched. This can be challenging in cold climates.

To accommodate the energy exchange required by the source and the sink, the sizes of which depend on the capacity of the heat pump, there needs to be

1. A minimum volume of the space where the HPWH is installed. Energy exchange happens within that space.

2. Passive ventilation into an adjacent space if the space where the HPWH is located is not large enough. The volume of the two spaces must meet the minimum volume requirements for the HPWH's capacity. The two spaces must share a common pressure zone.

3. Ducted ventilation into an adjacent or remote space if the minimum volume or passive ventilation requirements cannot be me. The HPWH needs to be ducted to and from a location with the ability to support required energy exchange. When ducted, the remote terminals for the intake need to come from, and exhaust ducts to, the same pressure zone so that they do not adversely affect the performance of other mechanical systems.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

P54-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The heat pump water heater industry is in flux with changeover of refrigerants. Too difficult to come up with universal space/volume requirements for these units. The manufacturer's installation instructions for the specific unit must be followed. Also, complex tables as presented in the proposal are discouraged. (10-0)

P54-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: SECTION 202

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

Water Heater, Heat Pump, Air Source. A water heater that transfers thermal energy from one temperature level to another temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function. There are two types of air source heat pump water heaters: ~~A water heating system, containing a heat pump and storage tank, where the heat pump uses ambient air as a heat source to heat water. There are two types:~~
(1) Unitary systems where the heat pump and storage tank are a single assembly. The heat pump is generally mounted on top of the storage tank.(2) Split systems where the heat pump and storage tank are separate assemblies.

Reason: The US Department of Energy (DOE) defines the various types of water heaters sold in the United States. It makes sense to align the definition in this code with the one provided by DOE.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed change is to the definition. This has no impact on the cost to install this type of water heater.

Comment (CAH2)# 610

Comment 2:

IRC: CHAPTER 20, SECTION M2005, M2005.1

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

CHAPTER 20 BOILERS AND WATER HEATERS

SECTION M2005 WATER HEATERS

Revise as follows:

M2005.1 General. Water heaters shall be installed in accordance with Chapter 28, the manufacturer's instructions and the requirements of this code. Water heaters installed in an *attic* shall comply with the requirements of Section M1305.1.2. Gas-fired water heaters shall comply with the requirements in Chapter 24. Domestic electric water heaters shall comply with UL 174. Oiled-fired water heaters shall comply with UL 732. Solar thermal water heating systems shall comply with Chapter 23 and ICC 900/SRCC 300. Solid fuel-fired water heaters shall comply with UL 2523. Electric air ~~Air~~ source heat pump water heaters shall comply with the requirements in Section M2005.3 and Section P2805.

Reason:

The proposed change clarifies that electric air source heat pump water heaters must also comply with the provisions for electric water heaters in Section M2005.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifying that the provisions apply to electric air source heat pump water heaters and that these water heaters must also comply with the provisions for any electric water heater does not increase the cost to comply with the provisions in the section.

Comment (CAH2)# 611

Comment 3:

IRC: P2805, P2805.1

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

P2805

Heat Pump Water Heaters

Revise as follows:

P2805.1 Air-source HPWHs. ~~Air~~ Electric air-source heat pump water heaters (HPWH) shall comply with Section P2805.2. through Section P2805.5.

Reason: The proposed change clarifies that the provisions apply to electric air source heat pump water heaters.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifying that the provisions apply to electric air source heat pump water heaters does not increase the cost to comply with the provisions in the section.

Comment (CAH2)# 612

Comment 4:

IRC: P2805.2

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

P2805.2 Obstructions and clearances. Air intakes, exhaust outlets, filters, heating elements, wiring connections, condensate drains, temperature and pressure relief valves shall not be obstructed. Clearances shall be provided for maintenance and replacement in accordance with Section M1305.
Cold air discharged from HPWHs shall not blow on or otherwise affect the operation of the space conditioning thermostat.

Reason: I learned about this issue since the first Committee Action Hearing while in conversation with industry.

It is not appropriate for cold air discharged from the electric air source heat pump water heater to blow onto or otherwise affect the operation of the thermostat that regulates the indoor temperature of the building. In the winter, it will cause the space heating system to come on when the majority of the building is at the desired temperature. In the summer, it will cause the space cooling system to turn off when the majority of the building is not at the desired temperature. In the swing seasons, the thermostat will be confused.

The cold air can blow onto the thermostat. It can also cool the wall behind the thermostat. Either case can result in an inappropriate response from the space conditioning system.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Comment 5:

IRC: P2805.5, P2805.5.1, P2805.5.1.1 (New), P2805.5.1.2 (New), P2805.5.1.3 (New), TABLE 2805.5.1, P2805.5.2, P2805.5.2.1 (New), P2805.5.2.2 (New), P2805.5.2.3 (New), TABLE 2805.5.2, P2805.5.3, P2805.5.3.1 (New), P2805.5.4

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

P2805.5 Airflow for water heating ~~Ventilation.~~ The ~~ventilation~~ airflow requirements for air-source HPWH shall be in accordance with Sections P2805.5.1 through P2805.5.4 ~~2805.5.5.~~ Intake air shall come from, and exhaust air shall be discharged to the same pressure zone. Where installed inside a building, the ~~The~~ minimum dimensions for the location ~~space volume~~ where a unitary HPWH or the heat pump portion of a split system HPWH is installed shall be 3.5 feet x 3.5 feet x 8 feet for each HPWH ~~= 98 cubic feet~~, or the minimum dimensions required by the manufacturer, whichever are greater. Access and service space shall conform to the requirements of Section M1305.

P2805.5.1 Conditioned air ~~Space volume method~~. Air-source HPWH shall be *listed* and *labeled* for use with conditioned air. ~~Ventilation shall comply with the provisions Table P2805.5.1.~~

Add new text as follows:

P2805.5.1.1 Direct access. HPWH shall be installed in spaces where the energy supplied by the heating and cooling system is equal to or greater than the capacity of the heat pump portion of the HPWH.

P2805.5.1.2 Indirect access. Where installed in an enclosed space with inadequate heat rate, the energy supplied by the heating and cooling system for the sum of the enclosed space and the adjacent conditioned space shall be equal to or greater than the capacity of the heat pump portion of the HPWH. Where installed in an enclosed space that has only indirect access to conditioned air, HPWH shall be installed in accordance with Section P2805.5.3 or P2805.5.4 as applicable.

P2805.5.1.3 Available energy. The energy supplied by the heating and cooling system shall be determined in accordance with Section M1305.Where the installation does not conform with the provisions in Sections P2805.5.1.1 or P2805.5.1.2 backup heating shall be provided.

Delete without substitution:

~~TABLE 2805.5.1 MINIMUM SPACE VOLUME FOR INSTALLING AIR-SOURCE HPW~~

~~Heat Pump Capacity (BTU/Hour)~~	~~<1,000~~	~~≥1,000 and <2,000~~	~~≥2,000 and <3,000~~	~~≥3,000 and <4,000~~	~~≥4,000 and <5,000~~	~~≥5,000 and <6,000~~	~~≥6,000 and <7,000~~	~~≥7,000 and <8,000~~	~~≥8,000 and <9,000~~	~~≥9,000 and <10,000~~	~~≥10,000 and <11,000~~	~~≥11,000 and <12,000~~	~~≥12,000 and <13,000~~	~~≥13,000 and <14,000~~	~~≥14,000 and <15,000~~	~~≥15,000 and <16,000~~	~~≥16,000 and <17,000~~	~~≥17,000 and <18,000~~
~~Space Volume (cubic feet)~~	~~175~~	~~350~~	~~525~~	~~700~~	~~875~~	~~1,050~~	~~1,225~~	~~1,400~~	~~1,575~~	~~1,750~~	~~1,925~~	~~2,100~~	~~2,275~~	~~2,450~~	~~2,625~~	~~2,800~~	~~2,975~~	~~3,150~~

~~For SI units: 1 cubic foot = 0.0283 m^3, 1000 British thermal units per hour = 0.293 kW~~

Revise as follows:

P2805.5.2 **Unconditioned and outdoor air** **~~Passive ventilation method~~.** Where installed to utilize unconditioned or outdoor air, air-source unitary HPWH and split system HPWH shall be *listed* and *labeled* for use with outdoor air based on the climate zone where the HPWH is being installed. Unless the HPWH are *listed* and *labeled* for use with outdoor air, backup heating is required.
~~Where the location of the HPWH is in a space smaller than required in Table P2805.5.1, additional ventilation shall be provided in accordance with Table P2805.5.2. Passive ventilation shall be into an adjacent space that shares the same pressure zone with the HPWH. The sum of the volume of the space where the HPWH is located and the volume in the adjacent space shall be not less than the space volume required for the capacity shown in Table P2805.5.2. The net free area of the passive ventilation shall be equally distributed between high and low openings. These openings shall be in the top quarter and bottom quarter of the space where the HPWH is located.~~

Add new text as follows:

P2805.5.2.1 **Direct access.** The heat pump portion of the HPWH shall be provided with direct access to unconditioned or outdoor air and installed in accordance with manufacturer's instructions.

P2805.5.2.2 **Indirect access.** Where installed in an enclosed space that has only indirect access to unconditioned or outdoor air, HPWH shall be installed in accordance with Section P2805.5.3 or P2805.5.4 as applicable, or backup heating shall be provided.

P2805.5.2.3 **Available energy.** The energy supplied to unconditioned spaces shall be determined in accordance with Section M1305. Where the energy supplied to the unconditioned space is not equal to or greater than the capacity of the heat pump portion of the HPWH, backup heating shall be provided.

Delete without substitution:

~~TABLE 2805.5.2 MINIMUM NET FREE AREA FOR INSTALLING AIR-SOURCE HPWH~~

~~Space Volume (cubic feet)~~	~~Heat Pump Capacity (BTU/Hour)~~																	
	~~<1,000~~	~~≥1,000 and <2,000~~	~~≥2,000 and <3,000~~	~~≥3,000 and <4,000~~	~~≥4,000 and <5,000~~	~~≥5,000 and <6,000~~	~~≥6,000 and <7,000~~	~~≥7,000 and <8,000~~	~~≥8,000 and <9,000~~	~~≥9,000 and <10,000~~	~~≥10,000 and <11,000~~	~~≥11,000 and <12,000~~	~~≥12,000 and <13,000~~	~~≥13,000 and <14,000~~	~~≥14,000 and <15,000~~	~~≥15,000 and <16,000~~	~~≥16,000 and <17,000~~	~~≥17,000 and <18,000~~
~~≥3,150~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~
~~≥2,975 and <3,150~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~
~~≥2,800 and <2,975~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~
~~≥2,625 and <2,800~~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~
~~≥2,450 and <2,625~~	-	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~
~~≥2,275 and <2,450~~	-	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~
~~≥2,100 and <2,275~~	-	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~
~~≥1,925 and <2,100~~	-	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~
~~≥1,750 and <1,925~~	-	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~
~~≥1,575 and <1,750~~	-	-	-	-	-	-	-	-	~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~

~~≥1,400 and <1,575~~	-	-	-	-	-	-	-		~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~
~~≥1,225 and <1,400~~	-	-	-	-	-	-		~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~
~~≥1,050 and <1,225~~	-	-	-	-	-		~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~
~~≥875 and <1,050~~	-	-	-	-		~~0~~	~~80~~	~~80~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~
~~≥700 and <875~~	-	-	-		~~0~~	~~80~~	~~80~~	~~100~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~	~~340~~
~~≥525 and <700~~	-	-		~~0~~	~~80~~	~~100~~	~~120~~	~~140~~	~~160~~	~~180~~	~~200~~	~~220~~	~~240~~	~~260~~	~~280~~	~~300~~	~~320~~	~~340~~	~~360~~
~~≥350 and <525~~	-		~~0~~	~~120~~	~~160~~	~~200~~	~~240~~	~~280~~	~~320~~	~~360~~	~~400~~	~~440~~	~~480~~	~~520~~	~~560~~	~~600~~	~~640~~	~~680~~	~~720~~
~~≥175 and <350~~		~~0~~	~~120~~	~~180~~	~~240~~	~~300~~	~~360~~	~~420~~	~~480~~	~~540~~	~~600~~	~~660~~	~~720~~	~~780~~	~~840~~	~~900~~	~~960~~	~~1020~~	~~1080~~
~~≥100 and <175~~		~~70~~	~~140~~	~~210~~	~~280~~	~~350~~	~~420~~	~~490~~	~~560~~	~~630~~	~~700~~	~~770~~	~~840~~	~~910~~	~~980~~	~~1050~~	~~1120~~	~~1190~~	~~1260~~
~~<100~~		~~70~~	~~140~~	~~210~~	~~280~~	~~350~~	~~420~~	~~490~~	~~560~~	~~630~~	~~700~~	~~770~~	~~840~~	~~910~~	~~980~~	~~1050~~	~~1120~~	~~1190~~	~~1260~~

~~For SI units: 1 cubic foot = 0.0283 m3, 1000 British thermal units per hour = 0.293 kW~~

Revise as follows:

P2805.5.3 Gravity airflow ~~Ducted ventilation method~~. Gravity airflow shall be sized to provide not less than 75 square inches of free area per 100 watts of compressor, fan, and control power, or the minimum total free area as determined by the manufacturer, whichever is greater, inclusive of all HPWH installed in the enclosed space. ~~Where the location of the HPWH is in a space smaller than required in Table P2805.5.1, and it is not possible to comply with the provisions for passive ventilation in accordance with Table P2805.5.2, the HPWH shall be ducted in accordance with the manufacturer's instructions. Air intake and exhaust ducts shall come from and go to the same pressure zone. The termination of the ducts in the remote space shall be directed so that they draw from and exhaust to different parts of the pressure zone. It is permissible to install a combination of passive and ducted ventilation to meet the air flow requirements of the HPWH.~~

Add new text as follows:

P2805.5.3.1 Louvers and openings. The enclosed space shall be connected to the adjacent space using fully louvered doors or two openings of equal area, one located within 12 inches from the enclosure top and one located within 12 inches from the enclosure bottom. Louvers and grilles shall be fixed in the open position. Louvered doors and openings shall be permitted to be combined to meet the free area.

Revise as follows:

P2805.5.4 New water heater installations ~~New construction~~. Where the installation is not a replacement for an existing water heater, and the HPWH is installed in an enclosed space that has only indirect access to air in accordance with Sections 2805.5.1 and 2805.5.2 intake and exhaust airflow shall be provided for a HPWH with not less than 1,500 watts of compressor, fan, and control power in accordance with Sections 2805.5.3 and 2805.5.4.
~~Ventilation shall comply with the provisions in Sections P2805.5.1, P2805.5.2 and P2805.5.3 for the 18,000 BTU per Hour capacity column in Tables P2805.5.1 and P2805.5.2.~~

> ~~**Exception:** For HPWHs larger than 18,000 BTU per hour, the minimum space volume shall be not less than 0.175 cubic feet per BTU per hour as rated by the manufacturer. Net free area and ducting shall be in accordance with the manufacturer's instructions.~~

Reason: Introduction This public comment is intended to improve the original proposal to include the minimum installation requirements for electric air-source heat pump water heaters into the plumbing code.

Since submitting the proposal in January and listening to comments at the Committee Action Hearing in April, I have been communicating with manufacturers and others working with these water heaters to clarify, refine and simplify the installation requirements. The overall public comment proposes minor revisions to a few sections. Most of the sections included in the original proposal remain.

Based on the feedback from the CAH comments and ongoing discussions with industry, the focus of this public comment is on the ventilation provisions related to ensuring that there is enough sensible air flow for the air-source heat pump water heaters to operate as heat pumps. Air flow is everything, having enough air flow is critical to the real-world performance of air source heat pump water heaters.

The space volume provisions allowing the installation of air source heat pump water heaters in an enclosed space that only can access new energy via conduction through the surfaces of the enclosure should be removed. As discussed below, such enclosed spaces limit the amount of hot water that can be made each day in heat pump mode. Additionally, future make and model HPWHs will likely have more powerful compressors that can extract more heat from the surrounding air. Thus, if HPWHs are allowed to be installed in enclosed spaces, future makes and models will not be able to operate at their rated performance level when installed into the enclosed space designed for today's HPWHs.
The provisions that explain how to provide air via passive or ducted ventilation have been simplified.

- For passive ventilation, the minimum net free area is proposed to be 75 square inches per 100 watts of compressor, fan, and control power.
- For ducted ventilation, the minimum air flow rate is proposed to be 60 cubic feet per minute (CFM) per 100 watts of compressor, fan, and control power.
- The derivation of these values is discussed below.

Table of Contents

1. Overview
2. Determining air flow requirements for ducted air source HPWH
3. Can conduction alone supply the energy needed for an air-source HPWH?
4. Ensuring access to enough "warm" air
5. What do manufacturers say about the air flow requirements for AS_HPWH?
6. Summary of the proposed revisions to the overall proposal that creates new sections for AS_HPWH

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Attached Files

- **IPC-IRCP Reason Statement v1.docx**
  https://www.cdpaccess.com/comment/614/32901/files/download/8056/

Comment (CAH2)# 614

Comment 6:

IRC: P2805, P2805.5, P2805.5.5 (New)

Proponents: Gary Klein, Gary Klein and Associates, Inc., Self (gary@garykleinassociates.com) requests As Modified by Committee

(AMC2)

Modify as follows:

2024 International Residential Code

P2805
Heat Pump Water Heaters

Revise as follows:

P2805.5 **Air flow for water heating** ~~**Ventilation.**~~ ~~The ventilation requirements for air-source HPWH shall be in accordance with Sections P2805.5.1 through P2805.5.4. The minimum dimensions for the space volume where the HPWH is installed shall be 3.5 x 3.5 x 8 = 98 cubic feet.~~ The airflow requirements for air-source HPWH shall be in accordance with Sections P2805.5.1 through P2805.5.5. Intake air shall come from, and exhaust air shall be discharged to the same pressure zone. Where installed inside a building, the minimum dimensions for the location where a unitary HPWH or the heat pump portion of a split system HPWH is installed shall be 3.5 feet x 3.5 feet x 8 feet for each HPWH, or the minimum dimensions required by the manufacturer, whichever are greater. Access and service space shall conform to the requirements of Section M1305.

Add new text as follows:

P2805.5.5 **New water heater installations.** Where the installation is not a replacement for an existing water heater, and the HPWH is installed in an enclosed space that has only indirect access to air in accordance with SectionsP2805.5.1 and P2805.5.2, intake and exhaust airflow shall be provided for a HPWH with not less than 1,500 watts of compressor, fan, and control power in accordance with Sections P2805.5.3 and P2805.5.4.

Reason: This proposal specifies that, for new water heating installations, in locations with indirect access to a source of "warm" air, the airflow for the intake and exhaust shall be installed for a HPWH with at least the same heat rates as aa typical electric resistance water heater (4,500 Watts, 240VAC). It does not specify that the HPWH that is being installed be that large. However, if the HPWH that is being installed is larger than 1500 watts, the airflow must match the needs for the larger heat pump. Since about 45 percent of the country has an electric resistance water heater, they will be able to get the same recovery time with the HPWH. If the other 45 percent of the country that has gas water heaters installs the larger HPWH, it will only take twice as long as they are used to recover the daily hot water use, instead of the 7-8 times longer that current HPWH take.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a revision to provisions for a new section in the code that has not yet been adopted. The overall proposal adds an option to the existing code. It does not add or remove existing options or solutions to the existing code. If this option is not chosen, the existing solutions/options are the existing costs of the previous code language.

Comment (CAH2)# 615

P55-24

IPC: 502.11 (New)

Proposed Change as Submitted

Proponents: Ronald George, Plumb-Tech Design & Consulting Services LLC, Self (ron@plumb-techllc.com)

2024 International Plumbing Code

Add new text as follows:

502.11 Hot water Generators, Heat Exchangers, Pre-heaters, Solar water heaters. Hot water generators, heat exchangers, pre-heaters, and solar water heaters that utilize heat exchangers to heat or pre-heat domestic hot water shall have a temperature-actuated mixing valve complying with ASSE 1017 located downstream of any hot water generators, heat exchangers, pre-heaters, or solar water heaters to limit and control the water temperature supplied to the potable hot water distribution system to a stable, temperature. The potability of the water shall be maintained throughout the domestic hot water distribution system. Requirements for the heat source piping systems shall be in accordance with the International Mechanical Code.

Reason: Heat exchangers used as pre-heaters or hot water generators have the ability to overheat the domestic hot water when steam or heating hot water valves stick open or when flue gasses are extremely hot. This code change assures that a temperature actuated mixing valve will mix the hot water downstream of the device to a stable and desired temperature. A specific temperature is not given, because in some applications the distribution temperature may need to be slightly above 140 F in order to keep the circulated return above a Legionella bacteria growth temperature in larger buildings with significant heat loss in the system. Having the mixing valve downstream of these heat exchangers and HW generators can control the temperature when the heat recovery or pre-heater system heats the water well beyond the desired hot water system temperature.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

This will slightly increase the cost of construction, but adds a significant level of safety.

The retail cost of a 3/4-inch valves starts at $88.89 and the wholesale price is typically 40% less than retail price. The installed cost with a labor rate of $95/hr can start at $183.

Estimated Immediate Cost Impact Justification (methodology and variables):

This will save lives for as little as $183.00 on smaller systems and up to a few thousand dollars on larger systems. The value of this safety device is cheap compared to the increase in safety. This code change is needed to provide a safe hot water distribution system. The retail cost of a 3/4-inch valves starts at $88.89 and the wholesale price is typically 40% less than retail price. The installed cost starts at about $183 for Water heaters up to 80 gallons or a maximum of gpm.

For larger systems, Bronze Thermostatic Mixing Valves 1” in size cost is about $100.00 to $300.00; Bronze Tempering Valves 3" in size cost about $2,400.00 to $3,925.00.

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Estimated Life Cycle Cost Impact:

This cost is much less than the cost of a burn injury which can reach millions of dollars in medical costs, and affect entire families who have to help care for burn victims. The physical, emotional, phycological and ongoing medical costs can be immense. Then add any litigation costs associated with litigation. Insurance companies should support this as a safer installation and a total reduction in overall medical and liability costs.

When a facility has an unsafe hot water system (Without temperature controls to prevent overheating conditions) injuries and deaths can occur. injuries include costs for medical treatment which includes burn care, debridement to scrape off dead tissue still attached to the body, skin grafting to cover burned areas with skin from the burn victim to prevent rejection issues, Ongoing surgeries to splice in skin as the body grows, because the scar tissue does not grow or have elasticity. Additional medical costs associated with related medical conditions, psychological counseling, etc. Another cost not accounted for is the Litigation cost associated with a burn injury.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

The average size of a cold water make-up valve in an institutional building is about 3 inches in size.

In my experience dealing with scald litigation, the judge and jury awards for scald cases have included costs to cover medical expenses, and ongoing medical equipment, assistance and treatments including punitive damages totaling in excess of 16 million dollars for one incident at a facility that had hot water systems that were not safely designed, controlled and maintained and caused burn injuries. According to Internet research, In Western countries and other democracies, estimates for the value of a statistical life typically range from $1 million US dollars to $10 million US Dollars; for example, the United States Federal Emergency Management Agency (FEMA) estimated the value of a statistical life at $7.5 million US Dollars in 2020.
The cost of a valve is far less expensive than the injury, pain, suffering, Medical and physical therapy expenses, and litigation expenses. Or the emotional issues from a serious burns or loss of life from a scald injury.

P55-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There is a debate that there could be another valve in this language. The language is very broad. The potability of water was stated and the committee was not sure how that fits into this section. (12-1)

P55-24

Individual Consideration Agenda

Comment 1:

Proponents: Ronald George, Plumb-Tech Design & Consulting Services LLC, Self (ron@plumb-techllc.com) requests As Submitted

Reason: Heat exchangers used as pre-heaters or hot water generators have the ability to overheat the domestic hot water when steam or heating hot water valves stick open or when flue gasses are extremely hot.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 779

P59-24

IPC: 504.6

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Plumbing Code

Revise as follows:

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an *air gap* located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the *air gap*.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank where the water heater or storage tank is not elevated off of the floor, to a waste receptor, or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or *flood level rim* of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section 605.4 or materials tested, rated and *approved* for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

Reason: When water heaters are elevated off the floor, discharging to the pan can create splashing that will result in scalding if persons are standing near the water heater or below the water heater. This potential would violate item #6 of this section.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is for clarification only to ensure that people are not put at risk by ensuring users of the code understand the section and how it should be applied.

P59-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: What is the elevation where there is concern about personal injury? (14-0)

P59-24

Individual Consideration Agenda

Comment 1:

IPC: 504.6

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Submitted

Reason: When water heaters are elevated off the floor, discharging to the pan can create splashing that will result in scalding if persons are standing near the water heater or below the water heater. This potential would violate item #6 of this section. To address some particular questions asked during CAH #1, specifically that note # 6 of the section already covers this, I would like to reference the 2021 IPC Commentary -
The relief valve discharge pipe must terminate not more than 6 inches (152 mm) but not less than two times the pipe diameter above the floor surface or a waste receptor (including a floor drain) in order to prevent hot water discharge from being directed onto a building occupant
[see Commentary Figure 504.6(1)]. The relief valve discharge pipe is also allowed to discharge to the pan serving the water heater or hot water storage tank [see Commentary Figure 504.6(2)]. For termination points to the floor, the floor must be a suitable location (e.g., garage floor that slopes toward a garage door for vehicle entry). Otherwise, a floor drain or waste receptor must be provided to capture discharges from the discharge pipe. Note that the code only requires the air gap to be in the same room as the water heater. In other words, the floor drain or waste receptor could be located in another room or possibly another floor level. This allows for unique solutions for capturing discharges. For example, in some multilevel buildings where water heaters are nearly in the same location on each floor, a discharge collection piping system could be designed to direct all of the discharges to a single waste receptor on the lowest level [see Commentary Figure 504.6(3)] or to the outdoors. The code is silent as to the size/shape of capturing receptors at each water heater and the size of the common collection piping down to the lowest level.
Discharge of a relief valve to laundry trays/tubs, kitchen/utility sinks and shower floors are not suitable locations as this violates Item 6 of this code section.
Persons using the fixture could be injured by hot water and steam that could come from the pipe.
Code users often go to the commentary for assistance in interpreting code requirements. Even the commentary is silent as to how this applies, so in many instances the code and commentary do not provide clear direction on this matter.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 394

P60-24

IPC: 504.6

Proposed Change as Submitted

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com)

2024 International Plumbing Code

Revise as follows:

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an *air gap* located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the *air gap*.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants. Where the discharge termination point is not readily visible and observable, a leak detection monitoring device with alarm notification (and not automatic shut-off), or a building management system shall be required.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or *flood level rim* of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section 605.4 or materials tested, rated and *approved* for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

Reason: Approval of this code change will allow design flexibility, and more importantly, provide for the allowance of leak detection technology to warn building occupants and managers of a problem with a safety device.

Current code language just requires visibility of the termination point, but if there is a significant discharge of the valve there may not be any awareness of the problem for an extended period. This can especially be a problem when a building is unoccupied and then significant flood damage can result.

This proposal does not intend to require the devices, just allow their use if the termination point is not visible. The allowance of leak detection technology makes for safer, smarter buildings.

Bibliography: Links date: 11-29-2023

https://www.homedepot.com/p/MOEN-Smart-Leak-Detectors-1-Pack-920-004/312855333

https://www.prowaterheatersupply.com/sentinel-hydrosolutions-leak-defense-system-lds-3-200.html

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

Residential: Moen retail $50

Commercial: Sentinel Systems $2,500 - $3,500 retail depending on size

Residential Installation Cost: $0

Commercial Installation Cost: Labor 2 hours at $100/hr.

Estimated Immediate Cost Impact Justification (methodology and variables):

Residential: Moen retail $50

Commercial: Sentinel Systems $2,500 - $3,500 retail depending on size

Residential Installation Cost: $0

Commercial Installation Cost: Labor 2 hours at $100/hr.

Estimated Life Cycle Cost Impact:

Life Cycle Cost: $0

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Life Cycle Cost: $0

P60-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The added language is an oxymoron. The first sentence requires the end to be readily visible and the new sentence speaks to when the end is not readily visible. Use of parenthesis in code text is not appropriate. (14-0)

P60-24

Individual Consideration Agenda

Comment 1:

IPC: 504.6

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an *air gap* located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the *air gap*.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants. ~~Where the discharge termination point is not readily visible and observable, a leak detection monitoring device with alarm notification (and not automatic shut-off), or a building management system shall be required.~~ and a leak detection or monitoring device with a visible or audible alarm, or a connection to a building management system, shall be installed when required by the local authority having jurisdiction.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or *flood level rim* of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section 605.4 or materials tested, rated and *approved* for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

Reason: Revised proposal to address committee's concerns about removing the requirement for readily observable termination port.

Cost Impact: Increase

Estimated Immediate Cost Impact:

The proposed modification does not change the immediate cost impact of the proposal, with the modification, as the modification does not add any additional materials or installation labor.

Residential: Moen retail $50

Commercial: Sentinel Systems $2,500 - $3,500 retail depending on size

Residential Installation Cost: $0

Commercial Installation Cost: Labor 2 hours at $100/hr.

Estimated Immediate Cost Impact Justification (methodology and variables):

Residential: Moen retail $50

Commercial: Sentinel Systems $2,500 - $3,500 retail depending on size

Residential Installation Cost: $0

Commercial Installation Cost: Labor 2 hours at $100/hr.

Comment (CAH2)# 773

P62-24 Part II

IRC: P2801.5.1, IAPMO Chapter 44 (New)

Proposed Change as Submitted

Proponents: Jay Peters, Codes and Standards International LLC, IPS Corporation (peters.jay@me.com)

2024 International Residential Code

Revise as follows:

P2801.5.1 Pan size and drain. The pan shall be not less than 1$^1/_2$ inches (38 mm) deep and shall be of sufficient size and shape to receive dripping or condensate from the tank or water heater. The pan shall be drained by an *indirect waste pipe* of not less than $^3/_4$ inch (19 mm) diameter or be equipped with a device complying with CAN/IAPMO Z1349 to automatically shut off the water supply to the water heater upon detection of a leak. Piping for safety pan drains shall be of those materials indicated in Table P2906.5. Where a pan drain was not previously installed, a pan drain shall not be required for a replacement water heater installation when equipped with a device complying with CAN/IAPMO Z1349 to automatically shut off the water supply to the water heater upon detection of a leak.

Add new standard(s) as follows:

IAPMO

IAPMO Group
4755 E. Philadelphia Street
Ontario, CA 91761-USA

ANSI/CAN/IAPMO Z1349-2021 Devices for Detection, Monitoring or Control of Plumbing Systems

Reason: The pan and drainage piping are intended to relieve small leaks. Although it might be small, a leak should not occur and is the first sign of a possible pending catastrophic event with no indication to the owner of any possible problem, as it is typically out of sight. In other instances, it can be extremely onerous to provide piping to an approved location in existing construction.

These listed devices are approved as options in many jurisdictions across Texas, California and more. In come cases, they are required in lieu of a pan and/or drain. They are reliable and sense a minuscule bit of moisture (one drop) and immediately shut off the water supply to the specific appliance. There are multiple manufacturers and well over a million units have been installed. Many water heater manufacturers, such as Rheem and AO Smith, have already incorporated this leak sensing technology into the equipment. This provision will raise the level of safety and protection for installations without integral devices.

T**he first change above** provides an option, could be a less expensive installation in some cases, raises the level of safety, has the potential to reduce injuries and save millions of dollars in water damages to structures.

T**he second change above** provides a much higher level of safety and corrects a potential safety hazard. The original provision allows for a noncompliant (unsafe) installation to be replaced and remain noncompliant in perpetuity regardless of whether it is above an occupied space or any other potential unsafe location. If a leak occurs above an occupied space, the pan may collect and have no place to drain. This new addition would now require a replacement water heater to have a pan drain or have an integral device or an approved external device to shut off the water to the heater in the event of a leak.

The code should not incentivize substandard installations and provide exceptions for noncompliant unsafe conditions that could cause damage and bodily harm just because it was already done previously.

Sample Local Jurisdiction Code Language:

Fort Worth, Texas

Exception: When a water heater retrofit or replacement occurs on a slab foundation and the line cannot be discharged to an approved location the T& P discharge line can be piped to the water heater pan provided with all of the following:

1. the water heater when water is detected inside the pan;

2. A device is installed that will sound an audible alarm when water is detected inside the pan to alert the occupants that a leak has occurred.

Frisco Texas

P2801.9 Water heaters installed in attics or with living space below: Water heaters, other than tankless, when located in an attic space or a space located above living space, shall be equipped with a WAGS, Floodstop or other approved device to automatically shut off the water supply if a water leak is detected.**Exception:** Replacement water heaters that were permitted on or before December 31, 2013, shall not be required to be equipped with an automatic Shut off device.

The following standard for the testing and certification of these devices has also beed proposed to the list of approved standards in the IRC and the IPC. **ANSI/CAN/IAPMO Z1349 Standard for Devices for Detection, Monitoring or Control of Plumbing Systems.**

This standard supports the proposals in the IRC and IPC to allow these devices as an additional option. It is an ANSI Standard

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

No Cost Impact. ($0)

Estimated Immediate Cost Impact Justification (methodology and variables):

The proposal only provides an additional option that could potentially reduce construction and installation costs and does not have a cost impact since it is merely an option.
This provision could save construction and installation costs, not to mention prevent leaks from becoming damaging over time or even catastrophic. Since it is **only another option, and not a required provision, it should never increase the cost of construction** if the decision is made on cost alone.The proposal corrects an unsafe provision and could also potentially save tens thousands of dollars per leak incident.

Estimated Life Cycle Cost Impact:

None

Estimated Life Cycle Cost Impact Justification (methodology and variables):

None

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/CAN/IAPMO Z1349-21 *Standard for Devices for Detection, Monitoring or Control of Plumbing Systems*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P62-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There is a concern that if water is shut off to the water heater that the elements could burn out. (10-0)

P62-24 Part II

Individual Consideration Agenda

Comment 1:

Proponents: Jay Peters, Codes and Standards International LLC, IPS Corporation (peters.jay@me.com) requests As Submitted

Reason: Proven protection of occupants and structures from water heater leaks should not be sacrificed to preserve an already damaged and potentially dangerous appliance. There has not been any data or reported issues in the millions of installations by multiple manufacturers. It was not also a concern to the technical committee members and industry stakeholders that developed the ANSI product safety standard for this product. Although only a hypothetical concern at this point, many installations are used for gas fired water heaters (without heating elements) so the pool of possible problems with elements is greatly reduced and a nonissue. Mineral build up, faulty wiring, and pockets of air (airlock) can cause damage not only to the heating element but can create leaks. An automatic shut off would not likely be the reason for an element burn-out. The safety device would only activate due to the presence of water or a leak. If a water heater is leaking, damage has most likely already occurred to the heater and components/elements. If the water heater is leaking, concern about an internal heating element or any other component will not improve the safety or reduce damage. Listed Automatic shut-offs prevent further damage, both in water claims, and structural damage. Please accept as originally submitted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 688

P67-24

IPC: 604.4, 604.4.1 (New), 604.4.2 (New), TABLE 604.4

Proposed Change as Submitted

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Bradley Corp. (jbengineer@aol.com)

2024 International Plumbing Code

Revise as follows:

604.4 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table 604.4. ~~**Exceptions:**~~

1. ~~Blowout design water closets having a water consumption not greater than 3 1/2 gallons (13 L) per flushing cycle.~~
2. ~~Vegetable sprays.~~
3. ~~Clinical sinks having a water consumption not greater than 4 1/2 gallons (17 L) per flushing cycle.~~
4. ~~Service sinks.~~
5. ~~Emergency showers.~~

Add new text as follows:

604.4.1 Group wash fixtures. Group wash fixtures used as public lavatories shall have a maximum water consumption flow rate in accordance with Table 604.4 based on each 16 inches of rim space.

604.4.2 Emergency fixtures. The maximum flow rates in Table 604.4 shall not apply to emergency fixtures.

Revise as follows:

TABLE 604.4 MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY[b]
Clinical sink	4.5 gallons per flushing cycle
Lavatory, private	2.2 gpm at 60 psi
Lavatory, public (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head[a, c]	2.0 gpm at 80 psi
~~Sink~~ Kitchen sink faucet	2.2 gpm at 60 psi
Urinal	1.0 gallon per flushing cycle
Water closet	1.6 gallons per flushing cycle
Water closet, blowout	3.5 gallons per flushing cycle

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

a. A hand-held shower spray is a shower head.

b. Consumption tolerances shall be determined from referenced standards.

c. Shower heads shall comply with all requirements for high-efficiency showerheads in ASME A112.18.1-2020/CSA B125.1.

Reason: This proposal is an alternative approach for addressing the exceptions currently listed in Section 604.4. Clinical sink and blowout water closets have been added to the table since there are water consumption requirements. These are not exceptions.
The other change to the table is the addition of the word “kitchen” in front of sink faucet in Table 604.4. The Federal water conservation

requirements are very clear in listing kitchen faucets. The use of the term “sink faucets” has led to some of the confusion regarding what sinks are regulated for water conservation.

A new subsection is proposed for determining the water consumption use for group wash fixtures used as public lavatories. Section 419.1 lists a rim space to be classified as a lavatory. However, for water consumption applications, the spacing listed is not consistent with the use of the fixture. The manufacturers have allocated the water use for each 16 inches of rim space.

The other new subsection states that emergency fixtures, showers, eyewash, or facewash, are not regulated by Table 604.4. This is consistent with the Federal requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change is editorial. If one reviews the change, they will notice that there is no additional requirements for plumbing fixtures. The text is simplified into a table format for better understanding. Hence, this has no impact on the cost of construction.

P67-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proponent wanted to fix his proposal with a floor modification but it was ruled out of order. The proposal needs to come back with a public comment. (14-0)

P67-24

Individual Consideration Agenda

Comment 1:

IPC: 604.4.1

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Bradley Corp. (jbengineer@aol.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

~~**604.4.1 Group wash fixtures.** Group wash fixtures used as public lavatories shall have a maximum water consumption flow rate in accordance with Table 604.4 based on each 16 inches of rim space.~~

Reason: During the first hearing, a modification was submitted to strike Section 604.4.1 Group wash fixtures. Everyone, including the proponent, was in agreement to strike this section as being inappropriate to add. Unfortunately, the modification was ruled out of order. Had the modification been accepted, in all likelihood this change would have been accepted.
Two changes were proposed to modify this section. The Committee was asked to decide which approach they liked the best. There

appeared to be complete agreement that P67-24 was preferred over P68-24. For that reason, a public comment is only being proposed to P67-24 with the requested modification.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change strikes a section originally proposed to be included. Therefore, there is no cost impact.

Comment (CAH2)# 242

P73-24 Part I

IPC: 604.8, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

604.8 Water pressure-reducing valve or regulator. Where water pressure within a building exceeds 80 psi (552 kPa) static, an *approved* water pressure-reducing valve conforming to ASSE 1003, ASSE 1103, or CSA B356 with strainer shall be installed to reduce the pressure in the building water distribution piping to not greater than 80 psi (552 kPa) static. **Exception:** Service lines to sill cocks and outside hydrants, and main supply risers where pressure from the mains is reduced to 80 psi (552 kPa) or less at individual fixtures.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1103-202x Pilot operated Water Pressure Reducing Valves for Potable Water

Reason: There are currently 2 types of pressure reducing valves allowed in the plumbing code. The ASSE 1003 Water Pressure Reducing Valves for Potable Water Distribution Systems, a directing acting valve in sizes ½" through 4" and the AWWA C530 Pilot Operated Control Valve. The ASSE 1103 valve is as the title states, a pilot operated valve in sizes 1-1/2" through 60". AWWA C530 valves were approved in the 2024 code cycle to provide an approved pressure reducing valve larger than 4" for systems that have larger volume requirements.

The new ASSE Standard 1103 "Pilot Operated Water Pressure Reducing Valves for Potable Water" will allow the use of pilot operated pressure control valves that are specifically intended for potable water applications. As such the standard requires compliance with NSF 61 and NSF 372.

The approval of this proposal will allow designers the flexibility to specify, and AHJs to approve, potable water pressure controllers with a valve specifically intended for use in potable water systems.

Bibliography: Link Date: 01/02/2024

Direct acting: https://www.zoro.com/zurn-water-pressure-reducing-valve-2-12-in-212-500xl/i/G5064236/?campaignid=19725397607&productid=G5064236&v=&gad_source=1

Pilot operated: https://masterbuildermercantile.com/products/zurn-wilkins-212-zw209-2-1-2-pressure-reducing-valve-pilot-controlled-lead-free

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

Product Cost: 2½" Zurn ASSE 1003 PRV @ Zorro - $2,635 vs Pilot operated $2,089

Installation Cost: Same cost to install

Estimated Immediate Cost Impact Justification (methodology and variables):

Product Cost: 2½” Zurn ASSE 1003 PRV @ Zorro - $2,635 vs Pilot operated $2,089

Installation Cost: Same cost to install

Estimated Life Cycle Cost Impact:

Comparatively same cost for repair/maintenance kits for each, so no increase or reduction. 30year Lifetime repair cost estimated $200-$300, parts and labor.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Comparatively same cost for repair/maintenance kits for each, so no increase or reduction. 30year Lifetime repair cost estimated $200-$300, parts and labor.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1103-202x *Pilot operated Water Pressure Reducing Valves for Potable Water*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P73-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The standard is still in draft form. (13-1)

P73-24 Part I

Individual Consideration Agenda

Comment 1:

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com) requests As Submitted

Reason: ASSE 1103 is officially published as an ANSI Standard

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 768

Comment 2:

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The ASSE 1103 Standard is now a Published Standard under ANSI

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

P73-24 Part II

IRC: P2903.3.2, ASSE Chapter 44 (New)

Proposed Change as Submitted

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com)

2024 International Residential Code

Revise as follows:

P2903.3.2 Maximum pressure. The static water pressure shall be not greater than 80 psi (551 kPa). Where the *main* pressure exceeds 80 psi (551 kPa), an *approved* pressure-reducing valve conforming to ASSE 1003, ASSE 1103, or CSA B356 shall be installed on the domestic water branch *main* or riser at the connection to the water service pipe.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1103-202x Pilot operated Water Pressure Reducing Valves for Potable Water

Reason: The addition of the new ASSE Standard 1103 Pilot Operated Water Pressure Reducing Valves for Potable Water will allow system designers another option for valve selection, particularly when sizes than 3" are required. These types of valves are capable of maintaining tighter control of the set pressure. The standard also requires their compliance with NSF 61 and NSF 372 in applications where the water is intended for human consumption.

Bibliography: Link Date: 01/02/2024

Direct acting: https://www.zoro.com/zurn-water-pressure-reducing-valve-2-12-in-212-500xl/i/G5064236/?campaignid=19725397607&productid=G5064236&v=&gad_source=1

Pilot operated: https://masterbuildermercantile.com/products/zurn-wilkins-212-zw209-2-1-2-pressure-reducing-valve-pilot-controlled-lead-free

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

Product Cost: 2½" Zurn ASSE 1003 PRV @ Zorro - $2,635 vs Pilot operated $2,089

Installation Cost: Same cost to install

Estimated Immediate Cost Impact Justification (methodology and variables):

Product Cost: 2½" Zurn ASSE 1003 PRV @ Zorro - $2,635 vs Pilot operated $2,089

Installation Cost: Same cost to install

Estimated Life Cycle Cost Impact:

Life Cycle Cost: Comparatively same cost for repair/maintenance kits for each, so no increase or reduction. 30year Lifetime repair cost estimated $200-$300, parts and labor.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Life Cycle Cost: Comparatively same cost for repair/maintenance kits for each, so no increase or reduction. 30year Lifetime repair cost estimated $200-$300, parts and labor.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1103-202x *Pilot operated Water Pressure Reducing Valves for Potable Water*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P73-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The standard is not complete. (10-0)

P73-24 Part II

Individual Consideration Agenda

Comment 1:

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com) requests As Submitted

Reason: ASSE 1103 is officially published as an ANSI Standard

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 769

Comment 2:

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com) requests As Submitted

Reason: The ASSE 1103 Standard is now a published ANSI Standard

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 686

P83-24

IPC: TABLE 608.1, 608.17.1.2, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com)

2024 International Plumbing Code

Revise as follows:

TABLE 608.1 APPLICATION OF BACKFLOW PREVENTERS

Portions of table not shown remain unchanged.

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ASME A112.1002/CSA B125.12; CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″– $^1/_2$″	ASSE 1022
Backflow preventer for carbonated and non-carbonated beverage machines.	Low Hazard	Backpressure or backsiphonage Sizes 1/4″–1/2″	ASSE 1032
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″–$^3/_4$″	ASSE 1012; CSA B64.3
Backflow preventer with intermediate atmospheric vent and pressure-reducing valve.	Low hazard	Backpressure or backsiphonage Sizes $^1/_2$″–$^3/_4$″	ASSE 1081
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″–2″	ASSE 1024; CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes $^1/_2$″–1″	ASME A112.21.3; ASSE 1052; CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes $^1/_2$″, $^3/_4$″, 1″	ASME A112.21.3; ASSE 1011; CSA B64.2; CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035; CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes $^1/_8$″–8″	ASSE 1001; CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes $^3/_4$″, 1″	ASME A112.21.3; ASSE 1019; CSA B64.2.2

For SI: 1 inch = 25.4 mm.

a. Low hazard—See Pollution (Section 202).

High hazard—See Contamination (Section 202).

b. See Backpressure, low head (Section 202, Backflow).

See Backsiphonage (Section 202, Backflow).

608.17.1.2 Coffee machines and noncarbonated drink dispensers. The water supply connection to each coffee machine and each noncarbonated beverage dispenser shall be protected against backflow by a backflow preventer conforming to ASSE 1022 or ASSE 1024, ASSE 1032, or protected by an *air gap*.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

ASSE/ANSI 1032-23 — Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers, Post Mix Type, and Non-Carbonated Beverage Dispensers

Reason: ASSE/ANSI 1032-2023 *"Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers, Post Mix Type, and Non-Carbonated Beverage Dispensers"* has been published and the title was updated to include the approval for applications that are carbonated and non-carbonated. The previous version of the standard did not include non-carbonated and was the basis for rejection in the last code cycle. ASSE technical committees reviewed the design and materials of the ASSE 1032 backflow preventors and verified that they exceed the requirements for non-carbonated applications. This title change will provide increased design flexibility and inclusion in the IPC will allow acceptance by AHJs.

Bibliography: Links date: 11-29-2023

Zurn 1022

https://www.grainger.com/product/454N98?gucid=N:N:PS:Paid:GGL:CSM-2295:4P7A1P:20501231&gad_source=1&gclid=EAIaIQobChMI6d_p9Z37ggMVRmJHAR1O-gkwEAQYASABEgLT8fD_BwE&gclsrc=aw.ds

Zurn 1032

https://www.grainger.com/product/454N98?gucid=N:N:PS:Paid:GGL:CSM-2295:4P7A1P:20501231&gad_source=1&gclid=EAIaIQobChMI6d_p9Z37ggMVRmJHAR1O-gkwEAQYASABEgLT8fD_BwE&gclsrc=aw.ds

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The approval of this proposal will allow designers the flexibility to specify, and AHJs to approve check valves specifically intended for use in potable water systems. Costs for the original purchase, installation and life cycle of the proposed additional valve are very similar to the currently approved check valve. These valves are small and are generally replaced versus being field repaired.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1032-23 *Dual Check Valve Type Backflow Preventers for Carbonated Beverage Dispensers, Post Mix Type, and Non-Carbonated Beverage Dispensers* , with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P83-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The word "carbonated" needs to be stricken from the new line in the table. (14-0)

P83-24

Individual Consideration Agenda

Comment 1:

IPC: TABLE 608.1

Proponents: George Istefan, Watts Water Technologies (george.istefan@wattswater.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

TABLE 608.1 APPLICATION OF BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ASME A112.1002/CSA B125.12; CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes 1/4″– 1/2″	ASSE 1022
Backflow preventer for ~~carbonated and~~ non-carbonated beverage machines.	Low Hazard	Backpressure or backsiphonage Sizes 1/4″–1/2″	ASSE 1032
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes 1/4″–3/4″	ASSE 1012; CSA B64.3
Backflow preventer with intermediate atmospheric vent and pressure-reducing valve.	Low hazard	Backpressure or backsiphonage Sizes 1/2″–3/4″	ASSE 1081
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes 1/4″–2″	ASSE 1024; CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes 1/2″–1″	ASME A112.21.3; ASSE 1052; CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes 1/2″, 3/4″, 1″	ASME A112.21.3; ASSE 1011; CSA B64.2; CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035; CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes 1/8″–8″	ASSE 1001; CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes 3/4″, 1″	ASME A112.21.3; ASSE 1019; CSA B64.2.2

For SI: 1 inch = 25.4 mm.

a. Low hazard—See Pollution (Section 202).

High hazard—See Contamination (Section 202).

b. See Backpressure, low head (Section 202, Backflow).

See Backsiphonage (Section 202, Backflow).

Reason: Removed the carbonated beverage dispensers application from Table 608.1 due to concern regarding the reaction of CO2 gases with copper piping.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

corrected the language of the original proposal to address the committee's concerns, no cost changes to the original proposal.

Comment (CAH2)# 771

P93-24

IPC: SECTION 609, 609.1, 609.3 (New), 609.3.1 (New), 609.3

Proposed Change as Submitted

Proponents: Jeff O'Neil, Chair, Committee on Healthcare (ahc@iccsafe.org)

2024 International Plumbing Code

SECTION 609
HEALTH CARE PLUMBING

609.1 Scope. This section shall govern those aspects of health care plumbing systems that differ from plumbing systems in other structures. Health care plumbing systems shall conform to the requirements of this section in addition to the other requirements of this code. The provisions of this section shall apply to the special devices and equipment installed and maintained in the following *occupancies* : Group I-1, Group I-2, ambulatory care facilities, medical offices, research and testing laboratories, and Group F facilities manufacturing pharmaceutical drugs and medicines.

Add new text as follows:

609.3 Water. Water shall be provided in health care facilities in accordance with Section 609.3.1 and 609.3.2.

609.3.1 Hand-washing water. Hand-washing water shall be provided to all dedicated handwashing stations. Water with a temperature not less than 45 degrees F (13 C) and not greater than 85 F degrees (32 C) or not less than 105 degrees F (40 C) to 120 degrees F (49 C), shall be delivered from dedicated hand-washing stations. Water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

Revise as follows:

~~**609.3**~~ **609.3.2 Hot water.** Other than at dedicated hand washing stations, *hot* ~~*Hot*~~ *water* shall be provided to supply all of the hospital fixture, kitchen and laundry requirements. Special fixtures and equipment shall have hot water supplied at a temperature specified by the manufacturer. The hot water system shall be installed in accordance with Section 607.

Reason: The purpose of this change is to allow for maximum amount of handwashing options in a hospital setting, while considering optimal operating performance of systems. In addition to the proven effectiveness of handwashing against COVID-19, other pathogens such as Legionella are a primary concern for healthcare facilities. Water systems are constantly being optimized to In addition, use of higher water temperature increases energy consumption, and therefore having alternate options for handwashing would be beneficial from an environmental standpoint. Even if ABHR is used, it is not recommended for use when hands are heavily soiled or greasy, also per the CDC (Show Me the Science – When & How to Use Hand Sanitizer in Community Settings | Handwashing | CDC). From that article, the "CDC recommends washing hands with soap and water whenever possible because handwashing reduces the amounts of all types of germs and chemicals on hands."

Hospital water systems do not directly reflect outside weather conditions in terms of temperature. Systems generally receive water from municipal mains at about 45 degrees minimum. To combat pathogens such as Legionella, CDC recommendations are to maintain cold water temperature at approximately 68 degrees, based on standard ASHRAE 12-2020. This is achieved by simple circulation of the water through the interior system of the hospital, where indoor air temperatures are maintained. Systems heat water, and also chilled water, to operational temperatures, but water from the cold water tap is not extreme in temperature. This dispels the notion of the "Minnesota Effect," which was a concern in the debate and discussion during the Committee Action Hearings on this code change.

Also, during proper handwashing, use of soap accounts for most of the 20 seconds recommended for hand scrubbing. Hands are only under the water briefly at the beginning, to rinse hands, and then at the end to rinse off the soap. Based on CDC observations, found at Frequent Questions About Hand Hygiene | Handwashing | CDC the effectiveness of the soap is not related to water temperature. Per the

CDC, on the topic of use of warm water or cold water for handwashing, “[u]se your preferred water temperature – cold or warm – to wash your hands. Warm and cold water remove the same number of germs from your hands. The water helps create soap lather that removes germs from your skin when you wash your hands. Water itself does not usually kill germs; to kill germs, water would need to be hot enough to scald your hands.” Other studies suggest that cold water handwashing is actually more effective than warm water handwashing, including elimination of a number of pathogens as noted in Quantifying the Effects of Water Temperature, Soap Volume, Lather Time, and Antimicrobial Soap as Variables in the Removal of Escherichia coli ATCC 11229 from Hands (https://meridian.allenpress.com/jfp/article/80/6/1022/200017/Quantifying-the-Effects-of-Water-Temperature-Soap). In brief, “the results of this study indicate that water temperature is not a critical factor for the removal of transient microorganisms from hands.”

Regarding data surrounding Legionella testing, ASHRAE 188-2017 requires a testing program to determine growth of Legionella at cooling towers and domestic water systems. The purpose for testing is to treat the water before the pathogen grows to lethal levels. In 2017, as noted in Legionellosis Report 2017 (pa.gov), the top jurisdictions had a total of 7,458 cases of Legionella. The monumental Legionnaires Disease outbreak of 1976 at the Bellevue Stratford Hotel in Philadelphia had 182 reported cases with 29 deaths, for a 15.9% death rate. There have been more recent outbreaks in 2017 at Lenox Hill Hospital in New York, and in relation to the Flint, MI water crisis in 2019. Water testing programs are instituted throughout the united states to avoid such a catastrophic result, so systems can be properly cleaned before they reach an outbreak level.The complexities of encouraging handwashing, while mitigating pathogens such as Legionella and COVID-19, are a balance that hospitals face regularly. This change to allow cold handwashing affords another tool to successfully create the safest environment possible.

