ISPSC™

2015 CODE AND COMMENTARY

The complete ISPSC with commentary after each section

APSP
The Association of Pool & Spa Professionals®

ICC
INTERNATIONAL CODE COUNCIL®

INTERNATIONAL CODE COUNCIL®

ISPSC®

2015 CODE AND COMMENTARY

Includes:

- The complete ISPSC with commentary after each section
- APSP-7 Standard for Suction Entrapment Avoidance

APSP
The Association of Pool & Spa Professionals®

ICC
INTERNATIONAL CODE COUNCIL

INTERNATIONAL CODE COUNCIL®

2015 International Swimming Pool and Spa Code® Commentary

First Printing: May 2015

ISBN: 978-1-60983-294-0 (soft-cover edition)

PRINTED IN THE U.S.A.

PREFACE

As a followup to the *International Swimming Pool and Spa Code*®, we offer a companion document, the *International Swimming Pool and Spa Code*® *Commentary.* The basic appeal of the Commentary is this: it provides in a small package and at reasonable cost thorough coverage of many issues likely to be dealt with when using the *International Swimming Pool and Spa Code*—and then supplements that coverage with historical and technical background. Reference lists, information sources and bibliographies are also included.

Throughout all of this, strenuous effort has been made to keep the vast quantity of material accessible and its method of presentation useful. With a comprehensive yet concise summary of each section, the Commentary provides a convenient reference for swimming pool and spa regulations. In the chapters that follow, discussions focus on the full meaning and implications of the code text. Guidelines suggest the most effective method of application and the consequences of not adhering to the code text. Illustrations are provided to aid understanding; they do not necessarily illustrate the only methods of achieving code compliance.

The format of the Commentary includes the full text of each section, table and figure in the code, followed immediately by the commentary applicable to that text. Each section's narrative includes a statement of its objective and intent, and usually includes a discussion about why the requirement commands the conditions set forth. Code text and commentary text are easily distinguished from each other. All code text is shown as it appears in the *International Swimming Pool and Spa Code*, and all commentary is indented below the code text and begins with the symbol ❖.

Readers should note that the Commentary is to be used in conjunction with the *International Swimming Pool and Spa Code* and not as a substitute for the code. **The Commentary is advisory only;** the code official alone possesses the authority and responsibility for interpreting the code.

Comments and recommendations are encouraged, for through your input, we can improve future editions. Please direct your comments to the Codes and Standards Development Department at the Chicago District Office.

TABLE OF CONTENTS

Chapter 1: Scope and Administration

General Comments

The law of building regulation is grounded on the police power of the state. In terms of how it is used, this is the power of the state to legislate for the general welfare of its citizens. This power enables passage of such laws as a swimming pool and spa code. It is from the police power delegated by the state legislature that local governments are able to enact building regulations. If the state legislature has limited this power in any way, the municipality may not exceed these limitations. Although the municipality may not further delegate its police power (e.g., by delegating the burden of determining code compliance to the building owner, contractor or architect), it may turn over the administration of building regulations to a municipal official, such as a code official, provided that he or she is given sufficient criteria to clearly establish the basis for decisions as to whether or not a proposed swimming pool or spa conforms to the code.

Chapter 1 is largely concerned with maintaining "due process of law" in enforcing the performance criteria contained in the code. Only through careful observation of the administrative provisions can the code official reasonably hope to demonstrate that "equal protection under the law" has been provided. Although it is generally assumed that the administrative and enforcement sections of a code are geared toward the code official, this is not entirely true. The provisions also establish the rights and privileges of the design professional, contractor and swimming pool or spa owner. The position of the code official is merely to review the proposed and completed work and determine whether a swimming pool or spa installation conforms to the code requirements. The design professional is responsible for the design of a safe swimming pool or spa.

The contractor is responsible for installing the swimming pool or spa in strict accordance with the plans.

During the course of the construction of a swimming pool or spa, the code official reviews the activity to make sure that the spirit and intent of the law are being met and that the swimming pool or spa provides adequate protection of public health. As a public servant, the code official enforces the code in an unbiased, proper manner. Every individual is guaranteed equal enforcement of the code. Furthermore, design professionals, contractors and building owners have the right of due process for any requirement in the code.

Purpose

A swimming pool and spa code, as with any other code, is intended for adoption as a legally enforceable document to safeguard health, safety, property and public welfare. A swimming pool and spa code cannot be effective without adequate provisions for its administration and enforcement. The official charged with the administration and enforcement of pool and spa regulations has a great responsibility, and with this responsibility goes authority. No matter how detailed the swimming pool and spa code may be, the code official must, to some extent, exercise judgment in determining compliance. The code official has the responsibility for establishing that pools and spas are designed and constructed to be reasonably free from hazards associated with the presence and use of the pools and spas. The code is intended to establish an acceptable level of safety.

PART 1—SCOPE AND APPLICATION

SECTION 101 GENERAL

[A] 101.1 Title. These regulations shall be known as the Swimming Pool and Spa Code of **[NAME OF JURISDICTION]**, hereinafter referred to as "this code."

❖ This section sets forth the scope and intent of the code as it applies to new and existing swimming pools and spas. The adopted regulations are identified by inserting the name of the adopting jurisdiction into the code.

[A] 101.2 Scope. The provisions of this code shall apply to the construction, alteration, movement, renovation, replacement, repair and maintenance of aquatic recreation facilities, pools and spas. The pools and spas covered by this code are either permanent or temporary, and shall be only those that are designed and manufactured to be connected to a circulation system and that are intended for swimming, bathing or wading.

❖ This section describes the types of swimming pool or spa construction-related activities to which the code is intended to apply. The applicability of the code encompasses the initial design of swimming pools and spas, the installation and construction phases and the maintenance of operating systems. The code intends to regulate any and all swimming pool- and spa-related appliances, systems and associated equipment that can affect the health, safety and wel-

fare of users insofar as they are affected by the installation, operation and maintenance of such appliances and systems.

The key factors as to whether this code applies to a swimming pool or spa is the intended use of the pool or spa for swimming, bathing or wading and whether the pool or spa is designed and manufactured to be connected to a circulation system. The pools or spas can be of permanent construction or of portable construction.

For example, although a permanent decorative fountain not associated with a pool has a circulation system, the fountain is not intended for swimming, bathing or wading. Thus, the fountain is not covered by the code. Similarly, consider a portable plastic wading pool intended for wading, but not designed to be connected to a circulation system. Therefore, the wading pool is also not covered by the code. See Commentary Figures 101.2(1) through 101.2(4).

[A] 101.3 Intent. The purpose of this code is to establish minimum standards to provide a reasonable level of safety and protection of health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location and maintenance or use of pools and spas.

❖ The intent of the code is to set forth requirements that establish the minimum acceptable level to safeguard life or limb, health, property and public welfare. Intent becomes important in the application of sections, such as Sections 102, 104.2, 105.2 and 108, as well as any enforcement-oriented interpretive action or judgment. As with any code, the written text is subject to interpretation. Interpretations should not be affected by economics or the potential impact on any party. The only consideration should be protection of the public health, safety and welfare.

FIGURE 101.2(1)
TYPICAL INGROUND POOL
(Photo courtesy of Hamilton & Associates Architecture, Engineering, Technical Services)

FIGURE 101.2(3)
PORTABLE POOL NOT DESIGNED TO HAVE A CIRCULATION SYSTEM
(Photo courtesy of Intex Marketing Inc.)

FIGURE 101.2(2)
NATURAL BODY OF WATER IS NOT POOL
(Photo courtesy of Hamilton & Associates Architecture, Engineering, Technical Services)

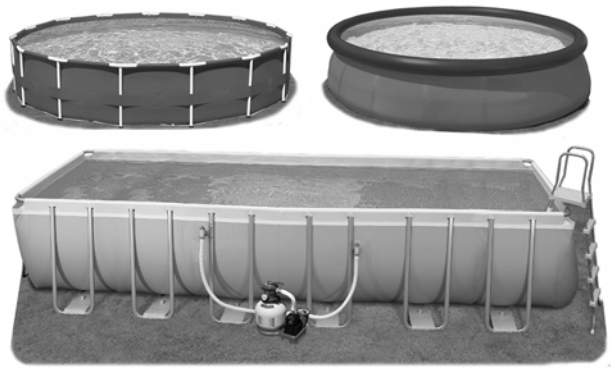


FIGURE 101.2(4)
ONGROUND STORABLE POOLS WITH CIRCULATION SYSTEM
(Photo courtesy of Intex Marketing Inc.)

[A] 101.4 Severability. If any section, subsection, sentence, clause or phrase of this code is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.

❖ Only invalid sections of the code (as established by the court of jurisdiction) can be set aside. This is essential to safeguard the application of the code text to situations in which a provision of the code is declared illegal or unconstitutional. This section preserves the legislative action that put the legal provisions in place.

SECTION 102
APPLICABILITY

[A] 102.1 General. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

❖ Specific requirements of the code override or take precedence over general requirements.

[A] 102.2 Existing installations. Any pool or spa and related mechanical, electrical and plumbing systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and no hazard to life, health or property is created.

❖ An existing swimming pool or spa is generally considered to be "grandfathered" with code adoption if the system meets a minimum level of safety. Frequently the criteria for this level are the regulations (or code) under which the existing swimming pool or spa was originally constructed. If there are no previous code criteria to apply, the code official is to apply those provisions that are reasonably applicable to existing swimming pools and spas.

[A] 102.3 Maintenance. Pools and spas and related mechanical, electrical and plumbing systems, both existing and new, and parts thereof, shall be maintained in proper operating condition in accordance with the original design in a safe and sanitary condition. Devices or safeguards that are required by this code shall be maintained in compliance with the edition of the code under which they were installed.

The owner or the owner's authorized agent shall be responsible for maintenance of systems. To determine compliance with this provision, the code official shall have the authority to require any system to be reinspected.

❖ All swimming pools, spas and equipment are subject to deterioration resulting from aging, wear, accumulation of dirt and debris, corrosion and other factors. Maintenance is necessary to keep swimming pools, spas and equipment in proper operating condition. Required safety devices and controls must be maintained to continue providing the protection that they afford. Existing equipment and systems could have safety devices or other measures that were necessary because of the nature of the equipment, and such safeguards may have been required by a code that predates the current code. Safeguards required by previous or present codes must be maintained for the life of the equipment or system.

The maintenance of swimming pools and spas as prescribed in this section is the responsibility of the owner of the property. The owner may authorize another party to be responsible for the property, in which case that party is responsible for the maintenance of the swimming pools and spas involved.

The reinspection authority of the code official is needed to ensure compliance with the maintenance requirements in this section

[A] 102.4 Additions, alterations or repairs. Additions, *alterations*, renovations or *repairs* to any pool, spa or related system shall conform to that required for a new system without requiring the existing systems to comply with the requirements of this code. Additions, alterations or repairs shall not cause existing systems to become unsafe, insanitary or overloaded.

Minor additions, alterations, renovations and repairs to existing systems shall be permitted in the same manner and arrangement as in the existing system, provided that such repairs or replacement are not hazardous and are *approved*.

❖ Simply stated, new work must comply with current code requirements. Any alteration or addition to an existing swimming pool or spa involves some new work, and therefore is subject to the requirements of the code. Additions or alterations to an existing swimming pool or spa can place different demands on the system, which could necessitate changing all or part of the swimming pool or spa.

Repair of an existing nonconforming swimming pool or spa is permitted without having to completely replace the nonconforming portion. This typically occurs when repairing the swimming pool or spa wall. This section distinguishes between alterations (subject to applicable provisions of the code) and ordinary repairs (maintenance activities not requiring a permit). The intent of this section is to allow the continued use of the existing swimming pools, spas and equipment that may or may not be designed and constructed as required for new installations.

Existing swimming pools, spas and equipment will normally require repair and component replacement to remain operational. This section permits repair and component replacements without requiring the redesign, alteration or replacement of the entire system. In other words, the swimming pool or spa is allowed to stay as is if it is not hazardous. It is important to note that the word "minor" in this section is intended to modify "additions," "alterations," "renovations" and "repairs." It is not the intent of this section to waive code requirements for the replacement of all or major portions of systems under the guise of repair. Any work, other than minor repairs or replacement of minor portions of a swimming pool or spa, must be considered as new work subject to all applicable provisions of the code. Repairs and minor component replacements are permitted in a manner that is con-

sistent with the existing swimming pool or spa if those repairs or replacements are approved by the code official; are not hazardous; do not cause the swimming pool, spa or equipment to be any less in compliance with the code than before; and are, to the extent practicable, in compliance with the provisions of the code applicable to new work.

[A] 102.5 Historic buildings. The provisions of this code relating to the construction, alteration, repair, enlargement, restoration, relocation or moving of pools, spas or systems shall not be mandatory for existing pools, spas or systems identified and classified by the state or local jurisdiction as part of a historic structure when such pools, spas or systems are judged by the code official to be safe and in the public interest of health, safety and welfare regarding any proposed construction, alteration, repair, enlargement, restoration, relocation or moving of such pool or spa.

❖ This section gives the code official the widest possible flexibility in enforcing the code where the swimming pool or spa in question has historic value. This flexibility does not come without conditions. The most important criterion for application of this section is that the swimming pool or spa must be specifically classified as being of historic significance by a qualified party or agency. Usually this is done by a state or local authority after considerable scrutiny. Most, if not all, states have such authorities, as do many local jurisdictions. Agencies with such authority typically exist at the state or local government level.

[A] 102.6 Moved pools and spas. Except as determined by Section 102.2, systems that are a part of a pool, spa or system moved into or within the jurisdiction shall comply with the provisions of this code for new installations.

❖ Swimming pools and spas that have been relocated are subject to the requirements of the code as if they were new construction. Placing a pool or spa where one did not previously exist is analogous to constructing a new swimming pool or spa. It is the intent of this section to require alteration of the existing pool or spa to the extent necessary to bring it into compliance with the provisions of the code applicable to new construction or make the existing swimming pool or spa comply with Section 102.2.

Some onground storable pools are intended to be disassembled and stored during winter and need not be treated as a new pool when reassembled or placed back in use.

[A] 102.7 Referenced codes and standards. The codes and standards referenced in this code shall be those that are listed in Chapter 11 and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and the referenced standards, the provisions of this code shall be the minimum requirements.

❖ The code references many standards and codes promulgated and published by other organizations. A complete list of referenced standards appears in Chapter 11. The wording of this provision, "shall be those that are listed in Chapter 11," was carefully chosen to establish the edition of the standard or code that is enforceable under the code.

[A] 102.7.1 Application of the International Codes. Where the *International Residential Code* is referenced in this code, the provisions of the *International Residential Code* shall apply to related systems in detached one- and two-family dwellings and townhouses not more than three stories in height. Other related systems shall comply with the applicable International Code or referenced standard.

❖ Where swimming pools or spas are associated with one- and two-family detached dwellings and townhouses not more than three stories in height, the *International Residential Code*® (IRC®) is the referenced building code. All other swimming pools or spas are covered by the remaining family of International Codes® (I-Codes®).

[A] 102.8 Requirements not covered by code. Any requirements necessary for the strength, stability or proper operation of an existing or proposed system, or for the public safety, health and general welfare, not specifically covered by this code shall be determined by the code official.

❖ Evolving technology in our society will inevitably result in a situation in which the code is comparatively silent on an identified hazard. The reasonable application of the code to such hazardous, unforeseen conditions is addressed in this section. Clearly this section and the code official's judicious and reasonable application of it is necessary. The purpose of this section, however, is not to impose requirements that may be preferred when the code provides alternative methods or is not silent on the circumstances. Additionally, this section can be used to implement the general performance-oriented language of the code to specific enforcement situations.

[A] 102.9 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

❖ Other laws enacted by the local, state or federal government may be applicable to a condition that is also governed by a requirement in the code. In such circumstances, the requirements of the code are in addition to those other laws, even though the code official may not be responsible for the enforcement of those laws.

[A] 102.10 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

❖ In a situation where the code may make reference to a chapter or section number or to another code provision without specifically identifying its location in the code, assume that the referenced section, chapter or provision is in the code and not in a referenced code or standard.

PART 2—ADMINISTRATION AND ENFORCEMENT

SECTION 103
DEPARTMENT OF BUILDING SAFETY

[A] 103.1 Creation of enforcement agency. The department of building safety is hereby created and the official in charge thereof shall be known as the code official.

❖ The executive official in charge of the building safety department is named the "code official" by this section. In actuality, the person who is in charge of the department may hold a different title such as building commissioner, plumbing inspector, construction official, etc. For the purpose of the code, the person is referred to as the "code official" on being appointed.

[A] 103.2 Appointment. The code official shall be appointed by the chief appointing authority of the jurisdiction.

❖ This section establishes the code official as an appointed position from which he or she cannot be removed, except for cause, subject to a due process review.

[A] 103.3 Deputies. In accordance with the prescribed procedures of the jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, the related technical officers, inspectors, plans examiners and other employees. Such employees shall have powers as delegated by the code official.

❖ This section gives the code official the authority to appoint other individuals to assist with the administration and enforcement of the code. These individuals have authority and responsibility as designated by the code official.

[A] 103.4 Liability. The *c*ode official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally and is hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.

❖ The code official is not intended to be held liable for actions performed in accordance with the code in a reasonable and lawful manner. The responsibility of the code official in this regard is subject to local, state and federal laws that may supersede this provision. This section further establishes that the code official (or subordinates) is not liable for costs in any legal action instituted in response to the performance of lawful duties. These costs are to be assumed by the state or municipality. The best way to be certain that the code official's action is a "lawful duty" is to always cite the applicable code section on which the enforcement action is based.

[A] 103.4.1 Legal defenses. Any suit or criminal complaint instituted against an officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by legal representatives of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.

❖ The cost of defending a code official in a legal action will be borne by the jurisdiction.

SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL

[A] 104.1 General. The code official is hereby authorized and directed to enforce the provisions of this code. The code official shall have the authority to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures shall be in compliance with the intent and purpose of this code. Such policies and procedures shall not have the effect of waiving requirements specifically provided for in this code.

❖ The duty of the code official is to enforce the code, and he or she is the "authority having jurisdiction" for all matters relating to the code and its enforcement. It is the duty of the code official to interpret the code and to determine compliance. Code compliance will not always be easy to determine and will require judgment and expertise, particularly when enforcing the provisions of Sections 104.10 and 104.11. In exercising this authority, however, the code official cannot set aside or ignore any provision of the code.

[A] 104.2 Applications and permits. The code official shall receive applications, review construction documents and issue permits for the erection, alteration, demolition and moving of pools, spas and related mechanical, electrical and plumbing systems. The code official shall inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.

❖ The code enforcement process is normally initiated with an application for a permit. The code official is responsible for processing the application and issuing permits for the installation, replacement, addition to or modification of swimming pools, spas and related systems in accordance with the code.

[A] 104.3 Notices and orders. The code official shall issue necessary notices or orders to ensure compliance with this code.

❖ An important element of code enforcement is the necessary advisement of deficiencies and needed corrections, which is accomplished through notices and orders. The code official is required to issue orders to abate illegal or unsafe conditions.

[A] 104.4 Inspections. The code official shall make the required inspections, or the code official shall have the authority to accept reports of inspection by *approved* agencies or individuals. Reports of such inspections shall be in writing and be certified by a responsible officer of such

approved agency or by the responsible individual. The code official is authorized to engage such expert opinion as deemed necessary to report on unusual technical issues that arise, subject to the approval of the appointing authority.

❖ The code official is required to make inspections, as necessary, to determine compliance with the code or to accept written reports of inspections by an approved agency. The inspection of the work in progress or accomplished is another significant element in determining code compliance. Even though a department may not have the resources to inspect every aspect of all work, the required inspections are those that are dictated by administrative rules and procedures based on many parameters, including available inspection resources. To expand the available inspection resources, the code official may approve an inspection agency that, in his or her opinion, possesses the proper qualifications. When unusual, extraordinary or complex technical issues arise relative to a pool or spa installation or to the safety of an existing pool or spa, the code official has the authority to seek the opinion and advice of experts. A technical report from an expert can be used to assist the code official in the approval process.

[A] 104.5 Identification. The code official shall carry proper identification when inspecting structures or premises in the performance of duties under this code.

❖ This section requires the code official (including by definition all authorized designees) to carry identification in the course of conducting the duties of the position. This identification removes any question concerning the purpose and authority of the inspector.

[A] 104.6 Right of entry. Where it is necessary to make an inspection to enforce the provisions of this code, or where the code official has reasonable cause to believe that there exists in a structure or upon a premises a condition which is contrary to or in violation of this code that makes the structure or premises unsafe, dangerous or hazardous, the code official is authorized to enter the structure or premises at reasonable times to inspect or to perform the duties imposed by this code, provided that if such structure or premises be occupied that credentials be presented to the occupant and entry requested. If such structure or premises is unoccupied, the code official shall first make a reasonable effort to locate the owner, the owner's authorized agent or other person having charge or control of the structure or premises and request entry. If entry is refused, the code official shall have recourse to the remedies provided by law to secure entry.

❖ The first part of this section establishes the right of the code official to enter the premises to make the inspections required by Section 106. Permit application forms typically include a statement signed by the applicant (who is the owner or owner's authorized agent) granting the code official the authority to enter specific areas to enforce code provisions related to the permit. The right to enter other structures or premises is more limited. First, to protect the right of privacy, the owner or occupant must grant the code official permission before the interior of the property can be inspected. Permission is not required for inspections that can be accomplished from within the public right-of-way. Second, access may be denied by the owner or occupant. Unless the inspector has reasonable cause to believe that a violation exists, access may be unattainable. Third, code officials must present proper identification and request admittance during reasonable hours—usually the normal business hours of the establishment. Fourth, inspections must be aimed at securing or determining compliance with the provisions and intent of the regulations that are specifically within the established scope of the code official's authority.

Searches to gather information for the purpose of enforcing other codes, ordinances or regulations are considered unreasonable and are prohibited by the Fourth Amendment to the U.S. Constitution. "Reasonable cause" in the context of this section must be distinguished from "probable cause," which is required to gain access to property in criminal cases. The burden of proof establishing reasonable cause may vary among jurisdictions. Usually, an inspector must show that the property is subject to inspection under the provisions of the code; that the interests of the public health, safety and welfare outweigh the individual's right to maintain privacy; and that such an inspection is required solely to determine compliance with the provisions of the code.

Many jurisdictions do not recognize the concept of an administrative warrant and may require the code official to prove probable cause in order to gain access upon refusal. This burden of proof is usually more substantial, often requiring the code official to stipulate in advance why access is needed (usually access is restricted to gathering evidence for seeking an indictment or making an arrest); what specific items or information is sought; its relevance to the case against the individual subject; how knowledge of the relevance of the information or items sought was obtained; and how the evidence sought will be used. In all such cases, the right to privacy must always be weighed against the right of the code official to conduct an inspection to establish public health, safety and welfare. Such important and complex constitutional issues should be discussed with the jurisdiction's legal counsel. Jurisdictions should establish procedures for securing the necessary court orders when an inspection is deemed necessary following a refusal.

[A] 104.7 Department records. The code official shall keep official records of applications received, permits and certificates issued, fees collected, reports of inspections, and notices and orders issued. Such records shall be retained in the official records for the period required for retention of public records.

❖ In keeping with the need for an efficiently conducted business practice, the code official must keep records pertaining to permit applications, permits, fees collected, inspections, notices and orders issued. Such

documentation provides a valuable resource if questions arise regarding the department's actions with respect to a building. It requires that other documents be kept for the length of time mandated by a jurisdiction's, or its state's, laws or administrative rules for retaining public records.

[A] 104.8 Modifications. Where there are practical difficulties involved in carrying out the provisions of this code, the code official shall have the authority to grant modifications for individual cases, upon application of the owner or owner's authorized agent, provided the code official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen sustainability, health, accessibility, life safety and structural requirements. The details of action granting modifications shall be recorded and entered in the files of the department of building safety.

❖ The code official may amend or make exceptions to the code as needed where strict compliance is impractical. Only the code official has authority to grant modifications. Consideration of a particular difficulty is to be based on the application of the owner and a demonstration that the intent of the code is accomplished. This section is not intended to permit setting aside or ignoring a code provision: rather, it is intended to provide acceptance of equivalent protection. Such modifications do not, however, extend to actions that are necessary to correct violations of the code. In other words, a code violation, or the expense of correcting one, cannot constitute a practical difficulty.

[A] 104.9 Alternative materials, methods and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material or method of construction shall be *approved* where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, durability and safety.

❖ The code is not intended to inhibit innovative ideas or technological advances. A comprehensive regulatory document such as a swimming pool and spa code cannot envision and then address all future innovations in the industry. As a result, a performance code must be applicable to and provide a basis for the approval of an increasing number of newly developed, innovative materials, systems and methods for which no code text or referenced standards yet exist. The fact that a material, product or method of construction is not addressed in the code is not an indication that the material, product or method is prohibited. The code official is expected to apply sound technical judgment in accepting materials, systems or methods which, although not anticipated by the drafters of the current code text, can be demonstrated to offer equivalent performance. By virtue of its text, the code regulates new and innovative construction practices while addressing the relative safety of building occupants. The code official is responsible for determining whether a requested alternative provides an equivalent level of protection of the public health, safety and welfare as required by the code.

The most common application of an alternative approval occurs with the proposed use of new material. For example, if a new piping material is produced, the manufacturer may gain approval for use by submitting adequate technical data indicating it is equivalent in quality, strength, effectiveness, fire resistance, durability and safety to the piping material listed as acceptable in the code. At the same time, the manufacturer may submit a proposed code change to recognize the new piping material. If the code official rejects the request for an alternative approval, the applicant may appeal the decision, as regulated by Section 108.

[A] 104.10 Required testing. Where there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the code official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction.

❖ To provide the basis on which the code official can make a decision regarding an alternative material or type of equipment, sufficient technical data, test reports and documentation must be provided for evaluation. If evidence satisfactory to the code official proves that the alternative equipment, material or construction method is equivalent to that required by the code, the code official is obligated to approve it for use. Any such approval cannot have the effect of waiving any requirements of the code. The burden of proof of equivalence lies with the applicant who proposes the use of alternative equipment, materials or methods.

[A] 104.10.1 Test methods. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the code official shall approve the testing procedures.

❖ The code official must require the submission of any appropriate information and data to assist in the determination of equivalency before a permit can be issued. The type of information required includes test data in accordance with the referenced standards, evidence of compliance with the referenced standard specifications and design calculations. An evaluation report issued by an authoritative agency, such as ICC Evaluation Service, Inc. (ICC-ES), is particularly useful in providing the code official with the technical basis for evaluation and approval of new and innovative plumbing materials and components. The use of authoritative research reports can greatly assist the code official by reducing the time-consuming engi-

neering analysis necessary to review materials and products. Failure to adequately substantiate a request for the use of an alternative is a valid reason for the code official to deny a request.

[A] 104.10.2 Testing agency. Tests shall be performed by an *approved* agency.

❖ The testing agency must be approved by the code official. The testing agency should have the technical expertise, test equipment and quality assurance to properly conduct and report the necessary testing.

[A] 104.10.3 Test reports. Reports of tests shall be retained by the code official for the period required for retention of public records.

❖ Test reports substantiating the modification must be retained in accordance with public record laws. The attorney of the jurisdiction could be asked to verify the specific time period in applicable laws of the jurisdiction.

[A] 104.11 Alternative engineered design. The design, documentation, inspection, testing and approval of an alternative engineered design shall comply with Sections 104.11.1 through 104.11.6.

❖ This section permits an engineer or architect to design a swimming pool or spa that may not comply with all of the provisions found in Chapters 3 through 11. The design must be approved by the code official and must conform to accepted engineering principles. The engineered pool or spa must provide an equivalent level of protection of the public health, safety and welfare intended by the code.

[A] 104.11.1 Design criteria. An alternative engineered design shall conform to the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, durability and safety. Material, equipment or components shall be designed and installed in accordance with the manufacturer's instructions.

❖ Although an engineered swimming pool or spa may not comply with all of the minimum requirements set forth in Chapters 3 through 11, it must comply with the intent of these provisions. This section permits the use of standard engineering principles in the design of an innovative system as long as there is no sacrifice of quality, strength, effectiveness, fire resistance, durability and safety. This section further reinforces the intent of Section 104.9 for the acceptance of alternative materials and equipment. The requirement for compliance with the manufacturer's installation instructions is generally intended to address entire engineered systems. The manufacturer or appropriate industry association provides criteria contained in design and installation handbooks. The manufacturer's instructions must be followed for all innovative fittings or products regulated by this section.

[A] 104.11.2 Submittal. The registered design professional shall indicate on the permit application that the system is an alternative engineered design. The permit and permanent permit records shall indicate that an alternative engineered design was part of the *approved* installation.

❖ The permit and permanent permit records must indicate that an alternative engineered design is part of the proposed swimming pool or spa design. This is essential information to have on file to maintain a complete legal record of the pool or spa. When future permits are applied for regarding alterations or modifications, appropriate measures can then be taken to determine that the future work will not adversely affect the original design.

[A] 104.11.3 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.

❖ The appropriate information and data must be submitted to the code official to assist in the approval of the alternative engineered design. This is not an option; rather, it is a requirement. Acceptable data to substantiate the performance of the proposed swimming pool, spa or components include results of tests performed by an approved third-party testing agency, design calculations or an evaluation report issued by an authoritative agency, such as ICC-ES.

[A] 104.11.4 Construction documents. The registered design professional shall submit to the code official two complete sets of signed and sealed construction documents for the alternative engineered design.

❖ This section is used in conjunction with Section 105.3. The required detailing of such documents is needed to provide the code official with the necessary information to review and approve the plans.

[A] 104.11.5 Design approval. Where the code official determines that the alternative engineered design conforms to the intent of this code, the system shall be *approved*. If the alternative engineered design is not *approved*, the code official shall notify the registered design professional in writing, stating the reasons why the alternative was not *approved*.

❖ The code official is responsible for determining whether the requested alternative engineered design provides the equivalent level of protection of public health, safety and welfare as required by the code. The code official's response to the design professional must be in writing, stating the reason for either accepting or rejecting the request. If the code official rejects the request for the alternative engineered system, the registered design professional may appeal the decision.

[A] 104.11.6 Inspection and testing. The alternative engineered design shall be tested and inspected in accordance with the requirements of Section 106.12.

❖ As is the case for all swimming pool and spa installations, the code official must inspect the alternative engineered design pools and spas to verify that the work is in compliance with the construction documents. Section 106 requires the code official to witness the testing of the swimming pool or spa before it

is placed in service to verify that it is free from leaks or other defects.

[A] 104.12 Material and equipment reuse. Materials, equipment and devices shall not be reused unless such elements have been reconditioned, tested, placed in good and proper working condition and *approved*.

❖ The code criteria for materials and equipment have changed over the years. Evaluation of testing and materials technology has permitted the development of new criteria, which the old materials may not satisfy. As a result, used materials must be evaluated in the same manner as new materials. Used (previously installed) equipment must be equivalent to that required by the code if it is to be used in a new installation.

SECTION 105
PERMITS

[A] 105.1 When required. Any owner, or owner's authorized agent who desires to construct, enlarge, alter, repair, move, or demolish a pool or spa or to erect, install, enlarge, alter, repair, remove, convert or replace any system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the code official and obtain the required permit for the work.

❖ This section contains the administrative rules governing the issuance, suspension, revocation or modification of swimming pool and spa permits. It also establishes how and by whom the application for a pool or spa permit is to be made, how it is to be processed and what information it must contain or have attached to it. In general, a permit is required for all activities that are regulated by the code, and these activities cannot begin until the permit is issued.

A swimming pool or spa permit is required for the installation, replacement, alteration or modification of all pools, spas and components that are in the scope of applicability of the code. Replacement of an existing component, piece of equipment or related piping is treated no differently than a new installation in new swimming pool or spa construction. The purpose of a permit is to cause the work to be inspected to determine compliance with the intent of the code.

[A] 105.2 Application for permit. Each application for a permit, with the required fee, shall be filed with the code official on a form furnished for that purpose and shall contain a general description of the proposed work and its location. The application shall be signed by the owner or the owner's authorized agent. The permit application shall contain such other information required by the code official.

❖ This section limits persons who may apply for a permit to the building owner or an authorized agent. An owner's authorized agent could be anyone who is given written permission to act in the owner's interest for the purpose of obtaining a permit, such as an architect, an engineer, a contractor, a tenant or other. Permit forms generally have sufficient space to write a very brief description of the work to be accomplished, which is acceptable for small jobs. For larger projects, the description will be augmented by construction documents.

[A] 105.3 Construction documents. Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional when required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code.

❖ A detailed description of the work for which application is made must be submitted. When the work is of a "minor nature," either in scope or needed description, the code official may use judgment in determining the need for a detailed description of the work. For example, the construction documents for an on-ground storable pool could be in the form of the manufacturer's installation instructions.

These provisions are intended to reflect the minimum scope of information needed to determine code compliance. A statement such as, "All swimming pool and spa work will comply with the 2015 ISPSC," on the construction document is not an acceptable substitute for showing the required information.

This section also requires the code official to determine compliance with any state professional registration laws as they apply to the preparation of construction documents.

[A] 105.4 Time limitation of application. An application for a permit for any proposed work shall be deemed to have been abandoned 180 days after the date of filing unless such application has been pursued in good faith or a permit has been issued; except that the code official is authorized to grant one or more extensions of time for additional periods not exceeding 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.

❖ Once an application for a permit has been submitted for proposed work, a time limit of 180 days is established for issuance of the permit. This prevents the code official from having to hold on to incomplete or delayed applications for an indefinite amount of time. The code official can grant extensions for this time period if provided with a written request with justifiable reasons for the extension request.

[A] 105.5 Permit issuance. The application, construction documents and other data filed by an applicant for permit shall be reviewed by the code official. If the code official finds that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, and that the fees specified in Section 105.6 have been paid, a permit shall be issued to the applicant.

❖ This section requires the code official to review all submittals for a permit for compliance with the code and to verify that the project will be carried out in accordance with any other applicable laws. This may

involve interagency communication and cooperation so that all laws are being obeyed. Once the code official verifies this, a permit may be issued upon payment of the required fees.

[A] 105.5.1 Approved construction documents. When the code official issues the permit where construction documents are required, the construction documents shall be endorsed in writing and stamped "APPROVED." Such *approved* construction documents shall not be changed, modified or altered without authorization from the code official. Work shall be done in accordance with the *approved* construction documents.

The code official shall have the authority to issue a permit for the construction of a part of a system before the entire construction documents for the whole system have been submitted or *approved*, provided adequate information and detailed statements have been filed complying with pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire system will be granted.

❖ Construction documents that reflect compliance with code requirements form an integral part of the permit process. Successful prosecution of the work depends on these documents. This section requires the code official to stamp the complying construction documents as being "approved." Once approved, no further revisions to the documents may be made without the expressed authorization of the code official in order to maintain code compliance.

In the interest of saving time and coordinating construction phases, it is common practice for contractors to seek permits solely applicable to the installation of site work, such as water or electric services. This practice allows the project to proceed before the final construction documents are completed, thus minimizing delays in the construction process. This also allows the builder to perform site work while the weather permits.

The holder of a partial permit must realize that a permit for the remainder of the pool or spa may not be granted for various reasons. Issuance of a partial permit in no way guarantees issuance of a permit for the entire scope of the project.

[A] 105.5.2 Validity. The issuance of a permit or approval of construction documents shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or any 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 construction documents and other data shall not prevent the code official from thereafter requiring the correction of errors in said construction documents and other data or from preventing building operations being carried on thereunder when in violation of this code or of other ordinances of this jurisdiction.

❖ An important code section, this section states the fundamental premise that the permit is only "a license to proceed with the work." It is not a license to "violate, cancel or set aside any provisions of the code." This is important because it means that despite any errors in the approval process, the permit applicant is responsible for code compliance.

[A] 105.5.3 Expiration. Every permit issued shall become invalid unless the work authorized by such permit is commenced within 180 days after its issuance, or if the work authorized by such permit is suspended or abandoned for a period of 180 days after the time the work is commenced. The code official is authorized to grant, in writing, one or more extensions of time, for a period not more than 180 days. The extension shall be requested in writing and justifiable cause demonstrated.

