2020 Report on Comments

The Swimming Pool, Spa and Hot Tub Technical Committee Report on Comments
Information on IAPMO Codes and Standards Development

1. **Applicable Regulations.** The primary rules governing the processing of the *Uniform Solar, Hydronics & Geothermal Code* and *Uniform Swimming Pool, Spa and Hot Tub Code* are the IAPMO Regulations Governing Consensus Development. Other applicable rules include the Guide for the Conduct of Participants in the IAPMO Codes and Standards Development Process. For copies of these documents, contact the Code Development Department at IAPMO World Headquarters at 4755 E. Philadelphia Street, Ontario, CA 91761-2816 USA, or at 909-472-4100. These documents are also available at the IAPMO website at [www.iapmo.org](http://www.iapmo.org).

   The following is general information on the IAPMO process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

2. **Technical Committee Report (TCR).** The Technical Committee Report is defined as “the Report of the Technical Committee, consisting of the Report on Proposals (ROP), as modified by the Report on Comments (ROC), published by the Association.”

3. **Report on Proposals (ROP).** The ROP is defined as “a report to the Association on the actions taken by Technical Committees, accompanied by a ballot statement and one or more proposals on text for a new Document or to amend an existing Document.” The ROP and the ROC together comprise the Technical Committee Report. Anyone who does not pursue an issue, either in person or by designated representative in accordance with Section 7.0 (Public Review and Comment of the Regulations Governing Consensus Development), as a proposed amendment of the Report on Proposals will be considered as having their objection resolved.

4. **Report on Comments (ROC).** The ROC is defined as “a report to the Association on the actions taken by Technical Committees, accompanied by a ballot statement and one or more comments resulting from public review of the Report on Proposals (ROP).” The ROP and the ROC together constitute the Technical Committee Report. Anyone who does not pursue an issue, either in person or by designated representative in accordance with Section 8.0 (Public Review and Comment of the Regulations Governing Consensus Development), as a proposed amendment of the Report on Comments will be considered as having their objection resolved.

5. **Appeals.** Anyone can appeal to the *Executive Committee* concerning procedural or substantive matters related to the development, content, or issuance of any Document of the Association or on matters within the purview of the authority of the Committee. Such appeals must be in written form and filed with the Secretariat (See 9.0 of the Regulations Governing Consensus Development). Time constraints for filing an appeal must be in accordance with Section 9.0. Objections are deemed to be resolved if not pursued at this level.

6. **Document Issuance.** The USHGC/USPSHTC Executive Committee is the issuer of the *Uniform Solar, Hydronics & Geothermal Code* and *Uniform Swimming Pool, Spa and Hot Tub Code*. The committee acts on the issuance of a Document within sixty days from the date of the recommendation from the ROC Technical Committee Meeting, unless this period is extended by the Executive Committee.
To: IAPMO Members and Other Interested Parties

Date: August 2020

Enclosed is your 2020 Report on Comments (ROC). These comments were presented to the Swimming Pool, Spa and Hot Tub Technical Committee who met via teleconference May 18, 2020.

Following the comments is a copy of how the 2021 edition of the Uniform Swimming Pool, Spa, and Hot Tub Code (pre-print) would appear if the Executive Committee accepts all committee actions.

This pre-print is provided to you as a courtesy. All changes are tentative and subject to revision. This document is not to be considered the final version of the 2021 Uniform Swimming Pool, Spa and Hot Tub Code. Specific authorization from IAPMO is required for republication or quotation.
## 2021 UNIFORM SWIMMING POOL, SPA & HOT TUB CODE COMMITTEE
(As of 05/29/2019)

<table>
<thead>
<tr>
<th>NAME</th>
<th>REPRESENTATION</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold Rodio, Chairman</td>
<td>Pace Setter Plumbing (Lancaster, CA)</td>
<td>Installer/Maintainer</td>
</tr>
<tr>
<td>Beth Hamil</td>
<td>O₃ Consulting (San Luis Obispo, CA)</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>Alison Osinski, Ph.D</td>
<td>Aquatic Consulting Services (Avalon, CA)</td>
<td>Special Expert</td>
</tr>
<tr>
<td>Richard J. English</td>
<td>English Pool Consulting (San Diego, CA)</td>
<td>Special Expert</td>
</tr>
<tr>
<td>Robert Holmer</td>
<td>H₂ Engineers LLP (Sacramento, CA)</td>
<td>Special Expert</td>
</tr>
<tr>
<td>James Majerowicz</td>
<td>Plumber JAC Local 130 UA (Chicago, IL)</td>
<td>Labor</td>
</tr>
<tr>
<td>John Taecker</td>
<td>Underwriters Laboratories (Fremont, CA)</td>
<td>Research/Standards/Testing Laboratory</td>
</tr>
<tr>
<td>Sung Choe</td>
<td>NSF International (Ann Arbor, MI)</td>
<td>Research/Standards/Testing Laboratory</td>
</tr>
<tr>
<td>Kenneth Lee Gregory</td>
<td>Pentair (Washington, UT)</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>Louis Sam Fruia</td>
<td>United Independent School District (Laredo, TX)</td>
<td>Consumer</td>
</tr>
<tr>
<td>Taylor Costea</td>
<td>IAPMO Staff</td>
<td></td>
</tr>
</tbody>
</table>
IAPMO Technical Committee Membership Application

IAPMO uses the information in this application to determine your qualifications and to assure that IAPMO technical committee appointments are made in a way that ensures that committees will contain a fair balance of interests. Please provide us with as much information as you feel will assist us in the selection process. Feel free to attach additional pages if necessary.

Name of Individual: ___________________________ Title: ___________________________
Employer: ________________________________________________________________
Mailing Address: __________________________________________________________
UPS or Other Mailing Address: ____________________________________________
City: __________________ State: ______ Zip: ______
Telephone: __________________ Fax: __________________ E-Mail: ________________

Please indicate committee for which you are applying:
☐ Plumbing Technical Committee ☐ Swimming Pool, Spa and Hot Tub Technical Committee
☐ Mechanical Technical Committee ☐ Solar, Hydronics and Geothermal Code Technical Committee

Member categories:
☐ Principal member
☐ Alternate member. If Alternate, to whom ______________________________________________
☐ Non-voting member

Please indicate the interest category (see definitions on page 2) which you believe best suits your qualifications:
☐ Manufacturer ☐ Research/Standards/Testing Laboratory
☐ User ☐ Enforcing Authority
☐ Installer/Maintainer ☐ Consumer
☐ Labor ☐ Special Expert

1. QUALIFICATIONS OF APPLICANT
   a. Provide evidence of your general knowledge and competence in the scope (work) of the committee (please attach résumé)
      ________________________________________________________________
      ________________________________________________________________
      ________________________________________________________________
   b. What is your specific relationship to one or more elements of the scope of the committee?
      ________________________________________________________________
      ________________________________________________________________
      ________________________________________________________________
   c. Will you be able to actively participate in the work of the committee including responding to correspondence and attending committee meetings?
      ________________________________________________________________
      ________________________________________________________________
      ________________________________________________________________

2. REPRESENTATION Indicate below the name of the entity you would be representing and include written authorization from that entity authorizing you to be their representative:

   a. Does the organization you would represent have a mechanism for instructing votes? If so, can the time constraints imposed by the Regulations Governing Committee Projects be met?
      ________________________________________________________________
      ________________________________________________________________
3. **FUNDING SOURCE(S) FOR YOUR PARTICIPATION**
   a. What person(s) or organization(s) would fund your participation as a committee member, either in whole or in part? (You should list your employer if your participation is funded by your employer or if your participation is part of your employment responsibilities or otherwise related to your employment.)

   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________

   b. Background and description of your employer and/or other person(s) or organization(s) funding participation:

   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________

4. **ADDITIONAL COMMENTS**

   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________

Languages other than English ________________________________

COMPLETE A SEPARATE APPLICATION FORM FOR EACH COMMITTEE ON WHICH YOU DESIRE TO SERVE. IN ORDER TO ASSURE THE PROMPT PROCESSING OF YOUR REQUEST, PLEASE BE SURE TO COMPLETE ALL QUESTIONS AND SIGN THIS APPLICATION.

If appointed, I agree to abide by the rules and guidelines of IAPMO. In addition, I hereby agree to notify the Secretary of the IAPMO Standards Council of a change in status, including change of employment, organization represented, or funding source. I also agree that IAPMO shall have, and I hereby grant, all and full rights in copyright in any material that I author, either individually or with others, as a member of this committee, or that I submit for the proposed use of the committee in an IAPMO code or standard or other IAPMO document. I further acknowledge that I acquire no rights in any publication of IAPMO and that copyright and all rights in all materials produced by IAPMO technical committees are owned by IAPMO and that IAPMO may register copyright in its own name.

I do not now hold, and I do not intend to hold any patent, the use of which would be required for compliance with any material that I author – either individually or with others – as a member of this committee, or that I submit for the proposed use of the committee in an IAPMO code or standard or other IAPMO document.

I attest that all the information on this application is true and accurate.

By signing below, I attest to my ability to communicate with IAPMO staff and the members of the Technical Committee through electronic means, namely via email and the internet.

Signature __________________________________________ Date___________________________

**INTEREST CATEGORIES**

(a) **Manufacturer.** A representative of a maker or marketer of a product, assembly or system, or portion thereof that is affected by the document.

(b) **User.** A representative of an entity that is subject to the provisions of the Document or that voluntarily uses the Document.

(c) **Installer/Maintainer.** A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the Document.

(d) **Labor.** A labor representative or employee concerned with safety in the workplace within the scope of the Document.

(e) **Research/Standards/Testing Laboratory.** A representative of an independent research organization; an organization that develops codes, standards and other similar documents; or an independent testing laboratory.

(f) **Enforcing Authority.** A representative of an agency or an organization that promulgates or enforces the Document.

(g) **Consumer.** A person who is or represents the ultimate purchaser of a product, system or service affected by the Document but who is not a User as defined in 3-2.5.1(b).

(h) **Special Expert.** A person not representing 3-2.5.1(a) through (g) and who has special expertise in the scope of the Document or portion thereof.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Item #</th>
<th>Code Section</th>
<th>Page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>205.0</td>
<td>1</td>
</tr>
<tr>
<td>002</td>
<td>206.0</td>
<td>3</td>
</tr>
<tr>
<td>003</td>
<td>208.0</td>
<td>5</td>
</tr>
<tr>
<td>004</td>
<td>208.0</td>
<td>7</td>
</tr>
<tr>
<td>005</td>
<td>209.0</td>
<td>9</td>
</tr>
<tr>
<td>006</td>
<td>216.0</td>
<td>11</td>
</tr>
<tr>
<td>007</td>
<td>221.0</td>
<td>13</td>
</tr>
<tr>
<td>008</td>
<td>221.0</td>
<td>15</td>
</tr>
<tr>
<td>010</td>
<td>301.2.2</td>
<td>17</td>
</tr>
<tr>
<td>011</td>
<td>302.0 – 302.5</td>
<td>19</td>
</tr>
<tr>
<td>012</td>
<td>Table 307.1, Table 1001.1, Table 1001.2</td>
<td>22</td>
</tr>
<tr>
<td>013</td>
<td>307.8.1, Table 1001.1</td>
<td>26</td>
</tr>
<tr>
<td>014</td>
<td>308.0 – 308.16.1</td>
<td>29</td>
</tr>
<tr>
<td>015</td>
<td>313.1, 313.2, 313.2.1</td>
<td>33</td>
</tr>
<tr>
<td>016</td>
<td>314.0 – 314.1.3, Table 1001.1, Appendix C</td>
<td>36</td>
</tr>
<tr>
<td>018</td>
<td>401.6</td>
<td>40</td>
</tr>
<tr>
<td>019</td>
<td>401.5</td>
<td>43</td>
</tr>
<tr>
<td>021</td>
<td>224.0, 402.8, 404.0 – 404.2.4</td>
<td>45</td>
</tr>
<tr>
<td>022</td>
<td>204.0</td>
<td>51</td>
</tr>
<tr>
<td>023</td>
<td>402.5.1</td>
<td>53</td>
</tr>
<tr>
<td>024</td>
<td>402.15</td>
<td>55</td>
</tr>
<tr>
<td>027</td>
<td>408.1.1 – 408.2</td>
<td>57</td>
</tr>
<tr>
<td>029</td>
<td>416.4.2, 416.4.3</td>
<td>59</td>
</tr>
<tr>
<td>031</td>
<td>416.4.4, Table 1001.1, Table 1001.2</td>
<td>64</td>
</tr>
<tr>
<td>032</td>
<td>214.0</td>
<td>67</td>
</tr>
<tr>
<td>034</td>
<td>Table 508.1</td>
<td>70</td>
</tr>
<tr>
<td>039</td>
<td>702.2, 702.4 – 702.4.3, Table 1001.1</td>
<td>72</td>
</tr>
<tr>
<td>039.01</td>
<td>702.3, Table 1001.1</td>
<td>76</td>
</tr>
<tr>
<td>044</td>
<td>802.6 – 802.6.2</td>
<td>77</td>
</tr>
<tr>
<td>045</td>
<td>805.1</td>
<td>80</td>
</tr>
<tr>
<td>046</td>
<td>810.1, 810.5, 810.6</td>
<td>84</td>
</tr>
<tr>
<td>049</td>
<td>Appendix A</td>
<td>90</td>
</tr>
<tr>
<td>051</td>
<td>Table 1001.2</td>
<td>97</td>
</tr>
<tr>
<td>052</td>
<td>Table 1001.1</td>
<td>99</td>
</tr>
<tr>
<td>053</td>
<td>Table 1001.1, Table 1001.2</td>
<td>102</td>
</tr>
<tr>
<td>054</td>
<td>Table 1001.1, Table 1001.2</td>
<td>105</td>
</tr>
<tr>
<td>055</td>
<td>Table 1001.1</td>
<td>110</td>
</tr>
<tr>
<td>058</td>
<td>Table 1001.1</td>
<td>112</td>
</tr>
<tr>
<td>059</td>
<td>Table 1001.1, Table 1001.2</td>
<td>114</td>
</tr>
<tr>
<td>060</td>
<td>Table 1001.2</td>
<td>116</td>
</tr>
<tr>
<td>061</td>
<td>Table 1001.1</td>
<td>118</td>
</tr>
<tr>
<td>062</td>
<td>Table 1001.1</td>
<td>120</td>
</tr>
<tr>
<td>063</td>
<td>Table 1001.1</td>
<td>122</td>
</tr>
</tbody>
</table>

Slip-Resistance Task Group Report

Technical Correlating Committee Report for USHGC/USPSHTC

2021 Uniform Swimming Pool, Spa & Hot Tub Code Preprint

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By

International Association of Plumbing and Mechanical Officials
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Proposals

Item #: 001
USPSHTC 2021  Section: 205.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

205.0 – C –

Circulation System. The equipment, components, and appurtenances used to circulate the water in a pool, spa or hot tub and may include, but is not limited to, heaters, chemical feeding devices, valves, gauges, strainers, filters, meters, skimmers, fittings, and pumps. The equipment, components and appurtenances, when connected, perform as a coordinated system for maintaining water quality and sanitary swimming pools, spas or hot tubs.

SUBSTANTIATION:
The proposed definition is being added for clarification on the term “circulation system” and what the term encompasses. The term is used throughout the code and therefore requires a statement of meaning. The circulation system of a pool is responsible for the flow of water to and from the pool and helps to maintain adequate water quality. Systems include, but are not limited to, heaters, chemical feeding devices, valves, gauges, strainers, filters, meters, skimmers, fittings, and pumps. Because the system encompasses so many components, it is important to include such examples within the definition to provide clarity for the end user. The definition will further enhance the code and provides clarification for the terminology used.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

205.0 – C –

Circulation System. The equipment, components, and appurtenances used to circulate the water in a pool, spa or hot tub and may include, but is not limited to, heaters, chemical feeding devices, valves, piping, gauges, strainers, filters, meters, skimmers, fittings, and pumps. The equipment, components and appurtenances, when connected, perform as a coordinated system for maintaining water quality and sanitary swimming pools, spas or hot tubs.

COMMITTEE STATEMENT:
The proposed terminology is being modified to include "piping" as an additional listed component since piping is a substantial part of the circulation system.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 205.0  Item #: 001

SUBMITTER: Arnold Rodio  
Pace Setter Plumbing Corp.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

205.0 – C –

Circulation System. The equipment, components, and appurtenances used to circulate the water in a pool, spa or hot tub and may include, but is not limited to, heaters, chemical feeding devices, valves, piping, gauges, strainers, filters, meters, surface skimmers, fittings, and pumps. The equipment, components and appurtenances, when connected, perform as a coordinated system to maintain water quality, provide sanitary water conditions, and heat water for maintaining water quality and sanitary swimming pools, spas or hot tubs.

SUBSTANTIATION:
Throughout the USPSHTC, the term "surface skimmer" is used rather than "skimmer." For consistency and clarity, the above revision is being submitted.

Furthermore, the circulation system of a swimming pool, spa or hot tub is not only used to maintain water quality and sanitize the water, but it also is used to heat the water to maintain temperatures specified within this code. For this reason, the revision is necessary.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 002
USPSHTC 2021 Section: 206.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

206.0 – D –

Deck. An area attached to or directly adjacent to a swimming pool, spa, hot tub or combination thereof that is installed for the purpose of providing an area for walking, sitting, or standing.

SUBSTANTIATION:
The term “deck” should be defined as it is commonly used throughout the USPSHTC with listed provisions. Decks serve various purposes including providing a safe area for exiting and entering a pool or spa as well as providing safe walkways around the perimeter of a pool or spa.

The provided definition ensures that the location and purpose of decks are clear for proper application of listed provisions.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

206.0 – D –

Deck. An area attached to, or directly adjacent, and/or serving a swimming pool, spa, hot tub or combination thereof that is installed for the purpose of providing an area for walking, sitting, or standing for the users.

COMMITTEE STATEMENT:
The definition is being modified to clarify that the deck "serves" a pool, spa, hot tub or combination thereof. Additionally, the definition is being modified to show "for the users" as this is who will be using the deck area.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 206.0

SUBMITTER: Arnold Rodio
Pace Setter Plumbing Corp.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

206.0 – D –

Deck. An unobstructed area attached to, directly adjacent, and/or serving a swimming pool, spa, hot tub or combination thereof that is installed for the purpose of providing an area for walking, sitting, or standing for the users.

SUBSTANTIATION:
Current code language requires decks to have a specified unobstructed width. Including this distinction further clarifies for the end user that the deck area is meant to serve as an area for walking, sitting, or standing around the pool or spa perimeter excluding platforms, diving boards, slides, lifeguard chairs, handrails, furniture and/or planters.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 8  NEGATIVE: 1  NOT RETURNED: 1  CHOE

EXPLANATION OF NEGATIVE:
ENGLISH: The deck should only be required to be unobstructed for 4 feet around the pool or spa.
Proposals

Item #: 003
USPSHTC 2021   Section: 208.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

208.0       – F –

Filter. A porous medium that removes impurities, unwanted material, or undissolved particles as water passes through.
   Cartridge Filter. (remaining text unchanged)
   Diatomite Filter. (remaining text unchanged)
   High-Rate Sand Filter. (remaining text unchanged)
   Rapid Sand Filter. (remaining text unchanged)
   Skim Filter. (remaining text unchanged)

SUBSTANTIATION:
A general definition for “filter” has been added as the term is used throughout the code. Furthermore, the existing definitions for the various types of filters used throughout the USPSHTC have been relocated below the general definition. This will assist the end user in locating all filter definitions under one location while being able to compare the differences.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

208.0       – F –

Filter. A porous medium that removes impurities, unwanted material, or undissolved particles as water passes through component of the circulation system that houses the filter media, cartridges, or elements.
   Cartridge Filter. (remaining text unchanged)
   Diatomite Filter. (remaining text unchanged)
   High-Rate Sand Filter. (remaining text unchanged)
   Rapid Sand Filter. (remaining text unchanged)
   Skim Filter. (remaining text unchanged)

COMMITTEE STATEMENT:
The definition has been amended to clarify the distinction between filters and filter media. The filter is a component of the circulation system and not simply a porous medium.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9   NOT RETURNED: 1   FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 208.0  Item #: 003

SUBMITTER: Arnold Rodio  Pace Setter Plumbing Corp.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

208.0 – F –

Filter. A component of the circulation system that houses the filter media, cartridges, or elements.  
Cartridge Filter. A filter which passes water through a disposable fibrous element or cartridge, where undissolved particles and debris are removed, that operates through a disposable cartridge. There are two general types:
(1) The surface or area type where the suspended matter is removed from the surface; and
(2) The depth type in which the interstices vary from large to small in depth.

SUBSTANTIATION:
The additional language provides a clearer understanding of what a cartridge filter does and how it functions. Including the term "fibrous element" adds more technical language and further enhances the terminology listed. Simply stating “a filter that operates through a disposable cartridge” is not sufficient.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 004
USPSHTC 2021  Section: 208.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

208.0  – F –

Flume. A narrow channel, ravine or tubular structure typically flowing with water and may incorporate twists and turns to direct the path of travel and influence the rate of descent of the rider. Also known as a water slide or water chute.

SUBSTANTIATION:
The proposed term is being added as “flumes” is used throughout the code. The addition of this definition will clarify that the provisions for flumes may apply to curves, turns, valleys, dips and exits. Flumes are installed in many aquatic facilities and are used frequently. Clarification on the term would make such provisions clearer for the end user. The addition further enhances the code and provides clarification on the term.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

208.0  – F –

Flume. An narrow open and/or closed channel, ravine or tubular structure typically flowing with water and may incorporate twists and turns to direct the path of travel and influence the rate of descent of the rider. Also known as a water slide or water chute.

COMMITTEE STATEMENT:
The proposed terminology is being modified to specify that the structure of a flume may be open, closed, or a combination thereof. Additionally, the term "narrow" is being removed from the definition as flumes may be wide.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 208.0 Item #: 004

SUBMITTER: Arnold Rodio  
            Pace Setter Plumbing Corp.

Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

208.0 – F –

Flume. An open and/or closed inclined channel, ravine or tubular structure typically flowing with water and may incorporate twists and turns to direct the path of travel and influence the rate of descent of the rider. Also known as a water slide or water chute.

SUBSTANTIATION:
The addition of “inclined” to the definition provided is needed since flumes are typically slides or channels used to “influence the rate of descent of the rider” and adding “incline” further supports this language.

COMMITTEE ACTION: Accepted as submitted

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 005
USPSHTC 2021  Section: 209.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

209.0  – G –

**Gutter.** A trough, channel, or depression which collects water and diverts it to a drain.

SUBSTANTIATION:
Gutters require further clarification as they are referred to in Sections 402.10, 404.10, and 410.5. Swimming pool gutters may collect debris and oil from the water surface or serve to recirculate and play a role in maintaining water quality of pools. The addition of such language is necessary as it further improves the code.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The proposed terminology is not specific to gutters installed for the purpose of serving a pool, spa, hot tub, or combination thereof. Furthermore, the proposed definition is too vague and does not clearly define the purpose of gutters. For these reasons, the proposal is being rejected.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 209.0  Item #: 005

SUBMITTER: Arnold Rodio
Pace Setter Plumbing Corp.

RECOMMENDATION:
Add new text

Request to **replace** the code change proposal by this public comment.

209.0  – G –

**Gutter.** An overflow trough along the edge of a swimming pool, spa or hot tub through which floating debris and oils flow.
SUBSTANTIATION:
The proposed terminology for “gutter” addresses the Technical Committee's concerns. The listed definition now includes what a gutter serves and its purpose.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

209.0 – G –

Gutter. An overflow trough along the edge of a swimming pool, spa or hot tub through which floating debris and oils flow, water returns to the circulation system or to a drain in the case of a water-to-waste pool.

COMMITTEE STATEMENT:
There are various types of gutters which may be excluded by this definition. Furthermore, the provided terminology is too vague and does not depict whether the collected water is diverted to either the circulation system or waste drain. For these reasons, the public comment is being modified to more appropriately represent the term.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 8 NEGATIVE: 1 NOT RETURNED: 1 CHOE

EXPLANATION OF NEGATIVE:

OSINSKI: Needs to include more detail: A perimeter overflow trough along the edges of a swimming pool, spa or hot tub through which water, dissolved particles, floating debris, oils and other contaminants flow and return via a surge or balancing tank to the circulation system, or to a waste in the case of a water-to-waste pool.
Proposals

Item #: 006
USPSHTC 2021  Section: 216.0

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Add new text

216.0   -N-

Natatorium. A building containing a swimming pool, spa, hot tub or combination thereof.

SUBSTANTIATION:
The term natatorium is used throughout the code and is currently the title of Section 416.0. Defining this term further enhances the code and provides clarity for the end user and the AHJ.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC
Amend proposal as follows:

216.0   -N-

Natatorium. A building, or portion thereof, containing a swimming pool, spa, hot tub or combination thereof.

COMMITTEE STATEMENT:
The proposed terminology is being modified to include “or portions thereof” to clarify that only the building area containing a pool, spa, or hot tub is considered to be a natatorium.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 216.0  Item #: 006
SUBMITTER: Arnold Rodio
Pace Setter Plumbing Corp.  Comment #: 1

RECOMMENDATION:
Revise text
Request to accept the code change proposal as modified by this public comment.

216.0   -N-

Natatorium. A building, or portion thereof, containing a swimming pool, spa, hot tub or combination thereof. Also known as an indoor aquatic facility.
SUBSTANTIATION:
Natatoriums are technically rooms, venues or facilities housing pools, spas or hot tubs. Within the USPSHTC, the term “indoor aquatic facility” is used with listed provisions for ventilation, humidity, dew points, and pressure differentials. These provisions are clearly applicable to natatoriums. For clarity, the proposed revision is necessary. In order to protect the structural integrity of buildings utilized as aquatic venues as well as ensure adequate ventilation, the end user and inspector must associate the two terms.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 007
USPSHTC 2021  Section: 221.0

SUBMITTER: Joel Nunez
  Upland Pool Supply LLC

RECOMMENDATION:
Add new text

221.0          - S –

**Safety Cover.** A structure, fabric or assembly which extends over the entire water surface of a pool, spa or hot tub and is typically anchored around the pool perimeter for the purpose of preventing entry; may serve to conserve energy, reduce heat loss, or reduce water and chemical evaporation.

SUBSTANTIATION:
A definition for "safety cover" is being proposed as safety covers are referred to in Section 803.5 and Section 806.0 with listed provisions. The inclusion of this new definition provides clarity for the end user.

Safety covers serve multiple purposes of which include keeping pets and small children out of the pool, reducing pool heating costs, preventing debris from accumulating within the pool, and reducing water and chemical evaporation. Safety covers may be made of various materials depending upon the needs of the end user and are typically anchored around the pool perimeter.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The Technical Committee agrees that a definition for "safety cover" is necessary within the code, but the provided definition needs additional work. The definition provided to the Technical Committee does not match what is found in ASTM F1346.

Additionally, the definition is too specific as it includes what purpose safety covers may serve. The definition provided does not include the various types of covers, how they operate, or other specific requirements such as the need to be removed before allowing access to the pool, spa or hot tub.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE:  8     NEGATIVE:  1     NOT RETURNED:  1     FRUIA

EXPLANATION OF NEGATIVE:
OSINSKI: Language needs to define how it locks to prevent access, drains water, and supports weight.
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 221.0  Item #: 007

SUBMITTER: Arnold Rodio
Pace Setter Plumbing Corp.

RECOMMENDATION:
Add new text

Request to replace the code change proposal by this public comment.

221.0 - S -

Safety Cover. A barrier or assembly covering the entire water surface of a swimming pool, spa or hot tub which includes anchoring mechanisms and serves as a means of preventing unauthorized access to the body of water.

There are two general types:
(1) The manual type where hand-operation is required for application.
(2) The powered type utilizing a motorized mechanism.

SUBSTANTIATION:
The terminology provided for “safety cover” addresses the Technical Committee’s concerns expressed within the Committee Statement. The new terminology now more closely reflects what is displayed in ASTM F1346 for “safety covers.”

The need for safety covers to be removed before bather use of a swimming pool, spa or hot tub was not included as this is a provision rather than a part of a definition. This requirement is already listed within the code under Section 806.1 (Safety Covers, General).

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 7  NEGATIVE: 2  NOT RETURNED: 1  CHOIE

EXPLANATION OF NEGATIVE:
FRUIA: I concur with Alison. The definition requires further clarification as the language is vague.
OSINSKI: This definition still needs work, and reference should be made to ASTM F1346, labeling, weight support, drainage...etc.
Proposals

Item #: 008
USPSHTC 2021  Section: 221.0

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Add new text

221.0  - S –

**Strainer.** A device which water passes through with the purpose of preventing the passage of lint, hair, debris, or appendages. Such devices are used on suction inlets to pumps, swimming pools, spas, hot tubs, and on open pipes.

SUBSTANTIATION:
Strainers provide a means of preventing any unwanted material from entering the piping system to which they are connected, and they play a role in protecting the piping system from clogs or blockages.

Provisions for strainers are included in three main sections of this code, and strainers are referred to frequently throughout the code. The proposed definition is necessary for these reasons and would further provide clarity for the end user in regard to the purpose and function of strainers.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The Technical Committee agrees that the definition is necessary but needs additional work. There are various types of strainers that are not included within the definition provided.

Furthermore, the definition contains specific requirements that are more suitable for the enforceable provisions of the code.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 221.0  Item #: 008
SUBMITTER: Arnold Rodio  Pace Setter Plumbing Corp.  Comment #: 1

RECOMMENDATION:
Add new text

Request to replace the code change proposal by this public comment.

221.0          - S -

**Strainer.** A fitting through which water flows and solids are filtered and separated to prevent passage.

SUBSTANTIATION:
The proposed definition for strainer is sufficient for the end user to understand the function and purpose of a strainer. Although various types of strainers exist, only the term "strainer" and "inline strainer" are used within the USPSHTC. For this reason, the above terminology is sufficient and necessary.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 010
USPSHTC 2021  Section: 301.2.2

SUBMITTER:  David Mann
Self

RECOMMENDATION:
Revise text

301.0 General.

301.2 Minimum Standards. (remaining text unchanged)

301.2.2 Standards. Standards listed or referred to in this chapter or other chapters cover materials that will conform to the requirements of this code, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of swimming pool, spa and hot tub standards that appear in specific sections of this code is referenced in Table 1001.1. Standards referenced in Table 1001.1 shall be applied as indicated in the applicable referenced section. A list of additional approved standards, publications, practices and guides that are not referenced in specific sections of this code appear in Table 1001.2. The documents indicated in Table 1001.2 shall be permitted in accordance with Section 301.3.

SUBSTANTIATION:
Section 301.2.2 is being revised to allow the end user to use an applicable approved standard in Table 1001.2 without the additional step of an alternate method and material. All standards in Table 1001.2 have been vetted and have a place in the code. To prevent confusion in the field and to prevent contradictions within the USPSHTC, Section 301.2.2 must be revised as the standards in Table 1001.2 can be used, where applicable, without additional approval in accordance with Section 301.3.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The proposed change is being rejected as it negates the current provisions for alternate methods and materials. The Technical Committee agrees that the Authority Having Jurisdiction should determine when and where the standards in Table 1001.2 are applicable.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9   NOT RETURNED: 1   FRUIA

Appended Comments
Request to accept the code change proposal **as submitted** by this public comment.

**SUBSTANTIATION:**
The revisions to Section 301.2.2 are being resubmitted to correlate with the language approved in Item #048 of the 2019 UMC ROC. The approval of such change allows for the use of an applicable approved standard in Table 1001.2 (Standards, Publications, Practices, and Guides) without the additional requirement of compliance with Section 301.3 (Alternative Materials and Methods of Construction Equivalency). This is necessary since the documents listed in Table 1001.2 have already been reviewed by the Technical Committee and deemed appropriate for use based on the listed application within the table.

**COMMITTEE ACTION:** REJECT

**COMMITTEE STATEMENT:**
The public comment is being rejected since the word “approved” is not appropriate for usage within the section. It refers to a standard being used “as approved by the AHJ.” Although the standards are within the scope of the USPSHTC, the AHJ has not reviewed the standards listed within the code. For this reason, the rejection is justified.

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9  NOT RETURNED: 1  CHOICE
Proposals

Item #: 011
USPSHTC 2021  Section: 301.4.4, Table 1001.1

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

301.0 General.

301.4 Swimming Pools in Flood Hazard Areas. (remaining text unchanged)

301.4.4 Swimming Pools Located in Coastal High Hazard Areas. Where pools are located in coastal high hazard areas, swimming pools shall be in accordance with ASCE 24 and the following requirements:
(1) Be elevated so that the lowest horizontal structural member is elevated to or above the design flood elevation.
(2) Be designed and constructed to break away during design flood conditions without producing debris capable of causing significant damage to any structure.
(3) Be sited to remain in the ground during design flood conditions without obstructing flow that results in damage to adjacent structures.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCE 24-2014</td>
<td>Flood Resistant Design and Construction</td>
<td>Miscellaneous</td>
<td>301.4.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASCE 24 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Section 301.4.4 is being revised to include standard ASCE 24 as it pertains to flood resistant design and construction of structures located in flood hazard areas. Such addition is necessary as this standard provides specifications on minimum elevations for lowest floors, flood damage resistant material, and various flood proofing methods to incorporate in flood hazard areas. The inclusion of this standard further enhances the code and helps to maintain building integrity in the event of flooding.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC
Amend proposal as follows:

301.0 General.

301.4 Swimming Pools in Flood Hazard Areas. (remaining text unchanged)

301.4.4 Swimming Pools Located in Coastal High Hazard Areas. Where pools are located in coastal high hazard areas, swimming pools shall be in accordance with ASCE 24 and one of the following requirements:
1. Be elevated so that the lowest horizontal structural member is elevated to or above the design flood elevation.
2. Be designed and constructed to break away during design flood conditions without producing debris capable of causing significant damage to any structure.
3. Be sited to remain in the ground during design flood conditions without obstructing flow that results in damage to adjacent structures.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
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<tr>
<td>ASCE 24-2014</td>
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<td>Miscellaneous</td>
<td>301.4.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

COMMITTEE STATEMENT:
The proposed language is being modified to show "one of the following," as ASCE 24 only requires one of the following from the list. The language is being modified to comply with ASCE 24.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 302.0 - 302.5  Item #: 011

SUBMITTER: Joel Nunez  Upland Pool Supply LLC  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

301.4.302.0 Swimming Pools in Flood Hazard Areas.

302.1 General. Where located in flood hazard areas, aboveground swimming pools, inground swimming pools that involve the placement of earthen fill, and onground swimming pools shall comply with this section Section 302.2 through Section 302.5. Aboveground and inground swimming pools shall be designed and installed to withstand flood associated loads. Where swimming pool liners and membranes are installed, such liners and membranes shall be anchored to either the structural frame or the ground.

301.4.302.2 Controls, Equipment, Appurtenances, and Associated Components. Where swimming pools are located in flood hazard areas:
1. - (3) (remaining text unchanged)
2. (4) Electrical equipment and components installed below the design flood elevation shall be waterproof and shall be in accordance with Section 603.0.

301.4.3302.3 Swimming Pools Located in Floodways. (remaining text unchanged)

301.4.4302.4 Swimming Pools Located Where Floodways Have Not Been Designated. (remaining text unchanged)

301.4.4302.5 Swimming Pools Located in Coastal High Hazard Areas. (remaining text unchanged)

(renumber remaining sections)
603.0 Electrical Systems.

603.1 General. The design, installation, alteration, modification, construction, maintenance, and testing of electrical systems and equipment associated with a swimming pool, spa, or hot tub shall comply with NFPA 70.

SUBSTANTIATION:
The above sections are being moved as these provisions currently seem misplaced in their current location. The “General” section was added to further support this relocation.

The additional language in the general section is being included to ensure that both aboveground and inground pools are designed and installed to resist anticipated flood associated loads. Furthermore, the language covering membranes and liners has been added to address such materials and their installation as seen in industry standards and various local codes. By anchoring the membranes and liners, it ensures that such materials do not pose as any hazards and are prevented from being carried away in the event of flooding.

The requirement for electrical components to be made waterproof when such components are installed below the design flood elevation is necessary for safety reasons. This requirement is also in compliance with previously accepted standard ASCE 24 (Flood Resistant Design and Construction). Additionally, compliance with Section 603.0 ensures that all electrical equipment and components are installed in accordance with NFPA 70 (National Electric Code).

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The requirement for equipment and components to be made waterproof is impractical and overly restrictive. Additionally, the proposed modification/comment language needs further work.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 012
USPSHTC 2021 Section: Table 307.1, Table 1001.1

SUBMITTER: Adam Segura
Self

RECOMMENDATION:
Revise text

TABLE 307.1
MATERIALS FOR BUILDING SUPPLY, WATER DISTRIBUTION, AND CIRCULATION SYSTEM PIPING AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEX-AL-PEX</td>
<td>X</td>
<td>X</td>
<td>ASTM F1281, ASTM F2262, CSA B137.10</td>
<td>ASTM F1281, ASTM F1974, ASTM F2434, CSA B137.10</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F1961-2009</td>
<td>Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing (WITHDRAWN)</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2262-2009</td>
<td>Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene Tubing OD Controlled SDR9 (WITHDRAWN)</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
The proposed modification removes reference to ASTM F1961 and ASTM F2262 as the promulgator has withdrawn these standards.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA
PUBLIC COMMENT 1

**Code Year:** 2021 USPSHTC  **Section #:** Table 307.1, Table 1001.1, Table 1001.2  
**Item #:** 012  
**SUBMITTER:** Andrew Todd  
V&T Carbonic Inc.  
**Comment #:** 1

**RECOMMENDATION:**
Revise text

Request to accept the code change proposal as modified by this public comment.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>X&lt;sup&gt;1&lt;/sup&gt;</td>
<td>-</td>
<td>ASTM D2239, ASTM D2737, ASTM D3035, AWWA C901, CSA B137.1</td>
<td>ASTM D2609, ASTM D2683, ASTM D3261, ASTM F1055, CSA B137.1</td>
</tr>
<tr>
<td>PE-RT</td>
<td>X</td>
<td>X</td>
<td>ASTM F2769, CSA B137.18</td>
<td>ASTM D3261, ASTM F1055, ASSE 1061, ASTM F1807, ASTM F2098, ASTM F2159, ASTM F2735, ASTM F2769, ASTM B137.18</td>
</tr>
<tr>
<td>PEX</td>
<td>X</td>
<td>X</td>
<td>ASTM F876, ASTM F877, CSA B137.5, AWWA C904&lt;sup&gt;1&lt;/sup&gt;</td>
<td>ASSE 1061, ASTM F877, ASTM F1807, ASTM F1960, ASTM F2080, ASTM F2159, ASTM F2735, CSA B137.5</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>X</td>
<td>X</td>
<td>ASTM A269, ASTM A312, ASTM A554, ASTM A778</td>
<td>ASTM F3226, IAPMO PS 117</td>
</tr>
</tbody>
</table>

**Notes:**

<sup>1</sup> For building supply or exterior cold-water applications, not for water distribution piping.

<sup>2</sup> For brazed fittings only.

(portions of table not shown remain unchanged)
**TABLE 1001.1**
REFERRED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME B16.50 - 2018</td>
<td>Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A554 – 2016</td>
<td>Welded Stainless Steel Mechanical Tubing</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A778/A778M – 2016</td>
<td>Welded, Unannealed Austenitic Stainless Steel Tubular Products</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM B135/B135M – 2017</td>
<td>Seamless Brass Tube</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F3226/F3226M – 2019</td>
<td>Metallic Press-Connect Fittings for Piping and Tubing Systems</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C907 - 2017</td>
<td>Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water, Wastewater, and Reclaimed Water Service</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.18 – 2017</td>
<td>Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications</td>
<td>Piping, Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>IAPMO PS 117 – 2019</td>
<td>Press Connections</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
</tbody>
</table>

Note: The above standards meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

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**TABLE 1001.2**
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME B16.50 – 2018</td>
<td>Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings</td>
<td>Fittings</td>
</tr>
<tr>
<td>ASTM B135/B135M – 2017</td>
<td>Seamless Brass Tube</td>
<td>Piping, Copper Alloy</td>
</tr>
</tbody>
</table>

Note: The newly added standards are applicable to Table 307.1 as depicted below.

**SUBSTANTIATION:**

Table 307.1 is being updated to correlate with the most recent edition of the Uniform Plumbing Code (UPC) which provides a similar table in Chapter 6 (Water Supply and Distribution). Since the addition of Table 307.1 into the USPSHTC, there have been other standards added to the same table in the UPC. For correlation between the two codes and to prevent conflicts, the above additional standards are necessary for inclusion.

The newly added standards are applicable to Table 307.1 as depicted below.

ASME B16.50 establishes requirements for wrought copper and wrought copper alloy braze-joint seamless fittings and covers pressure-temperature ratings, sizing, markings, material and testing.

ASSE 1061 establishes minimum performance requirements for push-fit fittings and push-fit connections that are integrated into plumbing devices.

ASTM A554 covers welded austenitic, ferritic, and austenitic-ferritic duplex stainless steel mechanical tubing intended for use in applications where appearance, mechanical properties, or corrosion resistance is needed.

ASTM A778 covers straight seam and spiral butt seam welded unannealed austenitic stainless steel tubular products intended for low and moderate temperatures and corrosive service where heat treatment is not necessary for corrosion resistance.
ASTM B43 establishes requirements for seamless copper alloy and covers workmanship, performance, testing and markings.

ASTM B135 covers seamless round and rectangular copper alloy tube in straight lengths. Ten alloys are included in the standard and listed with acceptable compositions. Also covered are general requirements, workmanship, testing, and mechanical properties.

ASTM D3261 covers polyethylene butt fusion fittings for use with polyethylene pipe and tubing. This standard includes requirements for materials, workmanship, dimensions, marking, sustained pressure, and burst pressure.

ASTM F1055 covers electrofusion polyethylene fittings for use with outside diameter-controlled polyethylene pipe and crosslinked polyethylene. Requirements for materials, workmanship, testing, performance, markings, and quality assurance are included.

ASTM F3226 establishes the performance characteristics required for metallic press-connect fittings for use in piping and tubing systems with a maximum allowable working pressure of 300 psi. These fittings directly attach to pipe or tube by mechanical deformation of the pipe or tube or fitting, or a combination thereof, creating a seal and a restrained joint.

AWWA C907 addresses polyvinyl chloride injection-molded fittings with push-on rubber-gasketed joints for use in water applications. The standard covers requirements for permeation, materials, and pressure class. Also included are specifications for testing, markings, and application.

CSA B137.18 specifies requirements for polyethylene of raised temperature tubing systems that are comprised of tubing and fittings. This standard specifies materials, workmanship, interior liners, hydrostatic capability, and markings.

IAPMO PS 117 covers press connections made with the following:
- copper or copper alloy fittings and Type K, L, and M copper tube;
- carbon steel fittings and Schedule 10 and 40 carbon steel pipe;
- stainless steel fittings and Schedule 5, 10, and 40 stainless steel pipe; or
- stainless steel fittings and stainless steel pipe.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 013
USPSHTC 2021  Section: 307.8.1, Table 1001.1

SUBMITTER: Christopher Jensen
UL LLC

RECOMMENDATION:
Revise text

307.0 Water Supply and Circulating System Pipe and Fitting Materials.

307.8 Plastic Materials. (remaining text unchanged)
307.8.1 Tracer Wire. Plastic materials for water service piping outside underground shall have a blue insulated copper tracer wire, or other approved conductor installed adjacent to the piping. Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG, and the insulation type shall be approved for direct burial.

Exception: Tracer wire utilizing copper-clad steel conductors listed and labeled in accordance with UL 2989 shall be permitted.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
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<tbody>
<tr>
<td>UL 2989-2016</td>
<td>Outline of Investigation for Tracer Wire</td>
<td>Miscellaneous</td>
<td>307.8.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 2989 does not meet the requirements for a consensus reference standard in accordance with Section 15.2 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Tracer wire that is listed and labeled in accordance with UL 2989 has undergone specific testing to determine its suitability for use underground as a tracer wire. The tests include:
• Physical Properties of Insulation
• Mechanical Water Absorption
• Cold-Bend Test
• Crushing Resistance
• Impact Resistance
• Unwinding at Low Temperature
• Dielectric-Voltage Withstand
The new exception will assist the AHJ in making a determination as to an approved alternate tracer wire to an insulated copper wire identified for direct burial. UL currently has 15 manufacturers that have tracer wire listed to UL 2989.

COMMITTEE ACTION: ACCEPT AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 307.8.1, Table 1001.1  Item #: 013
SUBMITTER: Lizette Guzman  Self  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

307.0 Water Supply and Circulating System Pipe and Fitting Materials.

307.8 Plastic Materials.  (remaining text unchanged)
307.8.1 Tracer Wire. Plastic materials for water service piping outside underground shall have a blue insulated copper tracer wire, or other approved conductor installed adjacent to the piping. Where tracer wires utilizing copper-clad steel conductors are installed, such tracer wires shall be in accordance with ASTM B1010 or UL 2989. Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG, and the insulation type shall be approved for direct burial.

Exception: Tracer wire utilizing copper-clad steel conductors listed and labeled in accordance with UL 2989 shall be permitted.

**TABLE 1001.1
REFERENCED STANDARDS**

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<td>ASTM B1010/B1010M-2019</td>
<td>Copper-Clad Steel Electrical Conductor for Tracer Wire Applications</td>
<td>Miscellaneous</td>
<td>307.8.1</td>
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</table>

(portions of table not shown remain unchanged)

Note: ASTM B1010/B1010M meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Section 307.8.1 is being revised for clarity as well as for the inclusion of ASTM B1010. The current organization of the section seems unclear since the section already states that “other approved conductor(s)” may be installed. This gives the Authority Having Jurisdiction the power to approve such tracer wires without the need for an exception. For this reason, the exception has been deleted and the UL standard has been moved to be in line with listed provisions.

ASTM B1010 is being added as it pertains to copper-clad steel conductors for tracer wire applications. This standard covers materials, manufacturing, physical properties, resistivity, workmanship, and testing. For these reasons, the standard should be included.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
PUBLIC COMMENT 2

Code Year: 2021 USPSHTC    Section #: 307.8.1

SUBMITTER: Andrew Todd
            V&T Carbonic Inc.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

307.0 Water Supply and Circulating System Pipe and Fitting Materials.

307.8 Plastic Materials. (remaining text unchanged)
307.8.1 Tracer Wire. Plastic materials for water service piping outside underground shall have a blue insulated copper tracer wire, or other approved conductor. Tracer wire or approved conductors shall be installed adjacent to the piping and secured in 10-foot (3048 mm) intervals. Tracer wire shall be securely bonded together at wire joints with an approved watertight connector. Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG, and the insulation type shall be approved for direct burial.

Exception: Tracer wire utilizing copper-clad steel conductors listed and labeled in accordance with UL 2989 shall be permitted.

SUBSTANTIATION:
The above modifications are being included to address how tracer wires should be installed and secured. Anchoring or securing the tracer wire at 10 foot intervals ensures that the wire will correctly indicate the location of corresponding piping. Where tracer wires are joined, it is imperative that they are bonded and made watertight to ensure electrical continuity.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

307.0 Water Supply and Circulating System Pipe and Fitting Materials.

307.8 Plastic Materials. (remaining text unchanged)
307.8.1 Tracer Wire. Plastic materials for water service piping outside underground shall have a blue insulated copper tracer wire, or other approved conductor. Tracer wire or approved conductors shall be installed adjacent to the piping and secured in 10-foot (3048 mm) intervals. Tracer wire shall be securely bonded together at wire joints with an approved watertight connector. Where tracer wires utilizing copper-clad steel conductors are installed, such tracer wires shall be in accordance with ASTM B1010 or UL 2989. Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG, and the insulation type shall be approved for direct burial.

Exception: Tracer wire utilizing copper-clad steel conductors listed and labeled in accordance with UL 2989 shall be permitted.

COMMITTEE STATEMENT:
Since the entire tracer wire is not waterproof, requiring an approved watertight connector does not make sense for this application.

Furthermore, the accepted actions taken on Public Comment #1 have been included in the provided modification for Public Comment #2.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9   NOT RETURNED: 1   CHOE
Proposals

Item #: 014
USPSHTC 2021  Section: 308.6.1

SUBMITTER: Adam Segura
Self

RECOMMENDATION:
Revise text

308.0 Water Supply and Circulating System Pipe Joints and Connections.

308.6 PE Plastic Pipe/Tubing and Joints. (remaining text unchanged)
308.6.1 Heat-Fusion Joints. Heat-fusion joints between PE pipe or tubing and fittings shall be assembled in accordance with Section 308.6.1.1 through Section 308.6.1.3 using butt, socket, and electro-fusion heat methods.

SUBSTANTIATION:
The proposed change will clarify the intent of the section on heat-fusion joints. There are three types of heat fusion methods which include "butt, socket, and electro-fusion." This section should read “or” as only one method can be applied at a time. This change will remove confusion for the end user and the AHJ.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 308.0 - 308.16.1  Item #: 014

SUBMITTER: Arnold Rodio
Pace Setter Plumbing Corp.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

308.0 Water Supply and Circulating System Pipe Joints and Connections.
308.1 Copper or Copper Alloy Pipe, Tubing, and Joints. (remaining text unchanged)
308.1.1 Brazed Joints. Brazed joints between copper or copper alloy pipe or tubing and fittings shall be made with brazing alloys having a liquid temperature above 1000°F (538°C). The joint surfaces to be brazed shall be cleaned bright by either manual or mechanical means. Tubing shall be cut square and reamed to full inside diameter. Brazing flux shall be applied to the joint surfaces where required by manufacturer’s recommendation. Brazing filler metal in accordance with shall conform to AWS A5.8 and shall be applied at the point where the pipe or tubing enters the socket of the fitting.
308.1.2 Flared Joints. Flared joints for soft copper or copper alloy water tubing shall be made with fittings that are in accordance comply with the applicable standards referenced in Table 307.1. Pipe or tubing shall be cut square using an
appropriate tubing cutter. The tubing shall be reamed to full inside diameter, resized to round, and expanded with a proper flaring tool.

308.1.3 Mechanical Joints. (remaining text unchanged)

308.1.3.2 Pressed-Connect Fittings. Pressed-Connect fittings for copper or copper alloy pipe or tubing shall have an elastomeric o-ring that forms the joint. The pipe or tubing shall be fully inserted into the fitting, and the pipe or tubing marked at the shoulder of the fitting. Pipe or tubing shall be cut square, chamfered, and reamed to full inside diameter. The fitting alignment shall be checked against the mark on the pipe or tubing to ensure the pipe or tubing is inserted into the fitting. The joint shall be pressed using the tool recommended by the manufacturer.

308.1.3.3 Push Fit Fittings. Removable and nonremovable push fit fittings for copper or copper alloy tubing or pipe that employ quick assembly push fit connectors shall be in accordance with ASSE 1061. Push fit fittings for copper or copper alloy pipe or tubing shall have an approved elastomeric o-ring that forms the joint. Pipe or tubing shall be cut square, chamfered, and reamed to full inside diameter. The tubing shall be fully inserted into the fitting, and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tube to ensure the tubing is inserted into the fitting and gripping mechanism has engaged on the pipe.

308.1.4 Soldered Joints. Soldered joints between copper or copper alloy pipe or tubing and fittings shall be made in accordance with ASTM B828 with the following sequence of joint preparation and operation as follows: measuring and cutting, reaming, cleaning, fluxing, assembly and support, heating, applying the solder, cooling and cleaning. Pipe or tubing shall be cut square and reamed to the full inside diameter including the removal of burrs on the outside of the pipe or tubing. Surfaces to be joined shall be cleaned bright by manual or mechanical means. Flux shall be applied to pipe or tubing and fittings and shall be in accordance with conform to ASTM B813, and shall become noncorrosive and nontoxic after soldering. Insert pipe or tubing into the base of the fitting and remove excess flux. Pipe or tubing and fittings shall be supported to ensure a uniform capillary space around the joint. Heat shall be applied using an air or fuel torch with the flame perpendicular to the pipe or tubing using acetylene or an LP gas. Preheating shall depend on the size of the joint. The flame shall be moved to the fitting cup and alternate between the pipe or tubing and fitting. Solder in accordance with conforming to ASTM B32 shall be applied to the joint surfaces until capillary action draws the molten solder into the cup. Solder and fluxes with a lead content that exceeds 0.2 percent shall be prohibited in piping systems conveying potable water. Joint surfaces shall not be disturbed until cool and any remaining flux residue shall be cleaned.

308.1.5 Threaded Joints. Threaded joints for copper or copper alloy pipe shall be made with pipe threads in accordance with ASME B1.20.1. Thread sealant tape or compound shall be applied only to male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

308.2 CPVC Plastic Pipe and Joints. (remaining text unchanged)

308.2.1 Mechanical Joints. Mechanical joints shall include compression, flanged, grooved and push fit fittings.

308.2.1.1 Push Fit Fittings. Removable and nonremovable push fit fittings that employ a quick assembly push fit connector shall be in accordance with ASSE 1061.

308.2.2 Solvent Cement Joints. Solvent cement joints for CPVC pipe and fittings shall be clean from dirt and moisture. Solvent cements shall comply with ASTM F493, requiring the use of a primer shall be orange in color. The primer shall be colored and shall comply with ASTM F656. Listed solvent cement shall comply with ASTM F493 and that does not require the use of primers, yellow or red in color, shall be permitted for pipe and fittings manufactured in accordance with ASTM D2846, 1/2 of an inch (15 mm) through 2 inches (50 mm) in diameter or ASTM F442, 1/2 of an inch (15 mm) through 3 inches (80 mm) in diameter. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until joint is set.

308.3 CPVC/AL/CPVC Plastic Pipe and Joints. Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.3.1 or Section 308.3.2.

308.3.1 Solvent Cement Joints. Solvent cement joints for CPVC/AL/CPVC pipe and fittings shall be clean from dirt and moisture. Solvent cements shall comply with ASTM F493, requiring the use of a primer shall be orange in color. The primer shall be colored and shall comply with ASTM F656. Listed solvent cement shall comply with ASTM F493 and that does not require the use of primers, yellow in color, shall be permitted to join pipe manufactured in accordance with ASTM D2855 and fittings manufactured in accordance with ASTM D2846, 1/2 of an inch (15 mm) through 2 inches (50 mm) in diameter. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until joint is set.

308.3.2 Mechanical Joints. Mechanical joints shall include flanged, grooved, and push fit fittings.
308.3.2.1 Push Fit Fittings. Removable and nonremovable push fit fittings that employ a quick assembly push fit connector shall comply with ASSE 1061.

308.5 Galvanized Steel Pipe and Joints. (remaining text unchanged)

308.5.2 Threaded Joints. Threaded joints shall be made with pipe threads that are in accordance comply with ASME B1.20.1. Thread sealant tape or compound shall be applied only to male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

308.6 PE Plastic Pipe/Tubing and Joints. (remaining text unchanged)

308.6.1 Heat-Fusion Joints. (remaining text unchanged)

308.6.1.3 Socket-Fusion Joints. Socket-fusion joints shall be installed and shall be made by simultaneously heating the outside surface of a pipe end and the inside of a fitting socket. Where the proper melt is obtained, the pipe and fitting shall be joined by inserting one into the other with applied force. The joint shall fuse together and remain undisturbed until cool.

308.6.2 Mechanical Joints. Mechanical joints between PE pipe or tubing and fittings shall include insert and mechanical compression fittings that provide a pressure seal resistance to pullout. Joints for insert fittings shall be made by cutting the pipe square, using a cutter designed for plastic piping, and removal of sharp edges. Two stainless steel clamps shall be placed over the end of the pipe. Fittings shall be checked for proper size based on the diameter of the pipe. The end of pipe shall be placed around the pipe. The ribbed end of the fitting shall be inserted into the pipe until the pipe contacts the shoulder of the fitting. Position and compress the split ring by tightening the compression nut onto the insert fitting.

308.6.3 Butt-Fusion Joints. Butt-fusion joints shall be placed into the pipe until the pipe contacts the shoulder of the fitting. Position and the compression nut and split ring shall be tightened to provide a leak tight joint. Compression type couplings and fittings shall be permitted for use in joining PE piping and tubing. Stiffeners that extend beyond the clamp or nut shall be prohibited. Bends shall be not less than 30 pipe diameters, or the coil radius where bending with the coil. Bends shall not be permitted closer than 10 pipe diameters of any fitting or valve. Mechanical joints shall be designed for their intended use.

308.7 PE-AL-PE Plastic Pipe/Tubing and Joints. (remaining text unchanged)

308.7.1 Mechanical Joints. (remaining text unchanged)

308.7.1.1 Compression Joints. Compression joints for PE-AL-PE pipe or tubing and fittings shall be joined through the compression of a split ring, by a compression nut around the circumference of the pipe. The compression nut and split ring shall be placed around the pipe. The ribbed end of the fitting shall be inserted into the pipe until the pipe contacts the shoulder of the fitting. Position and compress the split ring by tightening the compression nut onto the insert fitting.

308.8 PE-RT. Polyethylene of raised temperature (PE-RT) tubing and fitting joining methods shall comply with Section 308.8.1.

308.8.1 Mechanical Joints. Fittings for PE-RT tubing shall comply with the applicable standard designation(s) listed in Table 307.1. Metal insert fittings, metal compression fittings, and plastic fittings shall be manufactured to and marked in accordance with the standards for fittings in Table 307.1. Metal insert fittings, metal compression fittings, and plastic fittings shall be manufactured to and marked in accordance with the standards for fittings in Table 307.1. Metal insert fittings, metal compression fittings, and plastic fittings shall be manufactured to and marked in accordance with the standards for fittings in Table 307.1.

308.9 PEX Plastic Tubing and Joints. PEX plastic tubing and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.9.1 and through Section 308.9.2.

308.9.1 Fittings. Fittings for PEX tubing shall comply with the applicable standards referenced in Table 307.1. PEX tubing in accordance that complies with ASTM F876 shall be marked with the applicable standard designation for the fittings, specified by the tubing manufacturer for use with the tubing.

308.10 PEX-AL-PEX Plastic Tubing and Joints. (remaining text unchanged)

308.10.1 Mechanical Joints. Mechanical joints between PEX-AL-PEX tubing and fittings shall include mechanical and compression type fittings and insert fittings with a crimping ring. Insert fittings utilizing a crimping ring shall be in accordance comply with ASTM F1974 or ASTM F2434. Crimp joints for crimp insert fittings shall be joined to PEX-AL-PEX pipe by the compression of a crimp ring around the outer circumference of the pipe, forcing the pipe material into annular spaces formed by ribs on the fitting.

308.11 Polypropylene (PP) Piping and Joints. (remaining text unchanged)

308.11.3 Threaded Joints. PP pipe shall not be threaded. PP transition fittings for connection to other piping materials shall only be threaded by use of copper alloy or stainless steel inserts molded into the fitting.
308.12 PVC Plastic Pipe and Joints. PVC plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.12.1 through Section 308.12.3. PVC piping shall not be exposed to direct sunlight unless the piping does not exceed 24 inches (610 mm) and is wrapped with not less than 0.04 of an inch (1.02 mm) thick tape or otherwise protected from UV degradation.

308.12.2 Solvent Cement Joints. Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and pipe shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color in accordance that complies with ASTM F656. Primer shall be applied until the surface of the pipe and fitting is softened. Solvent cement in accordance cement that complies with ASTM D2564 shall be applied to all joint surfaces. Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

308.12.3 Threaded Joints. Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded; however, the pressure rating shall be reduced by 50 percent. The use of molded fittings shall not result in a 50 percent reduction in the pressure rating of the pipe provided that the molded fittings shall be fabricated so that the wall thickness of the material is maintained at the threads. Thread sealant compound that is compatible with the pipe and fitting, insoluble in water; and nontoxic shall be applied to male threads. Caution shall be used during assembly to prevent over tightening of the PVC components once the thread sealant has been applied. Female PVC threaded fittings shall be used with plastic male threads only.

308.13 Stainless Steel Pipe and Joints. (remaining text unchanged)

308.13.1 Mechanical Joints. Mechanical joints shall be designed for their intended use. Such joints shall include compression, flanged, grooved, pressed press-connect, and threaded.

308.13.2 Welded Joints. Welded joints shall be either fusion or resistance welded based on the selection of the base metal. The chemical composition of the filler metal shall comply with AWS A5.9 based on the alloy content of the piping material.

308.14 Slip Joints. In water piping, slip joints shall be permitted to be used only on the exposed fixture supply.

308.14.1 Copper or Copper Alloy Pipe or Tubing to Threaded Pipe Joints. Joints from copper or copper alloy pipe or tubing to threaded pipe shall be made by the use of using copper alloy adapter, copper alloy nipple [minimum 6 inches (152 mm)], dielectric fitting, or dielectric union in accordance with ASSE 1079. The joint between the copper or copper alloy pipe or tubing and the fitting shall be a soldered, brazed, flared, or pressed press-connect joint and the connection between the threaded pipe and the fitting shall be made with a standard pipe size threaded joint.

(renumber remaining sections)

Note: ASSE 1061 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above modifications are being submitted for correlation with the most recent edition of the Uniform Plumbing Code (UPC). These provisions should match to prevent conflict between the two codes and ensure that both installers and inspectors are following and utilizing the same provisions for water supply and distribution.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 015
USPSHTC 2021  Section: 313.1, Table 1001.1

SUBMITTER: Christopher Jensen
UL LLC

RECOMMENDATION:
Revise text

313.0 Accessibility.
313.1 General. An accessible route shall be provided to public swimming pools, spas, and hot tubs in accordance with the Building Code. Accessibility within the public swimming pools, spas, and hot tubs shall be provided in accordance with the Building Code. Pool lifts used to provide accessibility shall be listed and labeled for the purpose in accordance with UL 60335-2-1000 and installed in accordance with ICC A117.1.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>UL 60335-2-1000-2017</td>
<td>Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts</td>
<td>Miscellaneous</td>
<td>313.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 60335-2-1000 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
UL 60335-2-1000 is the ANSI consensus standard used to certify (list) electrically powered pool lifts. This standard addresses electrical hazards as well as mechanical and structural hazards associated with pool lifts. Adding UL 60335-2-1000 to the body of the code provides clarity for the AHJ, designers and installers as to the appropriate product standard used to certify (list) electrically powered pool lifts. UL has several manufacturers that currently have pool lifts listed to UL 60335-2-1000.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments
313.0 Accessibility.
313.1 General. An accessible route shall be provided to public swimming pools, spas, and hot tubs in accordance with the Building Code. Accessibility within the public swimming pools, spas, and hot tubs shall be provided in accordance with the Building Code. Pool lifts used to provide accessibility shall be listed and labeled in accordance with UL 60335-2-1000 and installed in accordance with ICC A117.1. Where electrically powered pool lifts are installed, such pool lifts shall be listed and labeled in accordance with UL 60335-2-1000.