This proposal is submitted by the ICC Committee for Healthcare (CHC).
The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2023 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Bibliography: 1. Carrico AR, Spoden M, Wallston KA, Vandenbergh MP. The Environmental Cost of Misinformation: Why the Recommendation to Use Elevated Temperatures for Handwashing is Problematic. Int J Consum Stud. 2013;37(4):433-441. doi:10.1111/ijcs.12012

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is an option for hospitals for water temperature and will not change the requirements for construction of the dedicated handwashing stations or the piping.

Staff Analysis: The proposed standard is in the current edition of the code.

P93-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proposal is confusing and needs to be brought back at CAH2 with clearer language. (14-0)

Individual Consideration Agenda

Comment 1:

IPC: SECTION 609, 609.1, 609.3, 609.3.1, 609.3.2

Proponents: Jeff O'Neil, Chair, Committee on Healthcare (ahc@iccsafe.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

SECTION 609 HEALTH CARE PLUMBING

609.1 Scope. This section shall govern those aspects of health care plumbing systems that differ from plumbing systems in other structures. Health care plumbing systems shall conform to the requirements of this section in addition to the other requirements of this code. The provisions of this section shall apply to the special devices and equipment installed and maintained in the following *occupancies* : Group I-1, Group I-2, ambulatory care facilities, medical offices, research and testing laboratories, and Group F facilities manufacturing pharmaceutical drugs and medicines.

609.3 Water. Water shall be provided in health care facilities in accordance with Section 609.3.1 and 609.3.2.

609.3.1 Hand-washing water. Hand-washing water shall be ~~provided to all~~ delivered from dedicated handwashing stations. Water ~~with a~~ temperature shall be either:

1. Cold water not ~~Not~~ less than 45 degrees F (13 C) and not greater than 85 F degrees (32 C)
2. ~~nor~~ Hot water not less than 105 degrees F (40 C) ~~to~~ and not greater 120 degrees F (49 C) ~~, shall be delivered from dedicated hand-washing stations~~.

Water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

Exception: Tempered water shall be permitted where the water management program has alternate control measures implemented to provide protection from waterborne pathogens. Tempered water shall be controlled in accordance with Section 607.1.2.

609.3.2 Hot water. Other than at lavatories and dedicated hand washing stations, *hot water* shall be provided to supply all of the hospital fixture, kitchen and laundry requirements. Special fixtures and equipment shall have hot water supplied at a temperature specified by the manufacturer. The hot water system shall be installed in accordance with Section 607.

Reason: Hand washing stations are clearly defined in healthcare facilities by Facility Guideline Institute (FGI). See the reason statement for the original proposal for the purpose of the original change.

The committee reason was that the language was confusing. The new section has been revised to be consistent with the language for lavatories in IPC Section 419.5. A list separated the options for water colder or hotter than tempered water for clarity.

> **419.5 Tempered water for public hand-washing facilities.** Tempered water shall be delivered from lavatories and group wash fixtures located in public toilet facilities provided for customers, patrons and visitors. Tempered water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

The new exception is for location, such as Texas, where the municipal water comes in hotter than 85 degrees. Allowing for tempered water to be treated instead of cooling or heating the water provides an additional option to address the spread of pathogens in water necessary in hospitals, and will save energy.

The definition of tempered water is as follows.

> TEMPERED WATER. Water having a temperature range between 85°F (29°C) and 110°F (43°C).

This proposal is submitted by the ICC Committee for Healthcare (CHC).
The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2024 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is an option for hospitals for water temperature and will not change the requirements for construction of the dedicated handwashing stations or the piping.

Comment (CAH2)# 200

Comment 2:

IPC: 609.3, 609.3.1, 609.3.2, 609.3.2 (New)

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Self (jbengineer@aol.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

609.3 Hot and tempered water ~~Water~~. *Hot* and *tempered water*~~Water~~ shall be provided in health care facilities in accordance with Section 609.3.1 and 609.3.2.

Delete without substitution:

~~**609.3.1 Hand-washing water.** Hand-washing water shall be provided to all dedicated handwashing stations. Water with a temperature not less than 45 degrees F (13 C) and not greater than 85 F degrees (32 C) or not less than 105 degrees F (40 C) to 120 degrees F (49 C), shall be delivered from dedicated hand-washing stations. Water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.~~

~~609.3.2~~ 609.3.1 Hot water. ~~Other than at dedicated hand washing stations *hot.*~~ *Hot water* shall be provided to supply all of the hospital fixture, kitchen and laundry requirements. Special fixtures and equipment shall have hot water supplied at a temperature specified by the manufacturer. The hot water system shall be installed in accordance with Section 607.

Add new text as follows:

609.3.2 Tempered water. *Tempered water* shall be provided to all hand washing stations. *Tempered water* shall be controlled in accordance with Section 607.1.2.

Reason: It appeared that the intent of the original change was to allow the use of tempered water for hand washing stations. By adding the heading "water" there needed to be requirements for cold water to hospital fixtures, however, that does not appear. Therefore, the modification changes the section to "hot and tempered water." Thus, the two following sections only address special requirements for hospital and health care facilities.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is only an editorial change of the original proposal. The original proposal listed the cost impact as being editorial in nature.

Comment (CAH2)# 653

P95-24

IPC: 611.1, Table 611.1 (New), ASSE Chapter 15 (New), NSF Chapter 15 (New)

Proposed Change as Submitted

Proponents: Jason Shank, ASSE International, ASSE International (jshank@plumbers55.com)

2024 International Plumbing Code

Revise as follows:

611.1 Design. Point-of-use reverse osmosis drinking water treatment units shall comply with CSA B483.1 or NSF 58. Drinking water treatment units shall meet the requirements of CSA B483.1, NSF 42, NSF 44, NSF 53 or NSF 62. Commercial and food service water treatment equipment shall comply with ASSE 1087. Table 611.1 shall be used to determine the applicable standards for the applications and uses for the requirements of this section.

Add new text as follows:

Table 611.1 Drinking Water Treatment Units

Application	Point of Use	Point of Entry
Aesthetic Contaminant Reduction Filters	NSF/ANSI 42 or CSA B483.1	NSF/ANSI 42 or CSA B483.1
Distillation Systems	NSF/ANSI 62 or CSA B483.1	NSF/ANSI 62 or CSA B483.1
Health Related Contaminant Reduction Filters	NSF/ANSI 53 or CSA B483.1	NSF/ANSI 53 or CSA B483.1
Reverse Osmosis	NSF/ANSI 58 or CSA B483.1	-
Ultraviolet Water Treatment	NSF/ANSI 55 or CSA B483.1	NSF/ANSI 55 or CSA B483.1
Water Softeners	-	Up to 1.25 in. inlet: NSF/ANSI 44, or CSA B483.1
		greater than 1.25 in, inlet : ASSE 1087

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1087 - 2022 Performance Requirements for Commercial and Food Service Water Treatment Equipment Utilizing Drinking Water

NSF

NSF International
789 N. Dixboro Road P.O. Box 130140
Ann Arbor, MI 48105

55 - 2022 Ultraviolet Microbiological Water Treatment Systems

Reason: The proposal to add this language and chart is to define what ASSE 1087 standard covers in regards to the other standards listed currently in this section and what they cover in the Code. The table also includes the applications, point of use and point of entry for each standard listed in this section.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These are optional items in a building and are not required. It is up to the Owner of the building to decide if they wish these or not.

Staff Analysis: A review of the standard proposed for inclusion in the code, NSF 55-2022 *Ultraviolet (UV) Water Treatment Systems* and ASSE 1087-2022 *Commercial and Food Service Water Treatment Equipment Utilizing Drinking Water*, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P95-24

<u>Public Hearing Results (CAH1)</u>

Committee Action: **Disapproved**

Committee Reason: The proponent indicated that there are issues with ASSE 1087 and it is not complete. (14-0)

P95-24

<u>Individual Consideration Agenda</u>

Comment 1:

IPC: 611.1, Table 611.1, ASSE Chapter 15

Proponents: Jeremy Brown, NSF International, NSF International (brown@nsf.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

611.1 Design. Point-of-use reverse osmosis drinking water treatment units shall comply with CSA B483.1 or NSF 58. Drinking water treatment units shall meet the requirements of CSA B483.1, NSF<u>/ANSI</u> 42, NSF<u>/ANSI</u> 44, NSF<u>/ANSI </u>53<u>, NSF/ANSI 55</u> or NSF<u>/ANSI</u> 62. ~~Commercial and food service water treatment equipment shall comply with ASSE 1087.~~ Table 611.1 shall be used to determine the applicable standards for the applications and uses for the requirements of this section.

Table 611.1 Drinking Water Treatment Units

Application	Point of Use	Point of Entry
Aesthetic Contaminant Reduction Filters	NSF/ANSI 42 or CSA B483.1	NSF/ANSI 42 or CSA B483.1
Distillation Systems	NSF/ANSI 62 or CSA B483.1	NSF/ANSI 62 or CSA B483.1
Health Related Contaminant Reduction Filters	NSF/ANSI 53 or CSA B483.1	NSF/ANSI 53 or CSA B483.1
Reverse Osmosis	NSF/ANSI 58 or CSA B483.1	-
Ultraviolet Water Treatment	NSF/ANSI 55 or CSA B483.1	NSF/ANSI 55 or CSA B483.1

Water Softeners	-	~~Up to 1.25 in. inlet:~~ NSF/ANSI 44, or CSA B483.1 ~~greater than 1.25 in, inlet : ASSE 1087~~

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

~~1087 - 2022~~	~~Performance Requirements for Commercial and Food Service Water Treatment Equipment Utilizing Drinking Water~~

Reason: This code change introduces a couple of standards, ASSE 1087 and NSF/ANSI 55. Since the appropriateness of ASSE 1087 is being disputed, this comment proposes to add only NSF/ANSI 55 for which there is no dispute. NSF/ANSI 55 establishes minimum structural, material safety and performance health claims for treatment systems that reduce microorganisms using UV radiation. This standard was originally published in 1991 and is the American National Standard for UV treatment technology. This standard is referenced by the other major model plumbing code in the US as well as several states. Notice I am also adding ANSI to the name of these NSF Standards which represents their proper names. A copy has been provided to the committee and the public can obtain a free copy for consideration of this code change by emailing brown@nsf.org.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Adding this standard only offers another option for water treatment but does not mandate the use of UV systems, therefore it does not add cost to construction.

Comment (CAH2)# 79

P97-24

IPC: TABLE 702.1, TABLE 702.2, TABLE 702.4

Proposed Change as Submitted

Proponents: Abraham MURRA, Abraham Murra Consulting, Georg Fischer

2024 International Plumbing Code

Revise as follows:

TABLE 702.1 ABOVE-GROUND DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Chlorinated polyvinylchloride (CPVC) plastic pipe, Schedule 80	ASTM F441/F441M, CSA B181.2
Galvanized steel pipe	ASTM A53
Glass pipe	ASTM C1053
Polyolefin pipe	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200), and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

TABLE 702.2 UNDERGROUND BUILDING DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Chlorinated polyvinylchloride (CPVC) plastic pipe, Schedule 80	ASTM F441/F441M, CSA B181.2
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polyolefin pipe	ASTM F714; ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Type 316L	ASME A112.3.1

For SI: 1 inch = 25.4 mm.

TABLE 702.4 PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters	ASME A112.4.4; ASTM D2661; ASTM F628; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters	ASTM D2751
Cast iron	ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Chlorinated polyvinylchloride (CPVC), Schedule 80	ASTM F439, CSA B181.2
Glass	ASTM C1053
Gray iron and ductile iron	AWWA C110/A21.10
Polyethylene	ASTM D2683
Polyolefin	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic in IPS diameters	ASME A112.4.4; ASTM D2665; ASTM F1866
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters	ASTM D3034
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D.	ASTM D2949
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Steel	ASME B16.9; ASME B16.11; ASME B16.28
Vitrified clay	ASTM C700

For SI: 1 inch = 25.4 mm.

Reason: CPVC is a widely used and accepted piping material and adding it to Tables 702.1, 702.2, and 702.3 will give users of the IPC a broader choice of materials.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal adds a piping material, thus giving users more options to choose from, without any cost impact because of the new alternative.

Staff Analysis: The proposed standards are in the current edition of the code.

P97-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The proponent had floor modifications which were ruled out of order. The proposal should be brought back at CAH1 with corrections, (14-0)

P97-24

Individual Consideration Agenda

Comment 1:

IPC: TABLE 702.1, TABLE 702.2, TABLE 702.4

Proponents: Abraham MURRA, Abraham Murra Consulting, Abraham Murra Consulting (abraham.murra@outlook.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

TABLE 702.1 ABOVE-GROUND DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Chlorinated polyvinylchloride (CPVC) plastic pipe[a]~~, Schedule 80~~	ASTM F441/F441M, CSA B181.2
Galvanized steel pipe	ASTM A53
Glass pipe	ASTM C1053
Polyolefin pipe	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200), and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3

MATERIAL	STANDARD
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

a. For vacuum drainage piping systems only.

TABLE 702.2 UNDERGROUND BUILDING DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Chlorinated polyvinylchloride (CPVC) plastic pipe[a]~~, Schedule 80~~	ASTM F441/F441M, CSA B181.2
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polyolefin pipe	ASTM F714; ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Type 316L	ASME A112.3.1

For SI: 1 inch = 25.4 mm.

a. For vacuum drainage piping systems only.

TABLE 702.4 PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters	ASME A112.4.4; ASTM D2661; ASTM F628; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters	ASTM D2751
Cast iron	ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Chlorinated polyvinylchloride (CPVC)[a]~~, Schedule 80~~	~~ASTM F439,~~ CSA B181.2
Glass	ASTM C1053
Gray iron and ductile iron	AWWA C110/A21.10
Polyethylene	ASTM D2683
Polyolefin	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic in IPS diameters	ASME A112.4.4; ASTM D2665; ASTM F1866
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters	ASTM D3034
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D.	ASTM D2949
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Steel	ASME B16.9; ASME B16.11; ASME B16.28
Vitrified clay	ASTM C700

For SI: 1 inch = 25.4 mm.

a. For vacuum drainage piping systems only

Reason: CPVC is a widely used and accepted piping material and adding it to Tables 702.1, 702.2, and 702.3 will give users of the IPC a broader choice of materials. The comment on proposal P97-24 addresses the concerns of the IPC Committee at the CAH #1 as follows:

1. Removes “Schedule 80”, allowing pipe with different wall thicknesses to be used
2. Adds a use restriction indicating that CPVC is intended to be used only in vacuum drainage piping systems; and
3. Removes the reference to ASTM F439 in Table 702.4

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal adds a material for drainage piping, AS AN OPTION, and therefore has no cost impact on the cost of construction.

Comment (CAH2)# 214

P99-24 Part I

IPC: 702.2, ASTM Chapter 15 (New)

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov); Brian Conner, Charlotte Pipe and Foundry (bconner@charlottepipe.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

702.2 Underground building sanitary drainage and vent pipe. Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 702.2. Thermoplastic pipe and fittings shall be installed in accordance with ASTM D2321.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

D2321-20	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

Reason: Every manufacturer of thermoplastic pipe has in their instruction a reference to the ASTM D 2321 standard for underground installations. The problem is that there is nothing in the code that also references this important standard except section 303.2. Inspectors do not necessarily have the time to read through every manufacturer's installation instructions during an inspection, however, if the installation standard was referenced in the code then the jurisdiction would be responsible for providing access to the standard for verification purposes.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal will make it easier to ensure installation are in compliance with the manufacturer's requirements and should not technically have any impact on the cost of construction if the installers were following these requirements as they should have been.

P99-24 Part I

Public Hearing Results (CAH1)

Committee Action: **As Submitted**

Committee Reason: The Committee agreed with the published reason statement. (8-5)

P99-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: 702.2, ASTM Chapter 15

Proponents: Michael Cudahy, PPFA Plastic Pipe and Fittings Association, PPFA Plastic Pipe and Fittings Association (mikec@cmservices.com) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Plumbing Code

702.2 Underground building sanitary drainage and vent pipe. Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 702.2~~. Thermoplastic pipe and fittings~~ <u>and</u> shall be installed in accordance <u>with this code or in accordance with</u> ASTM D2321.

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

D2321-20	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

Reason: PPFA supports this plastic pipe installation standard, especially for unusual soils and larger diameters of plastic piping, but for typical plumbing installations, in a Note in the standard, the standard simply refers users right back to the plumbing code requirements. It should be an option, and contains much that is useful, but it makes no sense to require obtaining the standard just to be sent back to the code in most circumstances. Worse if the note is not noticed and a simple installation is over complicated.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Making the standard an option would not alter costs, and would save the installer the cost of buying the standard in many cases.

Comment (CAH2)# 325

Comment 2:

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests Disapproved

Reason: If this proposal remains approved As Submitted it will create several conflicts within the IPC and further sets the stage for a circular work path that allows either the code regulations to prevail or maybe the new ASTM 2321-20 Standard's, it's just not clear.

IPC Section 306.2 already addresses any perceived problems with invoking the ASTM 2321-20 Standard provisions where required. It states that "where the manufacturers installation instructions are more restrictive than those prescribed by code the material shall be installed with the most restrictive requirements."

The referenced **ASTM 2321-20 Standard Scope, Section 1.1**, contains the statement that "it is "recommendations" for installation of buried thermoplastic pipe…." Not written in prescriptive mandatory language and therefore subjective in nature. In **Section 1.2, Note 3**, it references that "most plumbing codes and some building codes have provisions for the installation of underground "building drains and building sewers." See them for plumbing piping applications." thus creating previous circular path in any underground application without ever clearly determining which set of provisions prevails. It is simply not clear which provisions are more restrictive?

The proponent never offered up exactly how the current code is broken and how the addition of the referenced Standard fixes anything. Instead, the addition of this Standard creates a direct conflict with the following sections:

306.2 Trenching and bedding. This Section allows the trench bed to be the support for the piping.

ASTM D2321-20 Section 7.2.2 requires engineering and/or the trench have a minimum of 4 inches of bedding installed.

306.2.1 Overexcavation. This Section requires that when a trench is overexcavated that it shall be backfilled with compacted sand or fine gravel, in lifts not to exceed 6 inches, to the bottom of the pipe.

ASTM D2321-20 Section 7.2.4 requires the use the Table 3 of the Standard where multiple applications are referenced based on soil conditions.

306.2.2 Rock removal. This Section requires that when rock is encountered during excavation the rock shall be removed not less than 3 inches below the pipe bottom and backfilled with tamped sand up to the bottom of the pipe to provide uniform bearing.

ASTM D2321-20 Section 6.5 requires that when rock is encountered, excavate a minimum of 6 inches below the bottom of the pipe and replace with “proper embedment.”

306.2.3 Soft load-bearing materials. This Section requires that when poor load bearing materials are encountered during excavation, the materials be removed not less than 2 pipe diameters below the bottom of pipe. The poor bearing material shall be replaced with fine gravel, crushed stone or a concrete foundation.

ASTM D2321-20 Section 7.2.2 requires the use the Table 3 of the Standard where multiple applications are referenced based on soil conditions. Or for severe conditions an engineer may require a “special foundation.”

306.3 Backfilling. This Section requires that backfill, free from construction debris, rocks, broken concrete and frozen chunks, shall be placed in a maximum of 6-inch lifts and tamped in place until the pipe is covered by 12 inches of backfill. And goes further to once again reiterate that “in instances where the manufacturer’s instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement.”

ASTM D2321-20 Section 7.6 requires engineering or a minimum of 24 inches of cover or at least one pipe diameter, whichever is greater.

These IPC Sections are longstanding, time-tested methods to install underground piping and as stated earlier the proponent has failed to provide any evidence that the code is not working well to provide the best practices while maintaining its scope of “minimum standards.” If enforcement of the existing Chapter 3 regulations is the problem, then adding more confusing provisions in Chapter 7 will not resolve the issue, it will just compound.

The location of the suggested additional Standard ASTM 2321-20 is misplaced in the incorrect Section. The Standard addresses trenching, bedding and backfilling and as previously identified the IPC currently has Chapter 3 General Regulations, Sections 306.1 Support of piping, 306.2 Trenching and bedding, 306.2.1 Overexcavation, 306.2.2 Rock removal 306.2.3 Soft load-bearing materials- 306.3 Backfilling that all adequately cover trenching, bedding and backfill.

The term “thermoplastic” is not defined in the ASTM 2321-20, IPC or referenced in any piping material Tables. So, it is unclear when this Standard is to be referenced and exactly under what type of material application?

The referenced Standard ASTM 2321-20 is based on soil classification and backfill material combinations. It could be easily interpreted that a geotechnical engineer will need to be involved for any and all underground installations no matter how large or small the project.

The referenced Standard ASTM 2321-20 requires the minimum trench width “shall be not less than the greater of either the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25, plus 12 inches.” This creates a tremendous hardship for a hand-digging installations and eliminates the use of a 12” backhoe bucket, both of which have been used successfully for as long as the codes have been in existence. There is simply no technical justification for this extremely over cumbersome requirement.

The referenced Standard ASTM 2321-20 appears to be much more appropriate for larger piping installations, but it never states exactly what size, and if approved it will apply to any and all underground installations both inside and outside the structure. ASTM D 2321-20

Section 7.5 even talks about tamping in place the “haunching” material which is the material that is placed on the from the trench bottom alongside the piping up to the springline. This is just one clear example that would indicate its applicability to larger piping systems.

This has the appearance of an overburdensome regulation that unfairly targets a specific piping material. This begs the question, why would these same trenching, bedding and backfill requirements NOT be applicable to all piping materials the same way the requirements of Chapter 3 currently address them? For past decades, the minimum trenching, bedding and backfill provisions have been “material neutral.” Now with no technical justification the rules will become tremendously more weighted towards one piping material industry.

Lastly, is the cost impact statement. This proposal will in fact increase the cost of construction. Not just through the issues raised throughout this reason statement but the cost of the ASTM 2321-20 Standard itself needs to be factored into the cost impact on all installers, code officials, designers and users of the code.

PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 33 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: No change to code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 145

P99-24 Part II

IRC: P3002.1, P3002.2, ASTM Chapter 44 (New)

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov); Brian Conner, Charlotte Pipe and Foundry (bconner@charlottepipe.com)

2024 International Residential Code

Revise as follows:

P3002.1 Piping within buildings. Drain, waste and vent (DWV) piping in *buildings* shall be as indicated in Tables P3002.1(1) and P3002.1(2) except that galvanized wrought-iron or galvanized steel pipe shall not be used underground and shall be maintained not less than 6 inches (152 mm) above ground. Allowance shall be made for the thermal expansion and contraction of plastic piping. Thermoplastic pipe and fittings shall be installed in accordance with ASTM D 2321.

P3002.2 Building sewer. *Building sewer* piping shall be as indicated in Table P3002.2 Forced main sewer piping shall conform to one of the standards for ABS plastic pipe, copper or copper-alloy tubing, PVC plastic pipe or pressure-rated pipe indicated in Table P3002.2. Thermoplastic pipe and fittings shall be installed in accordance with ASTM D 2321.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

D2321-20	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

Reason: Every manufacturer of thermoplastic pipe has in their instruction a reference to the ASTM D 2321 standard for underground installations. The problem is that there is nothing in the code that also references this important standard except section 303.2. Inspectors do not necessarily have the time to read through every manufacturer's installation instructions during an inspection, however, if the installation standard was referenced in the code then the jurisdiction would be responsible for providing access to the standard for verification purposes.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal will make it easier to ensure installation are in compliance with the manufacturer's requirements and should not technically have any impact on the cost of construction if the installers were following these requirements as they should have been.

P99-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The ASTM standard is not appropriate for the application. The cost impact states editorial but in reality, there is a substantial cost impact. (10-0)

P99-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: P3002.1, P3002.2, ASTM Chapter 44

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Submitted

Reason: Every manufacturer of thermoplastic pipe has in their installation instructions a reference to the ASTM D 2321 standard for underground installations. The problem is that there is nothing in the code that also references this important standard except section 303.2. Inspectors do not necessarily have the time to read through every manufacturer's installation instructions during an inspection, however, if the installation standard was referenced in the code then the jurisdiction would be responsible for providing access to the standard for verification purposes.

Regardless of the comments made by some installers at CAH #1, just because you have been doing something for years does not mean you have been doing it correctly.

Additionally, the same proposal was accepted for the IPC at CAH #1.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 403

P104-24 Part I

IPC: 714.3, 714.1

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

714.3 ~~Location~~ Installation. Backwater valves shall be installed so that *access* is provided to the working parts.

714.1 Sewage backflow. Where plumbing fixtures are installed on a floor with a finished floor elevation below the elevation of the manhole cover of the next upstream manhole in the public *sewer,* such fixtures shall be protected by a backwater valve installed in the *building drain*, or horizontal *branch* serving such fixtures. ~~Plumbing fixtures installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the public *sewer* shall not discharge through a backwater valve.~~The backwater valve shall be of the normally open type.

~~**Exception:** In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the public *sewer* shall not be prohibited from discharging through a backwater valve.~~**Exception:** Normally closed backwater valve installations for *existing buildings* shall not be prohibited.Normally closed backwater valves shall be provided with a venting method in accordance with one of the methods in Chapter 9 upstream of the backwater valve.

Reason: The title of the section was improper to begin with, "Location", the entire section was referencing installation requirements. The remainder of the proposal is focused on the fact that most floor drains are installed as part of a combination waste and vent system, however, since most backwater valves are manufactured as normally closed backwater valves, this interrupts the pathway for venting in a combination waste and vent system. Additionally, a normally closed backwater valve poses a resistance to flow until a certain amount of flow is present to force the valve open. This results in slowing the flow below the desired flow rate and impedes the ability of the waste flow to scour the pipe as it flows. A normally open backwater valve will avoid both of these associated complications from backwater valves. Additionally, allowing normally closed backwater valves to be installed to serve an entire existing building results in restricting the ability of the sewer systems to use building DWV system to assist in providing a venting pathway to atmosphere. This results in less pathways and increased positive and/or negative pressures within the sewer network and ultimately can negatively impact the DWV system of surrounding buildings.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal doesn't create any additional requirements and should technically result in lower overall maintenance costs.

P104-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The committee disagrees with the removal of the sentence in Section714.1 because if a surcharge situation occurs then the surcharge will flood into the basement. (13-0)

P104-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: 714.1

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

714.1 Sewage backflow. Where plumbing fixtures are installed on a floor with a finished floor elevation below the elevation of the manhole cover of the next upstream manhole in the public *sewer,* such fixtures shall be protected by a backwater valve installed in the *building drain*, or horizontal *branch* serving such fixtures. In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the public *sewer* shall not be prohibited from discharging through a backwater valve. The backwater valve shall be of the normally open type.

> **Exception:** Normally closed backwater valve installations for existing buildings shall not be prohibited.~~ Normally closed backwater valves shall be provided with a venting method in accordance with one of the methods in Chapter 9 upstream of the backwater valve.~~ Normally closed backwater valves shall be permitted provided that a venting method in accordance with Chapter 9 is used upstream of the backwater valve.

Reason: The title of the section was improper to begin with, "Location", the entire section was referencing installation requirements. The remainder of the proposal is focused on the fact that most floor drains are installed as part of a combination waste and vent system, however, since most backwater valves are manufactured as normally closed backwater valves, this interrupts the pathway for venting in a combination waste and vent system. Additionally, a normally closed backwater valve poses a resistance to flow until a certain amount of flow is present to force the valve open. This results in slowing the flow below the desired flow rate and impedes the ability of the waste flow to scour the pipe as it flows. A normally open backwater valve will avoid both of these associated complications from backwater valves. The exception for existing buildings has been moved into the body and exception that still allows for a normally closed backwater valve to be used is included in the exception portion.
These changes should address the concerns raised by the IPC Code Development Committee at CAH #1.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal doesn't create any additional requirements, allows for additional products, and makes sure a proper venting method is provided where needed.

Comment (CAH2)# 406

P104-24 Part II

IRC: P3008.2

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Residential Code

Revise as follows:

P3008.2 Allowable installations. Where plumbing fixtures are installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the public sewer~~, and~~ a backwater valve ~~is~~ shall be installed in the *building drain* or *horizontal branch* serving such fixtures.~~,~~ ~~the~~ The backwater valve shall be of the normally open type.

> **Exception:** Normally closed backwater valve installations for *existing buildings* shall not be prohibited.Normally closed backwater valves shall be provided with a venting method in accordance with one of the methods in Chapter 9 upstream of the backwater valve.

Reason: The title of the section was improper to begin with, "Location", the entire section was referencing installation requirements. The remainder of the proposal is focused on the fact that most floor drains are installed as part of a combination waste and vent system, however, since most backwater valves are manufactured as normally closed backwater valves, this interrupts the pathway for venting in a combination waste and vent system. Additionally, a normally closed backwater valve poses a resistance to flow until a certain amount of flow is present to force the valve open. This results in slowing the flow below the desired flow rate and impedes the ability of the waste flow to scour the pipe as it flows. A normally open backwater valve will avoid both of these associated complications from backwater valves. Additionally, allowing normally closed backwater valves to be installed to serve an entire existing building results in restricting the ability of the sewer systems to use building DWV system to assist in providing a venting pathway to atmosphere. This results in less pathways and increased positive and/or negative pressures within the sewer network and ultimately can negatively impact the DWV system of surrounding buildings.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal doesn't create any additional requirements and should technically result in lower overall maintenance costs.

P104-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Proposal removes a viable option from the code. Would cause every horizontal branch to have a backwater valve. Cost impact would be significant. (10-0)

P104-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: P3008.2

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

P3008.2 Allowable installations. Where plumbing fixtures are installed on a floor with a finished floor elevation ~~above~~ below the elevation of the manhole cover of the next upstream manhole in the public *sewer,* a backwater valve shall be installed in the *building drain*, or horizontal *branch* serving such fixtures. In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the public *sewer* shall not be prohibited from discharging through a backwater valve. The backwater valve shall be of the normally open type.

> **Exception:** Normally closed backwater valve installations for *existing buildings* shall not be prohibited.Normally closed backwater valves shall be permitted provided ~~with~~ that a venting method in accordance with one of the methods in Chapter 9 is used upstream of the backwater valve.

Reason: Though the code section does already require the preferrable method for providing backflow protection, normally open valves, the exception does not address the need to provide a normally closed backwater valve with a venting method upstream of the valve. Additionally, the portion dealing with existing buildings should be moved to the body and reserve the exception for allowing the use of normally closed backwater valves as long as a venting method is provided upstream as previously stated.

An additional small change was added to harmonize this text with the text in the IPC. In the first sentence the word above was changed to below in relation to the next upstream manhole as that was the intent all along.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal doesn't create any additional requirements, it actually allows for additional products to be used as long as proper venting is provided upstream of the backwater valve.

Comment (CAH2)# 405

P105-24

IPC: 715.2, CSA Chapter 15 (New)

Proposed Change as Submitted

Proponents: Abraham MURRA, Abraham Murra Consulting, Jets Vacuum AS, Norway

2024 International Plumbing Code

Revise as follows:

715.2 System design. Vacuum drainage systems shall be designed in accordance with the vacuum drainage system manufacturer's instructions. The system layout, including piping layout, tank assemblies, vacuum pump assembly and other components necessary for proper function of the system shall be in accordance with CSA B45.13/IAPMO Z1700 and with the manufacturer's instructions. Plans, specifications and other data for such systems shall be submitted to the code official for review and approval prior to installation.

Add new standard(s) as follows:

CSA

CSA Group
8501 East Pleasant Valley Road
Cleveland, OH 44131-5516

CSA B45.13:19/IAPMO Z1700-2019	Vacuum waste-collection systems

Reason: Adding a reference to CSA B45.13/IAPMO Z1700 —a consensus standard that specifies requirements for materials, construction, performance testing, and markings— in the system design section of the IPC will standardize vacuum waste-collection systems. Mandating that such systems comply only with the manufacturer's instructions allows installation of substandard systems that do not benefit users or regulators.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Adding CSA B45.13/IAPMO Z1700 as a referenced standard to the IPC should not have a cost impact as major manufacturers of vacuum waste-collection systems are already listed to the standard.

P105-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The standard doesn't address all the items listed in the sentence. The proposal needs reworded to correct. (12-2)

P105-24

Individual Consideration Agenda

Comment 1:

IPC: 715.2

Proponents: Abraham MURRA, Abraham Murra Consulting, Abraham Murra Consulting requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

715.2 System design. Vacuum drainage systems shall be designed in accordance with the vacuum drainage system manufacturer's instructions <u>and shall comply with CSA B45.13/IAPMO Z1700</u>. The system layout, including piping layout, tank assemblies, vacuum pump assembly and other components necessary for proper function of the system shall be in accordance with ~~CSA B45.13/IAPMO Z1700 and with~~ the manufacturer's instructions. Plans, specifications and other data for such systems shall be submitted to the code official for review and approval prior to installation.

Reason:
The comment on proposal P105-24 addresses the concern expressed by the IPC Committee by mandating compliance with CSA B45.13/IAPMO Z1700 in accordance with the scope of the standard.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Adding CSA B45.13/IAPMO Z1700 as a referenced standard to the IPC does not have a cost impact as major manufacturers of vacuum systems are listed to the standard.

Comment (CAH2)# 226

P106-24

IPC: 717.1, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com)

2024 International Plumbing Code

Revise as follows:

717.1 General. This section shall govern the relining of existing *building sewers* and building drainage piping. Required Inspections shall be conducted by a ANSI/ASSE/IAPMO Series 28000 qualified inspector.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

ANSI/ASSE/IAPMO Series 28000-Standard 28001-xx	Professional Qualifications Standard for Inspectors of CIPP (Cured-in-Place-Pipe) Rehabilitation of Building Sewer and Drain, Waste and Vent Piping Systems (DRAFT)

Reason: The new ANSI/ASSE/IAPMO Series 2800 standard assures that the inspector and inspection of piping using CIPP is done appropriately. Unfortunately, many inspectors are not knowledgeable concerning CIPP rehabilitation, and the necessary requirements demanded for proper installation and inspection. This requirement is necessary and needed in the code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proper inspection is not only a cost built into the code but necessary to protect it's users ultimate health and safety.

P106-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The standard is not posted so we don't know what the qualifications for the inspectors will be. Everything is too vague yet. A better place for this requirement would be in Section 717.9. The proposal states that there is no cost impact but clearly there is. (14-0)

P106-24

Individual Consideration Agenda

Comment 1:

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com) requests As Submitted

Reason: The Committee denied the code change because of the standard still being under development. It is now completed and should be added to the code to assure that the inspector and the inspection of piping using CIPP is done appropriately.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 411

P107-24

IPC: 717.1

Proposed Change as Submitted

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com)

2024 International Plumbing Code

Revise as follows:

717.1 General. This section shall govern the relining of existing *building sewers* and building drainage <u>system</u> piping.

Reason: The title and scope of both Secton 717 and 718 are for Building sewers and Building drains. Building drains can include sanitary and storm water. A more inclusive and proper scope for both 717 and 718 would be to use Drainage System piping instead of drainage piping which are both defined in Section 3 of the code. This would eliminate confusion and recognize all piping covered under the requirements of these Sections.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Just as my reason states: This code change simply clarifies current requirements in the code and would add no additional cost to installation and technology currently used in Section 717.

P107-24

Public Hearing Results (CAH1)

Committee Action: **As Submitted**

Committee Reason: The additional word captures all that needs to be included. (13-1)

P107-24

Individual Consideration Agenda

Comment 1:

IPC: 717.1

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

717.1 General. This section shall govern the relining <u>and rehabilitation</u> of existing *building sewers* and building drainage system piping.

Reason: Editorial change for clarity and alignment with reference standards for cured-in-place pipe (CIPP) from Section 718 which is proposed and approved (CAH#1) to be moved to Section 717. The change is to add the term "rehabilitation" as CIPP is used to rehabilitate existing pipelines, and this is the term that is used within existing, new and proposed reference standards. Whereas, the term "relining" is not used in these standards. Confusion will be reduced by adding this term in the Section 717.1 General.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modification to this proposal simply edit the terminology slightly to better conform to industry and reference standards. The requirements are not changed by this modification.

Comment (CAH2)# 733

P108-24

IPC: 717.2

Proposed Change as Submitted

Proponents: Luther Grant Whittle, Nu Flow Technologies, "self" (gwhittle@nuflow.com)

2024 International Plumbing Code

Revise as follows:

717.2 Applicability. The relining of existing *building sewers* and building drainage piping shall be limited to gravity drainage piping 2"~~4~~ inches (~~102~~50 mm) in diameter and larger. The relined piping shall be of the same nominal size as the existing piping.

Reason: CIPP in building drains is routinely used in sizes down to 2". The scope of ASTM F1216-22 governs the usage of CIPP down to 2".

Documentation is provided that shows the ability to routinely preserve flow capacity while increasing scouring velocities in sizes down to 2", with typical CIPP thicknesses. It is recognized that the DFU design capacity requires preservation. The nominal pipe size is not altered.

The provided flow analysis chart does not take into consideration the inherent conservatism of DFU design being based upon data from cast iron pipe collected in the 1930s. As far as actually maintaining the original design DFUs, all CIPP relined pipes should be compared to iron pipe flows as the basis of their original DFU design capacity. What is apparent, is that CIPP does not negatively alter nominal sizing nor DFU capacity at typical installed thicknesses. Scouring velocity also greatly improves, further helping to correct for minor flow issues in the existing piping.

Bibliography: ASTM F1216-22 Scope

"1.1 This practice describes the procedures for the reconstruction of pipelines and conduits (**2 in.** to 108 in. diameter) by the installation of a resin-impregnated, flexible tube which is inverted into the existing conduit by use of a hydrostatic head or air pressure."

NuFlow Flow Analysis Chart to be attached.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal merely expands the applicable size range down to 2" with the same comparative cost impacts as are typical of relining / rehabilitation for repair or replacement with Cured-in-Place Pipe (CIPP) versus exhume and replace with other piping materials, as already otherwise approved for use within Sections 717 and 718 of the Code.

This proposal to expand the size range down to 2" creates no significant cost impact alteration as compared to the considerations behind the existing code inclusion of CIPP.

Attached Files

- **TECH BRIEF - NuDrain Flow Analysis - 20201117 Rev Lvl 1.1.pdf**
  https://www.cdpaccess.com/proposal/10434/30667/files/download/4388/

P108-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The current code does not have ASTM F1216 so it would be premature to approve this proposal based on information from a standard that is not yet part of the code.. (13-1)

P108-24

Individual Consideration Agenda

Comment 1:

IPC: 717.2

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

717.2 Applicability. The relining of existing *building sewers* and building drainage system piping shall be limited to gravity drainage piping 3~~2"~~ inches (~~50~~80 mm) in diameter and larger. The relined piping shall be of the same nominal size as the existing piping.

Reason:

This proposal was denied by CAH1 due to ASTM F1216 not yet being a part of the code. Therefore, a change in the reasoning was made to a current reference standard ASTM F2561 which includes piping down to 3 inch diameter. CIPP is routinely used to rehabilitate building drainage system piping in sizes down to 3 inch diameter.

Bibliography: ASTM F2561 - Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

*1. Scope**
1.1 This practice covers requirements and test methods for the reconstruction of a sewer service lateral pipe having an inner diameter of 3 to 12 in. (7.6 to 30.5 cm) and its connection to the main pipe having an inner diameter of 6 to 24 in. (15.2 to 61.0 cm) and up the lateral a maximum of 150 ft (46 m) without excavation.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal expand the diameter of existing piping in which CIPP may be used in accordance with referenced standards.

Comment (CAH2)# 748

P110-24

IPC: 717.5

Proposed Change as Submitted

Proponents: Luther Grant Whittle, Nu Flow Technologies, "self" (gwhittle@nuflow.com)

2024 International Plumbing Code

Revise as follows:

717.5 Prohibited applications. Where review of the preinstallation recorded video camera survey reveals that piping systems are not installed correctly or defects exist, that will not be corrected by relining, then relining shall not be permitted without correction of such defects prior to cured-in place-pipe relining. ~~The defective portions of piping shall be exposed and repaired with pipe and fittings in accordance with this code. Defects include, but are not limited to, backgrade or insufficient slope, complete pipe wall deterioration or complete separations such as from tree root invasion or improper support.~~

Reason: The deleted language is erroneous regarding the capabilities and limitations of CIPP and confusingly complicated. The revised opening language more appropriately covers the guidance required by AHJs to make informed decisions on when to prohibit the use of CIPP.

There seems to be the erroneous assumption that CIPP is only ever a "repair" option and not capable of being a "replacement" option. The industry consensus standards and their design equations (as found in the design appendix of ASTM F1216) provide for the use of CIPP as a structural replacement as well as a performance repair system.

The installation of CIPP as a "repair" in conjunction with the preparation of the existing pipe for relining can readily correct defects such as flow disruption by scaling or tuberculation (which can be mistaken for backgrade or insufficient slope) prior to cleaning. Although CIPP cannot correct significant line and grade issues, the improved flow characteristics (including the increased scouring velocity) frequently rectifies any sedimentation issues associated with minor bellies in piping. Properly designed in compliance with the IPC, CIPP does NOT reduce the nominal sizing, the original design flow capacity, or the original design DFU count.

CIPP can also reliably eliminate leakage and root penetration from failed joint seals and even function as "replacement" piping for missing sections of buried piping. CIPP can structurally "replace" pipe sections with "channel rot" and can also structurally "replace" pipes with missing pipe sections; there are also reliable methods to fill voids around the pipe wall while restoring the proper flow line for code compliance. Soil voiding in such smaller diameter CIPP applications is expected to fully reconsolidate within 2 to 3 years to restore proper soil support, with the CIPP structurally spanning the void in the interim.

Where existing pipe defects are capable of being corrected through pipe "replacement" with CIPP, there should be no reason to disallow a reviewed permit installation of certified and listed CIPP systems by a responsible, licensed contractor. The 2024 code language is unnecessarily restrictive.

Bibliography: The ASTM F1216 design appendix provides an industry consensus design approach for use of CIPP as a structural replacement for piping.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The clarifications are in regard to proper applicability for use as either "repair" or "replacement."

P110-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There is a lot of work to do in this grouping of proposals [P109-P112]. Fixing defects in pipe is something that you are going to do any way, There needs to be more clarification. The proposal is removing reasons for the code official to not allow the work to take place. The proposal is making the situation worse instead of better. (14-0)

P110-24

Individual Consideration Agenda

Comment 1:

IPC: 717.5

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

717.5 Prohibited applications. Where review of the preinstallation recorded video camera survey reveals that piping systems are not installed correctly, obstructions have not been removed, or defects exist that prevent proper installation of the rehabilitation system, ~~that will not be corrected by relining, then~~ relining shall not be permitted until corrected or removed in accordance with this code.~~without correction of such defects prior to cured-in-place-pipe relining.~~ Defects and obstructions include, but are not limited to, complete pipe wall deterioration or complete separations such as from tree root invasion or improper support, collapsed or crushed pipe, and reductions in the cross-sectional area of more than 20% of the inside pipe diameter.

Reason: This proposal was denied by CAH1 citing the need for more clarification. The changes are made to align the code to reference and industry standards providing additional clarity with the addition of CIPP to section 717.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal provide additional information which through added clarity can prevent improper installations which could impact cost where removal or excavation of improper relining applications may be required.

Comment (CAH2)# 752

P111-24

IPC: 717.6, ASTM Chapter 15 (New)

Proposed Change as Submitted

Proponents: Luther Grant Whittle, Nu Flow Technologies, "self" (gwhittle@nuflow.com)

2024 International Plumbing Code

Revise as follows:

717.6 Relining materials. The relining materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. Cured-in-place-pipe reline materials shall comply with ASTM F1216, ASTM F1743, ASTM F2561, ASTM F2599 or ASTM F3541. Fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

F1216-22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F1743-22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
F2599-22	Standard Practice for Sectional Repair of Damaged Pipe By Means of an Inverted Cured-In-Place Liner
F3541-22	Standard Practice for Sectional Repair of Existing Gravity Flow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)

Reason: The scope of Section 717 with its detailed guidance is clearly intended to include usage with Cured-in-Place Pipe (CIPP) reline materials. The Fold & Form PVC reline materials standards (ASTM F1871 & ASTM F1504) have never had a product certified and listed by ICC-ES and have exceptionally minimal usage in Building Sewer applications only.

This section needs to include the ASTM standards to which ICC-ES is actively certifying and listing CIPP systems to provide more thorough guidance to AHJs; currently, products are certified and listed to ASTM F1216-22 (with ICC required mandatory language) for inversion and ASTM F1743-22 (expected mandatory language revision in 2024 -- currently balloting) for pull-in-place CIPP.

We also propose that the recently passed standard of ASTM F3541-22 be included within this section. ASTM F3541 is for segmental relining by CIPP and closely reflects the actual installation practices utilized within Building Sewer and Building Drain applications. ASTM F3541 includes by reference the same performance property requirements of ASTM F1743 to which ICC-ES currently certifies CIPP systems.

We are also recommending the inclusion of ASTM F2599 (segmental CIPP lining by inversion with patented gaskets) and ASTM F2561 (utility sewer lateral to utility main connection CIPP lining with patented gaskets) that are currently included in the otherwise redundant (same title scope) Section 718. Note that no CIPP systems has ever been certified and listed for use to these standards. Any products applicable to ASTM F2599 or ASTM F2561 will also comply with the same performance property requirements of ASTM F1216 to which ICC-ES already certifies CIPP systems. As such, the inclusion of these proprietary standards is a bit redundant.

Bibliography: F1216-22 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

ASTM F1743-24 (expected) [F1743-22] Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

ASTM F2561-20 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

ASTM F2599-22 Standard Practice for Sectional Repair of Damaged Pipe By Means of an Inverted Cured-In-Place Liner

ASTM F3541-22 Standard Practice for Sectional Repair of Existing Gravity Flow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal only requests referencing standards of materials already otherwise governed by this Code section (thereby is editorial in nature or a clarification), and as such there is no new cost impact.

The addition of existing and newly referenced standards into Section 717 provides no significant cost impact alteration as compared to the existing costs impacts behind the existing code inclusion.

For those interested, we will further expound upon the comparative cost impacts between relining / rehabilitation with Cured-in-Place Pipe (CIPP) versus exhumation and replacement with other piping materials.

The unit costs of CIPP "materials" are typically about the same as other code approved piping alternatives. But depending upon the project scope and site conditions, the unit costs of CIPP "as constructed" are HIGHLY variable as compared to the alternative of exhuming existing piping and replacing with other code approved piping alternatives (refer to the attached project cost analysis documentation).

CIPP "project costs" are significantly driven by the site conditions (and the ancillary "costs" of facility operational disruption tend to also weigh into choosing relining / rehabilitation versus exhumation & replacement) rather than the piping materials cost differences. Hence, a more direct cost comparison to other piping materials' costs is not truly relevant or particularly useful.

So, we will explore how site conditions and operational disruptions create relevant “cost impacts” deserving of thoughtful consideration.

SITE CONDITIONS: Where surface structure restoration costs are exceptionally high, avoidance of such site restoration costs through the remote installation of CIPP (with limited site disruption) can provide significant project cost savings as compared to exhuming the existing piping and replacing with alternative code approved piping materials. The "ancillary" surface structure restoration costs associated with piping exhumation, removal, and replacement is frequently the primary driver of project cost differentials.

Exhumation and replacement can often negatively impact load bearing components of a structure resulting in exceptionally high restoration costs that can be avoided by pipe relining / rehabilitation with CIPP.

Relining / rehabilitation with CIPP can also greatly reduce site safety risks associated with exhumation and prospectively confined space entry. Exhumation and replacement can have environmental and health impacts such as disruption of encapsulated asbestos, lead paint or other hazardous materials, requiring high remediation and disposal costs, as well as subjecting workers and facility occupants to unnecessary risks. Relining / rehabilitation with CIPP can be leveraged to avoid such risks and costs.

Where surface structure restoration and/or remediation costs and risks are high, the higher materials, specialty labor, and equipment costs associated with CIPP installation are generally absorbed and frequently exceeded, resulting in the potential for significant cost savings with CIPP.

OPERATIONAL DISRUPTION & BROADER SOCIAL COSTS: In addition to direct construction costs and risks, the indirect costs and risks of operational disruption often weigh into any project "cost" comparison between a relining / rehabilitation installation with CIPP versus exhumation and replacement with other piping materials.

With facilities such as hospitals, jails, court houses, schools, etc. (even the Pentagon & White House on multiple occasions), the "social costs" of operational disruption from exhumation and replacement are frequently deemed to be entirely unacceptable. Relining / rehabilitation with CIPP can reduce the "social costs" to a more acceptable level.

Schools with emergency piping issues do not have the facility capacity and cannot afford the "social costs" to the community that would be caused by unscheduled shutting down of classrooms for extensive exhumation and replacement of piping during the school year. Jails and other government facilities often have security and operational concerns that are alleviated through remote pipe relining / rehabilitation with CIPP versus direct secure zone entry and disruption that is required for exhumation and replacement.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASTM F1216-22 *Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube*, ASTM F1743-22 *Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)* and ASTM F2599-22 *Standard Practice for Sectional Repair of Damaged Pipe By Means of an Inverted Cured-In-Place Liner1,* ASTM F3541-22 *Standard Practice for Sectional Repair of Existing Gravity Flow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)1,* with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

The proposed standard ASTM F2561 is in the current edition of the code.

Attached Files

- **Value Engineering Considerations.pdf**
  https://www.cdpaccess.com/proposal/10453/30661/files/download/4716/
- **Example Project Cost Analysis Documentation (2).docx**
  https://www.cdpaccess.com/proposal/10453/30661/files/download/4715/

P111-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The standard is not written in enforceable language. (11-3)

P111-24

Individual Consideration Agenda

Comment 1:

IPC: 717.6

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

717.6 Relining materials. The relining materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. Cured-in-place-pipe (CIPP) ~~reline~~ materials shall be in accordance ~~comply~~ with ASTM F1216, ASTM F1743, ASTM F2561, ASTM F2599 or ASTM F3541. Hydrophilic rings or gaskets in CIPP rehabililtation shall be in accordance with ASTM F3240.Fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.

Reason: This proposal was denied by CAH1 citing the standard is not written in enforceable language. The revised versions of ASTM F1216 and ASTM F1743 are anticipated to be approved by the date of the CAH#2. The addition of cured-in-place pipe materials to this section are made to define these materials within Section 717 given the approval during CAH#1 to move Section 718 to 717.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal simply move existing code from Section 718 to Section 717 and add industry standards. The requirements are not changed by this modification.

Comment (CAH2)# 755

P113-24

IPC: 717.6, 717.7 (New), 717.8 (New), ASTM Chapter 15 (New)

Proposed Change as Submitted

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com)

2024 International Plumbing Code

Revise as follows:

717.6 Relining materials. The relining materials shall be manufactured in compliance with applicable standards and certified as required in Section 303.~~Fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.~~

Add new text as follows:

717.7 Fold in form. Sectional repair using fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.

717.8 Cured-in-Place-Pipe. Sectional repair using push or pull in place cure-in-place pipe (CIPP) shall be in compliance with ASTM F3541 using gaskets in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration. Sectional repair using inversion cure-in-place pipe (CIPP)shall be in compliance with ASTMF1216 or ASTM F2599 using gaskets in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration. Main and lateral cured-in-place rehabilitation of building sewer and sewer service lateral pipe and their connections to the main sewer pipe shall be in accordance with ASTM F2561 using gaskets in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

F1216-22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F3541-22	Standard Practice for Sectional Repair of Existing Gravity Fow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-in-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)

Reason: ASTM F3541 is the preferred method of rehabilitation using CIPP technology inside the building parameter and ASTM F1216 is referenced for requirements in all other CIPP standards in Section 718. adding more clarification regarding Hydrophilic gaskets and rings is consistent with the requirements in Section 718 currently and is an health and safety issue.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

there is no material cost added to this code as the standards referenced are currently referenced in the code and the standards reference each other in most cases such as ASTM F1216 and ASTM F3541. ASTM F3240, and the required use of hydrophilic gaskets, is in Section 718 where the minimal cost is already recognized by the code.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM F1216-22 *Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube1,2* and ASTM F3541-22 *Standard Practice for Sectional Repair of Existing Gravity Flow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)1,* with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The words about 'fold and form' method need to be eliminated. (11-3)

Individual Consideration Agenda

Comment 1:

IPC: 717.8

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

717.8 Cured-in-Place-Pipe. Sectional repair using push or pull in place cure-in-place pipe (CIPP) shall be in compliance with ASTM F3541 using gaskets in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~. Sectional repair using inversion cure-in-place pipe (CIPP)shall be in compliance with ASTMF1216 or ASTM F2599 using gaskets in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~. Main and lateral cured-in-place rehabilitation of building sewer and sewer service lateral pipe and their connections to the main sewer pipe shall be in accordance with ASTM F2561 using gaskets in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~.

Reason: We would like to see the Committee accept this item with modifications. Those modifications would be to delete the wording "to ensure water tightness and elimination of ground eater penetration" after each mention of F3240. This action would be consistent with the Committee action on P 114.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The reason is the same as for the original submittal.

Comment (CAH2)# 580

P115-24

IPC: 717.10 (New), 717.10

Proposed Change as Submitted

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com)

2024 International Plumbing Code

Add new text as follows:

717.10 Pressure Testing. The rehabilitated piping system shall be tested in accordance with Section 312.

Revise as follows:

~~**717.10**~~ **717.11 Approval.** Upon verification of compliance with the requirements of Sections 717.1 through ~~717.9~~ 717.10, the code official shall approve the installation.