❖ The permit becomes invalid under two distinct situations, both based on a six-month period. The first situation is when no work has started six months from issuance of the permit. The second situation is when there is no continuation of authorized work for six months. The person who was issued the permit should be notified in writing that it is invalid and what steps must be taken to restart the work.

This section also provides the administrative authority with a means of offsetting the costs associated with expired permits by charging a nominal fee for permit reissuance. If, however, the nature or scope of the work to be resumed is different from that covered by the original permit, the permit process essentially starts from "scratch" and full fees are charged. The same procedure would also apply if the work has not commenced within one year of the date of permit issuance or if work has to be suspended for a year or more.

[A] 105.5.4 Extensions. Any permittee holding an unexpired permit shall have the right to apply for an extension of the time within which the permittee will commence work under that permit when work is unable to be commenced within the time required by this section for good and satisfactory reasons. The code official shall extend the time for action by the permittee for a period not exceeding 180 days if there is reasonable cause. The fee for an extension shall be one-half the amount required for a new permit for such work.

❖ Although it is typical for a project to begin immediately following issuance of a permit, there are occasions when an unforeseen delay may occur. This section intends to afford the permit holder the opportunity to apply for and receive a single, 180-day extension within which to begin a project under a still-valid permit (i.e., less than 180 days old). The applicant must, however, provide the code official with an adequate explanation for the delay in starting a project, which could include such things as the need to obtain approvals or permits from other agencies having jurisdiction. This section requires the code official to determine what constitutes "good and satisfactory" reasons for any delay, and further allows the jurisdiction to offset its administrative costs for extending the permit by charging one-half the fee for a new permit for the extension.

[A] 105.5.5 Suspension or revocation of permit. The code official shall revoke a permit or approval issued under the provisions of this code in case of any false statement or misrepresentation of fact in the application or on the construction documents upon which the permit or approval was based.

❖ A permit is, in reality, a license to proceed with the work. The code official must revoke all permits shown to be based, all or in part, on any false statement or misrepresentation of fact. An applicant may subsequently reapply for a permit with the appropriate corrections or modifications made to the application and construction documents.

[A] 105.5.6 Retention of construction documents. One set of *approved* construction documents shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws. One set of *approved* construction documents shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

❖ Once the code official has stamped or endorsed as approved the construction documents on which the permit is based (see the commentary to Section 105.5.1), one set of approved construction documents must be kept on the construction site to serve as the basis for all subsequent inspections. To avoid confusion, the construction documents on the site must be precisely the documents that were approved and stamped. This is because inspections are based on the approved documents. Additionally, the contractor cannot determine compliance with the approved construction documents unless those documents are readily available. Unless the approved construction documents are available, the inspection should be postponed and work on the project halted.

[A] 105.6 Fees. A permit shall not be valid until the fees prescribed by law have been paid. An amendment to a permit shall not be released until the additional fee, if any, has been paid.

❖ All fees are to be paid prior to permit issuance. This requirement establishes that the permit applicant intends to proceed with the work, as well as facilitates payment.

[A] 105.6.1 Work commencing before permit issuance. Any person who commences any work on a system before obtaining the necessary permits shall be subject to a fee as indicated in the adopted fee schedule and would be in addition to the required permit fees.

❖ This section is intended to serve as a deterrent to proceeding with work on a swimming pool or spa without a permit. As a punitive measure, it doubles the cost of the permit fee. This section does not, however, intend to penalize a contractor called on to do emergency work after hours, provided that he or she makes prompt notification to the code official the next business day, obtains the requisite permit for the work done and has the required inspections performed.

[A] 105.6.2 Fee schedule. The fees for work shall be as indicated in the following schedule:

[JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

❖ A published fee schedule must be established for plans examination, permits and inspections. Ideally, the department should generate revenues that cover operating costs and expenses. The permit fee schedule is an integral part of this process.

[A] 105.6.3 Fee refunds. The code official shall authorize the refunding of fees as follows:

1. The full amount of any fee paid hereunder that was erroneously paid or collected.
2. Not more than **[SPECIFY PERCENTAGE]** percent of the permit fee paid when no work has been done under a permit issued in accordance with this code.
3. Not more than **[SPECIFY PERCENTAGE]** percent of the plan review fee paid when an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan review effort has been expended.

The code official shall not authorize the refunding of any fee paid except upon written application filed by the original permittee not later than 180 days after the date of fee payment.

❖ This section allows for a partial refund of fees resulting from the revocation, abandonment or discontinuance of a swimming pool or spa project for which a permit has been issued and fees have been collected. The incomplete work for which the excess fees are to be refunded refers to the work that would have been required by the department had the permit not been terminated. The refund of fees should be related to the cost of enforcement services not provided because of termination of the project.

SECTION 106
INSPECTIONS

[A] 106.1 General. Construction or work for which a permit is required shall be subject to inspection by the code official and such construction or work shall remain accessible and exposed for inspection purposes until *approved*. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the code official nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

❖ The inspection function is one of the more important aspects of building department operations. This section authorizes the code official to inspect the work for which a permit has been issued and requires that the work to be inspected remain accessible to the code

official until inspected and approved. Any expense incurred in removing or replacing material that conceals an item to be inspected is not the responsibility of the code official or the jurisdiction. As with the issuance of permits, an approval as a result of an inspection is not a license to violate the code. Any work approved that might contain a violation of the code does not relieve the applicant from complying with the code.

[A] 106.2 Preliminary inspection. Before issuing a permit, the code official is authorized to examine or cause to be examined buildings, structures and sites for which an application has been filed.

❖ Some projects might require a preliminary inspection by the code official prior to a permit being issued. This is especially useful for remodel and addition projects where the conditions of the existing aquatic vessel are unknown or questionable. This section authorizes the code official to make such inspections.

[A] 106.3 Required inspections and testing. Pool and spa installations or alterations thereto, including equipment, piping, and appliances related thereto, shall be inspected by the code official to ensure compliance with the requirements of this code.

❖ This section requires that all portions of the swimming pool or spa be inspected before and after final accessories are installed. The code official has the authority to require noncomplying items to be brought into compliance and reinspected.

Inspections are necessary to determine that an installation conforms to all code requirements. Because some parts of swimming pool and spa systems are hidden underground, periodic inspections are necessary before portions of the system are concealed. The code official is required to determine that swimming pools, spas and equipment are installed in accordance with the approved construction documents and the applicable code requirements. All inspections that are necessary to provide such verification must be conducted. Generally, the administrative rules of a department may list the required interim inspections. Construction that occurs in steps or phases may necessitate multiple inspections; therefore, an exact number of required inspections cannot be specified. Where violations are noted and corrections are required, reinspections may be necessary. As time permits, frequent inspections of some job sites, especially where the work is complex, can be beneficial in detecting code compliance or other potential problems before they develop or become more difficult to correct.

It is the responsibility of the contractor, the builder, the owner or other authorized party to arrange for the required inspections and to coordinate them to prevent work from being concealed before it is inspected.

1. Inspection of underground piping is especially important because once it is covered, it is the most challenging part of a swimming pool and spa system in which to detect a leak. If repairs are necessary, underground repairs are proportionately more expensive because of the need for heavy equipment and the more labor-intensive nature of working below grade level.

2. A rough-in inspection is a visual observation of all parts of the piping system that will eventually be concealed. Rough-in inspections also include verification that the applicable test pressures are applied to the system and that leaks do not exist. The inspection must be made before any of the system is covered by finish materials or hidden by future work.

   A rough-in inspection may be completed in one visit or as a series of inspections. This is administratively determined by the local inspections department and typically is dependent on the size of the job.

3. A final inspection may be done as a series of inspections or in one visit, similar to a rough-in inspection. A final inspection is required prior to the approval of a swimming pool or spa installation. To verify that all previously issued correction orders have been complied with and to determine whether subsequent violations exist, a final inspection must be made. All violations observed during the final inspection must be noted and the permit holder must be advised.

   The final inspection follows the completion of the work or installation. The final inspection is an inspection of all that was installed after the rough-in inspection and not concealed in the construction. Subsequent re-inspections are necessary if the final inspection generates a notice of violation.

[A] 106.4 Other inspections. In addition to the inspections specified in Sections 106.2 and 106.3, the code official is authorized to make or require other inspections of any construction work to ascertain compliance with the provisions of this code and other laws that are enforced.

❖ Any item regulated by the code is subject to inspection by the code official to determine compliance with the applicable code provision, and no list can include all types of work in a given building. Also, other inspections before, during or after the rough-in could be necessary. This section gives the code official the authority to inspect any regulated work.

[A] 106.5 Inspection request. It shall be the duty of the holder of the permit or their duly authorized agent to notify the code official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

❖ This section clarifies that it is the responsibility of the permit holder to arrange for the required inspections when the completed work is ready. It also establishes his or her responsibility for keeping the work open for inspection and providing all means needed to accomplish the inspections.

[A] 106.6 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspection and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

❖ This section establishes that work cannot progress beyond the point of a required inspection without the code official's approval. On making the inspection, the code official must either approve the completed work or notify the permit holder or other responsible party of that which does not comply with the code. Approvals and notices of noncompliance must be in writing, as required by Section 104.4, to avoid any misunderstanding as to what is required. Any work not approved cannot be concealed until it has been corrected and approved by the code official.

[A] 106.7 Approved agencies. Test reports submitted to the code official for consideration shall be developed by *approved* agencies that have satisfied the requirements as to qualifications and reliability.

❖ The code official is responsible for determining whether to accept an agency's test report, as well as whether the reporting agency is acceptable.

[A] 106.8 Evaluation and follow-up inspection services. Prior to the approval of a closed, prefabricated system and the issuance of a permit, the code official shall require the submittal of an evaluation report on each prefabricated system indicating the complete details of the system, including a description of the system and its components, the basis upon which the system is being evaluated, test results and similar information, and other data as necessary for the code official to determine conformance to this code.

❖ As an alternative to a physical inspection at the plant or location where systems and components are prefabricated, the code official has the option of accepting an evaluation report from an approved agency detailing such inspections. These evaluation reports can serve as the basis for code compliance.

[A] 106.9 Evaluation service. The code official shall designate the evaluation service of an *approved* agency as the evaluation agency, and review such agency's evaluation report for adequacy and conformance to this code.

❖ The code official is required to review all submitted reports for conformity to the applicable code requirements. If, in the judgment of the code official, the submitted reports are acceptable, he or she should document the basis for the approval.

[A] 106.10 Follow-up inspection. Except where ready access is provided to systems, service equipment and accessories for complete inspection at the site without disassembly or dismantling, the code official shall conduct the frequency of in-plant inspections necessary to ensure conformance to the *approved* evaluation report or shall designate an independent, *approved* inspection agency to conduct such inspections. The inspection agency shall furnish the code official with the follow-up inspection manual and a report of inspections on request, and the system shall have an identifying label permanently affixed to the system indicating that factory inspections have been performed.

❖ The owner is required to provide special inspections of fabricated assemblies at the fabrication plant. The code official or an approved inspection agency must conduct periodic in-plant inspections to ensure conformance to the approved evaluation report. Such inspections would not be required where the pool or spa can be inspected completely at the job site.

[A] 106.11 Test and inspection records. Required test and inspection records shall be available to the code official at all times during the fabrication of the system and the installation of the system, or such records as the code official designates shall be filed.

❖ All testing and inspection records related to a fabricated assembly must be filed with the code official so he or she can maintain a complete and legal record of the assembly and erection of the swimming pool or spa.

[A] 106.12 Special inspections. Special inspections of alternative engineered design systems shall be conducted in accordance with Sections 106.12.1 and 106.12.2.

❖ This section establishes that the design professional has to periodically inspect the alternative engineered design, keep records of such inspections and submit a final report to the code official certifying that all work conforms to the construction documents. Because of the unusual nature and possible complexity of alternative engineered swimming pools and spas, it is necessary for the designer to be involved in the inspection process.

[A] 106.12.1 Periodic inspection. The registered design professional or designated inspector shall periodically inspect and observe the alternative engineered design to determine that the installation is in accordance with the *approved* construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. Records shall be kept of inspections.

❖ The registered design professional must periodically inspect the engineered swimming pools and spas during installation to determine that the pools and spas conform to the approved construction documents. This is an important step because the design professional can identify any deviations from the approved plans in the early stages of the work. The design professional must then advise the contractor of any problems so that corrective measures can be taken before needless costs are incurred, and labor and materials are wasted.

The design professional must compile a complete legal record of the project, which must include all inspections made, discrepancies found and resolutions of discrepancies. It is the responsibility of the design professional to document and submit inspec-

tion records and written certification in accordance with Section 106.12.2.

[A] 106.12.2 Written report. The registered design professional shall submit a final report in writing to the code official upon completion of the installation, certifying that the alternative engineered design conforms to the *approved* construction documents. A notice of approval for the system shall not be issued until a written certification has been submitted.

❖ After all work is completed, the design professional is required to inspect the entire alternative engineered swimming pool or spa. The details of that inspection, including verification of compliance with the approved construction documents, must be submitted in writing to the code official before final approval can be granted.

[A] 106.13 Testing. Systems shall be tested as required by this code. Tests shall be made by the permit holder and the code official shall have the authority to witness such tests.

❖ Visual inspection of a swimming pool or spa is not all that is required in the determination of compliance with the code. The code has requirements for testing to be performed to disclose leaks and defects.

[A] 106.14 New, altered, extended or repaired systems. New systems and parts of existing systems that have been altered, extended or repaired shall be tested as prescribed by this code.

❖ Every swimming pool or spa system must be tested before it is placed into service. Testing is necessary to make sure that the system is free from leaks or other defects. Testing is also required, to the extent practicable, for portions of existing systems that have been repaired, altered or extended.

[A] 106.15 Equipment, material and labor for tests. Equipment, material and labor required for testing a system or part thereof shall be furnished by the permit holder.

❖ The permit holder is responsible for performing tests, as well as for supplying all of the labor, equipment and apparatus necessary to conduct such tests. The code official observes, but never performs, the test.

[A] 106.16 Reinspection and testing. Where any work or installation does not pass any initial test or inspection, the necessary corrections shall be made to comply with this code. The work or installation shall then be resubmitted to the code official for inspection and testing.

❖ If a system, or portion thereof, does not pass the initial test or inspection, all violations must be corrected and the system must be reinspected.

To encourage code compliance and cover the expense of the code official's time, many jurisdictions charge fees for inspections that are required subsequent to the first reinspection.

[A] 106.17 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

❖ After the code official has performed the required inspections and observed the required equipment and system tests (or has received written reports of the results of such tests), he or she must determine whether the installation or work is in compliance with all applicable sections of the code. The code official must issue a written notice of approval if it has been determined that the work or installation is in apparent compliance with the code. The notice of approval is given to the permit holder, and a copy of the notice is retained on file by the code official.

[A] 106.17.1 Revocation. The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, or on the basis of the incorrect information supplied, or where it is determined that the building or structure, premise, system or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

❖ This section is needed to give the code official the authority to revoke a notice of approval for the reasons indicated in the code text. The code official can suspend the notice until all of the code violations are corrected.

[A] 106.18 Temporary connection. The code official shall have the authority to authorize the temporary connection of the building or system to the utility source for the purpose of testing systems.

❖ The typical procedure for a local jurisdiction is to withhold the issuance of the certificate of occupancy until approvals have been received from each code official responsible for inspection of the structure. The code official is permitted to issue a temporary authorization to make connections to the public utility system prior to the completion of all work. The certification is intended to acknowledge that, because of seasonal limitations, time constraints, the need for testing or partial operation of equipment, some systems may be connected even though the pool or spa is not suitable for use. The intent of this section is that a request for temporary occupancy or the connection and use of systems should not be denied when the requesting permit holder has demonstrated to the code official's satisfaction that the public health, safety and welfare will not be endangered.

The code official should view the issuance of a "temporary authorization or certificate of occupancy" as substantial an act as the issuance of the final certificate. Indeed, the issuance of a temporary certificate of occupancy offers a greater potential for conflict because once the pool or spa is in use, it is very difficult to remove the occupants through legal means.

[A] 106.19 Connection of service utilities. A person shall not make connections from a utility, source of energy, fuel, power, water system or sewer system to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

❖ This section establishes the authority of the code official to approve utility connections to a building, such as water, sewer, electricity, gas and steam, and to require their disconnection when such approval has

not been granted. For the protection of the people who work on swimming pools and spas, such systems must have had final inspection approvals.

SECTION 107
VIOLATIONS

[A] 107.1 Unlawful acts. It shall be unlawful for any person, firm or corporation to erect, construct, alter, repair, remove, demolish or utilize any system, or cause same to be done, in conflict with or in violation of any of the provisions of this code.

❖ This section describes the citing, recording and subsequent actions pursuant to observed code violations. Violations of the code are prohibited; this is the basis for all citations and correction notices.

[A] 107.2 Notice of violation. The code official shall serve a notice of violation or order to the person responsible for the erection, installation, alteration, extension, repair, removal or demolition of work in violation of the provisions of this code, or in violation of a detail statement or the *approved* construction documents there under, or in violation of a permit or certificate issued under the provisions of this code. Such order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

❖ The code official is required to notify the person responsible for the erection or use of a swimming pool or spa found to be in violation of the code. The section that is allegedly being violated must be cited so that the responsible party can respond to the notice.

[A] 107.3 Prosecution of violation. If the notice of violation is not complied with promptly, the code official shall request the legal counsel of the jurisdiction to institute the appropriate proceeding at law or in equity to restrain, correct or abate such violation, or to require the removal or termination of the unlawful pool or spa in violation of the provisions of this code or of the order or direction made pursuant thereto.

❖ The code official must pursue, through the use of legal counsel of the jurisdiction, legal means to correct the violation. This is not optional.

Any extensions of time for voluntary correction of the violations must be for a reasonable, legitimate cause, or the code official may be subject to criticism for "arbitrary and capricious" actions. In general, it is better to have a standard time limitation for correction of violations. Departures from this standard must be for a clear and reasonable purpose, usually stated in writing by the violator.

[A] 107.4 Violation penalties. Any person who shall violate a provision of this code or shall fail to comply with any of the requirements thereof or who shall erect, install, alter or repair a pool or spa in violation of the *approved* construction documents or directive of the code official, or of a permit or certificate issued under the provisions of this code, shall be guilty of a **[SPECIFY OFFENSE]**, punishable by a fine of not more than **[AMOUNT]** dollars or by imprisonment not exceeding **[NUMBER OF DAYS]**, or both such fine and imprisonment. Each day that a violation continues after due notice has been served shall be deemed a separate offense.

❖ A standard fine, or other penalty, as deemed appropriate by the jurisdiction is prescribed in this section. Additionally, this section identifies a principle that "each day that a violation continues shall be deemed a separate offense" for the purpose of applying the prescribed penalty in order to facilitate prompt resolution.

[A] 107.5 Stop work orders. Upon notice from the *code official*, work on any system that is being performed contrary to the provisions of this code or in a dangerous or unsafe manner shall immediately cease. Such notice shall be in writing and shall be given to the owner of the property, or to the owner's authorized agent, or to the person performing the work. The notice shall state the conditions under which work is authorized to resume. Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work. Any person who shall continue any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than **[AMOUNT]** dollars or more than **[AMOUNT]** dollars.

❖ On receipt of a violation notice from the code official, the owner of the property, the owner's agent or the person doing the work must immediately cease all construction activities identified in the notice, except as expressly permitted to correct the violation. A stop work order can prevent a violation from becoming worse and more difficult or expensive to correct. However, it can result in inconvenience and monetary loss to the affected parties; therefore, justification must be evident and judgment must be exercised before such an order is issued.

A stop work order may be issued where work is proceeding without a permit. Hazardous conditions could develop where the code official is unaware of the nature of the work and a permit has not been issued. As determined by the adopting jurisdiction, a penalty may be assessed for failure to comply with this section, and it is to be inserted in the blanks provided.

[A] 107.6 Abatement of violation. The imposition of the penalties herein prescribed shall not preclude the legal officer of the jurisdiction from instituting appropriate action to prevent violation, or to prevent illegal use of a pool or spa, or to stop an illegal act, conduct, business or utilization of the plumbing on or about any premises.

❖ Despite the assessment of a penalty in the form of a fine or imprisonment against a violator, the violation itself must still be corrected. Failure to make the necessary corrections will result in the violator being subject to additional penalties as described in the preceding section.

[A] 107.7 Unsafe systems. Any system regulated by this code that is unsafe or that constitutes a fire or health hazard, insanitary condition, or is otherwise dangerous to human life

is hereby declared unsafe. Any use of a system regulated by this code constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment is hereby declared an unsafe use. Any such unsafe system is hereby declared to be a public nuisance and shall be abated by repair, rehabilitation, demolition or removal.

❖ Unsafe conditions include those that constitute a health hazard, fire hazard, explosion hazard, shock hazard, asphyxiation hazard, physical injury hazard or are otherwise dangerous to human life and property.

In the course of performing duties, the code official may identify a hazardous condition. Such condition must be declared in violation of the code and, therefore, must be abated.

[A] 107.7.1 Authority to condemn a system. Whenever the code official determines that any system, or portion thereof, regulated by this code has become hazardous to life, health or property or has become insanitary, the code official shall order in writing that such system either be removed or restored to a safe or sanitary condition. A time limit for compliance with such order shall be specified in the written notice. No person shall use or maintain a defective system after receiving such notice.

When such a system is to be disconnected, written notice as prescribed in Section 107.2 shall be given. In cases of immediate danger to life or property, such disconnection shall be made immediately without such notice.

❖ When a swimming pool, spa or related equipment is determined to be unsafe, the code official is required to notify the owner or agent as the first step in correcting the difficulty. Such notice is to describe the repairs and improvements necessary to correct the deficiency or require removal or replacement of the unsafe equipment or system. All such notices must specify a time frame in which the corrective actions must occur. Additionally, such notice should require the immediate response of the owner or agent. If he or she is not available, public notice of such declaration should suffice for the purposes of complying with this section. The code official may also determine that disconnection of the utilities is necessary to correct an unsafe condition and must give written notice to that effect unless immediate disconnection is essential for public health and safety reasons (see the commentary to Section 107.7.2).

[A] 107.7.2 Authority to disconnect service utilities. The code official shall have the authority to authorize disconnection of utility service to the pool or spa regulated by the technical codes in case of an emergency, where necessary, to eliminate an immediate danger to life or property. Where possible, the owner or the owner's authorized agent and occupant of the building where the pool or spa is located shall be notified of the decision to disconnect utility service prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or the occupant of the building shall be notified in writing, as soon as practical thereafter.

❖ The code official must have the authority to order disconnection of any utility supplied to a swimming pool, spa or equipment regulated by the code when it is determined that the equipment or any portion thereof has become an immediate danger. Written notice of an order to disconnect service and the causes therefore should be given to the owner and the occupant of the swimming pool, spa or premises. However, disconnection should be done without such notice in cases of immediate danger to life or property.

[A] 107.7.3 Connection after order to disconnect. A person shall not make connections from any energy, fuel, power supply or water distribution system, or supply energy, fuel or water to any equipment regulated by this code that has been disconnected or ordered to be disconnected by the code official or the use of which has been ordered to be discontinued by the code official until the code official authorizes the reconnection and use of such equipment.

When any system is maintained in violation of this code, and in violation of any notice issued pursuant to the provisions of this section, the code official shall institute any appropriate action to prevent, restrain, correct or abate the violation.

❖ Once the reason for discontinuation of use or disconnection of the utility no longer exists, only the code official can authorize resumption of use or reconnection of the system after it is demonstrated to his or her satisfaction that all repairs or other work are in compliance with applicable sections of the code. This section also requires the owner to take action to abate code violations.

SECTION 108
MEANS OF APPEAL

[A] 108.1 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board of appeals. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted there under have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

❖ This section holds that any aggrieved party with a material interest in the decision of the code official may challenge such a decision before a board of appeals. This provides a forum, other than the court of jurisdiction, in which to review the code official's actions.

This section literally allows any person to appeal a decision of the code official. In practice, this section has been interpreted to permit appeals only by aggrieved parties with a material or definitive interest in the decision of the code official. An aggrieved party may not appeal a code requirement per se. The intent of the appeal process is not to waive or set aside a code requirement; rather, it is to provide a means of reviewing a code official's decision on an interpreta-

tion or application of the code or to review the equivalency of protection to the code requirements.

[A] 108.2 Membership of board. The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years, one for 4 years, one for 3 years, one for 2 years and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

❖ The board of appeals is to consist of five members appointed by the "chief appointing authority"—typically, the mayor or city manager. One member is to be appointed for five years, one for four, one for three, one for two and one for one year. This method of appointment allows for a smooth transition of board of appeals members, allowing continuity of action over the years.

[A] 108.2.1 Qualifications. The board of appeals shall consist of five individuals, one from each of the following professions or disciplines:

1. Registered design professional who is a registered architect; or a builder or superintendent of building construction with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
2. Registered design professional with structural engineering or architectural experience.
3. Registered design professional with mechanical and plumbing engineering experience; or a mechanical and plumbing contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
4. Registered design professional with electrical engineering experience; or an electrical contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.
5. Registered design professional with pool or spa experience; or a contractor with not less than 10 years' experience, 5 years of which shall have been in responsible charge of work.

❖ The board of appeals consists of five persons with the qualifications and experience indicated in this section. One must be a registered design professional (see Item 2) with structural or architectural experience. The others must be registered design professionals, construction superintendents or contractors with experience in various areas of swimming pool or spa construction. These requirements are important in that technical people rule on technical matters. The board of appeals is not the place for policy or political deliberations. It is intended that these matters be decided purely on their technical merits, with due regard for state-of-the-art construction technology.

[A] 108.2.2 Alternate members. The chief appointing authority shall appoint two alternate members who shall be called by the board chairman to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for 5 years or until a successor has been appointed.

❖ This section authorizes the chief appointing authority to appoint two alternate members who are to be available if the principal members of the board are absent or disqualified. Alternate members must possess the same qualifications as the principal members and are appointed for a term of five years or until such time that a successor is appointed.

[A] 108.2.3 Chairman. The board shall annually select one of its members to serve as chairman.

❖ It is customary to determine chairmanship annually so that a regular opportunity is available to evaluate and either reappoint the current chairman or appoint a new one.

[A] 108.2.4 Disqualification of member. A member shall not hear an appeal in which that member has any personal, professional or financial interest.

❖ All members must disqualify themselves regarding any appeal in which they have a personal, professional or financial interest.

[A] 108.2.5 Secretary. The chief administrative officer shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of proceedings in the office of the chief administrative officer.

❖ The chief administrative officer is to designate a qualified clerk to serve as secretary to the board. The secretary is required to record the proceedings using detailed records.

[A] 108.2.6 Compensation of members. Compensation of members shall be determined by law.

❖ Members of the board of appeals need not be compensated unless required by the local municipality or jurisdiction.

[A] 108.3 Notice of meeting. The board shall meet upon notice from the chairman, within 10 days of the filing of an appeal or at stated periodic meetings.

❖ The board must meet within 10 days of the filing of an appeal or at regularly scheduled meetings.

[A] 108.4 Open hearing. Hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

❖ All hearings before the board must be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected must be heard.

[A] 108.4.1 Procedure. The board shall adopt and make available to the public through the secretary procedures under which a hearing will be conducted. The procedures shall not

require compliance with strict rules of evidence, but shall mandate that only relevant information be received.

❖ The board is required to establish, and make available to the public, written procedures detailing how hearings are to be conducted. Additionally, this section provides that although strict rules of evidence are not applicable, the information presented must be deemed relevant.

[A] 108.5 Postponed hearing. When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

❖ When all five members of the board are not present, either the appellant or the appellant's representative may request a postponement of the hearing.

[A] 108.6 Board decision. The board shall modify or reverse the decision of the code official by a concurring vote of three members.

❖ A concurring vote of three members of the board is needed to modify or reverse the decision of the code official.

[A] 108.6.1 Resolution. The decision of the board shall be by resolution. Certified copies shall be furnished to the appellant and to the code official.

❖ A formal decision in the form of a resolution is required to provide an official record. Copies of this resolution are to be furnished to both the appellant and the code official. The code official is bound by the action of the board of appeals unless he or she thinks that the board of appeals has acted improperly. In such cases, relief through the court having jurisdiction may be sought by corporate council.

[A] 108.6.2 Administration. The code official shall take immediate action in accordance with the decision of the board.

❖ To avoid any undue hindrance in the progress of construction, the code official is required to act without delay, based on the board's decision. This action may be to enforce the decision or to seek legislative relief if the board's action can be demonstrated to be inappropriate.

[A] 108.7 Court review. Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

❖ This section allows any person to request a review, by the court of jurisdiction, of perceived errors of law. Application for such review must be made after the decision of the board is filed with the chief administrative officer. This helps to establish the observance of due process for all concerned.

Bibliography

The following resource material was used in the preparation of the commentary for this chapter of the code.

Legal Aspects of Code Administration. Washington, DC: International Code Council, 2002.

Chapter 2: Definitions

General Comments

Chapter 2 establishes the meanings of key words and terms used in the code. The words or terms are deemed to be of prime importance in both specifying the subject matter and giving meaning to certain terms used throughout the code for administrative or enforcement purposes.

Purpose

Codes, by their very nature, are technical documents. Every word, term and punctuation mark can alter a sentence's meaning and, if misused, muddy its intent.

Further, the code, with its broad scope of applicability, includes terms used in a variety of construction disciplines. These terms can often have multiple meanings depending on the context or discipline being used at the time.

For these reasons, a consensus on the specific meaning of terms contained in the code must be maintained. Chapter 2 performs this function by stating clearly what specific terms mean for the purpose of the code.

SECTION 201 GENERAL

201.1 Scope. Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

❖ This section contains language and provisions that are supplemental regarding the use of Chapter 2. It gives guidance to the use of the defined words relevant to tense, gender, and plurality.

201.2 Interchangeability. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

❖ Although the definitions contained in Chapter 2 are to be taken literally, gender and tense are considered to be interchangeable. This is so that any grammatical inconsistencies within the code do not hinder the understanding or enforcement of the requirements.

201.3 Terms defined in other codes. Where terms are not defined in this code and are defined in the *International Building Code*, *International Energy Conservation Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *International Plumbing Code* or *International Residential Code*, such terms shall have the meanings ascribed to them as in those codes.

❖ When a word or term appears in the code that is not defined in this chapter, other references may be used to find its definition, such as the other International Codes® (I-Codes®), which are coordinated to prevent conflict between documents.

201.4 Terms not defined. Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

❖ Another resource for defining words or terms not defined herein or in other codes is their "ordinarily accepted meanings." The intent of this statement is that a dictionary definition could suffice, provided that such definition refers to the context.

Some of the construction terms used throughout the code may not be defined in Chapter 2 or in a dictionary. In such a case, one would first turn to the definitions contained in the referenced standards (see Chapter 11) and then to published textbooks on the subject in question.

SECTION 202 DEFINITIONS

ACCESSIBLE. Signifies access that requires the removal of an access panel or similar removable obstruction.

❖ Components and equipment for pools or spas must be provided with access so that they can be adjusted, repaired or replaced. The term "accessible" indicates that a component or item must be provided with access.

ACTIVITY POOL. A pool designed primarily for play activity that uses constructed features and devices including lily pad walks, flotation devices, small slide features, and similar attractions.

❖ Where a pool has features or equipment that offer activities other than just swimming in the water, the pool is considered an activity pool.

AIR INDUCTION SYSTEM. A system whereby a volume of air is introduced into hollow ducting built into a spa floor, bench, or hydrotherapy jets.

❖ Air is sometimes used to provide turbulence in spas and in localized areas of pools for stimulation and relaxation of the spa or pool users. The system that provides the air for such uses can be piping or cavities that carry pressurized air to the outlets, orifices and jets.

ALTERATION. Construction or renovation to an existing pool or spa other than repair that requires a permit.

❖ Alterations generally increase or decrease the size or function of an existing pool or spa. Such changes require a permit.

[A] APPROVED. Acceptable to the code official or authority having jurisdiction.

❖ As related to the process of acceptance of pool or spa installations, including materials, equipment and construction systems, this definition identifies where ultimate authority rests. Whenever this term is used, it intends that only the enforcing authority can accept a specific installation or component as complying with the code. It should be noted that the research reports prepared and published by ICC Evaluation Service, Inc. (ICC-ES) can be used by code officials to aid in their review and approval of the material or method described in the report. Publishing a report does not indicate any form of "approval" for the material or method described in the report.

[A] APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been *approved* by the code official.

❖ An established and recognized agency approved by the code official that is regularly engaged in conducting tests or furnishing inspection services.

The word "approved" means "as approved by the code official." The basis for approval of an agency for a particular activity could include the capacity and capability of the agency to perform the work.

AQUATIC RECREATION FACILITY. A facility that is designed for free-form aquatic play and recreation. The facilities may include, but are not limited to, wave or surf action pools, leisure rivers, sand bottom pools, vortex pools, activity pools, inner tube rides, body slides and interactive play attractions.

❖ Aquatic recreation facilities typically are very large, have multiple sections with different activities, and are a centerpoint attraction for the region.

BACKWASH. The process of cleansing the filter medium or elements by the reverse flow of water through the filter.

❖ Filter mediums are cleaned by reversing the flow through the filter unit to flush out impurities trapped by the filter.

BACKWASH CYCLE. The time required to backwash the filter medium or elements and to remove debris in the pool or spa filter.

❖ Backwashing of a filter must occur for a specified amount of time in order to provide a filter that is sufficiently cleaned for the period of time that it will be in service.

BARRIER. A permanent fence, wall, building wall, or combination thereof that completely surrounds the pool or spa and obstructs the access to the pool or spa. The term "permanent" shall mean not being able to be removed, lifted, or relocated without the use of a tool.

❖ The purpose of a barrier is to provide significant restricted access and reliable latching devices on entry points to a pool or spa so that children cannot gain access unless an adult provides such access.

BATHER. A person using a pool, spa or hot tub and adjoining deck area for the purpose of water sports, recreation, therapy or related activities.

❖ Although the term "bathing" seems to imply that a user has the intent of cleaning body parts, in the context of the code, "bather" means a person who uses a pool or spa for activities other than personal hygiene maintenance.

BATHER LOAD. The number of persons in the pool or spa water at any given moment or during any stated period of time.

❖ The number of bathers in a body of water "loads" the water with impurities and bacteria that must be filtered and disinfected, respectively, in order to maintain sanitary conditions in the pool, spa or hot tub. Bather load is used in determining filter sizing and disinfectant levels.

BEACH ENTRY. Sloping entry starting above the waterline at deck level and ending below the waterline. The presence of sand is not required. Also called "zero entry."

❖ Just as one would find at a lake or the ocean, a beach entry permits entry into the water without having to use steps or ramps.

CHEMICAL FEEDER. A floating or mechanical device for adding a chemical to pool or spa water.

❖ The addition of chemicals to a pool or spa is necessary to maintain sanitary water conditions. Chemical feeders provide a metered amount of chemicals over time so that large doses of chemicals are not injected into the water all at once.

CIRCULATION EQUIPMENT. The components of a circulation system.

❖ This includes all of the pumping components of the circulation system.

CIRCULATION SYSTEM. The mechanical components that are a part of a recirculation system on a pool or spa. Circulation equipment may be, but is not limited to, categories of pumps, hair and lint strainers, filters, valves, gauges, meters, heaters, surface skimmers, inlet fittings, outlet fittings and chemical feeding devices. The components have separate

functions, but when connected to each other by piping, perform as a coordinated system for purposes of maintaining pool or spa water in a clear and sanitary condition.

❖ This is an all-encompassing definition that includes every part in the path that the water takes from the pool or spa and back into the pool or spa.

[A] CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

❖ The statutory power to enforce the code is normally vested in a building department (or the like) of a state, county or municipality whose designated enforcement officer is termed the "code official" (see commentary, Section 103).

[A] CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit.

❖ For the code official to determine that proposed construction is in compliance with code requirements, sufficient information must be submitted for review. This typically consists of the drawings (floor plans, elevations, sections, details, etc.), specifications and product information describing the proposed work. Some onground storable pools could be installed by the consumer, in which case the manufacturer's instructions will serve as the construction documents.

DECK. An area immediately adjacent to or attached to a pool or spa that is specifically constructed or installed for sitting, standing, or walking.