Note: UL 60335-2-1000 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Section 313.1 is being revised to ensure that pool lifts are not restricted only to those which are electrically powered. The current language requires for pool lifts to be listed and labeled to UL 60335-2-1000, but this standard is explicit to electrically powered pool lifts. For these reasons, the above revision is needed.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
Public Comment #1 is being rejected in favor of Public Comment #2 as this language is also included in Public Comment #2 appropriately. Additionally, the language provided in Public Comment #2 is more detailed and is therefore being kept.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE

313.2 Pool Lifts. Pool lifts used to provide accessibility shall be listed and labeled in accordance with UL 60335-2-1000 and installed in accordance with ICC A117.1, in accordance with the following:
1. Installed in accordance with ICC A117.1.
2. Designed to submerge the user to a water depth of not less than 18 inches (457 mm).
3. Designed to have a weight capacity of not less than 300 pounds (136 kg).
4. Capable of withstanding a static load of not less than 150 percent of the rated load.

313.2.1 Electrically Powered. Where electrically powered pool lifts are installed, such pool lifts shall be listed and labeled in accordance with UL 60335-2-1000.
Note: ICC A117.1 and UL 60335-2-1000 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The listed provisions for pool lifts address both design and installation requirements to ensure accessibility and compliance with the United States Access Board and the Americans with Disabilities Act (ADA). The design submerge depth is necessary to ensure buoyancy to make it easier for the end user to enter or exit the lift.

The included weight capacity of 300 lbs ensures that the lift meets the needs of the population with which it serves. Although a greater weight capacity may be advisable, this is the listed requirement within all codes and standards for accessibility. For safety reasons, the lift must be capable of withstanding a load that is 1.5 times that of the rated load.

All requirements are necessary for ensuring that installed pool lifts are capable of providing disabled patrons with a means of safe entry and exit of pools.


COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 016

USPSHTC 2021  Section: 314.0, 314.1, Table 1001.1

SUBMITTER:  Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Add new text

314.0 Slip Resistant Surfaces.
314.1 General. Slip resistant level surfaces shall have a dynamic coefficient of friction of not less than 0.42, as determined in accordance with TCNA A137.1 or TCNA A326.3.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
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<tbody>
<tr>
<td>TCNA A137.1-2017</td>
<td>Specifications for Ceramic Tile</td>
<td>Safety</td>
<td>314.1</td>
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<tr>
<td>TCNA A326.3-2017</td>
<td>Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials</td>
<td>Safety</td>
<td>314.1</td>
</tr>
</tbody>
</table>

Note: TCNA A137.1 and TCNA A326.3 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The term “slip resistant” is used throughout the USPSHTC and yet does not have a specific minimum dynamic coefficient of friction (DCOF) assigned. Such addition is necessary as pools and their surrounding surfaces are wet and may pose as a slip/fall risk. By providing a minimum value for the DCOF of wet hard surfaces, this risk may be lowered.

Standards TCNA A137.1 and TCNA A326.3 provide further clarification for the determination and testing of DCOF’s for various level hard wet surfaces. Both TCNA A137.1 and TCNA A326.3 state that a minimum DCOF of 0.42 is required for wet hard surfaces to be exposed to foot traffic. Although the standard title of TCNA A137.1 refers to ceramic tile, the standard is inclusive to multiple types of tile and can be applicable to various level hard wet surfaces. By providing both standards and their appropriate test methods, the required DCOFs for wet surfaces to be exposed to foot traffic in aquatic facilities can be met.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The Technical Committee agrees with the inclusion of the proposed concept but would like to form a task group to improve the proposed language on slip-resistant surfaces.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA
APPENDED COMMENTS

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 314.0 - 314.1.3, Appendix C  Item #: 016

SUBMITTER: Bill Griese  Chair, USPSHTC Slip-Resistance Task Group

RECOMMENDATION:

Add new text

Request to replace the code change proposal by this public comment.

314.0 Slip-Resistant Walkway Surfaces.

314.1 General. Where walkway surfaces are in locations subject to being wet with water, such surfaces shall be in accordance with Section 314.1.1 through Section 314.1.3. (See Appendix C for informative notes and an example calculation.)

314.1.1 DCOF, Level Walkways. Level hard-surface walkways intended to be walked upon while wet with water shall have a dynamic coefficient of friction (DCOF) of not less than 0.42 as determined in accordance with TCNA A326.3.

314.1.2 DCOF, Inclined Walkways. Inclined hard-surface walkways with a slope greater than or equal to 1 inch per 20 inches (50 mm/m) shall be tested in accordance with TCNA A326.3 and shall have a corrected minimum required DCOF in accordance with Equation 314.1.2.

\[
\mu_{corrected} = \frac{\tan \alpha + \mu_{level}}{1 - (\mu_{level} \times \tan \alpha)}
\]  

(Equation 314.1.2)

Where:

- \( \mu_{corrected} \) = corrected DCOF of surface
- \( \alpha \) = angle of slope, degrees
- \( \mu_{level} \) = level DCOF of surface = 0.42 minimum

314.1.3 Three-dimensionally Patterned or Profiled Walkways. Walkway DCOF data shall not be based on testing conducted across grout joints or across protruding features of three-dimensionally patterned or profiled hard surface walkways. DCOF data (obtained through complying with Sections 314.1.1 and Section 314.1.2) shall be based on testing conducted over a nominally flat section of such walkways. If a design professional specifies a walkway surface for which DCOF data from nominally flat sections is not obtainable, the design professional shall document their foundations for concluding the specified walkway surface is at least as slip-resistant as walkway surfaces meeting Sections 314.1.1 or Section 314.1.2. This documentation shall be included with the construction documents.

APPENDIX C
SLIP-RESISTANT WALKWAY SURFACES

C 101.0 General.

C 101.1 Applicability. This appendix provides additional information regarding the determination of dynamic coefficient of friction (DCOF) values for hard-surface walkways intended to be slip-resistant, in Section 314.0 through Section 314.1.3.

Notes: The minimum required DCOF of 0.42, as specified in Section 314.1.1, was based upon human slip research with pedestrians wearing hard sole shoes. There is no current consensus standard establishing minimum DCOF levels correlated to human barefoot slips on swimming pool, spa, or hot tub walking surfaces.

DCOF measurements taken across grout joints and protruding features of three-dimensionally patterned or profiled walkways can produce biased and misleading DCOF values due to test device limitations.

Cumulative wear of walkway surfaces typically decreases the DCOF. In order to ensure the minimum required DCOF is maintained, accelerated wear testing may be advisable for walkways with high pedestrian volume.

C 102.0 Example Calculation for Slope Corrected Slip-Resistant Walkway Surfaces.

C 102.1 Example Calculation. Determine the required corrected DCOF for an inclined walkway surface intended to be slip-resistant with a slope of 2.9 degrees and a level DCOF of 0.42.
TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCNA A326.3-2017</td>
<td>Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials</td>
<td>Safety</td>
<td>314.1.1, 314.1.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** TCNA A326.3 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

**SUBSTANTIATION:**
The proposed language pertaining to slip-resistant walkway surfaces is necessary for inclusion as it addresses level and inclined walkways as well as walkways which are three dimensionally patterned or profiled. Currently there are no specific provisions within the Uniform Swimming Pool, Spa and Hot Tub Code (USPSHTC) which provide the necessary guidelines for walkway friction testing along with required minimum friction test values for walkway surfaces intended to be slip-resistant. Various factors must be considered in order to appropriately assess such surfaces, and applicable standards must be applied.

In this case, there is a single standard, TCNA A326.3, which has been deemed the most appropriate by the USPSHTC Slip-Resistance Task Group for such provisions. This active ANSI standard provides a minimum DCOF (dynamic coefficient of friction) value of 0.42 for hard surface flooring materials along with a test method for measuring DCOF values that can be used in the laboratory or in the field.

The DCOF test method provided in TCNA A326.3 requires the use of a portable digital tribometer called the BOT 3000E. This tribometer and method have been used in the TCNA A137.1 standard for ceramic tile since 2012, and were generalized for hard surface walkways in TCNA A326.3 starting in 2017. For these reasons, TCNA A326.3 along with its required test method has been widely adopted.

The minimum DCOF value of 0.42 is based on TCNA's reference to German research by Stefan Bonig (1995) and Jens Sebald (2009). In the later paper by Sebald, a general correlation of BOT 3000 measurements to human slip research was derived. This correlation was based on the tribometer and human test subjects utilizing the same hard-sole footwear polymer. Beyond this correlation, a survey among researchers led to a safety factor being added to nominal research results, with the outcome being the 0.42 minimum DCOF.

Although TCNA A326.3 is deemed the most appropriate, there are considerations which must be made by the specifier to address a lack of reliable published correlation between tribometer measurements and the frictional requirements of barefoot pedestrians on wet pool, spa, and hot tub walking surfaces. Current publications are for barefoot humans on ordinary walkway materials, or for footwear-shod humans on bathing-type surfaces. As such, a proposed "Appendix C" provides appropriate caveats so that the specifier will know to consider the limitations of the 0.42 DCOF threshold.

As a result of gravity, inclined or sloped surfaces require greater available friction to prevent slipping. Therefore, as highlighted in the proposed Section 314.1.2, an adjusted and increased DCOF value must be determined and used for such surfaces. Utilizing the specified level 0.42 DCOF for inclined surfaces would not provide adequate frictional resistance and would result in a higher likelihood of slipping. In order to account for changes in available friction due to sloped surfaces, Equation 314.1.2 is being proposed along with sample calculations in Appendix C. This equation was gathered from "The Staircase: Studies of Hazards, Falls, and Safer Design" (1995), by John Templer, and generates a corrected DCOF value based on the incline of the surface being tested.

\[ \mu_{\text{corrected}} = \frac{\tan \alpha + \mu_{\text{level}}}{1 - (\mu_{\text{level}} \times \tan \alpha)} \]

\[ = \frac{\tan(2.9^\circ) + 0.42}{1 - [0.42 \times \tan(2.9^\circ)]} \]

\[ = 0.48 \]
Additionally, provisions have been proposed (in Section 314.1.3) which address measurements taken across grout joints or protruding features of three-dimensionally patterned or profiled hard surface walkways. Due to the operational characteristics of the BOT 3000E tribometer specified in TCNA A326.3, DCOF testing across such surfaces can provide inaccurate results which do not represent the true DCOF of the nominally flat portions of the tested walkways. For example, testing using the BOT 3000E across grout gaps typically produces varied DCOF spikes in collected data. Since the BOT 3000E DCOF measurement value is based on the average of numerous data points taken across a testing area, the DCOF value indicated on the BOT 3000E will be higher than the true DCOF of the surface being tested. For these reasons, Section 314.1.3 is being included to list provisions which require testing to be conducted over nominally flat portions of walkways required to be slip-resistant. The proposed Section 314.1.3 accommodates situations wherein DCOF data is not available for a nominally flat portion of the walkway material by requiring the specifier to document their selection rationale. A supporting description of this BOT 3000E technical issue is included in the proposed Appendix C.

One additional section of Appendix C addresses the effects of wear on DCOF values. This section is just advisory as there are no well-defined methods for characterizing “high pedestrian volume” as it relates to the durability of different walking surface materials.

For the above reasons, the proposed public comment is necessary and provides inspectors and specifiers with the necessary provisions for surfaces intended to be slip-resistant. In future code cycles, the USPSHTC Slip-Resistance Task Group will incorporate and modify provisions to include the most up to date applicable standards and test methods to promote public safety and ensure slip-resistant surfaces are accessed appropriately.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 018
USPSHTC 2021  Section: 211.0, 401.4, 401.4.1

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Add new text

401.0 General.

401.4 Islands. Where an island(s) is installed, the island shall be in accordance with the following:
(1) Islands intended for foot traffic shall be not less than 18 inches (457 mm) in width.
(2) Islands not more than 48 inches (1219 mm) in width shall be restricted to authorized personnel.
(3) Islands not intended for foot traffic shall be designated as such.
(4) Islands shall be slip resistant.

401.4.1 Island Markers. Island markers shall be in accordance with the following:
(1) Island lighting shall comply with Section 401.3.
(2) Island edge markers shall be located along the horizontal and vertical edges as follows:
   (a) of contrasting color
   (b) continuously marked along the island edge
   (c) not less than \( \frac{3}{4} \) of an inch (19.1 mm) and not more than 2 inches (51 mm) in width
   (d) located at not less than 2 inches (51 mm) from the island edge

211.0 – I –
Island. A surface area within a pool or natatorium at a higher elevation than the pool water level where the area is completely surrounded by pool water.

SUBSTANTIATION:
The addition of such language provides guidelines that are currently not covered within this code. Islands should be addressed as they are commonly installed in public aquatic facilities and resorts. The proposed guidelines are necessary for bather and user safety.

Islands intended for foot traffic must have a minimum width requirement. The listed width requirement of 18 inches was determined based on the average width of an adult person. Anything smaller would prohibit use. This listed minimum width up to 48 inches is only for authorized personnel as this width is not considered accessible to all users. Any width larger than 48 inches is considered acceptable for patrons and is deemed accessible. Single wheelchair passage requires 32 inches but does not allow for turn around space until 48 inches. Therefore, such provision is necessary.

The addition of slip-resistant surfaces prevents fall risks of bathers and patrons as islands are installed and used in wet areas.

Appropriate lighting of islands and markers is necessary to ensure safety in times when natural lighting is insufficient. Vertical and horizontal edge markers are included to provide further safety of the end users. Such edge markers must be continuous along edges so that they are readily visible. Provisions on edge marker dimensions and locations also ensures that the markers are readily visible. Dimensions for edge markers are consistent with provisions currently listed throughout the code.
Additionally, a definition for the term “island” is being proposed to provide clarification since the term has multiple meanings.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

401.0 General.

401.4 Islands. Where an island(s) is installed, the island shall be in accordance with the following:
(1) Islands intended for foot traffic shall be not less than 18 inches (457 mm) in width.
(2) Islands not more than 48 inches (1219 mm) in width shall be restricted to authorized personnel.
(3) Islands not intended for foot traffic shall be designated as such.
(4) Islands shall be slip resistant.

401.4.1 Island Markers. Island markers shall be in accordance with the following:
(1) Island lighting shall comply with Section 401.3.
(2) Island edge markers shall be located along the horizontal and vertical edges as follows:
   (a) of contrasting color
   (b) continuously marked along the island edge
   (c) not less than ¾ of an inch (19.1 mm) and not more than 2 inches (51 mm) in width
   (d) located at not less than 2 inches (51 mm) from the island edge

211.0 I Island. A surface area within a pool or natatorium at a higher elevation than the pool water level where the area is completely surrounded by pool water.

COMMITTEE STATEMENT:
The definition for "island" is being modified by removing "or natatorium" as it is unnecessary and confusing since islands may be located indoors or outdoors.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1
Code Year: 2021 USPSHTC  Section #: 401.6  Item #: 018
SUBMITTER: Lizette Guzman  Self

RECOMMENDATION:
Add new text

Request to accept the code change proposal as modified by this public comment.

401.0 General.

401.6 Lazy Rivers. Where installed, lazy rivers shall comply with the following:
(1) A means of entry/exit shall be provided at intervals not exceeding 150 feet (45.720 mm),
(2) Handholds shall be in accordance with Section 402.10 and shall be installed along the perimeter of the lazy river on not less than one wall.
(3) Islands shall comply with Section 401.4 and Section 401.4.1.
(4) Bridges shall comply with Section 401.5,
401.4 Islands. Where an island(s) is installed, the island shall be in accordance with the following:
(1) Islands intended for foot traffic shall be not less than 18 inches (457 mm) in width.
(2) Islands not more than 48 inches (1219 mm) in width shall be restricted to authorized personnel.
(3) Islands not intended for foot traffic shall be designated as such.
(4) Islands shall be slip resistant.

401.4.1 Island Markers. Island markers shall be in accordance with the following:
(1) Island lighting shall comply with Section 401.3.
(2) Island edge markers shall be located along the horizontal and vertical edges as follows:
   (a) of contrasting color
   (b) continuously marked along the island edge
   (c) not less than 3/4 of an inch (19.1 mm) and not more than 2 inches (51 mm) in width
   (d) located at not less than 2 inches (51 mm) from the island edge

401.5 Bridges. Where bridges are installed over a pool or lazy river, they shall have a vertical clearance of not less than 7 feet (2134 mm) from the bottom of the pool and have not less than a 4 foot (1219 mm) vertical clearance from the water surface to any structure or feature. Guardrails shall be installed on each side of a bridge and shall not be less than 42 inches (1067 mm) in height from the bridge surface. Balusters of guardrails shall be installed so as to prevent a 4 inch (102 mm) sphere to pass.

402.10 Handholds. Handholds shall be provided for swimming pools where the water depth exceeds 24 inches (610 mm). Handholds shall be located not more than 6 inches (152 mm) above the water surface and spaced not more than 4 feet (1219 mm) apart. Handholds shall consist of ladders, steps, gutters, railing, coping, or combination thereof of not more than 2 inches (51 mm) in size.

Exceptions:
(1) Where an underwater seat or bench is installed
(2) Wading pools
(3) Wave pools

SUBSTANTIATION:
Lazy rivers are installed in many public aquatic venues and require provisions for access, handholds, islands and bridges to promote safety for the end user.

Entry and exit must be considered during the design and installation of all lazy rivers. Providing a means of access at appropriate intervals, as listed above, is in accordance with the most recent edition of Model Aquatic Health Code. This provision does not conflict with Section 802.1 (Means of Entry and Exit Including Steps, Ladders, and Stairs – Swimming Pools) since this section only provides intervals for pools exceeding 30 feet wide.

Islands are often in the center of lazy rivers and require depth and edge markers as well as appropriate lighting as specified within Section 401.4 and Section 401.4.1. Provisions for depth markings and lighting have been also included to prevent injury since lazy rivers are shallow.

Where lazy rivers are installed with bridges, they must comply with Section 401.5. This section includes the requirement for guardrails to prevent fall risks and also includes minimum clearances to prevent injury to those passing underneath.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 019
USPSHTC 2021  Section: 401.4

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Add new text

401.0 General.

401.4 Bridges. Where bridges are installed over a pool or lazy river, they shall have a vertical clearance of not less than 7 feet (2134 mm) from the bottom of the pool and have not less than a 4 foot (1219 mm) vertical clearance from the water surface to any structure or feature. Guardrails shall be installed on each side of a bridge and shall not be less than 42 inches (1067 mm) in height from the bridge surface. Balusters of guardrails shall be installed so as to prevent a 4 inch (102 mm) sphere to pass.

SUBSTANTIATION:
Bridges are currently not discussed within this code and clearances for bridges should be addressed. A bridge installed over a pool poses a risk if the clearance from the pool is not sufficient enough to prevent patrons in the pool or river from being injured underneath. The proposed heights are listed in multiple local codes and have been proven to be effective as the necessary clearance to prevent injury. To prevent a fall risk or hazard, a bridge should have guardrails installed on each side. The standard guardrail height of 42 inches correlates with OSHA requirements to prevent a fall risk. Spacing between balusters must also be addressed and specifications should be provided in order to prevent small children from passing through or getting body parts trapped between balusters.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 401.5  Item #: 019
SUBMITTER: Jazmin Curiel
Self

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

401.0 General.

401.5 Bridges. Where bridges are installed over a pool or lazy river, they shall have a vertical clearance of not less than 7 feet (2134 mm) from the bottom of the pool and have not less than a 4 foot (1219 mm) vertical clearance from the water surface to any structure or feature. Bridges shall have a width of not less than 48 inches (1219 mm) and shall be slip-resistant. Guardrails
shall be installed on each side of a bridge and shall not be less than 42 inches (1067 mm) in height from the bridge surface. Balusters of guardrails shall be installed so as to prevent a 4 inch (102 mm) sphere to pass.

**SUBSTANTIATION:**
In order to comply with ADA requirements, the minimum width for accessibility must be listed as 48 inches. Single wheelchair passage requires 32 inches but does not allow for turn around space until 48 inches. Since bridges, in this case, are installed over pools or lazy rivers, surfaces must also be slip-resistant to prevent a fall risk. For the above reasons, the additional language is necessary.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
402.0 Swimming Pools.

402.8 Depth Markings. The various depths of the pool shall be visible and marked in accordance with the following:
(1) At or above the water surface on the vertical pool wall
(2) On the edge of the deck at points of change in floor slope
(3) On the vertical pool wall, indicating the depth in not more than 2 foot (610 mm) increments
(4) Spaced at not more than 25 foot (7620 mm) intervals
(5) On both sides and both ends of the pool
(6) Numerals shall be not less than 4 inches (102 mm) in height
(7) Numerals shall contrast with the background they are placed, and be of a durable material that is both weather-resistant and slip resistant where located on the pool deck
(8) Where installed, markings on horizontal surfaces shall be slip-resistant

Exception: On pool or spa walls with a vanishing edge, no depth markers shall be required on that portion.

404.0 Spas and Hot Tubs.

404.13 Vanishing Edge Pools. Where a vanishing edge is installed in a pool, spa or hot tub, an automatic filler shall be installed in the catch basin to maintain a sufficient level of water in the pool.

224.0 – V –

Vanishing Edge. Also known as disappearing edge, negative edge, infinity edge, or zero edge. A water-feature detail in which water flows over the edge of at least a portion of one of the pool walls and is collected in a catch basin, from where it is pumped back into the pool, producing a visual effect of water with no boundary.

SUBSTANTIATION:
Section 402.8 is being revised to clarify that the section is referring specifically to depth markers. Without the addition of "depth" in the title, the section seems unclear for the end user. The inclusion of depth markers in 2 foot increments ensures that the changing pool depths are labeled appropriately for bathers. Number (5) is amended to clarify that markings must be uniformly marked on both sides and both ends of a pool so that bathers can view markings from any location within the pool. Number (8) is added to ensure that any markings that may be walked over are slip-resistant to prevent a fall risk.

Pools with a vanishing edge shall not be required to have water depth markings at the vanishing edge. For vanishing edge pools, an auto-filler needs to be installed in the catch basin (trough) so that when the pump turns on, the pump takes water from the catch basin and pumps it to the upper swimming pool ensuring that it is sufficiently filled. As the water is depleted from the catch basin, the auto-filler maintains enough water level inside the catch basin to keep the pool supplied with water.
A definition for vanishing edge pool, along with other listed names, is provided as that type of pool has many titles and may confuse the end user and the AHJ if not specified somewhere within the code.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The proposal is being rejected as the provisions for automatic fillers may pose issues such as structural hazards if leaking occurs.

Furthermore, the provisions for slip-resistant markings may be misinterpreted as the provided language implies that the other surfaces do not need to be slip-resistant. The proposed depth marking increments may also create issues depending on the slope and geometry of the pool.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

EXPLANATION OF AFFIRMATIVE:

HOLMER: I agree with the committee action to reject.

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC Section #: 402.8 Item #: 021

SUBMITTER: Lizette Guzman Self

RECOMMENDATION:
Revise text

Request to replace the code change proposal by this public comment.

402.0 Swimming Pools.

402.8 Depth Markings. The various depths of the pool shall be visible and marked in accordance with the following:
(1) At or above the water surface on the vertical pool wall
(2) On the edge of the deck at points of change in floor slope
(3) Spaced at not more than 25 foot (7620 mm) intervals
(4) On both sides and both ends of the pool
(5) Numerals shall have a height of be not less than 4 inches (102 mm) in height and not greater than 6 inches (152 mm)
(6) Numerals shall contrast with the background they are placed, and be of a durable material that is both weather-resistant and slip-resistant where located on the pool deck

SUBSTANTIATION:
The title of Section 402.8 is being revised to clarify that the section is pertaining specifically to depth markings and correlating provisions to ensure such markings are visible. Number (4) is being revised to ensure that markers are included on both ends and both sides of the pool for safety purposes. Number (5) is also being revised to provide a minimum and maximum height for numerals. This prevents the installer from using numerals which are too small or excessively large. Such provisions are found in various local codes.
COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
Providing a range requirement is unnecessary as the inclusion of a minimum is sufficient. The 6-inch maximum is not realistic and is overly restrictive as various markers are currently larger than 6 inches. Additionally, there may be more than two ends of a pool.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 7  NEGATIVE: 2  NOT RETURNED: 1  CHOE

EXPLANATION OF NEGATIVE:
FRUIA: Alison’s comment is correct. For example, in Texas the unit of measure is not specified only required to be indicated.

OSINSKI: Number 6 and 7 of Section 402.8 are poorly worded and need to be rewritten. Also, the justification for adding number 7 was: “Each depth marking shall include the unit of measurement as required by the Authority Having Jurisdiction,” and it doesn’t do that.

PUBLIC COMMENT 2

Code Year: 2021 USPSHTC  Section #: 402.8, 224.0

SUBMITTER: Lizette Guzman  Self  Item #: 021  Comment #: 2

RECOMMENDATION:
Revise text

Request to replace the code change proposal by this public comment.

402.0 Swimming Pools.

402.8 Markings. The various depths of the pool shall be visible and marked in accordance with the following:
(1) At or above the water surface on the vertical pool wall
(2) On the edge of the deck at points of change in floor slope
(3) Spaced at not more than 25 foot (7620 mm) intervals
(4) On both sides and ends of the pool
(5) Numerals shall be not less than 4 inches (102 mm) in height
(6) Numerals shall contrast with the background they are placed, and be of a durable material that is both weather-resistant and slip resistant where located on the pool deck

Exception: On pool or spa walls with a vanishing edge, no depth markers shall be required on that portion.

224.0   – V –

Vanishing Edge. A water-feature detail in which water flows over the edge of at least a portion of one of the pool walls and is collected in a catch basin, from where it is pumped back into the pool, producing a visual effect of water with no boundary. Also known as a disappearing edge, negative edge, infinity edge, or zero edge.

SUBSTANTIATION:
Where vanishing edge pools are installed, the vanishing edge does not require depth markers. The markers only have to be installed along all other pool walls to ensure safety.

Vanishing edge pools are installed in many locations and go by many different names. A definition for "vanishing edge" pool has been added since the term is being proposed within Section 402.8. The definition provides insight as to how this type of pool works and includes the various applicable names.
Amend comment as follows:

402.0 Swimming Pools.

402.8 Markings. The various depths of the pool shall be visible and marked in accordance with the following:
(1) At or above the water surface on the vertical pool wall
(2) On the edge of the deck at points of change in floor slope
(3) Spaced at not more than 25 foot (7620 mm) intervals
(4) On both all sides and ends of the pool
(5) Numerals shall be not less than 4 inches (102 mm) in height
(6) Numerals shall contrast with the background they are placed, and be of a durable material that is both weather-resistant and slip resistant where located on the pool deck
(7) Each depth marking shall include the unit of measurement as required by the Authority Having Jurisdiction
(8) For pool water depths not greater than 5 feet (1524 mm), no diving markers with the universal symbol for "No Diving," which is a red circle with a slash through it superimposed over the image of a diver, and the words “NO DIVING” shall be installed on the deck directly adjacent to the depth markers
Exception: On pool or spa walls with a vanishing edge, no depth markers shall be required on that portion. The depth marking shall be permitted to be located elsewhere where approved by the Authority Having Jurisdiction.

402.8.2 Determining Depth. The depth shall be measured at the normal operating water level when measured 3 feet (914 mm) from the pool wall or at the tangent point where the cove radius meets the floor, whichever is deeper. The depth marking shall be accurate to within plus or minus 3 inches (76 mm).

224.0 – V –

Vanishing Edge. A water-feature detail in which water flows over the edge of at least a portion of one of the pool walls and is collected in a catch basin, from where it is pumped back into the pool, producing a visual effect of water with no boundary. Also known as a disappearing edge, negative edge, infinity edge, or zero edge.

COMMITTEE STATEMENT:
Number (4) is being modified to require depth markings on all sides and ends of the pool as there may be more than 2 sides or ends.

Number (7) is being added to ensure the use of units of measurement with depth markings for clarification for the end user. Additionally, the unit of measurement used should be uniform for all markings and deemed appropriate by the AHJ.

Number (8) is being added to prohibit the installation of “NO DIVING” markings on the deck area as this is meant to be unobstructed.

The exception for vanishing edge pools is being modified to require markings as approved by the AHJ for safety reasons.

Furthermore, Section 402.8.2 is being added to address the method which with depths are measured to ensure accuracy.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 7 NEGATIVE: 2 NOT RETURNED: 1 CHOE

EXPLANATION OF NEGATIVE:

FRUIA: Depth markings should be consistent with state jurisdiction.

OSINSKI: Vanishing edge pools still need depth markers, installed just above the edge or on a nearby surface.
PUBLIC COMMENT 3

Code Year: 2021 USPSHTC  Section #: 404.0 - 404.2.4  Item #: 021

SUBMITTER: Joel Nunez  Upland Pool Supply LLC  Comment #: 3

RECOMMENDATION:
Add new text

Request to replace the code change proposal by this public comment.

404.0 Vanishing Edge Pools.
404.1 General. Where a vanishing edge pool is installed, the vanishing edge shall be installed with a catch basin and a dedicated pump to recirculate water from the catch basin to the pool.

404.2 Sizing of the Catch Basin. The volume of the catch basin shall be not less than the sum of the volumes determined in Section 404.2.1 through Section 404.2.3. The minimum operating water depth shall be in accordance with Section 404.2.4.

404.2.1 Bather Spill. The catch basin volume required to replenish bather surge shall be the greater of the following:
(1) 25 gallons (95 L) or more per bather,
(2) 300 gallons (1136 L) or more, or
(3) Not less than the volume of the pool at a depth of 2 inches (51 mm)

404.2.2 Water in Transit. The catch basin shall be sized to accommodate the volume of water required to raise the pool water level such that the water flows over the spillway and into the catch basin.

404.2.3 Evaporation. The volume of water required within the catch basin to replenish evaporated water shall not be less than ¼ inch (6.4 mm) water depth of the pool and catch basin.

404.2.4 Minimum Operating Level. The catch basin shall maintain a water depth of not less than 12 inches (305 mm). Exception: Where an anti-vortex suction outlet or multiple suction outlets are installed in the catch basin, the water depth shall be not less than 6 inches (152 mm).

(renumber remaining sections)

SUBSTANTIATION:
Vanishing edges are installed in both public and private pools. These systems require specific provisions to prevent system failure and ensure adequate water is circulated. The most common problem experienced with vanishing edge pools revolves around incorrect sizing of the catch basin volume.

In order to recirculate the water to be spilled over the vanishing edge, a catch basin and dedicated pump are required. The catch basin collects all water spilled over the edge, and the dedicated pump moves the water collected back to the pool. In order to move water and appropriately replenish the pool water volume, the catch basin must be sized based on the topics listed below.

The minimum operating level is included for the catch basin since a vortex effect is created as water is pulled through the suction outlet. This vortex effect can be as high as 6 inches above the outlet and prevents proper suction at the outlet. The required water level of 12 inches provides a margin of safety since the pump can suck the basin dry and ruin the pump. An outlet configuration utilizing multiple pumps with lower flow rates can lower this vortex effect. Additionally, suction outlets with anti-vortex technology can limit such occurrence.

The number of bathers within a pool as well as bather activity effects the amount of water which is spilled over into the catch basin. This is accounted for using recommended methods for determining bather surge. Using 25 gallons per bather, 300 gallons, or the 2 inch pool depth volume ensures that an adequate volume of water is put back into the pool and that the catch basin can accommodate such a volume. According to experts, once the pool water level drops 2 inches, the system reaches equilibrium. This means the water is splashed or surged out as fast as the water is replenished back into the pool.

The water in transit refers to the volume of water which is pumped back into the pool to raise the water level high enough to overflow into the catch basin. This is dependent upon the weir of the vanishing edge and varies based on design.

Evaporation is inevitable and must be accounted for when sizing the catch basin. Water evaporates from both the pool and the basin daily. The amount of evaporation is based on water agitation and climate conditions. The ¼ inch of water depth over the entire pool and basin is based on expected daily water loss in warm dry areas like western
United States. This value is then used as the required minimum. For these reasons, the above provisions are necessary and further enhance the code.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:**  
AFFIRMATIVE: 9  
NOT RETURNED: 1  
CHOE
Proposals

Item #: 022
USPSHTC 2021  Section: 402.9, 503.2

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Revise text

402.0 Swimming Pools.

402.9 Maximum Bather Capacity. The maximum bather capacity [at a given time] shall not exceed one bather for each 5 gallons per minute (gpm) (0.32 L/s) of water circulated for a public swimming pool.

503.0 Turnover Time.

503.2 Bather Load Per Day. The maximum bather load per day (L_B) shall be in accordance with Equation 503.2.

\[ L_B = \frac{Q}{1400} \]  
(Equation 503.2)

Where:
\( L_B \) = Bather load, number of bathers per day
\( Q \) = Flowrate, gallons per day
For SI units: 1 gallon = 3.785 L, \( L_B = \frac{Q}{5300} \)

SUBSTANTIATION:
Section 402.9 is being revised to clarify that the flow rate of water circulated is based on the bather capacity “at a given time.” Furthermore, the correct determination of a pool’s bather load “per day” should be determined based on the method which will produce the safest water conditions.

Section 503.2 gives the recommended safest method which suggests that a minimum of 1400 gallons per day be circulated for each anticipated bather per day. The bather load to water volume ratios must be considered and accounted for when sizing filtration, water treatment and circulation system components. By increasing flowrates and decreasing turnover times, the pool can be made to accommodate peak and maximum bather loads without reducing safety/water quality. This is in accordance with Table 508.1 (Turnover Time) and allows for the determination of the bather load in relation to the flowrate of the circulation system.

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

402.0 Swimming Pools.

402.9 Maximum Bather Capacity. The maximum bather capacity at a given time shall not exceed one bather for each 5 gallons per minute (gpm) (0.32 L/s) of water circulated for a public swimming pool. The maximum bather load per day shall be in accordance with Section 503.2.
503.0 Turnover Time.

503.2 Bather Load Per Day. The maximum bather load per day ($L_B$) shall be in accordance with Equation 503.2.

$$L_B = \frac{Q}{1400}$$  

(Equation 503.2)

Where:
- $L_B$ = Bather load, number of bathers per day
- $Q$ = Flowrate, gallons per day

For SI units: 1 gallon = 3.785 L, $L_B = \frac{Q}{5300}$, where $Q$ is in L/day

COMMITTEE STATEMENT:
The proposed language is being modified to reference the maximum bather load per day within Section 402.9 to ensure that users apply provisions from both Section 402.9 and Section 503.2. The maximum bather load per day is directly related to turnover time.

Additionally, the SI units for flowrate are being added for clarity.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appendixed Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 204.0  Item #: 022
SUBMITTER: Lizette Guzman  Self  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

204.0 - B -

Bather Load. The number of permitted bathers in a public pool, spa, or hot tub at a specific period of time. Also known as bather capacity.

SUBSTANTIATION:
The definition for bather load is being revised for clarification. Bather load and bather capacity are interchangeable throughout the code. They both refer to the number of bathers dictated by the flowrate of the circulation system. The only difference within the code associated with these two terms is time. The bather load is measured per day, and bather capacity is measured at a given time. For these reasons, the definition should include both bather load and bather capacity as the end user may find this confusing.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The two terms are very different in that bather capacity pertains to the maximum number of bathers allowed in the pool at a given time while bather load refers to the use of turnover rates to determine the allowed number of bathers per day. Additionally, a separate definition should be added for "bather capacity."

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 023
USPSHTC 2021 Section: 402.11, 902.0, 903.0, 903.1, Table 1001.1

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

402.0 Swimming Pools.

402.11 Anchorage. Where provided, wall anchors shall be made of corrosion-resistant material. Wall anchors shall be recessed and shall not protrude beyond the pool wall.

(renumber remaining sections)

902.0 Diving Equipment.
902.1 General. Diving facilities including location and placement of diving equipment, minimum dimensions, depth, slope, size of envelope shall comply with Section 301.2 and FINA standards, and shall be installed in accordance with the manufacturer’s installation instructions. Minimum dimensions shall comply with FINA Part X FR 5 (Diving Facilities).

903.0 Swimming Pool Lane Ropes.
903.1 General. Where provided, lane ropes for competitive swimming and training shall be installed in accordance with FINA Part X. Lane rope anchors shall comply with Section 402.11.

(renumber remaining sections)

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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</thead>
</table>

( порtions of table not shown remain unchanged)

Note: FINA Part X meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Section 402.11 is being added to include anchorage of lane ropes, safety ropes, and pool covers. Such anchors must be corrosion resistant as they are installed near the water surface. Anchors must be addressed as they may pose as a hazard to bathers if not installed properly. Where anchors are installed, they must be secured and recessed to prevent injury to swimmers.

The proposed Sections 903.0 and 903.1 add lane ropes used for competitive swimming and training purposes. FINA provides specific guidelines for attached floaters and appropriate markings of lane ropes. Lane rope anchorage is also addressed by means of referencing Section 402.11 within Section 903.1.
The link for supporting documentation is as follows:

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 402.5.1  Item #: 023
SUBMITTER: Lizette Guzman  Comment #: 1
Self

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

402.0 Swimming Pools.

402.5 Floor Slopes. (remaining text unchanged)

402.5.1 Public Swimming Pools. Where the water depth is less than 5 feet (1524 mm), the floor slope shall not exceed 1 foot (305 mm) in 12 feet (3658 mm) to the point of the first slope change. Where the water depth exceeds 5 feet (1524 mm), the floor slope shall not exceed 1 foot (305 mm) in 3 feet (914 mm).

Exceptions:
(1) Pools designed for competitive diving, and swimming in accordance with FINA Part X.
(2) Pools designed for therapy, military, or other special use.

SUBSTANTIATION:
The above revisions have been made to include FINA Facility Rules Part X since this standard includes detailed requirements for dimensions, angles, slopes, depths, spacing and design of pools for competitive use. This standard is widely recognized for being the leader in providing competition pool design parameters and aims to promote safety by providing the best possible environment for competitive use and training. For this reason, the above modification is required.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
402.0 Swimming Pools.

402.13 Beach Entry Pools. Where sand or other approved composite materials are installed in conjunction with a zero-depth entry pool, such materials shall be clean and shall be installed over an impervious surface. The zero-depth entry area of a pool containing sand or other approved composite materials shall be designed such that the operation of equipment and the water quality of the pool are maintained in accordance with Chapter 5. Beach entry pools shall be in accordance with the requirements for zero-depth entries in Section 802.6.

SUBSTANTIATION:
The addition of Section 402.13 is being proposed to include provisions for beach entry pools utilizing sand or other composite materials. Such installation must take into consideration the location of those materials in relation to the circulation system to ensure that such installation does not adversely affect equipment and water quality.

Additionally, the surfaces lying underneath any sand or composite materials must be impervious and unaffected by such materials. Section 802.6 (Zero-Depth Entry) is required for compliance as this section addresses slip-resistance and slope requirements that must be applied to beach entry pools.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The proposed language is ambiguous and not enforceable as the Authority Having Jurisdiction has no method of determining what is considered clean sand or clean composite materials.

Furthermore, the term "impervious" is vague. Currently, there are standards that should be included with the proposed provisions that would define and make clear as to what is considered an impervious surface, clean sand, and clean composite materials.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 402.15  Item #: 024
SUBMITTER: Jazmin Curiel  Self
Comment #: 1

RECOMMENDATION:
Add new text

Request to replace the code change proposal by this public comment.

402.0 Swimming Pools.

402.15 Beach Entry Pools. Where sand is installed in an entry/exit of a pool, the entry/exit way shall have a zero-depth entry in accordance with Section 802.6 and shall be designed and controlled such that the circulation system, maintenance, safety, sanitation, and operation of the pool are not adversely affected.

(Section 802.6 is shown for information only)

802.6 Zero-Depth Entry. Where zero-depth entries are provided for public aquatic venues, they shall be slip-resistant. The slope of a zero-depth entry shall not exceed 1 foot (305 mm) in 20 feet (6096 mm) to a water depth of 3 feet (914 mm).

SUBSTANTIATION:
Beach entry pools are required to have a zero-depth entry for safety reasons as sand may cover required edge markings and pose as a risk to bathers. Provisions for zero-depth entry pools have already been provided in Section 802.6 and are therefore being referenced in this section. Furthermore, such pools must be capable of maintaining safety, sanitation and proper functioning of the circulation system. Currently there are no provisions within the code to address sand entry pools, and since these types of pools are being installed, this inclusion is necessary.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 027
USPSHTC 2021  Section: 216.0, 408.2.1

SUBMITTER:  Jay Peters
Codes and Standards International
Rep. Falcon Waterfree Technologies

RECOMMENDATION:  Revise text

408.0 Urinals.

408.2 Nonwater Urinals.  (remaining text unchanged)
408.2.1 Nonwater Urinals with Drain Cleansing Action.  Nonwater urinals with drain cleansing action shall comply with
ASME A112.19.19 and shall be cleaned, maintained and installed in accordance with the manufacturer’s installation
instructions.

216.0 - N -
Nonwater Urinals with Drain Cleansing Action.  A nonwater urinal that conveys waste into the drainage system without
the use of water for flushing and automatically performs a drain-cleansing action after a predetermined amount of time.

Note: ASME A112.19.19 meets the requirements for a mandatory reference standard in accordance with
Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics &
Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The proposed language is being added to address “Urinals with Drain Cleansing Action” currently referred to as
“Hybrid Urinals” in the 2018 UPC. The addition of Section 408.2.1 specifically addresses nonwater urinals with drain
cleansing action as well as compliance with ASME A112.19.19. This proposed standard provides specifications and
test methods for materials as well as sanitary and functional performance of nonwater urinals including those with
drain cleansing action.

Urinals with drain cleansing action are already connected to the water supply, have backflow protection and clear
the drainage line with a predetermined amount of water as dictated by ASME A112.19.19. They are rated at 1 water
fixture unit (WSFU) and 1 drain fixture unit (DFU) in the current code.

The definition proposed is taken from the 2018 UPC and provides further clarification for the term “Urinals with Drain
Cleansing Action” as it is being added to Section 408.2.1. The addition of such language further enhances the code
and provides clarification for the end user.

COMMITTEE ACTION:  ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE:  10

VOTING RESULTS:  AFFIRMATIVE:  9    NOT RETURNED:  1    FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 408.1.1 - 408.2         Item #: 027

SUBMITTER: Andrew Todd  Comment #: 1
V&T Carbonic Inc.

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

408.0 Urinals.
408.1 Application. (remaining text unchanged)
408.2.1 Nonwater Urinals. (remaining text unchanged)
408.2.2 Nonwater Urinals with Drain Cleansing Action. (remaining text unchanged)
408.2 Backflow Protection. A water supply to a urinal shall be protected by an approved-type vacuum breaker or other approved backflow prevention device in accordance with the plumbing code.

SUBSTANTIATION:
The above additional language is being added to correlate and comply with the most recent edition of the Uniform Plumbing Code. The water supply to a urinal must be protected for public health and safety. Contamination of potable water lines poses as a hazard for obvious reasons. The provided additional language is therefore necessary. Additionally, the sections have been reorganized in the same manner with which they are organized within the most recent addition of the UPC.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 029

USPSHTC 2021 Section: 203.0, 416.4 - 416.4.3, Table 416.4

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Revise text

416.0 Natatoriums.

417.0416.4 Ventilation. 417.1 General. Ventilation shall be provided to an indoor aquatic facility through mechanical ventilation. Aquatic facility ventilation system design, construction, and installation shall comply with the mechanical code. For an aquatic venue, deck, or spectator area located in an aquatic facility, the design outdoor air requirements shall be in accordance with Table 417.1 and Equation 417.1 during times when the facility is occupied. Where more than one aquatic venue type, deck, or spectator area is located in an aquatic facility, the outdoor airflow \( V_{bz} \) shall be determined for each aquatic venue, deck, or spectator area and added together to obtain the total outdoor airflow \( V_{bz} \) required for the facility.

\[
V_{bz} = A_z \cdot [R_a + (R_p/d)] \quad \text{(Equation 417.0416.4)}
\]

Where:

- \( A_z \) = Area of an aquatic venue, deck, or spectator area, square feet (m²)
- \( d \) = Average density, square feet (m²) per person in accordance with Table 417.0416.4
- \( R_a \) = Outdoor airflow rate required per aquatic venue, deck, or spectator area in accordance with Table 417.0416.4
- \( R_p \) = Outdoor airflow rate required per person in accordance with Table 417.0416.4
- \( V_{bz} \) = Total outdoor airflow

### TABLE 417.0416.4
OUTDOOR AIR REQUIREMENTS FOR AQUATIC FACILITIES

(Original table contents not shown, remaining unchanged)

417.2416.4.1 Design Parameters. (remaining text unchanged)
417.3416.4.2 Exhaust Air. Areas, where aquatic venues are located, shall be provided with a means of exhaust air to maintain a negative pressure of not less than 0.05 inch water column (0.01 kPa), and not more than 0.15 inch water column (0.04 kPa), as required by Equation 416.4.3(2). Means shall be provided to maintain a positive pressure within an aquatic facility in relation to the outdoor pressure.

**416.4.3 Supply Air.** The supply air shall be delivered at a rate not exceeding 8 air changes per hour and not less than 6 air changes per hour for recreational pools. The supply air for competition pools shall be delivered at a rate not exceeding 10 air changes per hour and not less than 8 air changes per hour. A portion of the supply air shall be directed towards the pool water surface and shall have a velocity not exceeding 0.49 feet per second (0.15 m/s) and not less than 0.16 feet per second (0.05 m/s). A portion of supply air shall be directed towards the breathing area directly above the pool water surface and up to 72 inches (1829 mm) above any decking. The required supply air delivery rate \( S \) per room within an aquatic facility shall be in accordance with Equation 416.4.3(1). The required return airflow rate \( R \) shall be determined in accordance with Equation 416.4.3(2).
\[ S = V_R \cdot \frac{N}{60} \quad \text{[Equation 416.4.3(1)]} \]
\[ R = 1.1 \cdot S \quad \text{[Equation 416.4.3(2)]} \]

**Where:**
- \( N \) = Number of air changes per hour
- \( R \) = Return airflow rate, cubic feet per minute
- \( S \) = Supply air delivery rate, cubic feet per minute
- \( V_R \) = Volume of room within an aquatic facility, cubic feet

For SI units: 1 cubic foot = 0.0283 m\(^3\), 1 cubic foot per minute = 0.0283 m\(^3\)/min

(renumber remaining sections)

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**FIGURE 416.4.3**
Simplified Ventilation of a Natatorium

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**Air, Exhaust.** Air being removed from any space or piece of equipment and conveyed directly to the atmosphere by means of openings or ducts.

**Air, Return.** Air from the conditioned area that is returned to the conditioning equipment for reconditioning.

**Air, Supply.** Air being conveyed to a conditioned area through ducts or plenums from a heat exchanger of a heating, cooling, absorption, or evaporative cooling system.

**SUBSTANTIATION:**

The sections pertaining to natatoriums and ventilation requirements are combined as the ventilation section refers to indoor aquatic facilities and their design parameters. Linking these sections provides further clarity for the end user, and the additional proposed language provides further guidelines for proper ventilation of natatoriums.

In order to maintain a negative pressure range of 0.01 kPa to 0.04 kPa in the pool space, the exhaust air rate must be greater than the supply air rate by roughly 10%. Equation 416.4.3(2) takes this 10% margin into account and determines the required return airflow rate dependent on this 10% margin in relation to the supply air flowrate. The return airflow rate then becomes 110% of the supply air delivery rate. A positive pressure in relation to the outdoor pressure is required so that contaminants are drawn out and kept out of the pool space and surrounding rooms within the natatorium.

The number of air changes per hour per room of a natatorium differs in relation to pool use or activity. Competition pools require a higher number of air changes because of the increased release of chloramines with increased activity. ASHRAE recommends ranges for air changes that are slightly less than those proposed. The proposed values have been increased in order to prevent condensation and remove chloramines and other disinfection by-products that can be...
harmful to bathers in high concentrations.

The limitations for air velocities over the pool water surface are necessary for thermal comfort of the occupants as well maintaining optimal humidity. Values for the provided air velocity range can be found in ASHRAE Handbook – HVAC Applications. A portion of the air supply must be directed over the breathing zone of the pool and decking area to carry away released chloramines and disinfection by-products from the pool water.

Equation 416.4.3(1) is being added to provide a means of determining the required supply air delivery rate dependent on the required air changes and volume of the space. The simple formula has been derived by ASHRAE and provides a supply air delivery rate that meets the ventilation, air distribution, dehumidification, and heat and cooling requirements for pool spaces.

The addition of Figure 416.4.3 provides a simplified visual of air that is circulated and disbursed throughout an indoor aquatic facility. The diagram prevents confusion and further enhances the section.

Definitions for exhaust, return and supply air are included to clarify the above ventilation section requirements. The additional terms are also listed in the proposed figure.

The link to supporting documentation is as follows:
ASHRAE Journal: Ventilation Requirements of Natatoriums -

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

EXPLANATION OF AFFIRMATIVE:

GREGORY: You should consider suggesting the use of UV or Ozone to reduce chloramines.

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 416.4.2, 416.4.3  Item #: 029

SUBMITTER: Chelsea Salaiz  V&T Carbonic Inc.

RECOMMENDATION: Revise text

Request to accept the code change proposal as modified by this public comment.

416.0 Natatoriums.

416.4 Ventilation. (remaining text unchanged)

416.4.2 Exhaust Air. Areas, where aquatic venues are located, shall be provided with a means of exhaust air to maintain a negative pressure relative to adjacent interior spaces and the outdoors of not less than 0.05 inch water column (0.01 kPa), and not more than 0.15 inch water column (0.04 kPa), as required by Equation 416.4.3(2). Means shall be provided to maintain a positive pressure within an aquatic facility in relation to the outdoor pressure.

416.4.3 Supply Air. The supply air shall be delivered at a rate not exceeding 8 air changes per hour and not less than 6 air changes per hour for recreational pools. The supply air for competition pools shall be delivered at a rate not exceeding 10 air changes per hour and not less than 8 air changes per hour. A portion of the supply air shall be directed towards the pool water surface and shall have a velocity not exceeding 0.49 feet per second (0.15 m/s) and not less than 0.16 feet per second (0.05 m/s). A portion of supply air shall be directed towards the breathing area directly above the pool water surface and up to 72 inches (1829 mm) above any decking. The required supply air delivery rate (S) per room within an aquatic facility shall be in accordance with Equation 416.4.3(1). The required return airflow rate (R) shall be determined in accordance with Equation 416.4.3(2). See Figure 416.4.3.
\[ S = V_R \cdot N/60 \]  
[Equation 416.4.3(1)]

\[ R = 1.1 \cdot S \]  
[Equation 416.4.3(2)]

Where:
- \( N \) = Number of air changes per hour
- \( R \) = Return airflow rate, cubic feet per minute
- \( S \) = Supply air delivery rate, cubic feet per minute
- \( V_R \) = Volume of room within an aquatic facility, cubic feet

For SI units: 1 cubic foot = 0.0283 m\(^3\), 1 cubic foot per minute = 0.0283 m\(^3\)/min

**FIGURE 416.4.3**
SIMPLIFIED VENTILATION OF A NATATORIUM

**SUBSTANTIATION:**
The above provision for maintaining a positive pressure in an aquatic facility seems confusing. The intent of the language is to create a pressure differential in which adjacent rooms within a building containing a natatorium are at a higher pressure than the room or space containing the pool. This positive pressure would draw and keep out contaminants from these adjacent rooms and therefore create safer surrounding environments. For clarity, the above revision has been made.

Furthermore, Figure 416.4.3 is being updated to better correlate with the terminology and provisions listed within Section 416.4.3 and must be referenced as shown.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE:  7    NEGATIVE:  2    NOT RETURNED:  1   CHOEO

EXPLANATION OF NEGATIVE:

FRUIA:  I concur with Alison’s comments.

OSINSKI:  Section 416.4.2 needs to be revised. Pollutants travel from positive to negative pressure areas. Natatoriums should be positively pressured in relation to the outdoors so chemical gasses are removed from the natatorium, but negatively pressured in relation to surrounding occupied spaces so the chemicals do not migrate to office, reception, and other working areas of the facility to prevent sick building syndrome problems.
Proposals

Item #: 031
USPSHTC 2021  Section: 417.4, Table 1001.1, Table 1001.2

SUBMITTER: David Bixby
Air Conditioning Contractors of America
ACCA

RECOMMENDATION:
Revise text

417.0 Ventilation.

417.4 Humidity Control. The ventilation system of an indoor aquatic facility shall be designed to maintain a relative humidity of not more than 65 percent when the facility is occupied. The ventilation system shall be designed to maintain air temperatures at not less than 2°F (1°C), and not more than 4°F (2°C), above the water temperature of the aquatic venue, not including aquatic venues that exceed 90°F (32°C). The design and installation of dehumidification systems shall comply with ACCA 10 Manual SPS.

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Note: ACCA 10 Manual SPS meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

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</table>

SUBSTANTIATION:
ACCA Manual SPS, HVAC Design for Swimming Pools and Spas, is a manual specifically focused on the design of HVAC systems for indoor pools and spas. Manual SPS is an ANSI-recognized standard that was developed with input from original equipment manufacturers (OEM), mechanical contractors, and consulting engineers. Manual SPS addresses the unique dynamics for pools and spas including controlling dew point temperatures of space air as well as space temperature, sealing and insulating duct work, and dehumidification systems and indoor air quality.
COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The Technical Committee agrees that there would be value in adding ACCA 10 Manual SPS to the code. However, this standard applies to more than just dehumidification systems.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 416.4.4, Table 1001.1, Table 1001.2  Item #: 031

SUBMITTER: David C. Bixby  Air Conditioning Contractors of America (ACCA)

RECOMMENDATION:
Revise text

Request to replace the code change proposal by this public comment.

416.0 Natatoriums.

416.4 Ventilation.

416.4.4 Humidity Control. The ventilation system of an indoor aquatic facility shall be designed to maintain a relative humidity of not less than 50 percent and no more than 60 percent when the facility is occupied. The ventilation system shall be designed to maintain air temperatures at not less than 2°F (1°C), and not more than 4°F (2°C), above the water temperature of the aquatic venue, not including aquatic venues that exceed 90°F (32°C). The design of ventilation systems serving indoor aquatic facilities shall comply with ACCA 10 Manual SPS.

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCA 10 Manual SPS-2010 (RA 2017)</td>
<td>HVAC Design for Swimming Pools and Spas</td>
<td>Heating, Ventilating, and Air Conditioning</td>
<td>416.4.4</td>
</tr>
</tbody>
</table>

Note: ACCA 10 Manual SPS meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>

(portions of table not shown remain unchanged)
SUBSTANTIATION:
ACCA requests the Technical Committee include ACCA Manual SPS within Section 416.4.4 of the USPSHTC as this standard currently specifies the requirements for “ventilation systems” to control relative humidity and air temperatures for indoor aquatic facilities. ACCA Manual SPS (HVAC Design for Swimming Pools and Spas) is the industry-developed national standard crafted for this very purpose: controlling air temperature and humidity while integrating ventilation requirements. Although the title of Manual SPS refers to “HVAC Design,” that term is essentially synonymous with the type of “ventilation system” described in Section 416.4.4.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

416.0 Natatoriums.

416.4 Ventilation.

416.4.4 Humidity Control. The ventilation system of an indoor aquatic facility shall be designed to maintain a relative humidity of not less than 50 percent and no more than 60 percent when the facility is occupied. The ventilation system shall be designed to maintain air temperatures at not less than 2°F (1°C), and not more than 4°F (2°C), above the water temperature of the aquatic venue, not including aquatic venues that exceed 90°F (32°C). The design of ventilation systems serving indoor aquatic facilities shall comply with ACCA Manual SPS. (See Appendix A for an alternative method of calculating evaporative loads for indoor aquatic facilities)

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
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<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCA 10 Manual SPS-2010 (RA 2017)</td>
<td>HVAC Design for Swimming Pools and Spas</td>
<td>Heating, Ventilating, and Air Conditioning</td>
<td>416.4.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

COMMITTEE STATEMENT:
Appendix A does not conflict with the guidelines listed within ACCA Manual SPS for evaporative load calculations. ACCA Manual SPS covers a wider range of HVAC design and installation requirements which include similar methods of calculations found in Appendix A. Referencing Appendix A within this section helps the end user know that there are alternative methods for evaporative load calculations in Appendix A that may be used.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 032
USPSHTC 2021 Section: 221.0, 503.1, 503.2

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

503.0 Turnover Time.
503.1 General. The entire design of matched components shall have a capacity to provide a complete turnover of water in accordance with local and state codes or regulations, and the manufacturer’s instructions. Minimum turnover time shall be required as follows:
(1) Private pools – 8 hours
(2) Public pools – 6 hours
(3) Wading pools – 1 hour
(4) Private spas and hot tubs – 1 hour
(5) Public spas and hot tubs – 1/2 hour
(6) Water slides and landing pools – 2 hours
(7) Wave pools – 3 hours
(8) Leisure rivers – 3 hours
(9) Spray grounds – 1/2 hour
(10) Activity Pools – 2 hours
(11) Diving Pools – 8 hours
(12) Surf Pools – as required by the manufacturer

503.2 Flow Rate. Turnover times shall be calculated based on the flow rate through the filtration system and the volume of pool water.

221.0 – S –

Surf Pool. A pool in which ocean waves are simulated for the purpose of surfing or other similar activities involving boards.

SUBSTANTIATION:
Section 503.1 is being revised to include turnover rates for activity pools, diving pools and surf pools. Currently these types of pools are addressed within the 2018 MAHC and should also be addressed within the USPSHTC.

Activity pools require more frequent turnovers due to an increased amount of “activity” within the pool. Diving pools require the same turnover rates as public pools due to similar activity levels.

Surf pool turnover rates must be provided by the manufacturer as surf pools are equipped with multiple wave settings that effect chemical evaporation of disinfectants within the water. Surf pools primarily use chlorine, and since such pools agitate the water excessively to create waves, chloramines will begin to evaporate as moving molecules aid in evaporation. Proper circulation of a surf pool must be followed in accordance with the manufacturer’s instructions in order for disinfecting equipment to meet required levels.

A definition for “surf pool” has been added to provide clarification on the difference between “wave pools” and “surf pools”. Such addition is necessary as both terms are used within the code and can be easily confused with one another. Surf pools are specifically for the purpose of boarding activities on generated or simulated waves.
The link for supporting documentation is as follows:

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

503.0 Turnover Time.
503.1 General. The entire design of matched components shall have a capacity to provide a complete turnover of water in accordance with local and state codes or regulations, and the manufacturer’s instructions. MinimumMaximum turnover time shall be required as follows:
(1) Private pools – 8 hours
(2) Public pools – 6 hours
(3) Wading pools – 1 hour
(4) Private spas and hot tubs – 1 hour
(5) Public spas and hot tubs – 1/2 hour
(6) Water slides and landing pools – 2 hours
(7) Wave pools – 3 hours
(8) Leisure rivers – 3 hours
(9) Spray grounds – 1/2 hour
(10) Activity Pools – 2 hours
(11) Diving Pools – 8 hours
(12) Surf Pools – as required by the manufacturer

503.2 Flow Rate. Turnover times shall be calculated based on the flow rate through the filtration system and the volume of pool water.

221.0           – S –

Surf Pool. A pool in which ocean waves are simulated for the purpose of surfing or other similar activities involving boards.

COMMITTEE STATEMENT:
The language within Section 503.1 is being revised to show the "maximum" turnover time rather than the "minimum" to ensure that turnover times will not be less than what is required for health and safety.

Additionally, the proposed terminology for “surf pool” is being amended to include various types of surfing which do not include boards.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:   AFFIRMATIVE: 9    NOT RETURNED: 1    FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 214.0  Item #: 032

SUBMITTER: Joel Nunez
Upland Pool Supply LLC  Comment #: 1

RECOMMENDATION:
Add new text

Request to accept the code change proposal as modified by this public comment.

214.0           – L –

Lazy River. An aquatic attraction in which a channeled flow of water carries bathers around a flat course by means of artificial current. Also known as a leisure river or current channel.
SUBSTANTIATION:
The above definition for lazy river has been added since these types of aquatic attractions are frequently installed and used. The above terminology accurately represents and defines what lazy rivers are, their purpose, and how they function. Including this definition provides clarity for the end user.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

214.0  – L –

Lazy River. An aquatic attraction in which a channeled flow of water carries bathers around a flat course by means of artificial current. Also known as a leisure river or current channel.

COMMITTEE STATEMENT:
The actions taken on this item do not conflict with previous items addressing lazy rivers. This provided definition further supports the provisions accepted previously.

Lazy rivers, or leisure rivers, do not necessarily carry bathers around a flat course of water. These channels may be slightly sloped and may also converge or diverge slightly to aid in movement of bathers.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 034
USPSHTC 2021  Section: Table 508.1

SUBMITTER: Ellen Meyer
Innovative Water Care

RECOMMENDATION:
Revise text

### TABLE 508.1
WATER CHEMISTRY

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>ACCEPTANCE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total alkalinity</td>
<td>80 - 120 ppm</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
The total alkalinity limits have been updated to be consistent with the 2018 Model Aquatic Health Code (5.7.4.4.1).

Where the total alkalinity is less than 60 ppm, there is not enough of a buffering capacity to resist a significant pH change if an acidic or basic chemical is added to the pool water. If there is not enough of a buffer capacity to resist a low pH, the water will become corrosive to metal fixtures and equipment, and bathers will experience discomfort. If there is a high pH, scale deposits will form. Where alkalinity is above 180 ppm, scale deposits form. The pH of the water also becomes difficult to adjust because it will drift up, and at high pH, chlorine disinfectant efficiency decreases.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
No technical justification was provided to merit the proposed range.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 8  NEGATIVE: 1  NOT RETURNED: 1  FRUIA

EXPLANATION OF NEGATIVE:
OSINSKI: The range is too wide.
Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 508.1  Item #: 034

SUBMITTER: Joel Nunez  
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

Request to accept the code change proposal as submitted by this public comment.

SUBSTANTIATION:
Total alkalinity is directly related to pH and represents the ability of a solution to neutralize hydrogen ions and resist a change in pH. According to the 2018 edition of the Model Aquatic Health Code, the acceptable range for alkalinity is 60 ppm to 180 ppm. This range has been updated as it helps to prevent wide variations in pH in the event that acids or alkali are added to the pool water. For the above reasons, the range is being updated.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE

The TCC has the responsibility to resolve conflicts and achieve correlation among the recommendations of the Technical Committee. The TCC has the authority to choose between alternative text recommended by the Technical Committees, but only as necessary for correlation, consistency, and the correction of errors and omissions in accordance with Section 3.6 of the Regulations Governing Consensus Development of the 2021 Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa, & Hot Tub Codes.