Reason: All sanitary drainage systems must be pressure tested in accordance with Section 312 as is noted in Section 701.6 and 716.8 in Chapter 7. It also needs to be clarified in Section 717 and 718 that this is necessary.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Pressure testing is required in multiple Sections of the code currently and the cost allowance is already recognized.

P115-24

Public Hearing Results (CAH1)

Committee Action: **As Submitted**

Committee Reason: The code needs to be clarified that pressure testing needs to be performed on relined piping. The presence of Section 312 is not sufficient. (11-3)

P115-24

Individual Consideration Agenda

Comment 1:

IPC: 717.10

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Plumbing Code

Revise as follows:

717.10 Tests Pressure Testing. Upon verification of compliance with the requirements of Sections 717.1 through 717.9, the code official shall approve the installation.The rehabilitated piping system shall be tested in accordance with Section 312.

Reason: Editorial for consistency with the code. "312 Tests and Inspections." " 701.6 Tests." "pressure testing" is not used.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal are editorial. The requirements are not changed by this modification.

Comment (CAH2)# 758

P116-24

IPC: SECTION 202 (New), 718.1, ASTM Chapter 15 (New)

Proposed Change as Submitted

Proponents: Joanne Carroll, Subtegic Group Inc., Subtegic Group Inc (jcarroll@subtegic.com)

2024 International Plumbing Code

Add new definition as follows:

CURED-IN-PLACE PIPE (CIPP). A system consisting of a flexible textile tube saturated with a thermosetting resin used to rehabilitate existing pipe in-place by insertion and cure within an existing pipe.

Revise as follows:

718.1 Cured-in-place pipe (CIPP). The cured-in-place pipe (CIPP) materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. ~~Sectional cure-in-place~~ CIPP rehabilitation of building drain and *building sewer* piping ~~and *sewer* service lateral piping~~ shall be installed in accordance with ASTM F1216, ASTM F3541, or F2599. ~~Main and lateral cure-in-place~~ CIPP rehabilitation of a *building sewer* ~~and *sewer*service lateral pipe~~ and ~~their~~ its connection~~s~~ to the main *sewer* pipe shall be installed in accordance with ASTM F2561. Seamless molded ~~H~~ hydrophilic ~~rings or~~ gaskets in ~~cure-in-place~~ CIPP rehabilitation of ~~*building sewer*piping and *sewer* service~~ lateral~~s~~ pipelines shall be installed in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

F1216 - 2022	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F3541 - 2022	Standard Practice for Sectional Repair of Existing Gravity Flow, Non-Pressure Pipelines and Conduits by Pushed or Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)

Reason: As is the case with all plumbing-related pipe, materials, fittings and fixtures, in order to ensure quality and appropriateness for the intended use, CIPP lining materials must be manufactured in accordance with an industry standard.

The addition of CIPP installation standards ASTM F1216 and ASTM F3541 cover the requirements for the installation of CIPP when using the inversion or pushed or pulled-in place installation methods.

Reference to ASTM F2561 is made to clearly describe the scope of F2561 as appropriate for the reference to installation of CIPP for the rehabilitation of a building sewer and its connection to the main. Reference to ASTM F3240 is clarified to the scope of ASTM F3240 that is specific to covering the requirements for the installation of seamless molded hydrophilic gaskets in the CIPP rehabilitation of main and lateral pipelines.

Bibliography: Scope from ASTM F2561 - "*1.1 This practice covers requirements and test methods for the reconstruction of a sewer service lateral pipe having an inner diameter of 3 to 12 in. (7.6 to 30.5 cm) and its connection to the main pipe having an inner diameter of 6 to 24 in. (15.2 to 61.0 cm) and up the lateral a maximum of 150 ft (46 m) without excavation."*

Scope from ASTM F3240 - *"1.1 This practice covers the requirements for the installation of seamless molded hydrophilic gaskets (SMHG) in cured-inplace pipe (CIPP) rehabilitation of main and lateral pipelines."*

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The change proposal adds industry standards and provides clarity for the application of CIPP already included in the code.

P116-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: ASTM F1216 has unenforceable language. (12-2)

P116-24

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202, 718.1

Proponents: Joanne Carroll, Subtegic Group Inc, Subtegic Group Inc (jcarroll@subtegic.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Delete without substitution:

~~**CURED-IN-PLACE PIPE (CIPP).** A system consisting of a flexible textile tube saturated with a thermosetting resin used to rehabilitate existing pipe in-place by insertion and cure within an existing pipe.~~

Revise as follows:

718.1 Cured-in-place pipe (CIPP). The cured-in-place pipe (CIPP) materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. CIPP rehabilitation of building drain<u>age system piping</u> and *building* ~~*sewer*~~ <u>*sewers*</u> ~~piping~~ shall be installed in accordance with ASTM F1216, ASTM F3541, or <u>ASTM</u> F2599. CIPP rehabilitation of a *building sewer* and its connection to the main *sewer* pipe shall be installed in accordance with ASTM F2561. ~~Seamless molded hydrophilic~~ <u>Hydrophilic</u> <u>rings or</u> gaskets in CIPP rehabilitation of <u>building sewer piping</u> ~~lateral pipelines~~ shall be installed in accordance with ASTM F3240.

Reason: This proposal was denied by CAH1 citing the standard is not written in enforceable language. Since this is a new standard proposed for inclusion in the code and submitted in the proposal in at least a consensus draft form in accordance with Section 4.4 of CP28, changes have been made to the listed Sections in ASTM F1216 following the ANSI development process and anticipated to be completed and readily available prior to the Public Comment Hearing in accordance with Section 4.6.3.1.1.
ASTM F1216 is the oldest and foremost industry referenced standard for cured-in-place pipe. Compliance to ASTM F1216 is required in all of the existing referenced standards in the 2024 IPC - ASTM F2599, ASTM F2561 and ASTM F3240. Because cured-in-place pipe materials are produced by a variety of individual manufacturers, the addition of ASTM F1216 provides critical product material and installation instructions necessary for the installed product to work properly that is not included within the existing referenced standards.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal provide alternatives for the installation of CIPP in accordance with recognized industry standards.

Comment (CAH2)# 765

P117-24 Part I

IPC: 718.1, ASTM Chapter 15 (New)

Proposed Change as Submitted

Proponents: Kevin Duerr-Clark, NYS DOS, NYS DOS (kevin.duerr-clark@dos.ny.gov); Jeanne Rice, NYSDOS (jeanne.rice@dos.ny.gov); China Clarke, New York State Dept of State, Manager Technical Support Unit (china.clarke@dos.ny.gov); Chad Sievers, NYS, NYS DOS (chad.sievers@dos.ny.gov); John R Addario - NYS Department of State, NEW YORK STATE CODES DIVISION, New York State Department of State Division of Building Standards and Codes (john.addario@dos.ny.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

718.1 Cure-in-place. ~~Sectional~~ ~~c~~Cure-in-place rehabilitation of *building sewer* piping and *sewer* service lateral piping shall be in accordance with ASTM F1216, ASTM F1743, ASTM F2561, or ASTM F2599. ~~Main and lateral cure-in-place rehabilitation of *building sewer* and *sewer* service lateral pipe and their connections to the main *sewer* pipe shall be in accordance with ASTM F2561.~~ Hydrophilic rings or gaskets in cure-in-place rehabilitation of *building sewer* piping and *sewer* service laterals shall be in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

F1216 - 22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1743 - 22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured in-Place Thermosetting Resin Pipe (CIPP)

Reason: Cure-in-place pipe lining is a commonly used method of rehabilitating existing sewer piping and laterals. The 2021 International Plumbing Code added this new Section 718, but left off several important ASTM reference standards that are necessary to allow different methods of cure-in-place lining to be used properly. This proposal adds two additional reference standards as noted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change is simply adding options for methods of rehabilitating existing sewers and laterals by cured-in-place lining. Owners and designers may chose to rehabilitate sewers via this method, and then chose which standards are most appropriate for their project. Therefore, nothing new is being mandated by this change; the change only provides more options.

P117-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Some of the proposed standards are written in unenforceable language. (13-1)

P117-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: 718.1

Proponents: Jeanne Rice, NYSDOS (jeanne.rice@dos.ny.gov); Chad Sievers, NYS, NYS DOS (chad.sievers@dos.ny.gov); Kevin Duerr-Clark, NYS DOS, NYS DOS (kevin.duerr-clark@dos.ny.gov); Stephen Van Hoose, NYS DOS, NYS DOS (stephen.vanhoose@dos.ny.gov); China Clarke, New York State Dept of State, Manager Technical Support Unit (china.clarke@dos.ny.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

718.1 Cured-in-place pipe (CIPP). Cured-in-place pipe (CIPP) rehabilitation of *building sewer* piping and *sewer* service lateral piping shall be in accordance with ASTM F1216, ASTM F1743, ASTM F2561, or ASTM F2599. Hydrophilic rings or gaskets in ~~cure-in-place~~ CIPP rehabilitation of *building sewer* piping and *sewer* service laterals shall be installed in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~.

Reason: This proposal was denied by CAH1 due to one of the ASTM standards having unenforceable language, with a request to bring the proposal back at the next committee action hearing. The revised version of this standard, ASTM F1216, is anticipated to be approved by the date of the second committee action hearing.

Additionally, editorial changes were made to utilize standard industry terminology: "Cured-in-Place Pipe (CIPP)," and to remove unnecessary language which is better suited to be commentary.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal simply edit the terminology slightly to better conform to industry standards. The requirements are not changed by this modification.

Comment (CAH2)# 446

P117-24 Part II

IRC: P3012.1 (New), ASTM Chapter 44 (New)

Proposed Change as Submitted

Proponents: Kevin Duerr-Clark, NYS DOS, NYS DOS (kevin.duerr-clark@dos.ny.gov); Brian Tollisen, NYS Department of State, NYS Department of State (brian.tollisen@dos.ny.gov); China Clarke, New York State Dept of State, Manager Technical Support Unit (china.clarke@dos.ny.gov); Chad Sievers, NYS, NYS DOS (chad.sievers@dos.ny.gov); John R Addario - NYS Department of State, NEW YORK STATE CODES DIVISION, New York State Department of State Division of Building Standards and Codes (john.addario@dos.ny.gov); Jeanne Rice, NYSDOS (jeanne.rice@dos.ny.gov)

2024 International Residential Code

Add new text as follows:

P3012.1 Cure-in-place. Cure-in-place rehabilitation of building sewer piping and sewer service lateral piping shall be in accordance with ASTM F1216, ASTM F1743, ASTM F2561, or ASTM F2599. Hydrophilic rings or gaskets in cure-in-place rehabilitation of building sewer piping and sewer service laterals shall be in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration.

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

F1216 - 22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F1743 - 22	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured in-Place Thermosetting Resin Pipe (CIPP)
F2599-22	Standard Practice for Sectional Repair of Damaged Pipe By Means of an Inverted Cured-In-Place Line
F3240-19 (2023)	Standard Practice for Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Watertightness of Cured-in-Place Rehabilitation of Main and Lateral Pipelines

Reason: Cure-in-place pipe lining is a commonly used method of rehabilitating existing sewer piping and laterals. The 2021 International Plumbing Code added a new Section 718 to the IPC, but nothing was added for the Residential Provisions and 718 left off several important ASTM reference standards that are necessary to allow different methods of cure-in-place lining to be used properly. This proposal pulls in the language from the IPC and adds two additional reference standards as noted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change is simply adding options for methods of rehabilitating existing sewers and laterals by cured-in-place lining. Owners and designers may chose to rehabilitate sewers via this method, and then chose which standards are most appropriate for their project. Therefore, nothing new is being mandated by this change; the change only provides more options.

P117-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There didn't appear to a major section (P3012) in the code for this new section to be placed under. (10-0)

P117-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: SECTION 3012 (New), P3012.1, ASTM Chapter 44 (New)

Proponents: Jeanne Rice, NYSDOS (jeanne.rice@dos.ny.gov); Chad Sievers, NYS, NYS DOS (chad.sievers@dos.ny.gov); Kevin Duerr-Clark, NYS DOS, NYS DOS (kevin.duerr-clark@dos.ny.gov); Stephen Van Hoose, NYS DOS, NYS DOS (stephen.vanhoose@dos.ny.gov); China Clarke, New York State Dept of State, Manager Technical Support Unit (china.clarke@dos.ny.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Add new text as follows:

SECTION 3012 REHABILITATION OF BUILDING SEWERS AND DRAINS

Revise as follows:

P3012.1 Cured-in-place pipe (CIPP). Cured-in-place pipe (CIPP) rehabilitation of building sewer piping and sewer service lateral piping shall be in accordance with ASTM F1216, ASTM F1743, ASTM F2561, or ASTM F2599. Hydrophilic rings or gaskets in ~~cure-in-place~~ CIPP rehabilitation of building sewer piping and sewer service laterals shall be in accordance with ASTM F3240 ~~to ensure water tightness and elimination of ground water penetration~~.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

F2561-20 Standard Practice for Sectional Repair of Damaged Pipe By Means of an Inverted Cured-In-Place Line

Reason: The proposal was initially submitted without the creation of section 3012 which subsection 3012.1 would fall under. This modification adds the section to address the committee comments.

Additionally, editorial changes were made to utilize standard industry terminology: "Cured-in-Place Pipe (CIPP)," and to conform to changes made to part 1 of this proposal.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications to this proposal simply edit the terminology slightly to better conform to industry standards. The requirements are not changed by this modification.

Comment (CAH2)# 454

P120-24

IPC: SECTION 202 (New), 802.1.9 (New)

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Plumbing Code

Add new definition as follows:

DUMP SINK. A sink provided in food service operations for the sole purpose of dumping leftover liquids from drinking containers, these sinks can be stand-alone fixtures or in combination with a 3-compartment sink.

Add new text as follows:

802.1.9 Dump sinks. When dump sinks are required, they shall discharge directly or indirectly through an air gap or air break to the drainage system.

Reason: Public health agencies are requiring these fixtures in an effort to keep food service operation staff from dumping leftover liquids/beverages into food preparation sinks where they could cause a potential contamination issue. This proposal is intended to provide direction for how these fixtures should be viewed and how they will be permitted to discharge to the drainage systems.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These sinks are already being required by public health agencies so there would be no additional costs.

P120-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The dump sink definition needs to be two sentences. (10-3)

P120-24

Individual Consideration Agenda

Comment 1:

IPC: SECTION 202

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

DUMP SINK. A sink provided in food service operations for the sole purpose of dumping leftover liquids~~,~~. These ~~these~~ sinks can be stand-alone fixtures or in combination with a 3-compartment sink.

Reason: Public health agencies are requiring these fixtures in an effort to keep food service operation staff from dumping leftover liquids/beverages into food preparation sinks where they could cause a potential contamination issue. This proposal is intended to provide direction for how these fixtures should be viewed and how they will be permitted to discharge to the drainage systems.

Changes have been made as suggested by the IPC Code Development Committee during CAH #1.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These sinks are already being required by public health agencies so there would be no additional costs.

Comment (CAH2)# 408

P121-24

IPC: 802.4, 802.4.3

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Plumbing Code

Revise as follows:

802.4 Waste receptors. For other than hub drains that receive only clear-water waste and standpipes, a removable strainer or basket shall cover the outlet of waste receptors. Waste receptors shall not be installed in concealed spaces. Waste receptors shall not be installed in plenums, crawl spaces, attics, interstitial spaces above ceilings and below floors. *Ready access* shall be provided to waste receptors. **Exception:** *Access* shall be provided for automatic clothes washer standpipe drains for rodding.

802.4.3 Standpipes. Standpipes shall be individually trapped. Standpipes shall extend not less than 18 inches (457 mm) but not greater than 42 inches (1067 mm) above the trap weir. ~~*Access* shall be provided to standpipes and drains for rodding.~~

Reason: It is imperative that indirect waste receptors are provided with 'Ready Access" since they receive indirect waste discharge. Without the clear view of the waste receptor, a backup in the drainage system can result in damage due to the concealed location of the waste receptor. The portion of this section which previously indicated standpipes shall be provided with "Access" allows for all standpipes to be concealed in some fashion. Allowing for "Access" to be provided specifically for automatic clothes washer standpipe makes sense due to the fact there is a minimum and maximum height the standpipe is permitted to extend above the trap which results in many of these being concealed by the automatic clothes washers. However, if only providing "Access" is permitted for all types of standpipes, it results in standpipes located under counters behind cabinet doors where they will not be observable to the occupants.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal does not positively or negatively impact costs, it just clarifies which waste receptors are required to be provided with "Ready Access" and which ones are required to be provided with "Access".

P121-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The original sentence places the access requirements where they belong. (9-4)

P121-24

Individual Consideration Agenda

Comment 1:

IPC: 802.4, 802.4.3

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Submitted

Reason: Section 802.4 covers all waste receptors that receive indirect waste discharge, and as the definition of a waste receptor indicates, this includes all standpipes, including Automatic clothes washers. The section also includes areas where waste receptor should not be installed and a requirement for waste receptors to be provided with "Ready Access". Since the primary section speaks to the access for maintenance that must be provided, it is in this section where any exceptions to that level of access should be listed, and since it is a specific exception it should remain as an exception and not in the body of the section.

- **ACCESS (TO).** That which enables a fixture, appliance or equipment to be reached by *ready access* or by a means that first requires the removal or movement of a panel or similar obstruction (see "*Ready access*").
- **READY ACCESS.** That which enables a fixture, appliance or equipment to be directly reached without requiring the removal or movement of any panel or similar obstruction and without the use of a portable ladder, step stool or similar device.
- **WASTE RECEPTOR.** A floor sink, standpipe, hub drain or floor drain that receives the discharge of one or more indirect waste pipes.

It is imperative that indirect waste receptors are provided with 'Ready Access" since they receive indirect waste discharge. Without the clear view of the waste receptor, a backup in the drainage system can result in damage due to the concealed location of the waste receptor. The portion of this section which previously indicated standpipes shall be provided with "Access" allows for all standpipes to be concealed in some fashion. Allowing for "Access" to be provided specifically for automatic clothes washer standpipe makes sense due to the fact there is a minimum and maximum height the standpipe is permitted to extend above the trap which results in many of these being concealed by the automatic clothes washers. However, if only providing "Access" is permitted for all types of standpipes, it results in standpipes located under counters behind cabinet doors where they will not be observable to the occupants.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 410

P125-24 Part I

IPC: 905.2

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

Revise as follows:

905.2 Grade. Horizontal ~~Vent~~ vent and *branch vent* pipes shall be installed level, or sloped ~~so graded and connected as~~ to drain back to the drainage pipe by gravity.

Reason: The intent of this section is to ensure vent systems are installed in a manner that does not result in a situation where condensate can collect in sufficient quantities which would result in a blockage of a vent. A vent pipe that is run level could not retain enough water to cause this to occur, at best, a residual amount of water could be left behind on the invert of the pipe due to surface tension. This residual water would never be enough to block or substantially restrict the emission or admission of air for balancing the system.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds no additional requirements for an installation, but rather provides more options for compliance.

P125-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: Vent piping should be sloped to promote drainage back to the drainage system. (13-0)

P125-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: 905.2

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

905.2 Grade. Horizontal vent and branch vent pipes shall be installed level or be sloped, and supported to allow moisture and condensate to drain back to the drainage pipe by gravity.

Reason: The intent of this section is to ensure vent systems are installed in a manner that does not result in a situation where condensate can collect in sufficient quantities which would result in a blockage of a vent. A vent pipe that is run level could not retain enough water to cause this to occur, at best, a residual amount of water could be left behind on the invert of the pipe due to surface tension. This residual water would never be enough to block or substantially restrict the emission or admission of air for balancing the system. Although the residential committee also disapproved this during CAH #1, they just asked that the additional language I have included in this proposal be kept from the original code language. This practice is used internationally as well as in the UPC and simply provides an option for installers.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds no additional requirements for an installation, but rather provides more options for compliance.

Comment (CAH2)# 511

P125-24 Part II

IRC: P3104.2

Proposed Change as Submitted

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Residential Code

Revise as follows:

P3104.2 Grade. Horizontal ~~Vent~~ vent and branch vent pipes shall installed level, or be ~~graded~~ sloped~~, connected and supported to allow moisture and condensate~~ to drain back to the ~~soil or waste~~ drainage pipe by gravity.

Reason: The intent of this section is to ensure vent systems are installed in a manner that does not result in a situation where condensate can collect in sufficient quantities which would result in a blockage of a vent. A vent pipe that is run level could not retain enough water to cause this to occur, at best, a residual amount of water could be left behind on the invert of the pipe due to surface tension. This residual water would never be enough to block or substantially restrict the emission or admission of air for balancing the system.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds no additional requirements for an installation, but rather provides more options for compliance.

P125-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The phrase "connected and supported" needs to remain in the code. (10-0)

P125-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: P3104.2

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Residential Code

Revise as follows:

P3104.2 Grade. Horizontal vent and branch vent pipes shall be installed level or be sloped, and supported to allow moisture and condensate to drain back to the drainage pipe by gravity.

Reason: The intent of this section is to ensure vent systems are installed in a manner that does not result in a situation where condensate can collect in sufficient quantities which would result in a blockage of a vent. A vent pipe that is run level could not retain enough water to cause this to occur, at best, a residual amount of water could be left behind on the invert of the pipe due to surface tension. This residual water would never be enough to block or substantially restrict the emission or admission of air for balancing the system.

I have added back in the language the committee suggested should be kept from the original text.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds no additional requirements for an installation, but rather provides more options for compliance.

Comment (CAH2)# 510

P127-24

IPC: 907.1, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com)

2024 International Plumbing Code

Revise as follows:

907.1 Vent for horizontal offset of drainage stack. Horizontal offsets of drainage *stacks* shall be vented where five or more *branch intervals* are located above the offset. The offset shall be vented by venting the upper section of the drainage *stack* and the lower section of the drainage *stack*, or in single stack drainage systems, a positive pressure reduction device conforming to ASSE 1030 shall be installed in accordance with the manufacturer's instructions.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1030-2016 Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems

Reason: The current language does not address single stack drainage systems where positive pressure reduction devices conforming to ASSE 1030 are used to protect the trap seals from positive pressure transients in the drainage system.

Bibliography: ASSE 1030 standard for Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems
Studor Engineered Products Manual - 10th Edition

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

- **PPRD Manual.pdf**
  https://www.cdpaccess.com/proposal/9710/30405/documentation/145586/attachments/download/4540/
- **Cost Impact Calculations - PPRD.pdf**
  https://www.cdpaccess.com/proposal/9710/30405/documentation/145586/attachments/download/4539/
- **Studor Engineered Products Manual - 10th Edition.pdf**
  https://www.cdpaccess.com/proposal/9710/30405/documentation/145586/attachments/download/4236/

Estimated Immediate Cost Impact:

The cost of a single stack pipe system is less than that of an equivalent conventional two-stack pipe system.

Estimated Immediate Cost Impact Justification (methodology and variables):

See Cost Impact Calculations attachment.

P127-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: This device has not been tested for pressures that could occur during a sewer surcharge event. Language would be better placed in Section 917. (12-1)

P127-24

Individual Consideration Agenda

Comment 1:

Proponents: steven white, Aliaxis, Aliaxis (swhite@aliaxis.com) requests As Submitted

Reason: 1: Device Testing for Sewer Surcharge Events Transient The objection that the device has not been tested for pressures that could occur during a sewer surcharge event is unfounded. The device has been specifically designed and tested to handle sewer surcharge transient events at the base of stacks and offsets. These transient surcharge pressures should not exceed +400 Pa (1.6 inch WG), as this is the threshold where positive or negative transients begin to affect the appliance water trap seals.

The device has been developed to attenuate positive transients. According to ASSE 1030, Chapter 3.5 “Device Characteristic Performance Test,” Chapter 3.6 “Device Opening Time Test,” and Chapter 3.7 “Device Filling Time Test,” the performance of the device in attenuating positive transients has been thoroughly addressed.

2: Pressure from Sewer Surcharge Events

The second objection may concerns the pressure from a sewer surcharge event, which occurs when the drainage pipe becomes surcharged at the base of the stack or offsets due to: a) Hydraulic flow exceeding the hydraulic performance of the pipe size. b) A restriction caused by a partial or full blockage.

In such cases, the positive pressure will not be transient but will rise more slowly, leading to a hydrostatic event. This scenario is partially addressed within the IPC Drainage and Vent Water Test:

Drainage and Vent Water Test: A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but sections shall not be tested with less than a 10-foot (3048 mm) head of water. In testing successive sections, not less than the upper 10 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a 10-foot (3048 mm) head of water. This pressure shall be held for not less than 15 minutes. The system shall then be tight at all points.

In this test, the pressure would be 4.27 psi (29.4 kPa)
According to ASSE 1030, Chapter 3.1 “Air Tightness Test,” the units are tested to 5 psi (34.5 kPa). This indicates that the device has been tested to withstand a hydrostatic (surcharge) event equivalent to a 10-foot (3 m) surcharge before the device. Therefore, the objection that the device has not been tested is incorrect, as the device tested to ASSE 1030 has been evaluated for both positive transients and surcharge pressures.

As P127- 24 is for offsets the image attached shows the surcharge event in the offset, and how a vent bypass or the device (PTA pressure transient attenuator) with AAV can vent the offset, which is the purpose of the P127-24 to allow the device with AAV as an alternative venting solution with better or same performance as a bypass vent.

Also see attached file for the PAPA best practice guide where guidance is offered on the offsets as well as the whole system.

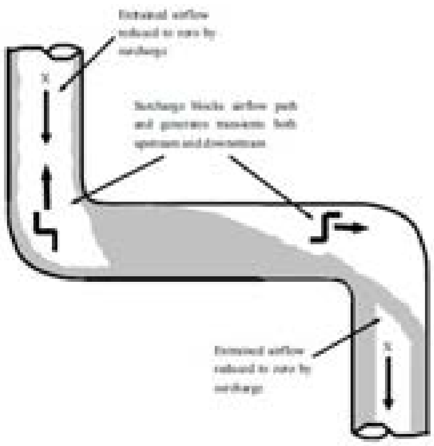


Figure 4.35 Offset surcharge in a vertical stack

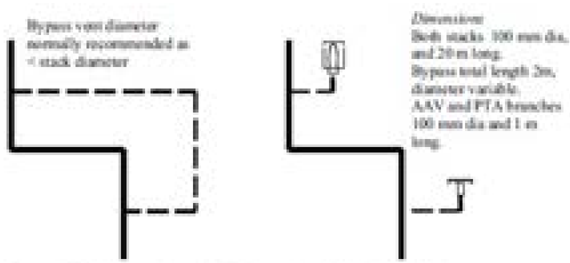


Figure 4.36 Offset venting or installation of an AAV / PTA combination

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Attached Files

- **PAPA Best Practice Guide Updated 2017.pdf**
  https://www.cdpaccess.com/comment/499/32278/files/download/7910/

Comment (CAH2)# 499

Comment 2:

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com) requests As Submitted

Reason: The objection that this device has not been tested for pressures that could occur during a sewer surcharge event, is not correct: Devices conforming to ASSE 1030 are tested to 5 psi (36Kpa).However, in a sewer surcharge event, positive pressures in the system will vent out through the open vent that is required in the manufacturer's installation instructions. The attached paper also explains the air pressure associated with the surcharge from the sewer into the building, as you can see the Positive Air Pressure Attenuator (PAPA) and Air Admittance Valve (AAV) are cited as a solution to protect the building from these events. Note that the pressure rating in ASSE 1030 is based on 312.2 of the IPC requirements:312.2 Drainage and vent water test. A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but sections shall not be tested with less than a 10-foot (3048 mm) head of water. In testing successive sections, not less than the upper 10 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a 10-foot (3048 mm) head of water. This pressure shall be held for not less than 15 minutes. The system shall then be tight at all points.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Attached Files

- **Vents for Offsets.pdf**
  https://www.cdpaccess.com/comment/776/32881/files/download/8046/
- **HWU Surcharge - IPC.pdf**
  https://www.cdpaccess.com/comment/776/32881/files/download/8032/

Comment (CAH2)# 776

P128-24

IPC: 907.2, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com)

2024 International Plumbing Code

Revise as follows:

907.2 Upper section. The upper section of the drainage *stack* shall be vented as a separate *stack* with a vent *stack* connection installed in accordance with Section 904.4, or in single stack drainage systems, a positive pressure reduction device conforming to ASSE 1030 shall be installed above the offset in the stack in accordance with the manufacturer's instructions. The offset shall be considered to be the base of the *stack*.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1030-2016	Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems

Reason: The current language does not address single stack drainage systems with offsets where positive pressure reduction devices (PPRDs) conforming to ASSE 1030 are used to protect the trap seals on branches from positive pressure transients. PPRDs are used to reduce positive pressures at the base of the stack.

Bibliography: ASSE 1030 standard for Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems
Studor Engineered Products Manual - 10th Edition

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

The cost of a single stack pipe system is less than that of an equivalent conventional two-stack pipe system

Estimated Immediate Cost Impact Justification (methodology and variables):

See Cost Impact Calculations attachment.

Estimated Life Cycle Cost Impact:

Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1030-2016 *Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems,* with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P128-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The added language would be better as an exception in Section 917. (11-2)

P128-24

Individual Consideration Agenda

Comment 1:

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com) requests As Submitted

Reason: See attached file regarding offsets.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Attached Files

- **Vents for Offsets.pdf**
  https://www.cdpaccess.com/comment/780/32888/files/download/8050/

Comment (CAH2)# 780

Comment 2:

Proponents: steven white, Aliaxis, Aliaxis (swhite@aliaxis.com) requests As Submitted

Reason: The active drainage single stack system has an equal to better performance, as a secondary vent system, this system has been fully researched and tested, and installed in high-rise buildings around the world since 2003, it is part of the Australian plumbing code the AS3500-2 standard since the early 2000's. The system has been fully researched and reviewed, and I recommend reading the "Swaffield, J.A. (2010). Transient airflow in building drainage systems. Spon Press, Oxon, UK" to understand the fluid mechanics of DWV systems for taller buildings. The following could be used for understanding to support the current wording changes or an addition to the section 917 (single stack)

Causes and behaviour of air pressure transients in building drainage systems: Air pressure transients generated within the building drainage system obey the same mechanisms that govern transient generation and propagation in any fluid carrying system. In general terms, pressure transients are generated as a consequence of changes to the flow conditions at some point within the system and are the means by which such changes are
communicated throughout the system (Swaffield, 2010). The Joukowsky expression provides the fundamental relationship between pressure rise, wave speed, fluid density and flow velocity:

$\Delta p = -pc\Delta V$

where Δp is pressure change, p is the fluid density, c is the wave speed and ΔV is flow velocity change. The significance of the negative sign means that pressure increases with a decrease of velocity, and vice versa.

Within the building drainage system, air pressure transients are generated due to changes in the entrained airflow as a consequence of changes to the annular water downflow initiated by the random discharge of system appliances. Increasing annular downflow generates an enhanced entrained airflow which reduces the system pressure. Slowing-down or stopping the airflow, due to some blockage of the passage of air caused by the formation of a water curtain by either wastewater flowing from a branch into the stack or by the change of

flow direction at an offset or the stack base, generates positive air transients (Swaffield et al., 2004). Pressure fluctuations from external events, such as surcharging of the main sewer, can also generate transients within the system. These low-amplitude air pressure transients, whose magnitude are dependent upon the rate of change of system conditions,
are transmitted and or reflected at all boundaries within the system including open terminations, connections to the sewer, appliance trap seals, and pipe junctions. An openended pipe, such an open stack termination, has a reflection coefficient of -1, while a closedended pipe, such as an appliance trap seal, has a reflection coefficient of +1. Changes in the system characteristics, such as a change in diameter or the inclusion of a pipe junction, will
alter the transmitted wave and induce a reflection.

What portion of the transient is reflected and transmitted, is dictated by both the pipe material (which affects wave speed) and pipe diameter. The time taken for a transient to travel to a reflecting boundary and return to its source is known as the pipe period and is given by the expression: pipe period=2L/c

where L is the pipe length and c is the wave speed. For most stack to branch situations this relates the division of a pressure transient to the ratio of pipe cross sectional areas, however when a positive pressure reduction devices (PPRDs) is included in the design
the division is much greater since the positive pressure reduction devices (PPRDs) also operates on the wave speed (c in equation 2-4 above). This is means that in a fully vented system using traditional pipe junctions a parallel vent pipe of at least 200 mm and a length of 100 m would be required to achieve the same reduction in positive air pressure transient. Consequences of air pressure transients in building drainage systems:

While the air pressure transients generated within the building drainage system are of low amplitude, they are, however, responsible for compromising system integrity and enabling cross-contamination of habitable space through the destruction of water trap seals. Negative air pressure transients are capable of depleting the water trap seal by either induced or self-siphonage by creating a suction pressure within the pipe adjacent to the trap. Positive air pressure transients are capable of displacing the water trap seal upwards towards the appliance which will either force air through the water seal into the appliance, or if of sufficient magnitude, cause the water seal to be completely displaced into the appliance, leaving the trap wither wholly or partially depleted. A depleted trap seal permits airflow both into and out of the drainage system, thus allowing foul air to exit the system and enter habitable space.

Control and suppression of air pressure transients Air pressure transients are an unwanted consequence of normal system operation and, although unavoidable, it is possible to protect water trap seal integrity through the correct alleviation of any pressure fluctuations. Traditionally, this has been approached through passive solutions which rely on the provision of cross connections and vertical stacks vented to atmosphere. However, this approach, while both proven and traditional, has inherent limitations (Swaffield, 2006). The key to maintaining a balance of pressure within the building drainage system is to provide pressure relief as close to the source as possible; long pipe runs and remote vent terminations lead to delays in the arrival of relieving reflections and therefore compromise system integrity. More recently, active solutions to the control and suppression of air pressure transients have been developed providing necessary localised relief.

Negative air pressure transients, which communicate the need for more air and represents a suction force, can be alleviated by air admittance valves (AAVs) which, responding directly to the local pressure conditions, opens as the pressure falls to allow inward relief airflow, hence limiting the pressure excursions experienced by the water trap seal. To avoid compromising system integrity by allowing foul sewer gases to enter the building, the AAV is designed with a fail-safe mechanism which ensures that it remains closed when not in use or when the local pressure exceeds atmospheric. AAVs can be installed locally to the water trap seal or at the stack termination to avoid the need for a roof penetration

Positive air pressure transients, which communicate the need to reduce the airflow and represents a pushing force, can be alleviated by variable volume containment attenuators (positive pressure reduction devices (PPRDs)) which absorb the airflow driven by positive air pressure transients. The positive pressure reduction devices (PPRDs), consisting of a variable volume bag that expands under the influence of a positive pressure transient, is capable of reducing the magnitude of a positive air pressure transient by up to 90% (Swaffield et al., 2005a, 2005b) by providing an alternative route which diverts and attenuates the system airflows gradually due to the significantly reduced wave speed within the positive pressure reduction devices (PPRDs). due to the properties of its elastic pipe construction. Designed as a collapsible reservoir, the variable volume bag provides an additional volume unseen by the system when the pressure regime at that point is sub-atmospheric, which absorbs the extra air induced by the positive air pressure transient.

Each positive pressure reduction devices (PPRDs) must meet the testing requirements of ASSE 1030

Base of stack.

The base of the stack is the most likely place for a blockage in the airflow to occur. As the distance between the base of the stack and the top stack termination is the maximum distance possible within the system, then a blockage at this location will lead to the greatest possible pressure rise. It is therefore recommended to use two PPRDs in series at the base of the stack. The devices should be located below the first branch connected to the stack. Note that is it still recommend that branches in the lower part of the stack be connected directly to the horizontal drainage and not to the main stack.
Offsets within the vertical stack, which in the past were wrongfully thought to “slow down” the water flow in tall buildings, can also be the cause of significant positive pressure
transients as they forcibly change the flow direction. It is recommended to use PPRDs above the offset.

Top of stack
It is optional to have a PPRDs located immediately below the top of the stack above the highest branch in the building. It should be noted that this point does not need to be at the top of the building, but merely above the last branch. The system can be terminated with an AAV to provide ventilation, and a PPRDs to assist in attenuating any positive transients in the system.

Distributed locations
As the operation of system appliances, which discharge wastewater into the system and hence govern the conditions necessary for air entrainment and pressure transient propagation, are entirely random, it is virtually impossible to predict where the greatest area of risk in the system will be. Given also, that the volume of extra air within the system, as a result of the propagating positive pressure transients, is dependent upon airflow rate, blockage closure time, and the system pipe period; all of which will change, then to accommodate these uncertainties, PPRDs should be distributed strategically throughout the height of the stack

Number of Devices
The number of devices installed in a system depends on the height of the building and the risk of air pressure transients being generated. This can be determined, in the main, using the building, and in particularly the intensity of usage.

For example, a stadium design, Recommended installation of PPRDs due to the expected surges from sanitary appliances at peak usage times.

PPRDs Design Table for 4” and 6” (100mmDN/150mm DN) drainage stacks

3-10 floors	One unit on the base
11-15 floors	One unit on the base, one halfway
16-25 Floors	One unit on the base, one unit on floor 5, one Halfway between the remaining floors above floor 5
26+ floors	Two units in series on the base, then one unit on every 5th floor to the 25th floor, then one every 10th floor thereafter
Offsets	ne unit must be installed above offsets of less than 10 floors Two units must be installed above offsets more than of 20 floors

Bibliography: Swaffield, J.A. (2006). “Sealed building drainage and vent systems – an application of active air pressure transient control and suppression”, Building and Environment, 41, 1435-1446.
Swaffield, J.A. (2010). Transient airflow in building drainage systems. Spon Press, Oxon, UK.

Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005a). "Pressure transient control: Part I - criteria for transient analysis and control." Building Services Engineering Research and Technology, 26(2), 99-114.

Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005b). "Pressure transient control: Part II - simulation and design of a positive surge protection device for building drainage networks." Building Services Engineering Research and Technology, 26(3), 195-212

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 578

P129-24

IPC: 907.3, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com)

2024 International Plumbing Code

Revise as follows:

907.3 Lower section. The lower section of the drainage *stack* shall be vented by a yoke vent connecting between the offset and the next lower horizontal *branch*. The yoke vent connection shall be permitted to be a vertical extension of the drainage *stack*. The size of the yoke vent and connection shall be not less than the size required for the vent *stack* of the drainage *stack*, or in single stack drainage systems, a positive pressure reduction device conforming to ASSE 1030 shall be installed in accordance with the manufacturer's instructions and stack type air admittance valves shall be installed at the top of offset drainage stacks in accordance with ASSE 1050.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1030-2016 Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems

Reason: The current language does not address single stack drainage systems with offsets where positive pressure reduction devices conforming to ASSE 1030 are used to protect the trap seals on branches from positive pressure transients.

Bibliography: ASSE 1030 standard for Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems
Studor Engineered Products Manual - 10th Edition

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

The cost of a single stack pipe system is less than that of an equivalent conventional two-stack pipe system.

Estimated Immediate Cost Impact Justification (methodology and variables):

See Cost Impact Calculations attachment.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1030-2016 *Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems,* with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P129-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The added language would be better as an exception. (13-0)

Individual Consideration Agenda

Comment 1:

Proponents: steven white, Aliaxis, Aliaxis (swhite@aliaxis.com) requests As Submitted

Reason: The active drainage single stack system has an equal to better performance, as a secondary vent system, this system has been fully researched and tested, and installed in high-rise buildings around the world since 2003, it is part of the Australian plumbing code the AS3500-2 standard since the early 2000's. The system has been fully researched and reviewed, and I recommend reading the "Swaffield, J.A. (2010). Transient airflow in building drainage systems. Spon Press, Oxon, UK" to understand the fluid mechanics of DWV systems for taller buildings. The following could be used for understanding to support the current wording changes or an addition to the section 917 (single stack)

Causes and behaviour of air pressure transients in building drainage systems: Air pressure transients generated within the building drainage system obey the same mechanisms that govern transient generation and propagation in any fluid carrying system. In general terms, pressure transients are generated as a consequence of changes to the flow conditions at some point within the system and are the means by which such changes are communicated throughout the system (Swaffield, 2010). The Joukowsky expression provides the fundamental relationship between pressure rise, wave speed, fluid density and flow velocity:

$\Delta p=-pc\Delta V$

where Δp is pressure change, p is the fluid density, c is the wave speed and ΔV is flow velocity change. The significance of the negative sign means that pressure increases with a decrease of velocity, and vice versa. Within the building drainage system, air pressure transients are generated due to changes in the entrained airflow as a consequence of changes to the annular water downflow initiated by the random discharge of system appliances. Increasing annular downflow generates an enhanced entrained airflow which reduces the system pressure. Slowing-down or stopping the airflow, due to some blockage of the passage of air caused by the formation of a water curtain by either wastewater flowing from a branch into the stack or by the change of flow direction at an offset or the stack base, generates positive air transients (Swaffield et al., 2004). Pressure fluctuations from external events, such as surcharging of the main sewer, can also generate transients within the system. These low-amplitude air pressure transients, whose magnitude are dependent upon the rate of change of system conditions, are transmitted and or reflected at all boundaries within the system including open terminations, connections to the sewer, appliance trap seals, and pipe junctions. An openended pipe, such an open stack termination, has a reflection coefficient of -1, while a closedended pipe, such as an appliance trap seal, has a reflection coefficient of +1. Changes in the system characteristics, such as a change in diameter or the inclusion of a pipe junction, will alter the transmitted wave and induce a reflection.

What portion of the transient is reflected and transmitted, is dictated by both the pipe material (which affects wave speed) and pipe diameter. The time taken for a transient to travel to a reflecting boundary and return to its source is known as the pipe period and is given by the expression:

$\text{pipe period}=2L/c$

where L is the pipe length and c is the wave speed.

For most stack to branch situations this relates the division of a pressure transient to the ratio of pipe cross sectional areas, however when a positive pressure reduction devices (PPRDs) is included in the design the division is much greater since the positive pressure reduction devices (PPRDs) also operates on the wave speed (c in equation 2-4 above). This is means that in a fully vented system using traditional pipe junctions a parallel vent pipe of at least 200 mm and a length of 100 m would be required to achieve the same reduction in positive air pressure transient.

Consequences of air pressure transients in building drainage systems: While the air pressure transients generated within the building drainage system are of low amplitude, they are, however, responsible for compromising system integrity and enabling cross-contamination of habitable space through the destruction of water trap seals. Negative air pressure transients are capable of depleting the water trap seal by either induced or self-siphonage by creating a suction pressure within the pipe adjacent to the trap. Positive air pressure transients are capable of displacing the water trap seal upwards towards the appliance which will either force air through the water seal into the appliance, or if of sufficient magnitude, cause the water seal to be completely displaced into the appliance, leaving the trap wither wholly or partially depleted. A depleted trap seal permits airflow both into and out of the drainage system, thus allowing foul air to exit the system and enter habitable space.

Control and suppression of air pressure transients
Air pressure transients are an unwanted consequence of normal system operation and, although unavoidable, it is possible to protect water trap seal integrity through the correct alleviation of any pressure fluctuations. Traditionally, this has been approached through passive solutions which rely on the provision of cross connections and vertical stacks vented to atmosphere. However, this approach, while both proven and traditional, has inherent limitations (Swaffield, 2006). The key to maintaining a balance of pressure within the building drainage system is to provide pressure relief as close to the source as possible; long pipe runs and remote vent terminations lead to delays in the arrival of relieving reflections and therefore compromise system integrity. More recently, active solutions to the control and suppression of air pressure transients have been developed providing necessary localised relief.

Negative air pressure transients, which communicate the need for more air and represents a suction force, can be alleviated by air admittance valves (AAVs) which, responding directly to the local pressure conditions, opens as the pressure falls to allow inward relief airflow, hence limiting the pressure excursions experienced by the water trap seal. To avoid compromising system integrity by allowing foul sewer gases to enter the building, the AAV is designed with a fail-safe mechanism which ensures that it remains closed when not in use or when the local pressure exceeds atmospheric. AAVs can be installed locally to the water trap seal or at the stack termination to avoid the need for a roof penetration

Positive air pressure transients, which communicate the need to reduce the airflow and represents a pushing force, can be alleviated by variable volume containment attenuators (positive pressure reduction devices (PPRDs)) which absorb the airflow driven by positive air pressure transients. The positive pressure reduction devices (PPRDs), consisting of a variable volume bag that expands under the influence of a positive pressure transient, is capable of reducing the magnitude of a positive air pressure transient by up to 90% (Swaffield et al., 2005a, 2005b) by providing an alternative route which diverts and attenuates the system airflows gradually due to the significantly reduced wave speed within the positive pressure reduction devices (PPRDs). due to the properties of its elastic pipe construction. Designed as a collapsible reservoir, the variable volume bag provides an additional volume unseen by the system when the pressure regime at that point is sub-atmospheric, which absorbs the extra air induced by the positive air pressure transient.
Each positive pressure reduction devices (PPRDs) must meet the testing requirements of ASSE 1030

Base of stack
The base of the stack is the most likely place for a blockage in the airflow to occur. As the distance between the base of the stack and the top stack termination is the maximum distance possible within the system, then a blockage at this location will lead to the greatest possible pressure rise. It is therefore recommended to use two PPRDs in series at the base of the stack. The devices should be located below the first branch connected to the stack. Note that is it still recommend that branches in the lower part of the stack be connected directly to the horizontal drainage and not to the main stack.
Offsets within the vertical stack, which in the past were wrongfully thought to “slow down” the water flow in tall buildings, can also be the cause of significant positive pressure
transients as they forcibly change the flow direction. It is recommended to use PPRDs above the offset.

Top of stack
It is optional to have a PPRDs located immediately below the top of the stack above the highest branch in the building. It should be noted that this point does not need to be at the top of the building, but merely above the last branch. The system can be terminated with an AAV to provide ventilation, and a PPRDs to assist in attenuating any positive transients in the system.

Distributed locations
As the operation of system appliances, which discharge wastewater into the system and hence govern the conditions necessary for air entrainment and pressure transient propagation, are entirely random, it is virtually impossible to predict where the greatest area of risk in the system will be. Given also, that the volume of extra air within the system, as a result of the propagating positive pressure transients, is dependent upon airflow rate, blockage closure time, and the system pipe period; all of which will change, then to accommodate these uncertainties, PPRDs should be distributed strategically throughout the height of the stack

Number of Devices

The number of devices installed in a system depends on the height of the building and the risk of air pressure transients being generated. This can be determined, in the main, using the building, and in particularly the intensity of usage.

For example, a stadium design, Recommended installation of PPRDs due to the expected surges from sanitary appliances at peak usage times.

PPRDs Design Table for 4” and 6” (100mmDN/150mm DN) drainage stacks

3-10 floors	One unit on the base
11-15 floors	One unit on the base, one halfway
16-25 Floors	One unit on the base, one unit on floor 5, one Halfway between the remaining floors above floor 5
26+ floors	Two units in series on the base, then one unit on every 5th floor to the 25th floor, then one every 10th floor thereafter
Offsets	ne unit must be installed above offsets of less than 10 floors Two units must be installed above offsets more than of 20 floors

Bibliography: Swaffield, J.A. (2006). “Sealed building drainage and vent systems – an application of active air pressure transient control and suppression”, Building and Environment, 41, 1435-1446.

Swaffield, J.A. (2010). Transient airflow in building drainage systems. Spon Press, Oxon, UK.

Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005a). "Pressure transient control: Part I - criteria for transient analysis and control." Building Services Engineering Research and Technology, 26(2), 99-114.

Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005b). "Pressure transient control: Part II - simulation and design of a positive surge protection device for building drainage networks." Building Services Engineering Research and Technology, 26(3), 195-212

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 577

P130-24

IPC: 908.1, ASSE Chapter 15 (New)

Proposed Change as Submitted

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com)

2024 International Plumbing Code

Revise as follows:

908.1 Where required. Soil and waste *stacks* in buildings having more than 10 *branch intervals* shall be provided with a relief vent at each tenth interval installed, beginning with the top floor.When a single stack drainage system is installed utilizing a combination of air admittance valves and positive pressure reduction devices (PPRDs), a PPRD shall be permitted to serve as a relief vent for the stack when the PPRDs are located no greater than six (6) branch intervals apart, and installed in accordance with the manufacturer's instructions.

Add new standard(s) as follows:

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448

1030-2016 Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems

Reason: The current code language does not address relief vents for single stack drainage systems. Positive pressure reduction devices conforming to ASSE 1030 installed in accordance with the manufacturer's instructions provide relief from positive pressure transients in waste stacks.

Bibliography: ASSE 1030 standard for Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems
Studor Engineered Products Manual - 10th Edition

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

The cost of a single stack pipe system is less than that of an equivalent conventional two-stack pipe system.

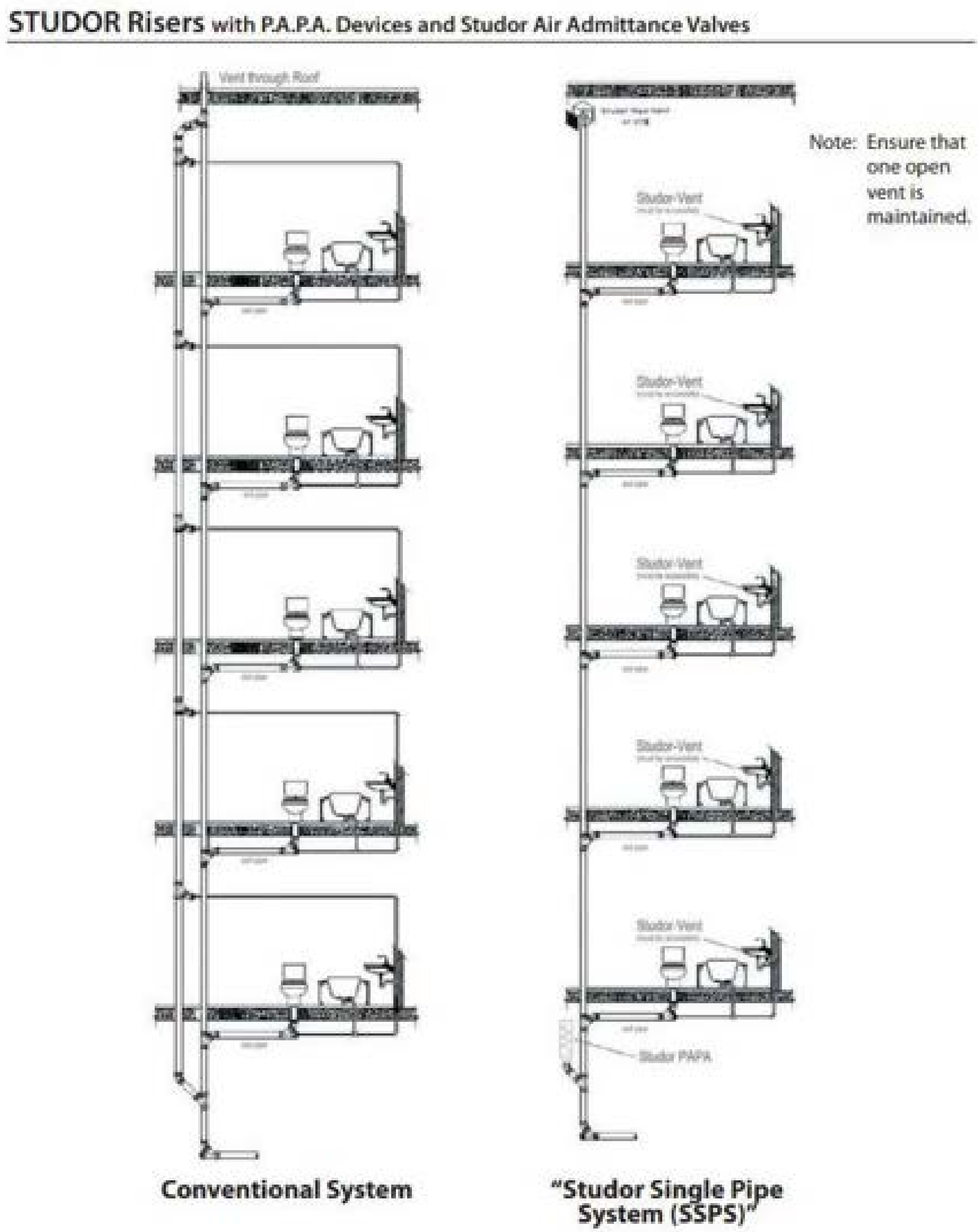
Estimated Immediate Cost Impact Justification (methodology and variables):

See Cost Impact Calculations

The cost of a single stack pipe system is less than that of an equivalent conventional two-stack pipe system.

Single Stack Costs	Units per Floor	Cost	Ext. Cost	Notes
Positive Pressure Reduction Device – one every 6 floors, per stack	0.167	$1,100.00	$ 183.70	
Stack-Type AAV – one per stack*	0.04	$ 95.00	$ 3.80	*calculation based upon 25 story example below
Branch-Type AAV – one per floor, per stack	1	$ 50.00	$ 50.00	
2" elbow coupling – one per floor, per stack	1	$ 20.00	$ 20.00	
2" hubless connectors – $8 (qty 2) = $16 per floor, per stack	2	$ 8.00	$ 16.00	
Labor – $95/hr x 10 hours (six floors, one stack)	0.167	$ 950.00	$ 158.65	
Total Cost per Floor, per stack for Single Stack System:			$ 432.15	
Conventional Two-Stack Costs:	**Units per Floor**	**Cost**	**Ext. Cost**	**Notes**
4" CI pipe (10 ft) – one per floor, per stack	1	$ 227.00	$ 227.00	
4" x 2" CI sanitary tee – one per floor, per stack	1	$ 39.00	$ 39.00	
4" hubless connector – two per floor, per stack	2	$ 18.00	$ 36.00	
2" hubless connector – five per floor, per stack	5	$ 8.00	$ 40.00	
2" CI pipe (10 ft) – three per floor, per stack	3	$ 103.00	$ 309.00	
2" Clevis hangers – four per floor, per stack	4	$ 24.00	$ 96.00	
2' All thread rod – four per floor, per stack	4	$ 3.00	$ 12.00	
2" Attachment device – four per floor, per stack	4	$ 14.00	$ 56.00	
4" Riser clamp – one per floor, per stack	1	$ 12.00	$ 12.00	
4" Fire stopping – one per hole/floor, per stack	1	$ 18.00	$ 18.00	
Labor – $95/hr x 72 hours (six floors, one stack)	0.167	$6,840.00	$1,142.28	
Labor – $28 to core each 6" ID hole in 4" slab - one per floor, per stack	1	$ 28.00	$ 28.00	
Total Cost per Floor for Conventional Two- Stack System:			$2,015.28	
Total Cost Savings per Floor, per Stack:			$1,583.13	

For example, in a 25-story condominium building with 24 waste stacks, the cost savings would be:
$1,583.13 cost x 25 stories = $39,578.25 per stack.
$39,578.25 cost per stack x 24 stacks in the building = $949,878.00 total savings.