❖ A deck for a pool or spa is that specific area next to the pool or spa that is intended for walking, sitting or standing directly adjacent to the pool or spa. The general requirements for decks in Section 306, and especially the slope requirement, also define a pool or spa deck.

DEEP AREA. Water depth areas exceeding 5 feet (1524 mm).

DESIGN PROFESSIONAL. An individual who is registered or licensed to practice his or her respective design profession as defined by the statutory requirements of the professional registration or licensing laws of the state or jurisdiction in which the project is to be constructed.

❖ This could be a professional engineer, a structural engineer, an architect, a mechanical engineer or any other type of design professional that the state or jurisdiction licenses to allow that person to do specific type of design work.

DESIGN RATE OF FLOW. The rate of flow used for design calculations in a system.

❖ The system referred to is the circulating system of a pool or spa.

DESIGN WATERLINE. The centerline of the *skimmer* or other point as defined by the designer of the pool or spa.

❖ This is the design elevation of the water in a pool or spa. At this elevation, the skimmer system is fully operational. In practice, the waterline will vary depending on how many users are in the pool or spa, the amount of evaporation and rainfall.

DIVING AREA. The area of a swimming pool that is designed for diving.

❖ If diving will occur in a swimming pool, the pool must be specifically designed for that purpose. A pool designed for diving must consider the type of diving board and must have certain depths, widths and transition zones to allow for safe diving. Diving equipment is tested and rated for pool type based on length, spring characteristic and intended height, all of which can affect diver trajectory and velocity. Proper installation in accordance with the manufacturer's instructions is critical to ensure that the user is provided with a sufficient body of water in which to safely maneuver and complete the dive.

DIVING BOARD. A flexible board secured at one end that is used for diving such as a spring board or a jump board.

❖ Diving and jump boards are specifically designed for the type of pool for which they will be used.

DIVING PLATFORM. A stationary platform designed for diving.

❖ Diving platforms are used in a specific location where diving into the pool can be safely executed.

DIVING STAND. Any supporting device for a springboard, jump board or diving board.

❖ Most diving boards require some elevation above the design waterline so that there is enough vertical clearance to allow the board to be sufficiently depressed to project the diver into the air to perform diving maneuvers, such as flips and twists, before entering the water. Diving stands can be relatively short in height or a typical building story or more in height.

EXERCISE SPA (Also known as a swim spa). Variants of a spa in which the design and construction includes specific features and equipment to produce a water flow intended to allow recreational physical activity including, but not limited to, swimming in place. Exercise spas can include peripheral jetted seats intended for water therapy, heater, circulation and filtration system, or can be a separate distinct portion of a combination spa/exercise spa and can have separate controls. These spas are of a design and size such that they have an unobstructed volume of water large enough to allow the 99th Percentile Man as specified in APSP 16 to swim or exercise in place.

❖ Swimming "laps" is usually done in large, long pools. However, swimming can also be performed "in place" if the water in the pool is moving at the same speed as the swimmer is swimming. See Commentary Figure 202(1).

FIGURE 202(1)
PERMANENT RESIDENTIAL EXERCISE SPA

EXISTING POOL OR SPA. A pool or spa constructed prior to the date of adoption of this code, or one for which a legal building permit has been issued.

FILTER. A device that removes undissolved particles from water by recirculating the water through a porous substance such as filter medium or elements.

❖ Circulating systems for small spas typically use reusable filter elements that can be removed and manually cleaned. Pools and large spas typically use diatomaceous earth filter media that can be backwashed to renew the cleaning capability of the media.

FILTRATION. The process of removing undissolved particles from water by recirculating the water through a porous substance such as filter medium or elements.

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as *a flood hazard area* on a community's flood hazard map, or otherwise legally designated.

❖ The Federal Emergency Management Agency (FEMA) prepares Flood Insurance Rate Maps (FIRMs) that delineate the land area that is subject to inundation by the 1-percent annual chance flood. Some states and local jurisdictions develop and adopt maps of flood hazard areas that are more extensive than the areas shown on FEMA's maps. For the purposes of the code, the flood hazard area within which the requirements are to be applied is the greater of the two delineated areas.

FLUME. A trough-like or tubular structure, generally recognized as a water slide, that directs the path of travel and the rate of descent by the rider.

❖ In general terms, a flume is a sloped open channel that conveys water from one point to another. In context with pools or spas, flumes are intended to also carry a rider along with the water flow. Flumes are attractions that allow riders to be safely transported at high velocity down the flume, ending in a big splash in a pool of water.

GUTTER. Overflow trough in the perimeter wall of a pool that is a component of the circulation system or flows to waste.

❖ Some pool and spa designs have perimeter gutters instead of skimmer openings. The gutters allow for more uniform skimming of the water surface and are often used for a handhold.

HAIR AND LINT STRAINER. A device attached on or in front of a pump to which the influent line (suction line) is connected for the purpose of entrapping lint, hair, or other debris that could damage the pump.

❖ Pumps can have difficulty with pumping lint and hair, so placing a strainer before the pump suction can eliminate those problems.

HANDHOLD. That portion of a pool or spa structure or a specific element that is at or above the design waterline that users in the pool grasp onto for support.

❖ Although a handhold is usually thought of as a rigid bar or tube that can be grasped for support, other features in a pool environment can provide the same intended support such as the edge of deck coping or rope handles.

HANDRAIL. A support device that is intended to be gripped by a user for the purpose of resting or steadying, typically located within or at exits to the pool or spa or as part of a set of steps.

❖ Handrails generally are round in shape, although other shapes are possible.

HYDROTHERAPY JET. A fitting that blends air and water, creating a high-velocity turbulent stream of air-enriched water.

❖ Air bubbles in a jet of water create turbulence. The turbulence massages areas of the body, allowing the bather to feel more refreshed than if the water was still. Hydrotherapy jets are the key feature that makes a spa relaxing.

JUMP BOARD. A manufactured diving board that has a coil spring, leaf spring, or comparable device located beneath the board that is activated by the force exerted by jumping on the board's end.

❖ The difference between a springboard and a jump board is that a springboard is designed to provide spring action through deflection of an engineered plank of composite materials, whereas a jump board obtains its spring action from an externally mounted spring. See "Diving board."

[A] JURISDICTION. The governmental unit that has adopted this code under due legislative authority.

❖ The governmental unit adopting the code has legal authority to do so under state statutes.

[A] LABEL. An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an *approved* agency and that indicates that the representative sample of the product or material has been tested and evaluated by an *approved* agency.

❖ See "Labeled."

[A] LABELED. Equipment, materials or products to which has been affixed a *label*, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-*labeled* items and whose *labeling* indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

❖ When a product is labeled, the label indicates that the material has been tested for conformance to an applicable standard and that the component is subject to third-party inspection to verify that the minimum level of quality required by the standard has been maintained. Labeling provides a readily available source of information that is useful for field inspection of installed products. The label identifies the product or material and provides other information that can be further investigated if there is question concerning the suitability of the product or material for the specific installation. The labeling agency performing the third-party inspection must be approved by the code official, and the basis for this approval may include, but is not necessarily limited to, the capacity and capability of the agency to perform the specific testing and inspection.

LADDER. A structure for ingress and egress that usually consists of two long parallel side pieces joined at intervals by crosspieces such as treads.

TYPE A DOUBLE ACCESS LADDER. An "A-Frame" ladder that straddles the pool wall of an above-ground pool and provides ingress and egress and is intended to be removed when not in use.

❖ See Figure 702.2.

TYPE B LIMITED ACCESS LADDER. An "A-Frame" ladder that straddles the pool wall of an above-ground/onground pool. Type B ladders are removable and have a built-in feature that prevents entry to the pool when the pool is not in use.

❖ See Figure 702.2.

TYPE C LADDER. A "ground to deck" staircase ladder that allows access to an above-ground pool deck and has a built-in entry-limiting feature.

❖ See Figure 702.3.

TYPE D IN-POOL LADDER. Located in the pool to provide a means of ingress and egress from the pool to the deck.

❖ See Figure 702.4.

TYPE E or F IN-POOL STAIRCASE LADDER. Located in the pool to provide a means of ingress and egress from the pool to the deck.

❖ See Figure 702.5.

LIFELINE. An anchored line thrown to aid in rescue.

❖ The key element of a lifeline is that it is anchored so that the person being rescued can pull him- or herself to safety without the aid of another person.

[A] LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the code official and concerned with evaluation of products or services that maintains periodic inspection of production of *listed* equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

❖ The term "listed," which is not to be confused with "labeled," is a form of quality control. Essentially, a particular product, piece of equipment or system is evaluated or tested and the results are published in a list by agencies, such as approved testing laboratories and inspection agencies. Listed products and equipment are periodically inspected to maintain the listing. The code often requires listed equipment or systems or equipment to be "labeled" (see the definition for "Labeled").

MAINTAINED ILLUMINATION. The value, in foot-candles or equivalent units, below which the average illuminance on a specified surface is not allowed to fall. *Maintained illumination* equals the initial average illuminance on the specified surface with new lamps, multiplied by the light loss factor (LLF), to account for reduction in lamp intensity over time.

❖ Proper illumination for public pools is critical for safety of the users. The design of lighting systems must consider the "aging" of the light source so after a period of time of operation, specific lighting levels are still maintained at the surface of the water.

NEGATIVE EDGE. See "Vanishing edge."

NONENTRY AREA. An area of the deck from which entry into the pool or spa is prohibited.

❖ Certain areas of a pool or spa may be unsafe for entry by the user. One example is behind a cassion wall, in a wave action pool.

ONGROUND STORABLE POOL. A pool which can be disassembled for storage or transport. This includes portable pools with flexible or nonrigid walls that achieve their structural integrity by means of uniform shape, a support frame or a combination thereof, and that can be disassembled for storage or relocation.

❖ Onground storable pools include those that have inflatable walls.

OVERFLOW GUTTER. The *gutter* around the top perimeter of the pool or spa, which is used to skim the surface.

❖ See definition for "Gutter."

[A] OWNER. Any person, agent, firm or corporation having a legal or equitable interest in the property.

[A] PERMIT. An official document or certificate issued by the authority having jurisdiction that authorizes performance of a specified activity.

❖ Permits control activity by requiring that the person doing such activity reports to the code official prior to the activity being performed.

POOL. See "Public swimming pool" and "Residential swimming pool."

POWER SAFETY COVER. A pool cover that is placed over the water area, and is opened and closed with a motorized mechanism activated by a control switch.

❖ The purpose of a power safety cover is to protect a pool against entry during the period of time when the pool is not open for use.

PUBLIC SWIMMING POOL (Public Pool). A pool, other than a *residential* pool, that is intended to be used for swimming or bathing and is operated by an owner, lessee, operator, licensee or concessionaire, regardless of whether a fee is charged for use. Public pools shall be further classified and defined as follows:

❖ If a pool is not a residential swimming pool as defined in this chapter, the pool is considered public.

CLASS A, COMPETITION POOL. A pool intended for use for accredited competitive aquatic events such as Federation Internationale De Natation (FINA), USA Swimming, USA Diving, USA Synchronized Swimming, USA Water Polo, National Collegiate Athletic Association (NCAA), or the National Federation of State High School Associations (NFHS).

❖ Competition pools are built to the stringent requirements of national or international competitive event organizations so that such pools offer the same competitive conditions no matter where they are constructed [see Commentary Figures 202(2) and 202(3)].

CLASS B, PUBLIC POOL. A pool intended for public recreational use that is not identified in the other classifications of public pools.

❖ Public pools can be of any shape, volume or depth. They are intended to be used by the public for play, exercise and relaxation [see Commentary Figures 202(4) and 202(5)]. Some public pools can be classified as being in another class. But where public pools do not fit into another class, they are classified as a Class B pool.

CLASS C, SEMI-PUBLIC POOL. A pool operated solely for and in conjunction with lodgings such as hotels, motels, apartments or condominiums.

❖ Semi-public pools are connected with hotels, motels, apartments and condominiums [see Commentary Figure 202(6)]. The code does not currently have any special consideration for semi-public pools. They are regulated the same as any other public pool.

CLASS D-1, WAVE ACTION POOL. A pool designed to simulate breaking or cyclic waves for purposes of general play or surfing.

❖ A wave pool simulates the action of ocean water at the beach.

CLASS D-2, ACTIVITY POOL. A pool designed for casual water play ranging from simple splashing activity to the use of attractions placed in the pool for recreation.

❖ Activity pools provide for self-directed activities in the water through the use of specialized equipment that enhances the enjoyment of being in and around the water [see Commentary Figure 202(7)].

CLASS D-3, CATCH POOL. A body of water located at the termination of a manufactured waterslide attraction. The body of water is provided for the purpose of terminating the slide action and providing a means for exit to a deck or walkway area.

❖ Catch pools are receptors of the persons who have ridden a water slide attraction to its end. The body of water provides for deceleration of the person coming

FIGURE 202(2)
CLASS A, COMPETITION POOL (INDOOR)

FIGURE 202(3)
CLASS A, COMPETITION POOL

FIGURE 202(4)
CLASS B, PUBLIC POOL

FIGURE 202(5)
CLASS B, PUBLIC POOL

FIGURE 202(6)
CLASS C, SEMI-PUBLIC POOL

FIGURE 202(7)
CLASS D-2, ACTIVITY POOL

from the slide and allows the person to stand to walk out of the catch pool [see Commentary Figures 202(8) through 202(10)].

CLASS D-4, LEISURE RIVER. A manufactured stream of water of near-constant depth in which the water is moved by pumps or other means of propulsion to provide a river-like flow that transports bathers over a defined path that may include water features and play devices.

❖ A leisure river simulates the action of a natural stream or river. Participants usually ride individual floating tubes or multiperson round floating vessels [see Commentary Figure 202(11)].

CLASS D-5, VORTEX POOL. A circular pool equipped with a method of transporting water in the pool for the purpose of propelling riders at speeds dictated by the velocity of the moving stream of water.

❖ Usually part of and within a larger pool, vortex pools are round and have a water current that moves the pool occupants around in a circular path.

CLASS D-6, INTERACTIVE PLAY ATTRACTION. A manufactured water play device or a combination of water-based play devices in which water flow volumes, pressures or patterns can be varied by the bather without negatively influencing the hydraulic conditions for other connected devices. These attractions incorporate devices or activities such as slides, climbing and crawling structures, visual effects, user-actuated mechanical devices and other elements of bather-driven and bather-controlled play.

❖ An interactive pool has many features that allow the occupants to direct water streams, change patterns of flow and generally interact with the water using various mechanisms [see Commentary Figures 202(12) and 202(13)].

CLASS E. Pools used for instruction, play or therapy and with temperatures above 86°F (30°C).

❖ This type of pool has water purposely heated to greater than 86°F (30°C).

FIGURE 202(8)
CLASS D-3, CATCH POOL
(Photo courtesy of Tolomato Community Development District—Novatee)

FIGURE 202(11)
CLASS D-4, LEISURE RIVER

FIGURE 202(9)
CLASS D-3, CATCH POOL

FIGURE 202(12)
CLASS D-6, INTERACTIVE PLAY ATTRACTION

FIGURE 202(10)
CLASS D-3, CATCH POOL
(Photo courtesy of Tolomato Community Development District—Novatee)

FIGURE 202(13)
CLASS D-6, INTERACTIVE PLAY ATTRACTION

CLASS F. Class F pools are wading pools and are covered within the scope of this code as set forth in Section 405.

❖ Wading pools are pools specifically designed for small children just learning to become adjusted to bodies of water that are much larger than a bathtub but not as expansive and deep as a regular swimming pool. The shallow depth allows for adults to easily sit in the water with the child and assist/encourage the child with learning the playful nature of pool use [see Commentary Figure 202(14)].

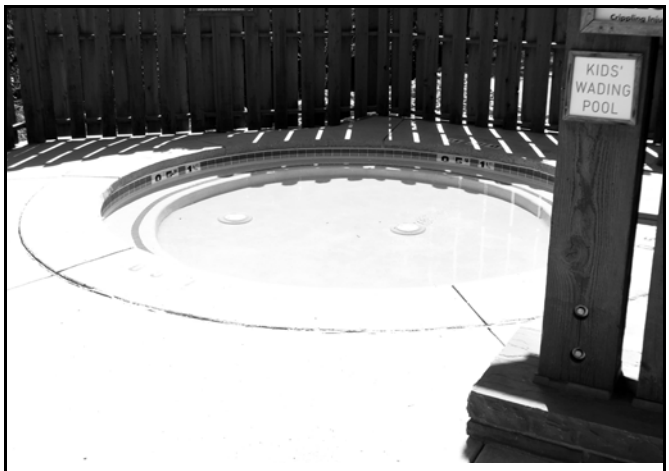


FIGURE 202(14)
WADING POOL

Public pools are either a diving or nondiving type. Diving types of public pools are classified into types as an indication of the suitability of a pool for use with diving equipment.

TYPES VI-IX. Public pools suitable for the installation of diving equipment by type.

❖ Pool types indicate what type of diving equipment can be used in a public pool, based on the pool's diving envelope dimensions (see Table 402.12).

TYPE O. A nondiving public pool.

❖ A Type O pool is a pool where a diving envelope has not been provided. Such pools must not be used for diving.

RECESSED TREADS. A series of vertically spaced cavities in a pool or spa wall creating tread areas for step holes.

❖ Recessed treads offer the same convenience of use that a ladder does, except without ladder hardware creating an obstruction in the main body of water.

RECIRCULATION SYSTEM. See "Circulation system."

[A] REPAIR. The restoration to good or sound condition of any part of a pool or spa for the purpose of its maintenance or to correct damage.

❖ Repairs might include replacement of broken piping, caulking cracks in concrete decks, resurfacing the inside of a concrete pool or replacement of broken tile or coping [see Commentary Figure 202(15)].

RESIDENTIAL. For purposes of this code, *residential* applies to detached one- and two-family dwellings and townhouses not more than three stories in height.

❖ The term "residential," as used in this code, does not include apartment buildings because in the family of I-Codes, apartment buildings are regulated by the *International Building Code*® (IBC®).

RESIDENTIAL SWIMMING POOL (Residential Pool). A pool intended for use which is accessory to a *residential* setting and available only to the household and its guests. All other pools shall be considered public pools for purposes of this code.

❖ Residential swimming pools are only those pools that are associated with buildings that are covered by the *International Residential Code*® (IRC®) [see Commentary Figures 101.2(4), 202(16) and 202(17)].

The use of the term "residential" in this definition appears to make clear that these pools are only those associated with detached one- and two- family dwellings and townhouses that are not more than three stories in height; in other words, buildings that would typically be constructed using the IRC. Section 102.7.1 provides some support for making the connection that "residential" means "in accordance with the IRC."

There are, however, at least a few gray areas known to exist for interpretation about whether a pool should be built under residential or public regulations.

One example is a townhouse development built under the IRC. There could be a "central" pool associated with the townhouses. Should the pool be built using the residential sections of this code? If the residential swimming pool definition is read literally, "...accessory to a residential setting" and "to the household," the implication seems to be that "residential" only applies to a pool for a single home (or dwelling unit in a townhouse building). The use of the term "it's" (as opposed to "their") in describing the

FIGURE 202(15)
REPAIR ON INSIDE OF POOL

household in which guests are allowed, makes a stronger connection. Further complicating this interpretation issue is the common practice of some jurisdictions allowing "pool support buildings" for residential subdivisions and townhouse developments adjacent to the pool, such as a "clubhouse" or "party building" to be built under the IRC. Perhaps those jurisdictions consider such a building not much different than someone's home where the homeowner invited a number of guests to attend a pool party. For example, know that these pool support buildings are: usually occupied on a less-frequent basis than a typical one- or two-family dwelling; located on a dedicated parcel of land owned by the housing subdivision (and not a public entity); and in making the "it's an IRC building" assessment, provide a cost-effective resolution for a number of IBC-generated design and cost issues such as design for accessibility, fire sprinkling, egress requirements and toilet facility requirements. As such, then maybe the jurisdiction has made a logical and realistic judgment call about these types of buildings. But how those pool support buildings are classified is not the direct subject of this code because such pools can be built without a pool support building.

Another example that creates an interpretation issue is some types of Group R3 buildings (IBC occupancy classification) that are allowed to be built (or renovated) under the IRC. IBC Sections 310.5.1 or 310.5.2 are involved. IBC Section 310.5.1 is about "care" homes that have five or fewer persons that receive care. For example, a single-family dwelling where persons, not related to the owner/occupant of the single-family dwelling, are provided custodial care (such as meals prepared, laundry performed, assistance with everyday living tasks) along with a sleeping room. In other words, such as a small group home involved with social rehabilitation of individuals. IBC Section 310.5.2 concerns small lodging houses, sometimes called "bed-and-breakfast" homes. The threshold is five or fewer guest rooms (sleeping rooms), regardless of how many persons are in each sleeping room. Given that these buildings are built (or renovated) under the IRC and as such, are considered to be detached one- or two-family dwellings, should the pools for these buildings be allowed to comply with residential provisions of this code?

Where the jurisdiction must coordinate with a public health department involved with the regulation of the operation of pools for health purposes, the decision as to whether the pool is residential or public may already be made by pool heath regulations. If not, the code official will need to carefully consider how to apply the intent of this code as there are significant impacts to the pool design with regard to costs and aesthetics. For example, an onground storable residential pool may or may not be an applicable choice for some applications that are considered to be "residential" by the IBC and IRC.

FIGURE 202(16)
RESIDENTIAL POOL

FIGURE 202(17)
RESIDENTIAL POOL AT REAR OF HOME

TYPES I–V. *Residential* pools suitable for the installation of diving equipment by type.

❖ Pool types indicate different sizes of diving envelopes so that equipment manufacturers can refer to a type of their choice for a specific product as it relates to Point A on the diving envelope (see Table 804.1). Note that if a residential pool has diving envelope dimensions meeting or exceeding the diving envelope dimensions for a public pool or a competitive diving event-type pool, those residential pools can have diving equipment that matches the diving envelope requirements for public pools or competitive diving pools.

TYPE O. A nondiving *residential* pool.

❖ A Type O pool is a pool where a diving envelope has not been provided. Such pools must not be used for diving.

RETURN INLET. The aperture or fitting through which the water under positive pressure returns into a pool.

❖ Water that has been drawn from the vessel and filtered is returned to the vessel through a return inlet.

RING BUOY. A ring-shaped floating buoy capable of supporting a user, usually attached to a throwing line.

❖ Ring buoys come in various diameters and are especially useful if a throwing line is attached so that the thrower can retrieve the buoy in case the intended destination (a swimmer in distress) is missed. The throwing rope can also be used to tow the swimmer to the side of the vessel.

ROPE AND FLOAT LINE. A continuous line not less than $^1/_4$ inch (6 mm) in diameter that is supported by buoys and attached to opposite sides of a pool to separate the deep and shallow ends.

❖ Rope and float lines can be of any color. There is no requirement for the number of floats to be used for such a line.

RUNOUT. A continuation of water slide flume surface where riders are intended to decelerate and come to a stop.

❖ A runout is an area of the pool where riders of water slide flumes are deposited at the end of the flume.

SAFETY COVER. A structure, fabric or assembly, along with attendant appurtenances and anchoring mechanisms, that is temporarily placed or installed over an entire pool, spa or hot tub and secured in place after all bathers are absent from the water.

❖ When properly installed or deployed, a safety cover (listed and labeled to ASTM F1346) provides the same protection against entry to the vessel by children as does a fence-type barrier constructed in accordance with Section 305.

SHALL. The term, when used in the code, is construed as mandatory.

SHALLOW AREAS. Portions of a pool or spa with water depths less than 5 feet (1524 mm).

❖ The definition of the shallow area of the pool or spa is necessary for establishing where the deep end begins.

SKIMMER. A device installed in the pool or spa that permits the removal of floating debris and surface water to the filter.

❖ A skimmer is an outlet (but not a suction outlet) from the pool or spa that captures flow at the top surface of the water.

SLIP RESISTANT. A surface that has been treated or constructed to significantly reduce the chance of a user slipping. The surface shall not be an abrasion hazard.

❖ It is very difficult to define the slip resistance of a surface with respect to secure footing. It is also just as difficult to determine what might be an abrasion hazard. This definition simply requires that surfaces are to be slip resistant but also specially constructed or treated to reduce slipping hazards.

SLOPE BREAK. Occurs at the point where the slope of the pool floor changes to a greater slope.

❖ See Commentary Figure 811.1 for illustrations of slope break.

SPA. A product intended for the immersion of persons in temperature-controlled water circulated in a closed system, and not intended to be drained and filled with each use. A spa usually includes a filter, an electric, solar or gas heater, a pump or pumps, and a control, and can also include other equipment, such as lights, blowers, and water-sanitizing equipment.

❖ A spa is a relatively small vessel of water (as compared to a swimming pool) where persons sit or recline while enjoying the warm, effervescent water. Because the volume of such vessels is too large to be refilled for each use, these vessels have circulating systems that filter the water.

PERMANENT RESIDENTIAL SPA. A spa, intended for use that is accessory to a *residential* setting and available to the household and its guests and where the water heating and water-circulating equipment is not an integral part of the product. The spa is intended as a permanent plumbing fixture and not intended to be moved.

❖ A permanent spa is field assembled. The vessel could be a factory-built plastic or fiberglass tub or could be field constructed using vinyl or other materials such as shotcrete. Other factory-manufactured components are installed and field connected to the vessel. Typically, a permanent spa is built in a deck so that the top surface of the spa is at or just above the deck surface. The residential part of this defined term means that the vessel is used by the residents and guests of a residential household. Commentary Figure 202(18) shows a permanent spa.

FIGURE 202(18)
PERMANENT SPA

PORTABLE RESIDENTIAL SPA. A spa intended for use that is accessory to a *residential* setting and available to the household and its guests and where it is either self-contained or nonself-contained.

❖ A portable spa is an appliance that is factory built, manufactured, sold, purchased and transported as a

unit ready for use by the consumer. It is designed and intended to be capable of being readily relocated. A portable spa incorporates a number of unique features that differentiate it from a permanent spa. These unique features include a preinstalled, connected and electrically bonded frame, pump, filtration, heating, low-voltage lighting and control equipment, provision for electrically grounding conductive portions of the entire manufactured assembly, provision for electrical connection to power via a properly sized and protected grounding-type wiring arrangement (cord-and-plug or hard-wired), and construction by the manufacturer with an enclosure on all four sides extending from the base to the top of the tub. Manufactured and listed self-contained portable spas and hot tubs are designed and intended to be placed on a deck surface and have relatively tall perimeter walls, making it extremely unlikely that a user immersed in the water will make solid contact with the perimeter surfaces at the same time. Therefore, a portable spa is not intended, designed or manufactured to be either partially or completely buried in the earth or abutted by berms or other similar structures [see Commentary Figure 202(19)].

FIGURE 202(19)
TYPICAL PORTABLE SPA
(Photo courtesy of Hot Springs Spas)

PUBLIC SPA. A spa other than a permanent *residential* spa or portable *residential* spa which is intended to be used for bathing and is operated by an owner, licensee or concessionaire, regardless of whether a fee is charged for use.

❖ Simply stated, a public spa is any spa that is not a residential spa.

SELF-CONTAINED SPA. A factory-built spa in which all control, water heating and water-circulating equipment is an integral part of the product. Self-contained spas may be permanently wired or cord connected.

❖ A self-contained spa is a complete packaged unit that does not require assembly at the job site. All that is required is connection to a power supply and filling with water.

NONSELF-CONTAINED SPA. A factory-built *spa* in which the water heating and circulating equipment is not an integral part of the product. Nonself-contained spas may employ separate components such as an individual filter, pump, heater and controls, or they can employ assembled combinations of various components.

❖ A nonself-contained spa could be a complete factory-supplied package that requires field assembly at the job site. Field assembly might include mounting heaters, pumps and controls on field-built equipment pads and installing piping to and from the vessel.

SPRAY POOL. A pool or basin occupied by construction features that spray water in various arrays for the purpose of wetting the persons playing in the spray streams.

❖ A spray pool is a vessel of water that has features that spray water onto the persons in the water.

SUBMERGED VACUUM FITTING. A fitting intended to provide a point of connection for suction side automatic swimming pool, *spa*, and hot tub cleaners.

❖ Pools and large spas periodically need to have their floors vacuumed to remove settled dirt. Vacuum equipment could connect to a port in the side of the pool or spa wall. The port is below the water level of the vessel.The port is connected to the suction side of the filtration pump.

SUCTION OUTLET. A submerged fitting, fitting assembly, cover/grate and related components that provide a localized low-pressure area for the transfer of water from a swimming pool, spa or hot tub. Submerged suction outlets have also been referred to as main drains.

❖ Essentially, a suction outlet is any designed and installed opening, below the design water line, through which water from the pool, spa or hot tub could escape. Although the term “suction” seems to imply that a pump suction inlet is connected to the opening, this is not always the situation. Any transfer of water through the outlet to a zone of lower pressure outside of the pool or spa creates a localized “suction” at the outlet. This is no different than removing a drain stopper in a kitchen sink full of water. The initial removal of the stopper requires minimal effort. However, once the water begins draining and flow is well established in the drain pipe below the sink, placing the stopper just above and in close proximity to the drain opening will result in the stopper being pulled into the drain opening with significant force. Such suction forces are of great concern to the

designer of pools and spas as the suction force can pull a bather in close proximity towards the outlet and prevent the bather from surfacing.

Many pools and spas are designed with a main drain located at the bottom. A main drain allows for an easy way to drain all of the water in the pool or spa. A main drain is also a convenient location (and in addition to the outflow from skimmers) for water to flow to the circulation system for filtration. Main drains for swimming pools and spas are not required.

SURFACE SKIMMING SYSTEM. A device or system installed in the pool or spa that permits the removal of floating debris and surface water to the filter.

❖ See the commentary for "Skimmer."

SURGE CAPACITY. The storage volume in a surge tank, *gutter*, and plumbing lines.

❖ When a pool or spa is at rest and bathers are not in the water, the water level is at the design water level. When bathers enter the water, the water level rises and the excess water spills over into the gutter system. The excess water is stored in a surge tank. As bathers leave the water, the water in the pool or spa drops below the design water level. The water in the surge tank is pumped back into the pool or spa to restore the water level to the design water level. The volume of the surge tank, gutter, and associated piping between the two is known as the surge capacity.

SURGE TANK. A storage vessel within the pool recirculating system used to contain the water displaced by bathers.

❖ See the commentary for "Surge capacity."

SWIMOUT. An underwater seat area that is placed completely outside of the perimeter shape of the pool. Where located at the deep end, swimouts are permitted to be used as the deep-end means of entry or exit to the pool.

❖ A swimout is a feature that allows swimmers an area of rest at the side of a pool but still within the water.

TUBE RIDE. A gravity flow attraction found at a waterpark designed to convey riders on an inner-tube-like device through a series of chutes, channels, flumes or pools.

❖ Also see "Leisure river."

TURNOVER RATE. The period of time, usually in hours, required to circulate a volume of water equal to the pool or spa capacity.

❖ Shorter turnover rates are required for heavier demands on the filtration system. For example, a public pool has many bathers and that creates a heavier demand than a private pool that does not have as many bathers. Therefore, public pools are required to have a shorter turnover rate as compared to private pools.

UNDERWATER LEDGE. A narrow shelf projecting from the side of a vertical structure whose dimensions are defined in the appropriate standard.

❖ Underwater ledges are typically used for standing.

UNDERWATER SEAT. An underwater ledge that is placed completely inside the perimeter shape of the pool, generally located in the shallow end of the pool.

❖ Underwater seats are wider than underwater ledges and typically are not more than 20 inches below the water level.

VANISHING EDGE. Water-feature detail in which water flows over the edge of at least one of the pool walls and is collected in a catch basin. Also called "Negative edge."

❖ Visually, a pool with a vanishing edge appears not to be bounded by a wall along the vanishing edge.

WATERLINE. See "Design waterline."

WAVE POOL CAISSON. A large chamber used in wave generation. This chamber houses pulsing water and air surges in the wave generation process and is not meant for human occupancy.

❖ Most wave pools are pneumatically driven, although some designs use hydraulics. The caisson chamber holds water that is forced out into the wave pool to create a surge or wave in the pool.

ZERO ENTRY. See "Beach entry."

Chapter 3: General Compliance

General Comments

There are a significant number of aspects concerning pool and spa design and installation that are common to all. For example, piping materials, suction entrapment avoidance, decks, dimensional tolerances, circulation systems, heater systems and barriers have general characteristics that are the same no matter with what pool or spa they are connected. Placing the regulations for these common items in one location, Chapter 3, makes them easier to find and results in fewer coordination problems as the code is changed in future editions.

Purpose

Chapter 3 contains regulations for electrical, plumbing, energy consumption, barriers, decks, suction entrapment avoidance, circulation systems, heaters and lighting for all types of pools and spas. First and foremost, these regulations provide for the protection of the users of pools and spas. The regulations also provide for a level of quality necessary to ensure that the pools and spas are installed correctly to provide for long-term performance.

SECTION 301 GENERAL

301.1 Scope. The provisions of this chapter shall govern the general design and construction of public and *residential* pools and spas and related piping, equipment, and materials. Provisions that are unique to a specific type of pool or spa are located in Chapters 4 through 10.

❖ Many requirements for different types of pools or spas are identical. For example, barriers (such as fences and walls) have the same requirements no matter what pool or spa the barriers protect. Rather than repeat these common requirements for each type of pool or spa, the requirements are stated once in this chapter. Requirements that are specific to each type of pool or spa are indicated in Chapters 4 through 10.

301.1.1 Application of Chapters 4 through 10. Where differences occur between the provisions of this chapter and the provisions of Chapters 4 through 10, the provisions of Chapters 4 through 10 shall apply.

❖ Chapters 4 through 10 have requirements that are specific to each type of pool or spa. Where Chapter 3 has a requirement that is also discussed in each of Chapters 4 through 10, and the requirements are different, the requirements in Chapters 4 through 10 take precedence over the requirement in Chapter 3. In other words, the specific overrides the general.

SECTION 302 ELECTRICAL, PLUMBING, MECHANICAL AND FUEL GAS REQUIREMENTS

302.1 Electrical. Electrical requirements for aquatic facilities shall be in accordance with NFPA 70 or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

Exception: Internal wiring for portable *residential* spas and portable *residential* exercise spas.

❖ The *National Electrical Code* (NEC), NFPA 70, is to be applied to the electrical installations in connection with pools and spas except for those pools and spas that are associated with residential structures covered by the *International Residential Code*® (IRC®). The IRC contains chapters on electrical installation that are based on residential-appropriate portions of NFPA 70. Internal wiring requirements for portable residential spas and portable residential exercise spas are covered under UL 1563 or CSA C22.2 No. 218.1. Chapter 10 requires portable residential spas and portable residential exercise spas to be listed and labeled to one of those standards.

This code references specific editions of NFPA 70 and the IRC. Unless the jurisdiction makes an amendment to the code at the time of adoption to change the year of NFPA 70 or the IRC that is referenced, the editions that are referenced in Chapter 11 are to be enforced. Note that a jurisdiction has the authority to adopt local amendments to the code as well as to NFPA 70 and the IRC. Local amendments to the electrical codes might be the result of formal interpretations (FI) or temporary interim amendments (TIA) that were generated by NFPA for the NEC. Designers and installers should never assume that these FIs or TIAs are part of the electrical codes being enforced in any jurisdiction. Designers and installers should always consult with each jurisdiction to determine what local amendments might apply for that jurisdiction.

This code, the IRC and the NEC do not address who is responsible for performing the design and installation of electrical work covered by the regulations in these codes. Each jurisdiction decides who is qualified to perform such work and typically requires licensure of those individuals at either a state or local

level. The licensing laws of the jurisdiction dictate the extent of work that can be performed by licensed individuals.

Section 102.4 covers additions, alterations, renovations or repairs to existing pools and spas. The code official has the responsibility to decide how much of an existing electrical installation must be brought up to the current code. Designers and installers should always consult with each jurisdiction to determine the extent of electrical rework that is necessary for any remodeling project on a pool or spa.

The electrical requirements in NFPA 70 and the IRC are minimum requirements. These codes do not prohibit designs that exceed the minimum requirements.