Actions taken on the USPSHTC Item # 034, Table 508.1 (Water Chemistry) and USHGC Table 505.2 (Water Chemistry) resulted in conflicting language between the codes. In order to correlate the language, the Technical Correlating Committee proposed the following modifications to the USPSHTC:

508.1 General. Chemicals for a swimming pool, spa, or hot tub shall be dispensed in accordance with the chemical manufacturer’s instructions, Material Safety Data Sheets (MSDS), and applicable standards and regulations. Parameters for chemicals used within a swimming pool, spa, and hot tub shall be in accordance with Table 508.1.

<table>
<thead>
<tr>
<th>TABLE 508.1 NUMBERS WATER CHEMISTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMETER</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Total Alkalinity</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

TCC ACTION: ACCEPT AS SUBMITTED

TCC STATEMENT: The language in USPSHTC Item # 034, Table 508.1 is being revised to correlate with the language in Table 505.2 of the USHGC regarding alkalinity range.

The action moves forward as approved by the TCC and supersedes the recommendation from the USPSHTC TC for actions taken for Table 508.1 with regards to the alkalinity range.
Proposals

Item #: 039
USPSHTC 2021  Section: 702.3 - 702.5, Table 1001.1

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

702.0 Heaters.

702.3 Heat Exchangers. Heat exchangers for pools, spas, or hot tubs shall comply with NSF 50.
702.4 Heat Pumps. Heat pumps for pools, spas, or hot tubs shall comply with UL 1995 and AHRI 1160.
702.5 Solar Pool, Spa, and Hot Tub Heaters. Where solar technology is used to heat a swimming pool, spa, or hot tub, it shall comply with NSF 50 and be installed in accordance with the Uniform Solar, Hydronics and Geothermal Code and the manufacturer’s installation instructions.

(renumber remaining sections)

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHRI 1160-2014</td>
<td>Performance Rating of Heat Pump Pool Heaters</td>
<td>Appliances and Equipment</td>
<td>702.4</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: AHRI 1160 and NSF 50 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The addition of heat exchangers is appropriate as they serve as alternatives for solar water heating and heat pumps and are a common type of water heater used in swimming pools, spas, and hot tubs. Additionally, NSF 50 is an accepted industry standard addressing heat exchangers, heaters, coolers, and solar water heating systems.

Section 702.5 is updated with reference to NSF 50 as these types of heaters fall under the prevue of this standard.

AHRI 1160 is being added to Section 702.4 as it pertains to “Heat Pump Pool and Spa Heaters”. The proposed standard establishes definitions, classifications, testing requirements, rating requirements, and performance ratings for heat pump pool and spa heaters. Such addition further enhances the code and prevents the end user from being restricted to only UL 1995.
COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:
The proposed revisions and additions are unnecessary. Heat exchangers are heat pumps, and therefore the addition of Section 702.3 is redundant. The inclusion of AHRI 1160 is for performance and efficiency only and does not address minimum safety requirements. The standards have value but provide minimal benefits. Furthermore, there is no technical justification provided for such change.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 8 NEGATIVE: 1 NOT RETURNED: 1 FRUIA

EXPLANATION OF NEGATIVE:

CHOE: NSF 50 contains a number of requirements. A series of pressure tests are performed on these products which are critical in preventing leakage. This addresses a similar concern the committee had with auto fillers.

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC Section #: 702.2, Table 1001.1

SUBMITTER: Andrew Todd
V&T Carbonic Inc.

RECOMMENDATION:
Add new text

Request to replace the code change proposal by this public comment.

702.0 Heaters.

702.2 Oil-Fired Heaters. Oil-fired heaters for pools, spas, or hot tubs shall comply with UL 726.

(renumber remaining sections)

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 726-1995</td>
<td>Oil-Fired Boiler Assemblies (with revisions through October 9, 2013)</td>
<td>Appliances and Equipment</td>
<td>702.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: UL 726 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Oil-fired heaters are used to heat swimming pools and spas since they are both efficient and reliable. The high specific heat capacity of the oil allows for effective transfer of thermal energy from the heating element. Since the oil has a high boiling point and remains in its liquid phase during heating, the heater does not have to be a high pressure vessel. Additionally, oil fired heaters are quiet in operation and heat the pool quickly. For these reasons, the inclusion of oil-fired heaters is necessary.

UL 726 applies to oil-fired boiler assemblies and covers construction, electrical components, performance, testing, and installation instructions.
COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9   NOT RETURNED: 1   CHOE

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PUBLIC COMMENT 2

Code Year: 2021 USPSHTC     Section #: 702.4 - 702.4.3     Item #: 039

SUBMITTER: Edmond Murray

Aztec Solar

Comment #: 2

RECOMMENDATION:

Revise text

Request to replace the code change proposal by this public comment.

702.0 Heaters.

702.4 Solar Pool, Spa, and Hot Tub Heaters. Where solar technology is used to heat a swimming pool, spa, or hot tub, it shall be installed in accordance with Section 702.4.1 through Section 702.4.3 and the manufacturer’s installation instructions.

702.4.1 Water Chemistry. Where water from a swimming pool, spa or hot tub is heated by way of circulation through solar collectors, the chemistry of such water shall comply with the requirements of Table 508.1 and shall be filtered in accordance with Section 702.4.2 and Section 702.4.2.1.

702.4.2 Filter. A filter shall be provided to remove debris from the water entering the solar loop.

Exception: A solar swimming pool, spa, or hot tub heating system with a heat exchanger.

702.4.2.1 Location. A filter shall be located upstream of a pump used to direct water to solar collectors.

702.4.3 Corrosion Resistant. Glazed solar collectors made of copper shall not be used for solar pool, spa, or hot tub heating.

Exception: Where a heat exchanger is provided between the collector circuit and the swimming pool, spa, or hot tub water.

SUBSTANTIATION:

The most recent edition of the USHGC has clear provisions pertaining to solar thermal systems which are utilized to heat swimming pools, spas, or hot tubs. Incorporating these provisions within the USPSHTC allows for this code to be used independently of the other Uniform Codes.

The requirements being addressed pertain to water chemistry, filters, and corrosion resistance. Proper water chemistry parameters have been listed within Table 508.1 and have been updated over recent code cycles to ensure such parameters are current. For this reason, Table 508.1 is being referenced within proposed Section 702.4.1.

A required filter is also being proposed to prevent debris and unwanted particles from entering the solar loop. This is necessary to ensure the flow rate of water through the loop is not decreased or stopped by a blockage within the loop.

Additionally, the use of glazed solar collectors made of copper has been prohibited since this material may lead to excessive concentrations of copper ions within the pool water. This causes the pool water to become acidic as it drops the pH of the water. This also commonly leads to the formation of colored residue along the pool wall. For these reasons, the above provisions are being added.

COMMITTEE ACTION: REJECT

COMMITTEE STATEMENT:

The listed provisions are outside of the scope of the USPSHTC. Additionally, there are requirements listed in the USHGC which are necessary for operation of such systems. For this reason, the item is being rejected.
<table>
<thead>
<tr>
<th>TOTAL ELIGIBLE TO VOTE: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOЕ</td>
</tr>
</tbody>
</table>
702.0 Heaters.

702.3 Heat Pumps. Heat pumps for pools, spas, or hot tubs shall comply with UL 1995 or UL 60335-2-40.

Note: UL 60335-2-40 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
UL 1995 (Safety Standard for Heating and Cooling Equipment) will be phased out by the end of year 2020 and will be replaced by UL 60335-2-40 (Safety Standard for Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers).

UL 60335-2-40 is harmonized with requirements in both Canada and Europe. These requirements include provisions for the most current technology and are currently being used to list new products. The word “or” is added where there are multiple standards for different types of heaters because only one standard needs to be used.

Furthermore, UL 60335-2-40 is currently referenced in Sections 903.1 and 904.13 of the 2018 UMC.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
802.6 Zero-Depth Entry. (remaining text unchanged)
802.6.1 Steps or Stairs. Steps and stairs installed in combination with zero-depth entries shall be in accordance with Section 802.4.
802.6.2 Underwater Benches or Seats. Where underwater benches or seats are installed in combination with zero-depth entries, the benches or seats shall be in accordance with Section 402.11.

(Section 402.11 and 802.4 are shown for information only)

402.11 Underwater Benches or Seats. For public swimming pools, underwater benches or seats, where installed, shall be constructed of slip-resistant materials and shall be outlined with a color contrasting stripe or other permanent marking of not less than 3/4 of an inch (19.1 mm) or more than 2 inches (51 mm) in width. Underwater benches and seats shall not be located in water depths that exceed 5 feet (1524 mm). The submerged depth of a bench or seat shall not exceed 20 inches (508 mm) measured from the waterline.

802.4 Ladder, Step, and Stair Construction. Ladders shall be constructed of corrosion-resistant material and shall be equipped with slip-resistant tread surfaces. Ladder treads shall be spaced not more than 12 inches (305 mm) vertically apart. Ladder shall be permanently affixed and shall provide a clearance of not less than 3 inches (76 mm) or not more than 5 inches (127 mm) between any part of the ladder and the pool, spa, or hot tub wall. Recessed steps shall have a depth of not less than 6 inches (152 mm), a width of not less than 12 inches (305 mm), and spaced not more than 12 inches (305 mm) vertically apart. Recessed treads shall be slip-resistant, and designed to drain into the spa. Stairs shall be constructed of corrosion-resistant material and shall be equipped with slip-resistant tread surfaces. Each stair shall have a tread depth of not less than 10 inches (254 mm), risers shall have a uniform height of not more than 7 inches (178 mm), and treads shall have a width of not less than 24 inches (610 mm). The front edge of each step shall be marked with a color contrasting stripe of not less than 2 inches (51 mm) wide for the entire width of the step.

Exception: Portable ladders or stairs for aboveground or onground pools, spas, or hot tubs shall be permitted where approved by the Authority Having Jurisdiction and used in accordance with the ladder or stair manufacturer’s instructions. Such ladders or stairs shall be removed or secured where the pool, spa, or hot tub is not in use.

SUBSTANTIATION:
Section 802.6.1 is being proposed to include provisions on steps or stairs to be installed in conjunction with zero-depth entries of pools. Section 802.4 (Ladder, Step, and Stair Construction) is referenced within the proposed Section 802.6.1 as it includes riser and tread depths as well as markings for front edges of steps.

Section 802.6.2 is being proposed to include provisions on underwater benches or seats to be installed in conjunction with zero-depth entries of pools. Section 402.11 (Underwater Benches or Seats) is referenced within the proposed Section 802.6.2 as it addresses slip-resistance, markings, and provisions on vertical depths.
Such addition is necessary for further clarification on steps, stairs, benches and seats installed with sloped entries or zero-depth entries. The requirements or provisions listed within the referenced sections aim to prevent injury of the end user and should therefore be included.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 802.6 - 802.6.2  Item #: 044

SUBMITTER: Lizette Guzman  Self  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

802.0 Means of Entry and Exit Including Steps, Ladders, and Stairs.
802.6 Zero-Depth Entry. Where zero-depth entries are provided for public aquatic venues, they shall be slip-resistant. The slope of a zero-depth entry shall be continuous and shall not exceed 1 foot (305 mm) in 20 feet (6096 mm) to a water depth of 30 inches (762 mm).

Exceptions:
(1) Where a zero-depth entry is provided with handrails, the slope of the zero-depth entry shall not exceed 1 foot (305 mm) in 12 feet (3658 mm).
(2) Where a zero-depth entry is provided in a wading pool, the slope of the zero-depth entry shall be continuous and extend to the deepest part of the pool.

802.6.1 Steps or Stairs. Steps and stairs installed in combination with zero-depth entries shall be in accordance with Section 802.4.

802.6.2 Underwater Benches or Seats. Where underwater benches or seats are installed in combination with zero-depth entries, the benches or seats shall be in accordance with Section 402.12.

SUBSTANTIATION:
Stairs, steps, benches and seats may pose as hazards where installed in the zero-depth entry portion of a pool. In various local codes, the slope of a zero-depth entry must be continuous for this reason. The required water depth of 30 inches has also been updated for ADA compliance. This water depth is required to ensure buoyancy of the bather.

Additional provisions dependent upon the steepness of the slope installed should also be included as provided in this public comment. According to the United States Access Board, handrails should be installed where slopes of a zero-depth entry exceed 1:20. This source also requires that slopes of pool surfaces never exceed 1:12 for safety reasons.

Links for supporting documentation are as such:

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 7 NEGATIVE: 2 NOT RETURNED: 1 CHOE
EXPLANATION OF NEGATIVE:

FRUIA: I concur with Alison. This should conform with ADA.

OSINSKI: We need to add clarification to continuous slope to 30 inches. ADA guidelines require wet ramps to add a minimum 5' x 5' flat, unobstructed area at the top, at a depth of 24-30 inches, at changes in direction, and at the bottom of the ramp.
Proposals

Item #: 045
USPSHTC 2021  Section: 805.1

SUBMITTER: Joel Nunez
Upland Pool Supply LLC

RECOMMENDATION:
Revise text

805.0 Signage.
805.1 General. Instructional, operational, and safety signage shall comply with the Authority Having Jurisdiction. Signage shall be clearly visible at all entrances and at specific locations where applicable. The following signage shall be provided, but not limited to:
(1) Maximum occupant load
(2) Warning signs
(3) Stair and ladder markings
(4) Operation of pool
(5) User sanitation and safety rules
(6) Transitional markings for pool slope
(7) Depth of pool markings
(8) No diving markings
(9) Notices on the dangers of diving and jumping from boards
(10) No lifeguard on duty
(11) The maximum water depth at the entrance of water slides wave pools, leisure rivers, and other types of aquatic recreational attractions.
(12) Emergency services telephone number(s)
(13) Location of the pump emergency shutoff switch

SUBSTANTIATION:
Emergency signage is critical for public health and safety. Such emergency signage should include the phone number(s) to emergency services and the location of the pump emergency shutoff switch.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 805.1  Item #: 045
SUBMITTER: Joel Nunez  Upland Pool Supply LLC  Comment #: 1

RECOMMENDATION:
Revise text
Request to accept the code change proposal as modified by this public comment.

805.0 Signage.
805.1 General. Instructional, operational, and safety signage shall comply with the Authority Having Jurisdiction. Signage shall be clearly visible at all entrances and at specific locations where applicable. The following signage shall be provided, but not limited to:
(1) Maximum bather capacity
(2) Maximum building occupancy
(3) Warning signs
(4) Stair and ladder markings
(5) Operation of pool
(6) User sanitation and safety rules
(7) Transitional markings for pool slope
(8) Depth of pool markings
(9) No diving markings
(10) Notices on the dangers of diving and jumping from boards
(11) No lifeguard on duty
(12) The maximum water depth at the entrance of water slides wave pools, leisure rivers, and other types of aquatic recreational attractions. If the depth varies, mark the maximum depth, the minimum depth, and include the wording "Depth Varies."
(13) Emergency services telephone number(s) and location address.
(14) Location of the pump emergency shutoff switch
(15) Location of first aid supplies and equipment

SUBSTANTIATION:
Maximum "occupant load" is not used within the code to describe the number of permitted bathers in the pool or spa at a given time. "Bather capacity" would be better suited for this distinction. Including both "maximum bather capacity" and "maximum building occupancy" helps the end user understand the distinction between the two. The maximum occupancy of an indoor aquatic facility is not the same as the number of permitted bathers in the water at a given time.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

805.0 Signage.
805.1 General. Instructional, operational, and safety signage shall comply with the Authority Having Jurisdiction. Signage shall be clearly visible at all entrances and at specific locations where applicable. The following signage shall be provided, but not limited to:
(1) Maximum bather capacity
(2) Maximum building occupancy
(3) Warning signs
(4) Stair and ladder markings
(5) Operation of pool
(6) User sanitation and safety rules
(7) Transitional markings for pool slope
(8) Depth of pool markings
(9) No diving markings
(10) Notices on the dangers of diving and jumping from boards into the pool
(11) No lifeguard on duty
(12) The maximum water depth at the entrance of water slides wave pools, leisure rivers, and other types of aquatic recreational attractions. If the depth varies, mark the maximum depth, the minimum depth, and include the wording "Depth Varies."
(13) Emergency services telephone number(s) and location address.
(14) Location of the pump emergency shutoff switch
(15) Location of first aid supplies and equipment
COMMITTEE STATEMENT:
Revisions to Public Comment #1 are being made to include the changes submitted in both Public Comments for Item #045.

Additionally, number (10) is being revised to show “into the pool” rather than “from boards” since diving into the pool from any location may be dangerous.

Number (12) is then being modified to remove “maximum” as this may be misleading. The language now addresses maximum and minimum depths along with required wording.

Number (13) now includes the location to provide to emergency services when contacted.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE

PUBLIC COMMENT 2

Code Year: 2021 USPSHTC Section #: 805.1 Item #: 045
SUBMITTER: Lizette Guzman Self Comment #: 2

RECOMMENDATION:
Revise text

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

805.0 Signage. 805.1 General. Instructional, operational, and safety signage shall comply with the Authority Having Jurisdiction. Signage shall be clearly visible at all entrances and at specific locations where applicable. The following signage shall be provided, but not limited to:
(1) Maximum occupant load
(2) Warning signs
(3) Stair and ladder markings
(4) Operation of pool
(5) User sanitation and safety rules
(6) Transitional markings for pool slope
(7) Depth of pool markings
(8) No diving markings
(9) Notices on the dangers of diving and jumping from boards
(10) No lifeguard on duty
(11) The maximum water depth at the entrance of water slides wave pools, leisure rivers, and other types of aquatic recreational attractions.
(12) Emergency services telephone number(s)
(13) Location of the pump emergency shutoff switch
(14) Location of first aid supplies and equipment

SUBSTANTIATION:
Signage for location of first aid supplies and equipment should be listed so that such items are available for bathers and patrons in the event of an injury. Patrons commonly slip and fall due to various wet surfaces. These surfaces are often contaminated with oils from sunscreen, lotion, etc. making them slippery when wet. Other emergency supply equipment should be made available such as non-latex gloves, band-aids, gauze pads and bandages, adhesive tape and antibacterial soap. Pool management may also include face shields, tweezers, and instant ice packs which need to be readily available and easy to locate.

COMMITTEE ACTION: REJECT
COMMITTEE STATEMENT:
Public Comment #2 is being rejected in favor of Public Comment #1.

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS:  AFFIRMATIVE: 9    NOT RETURNED: 1    CHOE
Proposals

Item #: 046
USPSHTC 2021 Section: 204.0, 209.0, 221.0, 810.0 - 810.5, Table 1001.1

SUBMITTER: Alison Osinski
Aquatic Consulting Services

RECOMMENDATION:
Revise text

810.0 Entrapment Prevention.
810.1 General. Suction outlets for pools, spas and hot tubs shall comply with Section 511.0. Single blockable suction outlet systems shall not be installed in new or retrofit applications. Existing public swimming pools, spas or hot tubs utilizing a single blockable suction outlet shall be installed with a means of secondary entrapment prevention in accordance with one of the systems in accordance with Section 810.2 through Section 810.5.

841.1-3810.2 Safety Vacuum Release Systems. Swimming pool, spa, or hot tub vacuum release systems shall comply with ASME A112.19.17 or ASTM F2387, and shall be installed in accordance with the manufacturer’s installation instructions.

810.3 Suction-Limiting Vent Systems. Where installed, suction-limiting vent systems shall be in accordance with ASTM F2707.

810.4 Automatic Pump Shutoff Systems. The pump(s) shall be designed to automatically shutoff in the event of a suction outlet blockage.

810.5 Gravity Drainage System. Gravity drainage systems shall be equipped with a collector tank installed between the pool or spa and circulation pump. The collector tank shall be installed below the pool water surface level and shall have an area of not less than 2.25 square feet (0.209 m²) exposed to the atmosphere. Means shall be provided to prevent unauthorized access to the collector tank. The main drain line shall be connected at the base of the collector tank and shall be sized such that the water flow rate in the main drain to the tank does not exceed 3 feet per second (ft/s) (0.9 m/s). The water flow rate across the suction outlet cover or grating shall not exceed 1.5 ft/s (0.46 m/s).

204.0 - B -

Blockable Suction Outlet. A drain of any size and shape that a human body can sufficiently block to create a suction entrapment hazard.

209.0 - G -

Gravity Drainage System. A circulation system in which water drains by gravity into a collector tank open to the atmosphere to be circulated back to the pool, spa or hot tub by means of a pump.

221.0 - S -

Safety Vacuum Release System. A system capable of providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage.

Suction-Limiting Vent System. An entrapment prevention system in which an atmospheric vent relieves vacuum caused by a blockage at the suction outlet.
TABLE 1001.1
REFERRED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
</table>

Note: ASTM F2387 and ASTM F2707 meet the requirements for mandatory referenced standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
Entrapment prevention designs for submerged suction outlets are necessary to reduce the risk of injury or death caused by entrapment. The Virginia Graeme Baker (VGB) Pool and Spa Safety Act states that existing single blockable drains be installed with secondary entrapment prevention systems or devices. Although the above secondary entrapment prevention systems are found in APSP 16 and this standard is currently referenced under Section 511.0 (Pool, Spa, and Hot Tub Suction Outlets), they are only listed and defined without any installation guidelines. These methods are also listed in the VGB Act and are not exclusive to APSP 16. Therefore, such additions are necessary and should be addressed further in this code.

Suction outlet covers/grating which are required to be VGB compliant to prevent suction entrapment are not discussed within the proposed sections as APSP 16 already addresses compliant drain covers and their required listings and markings.

The additional standard, ASTM F2387, in Section 810.2 for compliance is inserted as it covers the requirements for safety vacuum release systems. This standard provides specifications intended to reduce the risk and likelihood of entrapment at a submerged suction outlet by providing a method of rapid detection and release of any high vacuum occurrence at the outlet.

The addition of ASTM F2707 provides a safety performance specification for design and installation of suction-limiting vent systems utilized for the purpose of entrapment prevention at suction outlets in swimming pools, spas, hot tubs, or wading pools. A vent is installed to relieve a high vacuum occurrence at a submerged suction outlet and in turn prevents body entrapment at the outlet.

The installation of an automatic pump shutoff system requires that the system be equipped with an automatic mechanism capable of stopping pump function in the event of a high vacuum occurrence at the submerged suction outlet. This addition is separate from that of Section 804.5 (Emergency Shutoff) as that section pertains to manual emergency shutoff or control switches.

Proper installation of a gravity drainage system includes a connection from the suction line to a collector tank that is open to the atmosphere. The velocity through the main grate is still restricted to 1.5 ft/s as in APSP 16 and therefore does not conflict with Section 511.0. The required area of the collector tank to be open to the atmosphere is common in various jurisdictions.

Four definitions were added. The term “blockable drain” is defined in the Virginia Graeme Baker Pool and Spa Safety Act as “A drain of any size and shape that a human body can sufficiently block to create a suction entrapment hazard”.

Adding the definitions for “Gravity Drainage System” and “Suction-Limiting Vent System” is necessary as the terms are used in the Virginia Graeme Baker Pool Act as two of the approved methods for secondary entrapment prevention. These terms are further used in this code to provide guidelines and stipulations on installation of such systems.
According to Title 15: Commerce and Trade [Chapter 106. Pool and Spa Safety] the term “safety vacuum release system” means “a vacuum release system capable of providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage.”

The link to supporting documentation for the above proposed changes on entrapment prevention is as follows: 15 USC Ch.106: Pool and Spa Safety - http://uscode.house.gov/view.xhtml?path=/prelim@title15/chapter106&edition=prelim

COMMITTEE ACTION: ACCEPT AS AMENDED BY THE TC

Amend proposal as follows:

810.0 Entrapment Prevention.
810.1 General. Suction outlets for pools, spas and hot tubs shall comply with Section 511.0. Single blockable suction outlet systems shall not be installed in new or retrofit applications. Existing public swimming pools, spas or hot tubs utilizing a single blockable suction outlet system shall be installed with a means of secondary entrapment prevention in accordance with one of the systems in accordance with Section 810.2 through Section 810.5.
810.2 Safety Vacuum Release Systems. Swimming pool, spa, or hot tub vacuum release systems shall comply with ASME A112.19.17 or ASTM F2387, and shall be installed in accordance with the manufacturer’s installation instructions.
810.3 Suction-Limiting Vent Systems. Where installed, suction-limiting vent systems shall be in accordance with ASTM F2707.
810.4 Automatic Pump Shutoff Systems. The pump(s) shall be designed to automatically shutoff in the event of a suction outlet blockage.
810.5 Gravity Drainage System. Gravity drainage systems shall be equipped with a collector tank installed between the pool or spa and circulation pump. The collector tank water surface level shall be installed below the pool water surface level and shall have an area of not less than 2.25 square feet (0.209 m²) exposed to the atmosphere. Means shall be provided to prevent unauthorized access to the collector tank. The main drain line shall be connected at the base of the collector tank and shall be sized such that the water flow rate in the main drain to the tank does not exceed 3 feet per second (ft/s) (0.9 m/s). The water flow rate across the suction outlet cover or grating shall not exceed 1.5 ft/s (0.46 m/s).

204.0 - B -

Blockable Suction Outlet. A drain of any size and shape that a human body can sufficiently block to create a suction entrapment hazard.

209.0 - G -

Gravity Drainage System. A circulation system in which water drains by gravity into a collector tank open to the atmosphere to be circulated back to the pool, spa or hot tub by means of a pump.

221.0 - S -

Safety Vacuum Release System. A system capable of providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage.

Suction-Limiting Vent System. An entrapment prevention system in which an atmospheric vent relieves vacuum caused by a blockage at the suction outlet.

### TABLE 1001.1
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
</table>

(portions of table not shown remain unchanged)
COMMITTEE STATEMENT:
Section 810.5 is being amended so that the water level of the collector tank is installed at the pool water surface level and not below. Additionally, the required tank area is being removed as this varies based on tank volume and flow rate.

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: 810.1, 810.6  Item #: 046

SUBMITTER: Joel Nunez  Upland Pool Supply LLC  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

810.0 Entrapment Prevention.
810.1 General. Suction outlets for pools, spas and hot tubs shall comply with Section 511.0. Single blockable suction outlet systems shall not be installed in new or retrofit applications. Existing public swimming pools, spas or hot tubs utilizing a single blockable suction outlet shall be installed with a means of secondary entrapment prevention in accordance with one of the systems in accordance with Section 810.2 through Section 810.5.

810.6 Main Drain Disablement. Where main drain disablement is permitted by the Authority Having Jurisdiction, the skimmer overflow system shall be in accordance with the following:
(1) Capable of handling 100 percent of the circulation system flow
(2) Maintain turnover rates in accordance with Section 503.0
(3) Maintain water quality in accordance with Section 508.0

(Section 503.0 and 508.0 are shown for information only)

503.0 Turnover Time.
503.1 General. The entire design of matched components shall have a capacity to provide a complete turnover of water in accordance with local and state codes or regulations, and the manufacturer’s instructions. Maximum turnover time shall be required as follows:
(1) Private pools – 8 hours
(2) Public pools – 6 hours
(3) Wading pools – 1 hour
(4) Private spas and hot tubs – 1 hour
(5) Public spas and hot tubs – 1 /2 hour
(6) Water slides and landing pools – 2 hours
(7) Wave pools – 3 hours
(8) Leisure rivers – 3 hours
(9) Spray grounds – 1 /2 hour
(10) Activity Pools – 2 hours
(11) Diving Pools – 8 hours
(12) Surf Pools – as required by the manufacturer

503.2 Flow Rate. Turnover times shall be calculated based on the flow rate through the filtration system and the volume of pool water.

503.3 Bather Load Per Day. The maximum bather load per day (\( L_B \)) shall be in accordance with Equation 503.3.
\[ L_B = Q/1400 \quad \text{(Equation 503.3)} \]

Where:
\[ L_B = \text{Bather load, number of bathers per day} \]
\[ Q = \text{Flow rate, gallons per day} \]
For SI units: 1 gallon = 3.785 L, \[ L_B = Q/5300, \text{where } Q \text{ is in L/day} \]

**508.0 Primary Disinfection.**

**508.1 General.** Chemicals for a swimming pool, spa, or hot tub shall be dispensed in accordance with the chemical manufacturer’s instructions, Material Safety Data Sheets (MSDS), and applicable standards and regulations. Parameters for chemicals used within a swimming pool, spa, and hot tub shall be in accordance with Table 508.1.

**SUBSTANTIATION:**

Main drain disablement is listed in the Virginia Graeme Baker Pool and Spa Safety Act as an approved method of secondary entrapment prevention. This method entirely prevents entrapment prevention at a suction outlet since there is none. As long as water chemistry and quality are required to be maintained, this method along with appropriate provisions should be included within the code. Additionally, excluding this method conflicts with the VGB Act. Some jurisdictions require a main drain for all pools and spas, and hence the language “permitted by the Authority Having Jurisdiction” has been included for this purpose. Permitted main drain disablement requires additional provisions for skimmer overflow systems which address turnover rates, circulation system flow, and water quality.

A link for supporting documentation regarding the VGB ACT is as follows:

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9 \quad NOT RETURNED: 1 \quad CHOE

---

**PUBLIC COMMENT 2**

**Code Year:** 2021 USPSHTC \quad **Section #:** 810.5 \quad **Item #:** 046

**SUBMITTER:** Joel Nunez  
Upland Pool Supply LLC

**Comment #:** 2

**RECOMMENDATION:**

Revise text

Request to accept the code change proposal **as modified** by this public comment.

**810.0 Entrapment Prevention.**

**810.5 Gravity Drainage System.** Gravity drainage systems shall be equipped with a collector tank installed between the pool or spa and circulation pump. The collector tank water surface level shall be installed at the pool water surface level and exposed to the atmosphere. The volume of the collector tank shall be sized in accordance with Equation 810.5 with a retention time of not less than 1 minute. Means shall be provided to prevent unauthorized access to the collector tank. The main drain line shall be connected at the base of the collector tank and shall be sized such that the water flow rate in the main drain to the tank does not exceed 3 feet per second (ft/s) (0.9 m/s). The water flow rate across the suction outlet cover or grating shall not exceed 1.5 ft/s (0.46 m/s).

\[ V = t_R \times \sum Q_P \quad \text{(Equation 810.5)} \]
Where:
\( V \) = Volume of the collector tank, gallons (L)
\( t_R \) = Retention time, minutes
\( Q_P \) = Design flowrate of pump drawing from collector tank, gallons per minute (L/m)
For SI units: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m

SUBSTANTIATION:
The additional language for sizing of collector tanks is being added since sizing is pertinent to ensuring that the gravity drainage system installed functions properly. Gravity drainage systems work on the principle that an adequately sized collector tank, installed between the pool or spa and pump, can limit the amount of suction created and prevent a vacuum occurrence when the main drain is blocked. In these systems, the suction line to the pump is connected to the collector tank instead of the main drain. Water flows from the pool’s main drain to the collector tank by gravity and from the collector tank to the pump by pump-caused suction.

The sizing equation provided yields the minimum required collector tank volume which accounts for the flowrate of all pumps which draw from the tank. This guarantees that the tank will hold what is required for all pumps for at least one 1 minute. The minimum retention time listed is 1 minute for this reason.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
APPENDIX A
METHOD FOR DETERMINING
LATENT EVAPORATION LOADS OF NATATORIUMS

A 101.0 General.
A 101.1 Applicability. This appendix provides a general procedure for determining the latent evaporation load of an indoor aquatic facility (natatorium) for the purpose of maintaining stable space conditions. For adequate humidity control of a natatorium in accordance with Section 417.4, the determination of the building’s internal latent moisture load is required for selection of a properly sized ventilation dehumidification system. The internal load of a natatorium is equivalent to the evaporation load and contributes to a majority of the building’s total moisture latent load. Evaluation of the evaporation load includes both occupied and unoccupied conditions for proper modulation of equipment capacity.

A 102.0 Psychometric Chart.
A 102.1 Density. Density values required for calculations shall be determined in accordance with Figure A 102.1 as the inverse of specific volumes at provided design space conditions. The application of density differences provided in Table A 102.1 shall be permitted for simplified calculations.
A 102.2 Humidity Ratio. Humidity ratios shall be determined in accordance with Figure A 102.1 and provided design space conditions.
A 102.2.1 Partial Pressure. The partial pressure of water vapor in air ($p_a$) shall be determined in accordance with the design relative humidity ($RH$), Table A 102.2.1 and Equation A 102.2.1.

$$p_a = RH \cdot p_{w}$$  \hspace{1cm} \text{(Equation A 102.2.1)}

**TABLE A 102.2.1**
SATURATION VAPOR PARTIAL PRESSURE

<table>
<thead>
<tr>
<th>DRY BULB TEMPERATURE(^\circ)F</th>
<th>SATURATION VAPOR PARTIAL PRESSURE, $p_w$(inHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>0.9289</td>
</tr>
<tr>
<td>78</td>
<td>0.9911</td>
</tr>
<tr>
<td>80</td>
<td>1.053</td>
</tr>
<tr>
<td>82</td>
<td>1.116</td>
</tr>
<tr>
<td>84</td>
<td>1.178</td>
</tr>
<tr>
<td>86</td>
<td>1.240</td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8, 1 inch of mercury = 3.386 kPa
A 103.0 Evaporation Load.

A 103.1 General. The evaporation load \( (EL) \) of an indoor pool or spa shall be determined in accordance with Section A 103.2 through Section A 103.4.

A 103.2 Flux. The evaporation flux due to natural convection \( (EF_C) \) shall be determined in accordance with Equation A 103.2(1) and Table A 102.1, and the evaporation flux due to air currents from the ventilation system \( (EF_V) \) shall be determined in accordance with Equation A 103.2(2).

\[
EF_C = C \cdot p_w (\rho_a - \rho_w) \frac{1}{2} (W_w - W_a) \quad \text{[Equation A 103.2(1)]}
\]
\[
EF_V = B (\rho_w - \rho_a) \quad \text{[Equation A 103.2(2)]}
\]

The evaporation flux of an unoccupied indoor pool or spa \( (EF_U) \) shall be determined as the evaporation flux due to natural convection or the evaporation flux due to air currents from the ventilation system, whichever is greater, or alternatively, determined in accordance with Table A 103.2.

The evaporation flux of an occupied indoor pool or spa \( (EF_{OCC}) \) shall be determined in accordance with Equation A 103.2(3) and Table A 103.2.

\[
EF_{OCC} = EF_U [1.9 - 366(\rho_a - \rho_w) + 57 \left( \frac{H}{A_p} \right)] \quad \text{[Equation A 103.2(3)]}
\]

A 103.3 Rate. The evaporation rate \( (ER) \) of an indoor pool or spa shall be determined in accordance with Equation A 103.3 and Table A 103.3.

\[
ER = EF_{OCC} \cdot AF \cdot A_p \quad \text{[Equation A 103.3]}
\]

<table>
<thead>
<tr>
<th>CATEGORY OF POOL OR ACTIVITY</th>
<th>ACTIVITY FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unoccupied Pool</td>
<td>0.5</td>
</tr>
<tr>
<td>Residential Pool</td>
<td>0.5</td>
</tr>
<tr>
<td>Fitness Club</td>
<td>0.65</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>0.65</td>
</tr>
<tr>
<td>Competition</td>
<td>0.65</td>
</tr>
<tr>
<td>Elderly Aquatics</td>
<td>0.65</td>
</tr>
<tr>
<td>Condominium</td>
<td>0.65</td>
</tr>
<tr>
<td>Hotel</td>
<td>0.8</td>
</tr>
<tr>
<td>Recreation/Institution</td>
<td>0.8 – 1.0</td>
</tr>
<tr>
<td>Whirlpool</td>
<td>1.0</td>
</tr>
<tr>
<td>Wave Pool</td>
<td>1.5 – 2.0</td>
</tr>
</tbody>
</table>

A 103.4 Latent Load. The evaporation load \( (EL) \) shall be determined in accordance with Equation A 103.4.

\[
EL = 1050 \cdot ER \quad \text{[Equation A 103.4]}
\]

Where:
- \( A_p \) = Area of water surface, square feet
- \( AF \) = Activity Factor
- \( B = 0.0346 \)
- \( C = 290 \)
- \( EF_C \) = Evaporation flux due to natural convection, pound per square foot hour
- \( EF_{OCC} \) = Evaporation flux of an occupied indoor pool or spa, pound per square foot hour
- \( EF_U \) = Evaporation flux of an unoccupied indoor pool or spa, pound per square foot hour
EF = Evaporation flux due air currents from the ventilation system, pound per square foot hour
EL = Evaporation load, British thermal units per hour
ER = Evaporation rate, pound per hour
n = number of pool or spa occupants
p\_a = partial pressure of vapor at room conditions, inch of mercury
p\_w = saturation partial pressure of vapor at water surface temperature, inch of mercury

\[ W\_a = \text{humidity ratio of air at room conditions, pound of moisture per pound of dry air} \]
\[ W\_w = \text{humidity ratio of saturated air at water surface temperature, pound of moisture per pound of dry air} \]
\[ \rho\_a = \text{density of air at room conditions, pound per cubic foot} \]
\[ \rho\_w = \text{density of saturated air at water surface temperature, pound per cubic foot} \]

For SI units: 1 square foot = 0.0929 m\(^2\), 1 pound per square foot hour = 4.882 kg/(m\(^2\)•h), 1000 British thermal units per hour = 0.293 kW, 1 pound per hour = 0.454 kg/h, 1 inch of mercury = 3.386 kPa, 1 pound-force per square inch = 6.894 kPa, 1 pound = 0.453 kg, 1 pound per cubic foot = 16.02 kg/m\(^3\), \( B = 0.00005 \), \( C = 35 \).

\[ EF\_occ = EF\_u [1.9 - 21(\rho\_a - \rho\_w) + 5.3 \left( \frac{n}{A_p} \right)] \]
\[ EL = 2443 \cdot ER \]

### TABLE A 102.1
AIR DENSITY DIFFERENCES FOR STANDARD NATATORIUM CONDITIONS

<table>
<thead>
<tr>
<th>WATER TEMPERATURE (°F)</th>
<th>AIR TEMPERATURE AND RELATIVE HUMIDITY</th>
<th>DENSITY DIFFERENCE, ( \rho_a - \rho_w ) (lb/ft(^3))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76°F 78°F 80°F 82°F 84°F 86°F</td>
<td>50% 60% 50% 60% 50% 60% 50% 60% 50% 60% 50% 60%</td>
</tr>
<tr>
<td>76</td>
<td>0.0011 0.0009 0.0008 0.0005 0.0004 0.0002 0.0001 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>0.0015 0.0013 0.0012 0.0010 0.0008 0.0006 0.0005 0.0002 0.0001 0 0</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>0.0020 0.0017 0.0016 0.0014 0.0013 0.0010 0.0009 0.0006 0.0005 0.0003 0.0002 0</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>0.0024 0.0022 0.0020 0.0018 0.0017 0.0014 0.0013 0.0011 0.0010 0.0007 0.0006 0.0003</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>0.0028 0.0026 0.0025 0.0022 0.0021 0.0019 0.0018 0.0015 0.0014 0.0011 0.0010 0.0008</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>0.0033 0.0031 0.0029 0.0027 0.0026 0.0023 0.0022 0.0020 0.0019 0.0016 0.0015 0.0012</td>
<td></td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8, 1 pound per cubic foot = 16.02 kg/m\(^3\)

### TABLE A 103.2
EVAPORATION FLUX - UNOCCUPIED INDOOR AQUATIC FACILITIES

<table>
<thead>
<tr>
<th>WATER TEMPERATURE (°F)</th>
<th>AIR TEMPERATURE AND RELATIVE HUMIDITY</th>
<th>EF_u (lb/ft(^2)-h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76°F 78°F 80°F 82°F 84°F 86°F</td>
<td>50% 60% 50% 60% 50% 60% 50% 60% 50% 60% 50% 60%</td>
</tr>
<tr>
<td>76</td>
<td>0.0211 0.0159 0.0176 0.0120 0.0135 0.0099 0.0123 0.0085 0.0110 0.0069 0.0097 0.0053</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>0.0270 0.0211 0.0232 0.0173 0.0193 0.0133 0.0149 0.0106 0.0132 0.0091 0.0119 0.0075</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>0.0328 0.0266 0.0291 0.0228 0.0252 0.0188 0.0212 0.0146 0.0166 0.0114 0.0141 0.0098</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>0.0390 0.0326 0.0353 0.0287 0.0315 0.0245 0.0274 0.0204 0.0233 0.0160 0.0185 0.0110</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>0.0458 0.0391 0.0420 0.0351 0.0381 0.0309 0.0340 0.0266 0.0298 0.0222 0.0253 0.0176</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>0.0530 0.0461 0.0492 0.0419 0.0451 0.0377 0.0410 0.0333 0.0368 0.0288 0.0323 0.0241</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>0.0608 0.0536 0.0569 0.0494 0.0528 0.0450 0.0486 0.0405 0.0442 0.0358 0.0397 0.0311</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>0.0692 0.0618 0.0651 0.0574 0.0610 0.0529 0.0567 0.0482 0.0522 0.0435 0.0476 0.0386</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>0.1335 0.1250 0.1289 0.1199 0.1241 0.1147 0.1192 0.1093 0.1142 0.1037 0.1088 0.0979</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>0.1469 0.1383 0.1422 0.1333 0.1374 0.1279 0.1324 0.1222 0.1272 0.1165 0.1219 0.1106</td>
<td></td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8, 1 pound per square foot hour = 4.882 kg/m\(^2\)•h
FIGURE A 102.1
PSYCHOMETRIC CHART

TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHRAE Transactions, Volume 120, Part II-2014</td>
<td>Methods for Calculation of Evaporation from Swimming Pools and Other Water Surfaces</td>
<td>Design</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)
SUBSTANTIATION:
The proposed appendix provides a recommended method for determining the latent evaporation load for a natatorium. Such calculations are necessary when selecting a properly sized ventilation dehumidification system. In natatoriums, pool evaporation represents the majority of the total dehumidification load. Consequently, the latent evaporation load must be determined. While the recommended relative humidity for natatoriums is restricted to 50-60% for bather comfort and health, these levels can cause serious structural damage if a properly sized system is not installed. The role of a ventilation/dehumidification system is to remove evaporated moisture so humidity does not exceed the listed safe limits. Therefore, the design equipment capacity must meet the evaporation at maximum occupancy.

The above equations and table values for evaporation rates and density differences have been manipulated from original publication in ASHRAE Transactions Volume 119 and Volume 120. The equations and values have been determined to be the most reliable among available methods and should be used for practical calculations. The tables are provided to make calculations easier and simplified for the end user. The use of the psychometric chart cannot be avoided though and must be included.

The evaluation of the occupied pool must also be considered because evaporation rates and loads tend to be higher. This is a result of increased area of contact between air and water during movement of occupants. The activity factors provided in Table A 103.3 take this into account and modify the evaporation rate for many common types of activity or pools.

Adding such technical data and formulas further enhance this code and provide users with accurate methods of determining latent evaporation loads.

The equations and their purpose are listed as follows for further clarification:
Equation A 103.2(1) – Addresses the air currents caused by natural convection for unoccupied pools or spas
Equation A 103.2(2) – Addresses the air currents caused by the building ventilation system and is valid for air current velocities up to 0.15 m/s (30 fpm) for unoccupied pools or spas
The greater of the two values for evaporation flux of unoccupied pools calculated from Equation A 103.2(1) and Equation A 103.2(2) is used to determine the evaporation flux from occupied pools or spas.
Equation A 103.2(3) – Addresses the evaporation flux of an occupied indoor pool or spa
Equation A 103.3 – Addresses the effects of the water surface area and pool activity and determines the rate of evaporation
Equation A 103.4 – Addresses the effects of the latent heat of vaporization of water which is highest at 76°F (1050.3 BTU/lb and 2443 kJ/kg). The latent heat of vaporization is then used to convert the evaporation rate to the latent evaporation load.

The links to supporting documentation are as follows:
Methods for Calculation of Evaporation from Swimming Pools and Other Water Surfaces
Mirza Mohammed Shah, PE, PhD

New Method for Calculating Evaporation from Occupied Swimming Pools
Mirza Mohammed Shah, PE, PhD

Manual SPS Section 6 (Evaporation Load) – Supporting documentation has been submitted to the Technical Committee for review.

COMMITTEE ACTION: ACCEPT AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Appendix A  Item #: 049

SUBMITTER: Chelsea Salaiz  V&T Carbonic Inc.  Comment #: 1

RECOMMENDATION:

Revise text

Request to accept the code change proposal as modified by this public comment.

A 103.0 Evaporation Load.

A 103.2 Flux. The evaporation flux due to natural convection \( (EF_C) \) shall be determined in accordance with Equation A 103.2(1) and Table A 102.1, and the evaporation flux due to air currents from the ventilation system \( (EF_V) \) shall be determined in accordance with Equation A 103.2(2).

\[
EF_C = C \cdot \rho_w (\rho_a - \rho_w)^{\frac{1}{3}} (W_w - W_a) \quad \text{[Equation A 103.2(1)]}
\]

\[
EF_V = B (p_w - p_a) \quad \text{[Equation A 103.2(2)]}
\]

The evaporation flux of an unoccupied indoor pool or spa \( (EF_U) \) shall be as determined in accordance with Equation A 103.2(1) or Equation A 103.2(2), as the evaporation flux due to natural convection or the evaporation flux due to air currents from the ventilation system, whichever is greater, or, alternatively, determined in accordance with Table A 103.2.

The evaporation flux of an occupied indoor pool or spa \( (EF_{OCC}) \) shall be determined in accordance with Equation A 103.2(3) and Table A 103.2.

\[
EF_{OCC} = EF_V [1.9 - 366(\rho_a - \rho_w) + 57 \left( \frac{n}{A_p} \right)] \quad \text{[Equation A 103.2(3)]}
\]

A 103.3 Rate. The evaporation rate \( (ER) \) of an indoor pool or spa shall be determined in accordance with Equation A 103.3 and Table A 103.3.

\[
ER = EF_{OCC} \cdot AF \cdot A_p
\]  

(Equation A 103.3)

<table>
<thead>
<tr>
<th>CATEGORY OF POOL OR ACTIVITY</th>
<th>ACTIVITY FACTOR ( (AF) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unoccupied Pool</td>
<td>0.5</td>
</tr>
<tr>
<td>Residential Pool</td>
<td>0.5</td>
</tr>
<tr>
<td>Fitness Club</td>
<td>0.65</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>0.65</td>
</tr>
<tr>
<td>Competition</td>
<td>0.65</td>
</tr>
<tr>
<td>Elderly Aquatics</td>
<td>0.65</td>
</tr>
<tr>
<td>Condominium</td>
<td>0.65</td>
</tr>
<tr>
<td>Hotel</td>
<td>0.8</td>
</tr>
<tr>
<td>Recreation/Institution</td>
<td>0.8 – 1.0</td>
</tr>
<tr>
<td>Whirlpool</td>
<td>1.0</td>
</tr>
<tr>
<td>Wave Pool</td>
<td>1.5 – 2.0</td>
</tr>
</tbody>
</table>
SUBSTANTIATION:
The above revisions are for clarity during calculations. The previous language was too descriptive and required a modification. The new language carries the exact same intent with less language. Furthermore, Table A 103.3 has been modified to include the abbreviation for activity factor since this is used in Equation A 103.3.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 051
USPSHTC 2021 Section: Table 1001.1, Table 1001.2

SUBMITTER: Susan Hilaski
APSP

RECOMMENDATION:
Revise text

### TABLE 1001.1
REFERRED STANDARDs

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>APSP/ICC 16-2014</td>
<td>Suction Outlet Fittings Assemblies (SOFA) for Use in Swimming Pool, Wading Pool, Spas, and Hot Tubs</td>
<td>Fittings</td>
<td>511.1</td>
</tr>
</tbody>
</table>

Note: APSP/ICC 16 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

### TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>APSP/ICC 1-2014</td>
<td>Public Swimming Pools</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>APSP/ICC 3-2014</td>
<td>Permanently Installed Residential Spas and Swim Spas</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>APSP/ICC 4-2012</td>
<td>Aboveground/Onground Residential Swimming Pools (includes Addenda A approved April 4, 2013)</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>APSP/NSPI 2-1999</td>
<td>Public Spas</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

SUBSTANTIATION:
The above revisions reflect the latest updates to the APSP standards that are referenced in Table 1001.1 and Table 1001.2.
PUBLIC COMMENT 1
Code Year: 2021 USPSHTC  Section #: Table 1001.2  Item #: 051
SUBMITTER: Connor Barbaree  Comment #: 1
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHRAE 62.1-2016</td>
<td>Ventilation for Acceptable Indoor Air Quality</td>
<td>Heating, Ventilating, and Air Conditioning</td>
</tr>
<tr>
<td>ASHRAE/IES 90.1-2016</td>
<td>Energy Standard for Buildings Except Low-Rise Residential Buildings</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the ASHRAE standards that are referenced in Table 1001.2.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
### TABLE 1001.1
**REFERRED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.3.1-2007(2012)(2017)</td>
<td>Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above- and Below-Ground</td>
<td>Piping, Ferrous</td>
<td>310.6.2, 413.1, Table 309.1</td>
</tr>
<tr>
<td>ASME B1.20.1-2013(2018)</td>
<td>Pipe Threads, General Purpose (Inch)</td>
<td>Joints</td>
<td>308.1.5, 308.2.3, 308.5.2, 308.12.3, 310.1.3, 310.3.4, 310.4.2, 310.5.3</td>
</tr>
<tr>
<td>ASME B16.15-2012-2018</td>
<td>Cast Copper Alloy Threaded Fittings: Classes 125 and 250</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.18-2012-2018</td>
<td>Cast Copper Alloy Solder Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.22-2013-2018</td>
<td>Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.26-2013-2018</td>
<td>Cast Copper Alloy Fittings for Flared Copper Tubes</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.29-2012-2017</td>
<td>Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings – DWV</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASME B16.51-2013-2018</td>
<td>Copper and Copper Alloy Press-Connect Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
</tbody>
</table>
Note: The ASME standards meet the requirements for mandatory referenced standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

### TABLE 1001.2
**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.1.2-2012(R2017)</td>
<td>Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)</td>
<td>Fittings</td>
</tr>
<tr>
<td>ASME A112.18.3-2002(R2012)</td>
<td>Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASME B16.5-2013-2017</td>
<td>Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch</td>
<td>Fittings</td>
</tr>
<tr>
<td>ASME B16.47-2011-2017</td>
<td>Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch</td>
<td>Fittings</td>
</tr>
<tr>
<td>ASME B16.50-2013-2018</td>
<td>Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings</td>
<td>Fittings</td>
</tr>
</tbody>
</table>

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the ASME standards that are referenced in Table 1001.1 and Table 1001.2.

**COMMITTEE ACTION:** ACCEPT AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

---

**APPENDED COMMENTS**

---

**PUBLIC COMMENT 1**

**Code Year:** 2021 USPSHTC  **Section #:** Table 1001.1  **Item #:** 052

**SUBMITTER:** Angel Guzman  **Comment #:** 1

The American Society of Mechanical Engineering (ASME)

**RECOMMENDATION:**
Revise text

Request to accept the code change proposal as modified by this public comment.

### TABLE 1001.1
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME A112.6.3-20162019</td>
<td>Floor and Trench Drains</td>
<td>DWV Components</td>
<td>413.1</td>
</tr>
<tr>
<td>ASME B16.12-2009 (R2014)2019</td>
<td>Cast Iron Threaded Drainage Fittings</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)
Note: ASME A112.6.3, ASME A112.19.12, and ASME B16.12 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revisions reflect the latest updates to the ASME standards that are referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 053

USPSHTC 2021  Section: Table 1001.2

SUBMITTER: Conrad Jahrling
ASSE

RECOMMENDATION:
Revise text

### TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1011-2004-2017</td>
<td>Hose Connection Vacuum Breakers</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1024-2004-2017</td>
<td>Dual Check Backflow Preventers</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1055-2016-2018</td>
<td>Chemical Dispensing Systems with Integral Backflow Protection</td>
<td>Backflow Protection</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the ASSE standards that are referenced in Table 1001.2.

**COMMITTEE ACTION:** ACCEPT AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

**PUBLIC COMMENT 1**

**Code Year:** 2021 USPSHTC  **Section #:** Table 1001.1, Table 1001.2  **Item #:** 053

**SUBMITTER:** Conrad Jahrling
ASSE International (ASSE)

**RECOMMENDATION:**
Revise text
Request to accept the code change proposal as modified by this public comment.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1069-2020</td>
<td>Automatic Temperature Control Mixing Valves</td>
<td>Valves</td>
<td>410.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASSE 1070 is a working draft and was not completed at the time of this monograph.

Note: ASSE 1069 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1012-20092019 (Draft)</td>
<td>Backflow Preventers with an Intermediate Atmospheric Vent</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1014-20052020</td>
<td>Backflow Prevention Devices for Hand-Held Showers</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1017-20092019 (Draft)</td>
<td>Temperature Actuated Mixing Valves for Hot Water Distribution Systems</td>
<td>Valves</td>
</tr>
<tr>
<td>ASSE 1020-20042020</td>
<td>Pressure Vacuum Breaker Assembly Assemblies</td>
<td>Backflow Protection</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: ASSE 1012 and ASSE 1017 are working drafts and were not completed at the time of this monograph.

SUBSTANTIATION:
The above revisions reflect the latest updates to the ASSE standards that are referenced in Table 1001.1 and Table 1001.2.

COMMITTEE ACTION: ACCEPTED AS AMENDED

Amend comment as follows:

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1069-2020</td>
<td>Automatic Temperature Control Mixing Valves</td>
<td>Valves</td>
<td>410.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)
<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSE 1012-2019 (Draft)</td>
<td>Backflow Preventers with an Intermediate Atmospheric Vent</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1014-2020</td>
<td>Backflow Prevention Devices for Hand-held Showers</td>
<td>Backflow Protection</td>
</tr>
<tr>
<td>ASSE 1017-2019 (Draft)</td>
<td>Temperature Actuated Mixing Valves for Hot Water Distribution Systems</td>
<td>Valves</td>
</tr>
<tr>
<td>ASSE 1020-2020</td>
<td>Pressure Vacuum Breaker Assemblies</td>
<td>Backflow Protection</td>
</tr>
</tbody>
</table>

Committed to Card: 104

Committee Statement:
The Public Comment is being modified to only accept standards that are completed and not drafts. For this reason, ASSE 1070/ASME A112.1070/CSA B125.70, ASSE 1012, and ASSE 1017 are not being updated.

Total eligible to vote: 10

Voting Results: Affirmative: 9  Not Returned: 1  CHOET
### TABLE 1001.1
**REFERRED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A53/A53M-2012</td>
<td>Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless Piping, Ferrous</td>
<td>Table 307.1, Table 309.1</td>
<td></td>
</tr>
<tr>
<td>ASTM A74-2016</td>
<td>Cast Iron Soil Pipe and Fittings</td>
<td>Piping, Ferrous</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM A312/A312M-2018</td>
<td>Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes Piping, Ferrous</td>
<td>Table 307.1</td>
<td></td>
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<tr>
<td>ASTM A888-2018</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications Piping, Ferrous</td>
<td>Table 309.1</td>
<td></td>
</tr>
<tr>
<td>ASTM A1056-2012(R2017)</td>
<td>Cast Iron Couplings Used for Joining Hubless Cast Iron Soil Pipe and Fittings Piping, Ferrous</td>
<td>310.2.2</td>
<td></td>
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<tr>
<td>ASTM B251/B251M-2017</td>
<td>General Requirements for Wrought Seamless Copper and Copper-Alloy Tube Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
<td></td>
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<tr>
<td>ASTM B302-2017</td>
<td>Threadless Copper Pipe, Standard Sizes</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM B813-2016</td>
<td>Liquid and Paste Fluxes for Soldering of Copper and Copper-Alloy Tube</td>
<td>Joints</td>
<td>308.1.4, 310.3.3</td>
</tr>
<tr>
<td>ASTM C700-2013</td>
<td>Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated Piping, Non-Metallic</td>
<td>Table 309.1</td>
<td></td>
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<tr>
<td>ASTM C1173-2010(R2014)</td>
<td>Flexible Transition Couplings for Underground Piping Systems</td>
<td>Joints</td>
<td>310.8</td>
</tr>
<tr>
<td>ASTM C1277-2015</td>
<td>Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>ASTM C1460-2012</td>
<td>Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground</td>
<td>Joints</td>
<td>310.8</td>
</tr>
<tr>
<td>ASTM C1540-2015-2018</td>
<td>Heavy-Duty Shielded Couplings Joining Hubless Cast Iron</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>Standard</td>
<td>Description</td>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------</td>
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<td>ASTM D1785-2015(R2017)</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120</td>
<td>Piping, Plastic</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM D2466-2014-2017</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2564-2012(R2018)</td>
<td>Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems</td>
<td>Joints</td>
<td>308.12.2, 310.5.2</td>
</tr>
<tr>
<td>ASTM D2846/D2846M-2014</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>308.2.2, 308.3.1, Table 307.1</td>
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<tr>
<td>ASTM F438-2015</td>
<td>Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
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<td>ASTM F628-2012(R2017)</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F876-2015a2017</td>
<td>Crosslinked Polyethylene (PEX) Tubing</td>
<td>Piping, Plastic</td>
<td>308.9.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F877-2011a2018a</td>
<td>Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1281-20142017</td>
<td>Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1488-2014(R2019)</td>
<td>Coextruded Composite Pipe</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F1807-20142018a</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1866-20132018</td>
<td>Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F1960-20142018a</td>
<td>Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1961-2009</td>
<td>Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing(WITHDRAWN)</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2080-20162018</td>
<td>Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2098-20142018</td>
<td>Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) (WITHDRAWN) to Metal Insert and Plastic Insert Fittings</td>
<td>Joints</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2159-20142018a</td>
<td>Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Joints</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2262-2009</td>
<td>Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Tubing OD Controlled SDR9 (WITHDRAWN)</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
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<tr>
<td>ASTM F2376-20142017a</td>
<td>Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems</td>
<td>Water Slides</td>
<td>904.1</td>
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<tr>
<td>ASTM F2434-20142018</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing</td>
<td>Fittings</td>
<td>308.10.1, Table 307.1</td>
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<td>DOCUMENT TITLE</td>
<td>APPLICATION</td>
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<tr>
<td>ASTM A106/A106M-2015</td>
<td>Seamless Carbon Steel Pipe for High-Temperature Service</td>
<td>Piping, Ferrous</td>
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<tr>
<td>ASTM B135/B135M-2010</td>
<td>Seamless Brass Tube</td>
<td>Piping, Copper Alloy</td>
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<tr>
<td>ASTM F402-2005(R2012)2018</td>
<td>Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings</td>
<td>Joints</td>
<td></td>
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<tr>
<td>ASTM F2165-20132019</td>
<td>Flexible Pre-Insulated Plastic Piping</td>
<td>Piping, Plastic</td>
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Note: The ASTM standards meet the requirements for mandatory referenced standards in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

SUBSTANTIATION:
The above revisions reflect the latest updates to the ASTM standards that are referenced in Table 1001.1 and Table 1001.2.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 1001.1, Table 1001.2  Item #: 054

SUBMITTER: Steve Mawn  American Society of Testing and Materials (ASTM)

RECOMMENDATION:

Revise text

Request to accept the code change proposal as modified by this public comment.