Staff Analysis: A review of the standard proposed for inclusion in the code, ASSE 1030-2016 *Performance Requirements for Positive Pressure Reduction Devices for Sanitary Drainage Systems,* with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P130-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The language doesn't require that the device needs to comply with the standard proposed. (13-0)

P130-24

Individual Consideration Agenda

Comment 1:

IPC: 908.1

Proponents: Ken Smithart Jr, IPS Corporation, Studor (ken.smithart@ipscorp.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

908.1 Where required. Soil and waste *stacks* in buildings having more than 10 *branch intervals* shall be provided with a relief vent at each tenth interval installed, beginning with the top floor.When a single stack drainage system is installed utilizing a combination of air admittance valves and positive pressure reduction devices (PPRDs), a PPRD <u>conforming to ASSE 1030</u> shall be permitted to serve as a relief vent for the stack when the PPRDs are located no greater than six (6) branch intervals apart, and installed in accordance with the manufacturer's instructions.

Reason: Initial proposal failed to reference the pertinent ASSE standard.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

See original proposal for cost impact.

Estimated Immediate Cost Impact Justification (methodology and variables):

See original proposal for cost impact justification.

Comment (CAH2)# 783

Comment 2:

Proponents: steven white, Aliaxis, Aliaxis (swhite@aliaxis.com) requests As Submitted

Reason: The active drainage single stack system has an equal to better performance, as a secondary vent system, this system has been fully researched and tested, and installed in high-rise buildings around the world since 2003, it is part of the Australian plumbing code the AS3500-2 standard since the early 2000's. The system has been fully researched and reviewed, and I recommend reading the "Swaffield, J.A. (2010). Transient airflow in building drainage systems. Spon Press, Oxon, UK" to understand the fluid mechanics of DWV systems for taller buildings. The following could be used for understanding to support the current wording changes or an addition to the section 917 (single stack)

Causes and behaviour of air pressure transients in building drainage systems: Air pressure transients generated within the building drainage system obey the same mechanisms that govern transient generation and propagation in any fluid carrying system. In general terms, pressure transients are generated as a consequence of changes to the flow conditions at some point within the system and are the means by which such changes are
communicated throughout the system (Swaffield, 2010). The Joukowsky expression provides the fundamental relationship between pressure rise, wave speed, fluid density and flow velocity:

$\Delta p = -pc\Delta V$

where Δp is pressure change, p is the fluid density, c is the wave speed and ΔV is flow velocity change. The significance of the negative sign means that pressure increases with a decrease of velocity, and vice versa.

Within the building drainage system, air pressure transients are generated due to changes in the entrained airflow as a consequence of changes to the annular water downflow initiated by the random discharge of system appliances. Increasing annular downflow generates an enhanced entrained airflow which reduces the system pressure. Slowing-down or stopping the airflow, due to some blockage of the passage of air caused by the formation of a water curtain by either wastewater flowing from a branch into the stack or by the change of flow direction at an offset or the stack base, generates positive air transients (Swaffield et al., 2004). Pressure fluctuations from external events, such as surcharging of the main sewer, can also generate transients within the system. These low-amplitude air
pressure transients, whose magnitude are dependent upon the rate of change of system conditions,
are transmitted and or reflected at all boundaries within the system including open terminations, connections to the sewer, appliance trap seals, and pipe junctions. An openended pipe, such an open stack termination, has a reflection coefficient of -1, while a
closedended pipe, such as an appliance trap seal, has a reflection coefficient of +1. Changes in the system characteristics, such as a change in diameter or the inclusion of a pipe junction, will
alter the transmitted wave and induce a reflection.

What portion of the transient is reflected and transmitted, is dictated by both the pipe material (which affects wave speed) and pipe diameter. The time taken for a transient to travel to a reflecting boundary and return to its source is known as the pipe period and is given by the expression: pipe period=2L/c

where L is the pipe length and c is the wave speed. For most stack to branch situations this relates the division of a pressure transient to the ratio of pipe cross sectional areas, however when a positive pressure reduction devices (PPRDs) is included in the design
the division is much greater since the positive pressure reduction devices (PPRDs) also operates on the wave speed (c in equation 2-4 above). This is means that in a fully vented system using traditional pipe junctions a parallel vent pipe of at least 200 mm and a length of 100 m would be required to achieve the same reduction in positive air pressure transient. Consequences of air pressure transients in building drainage systems:

While the air pressure transients generated within the building drainage system are of low amplitude, they are, however, responsible for compromising system integrity and enabling cross-contamination of habitable space through the destruction of water trap seals. Negative air pressure transients are capable of depleting the water trap seal by either induced or self-siphonage by creating a suction pressure within the pipe adjacent to the trap. Positive air pressure transients are capable of displacing the water trap seal upwards towards the appliance which will either force air through the water seal into the appliance, or if of sufficient magnitude, cause the water seal to be completely displaced into the appliance, leaving the trap wither wholly or partially depleted. A depleted trap seal permits airflow both into and out of the drainage system, thus allowing foul air to exit the system and enter habitable space.

Control and suppression of air pressure transients Air pressure transients are an unwanted consequence of normal system operation and, although unavoidable, it is possible to protect water trap seal integrity through the correct alleviation of any pressure fluctuations. Traditionally, this has been approached through passive solutions which rely on the provision of cross connections and vertical stacks vented to atmosphere. However, this approach, while both proven and traditional, has inherent limitations (Swaffield, 2006). The key to maintaining a balance of pressure within the building drainage system is to provide pressure relief as close to the source as possible; long pipe runs and remote vent terminations lead to delays in the arrival of relieving reflections and therefore compromise system integrity. More recently, active solutions to the control and suppression of air pressure transients have been developed providing necessary localised relief.

Negative air pressure transients, which communicate the need for more air and represents a suction force, can be alleviated by air admittance valves (AAVs) which, responding directly to the local pressure conditions, opens as the pressure falls to allow inward relief airflow, hence limiting the pressure excursions experienced by the water trap seal. To avoid compromising system integrity by allowing foul sewer gases to enter the building, the AAV is designed with a fail-safe mechanism which ensures that it remains closed when not in use or when the local pressure exceeds atmospheric. AAVs can be installed locally to the water trap seal or at the stack termination to avoid the need for a roof penetration

Positive air pressure transients, which communicate the need to reduce the airflow and represents a pushing force, can be alleviated by variable volume containment attenuators (positive pressure reduction devices (PPRDs)) which absorb the airflow driven by positive air pressure transients. The positive pressure reduction devices (PPRDs), consisting of a variable volume bag that expands under the influence of a positive pressure transient, is capable of reducing the magnitude of a positive air pressure transient by up to 90% (Swaffield et al., 2005a, 2005b) by providing an alternative route which diverts and attenuates the system airflows gradually due to the significantly reduced wave speed within the positive pressure reduction devices (PPRDs). due to the properties of its elastic pipe construction. Designed as a collapsible reservoir, the variable volume bag provides an additional volume unseen by the system when the pressure regime at that point is sub-atmospheric, which absorbs the extra air induced by the positive air pressure transient.

Each positive pressure reduction devices (PPRDs) must meet the testing requirements of ASSE 1030

Base of stack.

The base of the stack is the most likely place for a blockage in the airflow to occur. As the distance between the base of the stack and the top stack termination is the maximum distance possible within the system, then a blockage at this location will lead to the greatest possible pressure rise. It is therefore recommended to use two PPRDs in series at the base of the stack. The devices should be located below the first branch connected to the stack. Note that is it still recommend that branches in the lower part of the stack be connected directly to the horizontal drainage and not to the main stack.
Offsets within the vertical stack, which in the past were wrongfully thought to “slow down” the water flow in tall buildings, can also be the cause of significant positive pressure
transients as they forcibly change the flow direction. It is recommended to use PPRDs above the offset.

Top of stack
It is optional to have a PPRDs located immediately below the top of the stack above the highest branch in the building. It should be noted that this point does not need to be at the top of the building, but merely above the last branch. The system can be terminated with an AAV to provide ventilation, and a PPRDs to assist in attenuating any positive transients in the system.

Distributed locations
As the operation of system appliances, which discharge wastewater into the system and hence govern the conditions necessary for air entrainment and pressure transient propagation, are entirely random, it is virtually impossible to predict where the greatest area of risk in the system will be. Given also, that the volume of extra air within the system, as a result of the propagating positive pressure transients, is dependent upon airflow rate, blockage closure time, and the system pipe period; all of which will change, then to accommodate these uncertainties, PPRDs should be distributed strategically throughout the height of the stack

Number of Devices
The number of devices installed in a system depends on the height of the building and the risk of air pressure transients being generated. This can be determined, in the main, using the building, and in particularly the intensity of usage.

For example, a stadium design, Recommended installation of PPRDs due to the expected surges from sanitary appliances at peak usage times.

PPRDs Design Table for 4” and 6” (100mmDN/150mm DN) drainage stacks

3-10 floors	One unit on the base
11-15 floors	One unit on the base, one halfway
16-25 Floors	One unit on the base, one unit on floor 5, one Halfway between the remaining floors above floor 5
26+ floors	Two units in series on the base, then one unit on every 5th floor to the 25th floor, then one every 10th floor thereafter
Offsets	ne unit must be installed above offsets of less than 10 floors Two units must be installed above offsets more than of 20 floors

Bibliography: Swaffield, J.A. (2006). “Sealed building drainage and vent systems – an application of active air pressure transient control and suppression”, Building and Environment, 41, 1435-1446.

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Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005a). "Pressure transient control: Part I - criteria for transient analysis and control." Building Services Engineering Research and Technology, 26(2), 99-114.

Swaffield, J.A, Campbell, D.P. and Gormley, M. (2005b). "Pressure transient control: Part II - simulation and design of a positive surge protection device for building drainage networks." Building Services Engineering Research and Technology, 26(3), 195-212

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Comment (CAH2)# 579

P150-24

IPC: 1102.4 (New)

Proposed Change as Submitted

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com)

2024 International Plumbing Code

Add new text as follows:

1102.5 Relining Storm Drainage. The relining and rehabilitation of storm drainage systems using cured-in-place pipe (CIPP) shall be in accordance with ASTM F2599.

Reason: Storm drainage is certainly a candidate for rehabilitation by CIPP and it should be added to Chapter 11.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The cost allowance is already recognized by fact that the standard is already referenced in the code and technology is currently being used in drainage systems.

Staff Analysis: The proposed standard is in the current edition of the code.

P150-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: There are other means for rehabilitating storm sewers. The method is already in Chapter 7. (13-1)

P150-24

Individual Consideration Agenda

Comment 1:

Proponents: Sidney Lee Cavanaugh, Cavanaugh Consulting, WRT (sidneycavanaugh@yahoo.com) requests As Submitted

Reason: While there are other ways to rehabilitate storm drains ASTM F2599 is the appropriate standard for CIPP rehabilitation of storm drains and is already a recognized standard by the code in Chapter 7.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

P152-24

IPC: 1106.2, 1106.2.1, TABLE 1106.2, 1106.2.2 (New), 1106.2.3 (New), TABLE 1106.2.3 (New), TABLE 1106.2.3(1) (New), TABLE 1106.2.3(2) (New), TABLE 1106.2.3(3) (New), 1106.2.4 (New), TABLE 1106.2.4 (New)

Proposed Change as Submitted

Proponents: Christopher Winnie PE CPD, SmithGroup, self (chris.winnie@smithgroup.com)

2024 International Plumbing Code

Revise as follows:

1106.2 Size of storm drain piping. ~~Vertical and horizontal *storm drain* piping shall be sized based on the flow rate through the roof drain. The flow rate, as calculated in accordance with Section 1106.2.1, shall be checked against the roof drain manufacturer's published flow rate for the specific roof drain model and size to verify that the selected roof drain will handle the anticipated flow. The flow rate in *storm drain* piping shall not exceed that specified in Table 1106.2.~~ The size of storm drain piping shall be in accordance with Sections 1106.2.1 through 1106.2.4.

1106.2.1 ~~**Rainfall rate conversion method**~~ **Maximum storm water demand.** ~~The rainfall rate falling on a roof surface shall be converted to a gallon per minute (L/m) flow rate in accordance with Equation 11-1.~~

$$GPM = R \times A \times 0.0104$$

~~where: *R* = Rainfall intensity in inches (mm) per hour. *A* = Roof area in square feet (m^2).~~ ~~**(Equation 11-1)**~~

The volumetric flow rate of storm drainage shall be the sum of the connected roof drain(s). The total connected load shall be used as the basis for pipe sizing, assuming all roof drains are at full capacity simultaneously.

Delete without substitution:

~~TABLE 1106.2 STORM DRAIN PIPE SIZING~~

~~PIPE SIZE (inches)~~	~~VERTICAL DRAIN~~	~~CAPACITY (gpm)~~ ~~SLOPE OF HORIZONTAL DRAIN~~			
		~~$^1/_{16}$ inch per foot~~	~~$^1/_8$ inch per foot~~	~~$^1/_4$ inch per foot~~	~~$^1/_2$ inch per foot~~
~~2~~	~~34~~	~~15~~	~~22~~	~~31~~	~~44~~
~~3~~	~~87~~	~~39~~	~~55~~	~~79~~	~~111~~
~~4~~	~~180~~	~~81~~	~~115~~	~~163~~	~~231~~
~~5~~	~~311~~	~~117~~	~~165~~	~~234~~	~~331~~
~~6~~	~~538~~	~~243~~	~~344~~	~~487~~	~~689~~
~~8~~	~~1,117~~	~~505~~	~~714~~	~~1,010~~	~~1,429~~
~~10~~	~~2,050~~	~~927~~	~~1,311~~	~~1,855~~	~~2,623~~
~~12~~	~~3,272~~	~~1,480~~	~~2,093~~	~~2,960~~	~~4,187~~
~~15~~	~~5,543~~	~~2,508~~	~~3,546~~	~~5,016~~	~~7,093~~

~~For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.~~

Add new text as follows:

1106.2.2 Sizing. Storm drain pipe sizing shall be sized in accordance with one of the following:

1. Pipe sizing tables or equations in accordance with Section 1106.2.3 and 1106.2.4
2. The sizing tables included in a listed piping system's manufacturer's installation instructions
3. Engineering methods.

1106.2.3 Sizing tables and equations. This section applies to horizontal drainage systems using building gravity. Where the drainage system material is known, Tables 1106.2.3(1), 1106.2.3(2) and 1106.2.3(3) shall be used to size drainage piping.
Where Equation 11-1 is used to determine the expected flow rate seen at a roof drain, or building drain.

Where Equations 11-2, 11-3 and 11-4 are used to size drainage piping based on the drainage pipe material used.

1. The rainfall rate falling on a roof surface shall be converted to a gallon per minute (L/m) flow rate in accordance with Equation 11-1, The Rational Method. $Q = C \times R \times A \times 0.0104$ (Equation 11-1)
   Where: C = Discharge Coefficient, *the roughness of the roof's surface.* Use 1.0 unless permitted by the local authority to factor in roof roughness for primary storm drainage. Secondary drainage shall use 1.0 in all cases.
   Q = Flow rate in gallons per minute (L/m)
   R= Rainfall intensity in inches (mm) per hour.
   A = Projected roof area in square feet (m^2)
2. The flow rates for horizontal sloped drains shall be calculated by use of the Flow Rate Equation and the Manning Equation based on full flow for pipe diameters of a given material, or coefficient of roughness.

   The Flow Rate Equation, Equation 11-2
   $Q = A \times V$ (Equation 11-2)

   Where: Q = Flow rate in gallons per minute (L/m)
   A = Cross-sectional area of the full flow

   V = Velocity of flow, feet per second (L/s)

   The Manning Equation, Equation 11-3
   $V = (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-3)
   Where: V = Velocity of flow, feet per second (m/s)

   k = unit conversion factor, 1.486 in English units

   n = roughness (Manning) coefficient

   R = hydraulic radius of pipe, ft (m); for full flow pipe, use radius of the pipe

   S = slope of pressure gradient

   The modified Flow Rate Equation, Equation 11-4
   $Q = A \times (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-4)

TABLE 1106.2.3 ROUGHNESS COEFFICIENT, n, FOR USE IN EQUATION 11-4

Surface Material	Manning's Roughness Coefficient, n
Cast iron, new	0.012
Cast iron, aged	0.0151
Concrete pipe	0.013
Copper	0.011

PVC	0.010
Vitrified Clay	0.014

TABLE 1106.2.3(1) PVC PIPE

PIPE SIZE (inches)	CAPACITY (gpm)			
	SLOPE OF HORIZONTAL DRAIN			
	1/16 inch per ft	1/8 inch per ft	1/4 inch per ft	1/2 inch per ft
2	12	17	25	35
3	37	50	74	105
4	80	110	160	225
5	145	205	290	410
6	235	330	470	665
8	505	715	1,015	1,435
10	920	1,300	1,845	2,605
12	1,500	2,120	3,000	4,240
15	2,720	3,845	5,440	7,690

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m

TABLE 1106.2.3(2) CAST IRON PIPE, AGED

PIPE SIZE (inches)	CAPACITY (gpm)			
	SLOPE OF HORIZONTAL DRAIN			
	1/16 inch per ft	1/8 inch per ft	1/4 inch per ft	1/2 inch per ft
2	8	11	15	23
3	24	35	49	69
4	53	75	105	150
5	95	135	190	270
6	155	220	310	440
8	335	475	670	950
10	610	860	1,220	1,725
12	990	1,405	1,985	2,810
15	1,800	2,545	3,600	5,095

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m

TABLE 1106.2.3(3) CAST IRON PIPE, NEW

PIPE SIZE (inches)	CAPACITY (gpm)			
	SLOPE OF HORIZONTAL DRAIN			
	1/16 inch per ft	1/8 inch per ft	1/4 inch per ft	1/2 inch per ft
2	10	14	21	29
3	30	40	60	85
4	65	90	130	185
5	120	170	240	340
6	195	275	390	555
8	420	600	845	1,200
10	765	1,085	1,535	2,170
12	1,250	1,765	2,500	3,535
15	2,265	3,205	4,530	6,410

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m

1106.2.4 Vertical sizing table. Vertical storm drain piping shall be sized for the expected flow rate through the roof drain(s). The flow rate, as calculated in accordance with Section 1106.2.2, shall be checked against the roof drain manufacturer's published flow rate for the specific roof drain model and size to verify that the selected roof drain will handle the anticipated flow. The storm drain piping shall not exceed that specified in Table 1106.2.4.

TABLE 1106.2.4 Vertical sizing table

PIPE SIZE (inches)	CAPACITY (gpm)
2	34
3	87
4	180
5	310
6	535
8	1,115
10	2,050
12	3,270
15	5,540

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m

Reason: If a building using cast iron storm drain pipe built from the model 2015, 2018, 2021 or 2024 codes were to have roof issues in the future; there is risk to the ICC because of faulty information in sizing storm drains. This proposal aims to fix that so engineers can follow a more complete model code.

As engineers, we have an ethical contract to not impose a hazard onto the occupants of the buildings we design. In its current form, the storm piping code imposes a hazard onto the occupants of the buildings we design. If we follow the current storm drain sizing criteria in 1106 and cast iron pipe is used, then the pipes would undersized between 20-50%, pending the size and slope of the installed pipe. Undersizing roof drain pipes increasing the possibility of the primary drains being overloaded and water ponding on the roof greater than the assumptions made by the structural engineer. The printed Tables in the 2015, 2018, 2021 and 2024 codes are assuming PVC pipe. The printed Tables in the IPC 2012 and earlier editions assumed aged cast iron. We must change this code immediately for the safety of the public and for the engineer's awareness in sizing pipes for a proper working system. This proposed change is a large overhaul from prior storm drainage sections, a code and commentary could be provided, but I didn't submit the context for that here. The layout and wording used was mimicked from the International Fuel Gas Code for gas pipe sizing (section 402), with obvious differences, so that the ICC reads similarly.

Use of roughness coefficients for tall/thick green roofs is viable, which is why mention of the complete Rational Method is shared. It would be fantastic if plumbing engineers use the same formulas as our Civil friends. It is true, storm piping within a building would have gravitational influence to drain faster if there is ponding at the roof drain, but this level of complexity does not appear warranted.

The manipulation of units can be seen/tested in the excels attached. PDFs are also included. I trusted the Manning's Roughness Coefficients from engineering toolbox, and have included them as a reference. The aged cast iron value for "n" was reverse engineered from the legacy storm tables. See documents "Manning Formula_proving code is based on Manning.pdf" and "Storm Rationale Method_04-Storm Drainage Calc.pdf" to see how accurate use of Manning Equation is to the legacy storm tables, so 0.0152 was proposed for the 2027 code to give homage to all storm tables of the last 20 years. PDFs and excel justifying the proposed tables are attached to answer questions about how the numbers were generated, and the excel can be used to see how the proposed Equations can be used should a less common pipe material be used.

Bibliography: For pipe roughness coefficients:

https://www.engineeringtoolbox.com/mannings-roughness-d_799.html

The layout and wording used was mimicked from the International Fuel Gas Code for gas pipe sizing (section 402), with obvious differences

The Rational Method and Manning Equation were sourced from my college fluid dynamics book. But they are readily available formulae that need not be sourced, right? I can provide more information as needed.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$20 / foot of storm pipe.

Estimated Immediate Cost Impact Justification (methodology and variables):

The potential cost increase would only be for cast iron (metal) pipe. The current code edition reflects pipe sizes for PVC/plastic pipe, and those values in the charts remain the same.

The cost was calculated on a cost per linear foot of pipe basis.

I found list prices from a leading cast iron foundry showing costs for 10-foot sections of no hub cast iron pipes. Note that from the reasoning section, PVC pipes can carry ~20% more water when compared to the same size cast iron pipes because of a smoother interior. Here are the costs for convenience on how the number above was guesstimated:

- 2" x 10' pipe --> $174

- 3" x 10' --> $240

- 4" x 10' --> $312

- 5" x 10' --> $449

- 6" x 10' --> $536

- 8" x 10' --> $834

- 10" x 10' --> $1,417

- 12" x 10' --> $2,059

- 15" x 10' --> $3,010

Note that the proposed code change will not require a certain material to be used, but with the differentiation of sizes between PVC and cast iron, more engineers may opt to use PVC pipe as a cost savings measure. To which, this cost impact analysis would be useless as pipe material change adds a certain degree of complexity. If the engineer uses PVC in all storm drain systems, then there would not be a cost impact.

Estimated Life Cycle Cost Impact:

no change

Attached Files

- **Storm Rationale Method_04-Storm Drainage Calc.xls**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4371/
- **Storm Rationale Method_04-Storm Drainage Calc.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4370/
- **Manning's Roughness Coefficients.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4369/
- **Manning Formula_proving code is based on Manning.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4368/
- **Manning Formula_pipe flow_PVC.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4366/
- **Manning Formula_pipe flow_new cast iron.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4365/
- **Manning Formula_pipe flow_aged cast iron.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4364/
- **Manning Formula_pipe flow and velocities.xlsx**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4363/
- **Manning Formula_pipe flow_coversheet.pdf**
  https://www.cdpaccess.com/proposal/10328/30804/files/download/4362/

P152-24

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: The language is unenforceable and is more prescriptive that what is required. (14-0)

P152-24

Individual Consideration Agenda

Comment 1:

IPC: 1106.2, 1106.2.1, 1106.2.2, 1106.2.3, 1106.2.3.1 (New), 1106.2.3.2 (New), 1106.2.4

Proponents: Emily Lorenz, self (emilyblorenz@gmail.com); Christopher Winnie, self (chris.winnie@smithgroup.com) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

1106.2 Size of storm drain piping. ~~The size of~~ Vertical and horizontal storm drain piping shall be sized in accordance with Sections 1106.2.1 through 1106.2.4, and shall be checked against the roof drain manufacturer's published flow rate for the specific roof drain model and size to verify that the selected roof drain will handle the anticipated flow. The horizontal sloped drains and vertical storm drain piping shall be sized to accommodate the volumetric flow rate of storm drainage, assuming all roof drains are at full capacity simultaneously.

1106.2.1 Maximum storm water demand. The rainfall rate falling on a roof surface shall be converted to a gallon per minute (L/m) volumetric flow rate (Q) in accordance with Equation 11-1.
Q = C x R x A x 0.0104 (Equation 11-1)
Where: C = Discharge Coefficient, the roughness of the roof's surface.

Q = Flow rate in gallons per minute (L/m)

R = Rainfall intensity in inches (mm) per hour.

A = Projected roof area in square feet (m)

The volumetric flow rate of storm drainage shall be the sum of the connected roof drain(s). The total connected load shall be used as the basis for pipe sizing, assuming all roof drains are at full capacity simultaneously.

1106.2.2 Sizing. Storm drain pipe sizing shall be sized in accordance with one of the following:

1. Horizontal p ~~P~~ipe sizing tables or equations in accordance with Section 1106.2.3 and vertical pipe sizing table in accordance with Section 1106.2.4
2. The sizing tables included in a listed piping system's manufacturer's installation instructions
3. Engineering methods.

1106.2.3 Horizontal s~~S~~izing tables and equations. This section applies to horizontal drainage systems using building gravity. Pipes for horizontal drainage systems shall be sized in accordance with Section 1106.2.3.1 or Section 1106.2.3.2. ~~Where the drainage system material is known, Tables 1106.2.3(1), 1106.2.3(2) and 1106.2.3(3) shall be used to size drainage piping.~~
~~Where Equation 11-1 is used to determine the expected flow rate seen at a roof drain, or building drain.~~

~~Where Equations 11-2, 11-3 and 11-4 are used to size drainage piping based on the drainage pipe material used.~~

1. ~~The rainfall rate falling on a roof surface shall be converted to a gallon per minute (L/m) flow rate in accordance with Equation 11-1, The Rational Method.Q = C x R x A x 0.0104 (Equation 11-1)~~

   ~~Where: C = Discharge Coefficient, *the roughness of the roof's surface.* Use 1.0 unless permitted by the local authority to factor in roof roughness for primary storm drainage. Secondary drainage shall use 1.0 in all cases.~~

   ~~Q = Flow rate in gallons per minute (L/m)~~

   ~~R= Rainfall intensity in inches (mm) per hour.~~

   ~~A = Projected roof area in square feet (m^2)~~

2. ~~The flow rates for horizontal sloped drains shall be calculated by use of the Flow Rate Equation and the Manning Equation based on full flow for pipe diameters of a given material, or coefficient of roughness.~~

   ~~The Flow Rate Equation, Equation 11-2~~

   ~~Q = A x V (Equation 11-2)~~

   ~~Where: Q = Flow rate in gallons per minute (L/m)~~

   ~~A = Cross-sectional area of the full flow~~

   ~~V = Velocity of flow, feet per second (L/s)~~

   ~~The Manning Equation, Equation 11-3~~

   ~~$V = (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-3)~~

   ~~Where: V = Velocity of flow, feet per second (m/s)~~

   ~~k = unit conversion factor, 1.486 in English units~~

   ~~n = roughness (Manning) coefficient~~

   ~~R = hydraulic radius of pipe, ft (m); for full flow pipe, use radius of the pipe~~

   ~~S = slope of pressure gradient~~

   ~~The modified Flow Rate Equation, Equation 11-4~~

   ~~$Q = A \times (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-4)~~

Add new text as follows:

1106.2.3.1 Horizontal sizing tables. Tables 1106.2.3(1), 1106.2.3(2) and 1106.2.3(3) shall be used to size horizontal drainage piping for the appropriate drainage pipe material.

1106.2.3.2 Horizontal sizing equations. Horizontal drainage piping shall be sized based on Equations 11-2, 11-3, and 11-4 and the drainage pipe material used.

The flow rates for horizontal sloped drains shall be calculated by use of the Flow Rate Equation and the Manning Equation based on full flow for pipe diameters of a given material, or coefficient of roughness.

The Flow Rate Equation, Equation 11-2

$Q = A \times V$ (Equation 11-2)

Where: Q = Flow rate in gallons per minute (L/m)

A = Cross-sectional area of the full flow

V = Velocity of flow, feet per second (L/s)

The Manning Equation, Equation 11-3

$V = (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-3)

Where: V = Velocity of flow, feet per second (m/s)

k = unit conversion factor, 1.486 in English units

n = roughness (Manning) coefficient

R = hydraulic radius of pipe, ft (m); for full flow pipe, use radius of the pipe

S = slope of pressure gradient

The modified Flow Rate Equation, Equation 11-4

$Q = A \times (k/n) \times R^{2/3} \times S^{1/2}$ (Equation 11-4)

Revise as follows:

1106.2.4 Vertical sizing table. Vertical storm drain piping shall be sized for the expected volumetric flow rate through the roof drain(s). The volumetric flow rate, as calculated in accordance with Section 1106.2.21, shall be checked against the roof drain manufacturer's published flow rate for the specific roof drain model and size to verify that the selected roof drain will handle the anticipated flow. The storm drain piping shall not exceed that specified in Table 1106.2.4.

Reason: Many of the changes proposed revert language in the original charging language to what is currently in the IPC. No changes were made to the tables in the original proposal, so those tables are not included within this code change. In response to the Committee’s Reason for disapproval based on “language is unenforceable and is more prescriptive than what is required”

The proposed changes mirror those in the current edition of International Fuel Gas Code (IFGC) for sizing of natural gas and propane systems. The IFGC has used the same prescriptive formulas for multiple code cycles. For these reasons, we feel that the language is enforceable. However, I am open to specific modifications that the committee feels would improve the language. The provided Tables for PVC and new cast iron are included so engineers and inspectors can more quickly confirm appropriate pipe sizes, similar to how the IFGC is enforced.

It is important that the engineers, designers and other entities referring to the code have the most accurate data available. Friction plays a pivotal role in the flow/movement of mass including fluids, gasses, electric current or physical items. The formulas calculating the flow/movement of mass use pressure drop, voltage or force as a variable to define the amount of friction opposing the movement of the mass. There is no mass moving on Earth that is able to avoid friction losses. It is known that plastic pipes have a smoother interior than metallic pipes. There are known friction coefficients that we can use to calculate the impact of friction on the flow of storm water within a pipe. Not all Storm Drain systems use plastic (PVC/ABS) and not all systems use cast iron, so it would be of most use to the industry if the Tables in Chapter 11 for Storm Drain Pipe Sizing included sizing criteria for both plastic and metallic piping.

In the most recent edition of International Plumbing Code (2024), Table 1106.2 Storm Drain Pipe Sizing is the only table listed to size drain pipes within and below a building. IPC does not currently alter sizing criteria for the pipes based on friction. This code change assists the user in correcting pipe sizes for friction.

In referencing the "Manning Formula, proving code is based on Manning.pdf" in the original code-change proposal, we see the IPC (2015-2024) flow rates for horizontal storm piping highlighted in forest green. The Manning equation calculated flow rate for the same size horizontal storm pipes are highlighted in a lighter green. A simple comparison between the flow rates defined in code and my own calculated flow rates (assuming 0.010 for pipe friction; PVC) is highlighted in a light red color. It can be seen the accuracy between the code and my own calculations are more than 95% accurate. Use of different friction coefficients can be used to determine the appropriate maximum flow rate that a pipe of (any) size and (any) material can carry.

In May of 2024, a peer reviewed white paper, IAPMO/ASPE WHITE PAPER 2-2024 'Capacities of Stacks and Horizontal Drains in Storm Drainage Systems', was released. The paper demonstrates a strong correlation between pipe material and draining flow rates. The adjusted equations in this code-change proposal agree with those presented in the peer-reviewed IAPMO/ASPE white paper.

In 2025, ASPE will open a task group to amend conflicts with the current ASPE Tables on storm drain pipe sizes and the conclusions found in the referenced white paper and the findings shared in this proposal.

Bibliography: See references in original code-change proposal.

In addition, the IAPMO/ASPE White Paper 2-2024, "Capacities of Stacks and Horizontal Drains in Storm Drainage Systems," is available through IAPMO.

Cost Impact: Increase

Estimated Immediate Cost Impact:

See original code-change proposal.

Estimated Immediate Cost Impact Justification (methodology and variables):

See original code-change proposal.

Attached Files

- **Manning Formula_pipe flow_coversheet.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8043/
- **Manning Formula_pipe flow and velocities.xlsx**
  https://www.cdpaccess.com/comment/39/32873/files/download/8042/
- **Manning Formula_pipe flow_aged cast iron.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8041/
- **Manning Formula_pipe flow_new cast iron.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8040/
- **Manning Formula_pipe flow_PVC.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8039/
- **Manning Formula_proving code is based on Manning.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8038/
- **Manning's Roughness Coefficients.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8037/
- **Storm Rationale Method_04-Storm Drainage Calc.pdf**
  https://www.cdpaccess.com/comment/39/32873/files/download/8036/

- **Storm Rationale Method_04-Storm Drainage Calc.xls**
  https://www.cdpaccess.com/comment/39/32873/files/download/8035/

Comment (CAH2)# 39

Comment 2:

Proponents: Christopher Winnie, self (chris.winnie@smithgroup.com) requests As Submitted

Reason: In response to the Committee's Reason for disapproval based on "language is unenforceable and is more prescriptive than what is required"

The proposed changes mirror those in the current edition of International Fuel Gas Code (IFGC) for sizing of natural gas and propane systems. The IFGC has used the same prescriptive formulas for multiple code cycles. For these reasons, we feel that the language is enforceable. However, I am open to specific modifications that the committee feels would improve the language. The provided Tables for PVC and new cast iron are included so engineers and inspectors can more quickly confirm appropriate pipe sizes, similar to how the IFGC is enforced.

It is important that the engineers, designers and other entities referring to the code have the most accurate data available. Friction plays a pivotal role in the flow/movement of mass including fluids, gasses, electric current or physical items. The formulas calculating the flow/movement of mass use pressure drop, voltage or force as a variable to define the amount of friction opposing the movement of the mass. There is no mass moving on Earth that is able to avoid friction losses. It is known that plastic pipes have a smoother interior than metallic pipes. There are known friction coefficients that we can use to calculate the impact of friction on the flow of storm water within a pipe. Not all Storm Drain systems use plastic (PVC/ABS) and not all systems use cast iron, so it would be of most use to the industry if the Tables in Chapter 11 for Storm Drain Pipe Sizing included sizing criteria for both plastic and metallic piping.

In the most recent edition of International Plumbing Code (2024), Table 1106.2 Storm Drain Pipe Sizing is the only table listed to size drain pipes within and below a building. IPC does not currently alter sizing criteria for the pipes based on friction. This code change assists the user in correcting pipe sizes for friction.

In referencing the attached "Manning Formula, proving code is based on Manning.pdf", we see the IPC (2015-2024) flow rates for horizontal storm piping highlighted in forest green. The Manning equation calculated flow rate for the same size horizontal storm pipes are highlighted in a lighter green. A simple comparison between the flow rates defined in code and my own calculated flow rates (assuming 0.010 for pipe friction; PVC) is highlighted in a light red color. It can be seen the accuracy between the code and my own calculations are more than 95% accurate. Use of different friction coefficients can be used to determine the appropriate maximum flow rate that a pipe of (any) size and (any) material can carry.

In May of 2024, a peer reviewed white paper, IAPMO/ASPE WHITE PAPER 2-2024 'Capacities of Stacks and Horizontal Drains in Storm Drainage Systems', was released. The paper demonstrates a strong correlation between pipe material and draining flow rates. The adjusted equations in this code-change proposal agree with those presented in the peer-reviewed IAPMO/ASPE white paper.

In 2025, ASPE will open a task group to amend conflicts with the current ASPE Tables on storm drain pipe sizes and the conclusions found in the referenced white paper and the findings shared in this proposal.

BASED ON CHAPTER 1 OF ASPE VOLUME 2 2018-19

PROJECT NAME: Manning Formula
PROJECT NUMBER: xxxxx.xxx

Manning formula --> V = (k/n) * R^2/3 * S^1/2
Flow formula --> Q = A * V

where:
Q = quantity rate of flow; cubic feet per second
A = Cross-sectional area of flow, ft^2
V = velocity of flow, feet per second
R = hydraulic radius of pipe, ft
S = slope of pressure gradient
C = Hazen-Williams coefficient
n = manning coefficient, (varies with pipe roughness)
k = unit conversion factor, 1.486 in english units

2012 IPC (assumed cast iron 0.0151 and 1% slope)

pipe Ø (inches)	Pipe slope (inches per ft)	n	k	Velocity (ft/sec)	Q, flow (gpm)	2012 flowrate (GPM)	% accuracy
3.00	0.125	0.01510	1.486	1.58	34.88	34	97.6%
4.00	0.125	0.01510	1.486	1.92	75.06	75	99.9%
5.00	0.125	0.01510	1.486	2.22	136.08	139	102.1%
6.00	0.125	0.01510	1.486	2.51	221.26	223	100.8%
8.00	0.125	0.01510	1.486	3.04	476.57	479	100.5%
10.00	0.125	0.01510	1.486	3.53	864.08	863	99.9%
12.00	0.125	0.01510	1.486	3.98	1405.10	1388	98.8%
15.00	0.125	0.01510	1.486	4.63	2547.61	2479	97.3%

2021 IPC (assumed PVC 0.010 and 1% slope)

pipe Ø (inches)	Pipe slope (inches per ft)	n	k	Velocity (ft/sec)	Q, flow (gpm)	2015 flowrate (GPM)	% accuracy
3.00	0.125	0.010	1.486	2.39	52.62	55	104.5%
4.00	0.125	0.010	1.486	2.89	113.33	115	101.5%
5.00	0.125	0.010	1.486	3.36	205.40	165	80.3%
6.00	0.125	0.010	1.486	3.79	334.15	344	102.9%
8.00	0.125	0.010	1.486	4.59	719.62	714	99.2%
10.00	0.125	0.010	1.486	5.33	1304.77	1311	100.5%
12.00	0.125	0.010	1.486	6.02	2121.89	2093	98.6%
15.00	0.125	0.010	1.486	6.98	3846.60	3546	92.2%

The accuracy of this comparison between 2012 IPC, 2021 IPC and the use of Manning formula and Rational Method is very accurate. Except for the 5" pipe

Bibliography: Engineers Edge, https://www.engineersedge.com/fluid_flow/piperoughness.htm (October 23, 2023)
The section headers and wording used was mirrored from the *International Fuel Gas Code* as it defined gas pipe sizing (section 402), with obvious differences for the different system

Cole, Daniel P. and Lohr, Christoph. (2024). Capacities of Stacks and Horizontal Drains in Storm Drainage Systems *IAPMO/ASPE* WHITE PAPER 2-2024

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Attached Files

- **Manning Formula_proving code is based on Manning.pdf**
  https://www.cdpaccess.com/comment/461/32880/files/download/8044/

Comment (CAH2)# 461

P157-24 Part I

IPC: SECTION 202, SECTION 202 (New), CHAPTER 13, 1301.1, 1301.2, TABLE 1301.2(1) (New), TABLE 1301.2(2) (New), TABLE 1301.2(3) (New), 1301.2.1, 1301.2.2, 1301.3, 1301.4, 1301.5, 1301.6, 1301.7, 1301.8, 1301.9, 1301.9.1, 1301.9.2, 1301.9.3, 1301.9.3.1, 1301.9.3.2, 1301.9.4, 1301.9.5, 1301.9.6, 1301.9.7, 1301.9.8, 1301.9.9, 1301.9.10, 1301.10, 1301.10.1 (New), 1301.10.2 (New), 1301.10.3 (New), 1301.11, 1301.12, 1301.13 (New), SECTION 1302, 1302.1, 1302.2, 1302.2.1, 1302.4 (New), 1302.3, 1302.4, 1302.4.1, 1302.4.2, 1302.4.3, 1302.4.4, 1302.5, 1302.8 (New), 1302.6, 1302.6.1, 1302.7, 1302.7.1, 1302.7.2, 1302.8, 1302.8.1, 1302.8.2, 1302.9, 1302.10, 1302.11, 1302.11.1, 1302.11.2, 1302.11.3, 1302.12, 1302.12.1, 1302.12.2, 1302.12.3, 1302.12.4, 1302.12.5, 1302.12.6, 1302.14.7 (New), 1302.13, 1302.13.1, 1302.13.2, 1302.13.3, 1302.13.4, DOE (New), (New)

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE PLUMBING CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Plumbing Code

SECTION 202 GENERAL DEFINITIONS

Add new definition as follows:

BLACKWATER. Wastewater that contains urine or fecal matter.

BLACKWATER CONTRIBUTION (BWC). The fraction equal to the quantity of blackwater divided by the sum of the quantities of raw and treated blackwater plus surface water, groundwater, and water from approved potable water systems.

LOG REDUCTION VALUE (LRV). The measure of the ability of a treatment process to remove or inactivate microorganisms such as bacteria, protozoa and viruses. LRV is the logarithm base 10 of the ratio of the levels of a pathogenic organism or other contaminant before and after treatment.

POTABLE REUSE. The practice of treating wastewater and utilizing it for potable applications.

REUSE WATER. Wastewater or rainwater treated to a level of quality suitable for reuse.

WASTEWATER. The water generated after use of freshwater, raw water, drinking water, or saline water in a deliberate application or process.

WATER REUSE SYSTEM. A system for the treatment, storage, distribution, and reuse of water including, but not limited to, wastewater and captured rainwater.

Revise as follows:

CHAPTER 13 ~~NONPOTABLE~~ WATER REUSE SYSTEMS

1301.1 General. The provisions of Chapter 13 shall govern the materials, design, construction and installation of systems for the ~~collection~~ treatment, storage, ~~treatment~~ and distribution of ~~nonpotable~~ reuse water. ~~For nonpotable rainwater systems, the~~ The provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment and distribution ~~of nonpotable water~~. The application of water reuse systems shall comply with all applicable laws, rules, and ordinances of the jurisdiction. ~~The use and application of nonpotable water shall comply with laws, rules and ordinances applicable in the jurisdiction~~.

1301.2 ~~Water~~ Reuse water quality. ~~Nonpotable~~ Reuse water ~~for each end use application~~ quality shall meet the minimum ~~water quality~~ requirements as specified in Tables 1301.2(1), 1301.2(2), 1301.2(3), and as established for the intended application by ~~the~~ all applicable laws, rules and ordinances ~~applicable in~~of the jurisdiction. Where ~~nonpotable~~ water from ~~different~~multiple sources is combined ~~in a system~~, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.

Add new text as follows:

TABLE 1301.2(1) REQUIRED WATER QUALITY FOR REUSE APPLICATIONS

Use Category	Application	Exposure[a]	Quality Tier[b]
Direct Potable Reuse	Direct Potable Reuse	DC	4
Indirect Potable Reuse	Aquifer Recharge - Direct Injection	IC	2
(Treatment Follows Reuse Application)	Aquifer Recharge - Surface Application	IC	2
	Aquifer Storage and Recovery	IC	2
	Rapid Infiltration Basins	IC	2
	Infiltration/Percolation Lagoons	IC	2
	Raw Water Augmentation	IC	2
	Saltwater Intrusion Barrier	IC	2
	Surface Water Augmentation to a Supply Source	IC	2
Irrigation of Food Crops for Human Consumption (Spray/Drip)	Food crop with processing that destroys pathogens (Restricted Access)	LC	1
	Orchards and Vineyards	AC/LC	4/1
	Water contacts edible portion of food crop (Includes Root Crops)	AC	4
	Water doesn't contact edible portion of food crop (Restricted Access)	IC	2
Irrigation of Crops Not for Human Consumption (Spray/Drip)	Christmas Tree Farms	AC/LC	3/1
	Hemp Crops	AC/LC	3/1
	Fiber crops	AC/LC	3/1
	Fodder /Feed Crop/ Forage Crops	AC/LC	3/1
	Ornamental nursery stock	AC/LC	3/1
	Seed Crops	AC/LC	3/1
	Silviculture / Tree Farms	AC/LC	3/1
	Sod/Turf Crops	AC/LC	3/1
	Tobacco	AC/LC	3/1
Landscape Irrigation (Spray/Drip)	Athletic Fields	AC/LC	3/1
	Cemeteries	AC/LC	3/1
	College and University Campuses	AC/LC	3/1
	Commercial Campuses	AC/LC	3/1
	Golf Courses (Restricted Access)	LC	1
	Golf Courses (Unrestricted Access)	AC/LC	3/1
	Highway/Freeway Medians/ Roadside Vegetation	AC/LC	3/1
	Open Access Land Irrigation	AC/LC	3/1
	Pasture for Milk Producing Animals (Restricted Access)	LC	1
	Pasture for Non-Milk Producing Animals (Restricted Access)	LC	1
	Parks	AC/LC	3/1
	Playgrounds	AC/LC	3/1
	Residential Irrigation	AC/LC	3/1
	Landscape Irrigation (Restricted Access)	LC	1
	Urban Landscaping	AC/LC	3/1
	Schoolyards	AC/LC	3/1
Water Features	Decorative Fountains	AC	3
	Landscape Impoundments (With Fountain(s))	AC	3
	Landscape Impoundments (Without Fountain(s))	LC	1
	Ponds and Lagoons	LC	1
	Recreational Impoundments (Restricted Access)	LC	1
	Recreational Impoundments (Unrestricted Access)	AC	3
	Reservoir Augmentation (Recreational)	AC	3
	Wetland Creation	LC	1
	Wetland Discharge / Application	LC	1
-	Fire Fighting Via Plane	AC	3
	Fire Hydrant Water Supply	AC	3
-	Fire Protection systems	AC	3
	Non Structural Fire Fighting	AC	3
Life Safety			

	Structural Fire Fighting	AC	3
Construction	Concrete and Cement mixing	LC	1
	Dust Control	LC	1
	Equipment Operation (Ex. Cooling Power Equipment)	LC	1
	Material Washing and Sieving	LC	1
	Soil Compaction and Consolidation	LC	1
Process Water	Agricultural Cleaning (Animal Washing & Animal Pens)	AC	3
	Aquaculture	LC	1
	Boiler Feed	LC	1
	Building Washing	AC	3
	Chemical Mixing (Herbicides, Pesticides, Fertilizers)	LC	1
	Commercial Car Washes	AC	1
	Commercial Laundries	AC	3
	Cooling Power Equipment	LC	3
	Cooling systems with aerosolization	AC	1
	Cooling systems with no aerosolization	LC	1
	Dust Control (Roads and Streets)	LC	1
Process Water	Flushing Sanitary Sewers	LC	1
	Flushing Toilets and Urinals	AC	3
	Bidets and personal hygiene devices	DC	4
	Frost Protection	LC	1
	Gas Pipeline Testing	LC	1
	Hydro Seeding	AC	3
	Impoundments at Fish Hatcheries	LC	1
	Industrial Oil and Gas Operations	LC	1
	Industrial Process Water (Possibility of Human Contact or Evaporative)	AC	1
	Industrial Washwater applications	AC	3
	Livestock Drinking Water (Milk Producing)	AC	3
	Livestock Drinking Water (Non-Milk Producing)	AC	3
	Parts Cleaning	LC	1
	Pool Water Makeup	AC	3
	Pressure Washing	AC	3
	Priming Drainage Traps	LC	1
	Road Milling	LC	1
	Ship Ballasting	LC	1
	Snow Making (Commercial / Recreational Use)	AC	3
	Snow Making (Storage)	AC	3
	Stack Scrubbing	LC	3
	Stream Flow Augmentation	LC	1
	Street, Sidewalk, Parking Lot Cleaning (Restricted Access)	LC	1
	Street, Sidewalk, Parking Lot Cleaning (Unrestricted Access)	AC	3
	Vehicle and equipment Washing	AC	3
	Wastewater Treatment (Process Uses)	LC	1
	Window Washing	AC	3

a. Where two Exposures and two Tiers are cited, the first refers to spray irrigation and the second refers to drip irrigation (or other subsurface irrigation).

b. Where the equipment manufacturer or the jurisdiction requires a level of free residual disinfectant that exceeds the requirement of the quality Tier indicated, such excess shall be provided.

DC (Quality Tier 4) = Direct Public Contact/Consumption Intended

AC (Quality Tier 3) = Aerosolization, or Accidental/Limited

Consumption Possible

IC (Quality Tier 2) = Indirect Public Consumption Intended or Possible

LC (Quality Tier 1) = Limited Contact / No Consumption Intended

TABLE 1301.2(2) WATER QUALITY FOR TIERS OF REUSE

Quality Tier	Minimun Design Water Quality
4	United States Environmental Protection Agency (USEPA) Primary and Secondary Drinking Water Quality Standards (40 CFR 141), plus 18/15/15 Log Removal of Enteric Viruses, Giardia, and Cryptosporidium
3	Compliant with all applicable laws, rules, ordinances and NSF 350
2	Compliant with all applicable laws, rules, ordinances, and end use fixture / equipment manufacturer requirements
1	Compliant with all applicable laws, rules, ordinances, and end use fixture / equipment manufacturer requirements

TABLE 1301.2(3) LOG REDUCTION (LRV) CREDITS APPLICALBLE TO DPR BASED ON SOURCE WATER

Source Water	**Maximum LRV Credits for DPR**
Blackwater	0/0/0
Blackwater blended with groundwater [a]	LRV credit [b] = negative log of BWC
Blackwater blended with surface water [a]	LRV credit [b] = negative log of BWC
Blackwater blended with groundwater and surface water [a]	LRV credit [b] = negative log of BWC
Graywater	Case by case basis
Stormwater	Case by case basis
Rainwater	Case by case basis
Industrial Water	Case by case basis
Process Water	Case by case basis

a. Groundwater and surface waters must be either an untreated source of drinking water approved by the jurisdiction or a treated drinking water approved by the jurisdiction.

b. LRV credit for all source waters containing blackwater shall not exceed 2.0.

Delete without substitution:

~~**1301.2.1 Residual disinfectants**. Where chlorine is used for disinfection, the nonpotable water shall contain not more than 4 ppm (4 mg/L) of chloramines or free chlorine when tested in accordance with ASTM D1253. Where ozone is used for disinfection, the nonpotable water shall not contain gas bubbles having elevated levels of ozone at the point of use. **Exception:** Reclaimed water sources shall not be required to comply with these requirements.~~

~~**1301.2.2 Filtration required.** Nonpotable water utilized for water closet and urinal flushing applications shall be filtered by a 100-micron (0.1 mm) or finer filter. **Exception:** Reclaimed water sources shall not be required to comply with these requirements.~~

Revise as follows:

1301.3 Signage required. ~~Nonpotable~~ Where nonpotable water is supplied to outlets such as hose connections, hydrants, open-ended pipes and faucets, each outlet shall be identified at the point of use ~~for each outlet~~ with signage that reads as follows: "~~Nonpotable water is utilized for [application name].~~ CAUTION: NONPOTABLE WATER – DO NOT DRINK." The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and in colors in contrast to the background on which they are applied. In addition to the required ~~wordage~~ text, the pictograph shown in Figure 1301.3 shall appear on the signage required by this section.

1301.4 Permits. Permits shall be required for the construction, installation, operation, alteration and repair of ~~nonpotable~~ water reuse systems. Construction documents, engineering calculations, diagrams, operations and maintenence manuals,and other such data pertaining to the ~~nonpotable~~ water reuse systems shall be submitted with each permit application.

1301.5 Potable water connections. Where a potable system is connected to a nonpotable water system, the potable water supply shall be protected against backflow in accordance with Section 608.

Revise as follows:

1301.6 Components and materials. Piping, plumbing components and materials used in ~~collection and~~ conveyance and distibution systems shall be of material approved ~~by the manufacturer~~ for the intended application.

1301.7 Insect and vermin control. The system shall be protected to prevent the entrance of insects and vermin into process tanks and equipment, storage tanks and piping systems. Screen materials shall be compatible with contacting system components and shall not accelerate the corrosion of system components.

1301.8 Freeze protection. Where ~~sustained~~ freezing temperatures occur, provisions shall be made to keep storage tanks, process tanks and equipment and the related piping from freezing.

1301.9 ~~Nonpotable water storage~~ Water tanks. ~~Nonpotable w~~Water storage and process tanks shall comply with Sections 1301.9.1 through 1301.9.10.

1301.9.1 Location. Any storage tank, process tank and equipment
or portion thereof that is above grade shall be protected from direct exposure to sunlight by one of the following methods:

1. Tank construction using opaque, UV-resistant materials such as heavily tinted plastic, fiberglass, lined metal, concrete, ~~wood,~~ or painted to prevent algae growth.
2. Specially constructed sun barriers.
3. Installation in garages, crawl spaces or sheds.

1301.9.2 Materials. ~~Where collected on-site,~~ Prior to treatment for reuse, water shall be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. The ~~storage~~ tank shall be constructed of materials compatible with ~~any~~ all disinfection systems used to treat water upstream of the tank and with ~~any~~all systems used to maintain water quality in the tank. ~~Wooden storage tanks that are not equipped with a makeup water source shall be provided with a flexible liner.~~

1301.9.3 Foundation and supports. ~~Storage~~ All tanks shall be supported on a firm base capable of withstanding the weight of the ~~storage~~ tank when filled to capacity. ~~Storage t~~Tanks shall be supported in accordance with the *International Building Code*.