302.2 Water service and drainage. Piping and fittings used for water service, makeup and drainage piping for pools and spas shall comply with the *International Plumbing Code*. Fittings shall be *approved* for installation with the piping installed.

❖ This section addresses piping for the supply of potable water to the pool or spa and drainage (wastewater) from the pool or spa. The *International Plumbing Code*® (IPC®) has provisions for the installation of such piping.

302.3 Pipe, fittings and components. Pipe, fittings and components shall be *listed* and *labeled* in accordance with NSF 50 or NSF 14. Plastic jets, fittings, and outlets used in public spas shall be *listed* and *labeled* in accordance with NSF 50.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes all pipe, fittings and components.

❖ The requirement for the listing and labeling of items to NSF 50 or NSF 14 provides for a certain level of quality for those items so that they will not structurally fail under the intended service conditions, not impart harmful chemicals to the water in the pool or spa, and will properly fit with other listed and labeled components. Where pipe, fittings, components, plastic jets and outlets are part of portable residential spas and portable residential exercise spas listed and labeled to UL 1563 or CSA C22.2 No. 218.1, the quality of the items are controlled, as necessary, by those standards.

Because onground storable pools are made for disassembly and storage, replacement of pipe and fittings is more easily accomplished. More frequent replacement of these types of components is generally expected by the owner of this type of pool. The owner will most likely not purchase replacement components listed and labeled to NSF 50 or NSF 14 because similar components that will "do the job" will be less expensive and be readily available at local hardware stores. Thus, from a manufacturer's point of view, there is no need to initially build these systems with components meeting NSF 50 because replacement of components is relatively easy and inexpensive. See Section 704.5.

302.4 Concealed piping inspection. Piping, including process piping, that is installed in trenches, shall be inspected prior to backfilling.

❖ Piping installed in trenches must be inspected prior to backfilling the trench so that the installation can be checked for leaks, proper piping bedding and the use of appropriate fittings.

302.5 Backflow protection. Water supplies for pools and spas shall be protected against backflow in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ Potable water supplies to pools or spas must be kept safe from contamination. The IPC or the IRC, as applicable, provides the necessary requirements for protection against backflow.

302.6 Waste-water discharge. Where waste water from pools and spas, backwash from filters and water from deck drains discharge to the building drainage system, such installation shall be in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ Where wastewater from a pool or spa can be legally disposed of is a decision that must be made in each jurisdiction. Where the jurisdiction requires that such water be discharged to a building drainage system, then the requirements of the IPC or the IRC, as applicable, must be followed.

302.7 Tests. Tests on water piping systems constructed of plastic piping shall not use compressed air for the test.

❖ Air testing of plastic piping is dangerous because compressed air contains significant potential energy. Should the piping or fittings have imperfections or cracks created during manufacturing, such defects could explode during testing. Dirt, rocks and plastic pipe shrapnel propelled by a failure of the piping could injure nearby personnel. Testing piping systems, including the equipment such as filters and pumps connected to the piping, with water, is much safer.

302.8 Maintenance. Pools and spas shall be maintained in a clean and sanitary condition, and in good repair.

❖ Pools and spas that are not maintained become breeding grounds for mosquitoes. A pool or spa in need of repair can be dangerous to users and possibly to the environment where water leaks out of the pool or spa into the surrounding earth. This section provides the code official with the authority to make the owner of a pool or spa perform the necessary maintenance and repairs.

302.8.1 Manuals. An operating and maintenance manual in accordance with industry-accepted standards shall be provided for each piece of equipment requiring maintenance.

❖ In order to properly maintain equipment associated with pools and spas, instructions in written form must be provided for each piece of equipment. Equipment manuals typically are included within the product or component packaging. Such materials, if not placed in a secure location, can be inadvertently lost, discarded or damaged. The contractor should deliver all product and component manuals, instructions, accompanying signage and other literature to the owner/operator at or before the completion of the project. Because manuals contain important end user safety, proper operation and maintenance information, it is helpful to include this requirement on inspection checklists.

SECTION 303
ENERGY

303.1 Energy consumption of pools and permanent spas. The energy consumption of pools and permanent spas shall be controlled by the requirements in Sections 303.1.1 through 303.1.3.

❖ The energy consumption of pools and permanent spas can be significant because filter pumps operate continuously. This section covers methods and equipment to limit energy consumption. Note that Section 303.3 has additional requirements for residential pools and permanent residential spas.

303.1.1 Heaters. The electric power to heaters shall be controlled by a readily accessible on-off switch that is an integral part of the heater, mounted on the exterior of the heater or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

❖ The provision of an easily accessed on-off switch for a heater goes a long way towards offering the user of the pool or spa a method to limit energy use. Where adjustment of a thermostat is required for turning off a heater, most users will elect not to make the adjustment because they have it set to their preferred temperature. The switch for the heater needs to be within close proximity to the heater (or mounted externally on the heater) so that a person knows to what piece of equipment the switch belongs. This is especially useful (and safe) for servicing a heater where there are multiple heaters in one location. Although NFPA 70 (and the electrical chapters of the IRC) do not require a separate switch where the circuit breaker is within sight of the equipment, having such a switch further enables users to turn off the heater when not in use. Some users might have safety concerns (generally unwarranted) about "flipping" a circuit breaker in a circuit breaker panel (having multiple circuit breakers). Also, some circuit breaker panel doors are difficult to open, especially those suitable for outdoor service. Older circuit breakers in existing circuit breaker panels might not have circuit breakers that are rated for "switch duty." Frequent use of those older circuit breakers might result in damage to the circuit breaker. Gas heaters with "standing pilots" (continuously burning pilots) waste energy. There are other technologies available to provide ignition for gas-fired heaters.

303.1.2 Time switches. Time switches or other control methods that can automatically turn off and on heaters and pump motors according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- or waste-heat recovery pool heating systems.

❖ The area where the pools or spas are located might not be open to users during certain hours of the day or on certain days. A time switch is a simple way to automatically shut off heaters and pumps during these times. The first exception allows for not providing the time switch where the public health standards require that the pool be heated or circulated (or both) 24 hours per day. The second exception is for pools that are provided with a heat recovery pool heating system or solar heating system. Pumps for these systems need to run when the heat source is available to maximize the energy savings that those systems offer.

303.1.3 Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means in accordance with Section 104.11.

Exception: Where more than 70 percent of the energy for heating, computed over an operating season, is from site-recovered energy such as from a heat pump or solar energy source, covers or other vapor-retardant means shall not be required.

❖ The majority of energy loss from a heated pool or spa is from the open surface of the water, primarily because of the cooling effect that evaporation of water from the surface causes. Covering pools and spas with a vapor-retardant cover when the pool or spa is not in use is highly beneficial. As an encouragement for pool and spa owners to actually install a cover on the pool or spa, this section requires that a cover be present (but not necessarily installed) at final inspection. Although the code official cannot make the owner install the cover, it is hoped that if the owner incurred the expense for having the cover present, he will use it to his benefit for saving money on energy use.

The exception recognizes that where the 70 percent of the energy (over an operating season) for

heating pool or spa water is "free" energy available at the site, such as capturing waste heat generated from equipment (site-recovered energy) or energy from the sun (site solar energy), then the overall objective for reducing consumption of utility energy is achieved. The 70-percent level is established because site waste energy (heat) might not be generated or the sun might not shine on the thermal collectors to the extent required to keep the pool or spa water heated to design temperatures.

There are many different types of equipment that can generate waste heat. A heat pump generates waste heat when in the mode of cooling conditioned spaces in a building. Fuel-fired boilers and water heaters waste heat. Refrigeration equipment generates heat waste heat. That heat can be captured and put to use to reduce consumption of utility energy.

Solar thermal energy is nearly always available. Site locations (geographic) and weather patterns (based on historic data) affect the amount of heat energy that is available from this source over the anticipated operating season for the pool or spa.

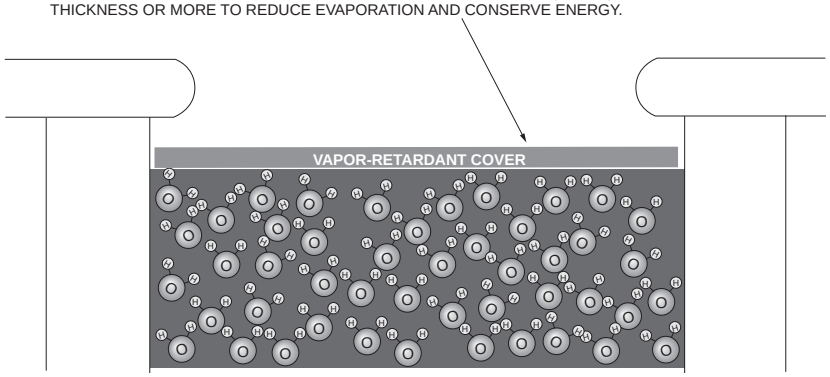
This exception is not concerned with the efficiency of pool or spa water heating equipment requiring utility power (electricity or gas) for directly heating pool and spa water. Although such equipment is becoming slightly more efficient as equipment designs improve over time, greater efficiencies are difficult to achieve without exorbitant equipment cost and increasing complexity. Installation of pool water heating equipment with higher efficiency (less use of utility power) is often a wise decision. However, choosing higher efficiency equipment at a greater cost to lower power costs where abundant "free" energy is available at the site might not be as wise of a decision in the long run. Equipment requires servicing, parts require replacement and eventually, equipment needs replacing. Complex, high-efficiency equipment can have a significant cost that needs to be carefully considered against the benefits gained. Thus, the purpose of this section and its exception becomes more clear. There is a cost associated with supplying a pool cover. Without question, pool and spa covers, especially for large or oddly-shaped pools and spas, can be difficult to install, resulting in the fact that many will never be installed. This defeats the intent for reducing consumption of utility-generated energy. Installing higher efficiency direct pool or spa water-heating equipment is senseless where that energy is just allowed to, literally, evaporate into the air. Where there is significant use of abundant free energy (heat) at the site, why not eliminate the requirement for the cover (that most times will rarely be used) and spend that money on equipment to capture that free energy? Once installed, the pool operator doesn't need to install a cover to gain the same benefit, if not a greater benefit, of reducing power costs.

A vapor-retardant cover is a solid layer of material (not mesh or netting) that rests on or at the water's surface to retard or curtail evaporation. In a swimming pool, the solid vapor retardant cover must touch most of the water's surface to impede the majority of water molecules from escaping [see Commentary Figures 303.1.3(1) and (2)].

On a spa, the vapor-retardant cover can be above the water's surface as long as all sides of the spa rim or coping are sealed by the cover to confine the water molecules that have escaped the water's surface to the airspace between the water and the cover, keeping them from escaping into the atmosphere [see Commentary Figure 303.1.3(3)].

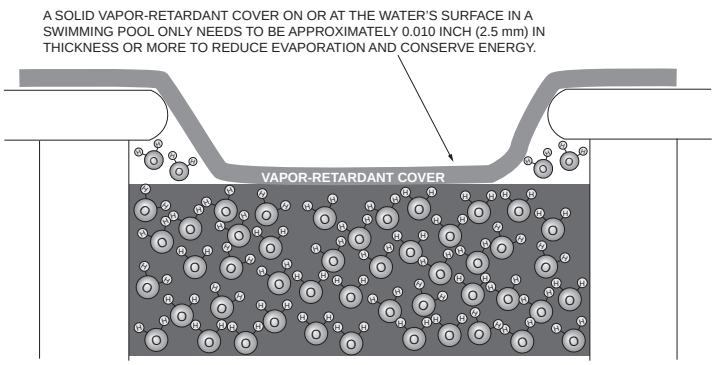
303.2 Portable spas. The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP 14.

❖ Electric-powered portable spas are products manufactured to numerous standards, one of which is APSP 14, which specifically addresses energy efficiency for these types of products.



For SI: 1 inch = 25.4 mm.

FIGURE 303.1.3(1)
FLOATING-TYPE SOLID VAPOR-RETARDANT COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]



For SI: 1 inch = 25.4 mm.

FIGURE 303.1.3(2)
POWERED OR PIN-DOWN-TYPE SOLID VAPOR-RETARDANT COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

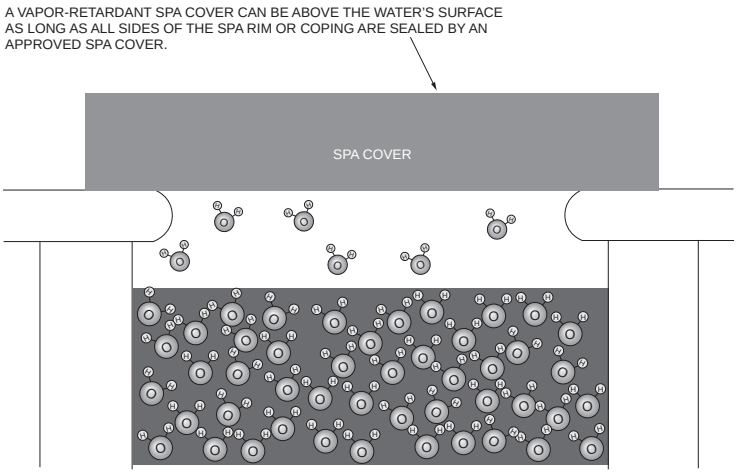


FIGURE 303.1.3(3)
SOLID VAPOR-RETARDANT SPA COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

303.3 Residential pools and permanent residential spas. The energy consumption of *residential* swimming pools and permanent *residential* spas shall be controlled in accordance with the requirements of APSP 15.

❖ By some estimates, there are over 7 million permanent inground residential swimming pools in the United States alone. Some of the "higher-end" residential pools also have permanent residential spas with separate circulation systems. There is also an increasing trend of installation of permanent residential spas without pools as space and finances might not be available for a pool installation. The number of permanent inground residential swimming pools and permanent residential spas far surpasses the number of public pools in the United States. As every pool and spa must have one or more pumps for circulation, the collective amount of energy used by all of these pumps is staggering. Controlling the energy consumption by these currently installed pumping systems is strongly encouraged by all electric utilities. Many owners of existing pools and spas have taken advantage of electric utility rebates to replace their old, inefficient pumps that consumed an amount of energy that was nearly 50% of their monthly household electric bill. For new pumping systems, APSP 15 provides the requirements to design and install low-energy-consuming circulation systems. APSP 15 also provides details on how to select energy-efficient pumps from a database that all pump manufacturers populate with certified energy usage data for the models that they sell.

APSP 15 covers residential swimming pool filtration systems, including the filtration pump, controller, filter, backwash valve, filtration piping and valves. Note that only systems used for filtration are regulated by the standard; other systems, such as for cleaning, spa boosting and various water features, are not regulated. However, where a system is used for multiple purposes, one of which is filtration, the system is regulated by APSP 15.

APSP 15 requires that residential swimming pool and spa filtration pumps be listed in either the APSP Appliance Efficiency Pool Pump Database (available from APSP) or the California Energy Commission's Appliance Efficiency Database for Residential Pool Pumps. In order to be listed in these databases, the manufacturer of the filtration pump/motor assembly must have the assembly tested by an independent testing laboratory to produce energy factor information about the pump operating at three different operating conditions that represent three different types of circulation systems. The energy factor in the database is listed in "gallons per watt-hour" ("liters per watt-hour") and is similar in concept to the "miles per gallon" ("km per liter") rating of an automobile. The energy factor information makes it easy for the purchaser of a pump/motor assembly to compare the energy consumption of various pump models. The purchaser can then make a decision about which assembly to use based on the expected savings in energy usage (energy cost). Commentary Figure 303.3 shows the three circulation system curves that are used in the pump testing required by APSP 15. Pools that are 17,000 gallons (64 352 L) or less in volume use the flow rate listed for Curve A; pools more than 17,000 gallons (64 352 L) use the flow rate listed for Curve C.

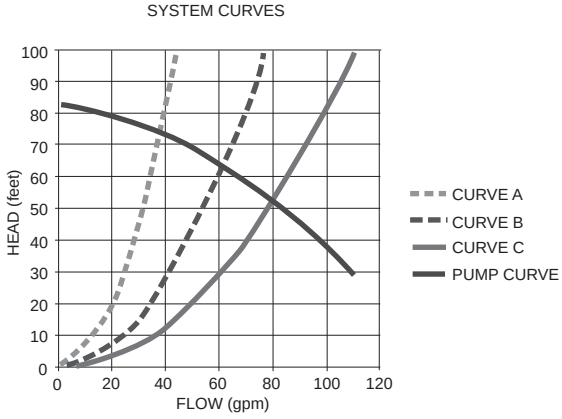
The size and capacity of pumps are limited based on pool volume, while ensuring adequate turnover. All residential pools must have a pump capable of achieving turnover in 12 hours or less (see Section 810). APSP 15 also requires that single-speed pumps in residential pools must not be capable of turning over the pool volume in less than 6 hours. Multispeed-pumps (which include dual and variable speed) must have at least one speed that will not turn over the pool volume in less than 6 hours.

According to APSP 15, pools with a capacity of less than 13,320 gallons (50 422 L) are not subject to the 6-hour turnover limit. Instead a single-speed pump that is not capable of exceeding 36 gallons per minute (gpm) (136 lpm) or a multiple-speed pump in which at least one setting will not exceed this flow rate can be used. This exception for smaller pools is necessary because skimmers or other sanitizing equipment might not operate properly at lower flow rates. Without the 36 gpm (136 lpm) allowance, a 4,000-gallon (15 141 L) patio home pool would be limited to a design flow rate of 11 gpm (42 lpm) (4000/360=11.1), a flow rate that few, if any, swimming pool filter pumps can achieve. This does not mean pool filter pumps cannot operate below 36 gpm (136 lpm): they can and often do. It is left to the contractor and property owner/operator to decide what is best to achieve the water quality requirements of Section 302.1. Using the 4,000-gallon (15 141 L) pool example, a two-speed pump on low speed, pumping 22 gpm (83 lpm), will turn over the pool in 3 hours, whereas 36 gpm (136 lpm) will turn over the pool in about 2 hours. Both flow rates exceed all turnover requirements for public pools (having more severe requirements), thereby ensuring that circulation is not compromised for smaller pools.

APSP 15 provides minimum sizes for pool filters, their backwash valves and the filtration piping to and from the swimming pool. These minimum sizes are calculated based on the pool volume; the larger the pool, the larger they must be. Control valves in the pool filtration loop must be at least as large as the pipe. This minimum pipe, fitting and valve size requirement does not apply to the pipe connections associated with the pump (which typically are smaller), heater, sanitizer and safety equipment, such as a safety vacuum release system and suction-limiting vents.

Note that APSP 15 does not currently specify a maximum limit for how much energy a pump can use. The information in the database should be enough to steer most buyers toward more energy-efficient pump models. Spending more for a high-efficiency pump that will be installed in a geographic location where electric energy costs are high should be an easy choice as the payback period for the higher cost of the pump (as compared to the lower cost of a lower-efficiency pump) will be relatively short. On the other hand, perhaps the decision on what pump to buy might not include the concern about having to pay for the energy consumption after the pump is installed. APSP 15 allows this flexibility in pump efficiency choice as the pump can be easily changed to a higher-efficiency model at a later date.

The APSP 15 requirements for permanently installed residential spas include those of Section 303.1 and minimum heater efficiency ratings that are set by federal regulations. Gas-fired heaters manufactured before April 16, 2013, must be at least 78-percent efficient; after this date they must be at least 82-percent efficient. Heat pumps must have a coefficient of performance of not less than 4.0.



For SI: 1 foot = 305 mm, 1 gallon per minute = 3.8 lpm.

FIGURE 303.3
CIRCULATION SYSTEM CURVES VERSUS PUMP CURVE
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

SECTION 304
FLOOD HAZARD AREAS

304.1 General. The provisions of Section 304 shall control the design and construction of pools and spas installed in *flood hazard areas.*

❖ Pools and spas installed in flood hazard areas must be specifically designed for the application.

[BS] 304.2 Determination of impacts based on location. Pools and spas located in *flood hazard areas* indicated within the *International Building Code* or the *International Residential Code* shall comply with Section 304.2.1 or 304.2.2.

> **Exception:** Pools and spas located in riverine *flood hazard areas* that are outside of designated floodways and pools and spas located in *flood hazard areas* where the source of flooding is tides, storm surges or coastal storms.

❖ The flood hazard areas are defined by the *International Building Code*® (IBC®) or the IRC. Pools and spas in designated floodways must comply with Section 304.2.1 or 304.2.2. Pools and spas, especially those that extend above ground and those that involve fill, can block floodwater and cause waters to rise higher if the vessels are placed in areas with effective flow (effective flow areas are those that pass the greatest volumes of water, typically with higher velocities). The requirement to consider the impacts of development on flood heights where floodways have not been designated is consistent with the National Flood Insurance Program (NFIP), IRC Section R322.1.4.2, and IBC Section 1612.3. No specific requirements apply if pools and spas are located outside of floodways (i.e., in areas sometimes referred to as the "floodway fringe") or in areas subject to coastal flooding.

[BS] 304.2.1 Pools and spas located in designated floodways. Where pools and spas are located in designated floodways, documentation shall be submitted to the code official that demonstrates that the construction of the pools and spas will not increase the design flood elevation at any point within the jurisdiction.

❖ Floodways are portions of riverine floodplains where encroachments may block the flow of floodwaters and increase flood heights and flood risks on adjacent properties. FEMA has provided floodway delineations along many rivers and streams shown on FIRMs. Placement of pools and spas that encroach into floodways, especially those that are on ground, partially in the ground and those that involve fill, are required to be evaluated by a qualified professional in accordance with accepted engineering practices. To be acceptable, the encroachment analysis must demonstrate that there will be no increase in the design flood elevation. Several states have more restrictive requirements, which can be determined by contacting the NFIP state coordinator (each state has an agency designated to coordinate the NFIP with communities).

[BS] 304.2.2 Pools and spas located where floodways have not been designated. Where pools and spas are located where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool or spa and any associated grading and filling, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

❖ Although FEMA has mapped floodways along many rivers and streams shown on a community's FIRM, other riverine flood hazard areas have base flood elevations but do not have designated floodways. In these areas, the potential effects that floodplain activities may have on flood elevations have not been evaluated. If FEMA has not designated a regulatory floodway, the community is responsible for regulating development that encroaches into these areas so as not to increase flood elevations by more than 1 foot (305 mm) at any point in the community. In effect, this means a community must either prepare a hydraulic analysis for proposed activities or require permit applicants to do so. Encroachment analyses should be prepared by a qualified professional in accordance with accepted engineering practices. Several states have more restrictive requirements, which can be determined by contacting the NFIP state coordinator.

[BS] 304.3 Pools and spas in coastal high-hazard areas. Pools and spas installed in coastal hazard areas shall be designed and constructed in accordance with ASCE 24.

❖ Flood hazard areas in a coastal community include areas subject to flooding that are not expected to have high waves and usually have coastal high-hazard areas where wave heights of 3 feet (914 mm) or higher are expected above the elevation of floodwaters during the base flood (identified on FIRMs as "Zone V"). Some FIRMs also delineate areas where wave heights of 1.5 to 3 feet are expected to occur (called "Coastal A Zones"). Waves impose significant loads on structures, including pools and spas. ASCE 24 requires consideration of flood loads and requires pools to be elevated and designed to break away without producing debris capable of causing significant damage to adjacent structures or designed to remain in the ground. Alternatively, pools may be designed and constructed to remain in the ground during design flood conditions without obstructing flow that results in damage to any structure. The IBC (by reference to ASCE 24) and IRC Section R322.3.3 require pools to be structurally independent of buildings unless the buildings are designed to resist the additional imposed flood load. Additional guidance is found in FEMA TB #5.

[BS] 304.4 Protection of equipment. Equipment shall be elevated to or above the design flood elevation or be anchored to prevent flotation and protected to prevent water from entering or accumulating within the components during conditions of flooding.

❖ Equipment associated with a pool or spa, such as filters, pumps and heaters, must be installed above the design flood elevation to protect such equipment. If equipment cannot be elevated and still serve the

intended function, it can be installed below the flood elevation if it is anchored and protected.

304.5 GFCI protection. Electrical equipment installed below the design flood elevation shall be supplied by branch circuits that have ground-fault circuit interrupter protection for personnel.

❖ Electrical equipment that is installed below the design flood level, such as lighting, receptacle outlets and motorized pool covers, must be supplied by circuits that have ground-fault circuit interrupter (GFCI) protection.

SECTION 305
BARRIER REQUIREMENTS

305.1 General. The provisions of this section shall apply to the design of barriers for pools and spas. These design controls are intended to provide protection against the potential drowning and near drowning by restricting access to such pools or spas. These requirements provide an integrated level of protection against potential drowning through the use of physical barriers and warning devices.

Exceptions:

1. Spas and hot tubs with a lockable *safety cover* that complies with ASTM F1346.
2. Swimming pools with a powered *safety cover* that complies with ASTM F1346.

❖ Barriers around pools and spas significantly restrict unauthorized access to such pools and spas. The perimeter barrier design requirements in this section are especially focused on preventing children from having access to an area where the potential for drowning or near drowning is very high. Once children are inside the barrier perimeter, only constant adult supervision of those children can prevent drowning or near drowning. Thus, when adults choose to leave the pool and spa area, common sense dictates that all children should also leave the area and be taken outside of the perimeter barrier. Therefore, a thorough inspection of perimeter barriers is necessary, as they are the only required line of defense against drowning or near drowning of children when adults are not present.

The exceptions allow for spas and hot tubs with lockable covers complying with ASTM F1346 and pools with power safety covers complying with ASTM F1346 to not require barriers. A cover installed on a pool or installed on a spa or hot tub offers the same level of protection as a barrier, so barriers are not required. Commentary Figures 305.1(1) and 305.1(2) show powered safety covers on residential and public swimming pools, respectively. When covers are retracted or removed, only constant adult supervision of a pool and spa can prevent children from drowning or near drowning. Thus, when adults choose to leave the pool or spa area, common sense dictates that children are removed from the pool or spa and the cover installed immediately. Therefore, a thorough inspection of covers, cover latching systems and cover deployment systems (and their operation) is necessary, as these covers are the only required line of defense against drowning or near drowning of children when adults are not present. Although the code is silent about the controls for electric-powered safety covers for pools, it is a reasonable assumption that care would be taken to keep the operating controls secured so only those persons responsible enough to not trap users in the pool would be operating the cover [see Commentary Figure 305.1(3)].

Note that a nonpowered pool cover (i.e., one that is manually installed) does not provide relief of the barrier requirement [see Commentary Figure 305.1(4)]. Even though a manual pool cover might comply with the requirements of ASTM F1346, installation of manually installed covers are time consuming and could be somewhat complicated such that they would not be used every time the pool was not in use.

FIGURE 305.1(1)
ON-DECK-TYPE POWERED SAFETY COVER FOR RESIDENTIAL POOL

FIGURE 305.1(2)
INTEGRAL-TYPE POWERED SAFETY COVER FOR PUBLIC POOL

FIGURE 305.1(3)
KEY SWITCH FOR POWERED POOL COVER OPERATION

FIGURE 305.1(4)
NONPOWERED MESH COVER DOES NOT ALLOW FOR ABSENCE OF BARRIER AROUND POOL

305.2 Outdoor swimming pools and spas. Outdoor pools and spas and indoor swimming pools shall be surrounded by a barrier that complies with Sections 305.2.1 through 305.7.

❖ Sections 305.2 through 305.7 cover the requirements for barriers.

305.2.1 Barrier height and clearances. Barrier heights and clearances shall be in accordance with all of the following:

1. The top of the barrier shall be not less than 48 inches (1219 mm) above grade where measured on the side of the barrier that faces away from the pool or spa. Such height shall exist around the entire perimeter of the barrier and for a distance of 3 feet (914 mm) measured horizontally from the outside of the required barrier.
2. The vertical clearance between grade and the bottom of the barrier shall not exceed 2 inches (51 mm) for grade surfaces that are not solid, such as grass or gravel, where measured on the side of the barrier that faces away from the pool or spa.
3. The vertical clearance between a surface below the barrier to a solid surface, such as concrete, and the bottom of the required barrier shall not exceed 4 inches (102 mm) where measured on the side of the required barrier that faces away from the pool or spa.
4. Where the top of the pool or spa structure is above grade, the barrier shall be installed on grade or shall be mounted on top of the pool or spa structure. Where the barrier is mounted on the top of the pool or spa, the vertical clearance between the top of the pool or spa and the bottom of the barrier shall not exceed 4 inches (102 mm).

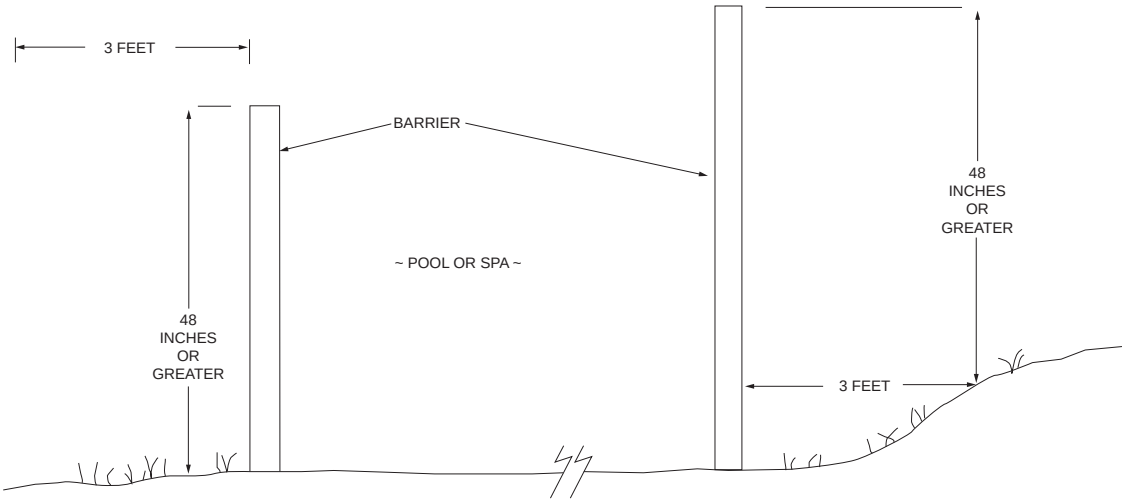
❖ The barrier height of 48 inches (1219 mm) ensures that smaller children cannot simply "hop the fence" to gain access to the pool or spa. Those persons who are capable of climbing over a 48-inch-high (1219 mm) barrier are probably of sufficient maturity to avoid the pool if they cannot swim or are uncomfortable with the idea of entering the water of a spa. The height is measured on the outside of the barrier from the highest elevation of grade or concrete slab for a distance of 3 feet (914 mm) away from the outside of the barrier [see Commentary Figure 305.2.1(1)]. This requirement coordinates with Section 305.2.9 that requires a clear zone of 36 inches (914 mm) around the outside of the barrier.

Barriers that are not close to the surface of the ground could be bypassed by a child maneuvering under the barrier. Where over grass or gravel, the bottom of the barrier must be within 2 inches (51 mm) of the ground surface from which the grass grows from or onto which the gravel is placed. It is unlikely that a child would be able to dig out more than 2 inches (51 mm) of settled, naturally compacted earth in order to make an opening large enough to gain access to the pool or spa. If the bottom of the barrier is over concrete, the bottom must be within 4 inches (102 mm) of the concrete surface to prevent a child from maneuvering through the opening to gain access to the pool or spa [see Commentary Figures 305.2.1(2) and (3)].

The top of a pool or spa could be above grade. The barrier for this arrangement could be installed at grade or the barrier could be installed on top of the pool or spa [see Commentary Figure 305.2.1(4)]. Where mounted on top of the pool or spa, the vertical clearance from the top of the pool or spa to the underside of the barrier cannot exceed 4 inches (102 mm) [see Commentary Figure 305.2.1(5)] to prevent a child from maneuvering through the opening to gain access to the pool or spa.

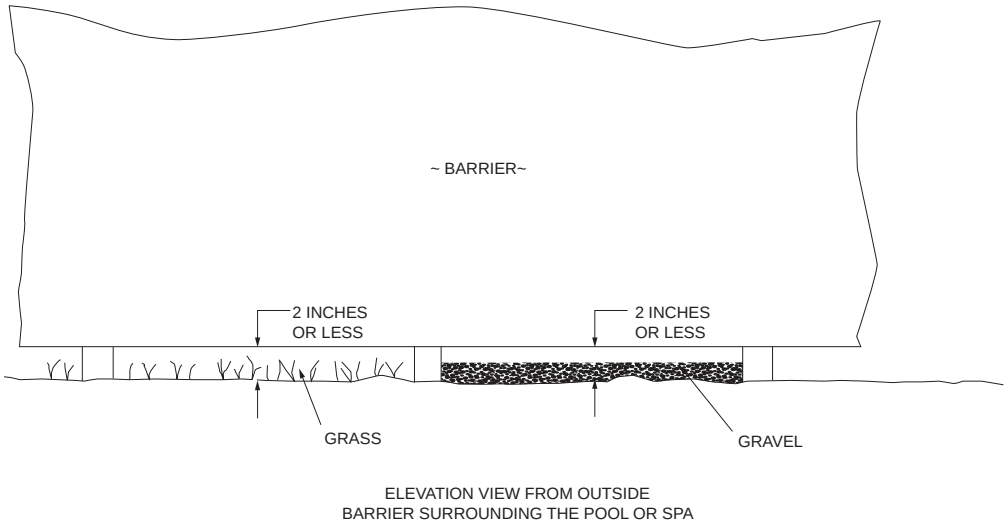
305.2.2 Openings. Openings in the barrier shall not allow passage of a 4-inch-diameter (102 mm) sphere.

❖ The 4-inch (102 mm) opening is narrow enough to prevent passage of a small child through the barrier (see Commentary Figure 305.2.2).



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 305.2.1(1)
HEIGHT OF BARRIER ABOVE GRADE



For SI: 1 inch = 25.4 mm.

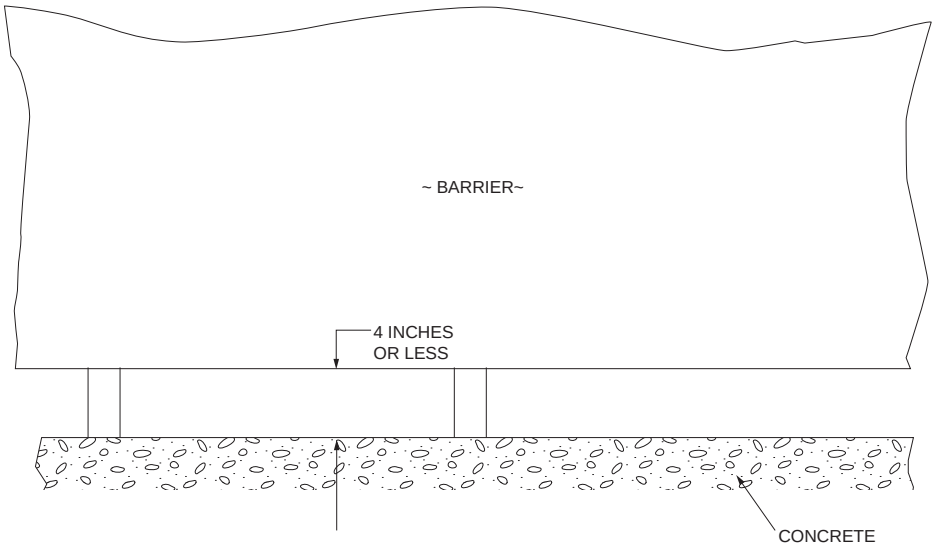
FIGURE 305.2.1(2)
MAXIMUM CLEARANCE FROM BOTTOM OF BARRIER TO GRADE

305.2.3 Solid barrier surfaces. Solid barriers that do not have openings shall not contain indentations or protrusions that form handholds and footholds, except for normal construction tolerances and tooled masonry joints.

❖ An important characteristic of a barrier is that the exterior vertical face not offer any protrusions or indentations such that a toehold or handhold could assist in the climbing of the barrier.