### TABLE 1001.1

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<thead>
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<th>STANDARD NUMBER</th>
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<tr>
<td>ASTM A240/A240M-2018</td>
<td>Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications</td>
<td>Miscellaneous</td>
<td>402.3.3, 404.3.3</td>
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<tr>
<td>ASTM A269/A269M-2015a(R2019)</td>
<td>Seamless and Welded Austenitic Stainless Steel Tubing for General Service</td>
<td>Piping, Ferrous</td>
<td>Table 307.1</td>
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<tr>
<td>ASTM A312/A312M-2018a(R2019)</td>
<td>Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes</td>
<td>Piping, Ferrous</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM B75/B75M-2014a</td>
<td>Seamless Copper Tube</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
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<td>ASTM D1593-2013</td>
<td>Nonrigid Vinyl Chloride Plastic Film and Sheeting</td>
<td>Testing</td>
<td>402.3.5, 404.3.5</td>
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<tr>
<td>ASTM D2846/D2846M-2019</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>308.2.2, 308.3.1, Table 307.1</td>
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<tr>
<td>ASTM F439-2013</td>
<td>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</td>
<td>Fittings</td>
<td>Table 307.1</td>
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<tr>
<td>ASTM F442/F442M-2013</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)</td>
<td>Piping, Plastic</td>
<td>308.2.2, Table 307.1</td>
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<td>ASTM F876-2017a(R2019a)</td>
<td>Crosslinked Polyethylene (PEX) Tubing</td>
<td>Piping, Plastic</td>
<td>308.9.1, Table 307.1</td>
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<tr>
<td>ASTM F877-2018a(R2019)</td>
<td>Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1807-2018a(R2019b)</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Crosslinked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1960-2014a(R2019a)</td>
<td>Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1970-2012a(R2019)</td>
<td>Special Engineered Fittings, Appurtenances or Valves for Use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
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<td>ASTM F2080-2018</td>
<td>Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe</td>
<td>Fittings</td>
<td>Table 307.1</td>
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<tr>
<td>ASTM F2159-</td>
<td>Plastic Insert Fittings Utilizing a Copper Crimp Ring, Joints</td>
<td>Joints</td>
<td>Table 307.1</td>
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<td>ASTM A106/A106M-2018a</td>
<td>Seamless Carbon Steel Pipe for High-Temperature Service</td>
<td>Piping, Ferrous</td>
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<td>ASTM A254/A254M-2012(R2019)</td>
<td>Copper-Brazed Steel Tubing</td>
<td>Piping, Ferrous</td>
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<tr>
<td>ASTM A377-2018</td>
<td>Ductile Iron Pressure Pipe</td>
<td>Piping, Ferrous</td>
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<tr>
<td>ASTM B152/B152M-2014(R2019)</td>
<td>Copper Sheet, Strip, Plate, and Rolled Bar</td>
<td>Miscellaneous</td>
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<td>ASTM B587-2014(R2019)</td>
<td>Welded Brass Tube</td>
<td>Piping, Copper Alloy</td>
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<td>ASTM F714-2013(R2019)</td>
<td>Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter</td>
<td>Piping, Plastic</td>
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Note: The above ASTM standards meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

**TABLE 1001.2**

**STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES**

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the ASTM standards that are referenced in Table 1001.1 and Table 1001.2.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Item #: 055
USPSHTC 2021  Section: Table 1001.1, Table 1001.2

SUBMITTER: Peter Portela
American Welding Society (AWS)

RECOMMENDATION:
Revise text

### TABLE 1001.1
REFERENCED STANDARDS

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<th>REFERENCED SECTIONS</th>
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<tr>
<td>AWS A5.8M/A5.8-2011: AMD 1</td>
<td>Filler Metals for Brazing and Braze Welding</td>
<td>Joints</td>
<td>308.1.1, 310.3.1</td>
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(portions of table not shown remain unchanged)

Note: AWS A5.8M/A5.8 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

### TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

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<td>AWS B2.2/B2.2M-2016</td>
<td>Brazing Procedure and Performance Qualification</td>
<td>Certification</td>
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SUBSTANTIATION:
The above revisions reflect the latest updates to the AWS standards that are referenced in Table 1001.1 and Table 1001.2.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 1001.1  Item #: 055

SUBMITTER: Peter Portela
American Welding Society (AWS)

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

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TABLE 1001.1
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<th>REFERENCED SECTIONS</th>
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<td>Filler Metals for Brazing and Braze Welding</td>
<td>Joints</td>
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(portions of table not shown remain unchanged)

Note: AWS A5.8M/A5.8 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revision reflects the latest update to the AWS standard that is referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 058
USPSHTC 2021  Section: Table 1001.1

SUBMITTER: Nikki Kidd
    Canadian Standards Association (CSA)

RECOMMENDATION:
Revise text

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TABLE 1001.1
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<th>REFERENCED SECTIONS</th>
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<td>Glass Plumbing Fixtures</td>
<td>Fixtures</td>
<td>409.1</td>
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<td>Z401-2017</td>
<td></td>
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<td>CSA B79-2008</td>
<td>Commercial and Residential Drains and</td>
<td>DWV Components</td>
<td>413.1</td>
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<td>(R2013)</td>
<td>Cleanouts</td>
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<td>(R2018)</td>
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<td>CSA B125.3-2014</td>
<td>Plumbing Fittings</td>
<td>Fittings</td>
<td>409.3</td>
</tr>
<tr>
<td>2018</td>
<td></td>
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<tr>
<td>CSA Z21.56</td>
<td>Gas-Fired Pool Heaters (same as CSA 4.7)</td>
<td>Fuel Gas, Appliances and</td>
<td>404.4, 702.1</td>
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<td>2017</td>
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<td>Equipment</td>
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Note: The CSA standards meet the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revisions reflect the latest updates to the CSA standards that are referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPT AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA
PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 1001.1  Item #: 058

SUBMITTER: Nikki Kid
Canadian Standards Association (CSA)

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

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Note: CSA Z21.56 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revision reflects the latest update to the CSA standard that is referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 059

USPSHTC 2021 Section: Table 1001.1

SUBMITTER: Ed Wirtschoreck
International Code Council (ICC)

RECOMMENDATION:
Revise text

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<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tr>
<td>ICC A117.1-2009-2017</td>
<td>Accessible and Usable Buildings and Facilities</td>
<td>Miscellaneous</td>
<td>313.1, 410.4</td>
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(portions of table not shown remain unchanged)

Note: ICC A117.1 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revisions reflect the latest updates to the ICC standard that is referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC Section #: Table 1001.1, Table 1001.2

SUBMITTER: Kyle Thompson
IAPMO

Item #: 059

Comment #: 1
RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPMO Z124.5-2013e1 (R2018)</td>
<td>Plastic Toilet Seats</td>
<td>Fixtures</td>
<td>407.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: IAPMO Z124.5 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

TABLE 1001.2
STANDARDS, PUBLICATIONS, PRACTICES, AND GUIDES

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
<th>DOCUMENT TITLE</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>IAPMO PS 25-20022019</td>
<td>Metallic Fittings for Joining Polyethylene Pipe for Water Service and Yard Piping</td>
<td>Joints</td>
</tr>
<tr>
<td>IAPMO PS 34-20032019</td>
<td>Encasement Sleeves for Potable Water Pipe and Tubing</td>
<td>Piping</td>
</tr>
<tr>
<td>IAPMO PS 37-19902019</td>
<td>Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventative Tape</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>IAPMO PS 53-20142019a</td>
<td>Grooved Mechanical Pipe Couplings and Grooved Fittings</td>
<td>Joints</td>
</tr>
<tr>
<td>IAPMO PS 69-20062019</td>
<td>Bathwaste and Overflow Assemblies with Tub Filler Spout</td>
<td>DWV Components</td>
</tr>
<tr>
<td>IAPMO PS 87-19992019</td>
<td>Diverter and Shut-off Valves for Pool/Spas</td>
<td>Valves</td>
</tr>
<tr>
<td>IAPMO Z124.8-2013e2 (R2018)</td>
<td>Plastic Liners for Bathtubs and Shower Receptors</td>
<td>Fixtures</td>
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</table>

(portions of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the IAPMO standards that are referenced in Table 1001.1 and Table 1001.2.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
Proposals

Item #: 060

USPSHTC 2021  Section: Table 1001.2

SUBMITTER: David Thompson
Manufacturers Standardization Society (MSS)

RECOMMENDATION:
Revise text

<table>
<thead>
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<th>DOCUMENT NUMBER</th>
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<tr>
<td>MSS SP-25-2013-2018</td>
<td>Standard Marking System for Valves, Fittings, Flanges, and Unions</td>
<td>Miscellaneous</td>
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(portions of table not shown remain unchanged)

SUBSTANTIATION:
The above revisions reflect the latest updates to the MSS standards that are referenced in Table 1001.2.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 1001.2  Item #: 060

SUBMITTER: David Thompson
Manufacturers Standardization Society (MSS)

RECOMMENDATION:
Revise text
Request to accept the code change proposal as modified by this public comment.

<table>
<thead>
<tr>
<th>DOCUMENT NUMBER</th>
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<tbody>
<tr>
<td>MSS SP-67-2017</td>
<td>Butterfly Valves (including errata, dated September 21, 2018)</td>
<td>Valves</td>
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</table>

(portions of table not shown remain unchanged)

**SUBSTANTIATION:**
The above revisions reflect the latest updates to the MSS standards that are referenced in Table 1001.2.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:** AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Proposals

Item #: 061
USPSHTC 2021  Section: Table 1001.1

SUBMITTER: Heath Dehn
National Fire Protection Association (NFPA)

RECOMMENDATION:
Revise text

<table>
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<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tr>
<td>NFPA 400-2016-2019</td>
<td>Hazardous Material Code</td>
<td>Miscellaneous</td>
<td>807.3</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

Note: NFPA 400 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revision reflects the latest update to the NFPA standard that is referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments

PUBLIC COMMENT 1

Code Year: 2021 USPSHTC  Section #: Table 1001.1  Item #: 061
SUBMITTER: Heath Dehn
National Fire Protection Association (NFPA)

RECOMMENDATION:
Revise text
Request to accept the code change proposal as modified by this public comment.

### TABLE 1001.1
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
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<tbody>
<tr>
<td>NFPA 70-20172020</td>
<td>National Electrical Code</td>
<td>Miscellaneous</td>
<td>401.3, 404.1, 417.1, 603.1, 804.1, 804.2, 804.3, 804.4, 804.5</td>
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<tr>
<td>NFPA 780-20172020</td>
<td>Installation of Lightning Protection Systems</td>
<td>Miscellaneous</td>
<td>401.2</td>
</tr>
</tbody>
</table>

(portions of table not shown remain unchanged)

**Note:** NFPA 70 and NFPA 780 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

**SUBSTANTIATION:**
The above revision reflects the latest updates to the NFPA standards that are referenced in Table 1001.1.

**COMMITTEE ACTION:** ACCEPTED AS SUBMITTED

**TOTAL ELIGIBLE TO VOTE:** 10

**VOTING RESULTS:**  AFFIRMATIVE: 9   NOT RETURNED: 1   CHOE
Proposals

Item #: 062
USPSHTC 2021  Section: Table 1001.1

SUBMITTER: Jeremy Brown  
NSF International (NSF)

RECOMMENDATION:  
Revise text

<table>
<thead>
<tr>
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<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>NSF 14-2016-2018</td>
<td>Plastics Piping System Components and Related Materials</td>
<td>Piping, Plastic</td>
<td>301.2, 307.1</td>
</tr>
<tr>
<td>NSF 61-2016-2018</td>
<td>Drinking Water System Components - Health Effects</td>
<td>Water Supply Components</td>
<td>307.1, 412.1, 504.6</td>
</tr>
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</table>

(portions of table not shown remain unchanged)

Note: NSF 14, NSF 50 and NSF 61 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:  
The above revisions reflect the latest updates to the NSF standards that are referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPT AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10

VOTING RESULTS:  AFFIRMATIVE: 9  NOT RETURNED: 1  FRUIA

Appended Comments
PUBLIC COMMENT 1
Code Year: 2021 USPSHTC  Section #: Table 1001.1  Item #: 062
SUBMITTER: Jeremy Brown  NSF International (NSF)  Comment #: 1

RECOMMENDATION:
Revise text

Request to accept the code change proposal as modified by this public comment.

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<th>APPLICATION</th>
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<tbody>
<tr>
<td>NSF 61-2018</td>
<td>Drinking Water System Components - Health Effects</td>
<td>Water Supply Components</td>
<td>307.1, 412.1, 504.6</td>
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</table>

(portions of table not shown remain unchanged)

Note: NSF 61 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revision reflects the latest update to the NSF standard that is referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED

TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9  NOT RETURNED: 1  CHOE
**SUBMITTER:** Christopher Jensen  
UL LLC

**RECOMMENDATION:**  
Revise text

**TABLE 1001.1**  
**REFERENCED STANDARDS**

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>UL 379-2013</td>
<td>Power Units for Fountain, Swimming Pool, and Spa Luminaires <em>(with revisions through September 19, 2017)</em></td>
<td>Equipment</td>
<td>401.3.5</td>
</tr>
<tr>
<td>UL 399-2017</td>
<td>Drinking Water Coolers (with revisions through May 17, 2017 August 29, 2018)</td>
<td>Appliances</td>
<td>412.1</td>
</tr>
<tr>
<td>UL 676-2015</td>
<td>Underwater Luminaires and Submersible Junction Boxes <em>(with revisions through February 26, 2018)</em></td>
<td>Miscellaneous</td>
<td>401.3.5</td>
</tr>
<tr>
<td>UL 1081-2016</td>
<td>Swimming Pool Pumps, Filters, and Chlorinators (with revisions through October 21, 2016 October 20, 2017)</td>
<td>Appliances and Equipment</td>
<td>507.2, 604.1</td>
</tr>
<tr>
<td>UL 1261-2016</td>
<td>Electric Water Heaters for Pools and Tubs (with revisions through October 7, 2016 September 1, 2017)</td>
<td>Appliances and Equipment</td>
<td>702.2</td>
</tr>
<tr>
<td>UL 1480-2016</td>
<td>Speakers for Fire Alarm, Emergency, and Commercial and Professional Use and Signaling Systems, Including Accessories <em>(with revisions through October 17, 2012 September 7, 2017)</em></td>
<td>Miscellaneous</td>
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<tr>
<td>UL 1563-2009</td>
<td>Electric Spas, Equipment Assemblies, and Associated Equipment <em>(with revisions through October 7, 2016 October 20, 2017)</em></td>
<td>Appliances and Equipment</td>
<td>404.1, 404.4, 511.1, 604.1, 702.2</td>
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<tr>
<td>UL 2017-2008</td>
<td>General-Purpose Signaling Devices and Systems <em>(with revisions through January 27, 2016 December 14, 2018)</em></td>
<td>Miscellaneous</td>
<td>803.5</td>
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(portions of table not shown remain unchanged)

**Note:** The UL standards meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

**SUBSTANTIATION:**  
The above revisions reflect the latest updates to the Underwriters Laboratories (UL) standards that are referenced in Table 1001.1.
COMMITTEE ACTION: ACCEPT AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 FRUIA

Appended Comments

PUBLIC COMMENT 1
Code Year: 2021 USPSHTC  Section #: Table 1001.1  Item #: 063
SUBMITTER: Christopher Jensen  UL LLC  Comment #: 1
RECOMMENDATION: Revise text

Request to accept the code change proposal as modified by this public comment.

TABLE 1001.1
REFERENCED STANDARDS

<table>
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<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
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<tr>
<td>UL 399-2017</td>
<td>Drinking Water Coolers (with revisions through August 29, 2018 May 23, 2019)</td>
<td>Appliances</td>
<td>412.1</td>
</tr>
<tr>
<td>UL 676-2015</td>
<td>Underwater Luminaires and Submersible Junction Boxes (with revisions through February 26, 2018 October 14, 2019)</td>
<td>Miscellaneous</td>
<td>401.3.5</td>
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</table>

(portions of table not shown remain unchanged)

Note: UL 399, UL 676, and UL 1241 meet the requirements for mandatory reference standards in accordance with Section 15.0 of IAPMO's Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.

SUBSTANTIATION:
The above revisions reflect the latest updates to the Underwriters Laboratories (UL) standards that are referenced in Table 1001.1.

COMMITTEE ACTION: ACCEPTED AS SUBMITTED
TOTAL ELIGIBLE TO VOTE: 10
VOTING RESULTS: AFFIRMATIVE: 9 NOT RETURNED: 1 CHOE
Slip-Resistance
Task Group
Report
During the Uniform Swimming Pool, Spa & Hot Tub Technical Committee (USPSHTC TC) Meeting on June 18, 2019, the USPSHTC TC requested a task group be formed to generate provisions for slip-resistance.

The scope of the USPSHTC Slip-Resistance Task Group is as follows:

The scope of the Slip-Resistance Task Group is to review available slip-resistance test methods and determine appropriate criteria. Also, research will be conducted to determine if additional applicable standards are available for the purpose of developing public comments for technical committee consideration.

The Task Group conducted four meetings which lasted roughly two hours each. During the first meeting, the Task Group reviewed the various test methods for determining dynamic coefficient of friction (DCOF) values of walkway surfaces. The group heavily compared and discussed the Wet Pendulum Method (as listed in AS 4586), the DCOF Test Method (as listed within TCNA A326.3), and various definitions pertaining to slip-resistance and testing.

After lengthy discussions, the Task Group determined that the DCOF Test Method provided in TCNA A326.3 was the most appropriate for inclusion within the USPSHTC. The Task Group further aimed to address limitations within TCNA A326.3 and introduce solutions in order to provide specifications for both inclined and profiled walkway surfaces.

A list of considerations to be made by the specifier were included within the provided public comment to address limitations of the standard. The minimum required DCOF value listed within TCNA A326.3 was based on human slip research with pedestrians wearing hard sole shoes as there is currently a lack of reliable published correlation between tribometer measurements and the frictional requirements of barefoot pedestrians on wet surfaces.

Additionally, the operational characteristics of the tribometer to be used in conjunction with TCNA A326.3 requires testing over nominally flat portions of walkways. For this reason, the Task Group’s proposed criteria preclude testing across grout joints and over profiled or patterned walkways, necessarily establishing separate provisions where nominally flat specimens are an impossibility.
Furthermore, an equation was provided which generates a “corrected” DCOF value for inclined walkway surfaces. This corrected value is dependent upon the level DCOF value as well as the angle of slope, and an example calculation was provided within a newly proposed Appendix C (Slip-Resistant Walkway Surfaces). This Appendix also addresses cumulative wear of walkways surfaces and recommended accelerated wear testing for walkways intended to have a high pedestrian volume.

Upon completion of the final Task Group meeting, a single public comment was generated which proposed the DCOF Test Method, compliance with TCNA A326.3, corrected DCOF values for inclined surfaces, example calculations for corrected DCOF values, and informative notes for the specifier to consider.

Item #: 016
Section: 314.0 – 314.1.3, Table 1001.1, Appendix C

RECOMMENDATION:

314.0 Slip-Resistant Walkway Surfaces.
314.1 General. Where walkway surfaces are in locations subject to being wet with water, such surfaces shall be in accordance with Section 314.1.1 through Section 314.1.3. (See Appendix C for informative notes and an example calculation.)

314.1.1 DCOF, Level Walkways. Level hard-surface walkways intended to be walked upon while wet with water shall have a dynamic coefficient of friction (DCOF) of not less than 0.42 as determined in accordance with TCNA A326.3.

314.1.2 DCOF, Inclined Walkways. Inclined hard-surface walkways with a slope greater than or equal to 1 inch per 20 inches (50 mm/m) shall be tested in accordance with TCNA A326.3 and shall have a corrected minimum required DCOF in accordance with Equation 314.1.2.

\[
\mu_{corrected} = \frac{\tan \alpha + \mu_{level}}{1-(\mu_{level} \times \tan \alpha)}
\]  
(Equation 314.1.2)

Where:
\(\mu_{corrected}\) = corrected DCOF of surface
\(\alpha\) = angle of slope, degrees
\(\mu_{level}\) = level DCOF of surface = 0.42 minimum

314.1.3 Three-dimensionally Patterned or Profiled Walkways. Walkway DCOF data shall not be based on testing conducted across grout joints or across protruding features of three-dimensionally patterned or profiled hard surface walkways. DCOF data (obtained through complying with Sections 314.1.1 and Section 314.1.2) shall be based on testing conducted over a nominally flat section of such walkways. If a design professional specifies a walkway surface for which DCOF data from nominally flat sections is not obtainable, the design professional shall document their foundations for concluding the specified walkway surface is at least as slip-resistant as walkway surfaces meeting Sections 314.1.1 or Section 314.1.2. This documentation shall be included with the construction documents.
C 101.0 General.  
C 101.1 Applicability. This appendix provides additional information regarding the determination of dynamic coefficient of friction (DCOF) values for hard-surface walkways intended to be slip-resistant, in Section 314.0 through Section 314.1.3.  

Notes: The minimum required DCOF of 0.42, as specified in Section 314.1.1, was based upon human slip research with pedestrians wearing hard sole shoes. There is no current consensus standard establishing minimum DCOF levels correlated to human barefoot slips on swimming pool, spa, or hot tub walking surfaces.  
DCOF measurements taken across grout joints and protruding features of three-dimensionally patterned or profiled walkways can produce biased and misleading DCOF values due to test device limitations.  
Cumulative wear of walkway surfaces typically decreases the DCOF. In order to ensure the minimum required DCOF is maintained, accelerated wear testing may be advisable for walkways with high pedestrian volume.  

C 102.0 Example Calculation for Slope Corrected Slip-Resistant Walkway Surfaces.  
C 102.1 Example Calculation. Determine the required corrected DCOF for an inclined walkway surface intended to be slip-resistant with a slope of 2.9 degrees and a level DCOF of 0.42.  

Solution:  
\[
\mu_{corrected} = \frac{\tan(\alpha) + \mu_{level}}{1 - (\mu_{level} \times \tan(\alpha))} \\
= \frac{\tan(2.9^\circ) + 0.42}{1 - [0.42 \times \tan(2.9^\circ)]} \\
= 0.48
\]

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
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<tbody>
<tr>
<td>TCNA A326.3-2017</td>
<td>Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials</td>
<td>Safety</td>
<td>314.1.1, 314.1.2</td>
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</tbody>
</table>

Note: TCNA A326.3 meets the requirements for a mandatory reference standard in accordance with Section 15.0 of IAPMO’s Regulations Governing Consensus Development of the Uniform Solar, Hydronics & Geothermal and Swimming Pool, Spa & Hot Tub Codes.
SUBSTANTIATION:

The proposed language pertaining to slip-resistant walkway surfaces is necessary for inclusion as it addresses level and inclined walkways as well as walkways which are three dimensionally patterned or profiled. Currently there are no specific provisions within the Uniform Swimming Pool, Spa and Hot Tub Code (USPSHTC) which provide the necessary guidelines for walkway friction testing along with required minimum friction test values for walkway surfaces intended to be slip-resistant. Various factors must be considered in order to appropriately assess such surfaces, and applicable standards must be applied.

In this case, there is a single standard, TCNA A326.3, which has been deemed the most appropriate by the USPSHTC Slip-Resistance Task Group for such provisions. This active ANSI standard provides a minimum DCOF (dynamic coefficient of friction) value of 0.42 for hard surface flooring materials along with a test method for measuring DCOF values that can be used in the laboratory or in the field.

The DCOF test method provided in TCNA A326.3 requires the use of a portable digital tribometer called the BOT 3000E. This tribometer and method have been used in the TCNA A137.1 standard for ceramic tile since 2012, and were generalized for hard surface walkways in TCNA A326.3 starting in 2017. For these reasons, TCNA A326.3 along with its required test method has been widely adopted.

The minimum DCOF value of 0.42 is based on TCNA’s reference to German research by Stefan Bonig (1995) and Jens Sebald (2009). In the later paper by Sebald, a general correlation of BOT 3000 measurements to human slip research was derived. This correlation was based on the tribometer and human test subjects utilizing the same hard-sole footwear polymer. Beyond this correlation, a survey among researchers led to a safety factor being added to nominal research results, with the outcome being the 0.42 minimum DCOF.

Although TCNA A326.3 is deemed the most appropriate, there are considerations which must be made by the specifier to address a lack of reliable published correlation between tribometer measurements and the frictional requirements of barefoot pedestrians on wet pool, spa, and hot tub walking surfaces. Current publications are for barefoot humans on ordinary walkway materials, or for footwear-shod humans on bathing-type surfaces. As such, a proposed “Appendix C” provides appropriate caveats so that the specifier will know to consider the limitations of the 0.42 DCOF threshold.

As a result of gravity, inclined or sloped surfaces require greater available friction to prevent slipping. Therefore, as highlighted in the proposed Section 314.1.2, an adjusted and increased DCOF value must be determined and used for such surfaces. Utilizing the specified level 0.42 DCOF for inclined surfaces would not provide adequate frictional resistance and would result in a higher likelihood of slipping. In order to account for changes in available friction due to sloped surfaces, Equation 314.1.2 is being proposed along with sample calculations in Appendix C. This equation was gathered from "The Staircase: Studies of Hazards, Falls, and Safer Design" (1995), by John Templer, and generates a corrected DCOF value based on the incline of the surface being tested.

Additionally, provisions have been proposed (in Section 314.1.3) which address measurements taken across grout joints or protruding features of three-dimensionally patterned or profiled hard surface walkways. Due to the operational characteristics of the BOT 3000E tribometer specified in TCNA A326.3, DCOF testing across such surfaces can provide inaccurate results which do
not represent the true DCOF of the nominally flat portions of the tested walkways. For example, testing using the BOT 3000E across grout gaps typically produces varied DCOF spikes in collected data. Since the BOT 3000E DCOF measurement value is based on the average of numerous data points taken across a testing area, the DCOF value indicated on the BOT 3000E will be higher than the true DCOF of the surface being tested. For these reasons, Section 314.1.3 is being included to list provisions which require testing to be conducted over nominally flat portions of walkways required to be slip-resistant. The proposed Section 314.1.3 accommodates situations wherein DCOF data is not available for a nominally flat portion of the walkway material by requiring the specifier to document their selection rationale. A supporting description of this BOT 3000E technical issue is included in the proposed Appendix C.

One additional section of Appendix C addresses the effects of wear on DCOF values. This section is just advisory as there are no well-defined methods for characterizing “high pedestrian volume” as it relates to the durability of different walking surface materials.

For the above reasons, the proposed public comment is necessary and provides inspectors and specifiers with the necessary provisions for surfaces intended to be slip-resistant. In future code cycles, the USPSHTC Slip-Resistance Task Group will incorporate and modify provisions to include the most up to date applicable standards and test methods to promote public safety and ensure slip-resistant surfaces are accessed appropriately.
Technical
Correlating Committee
Report for
USHGC/USPSHTC
2020 IAPMO Technical Correlating Committee (TCC) Report

Correlation Items Between the USPSHTC and USHGC

TCC ITEM # 001

2021 USHGC

ITEM # 003 Public Comment 1

302.0 Standards and Alternates.
302.1 Minimum Standards. (remaining text unchanged)

302.1.2 Standards. Standards listed or referred to in this chapter or other chapters cover materials that will conform to the requirements of this code, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of standards that appear in specific sections of this code are referenced in Table 901.1. Standards referenced in Table 901.1 shall be applied as indicated in the applicable referenced section. A list of additional approved standards, publications, practices and guides that are not referenced in specific sections of this code appear in Table 901.2.

2021 USPSHTC

ITEM # 010 Public Comment 1

301.0 General.
301.2 Minimum Standards. (remaining text unchanged)

301.2.2 Standards. Standards listed or referred to in this chapter or other chapters cover materials that will conform to the requirements of this code, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of swimming pool, spa and hot tub standards that appear in specific sections of this code is referenced in Table 1001.1. Standards referenced in Table 1001.1 shall be applied as indicated in the applicable referenced section. A list of additional approved standards, publications, practices and guides that are not referenced in specific sections of this code appear in Table 1001.2. The documents indicated in Table 1001.2 shall be permitted in accordance with Section 301.3.

X Accept Recommendation as Submitted

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<th>Substantiation:</th>
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<tbody>
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<td>The language in USPSHTC Item #010 for Section 301.2.2 is being revised to correlate with the language approved by USHGC Item #003 for Section 302.1.2 pertaining to approved standards, publications, practices and guides within the referenced standards tables.</td>
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<tr>
<td>The following is being provided for informational purposes only:</td>
</tr>
<tr>
<td>The substantiation provided for Item #003 Comment 1 of the USHGC is as follows: &quot;The revisions to Section 302.1.2 are being resubmitted to correlate with the language approved in Item #048 of the 2019 UMC ROC. The approval of such change allows for the use of an applicable approved standard in Table 901.2 (Standards, Publications, Practices, and Guides) without the additional requirement of compliance with Section 302.2 (Alternative Materials and Methods of Constructions Equivalency). This is necessary since the documents listed in Table 901.2 have already been reviewed by the Technical Committee and deemed appropriate for use based on the listed application within the table.&quot;</td>
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Reject the Recommendation
The substantiation provided for Item #010 Comment 1 of the USPSHTC is as follows: “The revisions to Section 301.2.2 are being resubmitted to correlate with the language approved in Item #048 of the 2019 UMC ROC. The approval of such change allows for the use of an applicable approved standard in Table 1001.2 (Standards, Publications, Practices, and Guides) without the additional requirement of compliance with Section 301.3 (Alternative Materials and Methods of Construction Equivalency). This is necessary since the documents listed in Table 1001.2 have already been reviewed by the Technical Committee and deemed appropriate for use based on the listed application within the table.”

The Committee Statement provided for rejecting Item #010 Public Comment 1 by the USPSHTC TC is as follows: “The public comment is being rejected since the word “approved” is not appropriate for usage within the section. It refers to a standard being used “as approved by the AHJ.” Although the standards are within the scope of the USPSHTC, the AHJ has not reviewed the standards listed within the code. For this reason, the rejection is justified.”
RECOMMENDATION:

505.0 Swimming Pools, Spas, and Hot Tubs.
505.1 Water Chemistry. Where water from a swimming pool, spa or hot tub is heated by way of circulation through solar collectors, the chemistry of such water shall comply with the requirements of Section 505.2, and shall be filtered in accordance with Section 505.3 and Section 505.3.1.

505.2 Parameters. Parameters for chemicals used within a swimming pool, spa, or hot tub shall be in accordance with Table 505.2.

<table>
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<tr>
<th>PARAMETER</th>
<th>ACCEPTANCE RANGE</th>
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<tbody>
<tr>
<td>Total Alkalinity</td>
<td>80-120 ppm</td>
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(portions of table not shown remain unchanged)

508.0 Primary Disinfection.
508.1 General. Chemicals for a swimming pool, spa, or hot tub shall be dispensed in accordance with the chemical manufacturer’s instructions, Material Safety Data Sheets (MSDS), and applicable standards and regulations. Parameters for chemicals used within a swimming pool, spa, and hot tub shall be in accordance with Table 508.1.

<table>
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<tr>
<th>PARAMETER</th>
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<tr>
<td>Total Alkalinity</td>
<td>60-180 80-120 ppm</td>
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</table>

(portions of table not shown remain unchanged)

Substantiation:
The language in USPSHTC Item #034 for Table 508.1 is being revised to correlate with the language shown in Table 505.2 of the USHGC. The alkalinity range which was accepted in USPSHTC Item #034 was considered to be too broad. It was concluded that the range listed in the USHGC is more appropriate.

The following is being provided for informational purposes only:

The substantiation provided for public comment #1 for Item #034 of the USPSHTC is as follows:

“Total alkalinity is directly related to pH and represents the ability of a solution to neutralize hydrogen ions and resist a change in pH. According to the 2018 edition of the Model Aquatic Health Code, the acceptable range for alkalinity is 60 ppm to 180 ppm. This range has been updated as it helps to prevent wide variations in pH in the event that acids or alkali are added to the pool water. For the above reasons, the range is being updated.”
Dear Technical Correlating Committee Members:

Attached are the final ballot results for the committee recommendations as a result of the actions taken during your recent meeting.

6 Members eligible to Vote

(See attached voting results for details)

There are two criteria necessary to pass the letter ballot for each item as follows:
1. The number of affirmative votes needed for each item to pass is ¾ affirmative.
2. In all cases, an affirmative vote of at least a simple majority of the total members eligible to vote is required.

All of the committee actions for the Technical Correlating Committee Report achieved the necessary ¾ affirmative votes and simple majority on returned ballots.

Thank you for your willingness to participate in this Committee. If you have any questions please contact Taylor Costea at (909) 218-8126 or email at Taylor.Costea@iapmo.org.

Best Regards,

Taylor Costea
<table>
<thead>
<tr>
<th>Ballot Name: TCC Item #001 - July 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Votes: 6</td>
</tr>
<tr>
<td>Vote Summary</td>
</tr>
<tr>
<td>Option</td>
</tr>
<tr>
<td>AFFIRMATIVE</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Murray, Edmond</td>
</tr>
<tr>
<td>Hamil, Beth</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Ballot Name: TCC Item #002 - July 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Votes: 6</td>
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<tr>
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</tr>
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<td>NEGATIVE w/comment</td>
</tr>
<tr>
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</tr>
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<td>Voter Name</td>
</tr>
<tr>
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</tr>
<tr>
<td>Murray, Edmond</td>
</tr>
<tr>
<td>Hamil, Beth</td>
</tr>
</tbody>
</table>
Uniform Swimming Pool, Spa & Hot Tub Code Preprint
TABLE OF CONTENTS

Note: Page numbers and section numbers will be updated before publishing.

**CHAPTER 1**  
**ADMINISTRATION**  
101.0 General . . . . . . . . . . . . . . . . . . . . . . 1  
101.1 Title . . . . . . . . . . . . . . . . . . . . . . . . . 1  
101.2 Scope . . . . . . . . . . . . . . . . . . . . . . . . . 1  
101.3 Purpose . . . . . . . . . . . . . . . . . . . . . . . . 1  
101.4 Unconstitutional . . . . . . . . . . . . . . . . . . . 1  
101.5 Validity . . . . . . . . . . . . . . . . . . . . . . . . 1  
102.0 Applicability . . . . . . . . . . . . . . . . . . . . . 1  
102.1 Conflicts Between Codes . . . . . . . . . . . . . . . 1  
102.2 Existing Installations . . . . . . . . . . . . . . . . . 1  
102.3 Maintenance . . . . . . . . . . . . . . . . . . . . . . 1  
102.4 Additions, Alterations, Renovations,  
or Repairs . . . . . . . . . . . . . . . . . . . . . . . . . 1  
102.5 Health and Safety . . . . . . . . . . . . . . . . . . . 1  
102.6 Changes in Building Occupancy . . . . . . . . . . . . 1  
102.7 Moved Structures . . . . . . . . . . . . . . . . . . . 1  
102.8 Appendices . . . . . . . . . . . . . . . . . . . . . . . 1  
103.0 Duties and Powers of the  
Authority Having Jurisdiction . . . . . . . . . . . . . . . 1  
103.1 General . . . . . . . . . . . . . . . . . . . . . . . . 1  
103.2 Liability . . . . . . . . . . . . . . . . . . . . . . . . 2  
103.3 Applications and Permits . . . . . . . . . . . . . . . 2  
103.4 Right of Entry . . . . . . . . . . . . . . . . . . . . . 2  
104.0 Permits . . . . . . . . . . . . . . . . . . . . . . . . . 2  
104.1 Permits Required . . . . . . . . . . . . . . . . . . . . 2  
104.2 Exempt Work . . . . . . . . . . . . . . . . . . . . . . 2  
104.3 Application for Permit . . . . . . . . . . . . . . . . . 2  
104.4 Permit Issuance . . . . . . . . . . . . . . . . . . . . 3  
104.5 Fees . . . . . . . . . . . . . . . . . . . . . . . . . . 4  
105.0 Inspections and Testing . . . . . . . . . . . . . . . . 4  
105.1 General . . . . . . . . . . . . . . . . . . . . . . . . 4  
105.2 Required Inspection . . . . . . . . . . . . . . . . . . 4  
105.3 Testing of Systems . . . . . . . . . . . . . . . . . . . 5  
105.4 Connection to Service Utilities . . . . . . . . . . . . 5  
106.0 Violations and Penalties . . . . . . . . . . . . . . . 5  
106.1 General . . . . . . . . . . . . . . . . . . . . . . . . 5  
106.2 Notice of Correction or Violation . . . . . . . . . . . . 5  
106.3 Penalties . . . . . . . . . . . . . . . . . . . . . . . . 5  
106.4 Stop Orders . . . . . . . . . . . . . . . . . . . . . . . 5  
106.5 Authority to Disconnect Utilities in Emergencies . . . . . 6  
106.6 Authority to Condemn . . . . . . . . . . . . . . . . . 6  
107.0 Board of Appeals . . . . . . . . . . . . . . . . . . . 6  
107.1 General . . . . . . . . . . . . . . . . . . . . . . . . 6  
107.2 Limitations of Authority . . . . . . . . . . . . . . . 6  
107.3 Penalties . . . . . . . . . . . . . . . . . . . . . . . . 6  
107.4 Notice of Correction or Violation . . . . . . . . . . . . 6  
107.5 Authority to Disconnect Utilities in Emergencies . . . . . 6  
107.6 Authority to Condemn . . . . . . . . . . . . . . . . . 6  
107.7 Board of Appeals . . . . . . . . . . . . . . . . . . . 6  

**CHAPTER 2**  
**DEFINITIONS**  
201.0 General . . . . . . . . . . . . . . . . . . . . . . . . 9  
201.1 Applicability . . . . . . . . . . . . . . . . . . . . . . 9  
202.0 Definition of Terms . . . . . . . . . . . . . . . . . . 9  
202.1 General . . . . . . . . . . . . . . . . . . . . . . . . 9  

**CHAPTER 3**  
**GENERAL REGULATIONS**  
301.0 General . . . . . . . . . . . . . . . . . . . . . . . . 19  
301.1 Applicability . . . . . . . . . . . . . . . . . . . . . . 19  
301.2 Minimum Standards . . . . . . . . . . . . . . . . . 19  
301.3 Alternate Materials and Methods  
of Construction Equivalency . . . . . . . . . . . . . . . . 19  
301.4 Swimming Pools in Flood  
Hazard Areas . . . . . . . . . . . . . . . . . . . . . . . 19  
301.5 Alternative Engineered Design . . . . . . . . . . . . 20  
302.0 Workmanship and Installation  
Practices . . . . . . . . . . . . . . . . . . . . . . . . . 20  
302.1 Non-Threaded Plastic Piping . . . . . . . . . . . . . . 20  
302.2 Threaded Plastic Piping . . . . . . . . . . . . . . . . 20  
302.3 Bends in Plastic Piping . . . . . . . . . . . . . . . . 21  
302.4 Bends in Copper or Copper  
Alloy Tubing . . . . . . . . . . . . . . . . . . . . . . . 21  
302.5 Protection of Circulating  
Piping . . . . . . . . . . . . . . . . . . . . . . . . . 21  
302.6 Burred Ends . . . . . . . . . . . . . . . . . . . . . . 21  
302.7 Increasers and Reducers . . . . . . . . . . . . . . . . 21  
303.0 Prohibited Fittings and  
Practices . . . . . . . . . . . . . . . . . . . . . . . . . 21  
303.1 Drainage and Vent Piping . . . . . . . . . . . . . . . 21  
303.2 Dissimilar Metals . . . . . . . . . . . . . . . . . . . . 21  
303.3 Direction of Flow . . . . . . . . . . . . . . . . . . . . 21  
304.0 Protection of Piping, Materials,  
and Structures . . . . . . . . . . . . . . . . . . . . . . . 21  
304.1 Installation . . . . . . . . . . . . . . . . . . . . . . . 21  
304.2 Building Sewer and Drainage  
Piping . . . . . . . . . . . . . . . . . . . . . . . . . 21  
304.3 Corrosion, Erosion, and  
Mechanical Damage . . . . . . . . . . . . . . . . . . . . 21  
304.4 Protectively Coated Pipe . . . . . . . . . . . . . . . . 21  
304.5 Freezing Protection . . . . . . . . . . . . . . . . . . . 21
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>304.6</td>
<td>Fire-Resistant Construction</td>
<td>21</td>
</tr>
<tr>
<td>304.7</td>
<td>Waterproofing of Openings</td>
<td>21</td>
</tr>
<tr>
<td>304.8</td>
<td>Steel Nail Plates</td>
<td>21</td>
</tr>
<tr>
<td>304.9</td>
<td>Sleeves</td>
<td>21</td>
</tr>
<tr>
<td>304.10</td>
<td>Structural Members</td>
<td>21</td>
</tr>
<tr>
<td>304.11</td>
<td>Rodentproofing</td>
<td>21</td>
</tr>
<tr>
<td>304.12</td>
<td>Exposed PVC Piping</td>
<td>21</td>
</tr>
<tr>
<td>305.0</td>
<td>Trenching, Excavation, and</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Backfill</td>
<td></td>
</tr>
<tr>
<td>305.1</td>
<td>Trenches</td>
<td>22</td>
</tr>
<tr>
<td>305.2</td>
<td>Tunneling and Driving</td>
<td>22</td>
</tr>
<tr>
<td>305.3</td>
<td>Open Trenches</td>
<td>22</td>
</tr>
<tr>
<td>305.4</td>
<td>Excavations</td>
<td>22</td>
</tr>
<tr>
<td>306.0</td>
<td>Energy Consumption for Pools,</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Spas, and Hot Tubs</td>
<td></td>
</tr>
<tr>
<td>306.1</td>
<td>General</td>
<td>22</td>
</tr>
<tr>
<td>307.0</td>
<td>Water Supply and</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Circulating System Pipe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Fitting Materials</td>
<td></td>
</tr>
<tr>
<td>307.1</td>
<td>Materials</td>
<td>22</td>
</tr>
<tr>
<td>307.2</td>
<td>Copper or Copper Alloy Tube</td>
<td>22</td>
</tr>
<tr>
<td>307.3</td>
<td>Hard-Drawn Copper or Copper</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Alloy Tubing</td>
<td></td>
</tr>
<tr>
<td>307.4</td>
<td>Flexible Connectors</td>
<td>22</td>
</tr>
<tr>
<td>307.5</td>
<td>Cast-Iron Fittings</td>
<td>22</td>
</tr>
<tr>
<td>307.6</td>
<td>Malleable Iron</td>
<td>22</td>
</tr>
<tr>
<td>307.7</td>
<td>Previously Used Piping and</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Tubing</td>
<td></td>
</tr>
<tr>
<td>307.8</td>
<td>Plastic Materials</td>
<td>22</td>
</tr>
<tr>
<td>307.9</td>
<td>Lead Content</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Table 307.1</td>
<td></td>
</tr>
<tr>
<td>307.10</td>
<td>Flexible PVC Hoses and</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Tubing</td>
<td></td>
</tr>
<tr>
<td>307.11</td>
<td>Pool, Spa, and Hot Tub Fittings</td>
<td>24</td>
</tr>
<tr>
<td>308.0</td>
<td>Water Supply and</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Circulating System Pipe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Connections</td>
<td></td>
</tr>
<tr>
<td>308.1</td>
<td>Copper or Copper Alloy Pipe</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Tubing, and Joints</td>
<td></td>
</tr>
<tr>
<td>308.2</td>
<td>CPVC Plastic Pipe and Joints</td>
<td>24</td>
</tr>
<tr>
<td>308.3</td>
<td>CPVC/AL/CPVC Plastic Pipe</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>and Joints</td>
<td></td>
</tr>
<tr>
<td>308.4</td>
<td>Ductile Iron Pipe and Joints</td>
<td>25</td>
</tr>
<tr>
<td>308.5</td>
<td>Galvanized Steel Pipe and</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>308.6</td>
<td>PE Plastic Pipe/Tubing and</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>308.7</td>
<td>PE-AL-PE Plastic Pipe/Tubing</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>and Joints</td>
<td></td>
</tr>
<tr>
<td>308.8</td>
<td>PE-RT</td>
<td>26</td>
</tr>
<tr>
<td>308.9</td>
<td>PEX Plastic Tubing and Joints</td>
<td>26</td>
</tr>
<tr>
<td>308.10</td>
<td>PEX-AL-PEX Plastic Tubing</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>and Joints</td>
<td></td>
</tr>
<tr>
<td>308.11</td>
<td>Polypropylene (PP) Piping</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>and Joints</td>
<td></td>
</tr>
<tr>
<td>308.12</td>
<td>PVC Plastic Pipe and Joints</td>
<td>27</td>
</tr>
<tr>
<td>308.13</td>
<td>Stainless Steel Pipe and Joints</td>
<td>27</td>
</tr>
<tr>
<td>308.14</td>
<td>Dielectric Unions</td>
<td>27</td>
</tr>
<tr>
<td>308.15</td>
<td>Joints Between Various</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>309.0</td>
<td>Drainage Pipe and Fitting</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>309.1</td>
<td>Table 309.1</td>
<td></td>
</tr>
<tr>
<td>309.2</td>
<td>Materials for Drain, Waste,</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Vent Pipe and Fittings</td>
<td></td>
</tr>
<tr>
<td>309.3</td>
<td>Drainage Piping</td>
<td>28</td>
</tr>
<tr>
<td>310.0</td>
<td>Drainage Pipe Joints and</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Connections</td>
<td></td>
</tr>
<tr>
<td>310.1</td>
<td>ABS and ABS Co-Extruded</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Plastic Pipe and Joints</td>
<td></td>
</tr>
<tr>
<td>310.2</td>
<td>Cast-Iron Pipe and Joints</td>
<td>29</td>
</tr>
<tr>
<td>310.3</td>
<td>Copper or Copper Alloy Pipe</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>(DWV) and Joints</td>
<td></td>
</tr>
<tr>
<td>310.4</td>
<td>Galvanized Steel Pipe and</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>310.5</td>
<td>PVC and PVC Co-Extruded</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Plastic Pipe and Joining</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methods</td>
<td></td>
</tr>
<tr>
<td>310.6</td>
<td>Stainless Steel Pipe and</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>310.7</td>
<td>Vitrified Clay Pipe and</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td></td>
</tr>
<tr>
<td>310.8</td>
<td>Joints Between Various</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>310.9</td>
<td>Tests and Test Gauges</td>
<td>30</td>
</tr>
<tr>
<td>311.0</td>
<td>Approval of Swimming Pool,</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Spa, and Hot Tub Piping</td>
<td></td>
</tr>
<tr>
<td>311.1</td>
<td>Approval of Drainage and</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Vent Piping</td>
<td></td>
</tr>
<tr>
<td>311.2</td>
<td>Dial Gauges</td>
<td>30</td>
</tr>
<tr>
<td>311.3</td>
<td>Pressure Tests (10 psi or less)</td>
<td>30</td>
</tr>
<tr>
<td>311.4</td>
<td>Pressure Tests (greater than</td>
<td>30</td>
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<td>10 psi to 100 psi)</td>
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<tr>
<td>311.5</td>
<td>Pressure Tests (exceeding 100 psi)</td>
<td>31</td>
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<tr>
<td>311.6</td>
<td>Pressure Range</td>
<td>31</td>
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<tr>
<td>311.7</td>
<td>Final Inspection</td>
<td>31</td>
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<td>312.0</td>
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</tbody>
</table>
CHAPTER 1
ADMINISTRATION

101.0 General.
101.1 Title. This document shall be known as the “Uniform Swimming Pool, Spa, and Hot Tub Code,” may be cited as such, and will be referred to herein as “this code.”

101.2 Scope. The provisions of this code shall apply to the erection, installation, alteration, repair, relocation, replacement, addition to, use, and maintenance of swimming pools, spas, or hot tub systems within this jurisdiction.

101.3 Purpose. This code is an ordinance providing minimum requirements and standards for the protection of the public health, safety, and welfare.

101.4 Unconstitutional. Where a section, subsection, sentence, clause, or phrase of this code is, for a reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code. The legislative body hereby declares that it would have passed this code, and each section, subsection, sentence, clause, or phrase thereof, irrespective of the fact that one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

101.5 Validity. Where a provision of this code, or the application thereof to a person or circumstance, is held invalid, the remainder of the code, or the application of such provision to other persons or circumstances, shall not be affected thereby.

102.0 Applicability.
102.1 Conflicts Between Codes. Where the requirements within the jurisdiction of this code conflict with the requirements of the plumbing or mechanical code, this code shall prevail. In instances where the code, applicable standards, or the manufacturer’s installation instructions conflict, the more stringent provisions shall prevail. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall prevail.

102.2 Existing Installations. Swimming pools, spas, or hot tub systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use, maintenance, or repair continued where the use, maintenance, or repair is in accordance with the original design and location and no hazard to life, health, or property has been created by such system.

102.3 Maintenance. Swimming pools, spas or hot tub systems of premises under the Authority Having Jurisdiction shall be maintained in a sanitary and safe operating condition. Swimming pools, spas, or hot tub systems, materials, equipment, structures, signage, safety devices, fencing, appurtenances and other associated components both existing and new, and parts thereof shall be maintained in operating condition. Devices or safeguards required by this code shall be maintained in accordance with the code edition under which it was installed.

The owner or the owner’s designated agent shall be responsible for the maintenance of swimming pools, spas, or hot tub systems. To determine compliance with this subsection, the Authority Having Jurisdiction shall be permitted to cause a swimming pool, spa, or hot tub system to be reinspected.

102.4 Additions, Alterations, Renovations, or Repairs. Additions, alterations, renovations, or repairs shall conform to that required for a new system without requiring the existing swimming pool, spa, or hot tub system to comply with the requirements of this code. Additions, alterations, renovations, or repairs shall not cause an existing system to become unsafe, insanitary, or overloaded.

Additions, alterations, renovations, or repairs to existing swimming pools, spas, or hot tubs shall comply with the provisions for new construction unless such deviations are found to be necessary and are first approved by the Authority Having Jurisdiction.

102.5 Health and Safety. Where compliance with the provisions of this code fail to eliminate or alleviate a nuisance, or other dangerous or insanitary condition that involves health or safety hazards, the owner or the owner’s agent shall install such additional swimming pool, spa, or hot tub facilities or shall make such repairs or alterations as ordered by the Authority Having Jurisdiction.

102.6 Changes in Building Occupancy. Swimming pool, spa, or hot tub systems that are a part of a building or structure undergoing a change in use or occupancy, as defined in the building code, shall be in accordance with the requirements of this code that are applicable to the new use or occupancy.

102.7 Moved Structures. Parts of the swimming pool, spa, or hot tub systems, of a building or part thereof that is moved from one foundation to another, or from one location to another, shall be in accordance with the provisions of this code for new installations and completely tested as prescribed elsewhere in this section for new work, except that walls or floors need not be removed during such test where other equivalent means of inspection acceptable to the Authority Having Jurisdiction are provided.

102.8 Appendices. The provisions in the appendices are intended to supplement the requirements of this code and shall not be considered part of this code unless formally adopted as such.

103.0 Duties and Powers of the Authority Having Jurisdiction.

103.1 General. The Authority Having Jurisdiction shall be the authority duly appointed to enforce this code. For such purposes, the Authority Having Jurisdiction shall have the powers of a law enforcement officer. The Authority Having Jurisdiction shall have the power to render interpretations of this code and to adopt and enforce rules and regulations sup-
plemental to this code as deemed necessary in order to clarify the application of the provisions of this code. Such interpretations, rules, and regulations shall comply with the intent and purpose of this code.

In accordance with the prescribed procedures and with the approval of the appointing authority, the Authority Having Jurisdiction shall be permitted to appoint such number of technical officers, inspectors, and other employees as shall be authorized from time to time. The Authority Having Jurisdiction shall be permitted to deputize such inspectors or employees as necessary to carry out the functions of the code enforcement agency.

The Authority Having Jurisdiction shall be permitted to request the assistance and cooperation of other officials of this jurisdiction so far as required in the discharge of the duties in accordance with this code or other pertinent law or ordinance.

103.2 Liability. The Authority Having Jurisdiction charged with the enforcement of this code, acting in good faith and without malice in the discharge of the Authority Having Jurisdiction’s duties, shall not thereby be rendered personally liable for damage that accrues to persons or property as a result of an act or by reason of an act or omission in the discharge of duties. A suit brought against the Authority Having Jurisdiction or employee because of such act or omission performed in the enforcement of provisions of this code shall be defended by legal counsel provided by this jurisdiction until final termination of such proceedings.

103.3 Applications and Permits. The Authority Having Jurisdiction shall be permitted to require the submission of plans, specifications, drawings, and such other information as required by the Authority Having Jurisdiction, prior to the commencement of, and at a time during the progress of, work regulated by this code.

The issuance of a permit upon construction documents shall not prevent the Authority Having Jurisdiction from thereafter requiring the correction of errors in said construction documents or from preventing construction operations being carried on thereunder where in violation of this code or of other pertinent ordinance or from revoking a certificate of approval where issued in error.

103.3.1 Licensing. Provision for licensing shall be determined by the Authority Having Jurisdiction.

103.4 Right of Entry. Where it is necessary to make an inspection to enforce the provisions of this code, or where the Authority Having Jurisdiction has reasonable cause to believe that there exists in a building or upon premises a condition or violation of this code that makes the swimming pool, spa, or hot tub unsafe, insanitary, dangerous, or hazardous, the Authority Having Jurisdiction shall be permitted to enter the building or premises at reasonable times to inspect or to perform the duties imposed by the Authority Having Jurisdiction by this code, provided that where such building or premises is occupied, the Authority Having Jurisdiction shall present credentials to the occupant and request entry. Where such building or premises is unoccupied, the Authority Having Jurisdiction shall first make a reasonable effort to locate the owner or other person having charge or control of the building or premises and request entry. Where entry is refused, the Authority Having Jurisdiction has recourse to every remedy provided by law to secure entry.

Where the Authority Having Jurisdiction shall have first obtained an inspection warrant or other remedy provided by law to secure entry, no owner, occupant, or person having charge, care, or control of a building or premises shall fail or neglect, after a request is made as herein provided, to promptly permit entry therein by the Authority Having Jurisdiction for the purpose of inspection and examination pursuant to this code.

104.0 Permits.

104.1 Permits Required. It shall be unlawful for a person, firm, or corporation to erect, construct, enlarge, move, improve, remove, convert, demolish, equip, make an installation, alteration, repair, replace, or remodel swimming pool, spa or hot tub, or drainage piping work; swimming pool equipment, appurtenances, and other associated components; or treating equipment regulated by this code except as permitted in Section 104.2, or to cause the same to be done without first obtaining a separate permit for each separate building, structure or swimming pool, spa, or hot tub.

104.2 Exempt Work. A permit shall not be required for the following:

1. The stopping of leaks in drains, soil, waste, or vent pipe, provided, however, that a trap, drainpipe, soil, waste, or vent pipe become defective, and it becomes necessary to remove and replace the same with new material, the same shall be considered as new work and a permit shall be procured and inspection made as provided in this code.

2. The clearing of stoppages, or the repairing of leaks in pipes, valves, or fixtures, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.

Exemption from the permit requirements of this code shall not be deemed to grant authorization for work to be done in violation of the provisions of the code or other laws or ordinances of this jurisdiction.

104.3 Application for Permit. To obtain a permit, the applicant shall first file an application therefore in writing on a form furnished by the Authority Having Jurisdiction for that purpose. Such application shall:

1. Identify and describe the work to be covered by the permit for which application is made.

2. Describe the land upon which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed building or work.

3. Indicate the use or occupancy for which the proposed work is intended.

4. Be accompanied by construction documents in accordance with Section 104.3.1.

5. Be signed by the permittee or the permittee’s authorized agent. The Authority Having Jurisdiction shall be permitted to require evidence to indicate such authority.
(6) Give such other data and information in accordance with the Authority Having Jurisdiction.

104.3.1 Construction Documents. Construction documents, engineering calculations, diagrams, and other data shall be submitted in two or more sets with each application for a permit. The construction documents, computations, and specifications shall be prepared by, and designed by, a registered design professional. Construction documents shall be drawn to scale with clarity to identify that the intended work to be performed is in accordance with the code.

Construction documents for indoor installations of public or private swimming pool, spa, hot tub, bathing, aquatic play, or wading facilities shall be submitted to the Authority Having Jurisdiction for approval prior to the commencement of work, piping, equipment, or combination thereof. Construction shall be equal to the types prescribed in the installation requirements of the plumbing code.

Exception: The Authority Having Jurisdiction shall be permitted to waive the submission of construction documents, calculations, or other data where the Authority Having Jurisdiction finds that the nature of the work applied for is such that reviewing of construction documents is not necessary to obtain compliance with the code.

104.3.2 Plan Review Fees. Where a plan or other data is required to be submitted in accordance with Section 104.3.1, a plan review fee shall be paid at the time of submitting construction documents for review.

The plan review fees for work to install, alter, or repair a swimming pool, spa, or hot tub system, or part thereof shall be determined and adopted by this jurisdiction.

The plan review fees specified in this subsection are separate fees from the permit fees specified in Section 104.5.

Where plans are incomplete or changed so as to require additional review, a fee shall be charged at the rate shown in Table 104.5.

104.3.3 Time Limitation of Application. Applications for which no permit is issued within 180 days following the date of application shall expire by limitation, plans and other data submitted for review thereafter, shall be returned to the applicant or destroyed by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall be permitted to exceed the time for action by the applicant for a period not to exceed 180 days upon request by the applicant showing that circumstances beyond the control of the applicant have prevented the action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans and pay a new plan review fee.

104.4 Permit Issuance. The application, construction documents, and other data filed by an applicant for a permit shall be reviewed by the Authority Having Jurisdiction. Such plans shall be permitted to be reviewed by other departments of this jurisdiction to verify compliance with applicable laws under their jurisdiction. Where the Authority Having Jurisdiction finds that the work described in an application for permit and the plans, specifications, and other data filed therewith are in accordance with the requirements of the code and other pertinent laws and ordinances and that the fees specified in Section 104.5 have been paid, the Authority Having Jurisdiction shall issue a permit therefore to the applicant.

104.4.1 Approved Plans or Construction Documents. Where the Authority Having Jurisdiction issues the permit where plans are required, the Authority Having Jurisdiction shall endorse in writing or stamp the construction documents “APPROVED.” Such approved construction documents shall not be changed, modified, or altered without authorization from the Authority Having Jurisdiction, and the work shall be done in accordance with approved plans.

The Authority Having Jurisdiction shall be permitted to issue a permit for the construction of a part of a swimming pool, spa or hot tub system before the entire construction documents for the whole system have been submitted or approved, provided adequate information and detailed statements have been filed in accordance with the pertinent requirements of this code. The holder of such permit shall be permitted to proceed at the holder’s risk without assurance that the permit for the entire building, structure, or swimming pool, spa or hot tub system will be granted.

104.4.2 Validity of Permit. The issuance of a permit or approval of construction documents shall not be construed to be a permit for, or an approval of, a violation of the provisions of this code or other ordinance of the jurisdiction. No permit presuming to give authority to violate or cancel the provisions of this code shall be valid.

The issuance of a permit based upon plans, specifications, or other data shall not prevent the Authority Having Jurisdiction from thereafter requiring the correction of errors in said plans, specifications, and other data or from preventing building operations being carried on thereunder where in violation of this code or of other ordinances of this jurisdiction.

104.4.3 Expiration. A permit issued by the Authority Having Jurisdiction under the provisions of this code shall expire by limitation and become null and void where the work authorized by such permit is not commenced within 180 days from the date of such permit, or where the work authorized by such permit is suspended or abandoned at a time after the work is commenced for a period of 180 days. Before such work is recommenced, a new permit shall first be obtained to do so, and the fee, therefore, shall be one-half the amount required for a new permit for such work, provided no changes have been made or will be made in the original construction documents for such work, and provided further that such suspensions or abandonment has not exceeded 1 year.

104.4.4 Extensions. A permittee holding an unexpired permit shall be permitted to apply for an extension of the
time within which work shall be permitted to commence under that permit where the permittee is unable to commence work within the time required by this section. The Authority Having Jurisdiction shall be permitted to extend the time for action by the permittee for a period not exceeding 180 days upon written request by the permittee showing that circumstances beyond the control of the permittee have prevented the action from being taken. No permit shall be extended more than once. In order to renew action on a permit after expiration, the permittee shall pay a new full permit fee.

**104.5 Fees.** Fees shall be assessed in accordance with the provisions of this section and as set forth in the fee schedule. Fees shall be assessed in accordance with the provisions of this section and as set forth in the fee schedule.

**104.4.5 Suspension or Revocation.** The Authority Having Jurisdiction shall be permitted to, in writing, suspend or revoke a permit issued under the provisions of this code where the permit is issued in error or on the basis of incorrect information supplied or in violation of an ordinance or regulation of the jurisdiction.

**104.4.6 Retention of Plans.** One set of approved construction documents and computations shall be retained by the Authority Having Jurisdiction until final approval of the work covered therein.

One set of approved construction documents, computations, and manufacturer’s installation instructions shall be returned to the applicant and said set shall be kept on the site of the building or work at times during which the work authorized thereby is in progress.

**104.5 Fees.** Fees shall be assessed in accordance with the provisions of this section and as set forth in the fee schedule. Table 104.5. The fees are to be determined and adopted by this jurisdiction.

**104.5.1 Work Commencing Before Permit Issuance.** Where work for which a permit is required by this code has been commenced without first obtaining said permit, a special investigation shall be made before a permit is issued for such work.

**104.5.2 Investigation Fees.** An investigation fee, in addition to the permit fee, shall be collected whether or not a permit is then or subsequently issued. The investigation fee shall be equal to the amount of the permit fee that is required by this code if a permit were to be issued. The payment of such investigation fee shall not exempt a person from compliance with other provisions of this code, nor from a penalty prescribed by law.

**104.5.3 Fee Refunds.** The Authority Having Jurisdiction shall be permitted to authorize the refunding of a fee as follows:

1. The amount paid hereunder that was erroneously paid or collected.
2. Refunding of not more than a percentage, as determined by this jurisdiction where no work has been done under a permit issued in accordance with this code.

The Authority Having Jurisdiction shall not authorize the refunding of a fee paid except upon written application filed by the original permittee not to exceed 180 days after the date of fee payment.

**105.0 Inspections and Testing.**

**105.1 General.** Swimming pools, spas, or hot tub systems, for which a permit is required by this code shall be inspected by the Authority Having Jurisdiction.

No swimming pool, spa, or hot tub system, or portion thereof, shall be covered, concealed, or put into use until inspected and approved as prescribed in this code. Neither the Authority Having Jurisdiction nor the jurisdiction shall be liable for expense entailed in the removal or replacement of material required to permit inspection. Swimming pools, spas, or hot tub systems regulated by this code shall not be connected to the water, the energy fuel supply, or the sewer system until authorized by the Authority Having Jurisdiction.

**105.2 Required Inspection.** New swimming pool, spa, or hot tub work, and such portions of existing systems as affected by new work, or changes, shall be inspected by the Authority Having Jurisdiction to ensure compliance with the requirements of this code and to ensure that the installation and construction of a swimming pool, spa or hot tub system are in accordance with approved plans. The Authority Having Jurisdiction shall make the following inspections and other such inspections as necessary. The permittee or the permittee’s authorized agent shall be responsible for the scheduling of such inspections as follows:

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
2. Rough-in inspection shall be made prior to the installation of wall or ceiling membranes.
3. Final inspection shall be made upon completion of the installation.

**105.2.1 Uncovering.** Where a swimming pool, spa or hot tub system, or part thereof, which is installed, altered, or repaired, is covered or concealed before being inspected, tested, and approved as prescribed in this code, it shall be uncovered for inspection after notice to uncover the work has been issued to the responsible person by the Authority Having Jurisdiction. The requirements of this section shall not be considered to prohibit the operation of the swimming pool, spa or hot tub system installed to replace existing equipment serving an occupied portion of the building in the event a request for inspection of such equipment has been filed with the Authority Having Jurisdiction not more than 72 hours after such replacement work is completed, and before a portion of such swimming pool, spa or hot tub system is concealed by a permanent portion of the building.

**105.2.2 Other Inspections.** In addition to the inspections required by this code, the Authority Having Jurisdiction shall be permitted to require other inspections to ascertain compliance with the provisions of this code and other laws that are enforced by the Authority Having Jurisdiction.

**105.2.3 Inspection Requests.** It shall be the duty of the person doing the work authorized by a permit to notify the Authority Having Jurisdiction that such work is ready for inspection. The Authority Having Jurisdiction shall be permitted to require that a request for
inspection be filed not less than 1 working day before such inspection is desired. Such request shall be permitted to be made in writing or by telephone, at the option of the Authority Having Jurisdiction. It shall be the duty of the person requesting inspections in accordance with this code to provide access to and means for inspection of such work.

105.2.4 Advance Notice. It shall be the duty of the person doing the work authorized by the permit to notify the Authority Having Jurisdiction, orally or in writing, that said work is ready for inspection. Such notification shall be given not less than 24 hours before the work is to be inspected.

105.2.5 Responsibility. It shall be the duty of the holder of a permit to make sure that the work will stand the test prescribed before giving the notification. The equipment, material, and labor necessary for inspection or tests shall be furnished by the person to whom the permit is issued or by whom inspection is requested.

105.2.6 Reinspections. A reinspection fee shall be permitted to be assessed for each inspection or reinspections where such portion of work for which inspection is called is not complete or where required corrections have not been made.

This provision shall not be interpreted as requiring reinspection fees the first time a job is rejected for failure to be in accordance with the requirements of this code, but as controlling the practice of calling for inspections before the job is ready for inspection or reinspection.

Reinspection fees shall be permitted to be assessed where the approved plans are not readily available to the inspector, for failure to provide access on the date for which the inspection is requested, or for deviating from plans requiring the approval of the Authority Having Jurisdiction.

To obtain reinspection, the applicant shall file an application therefore in writing upon a form furnished for that purpose and pay the reinspection fee in accordance with Table 104.5. In instances where reinspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

105.3 Testing of Systems. Swimming pool, spa, or hot tub systems shall be tested and approved in accordance with this code or the Authority Having Jurisdiction. Tests shall be conducted in the presence of the Authority Having Jurisdiction or the Authority Having Jurisdiction’s duly appointed representative.