1301.9.3.1 Ballast. Where the soil can become saturated, an underground ~~storage~~ tank shall be ballasted, or otherwise secured, to ~~prevent the tank from floating out of the ground~~ resist buoyant forces when empty. The combined weight of the empty tank and hold-down ballast shall ~~meet or~~ exceed the buoyancy force ~~of~~ applied to the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to resist the maximum buoyant forces when the tank is empty, and to support the weight of the ~~storage~~ tank when full, consistent with the bearing capability of adjacent soil.

1301.9.3.2 Structural support. Where installed below grade, ~~storage~~ tank installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when empty or filled with water.

1301.9.4 Makeup water. Where an uninterrupted supply is required for the intended application, ~~potable or reclaimed water shall be provided as a~~an additional source of makeup water shall be provided for the storage tank. ~~The~~ All makeup water suppl~~y~~ies shall be protected against backflow in accordance with Section 608. A *full-open valve* located on the makeup water supply lines to the storage tank ~~shall be provided~~. ~~Inlets to~~ Flow into the storage tank shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. ~~Where makeup water is provided,~~ ~~t~~The water level shall not be permitted to drop below the ~~source water inlet or the~~ intake of any ~~attached~~ pump supplying makeup water.

1301.9.5 Overflow. ~~The storage t~~Tanks shall be equipped with an overflow pipe having a diameter not less than that shown in Table ~~606.5.4~~ 606.5(4). The overflow pipe shall be protected from insects ~~or~~ and vermin and shall discharge in a manner consistent with all applicable laws, rules, and ordinances of the jurisdiction for storm water runoff requirements of the jurisdiction. The overflow pipe shall discharge at a sufficient distance from the tank to avoid damaging the tank foundation or the adjacent property. Drainage from overflow pipes shall be directed to prevent freezing on roof walkways, and on sidewalks, pavement, and other accessways subject to vehicular or pedestrian traffic. The overflow drain shall not be equipped with a shutoff valve. A cleanout shall be provided on each overflow pipe in accordance with Section 708.

1301.9.6 Access. Not less than one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an *approved* locking device or other *approved* method of securing access. Below-grade ~~storage~~ tanks, located outside of the building, shall be provided with ~~a manhole~~ an access opening either not less than 24 inches (610 mm) square or with an inside diameter not less than 24 inches (610 mm). ~~Manholes~~ Access opening shall extend not less than 4 inches (102 mm) above ground ~~or~~ and shall be designed to prevent water infiltration. ~~Finished~~ The finished grade shall be sloped away from the ~~manhole~~ maintenance hole to divert surface water. ~~Manhole~~ Access opening covers shall be secured to prevent unauthorized access. Service ports in ~~manhole~~ access opening covers shall be not less than 8 inches (203 mm) in diameter and shall be not less than 4 inches (102 mm) above the finished grade level. The service port shall be secured to prevent unauthorized access. Access locations to confined spaces shall be labeled "CONFINED SPACE."

> **Exception:** ~~Treated-water storage t~~Tanks that are less than 800 gallons (3028 L) in volume and installed below grade shall not be required to be equipped with a manhole an access opening provided that the tank has a service port of not less than 8 inches (203 mm) in diameter.

1301.9.7 Venting. ~~Storage t~~Tanks that receive flow by gravity shall be provided with a vent sized in accordance with Chapter 9 and based on the aggregate diameter of all tank influent pipes. The reservoir vent shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of an *approved* cap or U-bend installed with the opening directed downward. Vent outlets shall extend not less than 4 inches (102 mm) above grade or as necessary to prevent surface water from entering the ~~storage~~ tank. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section 1301.7.

1301.9.8 Draining of tanks. Tanks shall be provided with a means of emptying the contents for the purpose of service or cleaning. Tanks shall be drained by using a pump or by a drain located at the lowest point in the tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table ~~606.5.7~~ 606.5(7). Not less than one cleanout shall be provided on each drain pipe in accordance with Section 708.

Revise as follows:

1301.9.9 Marking and signage. Each nonpotable water ~~storage~~ tank shall be labeled with its rated volumetric capacity. The contents of ~~storage~~ tanks shall be identified with the words "CAUTION: NONPOTABLE WATER – DO NOT DRINK." Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, "DANGER – CONFINED SPACE." Markings shall be indelibly printed on the tank or on a tag or sign constructed of corrosion-resistant waterproof material that is mounted on the tank. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied.

1301.9.10 ~~Storage t~~Tank tests. ~~Storage~~ Pressurized tanks shall be be certified in accordance with Section 303.4. Tanks that receive flow by gravity shall tested in accordance with the following:~~Storage t~~Tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed and the tank shall remain watertight without leakage for a period of 24 hours.

1. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and that there are no leaks.
2. The tank drain shall be observed for proper operation.
3. The makeup water system shall be observed for proper operation and successful automatic shutoff of the system at the refill threshold shall be verified.

1301.10 System abandonment. If the owner of an on-site ~~nonpotable~~ water reuse system or ~~rainwater collection and conveyance system~~ components thereof, elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with ~~the following:~~ Sections 1301.10.1 through 1301.10.3.

1. ~~All system piping connecting to a utility-provided water system shall be removed or disabled.~~
2. ~~The distribution piping system shall be replaced with an *approved* potable water supply piping system. Where an existing potable pipe system is already in place, the fixtures shall be connected to the existing system.~~
3. ~~The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.~~

Add new text as follows:

1301.10.1 Utility-Connected Piping. All system piping connecting to a utility-provided water system shall be removed or disabled.

1301.10.2 Distribution Piping. The distribution piping system shall be removed or replaced with an approved potable water supply piping system. Where an existing potable pipe system is already in place, the fixtures shall be connected to the existing system.

1301.10.3 Tanks. Tanks shall be removed, or secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

Revise as follows:

1301.11 Trenching requirements for nonpotable water piping. Nonpotable water ~~collection and~~ distribution ~~piping and reclaimed water~~ piping shall be separated from the *building sewer* and potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Nonpotable water ~~collection and~~ distribution piping shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried nonpotable water piping shall comply with the requirements of Section 306. **Exceptions:**

1. The required separation distance shall not apply where the bottom of the nonpotable water pipe within 5 feet (1524 mm) of the *sewer* is not less than 12 inches (305 mm) above the top of the highest point of the *sewer* and the pipe materials conform to Table 702.3.
2. The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the nonpotable water pipe is not less than 12 inches (305 mm) above the top of the highest point of the nonpotable water pipe and the pipe materials comply with the requirements of Table 605.4.
3. Nonpotable water pipe is permitted to be located in the same trench with a *building sewer*, provided that such *sewer* is constructed of materials that comply with the requirements of Table 702.2.
4. The required separation distance shall not apply where a nonpotable water pipe crosses a *sewer* pipe, provided that the pipe is sleeved to not less than 5 feet (1524 mm) horizontally from the *sewer* pipe centerline on both sides of such crossing, with pipe materials that comply with Table 702.2.
5. The required separation distance shall not apply where a potable water service pipe crosses a nonpotable water pipe, provided that the potable water service pipe is sleeved for a distance of not less than 5 feet (1524 mm) horizontally from the centerline of the nonpotable pipe on both sides of such crossing, with pipe materials that comply with Table 702.2.
6. Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where nonpotable water is used for outdoor applications.

1301.12 Outdoor outlet access. Sill cocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by nonpotable water shall be located in a locked vault or shall be operable only by means of a removable key and marked in accordance with Section 1301.3.

Add new text as follows:

1301.13 Operations and monitoring. The design, installation, and continued operation of water reuse systems shall be in accordance with an approved operating and monitoring program. The program shall be implemented by an individual or entity in accordance with the requirements of the *International Property Maintenance Code*.

Revise as follows:

SECTION 1302
ON-SITE NONPOTABLE WATER REUSE SYSTEMS

1302.1 General. The provisions of ASTM E2635 and Section 1302 shall govern the construction, installation, alteration and repair of water reuse systems. on-site nonpotable water reuse systems for the collection, storage, treatment and distribution of on-site sources of nonpotable water as permitted by the jurisdiction water reuse systems..

1302.2 Graywater Ssources. On-site nonpotable water Graywater reuse systems shall collect waste discharge from only the following sources: bathtubs, showers, lavatories, clothes washers and laundry trays , laundry trays, condensate, and other domestic wastewaters that are not expected to contain urine, fecal matter, grease, or food wastes. Where *approved* and as appropriate for the intended application, water from other nonpotable sources shall be collected for reuse by on-site nonpotable water reuse systems..

1302.3 1302.2.1 Prohibited Blackwater sources. Wastewater containing urine or fecal matter Blackwater shall not be diverted to on-site nonpotable water reuse systems and shall discharge discharged to the sanitary drainage system of the building or premises in accordance with Chapter 7. Reverse osmosis system reject water, water softener discharge water, kitchen sink wastewater, dishwasher wastewater and wastewater discharged from wet-hood scrubbers shall not be collected for reuse in an on-site nonpotable wateror to an approved on-site blackwater reuse system.

Add new text as follows:

1302.4 Other sources.. Other sources including, but not limited to, condensate, reverse osmosis system reject water, water softener discharge water, and wastewater discharged from wet-hood scrubbers shall also be considered for use in a water reuse system.

Revise as follows:

1302.5 1302.3 Traps. Traps serving fixtures and devices discharging wastewater to on-site nonpotable water to water reuse systems shall comply with Section 1002.4.

Delete without substitution:

1302.4 Collection pipe. On-site nonpotable water reuse systems shall utilize drainage piping *approved* for use in plumbing drainage systems to collect and convey untreated water for reuse. Vent piping *approved* for use in plumbing venting systems shall be utilized for vents in the graywater system. Collection and vent piping materials shall comply with Section 702.

1302.4.1 Installation. Collection piping conveying untreated water for reuse shall be installed in accordance with Section 704.

1302.4.2 Joints. Collection piping conveying untreated water for reuse shall utilize joints *approved* for use with the distribution piping and appropriate for the intended applications as specified in Section 705.

1302.4.3 Size. Collection piping conveying untreated water for reuse shall be sized in accordance with drainage sizing requirements specified in Section 710.

Revise as follows:

1302.6 ~~1302.4.4~~ Pipe marking. Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 7.

1302.7 ~~1302.5 Filtration~~ Treatment. ~~Untreated w~~Water collected for reuse shall be ~~filtered as required for the intended end use. Filters shall be provided with *access* for inspection and maintenance. Filters shall utilize a pressure gauge or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.~~ treated to meet the quality standards required in Tables 1301.2(1) and 1301.2(2).

Add new text as follows:

1302.8 Treatment systems.. Treatment systems shall be installed to allow access for inspection and maintenance. All treatment equipment shall utilize pressure gauges, level sensors, intensity meters, or other approved methods to indicate when servicing or replacement is required. All treatment equipment shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.

Revise as follows:

1302.9 ~~1302.6 Disinfection and treatment~~ Tanks. ~~Where the intended application for nonpotable water collected on-site for reuse requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Nonpotable water collected on-site containing untreated graywater shall be retained in collection reservoirs for not longer than 24 hours.~~ Nopotable tanks utilized in water reuse systems shall comply with Sections 1301.9, 1302.8.1 and 1302.8.2.

Delete without substitution:

~~**1302.6.1 Graywater used for fixture flushing.** Graywater used for flushing water closets and urinals shall be disinfected and treated by an on-site water reuse treatment system complying with NSF 350.~~

~~**1302.7 Storage tanks.** Storage tanks utilized in on-site nonpotable water reuse systems shall comply with Sections 1301.9, 1302.7.1 and 1302.7.2.~~

Revise as follows:

1302.9.1 ~~1302.7.1~~ Location. ~~Storage t~~Tanks shall be located with a minimum horizontal distance between various elements as indicated in Table ~~1302.7.1~~ 1302.7(1).

1302.9.2 ~~1302.7.2~~ Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the ~~storage~~ tank and shall not skim water from the surface.

1302.10 ~~1302.8~~ Valves. Valves shall be ~~supplied~~ installed on ~~on-site nonpotable~~ the collection of the water reuse systems in accordance with Sections 1302.~~8~~ 9.1 and 1302.~~8~~ 9.2.

1302.10.1 ~~1302.8.1~~ Bypass valve. One three-way diverter valve listed and labeled to NSF 50 or other *approved* device shall be installed on collection piping upstream of each storage tank, ~~or drain field,~~ as applicable, to divert untreated on-site reuse sources to the sanitary *sewer* or approved receiving tank to allow servicing and inspection of the system. Bypass valves shall be installed downstream of fixture traps and vent connections. Bypass valves shall be marked to indicate the direction of flow~~, connection and storage tank or drainfield connection~~. Bypass valves shall be provided with *access* that allows for removal. Two shutoff valves shall not be installed to serve as a bypass valve.

1302.10.2 ~~1302.8.2~~ Backwater valve. One or more backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be installed in accordance with Section 714.

1302.11 ~~1302.9~~ Pumping and control system. Mechanical equipment including pumps, valves and ~~filters~~ treatment units shall have *access* ~~and be removable~~ in order to ~~perform~~ to replace, repair, ~~maintenance~~ maintain and clean~~ing~~. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section 604.

1302.12 ~~1302.10~~ Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the ~~nonpotable~~ water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1302.13 ~~1302.11~~ Distribution piping. Distribution piping utilized in ~~on-site nonpotable~~ water reuse systems shall comply with Sections ~~1302.11.1~~ 1302.12.1 through ~~1302.11.3~~ 1302.12.3. **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

~~1302.11.1~~ 1302.13.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section 605.

~~1302.11.2~~ 1302.13.2 Design. ~~On-site nonpotable w~~Water reuse distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

~~1302.11.3~~ 1302.13.3 Labeling and marking. ~~On-site n~~Nonpotable water distribution piping labeling and marking shall comply with Section 608.9.

1302.14 ~~1302.12~~ Tests and inspections. Tests and inspections shall be witnessed by the designer and performed in accordance with Sections 1302.12 14.1 through 1302.12 14.6.

1302.14.1 ~~1302.12.1~~ Collection pipe and vent test. Drain, waste and vent piping used for on-site water reuse systems shall be tested in accordance with Section 312.

1302.14.2 ~~1302.12.2~~ ~~Storage t~~Tank tests. ~~Storage t~~Tanks shall be tested in accordance with Section 1301.9.10.

1302.14.3 ~~1302.12.3~~ Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section 312.6.

1302.14.4 ~~1302.12.4~~ Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.11.

1302.14.5 ~~1302.12.5~~ Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the ~~storage~~ tank and piping systems in accordance with Section 1301.7.

1302.14.6 ~~1302.12.6~~ Initial ~~W~~water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with ~~the requirements~~ all applicable laws, rules, and ordinances of the jurisdiction.

Add new text as follows:

1302.14.7 Operational water quality testing.. The quality of the water for the intended application(s) shall be verified at the point of use in accordance with all applicable laws, rules, ordinances of the jurisdiction, and in accordance with the operation and maintenance manual, and where required, the operating permit.

Revise as follows:

1302.15 ~~1302.13~~ Operation and maintenance manuals. Operation and maintenance materials shall be supplied with nonpotable on-site water reuse systems in accordance with Sections 1302.13.1 through 1302.13.4~~.~~ and the maintenance program shall be implemented by an individual or entity in accordance with the requirements of the *International Property Maintenance Code.*

1302.15.1 ~~1302.13.1~~ **Manual.** A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

1302.15.2 ~~1302.13.2~~ **Schematics.** The manual shall include a detailed system schematic, and the locations and a list of all system components, including manufacturer and model number.

1302.15.3 ~~1302.13.3~~ **Maintenance procedures.** The manual shall provide a schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

1302.15.4 ~~1302.13.4~~ **Operations procedures.** The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

Add new text as follows:

Add new standard(s) as follows:

N/A. 40 CFR 141 United States Environmental Protection Agency (USEPA) Primary and Secondary Drinking Water Quality Standards

Reason: A version of this proposal was presented in 2020 and rejected. Feedback from the PMGCAC has been considered and addressed herein as follows:

The definitions of graywater, wastewater, and blackwater are unclear.

It is unclear how a code official would enforce odor controls.

Odors are addressed in this proposal by reference to 40 CFR 141, NSF 350, and required compliance with all applicable laws, rules, and ordinances. Furthermore, The designer is required to address odor control in the operation and monitoring program, if the code official has any concerns.

Wastewater reuse should be governed locally, not in ICC code.

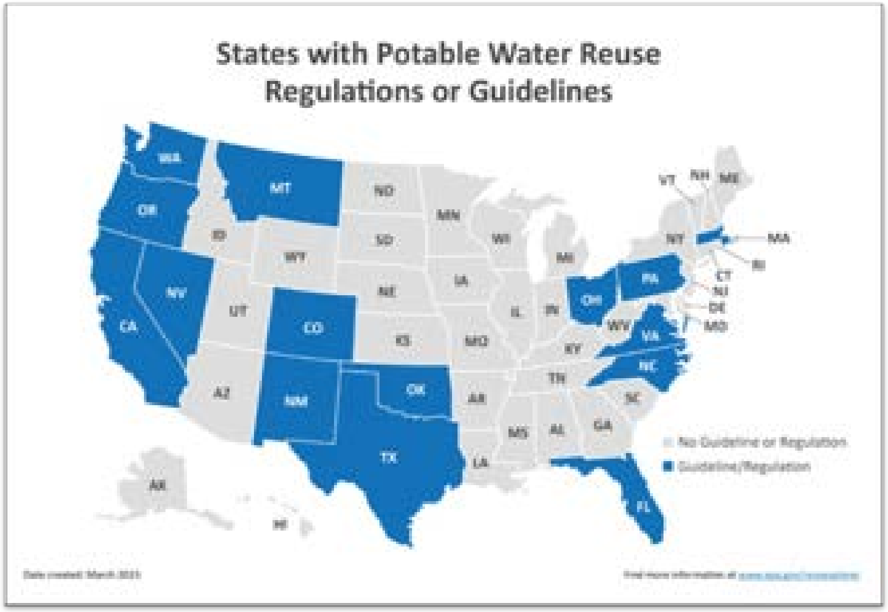
More detail is needed on blackwater reuse and related quality.

This proposal includes rigorous quality standards based on current science and focused on public safety.

Water reuse options should be expanded in the plumbing code not only because of the moral imperative to improve water efficiency and reduce consumption of valuable potable water for nonpotable purposes, but also because current technologies safely enable such practices. For example, by treating and reusing its own wastewater, a commercial office building can offset 100% of its toilet and urinal flushing demand, which can represent up to 70% of its total indoor potable water demands. In San Francisco, the San Francisco Public Utilities Commission headquarters building treats wastewater onsite for toilet and urinal flushing, reducing the use of potable water within the building by approximately 50%. In Sydney, Australia at 1 Bligh Street, a commercial high rise tower is offsetting 100% of the building's nonpotable water demands by reusing wastewater. In Portland, Oregon the Hassalo on Eighth eco-district, a cluster of residential, commercial, and mixed-use buildings is collecting its wastewater and reusing it for toilet flushing and irrigation. This system saves up to 7 million gallons of potable water per year. In New York City, the Solaire Building has successfully operated an onsite blackwater reuse system for two decades to meet the building's toilet flushing, cooling tower makeup, and irrigation demands. Similar to San Francisco, New York City has several buildings treating blackwater onsite for non-potable end uses. These are just a few examples of successfully operating nonpotable reuse systems with long histories.

Today, focus has shifted to Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR). IPR is when treated wastewater is supplied to a raw drinking water source such as an aquifer or reservoir. The naturally blended water is then withdrawn for treatment in a drinking water treatment facility prior to public consumption. DPR eliminates the environmental buffer and provides treated wastewater directly for public consumption.

According to the EPA, treated wastewater can be used for potable consumption in California, Colorado, Connecticut, Delaware, Florida, Massachusetts, Montana, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, Pennsylvania, Texas, Virginia, and Washington. Some of these states also permit DPR. Still other states are in the process of developing DPR regulations, including Arizona where the practice is currently labeled "Advanced Water Purification" (AWP) instead of DPR.



What Is Advanced Water Purification?

Advanced Water Purification (AWP) is an innovative set of water treatment processes that purifies recycled water into safe drinking without the need for an environmental buffer, such as a river or lake. The purified water is then blended with other sources of water, such as groundwater or surface water, and distributed as drinking water to consumers. AWP can help increase the availability of water in areas with water scarcity and reduce the dependence on limited sources of water.

Key Facts About AWP

- AWP involves using proven technologies such as Ultraviolet (UV) light, Reverse Osmosis (RO), ozone and biofiltration to purify water to meet or exceed state and federal drinking water standards.
- The treatment process effectively targets pathogens and harmful chemical contaminants.
- AWP is safe and effective in providing high-quality drinking water. Studies have shown that the purified water is of comparable or better quality than conventional drinking water sources.

What Is ADEQ Doing And Why?

Just like water conservation, water recycling and other sustainable water management practices, AWP is a part of Arizona's long-term strategy to ensure a safe and adequate drinking water supply sufficient to support Arizona's existing and future population.

ADEQ is working on a rule to establish a permitting process for collecting and treating wastewater to meet protective standards so that it may be used as a drinking water source.

What Are The Benefits Of AWP?

AWP is a valuable strategy for managing water resources, offering numerous benefits:

- Increased Water Quality
- Drought Resilience & Water Security
- Improved Public Health
- Reduced Environmental Impact
- Energy Efficiency
- Sustainability

Learn more about what ADEQ is doing to help utilities provide AWP as a viable drinking water source for Arizona communities and how you can get involved.

azdeq.gov/AWP

Health & Safety. Standards such as NSF 350 exist to guide the implementation of onsite treatment and reuse systems. Water quality standards are also evolving as public health regulators and utilities from across the country are adopting a health risk-based approach that applies to water sources including blackwater, graywater, and rainwater. This health risk- framework focuses on the removal of pathogens and ongoing monitoring to ensure water is treated appropriately based on the end use. Public health and safety is paramount. States including California and Washington are proceeding with establishing health risk-based frameworks for the treatment of onsite blackwater.

The quality defined for the sole Tier 4 application (DPR) is by necessity not only based on common drinking water quality standards (USEPA), but also on the recognition that additional biological barriers are appropriate, given the source water's origin. Extensive studies have been conducted in the past few decades to determine the level of treatment required to ensure public health and safety.

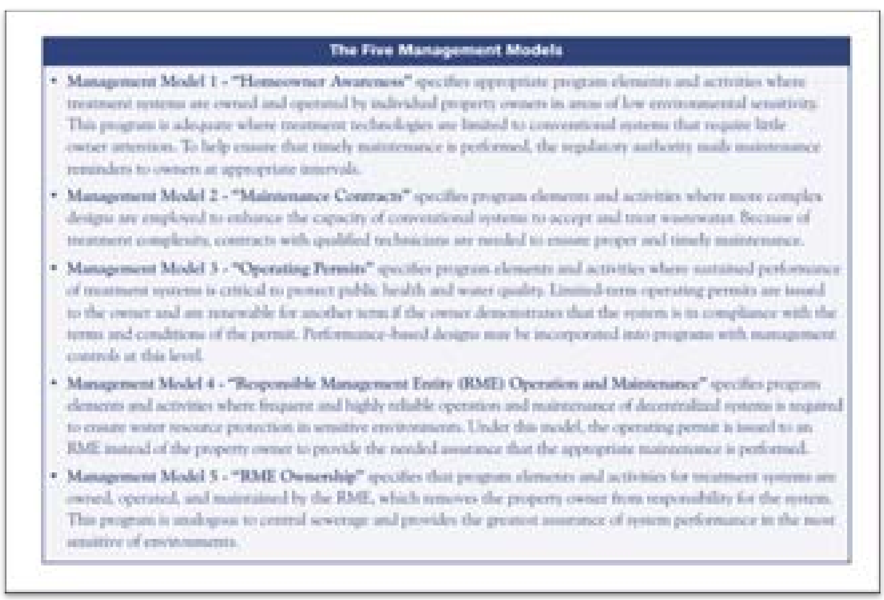
Log removals of Enteric Viruses, Giardia, and Cryptosporidium (18/15/15, respectively) are based on the National Water Research Institute's "DPR Criteria Expert Panel: Preliminary Findings and Recommendations", Fountain Valley, California, June 23, 2023

These log reductions, mean that enteric viruses are reduced by 99.9999999999999999% (18 nines), that giardia and cryptosporidium oocysts are each reduced by 99.9999999999999% (15 nines)

Engineering process design is expected to be based on treatment technique log removal values (LRVs), as published by generally accepted industry leaders and institutions (e.g., United States Environmental Protection Agency, Water Environment & Research Foundation, World Health Organization, etc.). Treatment verification is expected to be demonstrated by periodic challenge tests, as described by generally accepted industry leaders and institutions (see above). Due to the rapid evolution and variety of treatment techniques and challenge test protocols, neither are further specified herein although they may be in the future. Additionally, periodic challenge testing may not be required where treatment process surrogates are monitored to ensure ongoing performance within a credited window. At this time, flexibility is needed to promote water conservation and to empower decision makers.

This proposal does not seek to specifically define water quality requirements for Tier 1 and 2 applications. It is recognized that such standards may be highly dependent on source water quality,and should remain flexible to empower decision makers.

Public health and safety are further assured by requiring competent management of all water reuse systems. Section 1302.14 specifies Management Model 4 or Management Model 5 of USEPA's Management Guidelines for Decentralized Wastewater Management (EPA 832-B-03-001, March 2003)


The Five Management Models

- **Management Model 1 - "Homeowner Awareness"** specifies appropriate program elements and activities where treatment systems are owned and operated by individual property owners in areas of low environmental sensitivity. This program is adequate where treatment technologies are limited to conventional systems that require little owner attention. To help ensure that timely maintenance is performed, the regulatory authority mails maintenance reminders to owners at appropriate intervals.
- **Management Model 2 - "Maintenance Contracts"** specifies program elements and activities where more complex designs are employed to enhance the capacity of conventional systems to accept and treat wastewater. Because of treatment complexity, contracts with qualified technicians are needed to ensure proper and timely maintenance.
- **Management Model 3 - "Operating Permits"** specifies program elements and activities where sustained performance of treatment systems is critical to protect public health and water quality. Limited-term operating permits are issued to the owner and are renewable for another term if the owner demonstrates that the system is in compliance with the terms and conditions of the permit. Performance-based designs may be incorporated into programs with management controls at this level.
- **Management Model 4 - "Responsible Management Entity (RME) Operation and Maintenance"** specifies program elements and activities where frequent and highly reliable operation and maintenance of decentralized systems is required to ensure water resource protection in sensitive environments. Under this model, the operating permit is issued to an RME instead of the property owner to provide the needed assurance that the appropriate maintenance is performed.
- **Management Model 5 - "RME Ownership"** specifies that program elements and activities for treatment systems are owned, operated, and maintained by the RME, which removes the property owner from responsibility for the system. This program is analogous to central sewerage and provides the greatest assurance of system performance in the most sensitive of environments.

SAMPLE LRV CREDIT CALCULATION REGARDING IPC TABLE 1301.2(3) and IRC Table P3401.2(3):

10,000 gpd of Blackwater

70,000 gpd of groundwater

20,000 gpd of surface water

BWC = 10,000 / (10,000 + 70,000 + 20,000)

BWC = 0.10

LRV Credit = -log (BWC)

LRV Credit = -log (0.10)

LRV Credit = 1.0

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC) PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Bibliography: Alsup, Kayla and Alsup, Kayla E., "Sustainable Water Treatment Systems: A Direct Potable Proposal" (2021). Murray State University Honors College Theses. 89.

Case Studies of Innovative Water Reuse and Resource Recovery Projects, San Francisco Public Utilities Commission (SFPUC), https://sfpuc.org/documents/case-studies-innovative-water-reuse-and-resource-recovery-projects, accessed July 27, 2023.

Derivation of Log Removal Values for the Addendum to A Framework for Regulating Direct Potable Reuse, presenting an early draft of the anticipated criteria for DPR

, California State Water Board Division of Drinking Water, June 15, 2021.

Drinking Water Quality Standards, United States Environmental Protection Agency, Code of Federal Regulation https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-141.

Ghernaout, D. , Elboughdiri, N. and Alghamdi, A. (2019) Direct Potable Reuse: The Singapore NEWater Project as a Role Model. Open Access Library Journal, 6, 1-10. doi: 10.4236/oalib.1105980.

Kehoe P. & Nokhoudian T. 2022 “Onsite Water Recycling: an Innovative Approach to Solving an Old Problem”. San Francisco, CA.

Leslie, Jacques., “Where Water is Scarce, Communities Turn to Reusing Wastewater,” Yale Environment 360, May 1, 2018.

National Water Research Institute. “DPR Criteria Expert Panel: Preliminary Findings and Recommendations”, Fountain Valley, California, June 23, 2023.

“Onsite Water Reuse Program Guidebook (2022)”, San Francisco Public Utilities Commission (SFPUC), accessed July 27, 2023.

”Potable reuse: Guidance for producing safe drinking-water.” Geneva: World Health Organization; 2017. License: CC BY-NC-SA 3.0 IGO.

Rich, D., Andiroglu, E., Gallo, K., & Ramanathan, S. (2023). A Review of Water Reuse Applications and Effluent Standards in Response to Water Scarcity. *Water Security*. Accepted through Peer Review July 2023.

Sharvelle, S.; Ashbolt, N.; Clerico, E.; Hultquist, R.; Leverenz, H.; and A. Olivieri. (2017). “Risk-Based Framework for the Development of

Public Health Guidance for Decentralized Nonpotable Water Systems." Prepared by the National Water Research Institute for the Water Environment & Reuse Foundation. Alexandria, VA. WE&RF Project No. SIWM10C15.

Tchobanoglous, George, Franklin L. Burton, H. David Stensel, Metcalf & Eddy., Wastewater engineering : treatment and reuse. (4th ed.). Boston: McGraw-Hill. 2003. ISBN 0-07-041878-0. OCLC 48053912.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal to expand implementation of onsite wastewater reuse will not increase the cost of construction. The proposal is allowing for onsite wastewater reuse systems as an option, but not mandating installation. Buildings that choose to install a system would experience increased construction costs to install tanks, treatment, and distribution piping. However, buildings can also realize cost savings on water and sewer bills by reusing wastewater onsite. As a result, the building would consume less potable water and send less wastewater to the sewer.

An analysis was conducted to evaluate the amount of wastewater that could be treated and reused onsite in proposed mixed-use development in San Francisco. Using the water utility's rate schedule to estimate the financial savings, the analysis showed installing an onsite wastewater reuse system could result in savings of about $50,000 annually based on reduced potable consumption alone. As the cost of potable water increases, so would such savings.

Staff Analysis: A review of the standard proposed for inclusion in the code, DOE 40 CFR 141 *United States Environmental Protection Agency (USEPA) Primary and Secondary Drinking Water Quality Standards* , with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P157-24 Part I

Public Hearing Results (CAH1)

Committee Action: **As Submitted**

Committee Reason: This is a big leap forward for water reuse. This will encourage more technology to be developed. There is already overseas widespread use of all waters for applications. (10-4)

P157-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: TABLE 1301.2(1)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

TABLE 1301.2(1) REQUIRED WATER QUALITY FOR REUSE APPLICATIONS

Portions of table not shown remain unchanged.

Use Category	Application	Exposure[a]	Quality Tier[b]
Process Water	Agricultural Cleaning (Animal Washing & Animal Pens)	AC	3
	Aquaculture	LC	1
	Boiler Feed	LC	1
	Building Washing	AC	3
	Chemical Mixing (Herbicides, Pesticides, Fertilizers)	LC	1
	Commercial Car Washes	AC	1
	Commercial Laundries	AC	3
	Cooling Power Equipment	LC	3
	Cooling systems with aerosolization	AC	1
	Cooling systems with no aerosolization	LC	1
	Dust Control (Roads and Streets)	LC	1
	Flushing Sanitary Sewers	LC	1
	Flushing Toilets and Urinals	AC	3
	Bidets and personal hygiene devices	DC	4
	Frost Protection	LC	1
	Gas Pipeline Testing	LC	1
	Hydro Seeding	AC	3
	Impoundments at Fish Hatcheries	LC	1
	Industrial Oil and Gas Operations	LC	1
Process Water	Industrial Process Water (Possibility of Human Contact or Evaporative)	AC	1
	Industrial Washwater applications	AC	3
	Livestock Drinking Water (Milk Producing)	AC	3
	Livestock Drinking Water (Non-Milk Producing)	AC	3
	Parts Cleaning	LC	1
	Pool Water Makeup	~~AC~~ DC	~~3~~ 4
	Pressure Washing	AC	3
	Priming Drainage Traps	LC	1
	Road Milling	LC	1
	Ship Ballasting	LC	1
	Snow Making (Commercial / Recreational Use)	AC	3
	Snow Making (Storage)	AC	3
	Stack Scrubbing	LC	3
	Stream Flow Augmentation	LC	1
	Street, Sidewalk, Parking Lot Cleaning (Restricted Access)	LC	1
	Street, Sidewalk, Parking Lot Cleaning (Unrestricted Access)	AC	3
	Vehicle and equipment Washing	AC	3
	Wastewater Treatment (Process Uses)	LC	1
	Window Washing	AC	3

a. Where two Exposures and two Tiers are cited, the first refers to spray irrigation and the second refers to drip irrigation (or other subsurface irrigation).

b. Where the equipment manufacturer or the jurisdiction requires a level of free residual disinfectant that exceeds the requirement of the quality Tier indicated, such excess shall be provided.

DC (Quality Tier 4) = Direct Public Contact/Consumption Intended

AC (Quality Tier 3) = Aerosolization, or Accidental/Limited

Consumption Possible

IC (Quality Tier 2) = Indirect Public Consumption Intended or Possible

LC (Quality Tier 1) = Limited Contact / No Consumption Intended

Reason: Swimming pools and spas require potable water for startup and makeup water because water chemistry is extremely important for the safety of the users (bathers.)

PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 33 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Potable water is almost always readily available at the site location where pools and spas are constructed and used. As no treatment is needed for a potable water supply, the cost of potable water will likely be less than if lesser quality waters needed extensive treatment to make potable water.

Comment (CAH2)# 144

Comment 2:

IPC: 1301.2

Proponents: Kyle Thompson, Technical Director, Plumbing Manufacturers International (kthompson@safeplumbing.org) requests As Modified by Committee (AMC2)

Modify as follows:

2024 International Plumbing Code

Revise as follows:

1301.2 Reuse water quality. Reuse water quality shall meet the minimum requirements as specified in Tables 1301.2(1), 1301.2(2), 1301.2(3), and as established for the intended application by all applicable laws, rules and ordinances of the jurisdiction. Where water from multiple sources is combined , the system shall comply with the most stringent of the requirements of this code that are applicable to such sources. For Group R occupancies, where an alternate nonpotable water source for use in toilet flushing is installed, a potable water distribution line rough-in, sized in accordance with Section 604,that includes a shutoff valve located where the line originates, shall be provided at each toilet.

Reason: See CAH1 Proposal P155-24 for extended substantiation supporting the need for potable water use in smart toilets and personal hygiene devices. This proposed change only applies to buildings that chose to plumb non-potable water indoors specifically for toilet flushing. It would require a potable water supply line to be roughed in when the non-potable water supply line is installed to address smart toilets and personal hygiene devices. Smart toilets (See Figure 1) are those which include an integrated bidet feature and personal hygiene devices (See Figure 2) are an add on or toilet seat incorporating a bidet feature. When a residential building is plumbed with a non-potable water supply line to the toilet, residents opting for a smart toilet or personal hygiene device must connect to the available non-potable water supply or re-pipe with a potable water supply line for proper installation. This can be expensive after move-in but can be economically addressed during initial construction. Personal hygiene devices and smart toilets are crucial for many Americans with medical conditions, special needs or limited mobility. An allowance in the existing code to include provisions for these products is important to ensuring public health and safety. The water quality used with smart toilets and personal hygiene devices must be free of any pathogens that could cause infection or disease and, therefore, must be treated at a minimum in accordance with regulations for potable water.
Figure 1: Smart Toilet

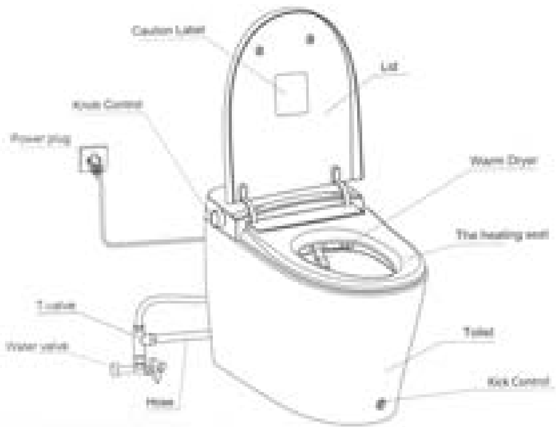


Figure 2: Personal Hygiene Device Connection

Cost Impact: Increase

Estimated Immediate Cost Impact:

Increase cost of $215 for rough in of potable water supply line.

Estimated Immediate Cost Impact Justification (methodology and variables):

a. Rough-in of potable water line that is dry until in use:

i. Parts: 2 shutoff valves ($40 ea.), 20 ft copper pipe ($60),

ii. Plumbing Labor: 0.5-hour labor @$150/hr ($75).

iii. Total $215

Estimated Life Cycle Cost Impact:

Savings of $735 for re piping when compared with the cost of rough in of potable supply pipe.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

i. Construction

1. Parts: Estimate Drywall $2.50/sq ft., Tile $10/sq ft.
2. Construction Labor: $100/hr.
3. Construction Subtotal: Remove and restore 20sq ft of drywall and tile. 2 hr labor plus parts (Sub Total $450)

ii. Plumbing

1. Parts: Shutoff valve ($40), 20 ft copper pipe ($60),
2. Plumbing Labor: $150/hr
3. Plumbing Subtotal: Reframe for new plumbing, pipe and fitting installation. 2 hr labor plus parts (Sub Total: $400)

iii. Permit: $100

iv. Total $950 for re-pipe after construction.

Comment (CAH2)# 215

P157-24 Part II

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Proposed Change as Submitted

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2024 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

BLACKWATER. Wastewater that contains urine or fecal matter.

BLACKWATER CONTRIBUTION (BWC). The fraction equal to the quantity of blackwater divided by the sum of the quantities of raw and treated blackwater plus surface water, groundwater, and water from approved potable water systems.

LOG REDUCTION VALUE (LRV). The measure of the ability of a treatment process to remove or inactivate microorganisms such as bacteria, protozoa and viruses. LRV is the logarithm base 10 of the ratio of the levels of a pathogenic organism or other contaminant before and after treatment.

POTABLE REUSE. The practice of treating *wastewater* and utilizing it for potable applications.

REUSE WATER. Wastewater or rainwater treated to a level of quality suitable for reuse.

WASTEWATER. The water generated after use of freshwater, raw water, drinking water, or saline water in a deliberate application or process.

WATER REUSE SYSTEM. A system for the treatment, storage, distribution, and reuse of water including, but not limited to, wastewater and captured rainwater.

Delete without substitution:

~~SECTION P2910~~
~~NONPOTABLE WATER SYSTEMS~~

~~**P2910.1 Scope.** The provisions of this section shall govern the materials, design, construction and installation of systems for the collection, storage, treatment and distribution of nonpotable water. The use and application of nonpotable water shall comply with laws, rules and ordinances applicable in the *jurisdiction*.~~

~~**P2910.2 Water quality.** Nonpotable water for each end use application shall meet the minimum water quality requirements as established for the intended application by the laws, rules and ordinances applicable in the *jurisdiction*. Where nonpotable water from different sources is combined in a system, the system shall comply with the most stringent requirements of this code applicable to such sources.~~

~~**P2910.2.1 Residual disinfectants.** Where chlorine is used for disinfection, the nonpotable water shall contain not more than 4 ppm (4 mg/L) of chloramines or free chlorine. Where ozone is used for disinfection, the nonpotable water shall not contain gas bubbles having elevated levels of ozone at the point of use. **Exception:** Reclaimed water sources shall not be required to comply with the requirements of this section.~~

~~**P2910.2.2 Filtration required.** Nonpotable water utilized for water closet and urinal flushing applications shall be filtered by a 100 micron or finer filter. **Exception:** Reclaimed water sources shall not be required to comply with the requirements of this section.~~

~~**P2910.3 Signage required.** Nonpotable water outlets such as hose connections, open-ended pipes and faucets shall be identified at the point of use for each outlet with signage that reads, "Nonpotable water is utilized for [application name]. CAUTION: NONPOTABLE WATER. DO NOT DRINK." The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant, waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inches (12.7 mm) in height and in colors contrasting the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure P2910.3 shall appear on the signage required by this section.~~

~~**FIGURE P2910.3 PICTOGRAPH—DO NOT DRINK**~~

~~**P2910.4 Permits.** *Permits* shall be required for the construction, installation, *alteration* and *repair* of nonpotable water systems. *Construction documents*, engineering calculations, diagrams and other such data pertaining to the nonpotable water system shall be submitted with each *permit* application.~~

~~**P2910.5 Potable water connections.** Where a potable system is connected to a nonpotable water system, the potable water supply shall be protected against backflow in accordance with Section P2902.~~

~~**P2910.6 Approved components and materials.** Piping, plumbing components and materials used in collection and conveyance systems shall be manufactured of material *approved* for the intended application and compatible with any disinfection and treatment systems used.~~

~~**P2910.7 Insect and vermin control.** The system shall be protected to prevent the entrance of insects and vermin into storage tanks and piping systems. Screen materials shall be compatible with contacting system components and shall not accelerate the corrosion of system components.~~

~~**P2910.8 Freeze protection.** Where sustained freezing temperatures occur, provisions shall be made to keep storage tanks and the related piping from freezing.~~

~~**P2910.9 Nonpotable water storage tanks.** Nonpotable water storage tanks shall comply with Sections P2910.9.1 through P2910.9.11.~~

~~**P2910.9.1 Sizing.** The holding capacity of the storage tank shall be sized in accordance with the anticipated demand.~~

~~**P2910.9.2 Location.** Storage tanks shall be installed above or below grade. Above-grade storage tanks shall be protected from direct sunlight and shall be constructed using opaque, UV-resistant materials such as, but not limited to, heavily tinted plastic, lined metal, concrete and wood; or painted to prevent algae growth; or shall have specially constructed sun barriers including, but not limited to, installation in garages, *crawl spaces* or sheds. Storage tanks and their manholes shall not be located directly under any soil piping, waste piping or any source of contamination.~~

~~**P2910.9.3 Materials.** Where collected on site, water shall be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. The storage tank shall be constructed of materials compatible with any disinfection systems used to treat water upstream of the tank and with any systems used to maintain water quality within the tank. Wooden storage tanks that are not equipped with a makeup water source shall be provided with a flexible liner.~~

~~**P2910.9.4 Foundation and supports.** Storage tanks shall be supported on a firm base capable of withstanding the weight of the storage tank when filled to capacity. Storage tanks shall be supported in accordance with this code.~~

~~**P2910.9.4.1 Ballast.** Where the soil can become saturated, an underground storage tank shall be ballasted or otherwise secured to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold-down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the storage tank weight when full, consistent with the bearing capability of adjacent soil.~~

~~**P2910.9.4.2 Structural support.** Where installed below grade, storage tank installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when empty or filled with water.~~

~~**P2910.9.5 Makeup water.** Where an uninterrupted nonpotable water supply is required for the intended application, potable or reclaimed water shall be provided as a source of makeup water for the storage tank. The makeup water supply shall be protected against backflow by means of an *air gap* not less than 4 inches (102 mm) above the overflow or an *approved* backflow device in accordance with Section P2902. A *full-open valve* located on the makeup water supply line to the storage tank shall be provided. Inlets to the storage tank shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. Where makeup water is provided, the water level shall be prohibited from dropping below the source water inlet or the intake of any attached pump.~~

~~**P2910.9.5.1 Inlet control valve alarm.** Makeup water systems shall be fitted with a warning mechanism that alerts the user to a failure of the inlet control valve to close correctly. The alarm shall activate before the water within the storage tank begins to discharge into the overflow system.~~

P2910.9.6 Overflow. The storage tank shall be equipped with an overflow pipe having a diameter not less than that shown in Table P2910.9.6. The overflow outlet shall discharge at a point not less than 6 inches (152 mm) above the roof or roof drain; floor or *floor drain*; or over an open water-supplied fixture. The overflow outlet shall be covered with a corrosion-resistant screen of not less than 16 by 20 mesh per inch (630 by 787 mesh per m) and by 1/4-inch (6.4 mm) hardware cloth or shall terminate in a horizontal angle seat check valve. Drainage from overflow pipes shall be directed to prevent freezing on roof walks. The overflow drain shall not be equipped with a shutoff valve. Not less than one cleanout shall be provided on each overflow pipe in accordance with Section P3005.2.

TABLE P2910.9.6 SIZE OF DRAIN PIPES FOR WATER TANKS

TANK CAPACITY (gallons)	DRAIN PIPE (inches)
Up to 750	1
751 to 1,500	1 1/2
1,501 to 3,000	2
3,001 to 5,000	2 1/2
5,001 to 7,500	3
Over 7,500	4

For SI: 1 gallon = 3.875 liters, 1 inch = 25.4 mm.

P2910.9.7 Access. Not less than one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an *approved* locking device or other *approved* method of securing access. Below-grade storage tanks, located outside of the *building*, shall be provided with a manhole either not less than 24 inches (610 mm) square or with an inside diameter not less than 24 inches (610 mm). Manholes shall extend not less than 4 inches (102 mm) above ground or shall be designed to prevent water infiltration. Finished grade shall be sloped away from the manhole to divert surface water. Manhole covers shall be secured to prevent unauthorized access. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be not less than 4 inches (102 mm) above the finished grade level. The service port shall be secured to prevent unauthorized access. **Exception:** Storage tanks under 800 gallons (3028 L) in volume installed below grade shall not be required to be equipped with a manhole, but shall have a service port not less than 8 inches (203 mm) in diameter.

P2910.9.8 Venting. Storage tanks shall be provided with a vent sized in accordance with Chapter 31 and based on the aggregate diameter of all tank influent pipes. The reservoir vent shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of an *approved* cap or a U-bend installed with the opening directed downward. Vent outlets shall extend not less than 4 inches (102 mm) above grade, or as necessary to prevent surface water from entering the storage tank. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section P2910.7.

SECTION P2911
ON-SITE NONPOTABLE WATER REUSE SYSTEMS

P2910.9.9 Drain. A drain shall be located at the lowest point of the storage tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table P2910.9.6. Not less than one cleanout shall be provided on each drain pipe in accordance with Section P3005.2.

P2910.10 Marking and signage. Each nonpotable water storage tank shall be *labeled* with its rated capacity. The contents of storage tanks shall be identified with the words, “CAUTION: NONPOTABLE WATER. DO NOT DRINK.” Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, “DANGER—CONFINED SPACE.” Markings shall be indelibly printed on the tank, or on a tag or sign constructed of corrosion-resistant waterproof material that is mounted on the tank. The letters of the words shall be not less than 0.5 inches (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied.

P2910.11 Storage tank tests. Storage tanks shall be tested in accordance with the following:

1. Storage tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed and the tank shall remain watertight without leakage for a period of 24 hours.
2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and leaks do not exist.
3. Following a successful test of the overflow, the water level in the tank shall be reduced to a level that is 2 inches (51 mm) below the makeup water trigger point by using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed for proper operation, and successful automatic shutoff of the system at the refill threshold shall be verified. Water shall not be drained from the overflow at any time during the refill test.

P2910.12 System abandonment. If the *owner* of an on-site nonpotable water reuse system or rainwater collection and conveyance system elects to cease use of or fails to properly maintain such system, the system shall be abandoned and shall comply with the following:

1. System piping connecting to a utility-provided water system shall be removed or disabled.
2. The distribution piping system shall be replaced with an *approved* potable water supply piping system. Where an existing potable water pipe system is already in place, the fixtures shall be connected to the existing system.
3. The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filled with sand or equivalent.

P2910.13 Separation requirements for nonpotable water piping. Nonpotable water collection and distribution piping and reclaimed water piping shall be separated from the *building sewer* and potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Nonpotable water collection and distribution piping shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried nonpotable water piping shall comply with the requirements of Section P2604.

Exceptions:

1. The required separation distance shall not apply where the bottom of the nonpotable water pipe within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials conforms to Table P3002.2.
2. The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the nonpotable water pipe is not less than 12 inches (305 mm) above the top of the highest point of the nonpotable water pipe and the pipe materials comply with the requirements of Table P2906.5.
3. The required separation distance shall not apply where a nonpotable water pipe is located in the same trench with a *building sewer* that is constructed of materials that comply with the requirements of Table P3002.2.
4. The required separation distance shall not apply where a nonpotable water pipe crosses a sewer pipe provided that the nonpotable water pipe is sleeved to not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing, with pipe materials that comply with Table P3002.2.
5. The required separation distance shall not apply where a potable water service pipe crosses a nonpotable water pipe, provided that the potable water service pipe is sleeved for a distance of not less than 5 feet (1524 mm) horizontally from the centerline of the nonpotable pipe on both sides of such crossing, with pipe materials that comply with Table P3002.2.
6. The required separation distance shall not apply to irrigation piping located outside of a building and downstream of the backflow preventer where nonpotable water is used for outdoor applications.

P2910.14 Outdoor outlet access. Sillcocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by nonpotable

~~water shall be located in a locked vault or shall be operable only by means of a removable key.~~

~~**P2911.1 General.** The provisions of this section shall govern the construction, installation, *alteration* and *repair* of *on-site nonpotable water reuse systems* for the collection, storage, treatment and distribution of on-site sources of nonpotable water as permitted by the *jurisdiction*.~~

~~**P2911.2 Sources.** *On-site nonpotable water reuse systems* shall collect waste discharge only from the following sources: bathtubs, showers, lavatories, clothes washers and laundry trays. Water from other *approved* nonpotable sources including swimming pool backwash operations, air conditioner condensate, rainwater, foundation drain water, fluid cooler discharge water and fire pump test water shall be permitted to be collected for reuse by *on-site nonpotable water reuse systems*, as *approved* by the *building official* and as appropriate for the intended application.~~

~~**P2911.2.1 Prohibited sources.** Reverse osmosis system reject water, water softener backwash water, *kitchen* sink wastewater, dishwasher wastewater and wastewater containing urine or fecal matter shall not be collected for reuse within an on-site nonpotable water reuse system.~~

~~**P2911.3 Traps.** Traps serving fixtures and devices discharging wastewater to *on-site nonpotable water reuse systems* shall comply with the Section P3201.2.~~

~~**P2911.4 Collection pipe.** *On-site nonpotable water reuse systems* shall utilize drainage piping *approved* for use within plumbing drainage systems to collect and convey untreated water for reuse. Vent piping *approved* for use within plumbing venting systems shall be utilized for vents within the *graywater* system. Collection and vent piping materials shall comply with Section P3002.~~

~~**P2911.4.1 Installation.** Collection piping conveying untreated water for reuse shall be installed in accordance with Section P3005.~~

~~**P2911.4.2 Joints.** Collection piping conveying untreated water for reuse shall utilize joints *approved* for use with the distribution piping and appropriate for the intended applications as specified in Section P3002.~~

~~**P2911.4.3 Size.** Collection piping conveying untreated water for reuse shall be sized in accordance with drainage sizing requirements specified in Section P3005.4.~~

~~**P2911.4.4 Marking.** Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 30.~~

~~**P2911.5 Filtration.** Untreated water collected for reuse shall be filtered as required for the intended end use. Filters shall be accessible for inspection and maintenance. Filters shall utilize a pressure gauge or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.~~

~~**P2911.6 Disinfection.** Nonpotable water collected on site for reuse shall be disinfected, treated or both to provide the quality of water needed for the intended end-use application. Where the intended end-use application does not have requirements for the quality of water, disinfection and treatment of water collected on site for reuse shall not be required. Nonpotable water collected on site containing untreated *graywater* shall be retained in collection reservoirs for not more than 24 hours.~~

~~**P2911.6.1 Graywater used for fixture flushing.** *Graywater* used for flushing water closets and urinals shall be disinfected and treated by an on-site water reuse treatment system complying with NSF 350.~~

~~**P2911.7 Storage tanks.** Storage tanks utilized in *on-site nonpotable water reuse systems* shall comply with Section P2910.9 and Sections P2911.7.1 through P2911.7.3.~~

~~**P2911.7.1 Location.** Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table P2911.7.1.~~

TABLE P2911.7.1 LOCATION OF NONPOTABLE WATER REUSE STORAGE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Public water main	10
Seepage pits	5
Septic tanks	5
Streams and lakes	50
Water service	5
Water wells	50

For SI: 1 foot = 304.8 mm.

P2911.7.2 Inlets. Storage tank inlets shall be designed to introduce water into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the storage tank.

P2911.7.3 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank, and shall not skim water from the surface.

P2911.8 Valves. Valves shall be supplied on *on-site nonpotable water reuse systems* in accordance with Sections P2911.8.1 and P2911.8.2.

P2911.8.1 Bypass valve. One three-way diverter valve certified to NSF 50 or other *approved* device shall be installed on collection piping upstream of each storage tank, or drainfield, as applicable, to divert untreated on-site reuse sources to the sanitary sewer to allow servicing and inspection of the system. Bypass valves shall be installed downstream of fixture traps and vent connections. Bypass valves shall be *labeled* to indicate the direction of flow, connection and storage tank or drainfield connection. Bypass valves shall be installed in accessible locations. Two shutoff valves shall not be installed to serve as a bypass valve.

P2911.8.2 Backwater valve. Backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section P3008.