305.2.4 Mesh fence as a barrier. Mesh fences, other than chain link fences in accordance with Section 305.2.7, shall be installed in accordance with the manufacturer's instructions and shall comply with the following:

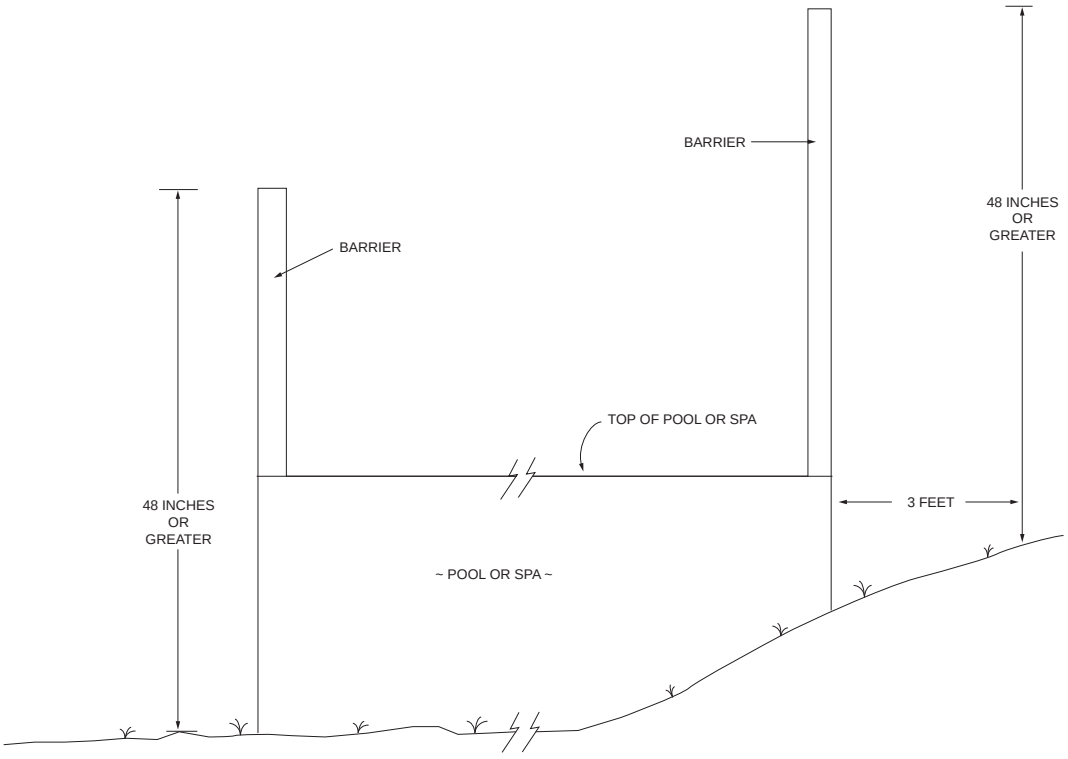
1. The bottom of the mesh fence shall be not more than 1 inch (25 mm) above the deck or installed surface or grade.
2. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not permit the fence to be lifted more than 4 inches (102 mm) from grade or decking.
3. The fence shall be designed and constructed so that it does not allow passage of a 4-inch (102 mm) sphere under any mesh panel. The maximum vertical clearance from the bottom of the mesh fence and the solid surface



ELEVATION VIEW FROM OUTSIDE
OF BARRIER SURROUNDING THE POOL OR SPA

For SI: 1 inch = 25.4 mm.

FIGURE 305.2.1(3)
MAXIMUM CLEARANCE FROM BOTTOM OF BARRIER TO SOLID SURFACE



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 305.2.1(4)
HEIGHT OF BARRIER WHERE MOUNTED ON TOP OF THE POOL OR SPA

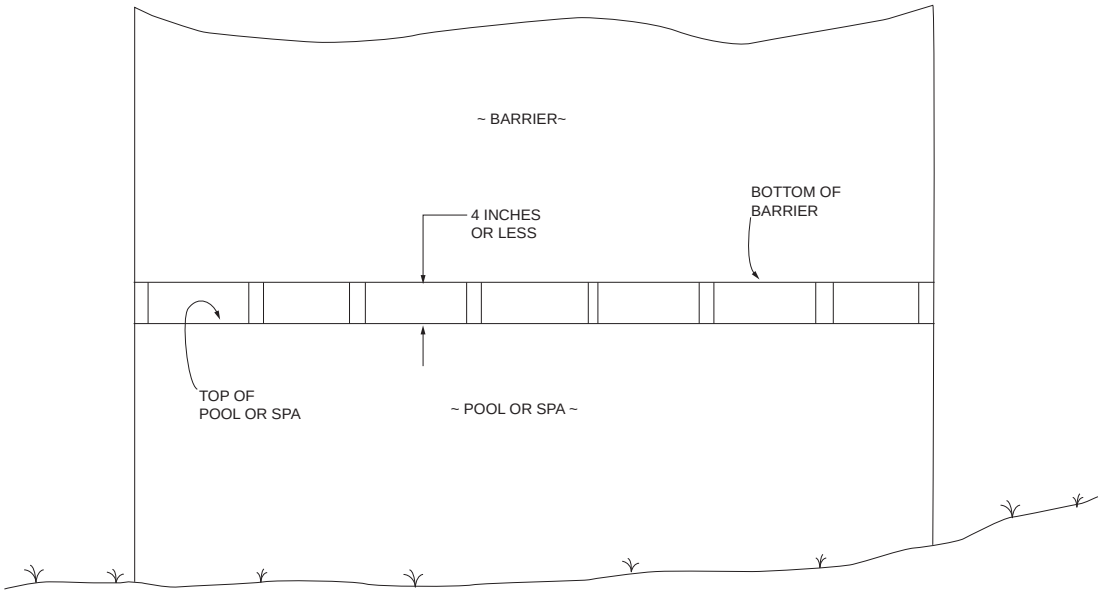
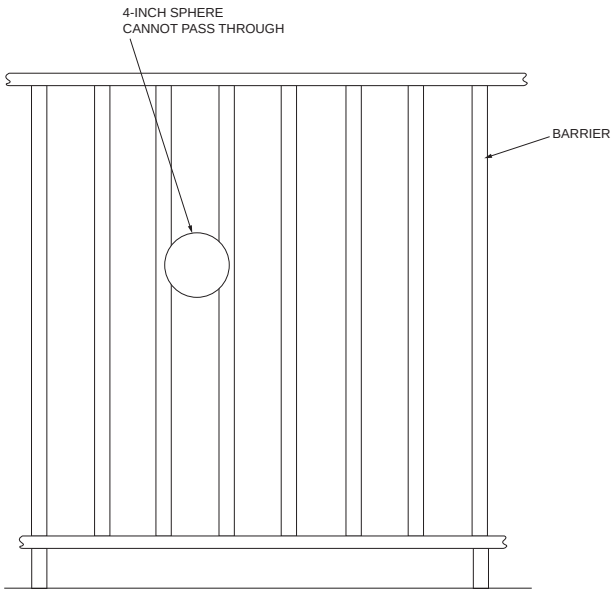


FIGURE 305.2.1(5)
MAXIMUM CLEARANCE FROM BOTTOM OF BARRIER TO TOP OF THE POOL OR SPA WHERE BARRIER IS MOUNTED ON TOP OF THE POOL OR SPA



For SI: 1 inch = 25.4 mm.

FIGURE 305.2.2
FOUR-INCH SPHERE CANNOT PASS THROUGH BARRIER OPENINGS

shall not be more than 4 inches (102 mm) from grade or decking.

4. An attachment device shall attach each barrier section at a height not lower than 45 inches (1143 mm) above grade. Common attachment devices include, but are not limited to, devices that provide the security equal to or greater than that of a hook-and-eye-type latch incorporating a spring-actuated retaining lever such as a safety gate hook.
5. Where a hinged gate is used with a mesh fence, the gate shall comply with Section 305.3.
6. Patio deck sleeves such as vertical post receptacles that are placed inside the patio surface shall be of a nonconductive material.
7. Mesh fences shall not be installed on top of onground *residential* pools.

❖ Mesh fences provide a temporary, removable barrier for a pool or spa. For example, consider a pool with a permanent barrier on three sides and the fourth side is bounded by a building. During times when the pool is not in use, a mesh barrier could be erected between the pool and the building so that the space between the building and the mesh fence could be used without concern that the pool could be easily accessed by children. The bottom of the mesh barrier (fence) must not be able to be lifted more than 4 inches (102 mm) above the pool deck so that a child cannot crawl under the barrier. The attachment devices between mesh barrier sections and the posts must be not less than 45 inches (1142 mm) above the deck so that they are out of reach of small children. The attachment devices must offer the same difficulty to disengage as a spring-loaded hook and eye latch. Gates with mesh fences must comply with gate requirements in Section 305.3.

Mesh fences must not be used on top of onground residential pools because mesh fencing cannot resist the forces of an adult falling against it. An adult could

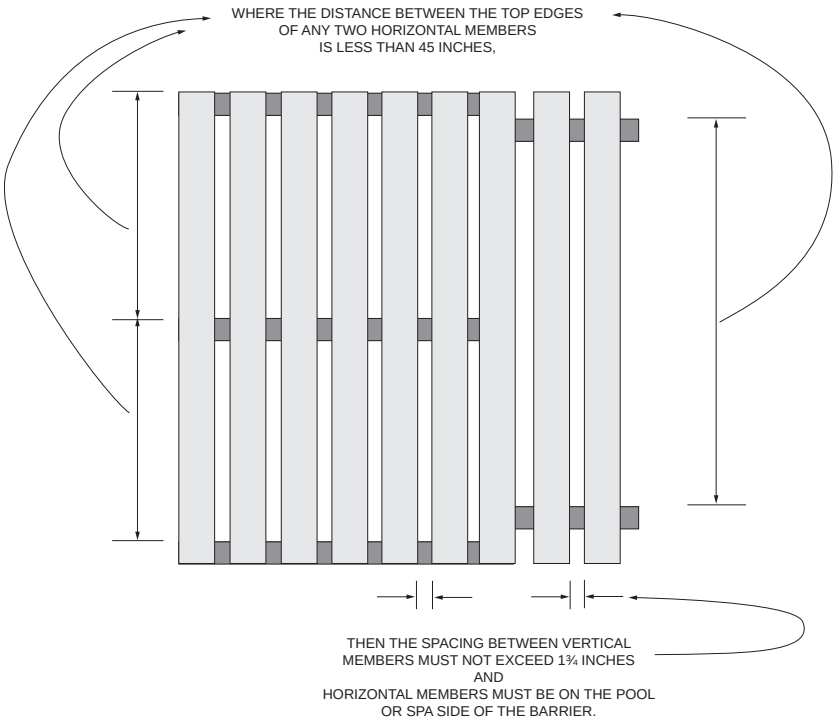
topple off the deck of an above-ground pool and onto the ground below (see Commentary Figure 305.2.4).

FIGURE 305.2.4
MESH FENCE AS A STRUCTURE-TO-POOL BARRIER

305.2.5 Closely spaced horizontal members. 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 or spa side of the fence. Spacing between vertical members shall not exceed $1^3/_4$ inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed $1^3/_4$ inches (44 mm) in width.

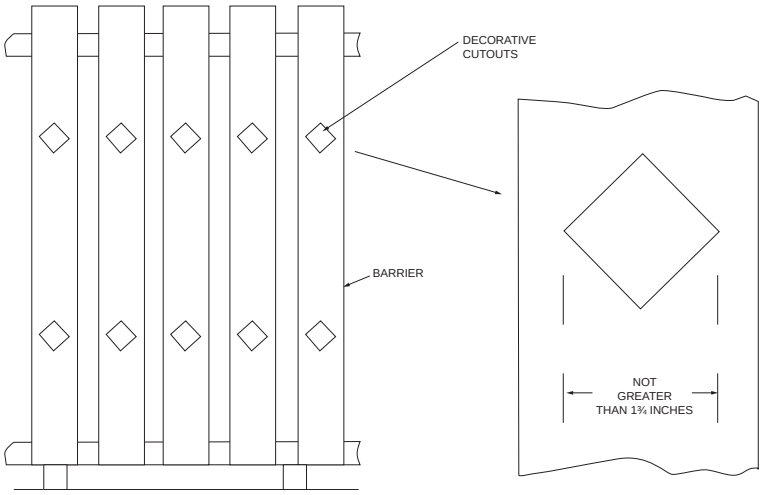
❖ Conventional fencing that is not chain link fence is typically constructed with horizontal rails attached to vertical posts. Vertical pickets are fastened to the horizontal rails to complete the barrier. If the distance between the top surface of the horizontal rails is less than 45 inches (1143 mm), such spacing could allow a child to climb up and over the barrier. Therefore, these closely spaced rails must be located on the pool or spa side of the barrier so that a child on the outside of the barrier cannot climb over it. Where closely spaced rails exist and are exposed between vertical members on the exterior of the fence, the gap between vertical pickets must not be more than $1^3/_4$ inches (44 mm) wide so that a child cannot wedge his or her foot in the gap and gain a handhold on the top closely spaced horizontal member in order to scale the fence [see Commentary Figure 305.2.5(1)]. Any decorative cutouts in the pickets must not have an opening greater than $1^3/_4$ inches (44 mm) for the same reason [see Commentary Figure 305.2.5(2)].

There are welded metal wire mesh products and flexible "on a roll" plastic fence products that "technically comply" with the dimensional requirements of this section. However, this section was written with the typical wood or rigid vinyl fence construction in mind. Consider a wood fence with 4-inch by 4-inch vertical posts with two 2-inch by 4-inch horizontal rails (one near the top, one near the bottom of the fence)



For SI: 1 inch = 25.4 mm.

FIGURE 305.2.5(1)
MAXIMUM SPACING BETWEEN VERTICAL MEMBERS WHERE DISTANCE BETWEEN TOP OF HORIZONTAL MEMBERS IS LESS THAN 45 INCHES



For SI: 1 inch = 25.4 mm.

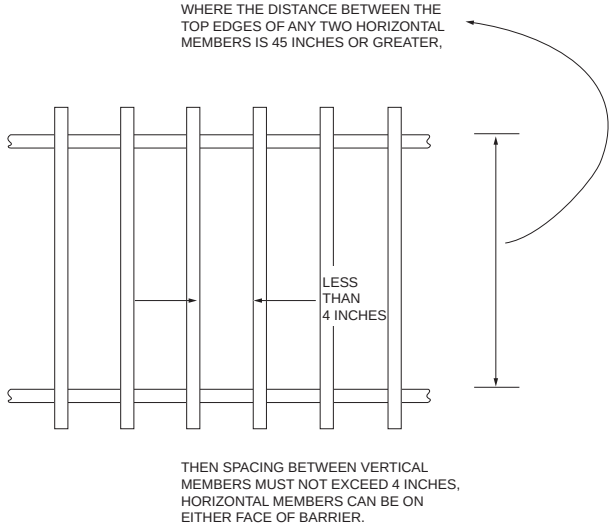
FIGURE 305.2.5(2)
MAXIMUM OPENING WIDTH OF DECORATIVE CUTOUTS IN BARRIER MATERIALS

with $^3/_4$-inch-thick vertical pickets (4 to 6 inches wide) horizontally spaced apart not more than about the thickness of 2-inch (nominal) material. Such construction has "thickness of its vertical members," making it difficult to climb. For example, reaching between the pickets to grab onto a 2-inch by 4-inch horizontal rail will be difficult. Similarly, wedging the toe of a shoe between the (thick) pickets to get a toehold onto the horizontal rail will be difficult. And generally, such a fence would not be constructed with many closely spaced horizontal rails as it would be too costly and structurally unnecessary.

Do these metal or plastic mesh products with horizontal "members" every 4 inches or closer (but with the width between vertical "members" less than $1^3/_4$ inches) offer an equivalent resistance to climbing by children? Does such a product offer a similar rigidity and ruggedness to a fence constructed of wood members given that the code does not specify a distance between vertical posts? There are situations where, for public safety, a code official might have to make a decision about items that are not specifically covered by the code. Section 102.8 provides support to the code official in these instances.

305.2.6 Widely spaced horizontal members. 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, spacing between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, the interior width of the cutouts shall not exceed $1^3/_4$ inches (44 mm).

❖ Conventional fencing that is not chain link fencing is typically constructed with horizontal rails attached to vertical posts. Vertical pickets are fastened to the horizontal rails to complete the barrier. If the distance between the top surface of the horizontal rails is greater than or equal to 45 inches (1143 mm), such spacing poses a climbing difficulty for children. Therefore, these widely spaced rails could be located on either side of the fence. Because there is not a reachable horizontal top member to gain a handhold, the vertical pickets could be spaced as far as 4 inches apart [see Commentary Figure 305.2.6(1)]. However, note that Section 305.2.2 requires that openings in the barrier must not allow the passage of a 4-inch (102 mm) sphere. Any decorative cutouts in the pickets must not have an opening that is greater



For SI: 1 inch = 25.4 mm.

FIGURE 305.2.6(1)
MAXIMUM SPACING BETWEEN VERTICAL MEMBERS WHERE DISTANCE BETWEEN TOPS OF HORIZONTAL MEMBERS IS 45 INCHES OR GREATER

than $1^3/_4$ inches (44 mm) to prevent a child from gaining a foothold to scale the fence [see Commentary Figure 305.2.5(2)].

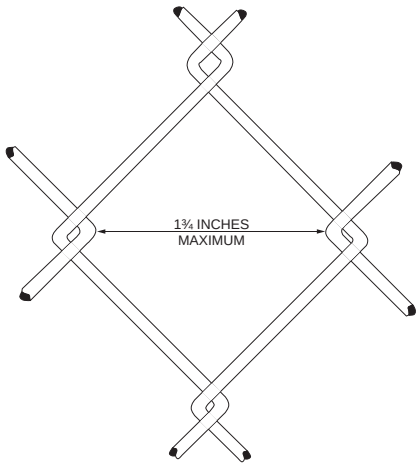
Commentary Figure 305.2.6(2) shows a barrier. The fence is known to be 4 feet (1219 mm) high. It is obvious that the distance between the horizontal rails is less than 45 inches (1143 mm) and the vertical pickets spaced wider than 1.75 inches (44 mm). Thus, this fence is a violation because the horizontal members are not at least 45 inches (1143 mm) apart.

FIGURE 305.2.6(2)
VIOLATION—BARRIER (FENCE) HORIZONTAL MEMBERS TOO CLOSE

305.2.7 Chain link dimensions. The maximum opening formed by a chain link fence shall be not more than $1^3/_4$ inches (44 mm). Where the fence is provided with slats fastened at the top and bottom which reduce the openings, such openings shall be not more than $1^3/_4$ inches (44 mm).

❖ Chain link fencing has diamond-shaped or square openings. The most common sizes of chain link openings (measured between parallel sides of the opening) are 2 inches (51 mm) and $2^1/_4$ inches (57 mm). This section requires that the openings be not greater than $1^3/_4$ inches (44 mm) so that a child cannot wedge his or her foot in the opening in order to climb the fence (see Commentary Figure 305.2.7). Two-inch (51 mm) and $2^1/_4$-inch (57 mm) chain link fence must have the openings reduced in size by the installation of slats (sometimes called privacy slats) vertically or diagonally. Where slats are used, they must be attached to the top and bottom of the fence so that they cannot be removed for gaining a hand- or foothold on the fence. The slats must be of a width that reduces the openings to less than $1^3/_4$ inches (44 mm).

Chain link fencing is also available in $1^1/_4$-inch (32 mm) size (mesh). The resulting diagonal opening is $1^3/_4$ inches (44 mm). Therefore, slats would not be required for this size of chain link fence.

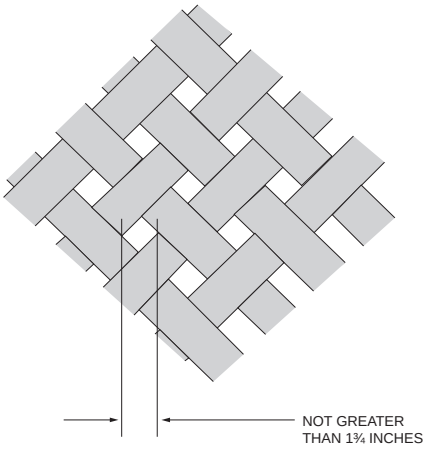


For SI: 1 inch = 25.4 mm.

FIGURE 305.2.7
MAXIMUM OPENING WIDTH IN BARRIERS BUILT WITH CHAIN LINK FENCING

305.2.8 Diagonal members. Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be not more than $1^3/_4$ inches (44 mm). The angle of diagonal members shall be not greater than 45 degrees (0.79 rad) from vertical.

❖ Some barrier designs use diagonal members (latticework) as part of the barrier. Where diagonal members are installed, the angle cannot be more than 45 degrees (0.79 rad) from vertical and the opening created by the diagonal members cannot be greater than $1^3/_4$ inches (44 mm) so a child cannot wedge a foot in the opening to climb the barrier (see Commentary Figure 305.2.8).



For SI: 1 inch = 25.4 mm.

FIGURE 305.2.8
MAXIMUM OPENING WIDTH IN BARRIERS BUILT WITH DIAGONAL MEMBERS

305.2.9 Clear zone. There shall be a clear zone of not less than 36 inches (914 mm) between the exterior of the barrier and any permanent structures or equipment such as pumps, filters and heaters that can be used to climb the barrier.

❖ A barrier of any height is not much of a deterrent to gaining access to the pool or spa if there is equipment, trees or storage boxes that are within 3 feet (914 mm) of the outside of the barrier. These items could be used to assist someone in climbing over the barrier.

305.2.10 Poolside barrier setbacks. The pool or spa side of the required barrier shall be not less than 20 inches (508 mm) from the water's edge.

❖ Barriers must not be installed so close to the pool or spa such that if a child did manage to climb over the barrier, he or she would not immediately fall into the water.

305.3 Gates. Access gates shall comply with the requirements of Sections 305.3.1 through 305.3.3 and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool or spa, shall be self-closing and shall have a self-latching device.

❖ There can be two types of gates in a barrier: a service access gate, which is required by Section 305.3.1 to be secured by a lock, and a pedestrian gate for user access to the pool or spa. This section requires that pedestrian gates open outward, self-close and self-latch so that the barrier is continuous all around the pool or spa after a user passes through the gate. The code is not specific as to the conditions whereby the gate must be self-closing and self-latching. Wind, degree of opening and instability of the barriers and gate could affect the closing and latching of the gate. The code official will have to use his or her best judgment concerning this section. Commentary Figure 305.3 shows a pedestrian access gate that swings in the wrong direction.

FIGURE 305.3
VIOLATION—WRONG SWING DIRECTION ON PEDESTRIAN ACCESS GATE

Some code officials might consider an outdoor public pool and spa area a location where "means of egress," as defined by the IBC, applies. Section 1010 of the IBC pertaining to doors and gates has requirements for self-closing and self-latching doors (of which the IBC considers gates as doors).

305.3.1 Utility or service gates. Gates not intended for pedestrian use, such as utility or service gates, shall remain locked when not in use.

❖ This section requires that service gates be locked when not in use.

305.3.2 Double or multiple gates. Double gates or multiple gates shall have at least one leaf secured in place and the adjacent leaf shall be secured with a self-latching device. The gate and barrier shall not have openings larger than $^1/_2$ inch (12.7 mm) within 18 inches (457 mm) of the latch-release mechanism. The self-latching device shall comply with the requirements of Section 305.3.3.

❖ In some cases, gates could be installed with several movable (swinging) sections. One swinging section must be provided with a self-latching device that is located on the pool or spa side of the gate. The other portions of the gate must be secured so that they are normally stationary. For example, the normally stationary side of the gate might be prevented from swinging by a sliding rod mounted on the gate that can penetrate into a hole in the deck or walkway. The latch on the other gate must be of the self-latching type and must be on the pool or spa side of the gate. The inside release mechanism must be protected against tampering from the outside of the gate by providing a solid panel or mesh with openings of not greater than $^1/_2$ inch (12.7 mm). The panel or small opening mesh must extend not less than 18 inches (457 mm) in all directions (except not beyond the top of the required gate height) of the inside latch-release mechanism (refer to the commentary to Section 305.3.3).

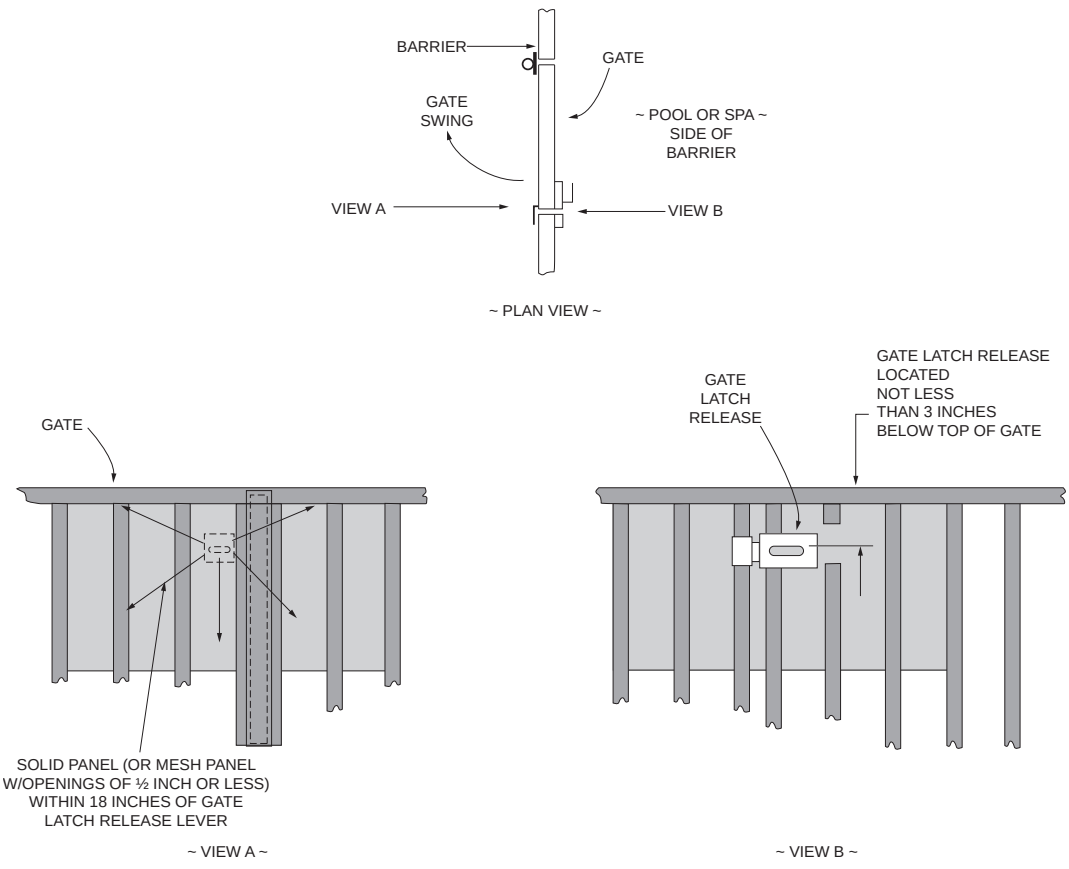
305.3.3 Latches. Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from grade, the release mechanism shall be located on the pool or spa side of the gate not less than 3 inches (76 mm) below the top of the gate, and the gate and barrier shall not have openings greater than $^1/_2$ inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

❖ This section requires that the gate's latch-release mechanism on the nonpool or spa side of the gate be not less than 54 inches (1372 mm) above grade or, if less than 54 inches (1372 mm), then the release mechanism must be on the pool or spa side of the gate. Placing the release mechanism at 54 inches (1372 mm) puts the release out of reach of small children. But there may be aesthetic reasons for having the latch at less than 54 inches (1372 mm) above grade. Where located on the pool or spa side of the gate, the latch must be not less than 3 inches (76 mm) below the top of the gate. This allows for adults outside of the gate to reach the release but preventing children outside the gate from reaching the latch

release. The inside (backside of the gate) release mechanism must be protected against tampering from the outside of the gate by providing a solid panel or mesh with openings of not greater than $^1/_2$ inch (12.7 mm). The panel or small opening mesh must extend not less than 18 inches (457 mm) in all directions of the inside latch-release mechanism [see Commentary Figure 305.3.3(1)].

This section reflects the "traditional approach" for latch-release mechanisms on pedestrian access gates to pool and spa areas. Although suitable for most residential (as defined by this code) pool and spa access gates, this approach might not coordinate with designs for accessibility and controlled access needs in a public environment. For example, a latch-release on the inside (backside) of the gate or at a 54-inch height above the walking surface on either side of a gate is out of the reach range for persons seated in a wheelchair. Key card or key entry might also be necessary to control when the pool or spa can be used and who can use the pool or spa [see Commentary Figure 305.3.3(2)]. Therefore, the designer of the barrier system and pedestrian access gate for a public environment will need to assess each gate arrangement against all code requirements and the needs of the client in order to propose an alternative method to the code official for compliance to this section (see Section 104.11).

FIGURE 305.3.3(2)
KEY CARD ENTRY ON GATE TO POOL AND SPA AREA MIGHT REQUIRE ALTERNATIVE METHOD APPROVAL



For SI: 1 inch = 25.4 mm.

FIGURE 305.3.3(1)
LOCATION AND PROTECTION OF BARRIER GATE LATCH RELEASE WHERE LOCATED AT LESS THAN 54 INCHES ABOVE WALKING SURFACE

305.4 Structure wall as a barrier. Where a wall of a dwelling or structure serves as part of the barrier and where doors or windows provide direct access to the pool or spa through that wall, one of the following shall be required:

1. Operable windows having a sill height of less than 48 inches (1219 mm) above the indoor finished floor and doors shall have an alarm that produces an audible warning when the window, door or their screens are opened. The alarm shall be *listed* and *labeled* as a water hazard entrance alarm in accordance with UL 2017. In dwellings or structures not required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located 54 inches (1372 mm) or more above the finished floor. In dwellings or structures required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located not greater than 54 inches (1372 mm) and not less than 48 inches (1219 mm) above the finished floor.
2. A *safety cover* that is *listed* and *labeled* in accordance with ASTM F1346 is installed for the pools and spas.
3. An *approved* means of protection, such as self-closing doors with self-latching devices, is provided. Such means of protection shall provide a degree of protection that is not less than the protection afforded by Item 1 or 2.

❖ A building wall can serve as part of the barrier. Where that building wall has openings such as doors or operable windows, those openings can provide access to the pool or spa by a child. If the wall has only operable windows and those windowsill heights are 48 inches (1219 mm) or more above the inside floor of the structure, then the wall provides a similar level of protection that a 48-inch-high (1219 mm) barrier does. Although furniture could be placed against that wall that could aid in a child gaining access to the window, the code official can only be concerned about the height of the window above what is considered to be a permanent and "normal" walking surface. The code official doesn't have any control over the placement of furniture in a building. Walking surfaces would include, for example, permanent stairs and landings intersecting walls having operable windows. However, a kitchen countertop with windows just above the countertop would not be considered a "normal" walking surface even though a child might use kitchen drawers to climb to the countertop to access the window.

If the operable windowsill heights are lower than 48 inches (1219 mm) above the floor, either screen or window alarms listed and labeled to UL 2017 must be installed; or a safety cover listed and labeled to ASTM F1346 must be provided for the pool or spa [see Commentary Figure 305.4(1)].

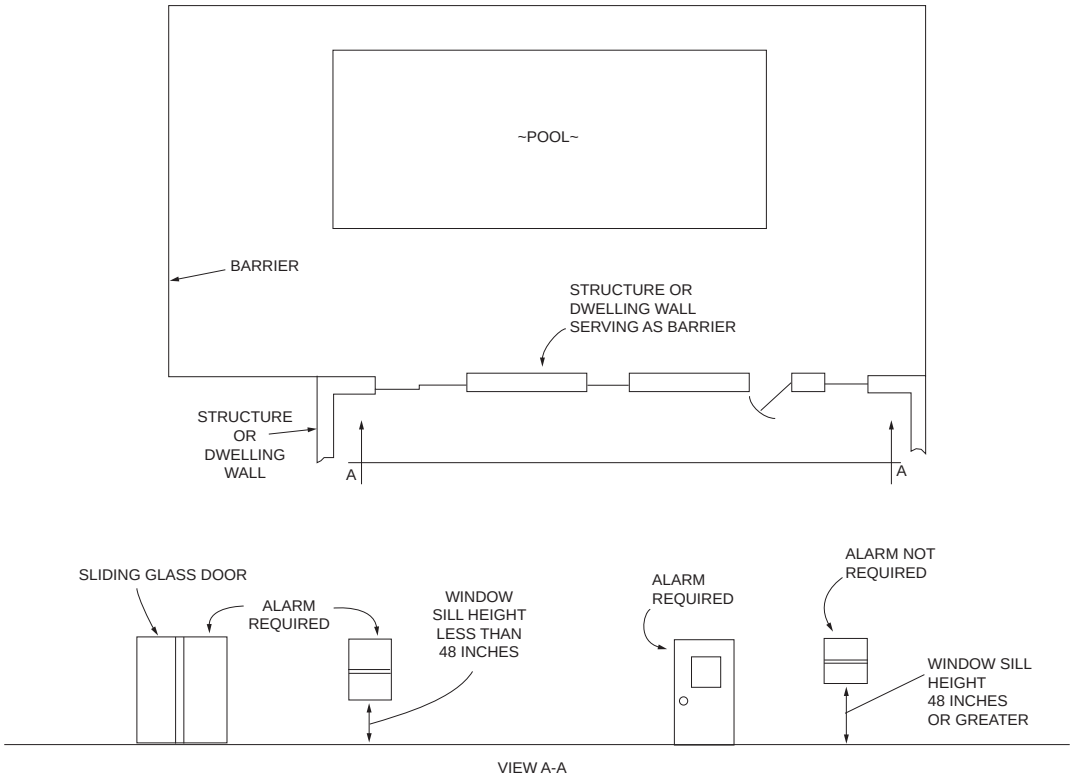
Where there is a door in the wall, either a door alarm listed and labeled to UL 2017 must be installed; or a safety cover listed and labeled to ASTM F1346 must be provided for the pool or spa. A third option for a door could be to provide a self-closing and self-latching door with a latch-release mechanism that is not less than 54 inches (1372 mm) above the floor, but this option requires approval by the code official.

Where a door or window alarm is installed, the deactivation switches must be not less than 54 inches (1372 mm) above the floor [see Commentary Figure 305.4(2)]. This height corresponds to the same height required for latch-release mechanisms for gates in Section 305.3.3. Where the structure is required to be an Accessible unit, a Type A accessible unit or a Type B accessible unit, the deactivation switch height can be reduced to 48 inches (1219 mm) above the floor to be within upper reach range of persons seated in a wheelchair. Accessible units, Type A accessible units and Type B accessible units are defined in the IBC.

Note that Item 2 does not specify that pools are required to have a powered safety cover in compliance with ASTM F1346. A manual safety cover is the minimum requirement. This is in contrast to Exception 2 in Section 305.1 for not requiring a barrier around the pool. If there is a barrier around the pool (perhaps a structure forms part of that barrier) or the pool has a powered safety cover, then the public at large is kept safe. The requirement for a safety cover (manual type as a minimum) for relief of the alarm requirement for doors and windows for a structure serving as part of the barrier is more for the occupants (including their children) of the structure. It is then a personal decision by the occupant as to whether they will install the safety cover to protect their children. The code intends that the means for safety be provided to the occupant—the code official cannot make the occupant use those means. Commentary Figure 305.1(4) shows a manual installed safety cover (however, it is unknown whether what is shown meets ASTM F1346). Note the barrier (fence) in the background on the left of the photo.