No test or inspection shall be required where a swimming pool, spa or hot tub system, or part thereof, is set up for exhibition purposes and has no connection with water or drainage system. In cases where it would be impractical to provide the required water or air tests, or for minor installations and repairs, the Authority Having Jurisdiction shall be permitted to make such inspection as deemed advisable in order to be assured that the work has been performed in accordance with the intent of this code. Joints and connections in the swimming pool, spa or hot tub system shall be airtight, gastight and watertight for the pressures required by the test.

105.3.1 Defective Systems. In buildings or premises condemned by the Authority Having Jurisdiction because of an insanitary condition of a swimming pool, spa or hot tub system, or part thereof, the alterations in such system shall be in accordance with the requirements of this code.

105.3.2 Retesting. Where the Authority Having Jurisdiction finds that the work will not pass the test, necessary corrections shall be made, and the work shall be resubmitted for test or inspection.

105.3.3 Approval. Where prescribed tests and inspections indicate that the work is in accordance with this code, a certificate of approval shall be issued by the Authority Having Jurisdiction to the permittee on demand.

105.4 Connection to Service Utilities. No person shall make connections from a source of energy or fuel to a swimming pool, spa or hot tub system or equipment regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction. No person shall make the connection from a water-supply line nor shall connect to a sewer system regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall be permitted to authorize temporary connection of a swimming pool, spa or hot tub equipment to the source of energy or fuel for the purpose of testing the equipment.

106.0 Violations and Penalties.

106.1 General. It shall be unlawful for a person, firm, or corporation to erect, construct, enlarge, alter, repair, move, improve, remove, convert, demolish, equip, use, or maintain a swimming pool, spa, or hot tub system, materials, equipment, appurtenances, and other associated components or permit the same to be done in violation of this code.

106.2 Notice of Correction or Violation. Notices of correction or violation shall be written by the Authority Having Jurisdiction and shall be permitted to be posted at the site of the work, mailed, or delivered to the permittee or their authorized representative.

Refusal, failure, or neglect to comply with such notice or order within 10 days of receipt thereof, shall be considered a violation of this code and shall be subject to the penalties set forth by the governing laws of the jurisdiction.

106.3 Penalties. A person, firm, or corporation violating a provision of this code shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punishable by a fine, imprisonment, or both set forth by the governing laws of the jurisdiction. Each separate day or portion thereof, during which a violation of this code occurs or continues, shall be deemed to constitute a separate offense.

106.4 Stop Orders. Where work is being done contrary to the provisions of this code, the Authority Having Jurisdiction shall be permitted to order the work stopped by notice in writing served on persons engaged in the doing or causing work
to be done, and such persons shall forthwith stop work until authorized by the Authority Having Jurisdiction to proceed with the work.

106.5 Authority to Disconnect Utilities in Emergencies. The Authority Having Jurisdiction shall have the authority to disconnect a swimming pool, spa, or hot tub system and other utilities serving a building, structure, or equipment regulated by this code in case of an emergency where necessary to eliminate an immediate hazard to life or property.

106.6 Authority to Condemn. Where the Authority Having Jurisdiction certifies that a swimming pool, spa, or hot tub system or portion thereof, regulated by this code, has become hazardous to life, health, or property, or has become insanitary, the Authority Having Jurisdiction shall order in writing that such swimming pool, spa, or hot tub system, either be removed or placed in a safe or sanitary condition. The order shall fix a reasonable time limit for compliance. No person shall use or maintain a defective swimming pool, spa, or hot tub system after receiving such notice.

Where such swimming pool, spa, or hot tub system is to be disconnected, written notice shall be given. In cases of immediate danger to life or property, such disconnection shall be permitted to be made immediately without such notice.

107.0 Board of Appeals.

107.1 General. In order to hear and decide appeals of orders, decisions, or determinations made by the Authority Having Jurisdiction relative to the application and interpretations of this code, there shall be and is hereby created a Board of Appeals consisting of members who are qualified by experience and training to pass upon matters pertaining to swimming pool, spa, or hot tub design, construction, and maintenance and the public health aspects of such systems and who are not employees of the jurisdiction. The Authority Having Jurisdiction shall be an ex-officio member and shall act as secretary to said board but shall have no vote upon a matter before the board. The Board of Appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render decisions and findings in writing to the appellant with a duplicate copy to the Authority Having Jurisdiction.

107.2 Limitations of Authority. The Board of Appeals shall have no authority relative to interpretation of the administrative provisions of this code, nor shall the board be empowered to waive requirements of this code.
TABLE 104.5
SWIMMING POOL, SPA, AND HOT TUB PERMIT FEES

Permission Issuance
1. For issuing each permit ................................................................. *
2. For issuing each supplemental permit ........................................... *

Unit Fee Schedule (in addition to Items 1 and 2 above)
1. For each swimming pool, spa, or hot tub:
   Public .......................................................................................... *
   Private ......................................................................................... *
2. For each pool filling system including backflow protection:
   Two inches (50 mm) in diameter and smaller .............................. *
   Over 2 inches (50 mm) in diameter ............................................ *
3. For each water heating equipment, vent, or both ...................... *
4. For each gas piping system of one to five outlets ..................... *
5. For each additional gas piping system outlet, per outlet ............. *
6. For each replacing of filter, water treating equipment, or both .... *
7. For each installation, alteration, or repair of water piping .......... *
8. For each repair or alteration of drainage or vent piping ............ *
9. For atmospheric-type vacuum breakers not referenced in Item 2:
   1 to 5 ........................................................................................ *
   over 5, each ............................................................................ *
10. For each backflow protective device other than atmospheric-type vacuum breakers not included in Item 2:
    Two inches (50 mm) in diameter and smaller ......................... *
    Over 2 inches (50 mm) in diameter ....................................... *
11. For each repair or alteration of a backwash receptor ................ *
12. For each miscellaneous repair or alteration not covered in Items 1 through 11 ......................................................... *

Other Inspections and Fees
1. Inspections outside of normal business hours .......................... *
2. Reinspection fee ......................................................................... *
3. Inspections for which no fee is specifically indicated ............... *
4. Additional plan review required by changes, additions, or
   revisions to approved plans (minimum charge – ½ hour) .......... *

For SI units: 1 inch = 25 mm

* Jurisdiction will indicate their fees here.
CHAPTER 2
DEFINITIONS

201.0 General.

201.1 Applicability. For the purpose of this code, the following terms have the meanings indicated in this chapter.

   No attempt is made to define ordinary words, which are used in accordance with their established dictionary meanings, except where a word has been used loosely, and it is necessary to define its meaning as used in this code to avoid misunderstanding.

202.0 Definition of Terms.

202.1 General. The definitions of terms are arranged alphabetically according to the first word of the term.

203.0 — A —

Abrasion Hazard. A sharp or rough surface that may cause injury under normal use.

ABS. Acrylonitrile-butadiene-styrene.

Accepted Engineering Practice. That which conforms to technical or scientific-based principles, tests, or standards that are accepted by the engineering profession.

Accessible. Where applied to a fixture, connection, appliance, or equipment, “accessible” means having access thereto, but which first may require the removal of an access panel, door, or similar obstruction.

Accessible, Readily. Having a direct access without the necessity of removing a panel, door, or similar obstruction.

Acid. A chemical that lowers pH by increasing the percentage of hydrogen ions (H*) in the solution. An acid is the opposite of a base.

Acid Wash. A procedure using an acid solution to clean or prepare the interior surface of a pool with subsequent neutralization of the acid.

Air Blower. An air blower, otherwise known as a bubbler or an air pump that introduces air into the spa through a series of injectors.

Air Break. A physical separation which may be a low inlet opening from a pipe or faucet conveying potable water to the flood-level rim of a tank, vat, or fixture.

Air, Return. Air from the conditioned area that is returned to the conditioning equipment for reconditioning.

Air, Supply. Air being conveyed to a conditioned area through ducts or plenums from a heat exchanger of a heating, cooling, absorption, or evaporative cooling system.

Air Switch System. A device in which compressed air travels through tubing to engage remotely located electrical equipment.

Algistat. A chemical able to inhibit the growth of algae.

Alkaline. A chemical having a pH between 7 and 14.

Amphoteric. A chemical compound having the capacity to act as both an acid and a base depending on their environment.

Ancillary Facility. Area used in conjunction with a pool, spa or hot tub such as dressing rooms, locker, and shower area, bathroom area, equipment area, pool deck area or building space intended to be served by pool, spa or hot tub users.

Appliance. A device that utilizes an energy source to produce light, heat, power, refrigeration, or air conditioning.

Approved. Acceptable to the Authority Having Jurisdiction.

Approved Testing Agency. An organization primarily established for the purpose of testing to approved standards and approved by the Authority Having Jurisdiction.

Aquatic Facility. A public facility that contains one or more aquatic venues and support infrastructure under a single management structure.

Aquatic Venue. An artificially constructed or modified natural structure where the general public is exposed to water intended for recreational or therapeutic purposes.

Area Drain. A receptor designed to collect surface or storm water from an open area.

Authority Having Jurisdiction. The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official, mechanical official, labor department official, health department official, building official, or others having statutory authority. In the absence of statutory authority, the Authority Having Jurisdiction may be some other responsible party. This definition shall include the Authority Having Jurisdiction’s duly authorized representative.

Automatic External Defibrillator (AED). A Class II medical device used under the supervision of a medical doctor to analyze heart rhythms, and detect ventricular fibrillations and ventricular tachycardia that delivers three stacked shocks to a victim to restore proper heart function.
DEFINITIONS

204.0 - B -
Backboard. A piece of rescue equipment that is constructed of coated marine plywood, lightweight plastic with a foam core, or aluminum. The board is not less than 6 feet (1829 mm) in length and not less than 8 inches (457 mm) in width. Holes are generally spaced every 3 inches (76 mm) along the length of the board, on both sides, to provide handholds and a place to secure restraining straps. Runners are attached to the bottom of the board to make sliding a victim out of a pool easier on the rescuers.

Backflow. The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from sources other than its intended source. See Backsiphonage and Backpressure Backflow.

Backflow Connection. An arrangement whereby backflow can occur.

Backflow Preventer. A backflow prevention device, an assembly, or other method to prevent backflow into the potable water system.

Backpressure Backflow. Backflow due to an increased pressure above the supply pressure, which may be due to pumps, boilers, gravity, or other sources of pressure.

Backsiphonage. The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a pressure less than atmospheric in such pipe. See Backflow.

Backwash. The process of cleaning the filter medium, elements, or both by the reverse flow of water through the filter.

Backwash Cycle. The time required to backwash the filter medium, elements, or both and to remove debris in the filter vessel.

Backwash Pipe. See Filter Waste Discharge Piping.

Barrier. A fence, wall, building wall, or combination thereof which completely surrounds, and obstructs access to, a swimming pool, spa, hot tub, or combination thereof.

Base. A chemical that raises pH by increasing the percentage of hydroxyl ions (OH⁻) in the solution. A base is the opposite of an acid.

Bather Load. The number of permitted bathers in a public pool, spa, or hot tub at a specific period of time.

Beginner's Area. An area or portion of a pool with a water depth of 36 inches (914 mm) or less.

Blockable Suction Outlet. A drain of any size and shape that a human body can sufficiently block to create a suction entrapment hazard.

Body Feed. The continuous addition of small amounts of filter aid during the operation of a diatomaceous earth filter.

Break In Grade. Transition point where the bottom of the pool surface changes in slope.

Bromine. A halogen, used in combination with chlorine to form a chemical compound [(bromochloro-dimethylhydantoin (BCDMH), dichloro-dimethylhydantoin (DCDMH), or dichloro-ethylmethylhydantoin (DECMH); or as bromine alone bound to an organic carrier molecule: dibromo-dimethylhydantoin (DBDMH)]. The chemical compound is usually sold in tablet form and used as an alternative disinfectant to chlorine in swimming pools, spas, or hot tubs.

Building Drain. That part of the lowest piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer beginning 2 feet (610 mm) outside the building wall.

Building Drain (Sanitary). A building drain that conveys sewage only.

Building Drain (Storm). A building drain that conveys storm water or other drainage, but no sewage.

Building Sewer. That part of the horizontal piping of a drainage system that extends from the end of the building drain and that receives the discharge of the building drain and conveys it to a public sewer, private sewer, private sewage disposal system, or other point of disposal.

205.0 - C -
Caissons. A structure located within a wave pool, typically at the deepest portion, where wave generation is mechanically produced.

Calcium Hardness. A measure of dissolved calcium compounds and mineral content of water. It is measured as calcium carbonate (CaCO₃).

Cavitation. The formation of partial vacuums causing air bubbles where the pump capacity exceeds water replacement supply.

Certified Backflow Assembly Tester. A person who has shown competence to test and maintain backflow assemblies to the satisfaction of the Authority Having Jurisdiction.

Chemical Piping. Piping that conveys concentrated chemical solutions from a feeding apparatus to the circulation piping.

Chlorinator. A device used to add or deliver a chlorine sanitizer at a controllable rate.

Circulation Piping System. The piping between a pool, spa, or hot tub structure and the mechanical equipment which usually includes suction piping, face piping and return piping.

Circulation System. The equipment, components, and appurtenances used to circulate the water in a pool, spa or hot tub and may include, but is not limited to, heaters, chemical feeding devices, valves, piping, gauges, strainers, filters, meters, surface skimmers, fittings, and pumps. The equipment, components and appurtenances, when connected, perform as a coordinated system to maintain water quality, provide sanitary water conditions, and heat water for maintaining water quality and sanitary swimming pools, spas or hot tubs.

Clarifier. A chemical compound used to collect or clump together suspended particles so they may be removed by vacuuming or filtration.

Coastal High Hazard Areas. An area within the flood hazard area that is subject to high-velocity wave action, and shown on a Flood Insurance Rate Map or other flood hazard map as Zone V, VO, VE or V1-30.
Cyanuric Acid. A chemical (C₃N₃O₃H₆) that is added to pool, spa, or hot tub water directly, or to chlorine compounds (to form isocyanurates), in order to reduce the loss of chlorine into the air from exposure to ultraviolet rays from the sun. Cyanuric acid is known as a stabilizer or a conditioner. Cyanuric acid significantly slows down chlorine’s ability to inactivate pathogenic organisms.

Deep Area. Water depth areas exceeding 5 feet (1524 mm).

Department Having Jurisdiction. The Authority Having Jurisdiction, including any other law enforcement agency affected by a provision of this code, whether such agency is specifically named or not.

Design Flood Elevation. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation is the elevation of the highest existing grade of the building’s perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number is taken as being equal to 2 feet (610 mm).

Design Head. The total head requirement of the circulation system at the design rate of flow.

Design Rate of Flow (Design Filter Rate). The rate of flow in a system that is used for design calculation. (The volume of the pool, spa, or hot tub in gallons (L) divided by the number of minutes in the turnover time.)

Developed Length. The length along the centerline of a pipe and fittings.

Diameter. Unless specifically stated, “diameter” is the nominal diameter.

Disinfectant. A sanitizer or chemical used in the process of disinfection.

Disinfection. The process of killing pathogenic microorganisms.

Diving Area. The area of a swimming pool that is designed to be used for diving.

Diving Board. A flexible board secured at one end used for diving.

Diving Platform. Stationary platform designed for diving.

Diving Stand. A supporting device for a springboard or diving board.

Drain. A pipe that carries waste or water-borne wastes in a building drainage system.

Drainage System. Includes all the piping within public or private premises that conveys sewage or other liquid wastes to a legal point of disposal, but does not include the mains of a public sewer system or a public sewage treatment or disposal plant.

2060 – D –

Deck. An unobstructed area attached to, directly adjacent, and/or serving a swimming pool, spa, hot tub or combination thereof that is installed for the purpose of providing an area for walking, sitting, or standing for the users.
DEFINITIONS

made of anodized aluminum or fiberglass and is either fixed or adjustable. The pole is used to extend the rescuer’s reach to a struggling, distressed (but not drowning) victim who is pulled to safety.

208.0  F  Filter. A component of the circulation system that houses the filter media, cartridges, or elements.

Cartridge Filter. A filter which passes water through a disposable fibrous element or cartridge, where undissolved particles and debris are removed that operate through a disposable cartridge. There are two general types:

1. The surface or area type where the suspended matter is removed from the surface; and
2. The depth type in which the interstices vary from large to small in depth.

Diatomite Filter. A filter designed to filter water through a thin layer of filter aid such as diatomaceous earth or volcanic ash. Diatomite filters may be of the pressure or vacuum type.

High-Rate Sand Filter. A sand filter designed for flows in excess of 5 gallons per minute (gpm) per square foot [204 (L/min)/m²], and not in excess of 20 gpm per square foot [815 (L/min)/m²].

Rapid Sand Filter. A sand-type filter designed for flows, not in excess of 5 gpm per square foot [204 (L/min)/m²].

Skim Filter. A surface skimmer combined with a vacuum filter.

Filter, Sand. A type of filter media composed of hard, sharp silica, quartz, or similar particles with proper grading for size and uniformity.

Filter Aid. A type of finely divided media used to coat a sep- tum-type filter, usually diatomaceous earth or volcanic ash. (Note: Alum, as used on the bed of a sand filter, is also referred to as a filter aid.)

Filter Element. That part of a filter that supports the surface upon which the filter aid is deposited (usually in diatomite filters).

Filter Media. The finely graded material that entraps suspended particles (sand, anthracite, etc.).

Filter Rate. The rate of application of water to a filter expressed in gallons per minute per square foot [(L/min)/m²] of effective filter area.

Filter Rock. Graded, rounded rock, gravel, or a combination thereof not subject to degradation by common pool chemical used to support filter media.

Filter Waste Discharge Piping. Piping that conducts wastewater from a filter to a drainage system. Connection to drainage system is made through an air gap or other approved methods.

Flood Hazard Area. The greater of the following two areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.
2. The area designated as a flood hazard area on a community’s flood hazard map, or otherwise legally designated.

Flood Level. See Flooded.

Flood-Level Rim. The top edge of a receptor from which water overflows.

Flooded. A fixture is flooded where the liquid therein rises to the flood-level rim.

Floodway. The channel of a river, creek, or other water-course and the adjacent land areas that shall be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Floodways shall be permitted to be delineated on flood hazard maps.

Flume. An open and/or closed inclined channel, ravine or tubular structure typically flowing with water and may incorporate twists and turns to direct the path of travel and influence the rate of descent of the rider. Also known as a water slide or water chute.

Free Chlorine. The part of total chlorine that is present in the water that serves as a disinfectant. Free chlorine, in the form of hypochlorous acid, provides the residual sanitizer—oxidizer which is immediately and readily available to destroy bacteria, viruses, protozoa, algae, and other pathogenic (disease causing) organisms entering the water.

Fresh Water. Those waters having a specific conductivity less than a solution containing 6000 parts per million (ppm) of sodium chloride.

Fuel Gas. Natural, manufactured, liquefied petroleum, or a mixture of these.

Fuel Gas Vent. A listed factory-made vent pipe and vent fittings for conveying flue gases to the outdoors.

209.0  G  Grade. The slope or fall of a line of pipe in reference to a horizontal plane. In drainage, it is usually expressed as the fall in a fraction of an inch (mm) or percentage slope per foot (meter) length of pipe.

Gravity Drainage System. A circulation system in which water drains by gravity into a collector tank open to the atmosphere to be circulated back to the pool, spa or hot tub by means of a pump.

Gutter. An overflow trough along the edge of a swimming pool, spa or hot tub through which water returns to the circulation system or to a drain in the case of a water-to-waste system.

210.0  H  Handhold. A piece of equipment or appurtenance that is slip-resistant and is intended to be used for an individual to grasp in distress, steady as they enter or exit, or situate oneself within a swimming pool, spa, or hot tub.

Handrail. A device that is intended to be gripped by a user for the purpose of supporting or steadying oneself, typically located at entry or exits to pools, spas or hot tubs or where stairs are located. Also known as a grab rail.

Handrail, Intermediate. A handrail(s) installed and located in such a manner that all portions of a stairway are capable of providing support and stability to the end user(s).
Head Immobilizer. A piece of rescue equipment used to prevent movement of a victim’s head and cervical spine column while secured to a backboard. Such equipment is made of thick foam that includes velcro attachments and straps.

Heat-Fusion Weld Joints. A joint used in some thermoplastic systems to connect the pipe to fittings or pipe lengths directly to one another (butt-fusion). This method of joining pipe to fittings includes socket-fusion, electro-fusion, and saddle-fusion. This method of welding involves the application of heat and pressure to the components, allowing them to fuse together forming a bond between the pipe and fitting.

Hot Tub. Refers specifically to a hydrotherapy unit normally constructed of wood designed and assembled in the traditional manner of tubs or casks, with side and bottoms formed of separate boards and the whole shaped to join together by pressure of the surrounding hoops, bands, or rods as distinct from spa units formed of plastic, concrete, metal, or other materials.

Hot Water. Water at a temperature exceeding or equal to 120°F (49°C).

Hydrojet Booster Pump System. A system whereby one or more hydrojets are activated by the use of a pump that is completely independent of the filtration and heating system of the spa or hot tub.

Hydrojets. A fitting that blends air and water creating a high-velocity, turbulent stream of air-enriched water.

Indirect Waste Pipe. A pipe that does not connect directly to the drainage system but conveys liquid wastes by discharging into a plumbing fixture, interceptor, or receptacle that is directly connected to the drainage system.

Insanitary. A condition that is contrary to sanitary principles or is injurious to health.

Conditions to which “insanitary” shall apply include the following:

1. A trap that does not maintain a proper trap seal.
2. An opening in a drainage system, except where lawful that is not provided with an approved liquid-sealed trap.
3. A plumbing fixture or other waste discharging receptor or device that is not supplied with water sufficient to flush and maintain the fixture or receptor in a clean condition.
4. A defective fixture, trap, pipe, or fitting.
5. A trap, except where in this code exempted, directly connected to a drainage system, the seal of which is not protected against siphonation and backpressure by a vent pipe.
6. A connection, cross-connection, construction, or condition, temporary or permanent that would permit or make possible by any means whatsoever for an unapproved foreign matter to enter a water distribution system used for domestic purposes.
7. The foregoing enumeration of conditions to which the term “insanitary” shall apply, shall not preclude the application of that term to conditions that are, in fact, insanitary.

Interactive Water Play Aquatic Venue. An indoor or outdoor installation that includes sprayed jetted or other water sources contacting bathers and not incorporating standing or captured water as part of the bather’s activity area. These aquatic venues are also known as splash pads, spray pads, wet decks. For the purposes of this code, only those designed to recirculate water and intended for public use and recreation shall be regulated.

Interactive Water Play Features. The devices and plumbing used to convey the treated water to the play area to spray the bathers.

Island. A surface area within a pool at a higher elevation than the pool water level where the area is completely surrounded by pool water.

Joint, Brazed. A joint obtained by joining of metal parts with alloys that melt at temperatures exceeding 840°F (449°C), but less than the melting temperature of the parts to be joined.

Joint, Compression. A multipiece joint with cup-shaped threaded nuts that, when tightened, compress tapered sleeves so that they form a tight joint on the periphery of the tubing they connect.

Joint, Flanged. One made by bolting together a pair of flanged ends.

Joint, Flared. A metal-to-metal compression joint in which a conical spread is made on the end of a tube that is compressed by a flare nut against a mating flare.

Joint, Mechanical. General form for gastight or liquid-tight joints obtained by the joining of parts through a positive holding mechanical construction.

Joint, Soldered. A joint obtained by the joining of metal parts with metallic mixtures or alloys that melt at a temperature up to and including 840°F (449°C).

Joint, Welded. A gastight joint obtained by the joining of metal parts in the plastic molten state.

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Joint, Welded. A gastight joint obtained by the joining of metal parts in the plastic molten state.

Labeled. Equipment or materials bearing a label of a listing agency (accredited conformity assessment body). See Listed (Third-Party Certified).

Landing Pool. A designated area of the pool located at the terminus point of an open or closed flume, vanishing edge pool, or similar structure.

Langelier Saturation Index. A formula used to measure water balance or mineral saturation control of pool, spa, or hot tub water. Total alkalinity, calcium hardness, pH, water temperature, and total dissolved solids are measured, given a factor, and calculated to determine whether water has a tendency to be corrosive or scale forming.
Lazy River. An aquatic attraction in which a channeled flow of water carries bathers around a course by means of artificial current. Also known as a leisure river or current channel.

Lifeguard Chair. A chair that is elevated over the deck of a pool to enable a lifeguard stationed in such a chair to monitor a larger area of a pool than possible from deck level. Such chairs are either stationary or portable; include a shelf or hook for securing rescue equipment, and include a means (e.g. umbrella) to protect a lifeguard from the sun.

Liquid Waste. The discharge from a fixture, appliance, or appurtenance in connection with a plumbing system that does not receive fecal matter.

Listed (Third-Party Certified). Equipment or materials included in a list published by a listing agency (accredited conformity assessment body) that maintains periodic inspection of current production of listed equipment or materials and whose listing states either that the equipment or material complies with approved standards or has been tested and found suitable for use in a specified manner.

Listing Agency. An agency accredited by an independent and authoritative conformity assessment body to operate a material and product listing and labeling (certification) system and that is accepted by the Authority Having Jurisdiction, which is in the business of listing and labeling. The system includes initial and ongoing product testing, a periodic inspection on current production of listed (certified) products, and that makes available a published report of such listing in which specific information is included that the material or product is in accordance with applicable standards and found safe for use in a specified manner.

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Main Outlet. The outlet fitting(s) at the bottom of a swimming pool, spa, or hot tub through which passes water to the recirculating pump (often erroneously referred to as the “main drain”).

Makeup Water. The addition of potable water to a pool, a spa, or a hot tub to maintain the normal operating water level.

May. A permissive term.

Mechanical Code. The Uniform Mechanical Code promulgated by the International Association of Plumbing and Mechanical Officials, as adopted by jurisdiction.

Multiport Valves. A valve for various filter operations that combines in one unit the function of two or more single direct flow valves.

Nuisance. Includes, but is not limited to:
1. A public nuisance known at common law or in equity jurisprudence
2. Where work regulated by this code is dangerous to human life or is detrimental to health and property
3. Inadequate or unsafe water supply or sewage disposal system

Offset. A combination of elbows or bends in a line of piping that brings one section of the pipe out of line but into a line parallel with the other section.

Oxidation Reduction Potential (ORP). A standard method of measuring a disinfectant’s ability to oxidize and sanitize water. It is a qualitative measure of sanitizer-oxidizer effectiveness. ORP takes into consideration all water constituents, including pH, TDS, cyanurates, and organic contaminants. It is a true, qualitative measure of water cleanliness. ORP is sometimes referred to as Redox.

Oxidizer. Chemicals or products used to destroy and remove organic and inorganic contaminants in water.

Ozone. Activated oxygen (O₃). A gaseous disinfectant-oxidant (generated on-site by ultraviolet or corona discharge methods) used in combination with a disinfectant that produces a residual in the water.

PE. Polyethylene.
PE-AL-PE. Polyethylene-aluminum-polyethylene.
PE-RT. Polyethylene of raised temperature.

Perimeter Overflow System. A continuous channel formed into the sidewall entirely around the perimeter of the pool, unless interrupted by steps, into which surface pool water is continuously drawn during normal operation to provide a skimming action.

Person. A natural person, his heirs, executor, administrator, or assigns and shall also include a firm, corporation, municipal or quasi-municipal corporation, or governmental agency. Singular includes plural; male includes female.

PEX. Cross-linked polyethylene.
PEX-AL-PEX. Cross-linked polyethylene-aluminum-cross-linked polyethylene.

pH. The log of the reciprocal of the hydrogen ion concentration of a solution, and a measure of the acidity or alkalinity of the water. It is determined by the concentration of hydrogen ions in a specific volume of water.

PHMB (Poly Hexamethylene Biguanide). A stable, odor-free, non-halogen sanitizer used in conjunction with a specially formulated and compatible clarifier, algaecide and hydrogen peroxide oxidizer to treat water. The chlorine-free liquid works by penetrating bacteria cell walls then bursting the cells from within.

Phosphates. Salt of phosphoric acid. Nutrients that help plants grow, and in pools, spas, or hot tubs increases algae growth.
growth. Introduced to pool, spa, or hot tub water by source water (from polyphosphates added by municipal drinking water systems to reduce pipe corrosion), fertilizers, dirt and debris, plant matter, bather waste, and specialty chemicals used to inhibit calcium scale formation which contains phosphoric acid.

**Pipe.** A cylindrical conduit or conductor conforming to the particular dimensions commonly known as “pipe size.”

**Plumbing.** The business, trade, or work having to do with the installation, removal, alteration, or repair of plumbing systems or parts thereof.

**Plumbing Code.** The Uniform Plumbing Code promulgated by the International Association of Plumbing and Mechanical Officials, as adopted by this jurisdiction.

**Plumbing Official.** See Authority Having Jurisdiction.

**Plumbing System.** Includes all potable water, building supply, and distribution pipes; all plumbing fixtures and traps; all drainage and vent pipes; and all building drains and building sewers, including their respective joints and connections, devices, receptors, and appurtenances within the property lines of the premises and shall include potable water piping, potable water treating or using equipment, liquid and fuel gas piping, and water heaters and vents for same.

**Plumbing Vent.** A pipe provided to ventilate a plumbing system, to prevent trap siphonage and backpressure, or to equalize the air pressure within the drainage system.

**Plumbing Vent System.** A pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and backpressure.

**Pool.** See Swimming Pool.

**Pool Depths.** The distance between the floor of the pool and the maximum operating water level.

**Pool Heater.** An appliance designed for heating nonpotable water stored at atmospheric pressure, such as water in swimming pools, spas, hot tubs and similar applications.

**Pool Plumbing.** Includes chemical, circulation, filter waste discharge piping, deck drainage, and water filling systems.

**Potable Water.** Water that is satisfactory for drinking, culinary, and domestic purposes and that meets the requirements of the Health Authority Having Jurisdiction.

**PP.** Polypropylene.

**Precoat.** The precoat or initial coating of filter aid on the septum of a diatomaceous earth filter.

**Pressed Fitting.** A mechanical connection for joining copper tubing that uses a crimping tool to affix the o-ring seal to copper or copper alloy fitting to the tubing. The tubing shall be inserted into the fitting, and the crimp shall be made using the tool recommended by the manufacturer.

**Pressure.** The normal force exerted by a homogeneous liquid or gas, per unit of area, on the wall of the container.

**Pressure, Residual.** The pressure available at the fixture or water outlet after allowance is made for pressure drop due to friction loss, head, meter, and other losses in the system during maximum demand periods.

**Pressure, Static.** The pressure existing without any flow.

**Purging.** The process of introducing outdoor air, and exhausting an equal volume of inside air, to reduce the effects on indoor air quality caused by chloramines and other air contaminants.

**Push Fit Fitting.** A mechanical fitting where the connection is assembled by pushing the tube or pipe into the fitting and is sealed with an o-ring.

**PVC.** Polyvinyl Chloride.

**PVC Hose.** Flexible polyvinyl chloride.

219.0 – Q –

No definitions.

220.0 – R –

**Receptor.** An approved plumbing fixture or device of such material, shape, and capacity as to adequately receive the discharge from indirect waste piping, so constructed and located as to be readily cleaned.

**Recirculation System.** The interconnected system traversed by the recirculated water from the pool until it is returned to the pool.

**Registered Design Professional.** An individual who is registered or licensed by the laws of the state to perform such design work in the jurisdiction.

**Regulating Equipment.** Includes valves and controls used in a plumbing system that is required to be accessible or readily accessible.

**Rescue Tube.** A piece of rescue equipment that is made of flexible foam covered with a vinyl skin that is red, yellow, or international orange in color. The tube measures 3 inches (76 mm) to 6 inches (152 mm) in thickness, and 40 inches (1016 mm) to 48 inches (1219 mm) in length. A polypropylene line or webbed material towline and nylon shoulder strap are attached to the tube at one end. On some tubes, brass or plastic fittings are attached to the end of the tube opposite the towline so that the tube can be secured around a victim or rescuer, or thrown like a ring buoy. A rescue tube can also be used to retrieve a submerged victim from the bottom of a pool.

**Return Inlet.** A fitting or fixture through which circulated or hydrojetted water enters the pool, spa, or hot tub.

**Return Piping.** That part of the piping between the filter and the pool, spa, or hot tub through which passes the filtered water.

**Ring Buoy.** A buoyant, donut-shaped piece of rescue equipment that is 18 inches (457 mm) to 36 inches (914 mm) in diameter. The equipment is white or international orange in color and constructed of foam or other approved material that will not rot or become waterlogged. A floating polypropylene line, ⅜ of an inch (9.5 mm) to ½ of an inch (12.7 mm) thick, and of a length not less than the maximum width of the pool shall be attached to the ring buoy. A ring buoy is only effective where thrown at a conscious, distressed victim who is able to hold on to the ring while being pulled a short distance to safety.
DEFINITIONS

**Ryznar Stability Index.** A formula used to determine carbonate equilibrium or water balance. The formula is \( RSI = 2 \times PH_s - PH \) (where \( PH_s \) is saturation pH). Total dissolved solids, pH, calcium ion, bicarbonate, and water temperature are entered into the formula to calculate the scaling and corrosion potential of water.

221.0 – S –

**Safety Cover.** A barrier or assembly covering the entire water surface of a swimming pool, spa or hot tub which includes anchoring mechanisms and serves as a means of preventing unauthorized access to the body of water.

There are two general types:

1. The manual type where hand-operation is required for application.
2. The powered type utilizing a motorized mechanism.

**Safety Vacuum Release System.** A system capable of providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage.

**Salinity.** The dissolved salt content of pool, spa, or hot tub water.

**Salt (Saline) Water.** Those waters having a specific conductivity in excess of a solution containing 6000 parts per million (ppm) of sodium chloride.

**SDR.** An abbreviation for “standard dimensional ratio,” which is the specific ratio of the average specified outside diameter to the minimum wall thickness for outside controlled diameter plastic pipe.

** Seam, Welded.** See Joint, Welded.

**Separation Tank.** A device used to clarify filter rinse or wastewater (sometimes called a reclamation tank).

**Septum.** That part of the filter element consisting of cloth, wire screen, or other porous material on which the filter cake is deposited.

**Sewage.** Liquid waste containing animal or vegetable matter in suspension or solution and that may include liquids containing chemicals in solution.

**Shall.** Indicates a mandatory requirement.

**Shepherd’s Crook.** A blunt or rounded hook added to one end of an extension pole used to grasp a conscious or an unconscious victim floating on or below the surface of the water by wrapping around the victim’s upper body and using an arm over arm motion on the pole to pull the victim to safety.

**Should.** Indicates a recommendation or that which is advised but not required.

**Slope.** See Grade.

**Solar, Hydronics and Geothermal Code.** For the purpose of this code, a reference to the Solar, Hydronics and Geothermal Code shall mean the Uniform Solar, Hydronics and Geothermal Code as promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

**Spa.** A unit primarily designed for therapeutic use that is not drained, cleaned, or refilled for each individual. It shall be permitted to include but is not limited to, hydrojet circulation, hot water, cold water, mineral baths, air induction bubbles, or a combination thereof. Industry terminology for a spa includes but is not limited to, therapeutic pool, hydrotherapy pool, whirlpool, hot spa, etc.

**Spa Pool.** Pool, not under medical supervision that incorporates water jets, aeration system, or both used for hydro massage.

**Stackless Vents.** A factory-supplied venting system that is an integral part of a listed pool heater intended for outdoor installations.

**Standard.** A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine print note and are not to be considered a part of the requirements of a standard.

**Strainer.** A fitting through which water flows and solids are filtered and separated to prevent passage.

**Suction Outlet.** An aperture or fitting through which the water under negative pressure is drawn from the pool, spa, or hot tub.

**Suction-Limiting Vent System.** An entrapment prevention system in which an atmospheric vent relieves vacuum caused by a blockage at the suction outlet.

**Suction Piping.** That portion of the circulation piping located between the pool structure and the inlet side of the pump and that usually includes the following:

1. Main outlet piping
2. Skimmer piping
3. Vacuum piping
4. Surge tank piping

**Suctioning Equipment.** Rescue equipment that is used to create a partial vacuum and assists in the removal of secretions, mucous, foamy discharge, or regurgitated matter from the mouth, throat, or airway which is interfering with the ventilation of a victim.

**Supplemental Oxygen Equipment.** Rescue equipment that consists of a face mask, BVM (bag valve mask) resuscitator, oxygen reservoir bag, oxygen cylinder with pressure regulator, and flow meter. This equipment is used to provide mechanical ventilation to victims who are suffering from respiratory distress or respiratory arrest. Such equipment eliminates the need to perform mouth-to-mouth resuscitation.

**Surf Pool.** A pool in which ocean waves are simulated for the purpose of surfing or other similar activities.

**Surface Skimmer.** A device designed to continuously remove surface film, water and return it through the filter as part of the recirculation system, usually incorporating a self-adjusting weir, a collection tank and a means to prevent air lock of the pump (sometimes referred to as a “recirculating overflow,” or a “mechanical” or “automatic skimmer”).

**Swim Spa.** A spa in which the design and construction includes specific features and equipment to produce a water current intended to create resistance and allow for recreational physical activity such as swimming or exercising in place.
Swimming Pool. A constructed or prefabricated pool used for swimming or bathing, exceeding 18 inches (457 mm) in depth.

Swimming Pool (Private). Constructed or fabricated pool that is used as a swimming pool in connection with a single-family residence and available only to the family of the householder and their private guests.

Swimming Pool (Public). A constructed or prefabricated pool other than a private swimming pool.

Swimming Pool Slide. A piece of equipment that is similar in construction to a playground slide that permits a user to slide from an elevated height to a swimming pool.

Swimout. An underwater seating or wading area that is located completely outside of the diving, current, or wave action area of the pool.

222.0 — T —

Therapy Pools. A pool of water that is specifically designed for physical therapy or rehabilitation purposes.

Total Alkalinity. The sum of all alkaline minerals in the water that is primarily in bicarbonate form, but also as sodium, calcium, magnesium, potassium carbonates, and hydroxides. It is a measure of the water’s ability to resist changes in pH.

Total Bromine. The quantitative sum of the free and combined bromine that is present in the water.

Total Chlorine. The quantitative sum of free and combined chlorine that is present in the water.

Total Dissolved Solids (TDS). A measure (by electrical conductivity) of the amount of soluble matter that is present in the water.

Total Hardness. The sum of calcium and magnesium hardness that is present in the water.

Trap. A fitting device so designed and constructed as to provide, where properly vented, a liquid seal that will prevent the back passage of air without materially affecting the flow of sewage or wastewater through it.

Trap Seal. The vertical distance between the crown weir and the top dip of the trap.

Crown Weir (Trap Weir). The lowest point in the cross-section of the horizontal waterway at the exit of the trap.

Top Dip (of trap). The highest point in the internal cross-section of the trap at the lowest part of the bend (inverted siphon). By contrast, the bottom dip is the lowest point in the internal cross-section.

Turbidity. A measure of the clarity of a clear liquid such as water. It is measured in Nephelometric Turbidity Units (NTUs).

Turbidity Meter. A device used to measure water clarity or turbidity.

Turnover Time. The time in hours and minutes required for the circulation system to filter and recirculate a volume of water equal to the aquatic venue volume. Also known as turnover rate or turnover period.

223.0 — U —

Ultraviolet Light. The light that is located on the electromagnetic spectrum between visible light and X-rays. Ultraviolet light is emitted by the sun or created artificially by a light bulb and is used in pool, spa, or hot tub water as a disinfectant to inactivate pathogenic organisms and destroy chloramines. Also used as a method of producing ozone.

Underwater Ledge. A continuous step that is recessed or protrudes from a pool wall, and allows a swimmer to rest while standing without treading water. Also known as a toe ledge.

224.0 — V —

Vacuum. Pressure is less than that exerted by the atmosphere.

Vacuum Breaker. See Backflow Preventer.

Vacuum Piping. The pipe from the suction side of a pump connected to a vacuum fitting located at the pool and below the water level to which underwater cleaning equipment shall be permitted to be attached.

Valve, Pressure-Relief. A pressure-actuated valve held closed by a spring or other means and designed to relieve pressure in excess of its setting automatically.

Vanishing Edge. A water-feature detail in which water flows over the edge of at least a portion of one of the pool walls and is collected in a catch basin, from where it is pumped back into the pool, producing a visual effect of water with no boundary. Also known as a disappearing edge, negative edge, infinity edge, or zero edge.

Velocity. The measurement of the motion of liquids expressed in feet per second (m/s).

Vent Pipe. See Plumbing Vent.

Vent Stack. The vertical vent pipe installed primarily for the purpose of providing circulation of air to and from a part of the drainage system.

Vertical Pipe. A pipe or fitting that is installed in a vertical position or that makes an angle of not more than 45 degrees (0.79 rad) with the vertical.

225.0 — W —

Wading Pool. A constructed or prefabricated pool used for wading that is 18 inches (457 mm) or less in depth.

Waste Pipe. A pipe that conveys only liquid waste, free of fecal matter.

Waste Piping. See Filter Waste Discharge Piping.

Wastewater. The water from a filter, perimeter overflow, pool emptying line, or similar apparatus or appurtenance.

Water Clarity. Clearness or lack of cloudiness in the water. Measured by the distance through the water at which an object can be seen or by using a device such as a turbidity meter.

Water Conditioning or Treating Device. A device that conditions or treats a water supply so as to change its chemical content or remove suspended solids by filtration.

Water Heater or Hot Water Heating Boiler. An appliance designed primarily to supply hot water for domestic or
commercial purposes and equipped with automatic controls limiting water temperature to a maximum of 210°F (99°C).

**Water Slide.** A public attraction that enables users to slide from an elevated height to a slide run-out or landing pool that may include the use of flumes.

**Wave Pool.** Pool in which standing waves are generated in an assortment of patterns.

**Width and/or Length.** The actual water dimension is taken from wall to wall at the maximum operating water level.

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226.0  ─ X ─
No definitions.

227.0  ─ Y ─
No definitions.

228.0  ─ Z ─
**Zero-Depth Entry.** An entry that starts at deck level and ends at the bottom of the aquatic venue. Also known as a beach entry or sloped entry.
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CHAPTER 3
GENERAL REGULATIONS

301.0 General.

301.1 Applicability. This chapter shall govern general and piping material requirements for swimming pools, spas, and hot tubs.

301.2 Minimum Standards. Pipe, pipe fittings, traps, fixtures, material, and devices used in a swimming pool, spa, hot tub, or plumbing system shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from defects. Plastic pipe and the fittings used for plastic pipe, other than for gas, shall meet the requirements of NSF 14. Unless otherwise provided for in this code, materials, fixtures, or devices used or entering into the construction of a swimming pool, spa, or hot tub system, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval.

301.2.1 Marking. Each length of pipe and each pipe fitting, trap, fixture, material, and device used in a swimming pool, spa, or hot tub system shall have cast, stamped, or indelibly marked on it any markings required by the applicable referenced standards and listing agency, and the manufacturer’s mark or name, which shall readily identify the manufacturer to the end user of the product. Where required by the approved standard that applies, the product shall be marked with the weight and the quality of the product. Materials and devices used or entering into the construction of swimming pools, spas, hot tubs, or parts thereof, shall be marked and identified in a manner satisfactory to the Authority Having Jurisdiction. Such marking shall be done by the manufacturer. Field markings shall not be acceptable.

Exception: Markings shall not be required on nipples created from cutting and threading of approved pipe.

301.2.2 Standards. Standards listed or referred to in this chapter or other chapters cover materials that will conform to the requirements of this code, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of swimming pool, spa, and hot tub standards that appear in specific sections of this code is referenced in Table 1001.1. Standards referenced in Table 1001.1 shall be applied as indicated in the applicable referenced section. A list of additional approved standards, publications, practices and guides that are not referenced in specific sections of this code appear in Table 1001.2. The documents indicated in Table 1001.2 shall be permitted in accordance with Section 301.3.

301.2.3 Equipment. A swimming pool, spa, or hot tub shall be equipped complete with approved mechanical equipment consisting of filter, pump, piping valves, and component parts.

Exception: Pools with a supply of fresh water equivalent to the volume of the pool in the specified turnover time shall be allowed.

301.2.4 Fuel Gas Piping. Fuel gas piping installations shall comply with the mechanical code.

301.2.5 Existing Buildings. In existing buildings or premises in which swimming pool, spa, or hot tub installations are to be altered, repaired, or renovated, the Authority Having Jurisdiction has discretionary powers to permit deviation from the provisions of this code, provided that such a proposal to deviate is first submitted for proper determination in order that health and safety requirements, as they pertain to swimming pools, spas or hot tubs, shall be observed.

301.3 Alternate Materials and Methods of Construction Equivalency. Nothing in this code is intended to prevent the use of systems, methods, devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code. Technical documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system, method, or device for the intended purpose.

However, the exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. An alternate material or method of construction so approved shall not be considered as in accordance with the requirements, intent, or both of this code for a purpose other than that granted by the Authority Having Jurisdiction where the submitted data does not prove equivalency.

301.3.1 Testing. The Authority Having Jurisdiction shall have the authority to require tests, as proof of equivalency.

301.3.1.1 Tests. Tests shall be made in accordance with approved or applicable standards, by an approved testing agency at the expense of the applicant. In the absence of such standards, the Authority Having Jurisdiction shall have the authority to specify the test procedure.

301.3.1.2 Request by Authority Having Jurisdiction. The Authority Having Jurisdiction shall have the authority to require tests to be made or repeated where, at any time, there is a reason to believe that material or device no longer is in accordance with the requirements on which its approval was based.
301.4 Swimming Pools in Flood Hazard Areas. Where located in flood hazard areas, aboveground swimming pools, inground swimming pools that involve the placement of earthen fill, and onground swimming pools shall comply with this section.

301.4.1 Controls, Equipment, Appurtenances, and Associated Components. Where swimming pools are located in flood hazard areas:

(1) Pool controls shall be inside an elevated building or, where located in a non-elevated accessory structure, the controls shall be elevated to or above the design flood elevation.

(2) Pool equipment, appurtenances, and other associated components shall either:

(a) Be elevated and securely anchored to a platform; the height of the platform shall either be at or above the design flood elevation or as high as practical, given limitations on the owner’s access.

(b) Where not elevated, be anchored to prevent flotation and protected to prevent water from entering or accumulating within the components during flooding.

(3) Tanks shall either be elevated or anchored to resist anticipated flood loads during conditions of the design flood.

301.4.2 Swimming Pools Located in Floodways. Where swimming pools are located in floodways designated on flood hazard maps, documentation shall be submitted to the Authority Having Jurisdiction that demonstrates that the proposed swimming pool will not increase the design flood elevation at any point within the jurisdiction.

301.4.3 Swimming Pools Located where Floodways have not been Designated. Where swimming pools are located in flood hazard areas where design flood elevations are specified, but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed swimming pool will not increase the design flood elevation more than 1 foot (305 mm) at a point within the jurisdiction.

301.4.4 Swimming Pools Located in Coastal High Hazard Areas. Where pools are located in coastal high hazard areas, swimming pools shall be in accordance with ASCE 24 and one of the following requirements:

(1) Be elevated so that the lowest horizontal structural member is elevated to or above the design flood elevation.

(2) Be designed and constructed to break away during design flood conditions without producing debris capable of causing significant damage to any structure.

(3) Be sited to remain in the ground during design flood conditions without obstructing flow that results in damage to adjacent structures.

301.5 Alternative Engineered Design. An alternative engineered design shall comply with the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, fire resistance, durability, and safety. Material, equipment, or components shall be designed and installed in accordance with the manufacturer’s installation instructions.

301.5.1 Permit Application. The registered design professional shall indicate on the design documents that the swimming pool, spa, hot tub, or parts thereof, is an alternative engineered design so that it is noted on the construction permit application. The permit and permanent permit records shall indicate that an alternative engineered design was part of the approved installation.

301.5.2 Technical Data. The registered design professional shall submit sufficient technical data to substantiate the proposed alternative engineered design and to prove that the performance meets the intent of this code.

301.5.3 Design Documents. The registered design professional shall provide two complete sets of signed and sealed design documents for the alternative engineered design for submittal to the Authority Having Jurisdiction. The design documents shall include floor plans and a riser diagram of the work. Where appropriate, they shall indicate the direction of flow, pipe sizes, grade of horizontal piping, loading, and location of appliances.

301.5.4 Design Approval. An approval of an alternative engineered design shall be at the discretion of the Authority Having Jurisdiction. The exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. An alternative engineered design so approved shall not be considered as in accordance with the requirements, intent, or both of this code for a purpose other than that granted by the Authority Having Jurisdiction.

301.5.5 Design Review. The Authority Having Jurisdiction shall have the authority to require testing of the alternative engineered design in accordance with Section 301.3.1, including the authority to require an independent review of the design documents by a registered design professional selected by the Authority Having Jurisdiction and at the expense of the applicant.

301.5.6 Inspection and Testing. The alternative engineered design shall be tested and inspected in accordance with the submitted testing and inspection plan and the requirements of this code.

302.0 Workmanship and Installation Practices.

302.1 Non-Threaded Plastic Piping. Listed plastic circulating piping and fittings for non-threaded applications between mechanical equipment and pools, spas, or hot tubs shall be not less than Schedule 40.

302.2 Threaded Plastic Piping. Listed plastic threaded circulating pipe between mechanical equipment and pools, spas, and hot tubs shall be not less than Schedule 80. Threading of plastic pipe in the field is prohibited. Threads shall be molded.
302.3 Bends in Plastic Piping. Plastic piping shall be permitted to be cold bent for sizes 2 inches (50 mm) or less with a radius of not less than 5 feet (1524 mm) without the application of heat. Bends of small radii and exceeding 2 inches (50 mm) shall be manufactured with the use of thermostatically controlled equipment and shall be listed.

302.4 Bends in Copper or Copper Alloy Tubing. Changes in direction in copper or copper alloy tubing shall be permitted to be made with bends, provided that such bends are made with bending equipment that does not deform or create a loss in the cross-sectional area of the tubing.

302.5 Protection of Circulating Piping. Circulating piping shall be protected from excessive high water temperature.

302.6 Burred Ends. Burred ends of pipe and tubing shall be reamed to the full bore of the pipe or tube, and chips shall be removed.

302.7 Increasers and Reducers. Where different sizes of pipes or pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes. Copper alloy or cast-iron body cleanouts shall not be used as a reducer or adapter from cast-iron drainage pipe to iron pipe size (IPS) pipe.

302.8 Insertion Fitting. Insertion fittings shall not be used in plastic pipe systems. Insertion fittings shall be used only in copper pipe systems.

302.9 Restriction of Jointing. Copper pipe shall be restricted to the usage and jointing as defined in the building code.

303.0 Prohibited Fittings and Practices.

303.1 Drainage and Vent Piping. No drainage or vent piping shall be drilled and tapped for the purpose of making connections thereto, and no cast-iron soil pipe shall be threaded.

303.2 Dissimilar Metals. Except for necessary valves, where intermembering or mixing of dissimilar metals occurs, the point of connection shall be confined to exposed or accessible locations.

303.3 Direction of Flow. Valves, pipes, and fittings shall be installed in correct relationship to the direction of flow.

304.0 Protection of Piping, Materials, and Structures.

304.1 Installation. Piping in connection with a swimming pool, spa or hot tub system shall be so installed that piping or connections will not be subject to undue strains or stresses, and provisions shall be made for expansion, contraction, and structural settlement. No piping shall be directly embedded in concrete or masonry. No structural member shall be seriously weakened or impaired by cutting, notching, or otherwise, as defined in the building code.

304.2 Building Sewer and Drainage Piping. No building sewer or other drainage piping or part thereof, constructed of materials other than those approved for use under or within a building, shall be installed under or within 2 feet (610 mm) of a building or structure, or less than 1 foot (305 mm) below the surface of the ground.

304.3 Corrosion, Erosion, and Mechanical Damage. Piping subject to corrosion, erosion, or mechanical damage shall be protected in an approved manner.

304.4 Protectively Coated Pipe. Protectively coated pipe or tubing shall be inspected and tested, and a visible void, damage, or imperfection to the pipe coating shall be repaired in an approved manner.

304.5 Freezing Protection. No water, soil, or waste pipe shall be installed or permitted outside of a building, in attics or crawl spaces, or in an exterior wall unless, where necessary, adequate provision is made to protect such pipe from freezing.

304.6 Fire-Resistant Construction. Piping penetrations of fire-resistance-rated walls, partitions, floors, floor/ceiling assemblies, roof/ceiling assemblies, or shaft enclosures shall be protected in accordance with the requirements of the building code.

304.7 Waterproofing of Openings. Joints at the roof around pipes, ducts, or other appurtenances shall be made watertight by the use of lead, copper, galvanized iron, or other approved flashings or flashing material. Exterior wall openings shall be made watertight. Counterflashing shall not restrict the required internal cross-sectional area of the vent.

304.8 Steel Nail Plates. Plastic and copper or copper alloy piping penetrating framing members to within 1 inch (25.4 mm) of the exposed framing shall be protected by steel nail plates not less than 18 gauge (0.0478 inches) (1.21 mm) in thickness. The steel nail plate shall extend along the framing member not less than 1½ inches (38 mm) beyond the outside diameter of the pipe or tubing.

304.9 Sleeves. Sleeves shall be provided to protect piping through concrete, masonry walls, and concrete floors. Exception: Sleeves shall not be required where openings are drilled or bored.

304.9.1 Building Loads. Piping through concrete or masonry walls shall not be subject to a load from building construction.

304.9.2 Exterior Walls. In exterior walls, an annular space between sleeves and pipes shall be sealed and made watertight, as approved by the Authority Having Jurisdiction. A penetration through fire-resistive construction shall be in accordance with Section 304.6.

304.9.3 Firewalls. A pipe sleeve through a firewall shall have the space around the pipe completely sealed with an approved fire-resistive material in accordance with other codes.

304.10 Structural Members. A structural member weakened or impaired by cutting, notching, or otherwise shall be reinforced, repaired, or replaced so as to be left in a safe structural condition in accordance with the requirements of the building code.

304.11 Rodentproofing. Strainer plates on drain inlets shall be designed and installed so that no opening exceeds ½ inch (12.7 mm) in the least dimension.

304.11.1 Metal Collars. In or on buildings where openings have been made in walls, floors, or ceilings for the passage of pipes, such openings shall be closed and protected by the installation of approved metal collars securely fastened to the adjoining structure.

304.12 Exposed PVC Piping. PVC piping shall not be exposed to direct sunlight. Exceptions:

(1) PVC piping exposed to sunlight that is protected by water-based synthetic latex paints.
(2) PVC piping wrapped with not less than 0.04 inch (1.02 mm) thick tape or otherwise protected from ultraviolet (UV) degradation.

305.0 Trenching, Excavation, and Backfill.
305.1 Trenches. Trenches deeper than the footing of a building or structure, and paralleling the same, shall be located not less than 45 degrees (0.79 rad) from the bottom exterior edge of the footing, or as approved in accordance with Section 301.0.

305.2 Tunneling and Driving. Tunneling and driving shall be permitted to be done in yards, courts, or driveways of a building site. Where an approved depth is available to permit, tunnels shall be permitted to be used between open-cut trenches. Tunnels shall have a clear height of 2 feet (610 mm) above the pipe and shall be limited in length to one-half the depth of the trench, with a maximum length of 8 feet (2438 mm). Where pipes are driven, the drive pipe shall be not less than one size larger than the pipe to be laid.

305.3 Open Trenches. Excavations required to be made for the installation of a swimming pool, spa, hot tub, or related piping system or part thereof, shall be open trench work and shall be kept open until the piping has been inspected, tested, and accepted.

305.4 Excavations. Excavations shall be completely backfilled as soon after inspection as practicable. Precaution shall be taken to ensure compactness of backfill around piping without damage to such piping. Trenches shall be backfilled in thin layers to 12 inches (305 mm) above the top of the piping with clean earth, which shall not contain stones, boulders, cinderfill, frozen earth, construction debris, or other materials that will damage or break the piping or cause corrosive action. Mechanical devices such as bulldozers, graders, etc., shall be permitted to be then used to complete backfill to grade. Fill shall be properly compacted. Precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

306.0 Energy Consumption for Pools, Spas, and Hot Tubs.
306.1 General. Energy consumption for pools, spas and hot tubs shall be in accordance with Section 306.1.1 through Section 306.1.3.

306.1.1 Heaters. Pool, spa, and hot tub heaters shall be equipped with a readily accessible on and off switch to allow shutting off the heaters without adjusting the thermostat setting. Gas-fired heaters shall not be equipped with continuously burning pilot lights.

306.1.2 Covers. Heated pools, including spas and hot tubs, shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with an insulation value of not less than R-12.

Exception: Pools deriving over 60 percent of the energy for heating from site-recovered energy or solar energy.

306.1.3 Time Switches. Time switches shall be installed on swimming pool, spa, and hot tub heaters and pumps.

Exceptions:
(1) Where public health standards require 24-hour pump operation.
(2) Where pumps are required to operate solar and waste heat recovery pool heating systems.

307.0 Water Supply and Circulating System Pipe and Fitting Materials.
307.1 Materials. Pipe, tube, fittings, solvent cement, thread sealants, solders, and flux used in potable water systems intended to supply drinking water shall be in accordance with the requirements of NSF 61. Where fittings and valves are made from copper alloys containing more than 15 percent zinc by weight and are used in plastic piping systems, they shall be resistant to dezincification and stress corrosion cracking in accordance with NSF 14.

Materials used in the water supply or circulating system, except valves and similar devices, shall be of a like material, except where otherwise approved by the Authority Having Jurisdiction.

Materials for building water piping, building supply piping, and water used in circulating systems for swimming pools, spas, or hot tubs shall be in accordance with the applicable standards referenced in Table 307.1.

307.2 Copper or Copper Alloy Tube. Copper or copper alloy tube for water piping shall have a weight of not less than Type L.

Exception: Type M copper or copper alloy tubing shall be permitted to be used for water piping where piping is aboveground in, or on, a building or underground outside of structures.

307.3 Hard-Drawn Copper or Copper Alloy Tubing. Hard-drawn copper or copper alloy tubing for water supply and distribution in addition to the required incised marking shall be marked in accordance with ASTM B88. The colors shall be Type K, green; Type L, blue; and Type M, red.

307.4 Flexible Connectors. Flexible water connectors shall be installed in readily accessible locations, and where under continuous pressure shall be in accordance with ASME A112.18.6/CSA B125.6.

307.5 Cast-Iron Fittings. Cast-iron fittings up to and including 2 inches (50 mm) in size, where used in connection with potable water piping, shall be galvanized.

307.6 Malleable Iron. Malleable iron water fittings shall be galvanized.

307.7 Previously Used Piping and Tubing. Piping and tubing that has previously been used for a purpose other than for potable water systems shall not be used.

307.8 Plastic Materials. Approved plastic materials shall be permitted to be used in water service piping, provided that where metal piping is used for electrical grounding purposes, replacement piping, therefore, shall be of like materials.
**Exception:** Where a grounding system acceptable to the Authority Having Jurisdiction is installed, inspected, and approved, metallic pipe shall be permitted to be replaced with nonmetallic pipe.

**307.8.1 Tracer Wire.** Plastic materials for water-service piping outside underground shall have a blue insulated copper tracer wire, or other approved conductor. **Tracer wire or approved conductors shall be installed adjacent to the piping and secured in 10-foot (3048 mm) intervals. Tracer wire shall be securely bonded together at wire joints.** Where tracer wires utilizing copper-clad steel conductors are installed, such tracer wires shall be in accordance with ASTM B1010 or UL 2989. Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG, and the insulation type shall be approved for direct burial.

**Exception:** Tracer wire utilizing copper-clad steel conductors listed and labeled in accordance with UL 2989 shall be permitted.

**307.9 Lead Content.** The maximum allowable lead content in pipes, pipe fittings, plumbing fittings and fixtures intended to convey or dispense water for human consumption shall be not more than a weighted average of 0.25 percent with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings,

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### TABLE 307.1

**MATERIALS FOR BUILDING SUPPLY, WATER DISTRIBUTION, AND CIRCULATION SYSTEM PIPING AND FITTINGS**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>BUILDING SUPPLY PIPE AND FITTINGS</th>
<th>WATER DISTRIBUTION PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPVC-AL-CPVC</td>
<td>X</td>
<td>X</td>
<td></td>
<td>ASTM D2846</td>
</tr>
<tr>
<td>Ductile-Iron</td>
<td>X</td>
<td>X</td>
<td></td>
<td>ASME B16.4, AWWA C110, AWWA C153</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>X</td>
<td>X</td>
<td></td>
<td>ASTM A53</td>
</tr>
<tr>
<td>Malleable Iron</td>
<td>X</td>
<td>X</td>
<td></td>
<td>ASME B16.3</td>
</tr>
<tr>
<td>PE</td>
<td>X</td>
<td>—</td>
<td>ASTM D2239, ASTM D2737, ASTM D3035, AWWA C901, CSA B137.1</td>
<td>ASME D2609, ASTM D2683, ASTM D3361, ASTM F1055, CSA B137.1</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>X</td>
<td>X</td>
<td>ASTM A269, ASTM A312, ASTM A554, ASTM A778</td>
<td>—</td>
</tr>
</tbody>
</table>

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1 For building supply or cold-water applications.
2 For brazed fittings only.
and fixtures. For solder and flux, the lead content shall be not more than 0.2 percent where used in piping systems that convey or dispense water for human consumption.

Exceptions:

1. Pipes, pipe fittings, plumbing fittings, fixtures, or back-flow preventers used for nonpotable services such as manufacturing, industrial processing, irrigation, outdoor watering, or any other uses where the water is not used for human consumption.

2. Flush valves, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches (50 mm) in diameter or larger.

307.9.1 Lead Content of Water Supply Pipe and Fittings. Pipes, pipe fittings, valves, and faucets utilized in the water supply system for non-drinking water applications shall have a maximum of 8 percent lead content.

307.9.2 Structures and Equipment. Structures, equipment, or both that are immersed in water that are capable of being consumed shall not have a lead content exceeding 8 percent.

307.10 Flexible PVC Hoses and Tubing. Flexible PVC hoses and tubing intended to be used for swimming pool, spa, or hot tub water circulation systems or pneumatic systems shall be in accordance with IAPMO Z1053.

307.11 Pool, Spa, and Hot Tub Fittings. Pool, spa or hot tub fittings shall be of an approved-type design for the specific application.

308.0 Water Supply and Circulating System Pipe Joints and Connections.

308.1 Copper or Copper Alloy Pipe, Tubing, and Joints. Joining methods for copper or copper alloy pipe, tubing, and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.1.1 through Section 308.1.5.

308.1.1 Brazed Joints. Brazed joints between copper or copper alloy pipe or tubing and fittings shall be made with brazing alloys having a liquid temperature above 1000°F (538°C). The joint surfaces to be brazed shall be cleaned bright by either manual or mechanical means. Tubing shall be cut square and reamed to full inside diameter. Brazing flux shall be applied to the joint surfaces where required by manufacturer’s recommendation. Brazing filler metal in accordance with shall conform to AWS A5.8 and shall be applied at the point where the pipe or tubing enters the socket of the fitting.