P2911.9 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be accessible and removable in order to perform *repair*, maintenance and cleaning. The minimum flow rate and *flow pressure* delivered by the pumping system shall be appropriate for the application and in accordance with Section P2903.

P2911.10 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the nonpotable water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2.

P2911.11 Distribution pipe. Distribution piping utilized in *on-site nonpotable water reuse systems* shall comply with Sections P2911.11.1 through P2911.11.3. **Exception:** Irrigation piping located outside of the *building* and downstream of a backflow preventer.

P2911.11.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section P2906 for nonpotable water.

P2911.11.2 Design. On-site nonpotable water reuse distribution piping systems shall be designed and sized in accordance with Section P2903 for the intended application.

Delete without substitution:

P2911.11.3 Marking. On-site nonpotable water distribution piping labeling and marking shall comply with Section P2901.2.

P2911.12 Tests and inspections. Tests and inspections shall be performed in accordance with Sections P2911.12.1 through P2911.12.6.

P2911.12.1 Collection pipe and vent test. Drain, waste and vent piping used for on-site water reuse systems shall be tested in accordance with Section P2503.

P2911.12.2 Storage tank test. Storage tanks shall be tested in accordance with Section P2910.11.

P2911.12.3 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section P2503.7.

P2911.12.4 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section P2503.8.

P2911.12.5 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section P2910.7.

P2911.12.6 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the *jurisdiction*.

P2911.13 Operation and maintenance manuals. Operation and maintenance materials shall be supplied with nonpotable on-site water reuse systems in accordance with Sections P2911.13.1 through P2911.13.4.

P2911.13.1 Manual. A detailed operations and maintenance manual shall be supplied in hard-copy form for each system.

P2911.13.2 Schematics. The manual shall include a detailed system schematic, the location of system components and a list of system components that includes the manufacturers and model numbers of the components.

P2911.13.3 Maintenance procedures. The manual shall provide a schedule and procedures for system components requiring periodic maintenance. Consumable parts including filters shall be noted along with part numbers.

P2911.13.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

SECTION P2912
NONPOTABLE RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS

P2912.1 General. The provisions of this section shall govern the construction, installation, *alteration* and *repair* of rainwater collection and conveyance systems for the collection, storage, treatment and distribution of rainwater for nonpotable applications. For nonpotable rainwater systems, the provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment and distribution of nonpotable water. The use and application of nonpotable water shall comply with laws, rules and ordinances applicable in the *jurisdiction*.

P2912.2 Collection surface. Rainwater shall be collected only from above-ground impervious roofing surfaces constructed from *approved* materials. Collection of water from vehicular parking or pedestrian walkway surfaces shall be prohibited except where the water is used exclusively for landscape irrigation. Overflow and bleed-off pipes from roof-mounted *appliances* including, but not limited to, evaporative coolers, water heaters and solar water heaters shall not discharge onto rainwater collection surfaces.

P2912.3 Debris excluders. Downspouts and leaders shall be connected to a roof washer and shall be equipped with a debris excluder or equivalent device to prevent the contamination of collected rainwater with leaves, sticks, pine needles and similar material. Debris excluders and equivalent devices shall be self cleaning.

P2912.4 Roof washer. An amount of rainwater shall be diverted at the beginning of each rain event, and not allowed to enter the storage tank, to wash accumulated debris from the collection surface. The amount of rainfall to be diverted shall be field adjustable as necessary to minimize storage tank water contamination. The roof washer shall not rely on manually operated valves or devices and shall operate automatically. Diverted rainwater shall not be drained to the roof surface and shall be discharged in a manner consistent with the stormwater runoff requirements of the *jurisdiction*. Roof washers shall be accessible for maintenance and service.

P2912.5 Roof gutters and downspouts. Gutters and downspouts shall be constructed of materials that are compatible with the collection surface and the rainwater quality for the desired end use. Joints shall be watertight.

P2912.5.1 Slope. Roof gutters, leaders and rainwater collection piping shall slope continuously toward collection inlets and shall be free of leaks. Gutters and downspouts shall have a slope of not less than $^1/_8$ inch per foot (10.4 mm/m) along their entire length. Gutters and downspouts shall be installed so that water does not pool at any point.

P2912.5.2 Cleanouts. Cleanouts shall be provided in the water conveyance system to allow *access to* filters, flushes, pipes and downspouts.

P2912.6 Drainage. Water drained from the roof washer or debris excluder shall not be drained to the sanitary sewer. Such water shall be diverted from the storage tank and shall discharge to a location that will not cause erosion or damage to property. Roof washers and debris excluders shall be provided with an automatic means of self draining between rain events and shall not drain onto roof surfaces.

P2912.7 Collection pipe. Rainwater collection and conveyance systems shall utilize drainage piping *approved* for use within plumbing drainage systems to collect and convey captured rainwater. Vent piping *approved* for use within plumbing venting systems shall be utilized for vents within the rainwater system. Collection and vent piping materials shall comply with Section P3002.

P2912.7.4 Marking. Additional marking of collection piping conveying captured rainwater for reuse shall not be required beyond that required for sanitary drainage, waste, and vent piping by Chapter 30.

P2912.7.2 Joints. Collection piping conveying captured rainwater shall utilize joints *approved* for use with the distribution piping and appropriate for the intended applications as specified in Section P3003.

P2912.7.3 Size. Collection piping conveying captured rainwater shall be sized in accordance with drainage sizing requirements specified in Section P3005.4.

P2912.7.1 Installation. Collection piping conveying captured rainwater shall be installed in accordance with Section P3005.3.

P2912.8 Filtration. Collected rainwater shall be filtered as required for the intended end use. Filters shall be accessible for inspection and maintenance. Filters shall utilize a pressure gauge or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

P2912.9 Disinfection. Where the intended application for rainwater requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use.

P2912.10 Storage tanks. Storage tanks utilized in nonpotable rainwater collection and conveyance systems shall comply with Section P2910.9 and Sections P2912.10.1 through P2912.10.3.

P2912.10.1 Location. Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table P2912.10.1.

TABLE P2912.10.1 LOCATION OF RAINWATER STORAGE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5

For SI: 1 foot = 304.8 mm

P2912.10.2 Inlets. Storage tank inlets shall be designed to introduce collected rainwater into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the storage tank.

P2912.10.3 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

P2912.11 Valves. Valves shall be supplied on rainwater collection and conveyance systems in accordance with Sections P2912.11.1 and P2912.11.2.

P2912.11.1 Influent diversion. A means shall be provided to divert storage tank influent to allow for maintenance and repair of the storage tank system.

P2912.11.2 Backwater valve. Backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section P3008.

P2912.12 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be easily accessible and removable in order to perform repair, maintenance and cleaning. The minimum flow rate and *flow pressure* delivered by the pumping system shall be appropriate for the application and in accordance with Section P2903.

P2912.13 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the rainwater distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2.

P2912.14 Distribution pipe. Distribution piping utilized in rainwater collection and conveyance systems shall comply with Sections P2912.14.1 through P2912.14.3. **Exception:** Irrigation piping located outside of the *building* and downstream of a backflow preventer.

P2912.14.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section P2906 for nonpotable water.

P2912.14.2 Design. Distribution piping systems shall be designed and sized in accordance with Section P2903 for the intended application.

P2912.14.3 Labeling and marking. Nonpotable rainwater distribution piping labeling and marking shall comply with Section P2901.2.

P2912.15 Tests and inspections. Tests and inspections shall be performed in accordance with Sections P2912.15.1 through P2912.15.8.

P2912.15.1 Roof gutter inspection and test. Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section P2912.5.1. Gutters shall be tested by pouring not less than 1 gallon of water (3.8 L) into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.

P2912.15.2 Roofwasher test. Roofwashers shall be tested by introducing water into the gutters. Proper diversion of the first quantity of water in accordance with the requirements of Section P2912.4 shall be verified.

P2912.15.3 Collection pipe and vent test. Drain, waste and vent piping used for rainwater collection and conveyance systems shall be tested in accordance with Section P2503.

P2912.15.4 Storage tank test. Storage tanks shall be tested in accordance with Section P2910.11.

P2912.15.5 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section P2503.7.

P2912.15.6 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section P2503.8.

P2912.15.7 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section P2910.7.

P2912.15.8 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the *jurisdiction*.

P2912.16 Operation and maintenance manuals. Operation and maintenance manuals shall be supplied with rainwater collection and conveyance systems in accordance with Sections P2912.16.1 through P2912.16.4.

P2912.16.1 Manual. A detailed operations and maintenance manual shall be supplied in hard-copy form for each system.

P2912.16.2 Schematics. The manual shall include a detailed system schematic, the location of system components and a list of system components that includes the manufacturers and model numbers of the components.

P2912.16.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

P2912.16.4 Operations procedures. The manual shall include system startup and shutdown procedures, and detailed operating procedures.

SECTION P2913
RECLAIMED WATER SYSTEMS

P2913.1 General. The provisions of this section shall govern the construction, installation, *alteration* and *repair* of systems supplying nonpotable reclaimed water.

P2913.2 Water pressure-reducing valve or regulator. Where the reclaimed water pressure supplied to the *building* exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the reclaimed water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2

P2913.3 Reclaimed water systems. The design of the reclaimed water systems shall conform to accepted engineering practice.

P2913.3.1 Distribution pipe. Distribution piping shall comply with Sections P2913.3.1.1 through P2913.3.1.3. **Exception:** Irrigation piping located outside of the *building* and downstream of a backflow preventer.

~~**P2913.3.1.1 Materials, joints and connections.** Distribution piping conveying reclaimed water shall conform to standards and requirements specified in Section P2906 for nonpotable water.~~

~~**P2913.3.1.2 Design.** Distribution piping systems shall be designed and sized in accordance with Section P2903 for the intended application.~~

~~**P2913.3.1.3 Labeling and marking.** Nonpotable rainwater distribution piping labeling and marking shall comply with Section P2901.2.~~

~~**P2913.4 Tests and inspections.** Tests and inspections shall be performed in accordance with Sections P2913.4.1 and P2913.4.2.~~

~~**P2913.4.1 Water supply system test.** The testing of makeup water supply piping and reclaimed water distribution piping shall be conducted in accordance with Section P2503.7.~~

~~**P2913.4.2 Inspection and testing of backflow prevention assemblies.** The testing of backflow preventers shall be conducted in accordance with Section P2503.8.~~

Add new text as follows:

CHAPTER 34
WATER REUSE SYSTEMS

SECTION 3401
GENERAL

P3401.1 General. The provisions of this chapter shall govern the materials, design, construction, and installation of systems for the treatment, storage, and distribution of *reuse water*. The provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment, and distribution. The application of water reuse systems shall comply with all applicable laws, rules, and ordinances of the jurisdiction.

P3401.2 Reuse water quality. Reuse water quality shall meet the minimum requirements as specified in Tables P3401.2(1), P3401.2(2), P3401.2(3), and as established for the intended application by all applicable laws, rules, and ordinances of the jurisdiction. Where water from multiple sources is combined, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.

TABLE P3401.2(1) REQUIRED WATER QUALITY FOR REUSE APPLICATIONS

Use Category	Application	Exposure[a]	Quality Tier[b]
Direct Potable Reuse	Direct Potable Reuse	DC	4
Indirect Potable Reuse	Aquifer Recharge - Direct Injection	IC	2
	Aquifer Recharge - Surface Application	IC	2
(Treatment Follows Reuse Application)	Aquifer Storage and Recovery	IC	2
	Rapid Infiltration Basins	IC	2
	Infiltration/Percolation Lagoons	IC	2
	Raw Water Augmentation	IC	2
	Saltwater Intrusion Barrier	IC	2
	Surface Water Augmentation to a Supply Source	IC	2
-	Food crop w/ processing that destroys pathogens (Restricted Access)	LC	1
-	Orchards and Vineyards	AC/LC	4/1
-	Water contacts edible portion of food crop (Includes Root Crops)	AC	4
Irrigation of Food Crops for Human Consumption (Spray/Drip)			

	Water doesn't contact edible portion of food crop (Restricted Access)	IC	2
	Christmas Tree Farms	AC/LC	3/1
	Hemp Crops	AC/LC	3/1
Irrigation of Crops Not for Human Consumption	Fiber crops	AC/LC	3/1
	Fodder /Feed Crop/ Forage Crops	AC/LC	3/1
(Spray/Drip)	Ornamental nursery stock	AC/LC	3/1
	Silviculture / Tree Farms	AC/LC	3/1
	Sod/Turf Crops	AC/LC	3/1
	Tobacco	AC/LC	3/1
	Athletic Fields	AC/LC	3/1
Landscape Irrigation	Cemeteries	AC/LC	3/1
	College and University Campuses	AC/LC	3/1
(Spray/Drip)	Commercial Campuses	AC/LC	3/1
	Golf Courses (Restricted Access)	LC	1
	Golf Courses (Unrestricted Access)	AC/LC	3/1
	Highway/Freeway Medians/ Roadside Vegetation	AC/LC	3/1
	Open Access Land Irrigation	AC/LC	3/1
	Pasture for Milk Producing Animals (Restricted Access)	LC	1
	Pasture for Non-Milk Producing Animals (Restricted Access)	LC	1
	Parks	AC/LC	3/1
	Playgrounds	AC/LC	3/1
	Residential Irrigation	AC/LC	3/1
	Landscape Irrigation (Restricted Access)	LC	1
	Urban Landscaping	AC/LC	3/1
	Schoolyards	AC/LC	3/1
Water Features	Decorative Fountains	AC	3
	Landscape Impoundments (With Fountain(s))	AC	3
	Landscape Impoundments (Without Fountain(s))	LC	1
	Ponds and Lagoons	LC	1
	Recreational Impoundments (Restricted Access)	LC	1
	Recreational Impoundments (Unrestricted Access)	AC	3
	Reservoir Augmentation (Recreational)	AC	3
	Wetland Creation	LC	1
	Wetland Discharge / Application	LC	1
Life Safety	Fire Fighting Via Plane	AC	3
	Fire Hydrant Water Supply	AC	3
	Fire Protection systems	AC	3
	Non Structural Fire Fighting	AC	3
	Structural Fire Fighting	AC	3
Construction	Concrete and Cement mixing	LC	1
	Dust Control	LC	1
	Equipment Operation (Ex. Cooling Power Equipment)	LC	1
	Material Washing and Sieving	LC	1
	Soil Compaction and Consolidation	LC	1
	Agricultural Cleaning (Animal Washing & Animal Pens)	AC	3
Process Water	Aquaculture	LC	1
	Boiler Feed	LC	1
	Building Washing	AC	3
	Chemical Mixing (Herbicides, Pesticides, Fertilizers)	LC	1
	Commercial Car Washes	AC	3
	Commercial Laundries	AC	3
	Cooling Power Equipment	LC	1
	Cooling systems with aerosolization	AC	3
	Cooling systems with no aerosolization	LC	1
	Dust Control (Roads and Streets)	LC	1
	Flushing Sanitary Sewers	LC	1
	Flushing Toilets and Urinals	AC	3
	Bidets and personal hygiene devices	DC	4
	Frost Protection	LC	1
	Gas Pipeline Testing	LC	1
	Hydro Seeding	AC	3
	Impoundments at Fish Hatcheries	LC	1
	Industrial Oil and Gas Operations	LC	1
	Industrial Process Water (No Possibility of Human Contact)	LC	1
Process Water	Industrial Process Water (Possibility of Human Contact or Evaporative)	AC	3
	Industrial Washwater applications	AC	3
	Livestock Drinking Water (Milk Producing)	AC	3
	Livestock Drinking Water (Non-Milk Producing)	AC	3
	Parts Cleaning	LC	1
	Pool Water Makeup	AC	3

Pressure Washing	AC	3
Priming Drainage Traps	LC	1
Road Milling	LC	1
Ship Ballasting	LC	1
Snow Making (Commercial / Recreational Use)	AC	3
Snow Making (Storage)	AC	3
Stack Scrubbing	AC	3
Stream Flow Augmentation	LC	1
Street, Sidewalk, Parking Lot Cleaning (Restricted Access)	LC	1
Street, Sidewalk, Parking Lot Cleaning (Unrestricted Access)	AC	3
Vehicle and equipment Washing	AC	3
Wastewater Treatment (Process Uses)	LC	1
Window Washing	AC	3

a. Where two Exposures and two Tiers are cited, the first refers to spray irrigation and the second refers to drip irrigation (or other subsurface irrigation).

b. Where the equipment manufacturer or the jurisdiction requires a level of free residual disinfectant that exceeds the requirement of the quality Tier indicated, such excess shall be provided.

DC (Quality Tier 4) = Direct Public Contact/Consumption Intended

AC (Quality Tier 3) = Aerosolization, or Accidental/Limited Consumption Possible

IC (Quality Tier 2) = Indirect Public Consumption Intended or Possible

LC (Quality Tier 1) = Limited Contact / No Consumption Intended

TABLE P3401.2(3) LOG REDUCTION (LRV) CREDITS APPLICABLE TO DPR BASED ON SOURCE WATER

Source Water	Maximum LRV Credits for DPR
Blackwater	0/0/0
Blackwater blended with ground water [a]	*LRV* credit [b] = negative log of *BWC*
Blackwater blended with surface water [a]	LRV credit [b] = negative log of BWC
Blackwater blended with groundwater and surface water [a]	*LRV* credit [b] = negative log of *BWC*
Graywater	Case by case basis
Stormwater	Case by case basis
Rainwater	Case by case basis
Industrial Water	Case by case basis
Process water	Case by case basis

a. Groundwater and surface waters must be either an untreated source of drinking water approved by the jurisdiction or a treated drinking water approved by the jurisdiction.

b. LRV credit for all source waters containing blackwater shall not exceed 2.0.

TABLE P3401.2.2(2) WATER QUALITY FOR TIERS OF REUSE

Quality Tier	Minimum Design Water Quality
4	United States Environmental Protection Agency (USEPA) Primary and Secondary Drinking Water Quality Standards (40 CFR 141), plus 18/15/15 Log Removal of Enteric Viruses, Giardia, and Cryptosporidium
3	Compliant with all applicable laws, rules, ordinances, and NSF/ANSI 350

2	Compliant with all applicable laws, rules, ordinances, and end use fixture / equipment manufacturer requirements
1	Compliant with all applicable laws, rules, ordinances, and end use fixture / equipment manufacturer requirements

P3401.3 Signage required. Where nonpotable water is supplied to outlets such as hose connections, hydrants, open-ended pipes and faucets each outlet shall be identified at the point of use with signage that reads as follows: "CAUTION: NONPOTABLE WATER – DO NOT DRINK." The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and in colors in contrast to the background on which they are applied. In addition to the required text, the pictograph shown in Figure P3401.3 shall appear on the signage required by this section.

FIGURE P3401.3 PICTOGRAPH—DO NOT DRINK

P3401.4 Permits. Permits shall be required for the construction, installation, operation, alteration and repair of water reuse systems. Construction documents, engineering calculations, diagrams, operation and maintenance manuals, and other such data pertaining to the water reuse system shall be submitted with each permit application.

P3401.5 Potable water connections. Where a potable system is connected to a nonpotable water system, the potable water supply shall be protected against backflow in accordance with Section P2902.

P3401.6 Components and materials. Piping, plumbing components, and materials used in conveyance and distribution systems shall be of material *approved* for the intended application.

P3401.7 Insect and vermin control. The system shall be protected to prevent the entrance of insects and vermin into process tanks and equipment, storage tanks and piping systems. Screen materials shall be compatible with contacting system components and shall not accelerate the corrosion of system components.

P3401.8 Freeze protection. Where freezing temperatures occur, provisions shall be made to keep storage tanks, process tanks and equipment, and the related piping from freezing.

P3401.9 Water tanks. Water storage and process tanks shall comply with Sections P3401.9.1 through P3401.9.10.

P3401.9.1 Location. Any storage tank, process tank and equipment, or portion thereof that is above grade shall be protected from direct exposure to sunlight by one of the following methods:

1. Tank construction using opaque, UV-resistant materials such as heavily tinted plastic, fiberglass, lined metal, concrete, or painted to prevent algae growth.
2. Specially constructed sun barriers.
3. Installation in garages, crawl spaces or sheds.

P3401.9.2 Materials. Prior to treatment for reuse, water shall be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. The tank shall be constructed of materials compatible with all disinfection systems used to treat water upstream of the tank and with all systems used to maintain water quality in the tank.

P3401.9.3 Foundation and supports.. All tanks shall be supported on a firm base capable of withstanding the weight of the tank when filled to capacity. Tanks shall be supported in accordance with the *International Building Code*.

P3401.9.3.1 Ballast. Where the soil can become saturated, an underground tank shall be ballasted, or otherwise secured, to resist buoyant forces when empty. The combined weight of the empty tank and hold-down ballast shall exceed the buoyancy force applied to the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to resist the maximum buoyant forces when the tank is empty, and to support the weight of the tank when full, consistent with the bearing capability of adjacent soil.

P3401.9.3.2 Structural support. Where installed below grade, tank installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when empty or filled with water.

P3401.9.4 Makeup water. Where an uninterrupted supply is required for the intended application, an additional source of makeup water shall be provided for the storage tank. All makeup water supplies shall be protected against backflow in accordance with Section P2902. A *full-open valve* located on the makeup water supply lines to the storage tank shall be provided. Flow into the storage tank shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. The water level shall not be permitted to drop below the intake of any pump supplying makeup water.

P3401.9.5 Overflow. Tanks shall be equipped with an overflow pipe having a diameter not less than that shown in Table P3401.9.5. The overflow pipe shall be protected from insects and vermin and shall discharge in a manner consistent with all applicable laws, rules, and ordinances of the jurisdiction for storm water runoff requirements. The overflow pipe shall discharge at a sufficient distance from the tank to avoid damaging the tank foundation or the adjacent property. Drainage from overflow pipes shall be directed to prevent freezing on roof walkways, and on sidewalks, pavement, and other accessways subject to vehicular or pedestrian traffic. The overflow drain shall not be equipped with a shutoff valve. A cleanout shall be provided on each overflow pipe in accordance with Section P3005.2.

TABLE P3401.9.5 SIZE OF DRAIN PIPES FOR WATER TANKS

TANK CAPACITY (gallons)	DRAIN PIPE (inches)
Up to 750	1
751 to 1,500	1$^1/_2$
1,501 to 3,000	2
3,001 to 3,000	2$^1/_2$
5,001 to 7,500	3
Over 7,500	4

For SI: 1 gallon = 3.875 liters, 1 inch = 25.4 mm.

P3401.9.6 Access. Not less than one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an *approved* locking device or other *approved* method of securing access. Below-grade tanks, located outside of the building, shall be provided with an access opening either not less than 24 inches (610 mm) square or with an inside diameter not less than 24 inches (610 mm). An access opening shall extend not less than 4 inches (102 mm) above ground and shall be designed to prevent water infiltration. The finished grade shall be sloped away from the maintenance hole to divert surface water. Access opening covers shall be secured to prevent unauthorized access. Service ports in an access opening shall be not less than 8 inches (203 mm) in diameter and shall be not less than 4 inches (102 mm) above the finished grade level. The service port shall be secured to prevent unauthorized access. Access locations to confined spaces shall be labeled “CONFINED SPACE.” **Exception:** Tanks that are less than 800 gallons (3028 L) in volume and installed below grade shall not be required to be equipped with an access opening provided that the tank has a service port of not less than 8 inches (203mm) in diameter.

P3401.9.7 Venting. Tanks that receive flow by gravity shall be provided with a vent sized in accordance with Chapter 31 and based on the aggregate diameter of all tank influent pipes. The reservoir vent shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of an approved cap or U-bend installed with the opening directed downward. Vent outlets shall extend not less than 4 inches (102 mm) above grade or as necessary to prevent surface water from entering the tank. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section P3401.7.

P3401.9.8 Draining of tanks. Tanks shall be provided with a means of emptying the contents for the purpose of service or cleaning. Tanks shall be drained by using a pump or by a drain located at the lowest point in the tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table P3401.9.5.Not less than one cleanout shall be provided on each drain pipe in accordance with Section P3005.2.

P3401.9.9 Marking and signage. Each nonpotable water tank shall be labeled with its rated volumetric capacity. The contents of tanks shall be identified with the words “CAUTION: NONPOTABLE WATER – DO NOT DRINK.” Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, “DANGER – CONFINED SPACE.” Markings shall be indelibly printed on the tank or on a tag or sign constructed of corrosion-resistant waterproof material that is mounted on the tank. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied

P3401.9.10 Tank tests. Pressurized tanks shall be certified in accordance with Section P2609.4. Tanks that receive flow by gravity shall be tested in accordance with the following:
Tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed and the tank shall remain watertight without leakage for a period of 24 hours.

1. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and that there are no leaks.
2. The tank drain shall be observed for proper operation.
3. The makeup water system shall be observed for proper operation, and successful automatic shutoff of the system at the refill threshold shall be verified.

P3401.10 System abandonment. If the owner of an on-site *water reuse system* or components thereof elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with Sections P3401.10.1 through P3401.10.3.

P3401.10.1 Utility-connected piping. All system piping connecting to a utility-provided water system shall be removed or disabled.

P3401.10.2 Distribution piping. The distribution piping system shall be removed or replaced with an approved potable water supply piping system. Where an existing potable pipe system is already in place, the fixtures shall be connected to the existing system.

P3401.10.3 Tanks. Tank(s) shall be removed, or secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

P3401.11 Trenching requirements for nonpotable water piping. Nonpotable water distribution piping shall be separated from the *building sewer* and potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Nonpotable water distribution piping shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried nonpotable water piping shall comply with the requirements of Section P2604. **Exceptions:**

1. The required separation distance shall not apply where the bottom of the nonpotable water pipe within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the top of the highest point of the *sewer* and the pipe materials conform to Table P3002.2.

2. The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the nonpotable water pipe is not less than 12 inches (305 mm) above the top of the highest point of the nonpotable water pipe and the pipe materials comply with the requirements of Table P2906.5
3. Nonpotable water pipe is permitted to be located in the same trench as a *building sewer*, provided that such sewer is constructed of materials that comply with the requirements of Table P3002.1(2).
4. The required separation distance shall not apply where a nonpotable water pipe crosses a sewer pipe, provided that the pipe is sleeved to not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing, with pipe materials that comply with Table P3002.1(2).
5. The required separation distance shall not apply where a potable water service pipe crosses a nonpotable water pipe, provided that the potable water service pipe is sleeved for a distance of not less than 5 feet (1524 mm) horizontally from the centerline of the nonpotable pipe on both sides of such crossing, with pipe materials that comply with Table P3002.1(2).
6. Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where nonpotable water is used for outdoor applications.

P3401.12 Outdoor outlet access. Sillcocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by nonpotable water shall be located in a locked vault or shall be operable only by means of a removable key and marked in accordance with Section P3401.3.

P3401.13 Operation and Monitoring. The design, installation and continued operation of water reuse systems shall be in accordance with an approved operating and monitoring program. The program shall be implemented by an individual or entity in accordance with the requirements of the *International Property Maintenance Code*.

SECTION P3402
GRAYWATER AND BLACKWATER REUSE

P3402.1 General. The provisions of ASTM E2635 and Section P3402 shall govern the construction, installation, alteration and repair of water reuse systems.

3402.2 Graywater sources. Graywater reuse systems shall collect waste discharge from only the following sources: bathtubs, showers, lavatories, clothes washers, laundry trays, condensate and other domestic wastewaters that are not expected to contain urine, fecal matter, grease or food wastes.

P3402.3 Blackwater sources. Blackwater shall be discharged to the sanitary drainage system in accordance with Chapter 30 or to an approved on-site blackwater reuse system.

P3402.4 Other sources. Other sources including, but not limited to, condensate, reverse osmosis system reject water and water softener discharge water shall also be considered for use in a water reuse system.

P3402.5 Traps. Traps serving fixtures and devices discharging water to water reuse systems shall comply with Section P3201.2.

P3402.6 Pipe marking. Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 30.

P3402.7 Treatment. Water collected for reuse shall be treated to meet the quality standards required in Tables P3401.2(1) and P3401.2(2).

P3402.8 Treatment systems. Treatment systems shall be installed to allowaccess for inspection and maintenance. All treatment equipment shall utilize pressure gauges, level sensors, intensity meters or other approved methods to indicate when servicing or replacement is required. All treatment equipment shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.

P3402.9 Tanks. Nonpotabletanksutilized in water reuse systems shall comply with Sections P3401.9, P3402.9.1 and P3402.9.2.

P3402.9.1 Location. Tanks shall be located with a minimum horizontal distance between various elements as indicated in Table P3402.9.1.

TABLE P3402.9.1 LOCATION OF NONPOTABLE WATER REUSE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM TANK (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Public water main	10
Seepage pits	5
Septic tanks	5
Streams and lakes	50
Water service	5
Water wells	50

1 foot = 304.8 mm.

P3402.9.2 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the tank and shall not skim water from the surface.

P3402.10 Valves. Valves shall be installed on the collection piping of the *water reuse system*s in accordance with Sections P3402.10.1 and P3402.10.2.

P3402.10.1 Bypass valve. One three-way diverter valve listed and labeled to NSF 50 or other *approved* device shall be installed on collection piping upstream of each storage tank, as applicable, to divert untreated on-site reuse sources to the sanitary sewer or approved receiving tank to allow servicing and inspection of the system. Bypass valves shall be installed downstream of fixture traps and vent connections. Bypass valves shall be marked to indicate the direction of flow. Bypass valves shall be provided with access that allows for removal. Two shutoff valves shall not be installed to serve as a bypass valve.

P3402.10.2 Backwater valve. One or more backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be installed in accordance with Section P3008.

P3402.11 Pumping and control system. Mechanical equipment including pumps, valves, and treatment units shall have *access* in order to replace, repair, maintain and clean. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section P2903.

P3402.12 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2.

P3402.13 Distribution piping. Distribution piping utilized in water reuse systems shall comply with Sections P3402.13.1 through P3402.13.3. **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

P3402.13.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section P2906.

P3402.13.2 Design. Water reuse distribution piping systems shall be designed and sized in accordance with Section P2903 for the intended application.

P3402.13.3 Labeling and marking. Nonpotable water distribution piping labeling and marking shall comply with Section P2901.2.

P3402.14 Tests and Inspections. Tests and inspections shall be witnessed by the designer and performed in accordance with Sections P3402.14.1 through P3402.14.7.

P3402.14.1 Collection pipe and vent test. Drain, waste and vent piping used for on-site water reuse systems shall be tested in accordance with Section P2503.5.

P3402.14.2 Tank test. Tanks shall be tested in accordance with Section P3401.9.10.

P3402.14.3 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section P2503.7.

P3402.14.4 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section P2503.8.

P3402.14.5 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the tank and piping systems in accordance with Section P3401.7.

P3402.14.6 Initial water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with all applicable laws, rules and ordinances of the jurisdiction.

P3402.14.7 Operational water quality testing. The quality of the water for the intended application(s) shall be verified at the point of use in accordance with all applicable laws, rules, ordinances of the jurisdiction, and in accordance with the operation and maintenance manual, and where required, the operating permit.

P3402.15 Operation and maintenance manuals. Operation and maintenance materials shall be supplied with nonpotable on-site*water reuse system*s in accordance with Sections P3402.15.1 through P3402.15.4 and the maintenance program shall be implemented by an individual or entity in accordance with the requirements of the *International Property Maintenance Code*.

P3402.15.1 Manual. A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

P3402.15.2 Schematics. The manual shall include a detailed system schematic, and the locations and a list of all system components, including manufacturer and model number.

P3402.15.3 Maintenance procedures. The manual shall provide a schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

P3402.15.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

SECTION 3403
NONPOTABLE RAINWATER COLLECTION SYSTEMS

P3403.1 General. The provisions of this section shall govern the construction, installation, alteration and repair of rainwater collection and conveyance systems for the collection, storage, treatment and distribution of rainwater for nonpotable applications. For nonpotable rainwater systems, the provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment and distribution of nonpotable water. The use and application of nonpotable water shall comply with laws, rules and ordinances applicable in the jurisdiction.

P3403.2 Collection surface. Rainwater shall be collected only from above-ground impervious roofing surfaces constructed from approved materials. Collection of water from vehicular parking or pedestrian walkway surfaces shall be prohibited except where the water is used exclusively for landscape irrigation. Overflow and bleed-off pipes from roof-mounted appliances including, but not limited to, evaporative coolers, water heaters and solar water heaters shall not discharge onto rainwater collection surfaces.

P3403.3 Debris excluders. Downspouts and leaders shall be connected to a roof washer and shall be equipped with a debris excluder or equivalent device to prevent the contamination of collected rainwater with leaves, sticks, pine needles and similar material. Debris excluders and equivalent devices shall be self-cleaning.

P3403.4 Roof washer. An amount of rainwater shall be diverted at the beginning of each rain event, and not allowed to enter the storage tank, to wash accumulated debris from the collection surface. The amount of rainfall to be diverted shall be field adjustable as necessary to minimize storage tank water contamination. The roof washer shall not rely on manually operated valves or devices, and shall operate automatically. Diverted rainwater shall not be drained to the roof surface, and shall be discharged in a manner consistent with the stormwater runoff requirements of the jurisdiction. Roof washers shall be accessible for maintenance and service.

P3403.5 Roof gutters and downspouts . Gutters and downspouts shall be constructed of materials that are compatible with the collection surface and the rainwater quality for the desired end use. Joints shall be watertight.

P3403.5.1 Slope. Roof gutters, leaders and rainwater collection piping shall slope continuously toward collection inlets and shall be free of leaks. Gutters and downspouts shall have a slope of not less than $^1/_8$ inch per foot (10.4 mm/m) along their entire length. Gutters and downspouts shall be installed so that water does not pool at any point.

P3403.5.2 Cleanouts. Cleanouts shall be provided in the water conveyance system to allow access to filters, flushes, pipes and downspout

P3403.6 Drainage. Water drained from the roof washer or debris excluder shall not be drained to the sanitary sewer. Such water shall be diverted from the storage tank and shall discharge to a location that will not cause erosion or damage to property. Roof washers and debris excluders shall be provided with an automatic means of self-draining between rain events and shall not drain onto roof surfaces.

P3403.7 Collection pipe. Rainwater collection and conveyance systems shall utilize drainage piping approved for use within plumbing drainage systems to collect and convey captured rainwater. Vent piping approved for use within plumbing venting systems shall be utilized for vents within the rainwater system. Collection and vent piping materials shall comply with Section P3002.

P3403.7.1 Installation. Collection piping conveying captured rainwater shall be installed in accordance with Section P3005.3.

P3403.7.2 Joints. Collection piping conveying captured rainwater shall utilize joints approved for use with the distribution piping and appropriate for the intended applications as specified in Section P3003.

P3403.7.3 Size. Collection piping conveying captured rainwater shall be sized in accordance with drainage-sizing requirements specified in Section P3005.4

P3403.7.4 Marking. Additional marking of collection piping conveying captured rainwater for reuse shall not be required beyond that required for sanitary drainage, waste, and vent piping by Chapter 30.

P3403.8 Filtration. Collected rainwater shall be filtered as required for the intended end use. Filters shall be accessible for inspection and maintenance. Filters shall utilize a pressure gauge or other approved method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

P3403.9 Disinfection. Where the intended application for rainwater requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use.

P3403.10 Storage tanks. Storage tanks utilized in nonpotable rainwater collection and conveyance systems shall comply with Section P3401.9 and Sections P3403.10.1 through P3403.10.3.

P3403.10.1 Location. Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table P3403.10.1.

TABLE P3403.10.1 LOCATION OF RAINWATER STORAGE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE (feet)
Critical root zone	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5

For SI: 1 foot = 304.8 mm

P3403.10.2 Inlets. Storage tank inlets shall be designed to introduce collected rainwater into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the storage tank.

P3403.10.3 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

P3403.11 Valves. Valves shall be supplied on rainwater collection and conveyance systems in accordance with Sections P3403.11.1 and P3403.11.2.

P3403.11.1 Influent diversion. A means shall be provided to divert storage tank influent to allow for maintenance and repair of the storage tank system.

P3403.11.2 Backwater valve. Backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section P3008.

P3403.12 Pumping and control system.. Mechanical equipment including pumps, valves and filters shall be easily accessible and removable in order to perform repair, maintenance and cleaning. The minimum flow rate and flow pressure delivered by the pumping system shall appropriate for the application and in accordance with Section P2903.

P3403.13 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the rainwater distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2.

P3403.14 Distribution pipe. Distribution piping utilized in rainwater collection and conveyance systems shall comply with Sections P3403.14.1 through P3403.14.3. **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventerrigation piping located outside of the building and downstream of a backflow preventer.

P3403.14.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirementsspecified in Section

P2906 for nonpotable water.

P3403.14.2 Design. Distribution piping systems shall be designed and sized in accordance with the Section P2903 for the intended application.

P3403.14.3 Labeling and marking. Nonpotable rainwater distribution piping labeling and marking shall comply with Section P2901.2.

P3403.15 Tests and inspections. Tests and inspections shall be performed in accordance with Sections P3403.15.1 through P3403.15.8.

P3403.15.1 Roof gutter inspection and test. Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section P3403.5.1. Gutters shall be tested by pouring not less than 1 gallon of water (3.8 L) into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.

P3403.15.2 Roofwasher test.. Roofwashers shall be tested by introducing water into the gutters. Proper diversion of the first quantity of water in accordance with the requirements of Section P3403.4 shall be verified.

P3403.15.3 Collection pipe and vent test. Drain, waste and vent piping used for rainwater collection and conveyance systems shall be tested in accordance with Section P2503.5.

P3403.15.4 Storage tank test . Storage tanks shall be tested in accordance with the Section P3401.9.10.

P3403.15.5 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section P2503.7.

P3403.15.6 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section P2503.8.

P3403.15.7 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section P3401.7.

P3403.15.8 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the jurisdiction.

>P3403.16 Operation and maintenance manuals.. Operation and maintenance manuals shall be supplied with rainwater collection and conveyance systems in accordance with Sections P3403.16.1 through P3403.16.4.

P3403.16.1 Manual.. A detailed operations and maintenance manual shall be supplied in hard-copy form for each system.

P3403.16.2 Schematics. The manual shall include a detailed system schematic, the location of system components and a list of system components that includes the manufacturers and model numbers of the components.

P3403.16.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

P3403.16.4 Operations procedures. The manual shall include system startup and shutdown procedures, and detailed operating procedures.

SECTION P3404
RECLAIMED WATER SYSTEMS

P3404.1 General. The provisions of this section shall govern the construction, installation, alteration and repair of systems supplying nonpotable reclaimed water.

P3404.2 Water pressure-reducing valve or regulator. Where the reclaimed water pressure supplied to the building exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the reclaimed water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section P2903.3.2.

P3404.3 Reclaimed water systems. The design of the reclaimed water systems shall conform to accepted engineering practice.

P3404.3.1 Distribution pipe. Distribution piping shall comply with Sections P3404.3.1.1 through P3404.3.1.3. **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

P3404.3.1.1 Materials, joints and connections. . Distribution piping conveying reclaimed water shall conform to standards and requirements specified in Section P2906 for nonpotable water.

P3404.3.1.2 Design. Distribution piping systems shall be designed and sized in accordance with Section P2903 for the intended application.

P3404.3.1.3 Labeling and marking. Nonpotable rainwater distribution piping labeling and marking shall comply with Section P3401.3.

P3404.4 Tests and inspections.. Tests and inspections shall be performed in accordance with Sections P3404.4.1 and P3404.4.2.

P3404.4.1 Water supply system test. The testing of makeup water supply piping and reclaimed water distribution piping shall be conducted in accordance with Section P2503.7.

P3404.4.2 Inspection and testing of backflow prevention assemblies. . The testing of backflow preventers shall be conducted in accor dance with Section P2503.8.

Add new standard(s) as follows:

N/A. 40 CFR 141 United States Environmental Protection Agency (USEPA) Primary and Secondary Drinking Water Quality Standards

Reason: A version of this proposal was presented in 2020 and rejected. Feedback from the PMGCAC has been considered and addressed herein as follows:
The definitions of graywater, wastewater, and blackwater are unclear.

It is unclear how a code official would enforce odor controls.

Odors are addressed in this proposal by reference to 40 CFR 141, NSF 350, and required compliance with all applicable laws, rules, and ordinances. Furthermore, The designer is required to address odor control in the operation and monitoring program, if the code official has any concerns.

Wastewater reuse should be governed locally, not in ICC code.

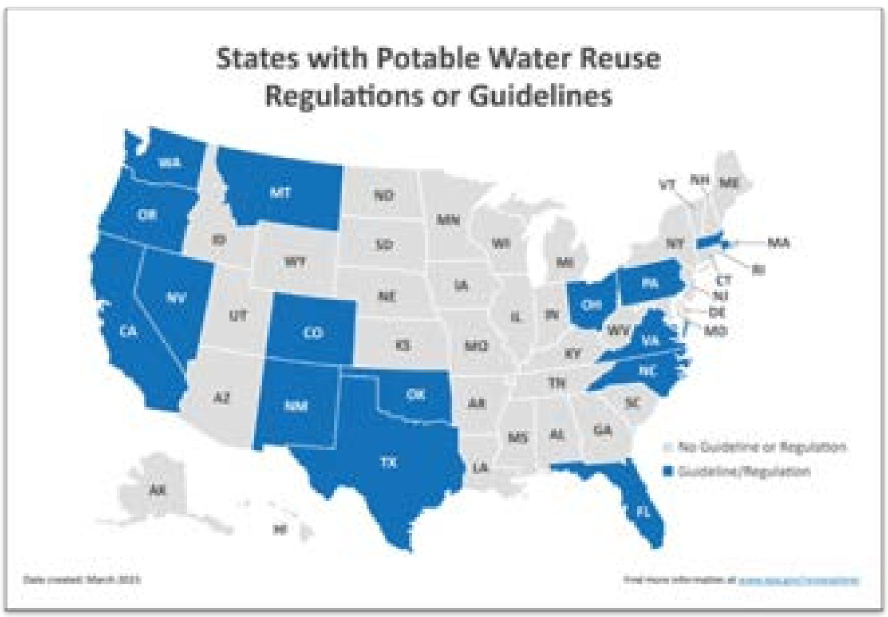
More detail is needed on blackwater reuse and related quality.

This proposal includes rigorous quality standards based on current science and focused on public safety.

Water reuse options should be expanded in the plumbing code not only because of the moral imperative to improve water efficiency and reduce consumption of valuable potable water for nonpotable purposes, but also because current technologies safely enable such practices. For example, by treating and reusing its own wastewater, a commercial office building can offset 100% of its toilet and urinal flushing demand, which can represent up to 70% of its total indoor potable water demands. In San Francisco, the San Francisco Public Utilities Commission headquarters building treats wastewater onsite for toilet and urinal flushing, reducing the use of potable water within the building by approximately 50%. In Sydney, Australia at 1 Bligh Street, a commercial high rise tower is offsetting 100% of the building’s nonpotable water demands by reusing wastewater. In Portland, Oregon the Hassalo on Eighth eco-district, a cluster of residential, commercial, and mixed-use buildings is collecting its wastewater and reusing it for toilet flushing and irrigation. This system saves up to 7 million gallons of potable water per year. In New York City, the Solaire Building has successfully operated an onsite blackwater reuse system for two decades to meet the building’s toilet flushing, cooling tower makeup, and irrigation demands. Similar to San Francisco, New York City has several buildings treating blackwater onsite for non-potable end uses. These are just a few examples of successfully operating nonpotable reuse systems with long histories.

Today, focus has shifted to Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR). IPR is when treated wastewater is supplied to a raw drinking water source such as an aquifer or reservoir. The naturally blended water is then withdrawn for treatment in a drinking water treatment facility prior to public consumption. DPR eliminates the environmental buffer and provides treated wastewater directly for public consumption.

According to the EPA, treated wastewater can be used for potable consumption in California, Colorado, Connecticut, Delaware, Florida, Massachusetts, Montana, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, Pennsylvania, Texas, Virginia, and Washington. Some of these states also permit DPR. Still other states are in the process of developing DPR regulations, including Arizona where the practice is currently labeled “Advanced Water Purification” (AWP) instead of DPR.




ADEQ
Arizona Department of Environmental Quality

FACT SHEET

What Is Advanced Water Purification?

Advanced Water Purification (AWP) is an innovative set of water treatment processes that purifies recycled water into safe drinking without the need for an environmental buffer, such as a river or lake. The purified water is then blended with other sources of water, such as groundwater or surface water, and distributed as drinking water to consumers. AWP can help increase the availability of water in areas with water scarcity and reduce the dependence on limited sources of water.

Consumer → Wastewater Treatment → Advanced Water Treatment

Key Facts About AWP

- AWP involves using proven technologies such as UltraViolet (UV) light, Reverse Osmosis (RO), ozone and biofiltration to purify water to meet or exceed state and federal drinking water standards.
- The treatment process effectively targets pathogens and harmful chemical contaminants.
- AWP is safe and effective in providing high-quality drinking water. Studies have shown that the purified water is of comparable or better quality than conventional drinking water sources.

What Is ADEQ Doing And Why?

Just like water conservation, water recycling and other sustainable water management practices, AWP is a part of Arizona's long-term strategy to ensure a safe and adequate drinking water supply sufficient to support Arizona's existing and future population.

ADEQ is working on a rule to establish a permitting process for collecting and treating wastewater to meet protective standards so that it may be used as a drinking water source.

What Are The Benefits Of AWP?

AWP is a valuable strategy for managing water resources, offering numerous benefits:

- Increased Water Quality
- Drought Resilience & Water Security
- Improved Public Health
- Reduced Environmental Impact
- Energy Efficiency
- Sustainability

Learn more about what ADEQ is doing to help utilities provide AWP as a viable drinking water source for Arizona communities and how you can get involved.

Health & Safety. Standards such as NSF 350 exist to guide the implementation of onsite treatment and reuse systems. Water quality standards are also evolving as public health regulators and utilities from across the country are adopting a health risk-based approach that applies to water sources including blackwater, graywater, and rainwater. This health risk- framework focuses on the removal of pathogens and ongoing monitoring to ensure water is treated appropriately based on the end use. Public health and safety is paramount. States including California and Washington are proceeding with establishing health risk-based frameworks for the treatment of onsite blackwater.

The quality defined for the sole Tier 4 application (DPR) is by necessity not only based on common drinking water quality standards (USEPA), but also on the recognition that additional biological barriers are appropriate, given the source water's origin. Extensive studies have been conducted in the past few decades to determine the level of treatment required to ensure public health and safety.

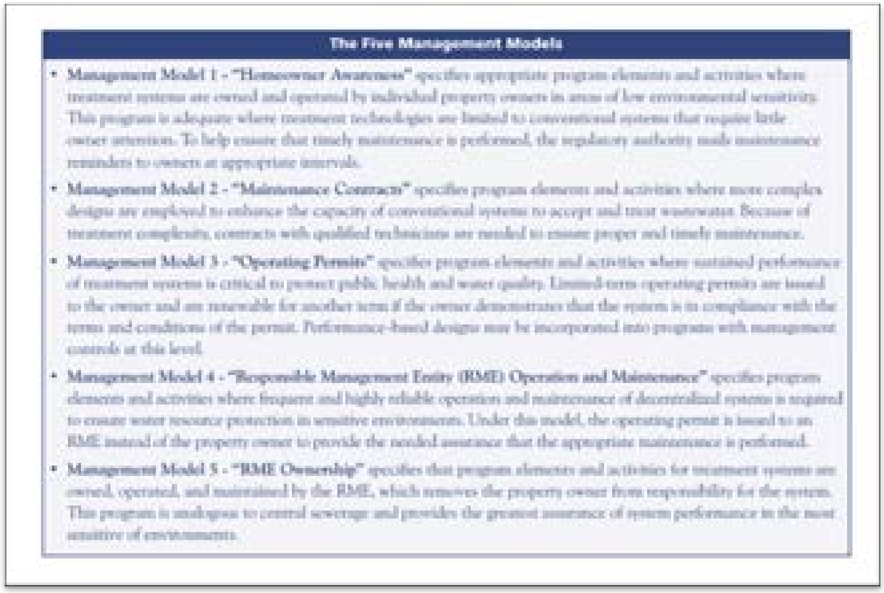
Log removals of Enteric Viruses, Giardia, and Cryptosporidium (18/15/15, respectively) are based on the National Water Research Institute's "DPR Criteria Expert Panel: Preliminary Findings and Recommendations", Fountain Valley, California, June 23, 2023

These log reductions, mean that enteric viruses are reduced by 99.9999999999999999% (18 nines), that giardia and cryptosporidium oocysts are each reduced by 99.9999999999999% (15 nines)

Engineering process design is expected to be based on treatment technique log removal values (LRVs), as published by generally accepted industry leaders and institutions (e.g., United States Environmental Protection Agency, Water Environment & Research Foundation, World Health Organization, etc.). Treatment verification is expected to be demonstrated by periodic challenge tests, as described by generally accepted industry leaders and institutions (see above). Due to the rapid evolution and variety of treatment techniques and challenge test protocols, neither are further specified herein although they may be in the future. Additionally, periodic challenge testing may not be required where treatment process surrogates are monitored to ensure ongoing performance within a credited window. At this time, flexibility is needed to promote water conservation and to empower decision makers.

This proposal does not seek to specifically define water quality requirements for Tier 1 and 2 applications. It is recognized that such standards may be highly dependent on source water quality,and should remain flexible to empower decision makers.

Public health and safety are further assured by requiring competent management of all water reuse systems. Section 1302.14 specifies Management Model 4 or Management Model 5 of USEPA's Management Guidelines for Decentralized Wastewater Management (EPA 832-B-03-001, March 2003)


The Five Management Models

- **Management Model 1 - "Homeowner Awareness"** specifies appropriate program elements and activities where treatment systems are owned and operated by individual property owners in areas of low environmental sensitivity. This program is adequate where treatment technologies are limited to conventional systems that require little owner attention. To help ensure that timely maintenance is performed, the regulatory authority mails maintenance reminders to owners at appropriate intervals.
- **Management Model 2 - "Maintenance Contracts"** specifies program elements and activities where more complex designs are employed to enhance the capacity of conventional systems to accept and treat wastewater. Because of treatment complexity, contracts with qualified technicians are needed to ensure proper and timely maintenance.
- **Management Model 3 - "Operating Permits"** specifies program elements and activities where sustained performance of treatment systems is critical to protect public health and water quality. Limited-term operating permits are issued to the owner and are renewable for another term if the owner demonstrates that the system is in compliance with the terms and conditions of the permit. Performance-based designs may be incorporated into programs with management controls at this level.
- **Management Model 4 - "Responsible Management Entity (RME) Operation and Maintenance"** specifies program elements and activities where frequent and highly reliable operation and maintenance of decentralized systems is required to ensure water resource protection in sensitive environments. Under this model, the operating permit is issued to an RME instead of the property owner to provide the needed assurance that the appropriate maintenance is performed.
- **Management Model 5 - "RME Ownership"** specifies that program elements and activities for treatment systems are owned, operated, and maintained by the RME, which removes the property owner from responsibility for the system. This program is analogous to central sewerage and provides the greatest assurance of system performance in the most sensitive of environments.

SAMPLE LRV CREDIT CALCULATION REGARDING IPC TABLE 1301.2(3) and IRC Table P3401.2(3):

10,000 gpd of Blackwater

70,000 gpd of groundwater

20,000 gpd of surface water

BWC = 10,000 / (10,000 + 70,000 + 20,000)

BWC = 0.10

LRV Credit = -log (BWC)

LRV Credit = -log (0.10)

LRV Credit = 1.0

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC) PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

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, California State Water Board Division of Drinking Water, June 15, 2021.

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Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal to expand implementation of onsite wastewater reuse will not increase the cost of construction. The proposal is allowing for onsite wastewater reuse systems as an option, but not mandating installation. Buildings that choose to install a system would experience increased construction costs to install tanks, treatment, and distribution piping. However, buildings can also realize cost savings on water and sewer bills by reusing wastewater onsite. As a result, the building would consume less potable water and send less wastewater to the sewer.

An analysis was conducted to evaluate the amount of wastewater that could be treated and reused onsite in proposed mixed-use development in San Francisco. Using the water utility’s rate schedule to estimate the financial savings, the analysis showed installing an onsite wastewater reuse system could result in savings of about $50,000 annually based on reduced potable consumption alone. As the cost of potable water increases, so would such savings.

Staff Analysis: A review of the standard proposed for inclusion in the code, DOE 40 CFR 141 *United States Environmental Protection*

Agency (USEPA) Primary and Secondary Drinking Water Quality Standards , with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

P157-24 Part II

Public Hearing Results (CAH1)

Errata: This proposal includes published errata Errata: The notes were missing from the table. See the Consolidated Monograph Updates document; https://www.iccsafe.org/wp-content/uploads/2024-Group-A-Consolidated-Monograph-Updates.pdf

Committee Action: **As Modified by Committee**

Committee Modification: TABLE P3401.2(1)REQUIRED WATER QUALITY FOR REUSE APPLICATION

Use Category	Application	Exposure[a]	Quality Tier[b]
Process Water	Industrial Process Water (Possibility of Human Contact or Evaporative)	AC	3
	Industrial Washwater applications	AC	3
	Livestock Drinking Water (Milk Producing)	AC	3
	Livestock Drinking Water (Non-Milk Producing)	AC	3
	Parts Cleaning	LC	1
	Pool Water Makeup	~~AC~~DC	~~3~~4
	Pressure Washing	AC	3

Committee Reason: For the modification: This corrects makeup water for pools to be suitable for Direct Contact Tier 4. (8-2)
For the proposal as modified: The Committee agreed with the published reason statement. (8-2)

P157-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: P3401.2

Proponents: Kyle Thompson, Technical Director, Plumbing Manufacturers International (kthompson@safeplumbing.org) requests As Modified by Committee (AMC2)

Further modify as follows:

2024 International Residential Code

Revise as follows:

P3401.2 Reuse water quality. Reuse water quality shall meet the minimum requirements as specified in Tables P3401.2(1), P3401.2(2), P3401.2(3), and as established for the intended application by all applicable laws, rules, and ordinances of the jurisdiction. Where water from multiple sources is combined, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources. Where an alternate non-potable water source for use in toilet flushing is installed, a potable water distribution line rough-in, sized in accordance with Section P2903, that includes a shutoff valve located where the line originates, shall be provided at each toilet.