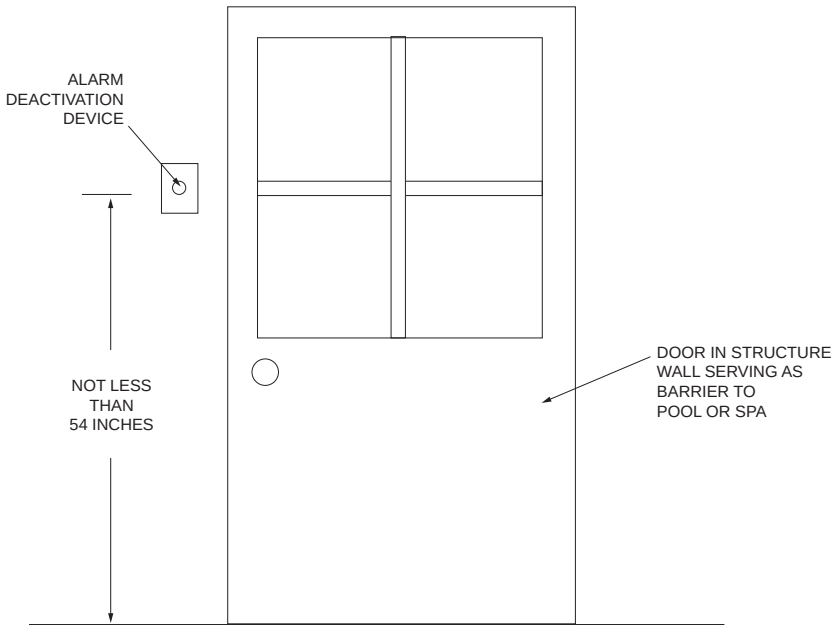
305.5 Onground residential pool structure as a barrier. An onground *residential* pool wall structure or a barrier mounted on top of an onground *residential* pool wall structure shall serve as a barrier where all of the following conditions are present:

1. Where only the pool wall serves as the barrier, the bottom of the wall is on grade, the top of the wall is not less than 48 inches (1219 mm) above grade for the entire perimeter of the pool, the wall complies with the requirements of Section 305.2 and the pool manufacturer allows the wall to serve as a barrier.
2. Where a barrier is mounted on top of the pool wall, the top of the barrier is not less than 48 inches (1219 mm) above grade for the entire perimeter of the pool, and the wall and the barrier on top of the wall comply with the requirements of Section 305.2.
3. Ladders or steps used as means of access to the pool are capable of being secured, locked or removed to prevent



For SI: 1 inch = 25.4 mm.

FIGURE 305.4(1)
STRUCTURE OR DWELLING WALL SERVING AS A BARRIER TO A POOL OR SPA



For SI: 1 inch = 25.4 mm.

FIGURE 305.4(2)
ALARM DEACTIVATION DEVICE LOCATION FOR OPENING IN STRUCTURE OR DWELLING WALL SERVING AS BARRIER TO A POOL OR SPA

access except where the ladder or steps are surrounded by a barrier that meets the requirements of Section 305.

4. Openings created by the securing, locking or removal of ladders and steps do not allow the passage of a 4-inch (102 mm) diameter sphere.
5. Barriers that are mounted on top of onground *residential* pool walls are installed in accordance with the pool manufacturer's instructions.

❖ Onground pools that have the top of the structure at 48 inches (1219 mm) or more above grade around the entire perimeter can serve as their own barrier from entry to the vessel. In order to serve as the barrier, all the requirements of Section 305.2 must be met; for example, a clear zone of 36 inches (914 mm) around the vessel and the outside of the pool wall cannot be climbable by children. Because the pool is above ground, a stairway or ladder is needed to access the vessel. Such ladders or stairways must be either removable or locked in some manner so that children cannot access the vessel. Any resulting opening from the removal or securing of a stairway must not leave openings where a 4-inch sphere (102 mm) will pass through. Barriers for stairways are provided by the manufacturer of the stairway, so the installation of such barriers must be in accordance with the manufacturer's instructions.

305.6 Natural barriers. In the case where the pool or spa area abuts the edge of a lake or other natural body of water, public access is not permitted or allowed along the shoreline, and required barriers extend to and beyond the water's edge not less than 18 inches (457 mm), a barrier is not required between the natural body of water shoreline and the pool or spa.

❖ Although natural bodies of water are not a barrier, they can restrict access to pools and spas by a child simply because he or she would have to navigate through not less than 18 inches (457 mm) depth of the natural body of water before reaching the pool or spa. If the child is successful, there is a low probably that he or she will have difficulty in the pool and spa water.

305.7 Natural topography. Natural topography that prevents direct access to the pool or spa area shall include but not be limited to mountains and natural rock formations. A natural barrier approved by the governing body shall be acceptable provided that the degree of protection is not less than the protection afforded by the requirements of Sections 305.2 through 305.5.

❖ Natural topography could present significant difficulty for children to access the pool and spa. For example, a pool or spa area that is adjacent to a steep and rocky hillside might be too treacherous for anyone to traverse, let alone a child. However, the code official must approve such arrangements to allow elimination of a barrier or portion thereof.

SECTION 306
DECKS

306.1 General. Decks shall be designed and installed in accordance with the *International Residential Code* or the *International Building Code*, as applicable in accordance with Section 102.7.1, except as provided in this section.

❖ The design and construction of decks must follow the requirements of the IBC or IRC, as applicable, and the requirements of this section.

306.2 Slip resistant. Decks, ramps, coping, and similar step surfaces shall be slip resistant and cleanable. Special features in or on decks such as markers, brand insignias, and similar materials shall be slip resistant.

❖ The presence of water on a walking surface significantly increases the slip potential. Special attention must be given to markers and insignias to make sure that they do not present an increased slip hazard.

306.3 Step risers and treads. Step risers for decks of public pools and spas shall be uniform and have a height not less than $3^3/_4$ inches (95 mm) and not greater than $7^1/_2$ inches (191 mm). The tread distance from front to back shall be not less than 11 inches (279 mm). Step risers for decks of *residential* pools and spas shall be uniform and shall have a height not exceeding $7^1/_2$ inches (191 mm). The tread distance from front to back shall be not less than 10 inches (254 mm).

❖ Step riser heights and tread depths are slightly different for decks associated with pools and spas, depending on whether they are associated with the IBC or the IRC.

306.4 Deck steps handrail required. Public pool and spa deck steps having three or more risers shall be provided with a handrail.

❖ For three or more steps associated with a pool or spa deck for a public pool or public spa, a handrail is needed. There is not a similar requirement for steps associated with pool or spa decks for residential pools or spas, noting the definition of "residential" in Chapter 2. Note that the IRC does require handrails for stairways with four or more risers where the stairway is part of the means of egress for an IRC building (see IRC Section 311). However, not all exterior doors (such as a sliding patio door) of an IRC building are intended to be means of egress doors.

306.5 Slope. The minimum slope of decks shall be in accordance with Table 306.5 except where an alternative drainage method is provided that prevents the accumulation or pooling of water. The slope for decks, other than wood decks, shall be not greater than $^1/_2$ inch per foot (1 mm per 24 mm) except for ramps. The slope for wood and wood/plastic composite decks shall be not greater than $^1/_4$ inch per 1 foot (1 mm per 48 mm). Decks shall be sloped so that standing water will not be deeper than $^1/_8$ inch (3.2 mm), 20 minutes after the cessation of the addition of water to the deck.

❖ Decks around pools and spas must be sloped to drain excess water. Puddles of water deeper than $^1/_8$

TABLE 306.5
MINIMUM DRAINAGE SLOPES FOR DECK SURFACES

SURFACE	MINIMUM DRAINAGE SLOPE (INCH PER FOOT)
Carpet	$^1/_2$
Exposed aggregate	$^1/_4$
Textured, hand-finished concrete	$^1/_8$
Travertine/brick-set pavers, public pools or spas	$^3/_8$
Travertine/brick-set pavers, residential pools or spas	$^1/_8$
Wood	$^1/_8$
Wood/plastic composite	$^1/_8$

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

inch (3.2 mm) are a slip hazard. The maximum slope of a deck other than a wood deck cannot be more than $^1/_2$ inch per foot (41.7 mm per meter) because excess slope and a wet surface is also a slip hazard. The slope of wood and wood/plastic decks' must be held to not greater than $^1/_4$ inch per foot (20.8 mm per meter), as these surfaces are considerably "slicker" than decks of other material. See Table 306.5.

306.6 Gaps. Gaps shall be provided between deck boards in wood and wood/plastic composite decks. Gaps shall be consistent with *approved* engineering methods with respect to the type of wood used and shall not cause a tripping hazard.

❖ Floor planks of wood and wood/plastic composite decks must be properly gapped to prevent buckling when the planks expand.

306.6.1 Maximum gap. The open gap between pool decks and adjoining decks or walkways, including joint material, shall be not greater than $^3/_4$ inch (19.1 mm). The difference in vertical elevation between the pool deck and the adjoining sidewalk shall be not greater than $^1/_4$ inch (6.4 mm).

❖ Gaps between pool decks and adjoining decks and walkways must be limited to not greater than $^3/_4$ inch (19.1 mm) so that toes will not get caught in the gap. The vertical elevation between decks must not exceed $^1/_4$ inch (6.4 mm) to prevent a tripping hazard.

306.7 Concrete joints. Isolation joints that occur where the pool coping meets the concrete deck shall be water tight.

❖ Water intrusion between the coping of the pool and the adjacent concrete deck can cause damage to both the deck and the coping.

306.7.1 Joints at coping. Joints that occur where the pool coping meets the concrete deck shall be installed to protect the coping and its mortar bed from damage as a result of the anticipated movement of adjoining deck.

❖ There must be a joint between the pool coping and the adjoining concrete deck so that thermal expansion of those materials can occur without damage to the coping or deck. Typically, the joint will be $^1/_4$ to $^1/_2$ inch (6.4 mm to 12.8 mm) in width and will be occupied by compressible foam material that completely separates the coping mortar bed and coping from the concrete deck slab. The top of the joint is filled with a flexible caulking material to prevent water entry into the joint.

306.7.2 Crack control. Joints in a deck shall be provided to minimize visible cracks outside of the control joints caused by imposed stresses or movement of the slab.

❖ Concrete decks must have an adequate number of control joints to limit random cracking in the concrete slab. The control joints can be tooled into the slab when the concrete is in a plastic state or cut into the slab when the concrete is in a "green" state. Control joints are typically not deeper than one-third of the slab thickness and must not cut any reinforcing steel that was placed in the slab. Control joints provide a weakened area in the slab so that when stresses develop in the slab, the slab will be most likely to crack along these joint lines.

306.7.3 Movement control. Areas where decks join existing concrete work shall be provided with a joint to protect the pool from damage caused by relative movement.

❖ New concrete decks placed against existing concrete must have a joint between the two so that differential movement does not cause damage.

306.8 Deck edges. The edges of decks shall be radiused, tapered, or otherwise designed to eliminate sharp corners.

❖ A sharp edge on a concrete slab can be very dangerous, especially to wet feet.

306.9 Valves under decks. Valves installed in or under decks shall be accessible for operation, service, and maintenance. Where access through the deck walking surface is required, an access cover shall be provided for the opening in the deck. Such access covers shall be slip resistant and secured.

❖ There could be a need for a valve to be placed below a pool or spa deck. Such valves must be provided with access, and the opening must have a cover. The cover's walking surface must be slip resistant.

306.9.1 Hose bibbs. Hose bibbs shall be provided for rinsing down the entire deck and shall be installed in accordance with the *International Plumbing Code* or *International Residential Code*, as applicable in accordance with Section 102.7.1, and shall be located not more than 150 feet (45 720 mm) apart.

Water-powered devices, such as water-powered lifts, shall have a dedicated hose bibb water source.

Exception: *Residential* pools and spas shall not be required to have hose bibbs located at 150-foot (45 720 mm) intervals, or have a dedicated hose bibb for water-powered devices.

❖ Decks around pools and spas need periodic wash downs. Therefore, hose bibbs must be located every 150 feet (45 720 mm) around the deck to facilitate this maintenance operation. Where water power devices are installed on a pool or spa, a dedicated hose bibb must be provided for these devices. As most residential pools and residential spas are small and typically are located close to a building, hose bibbs are not required to be installed as part of those pool or spa installations. A hose can always be connected to an available hose connection located on the residential building.

SECTION 307
GENERAL DESIGN

307.1 General. The provisions of this section apply to all pools and spas.

Exception: The provisions of Sections 307.3 through 307.6 do not apply to *listed* and *labeled* portable *residential* spas and *listed* and *labeled* portable *residential* exercise spas.

❖ Section 307 covers the general design requirements for all pools and spas, except for listed and labeled portable residential spas and portable residential exercise spas.

307.2 Glazing in hazardous locations. Hazardous locations for glazing shall be as defined in the *International Building Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1 of this code. Where glazing is determined to be in a hazardous location, the requirements for the glazing shall be in accordance with those codes, as applicable.

❖ Section R308 of the IRC defines what glazing is considered hazardous. Section R308.4.5 of the IRC specifically covers walls, enclosures or fences that are 60 inches (1524 mm) or less from the water's edge. Where the bottom edge of the glazing is 60 inches (1524 mm) or less above the walking surfaces, the glazing must be safety glazing.

Section 2406.4 of the IBC defines what glazing is considered hazardous. Section 2406.4.5 specifically covers walls, enclosures or fences that are 60 inches (1524 mm) or less from the water's edge. Where the bottom edge of the glazing is 60 inches (1524 mm) or less above the walking surfaces, the glazing must be safety glazing.

307.3 Materials. Pools and spas and appurtenances thereto shall be constructed of materials that are nontoxic to humans and the environment; that are generally or commonly regarded to be impervious and enduring; that will withstand the design stresses; and that will provide a watertight structure with a smooth and easily cleanable surface without cracks or joints, excluding structural joints, or that will provide a watertight structure to which a smooth, easily cleaned surface/finish is applied or attached. Material surfaces that come in contact with the user shall be finished, so that they do not constitute a cutting, pinching, puncturing or abrasion hazard under casual contact and intended use.

❖ This section covers the required general attributes for materials that are used to build pools and spas. The last line of this section is very important, as wet skin is easily torn or cut by edges that normally would not present a hazard when the skin is dry.

307.3.1 Beach pools. Clean sand or similar material, where used in a beach pool environment, shall be used over an impervious surface. The sand area shall be designed and controlled so that the circulation system, maintenance, safety, sanitation, and operation of the pool are not adversely affected.

❖ A beach pool allows the user to walk directly into the pool. Some beach pool entry areas have a sand bottom to simulate entry into the ocean's edge. A sand bottom must be placed over an impervious surface to prevent the beach area from eroding an earth surface.

307.3.2 Compatibility. Assemblies of different materials shall be chemically and mechanically compatible for their intended use and environment.

❖ Materials in a water environment, especially those in water that has been disinfected with chlorine, will experience accelerated corrosion. Where two or more different materials in contact with one another have a chemical reaction in a dry environment, the water environment increases the reactivity between the materials, which could lead to material degradation or failures.

307.4 Materials and structural design. Pools and spas shall conform to one or more of the standards indicated in Table 307.4. The structural design of pools and spas shall be in accordance with the *International Building Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1 of this code.

❖ Table 307.4 indicates the common materials, other than "concrete" materials, and their applicable standards, that pools and spas are made from.

The IBC and the IRC do not currently have structural design requirements that are specifically for pools and spas. Note that Section 304 does have requirements for pools and spas located in flood hazard areas.

For "concrete" pools and spas, some people might say that the reference to the IRC and the IBC for structural design requirements implies that the sections covering retaining walls in those codes apply. Section R404.4 of the IRC indicates that retaining walls are to be designed in accordance with accepted engineering practices. Section 1807.2 of the IBC covering retaining walls addresses issues that would be

considered as accepted engineering practice. Although some of the same (retaining wall) engineering analyses might be necessary for the design of "concrete" swimming pool and spa structures, the design of swimming pool and spa structures of "concrete" or any other material is very specialized and not within the intended coverage for structural design of the IRC and the IBC.

TABLE 307.4
RESERVOIRS AND SHELLS

MATERIAL	STANDARD
Fiberglass reinforced plastic	IAPMO Z124.7
Plastic	IAPMO Z124.7
Stainless steel (Types 316, 316L, 304, 304L)	ASTM A240
Tile	ANSI A108/A118/A136.1
Vinyl	ASTM D1593

307.4.1 Installation. Equipment for pools and spas shall be supported to prevent damage from misalignment and settling and located so as to allow access for inspection, servicing, removal and repair of component parts.

❖ Equipment, such as pumps and filters, must be installed on a solid base such as a concrete pad, a metal bracket or wood decking so that piping connected between the pumps and filters and the pool or spa will not be misaligned and stressed.

307.5 Freeze protection. In climates subject to freezing temperatures, outdoor pool and spa shells and appurtenances, piping, filter systems, pumps and motors, and other components shall be designed and constructed to provide protection from damage from freezing.

❖ When water freezes into ice, the ice expands. If the moisture in the ground freezes, this can cause the soil to expand and apply pressure to the outside of the pool or spa shell. The shell must be designed to accommodate these pressures under the designer-specified external earth-fill conditions and internal water-fill conditions. Normally there is water in the piping from the pool or spa to the pumps and filters. If the piping is exposed to freezing temperatures, the water freezing in the pipes could cause them to break. The design and installation of the piping, filters and pumps must allow for the water to be drained, vacuumed out or blown out with air so that freeze damage will not occur. Onground storable pools can be drained or pumped out and the piping systems disassembled so that freezing temperatures will not cause damage to these types of pools themselves or to the piping for them.

307.6 Surface condition. The surfaces within public pools and spas intended to provide footing for users shall be slip resistant and shall not cause injury during normal use.

❖ Pools and spas in a public setting have a variety of users who might not be familiar with the walking surfaces in the pool or spa. Therefore, all walking surfaces in the pool must be slip resistant to aid in the prevention of falls.

307.7 Colors and finishes. The colors, patterns, or finishes of the pool or spa interior shall not obscure objects or surfaces within the pool or spa.

Exception: *Residential* pools and spas.

❖ In a public setting, it is imperative that the operators of pools and spas have the best possible view of all swimmers and bathers in the pool or spa so that it can be easily and quickly determined if someone is in distress. Typically, light pastel blue to white colors are used to color the pool or spa interior, providing for maximum visibility of swimmers and bathers in and under the water. The exception allows the interior surfaces of residential pools and spas to have any colors, patterns or finishes that the customer desires.

307.8 Roofs or canopies. Roofs or canopies over pools and spas shall be in accordance with the *International Building Code* or *International Residential Code*, as applicable in accordance with Section 102.7.1 and shall be constructed so as to prevent water runoff into the pool or spa.

❖ Structures such as roofs or canopies built over a pool or spa must be designed in accordance with the IRC or the IBC, as applicable. Rainwater runoff from such structures must not be allowed to flow into the pool or spa, because the roof surfaces collect dirt, pollutants and bird droppings that would wash into the pool or spa and contaminate the water with a concentrate of pollutants. The concentrated polluted rainwater could make the pool or spa water unsuitable for use until after the circulation system has had time to process the pool or spa water to make it clean enough for use.

307.9 Accessibility. An accessible route to public pools and spas shall be provided in accordance with the *International Building Code*. Accessibility within public pools and spas shall be provided as required by the accessible recreational facilities provisions of the *International Building Code*. Accessibility for pools and spas accessory to detached one- and two-family dwellings and townhouses not more than three stories in height shall be provided where required by the *International Residential Code*.

❖ The term "accessible" in this code section concerns facilities designed to accommodate persons having physical disabilities. For public pools and spas, Chapters 10 and 11 of the IBC cover the requirements for accessible routes to and around pool and spa areas. Section 1110.4.13 of the IBC states that all swimming pools, wading pools, hot tubs and spas are required to be accessible. There are few exceptions in that section that relax this requirement. Note that Section 411.1 of this code indicates that pool lifts, transfer walls and transfer systems provided for accessibility cannot be counted as a means of entry and exit as required by Section 411.

Residential pool and spa areas associated with a detached one- and two-family dwelling or a townhouse dwelling unit not more than three stories in height are not required to have accessible routes or to have pools and spas be accessible.

SECTION 308
DIMENSIONAL DESIGN

308.1 Floor slope. The slope of the floor from the point of the first slope change to the deep area shall not exceed one unit vertical in three units horizontal (33-percent slope).

Exception: Portable *residential* spas and portable *residential* exercise spas.

❖ Changes in floor slope to the deep area of a pool should not be so abrupt that the bather walking on the floor is startled and loses footing. A slope of 1 unit vertical in 3 units horizontal has been established, through experience and time, to be acceptable. The exception recognizes that portable residential spas and residential exercise spas don't have "deep" areas so that the slope of floor transitions would not be of concern.

308.2 Walls. Walls shall intersect with the floor at an angle or a transition profile. Where a transitional profile is provided at water depths of 3 feet (914 mm) or less, a transitional radius shall not exceed 6 inches (152 mm) and shall be tangent to the wall and is permitted to be tangent to or intersect the floor.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. *Onground storable pools*.

❖ Walls of pools and spas could intersect the floor at a sharp angle, but in most cases this intersection is a smooth radius, as it allows for easier construction of the walls and floor. Where the water depth is 3 feet (914 mm) or less, a small radius at the wall-to-floor intersection is needed so that bathers have a flat footing surface next to the wall, as in shallow areas where bathers tend to congregate at the wall to rest.

Exception 1 recognizes that portable residential spas and residential exercise spas are not the types of spas where bathers typically stand at the walls of the spa.

Exception 2 recognizes that onground storable pools have a liner that conforms to whatever contour is created by the earth-to-wall intersection. Such contours are difficult to accurately control during installation of the liner.

308.3 Shape. This code is not intended to regulate the shape of a pool or spa other than to take into account the effect that a given shape will have on the safety of the occupants and to maintain the minimum required level of circulation to ensure sanitation.

❖ Pools and spas can be designed with any shape, as long as the safety of the bathers and adequate circulation for sanitation is taken into account in the design.

308.4 Waterline. The *design waterline* shall have a maximum construction tolerance at the time of completion of the work of plus or minus $^1/_4$ inch (6.4 mm) for pools and spas with adjustable weir surface skimming systems, and plus or minus $^1/_8$ inch (3.2 mm) for pools and spas with nonadjustable surface skimming systems.

❖ The design waterline must be held to close tolerances so that skimmers and gutters function as designed and water depths around the perimeter are consistent.

SECTION 309
EQUIPMENT

309.1 Electrically operated equipment. Electrically operated equipment shall be *listed* and *labeled* in accordance with applicable product standards.

Exception: Portable *residential* spas and portable *residential* exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.

❖ Where electrically operated equipment is installed in conjunction with a pool or spa, such equipment must be listed and labeled to the standards to which the equipment is stated to be in compliance. Electrically operated equipment includes, but is not limited to, pump motors, lighting, time clocks, heaters and automation controls. The listing and labeling requirement provides for an increased level of safety because the manufacturing of such equipment is carefully monitored and the products tested on a periodic basis. The exception recognizes that portable residential spas and portable residential exercise spas are covered by different standards that ensure safe electrical products.

309.2 Treatment and circulation system equipment. Treatment and circulation system equipment for public pools and spas shall be *listed* and *labeled* in accordance with NSF 50 and other applicable standards.

❖ The requirement for treatment and circulation equipment to be listed and labeled to NSF 50 provides for a level of quality suitable for the intended use.

SECTION 310
SUCTION ENTRAPMENT AVOIDANCE

310.1 General. Suction entrapment avoidance for pools and spas shall be provided in accordance with APSP 7.

Exceptions:

1. Portable spas and portable exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.
2. Suction entrapment avoidance for wading pools shall be provided in accordance with Section 405.

❖ APSP 7 covers the design and performance criteria for circulation systems, including components, devices and related technology installed to protect against entrapment hazards in residential and public swimming pools, wading pools, spas, hot tubs and catch basins. The first exception recognizes that portable residential spas and portable residential exer-

cise spas that are in compliance with UL 1563 or CSA C22.2 No. 218.1 are tested by a third-party agency to ensure compliance to APSP 7. The second exception allows for the requirements of Section 405 to provide for suction entrapment avoidance. Section 405 prohibits suction outlets from being installed in wading pools.

SECTION 311
CIRCULATION SYSTEMS

311.1 General. The provisions of this section shall apply to circulation systems for pools and spas.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes circulation system equipment that is in accordance with Section 704.

❖ Section 311 covers requirements for circulation systems for all pools and spas other than portable residential spas, onground storable pools and portable residential exercise spas.

311.2 System design. A circulation system consisting of pumps, piping, return inlets and outlets, filters, and other necessary equipment shall be provided for the complete circulation of water. Wading pools and spas shall have separate dedicated filtering systems.

Exception: Separate filtering systems are not required for *residential* pools and spas.

❖ A water circulation system for a pool and spa is required in order to filter out dirt, hair and other particulates that accumulate in the water; provide sanitizing chemicals to the vessel water; and, in some cases, provide heated water to the pool or spa. The circulation system provides for complete movement of the water in all areas of the pool or spa so that disinfection chemicals are well distributed for proper sanitary conditions. The requirement for wading pools and spas to have filter systems that are separate from each other and a main pool or spa is so that the disinfection levels in those smaller pools and spas can be better controlled. Also, if someone in the smaller pool or spa throws up or a child has an unexpected bowel movement, the pool or spa is isolated from the other pools and spas.

The exception allows residential spas to be an integral part of a residential swimming pool and share a common circulation system. Separate filtering systems are not needed because in a residential environment, use of the pool can be easily discontinued until the disinfection levels are returned to proper levels (see Commentary Figure 311.2).

311.2.1 Turnover rate. The equipment shall be sized to turn over the volume of water that the pool or spa is capable of containing as specified in this code for the specific installation.

❖ Turnover rate is the number of hours required to circulate the entire volume of water in the pool or spa through the filter one time. The flow capacity of the filtration pump determines the turnover rate. Thus, choosing the correct size of filtration pump is critical for providing a safe water quality in the pool or spa.

The flow rate of a filtration pump is dependent on the resistance to flow in the circulating system. Commentary Figure 311.2.1(1) shows the typical equipment in a circulation system.

This resistance to flow is called the total dynamic head of the system. Total dynamic heads for a circulation system can be calculated for various flow rates through the system. Plotting those points on a graph allows a circulation system curve to be drawn. Commentary Figure 311.2.1(2) illustrates the resulting circulating system curves for three different circulation systems. Circulation system A (Curve A) has the highest total dynamic head for any given flow rate. Circulation system C (Curve C) has the lowest total

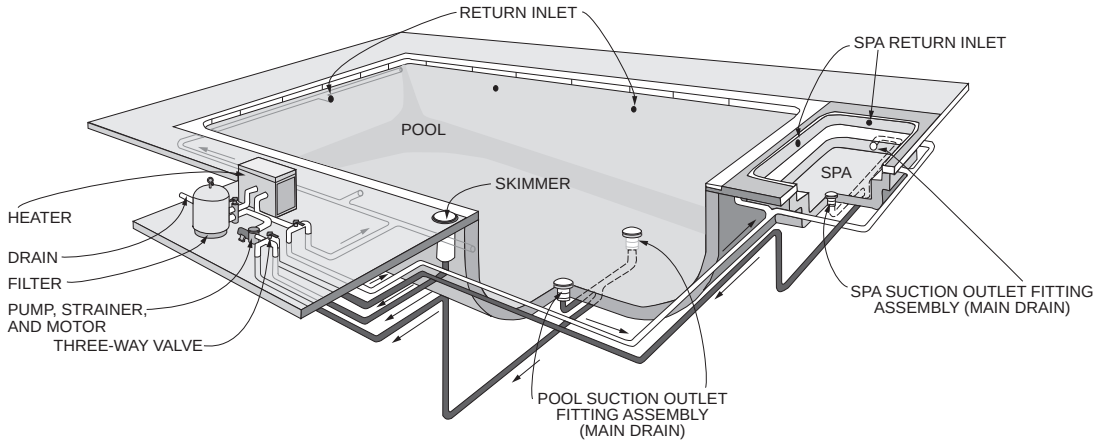


FIGURE 311.2
TYPICAL RESIDENTIAL POOL AND SPA COMBINATION
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

dynamic head for those same given flow rates. The intersection of the system curve and the pump curve is the operating point of the system.

Each design of the filtration pump (a centrifugal pump) is tested to generate a performance curve that indicates the flow rate that the pump will produce when pumping against resistance (head). Commentary Figure 311.2.1(2) illustrates a pump performance curve for a single-speed pump. Even though the pump is capable of a wide flow range, the total dynamic head of the circulation system determines what the flow rate of the pump will be. In other words, when choosing a single-speed pump for this application, the total dynamic head of the system at the desired flow rate must be carefully calculated so that the pump will produce the desired flow rate.

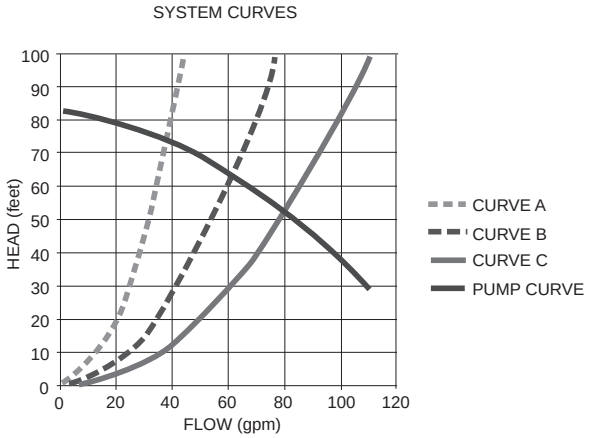
The use of multispeed or variable speed circulation pumps reduces the need for detailed head calculations for the system as the pump speed can be field adjusted to produce the desired flow rate for meeting the minimum turnover rate. Lower speeds provide for maximum energy efficiency and quieter operation. Multispeed and variable speed pumps can be temporarily operated at higher speeds for operating cleaning equipment.

311.2.2 Servicing. Circulation system components that require replacement or servicing shall be provided with access for inspection, repair, or replacement and shall be installed in accordance with the manufacturer's specifications.

❖ Pumps, pump motor filters, motors, heaters, control systems and other serviceable equipment require inspection, adjustment and replacement. Adequate space must be provided for these operations. The manufacturer's instructions regarding access must be followed when installing components. Commentary Figure 311.2.2 shows an example of access to the equipment. Although it cannot be determined from this photo whether manufacturer-specified access has been provided, the area does appear to be usually congested to allow for maintenance.

311.2.3 Equipment anchorage. Pool and spa equipment and related piping shall be designed and installed in accordance with the manufacturer's instructions.

❖ The installation instructions for pool and spa equipment provide the best source of information on how to properly install the equipment. Such instructions, along with the code, provide the basis for inspection of the installation. Note that anchoring of pool and spa equipment in high-wind locations or seismic zones is especially critical.



For SI: 1 foot = 305 mm, 1 gpm = 3.8 lpm.

FIGURE 311.2.1(2)
CIRCULATION SYSTEM
CURVES VERSUS PUMP CURVE
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

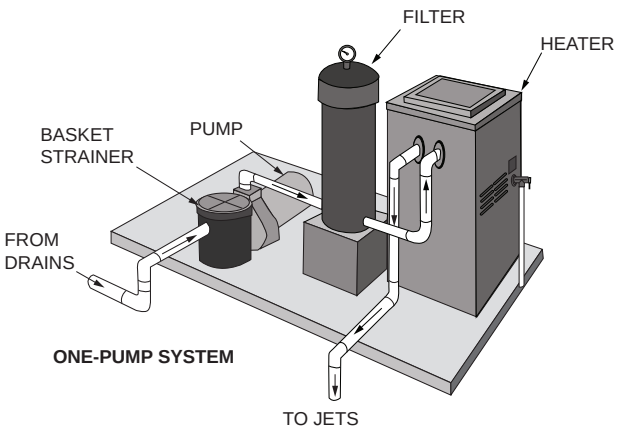


FIGURE 311.2.1(1)
TYPICAL EQUIPMENT IN A
CIRCULATION SYSTEM
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

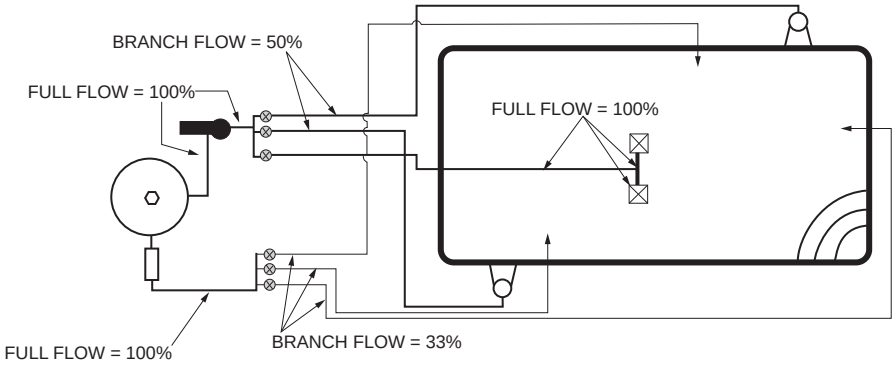
FIGURE 311.2.2
EXAMPLE OF ACCESS

311.3 Water velocity. The water velocity in return lines shall not exceed 8 feet (2.4 m) per second. The water velocity in suction piping shall be as required by Section 310.

❖ Return piping discharges water into the pool and spa. Suction piping removes water from the pool and spa. The generally accepted maximum velocity (for pipe longevity and low "flowing noise") in circulation piping for pool and spa applications is 8 feet (2.4 m) per second. This section's pointer to Section 310 for suction piping maximum water velocity is a dead end because APSP 7 no longer specifies such velocities. However, note that APSP 15 (as referenced in Section 303.3) limits the velocity in all filtration suction piping to 6 feet (1.8) per second for residential pools and inground spas to keep piping friction losses in check for pump energy consumption considerations. Although APSP 15 does not apply to public pools, designing for low water velocity in suction piping of a public pool would be prudent for the same reason. The code and APSP 7 do not specify a maximum water velocity in suction piping for public pools.

Suction piping systems can be designed without any control/isolation valves. Without valves installed, the flow velocity in the piping will always be the same. However, where a suction piping system has control/isolation valves, those valves could be adjusted to cause 100 percent of the pump flow to be drawn through any piping section. For residential pools and spas complying with APSP 15 and ideally for public pools, the calculated flow velocity must be at or below the maximum allowable calculated flow velocity for the piping section when the piping is carrying 100 percent of the pump flow. When evaluating water velocity, the circulation flow between all operating pipes is divided accordingly. For example, if two skimmers are piped separately between a pool and the circulation pump, the total flow for the skimmers is divided by two for sizing each skimmer pipe. The same concept applies to the return piping system. Branch piping can reduce in size after each tee, dividing the flow of water between any number of adjustable return inlets (see Commentary Figure 311.3).

Compliance with APSP 7 and APSP 15 helps to conserve energy, reduce noise and improve equipment performance. Such compliance also serves to prevent or reduce the risk of entrapment on residen-



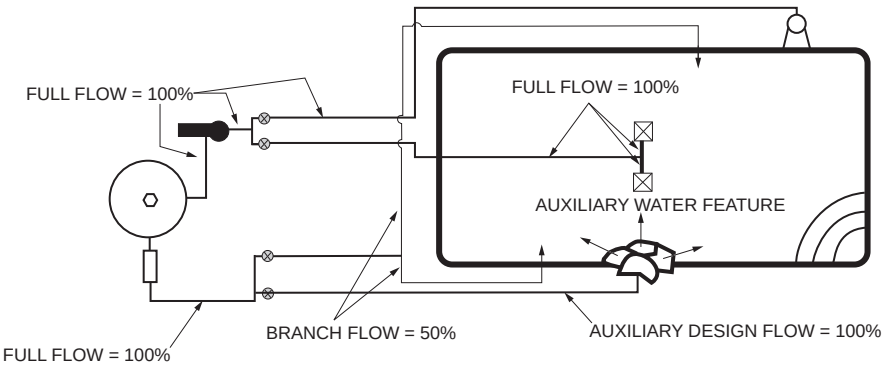


FIGURE 311.3
DETERMINING FLOWS IN PIPING TO DETERMINE PIPING VELOCITY
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

tial pools that still contain suction fittings manufactured prior to the December 19, 2008, effective date of the federal Virginia Graeme Baker Pool and Spa Safety Act regulating suction outlet fittings (main drains). Suction fittings manufactured and sold prior to that date might be of "flat" configuration that are intended to be, and frequently are, flush mounted to the pool (or spa) wall and floor surface. The flush mounting might not prevent certain forms of entrapment. Larger pipe between multiple suction outlets reduces the suction force at each outlet by limiting how fast the water moves through each of the outlets. Federal law requires all suction outlet fittings manufactured or sold after this effective date to pass a revised and enhanced body entrapment and hair entrapment test. Flush or flat mount fittings will not pass the body test, unless they are listed as unblockable, meaning the fitting cannot be sufficiently shadowed by an 18-inch by 23-inch (457 mm by 584 mm) blocking element to create a hazardous suction force as described in APSP 7.