308.1.2 Flared Joints. Flared joints for soft copper or copper alloy water tubing shall be made with fittings that are in accordance with comply with the applicable standards referenced in Table 307.1. Pipe or tubing shall be cut square using an appropriate tubing cutter. The tubing shall be reamed to full inside diameter, resized to round, and expanded with a proper flaring tool.

308.1.3 Mechanical Joints. Mechanical joints shall include, but are not limited to, compression, flanged, grooved, pressed, and push fit fittings.

308.1.3.1 Mechanically Formed Tee Fittings. Mechanically formed tee fittings shall have extracted collars that shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the pipe or tube surface to form a collar having a height not less than three times the thickness of the branch tube wall. The branch pipe or tube shall be notched to conform to the inner curve of the run pipe or tube and shall have two dimple depth stops to ensure that penetration of the branch pipe or tube into the collar is of a depth for brazing and that the branch pipe or tube does not obstruct the flow in the main line pipe or tube. Dimple depth stops shall be in line with the run of the pipe or tube. The second dimple shall be 1/4 of an inch (6.4 mm) above the first and shall serve as a visual point of inspection. Fittings and joints shall be made by brazing. Soldered joints shall not be permitted.

308.1.3.2 Press-Connect Fittings. Press-Connect fittings for copper or copper alloy pipe or tubing shall have an elastomeric o-ring that forms the joint. The pipe or tubing shall be fully inserted into the fitting, and the pipe or tubing marked at the shoulder of the fitting. Pipe or tubing shall be cut square, chamfered, and reamed to full inside diameter. The fitting alignment shall be checked against the mark on the pipe or tubing to ensure the pipe or tubing is inserted into the fitting. The joint shall be pressed using the tool recommended by the manufacturer.

308.1.3.3 Push Fit Fittings. Removable and non-removable push fit fittings for copper or copper alloy tubing or pipe that employ quick assembly push fit connectors shall be in accordance with ASSE 1061. Push fit fittings for copper or copper alloy pipe or tubing shall have an approved elastomeric o-ring that forms the joint. Pipe or tubing shall be cut square, chamfered, and reamed to full inside diameter. The tubing shall be fully inserted into the fitting, and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to ensure the tubing is inserted into the fitting and gripping mechanism has engaged on the pipe.

308.1.4 Soldered Joints. Soldered joints between copper or copper alloy pipe or tubing and fittings shall be made in accordance with ASTM B828 with the following sequence of joint preparation and operation as follows: measuring and cutting, reaming, cleaning, fluxing, assembly and support, heating, applying the solder, cooling and cleaning. Pipe or tubing shall be cut square and reamed to the full inside diameter including the removal of burrs on the outside of the pipe or tubing. Surfaces to be joined shall be cleaned bright by manual or mechanical means. Flux shall be applied to pipe or tubing and fittings and shall be in accordance with conform to ASTM B813, and shall become noncorrosive and non-toxic after soldering. Insert pipe or tubing into the base.
of the fitting and remove excess flux. Pipe or tubing and fittings shall be supported to ensure a uniform capillary space around the joint. Heat shall be applied using an air or fuel torch with the flame perpendicular to the pipe or tubing using acetylene or an LP gas. Preheating shall depend on the size of the joint. The flame shall be moved to the fitting cup and alternate between the pipe or tubing and fitting. Solder in accordance with conforming to ASTM B32 shall be applied to the joint surfaces until capillary action draws the molten solder into the cup. Solder and fluxes with a lead content that exceeds 0.2 percent shall be prohibited in piping systems conveying potable water. Joint surfaces shall not be disturbed until cool and any remaining flux residue shall be cleaned.

308.1.5 Threaded Joints. Threaded joints for copper or copper alloy pipe shall be made with pipe threads in accordance with ASME B1.20.1. Thread sealant tape or compound shall be applied only to male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

308.2 CPVC Plastic Pipe and Joints. CPVC plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.2.1 through Section 308.2.3.

308.2.1 Mechanical Joints. Mechanical joints shall include compression, flanged, grooved and push fit fittings.

308.2.1.1 Push Fit Fittings. Removable and non-removable push fit fittings that employ a quick assembly push fit connector shall be in accordance with ASSE 1061.

308.2.2 Solvent Cement Joints. Solvent cement joints for CPVC pipe and fittings shall be clean from dirt and moisture. Solvent cement in accordance shall comply with ASTM F493, requiring the use of a primer shall be orange in color. The primer shall be colored and in accordance shall comply with ASTM F656. Listed solvent cement in accordance that complies with ASTM F493 and that does not require the use of primers, yellow in color, shall be permitted to join pipe manufactured in accordance that comply with ASTM F2855 and fittings manufactured in accordance that comply with ASTM D2846, ½ of an inch (15 mm) through 2 inches (50 mm) in diameter. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until joint is set.

308.3 CPVC/AL/CPVC Plastic Pipe and Joints. Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.3.1 or Section 308.3.2.

308.3.1 Solvent Cement Joints. Solvent cement joints for CPVC/AL/CPVC pipe and fittings shall be clean from dirt and moisture. Solvent cements in accordance shall comply with ASTM F493, requiring the use of a primer shall be orange in color. The primer shall be colored and in accordance shall comply with ASTM F656. Listed solvent cement in accordance that complies with ASTM F493 and that does not require the use of primers, yellow in color, shall be permitted to join pipe manufactured in accordance that comply with ASTM F2855 and fittings manufactured in accordance that comply with ASTM D2846, ½ of an inch (15 mm) through 2 inches (50 mm) in diameter. Apply primer where required inside the fitting and to the depth of the fitting on pipe. Apply liberal coat of cement to the outside surface of pipe to depth of fitting and inside of fitting. Place pipe inside fitting to forcefully bottom the pipe in the socket and hold together until joint is set.

308.4 Ductile Iron Pipe and Joints. Ductile iron pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.4.1 or Section 308.4.2.

308.4.1 Mechanical Joints. Mechanical joints for ductile iron pipe and fittings shall consist of a bell that is cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting. The elastomeric gasket shall comply with AWWA C111. Lubricant recommended for potable water application by the pipe manufacturer shall be applied to the gasket and plain end of the pipe.

308.4.2 Push-On Joints. Push-on joints for ductile iron pipe and fittings shall consist of a single elastomeric gasket that shall be assembled by positioning the elastomeric gasket in an annular recess in the pipe or fitting socket and forcing the plain end of the pipe or fitting into the socket. The plain end shall compress the elastomeric gasket to form a positive seal and shall be designed so that the elastomeric gasket shall be locked in place against displacement. The elastomeric gasket shall com-
ply with AWWA C111. Lubricant recommended for potable water application by the pipe manufacturer shall be applied to the gasket and plain end of the pipe.

308.5 Galvanized Steel Pipe and Joints. Galvanized steel pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.5.1 or Section 308.5.2.

308.5.1 Mechanical Joints. Mechanical joints shall be made with an approved and listed elastomeric gasket.

308.5.2 Threaded Joints. Threaded joints shall be made with pipe threads that are in accordance with ASME B1.20.1. Thread sealant tape or compound shall be applied to the male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

308.6 PE Plastic Pipe/Tubing and Joints. PE plastic pipe or tubing and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.6.1 or Section 308.6.2.

308.6.1 Heat-Fusion Joints. Heat-fusion joints between PE pipe or tubing and fittings shall be assembled in accordance with Section 308.6.1.1 through Section 308.6.1.3 using butt, socket, or electro-fusion heat methods.

308.6.1.1 Butt-Fusion Joints. Butt-fusion joints shall be installed in accordance with ASTM F2620. Joints and shall be made by heating the squared ends of two pipes, pipe and fitting, or two fittings by holding ends against a heated element. The heated element shall be removed where the proper melt is obtained and joined ends shall be placed together with applied force.

308.6.1.2 Electro-Fusion Joints. Electro-fusion joints shall be heated internally by a conductor at the interface of the joint. Align and restrain fitting to pipe to prevent movement and apply electric current to the fitting. Turn off the current when the proper time has elapsed to heat the joint. The joint shall fuse together and remain undisturbed until cool.

308.6.1.3 Socket-Fusion Joints. Socket-fusion joints shall be installed in accordance with ASTM F2620. Joints and shall be made by simultaneously heating the outside surface of a pipe end and the inside of a fitting socket. Where the proper melt is obtained, the pipe and fitting shall be joined by inserting one into the other with applied force. The joint shall fuse together and remain undisturbed until cool.

308.6.2 Mechanical Joints. Mechanical joints between PE pipe or tubing and fittings shall include insert and mechanical compression fittings that provide a pressure seal resistance to pullout. Joints for insert fittings shall be made by cutting the pipe square, using a cutter designed for plastic piping, and removal of sharp edges. Two stainless steel clamps shall be placed over the end of the pipe. Fittings shall be checked for proper size based on the diameter of the pipe. The end of pipe shall be placed over the barbed insert fitting, making contact with the fitting shoulder. Clamps shall be positioned equal to 180 degrees (3.14 rad) apart and shall be tightened to provide a leak tight joint. Compression type couplings and fittings shall be permitted for use in joining PE piping and tubing. Stiffeners that extend beyond the clamp or nut shall be prohibited. Bends shall be not less than 30 pipe diameters, or the coil radius where bending with the coil. Bends shall not be permitted closer than 10 pipe diameters of any fitting or valve. Mechanical joints shall be designed for their intended use.

308.7 PE-AL-PE Plastic Pipe/Tubing and Joints. PE-AL-PE plastic pipe or tubing and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.7.1 and Section 308.7.1.1.

308.7.1 Mechanical Joints. Mechanical joints for PE-AL-PE pipe or tubing and fittings shall be either of the metal insert fittings with a split ring and compression nut or metal insert fittings with copper crimp rings. Metal insert fittings shall comply with ASTM F1974. Crimp insert fittings shall be joined to the pipe by placing the copper crimp ring around the outer circumference of the pipe, forcing the pipe material into the space formed by the ribs on the fitting until the pipe contacts the shoulder of the fitting. The crimp ring shall then be positioned on the pipe so the edge of the crimp ring is ¼ of an inch (3.2 mm) to ⅛ of an inch (6.4 mm) from the end of the pipe. The jaws of the crimping tool shall be centered over the crimp ring and tool perpendicular to the barb. The jaws shall be closed around the crimp ring and shall not be crimped more than once.

308.7.1.1 Compression Joints. Compression joints for PE-AL-PE pipe or tubing and fittings shall be joined through the compression of a split ring, by a compression nut around the circumference of the pipe. The compression nut and split ring shall be placed around the pipe. The ribbed end of the fitting shall be inserted into the pipe until the pipe contacts the shoulder of the fitting. Position and compress the split ring by tightening the compression nut onto the insert fitting.

308.8 PE-RT. Polyethylene of raised temperature (PE-RT) tubing and fitting joining methods shall be marked in accordance with Section 308.8.1.

308.8.1 Mechanical Joints. Fittings for PE-RT tubing shall comply with the appropriate standard designations and shall be listed in Table 307.1. Mechanical joints for which the tubing has been approved PE-RT tubing shall be installed in accordance with the manufacturer’s installation instructions.

308.8.1 Fittings. Metal insert fittings, metal compression fittings, and plastic fittings shall be manufactured to and marked in accordance with the standards for fittings in Table 307.1.
Section 308.9 PEX Plastic Tubing and Joints. PEX plastic tubing and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.9.1 through Section 308.9.2.

308.9.1 Fittings. Fittings for PEX tubing shall comply with the applicable standards referenced in Table 307.1. PEX tubing in accordance with ASTM F876 shall be marked with the applicable standard designation for the fittings, specified by the tubing manufacturer for use with the tubing.

308.9.2 Mechanical Joints. Mechanical joints shall be installed in accordance with the manufacturer’s installation instructions.

308.10 PEX-AL-PEX Plastic Tubing and Joints. PEX-AL-PEX plastic pipe or tubing and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.10.1 and Section 308.10.1.1.

308.10.1 Mechanical Joints. Mechanical joints between PEX-AL-PEX tubing and fittings shall include mechanical and compression type fittings and insert fittings with a crimping ring. Insert fittings utilizing a crimping ring shall be in accordance with ASTM F1974 or ASTM F2434. Crimp joints for crimp insert fittings shall be joined to PEX-AL-PEX pipe by the compression of a crimp ring around the outer circumference of the pipe, forcing the pipe material into annular spaces formed by ribs on the fitting.

308.10.1.1 Compression Joints. Compression joints shall include compression insert fittings and shall be joined to PEX-AL-PEX pipe through the compression of a split ring or compression nut around the outer circumference of the pipe, forcing the pipe material into the annular space formed by the ribs on the fitting.

308.11 Polypropylene (PP) Piping and Joints. PP pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.11.1 through Section 308.11.3.

308.11.1 Heat-Fusion Joints. Heat-fusion joints for polypropylene (PP) pipe and fitting joints shall be installed with socket-type heat-fused polypropylene fittings, fusion outlets, butt-fusion polypropylene fittings or pipe, or electro-fusion polypropylene fittings. Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F2389 or CSA B137.11.

308.11.2 Mechanical and Compression Sleeve Joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer’s installation instructions.

308.11.3 Threaded Joints. PP pipe shall not be threaded. PP transition fittings for connection to other piping materials shall only be threaded by use of copper alloy or stainless steel inserts molded in the fitting.

308.12 PVC Plastic Pipe and Joints. PVC plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.12.1 through Section 308.12.3. PVC piping shall not be exposed to direct sunlight unless the piping does not exceed 24 inches (610 mm) and is wrapped with not less than 0.04 of an inch (1.02 mm) thick tape or otherwise protected from UV degradation.

308.12.1 Mechanical Joints. Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint. The mechanical joint shall include a pipe spigot that has a wall thickness to withstand without deformation or collapse; the compressive force exerted where the fitting is tightened. The push-on joint shall have a minimum wall thickness of the bell at any point between the ring and the pipe barrel. The elastomeric gasket shall comply with ASTM D3139, and be of such size and shape as to provide a compressive force against the spigot and socket after assembly to provide a positive seal.

308.12.2 Solvent Cement Joints. Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and pipe shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color in accordance with ASTM D143. Primer shall be applied. Female PVC threaded fittings shall be used with the pipe and fitting. Primer shall be applied. Caution shall be used during assembly to prevent over tightening of the PVC components once the thread sealant has been applied. Female PVC threaded fittings shall be used with plastic male threads only.

308.12.3 Threaded Joints. Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded; however, the pressure rating shall be reduced by 50 percent. The use of molded fittings shall not result in a 50 percent reduction in the pressure rating of the pipe provided that the molded fittings shall be fabricated so that the wall thickness of the material is maintained at the threads. Thread sealant compound that is compatible with the pipe and fitting, insoluble in water, and nontoxic shall be applied to male threads. Caution shall be used during assembly to prevent over tightening of the PVC components once the thread sealant has been applied. Female PVC threaded fittings shall be used with plastic male threads only.

308.13 Stainless Steel Pipe and Joints. Joining methods for stainless steel pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.13.1 or Section 308.13.2.

308.13.1 Mechanical Joints. Mechanical joints shall be designed for their intended use. Such joints shall include compression, flanged, grooved, pressed-press-connect, and threaded.

308.13.2 Welded Joints. Welded joints shall be either fusion or resistance welded based on the selection of the
### TABLE 309.1
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS</th>
<th>BUILDING SEWER PIPE AND FITTINGS</th>
<th>REFERENCED STANDARD(S) PIPE</th>
<th>REFERENCED STANDARD(S) FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS (Schedule 40)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM D2661, ASTM D2680*</td>
<td>ASTM D2661, ASTM D2680*</td>
</tr>
<tr>
<td>Cast-Iron</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ASTM A74, ASTM A888, CISPI 301</td>
<td>ASME B16.12, ASTM A74, ASTM A888, CISPI 301</td>
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<tr>
<td>Co-Extruded ABS (Schedule 40)</td>
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<td>X</td>
<td>X</td>
<td>ASTM F628</td>
<td>ASTM D2661, ASTM D2680*</td>
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<td>Co-Extruded Composite (Schedule 40)</td>
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<td>X</td>
<td>X</td>
<td>ASTM F1488</td>
<td>ASTM D2661, ASTM D2680*</td>
</tr>
<tr>
<td>Co-Extruded PVC (Schedule 40)</td>
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<td>X</td>
<td>X</td>
<td>ASTM F891</td>
<td>ASTM D2665, ASTM F794*, ASTM F1866</td>
</tr>
<tr>
<td>Galvanized Malleable Iron</td>
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<td>X</td>
<td>—</td>
<td>—</td>
<td>ASME B16.3</td>
</tr>
<tr>
<td>Galvanized Steel</td>
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<td>X</td>
<td>—</td>
<td>ASTM A53</td>
<td>—</td>
</tr>
<tr>
<td>PVC (Schedule 40)</td>
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<td>X</td>
<td>X</td>
<td>ASTM D1785, ASTM D2665, ASTM F794*</td>
<td>ASTM D2665, ASTM F794*, ASTM F1866</td>
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<tr>
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<td>—</td>
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<tr>
<td>Stainless Steel 316L</td>
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<td>X</td>
<td>X</td>
<td>ASME A112.3.1</td>
<td>ASME A112.3.1</td>
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<tr>
<td>Vitrified Clay (Extra strength)</td>
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<td>—</td>
<td>X</td>
<td>ASTM C700</td>
<td>ASTM C700</td>
</tr>
</tbody>
</table>

* For building sewer applications.

The chemical composition of the filler metal shall comply with AWS A5.9 based on the alloy content of the piping material.

**308.14 Slip Joints.** In water piping, slip joints shall be permitted to be used only on the exposed fixture supply.

**308.14-308.15 Dielectric Unions.** Dielectric unions where installed at points of connection where there is a dissimilarity of metals shall be in accordance with ASSE 1079.

**308.15–308.16 Joints Between Various Materials.** Joints between various materials shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 308.15-1 308.16.1 through Section 308.15-2 308.16.3.

**308.15-1 308.16.1 Copper or Copper Alloy Pipe or Tubing to Threaded Pipe Joints.** Joints from copper or copper alloy pipe or tubing to threaded pipe shall be made by the use of a flared or pressed joint and the connection between the threaded pipe and the fitting shall be made with a standard pipe size threaded joint.

**308.15-2 308.16.2 Plastic Pipe to Other Materials.** Where connecting plastic pipe to other types of piping, approved types of adapter or transition fittings designed for the specific transition intended shall be used.

**308.15-3 308.16.3 Stainless Steel to Other Materials.** Where connecting stainless steel pipe to other types of piping, mechanical joints of the compression type, dielectric fitting, or dielectric union in accordance with ASSE 1079 and designed for the specific transition intended shall be used.

**309.0 Drainage Pipe and Fitting Materials.**

**309.1 Materials.** Materials for drainage pipe and fittings shall comply with the applicable standards referenced in Table 309.1 except that:
(1) No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept not less than 6 inches (152 mm) aboveground.

(2) No vitrified clay pipe or fittings shall be used above-ground or where pressurized by a pump or ejector. They shall be kept not less than 12 inches (305 mm) belowground.

(3) Copper or copper alloy tube for drainage and vent piping shall have a weight of not less than that of copper or copper alloy drainage tube type DWV.

(4) Stainless steel 304 pipe and fittings shall not be installed underground and shall be kept not less than 6 inches (152 mm) aboveground.

(5) Cast-iron soil pipe and fittings shall be marked with the country of origin and identification of the original manufacturer in addition to markings required by the referenced standards.

309.2 Fittings. Materials for drainage fittings shall be in accordance with the applicable standards referenced in Table 309.1 of the same diameter as the piping served, and such fittings shall be compatible with the type of pipe used.

309.2.1 Type. Fittings used for drainage shall be of the drainage type, have a smooth interior water-way, and be constructed so as to allow \( \frac{1}{2} \) inch per foot (20.8 mm/m) grade.

309.3 Drainage Piping. Drainage piping to waste-serving gravity overflow gutter drains and deck drains shall be installed to provide a continuous grade to the point of discharge.

310.1 ABS and ABS Co-Extruded Plastic Pipe and Joints. Joining methods for ABS plastic pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.1.1 through Section 310.1.3.

310.1.1 Mechanical Joints. Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint. The push-on joint shall include an elastomeric gasket in accordance with ASTM D3212 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal.

310.1.2 Solvent Cement Joints. Solvent cement joints for ABS pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, solvent cement in accordance with ASTM D2235 shall be applied to all joint surfaces. Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

310.1.3 Threaded Joints. Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded. Molded threads on adapter fittings for the transition to threaded joints shall be permitted.

Thread sealant compound shall be applied to male threads, insoluble in water, and nontoxic. The joint between the pipe and transition fitting shall be of the solvent cement type. Caution shall be used during assembly to prevent over tightening of the ABS components once the thread sealant compound has been applied.

310.2 Cast-Iron Pipe and Joints. Joining methods for cast-iron pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.2.1 or Section 310.2.2.

310.2.1 Caulked Joints. Caulked joints shall be firmly packed with oakum or hemp and filled with molten lead to a depth of not less than 1 inch (25.4 mm) in one continuous pour. The lead shall be caulked thoroughly at the inside and outside edges of the joint. After caulking, the finished joint shall not exceed \( \frac{3}{4} \) of an inch (3.2 mm) below the rim of the hub. No paint, varnish, or other coatings shall be permitted on the joining material until after the joint has been tested and approved.

310.2.2 Mechanical Joints and Compression Joints. Mechanical joints for cast iron pipe and fittings shall be of the elastomeric compression type or mechanical joint couplings. Compression type joints with an elastomeric gasket for cast-iron hub and spigot pipe shall comply with ASTM C564 and be tested in accordance with ASTM C1563. Hub and spigot shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Fold and insert gasket into the hub. Lubricate the joint following manufacturer’s instructions. Insert spigot into hub until the spigot end of the pipe bottom out in the hub. Use the same procedure for the installation of fittings.

A mechanical joint shielded coupling type for hubless cast-iron pipe and fittings shall have a metallic shield in accordance with ASTM A1056, ASTM C1277, ASTM C1540, or CISPI 310. The elastomeric gasket shall comply with ASTM C564. Hubless cast-iron pipe and fittings shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Gasket shall be placed on the end of the pipe or fitting and the stainless steel shield and clamp assembly on the end of the other pipe or fitting. Pipe or fittings shall be seated against the center stop inside the elastomeric sleeve. Slide the stainless steel shield and clamp assembly into position centered over the gasket and tighten. Bands shall be tightened using an approved calibrated torque wrench specifically set by the manufacturer of the couplings.

310.3 Copper or Copper Alloy Pipe (DWV) and Joints. Joining methods for copper or copper alloy pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.3.1 through Section 310.3.4.

310.3.1 Brazed Joints. Brazed joints between copper or copper alloy pipe and fittings shall be made with brazing alloys having a liquid temperature above 1000°F (538°C). The joint surfaces to be brazed shall be cleaned.
310.3.2 Mechanical Joints. Mechanical joints in copper or copper alloy piping shall be made with a mechanical coupling with grooved end piping or approved joint designed for the specific application.

310.3.3 Soldered Joints. Soldered joints between copper or copper alloy pipe and fittings shall be made in accordance with ASTM B828 with the following sequence of joint preparation and operation as follows: measuring and cutting, reaming, cleaning, fluxing, assembly and support, heating, applying the solder, cooling, and cleaning. Pipe shall be cut square and reamed to the full inside diameter including the removal of burrs on the outside of the pipe. Surfaces to be joined shall be cleaned bright by manual or mechanical means. Flux shall be applied to pipe and fittings and shall be in accordance with ASTM B813, and shall become noncorrosive and nontoxic after soldering. Insert pipe into the base of the fitting and remove excess flux. Pipe and fitting shall be supported to ensure a uniform capillary space around the joint. Heat shall be applied using an air or fuel torch with the flame perpendicular to the pipe using acetylene or an LP gas. Preheating shall depend on the size of the joint. The flame shall be moved to the fitting cup and alternate between the pipe and fitting. Solder in accordance with ASTM B32 shall be applied to the joint surfaces where pipe and fitting shall be supported to ensure a uniform capillary space around the joint. The flame shall be moved to the fitting cup and alternate between the pipe and fitting. Solder in accordance with ASTM B32 shall be applied to the joint surfaces where

310.5.1 Mechanical Joints. Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint type. The push-on joint shall include an elastomeric gasket in accordance with ASTM D3212 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal.

310.5.2 Solvent Cement Joints. Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and pipe shall be deburred. Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color in accordance with ASTM F656. Primer shall be applied until the surface of the pipe and fitting is softened. Solvent cements in accordance with ASTM D2564 shall be applied to all joint surfaces. Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

310.5.3 Threaded Joints. Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded. Molded threads on adapter fittings for transition to threaded joints shall be permitted. Thread sealant compound that is compatible with the pipe and fitting, insoluble in water, and nontoxic shall be applied to male threads. The joint between the pipe and transition fitting shall be of the solvent cement type. Caution shall be used during assembly to prevent over tightening of the PVC components once the thread sealant has been applied. Female PVC threaded fittings shall be used with plastic male threads only.

310.6 Stainless Steel Pipe and Joints. Joining methods for stainless steel pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.6.1 or Section 310.6.2.

310.6.1 Mechanical Joints. Mechanical joints between stainless steel pipe and fittings shall be of the compression, grooved coupling, hydraulic pressed fittings, or flanged.

310.6.2 Welded Joints. Welded joints between stainless steel pipe and fittings shall comply with ASME A112.3.1 and shall be welded autogenously. Pipe shall be cleaned, free of scale and contaminating particles. Pipe shall be cut with a combination cutting and beveling tool that provides a square cut, and free of burrs. Mineral oil lubricant shall be used during the cutting and beveling process.

310.7 Vitrified Clay Pipe and Joints. Joining methods for vitrified clay pipe and fittings shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.7.1.

310.7.1 Mechanical Joints. Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint type. The push-on joint shall include an elastomeric gasket in accordance with ASTM C425 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal.
310.8 Joints Between Various Materials. Joints between various materials shall be installed in accordance with the manufacturer’s installation instructions and shall comply with Section 310.8.1 through Section 310.8.4. Mechanical couplings used to join different materials shall be in accordance with ASTM C1173 for belowground use, ASTM C1460 for aboveground use, or ASTM C1461 for aboveground and belowground use.

310.8.1 Copper or Copper Alloy Pipe to Cast-Iron Pipe. Joints from copper or copper alloy pipe or tubing to cast-iron pipe shall be made with a listed compression-type joint or copper alloy ferrule. The copper or copper alloy pipe or tubing shall be soldered or brazed to the ferrule, and the ferrule shall be joined to the cast-iron hub by a compression or caulked joint.

310.8.2 Copper or Copper Alloy Pipe to Threaded Pipe Joints. Joints from copper or copper alloy pipe or tubing to threaded pipe shall be made by the use of a listed copper alloy adapter or dielectric fitting. The joint between the copper or copper alloy pipe and the fitting shall be a soldered or brazed, and the connection between the threaded and the fittings shall be made with a standard pipe size threaded joint.

310.8.3 Plastic Pipe to other Materials. Where connecting plastic pipe to other types of plastic or other types of piping material; approved listed adapter or transition fittings and listed for the specific transition intended shall be used.

310.8.4 Stainless Steel Pipe to Other Materials. Where connecting stainless steel pipe to other types of piping, listed mechanical joints of the compression type and listed for the specific transition intended shall be used.

311.0 Tests and Test Gauges.

311.1 Approval of Swimming Pool, Spa, and Hot Tub Piping. Pool, spa, or hot tub piping shall be inspected and approved before being covered or concealed. It shall be tested and proved tight under a static water or air pressure test of not less than 35 pounds-force per square inch (psi) (241 kPa) for 15 minutes and shall be approved by the Authority Having Jurisdiction.

Exception: Exposed equipment shall be tested as required by the Authority Having Jurisdiction, the manufacturer’s instructions, or both.

311.2 Approval of Drainage and Vent Piping. Drainage and vent piping, except outside deck drains, shall be inspected and approved before being covered or concealed. They shall be tested by plugging all outlets, filling with water, and joints shall be tight.

311.3 Dial Gauges. Tests in accordance with this code, which are performed utilizing dial gauges, shall be limited to gauges having the following pressure graduations or incrementations.

311.4 Pressure Tests (10 psi or less). Required pressure tests of 10 psi (69 kPa) or less shall be performed with gauges of 0.10 psi (0.69 kPa) incrementation or less.

311.5 Pressure Tests (greater than 10 psi to 100 psi). Required pressure tests exceeding 10 psi (69 kPa) but less than or equal to 100 psi (689 kPa) shall be performed with gauges of 1 psi (7 kPa) incrementation or less.

311.6 Pressure Tests (exceeding 100 psi). Required pressure tests exceeding 100 psi (689 kPa) shall be performed with gauges incremented for 2 percent or less of the required test pressure.

311.7 Pressure Range. Test gauges shall have a pressure range not exceeding twice the test pressure applied.

312.0 Final Inspection.

312.1 General. Swimming pool, spa, or hot tub installations shall be completed. The pool shall be completely filled with water and in operation before final inspection.

312.0.1.2 DCOF, Level Walkways. Level hard-surface walkways intended to be walked upon while wet with water shall have a dynamic coefficient of friction (DCOF) of not less than 0.42 as determined in accordance with TCNA A326.3.

314.0 Slip-Resistant Walkway Surfaces.

314.1 General. Where walkway surfaces are in locations subject to being wet with water, such surfaces shall be in accordance with Section 314.1.1 through Section 314.1.3. (See Appendix C for informative notes and an example calculation.)

314.1.1 DCOF, Level Walkways. Level hard-surface walkways intended to be walked upon while wet with water shall have a dynamic coefficient of friction (DCOF) of not less than 0.42 as determined in accordance with TCNA A326.3.

314.1.2 DCOF, Inclined Walkways. Inclined hard-surface walkways with a slope greater than or equal to 1 inch per 20 inches (50 mm/m) shall be tested in accordance with TCNA A326.3 and shall have a corrected minimum required DCOF in accordance with Equation 314.1.2.
Where:

$\mu_{\text{corrected}} = \text{corrected DCOF of surface}$

$\mu_{\text{level}} = \text{level DCOF of surface} = 0.42 \text{ minimum}$

$\alpha = \text{angle of slope, degrees}$

**314.1.3 Three-dimensionally Patterned or Profiled Walkways.** Walkway DCOF data shall not be based on testing conducted across grout joints or across protruding features of three-dimensionally patterned or profiled hard surface walkways. DCOF data (obtained through complying with Sections 314.1.1 and Section 314.1.2) shall be based on testing conducted over a nominally flat section of such walkways. If a design professional specifies a walkway surface for which DCOF data from nominally flat sections is not obtainable, the design professional shall document their foundations for concluding the specified walkway surface is at least as slip-resistant as walkway surfaces meeting Sections 314.1.1 or Section 314.1.2. This documentation shall be included with the construction documents.

(Equation 314.1.2)

$$\mu_{\text{corrected}} = \frac{\tan \alpha + \mu_{\text{level}}}{1 - (\mu_{\text{level}} \times \tan \alpha)}$$
CHAPTER 4
DESIGN, MATERIALS, AND METHODS OF CONSTRUCTION

401.0 General.
401.1 Applicability. This chapter shall govern the general requirements for design, materials, methods of construction, facilities, and decks as they pertain to swimming pools, spas, and hot tubs.

401.2 Lightning Protection Systems. Public facilities that contain indoor or outdoor swimming pools, spas, hot tubs, or combination thereof shall be equipped with an approved lightning protection system installed in accordance with NFPA 780 or UL 96A.

401.2.1 Testing. Lightning protection systems shall be tested periodically in accordance with the manufacturer’s instructions.

401.3 Lighting. Artificial lighting shall be provided at public aquatic venues used at night or at public aquatic venues that do not provide, while in use, natural lighting at levels that are in accordance with Section 401.3.1. Lighting shall illuminate all parts of the aquatic venue including water surface area, main drains, depth markings, signage, entrances, safety equipment, decks, and walkways in accordance with the Authority Having Jurisdiction. Artificial lighting systems shall be installed in accordance with the manufacturer’s installation instructions and NFPA 70.

401.3.1 Lighting Levels. Lighting levels for the water surface and deck of an aquatic venue shall be not less than the following:
- Indoor water surface - 60 horizontal footcandles (646 lx)
- Outdoor water surface - 10 horizontal footcandles (108 lx)
- Deck - 10 horizontal footcandles (108 lx)

401.3.2 Underwater Lighting. Underwater lighting shall be provided for an aquatic venue at not less than 8 initial rated lumens per square foot (86 lx) of water surface area except where surface lighting levels are not less than 15 horizontal footcandles (161 lx) for all portions of the aquatic venue. Underwater lighting shall be grounded in accordance with Section 804.2.

401.3.3 Emergency Egress Lighting. Emergency egress lighting shall be provided in accordance with the building code, but not less than 0.5 footcandles (5.4 lx).

401.3.4 Glare. Windows, skylights, and overhead lighting shall be located to avoid glare on the water surface area of an aquatic venue in accordance with the Authority Having Jurisdiction.

401.3.5 Listed Equipment. Underwater luminaires shall be listed and labeled for use in swimming pools and spas in accordance with UL 676. Potting compounds used to protect bonding connections from the possible deteriorating effect of swimming pool or spa water shall be listed and labeled in accordance with UL 676A. Transformers and power supplies used for the supply of low voltage underwater luminaires shall be listed and labeled in accordance with UL 379. Junction boxes used with underwater swimming pool and spa luminaires shall be listed and labeled in accordance with UL 1241. Equipment shall be installed in accordance with the manufacturer’s installation instructions.

401.4 Islands. Where an island(s) is installed, the island shall be in accordance with the following:
- Islands intended for foot traffic shall be not less than 18 inches (457 mm) in width.
- Islands not more than 48 inches (1219 mm) in width shall be restricted to authorized personnel.
- Islands not intended for foot traffic shall be designated as such.
- Islands shall be slip resistant.

401.4.1 Island Markers. Island markers shall be in accordance with the following:
- Island lighting shall comply with Section 401.3.
- Island edge markers shall be located along the horizontal and vertical edges as follows:
  - (a) of contrasting color
  - (b) continuously marked along the island edge
  - (c) not less than ¾ of an inch (19.1 mm) and not more than 2 inches (51 mm) in width
  - (d) located at not less than 2 inches (51 mm) from the island edge

401.5 Bridges. Where bridges are installed over a pool or lazy river, they shall have a vertical clearance of not less than 7 feet (2134 mm) from the bottom of the pool and have not less than a 4 foot (1219 mm) vertical clearance from the water surface to any structure or feature. Bridges shall have a width of not less than 48 inches (1219 mm) and shall be slip-resistant. Guardrails shall be installed on each side of a bridge and shall not be less than 42 inches (1067 mm) in height from the bridge surface. Balusters of guardrails shall be installed so as to prevent a 4 inch (102 mm) sphere to pass.

401.6 Lazy Rivers. Where installed, lazy rivers shall comply with the following:
- A means of entry/exit shall be provided at intervals not exceeding 150 feet (45 720 mm).
- Handholds shall be in accordance with Section 402.10 and shall be installed along the perimeter of the lazy river on not less than one wall.
- Islands shall comply with Section 401.4 and Section 401.4.1.
- Bridges shall comply with Section 401.5.
402.0 Swimming Pools.

402.1 Public and Private Swimming Pools. Public and private swimming pools shall be installed in accordance with this code and the manufacturer’s installation instructions. The location of the pool shall in no way hinder the operation for which it is designed nor adversely affect bather’s safety or water quality.

402.2 Construction Material. A pool shall be constructed of reinforced concrete or other approved materials that are impervious and provide a watertight structure.

402.2.1 Dissimilar Material. Where a pool structure is to be lined with dissimilar material, the two materials shall be continually and permanently bonded so not to separate at any time or place.

402.2.2 Freeze Protection. Where located in areas subject to freezing, pools and appurtenances shall be protected and designed from damage due to freezing.

402.3 Structural Design. Swimming pools shall be designed to withstand anticipated stresses under both full and empty conditions, taking into consideration climatic, hydrostatic, seismic, geotechnical, and the integration of the pool with other structural conditions.

402.3.1 Concrete. Concrete used in swimming pools shall be designed to have minimum compressive strength and concrete cover for reinforcement in accordance with ACI 318.

402.3.2 Fiberglass Reinforced Plastic. Where fiberglass reinforced plastic is used in the construction of a swimming pool, it shall be designed in accordance with IAPMO IGC 158.

402.3.3 Stainless Steel. Where stainless steel is used in the construction of a swimming pool, it shall be designed in accordance with ASTM A240.

402.3.4 Tile. Where tile is used in the construction of a swimming pool, it shall be installed in accordance with TCNA A108/A118/A136.

402.3.5 Vinyl. Materials used in the manufacturing of vinyl liners for aboveground swimming pools shall be tested in accordance with ASTM D1593 and ASTM D1790.

402.4 Testing. Pools and hydraulic systems shall be tested for water tightness before being approved by the Authority Having Jurisdiction. For inground pools, a hydrostatic relief valve shall be provided where the water table exerts hydrostatic pressure to uplift the pool where empty or drained.

402.5 Floor Slopes. Public and private swimming pool floor slopes shall be uniform and slope toward the main drains.

402.5.1 Public Swimming Pools. Where the water depth is less than 5 feet (1524 mm), the floor slope shall not exceed 1 foot (305 mm) in 12 feet (3658 mm) to the point of the first slope change. Where the water depth exceeds 5 feet (1524 mm), the floor slope shall not exceed 1 foot (305 mm) in 3 feet (914 mm).

Exceptions:
1. Pools designed for competitive diving and swimming in accordance with FINA Part X.
2. Pools designed for therapy, military, or other special use.

402.5.2 Private Swimming Pools. Where the water depth is less than 2 feet (610 mm), the floor slope shall not exceed 1 foot (305 mm) in 7 feet (2134 mm). The floor slope shall not exceed 1 foot (305 mm) in 3 feet (914 mm) from the first slope change to the deepest point of the swimming pool.

402.6 Wall Slopes. Walls of the pool shall be vertical or not exceed 11 degrees (0.19 rad) from vertical for water depths, not less than 6 feet (1829 mm), or vertical for a distance not less than 3 feet (914 mm) below the water level and curved to join the wall and floor.

402.7 Finishes and Surfaces. The interior finish of a swimming pool shall be nonabrasive and slip-resistant. The interior floor of pools shall be such to facilitate the identification of objects and markers within such area. A non-slip white or light-colored waterproof finish which withstands repeated brushing, scrubbing, and cleaning shall line the pool.

Paint, fiberglass, or epoxy coated finishes shall be nontoxic, water resistant, of one single light color, and shall continually and permanently bond so as not to separate. Corners and edges shall be rounded and smooth to prevent abrasions, and shall be rounded with a minimum 6 inch (152 mm) radius.

402.8 Markings. The various depths of the pool shall be visible and marked in accordance with the following:
1. At or above the water surface on the vertical pool wall
2. On the edge of the deck at points of change in floor slope
3. Spaced at not more than 25 foot (7620 mm) intervals
4. On bottom sides and ends of the pool
5. Numerals shall be not less than 4 inches (102 mm) in height
6. Numerals shall contrast with the background they are placed, and be of a durable material that is both weather-resistant and slip resistant where located on the pool deck
7. Each depth marking shall include the unit of measurement as required by the Authority Having Jurisdiction
8. For pool water depths not greater than 5 feet (1524 mm), no diving markers with the universal symbol for “No Diving,” which is a red circle with a slash through it superimposed over the image of a diver, and the words “NO DIVING” shall be installed on the deck directly adjacent to the depth markers

Exception: On pool or spa walls with a vanishing edge, the depth marking shall be permitted to be located elsewhere where approved by the Authority Having Jurisdiction.

402.8.1 No Diving. For public swimming pools, where water depths are 5 feet (1524 mm) or less, the universal symbol for “No Diving” and lettering that states: “NO DIVING” shall be marked adjacent to the depth markings in accordance with Section 402.8. The symbol and lettering shall be not less than 4 inches (102 mm) in...
402.8.2 Determining Depth. The depth shall be measured at the normal operating water level when measured 3 feet (914 mm) from the pool wall or at the tangent point where the cove radius meets the floor, whichever is deeper. The depth marking shall be accurate to within plus or minus 3 inches (76 mm).

402.9 Maximum Bather Capacity. The maximum bather capacity at a given time shall not exceed one bather for each 5 gallons per minute (gpm) (0.32 L/s) of water circulated for a public swimming pool. The maximum bather load per day shall be in accordance with Section 503.3.

402.10 Handholds. Handholds shall be provided for swimming pools where the water depth exceeds 24 inches (610 mm). Handholds shall be located not more than 6 inches (152 mm) above the water surface and spaced not more than 4 feet (1219 mm) apart. Handholds shall consist of ladders, steps, gutters, railing, coping, or combination thereof of not more than 2 inches (51 mm) in size.

Exceptions:
1. Where an underwater seat or bench is installed
2. Wading pools
3. Wave pools

402.11 Anchorage. Where provided, wall anchors shall be made of corrosion-resistant material. Wall anchors shall be recessed and shall not protrude beyond the pool wall.

402.12 Underwater Benches or Seats. For public swimming pools, underwater benches or seats, where installed, shall be constructed of slip-resistant materials and shall be outlined with a color contrasting stripe or other permanent marking of not less than 3⁄4 of an inch (19.1 mm) or more than 2 inches (51 mm) in width. Underwater benches and seats shall not be located in water depths that exceed 5 feet (1524 mm). The submerged depth of a bench or seat shall not exceed 18 inches (457 mm). Underwater ledges shall be installed in water depths that exceed 20 inches (508 mm) measured from the waterline.

402.13 Swimouts. Where swimouts are installed, swimout benches shall comply with the following:
1. Swimouts installed for the purpose of entry and exit of a pool shall be installed with stairs in accordance with Section 802.4.
2. Swimouts shall not be installed in the diving area of a pool.
3. The front edge of a swimout shall be distinguished by a stripe of a contrasting color on the vertical and horizontal surfaces having a width not less than 1⁄4 of an inch (19.1 mm) and not more than 2 inches (51 mm).
4. The horizontal surface of a swimout shall comply with the following:
   a. Shall have an unobstructed surface area of not less than 240 square inches (0.155 m²).
   b. Shall have an unobstructed horizontal depth of not less than 10 inches (254 mm).
   c. Shall not have a vertical depth of less than 20 inches (508 mm) below the pool water surface.

402.14 Underwater Ledges. For public swimming pools, underwater ledges, where installed, shall be constructed of slip-resistant materials; shall be outlined with a color contrasting stripe or other permanent marking of not less than 1⁄4 of an inch (19.1 mm) or more than 2 inches (51 mm) in width; and have a horizontal tread depth of not more than 4 inches (102 mm). Underwater ledges shall be installed in water depths of not less than 5 feet (1524 mm).

402.15 Beach Entry Pools. Where sand is installed in an entry/exit of a pool, the entry/exit way shall have a zero-depth entry in accordance with Section 802.6 and shall be designed and controlled such that the circulation system, maintenance, safety, sanitation, and operation of the pool are not adversely affected.

403.0 Wading Pools.

403.1 General. Wading pools shall be physically separated from the swimming pool area by not less than 7 feet (2134 mm), and a barrier shall be installed to separate the two areas with a height of not less than 4 feet (1219 mm) measured from the pool water surface to the top of the barrier.

403.2 Gates. Gates used for ingress or egress of the wading pool shall be self-closing, self-latching, lockable, open outward away from the pool, and not less than the height of the surrounding fence.

403.3 Water Depth. Wading pools and the perimeter water depth shall not exceed 18 inches (457 mm).

403.4 Walls. Walls of the pool shall be vertical or not exceed 11 degrees (0.19 rad) from vertical, and such walls shall slope inward away from the pool, and not less than the height of the surrounding fence.

403.5 Markers. Wading pools shall have not less than two depth markers indicating the maximum depth.

403.6 Floor Slope. Floor slope shall be uniform and slope toward the main drain.

404.0 Vanishing Edge Pools.

404.1 General. Where a vanishing edge pool is installed, the vanishing edge shall be installed with a catch basin and a dedicated pump to recirculate water from the catch basin to the pool.

404.2 Sizing of the Catch Basin. The volume of the catch basin shall be not less than the sum of the volumes determined in Section 404.2.1 through Section 404.2.3. The minimum operating water depth shall be in accordance with Section 404.2.4.

404.2.1 Bather Spill. The catch basin volume required to replenish bather surge shall be the greater of the following:
1. 25 gallons (95 L) or more per bather
2. 300 gallons (1136 L) or more, or
3. Not less than the volume of the pool at a depth of 2 inches (51 mm)
404.2.2 Water in Transit. The catch basin shall be sized to accommodate the volume of water required to raise the pool water level such that the water flows over the spillway and into the catch basin.

404.2.3 Evaporation. The volume of water required within the catch basin to replenish evaporated water shall not be less than ½ inch (6.4 mm) water depth of the pool and catch basin.

404.2.4 Minimum Operating Level. The catch basin shall maintain a water depth of not less than 12 inches (305 mm).

Exception: Where an anti-vortex suction outlet or multiple suction outlets are installed in the catch basin, the water depth shall be not less than 6 inches (152 mm).

404.0 405.0 Spas and Hot Tubs.

404.1 405.1 Public and Private. Public and private spas and hot tubs shall be installed in accordance with Section 404.2 through Section 404.12. Self-contained spas shall be listed and labeled in accordance with UL 1563 and installed in accordance with the manufacturer’s installation instructions and NFPA 70.

404.2 405.2 Hydrostatic Relief. An approved hydrostatic relief shall be installed on spas and hot tubs built in areas of anticipated high water table.

404.3 405.3 Structural Design. Spas and hot tubs shall be designed to withstand anticipated stresses caused by normal usage, climatic, hydrostatic, seismic, geotechnical, and structural conditions.

404.3.1 405.3.1 Concrete. Where concrete is used for the construction of a spa, it shall be designed in accordance with ACI 318.

404.3.2-405.3.2 Fiberglass Reinforced Plastic. Where fiberglass reinforced plastic is used in the construction of a spa, it shall be designed in accordance with IAPMO Z124.7.

404.3.3-405.3.3 Stainless Steel. Where stainless steel is used in the construction of a spa or hot tub, it shall be designed in accordance with ASTM A240.

404.3.4-405.3.4 Tile. Where tile is used in the construction of a spa or hot tub, it shall be installed in accordance with TCNA A108/A118/A136.

404.3.5-405.3.5 Vinyl. Where vinyl is used in the construction of a spa or hot tub, it shall be designed in accordance with ASTM D1593.

404.4 405.4 Maximum Water Temperature. The water temperature in a spa or a hot tub shall not exceed 104°F (40°C). Devices used to regulate water temperature for electric spas, and hot tubs shall be in accordance with UL 1563. For gas-fired spas and hot tubs such devices shall comply with CSA Z21.56.

404.5 405.5 Water Depth. The water depth of a spa or a hot tub shall not exceed 4 feet (1219 mm).

Exception: Swim spas and other specialty spas as approved by the Approved Having Jurisdiction.

404.6 405.6 Maximum Bather Load. The bather load for a public spa or a hot tub shall not exceed 1 bather per 10 square feet (0.93 m²) of water surface area.

404.7 405.7 Floor Slope. Spa and hot tub floors shall be uniform and slope towards the main drains where present. The floor slope shall not exceed 1 foot (305 mm) in 12 feet (3658 mm).

404.8 405.8 Depth of Seating. The depth of spa or hot tub seating below the water line shall not exceed 26 inches (660 mm).

### TABLE 405.4

<table>
<thead>
<tr>
<th>WATER CLOSETS (FIXTURES PER PERSON)</th>
<th>URINALS (FIXTURES PER PERSON)</th>
<th>LAVATORIES (FIXTURES PER PERSON)</th>
<th>SHOWERS (FIXTURES PER PERSON)</th>
<th>DRINKING FOUNTAINS (FIXTURES PER PERSON)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 400, add 1 fixture for each additional 500 males and 1 for each additional 250 females.</td>
<td>Over 600, add 1 fixture for each additional 500 males.</td>
<td>Over 750, add 1 fixture for each additional 500 males and 1 fixture for each additional 250 females.</td>
<td>Over 200, add 1 fixture for each additional 100 persons.</td>
<td>Over 750, add 1 fixture for each additional 250 persons.</td>
</tr>
</tbody>
</table>

Notes:
1 Minimum number of fixtures shall be calculated as 50 percent male and 50 percent female. Where information submitted indicates a difference in distribution of the sexes, such information shall be used in order to determine the number of fixtures for each sex.
2 Water stations at no cost shall be permitted to be substituted for drinking fountains where drinking water is available at an adjacent building such as bath house, club house, or recreational facility and located within 500 feet (152 m) of the pool.
3 Drinking fountains shall not be installed in toilet rooms.
4 For each urinal added in excess of the minimum required, one water closet shall be permitted to be deducted. The number of water closets shall be not reduced to less than two-thirds of the minimum required.
5 Surrounding materials, wall, and floor space to a point 2 feet (610 mm) in front of a water closet or urinal and 4 feet (1219 mm) above the floor, and not less than 2 feet (610 mm) to each side shall be lined with nonabsorbent material.
**Design, Materials, and Methods of Construction**

404.9-405.9 Finishes and Surfaces. Finishes including colors, textures, or patterns shall not prevent an individual from clearly seeing the bottom of a spa or hot tub, or other surfaces or objects located below the water surface. Floor or seat surfaces or other surfaces shall be non-abrasive and slip-resistant. Corners and edges shall be rounded and smooth to prevent abrasions and shall be rounded with a minimum 6 inch (152 mm) radius.

404.10-405.10 Handholds. Handholds shall be provided for spas and hot tubs. Handholds shall be located not more than 6 inches (152 mm) above the water surface, and spaced not more than 4 feet (1219 mm) apart. Handholds shall consist of ladders, steps, gutters, railing, coping, or combination thereof of not more than 2 inches (51 mm) in size.

404.11-405.11 Markings. There shall be not less than two depth markings at or above the water surface on the vertical wall located on opposite sides of the deck of a public spa. Markings shall be readable from the deck facing the spa, and contrast the surface upon which they are placed. The size of the markings shall not be less than 4 inches (102 mm) in height, and shall be of a durable, weather and slip-resistant material, and indicate the unit of measurements.

404.12-405.12 Wooden Hot Tubs. Wooden hot tubs, installed below grade, shall have not less than 12 inches (305 mm) of clearance between the outside walls of the tub and the interior wall of a supported sump or pit.

405.0-406.0 Public Aquatic Facilities.

405.1-406.1 General. Public facilities for swimming pools, spas, hot tubs, or combination thereof shall comply with Section 406.1-406.2 through Section 414.4-415.1. Decks shall comply with Section 415.9-416.0.

406.1-406.2 Accessible Facilities. Where accessible facilities are required in applicable building regulations, such facilities shall be installed in accordance with those regulations.

406.3 Toilet Facilities. Public aquatic facilities shall be provided with sanitary facilities, including provisions for persons with disabilities as prescribed by the Authority Having Jurisdiction.

406.4 Occupant Load. Plumbing fixtures shall be provided in accordance with Table 406.4-406.4 based on the occupant load. The total occupant load shall be determined in accordance with the building code. Table 406.4-406.4 applies to new pools, additions to the pool, and changes of occupancy or type in an existing pool resulting in increased occupant load. Separate toilet facilities shall be provided for each sex.

406.4.1-406.4.1 Family or Assisted-Use Toilet Facilities. Where a separate toilet facility is required for each sex, and each toilet facility is required to have only one water closet, two family or assisted-use toilet facilities shall be permitted in place of the required separate toilet facilities.

406.5-406.5 Privacy. Each water closet utilized by the public and employees shall be enclosed by a separate compartment with walls or partitions and a door enclosing the fixture to ensure privacy.

**Exception:** Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.

406.6-406.6 Floors. Floors shall be constructed of a non-absorbent and slip-resistant material and sloped not less than ¼ inch per foot (20.8 mm/m) to the floor drains, trench drains, or other approved surface water disposal area.

406.7-406.7 Walls. Walls and surrounding areas shall be smooth, moisture resistant finishes throughout.

406.8-406.8 Hardware. Single approved soap dispensers (liquid or powder) shall be provided at each lavatory and shower. Paper towel dispensers or air blowers shall be provided at lavatories. Toilet paper dispensers shall be provided at toilets. Diaper changing stations shall be provided in accordance with the Authority Having Jurisdiction.

407.0 Access to Fixtures.

407.1 Public and Employee Use. Fixtures for the public and employees shall be located such that the maximum travel distance shall not exceed 500 feet (152 m) from the pool. Restrooms shall not be required where available in adjacent living quarters or adjacent building and shall not exceed 500 feet (152 m) in travel distance.

407.2 Installation. Fixtures shall be set level and in proper alignment with reference to adjacent walls. No water closet or bidet shall be set closer than 15 inches (381 mm) from its center to a side wall or obstruction, or closer than 30 inches (762 mm) center to center to a similar fixture. The clear space in front of a water closet, lavatory, or bidet shall be not less than 24 inches (610 mm). No urinal shall be set closer than 12 inches (305 mm) from its center to a side wall or partition, and not closer than 24 inches (610 mm) center to center. Installations not covered shall be in accordance with the plumbing code.

**Exception:** The installation of paper dispensers or accessibility grab bars shall not be considered obstructions.

408.0 Water Closets.

408.1 Application. Water closets shall comply with ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, or CSA B45.5/IAPMO Z124. Water closet bowls for public use shall be of the elongated type.

408.2 Water Consumption. Water closets shall have a maximum consumption not to exceed 1.6 gallons of water per flush (6.0 Lpf) in accordance with ASME A112.19.2/CSA B45.1.

408.2.1 Dual Flush Water Closets. Dual flush water closets shall comply with ASME A112.19.14. The effective flush volume for dual flush water closets shall be defined as the composite, average flush volume of two reduced flushes and one full flush.

408.2.2 Flushometer Valve Activated Water Closets. Flushometer valve activated water closets shall have a maximum flush volume of 1.6 gallons of water per flush (6.0 Lpf) in accordance with ASME A112.19.2/CSA B45.1.
407.3 Water Closet Seats. Water closet seats shall be properly sized for the water closet bowl type and shall be of smooth, nonabsorbent material. Seats, for public use, shall be of the elongated type and either of the open front type or have an automatic seat cover dispenser. Plastic seats shall comply with IAPMO Z124.5.

408.0 Urinals. 

408.1 Application. Urinals shall comply with ASME A112.19.2/CSA B45.1, ASME A112.19.19, or CSA B45.5/IAPMO Z124. Urinals shall have an average water consumption not to exceed 1 gallon of water per flush (3.8 Lpf).

408.2 Nonwater Urinals. Nonwater urinals shall have a barrier liquid sealant to maintain a trap seal. Nonwater urinals shall permit the uninhibited flow of waste through the urinal to the sanitary drainage system. Nonwater urinals shall be cleaned and maintained in accordance with the manufacturer’s instructions after installation. Where nonwater urinals are installed, not less than one water supplied fixture rated at not less than 1 water supply fixture unit (WSFU) shall be installed upstream on the same drain line to facilitate drain line flow and rinsing. Where nonwater urinals are installed, they shall have a water distribution line rough-in to the urinal location to allow for the installation of an approved backflow prevention device in the event of a retrofit.

408.2.1 Nonwater Urinals with Drain Cleansing Action. Nonwater urinals with drain cleansing action shall comply with ASME A112.19.19 and shall be cleaned, maintained and installed in accordance with the manufacturer’s installation instructions.

409.0 Lavatories. 

409.1 Application. Lavatories shall comply with ASME A112.19.11/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.19, or CSA B45.4/IAPMO Z124. Lavatories shall comply with CSA B45.9.1 and shall have a finished interior of a minimum of 10 square feet (0.93 m²) of usable floor area.

409.2 Backflow Protection. A water supply to a urinal shall be protected by an approved-type vacuum breaker or other approved backflow prevention device in accordance with the plumbing code.

410.0 Showers. 


410.2 Water Consumption. Showerheads shall have a maximum flow rate of not more than 2.5 gpm at 80 psi (9.5 L/min at 552 kPa), in accordance with ASME A112.18.1/CSA B125.1.

410.3 Individual Shower and Tub-Shower Combinations. Showers and tub-shower combinations in buildings shall be provided with individual control valves of the pressure balance, thermostatic, or combination pressure balance/thermostatic mixing valve type that provide scald and thermal shock protection for the rated flow rate of the installed showerhead. These valves shall be installed at the point of use and in accordance with ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1.

410.4 Shower Compartments. Shower compartments, regardless of shape, shall have a finished interior of not less than 1024 square inches (6.606 m²) and shall be capable of encompassing a 30 inch (762 mm) circle. The minimum required area and dimensions shall be measured at a height equal to the top of the threshold and at a point tangent to its centerline. The area and dimensions shall be maintained to a point of not less than 70 inches (1778 mm) above the shower drain outlet with no protrusions other than the fixture valve or valves, shower head, soap dishes, shelves, and safety grab bars or rails. Fold-down seats in accessible shower stalls shall be permitted to protrude into the 30 inch (762 mm) circle.

Exception: Showers that are designed in accordance with ICC A117.1.

410.5 Public Shower Floors. Floors of public shower rooms shall have a nonskid surface and shall be drained in such a manner that wastewater from one bather shall not pass over areas occupied by other bathers. Gutters in public or gang shower rooms shall have rounded corners for easy cleaning and shall be sloped not less than 2 percent toward drains. Drains in gutters shall be spaced not more than 8 feet (2438 mm) from sidewalls and not more than 16 feet (4877 mm) apart.
410.6-411.6 **Location of Valves and Heads.** Control valves and showerheads shall be located on the sidewall of shower compartments, or otherwise arranged so that the showerhead does not discharge directly at the entrance to the compartment so that the bather can adjust the valve prior to stepping into the shower spray.

410.7-411.7 **Water Supply Riser.** A water supply riser from the shower valve to the showerhead outlet, whether exposed or not, shall be securely attached to the structure.

411.0-412.0 **Female Hygiene Products.**

411.1-412.1 **General.** In public toilet facilities for females, sanitary napkin and tampon dispensers, and receptacles shall be provided in accordance with the Authority Having Jurisdiction. Where the Authority Having Jurisdiction does not provide such requirements, not less than one dispenser of sanitary napkins and tampons shall be provided within the toilet facility. A sanitary napkin receptacle, tampon receptacle, or combination of both shall be located in each water closet compartment.

412.0-413.0 **Drinking Fountains.**

412.1 **General.** Drinking fountains shall be self-closing and comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, or ASME A112.19.3/CSA B45.4, and NSF 61. Permanently installed electric water coolers shall also comply with UL 399.

412.2-413.2 **Location.** Drinking fountains shall not be installed in toilet rooms.

413.0-414.0 **Floor Drains.**

413.1-414.1 **General.** Floor drains shall comply with ASME A112.3.1, ASME A112.6.3, or CSA B79 and provide a water-tight joint in the floor. Floor drains shall be installed in toilet facilities containing two or more water closets or a combination of one water closet and one urinal. Floor drains shall be provided with an approved type strainer having a waterway equivalent to the area of the tailpiece and floors shall be sloped to floor drains.

414.0-415.0 **Hose Bibbs.**

414.1-415.1 **General.** Hose bibbs shall be provided at not less than 100 foot (30 480 mm) intervals for flushing down the entire pool area and toilet facilities for cleaning purposes and located such that where hoses are attached shall not constitute a safety hazard. Hose bibbs shall be protected against backflow by an approved vacuum breaker that is in accordance with ASSE 1019 or CSA B64.2.1.1.

415.0-416.0 **Decks.**

415.1-416.1 **General.** Decks shall be constructed of corrosion-resistant material and designed for the anticipated loads. Surfaces shall be non-abrasive, slip-resistant, not subject to microbial growth or deterioration. Where deck boards are used, a gap between boards shall be present and shall not exceed ¼ of an inch (6.4 mm) for non-wood products and ⅙ of an inch (3.2 mm) for wood. The elevation difference between decks and other walking surfaces shall not exceed ¼ of an inch (6.4 mm). Change in vertical elevation shall be considered an edge condition. Deck edges shall be beveled, rounded, or otherwise relieved to eliminate sharp corners.

416.2-416.2 **Public Swimming Pools.** Decks for public swimming pools shall extend continuously around the pool’s perimeter including the coping, shall be not less than 8 feet (2438 mm) in unobstructed width, shall be in accordance with Section 405.2-406.2, and shall be provided flush with the top of the pool shell wall. A minimum of ⅛ inch (6.4 mm) expansion joint shall be provided that separates the deck from the coping and pool. Spacing between decks and coping shall be made watertight by the use of a sealant that allows for thermal expansion and contraction between the deck and coping. Spacing shall extend the full thickness of the deck slab. Decks shall be provided on the sides and rear of diving equipment at public pools and shall be not less than 12 feet (3658 mm) in width. The deck width shall be measured from the deckside edge of the coping lip.

**Exceptions:**

1. At the overflow edge of a vanishing edge pool.
2. Where perimeter gutters are installed, the deck width shall be measured from the gutter’s outer edge.
3. Cantilever decks shall be separated from the pool with a bond break.

416.3-416.3 **Public Spas and Hot Tubs.** Decks shall be not less than 4 feet (1219 mm) in unobstructed width, shall comply with Section 405.2-406.2, and shall be flush with the top of the spa or hot tub wall. The deck shall encompass not less than 50 percent of the total perimeter of the spa or hot tub in a continuous manner.

416.4-416.4 **Deck Drainage.** Pool, spa, and hot tub decks shall be constructed to provide drainage from the deck and to prevent standing water. The deck surface shall be sloped not less than ¼ of an inch per foot (10.4 mm/m) to deck drains or other approved surface disposal areas. The deck surface shall not be drained into the pool, spa, or hot tub, including the perimeter overflow channel or connected to the recirculation system.

416.4.1-416.4.1 **Within the Interior of a Building.** Deck drain piping placed within the interior of a building shall be in accordance with the applicable standards referenced in Table 309.1, or other approved materials.

416.4.2-416.4.2 **Located at the Exterior of a Building.** Deck drain piping commencing 2 feet (610 mm) from the exterior of a building shall be permitted to be of any approved material.

416.4.3-416.4.3 **Protection from Damage.** Deck drain piping installed in locations where subjected to damage shall be protected.

416.4.4-416.4.4 **Concealed Locations.** Deck drains and overflow drains where concealed within the construction of the building shall be tested in accordance with the provisions of this code for testing drain, waste, and vent systems.