Reason: See CAH1 Proposal P155-24 for extended substantiation supporting the need for potable water use in smart toilets and personal hygiene devices.

This proposed change only applies to buildings that chose to plumb non-potable water indoors specifically for toilet flushing. It would require a potable water supply line to be roughed in when the non-potable water supply line is installed to address smart toilets and personal hygiene devices. Smart toilets (See Figure 1) are those which include an integrated bidet feature and personal hygiene devices (See Figure 2) are an add on or toilet seat incorporating a bidet feature.

When a residential building is plumbed with a non-potable water supply line to the toilet, residents opting for a smart toilet or personal hygiene device must connect to the available non-potable water supply or re-pipe with a potable water supply line for proper installation. This can be expensive after move-in but can be economically addressed during initial construction.

Personal hygiene devices and smart toilets are crucial for many Americans with medical conditions, special needs or limited mobility. An allowance in the existing code to include provisions for these products is important to ensuring public health and safety. The water quality used with smart toilets and personal hygiene devices must be free of any pathogens that could cause infection or disease and, therefore, must be treated at a minimum in accordance with regulations for potable water.

Figure 1: Smart Toilet

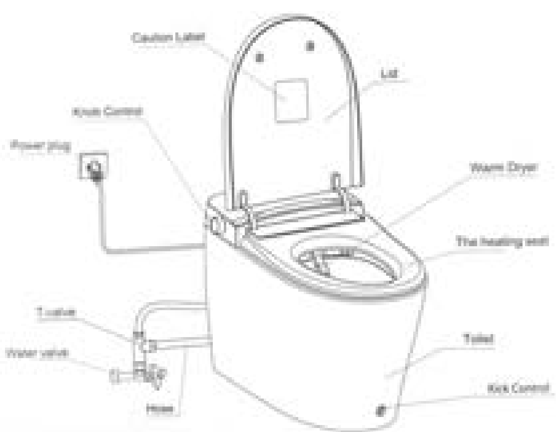

Figure 2: Personal Hygiene Device Connection

Cost Impact: Increase

Estimated Immediate Cost Impact:

Increase cost of $215 for rough in of potable water supply line.

Estimated Immediate Cost Impact Justification (methodology and variables):

a. Rough-in of potable water line:
    i. Parts: 2 shutoff valves ($40 ea.), 20 ft copper pipe ($60),
    ii. Plumbing Labor: 0.5-hour labor @$150/hr ($75).
    iii. Total $215

Estimated Life Cycle Cost Impact:

Savings of $735 for re piping when compared with the cost of rough in of potable supply pipe.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

a. Re-pipe for potable water supply line after construction:

i. Construction

1. Parts: Estimate Drywall $2.50/sq ft., Tile $10/sq ft.
2. Construction Labor: $100/hr.
3. Construction Subtotal: Remove and restore 20sq ft of drywall and tile. 2 hr labor plus parts (Sub Total $450)

ii. Plumbing

1. Parts: Shutoff valve ($40), 20 ft copper pipe ($60),
2. Plumbing Labor: $150/hr
3. Plumbing Subtotal: Reframe for new plumbing, pipe and fitting installation. 2 hr labor plus parts (Sub Total: $400)

iii. Permit: $100

iv. Total $950 for re-pipe after construction.

Comment (CAH2)# 647

P162-24 Part I

IPC: APPENDIX G (New), SECTION G101 (New), G101.1 (New), G101.2 (New), SECTION G201 (New), G201.1 (New), SECTION 202 (New), SECTION G301 (New), G301.1 (New), G301.2 (New), G301.3 (New), G301.3.1 (New), G301.3.2 (New), G301.3.3 (New), G301.3.4 (New), G301.3.5 (New), G301.3.6 (New), G301.3.7 (New), G301.4 (New), G301.4.1 (New), G301.4.2 (New), G301.5 (New), G301.5.1 (New), G301.5.2 (New), G301.5.3 (New), G301.5.4 (New), G301.5.5 (New), G301.5.6 (New), G301.5.7 (New), G301.5.8 (New), G301.5.9 (New), G301.5.10 (New), G301.6 (New), G301.6.1 (New), G301.6.2 (New), G301.6.3 (New), G301.6.4 (New), G301.6.4.1 (New), G301.6.5 (New), TABLE G301.6.5 (New), SECTION G401 (New), G401.1 (New), TABLE G401.1 (New), G401.2 (New), G401.2.1 (New), G401.2.2 (New), G401.3 (New), TABLE G401.3 (New), G401.4 (New), SECTION G501 (New), G501.1 (New), G501.2 (New), G501.2.1 (New), G501.2.1.1 (New), G501.2.1.1.1 (New), G501.2.1.2 (New), G501.2.2 (New), G501.2.2.1 (New), 501.2.2.1.1 (New), G501.2.2.1.2 (New), G501.2.2.1.3 (New), G501.2.2.1.3.1 (New), G501.2.2.1.3.2 (New), G501.2.2.1.3.2.1 (New), G501.2.2.1.3.2.1.2 (New), G501.2.2.1.3.3 (New), G501.2.2.1.3.4 (New), G501.2.2.1.3.5 (New), G501.2.2.2 (New), G501.2.2.2.1 (New), G501.2.2.2.2 (New), G501.2.2.2.3 (New), G501.2.2.2.3.1 (New), G501.2.2.2.3.2 (New), G501.2.2.2.4 (New), G501.2.2.2.5 (New), G501.2.2.2.6 (New), G501.2.2.3 (New), G501.2.3 (New), G501.2.3.1 (New), G501.2.3.2 (New), G501.2.3.4 (New), G501.2.3.5 (New), G501.2.3.6 (New), G501.2.4 (New), G501.2.4.1 (New), G501.2.4.1.1 (New), G501.2.4.1.2 (New), G501.2.4.1.3 (New), G501.2.4.2 (New), G501.2.4.2.1 (New), G501.2.4.2.2 (New), G501.2.4.2.3 (New), G501.2.4.3 (New), G501.2.4.3.1 (New), G501.2.4.3.2 (New), G501.2.4.3.3 (New), G501.3 (New), G501.3.1 (New), G501.3.1.1 (New), G501.3.1.2 (New), G501.3.1.3 (New), G501.3.1.4 (New), G501.3.1.5 (New), G501.3.2 (New), SECTION G601 (New), G601.1 (New), TABLE G601.1 (New)

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Plumbing Code

Add new text as follows:

APPENDIX G
Calculation and Labeling of the Water Use Performance of One- and Two-Family Dwellings

SECTION G101
GENERAL

G101.1 Purpose. The provisions of this appendix establish a uniform methodology for evaluating, rating and labeling the water use performance of one and two-family dwellings.

G101.2 Scope. This appendix shall provide a uniform methodology for evaluating, rating and labeling the indoor and outdoor water use performance of one- and two-family dwellings. Such evaluations, rating and labeling shall be in accordance with this appendix and RESNET/ICC-850.

SECTION G201
DEFINITIONS

G201.1 Definitions. The following terms and acronyms have specific meanings as used in this Appendix. In the event that definitions given here differ from definitions given elsewhere, the definitions given here shall govern.

Add new definition as follows:

APPROVED RATING PROVIDER. An approved entity responsible for the certification of home water efficiency raters working under its auspices and who is responsible for the quality assurance of such Certified Raters and for the quality assurance of water efficiency ratings produced by such home water efficiency raters.

APPROVED SOFTWARE RATING TOOL. A computerized procedure that is approved for the purpose of conducting home water efficiency ratings and calculating the annual water consumption, annual water costs and a Water Rating Index for a home.

AUTOMATIC IRRIGATION SYSTEM. An irrigation system that is initiated by a clock timer, irrigation controller, or other method that does not require human intervention to initiate an irrigation event.

BEDROOM. A room or space 70 square feet of floor area or greater, with egress window and closet, used or intended to be used for sleeping. A "den," "library," "home office" with a closet, egress window, and 70 square feet of floor area or greater or other similar rooms shall count as a Bedroom, but living rooms and foyers shall not.

IRRIGATED AREA. The portion of a lot that receives supplemental water for irrigation.

LOT SIZE. The area of a single parcel of land on which the Rated Home is located.

OTHER WATER USE. Water use associated with leaks, minor draws, and other end uses not specified in the Reference Home or Rated Home.

OUTDOOR WATER USE. Water use that occurs outside of the exterior walls of a dwelling unit.

RATED HOME. The specific real property that is evaluated using the water use performance rating procedures specified by this Appendix.

REFERENCE HOME. A hypothetical home configured in accordance with the specifications set forth in Section G301.3 of this code and the basis of comparison for the purpose of calculating the Water Rating Index of a Rated Home.

RESIDENTIAL IRRIGATION CAPACITY INDEX (RICI). The intensity with which an automatic irrigation system applies water calculated in accordance with Section G301.6.3.

WATER RATING INDEX (WRI). An integer representing the relative water use of a Rated Home as compared with the water use of the Reference Home and where an Index value of 100 represents the water use of the Reference Home and each integer reduction represents a one percent improvement in water use efficiency.

Add new text as follows:

SECTION G301
HOME WATER RATING CALCULATION PROCEDURE

G301.1 **Determining the Water Rating Index.** The Water Rating Index (WRI) shall be determined in accordance with Sections G301.2 through G301.6. The Reference Home shall be configured in accordance with Sections G301.3 and G301.4, and the Rated Home shall be configured in accordance with Section G301.5 and G301.6 .

G301.2 Calculating the Water Rating Index. . A Water Rating Index shall be calculated as follows:

$$WRI = \frac{\text{indoor and outdoor daily water use for the Rated Home}}{\text{indoor and outdoor daily water use for the Reference Home}} \times 100$$

Equation G301.2-1

G301.3 **Determining the Daily Indoor Water Use for the Reference Home.** The indoor daily water use for the Reference Home shall be calculated as follows:

refingpd = refFgpd + refWgpd + refDWgpd + refCWgpd +
refTgpd + refSofgpd + refOther

(Equation G301.3-1)

Where:

refFgpd = daily fixture water use for the Reference Home

refWgpd = daily water use wasted from hot water outlets for the Reference Home

refDWgpd = daily dishwasher water use for the Reference Home

refCWgpd = daily clothes washer water use for the Reference Home

refTgpd = daily toilet water use for the Reference Home

refSofgpd = daily water softener water use for the Reference Home

refOther = daily total other/unidentified water use for the Reference Home

G301.3.1 Determining Daily Reference Home Fixture Water Use. Reference Home daily fixture water use shall be calculated as follows:

$refFgpd = 14.6 + 10 \times Nbr$ **(Equation G301.3.1-1)**

Where:

Nbr = number of bedrooms in the Rated Home

G301.3.2 Determining Daily Reference Home Hot Water Waste. Reference Home daily hot water waste shall be calculated as follows:

$refWgpd = 9.8 \times Nbr0.43$ **(Equation G301.3.2-1)**

Where:

Nbr = number of bedrooms

G301.3.3 Determining Daily Reference Home Dishwasher Water Use. Reference Home dishwasher water use shall be calculated as follows:

$$refDWgpd = \frac{(88.4 + 34.9 \times Nbr) \times 8.16}{365}$$

(Equation G301.3.3-1)

Which simplifies to:

refWgpd = 1.97 + 0.7802 × *Nbr*

Where:

Nbr = number of bedrooms

(88.4 + 34.9 × *Nbr*) = best fit regression equation for dishwasher cycles per year using data from the 2005 Residential Energy Consumption Survey

8.16 = gallons per cycle from the DOE Technical Support Document from the NAECA standard in effect in 2006

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

G301.3.4 Determining Daily Reference Home Clothes Washer Water Use. Reference Home daily clothes washer water use shall be calculated as follows:

$$refCWgpd = \frac{(3.0 \times 11.4 \times ACY)}{365}$$

(Equation G301.3.4-1)

Where:

3.0 = reference washer capacity (*CAPw*) in ft3

11.4 = reference integrated water factor (IWF) in (gal/cyc) per ft3

ACY = Adjusted Cycles per Year = (164 + 46.5 × *Nbr*)

Nbr = number of bedrooms

G301.3.5 Determining Daily Reference Home Toilet Water Use. Reference Home daily toilet water use shall be calculated as follows:

refTgpd = *refFPO* × *refGPF* × *Occ* **(Equation G301.3.5-1)**

Where:

RefFPO = the Reference Home flushes per person per day = 5.05

RefGPF = the Reference Home gallons per flush for toilets = 1.6

Occc = the number of occupants = 1.09 + 0.54 × *Nbr*

Nbr = number of bedrooms

G301.3.6 Determining Daily Reference Home Water Softener Use. Where the Rated Home has a water softener and the water hardness at the Rated Home location is greater than or equal to 180 milligrams/liter, the Reference Home water softener daily water use shall be calculated as follows:

refSofgpd =

$$\frac{\text{grains of hardness}}{\text{gallon of water}}$$

× sum of indoor water uses in the

Reference Home ×

$$\frac{\text{5 gallons used}}{\text{1,000 grains removed}}$$

(Equation G301.3.6-1)

Where the Rated Home does not meet these conditions, the *refSofgpd* = 0.

G301.3.7 Determining Daily Reference Home Other Water Use. Reference Home daily other water use shall be determined as follows:

refOther = 5.93 × *Nbr* **(Equation G301.3.7-1)**

Where:

Nbr = the number of bedrooms in the Rated Home

G301.4 Determining the Reference Home Outdoor Water Use. The reference home outdoor annual water use (in thousands of gallons per year) shall be calculated using the following two equations:

If the rated home has a netET of less than 12 inches/year OR the rated home has an automatic irrigation system, use Equation G301.4-1.

$$\left[\frac{Exp(A)}{1 + Exp(A)}\right]$$

× 1.18086 × [2.0341 × *netET*0.7154 ×

*Ref_Irr_Area*0.6227 + 0.5756 × *ind_Pool* × *netET*]

(Equation G301.4-1)

If the rated home has a netET of greater than 12 inches/year AND the rated home does NOT have an automatic irrigation system, use Equation G301.4-2.

[

$\left[\frac{Exp(B)}{1+Exp(B)}\right]$

× 1.22257 × [1.4233 + 0.6311 × *netET* + 0.9376 × *Ref_Irr_Area*]]+ *ref_Pool*(Equation G301.4-2)

Either equation shall be constrained as follows:

IF

Rat_Irr_Area < Ref_Irr_Area

THEN

Ref_Out = Equation G301.4-1 or G301.4-2

$$\frac{\text{Equation 1 (Using Rat\_Irr\_Area and ind\_Pool = 0)}}{\text{Equation 1 (with Ref\_Irr\_Area and ind\_Pool = 0)}}$$

AND

Outdoor Reference Home Annual Water Use shall never be lower than Equation G301.4-2

Where:

Exp(A) = exponent of [1.4416 + 0.5069 × (*Irr_Area*/1,000)]

Exp(B) = exponent of [0.6911 + 0.00301 × *netET* × (*Irr_Area*/1,000)]

Ref_Irr_Area = the size of the irrigated area in the Reference Home, calculated in accordance with Section G301.4.1

Rat_Irr_Area = the size of the irrigated area in the Rated Home

NetET = the annual historic sum of mean reference evapotranspiration minus the mean precipitation for all months that evapotranspiration exceeds precipitation

ind_Pool = indicator representing the presence or absence of a swimming pool in the Rated Home

ref_Pool = Equation G301.4-1 (using *ind_Pool* = 1) – Equation G301.4-1 (using *ind_Pool* = 0)

G301.4.1 Determining Outdoor Daily Water Use for the Reference Home. Reference Home daily outdoor water use shall be determined by multiplying the result of either Equation G301.4-1 or Equation G301.4-2, as appropriate, by 1,000 and dividing the product by 365.

G301.4.2 **Determining Irrigated Area for the Reference Home.** Reference Home Irrigated Area shall be calculated as follows: Where the lot size of the Rated Home is less than 7,000 ft2, the Irrigated Area of the Reference Home shall be calculated as follows:

Ref_Irr_Area = *Lot_Area* × (0.002479 × *Lot_Area*0.6157) **(**Equation G301.4.2-1)

Where the Lot Size of the Rated Home is greater than or equal to 7,000 ft2, the Irrigated Area of the Reference Home shall be calculated as follows:

Ref_Irr_Area = *Lot_Area* × 0.577 **(Equation G301.4.2-2)**

Where:

Ref_Irr_Area = the size of the landscape that receives supplemental water in the Reference Home

Lot_Area = the size of the lot on which the Rated Home is being constructed

G301.5 **Determining Daily Indoor Water Use of the Rated Home.** The daily Indoor Water Use of the Rated Home shall be calculated as follows:
Indoorgpd = *Showergpd* + *KitchFgpd* + *LavFgpd* + *Wastegpd* + *CWgpd* + *DWgpd* + *Toiletsgpd* + *Softgpd* + *Other* + *EPgpd* **(Equation G301.5-1)**

Where:

Showergpd = daily shower water use for the Rated Home

KitchFgpd = daily kitchen faucet water use for the Rated Home

LavFgpd = daily lavatory water use for the Rated Home

Wastegpd = daily water use wasted for the Rated Home

CWgpd = daily clothes washer water use for the Rated Home

DWgpd = daily dishwasher water use for the Rated Home

Toiletsgpd = daily toilet water use for the Rated Home

Softgpd = daily water softener water use for the Rated Home

Othergpd = daily other/unidentified water use for the Rated Home

EPgpd = daily excess pressure adjustment

G301.5.1 Determining Daily Shower Water Use for the Rated Home. Rated Home daily shower water use shall be calculated as follows:

$$Showergpd = FixtureTot \times showerpc \times SHeff$$ **(Equation G301.5.1-1)**

Where: *FixtureTot* = determined in accordance with ANSI/RESNET/ICC 301, Addendum A = $\frac{adjFmix}{Fmix} \times refFgpd$

Shower_pc = percent of fixture water use consumed by showers = 54%

SHeff = the ratio of the average rated flow rate of showerheads to the reference home flow rate $= \frac{\text{average flow rate of showerheads in the Rated Hame}}{2.5}$

G301.5.2 Determining Daily Kitchen Faucet Water Use for the Rated Home. Rated Home daily kitchen faucet water use shall be calculated as follows:

$$KitchFgpd = FixtureTot \times faucetpc \times KitchFeff \times kitch$$ **(Equation 301.5.2-1)**

Where:

FixtureTot = determined in accordance with ANSI/RESNET/ICC 301 Addendum A =

$\frac{adjFmix}{Fmix} \times refFgpd$

faucetpc = percent of fixture water use consumed by faucets = 46%

KitchFeff = the ratio of the average rated flow rate of kitchen faucets to the Reference Home flow rate

$= \frac{\text{average flow rate of kitchen faucets in the Rated Hame}}{2.2}$

Kitch = the percentage of faucet use that is attributed to kitchen faucets = 69%

G301.5.3 Determining Daily Lavatory Faucet Water Use for the Rated Home. Rated Home daily lavatory faucet use shall be calculated as follows:*LavFgpd* = FixtureTot × faucetpc × LavFeff × Lav (Equation G301.5.3-1)

Where:

Lav = the percentage of faucet use that is attributed to lavatory faucets= 31%

FixtureTot = determined in accordance with ANSI/RESNET/ICC 301 Addendum A =

$\frac{adjFmix}{Fmix}$

× *refFgpd*

faucet_pc = percent of fixture water use consumed by faucets = 46%

LavFeff = the ratio of the average rated flow rate of lavatory faucets to the Water Rating Reference Home flow rate = 1 for standard faucets and 0.95 for high-efficiency faucets

G301.5.4 Determining Daily Hot Water Waste for the Rated Home. Rated Home daily hot water waste shall be calculated as follows: *Wastegpd = Feff* × (*oWgpd + sWgpd × WDeff*) **(Equation G301.5.4-1)**

Where:

Feff = fixture efficiency of showerheads, kitchen faucets, and lavatory faucets weighted by contribution to total fixture use = daily standard operating condition hot water wasted quantity as determined by ANSI/RESNET/ICC 301 Addendum A

sWgpd = daily structural hot water wasted quantity as determined by ANSI/RESNET/ICC 301 Addendum A

WDeff = distribution system water use effectiveness from Table 4.2.2.5.2.11(3) of ANSI/RESNET/ICC 301 Addendum A

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

G301.5.5 Determining Daily Clothes Washer Water Use for the Rated Home. Rated Home daily clothes washer water use shall be calculated as follows:

$$CW_{gpd} = \frac{CAPw \times IWF \times ACY}{365}$$

(Equation G301.5.5-1)

Where:

CAPw = washer capacity in cubic feet = the manufacturer's data or the CEC database or the EPA Energy Star® website

IWF = Integrated Water Factor from manufacturer's data [(gal/cyc)/ft3]

ACY = Adjusted cycles per year

Determining ACY:

ACY = (164 + 46.5 × *Nbr*)

×
$$\frac{(3.0 \times 2.08 + 1.59)}{(CAPw \times 2.08 + 1.59)}$$

Where:*CAPw* = the capacity of the clothes washer in ft3

(164 + 46.5 × *Nbr*) = standard cycles per year based on 2005 Residential Energy Consumption Survey data

$$\frac{(3.0 \times 2.08 + 1.59)}{(CAPw \times 2.08 + 1.59)}$$
= best fit regression equation to adjust the standard cycles per year to account for occupancy and size of clothes washer; based on 2005 Residential Energy Consumption Survey data

G301.5.6 Determining Daily Dishwasher Water Use for the Rated Home. Rated Home daily dishwasher water use shall be calculated as follows:
DWgpd = [(88.4 + 34.9 × *Nbr*) × (12/*dWcap*) × gal/cycle/365 **(Equation G301.5.6-1)**

Where:

Nbr = number of bedrooms in the Rated Home

DWcap = capacity of the dishwasher in the Rated Home (in place settings) as included in the manufacturer's data (88.4 + 34.9 × *Nbr*) = best fit regression equation for dishwasher cycles per year using data from the 2005 Residential Energy Consumption Survey gal/cycle can be entered either directly or as listed on:

a. The ENERGY STAR product finder database.
b. The California Energy Commission (CEC) Modernized Appliance Efficiency Database.
c. The Department of Energy (DOE) Compliance Certification Management System (CCMS).

OR gal/cycle can be calculated from the Energy Guide label as follows (developed using the equations from 10 CFR 430, Subpart B, Appendix C and values on the Energy Guide label) to isolate the energy used by the appliance from the energy used in water heating):
gal/cycle = h2o_kWh × elec_h2o

h2o_kWh = LER-Appl_kWh

LER = Labeled Energy Rating in kWh per year per the dishwasher Energy Guide label

Appl_kWh = dishwasher appliance annual electric energy use = (GHWC × gas_h2o/$_therm-LER × $_kWh × elec_h2o/per_kWh) / ($_kWh × gas_h2o/$_therm-elec_h2o)

Where:

$_kWh = the cost of one kWh per the dishwasher Energy Guide label

$_therm = the cost of one therm per the dishwasher Energy Guide label

GHWC = Gas Hot Water Cost per the dishwasher Energy Guide label

elec_h2o = gallons of hot water use per cycle per unit of annual electricity use in gal × y/kWh × cyc = 1/(80 × 0.0024 × 208) = 0.02504

gas_h2o = gallons of hot water use per cycle per unit of annual gas use in gal × y/therm × cyc = 1/(80 × 8.2/0.75 × 208/100,000) = 0.5497

80 = the average hot water heater temperature rise per 10 CFR 430, Subpart B, Appendix C

0.0024 = specific heat of water in kWh/gal × F per 10 CFR 430, Subpart B, Appendix C

8.2 = specific heat of water in Btu/gal × F per 10 CFR 430, Subpart B, Appendix C

0.75 = recovery efficiency of gas hot water heater per 10 CFR 430, Subpart B, Appendix C

208 = cycles per year

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

G301.5.7 Determining Daily Toilet Water Use for the Rated Home. Rated Home daily toilet water use shall be calculated as follows:
Toiletgpd = *refFPO* × *gpf* × *Occ*
Where:

RefFPO = the reference flushes per person per day = 5.05

gpf = the average gallons per flush of all toilets installed in the Rated Home; for tank-type dual-flush toilets, use the effective flush volume per flush based on EPA Water Sense specification for Tank-Type Toilets

Occc = the number of predicted occupants in the Rated Home = 1.09 + 0.54 × *Nbr*

Nbr = the number of bedrooms in the Rated Home

G301.5.8 Determining Daily Water Softener Water Use for the Rated Home. Rated Home daily water softener water use shall be calculated as follows:

$$Softgpd = \frac{\text{grains of hardness}}{\text{gallon of water}} \times \text{[sum of softened water uses in the Rated Home]} \times \text{[gallons used per 1,000 grains of hardness]}$$

(Equation G301.5.8-1)

Where:

softened water = water conditioned by a water softener

G301.5.9 Determining Daily Other Water Use for the Rated Home. Rated Home daily other water use shall be calculated as follows:*Othergpd* = 5.93 × *Nbr* **(Equation G301.5.9-1)**

Where:

Nbr = the number of bedrooms in the rated home

G301.5.10 Determining Daily Excess Pressure Adjustment Water Use for the Rated Home. Where a Rated Home does not have a pressure-reducing valve or pressure tank, additional water use attributed to excess water pressure shall be calculated as follows:*EPgpd* = MAX {[(*Showergpd* + (0.5 × (*LavFgpd* + *KitchFgpd* + *Othergpd*))) × 0.006 × (*PR* – 90)],0} **(Equation G301.5.10-1)**

Where:

PR = static water pressure (in psi) measured at the indoor fixture outlet on the lowest floor and (if more than one) closest to the water service entry to the house

Shower and lavatory faucets controlled by integral or accessory pressure-compensating devices shall be permitted to be excluded from this equation.

G301.6 Determining Outdoor Water Use for the Rated Home. The Rated Home outdoor water use shall be calculated as follows: Where the Rated Home has an automatic irrigation system, outdoor water use shall be calculated as follows:

$\left[\frac{Exp(A)}{1+Exp(A)}\right]$

× 1.18086 × [2.0341 × netET0.7154 ×

*Rat_Irr_Area*0.6227 + 0.5756 × *ind_Pool* × *netET*] **(Equation G301.6-1)**Where the Rated Home does not have an automatic irrigation system, outdoor water use shall be calculated as follows:

[

$\left[\frac{Exp(B)}{1+Exp(B)}\right]$

× 1.22257 × [1.4233 + 0.6311 ×

netET + 0.9376 × *Rat_Irr_Area*]] + *Pool_use* **(Equation G301.6-2)**

The outdoor water use for the Rated Home shall never be less than the result of the following calculation:

$\left[\frac{Exp(B)}{1+Exp(B)}\right]$

× 1.22257 × [1.4233 + 0.6311 × *netET* + 0.9376 ×

Rat_Irr_Area] **(Equation G301.6-3)**

Where:

Exp(A) = exponent of [1.4416 + 0.5069 × (*Rat_Irr_Area*/1,000)]

Exp(B) = exponent of [0.6911 + 0.00301 × netET * (*Rat_Irr_Area*/1,000)]

Rat_Irr_Area = the size of the landscape that might receive supplemental water in the Rated Home

NetET = the annual historic sum of mean reference evapotranspiration minus the mean precipitation for all months that evapotranspiration exceeds precipitation

ind_Pool = indicator representing the presence or absence of a swimming pool

Pool_use = Equation G301.6-1 (using *ind_Pool* = 1) – Equation G301.6-1 (using *ind_Pool* = 0)

G301.6.1 Determining Outdoor Daily Water Use for the Rated Home. Rated Home daily outdoor water use shall be determined by multiplying the result of either Equation G301.6-1 or Equation G301.6-2, as appropriate, as such result may be further modified pursuant to Sections G301.6.1 through G301.6.4, by 1,000 and dividing the product by 365.

G301.6.2 Weather-based Controllers. Sensor- and weather- based irrigation controllers that are certified by the US EPA WaterSense program shall decrease the portion of predicted Rated Home outdoor water use associated with irrigation (less the water use associated with pools) by 15% in homes that have automatic irrigation system.

G301.6.3 Commissioning of an Automatic Irrigation System. In Rated Homes with an automatic irrigation system, where documentation is provided, the water use associated with irrigation shall be decreased by 5% where a certified professional, as identified by a WaterSense labeled certification, has inspected the irrigation system according to the protocols identified in ASABE S626 and verified as follows:

1. Average distribution uniformity of at least 65% on turf areas.
2. Sprinklers are operating at the manufacturer's recommended water pressure +/- 10%.
3. The system operates without leaks
4. The system prevents runoff and overspray from leaving the property (checked during the audit).
5. Two seasonal water schedules (initial grow-in period and established landscape) are posted at the controller.

G301.6.4 Residential Irrigation Capacity Index (RICI). In a Rated Home with an automatic irrigation system, where documentation is provided, a RICI shall be calculated as follows:

$$RICI_{rat} = \frac{\text{sum of flow (gpm) of all irrigation valves}}{\text{square feet irrigated area}} \times 1{,}000$$

(Equation G301.6.4-1)

G301.6.4.1 Applying RICI. A Rated Home, where documentation for a RICI is provided, may adjust the volume of water use associated with irrigation (less the water use associated with pools) in the outdoor water use of the Rated Home by 10% for every point from a baseline RICI (RICI_ref) of 5.

G301.6.5 Applying Adjustments to the Outdoor Water Use of Rated Homes. Because the Water Rating Index model includes a number of percent adjustments for the outdoor water use of the Rated Home, the order of application becomes important. The correct order in which to apply these adjustments is as indicated in Table G301.6.5.

TABLE G301.6.5 APPLYING ADJUSTMENTS TO OUTDOOR WATER USE OF THE RATED HOME

STEP	SECTION	DETERMINED BY
1	G301.6.2 —Weather-based Controllers	Shall be determined by the presence or absence of a smart controller in the installed portion of the landscape.
2	G301.6.3 — Commissioning of an Automatic Irrigation System	Shall be determined by the presence or absence of commissioning in the installed portion of the landscape.
3	CI301.6.4 —Residential Irrigation Capacity Index (RICI)	Shall be calculated in accordance with Section G301.6.4 and adjusted in partially finished landscapes to be calculated as: - *RICI_rat* ______ (Predicted *Back_irr* is defined in Section G401.5 .)

SECTION G401
MINIMUM RATED FEATURES

G401.1 N/A MINIMUM RATED FEATURES TABLE. The estimated annual indoor and outdoor water use shall be determined using the minimum rated features set forth in Table G401.1.

TABLE G401.1 MINIMUM RATED FEATURES

Building Element	Minimum Rated Feature
Toilet	Flush volume for each toilet as measured on-site or from manufacturer's data.
Shower/Bath	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Bathroom Faucet	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Kitchen Faucet	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Clothes Washer	Washer capacity (cubic feet) from manufacturer's data or the CEC Appliance Efficiency Database or the EPA ENERGY STAR website for all clothes washers located within the Rated Home.
Dishwasher	Capacity of the dishwasher (in place settings) as included in the manufacturer's data, labeled energy factor (cycles/kWh) for all dishwashers located within the Rated Home.
Water Softener	Gallons of water used per 1,000 grains of hardness removed.
Hot Water Distribution	Insulation *R*-value of pipe insulation, type of recirculation system, length of pipe.
Outdoor Water Use	Irrigation system type (automatic or manual), lot size, irrigated area (square feet).
Pool/Spa	Indicate presence or absence of a pool or spa.
Service Water Pressure	Service pressure of water being supplied to the home, as established by the setting of an installed pressure-reducing valve OR the setting of an installed pressure tank OR written documentation from the water supplier that service pressure to the site is 90 psi OR an on-site static pressure test.

G401.2 Data Sources. Data required for the calculation of indoor and outdoor daily water use in the Rated and Reference Homes shall be determined by the location of the Rated Home and using data as set forth in Sections G401.2.1 and G401.2.2.

G401.2.1 Net Evapotranspiration. Data for net evapotranspiration shall be determined for the location of the Rated Home using the World Water and Climate Atlas.

G401.2.2 Hardness of Water. Data for the hardness of water shall be determined by the location of the Rated Home and one of the following:

1. US Geological Survey Concentrations of Hardness as Calcium Carbonate Map.
2. Data provided by the local water supplier.
3. A hardness test of water collected in the home using an EPA-approved method for determination of hardness.

G401.3 Default Values. Values that are not available in accordance with Table G401.1 or are absent from the home at the time of the rating shall use default values in accordance with Table G401.3. Values for building elements that are not specified in Table G401.3 are required for a rating to be issued.

TABLE G401.3 DEFAULT VALUES

Building Element	Default
Water Softeners	Can be entered as 0 if they are absent from a Rated Home. If they are present and no documentation is available, they may be assumed to use 5 gallons/1,000 grains removed for cation water softeners if information is unavailable.

Clothes Washer	Same as Reference Home.
Dishwasher	Determined by ANSI/RESNET/ICC 301. A Rated Home without either a dishwasher or an undercounter cavity for placement of a dishwasher shall be assigned a Daily Dishwasher Water Use of 0.
Hot Water Distribution	Determined by ANSI/RESNET/ICC 301 Addendum A.
Outdoor Water Use	Must be done in accordance with Section G301.4.

G401.4 Incomplete Outdoor Area. To receive a rating, a home must (at a minimum) have the front yard landscape completed. Homes that do not have landscaping completed in the back yard shall be determined in accordance with Section G301.6 with the portion of landscaping that is done determining the presence or absence of an automatic irrigation system. The following steps shall be followed in determining irrigated area in this instance:

Rater must determine a line between the front and back area (*Front_area* + *Back_area* must = *Total_available_area*)

Lot_Area – Pad Footprint = *Total_available_area*

(Back_area/*Total_available_area*) × *Ref_Irr_Area* = *Predicted Back_irr*

Irr_Area = *Predicted Back_irr* + *Front_irr*

Where:

Pad Footprint = the portion of the lot area covered by the dwelling unit and any attached or detached garage

Total_available_area = the portion of the lot excluding the pad of the house that is available for landscaping or other design features (hardscape, softscape, etc.)

Front_area = the area (ft2) of the total available area that is located primarily in front of the house

Back_area = the area (ft2) of the total available area that is located primarily behind the house

Front_irr = the area located primarily in front of the house that receives supplemental water for irrigation at the time of the rating

Predicted Back_irr = the portion of the area located primarily behind the house that can be predicted to receive supplemental water for irrigation in the future

SECTION G501
CERTIFICATION AND LABELING

G501.1 STANDARD FOR CERTIFICATION AND LABELING. This section establishes minimum uniform standards for certifying and labeling home water use performance using the Water Rating Index. These include minimum requirements of the home water use rating process, standard methods for estimating water use, minimum reporting requirements, and specification of the types of ratings that are performed in accordance with this code.

G501.2 Rating Requirements. .

G501.2.1 General. The rating for a home shall be determined in accordance with Sections G501.2.1.1 through G501.2.1. 2 .

G501.2.1.1 EXISTING HOMES. For an existing home, required data shall be collected on-site.

G501.2.1.1.1 NEW HOMES. For a new, to-be-built home, the procedures of Section G401 shall be used to collect required data.

G501.2.1.2 ESTIMATED ANNUAL WATER CONSUMPTION. The collected data shall be used to estimate the annual water consumption for indoor and outdoor water use for both the Rated Home and the Reference Home as specified by Section G301.

G501.2.2 Cost Savings Estimates. Where determined, cost savings estimates for water and wastewater (sanitary sewer) service for the Rated Home shall be calculated in accordance with Sections G501.2.2.1 through G501.2.2.1.3 .

G501.2.2.1 Water Cost Savings.

501.2.2.1.1 Water Prices. Water cost savings for homes receiving potable water service from a water supplier shall be based on the schedule of rates and charges adopted by the water supplier serving the Rated Home.

G501.2.2.1.2 Relevant Rates and Charges. Water cost savings shall be calculated from the volumetric portion of the schedule of rates and charges, sometimes referred to as the commodity charge. Fixed or flat charges that do not vary with the volume of water delivered to the home, sometimes referred to as the meter charge or service charge, shall not contribute to the cost savings estimate.

G501.2.2.1.3 Water Cost Savings Calculations. .

G501.2.2.1.3.1 Average Billed Indoor Volume of the Reference Home. Convert the total annual volume of indoor water use by the Reference Home to an increment of indoor use during a water billing period by dividing the annual indoor volume by the number of bills per year generated by the water supplier (e.g., for monthly billing divide by 12 and for quarterly billing divide by 4). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed indoor volume of the Reference Home.

G501.2.2.1.3.2 Determine Outdoor Water Use for a Billing Period. Convert the total annual volume of outdoor water use in the Reference Home to an increment of outdoor use during a water billing period using one of two methods, based on prevailing practice at the location of the Rated Home.

G501.2.2.1.3.2.1 Peak Season Irrigation. Divide the annual outdoor volume by the number of bills generated by the water supplier during the irrigation season (e.g., for a 6-month irrigation season with monthly billing, divide by 6; for a 6-month irrigation season with quarterly billing, divide by 2). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed outdoor volume of the Reference Home.

G501.2.2.1.3.2.1.2 Year-Round Irrigation. Divide the annual outdoor volume by the number of bills generated by the water supplier during a full year (e.g., for monthly billing, divide by 12 and for quarterly billing, divide by 4). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed outdoor volume of the Reference Home.

G501.2.2.1.3.3 Combine Indoor and Outdoor Water Use Charges. For each billing period in a year, calculate the billed water volume by combining the average billed indoor volume with any average billed outdoor volume applicable to such billing period. Note that where peak season irrigation has been calculated, the billed water volume for the billing period outside of the irrigation season will consist entirely of the average billed indoor volume. Apply the volumetric portion of the rate schedule to the billed volume for each billing period, accounting for any rate blocks or seasonal variations in the rate schedule, to produce the billed volume charge (in dollars) for each billing period. Combine the billed volume charge for each billing period to yield the annual water volume charge of the Reference Home.

G501.2.2.1.3.4 Determine Water Use Cost for the Rated Home. Repeat the process described in Sections G501.2.2.1.3 through G501.2.2.1.3.3 for the Rated Home to calculate the annual water volume charge of the Rated Home.

G501.2.2.1.3.5 Total Estimated Water Cost Savings. Estimated water cost savings shall be the difference between the estimated annual water volume charge of the Reference Home and the estimated annual water volume charge of the Rated Home.

G501.2.2.2 Sanitary Sewer Service Cost Saving. .

G501.2.2.2.1 Sewer Service Prices. Sanitary sewer service cost savings for homes with a permanent connection to sanitary collection and treatment works shall be based on the schedule of rates and charges adopted by the sanitary sewer service provider serving the Rated Home. Note that collection and treatment of sanitary discharges may be performed by separate entities, and that billing to the Rated Home by such entities may be combined or separate.

G501.2.2.2.2 Relevant Rates and Charges. Sanitary sewer service cost savings shall be calculated from the volumetric portion of the schedule of rates and charges. Fixed or flat charges that do not vary with the volume of water delivered to the home shall not contribute to the cost savings estimate.

G501.2.2.2.3 Sewer Cost Savings Calculations. .

G501.2.2.2.3.1 Average Billed Indoor Volume of the Reference Home. Convert the total annual volume of indoor water use by the Reference Home to an increment of indoor use during a sewer billing period by dividing the annual indoor volume by the number of bills per year generated by the sewer service provider (e.g., for monthly billing, divide by 12 and for semi-annual billing, divide by 2). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed indoor volume of the Reference Home.

G501.2.2.2.3.2 Annual Sewer Volume Charge for the Reference Home. Apply the volumetric portion of the sewer rate schedule to the average billed indoor volume for each billing period, accounting for any rate blocks or seasonal variations in the rate schedule, to produce the billed volume charge (in dollars) for each billing period. Combine the billed volume charge for each billing period to yield the annual sewer volume charge of the Reference Home.

G501.2.2.2.4 Determine Annual Sewer charge for the Rated Home. Repeat the process described in Section CI501.2.2.2.3 for the Rated Home to calculate the annual sewer volume charge of the Rated Home.

G501.2.2.2.5 Estimated Sewer Cost Savings. Estimated sewer cost savings shall be the difference between the estimated annual sewer volume charge of the Reference Home and the estimated annual sewer volume charge of the Rated Home.

G501.2.2.2.6 Combined Presentation of Cost Savings. Estimated water cost savings and estimated sewer cost savings may be presented as a total estimated cost savings when designated as “water and sewer” savings.

G501.2.2.3 Other Cost Savings. Performance attributes of the Rated Home may influence other types of charges, depending on the fee structure in the jurisdiction of the Rated Home. While less common, these savings may be significant. Any determinations for cost savings associated with the following charges shall be submitted for individual review and approval by the body providing quality assurance for the rating service provider of the Rated Home.

1. Water service connection charges, also known as tap fees.
2. Sanitary sewer service connection charges, also known as capacity charges.

3. Stormwater fees.

G501.2.3 Reports. All reports generated by an Approved Software Rating Tool shall, at a minimum, contain the information specified by Sections G501.2.3.1 through G501.2.3.6

G501.2.3.1 Location. The property location, including city, state, zip code and either the street address or the Community Name and Plan Name for the Rating.

G501.2.3.2 Name of rater. The name of the certified rater conducting the Rating.

G501.2.3 Name of provider. The name of the Approved Rating Provider under whose auspices the rater is certified.

G501.2.3.4 DATE. The date the Rating was conducted.

G501.2.3.5 TOOL NAME AND VERSION. The name and version number of the Approved Software Rating Tool used to determine the Rating.

G501.2.3.6 DISCLOSURE. The following statement in not less than 10-point font: "The Home Water Rating Standard Disclosure for this home is available from the Rating Provider." At a minimum, this statement shall also include the Rating Provider's mailing address and phone number.

G501.2.4 Rating Types. There shall be three Rating Types in accordance with Sections G501.2.4.1 through G501.2.4.3.

G501.2.4.1 Confirmed Rating. A Rating Type that encompasses one individual dwelling and is conducted in accordance with Sections G501.2.4.1.1 through G501.2.4.1.3.

G501.2.4.1.1 Field verified. All Minimum Rated Features of the Rated Home shall be field-verified through inspection and testing in accordance with Section G401.

G501.2.4.1.2 Entry into tool. All field-verified Minimum Rated Features of the Rated Home shall be entered into the Approved Software Rating Tool that generates the home water rating. The home water rating shall report the Water Rating Index that comports with these inputs.

G501.2.4.1.3 Quality Assurance. Confirmed Ratings shall be subjected to Quality Assurance requirements equivalent to Section 900 of the Mortgage Industry National Home Energy Rating Systems Standard.

G501.2.4.2 Sampled Ratings. A Rating Type that encompasses a set of dwellings and is conducted in accordance with Sections G501.2.4.2.1 through G501.2.4.2.3.

G501.2.4.2.1 Set of rated homes. For the set of Rated Homes, all Minimum Rated Features shall be field verified through inspection and testing of a single home in the set, or distributed across multiple homes in the set, in accordance with the requirements equivalent to Section 600 of the Mortgage Industry National Home Energy Rating Systems Standard.

G501.2.4.2.2 Worst case analysis. The threshold specifications from the Worst-Case Analysis for the Minimum Rated Features of the set of Rated Homes shall be entered into the Approved Software Rating Tool that generates the home water use rating. The home water use rating shall report the Water Rating Index that comports with these inputs.

G501.2.4.2.3 QUALITY ASSURANCE. Sampled Ratings shall be subjected to Quality Assurance requirements equivalent to Section 900 of the Mortgage Industry National Home Energy Rating Systems Standard.

G501.2.4.3 **Projected Ratings.** A Rating Type that encompasses one individual dwelling and is conducted in accordance with Sections G501.2.4.3.1 through G501.2.4.3.3.

G501.2.4.3.1 **Minimum rated features.** All Minimum Rated Features of the Rated Home shall be determined from architectural drawings, threshold specifications, and the planned location for a new home or from a site audit and threshold specifications for an existing home that is to be improved.

G501.2.4.3.2 **Unknown values.** Unknown values shall be determined in accordance with Section G401.3.

G501.2.4.3.3 **Text required.** The Projected Rating Report shall contain the following text in not less than 14-point font at the top of the first page of the report: "Projected Rating Based on Plans—Field Confirmation Required."

G501.3 **Innovative Design Requests.** .

G501.3.1 **Petition.** Water Rating providers can petition for adjustment to the Water Rating Index for a Rated Home with features or technologies not addressed by Approved Software Rating Tools or this Standard. Innovative Design Requests (IDRs) shall be submitted to an Approved IDR authority and shall include, at a minimum, the following:

G501.3.1.1 **Features required.** A Rating generated from an Approved Software Rating Tool for the Rated Home without feature(s) that cannot be modeled in the software tool.

G501.3.1.2 **Features not included.** Written description of feature(s) not included in the Rating generated from software.

G501.3.1.3 **Manufacturer's specifications.** Manufacturer's technical and/or performance specifications for feature(s) not included in the Rating generated from the Approved Software Rating Tool.

G501.3.1.4 **Estimated water use impact.** Calculations or simulation results estimating the water use impact of feature(s) not included in the Rating generated from an Approved Software Rating Tool and documentation to support the calculation methodology and/or describe the modeling approach used.

G501.3.1.5 **Estimated adjustment.** Estimated adjustment to the Water Rating Index. Calculations shall follow the procedures of Sections G301.1 and G301.2.

G501.3.2 **Approval.** IDRs shall be approved on a case by case basis. The Approved IDR review authority shall accept or reject the IDR as submitted, or request additional information. The Approved IDR review authority shall assign a unique identifier to each IDR and maintain a database of IDRs. If the IDR is approved, the Water Rating provider is authorized to issue a supplemental report that adjusts the Water Rating Index, as approved.

SECTION G601
REFERENCE STANDARD

G601.1 **General.** See Table G601.1 for standards that are referenced in various section of this appendix. Standards are listed by the standard identification with the effective date, the standard title, and the section or sections of this appendix that reference this standard.

TABLE G601.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ANSI/RESNET/ICC-301-2022	Standard for the Calculation and Labeling of the Energy Performance of Dwelling and Sleeping Units using an Energy Rating Index.	

RESNET/ICC-850-2020	Calculation and Labeling of the Water Use Performance of One-and Two-Family Dwellings Using the Water Rating Index
ANSI/ASABE S626 SEP2016 (R2020)	Landscape Irrigation System Uniformity and Application Rate Testing
--	CEC appliance database
--	EPA Energy Star Website
--	ENERGY STAR product finder database
--	California Energy Commission (CEC) Modernized Appliance Efficiency Database
--	Department of Energy (DOE) Compliance Certification Management System (CCMS).
--	EPA Water Sense specification for Tank-Type Toilets
--	US Geological Survey Concentrations of Hardness as Calcium Carbonate Map
--	Mortgage Industry National Home Energy Rating Systems Standard.

Reason: In response to water resources becoming increasingly strained throughout the country and water prices rising fast due to aging infrastructure and water utility rate structures, ANSI/RESNET/ICC 850-2020 was developed to provide a consistent, uniform methodology for evaluating, quantifying, and labeling the water use performance of one- and two-family dwellings and to serve as the basis for RESNET's residential water efficiency rating system (known as HERS$_{H2O}$®).

Drought, new development and aging water infrastructure can all put a strain on local water resources. In some instances this has caused local officials to put a moratorium on new permits for fear the water utility could not meet the increased demand, as described in a New York Times article. ANSI/RESNET/ICC 850 provides a much-needed resource for states, municipalities and builders to not only evaluate a home's water efficiency but to estimate their annual water use. This estimate of annual water use can serve as an important tool for anticipating the water needs of new development.

For user convenience and to provide a resource for builders to measure the water efficiency of the homes they build, ANSI/RESNET/ICC 850 should be added in its entirety as a new appendix in both the International Plumbing Code and International Residential Code since both are adopted for use in residential construction.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Bibliography: RESNET's Water Efficiency Rating System HERS$_{H2O}$® - https://www.resnet.us/about/hersh2o/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed language is being recommended for inclusion into the code(s) as a voluntary appendix.

P162-24 Part I

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: This is not a code requirement and doesn't need to be in the code. Information can be published elsewhere. (10-4)

P162-24 Part I

Individual Consideration Agenda

Comment 1:

IPC: (New), SECTION G101 (New), G101.1 (New), G101.2 (New), G101.3 (New), SECTION G201 (New), G201.1 (New), TABLE G201.1 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Replace as follows:

2024 International Plumbing Code

Add new text as follows:

APPENDIX G Calculation and Labeling of the Water Use Performance of One- and Two-Family Dwellings

SECTION G101 GENERAL

G101.1 Purpose. The provisions of this appendix establish a uniform methodology for evaluating and rating the water use performance of one-and two-family dwellings.

G101.2 Scope. This appendix shall provide a uniform methodology for evaluating and rating the indoor and outdoor water use performance of one-and two-family dwellings.

G101.3 Evaluation and rating. All evaluations and rating shall be performed in accordance with the RESNET/ICC-850 or other approved rating methodology

SECTION G201 REFERENCE STANDARDS

G201.1 General. See Table G201.1 for standards that are referenced in various section of this appendix. Standards are listed by the standard identification with the effective date, the standard title, and the section or sections of this appendix that reference this standard.

TABLE G201.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED

ANSI/RESNET/ICC-850-2020 Calculation and Labeling of the Water Use Performance of One-and Two-Family Dwellings Using the Water Rating Index G101.3

Reason: This comment replaces the original proposal to provide a simplified approach of directly referencing the RESNET/ICC 850 standard. The language recognizes that there may be other rating methodologies that could be approved by the code official. The term labeling was removed from the proposed language to avoid any misunderstanding with respect to the defined term "labeled".

This proposal is needed for those jurisdictions where water is a precious commodity. The design of buildings has significant impact on water use efficiency. Evaluation and rating methodologies are needed to be able to compare building designs.

The committee should note that although this proposal adds subject matter pertaining only to one- and two family dwellings (not typically within the scope of the IPC), IPC Section 101.2 Scope states the following (underlined added):

> "The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use, or maintenance of plumbing systems within this jurisdiction. This code shall regulate nonflammable medical gas, inhalation anesthetic, vacuum piping, nonmedical oxygen systems, and sanitary and condensate vacuum collection systems. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters, and water heater venting systems shall be regulated by the *International Fuel Gas Code*.
>
> **Exception:** Detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the *International Residential Code*."

In other words, there are some jurisdictions where the IRC Plumbing Chapters are not used for one and two family dwellings but instead, the IPC is used for all buildings, including one- and two family dwellings. Therefore, this proposed appendix will be useful in the IPC under these jurisdictional circumstances.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This appendix is intended to be nonmandatory for the model I-codes and as such, there is no cost impact to the IPC. However, where a jurisdiction wishes to adopt this appendix, there would be a cost associated with having an evaluation and rating performed for a building. As stated in the original proposal, such services cost approximately $50 to $300 per home. This estimate of cost comes from a small survey of what third party home rating firms currently charge for completing the water efficiency rating for various sizes of typical homes. Larger homes may cost more than small homes and builders with more homes may receive volume discounts. The costs also vary based on geographic location of the home rating companies.

Comment (CAH2)# 182

P162-24 Part II

IRC: APPENDIX CI (New), SECTION CI101 (New), CI101.1 (New), CI101.2 (New), CI201 (New), CI201.1 (New), SECTION 202 (New), SECTION CI301 (New), CI301.1 (New), CI301.2 (New), CI301.3 (New), CI301.3.1 (New), CI301.3.2 (New), CI301.3.3 (New), CI301.3.4 (New), CI301.3.5 (New), CI301.3.6 (New), CI301.3.7 (New), CI301.4 (New), CI301.4.1 (New), CI301.4.2 (New), CI301.5 (New), CI301.5.1 (New), CI301.5.2 (New), CI301.5.3 (New), CI301.5.4 (New), CI301.5.5 (New), CI301.5.6 (New), CI301.5.7 (New), CI301.5.8 (New), CI301.5.9 (New), CI301.5.10 (New), CI301.6 (New), CI301.6.1 (New), CI301.6.2 (New), CI301.6.3 (New), CI301.6.4 (New), CI301.6.4.1 (New), CI301.6.5 (New), TABLE CI301.6.5 (New), SECTION CI401 (New), CI401.1 (New), TABLE CI401.1 (New), CI401.2 (New), CI401.2.1 (New), CI401.2.2 (New), CI401.3 (New), TABLE CI401.3 (New), CI401.4 (New), CI501 (New), CI501.1 (New), CI501.2 (New), CI501.2.1 (New), CI501.2.1.1 (New), CI501.2.1.1.1 (New), CI501.2.1.2 (New), CI501.2.2 (New), CI501.2.2.1 (New), CI501.2.2.1.1 (New), CI501.2.2.1.2 (New), CI501.2.2.1.3 (New), CI501.2.2.1.3.1 (New), CI501.2.2.1.3.2 (New), CI501.2.2.1.3.2.1 (New), CI501.2.2.1.3.2.1.2 (New), CI501.2.2.1.3.3 (New), CI501.2.2.1.3.4 (New), CI501.2.2.1.3.5 (New), CI501.2.2.2 (New), CI501.2.2.2.1 (New), CI501.2.2.2.2 (New), CI501.2.2.2.3 (New), CI501.2.2.2.3.1 (New), CI501.2.2.2.3.2 (New), CI501.2.2.2.4 (New), CI501.2.2.2.5 (New), CI501.2.2.2.6 (New), CI501.2.2.3 (New), CI501.2.3 (New), CI501.2.3.1 (New), CI501.2.3.2 (New), CI501.2.3.4 (New), CI501.2.3.5 (New), CI501.2.3.6 (New), CI501.2.4 (New), CI501.2.4.1 (New), CI501.2.4.1.1 (New), CI501.2.4.1.2 (New), CI501.2.4.1.3 (New), CI501.2.4.2 (New), CI501.2.4.2.1 (New), CI501.2.4.2.2 (New), CI501.2.4.2.3 (New), CI501.2.4.3 (New), CI501.2.4.3.1 (New), CI501.2.4.3.2 (New), CI501.2.4.3.3 (New), CI501.3 (New), CI501.3.1 (New), CI501.3.1.1 (New), CI501.3.1.2 (New), CI501.3.1.3 (New), CI501.3.1.4 (New), CI501.3.1.5 (New), CI501.3.2 (New), CI601 (New), CI601.1 (New), TABLE CI601.1 (New)

Proposed Change as Submitted

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Residential Code

Add new text as follows:

APPENDIX CI
Calculation and Labeling of the Water Use Performance of One- and Two-Family Dwellings

SECTION CI101
GENERAL

CI101.1 Purpose. The provisions of this appendix establish a uniform methodology for evaluating, rating and labeling the water use performance of one and two-family dwellings.