311.4 Piping and fittings. Plastic pipe and fittings used in circulation systems shall be nontoxic and shall be able to withstand the design operating pressures and conditions of the pool or spa. Plastic pipe shall be *listed* and *labeled* as complying with NSF 14. Circulation system piping shall be *listed* and *labeled* as complying with one of the standards in Table 311.4.

❖ The requirement for the listing and labeling of plastic pipe to NSF 14 ensures that the pipe manufacturing process is closely monitored to ensure the quality of the product. The pipe used in the circulation system must be listed and labeled to any of the standards identified in Table 311.4.

TABLE 311.4. See below.

❖ The choice of what pipe material to use in an application must also consider the pressure and temperature of use.

311.4.1 Fittings. Fittings used in circulation systems shall be *listed* and *labeled* as complying with one of the standards in Table 311.4.1.

Exceptions:

1. Suction outlet fitting assemblies and manufacturer-provided components certified in accordance with APSP 16.
2. Skimmers and manufacturer-provided components.
3. *Gutter* overflow grates and fittings installed above or outside of the overflow point of the pool or spa.

❖ Fittings for the piping material chosen must comply with any of the standards indicated in Table 311.4. Fittings must be listed and labeled to the standard. The exceptions recognize special fitting assemblies, such as suction outlet fittings, skimmers and gutter overflow grates, that do not meet the standards indicated in Table 311.4.1 but are an integral part of many pool or spa designs.

Suction outlet fittings are federally regulated by the Virginia Graeme Baker Pool and Spa Safety Act. They are tested to and must be marked with either "APSP 16," "ASME A112.19.8-2007" or "VGB-2008." In accordance with APSP 16 (or the predecessor ASME/ANSI edition), field-fabricated suction fittings that exceed 18 inches by 23 inches (457 mm by 584 mm) and are typically found in water parks need not be marked, provided they have been approved by a registered design professional. In this case, there will be a sealed engineering report documenting compliance with the standard. Commentary Figure 311.4.1 shows a typical suction outlet cover at the bottom of a spa (it is unknown whether this particular cover complies with APSP 16 as this photo was taken some time ago).

The overflow point of a gutter system is the inside rim, where water spills into the channel or opening, even if this is below the level of the deck. These pools typically have a "high water overflow point" associated with the gutter collection system, and it may be readily visible. The key to Exception 3 is that the grate and fittings cannot be installed where a bather can be held under water because of suction, limb or hair entrapment.

TABLE 311.4.1. See page 3-29.

❖ The choice of what pipe fitting material to use in an application must also consider the pressure and temperature of use.

311.4.2 Joints. Joints shall be made in accordance with manufacturer's instructions.

❖ Pipe-to-fitting joints must be made in accordance with the pipe manufacturer's instructions to ensure a strong, leak-free connection.

TABLE 311.4
CIRCULATION SYSTEM PIPE MATERIAL STANDARD

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D1527
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D2846; CSA B137.6
Copper or copper-alloy tubing	ASTM B88; ASTM B447
Polyvinyl chloride (PVC) hose	ASTM D1785; ASTM D2241; ASTM D2672; CSA B137.3
Polyvinyl chloride (PVC) plastic pipe	ASTM D1785; CSA B137.3
Stainless steel pipe, Types 304, 304L, 316, 316L	ASTM A312

TABLE 311.4.1
CIRCULATION SYSTEM FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D1527
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6
Copper or copper-alloy tubing	ASME B 16.15
Polyvinyl chloride (PVC) plastic pipe	ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3
Stainless steel pipe, Types 304, 304L, 316, 316L	ASTM A182; ASTM A403

311.4.3 Piping subject to freezing. Piping subject to damage by freezing shall have a uniform slope in one direction and shall be equipped with valves for drainage or shall be capable of being evacuated to remove the water.

❖ Many outdoor pools are only used seasonally because the weather conditions are too cold for bathers. Some climates experience freezing temperatures such that water remaining in circulation system piping would freeze and break the piping. Piping that could freeze must be drained of water. This section requires that the piping be sloped to a drain point or some other method for removing the water from the piping is provided. Piping in pools that are disassembled and stored in the winter is not subject to damage from freezing.

311.4.4 Suction outlet fitting assemblies. Suction outlet fitting assemblies shall be *listed* and *labeled* in compliance with APSP 16.

❖ APSP 16 requires testing of each design of suction outlet fitting assembly to verify that the design meets the suction entrapment avoidance criteria (see Commentary Figure 311.4.1).

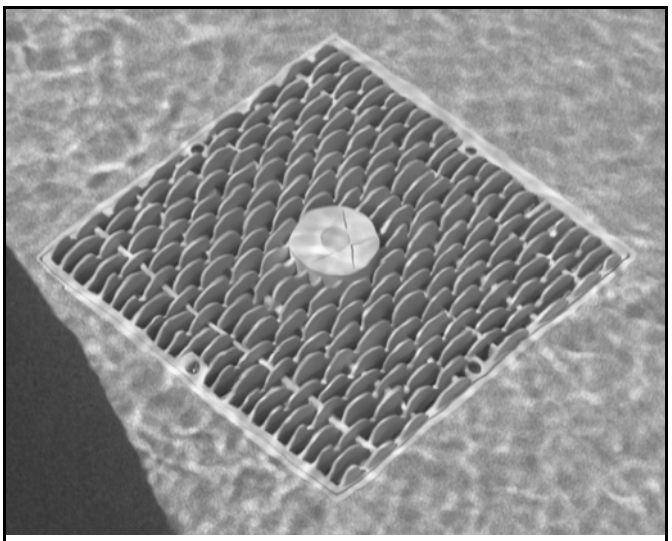


FIGURE 311.4.1
SUCTION OUTLET COVER

311.5 System draining. Equipment shall be designed and fabricated to drain the water from the equipment, together with exposed face piping, by removal of drain plugs, manipulating valves, or by other methods. Drainage shall be in accordance with manufacturer's specifications.

❖ Circulation system equipment must be protected from water freezing and damaging the equipment. This section requires that a method for draining water from the equipment be provided (see the commentary to Section 307.5).

311.6 Pressure or vacuum gauge. Gauges shall be provided on the circulation system for public pools. Gauges shall be provided with ready access.

1. A pressure gauge shall be located downstream of the pump and between the pump and filter.
2. A vacuum gauge shall be located between the pump and filter and upstream of the pump.

❖ Pressure (and vacuum) gauges provide operational information about the circulation system such as when a pump is running, condition of the filter media and when it is safe to open a filter unit. It would be difficult to operate a public pool without gauges being installed. Circulation systems for other than public pools are not as complex and operation of those systems can be accomplished without gauges.

The pressure gauge is installed between the pump and filter, or can be installed in the drain plug opening on the pressure side of the pump housing. If a pressure gauge calibrated in pounds per square inch (psi) is used, the pressure indicated can be multiplied by 2.31 feet per psi to approximate the pressure head (in feet of water head) of the circulation system. The vacuum gauge is installed on the suction side of the pump, or it can be installed in the drain plug opening on the suction side of the pump housing. If the vacuum gauge, calibrated in inches of mercury column, is used, the vacuum indicated can be multiplied by 1.13 feet per inch of mercury column to approximate the suction head (in feet of water head) of the circulation system. Adding the suction and pressure heads together when the pump is running, provides a close approximation of the total dynamic head of the circulation system. Commentary Figure 311.6 shows pressure and vacuum gauges installed on a circulation pump.

311.7 Flow measurement. Public swimming pools and wading pools shall be equipped with a flow-measuring device that indicates the rate of flow through the filter system. The flow rate measuring device shall indicate gallons per minute (lpm) and shall be selected and installed to be accurate within plus or minus 10 percent of actual flow.

❖ Flow meters for public swimming pool and wading pool filter systems are necessary to verify that the flow rate achieves the required turnover rate. If the filter clogs, the circulation system will not provide enough circulation to keep the water in a sanitary condition. The location of the flow meter greatly affects accuracy and the accuracy published by the manufacturer is dependent on being installed in accordance with the flow meter's instructions. The most common flow meters require 10 pipe diameters of straight pipe upstream of the flow meter location. Commentary Figure 311.7 shows the display panel for a typical flow meter.

311.8 Instructions. Written operation and maintenance instructions shall be provided for the circulation system of public pools.

❖ Public pool circulation systems can be complex. Written instructions provide the needed information to troubleshoot problems, properly maintain the equipment and operate the system as was intended by the designer.

311.9 Hydrostatic pressure test. Circulation system piping, other than that integrally included in the manufacture of the pool or spa, shall be subjected to a hydrostatic pressure test of 25 pounds per square inch (psi) (172.4 kPa). This pressure shall be held for not less than 15 minutes.

❖ Field-installed circulation system piping must be tested for leaks. Ideally, this testing should occur before backfilling with earth, placement of concrete or application of shotcrete so that repairs are simple to perform. Where circulation system piping is included as part of the manufacture of a factory-built pool or spa, field pressure testing is not required. Typically, factory-built circulation systems are only designed to withstand a test pressure of 1.5 times the rated pressure of the pump. Section 302.7 prohibits the use of compressed air for testing.

SECTION 312
FILTERS

312.1 General. The provisions of this section apply to filters for pools and spas.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes a filter that is in accordance with Section 704.

❖ Section 312 covers filters for all pools and spas other than those for portable residential spas and portable exercise spas. Commentary Figure 312.1 shows three common filter types.

312.2 Design. Filters shall have a flow rating equal to or greater than the design flow rate of the system. Filters shall be installed in accordance with the manufacturer's instructions. Filters shall be designed so that filtration surfaces can be inspected and serviced.

❖ In order to ensure effective filtration and removal of unwanted particulates and to minimize system total dynamic head, the maximum filter flow rate must be compatible with the complete circulation system (including pipe, fitting and pump sizing). Filters must have the capacity to pass water through the unit at the design flow rate of the circulation system when the filter is in clean condition. The filter surfaces must be able to be inspected and cleaned or replaced when dirty. Filters must be installed according to the manufacturer's instructions to ensure proper performance. APSP 15 covers sizing of various types of filters.

FIGURE 311.6
LOCATION OF PRESSURE GAUGES

FIGURE 311.7
TYPICAL FLOW METER DISPLAY PANEL

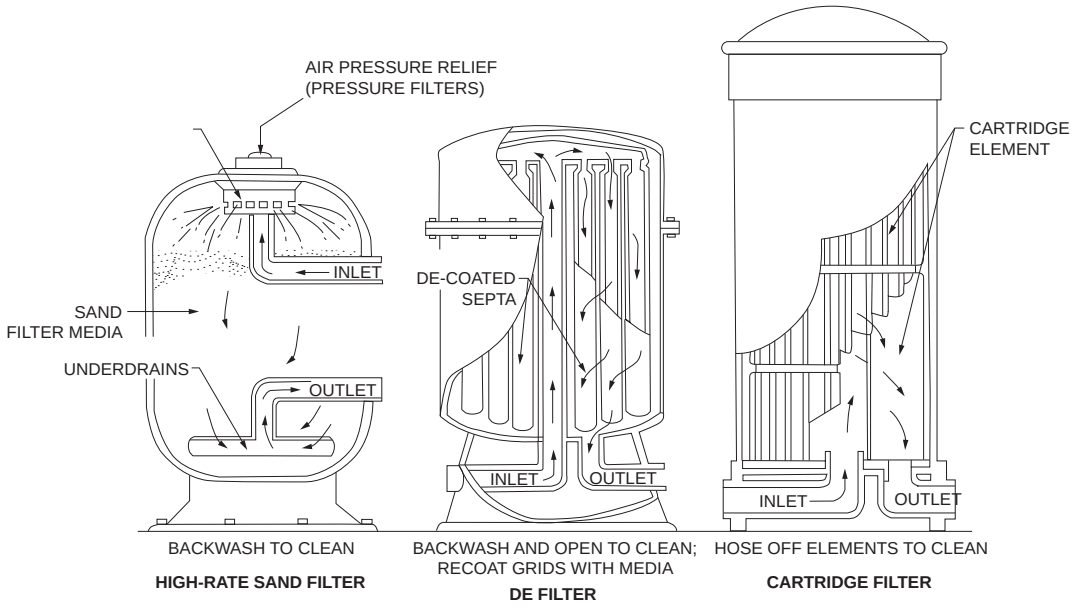


FIGURE 312.1
TYPICAL FILTER TYPES
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

312.3 Internal pressure. For pressure-type filters, a means shall be provided to allow the release of internal pressure.

❖ A pressure filter could retain internal pressure after the pump has been shut off. Some type of pressure relief device for the filter must be provided.

312.3.1 Air release. Filters incorporating an automatic means of internal air release as the principal means of air release shall have one or more lids that provide a slow and safe release of pressure as a part of the design and shall have a manual air release in addition to an automatic release.

❖ Buildup of air pressure in a filter can be very hazardous and can result in the separation of the filter or forceful release of various sections of the filter. Some filters have an automatic air release device that relieves air pressure in the filter. The lids for these filters must be designed to relieve pressure before allowing the lid to be removed. Automatic air release devices must be provided with a manual air release device. Only original equipment manufacturers' air release systems should be installed on equipment, as other air release systems might not be properly designed to safely relieve air pressure. Commentary Figure 312.3.1(1) shows a sand filter unit with air release. Commentary Figure 312.3.1(2) shows a cartridge filter unit with air release.

312.3.2 Separation tanks. A separation tank used in conjunction with a filter tank shall have a manual method of air release or a lid that provides for a slow and safe release of pressure as it is opened.

❖ Separation tanks are typically used in conjunction with diatomaceous earth (DE) to capture backwash carryover of the media. The tank must have an air release or a lid design that cannot be fully opened until pressure is relieved. Commentary Figure 312.3.2 shows a separation tank with a filter tank arrangement.

SECTION 313
PUMPS AND MOTORS

313.1 General. The provisions of this section apply to pumps and motors for pools and spas.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes a pump and motor that is in accordance with Section 704.

❖ Section 313 covers pumps and motors for all pools and spas other than those for portable residential spas and portable exercise spas.

FIGURE 312.3.1(1)
SAND FILTER WITH AUTOMATIC AIR RELEASE
(Photo courtesy of Zodiac Pool Systems, Inc.)

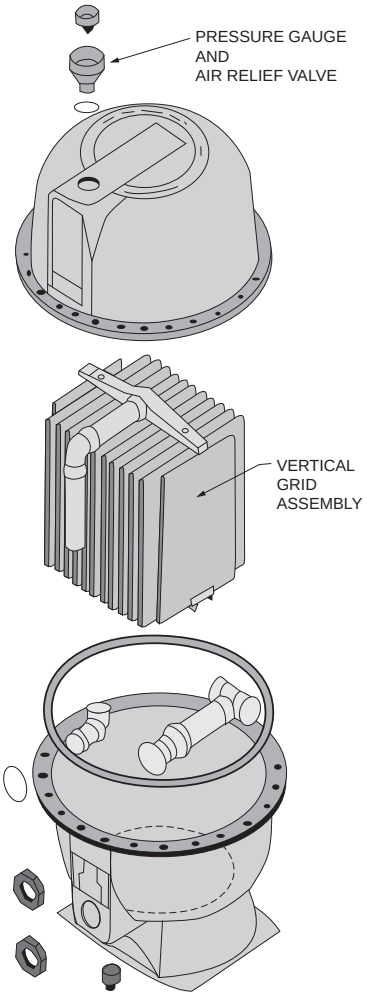


FIGURE 312.3.1(2)
GRID FILTER WITH AIR RELEASE
(Illustration courtesy of Pentair Aquatic Systems)

313.2 Performance. A pump shall be provided for circulation of the pool water. The pump shall be capable of providing the flow required for filtering the pool water and filter cleaning, if applicable, against the total dynamic head developed by the complete system.

❖ A pump must be installed to circulate the water in a pool or spa through a filter and return the water to the pool or spa. The pump must have the capability of providing for the required flow rate at the total dynamic head of the circulation system. Commentary Figure 313.2 shows one-pump and two-pump systems.

All centrifugal pumps are capable of operating over a wide flow range that is determined by the rest of the system, including pipe size and length of pipe run, filter size and many other engineering factors. Commentary Figure 311.2.1(2) illustrates the performance of a single-speed pump performance where installed on three different systems. Design professionals need to factor in all elements of the system before selecting a pump of any type. Where two-speed and variable-speed pumps are used, they can be field adjusted to meet this and other performance requirements, including energy efficiency, without detailed head loss calculations.

Multispeed pumps must have a speed capable of meeting the required gpm to operate the cleaning or auxiliary function plus a lower speed that meets the energy efficiency requirements and limited turnover rate for residential swimming pool filtration systems. APSP 15 covers the details concerning pump selection.

APSP 15 (as referenced by Section 303.3) requires pumps for residential pools and inground spas be listed in the APSP Appliance Efficiency Pool Pump Database or the California Energy Commission's Appliance Efficiency Database for Residential Pool Pumps.

Proper pump location is critical in getting the expected performance of a pump. Suction lift, static head, equipment vault/room heat and humidity, electrical load schedule, drainage and serviceability are all important factors.

313.3 Intake protection. A cleanable strainer, skimmer basket, or screen shall be provided for pools and spas, upstream or as an integral part of circulation pumps, to remove solids, debris, hair, and lint on pressure filter systems.

❖ Where a public pool or spa has a pressure filter system, the intake to the circulation pump must have a strainer to remove solids, debris, hair and lint before becoming trapped in the filter unit.

313.4 Location. Pumps and motors shall be accessible for inspection and service in accordance with the manufacturer's specifications.

❖ Pumps and motors require inspection and servicing so it is important that manufacturer's instructions concerning required access be followed.

313.5 Safety. The design, construction, and installation of pumps and component parts shall be in accordance with the manufacturer's specifications.

❖ Pumps and component parts must be installed in accordance with the manufacturer's instructions.

313.6 Isolation valves. Shutoff valves shall be installed on the suction and discharge sides of pumps that are located below the waterline. Such valves shall be provided with access.

❖ Pumps located below the waterline would be impossible to remove and replace without draining the pool or spa if shutoff valves were not provided on the inlet and outlet piping to the pump.

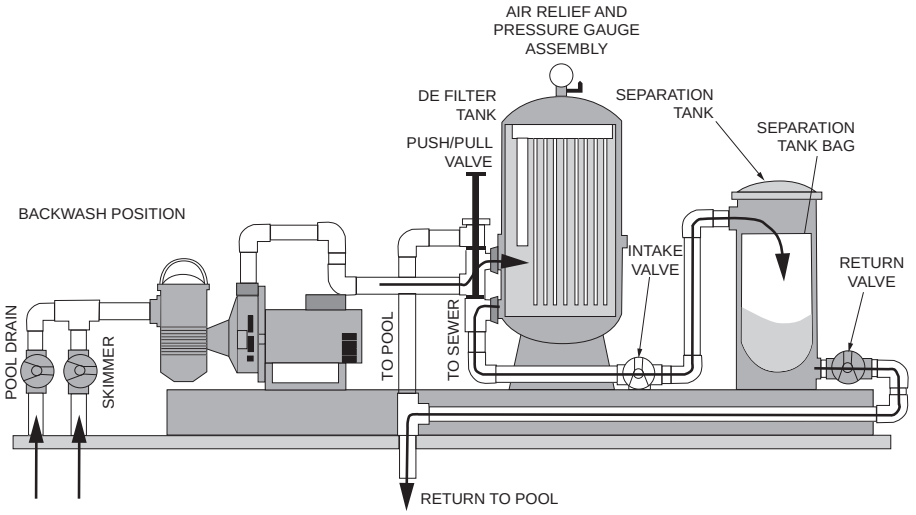


FIGURE 312.3.2
SEPARATION TANK WITH FILTER TANK ARRANGEMENT
(Illustration courtesy of PoolPlaza.com)

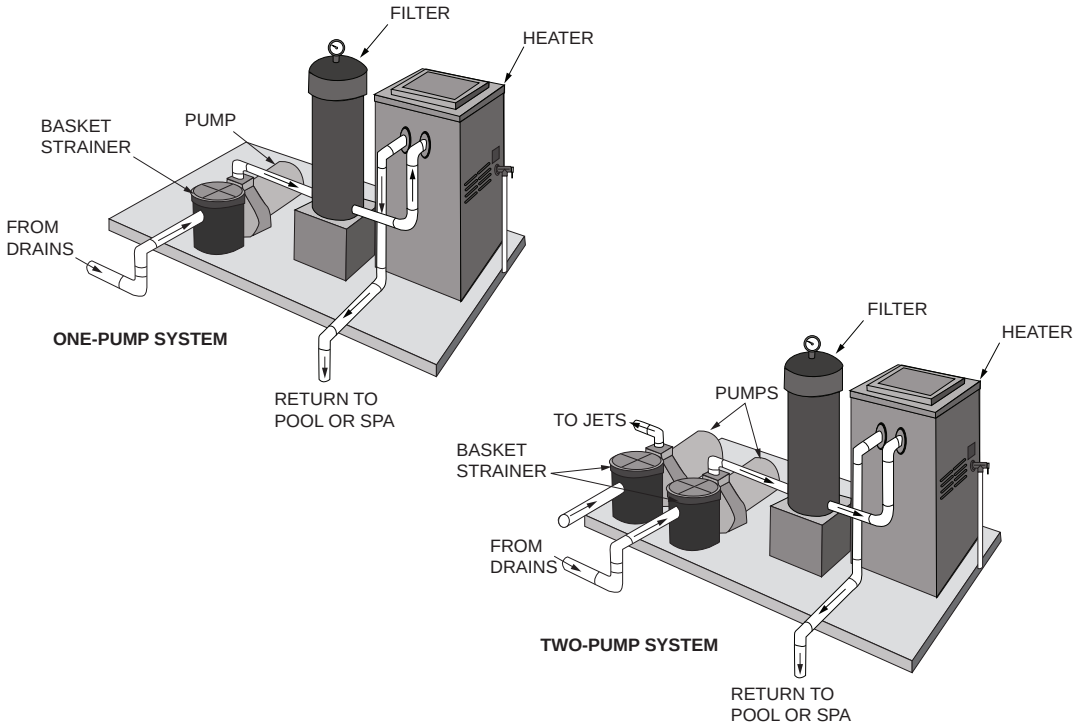


FIGURE 313.2
SINGLE- AND DOUBLE-PUMP CONFIGURATIONS
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

313.7 Emergency shutoff switch. An emergency shutoff switch shall be provided to disconnect power to recirculation and jet system pumps and air blowers. Emergency shutoff switches shall be: provided with access; located within sight of the pool or spa; and located not less than 5 feet (1524 mm) horizontally from the inside walls of the pool or spa.

Exception: *Onground storable pools*, permanent inground *residential* swimming pools, *residential* spas and *residential* water features.

❖ If an emergency condition develops with a swimmer or bather in a pool or spa, quick shutdown of the recirculation system and air blowers enables rescuers to see into the water more clearly (see Commentary Figure 313.7). Onground storable and permanent inground residential swimming pools are exempt from this requirement, as providing a disconnect would simply invite children to tamper with the switch and result in the circulation system not operating for long periods of time.

FIGURE 313.7
EMERGENCY SHUTOFF FOR CIRCULATION PUMPS AND AIR BLOWERS

313.8 Motor performance. Motors shall comply with UL 1004-1, UL 1081, CSA C22.2 No. 108 or the relevant motor requirements of UL 1563 or CSA C22.2 No. 218.1, as applicable.

❖ Motors for pumps must meet one of the standards listed to ensure quality and safety.

SECTION 314
RETURN AND SUCTION FITTINGS

314.1 General. The provisions of this section apply to return and suction fittings for pools and spas

Exception: Portable *residential* spas and portable *residential* exercise spas.

❖ Section 314 covers return and suction fittings for all pools and spas other than those for portable residential spas and portable exercise spas.

314.2 Entrapment avoidance. Entrapment avoidance means shall be provided in accordance with Section 310.

❖ Suction fittings, if not designed and installed properly, have the potential to entrap a swimmer. This section refers to the regulations in Section 310, which directs the code user to comply with APSP 7.

314.3 Flow distribution. The suction outlet fitting assemblies, where installed, and the skimming systems shall each be designed to accommodate 100 percent of the circulation turnover rate.

❖ Pools and spas are not required to have submerged suction outlets or main drains in order to maintain adequate circulation and sanitization of the water in the pool or spa. [APSP 7, as referenced by Section 310, also indicates that submerged suction outlets (main drains) are optional.] If one or two submerged suction outlets are provided, each suction outlet fitting must be designed for the full design flow rate required by the turnover rate. If three or more suction outlets are provided, see APSP 7. Skimming systems must also be designed for the full design flow rate required by the turnover rate.

314.3.1 Multiple systems. Where multiple systems are used in a single pool to meet this requirement, each subsystem shall proportionately be designed such that the maximum design flow rates cannot be exceeded during normal operation.

❖ Some pools and spas might require multiple circulation systems. Each system's suction outlet fittings must be designed for the full design flow rate for the individual system.

314.4 Return inlets. One return inlet shall be provided for every 300 square feet (27.9 m^2) of pool surface area, or fraction thereof.

Exception: *Onground storable pools*.

❖ Having a sufficient number of return inlets into a pool or spa provides for proper circulation of the water. A return inlet for each 300 square feet (27.87 m^2) of pool or spa water surface ensures that enough inlets are provided; however, more inlets may be used. Commentary Figure 314.4 shows a typical return inlet.

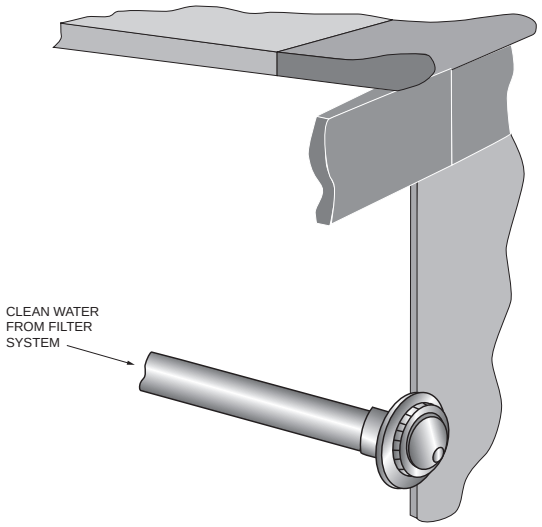


FIGURE 314.4
TYPICAL RETURN INLET
(Illustration courtesy of Pentair Aquatic Systems)

314.4.1 Design. Return and suction fittings for the circulation system shall be designed so as not to constitute a hazard to the bather.

❖ The bather is exposed to the fittings at the termination of the return inlets and suction. The fittings should not excessively protrude from the inside surface of the pool or spa, and the surfaces of the fittings should be smooth.

314.5 Vacuum fittings. Where installed, s*ubmerged vacuum fittings* shall be accessible and shall be located not greater than 12 inches (305 mm) below the water level.

❖ A submerged vacuum fitting is a special suction outlet fitting that is located in the wall of the pool or spa just below the waterline. The purpose of the fitting is to allow maintenance personnel to connect vacuuming equipment to the suction side of the circulation system so that the floor of the pool or spa can be cleaned. The reference to Section 310 in Section 314.2 directs the code user to APSP 7 as a submerged vacuum fitting is a suction outlet. The standard specifies the location of the fitting and requires that the fitting have a self-closing, self-latching cover. The standard also requires that the piping to the suction fitting be provided with a shutoff valve.

SECTION 315
SKIMMERS

315.1 General. The provisions of this section apply to skimmers for pools and spas.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes a skimming system that is in accordance with Section 704.

❖ Section 315 covers skimmers for all pools and spas other than those for portable residential spas, portable exercise spas and onground storable pools.

315.2 Required. A surface skimming system shall be provided for public pools and spas. Surface skimming systems shall be *listed* and *labeled* in accordance with NSF 50. Either a surface skimming system or perimeter overflow system shall be provided for permanent inground *residential* pools and permanent *residential* spas. Where installed, surface skimming systems shall be designed and constructed to create a skimming action on the pool water surface when the water level in the pool is within operational parameters.

Exceptions:

1. Class D public pools designed in accordance with Chapter 6.
2. Skimmers that are an integral part of a spa that has been *listed* and *labeled* in accordance with UL1563 shall not be required to be *listed* and *labeled* in accordance with NSF 50.

❖ A skimming system causes flow on the water surface to direct floating particles and oils to the skimmer openings at the walls of the pool or spa. Commentary Figure 315.2(1) shows a skimmer wall opening. The water collected by the skimmers is directed into the circulation system for the pool or spa. An alternative to a skimmer system is a perimeter overflow system, which consists of a continuous gutter arrangement completely or partially around the pool or spa. Commentary Figure 315.2(2) shows a perimeter overflow system. The water level in the pool or spa is manually or automatically adjusted so that surface water continuously flows into the gutter and then into the circulation system.

The exception allows Class D public pools to not have a skimming system because these pools do not have a consistent level water surface during operation that would allow a skimming system to be effective.

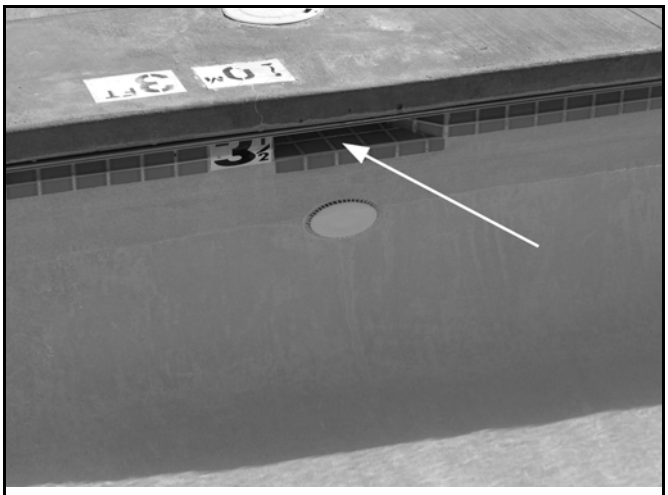


FIGURE 315.2(1)
SKIMMER OPENING IN WALL

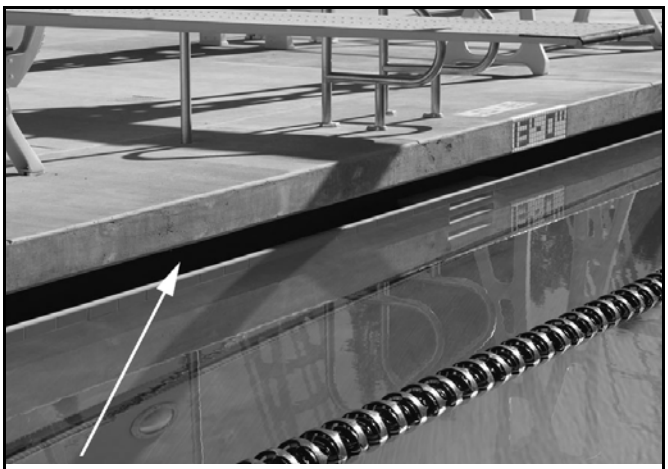


FIGURE 315.2(2)
PERIMETER OVERFLOW (GUTTER) SKIMMING SYSTEM

315.2.1 Circulation systems. Public pool circulation systems shall be designed to process not less than 100 percent of the turnover rate through skimmers.

❖ The circulation system of a public pool or spa must have the capability to handle the turnover rate (the flow necessary to circulate the entire volume of the pool or spa in so many hours) for the pool or spa through the skimming system.

315.3 Skimmer sizing. Where automatic surface skimmers are used as the sole overflow system, not less than one surface skimmer shall be provided for the square foot (square meter) areas, or fractions thereof, indicated in Table 315.3. Skimmers shall be located to maintain effective skimming action.

❖ Depending on the type of pool or spa that a skimmer is installed in, the effectiveness of the skimmer is limited by the water surface area that the skimmer is intended to cover. Table 315.3 indicates the maximum water surface area that a skimmer can cover.

TABLE 315.3
SKIMMER SIZING TABLE

POOL OR SPA	AREA PER SKIMMER (SQ. FT)
Public pool	500
Residential pool	800
Spas (all types)	150

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

❖ Spas have warm water and turbulence that accelerates the removal of body oil, hair and dead skin. Therefore, spas need a higher density of skimmers than pools. Residential pools typically do not have the bather load that a public pool has, so those pools have the lowest density of skimmers.

315.4 Perimeter coverage. Where a perimeter-type surface skimming system is used as the sole surface skimming system, the system shall extend around not less than 50 percent of the pool or spa perimeter.

❖ Perimeter skimming systems are not required to be completely around the pool or spa, but they must be present for at least 50 percent of the perimeter.

315.4.1 Surge capacity. Where perimeter surface skimming systems are used, they shall be connected to a circulation system with a system surge capacity of not less than 1 gallon for each square foot (40.7 liters per square meter) of water surface. The capacity of the perimeter overflow system and related piping is permitted to be considered as a portion of the surge capacity.

❖ A perimeter surface skimming system [see Commentary Figure 315.2(2)] could become "flooded" if a large number of bathers enter the pool or spa in a short amount of time. Flooding of the system would allow the particulates already captured by the system to refloat out onto the surface of the water. This section requires that perimeter skimming systems have a minimum surge capacity based on the water surface area of the pool or spa so that the potential for a flooding event is minimized.

315.5 Equalizers. Equalizers on skimmers shall be prohibited.

❖ An equalizer for a surface skimmer is a pipe installed between the pool or spa to the skimmer body. The pipe is below the waterline [see Commentary Figure 315.5(1)]. The purpose of an equalizer pipe is to make sure that the skimmer is constantly supplied with water, so that air is not pulled into the circulation system should the pool or spa water level drop below the elevation of the skimmer. Because the inlet of the equalizer pipe is submerged in the pool or spa, this could constitute a suction outlet. With proper circulation system design, equalizers are unnecessary and because they might not be provided with proper protection, the code simply prohibits them.

Commentary Figure 315.5(2) shows a skimmer equalizer that was retrofitted with a suction outlet cover (it is unknown whether this particular cover complies with APSP 16). New construction in compliance with this code would not allow a skimmer equalizer. However, skimming systems for public pools in existence prior to adoption of this code were required to have suction outlet covers installed on equalizers as the design of those circulation/skimming systems might have not tolerated elimination of the equalizer.

315.6 Hazard. Skimming devices shall be designed and installed so as not to create a hazard to the user.

❖ The inlet to a surface skimmer could pose a danger to a bather with respect to entrapment of hands and arms. Proper design of the skimmer ensures that such hazards are abated.

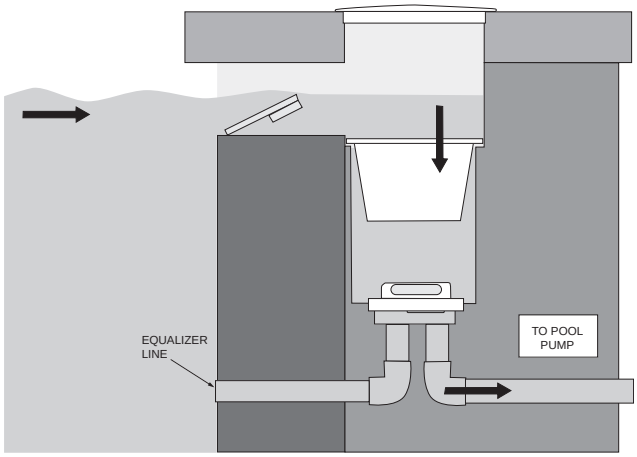


FIGURE 315.5(1)
PROHIBITED SKIMMER EQUALIZER LINE
(Illustration courtesy of PoolPlaza.com)

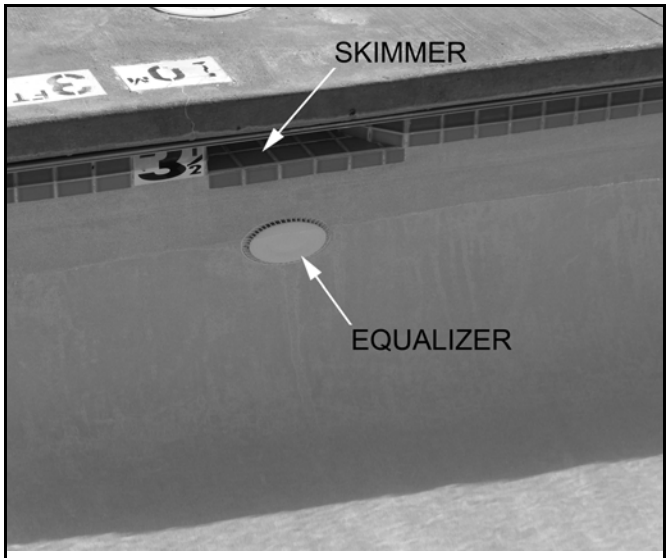


FIGURE 315.5(2)
SUCTION OUTLET COVER INSTALLED ON EXISTING SKIMMER EQUALIZER (NOT PERMITTED FOR NEW CONSTRUCTION)

SECTION 316
HEATERS

316.1 General. The provisions of this section apply to heaters for pools and spas.

Exception: Portable *residential* spas and portable *residential* exercise spas.