416.4.5-416.4.5 **Strainers.** Deck strainers shall be of an approved flat-surface type that is level with the deck,
shall not allow a 1/8 inch (3.2 mm) sphere to pass, and shall be removable and accessible. Such drains shall have an inlet area of not less than two times the area of the pipe to which the drain is connected.

### 416.4.6 Drain Covers

Drain covers shall be in accordance with the following:

1. Drain covers shall be capable of withstanding the imposed loads due to foot traffic or equipment.
2. Drain covers shall be installed flush with the floor and secured.
3. Drain covers shall not create a hazard to persons or property.

### 416.0.417.0 Natatoriums

#### 416.1.417.1 Building Envelope

The building envelope of a natatorium shall incorporate an approved vapor retarder that is sealed around doors, windows, and skylights, and installed in accordance with the building code.

#### 416.2.417.2 Interior Finish

The interior finish of a natatorium shall be designed for an indoor relative humidity of not less than 80 percent.

#### 416.2.1.417.2.1 Doors and Glazing

Doors, windows, and skylights shall be constructed of corrosion- and mold-resistant materials. Doors shall be sealed or gasketed and equipped with self-closing door closers.

#### 416.2.2.417.2.2 Ducts

Ducts located on the inside of a natatorium shall be corrosion-resistant. Ducts shall be insulated on the exterior of the duct with a mold-resistant material where the surface temperature of the duct is capable of being less than the airstream temperature within the duct.

#### 416.3.417.3 Spectator Areas

A spectator area shall be separated from an aquatic venue by a deck of not less than 8 feet (2438 mm) wide. An approved barrier installed in accordance with Section 803.0, or a demarcation line that is permanently marked on the deck, shall separate the areas of the deck intended for bather and spectator use.

#### 416.4.417.4 Ventilation

Ventilation shall be provided to an indoor aquatic facility through mechanical ventilation. Aquatic facility ventilation system design, construction, and installation shall comply with the mechanical code. For an aquatic venue, deck, or spectator area located in an aquatic facility, the design outdoor air requirements shall be in accordance with Table 416.4.417.4 and Equation 416.4.417.4 during times when the facility is occupied. Where more than one aquatic venue type, deck, or spectator area is located in an aquatic facility, the outdoor airflow \(V_{bz}\) shall be determined for each aquatic venue, deck, or spectator area and added together to obtain the total outdoor airflow \(V_{bz}\) required for the facility.

\[
V_{bz} = A_z \cdot \left[ R_d + \left( \frac{R_p}{d} \right) \right]
\]

(Equation 416.4.417.4)

Where:

- \(A_z\) = Area of an aquatic venue, deck, or spectator area, square feet (m²)
- \(d\) = Average density, square feet (m²) per person in accordance with Table 416.4.417.4
- \(R_d\) = Outdoor airflow rate required per aquatic venue, deck, or spectator area in accordance with Table 416.4.417.4
- \(R_p\) = Outdoor airflow rate required per person in accordance with Table 416.4.417.4

\[
V_{bz} = \text{Total outdoor airflow}
\]

### 416.4.1.417.4.1 Design Parameters

The ventilation system shall be designed to maintain the surface temperature of exterior windows and skylights, in the area where an aquatic venue is located, to not less than 5°F (3°C) above the dew point of the area. The ventilation system shall be capable of purging the aquatic facility.

### 416.4.2.417.4.2 Exhaust Air

Areas, where aquatic venues are located, shall be provided with a means of exhaust air to maintain a negative pressure relative to adjacent interior spaces and the outdoors of not less than 0.05 inch water column (0.01 kPa), and not more than 0.15 inch water column (0.04 kPa), as required by Equation 416.4.3(2)–417.4.3(2). Means shall be provided to maintain a positive pressure within an aquatic facility in relation to the outdoor pressure.

### 416.4.3.417.4.3 Supply Air

The supply air shall be delivered at a rate not exceeding 8 air changes per hour and not less than 6 air changes per hour for recreational pools. The supply air for competition pools shall be delivered at a rate not exceeding 10 air changes per hour.

### Table 416.4.417.4

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>AQUATIC VENUE TYPE</th>
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<tr>
<td>(R_d) (cfm/ft²)</td>
<td>FLAT WATER¹</td>
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<tr>
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<td>0.48</td>
</tr>
<tr>
<td>(R_p) (cfm/person)</td>
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<tr>
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<tr>
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<td>10</td>
</tr>
<tr>
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<td>(d) (ft²/person)</td>
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</tr>
<tr>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

Notes:

1. “Flat Water” is an aquatic venue in which the water line is static except for movement made by users (i.e. swimming pools).
2. “Agitated Water” is an aquatic venue with mechanical means to discharge, spray, or move the water’s surface above or below the static water line of the aquatic venue (i.e. leisure rivers and wave pools).
3. “Hot Water” is an aquatic venue with a water temperature more than 90°F (32°C) (i.e. spas and hot tubs).

For SI Units: 1 cubic foot per minute = 0.0283 m³/min, 1 square foot = 0.0929 m²
and not less than 8 air changes per hour. A portion of the supply air shall be directed towards the pool water surface and shall have a velocity not exceeding 0.49 feet per second (0.15 m/s) and not less than 0.16 feet per second (0.05 m/s). A portion of supply air shall be directed towards the breathing area directly above the pool water surface and up to 72 inches (1829 mm) above any decking. The required supply air delivery rate \( S \) per room within an aquatic facility shall be in accordance with Equation 416.4.3(1). The required return airflow rate \( R \) shall be determined in accordance with Equation 416.4.3(2). See Figure 417.4.3.

\[
S = V_R \cdot N/60 \quad \text{[Equation 416.4.3(1)]}
\]

\[
R = 1.1 \cdot S \quad \text{[Equation 416.4.3(2)]}
\]

Where:
- \( N \) = Number of air changes per hour
- \( R \) = Return airflow rate, cubic feet per minute
- \( S \) = Supply air delivery rate, cubic feet per minute
- \( V_R \) = Volume of room within an aquatic facility, cubic feet

For SI units: 1 cubic foot = 0.0283 m³, 1 cubic foot per minute = 0.0283 m³/min

**416.4.4 Humidity Control.** The ventilation system of an indoor aquatic facility shall be designed to maintain a relative humidity of not less than 50 percent and no more than 60 percent when the facility is occupied. The ventilation system shall be designed to maintain air temperatures at not less than 2°F (1°C), and not more than 4°F (2°C), above the water temperature of the aquatic venue, not including aquatic venues that exceed 90°F (32°C). The design of ventilation systems serving indoor aquatic facilities shall comply with ACCA 10 Manual SPS. (See Appendix A for an alternative method of calculating evaporative loads for indoor aquatic facilities).

**416.4.5 Equipment.** Ventilation system equipment shall be located in accordance with Section 602.1. A permanent data plate or label shall be placed in a readily accessible location upon the equipment which indicates the amount of outdoor air supplied by the equipment.

**417.0 Underwater Audio Equipment.**

**417.1 General.** Where installed, underwater audio equipment shall be listed and labeled in accordance with UL 1480 and installed in accordance with the manufacturer’s installation instructions and NFPA 70.
CHAPTER 5
WATER QUALITY

501.0 General.
501.1 Applicability. This chapter shall govern the general requirements for water quality, filtration, drainage, overflow systems, and wastewater disposal as they pertain to swimming pools, spas, and hot tubs.

502.0 Sizing for Velocity.
502.1 General. Water piping systems shall not exceed the maximum velocities listed in Section 502.2 through Section 502.2.2 or the plumbing code.

502.2 Circulating Piping System. The circulating piping system shall be designed so that the velocity shall not exceed 10 feet per second (ft/s) (3.05 m/s), and the suction pipe system shall not exceed the velocity of 8 ft/s (2.4 m/s). Water velocity in branch suction piping shall not exceed 6 ft/s (1.8 m/s) where one of a pair is blocked. In normal operation, the branch suction piping velocity shall be 3 ft/s (0.9 m/s). Other suction piping velocities shall be 6 ft/s (1.8 m/s) for public pools or 8 ft/s (2.4 m/s) for private pools.

502.2.1 Copper and Copper Alloy Tube Systems. Velocities in copper and copper alloy tube and fitting systems shall not exceed 8 ft/s (2.4 m/s) in cold water and 5 ft/s (1.5 m/s) in hot water.

502.2.2 Tubing Systems Using Copper Fittings. Velocities through copper fittings in tubing other than copper shall not exceed 8 ft/s (2.4 m/s) in cold water and 5 ft/s (1.5 m/s) in hot water. Jet inlet fittings shall be excluded from this requirement.

503.0 Turnover Time.
503.1 General. The entire design of matched components shall have a capacity to provide a complete turnover of water in accordance with local and state codes or regulations, and the manufacturer’s instructions. Maximum turnover time shall be required as follows:

(1) Private pools – 8 hours
(2) Public pools – 6 hours
(3) Wading pools – 1 hour
(4) Private spas and hot tubs – 1 hour
(5) Public spas and hot tubs – ½ hour
(6) Water slides and landing pools – 2 hours
(7) Wave pools – 3 hours
(8) Leisure rivers – 3 hours
(9) Spray grounds – ½ hour
(10) Activity Pools – 2 hours
(11) Diving Pools – 8 hours
(12) Surf Pools – as required by the manufacturer

503.2 Flow Rate. Turnover times shall be calculated based on the flow rate through the filtration system and the volume of pool water.

503.3 Bather Load Per Day. The maximum bather load per day \( L_B \) shall be in accordance with Equation 503.3.

\[
L_B = \frac{Q}{1400}
\]

(Equation 503.3)

Where:

\( L_B \) = Bather load, number of bathers per day
\( Q \) = Flow rate, gallons per day

For SI units: 1 gallon = 3.785 L, \( L_B = \frac{Q}{5300} \), where \( Q \) is in L/day

504.0 Valves.
504.1 Fullway Valves. Fullway valves shall be installed to ensure functioning of the filtration and piping system in accordance with the approved design, manufacturer’s installation instructions, or both.

504.2 Below the Overflow Rim. Where equipment is located below the overflow rim of the pool or spa, valves shall be placed in the circulation piping system to isolate the equipment from the pool or spa.

504.3 Grade. Valves shall not be located below the surrounding grade unless first approved by the Authority Having Jurisdiction. Valves located below the surrounding grade shall be set in a pit with a removable cover approved by the Authority Having Jurisdiction.

504.4 Check Valves. Where check valves are installed, they shall be of the swing or vertical check patterns.

504.5 Multiport Valves. Where multiport valves are installed, they shall comply with NSF 50.

504.6 Size. Valves up to and including 2 inches (50 mm) in size shall be copper alloy or other approved material. Sizes exceeding 2 inches (50 mm) shall be permitted to have cast iron or copper alloy bodies. Each gate or ball valve shall be a fullway-type with working parts of non-corrosive material. Valves carrying water used in potable water systems intended to supply drinking water shall be in accordance with the requirements of NSF 61.

505.0 Water Supply Inlets and Connections.
505.1 Water Supply Inlets. Water supply inlets to swimming pools, spas, or hot tubs shall be protected by one of the following means:

(1) An approved air gap
(2) A vacuum breaker installed on the discharge side of the last valve with the critical level not less than 6 inches (152 mm) or in accordance with its listing
WATER QUALITY

(3) A backflow preventer suitable for the degree of hazard, and installed in accordance with the manufacturer’s installation instructions and the plumbing code.

505.2 Manual Override. Automatic fresh water makeup control valves shall be provided with manual override.

505.3 Water Supply Connections. Water supply connections to equipment, appliances, or appurtenances shall be protected as provided for in the plumbing code.

506.0 Filters.

506.1 General. Filters and filter media shall be installed in accordance with the manufacturer’s installation instructions and shall comply with NSF 50. The maximum design flow rate for filter operation, with alternate media, shall comply with Section 506.2 through Section 506.5, or the filter media manufacturer’s instructions.

506.2 Rapid Sand Filters. Rapid sand filters shall have a flow rate not to exceed 5 gallons per minute (gpm) per square foot [204 (L/min)/m²] for private applications and 3 gpm per square foot [122 (L/min)/m²] for public applications. The circulation system and backwash piping shall be provided for backwashing of sand filter and backwash flow rates of not less than 15 gpm per square foot [611 (L/min)/m²].

506.3 High-Rate Sand Filters. High rate sand filters shall have a flow rate not to exceed 20 gpm per square foot [815 (L/min)/m²] for private applications and 15 gpm per square foot [611 (L/min)/m²] for public applications, or the filter media manufacturer’s instructions. The circulation system and backwash piping shall be provided for backwashing of sand filter and backwash flow rates of not less than 15 gpm per square foot [611 (L/min)/m²].

506.4 Diatomite Type Filters. Diatomite type filters shall be designed for operation under pressure or vacuum. The design flow rate shall not exceed 2.5 gpm per square foot [102 (L/min)/m²] for private applications and 2 gpm per square foot [81 (L/min)/m²] for public applications, or the filter media manufacturer’s instructions. The circulation system and backwash piping shall be provided for backwashing of sand filter and backwash flow rates of not less than 15 gpm per square foot [611 (L/min)/m²].

506.5 Cartridge Filters. Cartridge filters shall be designed for pressure or vacuum applications. The designed flow rate for surface-type cartridge filters shall not exceed 1 gpm per square foot [41 (L/min)/m²] for private applications and 0.375 gpm per square foot [15 (L/min)/m²] for public applications. The designed flow rate for depth-type cartridge filters shall not exceed 8 gpm per square foot [326 (L/min)/m²] for private applications and 3 gpm per square foot [122 (L/min)/m²] for public applications.

506.6 Operating Instructions. Filter systems shall be provided with written operating instructions.

506.7 Pressure Filter System. The pressure filter system shall be equipped with the following:

(1) An influent pressure gauge
(2) An effluent pressure gauge for public use
(3) A means for air relief at the top of each filter
(4) A backwash sight glass shall be installed adjacent to the backwash discharge outlet to the receptor where not visible from the backwash control valve
(5) A means to drain the tank

Exception: A backwash sight glass for cartridge filters

507.0 Chemical Feed Equipment.

507.1 General. An aquatic facility shall be equipped with chemical feed equipment that is in accordance with NSF 50. Such equipment shall be sized and installed in accordance with the manufacturer’s installation instructions, and shall comply with Section 507.1.1 through Section 507.1.4.

507.1.1 Equipment Design. Chemical feed equipment shall be capable of withstanding wear without developing leaks. Chemical feed equipment shall be designed to supply disinfectant and pH control chemicals to an aquatic venue at the levels required in accordance with this code. Chemicals shall be introduced into an aquatic venue downstream of the filtration system, and the equipment shall not permit backflow into the chemical feed equipment or components.

507.1.2 Interlocked. Chemical feed equipment shall be disabled when the pump is turned off, loses prime, or filters are backwash. Where not specified elsewhere in this code, chemical feed equipment shall be interlocked electrically with not less than two of the following:

(1) Recirculation pump
(2) Flow meter and switch in the return line
(3) Chemical controller and paddle wheel
(4) Flow cell on the chemical controller

507.1.3 System Control. Chemical feed equipment shall be provided with an automatic controller to power on and off the equipment. Chemical controllers shall comply with NSF 50, and be installed in accordance with the manufacturer’s installation instructions.

507.1.4 Ventilation. A separate ventilation system shall be provided for each enclosed room or space where chemical feed equipment is located at not less than 60 air changes per hour of outdoor air. The exhaust intake of the ventilation system shall be taken within 6 inches (152 mm) of the floor, and located on the opposite side of the room or space from the outdoor air intake. Exhaust air shall be discharged above grade level to the outdoors, and shall discharge not less than 10 feet (3048 mm) from an operable opening or adjacent building. Outdoor air intake shall be provided within 6 inches (152 mm) of the ceiling.

507.2 Gas Chlorinators. Chlorine and chlorinating equipment shall be located in a separate well-ventilated room located at or above ground level. Electric motor operated chlorinators shall comply with UL 1081 and be installed in accordance with the manufacturer’s installation instructions.

507.2.1 Storage. Chlorine cylinders, including empty cylinders, shall be stored and secured in an upright position.
507.2.2 Shut Off. A valve wrench shall be installed on the chlorine cylinder valve so the supply can be shut off in the case of an emergency. Valve protection hoods shall be in place except where the cylinder is connected.

507.2.3 Chlorine Feeding Device Design. The chlorine feeding device shall be designed so that, during accidents or interruptions of the chlorinator booster pump, leaking chlorine gas shall be conducted to the outdoors.

507.2.4 Type of Feeding Device. The feeding device shall be a solution feed type, capable of delivering chlorine at its maximum rate without releasing chlorine gas to the atmosphere.

507.2.5 Interlocked. Gas-type chlorinators shall have protection against siphoning of gas into the recirculation system.

The recirculating pump and chlorine booster pump motor controls shall be interlocked electrically so that the booster pump shall not operate where the recirculating pump is off, or during the backwash cycle. Connections shall not be made to an external water supply for chlorinator operation.

507.2.6 Scale. A scale for determining weight of chlorine shall be provided.

508.0 Primary Disinfection.

508.1 General. Chemicals for a swimming pool, spa, or hot tub shall be dispensed in accordance with the chemical manufacturer’s instructions, Material Safety Data Sheets (MSDS), and applicable standards and regulations. Parameters for chemicals used within a swimming pool, spa, and hot tub shall be in accordance with Table 508.1.

509.0 Secondary Disinfection Systems.

509.1 General. Secondary disinfection systems shall comply with NSF 50, and shall be installed in accordance with the manufacturer's installation instructions.

509.2 Where Required. A secondary disinfection system shall be provided for the following:

1. Aquatic venues designed for children, such as wading pools, and recirculating interactive water play venues
2. Therapy pools
3. Sensory deprivation tanks

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>ACCEPTABLE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium hardness</td>
<td>200 – 400 parts per million (ppm)</td>
</tr>
<tr>
<td>Combined chlorine</td>
<td>0 - 0.3 ppm</td>
</tr>
<tr>
<td>Cyanuric acid</td>
<td>0 ppm (indoors)</td>
</tr>
<tr>
<td></td>
<td>10 – 30 ppm (outdoors)</td>
</tr>
<tr>
<td>Free chlorine</td>
<td>1.0 - 5.0 ppm (pools) or as needed to maintain a 750 millivolt (mV) ORP</td>
</tr>
<tr>
<td></td>
<td>3.0 – 10.0 ppm (spas and hot tubs) or as needed to maintain a 750 mV ORP</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30 – 40 ppm or as needed to maintain a 750 mV ORP</td>
</tr>
<tr>
<td>Langelier saturation index</td>
<td>0 (+ or - 0.3 acceptable)</td>
</tr>
<tr>
<td>Metals (iron, copper, and manganese)</td>
<td>0 – 0.2 ppm</td>
</tr>
<tr>
<td>Nitrites</td>
<td>&lt; 10 ppm</td>
</tr>
<tr>
<td>ORP</td>
<td>650 mV (private)</td>
</tr>
<tr>
<td></td>
<td>750 - 900 mV (public)</td>
</tr>
<tr>
<td>Ozone</td>
<td>Generator output shall equal 4 – 6 percent ozone by weight concentration</td>
</tr>
<tr>
<td></td>
<td>Slip stream shall be 25 – 33 percent. ORP shall be &gt; 850 mV</td>
</tr>
<tr>
<td>pH</td>
<td>7.2 – 7.8</td>
</tr>
<tr>
<td>PHMB</td>
<td>30 – 50 ppm</td>
</tr>
<tr>
<td>Phosphates</td>
<td>0.125 – 0.5 ppm</td>
</tr>
<tr>
<td>Salinity (electrolytic cells)</td>
<td>2500 – 6000 ppm</td>
</tr>
<tr>
<td>Ryznar stability index</td>
<td>6.3 – 6.7</td>
</tr>
<tr>
<td>Sulfates</td>
<td>&lt; 250 ppm</td>
</tr>
<tr>
<td>TDS</td>
<td>&lt; 1500 ppm</td>
</tr>
<tr>
<td>Total alkalinity</td>
<td>80 – 120 ppm</td>
</tr>
<tr>
<td>Total bromine</td>
<td>4.5 – 6.5 ppm or as needed to maintain a 750 mV ORP</td>
</tr>
<tr>
<td></td>
<td>(2.25 times the equivalent amount of chlorine)</td>
</tr>
<tr>
<td>Total chlorine</td>
<td>Not more than 0.2 ppm higher than free chlorine</td>
</tr>
<tr>
<td>Turnover time</td>
<td>1400 gallons per day (gal/d) for each anticipated bather per day</td>
</tr>
<tr>
<td>Ultraviolet light</td>
<td>0.39 – 0.65 watt seconds per square inches</td>
</tr>
<tr>
<td></td>
<td>(W/s/in²)</td>
</tr>
</tbody>
</table>

For SI Units: 1 millivolt = 0.001 V, 1 gallon per day = 0.0000438 L/s, 1 watt second per square inches = 0.155 J/cm²
509.3 System Design. Secondary disinfection systems shall be designed to achieve not less than a 3-log (99.9 percent) reduction in the number of infective cryptosporidium parvum oocysts per pass through the system in accordance with NSF 50.

509.4 Approved Systems. Secondary disinfection shall be provided by an ultraviolet light (UV) system or ozone system.

509.4.1 Ultraviolet Light (UV) Systems. Where used, ultraviolet light (UV) systems shall be installed in the recirculation system downstream of the filters and water heating equipment, and upstream of the halogen feed location and pH chemical feed equipment.

509.4.1.1 Maintenance. A bypass pipe that is interlocked electrically with the recirculation pump, and the UV equipment shall be provided with an approved oxidation reduction potential (ORP) monitor/controller. The ORP of the ozone system shall be not less than 600 mV, and not more than 900 mV where measured after the ozone side-stream remixes into the recirculation system and upstream of the halogen feed location and pH chemical feed equipment.

509.4.1.2 Interlocked. The UV system shall be interlocked electrically with the recirculation pump, and the UV equipment shall be provided with calibrated sensors in accordance with the manufacturer’s installation instructions.

509.4.1.3 Strainer. An inline strainer shall be installed downstream of the UV system.

509.4.1.4 Alarm Required. When the UV system shuts down, an approved visual alarm shall be installed to alert facility staff.

509.4.2 Ozone Systems. When used, ozone system side-stream loop shall be installed in the recirculation system downstream of the filters and the water heating equipment, and upstream of the halogen feed location and pH chemical feed equipment.

509.4.2.1 Oxidation Reduction Potential. Ozone generating equipment shall be equipped with an approved oxidation reduction potential (ORP) monitor/controller. The ORP of the ozone system shall be not less than 600 mV, and not more than 900 mV where measured after the ozone side-stream remixes into the recirculation system and upstream of the halogen feed location and pH chemical feed equipment.

509.4.2.2 Gas Leak. An ambient ozone gas monitor/controller shall be installed in the equipment room where the ozone system is located.

509.4.2.3 Interlocked. The ozone system shall be interlocked electrically with the recirculation pump or automated feature supply valves.

509.4.2.4 Alarm Required. When the ORP reading for the ozone system drops below 600 mV, approved audible and visual alarms shall be installed to alert facility staff.

510.3.6 Opening Area. Overflow channel outlets shall be provided with a clear opening area in the grating not less than 1⁄4 inch per foot (20.8 mm/m).

Other drain spacing or channel bottom slope shall be permitted where hydraulically designed in accordance with acceptable engineering principles.

510.3.7 Overflow Drain Piping. Overflow drain piping shall provide drainage of the overflow system, carry overflow water to a surge storage chamber, and establish
hydraulic equilibrium in the pool and return to skimming
not less than 10 minutes after being flooded by a sudden
large use of the pool by bathers.

510.3.8 **Surge Storage Capacity.** A perimeter over-
flow system shall be provided with a surge storage of not
less than 1 gallon per square foot (41 L/m²) of pool water
surface area. Surge storage shall be permitted in the
perimeter overflow channel, the overflow water drain
piping returning to the surge chamber, and in the surge
chamber.

510.3.9 **Surge Flow Control.** Automatic water flow
controls with a manual override provision shall be pro-
vided to maintain the approved operating pool water
evel.

The top of the channel lip shall not exceed ¼ inch
(6.4 mm) from the lowest point to the highest point.

510.3.10 **Overflow Drains.** Where overflow drains are
provided, they shall be installed in accordance with the
requirements of the Authority Having Jurisdiction.

**511.0 Pool, Spa, and Hot Tub Suction Outlets.**

**511.1 General.** Pool, spa, or hot tub suction outlets shall
comply with APSP 16.

**Exception:** Self-contained spas that are in accordance with
UL 1563.

511.1.1 **Skimmer.** A skimmer with a bottom outlet shall
be installed on the filtration suction line. The filtration
suction line shall be connected to a second outlet to
relieve suction in the event blockage occurs.

511.1.2 **Suction Cleaner Device Outlets.** Suction
cleaner device outlets shall remain covered where not in
use so as not to pose an entrapment hazard.

511.1.2.1 **Dedicated Vacuum Outlets.** A shut-
off valve shall be installed in the vacuum piping and
shall remain in the closed position when the vacuum
outlet is not in use. Wall vacuum outlets shall be
installed at a depth not exceeding 12 inches (305
mm) below the pool, spa, or hot tub water surface.
Suction fittings shall be in accordance with IAPMO
SPS 4.

511.2 **Return Inlets.** Return inlets shall be installed in
accordance with the manufacturer’s installation instructions.
Return inlets shall not have sharp edges or present a hazard to
bathers. Swimming pool, spa, and hot tub return inlets shall
be sized based on the required turnover rates in accordance
with Section 503.1 and shall be located in accordance with
Section 511.2.1 and Section 511.2.2.

511.2.1 **Swimming Pools.** Where floor return inlets are
used, the distance between inlets shall be not more
than 20 feet (6096 mm). Floor return inlets shall be
located not more than 15 feet (4572 mm) from adjacent
walls. Floor return inlets shall be installed flush. Where
wall return inlets are used, the distance between inlets
shall be not more than 20 feet (6096 mm). A wall return
inlet shall be located not more than 5 feet (1524 mm)
from each corner of a pool. Where a swimming pool is
more than 50 feet (15 240 mm) wide, a combination of
floor and wall return inlets shall be installed.

511.2.2 **Spas and Hot Tubs.** Not less than two equally
spaced return inlets shall be installed in a spa or hot tub.
The circulation system shall be separate from the hydro-
jet booster pump system.

512.0 **Wastewater Disposal.**

512.1 **General.** Waste shall be disposed of as set forth in this
section, and the type of disposal proposed shall be approved by
the Authority Having Jurisdiction, prior to the commencement
of work. A means of disposal of the total contents of the pool
(periodic emptying) without surface runoff shall be established
to the approval of the Authority Having Jurisdiction.

512.2 **Direct Connection.** No direct connection shall be
made between a storm drain, sewer, drainage system, seepage
pit, underground leaching pit, or subsoil drainage line, and a
line connected to a swimming pool, spa, or hot tub.

512.3 **Traps.** Where the wastewater is to be disposed of
through a public sewer, not less than a 3 inch (80 mm) P-trap
shall be installed. Such drains shall not be installed in patios,
floors, or sidewalks. The tailpiece from the trap shall extend
not less than 3 inches (76 mm) above finished grade and
below finished floor grade. Traps need not be vented where
located on the exterior of the building. The connection
between the filter waste discharge piping and the P-trap shall
be made by means of an air gap.

Plans and specifications for a deviation from the above
manner of installation shall first be approved by the Author-
ity Having Jurisdiction before a portion of such system is
installed. Where wastewater is discharged to a seepage pit
installation, it shall be installed in accordance with the
approval granted by the Authority Having Jurisdiction.

512.4 **Availability of a Public Sewer or Storm Drain.**
Except as provided in Section 512.5, where a public sewer or
storm drain of adequate capacity is available for use, waste-
water shall be discharged thereinto and permission shall be
obtained in writing from the Authority Having Jurisdiction to
do so. A copy of such permission stating the maximum size
of the waste line between the receptor and the sewer, and
other specific requirements shall accompany the application
for a permit made to the Authority Having Jurisdiction.

512.5 **Used for Irrigation.** Where space and conditions are
such that no hazard, nuisance, or insanitary condition is evi-
denced, wastewater shall be permitted to be used for irrigation
by surface or subsurface spreading.

512.6 **Drywells.** Where no other means of wastewater dis-
posal is available, a drywell shall be permitted to be installed.
Each such drywell shall be constructed in the manner pre-
scribed for cesspools in the plumbing code, and drywells
receiving only filter backwash shall have a capacity of not
less than twice the amount of effluent discharged during one
normal backwash operation, but shall in no case have less
than a 5 foot (1524 mm) vertical sidewall. The size and leach-
ing capacity of such dry well shall be proportionately
increased to the satisfaction of the Authority Having Jurisdiction. No wastewater, other than that from a swimming pool, spa, or hot tub, shall discharge into such drywell, and no wastewater from a swimming pool, spa, or hot tub shall discharge into a private sewage disposal system.

**512.7 Separation Tank.** A separation tank of an approved type shall be permitted to be used in lieu of the aforementioned means of wastewater disposal where connected as a reclamation system. A relief valve shall be installed on each such separation tank to relieve pressure where the filters are serviced.
CHAPTER 6
EQUIPMENT

601.0 General.
601.1 Applicability. This chapter shall govern the general requirements for equipment, pumps, diving equipment and slides as they pertain to swimming pools, spas, and hot tubs.

602.0 Installation Requirements.
602.1 General. Equipment shall be installed in accordance with the manufacturer’s installation instructions. Equipment shall be installed within the space it is located so as to provide ready accessibility for cleaning, operating, maintenance, and servicing. The equipment controls shall not be capable of being accessed by unauthorized personnel. Equipment, unless designed for outdoor installation, shall be protected against the weather in an approved manner or installed within an enclosed room in accordance with Section 602.2. Equipment installed outdoors shall be supported on a level concrete or other approved base designed to handle the anticipated loads, and such base shall be not less than 3 inches (76 mm) above the adjoining ground level.

602.1.1 Marking. Equipment, piping, valves, and system components shall be marked in an approved manner to identify their function. System piping shall indicate the direction of flow.

602.2 Equipment Rooms or Enclosures. Floors shall be constructed of concrete or other nonabsorbent material in accordance with the building code, and shall be provided with an approved means of drainage in accordance with the plumbing code. Enclosed equipment rooms shall be ventilated in accordance with the mechanical code. Combustion, HVAC, and electrical equipment shall not be located in the same room used for chemical storage or exposed to chemical fumes or vapors.

602.2.1 Indoor Access. Where access to an equipment room is made through an aquatic facility, a door shall be installed. The door shall be equipped with an automatic closer and lock, and a gasket or other approved means to prevent passage of air, fumes, or vapors. The floor of the equipment room shall be sloped away from the door to the aquatic facility.

603.0 Electrical Systems.
603.1 General. The design, installation, alteration, modification, construction, maintenance, and testing of electrical systems and equipment associated with a swimming pool, spa, or hot tub shall comply with NFPA 70.

604.0 Pumps.
604.1 General. Electrically operated pumps shall comply with NSF 50 and UL 1081. Strainers shall comply with NSF 50. Pumps and strainers shall be installed in accordance with the manufacturer’s installation instructions.

Exception: Self-contained spas that comply with UL 1563

604.2 Strainers. Circulating pumps shall be equipped with an approved-type hair and lint strainer on the inlet side where used in conjunction with pressure filters. Pumps used with vacuum filters do not require strainers except where filter elements are removed for cleaning.

604.3 Base. Pumps shall be mounted on a substantial base in a manner that will eliminate strain on piping and isolate pump vibration.

604.4 Design Capacity. Pumps shall have design capacity at the following heads:

1. Pressure diatomite type - not less than 60 feet (18 288 mm)
2. Vacuum diatomite type - 20 inches (508 mm) vacuum on the suction side and 40 feet (12 192 mm) total head
3. Rapid sand - not less than 45 feet (13 716 mm)
4. High-rate sand - not less than 60 feet (18 288 mm)
5. Cartridge - not less than 50 feet (15 240 mm)
CHAPTER 7
HEATERS

701.0 General.

701.1 Applicability. The regulations of this chapter shall govern the construction, location, and installation of heaters specifically designed and listed for swimming pools, spas, or hot tubs. Design, construction, and workmanship shall comply with accepted engineering practices, manufacturer’s instructions, and applicable standards and shall be of such character as to secure the results sought to be obtained by this code.

701.2 Permits. It shall be unlawful for a person to install, remove, or replace or cause to be installed, removed, or replaced a swimming pool, spa, or hot tub heater without first obtaining a permit from the Authority Having Jurisdiction to do so.

701.3 Final Inspection. This inspection shall be made after the work authorized by the permit has been installed. The Authority Having Jurisdiction will make such inspection as deemed necessary to be assured that the work has been installed in accordance with the intent of this code. No heater or part thereof shall be covered or concealed until the same has been inspected and approved by the Authority Having Jurisdiction.

702.0 Heaters.

702.1 Gas Fired Heaters. Gas-fired heaters for pools, spas, or hot tubs shall comply with CSA Z21.56.

702.2 Oil-Fired Heaters. Oil-fired heaters for pools, spas, or hot tubs shall comply with UL 726.

702.3 Electric Heaters. Electric heaters for pools, spas, or hot tubs shall comply with UL 1261.

Exception: Electric heaters for self-contained spas that comply with UL 1563.

702.4 Heat Pumps. Heat pumps for pools, spas, or hot tubs shall comply with UL 1995 or UL 60335-2-40.

702.5 Solar Pool, Spa, and Hot Tub Heaters. Where solar technology is used to heat a swimming pool, spa, or hot tub, it shall be installed in accordance with the Uniform Solar, Hydronics and Geothermal Code and the manufacturer’s installation instructions.

702.6 Sizing. Heaters shall be sized in accordance with the manufacturer’s instructions.

702.7 Installation. Heaters shall be installed in accordance with the manufacturer’s installation instructions and the mechanical code.

702.7.1 Temperature. A means shall be provided to monitor water temperature.

702.7.2 Pump Delay. Where required by the manufacturer, heaters shall be installed with an automatic device that will ensure that the pump continues to run after the heater shuts off for the time period specified by the manufacturer.

702.7.3 Ground Support. Heaters supported from the ground shall rest on level concrete or other approved base extending not less than 3 inches (76 mm) above the adjoining ground level.
CHAPTER 8
SAFETY

801.0 General.
801.1 Applicability. This chapter shall govern general safety requirements (e.g. means of entry and exit, barriers, signage, etc.) as they pertain to swimming pools, spas, and hot tubs.

802.0 Means of Entry and Exit Including Steps, Ladders, and Stairs.
802.1 Swimming Pools. Swimming pools shall have not less than two means of entry/exit located to serve both ends of the pool by means of steps, recessed steps, ladders, stairs, zero-depth entry, or combination thereof. One entry/exit shall be provided in the shallow area of the pool where the vertical distance from the bottom of the pool to the deck exceeds 2 feet (610 mm). A second means of entry/exit shall be provided in the deep area of a pool having a depth that exceeds 54 inches (1372 mm). Where the width of the pool exceeds 30 feet (9144 mm), such means of entry/exit shall be provided at each side not more than 100 feet (30 480 mm) apart. Wading pools shall have not less than one means of entry/exit by means of steps, stairs, zero-depth entry, or combination thereof. Swimouts in accordance with Section 402.13 shall be permitted to be used as a means of entry or exit of a pool.
Exception: Private swimming pools shall be permitted to have one entry/exit where the pool depth does not exceed 54 inches (1372 mm) and the width of the pool does not exceed 30 feet (9144 mm).

802.2 Spas and Hot Tubs. Spas and hot tubs shall have not less than one entry/exit by means of steps, ladders, stairs, seats, or combination thereof. No point within a spa or a hot tub shall be located more than 16 feet (4877 mm) from the required entry/exit. Where the distance exceeds 16 feet (4877 mm), an additional entry/exit shall be required.

802.3 Wave Pools. Bathers shall gain access to a wave pool at a zero-depth entry. Ladders shall be utilized for exit purposes. Ladders shall be installed flush with the pool wall and designed, so that body extremities will not become entangled.

802.4 Ladder, Step, and Stair Construction. Ladders shall be constructed of corrosion-resistant material and shall be equipped with slip-resistant tread surfaces. Ladder treads shall be spaced not more than 12 inches (305 mm) vertically apart. The width of ladder treads shall not be less than 17 inches (432 mm) and shall not exceed 24 inches (610 mm). The depth of ladder treads shall not be less than 1.5 inches (38 mm) and shall not exceed 4 inches (102 mm). Ladder treads shall be not less than 4 inches (102 mm) horizontally from the pool wall. Ladders shall be permanently affixed and shall provide a clearance of not less than 3 inches (76 mm) or not more than 5 inches (127 mm) between any part of the ladder and the pool, spa, or hot tub wall. Ladder handrails shall be in accordance with Section 802.5.

Where pool depths exceed 5 feet (1524 mm), stairs shall be recessed, and the lowest step shall be not less than 4 feet (1219 mm) below the pool water level. Recessed steps shall have a depth of not less than 6 inches (152 mm), a width of not less than 12 inches (305 mm), and spaced not more than 12 inches (305 mm) vertically apart. Recessed treads shall be slip-resistant, and designed to drain into the spa. Stairs shall be constructed of corrosion-resistant material and shall be equipped with slip-resistant tread surfaces. Each stair shall have a tread depth of not less than 10 inches (254 mm). Risers shall have a uniform height of not more than 7 inches (178 mm), and treads shall have a width of not less than 24 inches (610 mm). The front edge of each step shall be marked on the vertical and horizontal surfaces with a color contrasting stripe of not less than 3/4 inch (19.1 mm) and not more than 2 inches (51 mm) wide for the entire width of the step. Stairs shall not be installed as a means of underwater connection between different floor depths of a swimming pool. The use of perimeter gutters as a step shall be permitted only when the perimeter gutters are installed with approved grating.

Exceptions:
(1) An alcove of a pool.
(2) Therapy pools that contain handrails for each set of stairs and vertical and horizontal edge markers.
(3) Portable ladders or stairs for aboveground or onground pools, spas, or hot tubs approved by the Authority Having Jurisdiction, used in accordance with the ladder or stair manufacturer’s instructions, and removed or secured when the pool, spa, or hot tub is not in use.

802.5 Handrails. Handrails shall be installed in accordance with the following:
(1) Shall be constructed of corrosion-resistant material and shall be securely anchored.
(2) Shall be provided at the top and both sides and shall extend not less than 28 inches (711 mm) over the coping for all ladders, steps, and stairs.
(3) The top of handrails shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) above the ramp or step surface.
(4) Handrail diameters shall be not less than 1 1/4 inches (32 mm) and not more than 2 inches (51 mm).
(5) Where stairs are wider than 88 inches (2235 mm), an intermediate handrail per 88 inches (2235 mm) of stair width shall be installed.
(6) Handrails shall be designed to withstand a load of 50 pounds-force per linear foot (0.73 kN/m) and shall be capable of withstanding a concentrated load of 200 pounds-force (0.89 kN) applied in any direction and location.

Exception: Handrails are not required where stairways are installed with less than four steps.

802.6 Zero-Depth Entry. Where zero-depth entries are provided for public aquatic venues, they shall be slip-resistant. The slope of a zero-depth entry shall be continuous and shall not exceed 1 foot (305 mm) in 20 feet (6096 mm) to a water depth of 3 feet (914 mm) to 30 inches (762 mm).
Exceptions:
(1) Where a zero-depth entry is provided with handrails, the slope of the zero-depth entry shall not exceed 1 foot (305 mm) in 12 feet (3658 mm).
(2) Where a zero-depth entry is provided in a wading pool, the slope of the zero-depth entry shall be continuous and extend to the deepest part of the pool.

802.6.1 Steps or Stairs. Steps and stairs installed in combination with zero-depth entries shall be in accordance with Section 802.4.
802.6.2 Underwater Benches or Seats. Where underwater benches or seats are installed in combination with zero-depth entries, the benches or seats shall be in accordance with Section 402.12.

803.0 Barrier Requirements.
803.1 General. An outdoor swimming pool (including an inground, aboveground, or onground pool), spa, or hot tub shall be provided with a barrier in accordance with Section 803.2 through Section 803.7 and enclosed on all sides.

803.2 Barrier Location. Barriers shall be not less than 48 inches (1219 mm) above a permanent object that is within 48 inches (1219 mm) of the outside of the barrier. Measurement shall be taken perpendicular from the height of the barrier.

803.3 Barrier Height. The top of the barrier shall be not less than 48 inches (1219 mm) above grade measured on the side of the barrier that faces away from the swimming pool, spa, or hot tub. The maximum vertical clearance between grade and the bottom of the barrier shall not exceed 4 inches (102 mm) measured on the side of the barrier that faces away from the swimming pool, spa, or hot tub. Where the top of the pool, spa, or hot tub structure is above grade, the barrier shall be permitted to be at ground level or mounted on top of the pool structure only where permitted by the manufacturer. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the structure and the bottom of the barrier shall not exceed 4 inches (102 mm).

803.3.1 Openings in Barrier. Openings in the barrier shall not allow passage of a 4 inch (102 mm) diameter sphere.
803.3.2 Solid Barrier. Solid barriers that do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

803.3.3 Horizontal and Vertical Members for Barrier. Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches (1143 mm), the horizontal members shall be located on the pool, spa, or hot tub side of the fence. The spacing between vertical members shall not exceed 1 1/4 inches (44 mm) in width.

Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, the spacing between vertical members shall not exceed 4 inches (102 mm).

Where there are decorative cutouts, the spacing with the cutouts shall not exceed 1 1/4 inches (44 mm) in width.

803.4 Access Gates or Doors. Pedestrian access gates or doors shall comply with Section 803.1 through Section 803.5 and shall be equipped with a self-closing and self-latching device. Gates or doors shall open outward or away from the pool, spa, or hot tub area. Gates or doors other than pedestrian access gates or doors shall have a self-latching device. Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from the bottom of the gate, the release mechanism shall be located on the pool, spa, or hot tub side of the gate at not less than 3 inches (76 mm) below the top of the gate and the top of the gate or door, and the barrier shall have no opening greater than 1/2 inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

803.5 Barrier Wall. Where a wall of a building or structure serves as part of the barrier, one of the following conditions shall apply:
(1) The pool, spa, or hot tub shall be equipped with a powered safety cover in accordance with ASTM F1346.
(2) Doors, windows or any other openings providing direct access to the pool, spa, or hot tub through such wall shall be equipped with an alarm listed for the purpose in accordance with UL 2017 that produces an audible warning where the door and its screen, where present, are opened. The alarm shall be installed in accordance with the manufacturer’s installation instructions, and the deactivation touch pads, or switches shall be located not less than 54 inches (1372 mm) above the threshold of the door.
(3) Other means of protection, such as self-closing doors with self-latching devices shall be permitted where the degree of protection is not less than the protection in Section 803.5(1) or Section 803.5(2).

803.6 Aboveground Barrier. Where an aboveground pool structure is used as a barrier or where the barrier is mounted on the top of the structure, and the means of access is a ladder or steps, then the ladder or steps shall be capable of being secured, locked, or removed to prevent access or the ladder or steps shall be surrounded by a barrier that is in accordance with Section 803.1 through Section 803.5. Where the ladder or steps are secured, locked, or removed, any opening created shall not permit the passage of a 4 inch (102 mm) diameter sphere.

803.7 Indoor Swimming Pool. Walls surrounding an indoor swimming pool, spa, or hot tub shall comply with Section 803.5.
804.0 Electrical Safety.

804.1 General. Swimming pools, spas, and hot tubs shall comply with the electrical safety requirements of Section 804.2 through Section 804.5, and NFPA 70.

804.2 Grounding. The following devices and equipment associated with a swimming pool, spa, or hot tub shall be grounded in accordance with NFPA 70, Article 680:

1. Underwater lighting
2. Electrical equipment and panelboards
3. Ground-fault circuit interrupters

804.3 Bonding. The following devices, parts, and equipment associated with a swimming pool, spa, or hot tub shall be bonded in accordance with NFPA 70, Article 680:

1. Metal parts within or attached to a pool, spa, or hot tub
2. Electrical equipment that is part of the circulation system
3. Electrical equipment that is part of a pool cover assembly
4. Metal piping
5. Metal surfaces
6. Electrical devices and controls that are not part of a pool, spa, or hot tub

804.4 GFCI Protection. The following devices and equipment associated with a swimming pool, spa, or hot tub shall be GFCI protected in accordance with NFPA 70, Article 680:

1. Receptacles located within the general area of a pool, spa, or hot tub
2. Receptacles used for power generation for pools, spas, and hot tubs
3. Electrical equipment

804.5 Emergency Shutoff. An emergency shutoff device that stops power to all systems and equipment of a public swimming pool, spa, or hot tub shall be marked and located in accordance with NFPA 70, Article 680.

805.0 Signage.

805.1 General. Instructional, operational, and safety signage shall comply with the Authority Having Jurisdiction. Signage shall be clearly visible at all entrances and at specific locations where applicable. The following signage shall be provided, but not limited to:

1. Maximum occupant load
2. Maximum building occupancy
3. Warning signs
4. Stair and ladder markings
5. Operation of pool
6. User sanitation and safety rules
7. Transitional markings for pool slope
8. Depth of pool markings
9. No diving markings
10. Notices on the dangers of diving and jumping from boards into the pool

11. No lifeguard on duty
12. The minimum water depth at the entrance of water slides wave pools, leisure rivers, and other types of aquatic recreational attractions. If the depth varies, mark the maximum depth, the minimum depth, and include the wording "Depth Varies."
13. Emergency services telephone number(s) and location address
14. Location of the pump emergency shutoff switch
15. Location of first aid supplies and equipment

806.0 Safety Covers.

806.1 General. Safety covers for swimming pools, spas, and hot tubs shall be installed in accordance with ASTM F1346. A cover shall not be installed where a swimming pool, spa, or hot tub is in use. Operators for electrically operated swimming pool and spa covers shall comply with UL 2452.

807.0 Chemicals.

807.1 General. Chemicals for a swimming pool, spa, or hot tub shall be handled in accordance with Section 807.2 and stored in accordance with Section 807.3.

807.2 Handling. Chemicals shall be handled in accordance with the following provisions:

1. Chemical containers shall be labeled.
2. Chemicals shall be handled in accordance with the manufacturer’s instructions and Material Safety Data Sheets (MSDS).
3. Protective gear shall be worn in accordance with the manufacturer’s instructions and Material Safety Data Sheets (MSDS).
4. A separate measuring device shall be used for each chemical.
5. The mixing of chemicals that will violate the manufacturer’s instructions shall be prohibited.
6. Water shall not be added to a chemical located within its container.

807.3 Storage. Chemicals used in the treatment of a public swimming pool, spa, or hot tub shall be stored in accordance with NFPA 400. Chemicals used in the treatment of a private swimming pool, spa, or hot tub shall be stored in accordance with the following provisions:

1. Federal, state and local requirements shall be followed.
2. Chemicals shall be stored and stacked in accordance with the manufacturer’s instructions and Material Safety Data Sheets (MSDS).
3. Liquid chemicals shall be stored below solid, powdered, or granular products. Chemicals shall be stored on pallets or shelves, not on the floor. Secondary containment for all liquid chemicals shall be provided.
4. Chemicals shall be stored in a clean, cool, dry, uncluttered, well-lit, and well-ventilated area that is out of the reach of children and unauthorized personnel.
(5) Chemical containers shall be sealed with the original label affixed.
(6) Chemicals shall be stored away from flammable products. Smoking shall be prohibited in the presence of chemicals.
(7) Chemicals shall not be stored in the same area as other chemicals or substances; this includes dissimilar or non-compatible chemicals, that are not used for the treatment of a pool, spa, or hot tub.
(8) Chemical containers shall regularly be inspected for signs of moisture, corrosion, or damage.
(9) Chemicals shall be used on a first in, first out basis.

808.0 Water Clarity.

808.1 General. The provisions for measuring water clarity in a public swimming pool, spa, or hot tub shall be in accordance with Section 808.2.

808.2 Parameters. Water clarity shall be checked and measured on a daily basis before use in accordance with local and state codes or regulations. Where such codes or regulations do not exist, one of the following methods shall be used to measure water clarity:

(1) A 2 inch (51 mm) disk, with alternating black and red quadrants, placed in the deepest portion of the water that is capable of being seen clearly. This method is only permitted for a swimming pool.
(2) A measuring device such as an approved turbidity meter used in accordance with the manufacturer’s instructions and shall not exceed a reading of 0.25 Nephelometric Turbidity Units (NTUs).
(3) Clearly distinguish the main drain from the background.
(4) A 6 inch (152 mm) black disk, placed in the deepest portion of the water that is capable of being seen clearly. This method is only permitted for a swimming pool.

809.0 Life Safety and Rescue Equipment.

809.1 General. Approved life safety and rescue equipment shall be present at a public facility that incorporates a swimming pool, spa, hot tub, or combination thereof in accordance with Section 809.2.

809.2 Equipment. Life safety and rescue equipment shall be provided in accordance with Section 809.2.1 and Section 809.2.2. The equipment manufacturer’s instructions for maintenance shall be followed. Such equipment shall not be used for purposes for which it was not designed or intended, and shall be inspected daily for wear or breakage.

809.2.1 Guarded Facilities. For each 2000 square feet (185.8 m²) of water surface area and where a life-guard is present, the following life safety and rescue equipment shall be present at all times in a visible, readily accessible location:

(1) Ring buoy
(2) Rescue tube
(3) Extension pole
(4) Shepherd’s crook
(5) Backboard with not less than six straps and a head immobilizer
(6) Lifeguard chair
(7) First-aid kit
(8) Biohazard kit
(9) Supplemental oxygen equipment
(10) Suctioning equipment
(11) Automatic External Defibrillator (AED)
(12) Emergency telephone
(13) Fire extinguisher

809.2.2 Unguarded Facilities. For each 2000 square feet (185.8 m²) of water surface area and where a life-guard is not present, the following life safety and rescue equipment shall be present at all times in a visible, readily accessible location:

(1) Ring buoy
(2) Rescue tube
(3) Extension pole
(4) Shepherd’s crook
(5) Backboard with not less than six straps and a head immobilizer
(6) First-aid kit
(7) Biohazard kit
(8) Emergency telephone
(9) Fire extinguisher

810.0 Entrapment Prevention.

810.1 General. Suction outlets for pools, spas and hot tubs shall comply with Section 511.0. Single blockable suction outlet systems shall not be installed in new or retrofit applications. Existing public swimming pools, spas or hot tubs utilizing a single blockable suction outlet shall be installed with a means of secondary entrapment prevention in accordance with one of the systems in accordance with Section 810.2 through Section 810.5-810.6.

810.2 Safety Vacuum Release Systems. Swimming pool, spa, or hot tub vacuum release systems shall comply with ASME A112.19.17 or ASTM F2387, and shall be installed in accordance with the manufacturer’s installation instructions.

810.3 Suction-Limiting Vent Systems. Where installed, suction-limiting vent systems shall be in accordance with ASTM F2707.

810.4 Automatic Pump Shutoff Systems. The pump(s) shall be designed to automatically shutoff in the event of a suction outlet blockage.

810.5 Gravity Drainage System. Gravity drainage systems shall be equipped with a collector tank installed between the pool or spa and circulation pump. The collector tank water surface level shall be installed at the pool water surface level.
and exposed to the atmosphere. The volume of the collector tank shall be sized in accordance with Equation 810.5 with a retention time of not less than 1 minute. Means shall be provided to prevent unauthorized access to the collector tank. The main drain line shall be connected at the base of the collector tank and shall be sized such that the water flow rate in the main drain to the tank does not exceed 3 feet per second (ft/s) (0.9 m/s). The water flow rate across the suction outlet cover or grating shall not exceed 1.5 ft/s (0.46 m/s).

\[ V = t_R \times \sum Q_P \]  
*Equation 810.5*

Where:

- \( V \) = Volume of the collector tank, gallons (L)
- \( t_R \) = Retention time, minutes
- \( Q_P \) = Design flow rate of pump drawing from collector tank, gallons per minute (L/m)

For SI units: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m

**810.6 Main Drain Disablement.** Where main drain disablement is permitted by the Authority Having Jurisdiction, the skimmer overflow system shall be in accordance with the following:

1. Capable of handling 100 percent of the circulation system flow
2. Maintain turnover rates in accordance with Section 503.0
3. Maintain water quality in accordance with Section 508.0
CHAPTER 9
AQUATIC RECREATIONAL ATTRACTIONS

901.0 General.
901.1 Applicability. This chapter shall govern the general requirements for design, materials, and methods of construction for diving facilities and equipment, swimming pool slides, water slides, wave pools, leisure rivers, and spray grounds.

902.0 Diving Equipment.
902.1 General. Diving facilities including location and placement of diving equipment, minimum dimensions, depth, slope, size of envelope shall comply with Section 301.2 and FINA standards, and shall be installed in accordance with the manufacturer’s installation instructions. Minimum dimensions shall comply with FINA Part X.

902.2 Diving Boards. Springboards and jumpboards including their supports and platforms shall be designed and of structural strength to carry the maximum anticipated loads. Where diving equipment is installed, it shall be located in a separate diving area of the pool segregated from swimming areas.

902.3 Diving Stands, Stairs, and Ladders. Diving stands, stairs, and ladders for diving equipment shall be of approved construction and of structural strength to carry anticipated loads. Stairs and ladders shall be of corrosion resistant material and treads shall be slip-resistant design. Diving stands exceeding 24 inches (610 mm) measured from the deck to the top end of the board shall be provided with stairs or ladders.

902.4 Guardrails. Guardrails shall be provided for diving equipment that exceeds 39 inches (991 mm) in height measured from the deck to the top end of the board. Guardrails shall be not less than 30 inches (762 mm) above the diving board and extending to not less than 6 inches (152 mm) past the edge of the pool wall.

903.0 Swimming Pool Lane Ropes.
903.1 General. Where provided, lane ropes for competitive swimming and training shall be installed in accordance with FINA Part X. Lane rope anchors shall comply with Section 402.11.

904.0 Starting Platforms.
904.1 General. Starting platforms for competitive use shall be installed in accordance with the manufacturer’s installation instructions and shall comply with FINA Part X. Starting platforms utilized for training purposes shall not be installed where pool depths are less than 79 inches (2007 mm).

905.0 Swimming Pool Slides.
905.1 General. Swimming pool slides shall comply with 16 C.F.R. part 1207 (Safety Standard for Swimming Pool Slides) or equivalent standards.

905.2 Installation. Swimming pool slides shall be installed in accordance with the manufacturer’s installation instructions. Swimming pool slides shall not exceed 10 feet (3048 mm) in height, and shall terminate at or below the normal operating water level of the pool. Where water is used, the flow rate shall not exceed 100 gallons per minute (gpm) (6.31 L/s).

906.0 Water Slides and Landing Pools.
906.1 General. The design, construction, and operation of a water slides and landing pools shall comply with ASTM F2376, and shall be installed in accordance with Section 906.2 through Section 906.11.1 and the manufacturer’s installation instructions.

906.2 Handholds. Handholds consisting of railings, or other approved methods, not more than 2 inches (51 mm) in size shall be installed at the entrance of a water slide.

906.3 Structural Design. The structural design of a water slide and the materials used in its construction shall sustain all the dead loads, live loads, and hydrostatic pressures.

906.4 Flumes. Flume surfaces shall be inert, nontoxic, and smooth.

906.4.1 Curves and Turns. Curves and turns in a flume shall comply with the following:
(1) Impact between the bather and the flume walls shall not present a hazard, cause injury, or cause the bather to become inverted in the flume.
(2) Flumes shall be banked so that the forces on the bathers will keep them inside the flume.
(3) Unless designed for such use, bathers shall not become airborne.

906.4.2 Valleys and Dips. Flume valleys and dips shall be capable of being drained, be designed to contain the rider inside the flume under operating conditions, and shall have a means of egress.

906.5 Flume Exits. Flume exits shall be designed to ensure that the bathers enter the landing pool or slide runout at a safe speed and angle of entry.

906.6 Water Slide Termination. Waterslides shall terminate at or below water level.

Exceptions:
(1) Drop slides
(2) Where permitted by the water slide manufacturer

906.6.1 Perpendicular. Water slide exits shall be perpendicular to the wall of the aquatic venue at the point of exit.

906.7 Landing Pools. Where steps are provided instead of exit ladders or recessed steps with grab rails, a handrail shall be provided at the steps opposite to the point of exit from each flume.
906.7.1 Landing Area. Where the water slide flume ends in a swimming pool, the landing area shall be divided from the rest of the aquatic venue by a float line or in accordance with the Authority Having Jurisdiction.

906.8 Decks. A perimeter deck shall be provided along the exit side of the landing.

906.9 Means of Access. A walkway, steps, stairway or ramp shall be provided between the landing pools and the top of the flume.

906.10 Slide Run-Outs. Waterslide run-outs shall have a means of egress unless one or both of the walls of the run-out are not more than 12 inches (305 mm) in height.

906.11 Drop Slides. A slide landing area shall be provided in accordance with the slide manufacturer’s instructions.

906.11.1 Landing Area. The slide landing area shall not infringe on the landing area for other water slides, diving equipment, or other minimum aquatic venue clearance requirements. Steps shall not infringe on the slide landing area.

907.0 Wave Pools.

907.1 General. Wave pools shall have a means of entry and exit in accordance with Section 802.3. The floor slope of a wave pool shall not exceed 1 foot (305 mm) in 12 feet (3658 mm). Caissons shall be separated from areas used by bathers with a float line in accordance with the Authority Having Jurisdiction. Openings in a caisson shall be designed to prevent the passage of a 4 inch (102 mm) diameter sphere. Not less than two emergency shut-off switches (one on each side) shall be provided to disable the wave action, and shall be located such that the switches or wave generation equipment are not capable of being accessed by unauthorized personnel. An automatic audible warning system shall be provided to indicate the beginning of wave generation. Approved “NO DIVING” signage shall be provided around the perimeter of the pool, except in areas not accessible by bathers or at zero-depth entries, at intervals of not less than 25 feet (7620 mm). A perimeter deck shall be provided at the shallow or beach end where bathers are capable of accessing the wave pool, and in locations where access is required for lifeguards. The sides of the wave pool shall be protected from unauthorized entry into the wave pool by the use of a fence or other approved barrier.

908.0 Interactive Water Play Venues.

908.1 General. An interactive water play venue shall have a nonabrasive, slip-resistant surface that will withstand repeated cleanings. Interactive water play venues shall be sloped uniformly not less than ¼ inch per foot (20.8 mm/m) towards the drains or as required by the Authority Having Jurisdiction to prevent the accumulation of water. Drainage flow to the spray ground treatment tank shall be by gravity. Openings in drain covers shall not exceed ½ of an inch (12.7 mm) in size. Interactive water play venues shall be kept free of landscape debris in accordance with one of the following:
CHAPTER 10
REFERENCED STANDARDS

Note: Referenced sections in Table 1001.1 will be updated before publishing.

1001.0 General.
1001.1 Standards. The standards listed in Table 1001.1 are referenced in various sections of this code and shall be considered part of the requirements of this document. The standards are listed herein by the standard number and effective date, the title, application and the section(s) of this code that reference the standard. The application of the referenced standard(s) shall be as specified in Section 301.2.2. The promulgating agency acronyms referred to in Table 1001.1 are defined in a list found at the end of the chapter.