CI101.2 Scope. This appendix shall provide a uniform methodology for evaluating, rating and labeling the indoor and outdoor water use performance of one- and two-family dwellings. Such evaluations, rating and labeling shall be in accordance with this appendix and RESNET/ICC-850.

Add new definition as follows:

CI201
DEFINITIONS

Add new text as follows:

CI201.1 Definitions. The following terms and acronyms have specific meanings as used in this Appendix. In the event that definitions given here differ from definitions given elsewhere, the definitions given here shall govern.

Add new definition as follows:

Approved Rating Provider. An approved entity responsible for the certification of home water efficiency raters working under its auspices and who is responsible for the quality assurance of such Certified Raters and for the quality assurance of water efficiency ratings produced by such home water efficiency raters.

Approved Software Rating Tool. A computerized procedure that is approved for the purpose of conducting home water efficiency ratings and calculating the annual water consumption, annual water costs and a Water Rating Index for a home.

Automatic Irrigation System. An irrigation system that is initiated by a clock timer, irrigation controller, or other method that does not require human intervention to initiate an irrigation event.

Bedroom. A room or space 70 square feet of floor area or greater, with egress window and closet, used or intended to be used for sleeping. A “den,” “library,” “home office” with a closet, egress window, and 70 square feet of floor area or greater or other similar rooms shall count as a Bedroom, but living rooms and foyers shall not.

Irrigated Area. The portion of a lot that receives supplemental water for irrigation.

Lot Size. The area of a single parcel of land on which the Rated Home is located.

Other Water Use. Water use associated with leaks, minor draws, and other end uses not specified in the Reference Home or Rated Home.

Outdoor Water Use. Water use that occurs outside of the exterior walls of a dwelling unit.

Rated Home. The specific real property that is evaluated using the water use performance rating procedures specified by this Appendix.

Reference Home. A hypothetical home configured in accordance with the specifications set forth in Section CI301.3of this code andthe basis of comparison for the purpose of calculating the Water Rating Index of a Rated Home.

Residential Irrigation Capacity Index (RICI). The intensity with which an automatic irrigation system applies water calculated in accordance with Section **CI301.6.3.**

Water Rating Index (WRI). An integer representing the relative water use of a Rated Home as compared with the water use of the Reference Home and where an Index value of 100 represents the water use of the Reference Home and each integer reduction represents a one percent improvement in water use efficiency.

Add new text as follows:

SECTION CI301 HOME WATER RATING CALCULATION PROCEDURES

CI301.1 Determining the Water Rating Index. The Water Rating Index (WRI) shall be determined in accordance with Sections CI301.2 through CI301.6. The Reference Home shall be configured in accordance with Sections CI301.3 and CI301.4, and the Rated Home shall be configured in accordance with Section CI301.5 and CI301.6 .

CI301.2 Determining the Daily Indoor Water Use for the Reference Home. The indoor daily water use for the Reference Home shall be calculated as follows:

$$WRI = \frac{\text{indoor and outdoor daily water use for the Rated Home}}{\text{indoor and outdoor daily water use for the Reference Home}} \times 100$$

(Equation CI301.2-1)

CI301.3 Determining the Daily Indoor Water Use for the Reference Home.. The indoor daily water use for the Reference Home shall be calculated as follows:**refingpd = refFgpd + refWgpd + refDWgpd + refCWgpd +refTgpd + refSofgpd + refOther(Equation CI301.3-1)**

where:*refF*$_{gpd}$ = daily fixture water use for the Reference Home *refWgpd* = daily water use wasted from hot water outlets for the Reference Home

refDWgpd = daily dishwasher water use for the Reference Home

refCWgpd = daily clothes washer water use for the Reference Home

refTgpd = daily toilet water use for the Reference Home

refSofgpd = daily water softener water use for the Reference Home

refOther = daily total other/unidentified water use for the Reference Home

CI301.3.1 Determining Daily Reference Home Fixture Water Use. Reference Home daily fixture water use shall be calculated as follows: $refFgpd = 14.6 + 10 \times Nbr$ **(Equation CI301.3.1-1)**

where:

Nbr = number of bedrooms in the Rated Home

CI301.3.2 Determining Daily Reference Home Hot Water Waste. Reference Home daily hot water waste shall be calculated as follows:

$refWgpd = 9.8 \times Nbr^{0.43}$ **(Equation CI301.3.2-1)**

where:

Nbr = number of bedrooms

CI301.3.3 Determining Daily Reference Home Dishwasher Water Use. Reference Home dishwasher water use shall be calculated as follows: $refDWgpd =$

$$\frac{(88.4 + 34.9 \times Nbr) \times 8.16}{365}$$

(Equation CI301.3.3-1)

Which simplifies to:

$refWgpd = 1.97 + 0.7802 \times Nbr$

Where:

Nbr = number of bedrooms

$(88.4 + 34.9 \times Nbr)$ = best fit regression equation for dishwasher cycles per year using data from the 2005 Residential Energy Consumption Survey

8.16 = gallons per cycle from the DOE Technical Support Document from the NAECA standard in effect in 2006

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

CI301.3.4 Determining Daily Reference Home Clothes Washer Water Use. Reference Home daily clothes washer water use shall be calculated as follows: $refCWgpd =$

$$\frac{(3.0 \times 11.4 \times ACY)}{365}$$

(Equation CI301.3.4-1)

Where:

3.0 = reference washer capacity (*CAPw*) in ft3

11.4 = reference integrated water factor (IWF) in (gal/cyc) per ft3

ACY = Adjusted Cycles per Year = (164 + 46.5 × *Nbr*)

Nbr = number of bedrooms

CI301.3.5 Determining Daily Reference Home Toilet Water Use. *refTgpd= refFPO* × *refGPF* × *Occ* **(Equation CI301.3.5-1)**

where:

refFPO = the Reference Home flushes per person per day = 5.05

refGPF = the Reference Home gallons per flush for toilets = 1.6

Occ = the number of occupants = 1.09 + 0.54 ×*Nbr*

Nbr = number of bedrooms

CI301.3.6 Determining Daily Reference Home Water Softener Use.. Where the Rated Home has a water softener and the water hardness at the Rated Home location is greater than or equal to 180 milligrams/liter, the Reference Home water softener daily water use shall be calculated as follows:*refSofgpd* =

$$\frac{\text{grains of hardness}}{\text{gallon of water}}$$

× sum of indoor water uses in the Reference Home ×

$$\frac{\text{5 gallons used}}{\text{1,000 grains removed}}$$

(Equation CI301.3.6-1)

Where the Rated Home does not meet these conditions, the *refSofgpd* = 0.

CI301.3.7 Determining Daily Reference Home Other Water Use. . Reference Home daily other water use shall be determined as follows:*refOther* = 5.93 × *Nbr* **(Equation CI301.3.7-1)**

where:

Nbr = the number of bedrooms in the Rated Home

CI301.4 Determining the Reference Home Outdoor Water Use. The reference home outdoor annual water use (in thousands of gallons per year) shall be calculated using the following two equations:

If the rated home has a netET of less than 12 inches/year OR the rated home has an automatic irrigation system, use Equation **CI301.4-1**.

$$\left[\frac{Exp(A)}{1 + Exp(A)}\right]$$

× 1.18086 × [2.0341 × *netET*0.7154 ×

*Ref_Irr_Area*0.6227 + 0.5756 × *ind_Pool* ×

netET] **(Equation CI301.4-1)**

If the rated home has a netET of greater than 12 inches/year AND the rated home does NOT have an automatic irrigation system, use **Equation CI301.4-2**.

$$\left[\frac{Exp(B)}{1+Exp(B)}\right]$$

$\times\ 1.22257 \times [1.4233 + 0.6311 \times netET +$

$0.9376 \times Ref\_Irr\_Area]] + ref\_Pool$ (Equation **CI301.4-2**)*Either equation shall be constrained as follows:*

IF

Rat_Irr_Area < Ref_Irr_Area ***THEN*** *Ref_Out* = Equation **CI301.4-1** or **CI301.4-2**

$$\frac{\text{Equation 1 (Using Rat\_Irr\_Area and ind\_Pool = 0)}}{\text{Equation 1 (with Ref\_Irr\_Area and ind\_Pool = 0)}}$$

(Equation **CI301.4-3**)

AND

Outdoor Reference Home Annual Water Use shall never be lower than Equation **CI301.4-2**

Where:

Exp(A) = exponent of [1.4416 + 0.5069 × (*Irr_Area*/1,000)]

Exp(B) = exponent of [0.6911 + 0.00301 × *netET* × (*Irr_Area*/1,000)]

Ref_Irr_Area = the size of the irrigated area in the Reference Home, calculated in accordance with Section **CI301.4.1**

Rat_Irr_Area = the size of the irrigated area in the Rated Home

netET = the annual historic sum of mean reference evapotranspiration minus the mean precipitation for all months that evapotranspiration exceeds precipitation

ind_Pool = indicator representing the presence or absence of a swimming pool in the Rated Home

ref_Pool = Equation **CI301.4-1** (using *ind_Pool* = 1) – Equation **CI301.4-1** (using *ind_Pool* = 0)

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CI301.4.1 Determining Outdoor Daily Water Use for the Reference Home. . Reference Home daily outdoor water use shall be determined by multiplying the result of either Equation **CI301.4-1** or Equation **CI301.4-2**, as appropriate, by 1,000 and dividing the product by 365.

CI301.4.2 **Determining Irrigated Area for the Reference Home.** Reference Home Irrigated Area shall be calculated as follows: Where the lot size of the Rated Home is less than 7,000 ft2, the Irrigated Area of the Reference Home shall be calculated as follows:

Ref_Irr_Area = *Lot_Area* × (0.002479 × *Lot_Area*0.6157) **(Equation CI301.4.2-1)**

wherethe Lot Size of the Rated Home is greater than or equal to 7,000 ft2, the Irrigated Area of the Reference Home shall be calculated as follows:

Ref_Irr_Area = *Lot_Area* × 0.577Equation **CI301.4.2-2**)

Where:

Ref_Irr_Area = the size of the landscape that receives supplemental water in the Reference Home

Lot_Area = the size of the lot on which the Rated Home is being constructed

CI301.5 **Determining Daily Indoor Water Use of the Rated Home..** The daily Indoor Water Use of the Rated Home shall be calculated as follows:*Indoorgpd* = *Showergpd* + *KitchFgpd* + *LavFgpd* + *Wastegpd* + *CWgpd* + *DWgpd* + *Toiletsgpd* + *Softgpd* + *Other* + *EPgpd* where: **(Equation CI301.5-1)**

Where:

Showergpd = daily shower water use for the Rated Home

KitchFgpd = daily kitchen faucet water use for the Rated Home

LavFgpd = daily lavatory water use for the Rated Home

Wastegpd = daily water use wasted for the Rated Home

CWgpd = daily clothes washer water use for the Rated Home

DWgpd = daily dishwasher water use for the Rated Home

Toiletsgpd = daily toilet water use for the Rated Home

Softgpd = daily water softener water use for the Rated Home

Othergpd = daily other/unidentified water use for the Rated Home

EPgpd = daily excess pressure adjustment

CI301.5.1 **Determining Daily Shower Water Use for the Rated Home.** Rated Home daily shower water use shall be calculated as follows:*Showergpd* = *FixtureTot* × *showerpc* × *SHeff* **(Equation CI301.5.1-1)**

where:

FixtureTot = determined in accordance with ANSI/RESNET/ICC 301, Addendum A =

$$\frac{adjFmix}{Fmix}$$

x *refFgpd*

Shower_pc = percent of fixture water use consumed by showers = 54%

SHeff = the ratio of the average rated flow rate of showerheads to the reference home flow rate

$$= \frac{\text{average flow rate of showerheads in the Rated Hame}}{2.5}$$

CI301.5.2 Determining Daily Kitchen Faucet Water Use for the Rated Home. Rated Home daily kitchen faucet water use shall be calculated as follows:*KitchFgpd = FixtureTot × faucetpc × KitchFeff × kitch* **(Equation CI301.5.2-1**

where:

FixtureTot = determined in accordance with ANSI/RESNET/ICC 301 Addendum A =

$$\frac{adjFmix}{Fmix}$$

× *refFgpdfaucetpc* = percent of fixture water use consumed by faucets = 46%

KitchFeff = the ratio of the average rated flow rate of kitchen faucets to the Reference Home flow rate

average flow rate of kitchen faucets in rated home

2.2

Kitch = the percentage of faucet use that is attributed to kitchen faucets = 69%

-

CI301.5.3 Determining Daily Lavatory Faucet Water Use for the Rated Home. . Rated Home daily lavatory faucet use shall be calculated as follows:*LavFgpd* = FixtureTot × faucetpc × LavFeff × Lav **(Equation CI301.5.3-1)**

where:

Lav = the percentage of faucet use that is attributed to lavatory faucets= 31%*FixtureTot* = determined in accordance with ANSI/RESNET/ICC 301 Addendum A =

$$\frac{adjFmix}{Fmix}$$

x *refFgpdfaucet pc* = percent of fixture water use consumed by faucets = 46%

LavFeff = the ratio of the average rated flow rate of lavatory faucets to the Water Rating Reference Home flow rate = 1 for standard faucets and 0.95 for high-efficiency faucets

-

CI301.5.4 Determining Daily Hot Water Waste for the Rated Home. Rated Home daily hot water waste shall be calculated as follows:

Wastegpd = *Feff* × (*oWgpd + sWgpd × WDeff*) **(Equation CI301.5.4-1)**

where:

Feff = fixture efficiency of showerheads, kitchen faucets, and lavatory faucets weighted by contribution to total fixture use (by volume)

oWgpd = daily standard operating condition hot water wasted quantity as determined by ANSI/RESNET/ICC 301 Addendum A

sWgpd = daily structural hot water wasted quantity as determined by ANSI/RESNET/ICC 301 Addendum A

WDeff = distribution system water use effectiveness from Table 4.2.2.5.2.11(3) of ANSI/RESNET/ICC 301 Addendum A

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

CI301.5.5 Determining Daily Clothes Washer Water Use for the Rated Home. Rated Home daily clothes washer water use shall be calculated as follows:

$$CW_{gpd} = \frac{CAPw \times IWF \times ACY}{365}$$

(Equation CI301.5.5-1)

where:

CAPw = washer capacity in cubic feet = the manufacturer's data or the CEC database or the EPA Energy Star® website

IWF = Integrated Water Factor from manufacturer's data [(gal/cyc)/ft3]

ACY = Adjusted cycles per year

Determining ACY:

ACY = (164 + 46.5 × *Nbr*)

x

$$\frac{(3.0 \times 2.08 + 1.59)}{(CAPw \times 2.08 + 1.59)}$$

=

best fit regression equation to adjust the standard cycles per year to account for occupancy and size of clothes washer; based on 2005 Residential Energy Consumption Survey data

Where:

CAPw = the capacity of the clothes washer in ft3(164 + 46.5 × *Nbr*) = standard cycles per year based on 2005 Residential Energy Consumption Survey data

$$\frac{(3.0 \times 2.08 + 1.59)}{(CAPw \times 2.08 + 1.59)}$$

CI301.5.6 Determining Daily Dishwasher Water Use for the Rated Home. . Rated Home daily dishwasher water use shall be calculated as follows:

DWgpd = [(88.4 + 34.9 × *Nbr*) × (12/*dWcap*) × gal/cycle/365 **(Equation CI301.5.6-1)**

where:

Nbr = number of bedrooms in the Rated Home

dWcap = capacity of the dishwasher in the Rated Home (in place settings) as included in the manufacturer's data (88.4 + 34.9 × *Nbr*) = best fit regression equation for dishwasher cycles per year using data from the 2005 Residential Energy Consumption Survey gal/cycle can be entered either directly or as listed on:

a. The ENERGY STAR product finder database.

b. The California Energy Commission (CEC) Modernized Appliance Efficiency Database.

c. The Department of Energy (DOE) Compliance Certification Management System (CCMS).

OR gal/cycle can be calculated from the Energy Guide label as follows (developed using the equations from 10 CFR 430, Subpart B, Appendix C and values on the Energy Guide label) to isolate the energy used by the appliance from the energy used in water heating):gal/cycle = h2o_kWh × elec_h2o
h2o_kWh = LER-Appl_kWh

LER = Labeled Energy Rating in kWh per year per the dishwasher Energy Guide label

Appl_kWh = dishwasher appliance annual electric energy use = (GHWC × gas_h2o/$_therm-LER × $_kWh × elec_h2o/per_kWh) / ($_kWh × gas_h2o/$_therm-elec_h2o)

Where:

$_kWh = the cost of one kWh per the dishwasher Energy Guide label

$_therm = the cost of one therm per the dishwasher Energy Guide label

GHWC = Gas Hot Water Cost per the dishwasher Energy Guide label

elec_h2o = gallons of hot water use per cycle per unit of annual electricity use in gal × y/kWh × cyc = 1/(80 × 0.0024 × 208) = 0.02504gas_h2o = gallons of hot water use per cycle per unit of annual gas use in gal × y/therm × cyc = 1/(80 × 8.2/0.75 × 208/100,000) = 0.5497

80 = the average hot water heater temperature rise per 10 CFR 430, Subpart B, Appendix C

0.0024 = specific heat of water in kWh/gal × F per 10 CFR 430, Subpart B, Appendix C

8.2 = specific heat of water in Btu/gal × F per 10 CFR 430, Subpart B, Appendix C

0.75 = recovery efficiency of gas hot water heater per 10 CFR 430, Subpart B, Appendix C

208 = cycles per year

This value is determined in accordance with ANSI/RESNET/ICC 301 Addendum A.

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CI301.5.7 Determining Daily Toilet Water Use for the Rated Home. Rated Home daily toilet water use shall be calculated as follows:
Toiletgpd = *refFPO* × *gpf* × *Occ*

Where:

refFPO = the reference flushes per person per day = 5.05

gpf = the average gallons per flush of all toilets installed in the Rated Home; for tank-type dual-flush toilets, use the effective flush volume per flush based on EPA Water Sense specification for Tank-Type Toilets

Occ = the number of predicted occupants in the Rated Home = 1.09 + 0.54 × *Nbr*

Nbr = the number of bedrooms in the Rated Home

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CI301.5.8 Determining Daily Water Softener Water Use for the Rated Home. . Rated Home daily water softener water use shall be calculated as follows:*Softgpd* =

$$\frac{\text{grains of hardness}}{\text{gallon of water}}$$

× [sum of softened water
uses in the Rated Home] × [gallons used per 1,000 grains of hardness]

(Equation CI301.5.8-1)

where:
softened water = water conditioned by a water softener

CI301.5.9 Determining Daily Other Water Use for the Rated Home. . Rated Home daily other water use shall be calculated as follows:
Othergpd = 5.93 × *Nbr* **(Equation CI301.5.9-1)**
where:
Where:
Nbr = the number of bedrooms in the rated home

CI301.5.10 Determining Daily Excess Pressure Adjustment Water Use for the Rated Home.. Where a Rated Home does not have a pressure-reducing valve or pressure tank, additional water use attributed to excess water pressure shall be calculated as follows:*EPgpd* = MAX {[(*Showergpd* + (0.5 × (*LavFgpd* +
KitchFgpd + *Othergpd*))) × 0.006 × (*PR* – 90)],0} **(Equation CI301.5.10-1)**
where:
Where:

PR = static water pressure (in psi) measured at the indoor fixture outlet on the lowest floor and (if more than one) closest to the water service entry to the house

Shower and lavatory faucets controlled by integral or accessory pressure-compensating devices shall be permitted to be excluded from this equation.

CI301.6 Determining Outdoor Water Use for the Rated Home. The Rated Home outdoor water use shall be calculated as follows: Where the Rated Home has an automatic irrigation system, outdoor water use shall be calculated as follows:

$$\left[\frac{Exp(A)}{1 + Exp(A)}\right]$$

× 1.18086 × [2.0341 × netET0.7154 ×
*Rat_Irr_Area*0.6227 + 0.5756 × *ind_Pool* ×
netET] **(Equation CI301.6-1)**

Where the Rated Home does not have an automatic irrigation system, outdoor water use shall be calculated as follows:

$$\left[\frac{Exp(B)}{1 + Exp(B)}\right]$$

× 1.22257 × [1.4233 + 0.6311 ×

netET + 0.9376 × *Rat_Irr_Area*]] + *Pool_use*
(Equation **CI301.6-2**)

The outdoor water use for the Rated Home shall never be less than the result of the following calculation:

$$\left[\frac{Exp(B)}{1 + Exp(B)}\right]$$

× 1.22257 × [1.4233 + 0.6311 × *netET* + 0.9376 ×
Rat_Irr_Area]
(Equation **CI301.6-3**)

Where:

Exp(A) = exponent of [1.4416 + 0.5069 × (*Rat_Irr_Area*/1,000)]

Exp(B) = exponent of [0.6911 + 0.00301 × netET * (*Rat_Irr_Area*/1,000)]

Rat_Irr_Area = the size of the landscape that might receive supplemental water in the Rated Home

netET = the annual historic sum of mean reference evapotranspiration minus the mean precipitation for all months that evapotranspiration exceeds precipitation

ind_Pool = indicator representing the presence or absence of a swimming pool

Pool_use = Equation **CI301.6-1** (using *ind_Pool* = 1) – Equation **CI301.6-1** (using *ind_Pool* = 0)

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CI301.6.1 Determining Outdoor Daily Water Use for the Rated Home. Rated Home daily outdoor water use shall be determined by multiplying the result of either Equation CI301.6-1 or Equation CI301.6-2 as appropriate, as such result may be further modified pursuant to Sections CI301.6.1 through CI301.6.4 , by 1,000 and dividing the product by 365.

CI301.6.2 Weather-based Controllers. . Sensor- and weather- based irrigation controllers that are certified by the US EPA WaterSense program shall decrease the portion of predicted Rated Home outdoor water use associated with irrigation, less the water use associated with pools, by 15% in homes that have automatic irrigation system.

CI301.6.3 Commissioning of an Automatic Irrigation System. In Rated Homes with an automatic irrigation system, where documentation is provided, the water use associated with irrigation shall be decreased by 5% where a certified professional, as identified by a WaterSense labeled certification, has inspected the irrigation system according to the protocols identified in ASABE S626 and verified as follows:

1. Average distribution uniformity of at least 65% on turf areas.
2. Sprinklers are operating at the manufacturer's recommended water pressure +/- 10%.
3. The system operates without leaks
4. The system prevents runoff and overspray from leaving the property (checked during the audit).
5. Two seasonal water schedules (initial grow-in period and established landscape) are posted at the controller.

CI301.6.4 Residential Irrigation Capacity Index (RICI). In a Rated Home with an automatic irrigation system, where documentation is provided, a RICI shall be calculated as follows:

$$RICI_{rat} = \frac{\text{sum of flow (gpm) of all irrigation valves}}{\text{square feet irrigated area}} \times 1{,}000$$

(Equation CI301.6.4-1

CI301.6.4.1 Applying RICI. . A Rated Home, where documentation for a RICI is provided, may adjust the volume of water use associated with irrigation (less the water use associated with pools) in the outdoor water use of the Rated Home by 10% for every point from a baseline RICI (RICI_ref) of 5.

CI301.6.5 Applying Adjustments to the Outdoor Water Use of Rated Homes. . Because the Water Rating Index model includes a number of percent adjustments for the outdoor water use of the Rated Home, the order of application becomes important. The correct order in which to apply these adjustments is as indicated in Table **CI301.6.5.**

TABLE CI301.6.5 APPLYING ADJUSTMENTS TO OUTDOOR WATER USE OF THE RATED HOME

STEP	SECTION	DETERMINED BY
1	**CI301.6.2** —Weather-based Controllers	Shall be determined by the presence or absence of a smart controller in the installed portion of the landscape.
2	**CI301.6.3** — Commissioning of an Automatic Irrigation System	Shall be determined by the presence or absence of commissioning in the installed portion of the landscape.
3	**CI301.6.4**—Residential Irrigation Capacity Index (RICI)	Shall be calculated in accordance with Section **CI301.6.4** and adjusted in partially finished landscapes to be calculated as: *RICI rat* (Predicted *Back irr* is defined in Section **CI401.5**)

SECTION CI401
MINIMUM RATED FEATURES

CI401.1 MINIMUM RATED FEATURES TABLE. The estimated annual indoor and outdoor water use shall be determined using the minimum rated features set forth in Table **CI401.1**

TABLE CI401.1 MINIMUM RATED FEATURES

Building Element	Minimum Rated Feature
Toilet	Flush volume for each toilet as measured on-site or from manufacturer's data.
Shower/Bath	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Bathroom Faucet	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Kitchen Faucet	As imprinted on the product, stated by manufacturer in product documentation, or tested via flow rate test in the field.
Clothes Washer	Washer capacity (cubic feet) from manufacturer's data or the CEC Appliance Efficiency Database or the EPA ENERGY STAR website for all clothes washers located within the Rated Home.
Dishwasher	Capacity of the dishwasher (in place settings) as included in the manufacturer's data, labeled energy factor (cycles/kWh) for all dishwashers located within the Rated Home.
Water Softener	Gallons of water used per 1,000 grains of hardness removed.
Hot Water Distribution	Insulation *R*-value of pipe insulation, type of recirculation system, length of pipe.
Outdoor Water Use	Irrigation system type (automatic or manual), lot size, irrigated area (square feet).
Pool/Spa	Indicate presence or absence of a pool or spa.
Service Water Pressure	Service pressure of water being supplied to the home, as established by the setting of an installed pressure-reducing valve OR the setting of an installed pressure tank OR written documentation from the water supplier that service pressure to the site is 90 psi OR an on-site static pressure test.

CI401.2 Data Sources. Data required for the calculation of indoor and outdoor daily water use in the Rated and Reference Homes shall be determined by the location of the Rated Home and using data as set forth in Sections **CI401.2**.1 and **CI401.2**.2.

CI401.2.1 Net Evapotranspiration. Data for net evapotranspiration shall be determined for the location of the Rated Home using the World Water and Climate Atlas.

CI401.2.2 Hardness of Water. Data for the hardness of water shall be determined by the location of the Rated Home and one of the following:

1. US Geological Survey Concentrations of Hardness as Calcium Carbonate Map.
2. Data provided by the local water supplier.
3. A hardness test of water collected in the home using an EPA-approved method for determination of hardness.

CI401.3 Default Values. Values that are not available in accordance with Table CI401.1 5.0 or are absent from the home at the time of the rating shall use default values in accordance with Table **CI401.3** . Values for building elements that are not specified in Table **CI401.3** are required for a rating to be issued.

TABLE CI401.3 DEFAULT VALUES

Building Element	Default
Water Softeners	Can be entered as 0 if they are absent from a Rated Home. If they are present and no documentation is available, they may be assumed to use 5 gallons/1,000 grains removed for cation water softeners if information is unavailable.
Clothes Washer	Same as Reference Home.
Dishwasher	Determined by ANSI/RESNET/ICC 301. A Rated Home without either a dishwasher or an undercounter cavity for placement of a dishwasher shall be assigned a Daily Dishwasher Water Use of 0.
Hot Water Distribution	Determined by ANSI/RESNET/ICC 301 Addendum A.
Outdoor Water Use	Must be done in accordance with Section CI301.4

CI401.4 Incomplete Outdoor Area. To receive a rating, a home must (at a minimum) have the front yard landscape completed. Homes that do not have landscaping completed in the back yard shall be determined in accordance with Section **CI301.6** with the portion of landscaping that is done determining the presence or absence of an automatic irrigation system. The following steps shall be followed in determining irrigated area in this instance:

Rater must determine a line between the front and back area (*Front_area* + *Back_area* must = *Total_available_area*)

Lot_Area – Pad Footprint = *Total_available_area*

(Back_area/*Total_available_area*) × *Ref_Irr_Area* = *Predicted Back_irr*

Irr_Area = *Predicted Back_irr* + *Front_irr*

Where:

Pad Footprint = the portion of the lot area covered by the dwelling unit and any attached or detached garage

Total_available_area = the portion of the lot excluding the pad of the house that is available for landscaping or other design features (hardscape, softscape, etc.)

Front_area = the area (ft2) of the total available area that is located primarily in front of the house

Back_area = the area (ft2) of the total available area that is located primarily behind the house

Front_irr = the area located primarily in front of the house that receives supplemental water for irrigation at the time of the rating

Predicted Back_irr = the portion of the area located primarily behind the house that can be predicted to receive supplemental water for irrigation in the future

CI501
CERTIFICATION AND LABELING

CI501.1 STANDARD FOR CERTIFICATION AND LABELING. This section establishes minimum uniform standards for certifying and labeling home water use performance using the Water Rating Index. These include minimum requirements of the home water use rating process, standard methods for estimating water use, minimum reporting requirements, and specification of the types of ratings that are performed in accordance with this code.

CI501.2 Rating Requirements. .

CI501.2.1 General. The rating for a home shall be determined in accordance with Sections CI501.2.1.1through CI501.2.1. 2.

CI501.2.1.1 EXISTING HOMES. For an existing home, required data shall be collected on-site.

CI501.2.1.1.1 NEW HOMES. For a new, to-be-built home, the procedures of Section CI401 shall be used to collect required data.

CI501.2.1.2 ESTIMATED ANNUAL WATER CONSUMPTION. The collected data shall be used to estimate the annual water consumption for indoor and outdoor water use for both the Rated Home and the Reference Home as specified by Section CI301

CI501.2.2 Cost Savings Estimates. Where determined, cost savings estimates for water and wastewater (sanitary sewer) service for the Rated Home shall be calculated in accordance with Sections CI501.2.2.1 through CI501.2.2.1.3

CI501.2.2.1 Water Cost Savings. .

CI501.2.2.1.1 Water Prices. Water cost savings for homes receiving potable water service from a water supplier shall be based on the schedule of rates and charges adopted by the water supplier serving the Rated Home.

CI501.2.2.1.2 Relevant Rates and Charges. Water cost savings shall be calculated from the volumetric portion of the schedule of rates and charges, sometimes referred to as the commodity charge. Fixed or flat charges that do not vary with the volume of water delivered to the home, sometimes referred to as the meter charge or service charge, shall not contribute to the cost savings estimate.

CI501.2.2.1.3 Water Cost Savings Calculations. .

CI501.2.2.1.3.1 Average Billed Indoor Volume of the Reference Home. Convert the total annual volume of indoor water use by the Reference Home to an increment of indoor use during a water billing period by dividing the annual indoor volume by the number of bills per year generated by the water supplier (e.g., for monthly billing divide by 12 and for quarterly billing divide by 4). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed indoor volume of the Reference Home.

CI501.2.2.1.3.2 Determine Outdoor Water Use for a Billing Period. Convert the total annual volume of outdoor water use in the Reference Home to an increment of outdoor use during a water billing period using one of two methods, based on prevailing practice at the location of the Rated Home.

CI501.2.2.1.3.2.1 Peak Season Irrigation. Divide the annual outdoor volume by the number of bills generated by the water supplier during the irrigation season (e.g., for a 6-month irrigation season with monthly billing, divide by 6; for a 6-month irrigation season with quarterly billing, divide by 2). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed outdoor volume of the Reference Home.

CI501.2.2.1.3.2.1.2 Year-Round Irrigation. Divide the annual outdoor volume by the number of bills generated by the water supplier during a full year (e.g., for monthly billing, divide by 12 and for quarterly billing, divide by 4). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed outdoor volume of the Reference Home.

CI501.2.2.1.3.3 Combine Indoor and Outdoor Water Use Charges. For each billing period in a year, calculate the billed water volume by combining the average billed indoor volume with any average billed outdoor volume applicable to such billing period. Note that where peak season irrigation has been calculated, the billed water volume for the billing period outside of the irrigation season will consist entirely of the average billed indoor volume. Apply the volumetric portion of the rate schedule to the billed volume for each billing period, accounting for any rate blocks or seasonal variations in the rate schedule, to produce the billed volume charge (in dollars) for each billing period. Combine the billed volume charge for each billing period to yield the annual water volume charge of the Reference Home.

CI501.2.2.1.3.4 Determine Water Use Cost for the Rated Home. Repeat the process described in Sections CI501.2.2.1.3 through CI501.2.2.1.3.3 for the Rated Home to calculate the annual water volume charge of the Rated Home.

CI501.2.2.1.3.5 Total Estimated Water Cost Savings. Estimated water cost savings shall be the difference between the estimated annual water volume charge of the Reference Home and the estimated annual water volume charge of the Rated Home.

CI501.2.2.2 Sanitary Sewer Service Cost Savings. .

CI501.2.2.2.1 Sewer Service Prices. Sanitary sewer service cost savings for homes with a permanent connection to sanitary collection and treatment works shall be based on the schedule of rates and charges adopted by the sanitary sewer service provider serving the Rated Home. Note that collection and treatment of sanitary discharges may be performed by separate entities, and that billing to the Rated Home by such entities may be combined or separate.

CI501.2.2.2.2 Relevant Rates and Charges. Sanitary sewer service cost savings shall be calculated from the volumetric portion of the schedule of rates and charges. Fixed or flat charges that do not vary with the volume of water delivered to the home shall not contribute to the cost savings estimate.

CI501.2.2.2.3 Sewer Cost Savings Calculations. .

CI501.2.2.2.3.1 Average Billed Indoor Volume of the Reference Home. Convert the total annual volume of indoor water use by the Reference Home to an increment of indoor use during a sewer billing period by dividing the annual indoor volume by the number of bills per year generated by the sewer service provider (e.g., for monthly billing, divide by 12 and for semi-annual billing, divide by 2). Convert the units of consumption of the Reference Home as necessary to match the units of the rate schedule (e.g., 1,000 gallons, 100 cubic feet) to yield the average billed indoor volume of the Reference Home.

CI501.2.2.2.3.2 Annual Sewer Volume Charge for the Reference Home. Apply the volumetric portion of the sewer rate schedule to the average billed indoor volume for each billing period, accounting for any rate blocks or seasonal variations in the rate schedule, to produce the billed volume charge (in dollars) for each billing period. Combine the billed volume charge for each billing period to yield the annual sewer volume charge of the Reference Home.

CI501.2.2.2.4 Determine Annual Sewer charge for the Rated Home. . Repeat the process described in Section CI501.2.2.2.3 for the Rated Home to calculate the annual sewer volume charge of the Rated Home.

CI501.2.2.2.5 Estimated Sewer Cost Savings. . Estimated sewer cost savings shall be the difference between the estimated annual sewer volume charge of the Reference Home and the estimated annual sewer volume charge of the Rated Home.

CI501.2.2.2.6 Combined Presentation of Cost Savings. . Estimated water cost savings and estimated sewer cost savings may be presented as a total estimated cost savings when designated as “water and sewer” savings.

CI501.2.2.3 Other Cost Savings. Performance attributes of the Rated Home may influence other types of charges, depending on the fee structure in the jurisdiction of the Rated Home. While less common, these savings may be significant. Any determinations for cost savings associated with the following charges shall be submitted for individual review and approval by the body providing quality assurance for the rating service provider of the Rated Home.

1. Water service connection charges, also known as tap fees.
2. Sanitary sewer service connection charges, also known as capacity charges.
3. Stormwater fees.

CI501.2.3 Reports. All reports generated by an Approved Software Rating Tool shall, at a minimum, contain the information specified by Sections CI501.2.3.1 through CI501.2.3.6.

CI501.2.3.1 LOCATION. The property location, including city, state, zip code and either the street address or the Community Name and Plan Name for the Rating.

CI501.2.3.2 NAME OF RATER. The name of the certified rater conducting the Rating.

CI501.2.3.2 NAME OF Provider. The name of the Approved Rating Provider under whose auspices the rater is certified.

CI501.2.3.4 DATE. The date the Rating was conducted.

CI501.2.3.5 TOOL NAME AND VERSION. The name and version number of the Approved Software Rating Tool used to determine the Rating.

CI501.2.3.6 DISCLOSURE. The following statement in not less than 10-point font: "The Home Water Rating Standard Disclosure for this home is available from the Rating Provider." At a minimum, this statement shall also include the Rating Provider's mailing address and phone number.

CI501.2.4 Rating Types. . There shall be three Rating Types in accordance with Sections CI501.2.4.1through CI501.2.4.3.

CI501.2.4.1 Confirmed Rating. . A Rating Type that encompasses one individual dwelling and is conducted in accordance with Sections CI501.2.4.1.1 through CI501.2.4.1.3 .

CI501.2.4.1.1 Field verified. All Minimum Rated Features of the Rated Home shall be field-verified through inspection and testing in accordance with Section CI401 .

CI501.2.4.1.2 Entry into tool. All field-verified Minimum Rated Features of the Rated Home shall be entered into the Approved Software Rating Tool that generates the home water rating. The home water rating shall report the Water Rating Index that comports with these inputs.

CI501.2.4.1.3 Quality Assurance. Confirmed Ratings shall be subjected to Quality Assurance requirements equivalent to Section 900 of the Mortgage Industry National Home Energy Rating Systems Standard.

CI501.2.4.2 Sampled Ratings. . A Rating Type that encompasses a set of dwellings and is conducted in accordance with Sections CI501.2.4.2.1 through CI501.2.4.2.3.

CI501.2.4.2.1 Set of rated homes. For the set of Rated Homes, all Minimum Rated Features shall be field verified through inspection and testing of a single home in the set, or distributed across multiple homes in the set, in accordance with the requirements equivalent to Section 600 of the Mortgage Industry National Home Energy Rating Systems Standard.

CI501.2.4.2.2 Worst case analysis. The threshold specifications from the Worst-Case Analysis for the Minimum Rated Features of the set of Rated Homes shall be entered into the Approved Software Rating Tool that generates the home water use rating. The home water use rating shall report the Water Rating Index that comports with these inputs.

CI501.2.4.2.3 QUALITY ASSURANCE. Sampled Ratings shall be subjected to Quality Assurance requirements equivalent to Section 900 of the Mortgage Industry National Home Energy Rating Systems Standard.

CI501.2.4.3 Projected Ratings. . A Rating Type that encompasses one individual dwelling and is conducted in accordance with Sections CI501.2.4.3.1 through CI501.2.4.3.3 .

CI501.2.4.3.1 Minimum rated features. All Minimum Rated Features of the Rated Home shall be determined from architectural drawings, threshold specifications, and the planned location for a new home or from a site audit and threshold specifications for an existing home that is to be improved.

CI501.2.4.3.2 Unknown values. Unknown values shall be determined in accordance with Section CI401.3 5.2.

CI501.2.4.3.3 Text required. The Projected Rating Report shall contain the following text in not less than 14-point font at the top of the first page of the report: "Projected Rating Based on Plans—Field Confirmation Required."

CI501.3 Innovative Design Requests. .

CI501.3.1 Petition. Water Rating providers can petition for adjustment to the Water Rating Index for a Rated Home with features or technologies not addressed by Approved Software Rating Tools or this Standard. Innovative Design Requests (IDRs) shall be submitted to an Approved IDR authority and shall include, at a minimum, the following:

CI501.3.1.1 Features required. A Rating generated from an Approved Software Rating Tool for the Rated Home without feature(s) that cannot be modeled in the software tool.

CI501.3.1.2 Features not included. Written description of feature(s) not included in the Rating generated from software.

CI501.3.1.3 Manufacturer's specifications. Manufacturer's technical and/or performance specifications for feature(s) not included in the Rating generated from the Approved Software Rating Tool.

CI501.3.1.4 Estimated water use impact. Calculations or simulation results estimating the water use impact of feature(s) not included in the Rating generated from an Approved Software Rating Tool and documentation to support the calculation methodology and/or describe the modeling approach used.

CI501.3.1.5 Estimated adjustment. Estimated adjustment to the Water Rating Index. Calculations shall follow the procedures of Sections CI301.1 and CI301.2 .

CI501.3.2 Approval.. IDRs shall be approved on a case by case basis. The Approved IDR review authority shall accept or reject the IDR as submitted, or request additional information. The Approved IDR review authority shall assign a unique identifier to each IDR and maintain a database of IDRs. If the IDR is approved, the Water Rating provider is authorized to issue a supplemental report that adjusts the Water Rating Index, as approved.

CI601
REFERENCE STANDARDS

CI601.1 General. See Table CI601.1 for standards that are referenced in various section of this appendix. Standards are listed by the standard identification with the effective date, the standard title, and the section or sections of this appendix that reference this standard.

TABLE CI601.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ANSI/RESNET/ICC-301-2022	Standard for the Calculation and Labeling of the Energy Performance of Dwelling and Sleeping Units using an Energy Rating Index.	
RESNET/ICC-850-2020	Calculation and Labeling of the Water Use Performance of One-and Two-Family Dwellings Using the Water Rating Index	
ANSI/ASABE S626 SEP2016 (R2020)	Landscape Irrigation System Uniformity and Application Rate Testing	
--	CEC appliance database	
--	EPA Energy Star Website	
--	ENERGY STAR product finder database	
--	California Energy Commission (CEC) Modernized Appliance Efficiency Database	
--	Department of Energy (DOE) Compliance Certification Management System (CCMS).	
--	EPA Water Sense specification for Tank-Type Toilets	
--	US Geological Survey Concentrations of Hardness as Calcium Carbonate Map	
--	Mortgage Industry National Home Energy Rating Systems Standard.	

Reason: In response to water resources becoming increasingly strained throughout the country and water prices rising fast due to aging infrastructure and water utility rate structures, ANSI/RESNET/ICC 850-2020 was developed to provide a consistent, uniform methodology for evaluating, quantifying, and labeling the water use performance of one- and two-family dwellings and to serve as the basis for RESNET's residential water efficiency rating system (known as $HERS_{H2O}$®).

Drought, new development and aging water infrastructure can all put a strain on local water resources. In some instances this has caused local officials to put a moratorium on new permits for fear the water utility could not meet the increased demand, as described in a New York Times article. ANSI/RESNET/ICC 850 provides a much-needed resource for states, municipalities and builders to not only evaluate a home's water efficiency but to estimate their annual water use. This estimate of annual water use can serve as an important tool for anticipating the water needs of new development.

For user convenience and to provide a resource for builders to measure the water efficiency of the homes they build, ANSI/RESNET/ICC 850 should be added in its entirety as a new appendix in both the International Plumbing Code and International Residential Code since both are adopted for use in residential construction.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC) PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Bibliography: RESNET's Water Efficiency Rating System HERS$_{H2O}$® - https://www.resnet.us/about/hersh2o/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Estimated Immediate Cost Impact:

$50 to $300 per home

Estimated Immediate Cost Impact Justification (methodology and variables):

This cost comes from a small survey of what third party home rating firms currently charge for completing the water efficiency rating for various sizes of typical homes. Larger homes may cost more than small homes and builders with more homes may receive volume discounts. The costs also vary based on geographic location of the home rating companies.

Estimated Life Cycle Cost Impact:

N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

N/A

P162-24 Part II

Public Hearing Results (CAH1)

Committee Action: **Disapproved**

Committee Reason: These calculation tools are in their infancy. This was disapproved in the IPC. (9-1)

P162-24 Part II

Individual Consideration Agenda

Comment 1:

IRC: APPENDIX CI (New), SECTION CI101 (New), CI101.1 (New), CI101.2 (New), CI101.3 (New), SECTION CI201 (New), CI201.1 (New), TABLE CI201.1 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org) requests As Modified by Committee (AMC2)

Replace as follows:

2024 International Residential Code

Add new text as follows:

APPENDIX CI Calculation and Labeling of the Water Use Performance of One- and Two-Family Dwellings

SECTION CI101 GENERAL

CI101.1 Purpose. The provisions of this appendix establish a uniform methodology for evaluating and rating the water use performance of one-and two-family dwellings.

CI101.2 Scope. This appendix shall provide a uniform methodology for evaluating and rating the indoor and outdoor water use performance of one-and two-family dwellings.

CI101.3 Evaluation and rating. All evaluations and rating shall be performed in accordance with the RESNET/ICC-850 or other approved rating methodology

SECTION CI201 REFERENCE STANDARDS

CI201.1 General. See Table CI201.1 for standards that are referenced in various section of this appendix. Standards are listed by the standard identification with the effective date, the standard title, and the section or sections of this appendix that reference this standard.

TABLE CI201.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ANSI/RESNET/ICC-850-2020	Calculation and Labeling of the Water Use Performance of One-and Two-Family Dwellings Using the Water Rating Index	CI101.3

Reason: This comment replaces the original proposal to provide a simplified approach of directly referencing the RESNET/ICC 850 standard. The language recognizes that there may be other rating methodologies that could be approved by the code official. The term labeling was removed from the proposed language to avoid any misunderstanding with respect to the defined term "labeled".

This proposal is needed for those jurisdictions where water is a precious commodity. The design of buildings has significant impact on water use efficiency. Evaluation and rating methodologies are needed to be able to compare building designs.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This appendix is intended to be nonmandatory for the IRC and as such, there is no cost impact including this in the IRC. However, where a jurisdiction wishes to adopt this appendix, there would be a cost associated with having an evaluation and rating performed for a building. As stated in the original proposal, such services cost approximately $50 to $300 per home. This estimate of cost comes from a small survey of what third party home rating firms currently charge for completing the water efficiency rating for various sizes of typical homes. Larger homes may cost more than small homes and builders with more homes may receive volume discounts. The costs also vary based on geographic location of the home rating companies.

Comment (CAH2)# 173

Comment 2:

IRC: APPENDIX CI (New), SECTION CI101 (New), CI101.1 (New), CI101.2 (New), SECTION CI102 (New), (New), SECTION CI103 (New), CI103.1 (New), CI103.2 (New), CI104 (New), TABLE CI104.1 (New)

Proponents: Ryan Meres, RESNET, RESNET (ryan@resnet.us) requests As Modified by Committee (AMC2)

Replace as follows:

2024 International Residential Code

Add new text as follows:

APPENDIX CI
Water Use Performance Requirements for One- and Two-Family Dwellings and Townhouses

SECTION CI101
GENERAL

CI101.1 Purpose. The provisions of this appendix establish a uniform methodology for quantifying the water use performance of new one and two-family dwellings and townhouses, for use by jurisdictions seeking to adopt incentives or requirements pertaining to the water efficiency of new homes.

CI101.2 Scope. This appendix incorporates the methodology for quantifying the efficiency of the indoor and outdoor water use performance of one- and two-family dwellings and townhouses in the as-built condition. Such evaluations shall be in accordance with this appendix and ANSI/RESNET/ICC-850.

SECTION CI102
DEFINITIONS

Add new definition as follows:

Approved Rating Provider. An approved entity responsible for the certification of home water efficiency raters working under its auspices and who is responsible for the quality assurance of such certified raters and for the quality assurance of water efficiency ratings produced by such home water efficiency raters.

-

Approved Software Rating Tool. A computerized procedure that is approved for the purpose of conducting home water efficiency ratings and calculating the annual water consumption, annual water costs and a Water Rating Index for a home.

RATED HOME. The specific real property that is evaluated using the water use performance rating procedures specified by ANSI/RESNET/ICC-850.

REFERENCE HOME. A hypothetical home configured in accordance with the specifications set forth in Section 4.3 of ANSI/RESNET/ICC-850 and the basis of comparison for the purpose of calculating the Water Rating Index of a rated home.

WATER RATING INDEX (WRI). An integer representing the relative water use of a rated home as compared with the water use of the reference home and where an Index value of 100 represents the water use of the reference home and each integer reduction represents a one percent improvement in water use efficiency.

Add new text as follows:

SECTION CI103 WATER USE PERFORMANCE

CI103.1 Compliance. The rated home shall not exceed the maximum water rating index score of [an integer between 1 and 100 selected by the adopting jurisdiction] as calculated in accordance with ANSI/RESNET/ICC 850 using an approved software rating tool.

CI103.2 Verification. Verification of the water rating index shall be by a report provided by an approved rating provider.

Add new standard(s) as follows:

CI104 REFERENCED STANDARDS

Add new text as follows:

TABLE CI104.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ANSI/RESNET/ICC-850-2020	Calculation and Labeling of the Water Use Performance of One-and Two-Family Dwellings Using the Water Rating Index	CI101.2 CI103.1

Reason: The IRC Committee disapproved of P162-24 Part II in part due to the disapproval of Part I of this proposal by the IPC Committee on the previous day. The proponent is not commenting on Part I, but will respond to points raised by both technical committees. The IPC Committee stated that the proposal was not a code requirement and thus did not need to be in the code and could be found elsewhere. The IPC Committee was correct. As originally submitted, the proposal was simply a restatement of ANSI/RESNET/ICC 850-2020. As revised by this public comment, however, the proposal now is framed as a code requirement for jurisdictions that choose to adopt an enforceable performance requirement for the water efficiency of new homes. The proposal is greatly simplified by incorporating Standard 850 by reference, rather than restating it verbatim.The IRC Committee, in addition to citing the disapproval by the IPC Committee, stated that the calculation tools for quantifying the water efficiency of new homes “are in their infancy”. In actuality, Standard 850 was first adopted in 2020, and since that time over 10,000 new homes have received a rating. In 2021, Standard 850 received approval from the Environmental Protection Agency as a WaterSense Approved Certification Methodology for the WaterSense Labeled Homes Program, Version 2.0. There are currently two approved Home Certification Organizations using Standard 850 to certify homes for the WaterSense Program. The methodology in the current standard is sound and robust, and while a draft revision of Standard 850 is now out for public comment, the primary import of the forthcoming revision will be to expand its application to multifamily dwellings, rather than to correct major flaws in the methodology.

This appendix provides the means for states and local jurisdictions to set performance-based requirements for the water efficiency of new one- and two-family dwellings and townhouses. The appendix gives the adopting entity the authority to set the required maximum water rating index score. Similar to the energy rating index compliance path option for energy efficiency, the water rating index is based on a scale from zero to 100, where each one-point reduction on the index scale equates to a one percent reduction in annual water use. The reference home represents a score of 100 on the index scale and reflects a home built in compliance with 2006 codes and standards.

According to the World Resources Institute, 25 of 50 states are in areas of medium-high to extremely high-water stress. Putting even more pressure on already-strained water resources is that as of June 2024, 41 of the top 50 new construction markets[1] were in these areas. In response to water resources becoming increasingly strained throughout the country and water prices rising fast due to aging infrastructure and water utility rate structures, ANSI/RESNET/ICC 850-2020 was developed to provide a consistent, uniform methodology for evaluating, quantifying, and labeling the water use performance of one- and two-family dwellings and townhouses and to serve as the basis for RESNET's residential water efficiency rating system (known as $HERS_{H2O}$®).

Drought, new development and aging water infrastructure can all put a strain on local water resources. In some instances, this has caused local officials to put a moratorium on new permits for fear the water utility could not meet the increased demand, as described in an August 3, 2021 *New York Times* article[2] about Oakley, UT. ANSI/RESNET/ICC 850 provides a much-needed resource for states, municipalities and builders to not only evaluate a home's water efficiency but to estimate its annual water use. This estimate of annual water use can serve as an important tool for anticipating the water needs of new development.

Dozens of counties, cities, towns and water utilities are working on ordinances to create their own water efficiency requirements. This will create a patchwork of different construction requirements for builders to deal with. This appendix offers a whole-house (indoor and outdoor) performance-based approach that jurisdictions can adopt, rather than creating their own, often very prescriptive and restrictive, requirements.

[1] https://www.thebuildersdaily.com/a-majority-of-new-home-markets-are-water-stressed/?utm_source=The+Builder%27s+Daily&utm_campaign=b3a5f29e94-June+13%2C+2024+-+New+Ground&utm_medium=email&utm_term=0_-b3a5f29e94-%5BLIST_EMAIL_ID%5D

[2] https://www.nytimes.com/2021/07/20/us/utah-water-drought-climate-change.html (August 3, 2021)

Bibliography: RESNET's Water Efficiency Rating System HERS ® - https://www.resnet.us/about/hersh2o/

Cost Impact: Increase

Estimated Immediate Cost Impact:

$50 to $300 per home

Estimated Immediate Cost Impact Justification (methodology and variables):

The methodology for quantifying the water efficiency of new homes under Standard 850 has no prescriptive requirements. Thus, since the rating system is entirely performance-based, it offers a builder broad flexibility in design and material choices to achieve the Water Rating Index score that may be required by the adopting local jurisdiction. Some of these options, such as compact design of domestic hot water distribution systems, actually reduce construction costs.

The cost impact presented here for this proposal is the cost of carrying out the assessment and rating of the home by a certified rating service provider. The cost estimate is drawn from a small survey conducted by RESNET in 2023 of what third-party home rating firms currently charge for completing the water efficiency rating for various sizes of typical homes. Larger homes may cost more than small homes and builders with more homes may receive volume discounts. The costs also vary based on geographic location of the home rating companies.

Estimated Life Cycle Cost Impact:

N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

N/A