TABLE 1001.1
REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACI 318-2014</td>
<td>Building Code Requirements for Structural Concrete</td>
<td>Miscellaneous</td>
<td>402.3.1, 404.3.1</td>
</tr>
<tr>
<td>APSP/ICC 16-2017</td>
<td>Suction Outlet Fitting Assemblies (SOFA) for Use in Pools, Spas and Hot Tubs</td>
<td>Fittings</td>
<td>511.1</td>
</tr>
<tr>
<td>ASCE 24-2014</td>
<td>Flood Resistant Design and Construction</td>
<td>Miscellaneous</td>
<td>301.4.4</td>
</tr>
<tr>
<td>ASME A112.6.3-2019</td>
<td>Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above- and Below-Ground</td>
<td>Piping, Ferrous</td>
<td>310.6.2, 413.1, Table 309.1</td>
</tr>
<tr>
<td>ASME A112.3.1-2007 (R2017)</td>
<td>Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures</td>
<td>Fixtures</td>
<td>409.1, 410.1, 412.1</td>
</tr>
<tr>
<td>ASME A112.19.3-2017/CSA B45.4-2017</td>
<td>Stainless Steel Plumbing Fixtures</td>
<td>Fixtures</td>
<td>407.1, 409.1, 410.1, 412.1</td>
</tr>
<tr>
<td>ASME A112.19.14-2013 (R2018)</td>
<td>Six-Liter Water Closets Equipped with a Dual Flushing Device</td>
<td>Fixtures</td>
<td>407.2.1</td>
</tr>
<tr>
<td>ASME A112.19.19-2016</td>
<td>Vitreous China Nonwater Urinals</td>
<td>Fixtures</td>
<td>408.1, 408.2.1</td>
</tr>
<tr>
<td>ASME B1.20.1-2013 (R2018)</td>
<td>Pipe Threads, General Purpose (Inch)</td>
<td>Joints</td>
<td>308.1.5, 308.2.3, 308.5.2, 308.12.3, 310.1.3, 310.3.4, 310.4.2, 310.5.3</td>
</tr>
<tr>
<td>ASME B16.3-2016</td>
<td>Malleable Iron Threaded Fittings: Classes 150 and 300</td>
<td>Fittings</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASME B16.4-2016</td>
<td>Gray Iron Threaded Fittings: Classes 125 and 250</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.12-2009 (R2014) 2019</td>
<td>Cast Iron Threaded Drainage Fittings</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASME B16.15-2018</td>
<td>Cast Copper Alloy Threaded Fittings: Classes 125 and 250</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.18-2018</td>
<td>Cast Copper Alloy Solder Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
</tbody>
</table>
# TABLE 1001.1 (continued) REFERENCED STANDARDS

<table>
<thead>
<tr>
<th>STANDARD NUMBER</th>
<th>STANDARD TITLE</th>
<th>APPLICATION</th>
<th>REFERENCED SECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME B16.22-2018</td>
<td>Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.23-2016</td>
<td>Cast Copper Alloy Solder Joint Drainage Fittings: DWV</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASME B16.26-2018</td>
<td>Cast Copper Alloy Fittings for Flared Copper Tubes</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.29-2017</td>
<td>Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASME B16.50-2018</td>
<td>Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASME B16.51-2018</td>
<td>Copper and Copper Alloy Press-Connect Pressure Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASSE 1019-2011 (R2016)</td>
<td>Wall Hydrant with Backflow Protection and Freeze Resistance</td>
<td>Backflow Protection</td>
<td>414.1</td>
</tr>
<tr>
<td>ASSE 1061-2015</td>
<td>Push-Fit Fittings</td>
<td>Fittings</td>
<td>308.1.3.3, 308.2.1, Table 307.1</td>
</tr>
<tr>
<td>ASSE 1069-2020</td>
<td>Automatic Temperature Control Mixing Valves</td>
<td>Valves</td>
<td>410.3</td>
</tr>
<tr>
<td>ASSE 1079-2012</td>
<td>Dielectric Pipe Unions</td>
<td>Joints</td>
<td>308.14, 308.15.1, 308.15.3</td>
</tr>
<tr>
<td>ASTM A53/A53M-2018</td>
<td>Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless</td>
<td>Piping, Ferrous</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM A74-2017</td>
<td>Cast Iron Soil Pipe and Fittings</td>
<td>Piping, Ferrous</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM A240/A240M-2018</td>
<td>Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications</td>
<td>Miscellaneous</td>
<td>402.3.3, 404.3.3</td>
</tr>
<tr>
<td>ASTM A269/A269M-2015a</td>
<td>Seamless and Welded Austenitic Stainless Steel Tubing for General Service</td>
<td>Piping, Ferrous</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A312/A312M-2018</td>
<td>Seamless, Welded, and Heavy Cold Worked Austenitic Stainless Steel Pipes</td>
<td>Piping, Ferrous</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A554-2016</td>
<td>Welded Stainless Steel Mechanical Tubing</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A778/A778M-2016</td>
<td>Welded, Unannealed Austenitic Stainless Steel Tubular Products</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM A888-2018a</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Piping, Ferrous</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM A1056-2012 (R2017)</td>
<td>Cast Iron Couplings Used for Joining Hubless Cast Iron Soil Pipe and Fittings</td>
<td>Piping, Ferrous</td>
<td>310.2.2</td>
</tr>
<tr>
<td>ASTM B32-2008 (R2014)</td>
<td>Solder Metal</td>
<td>Joints</td>
<td>308.1.4, 310.3.3</td>
</tr>
<tr>
<td>ASTM B42-2015a</td>
<td>Seamless Copper Pipe, Standard Sizes</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM B43-2015</td>
<td>Seamless Red Brass Pipe, Standard Sizes</td>
<td>Piping, Copper Alloy</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM B75/B75M-2011-2019</td>
<td>Seamless Copper Tube</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM B88-2016</td>
<td>Seamless Copper Water Tube</td>
<td>Piping, Copper Alloy</td>
<td>307.3, Table 307.1</td>
</tr>
<tr>
<td>ASTM B135/B135M-2017</td>
<td>Seamless Brass Tube</td>
<td>Piping</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM B251/B251M-2017</td>
<td>General Requirements for Wrought Seamless Copper and Copper-Alloy Tube</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM B302-2017</td>
<td>Threadless Copper Pipe, Standard Sizes</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM B306-2013</td>
<td>Copper Drainage Tube (DWV)</td>
<td>Piping, Copper Alloy</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
<td>APPLICATION</td>
<td>REFERENCED SECTIONS</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>ASTM B447-2012a</td>
<td>Welded Copper Tube</td>
<td>Piping, Copper Alloy</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM B813-2016</td>
<td>Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube</td>
<td>Joints</td>
<td>308.1.4, 310.3.3</td>
</tr>
<tr>
<td>ASTM B828-2016</td>
<td>Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings</td>
<td>Joints</td>
<td>308.1.4, 310.3.3</td>
</tr>
<tr>
<td>ASTM B1010/B1010M-2019</td>
<td>Copper-Clad Steel Electrical Conductor for Tracer Wire Applications</td>
<td>Miscellaneous</td>
<td>307.8.1</td>
</tr>
<tr>
<td>ASTM C425-2004 (R2018)</td>
<td>Compression Joints for Vitrified Clay Pipe and Fittings</td>
<td>Joints</td>
<td>310.7.1</td>
</tr>
<tr>
<td>ASTM C564-2014</td>
<td>Rubber Gaskets for Cast Iron Soil Pipe and Fittings</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>ASTM C700-2018</td>
<td>Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated</td>
<td>Piping, Non-Metallic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM C1173-2018</td>
<td>Flexible Transition Couplings for Underground Piping Systems</td>
<td>Joints</td>
<td>310.8</td>
</tr>
<tr>
<td>ASTM C1277-2018</td>
<td>Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>ASTM C1460-2017</td>
<td>Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground</td>
<td>Joints</td>
<td>310.8</td>
</tr>
<tr>
<td>ASTM C1461-2008 (R2017)</td>
<td>Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems for Above and Below Ground Use</td>
<td>Joints</td>
<td>310.8</td>
</tr>
<tr>
<td>ASTM C1540-2018</td>
<td>Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>ASTM D1593-2014-2019</td>
<td>Nonrigid Vinyl Chloride Plastic Film and Sheeting</td>
<td>Testing</td>
<td>402.3.5, 404.3.5</td>
</tr>
<tr>
<td>ASTM D1785-2015a</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120</td>
<td>Piping, Plastic</td>
<td>Table 307.1, Table 309.1</td>
</tr>
<tr>
<td>ASTM D1790-2014</td>
<td>Brittleness Temperature of Plastic Sheeting by Impact</td>
<td>Testing</td>
<td>402.3.5</td>
</tr>
<tr>
<td>ASTM D2239-2012a</td>
<td>Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2241-2015</td>
<td>Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2464-2015</td>
<td>Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2466-2017</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2467-2015</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2564-2012 (R2018)</td>
<td>Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems</td>
<td>Joints</td>
<td>308.12.2, 310.5.2</td>
</tr>
<tr>
<td>ASTM D2609-2015</td>
<td>Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2661-2014a</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM D2665-2014</td>
<td>Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM D2680-2001 (R2014)</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM D2683-2014</td>
<td>Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D2737-2012a</td>
<td>Polyethylene (PE) Plastic Tubing</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
<td>APPLICATION</td>
<td>REFERENCED SECTIONS</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>ASTM D2846/D2846M-2019</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>308.2.2, 308.3.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM D3035-2015</td>
<td>Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM D3212-2007 (R2013)</td>
<td>Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals</td>
<td>Joints</td>
<td>310.1.1, 310.5.1</td>
</tr>
<tr>
<td>ASTM D3261-2016</td>
<td>Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F437-2015</td>
<td>Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F438-2017</td>
<td>Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F439-2014</td>
<td>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F441/F441M-2015</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F442/F442M-2013</td>
<td>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)</td>
<td>Piping, Plastic</td>
<td>308.2.2, Table 307.1</td>
</tr>
<tr>
<td>ASTM F493-2014</td>
<td>Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings</td>
<td>Joints</td>
<td>308.2.2, 308.3.1</td>
</tr>
<tr>
<td>ASTM F628-2012</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F656-2015</td>
<td>Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings</td>
<td>Joints</td>
<td>308.2.2, 308.3.1, 308.12.2, 310.5.2</td>
</tr>
<tr>
<td>ASTM F794-2003 (R2014)</td>
<td>Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F876-2017-2019</td>
<td>Crosslinked Polyethylene (PEX) Tubing</td>
<td>Piping, Plastic</td>
<td>308.9.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F877-2019</td>
<td>Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F891-2016</td>
<td>Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F1055-2016a</td>
<td>Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1281-2017</td>
<td>Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1282-2017</td>
<td>Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1346-1991 (R2018)</td>
<td>Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs</td>
<td>Miscellaneous</td>
<td>803.5, 806.1</td>
</tr>
<tr>
<td>ASTM F1488-2014 (R2019)</td>
<td>Coextruded Composite Pipe</td>
<td>Piping, Plastic</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>ASTM F1807-2018</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F1866-2018</td>
<td>Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings</td>
<td>Fittings</td>
<td>Table 309.1</td>
</tr>
</tbody>
</table>
### Referenced Standards

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Standard Title</th>
<th>Application</th>
<th>Referenced Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F960-2018</td>
<td>Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F970-2018</td>
<td>Special Engineered Fittings, Appurtenances or Valves for Use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F974-2009 (R2015)</td>
<td>Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Composite Pressure Pipe</td>
<td>Fittings</td>
<td>308.7.1, 308.10.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F2080-2018</td>
<td>Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2098-2018</td>
<td>Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) to Metal Insert and Plastic Insert Fittings</td>
<td>Joints</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2159-2018</td>
<td>Plastic Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Joints</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2376-2017a</td>
<td>Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems</td>
<td>Water Slides</td>
<td>906.1</td>
</tr>
<tr>
<td>ASTM F2389-2012</td>
<td>Pressure-Rated Polypropylene (PP) Piping Systems</td>
<td>Piping, Plastic</td>
<td>308.11.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F2434-2018</td>
<td>Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEA) Tubing and SDR9 Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Tubing</td>
<td>Fittings</td>
<td>308.10.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F2461-2018</td>
<td>Manufacture, Construction, Operation, and Maintenance of Aquatic Play Equipment</td>
<td>Equipment</td>
<td>908.2</td>
</tr>
<tr>
<td>ASTM F2620-2014</td>
<td>Heat Fusion Joining of Polyethylene Pipe and Fittings</td>
<td>Joints</td>
<td>308.6.1.1, 308.6.1.3</td>
</tr>
<tr>
<td>ASTM F2735-2018</td>
<td>Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2769-2018</td>
<td>Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems</td>
<td>Piping and Fittings, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>ASTM F2855-2012</td>
<td>Chlorinated Poly (Vinyl Chloride)/Aluminum/Chlorinated Poly (Vinyl Chloride) (CPVC-AL-CPVC) Composite Pressure Tubing</td>
<td>Piping, Plastic</td>
<td>308.3.1, Table 307.1</td>
</tr>
<tr>
<td>ASTM F3226/F3226M-2019</td>
<td>Metallic Press-Connect Fittings for Piping and Tubing Systems</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWS A5.8M/A5.8-2018</td>
<td>Filler Metals for Brazing and Braze Welding</td>
<td>Joints</td>
<td>308.1.1, 310.3.1</td>
</tr>
<tr>
<td>AWWA C110-2012</td>
<td>Ductile-Iron and Gray-Iron Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C111-2017</td>
<td>Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings</td>
<td>Joints</td>
<td>308.4.1, 308.4.2</td>
</tr>
<tr>
<td>AWWA C151-2017</td>
<td>Ductile-Iron Pipe, Centrifugally Cast</td>
<td>Piping, Ferrous</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
<td>APPLICATION</td>
<td>REFERENCED SECTIONS</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>AWWA C153-2011</td>
<td>Ductile-Iron Compact Fittings</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C900-2016</td>
<td>Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. (100 mm through 1,500 mm)</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C901-2017</td>
<td>Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. (19 mm) through 3 in. (76 mm), for Water Service</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C904-2016</td>
<td>Crosslinked Polyethylene (PEX) Pressure Tubing, 1/2 in. (13 mm) through 3 in. (76 mm), for Water Service</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>AWWA C907-2017</td>
<td>Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water, Wastewater, and Reclaimed Water Service</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CISPI 301-2018</td>
<td>Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Piping, Ferrous</td>
<td>Table 309.1</td>
</tr>
<tr>
<td>CISPI 310-2018</td>
<td>Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications</td>
<td>Joints</td>
<td>310.2.2</td>
</tr>
<tr>
<td>CSA B45.5-2017 /IAPMO Z124-2017</td>
<td>Plastic Plumbing Fixtures</td>
<td>Fixtures</td>
<td>407.1, 408.1, 409.1, 410.1</td>
</tr>
<tr>
<td>CSA B45.11-2017/IAPMO Z401-2017</td>
<td>Glass Plumbing Fixtures</td>
<td>Fixtures</td>
<td>409.1</td>
</tr>
<tr>
<td>CSA B64.2.1.1-2011 (R2016)</td>
<td>Hose Connection Dual Check Vacuum Breakers (HCDVB)</td>
<td>Backflow Protection</td>
<td>414.1</td>
</tr>
<tr>
<td>CSA B79-2008 (R2018)</td>
<td>Commercial and Residential Drains and Cleanouts</td>
<td>DWV Components</td>
<td>413.1</td>
</tr>
<tr>
<td>CSA B125.3-2018</td>
<td>Plumbing Fittings</td>
<td>Fittings</td>
<td>409.3</td>
</tr>
<tr>
<td>CSA B137.1-2017</td>
<td>Polyethylene (PE) Pipe, Tubing, and Fittings for Cold-Water Pressure Services</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.5-2017</td>
<td>Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.6-2017</td>
<td>Chlorinated Polyvinyl Chloride (CPVC) Pipe, Tubing, and Fittings for Hot- and Cold-Water Distribution Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.9-2017</td>
<td>Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.10-2017</td>
<td>Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems</td>
<td>Piping, Plastic</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>CSA B137.11-2017</td>
<td>Polypropylene (PP-R) Pipe and Fittings for Pressure Applications</td>
<td>Piping, Plastic</td>
<td>308.11.1, Table 307.1</td>
</tr>
<tr>
<td>CSA B137.18–2017</td>
<td>Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications</td>
<td>Piping, Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>IAPMO IGC 158-2019</td>
<td>Fiberglass Reinforced Plastic Pool Shells</td>
<td>Miscellaneous</td>
<td>402.3.2</td>
</tr>
<tr>
<td>IAPMO PS 117-2019</td>
<td>Press Connections</td>
<td>Fittings</td>
<td>Table 307.1</td>
</tr>
<tr>
<td>IAPMO SPS 4-2019</td>
<td>Special Use Suction Fittings for Swimming Pools, Spas and Hot Tubs (for Suction Side Automatic Swimming Pool Cleaners)</td>
<td>Fittings</td>
<td>511.1.2.1</td>
</tr>
<tr>
<td>IAPMO Z124.5-2013(R2018)</td>
<td>Plastic Toilet Seats</td>
<td>Fixtures</td>
<td>407.3</td>
</tr>
<tr>
<td>IAPMO Z124.7-2013</td>
<td>Prefabricated Plastic Spa Shells</td>
<td>Fixtures</td>
<td>404.3.2</td>
</tr>
<tr>
<td>IAPMO Z1033-2015</td>
<td>Flexible PVC Hoses and Tubing for Pools, Hot Tubs, Spas, and Jetted Bathubs</td>
<td>Miscellaneous</td>
<td>307.10</td>
</tr>
<tr>
<td>ICC A117.1-2017</td>
<td>Accessible and Usable Buildings and Facilities</td>
<td>Miscellaneous</td>
<td>313.1, 410.4</td>
</tr>
<tr>
<td>STANDARD NUMBER</td>
<td>STANDARD TITLE</td>
<td>APPLICATION</td>
<td>REFERENCED SECTIONS</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>NFPA 400-2019</td>
<td>Hazardous Material Code</td>
<td>Miscellaneous</td>
<td>807.3</td>
</tr>
<tr>
<td>NFPA 780-2012-2020</td>
<td>Installation of Lightning Protection Systems</td>
<td>Miscellaneous</td>
<td>401.2</td>
</tr>
<tr>
<td>TCNA A108/A118/A136-2017</td>
<td>Installation of Ceramic Tile</td>
<td>Miscellaneous</td>
<td>402.3.4, 404.3.4</td>
</tr>
<tr>
<td>TCNA A326.3-2017</td>
<td>Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials</td>
<td>Safety</td>
<td>314.1.1, 314.1.2</td>
</tr>
<tr>
<td>UL 96A-2016</td>
<td>Installation Requirements for Lightning Protection Systems (with revisions through December 18, 2018)</td>
<td>Miscellaneous</td>
<td>401.2</td>
</tr>
<tr>
<td>UL 379-2013</td>
<td>Power Units for Fountain, Swimming Pool, and Spa Luminaires (with revisions through September 19, 2017)</td>
<td>Equipment</td>
<td>401.3.5</td>
</tr>
<tr>
<td>UL 399-2017</td>
<td>Drinking Water Coolers (with revisions through August 20, 2018-May 23, 2019)</td>
<td>Appliances</td>
<td>412.1</td>
</tr>
<tr>
<td>UL 676-2015</td>
<td>Underwater Luminaires and Submersible Junction Boxes (with revisions through February 26, 2018-October 14, 2019)</td>
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<td>Potting Compounds for Swimming Pool, Fountain, and Spa Equipment</td>
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<td>UL 726-1995</td>
<td>Oil-Fired Boiler Assemblies (with revisions through October 9, 2013)</td>
<td>Appliances and Equipment</td>
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<tr>
<td>UL 1081-2016</td>
<td>Swimming Pool Pumps, Filters, and Chlorinators (with revisions through October 20, 2017)</td>
<td>Appliances and Equipment</td>
<td>507.2, 604.1</td>
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<tr>
<td>UL 1261-2016</td>
<td>Electric Water Heaters for Pools and Tubs (with revisions through September 1, 2017)</td>
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<td>Speakers for Fire Alarm and Signaling Systems, Including Accessories (with revisions through September 7, 2017)</td>
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<td>Electric Spas, Equipment Assemblies, and Associated Equipment (with revisions through October 20, 2017)</td>
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<td>Miscellaneous</td>
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<td>Outline of Investigation for Electric Swimming Pool and Spa Cover Operators</td>
<td>Miscellaneous</td>
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<td>Outline of Investigation for Tracer Wire</td>
<td>Miscellaneous</td>
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<td>UL 60335-2-1000-2017</td>
<td>Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts</td>
<td>Miscellaneous</td>
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</table>
1001.2 Standards, Publications, Practices, and Guides. The standards, publications, practices and guides listed in Table 1001.2 are not referenced in other sections of this code. The application of the referenced standards, publications, practices and guides shall be as specified in Section 301.2.2. The promulgating agency acronyms are found at the end of the table.

<table>
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<th>DOCUMENT NUMBER</th>
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<tbody>
<tr>
<td>APSP/ICC 1-2014</td>
<td>Public Swimming Pools</td>
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<td>APSP/ICC 3-2014</td>
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<td>Aboveground/Onground Residential Swimming Pools (includes Addenda A approved April 4, 2013)</td>
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<td>Methods for Calculation of Evaporation from Swimming Pools and Other Water Surfaces</td>
<td>Design</td>
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<tr>
<td>ASME A112.1.2-2012 (R2017)</td>
<td>Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)</td>
<td>Fittings</td>
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<td>Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings</td>
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<td>ASME A112.19.7-2012/CSA B45.10-2012 (R2017)</td>
<td>Hydromassage Bathtub Systems</td>
<td>Fixtures</td>
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<td>Pipe Flanges and Flanged Fittings: NPS 1½ through NPS 24 Metric/Inch</td>
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<td>ASME B16.20-2017</td>
<td>Metallic Gaskets for Pipe Flanges</td>
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<td>Nonmetallic Flat Gaskets for Pipe Flanges</td>
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<td>Valves - Flanged, Threaded, and Welding End</td>
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<td>Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300</td>
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<td>Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch</td>
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<td>Wrought Copper and Copper Alloy Braze Joint Pressure Fittings</td>
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<tr>
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<td>Hose Connection Vacuum Breakers</td>
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<td>Backflow Preventers with an Intermediate Atmospheric Vent</td>
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<td>Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers</td>
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<td>Chemical Dispensing Systems with Integral Backflow Protection</td>
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<td>Freeze Resistant Sanitary Yard Hydrants with Backflow Protection</td>
<td>Backflow Protection</td>
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<td>Outdoor Enclosures for Fluid Conveying Components</td>
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<td>Copper-Brazed Steel Tubing</td>
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<td>ASTM A377-2018</td>
<td>Ductile-Iron Pressure Pipe</td>
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<tr>
<td>ASTM A733-2016</td>
<td>Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples</td>
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<td>ASTM A861-2004 (R2017)</td>
<td>High-Silicon Iron Pipe and Fittings</td>
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<td>Seamless Brass Tube</td>
<td>Piping, Copper Alloy</td>
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<td>ASTM B152/B152M-2013 (R2019)</td>
<td>Copper Sheet, Strip, Plate, and Rolled Bar</td>
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<td>ASTM B587-2013-2019</td>
<td>Welded Brass Tube</td>
<td>Piping, Copper Alloy</td>
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<td>ASTM B687-1999 (R2016)</td>
<td>Brass, Copper, and Chromium-Plated Pipe Nipples</td>
<td>Piping, Copper Alloy</td>
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<td>Joints for IPS PVC Pipe Using Solvent Cement</td>
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<tr>
<td>ASTM D2855-2015</td>
<td>Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets</td>
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<tr>
<td>ASTM F402-2018</td>
<td>Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings</td>
<td>Joints</td>
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<tr>
<td>ASTM F409-2017</td>
<td>Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings</td>
<td>Piping, Plastic</td>
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<tr>
<td>ASTM F714-2013 (R2019)</td>
<td>Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter</td>
<td>Piping, Plastic</td>
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<tr>
<td>ASTM F2165-2019</td>
<td>Flexible Pre-Insulated Plastic Piping</td>
<td>Piping, Plastic</td>
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<td>AWS B2.2/B2.2M-2016</td>
<td>Brazing Procedure and Performance Qualification</td>
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</tr>
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<td>AWS B2.4-2012</td>
<td>Welding Procedure and Performance Qualification for Thermoplastics</td>
<td>Joints, Certification</td>
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### TABLE 1001.2 (continued)

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<td>Miscellaneous</td>
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<td>AWWA C213-2015</td>
<td>Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings</td>
<td>Miscellaneous</td>
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<td>AWWA C500-2009</td>
<td>Metal-Seated Gate Valves for Water Supply Service</td>
<td>Valves</td>
</tr>
<tr>
<td>AWWA C507-2018</td>
<td>Ball Valves, 6 in. through 60 in. (150 mm through 1,500 mm)</td>
<td>Valves</td>
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<tr>
<td>CSA Z21.22-2015</td>
<td>Relief Valves for Hot Water Supply Systems (same as CSA 4.4)</td>
<td>Valves</td>
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<td>IAF 9-2005</td>
<td>Aquatic Recreation Facilities</td>
<td>Miscellaneous</td>
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<td>Metallic Fittings for Joining Polyethylene Pipe for Water Service and Yard Piping</td>
<td>Joints</td>
</tr>
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<td>Encasement Sleeves for Potable Water Pipe and Tubing</td>
<td>Piping</td>
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<tr>
<td>IAPMO PS 36-2014-e1</td>
<td>Lead-Free Sealing Compounds for Threaded Joints</td>
<td>Joints</td>
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<td>IAPMO PS 37-2000-2019</td>
<td>Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventative Tape</td>
<td>Miscellaneous</td>
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<td>IAPMO PS 42-2013-e1</td>
<td>Pipe Alignment and Secondary Support Systems</td>
<td>Miscellaneous</td>
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<td>IAPMO PS 51-2016</td>
<td>Expansion Joints and Flexible Expansion Joints for DWV Piping Systems</td>
<td>Joints</td>
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<tr>
<td>IAPMO PS 53-2019-e1</td>
<td>Grooved Mechanical Pipe Couplings and Grooved Fittings</td>
<td>Joints</td>
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<tr>
<td>IAPMO PS 69-2006-2019</td>
<td>Bathwaste and Overflow Assemblies with Tub Filler Spout</td>
<td>DWV Components</td>
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<tr>
<td>IAPMO PS 87-2019</td>
<td>Diverter and Shut-off Valves for Pool/Spas</td>
<td>Valves</td>
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<tr>
<td>IAPMO Z124.8-2013-e2</td>
<td>Plastic Liners for Bathtubs and Shower Receptors</td>
<td>Fixtures</td>
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<tr>
<td>MSS SP-6-2017</td>
<td>Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings</td>
<td>Fuel Gas</td>
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<td>MSS SP-25-2018</td>
<td>Standard Marking System for Valves, Fittings, Flanges, and Unions</td>
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<td>MSS SP-67-2017</td>
<td>Butterfly Valves (including errata, dated September 21, 2018)</td>
<td>Valves</td>
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<td>NFPA 31-2016</td>
<td>Installation of Oil-Burning Equipment</td>
<td>Fuel Gas, Appliances and Equipment</td>
</tr>
<tr>
<td>NSPI 2-1999</td>
<td>Public Spas</td>
<td>Miscellaneous</td>
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<tr>
<td>UL 296-2017</td>
<td>Oil Burners</td>
<td>Fuel Gas, Appliances and Equipment</td>
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### ABBREVIATIONS IN TABLE 1001.1 AND TABLE 1001.2

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<td>ACCA</td>
<td>Air Conditioning Contractors of America Association, Inc., 2800 Shirlington Road, Suite 300, Arlington, VA 22206.</td>
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<tr>
<td>ACI</td>
<td>American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48331-3439.</td>
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<tr>
<td>ANSI</td>
<td>American National Standards Institute, Inc., 25 W. 43rd Street, 4th Floor, New York, NY 10036.</td>
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<tr>
<td>APSP</td>
<td>Association of Pool and Spa Professionals, 2111 Eisenhower Avenue, Suite 500, Alexandria, VA 22314-4679.</td>
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<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.</td>
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<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.</td>
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<tr>
<td>ASSE</td>
<td>American Society of Sanitary Engineering, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448.</td>
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<td>ASTM</td>
<td>ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.</td>
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<tr>
<td>AWS</td>
<td>American Welding Society, 8669 NW 36th Street, #130, Miami, FL 33166-6672.</td>
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<td>AWWA</td>
<td>American Water Works Association, 6666 W. Quincy Avenue, Denver, CO 80235.</td>
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<td>CISPI</td>
<td>Cast-Iron Soil Pipe Institute, 2401 Fieldcrest Drive, Mundelein, IL 60060.</td>
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<tr>
<td>CSA</td>
<td>Canadian Standards Association, 178 Rexdale Boulevard, Toronto, ON, Canada M9W 1R3.</td>
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<td>FINA</td>
<td>Fédération Internationale de Natation, Chemin de Bellevue 24a/24b, CH - 1005 Lausanne, Switzerland.</td>
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<td>IAF</td>
<td>International Aquatic Foundation, P.O. Box 4038, Alexandria, VA 22303.</td>
</tr>
<tr>
<td>IAPMO</td>
<td>International Association of Plumbing and Mechanical Officials, 4755 E. Philadelphia Street, Ontario, CA 91761.</td>
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<td>ICC</td>
<td>International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001.</td>
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<td>MSS</td>
<td>Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, NE, Vienna, VA 22180.</td>
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<td>NFPA</td>
<td>National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.</td>
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<td>NSF</td>
<td>NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.</td>
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<td>NSPI</td>
<td>National Spa and Pool Institute, 2111 Eisenhower Avenue, Alexandria, VA 22314.</td>
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<td>UL</td>
<td>Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.</td>
</tr>
</tbody>
</table>
APPENDICES

The appendices are intended to supplement the provisions of the installation requirements of this code. The definitions in Chapter 2 are also applicable to the appendices.

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A</td>
<td></td>
</tr>
<tr>
<td>Method for Determining Latent Evaporation Loads of Natatoriums</td>
<td>75</td>
</tr>
<tr>
<td>Appendix B</td>
<td></td>
</tr>
<tr>
<td>Standard Water Temperatures for Indoor Aquatic Facilities</td>
<td>79</td>
</tr>
<tr>
<td>Appendix C</td>
<td></td>
</tr>
<tr>
<td>Slip-Resistant Walkway Surfaces</td>
<td>81</td>
</tr>
</tbody>
</table>
APPENDIX A
METHOD FOR DETERMINING LATENT EVAPORATION LOADS OF NATATORIUMS

A 101.0 General.
A 101.1 Applicability. This appendix provides a general procedure for determining the latent evaporation load of an indoor aquatic facility (natatorium) for the purpose of maintaining stable space conditions. For adequate humidity control of a natatorium in accordance with Section 416.4.4, the determination of the building’s internal latent moisture load is required for selection of a properly sized ventilation dehumidification system. The internal load of a natatorium is equivalent to the evaporation load and contributes to a majority of the building’s total moisture latent load. Evaluation of the evaporation load includes both occupied and unoccupied conditions for proper modulation of equipment capacity.

A 102.0 Psychometric Chart.
A 102.1 Density. Density values required for calculations shall be determined in accordance with Figure A 102.1 as the inverse of specific volumes at provided design space conditions. The application of density differences provided in Table A 102.1 shall be permitted for simplified calculations.

A 102.2 Humidity Ratio. Humidity ratios shall be determined in accordance with Figure A 102.1 and provided design space conditions.

A 102.2.1 Partial Pressure. The partial pressure of water vapor in air ($p_d$) shall be determined in accordance with the design relative humidity ($RH$), Table A 102.2.1 and Equation A 102.2.1.

$$p_d = RH \cdot p_w$$  \hspace{1cm}  \text{(Equation A 102.2.1)}

A 103.0 Evaporation Load.
A 103.1 General. The evaporation load ($EL$) of an indoor pool or spa shall be determined in accordance with Section A 103.2 through Section A 103.4.

A 103.2 Flux. The evaporation flux due to natural convection ($EF_C$) shall be determined in accordance with Equation A 103.2(1) and Table A 102.1, and the evaporation flux due to air currents from the ventilation system ($EF_U$) shall be determined in accordance with Equation A 103.2(2).

$$EF_C = C \cdot RW_d \cdot (p_d - p_w)$$  \hspace{1cm}  \text{[Equation A 103.2(1)]}

$$EF_U = B \cdot (p_w - p_d)$$  \hspace{1cm}  \text{[Equation A 103.2(2)]}

The evaporation flux of an unoccupied indoor pool or spa ($EF_{U}$) shall be as determined in accordance with Equation A 103.2(1) or Equation A 103.2(2), as the evaporation flux due to natural convection or the evaporation flux due to air currents from the ventilation system, whichever is greater, or, alternatively, determined in accordance with Table A 103.2.

The evaporation flux of an occupied indoor pool or spa ($EF_{OCC}$) shall be determined in accordance with Equation A 103.2(3) and Table A 103.2.

$$EF_{OCC} = EF_U \cdot [1.9 - 366(p_d - p_w) + 57 \left( \frac{n}{T_p} \right)]$$  \hspace{1cm}  \text{[Equation A 103.2(3)]}

A 103.3 Rate. The evaporation rate ($ER$) of an indoor pool or spa shall be determined in accordance with Equation A 103.3 and Table A 103.3.

$$ER = EF_{OCC} \cdot AF \cdot Ap$$  \hspace{1cm}  \text{(Equation A 103.3)}

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A 103.4 Latent Load. The evaporation load \((EL)\) shall be determined in accordance with Equation A 103.4.

\[ EL = 1050 \times ER \]  

(Equation A 103.4)

Where:

- \(A_p\) = Area of water surface, square feet
- \(AF\) = Activity Factor
- \(B\) = 0.0346
- \(C\) = 290
- \(EF_c\) = Evaporation flux due to natural convection, pound per square foot hour
- \(EF_{OCC}\) = Evaporation flux of an occupied indoor pool or spa, pound per square foot hour
- \(EF_U\) = Evaporation flux of an unoccupied indoor pool or spa, pound per square foot hour
- \(EF_v\) = Evaporation flux due air currents from the ventilation system, pound per square foot hour
- \(EL\) = Evaporation load, British thermal units per hour
- \(ER\) = Evaporation rate, pound per hour
- \(n\) = number of pool or spa occupants
- \(p_a\) = partial pressure of vapor at room conditions, inch of mercury
- \(p_w\) = saturation partial pressure of vapor at water surface temperature, inch of mercury
- \(W_a\) = humidity ratio of air at room conditions, pound of moisture per pound of dry air
- \(W_w\) = humidity ratio of saturated air at water surface temperature, pound of moisture per pound of dry air
- \(\rho_a\) = density of air at room conditions, pound per cubic foot
- \(\rho_w\) = density of saturated air at water surface temperature, pound per cubic foot

For SI units: 1 square foot = 0.0929 m², 1 pound per square foot hour = 4.882 kg/(m²•h), 1000 British thermal units per hour = 0.293 kW, 1 pound per hour = 0.454 kg/h, 1 inch of mercury = 3.386 kPa, 1 pound-force per square inch = 6.894 kPa, 1 pound = 0.453 kg, 1 pound per cubic foot = 16.02 kg/m³, B = 0.00005, C = 35.

\[ EF_{OCC} = EF_U \left[ 1.9 - 21(p_a - p_w) + 5.3 \left( \frac{n}{A_p} \right) \right], \quad EL = 2443 \times ER \]
### TABLE A 102.1
AIR DENSITY DIFFERENCES FOR STANDARD NATATORIUM CONDITIONS

<table>
<thead>
<tr>
<th>WATER TEMPERATURE (°F)</th>
<th>AIR TEMPERATURE AND RELATIVE HUMIDITY</th>
<th>DENSITY DIFFERENCE, $\rho_a - \rho_w$ (lb/ft(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>76</td>
<td>0.0011</td>
<td>0.0009</td>
</tr>
<tr>
<td>78</td>
<td>0.0015</td>
<td>0.0013</td>
</tr>
<tr>
<td>80</td>
<td>0.0020</td>
<td>0.0017</td>
</tr>
<tr>
<td>82</td>
<td>0.0024</td>
<td>0.0022</td>
</tr>
<tr>
<td>84</td>
<td>0.0028</td>
<td>0.0026</td>
</tr>
<tr>
<td>86</td>
<td>0.0033</td>
<td>0.0031</td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8, 1 pound per square foot hour = 4.882 kg/m\(^2\)h

### TABLE A 103.2
EVAPORATION FLUX - UNOCCUPIED INDOOR AQUATIC FACILITIES

<table>
<thead>
<tr>
<th>WATER TEMPERATURE (°F)</th>
<th>AIR TEMPERATURE AND RELATIVE HUMIDITY</th>
<th>EFU (lb/ft(^2\h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>76</td>
<td>0.0211</td>
<td>0.0159</td>
</tr>
<tr>
<td>78</td>
<td>0.0270</td>
<td>0.0211</td>
</tr>
<tr>
<td>80</td>
<td>0.0328</td>
<td>0.0266</td>
</tr>
<tr>
<td>82</td>
<td>0.0390</td>
<td>0.0326</td>
</tr>
<tr>
<td>84</td>
<td>0.0458</td>
<td>0.0391</td>
</tr>
<tr>
<td>86</td>
<td>0.0530</td>
<td>0.0461</td>
</tr>
<tr>
<td>88</td>
<td>0.0608</td>
<td>0.0536</td>
</tr>
<tr>
<td>90</td>
<td>0.0692</td>
<td>0.0616</td>
</tr>
<tr>
<td>102</td>
<td>0.1353</td>
<td>0.1250</td>
</tr>
<tr>
<td>104</td>
<td>0.1469</td>
<td>0.1383</td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8, 1 pound per square foot hour = 4.882 kg/m\(^2\)h
METHOD FOR DETERMINING LATENT EVAPORATION LOADS OF NATATORIUMS

FIGURE A 102.1
PSYCHOMETRIC CHART
APPENDIX B
STANDARD WATER TEMPERATURES FOR INDOOR AQUATIC FACILITIES

B 101.0 General.
B 101.1 Applicability. This appendix provides a recommended range of acceptable water temperatures for indoor aquatic facilities. The provided temperatures serve as a guide for providing comfort, health and safety for bathers based on the varying types of aquatic activities.

B 101.2 Recommended Water Temperatures. The recommended ranges for water temperatures for indoor aquatic facilities shall be in accordance with Table B 101.2.

<table>
<thead>
<tr>
<th>CATEGORY OF POOL</th>
<th>POOL WATER TEMPERATURE (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whirlpool Spa – Polar Plunge</td>
<td>50 – 60</td>
</tr>
<tr>
<td>Residential</td>
<td>76 – 86</td>
</tr>
<tr>
<td>Competition Swimming*</td>
<td>77 – 82</td>
</tr>
<tr>
<td>Competition Diving*</td>
<td>≥ 79</td>
</tr>
<tr>
<td>Competition Water Polo*</td>
<td>79 ± one degree</td>
</tr>
<tr>
<td>Competition Synchronized Swimming*</td>
<td>81 ± one degree</td>
</tr>
<tr>
<td>Recreational/Institution</td>
<td>84 – 86</td>
</tr>
<tr>
<td>Hotel</td>
<td>84 – 86</td>
</tr>
<tr>
<td>Elderly Aquatics/Youth Instructional Swim Programs</td>
<td>86 – 92</td>
</tr>
<tr>
<td>Therapeutic</td>
<td>86 – 98</td>
</tr>
<tr>
<td>Whirlpool Spa – Hot Tub</td>
<td>96 – 104</td>
</tr>
</tbody>
</table>

For SI units: °C = (°F-32)/1.8
*As stipulated in Part X of FINA Facility Rules.
C 101.0 General.

C 101.1 Applicability. This appendix provides additional information regarding the determination of dynamic coefficient of friction (DCOF) values for hard-surface walkways intended to be slip-resistant, in Section 314.0 through Section 314.1.3.

Notes: The minimum required DCOF of 0.42, as specified in Section 314.1.1, was based upon human slip research with pedestrians wearing hard sole shoes. There is no current consensus standard establishing minimum DCOF levels correlated to human barefoot slips on swimming pool, spa, or hot tub walking surfaces.

DCOF measurements taken across grout joints and protruding features of three-dimensionally patterned or profiled walkways can produce biased and misleading DCOF values due to test device limitations.

Cumulative wear of walkway surfaces typically decreases the DCOF. In order to ensure the minimum required DCOF is maintained, accelerated wear testing may be advisable for walkways with high pedestrian volume.

C 102.0 Example Calculation for Slope Corrected Slip-Resistant Walkway Surfaces.

C 102.1 Example Calculation. Determine the required corrected DCOF for an inclined walkway surface intended to be slip-resistant with a slope of 2.9 degrees and a level DCOF of 0.42.

Solution:

\[ \mu_{\text{corrected}} = \frac{\tan \alpha + \mu_{\text{level}}}{1 - (\mu_{\text{level}} \cdot \tan \alpha)} \]

\[ = \frac{\tan(2.9^\circ) + 0.42}{1 - (0.42 \cdot \tan(2.9^\circ))} \]

\[ = 0.48 \]
<table>
<thead>
<tr>
<th>ABRASION HAZARD, DEFINITION</th>
<th>203.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCEPTED ENGINEERING PRACTICE, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>ACCESS GATES OR DOORS</td>
<td>803.4</td>
</tr>
<tr>
<td>ACCESS TO Equipment</td>
<td>602.1</td>
</tr>
<tr>
<td>Equipment room</td>
<td>602.2.1</td>
</tr>
<tr>
<td>Flexible connectors</td>
<td>307.4</td>
</tr>
<tr>
<td>Landing pool</td>
<td>904.9</td>
</tr>
<tr>
<td>Plumbing fixtures</td>
<td>406.0</td>
</tr>
<tr>
<td>Pool heaters on/off switch</td>
<td>306.1.1</td>
</tr>
<tr>
<td>Tracer wire</td>
<td>307.8.1</td>
</tr>
<tr>
<td>Wave pools</td>
<td>802.3, 905.1</td>
</tr>
<tr>
<td>ACCESSIBILITY Public swimming pools, spas, and hot tubs</td>
<td>313.0</td>
</tr>
<tr>
<td>ACCESSIBLE, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>ACCESSIBLE, READILY, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>ACCESSIBLE FACILITIES</td>
<td>405.2</td>
</tr>
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<td>ACID WASH, DEFINITION</td>
<td>203.0</td>
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<tr>
<td>ACRYLONITRILE-BUTADIENE-STYRENE (ABS)</td>
<td>203.0, 310.1, Table 309.1</td>
</tr>
<tr>
<td>AIR BLOWER, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>AIR CHANNEL, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>AIR GAPS</td>
<td>203.0, 505.1, 512.3</td>
</tr>
<tr>
<td>AIR SWITCH SYSTEM, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>ALGISTAT, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>ALTERNATE MATERIALS AND METHODS</td>
<td>301.3</td>
</tr>
<tr>
<td>AMPHOTERIC, DEFINITION</td>
<td>203.0</td>
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<tr>
<td>ANCILLARY FACILITY, DEFINITION</td>
<td>203.0</td>
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<tr>
<td>APPLIANCE, DEFINITION</td>
<td>203.0</td>
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<td>APPLICATION FOR PERMIT</td>
<td>104.3</td>
</tr>
<tr>
<td>APPROVED, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>APPROVED TESTING AGENCY, DEFINITION</td>
<td>203.0</td>
</tr>
<tr>
<td>AUTOMATIC Alarms</td>
<td>803.5</td>
</tr>
<tr>
<td>Audible warning</td>
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<tr>
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<td>505.2</td>
</tr>
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<td>SEAT COVER DISPENSERS</td>
<td>407.3</td>
</tr>
<tr>
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<td>510.3.9</td>
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<tr>
<td>AUTOMATIC EXTERNAL DEFIBRILLATORS (AED) Definition</td>
<td>203.0</td>
</tr>
<tr>
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<td>809.2.1</td>
</tr>
<tr>
<td>BACKBOARDS Definition</td>
<td>204.0</td>
</tr>
<tr>
<td>Where required</td>
<td>809.2.1, 809.2.2</td>
</tr>
<tr>
<td>BACKFILLING</td>
<td>305.0</td>
</tr>
<tr>
<td>BACKFLOW Definition</td>
<td>204.0</td>
</tr>
<tr>
<td>Prevention required</td>
<td>414.1, 505.1, 507.1.1</td>
</tr>
<tr>
<td>BACKFLOW CONNECTION, DEFINITION</td>
<td>204.0</td>
</tr>
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</tr>
<tr>
<td>Flow rates</td>
<td>506.2, 506.3</td>
</tr>
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<td>Piping</td>
<td>204.0, 506.2, 506.3</td>
</tr>
<tr>
<td>BARRIERS Definition</td>
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<td>403.1, 416.3, 803.1, 905.1, 906.1</td>
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<tr>
<td>BATHER CAPACITY</td>
<td>402.9, 404.6</td>
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<td>BATHER LOAD</td>
<td>204.0, 402.9, 404.6</td>
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<tr>
<td>BEGINNER’S AREA, DEFINITION</td>
<td>204.0</td>
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<td>BODY FEED, DEFINITION</td>
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<td>BREAK IN GRADE, DEFINITION</td>
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<td>BUILDING DRAIN (SANITARY)</td>
<td>204.0, 304.2</td>
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<tr>
<td>BUILDING DRAIN (STORM), DEFINITION</td>
<td>204.0</td>
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<td>BUILDING SEWERS Definition</td>
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<td>Location</td>
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<td>Material</td>
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<td>CAISSONS, DEFINITION</td>
<td>205.0</td>
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<td>CAPACITY OF Drywells</td>
<td>512.6</td>
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<tr>
<td>Pumps</td>
<td>604.4</td>
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<tr>
<td>Surge storage</td>
<td>510.3.8</td>
</tr>
</tbody>
</table>
INDEX

DRAINS
Deck ........................................ 415.3
Definition .................................. 206.0
Floor ........................................ 413.0
Main ........................................ 403.6, 404.7, 808.2
Overflow .................................... 510.3.10
Showers ...................................... 410.5
Storm ........................................ 204.0, 512.4

DRINKING FOUNTAINS .................. 412.0
DUCTILE IRON PIPE ...................... 308.4, Table 307.1

EFFECTIVE OPENING, DEFINITION .... 207.0
ELECTRICAL SAFETY
Bonding ...................................... 804.3
Emergency Shutoff ........................ 804.5
GFCl Protection ............................ 804.4
Grounding .................................. 804.2

ELECTRICAL SYSTEMS ................. 603.0
EXPANSION AND CONTRACTION OF PIPE
Provision for ............................... 304.1
EXPOSED PVC PIPING .................... 304.12

FAUCETS
Maximum flow rate ......................... 409.2
Metering .................................... 409.2, 409.4
Self closing ................................ 409.4
Temperature limitation .................... 409.3

FEMALE HYGIENE PRODUCTS .......... 411.0
FILTERS .................................... 506.0
Aid, definition .............................. 208.0
Cartridge ................................... 205.0, 506.4
Diatomite ................................... 206.0, 506.4
Element, definition ....................... 208.0
High-rate sand type ........................ 210.0, 506.3
Media, definition ........................... 208.0
Pressure systems .......................... 506.7
Rate ......................................... 208.0, 506.2–506.5
Rapid sand filters .......................... 220.0, 506.2
Rock, definition ............................ 208.0
Sand .......................................... 208.0, 210.0
Skim, definition ............................. 221.0
Waste Discharge Piping, definition ...... 208.0

FITTINGS
Dielectric .................................... 308.15.1, 308.15.3, 310.8.2
Drainage system ........................... 309.1, 309.2, Table 309.1
Lead content ................................ 307.9–307.9.2
Material of .................................. 307.0, 309.1, 309.2,
Table 307.1, Table 309.1
Pool, spa, or hut tubs ....................... 307.11
Prohibited ................................... 303.0
Water supply system ....................... 307.0

FLASHING .................................. 304.7
FLOOR DRAINS ............................. 413.0
FLUSHOMETER VALVE ..................... 407.2.2
FLUX ........................................ 307.1, 307.9, 308.11,
308.14, 310.3.1, 310.3.3
FREEZE PROTECTION ....................... 304.5, 402.2.2
FRESH WATER .............................. 208.0, 505.2

FUEL GAS
Definition ................................... 208.0
FUEL GAS PIPING
Installation ................................. 301.2.4
FUEL GAS VENT
Definition ................................... 208.0

GRADE ..................................... 209.0, 309.2.1
GROUNDING ................................ 804.2

HANDBOLDS ................................. 210.0, 402.10,
404.10, 904.2
HEALTH AND SAFETY ...................... 101.3, 102.5
HEAT-FUSION WELD JOINTS ............ 210.0, 308.6.1,
308.11.1
HEATERS .................................... Chapter 7
HOSE BIBBS ................................ 414.0
HOT TUBS ................................... 210.0, 404.1–404.10,
404.12, 802.2
HOT WATER, DEFINITION ............... 210.0
HOUSE DRAINS ............................. (see Building sewers)
HOUSE SEWERS ............................ (see Building sewers)
HYDROJET BOOSTER
PUMP SYSTEM, DEFINITION ............ 210.0
HYDROJETS, DEFINITION ............... 210.0
HYDROSTATIC RELIEF .................... 402.4, 404.2

IDENTIFICATION
Cast-iron soil pipe ......................... 309.1
Copper tubing .............................. 307.3
Piping, fittings, traps, and fixtures .... 301.2.1
INCREASERS AND REDUCERS .......... 302.7
INDIRECT WASTE, DEFINITION ......... 211.0

INSANITARY
Defective systems .......................... 105.3.1
Definition ................................... 211.0
Health and safety .......................... 102.5

INSPECTION AND TESTING ............. 105.0
Alternative engineering design .......... 301.3.1–301.3.12, 301.5.6
Final ......................................... 105.2
Reinspection ............................... 105.2.6

INDEX
MARKINGS
No diving ........................................... 402.8.1
Piping .............................................. 419.0
Spas and hot tubs ................................. 404.11
Swimming pools ................................. 402.8, 402.11, 402.12

MATERIALS
Alternate .......................................... 301.3
Approval required .............................. 301.2
Building drains ................................ 309.0, Table 309.1
Building sewers ................................ 309.0, Table 309.1
Decks .............................................. 301.2
Drainage piping, joints,
and fittings ...................................... 309.0, 310.0, Table 309.1
Marking of ........................................ 301.2.1
Potable water piping,
joints, and fittings ............................. 307.0, 308.0, Table 307.1
Spas and hot tubs ............................... 404.3
Standards ......................................... 301.2.2
Swimming pools ................................. 402.2
Vents (DWV) ....................................... 309.0, Table 309.1

MAY, DEFINITION ................................. 215.0
METERED FAUCETS .............................. 409.2
MINIMUM STANDARDS ......................... 301.2
MULTI-PORT VALVES ......................... 215.0, 504.5

NATATORIUMS ..................................... 416.0
NONWATER URINALS ........................... 408.2
NUISANCE ........................................ 405.2, 410.4

OFFSET, DEFINITION .......................... 2170
OPEN TRENCH WORK ........................... 305.3
OUTLETS ......................................... 511.0

PENALTIES ........................................ 106.0
PERIMETER OVERFLOW SYSTEM ............. 218.0, 415.3,
............................................. 510.1–510.3
PERMITS, REQUIRED ............................ 104.1
PERMITS FEES ................................... 104.5, Table 104.5
PIPING
Building supply,
water distribution,
and circulation ................................. 307.1, Table 307.1
Drainage, material .............................. 309.0, Table 309.1
Exposed to sunlight, PVC ....................... 304.12
Joints and connections ......................... (see Joints
and connections)
Plumbing vent, material ....................... 307.0, Table 307.1
Protection of .................................... 302.5, 513.3
Trenching, excavation,
and backfill .................................... 305.0
Underground ..................................... 307.2, 307.8.1, 309.1
Water supply, material ....................... 307.1, Table 307.1

PLUMBING
Additions, alterations,
renovations or repairs ........................ 102.4
Definition ......................................... 218.0
Official ........................................... (see Authority Having
Jurisdiction)
System, definition ............................. 218.0
Vent, definition ................................ 218.0
Vent system, definition ....................... 218.0

PLUMBING FIXTURES
Access to ......................................... 406.0
Accessibility ..................................... 405.2, 410.4
Alternate materials ............................ 301.3
Approved standards .......................... 407.1, 408.1, 409.1,
............................................. 410.1, 412.1, 413.1
Control valves .................................. 410.3, 410.6
Installation of ................................... 406.2, 408.2, 410.3, 413.1
Minimum number .............................. 405.4, Table 405.4
Water consumption ............................. 4072, 408.1,
............................................. 409.2, 410.2

POLYETHYLENE (PE)
PIPE OR TUBING
Approved standards,
water supply, distribution,
circulation, and DWV ......................... Table 307.1,
............................................. Table 309.1
Definition ......................................... 218.0
Joining and connections ...................... (see Joints
and connections)

POLYETHYLENE-ALUMINUM-POLYETHYLENE
(PE-AL-PE) PIPE OR TUBING
Approved standards,
water supply, distribution,
circulation, and backfill ...................... Table 307.1
Definition ......................................... 218.0
Joining and connections ...................... (see Joints
and connections)

POLYETHYLENE OF RAISED
TEMPERATURE (PE-RT) PIPE OR TUBING
Approved standards,
water supply, distribution,
circulation ...................................... Table 307.1
Definition ......................................... 218.0
Joining and connections ...................... (see Joints
and connections)

POLYPROPYLENE (PP) PIPE OR TUBING
Approved standards,
water supply, distribution,
circulation ...................................... Table 307.1
Definition ........................................ 218.0
Joining and connections ....................... (see Joints and connections)

POLYVINYL CHLORIDE (PVC)
PIPE OR TUBING
Approved standards, water supply, distribution, circulation, and DWV .............. Table 307.1, Table 309.1
Definition ........................................ 218.0
Exposed to sunlight ................................ 304.12
Flexible tubing for whirlpool bathtubs ............. 307.10
Joining and connections ....................... (see Joints and connections)

POOL DEPTHS .................................. 402.11, 402.12, 403.3, 403.5

POOL HEATER .................................. 218.0, Chapter 7

POTABLE WATER
Backflow protection required ..................... 505.3
Definition ........................................ 218.0
Piping materials .................................. 307.1, Table 307.1
Valves carrying ................................... 504.6

PRESSED FITTINGS ................................ 218.0, 308.13.1, 308.13.2, 308.13.3, 308.15.1, 308.15.2, 310.6.1

PRIMARY DISINFECTION ................................ 508.0

PROHIBITED
Concealment of work before Inspection .............. 105.0, 311.1, 311.2, 311.3, 311.4, 311.5
301.2, 301.3, 301.5–301.5.5
Damage to drainage system ......................... 304.2, 304.5
Fittings and practices ................................ 303.0
Installations ........................................ 308.1.4, 308.6.2
Joints and connections .............................. 308.1.5
Pipes in concrete or masonry ....................... 304.1
Practices .............................................. 104.1, 106.1, 303.0
Water piping ......................................... 304.5

PROTECTION FROM
Corrosion .......................................... 304.3, 307.1, 416.2.1, 416.2.2, 415.1, 802.4, 802.5, 902.3
Damage .............................................. 304.3, 513.3
Freezing .............................................. 304.5, 402.2.2
Seismic .............................................. 402.3, 404.3

PROTECTION OF
Chlorinators ......................................... 507.2.5
Piping materials and structures ................... 302.5, 304.0, 305.4, 513.3
Potable water supply ............................... 505.0

PUBLIC FACILITIES ................................ Chapter 4
Accessible ............................................ 405.2
Decks .................................................. 415.0

Natatoriums ......................................... 416.0
Toilet facilities ...................................... 405.3
Ventilation .......................................... 417.0, Table 417.1

PUBLIC SHOWER FLOORS ......................... 410.5

PUMPS .............................................. 507.2.5, 604.0, 702.3
PURGING ............................................. 218.0, 417.2
PUSH FITTINGS ..................................... 218.0, 308.13, 308.13.3, 308.13.4, 308.2.1

QUALITY AND WEIGHT
OF MATERIALS, GENERAL REGULATIONS ............ 301.2, 301.3, 301.5

REAMING PIPES ................................... 302.6, 308.11, 308.12, 308.14, 310.3.1, 310.3.3

RECEPTORS
Definition ............................................ 220.0
Showers .............................................. 410.1

REDUCERS .......................................... 302.7

REGISTERED DESIGN
PROFESSIONAL .................................... 220.0, 301.5–301.5.5

REGULATING EQUIPMENT,
DEFINITION ........................................ 220.0
REPAIRS ............................................. 102.4

REQUIRED
Air gaps .............................................. 505.1
Barrier .............................................. 803.0
Filters ................................................ 301.2.3
Inspections .......................................... 105.2, 311.1, 311.2, 312.0, 701.3
Means of entry/exit ................................ 802.1
Permits .............................................. 104.0, 701.2
Plans ................................................ 103.3
Plumbing fixtures ................................... 405.4, Table 405.4
Signage .............................................. 805.1
Tests .................................................. 311.1, 311.2, 401.2.1, 402.4, 513.4, 603.1

RESCUE EQUIPMENT .................. 809.0

RESPONSIBLE FOR TESTING ................. 105.2.5

RETESTING ........................................ 105.3.2

RISERS
Water supply ....................................... 410.7

RODENTPROOFING .................................. 304.11

SAFETY AND HEALTH ........................... 102.5

SAFETY COVERS .................................. 803.5, 806.0

SAFETY VACUUM RELEASE SYSTEMS ........... 511.1.3
### INDEX

<table>
<thead>
<tr>
<th>Category</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pools and hydraulic systems</td>
<td>402.4</td>
</tr>
<tr>
<td>Required</td>
<td>105.3</td>
</tr>
<tr>
<td>Responsibility for</td>
<td>105.2.5</td>
</tr>
<tr>
<td>Testing agency</td>
<td>301.3.11</td>
</tr>
<tr>
<td><strong>THERAPY POOLS, DEFINITION</strong></td>
<td>222.0</td>
</tr>
<tr>
<td><strong>THREADED JOINTS</strong></td>
<td>308.15, 308.2.3, 308.5.2, 308.11.3, 308.12.3, 308.15.1, 310.13, 310.3.4, 310.4.2, 310.5.3, 310.8.2</td>
</tr>
<tr>
<td><strong>TRAPS</strong></td>
<td>222.0</td>
</tr>
<tr>
<td>Crown weir (trap weir), definition</td>
<td></td>
</tr>
<tr>
<td>Definition</td>
<td></td>
</tr>
<tr>
<td>Nonwater urinals</td>
<td>408.2</td>
</tr>
<tr>
<td>P-trap</td>
<td>512.3</td>
</tr>
<tr>
<td>Seal</td>
<td>408.2</td>
</tr>
<tr>
<td>Top dip (of trap), definition</td>
<td>222.0</td>
</tr>
<tr>
<td>Wastewater disposal</td>
<td>512.3</td>
</tr>
<tr>
<td><strong>TRENCHING, EXCAVATION, AND BACKFILLING</strong></td>
<td>305.0</td>
</tr>
<tr>
<td><strong>TUBING, COPPER</strong></td>
<td>307.2, 307.3, 308.1, 502.2.1, Table 307.1, Table 309.1</td>
</tr>
<tr>
<td><strong>TUNNELING</strong></td>
<td>305.2</td>
</tr>
<tr>
<td><strong>TURBIDITY, DEFINITION</strong></td>
<td>222.0</td>
</tr>
<tr>
<td><strong>TURBIDITY METER</strong></td>
<td>222.0, 808.2</td>
</tr>
<tr>
<td><strong>TURNOVER TIME</strong></td>
<td>222.0, 503.0</td>
</tr>
<tr>
<td><strong>UNDERGROUND</strong></td>
<td></td>
</tr>
<tr>
<td>Drainage piping</td>
<td>309.1</td>
</tr>
<tr>
<td>Water piping</td>
<td>307.2</td>
</tr>
<tr>
<td><strong>UNDERWATER AUDIO EQUIPMENT</strong></td>
<td>418.0</td>
</tr>
<tr>
<td><strong>UNDERWATER BENCHES AND SEATS</strong></td>
<td>402.11</td>
</tr>
<tr>
<td><strong>UNDERWATER LEDGE</strong></td>
<td>223.0, 402.12</td>
</tr>
<tr>
<td><strong>UNDERWATER LIGHTING</strong></td>
<td>401.3.2</td>
</tr>
<tr>
<td><strong>UNIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Dielectric</td>
<td>308.14, 308.15.1, 308.15.3</td>
</tr>
<tr>
<td><strong>URINALS</strong></td>
<td>406.2, 408.0</td>
</tr>
<tr>
<td><strong>USE OF ALTERNATE MATERIAL</strong></td>
<td>301.3</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td></td>
</tr>
<tr>
<td><strong>VACUUM</strong></td>
<td>224.0, 604.4</td>
</tr>
<tr>
<td><strong>VACUUM BREAKERS</strong></td>
<td>224.0, 414.1, 505.1</td>
</tr>
<tr>
<td><strong>VACUUM PIPING, DEFINITION</strong></td>
<td>224.0</td>
</tr>
<tr>
<td><strong>VALIDITY OF CODE</strong></td>
<td>101.5</td>
</tr>
<tr>
<td><strong>VALVE, PRESSURE-RELIEF</strong></td>
<td>224.0, 512.7</td>
</tr>
<tr>
<td><strong>VALVES</strong></td>
<td></td>
</tr>
<tr>
<td>Ball</td>
<td>504.6</td>
</tr>
<tr>
<td>Check</td>
<td>504.4</td>
</tr>
<tr>
<td>Combination pressure balance/thermostatic mixing</td>
<td>410.3</td>
</tr>
<tr>
<td><strong>COMBINATION TEMPERATURE AND PRESSURE-RELIEF, DEFINITION</strong></td>
<td>205.0</td>
</tr>
<tr>
<td><strong>CONTROL</strong></td>
<td>410.6</td>
</tr>
<tr>
<td><strong>FLUSHOMETER</strong></td>
<td>407.2.2</td>
</tr>
<tr>
<td><strong>FULLWAY</strong></td>
<td>504.1, 504.6</td>
</tr>
<tr>
<td><strong>GATE</strong></td>
<td>504.6</td>
</tr>
<tr>
<td><strong>HYDROSTATIC RELIEF</strong></td>
<td>402.4</td>
</tr>
<tr>
<td><strong>MULTIPOLE</strong></td>
<td>215.0, 504.5</td>
</tr>
<tr>
<td><strong>PRESSURE-BALANCE</strong></td>
<td>410.3</td>
</tr>
<tr>
<td><strong>PRESSURE-RELIEF</strong></td>
<td>224.0, 512.7</td>
</tr>
<tr>
<td><strong>SHUTOFF</strong></td>
<td>507.2.2</td>
</tr>
<tr>
<td><strong>THERMOSTATIC</strong></td>
<td>410.3</td>
</tr>
<tr>
<td><strong>VELOCITY</strong></td>
<td>224.0</td>
</tr>
<tr>
<td><strong>NOZZLE, INTERACTIVE WATER PLAY VENUES</strong></td>
<td>906.1</td>
</tr>
<tr>
<td><strong>WATER PIPING</strong></td>
<td>502.0</td>
</tr>
<tr>
<td><strong>VENTILATION</strong></td>
<td>417.0, Table 417.1</td>
</tr>
<tr>
<td><strong>VERTICAL PIPE, DEFINITION</strong></td>
<td>224.0</td>
</tr>
<tr>
<td><strong>VIOLATIONS, NOTICES OF</strong></td>
<td>106.2</td>
</tr>
<tr>
<td><strong>VITRIFIED CLAY PIPE</strong></td>
<td>309.1, 307.0, Table 309.1</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td></td>
</tr>
<tr>
<td><strong>WADING POOLS</strong></td>
<td>225.0, 403.0, 802.1</td>
</tr>
<tr>
<td><strong>WASTES</strong></td>
<td></td>
</tr>
<tr>
<td>Direction connection prohibited</td>
<td>512.2</td>
</tr>
<tr>
<td>Disposal</td>
<td>512.0</td>
</tr>
<tr>
<td>Indirect waste pipe, definition</td>
<td>211.0</td>
</tr>
<tr>
<td>Liquid, definition</td>
<td>214.0</td>
</tr>
<tr>
<td>Pipe, definition</td>
<td>225.0</td>
</tr>
<tr>
<td><strong>WASTEWATER</strong></td>
<td>225.0, 512.0</td>
</tr>
<tr>
<td><strong>WATER CLARITY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>WATER CLOSETS</strong></td>
<td>407.0</td>
</tr>
<tr>
<td>Approved standards</td>
<td>407.1</td>
</tr>
<tr>
<td>Clearance</td>
<td>406.2</td>
</tr>
<tr>
<td>Seats</td>
<td>407.3</td>
</tr>
<tr>
<td>Water consumption</td>
<td>407.2</td>
</tr>
<tr>
<td><strong>WATER CONDITIONING OR TREATING DEVICE, DEFINITION</strong></td>
<td>225.0</td>
</tr>
<tr>
<td><strong>WATER HEATER, DEFINITION</strong></td>
<td>225.0</td>
</tr>
<tr>
<td><strong>WATER SLIDE</strong></td>
<td>225.0, 904.0</td>
</tr>
<tr>
<td><strong>WATER TESTS</strong></td>
<td></td>
</tr>
<tr>
<td>Drainage and vent systems</td>
<td>105.3</td>
</tr>
<tr>
<td>Water supply systems</td>
<td>105.3</td>
</tr>
<tr>
<td><strong>WORK, CONCEALED</strong></td>
<td>105.0-105.2.1, 701.3</td>
</tr>
<tr>
<td><strong>WORKMANSHIP</strong></td>
<td>302.0, 701.1</td>
</tr>
<tr>
<td><strong>WROUGHT IRON</strong> (GALVANIZED)</td>
<td>307.5, 307.6, 308.5, 309.1</td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ZERO-DEPTH ENTRY</strong></td>
<td>228.0, 802.6</td>
</tr>
</tbody>
</table>

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**Notes:**
- All page numbers are referenced from the Uniform Swimming Pool, Spa and Hot Tub Code.