❖ Section 316 covers heaters for all pools and spas other than those for portable residential spas and portable exercise spas. Commentary Figure 316.1 shows typical heater configurations.

316.2 Listed and labeled. Heaters shall be *listed* and *labeled* in accordance with the applicable standard listed in Table 316.2.

❖ Heating equipment must be listed and labeled to one or more of the applicable standards in Table 316.2 to ensure safe, reliable operation of such units. Water heaters must comply with one or more of the standards listed so that quality and safety of the appliance is ensured.

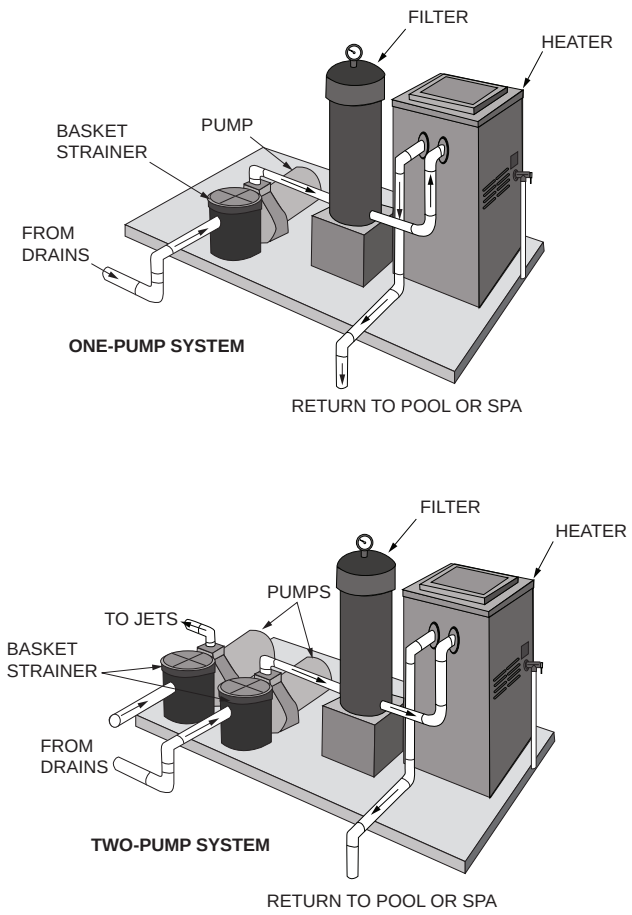


FIGURE 316.1
TYPICAL HEATER CONFIGURATIONS
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

316.3 Sizing. Heaters shall be sized in accordance with the manufacturer's specifications.

❖ Sizing of a pool heater is not an exact science because of the unknown variables, such as the desired temperature setting, wind on the water surface area, air temperature and the amount of time it takes to bring up to temperature. Manufacturers of water heaters have the experience to make appropri-

TABLE 316.2
WATER HEATERS

DEVICE	STANDARD
Electric water heater	UL 1261, UL 1563 or CSA C22.2 No. 218.1
Gas-fired water heater	ANSI Z21.56/CSA 4.7a
Heat exchanger	NSF 50
Heat pump water heater	UL 1995, AHRI 1160, CSA C22.2 No. 236
Photovoltaic solar water heaters	NSF 50
Thermal radiant solar water heater	NSF 50

ate recommendations for satisfactory outcomes in various climates.

316.4 Installation. Heaters shall be installed in accordance with the manufacturer's specifications and the *International Fuel Gas Code*, *International Mechanical Code*, *International Energy Conservation Code*, NFPA 70 or *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ Depending on the energy sources required by the heater and what type of building the pool or spa is associated with, various codes could have requirements that affect the installation of water heaters. Installation of any pool or spa water heater must be performed in accordance with the manufacturer's instructions, as well as any codes that apply to such installations.

316.4.1 Temperature. A means shall be provided to monitor water temperature.

❖ Pool and spa water heaters must have controls that monitor the temperature of the water discharged. Commentary Figure 316.4.1 shows a typical heater control.

FIGURE 316.4.1
TYPICAL TEMPERATURE CONTROL
(Photo courtesy of Pentair Aquatic Systems)

316.4.2 Access prohibited. For public pools and spas, public access to controls shall be prohibited.

❖ In a public environment, the controls for pool or spa water heating must be protected against tampering by unauthorized persons. Controls typically are located behind a locked door or gate.

316.5 Heater circulation system. Heater circulation systems shall comply with Sections 316.5.1 and 316.5.2.

❖ Sections 316.5.1 and 316.5.2 provide requirements for pool and spa water heater circulation systems.

316.5.1 Water flow. Water flow through the heater bypass piping, back-siphonage protection, and the use of heat sinks shall be in accordance with the heater manufacturer's specifications.

❖ The discharge temperature from some pool and spa water heaters is controlled by blending cool water from the inlet of the heater with hotter water coming from the outlet of the heating element or heat exchanger. The cool water flows through bypass piping. The piping from the outlet of the heating element or heat exchanger is subject to temperatures that are too extreme to be carried by polyvinyl chloride (PVC) plastic pipe. A heat sink pipe of metal or high-temperature plastic must be used to accommodate the higher temperatures before the hot water is blended with cooler water. The type and arrangement of bypass piping and heat sink piping must be in accordance with the manufacturer's instructions.

316.5.2 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.

❖ Abruptly shutting off the flow through a pool or spa water heater immediately after the element or burner stops can cause damage to the heater. Circulation pumps must be kept running for a period of time after the heater has shut off to cool down the heater components.

SECTION 317
AIR BLOWER AND AIR INDUCTION SYSTEM

317.1 General. This section applies to devices and systems that induce or allow air to enter pools and spas either by means of a powered pump or passive design.

❖ Section 317 covers those devices that push air into the pool or spa to create turbulence.

317.2 Backflow prevention. Air blower systems shall be equipped with backflow protection as specified in UL 1563 or CSA C22.2 No. 218.1.

❖ An air blower system must be protected against the backflow of water into the air-producing unit to prevent damage to the unit. The standards indicated cover such methods or devices that will prevent this from happening.

317.3 Air intake source. Air intake sources shall not induce water, dirt or contaminants.

❖ The air drawn by the air induction system must be filtered and protected from rainwater entry.

317.4 Sizing. Air induction systems shall be sized in accordance with the manufacturer's specifications.

❖ Manufacturers of air induction systems have the experience to properly size systems for pools or spas. Manufacturer's instructions for such systems must be followed.

317.5 Inspection and service. Air blowers shall be provided with access for inspection and service.

❖ Air blowers for air induction systems consist of an air pump with a motor. The blower must be serviced or replaced periodically, so such units must be provided with access for that purpose.

SECTION 318
WATER SUPPLY

318.1 Makeup water. Makeup water to maintain the water level and water used as a vehicle for sanitizers or other chemicals, for pump priming, or for other such additions, shall be from a potable water source.

❖ Pools and spas will lose water by evaporation and carryout on bather's bodies. Water used to either refill the pool or spa or provide it with sanitizing chemicals must be potable water.

318.2 Protection of potable water supply. Potable water supply systems shall be designed, installed and maintained so as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply through cross-connections or other piping connections to the system. Means of protection against backflow in the potable water supply shall be provided through an air gap complying with ASME A112.1.2 and the *International Residential Code* or the *International Plumbing Code*, as applicable in accordance with Section 102.7.1.

❖ Water supplies to a pool or spa or to the equipment serving it must be kept in a potable condition. This section requires that potable water be provided to the pool or spa or equipment through an air gap.

318.3 Over-the-rim spouts. Over-the-rim spouts shall be located under a diving board, adjacent to a ladder, or otherwise shielded so as not to create a hazard. The open end of such spouts shall not have sharp edges and shall not protrude more than 2 inches (51 mm) beyond the edge of the pool. The open end shall be separated from the water by an air gap of not less than 1.5 pipe diameters measured from the pipe outlet to the rim.

❖ Where water is discharged into the pool or spa through an over-the-rim spout, the spout needs to be in a protected area, such as under a diving board, if one exists. Spouts must not have sharp edges and must not project beyond the edge of the vessel by more than 2 inches (50.8 mm). The outlet must be located at least 1.5 pipe diameters above the rim of the vessel.

SECTION 319
SANITIZING EQUIPMENT

319.1 Equipment standards. Sanitizing equipment installed in public pools and spas shall be capable of introducing the quantity of sanitizer necessary to maintain the appropriate levels under all conditions of intended use.

❖ Public pools or spas must have a sanitizing system that ensures that appropriate sanitation of the water is maintained under all intended use conditions. Commentary Figure 319.1 shows a typical sanitizing equipment room.

FIGURE 319.1
TYPICAL SANITIZING EQUIPMENT ROOM

319.2 Chemical feeders. Where installed, chemical feed systems shall be installed in accordance with the manufacturer's specifications. Chemical feed pumps shall be wired so that they cannot operate unless there is adequate return flow to disburse the chemical throughout the pool or spa as designed.

❖ If chemical feeders are installed, it must be in accordance with the manufacturer's instructions. The flow from chemical feeders must be mixed with the return inlet flow to the pool or spa so that the chemicals are distributed throughout the pool or spa.

SECTION 320
WASTE WATER DISPOSAL

320.1 Backwash water or draining water. Backwash water and draining water shall be discharged to the sanitary or storm sewer, or into an *approved* disposal system on the premise, or shall be disposed of by other means *approved* by the state or local authority. Direct connections shall not be made between the end of the backwash line and the disposal system. Drains shall discharge through an air gap.

❖ Water from pool or spa filter system backwashing or from draining a pool or spa must be disposed of in a sanitary sewer system, in a storm water system, in an approved disposal system on the premises or in accordance with the requirements of the state or local authority. Backwash drain lines and drain lines must not be directly connected to the point of disposal [see Commentary Figures 320.1(1) through (3)].

320.2 Water salvage. Filter backwash water shall not be returned to the vessel except where the backwash water has been filtered to remove particulates, treated to eliminate coli form bacteria and waterborne pathogens, and such return has been *approved* by the state or local authority.

❖ Backwash water from a circulation filter unit must not be returned to the pool or spa unless it has been filtered and treated to remove coliform bacteria and

pathogens. Reuse of water must be approved by the state or local authority.

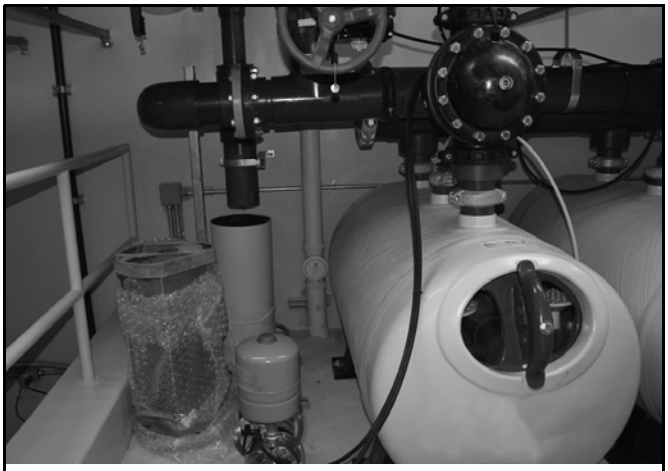


FIGURE 320.1(1)
TYPICAL WASTEWATER DISPOSAL

FIGURE 320.1(2)
AIR GAP AT WASTEWATER DISPOSAL POINT

320.3 Waste post treatment. Where necessary, filter backwash water and drainage water shall be treated chemically or through the use of settling tanks to eliminate or neutralize chemicals, diatomaceous earth, and contaminants in the water that exceed the limits set by the state or local effluent discharge requirements.

❖ State or local authorities could set limitations on what level of contaminants can be in wastewater from pools and spas when such water is discharged to a sanitary sewer system or a storm sewer system. If the wastewater exceeds those limits, some type of pretreatment might be necessary, including treatment with chemicals, settling or other methods.

SECTION 321
LIGHTING

321.1 General. The provisions of Sections 321.2 and 321.3 shall apply to lighting for public pools and spas. The provisions of Section 321.4 shall apply to lighting for residential pools and spas.

❖ Sections 321.2 and 321.3 cover lighting requirements for public pools and spas. Section 321.4 covers lighting requirements for residential pools and spas. This section applies to inground, above ground, indoor, outdoor, permanent, temporary and portable installations.

321.2 Artificial lighting required. When a pool is open during periods of low natural illumination, artificial lighting shall be provided so that all areas of the pool, including all suction outlets on the bottom of the pool, will be visible. Illumination shall be sufficient to enable a lifeguard or other persons standing on the deck or sitting on a lifeguard stand adjacent to the pool edge to determine if a pool user is lying on the bottom of the pool and that the pool water is transparent and free from cloudiness.

These two conditions shall be met when all suction outlets are visible from the edge of the deck at all times when artificial lighting is illuminated and when an 8-inch-diameter (152 mm) black disk, placed at the bottom of the pool in the deepest point, is visible from the edge of the pool deck at all times when artificial lighting is illuminated.

❖ This section and its subsections apply only to public pools. The intent is for all areas within the pool to be visible at all times that the pool is open to the public.

A public pool that is accessible to swimmers, waders and other persons, both in and out of the water, must be illuminated and the water must be of sufficient clarity to allow unimpeded viewing of all areas of the pool, including the deepest part(s) and the main drain(s) during all periods when the pool is open.

Proper and unimpeded visibility is essential at all times for swimmers in the water and persons out of the water on adjacent perimeter surfaces, such as the deck, diving boards, lifeguard stands, etc. Water is a good transmitter and diffuser of light, but it also is a good reflector. Pool lighting should be designed and installed to reduce the effects of glare caused by reflection of light off the surface of the water. Gener-

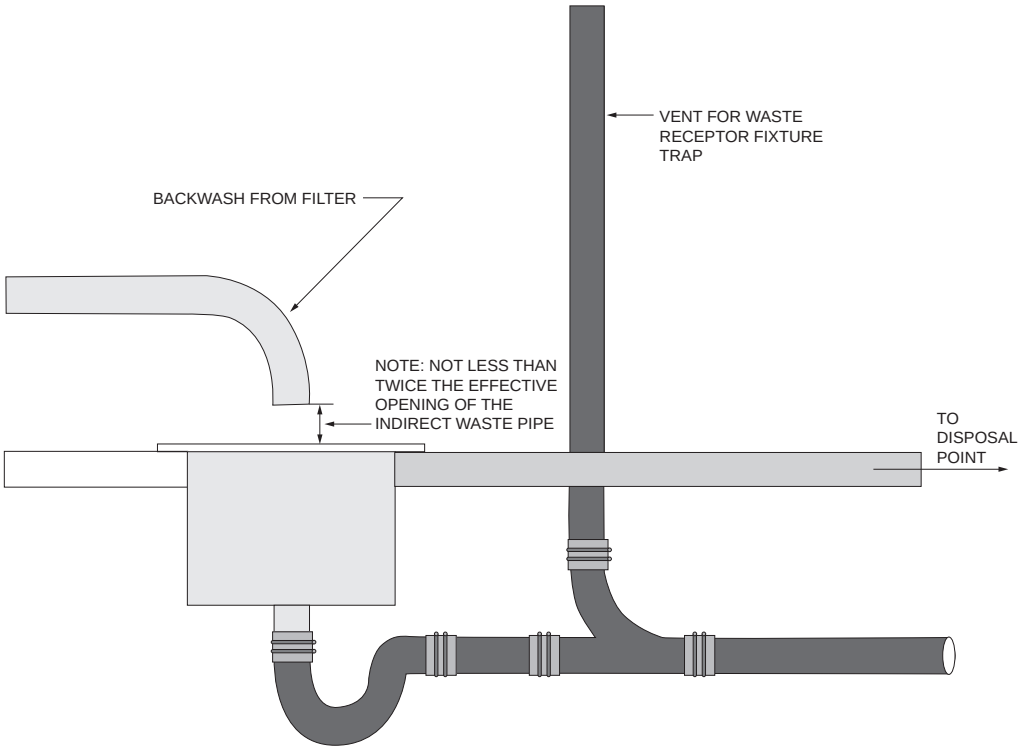


FIGURE 320.1(3)
AIR GAP AT WASTEWATER DISPOSAL POINT

ally, the glare from reflected components of light increases as the angle between the light source and the pool surface decreases. Consequently, there is minimal glare and deep penetration of light into the water from overhead luminaires, skylights and windows placed directly over the pool or spa [effectively a 90-degree (1.57 rad) angle with the surface]. As the angle becomes shallower (i.e., the light source position is moved outward away from the edge of the pool or spa and over the perimeter surface while being lowered toward pool water elevation), the reflected component increases and light penetration of the water decreases, causing what are referred to as "veiling reflections" that obscure visibility into and within the pool, by (1) making it progressively more difficult for swimmers to be seen from the perimeter surface and (2) reducing illumination in the water itself. If the overhead luminaires or exterior windows are at or near the perimeter surface level, there may be little or no visibility in the water itself, and swimmers also may not be visible from the perimeter surface.

Diffuse light sources generally will reduce glare. The use of translucent overhead skylights or windows with splayed matte-finish wells and matte-finish metallic parts produce more uniform lighting levels and prevent shafts of light from entering the pool area.

Expected water turbidity must be considered in determining proper illumination levels. Obviously, clear water is desirable for a number of reasons, including visibility. An excessively turbid pool will impede visibility both in the water and from the perimeter surface into the water, and thus poses a safety hazard.

This section requires that the artificial lighting be of an intensity to be able to see all suction outlets (whether on the bottom or on the sides) and an 8-inch-diameter black disc placed at the deepest point, when viewed from the edge of the pool (or spa). Obviously, the turbidity of the water for this "test" would have to be within acceptable parameters required by the authority that regulates public pool and spa operations.

321.2.1 Pool and deck illumination. Overhead lighting, underwater lighting or both shall be provided to illuminate the pool and adjacent deck areas. The lighting shall be *listed* and *labeled*. The lighting shall be installed in accordance with NFPA 70.

❖ When the pool is open to the public, it must have lighting for the pool and the adjacent deck. The lighting devices must be listed and labeled to a standard. The installation of such devices must be in accordance with NFPA 70.

All listed equipment will have a prominent label and an identifying mark from an independent testing labo-

ratory. Commentary Figure 321.2.1 shows an example of the typical markings. If such a label is not found on the equipment, the installer must assume that the equipment is not listed and labeled and, therefore, must not install the equipment.

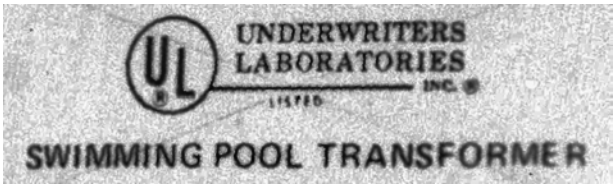


FIGURE 321.2.1
LABEL FOR LISTED AND LABELED PRODUCT
(Photo Courtesy of Hamilton & Associates Architecture, Engineering, Technical Services)

321.2.2 Illumination intensity. For outdoor pools, any combination of overhead and underwater lighting shall provide *maintained illumination* not less than 10 horizontal foot-candles (10 lumens per square foot) [108 lux] at the pool water surface. For indoor pools, any combination of overhead and underwater lighting shall provide *maintained illumination* of not less than 30 horizontal foot-candles (30 lumens per square foot) [323 lux] at the pool water surface. Deck area lighting for both indoor and outdoor pools shall provide *maintained illumination* of not less than 10 horizontal foot-candles (10 lumens per square foot) [108 lux] at the walking surface of the deck.

❖ Adequate illumination intensity (technically referred to as illuminance) over the life of the installation is essential for safety both in and around the pool. For outdoor public pools, the illumination at the surface of the water is required to be at least 10 horizontal foot-candles (10 lumens per square foot) [108 lux]. For indoor public pools, the illumination at the surface of the water is required to be at least 30 horizontal foot-candles (30 lumens per square foot) [323 lux]. The illumination values are "maintained illumination" values. "Maintained illumination" is a term that is specific to the lighting industry and is defined in Chapter 2. Illumination at the pool can be achieved by overhead area lighting, underwater lighting, or both. Many technical terms in the lighting industry are not universally understood or accepted; the specifier and purchaser should carefully consult with lighting equipment vendors to prevent misunderstanding.

According to good design practice, luminances (measured in foot-lamberts) in the pool should exceed the luminance of any reflected light to provide improved safety and visibility of swimmers, both from within the water and from the perimeter surface. While the general minimum values are indicated in this section, different locations and facility functions may require higher levels of illumination.

In addition to the lighting for in-the-pool water and on-the-pool water, this section also requires illumination of the pool deck of at least 10 horizontal foot-candles (10 lumens per square foot) [108 lux] so that egress and emergency operations around the pool are not hindered.

Obviously, light sources should be located to provide as much uniform illumination as possible throughout the pool and perimeter surface areas expected to be used by people. Any pedestrian hazards outside the perimeter surface area should also be lighted for safety.

The reflectance (in percent) of the pool basin surfaces (pool walls and bottom) can have a significant effect on illumination and visibility within the water for a given light input. Darker (less reflective) surfaces will result in darker underwater areas, requiring increased lumen output to achieve safe levels of lighting.

321.2.3 Underwater lighting. Underwater lighting shall provide not less than 8 horizontal foot-candles (8 lumens per square foot) [86 lux] at the pool water surface area, or not less than a total wattage of $^1/_2$ watt/ft^2 (5.4 watts/m^2) of pool water surface for incandescent underwater lighting where the fixtures and lamps are rated in watts.

Exception: The requirement of this section shall not apply where overhead lighting provides not less than 15 foot-candles (15 lumens per square foot) [161 lux] of *maintained illumination* at the pool water surface, the overhead lighting provides visibility, without glare, of all areas of the pool, and the requirements of Section 321.2.2 are met or exceeded.

❖ Where underwater lighting is used in public pools, not less than 8 foot-candles (8 lumens per square foot) [86 lux] must be provided at the pool water surface.

A good design practice (but not a code requirement) is to aim underwater lights upwards approximately 10 degrees (0.17 rad) above horizontal to increase the reflection of light off the water surface back into the pool to enhance underwater visibility.

Underwater lights should not be mounted so that they face swimmers in competitive lanes, but should be placed along the long side of the pool. Closer light spacing may be required for competitive pools that are too wide for safe illumination using conventional spacings. Similarly, bottom-mounted underwater lights should not be installed in the area beneath diving boards and platforms where they could interfere with divers' visibility.

Underwater lights are not required where adequate illumination levels, without glare, are achieved or exceeded with overhead area lighting. The exception recognizes that if the overhead lighting provides at least 15 foot-candles per square foot (8 lumens per square foot) [161 lux] at the water surface, without glare, the underwater lighting is not required to be 8 foot-candles (8 lumens per square foot) [86 lux].

321.3 Emergency illumination. Public pools and public pool areas that operate during periods of low illumination shall be provided with emergency lighting that will automatically turn on to permit evacuation of the pool and securing of the area in

the event of power failure. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than 0.1 foot-candle (0.1 lumen per square foot) [1 lux] measured at any point on the water surface and at any point on the walking surface of the deck, and not less than an average of 1 foot-candle (1 lumen per square foot) [11 lux]. At the end of the emergency lighting time duration, the illumination level shall be not less than 0.06 foot-candle (0.06 lumen per square foot) [0.65 lux] measured at any point on the water surface and at any point on the walking surface of the deck, and not less than an average of 0.6 foot-candle (0.6 lumen per square foot) [6.46 lux]. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

❖ Emergency escape from the water and egress from pool areas must be provided for all public pools and pool areas operating at night or during other periods of darkness or low ambient illumination. Public pools must have emergency lighting (lighting that activates in case of a power outage) that provides for at least 0.1 foot-candle (0.1 lumen per square foot) [1 lux] at the water surface and at the walking surface of the deck at the beginning of the emergency lighting period. The 0.1 foot-candle (0.1 lumen per square foot) [1 lux] minimum requirement is consistent with requirements for emergency egress lighting for other types of facilities.

Numerous means to facilitate emergency lighting are available, ranging from battery-powered wall packs and overhead light fixtures, to generator installations. For battery-powered emergency lighting, the connected and operating lighting will usually become dimmer as the battery set "dies." This code does not specify the amount of time that is required for the emergency lighting to be working. For whatever time period is required, this section does require that at the end of that time period, the illumination shall be not less than 0.06 foot-candle (0.06 lumen per square foot) [0.65 lux].

321.4 Residential pool and deck illumination. Where lighting is installed for, and in, *residential* pools and permanent *residential* spas, such lighting shall be installed in accordance with NFPA 70 or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ The code does not require lighting for residential pools and spas. Where lighting is desired by the owner, there are not any minimum illumination requirements. Residential pool and permanent residential spa lighting must be installed in accordance with NFPA 70 or the electrical provisions of the IRC. Listed self-contained (factory-built) portable electric spas and exercise spas equipped with lighting are factory configured and tested to meet the electrical requirements of standards associated with these products.

SECTION 322
LADDERS AND RECESSED TREADS

322.1 General. Ladders and recessed treads shall comply with the provisions of this section and the applicable provisions of Chapters 4 through 10 based on the type of pool or spa.

❖ This section covers the general requirements for ladders and treads used in pools and spas. Other provisions for ladders and treads found in Chapters 4 through 10 also apply.

322.2 Outside diving envelope. Where installed, steps and ladders shall be located outside of the minimum diving water envelope as indicated in Figure 322.2.

❖ The minimum diving envelope (the dimensions required for installation and use of manufactured diving equipment) is defined for public and residential

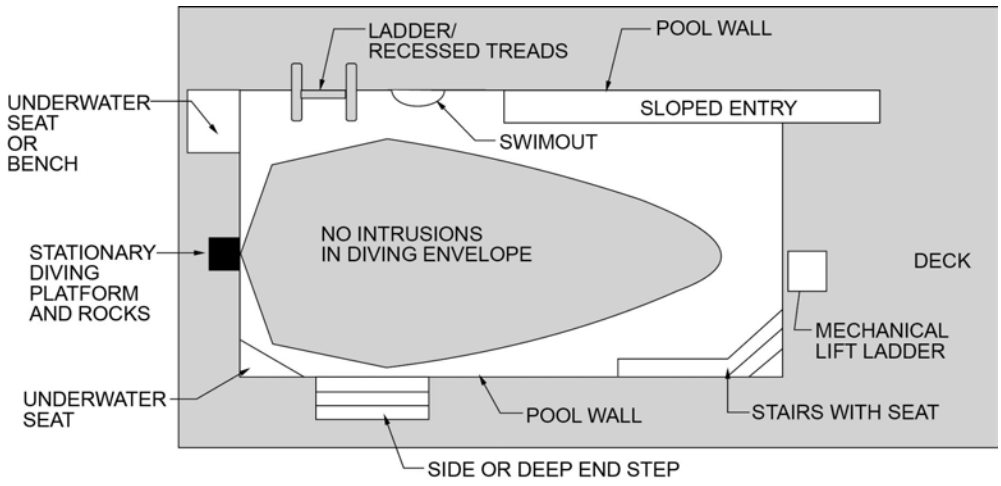


FIGURE 322.2
MINIMUM WATER DIVING ENVELOPE

inground pools in Chapters 4 and 8, respectively. Where diving equipment is installed, all protrusions, including ladders, benches, swimouts and steps, must be located outside the minimum diving envelope. Figure 322.2 illustrates a typical shape of a diving envelope. While this figure shows a stationary platform or diving rock, the same principle applies where a diving or springboard is present.

The minimum diving envelope encompasses the shape within the water that a diver's trajectory will most likely travel in the water.

322.3 Ladders. Ladder treads shall have a uniform horizontal depth of not less than 2 inches (51 mm). There shall be a uniform distance between ladder treads, with a distance of not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The top tread of a ladder shall be located not greater than 12 inches (305 mm) below the top of the deck or coping. Ladder treads shall have slip-resistant surfaces.

❖ Uniform tread depth and uniform tread spacing on ladders lowers the probability that a user could slip and fall back into the water. Slip-resistant surfaces on ladder treads are especially necessary in a wet environment.

322.3.1 Wall clearance. There shall be a clearance of not less than 3 inches (76 mm) and not greater than 6 inches (152 mm) between the pool wall and the ladder.

❖ Ladder treads are not very usable if the backside of the tread is so close to the wall that the user cannot get a good foothold onto the tread. A minimum clearance of 3 inches (76 mm) provides the necessary space for an adult foot on a tread. The clearance should not be too great, as legs and arms could get entangled behind the ladder.

322.3.2 Handrails and handholds. Ladders shall be provided with two handholds or two handrails. The clear distance between ladder handrails shall be not less than 17 inches (432 mm) and not greater than 24 inches (610 mm).

❖ Climbing a ladder is nearly impossible without using two hands on separate handholds or handrails. The separation between handrails is necessary to provide stability for the ladder user [see Commentary Figures 322.3.2(1) and 322.3.2(2)].

322.4 Recessed treads. Recessed treads shall have a minimum depth of not less than 5 inches (127 mm) and a width of not less than 12 inches (305 mm). The vertical distance between the pool coping edge, deck, or step surface and the uppermost recessed tread shall be not greater than 12 inches (305 mm). Recessed treads shall have slip-resistant surfaces.

❖ A recessed tread is a pocket built into the wall of a pool that is large enough for a foothold. A vertical series of recessed treads provides the user with a ladder effect to climb out of the pool. Slip-resistant surfaces on recessed treads are especially necessary in a wet environment.

322.4.1 Vertical spacing. Recessed treads at the centerline shall have a uniform vertical spacing of not less than 7 inches (178 mm) and not greater than 12 inches (305 mm).

❖ Uniform tread depth and uniform tread spacing on recessed treads lower the probability that a user could slip and fall back into the water.

322.4.2 Drainage. Recessed treads shall drain into the pool.

❖ Drainage of recessed treads keeps dirt from accumulating in the recessed area.

322.4.3 Handrails and grab rails. Recessed treads shall be provided with a handrail or grab rail on each side of the treads. The clear distance between handrails and grab rails shall be not less than 17 inches (432 mm) and not greater than 24 inches (610 mm).

❖ Climbing a set of recessed treads is nearly impossible without using two hands on separate grab rails or handrails. The separation between the rails is necessary to provide stability for the ladder user.

FIGURE 322.3.2(1)
LADDER AS VIEWED ABOVE THE WATERLINE

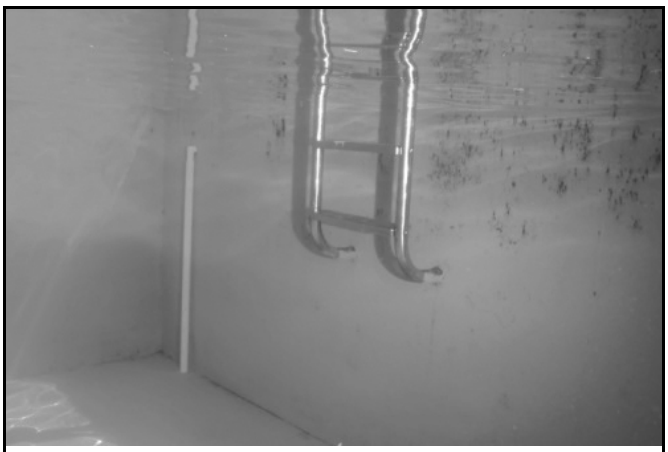


FIGURE 322.3.2(2)
LADDER AS VIEWED BELOW THE WATERLINE

SECTION 323
SAFETY

323.1 Handholds required. Where the depth below the *design waterline* of a pool or spa exceeds 42 inches (1067 mm), handholds along the perimeter shall be provided. Handholds shall be located at the top of deck or coping.

Exceptions:

1. Handholds shall not be required where an underwater bench, seat or swimout is installed.
2. Handholds shall not be required for wave action pools and action rivers.

❖ All sides of pools and spas are considered to be the nearest point of safety for water depths greater than 42 inches (1067 mm). In order for these locations to be a point of safety, there must be a place to grasp to hold the user in position at the side of the pool or spa.The edge of the decking typically is made so that it can easily be grasped or special coping materials with a rounded grasping area are installed all along these locations. Because an underwater beach, seat or a swimout provides a place for the user to sit, handholds are not required in those areas. In wave action pools and action rivers, handholds are not desirable because this would encourage users to congregate against the walls where wave action could force a user into the wall and cause injury.

323.1.1 Height above water. Handholds shall be located not more than 12 inches (305 mm) above the *design waterline*.

❖ Handholds must be close to the surface of the water so that small children can reach them.

323.1.2 Handhold type. Handholds shall be one or more of the following:

1. Top of pool deck or coping.
2. Secured rope.
3. Rail.
4. Rock.
5. Ledge.
6. Ladder.
7. Stair step.
8. Any design that allows holding on with one hand while at the side of the pool.

❖ Item 8 provides the overall intent of this list. If the user can grasp it, then the item can serve as a handhold.

323.1.3 Handhold spacing. Handholds shall be horizontally spaced not greater than 4 feet (1219 mm) apart.

❖ Where handholds are required, it is not necessary that they be continuous. A spacing of up to 4 feet (2438 mm) apart is well within reach of most young adult users.

323.2 Handrails. Where handrails are installed, they shall conform to this section.

❖ Handrails are covered by this section and its subsections. This section only covers handrails within the pool and not elsewhere on the pool deck or on the route leading to the pool deck.

323.2.1 Height. The top of the gripping surface of handrails for public pools and public spas shall be 34 inches (864 mm) to 38 inches (965 mm) above the ramp or step surface as measured at the nosing of the step or finished surface of the slope. The top of the gripping surface of handrails for *residential* pools and *residential* spas shall be 30 inches (762 mm) to 38 inches (965 mm) above the ramp or step surface as measured at the nosing of the step or finished surface of the slope.

❖ The 34-inch (864 mm) to 38-inch (965 mm) height range is the standard range for handrails in the public environment. The lower 30-inch (762 mm) dimension for residential pools is more “child friendly” and less obtrusive for a residential environment.

323.2.2 Material. Handrails shall be made of corrosion-resistant materials.

❖ A wet environment is hard on metal materials unless they are of corrosion-resistant material.

323.2.3 Nonremovable. Handrails shall be installed so that they cannot be removed without the use of tools.

❖ Handrails are sometimes removed for maintenance to the pool or to install seasonal pool covers. When the handrail is in position, the removability feature without some type of locking mechanism could present a hazard to the user. Therefore, handrails must require tools to remove.

323.2.4 Leading edge distance. The leading edge of handrails for stairs, pool entries and exits shall be located not greater than 18 inches (457 mm) from the vertical face of the bottom riser.

❖ The leading edge of a handrail is an indicator that the beginning of the stairs is near. Placement of the end of the handrail behind the leading edge of the stairs could cause the user to trip.

323.2.5 Diameter. The outside diameter or width of *handrails* shall be not less than $1^1/_4$ inches (32 mm) and not greater than 2 inches (51 mm).

❖ Handrails must be graspable by all users. The range of dimensions has been proved to be user friendly.

323.3 Obstructions and entrapment avoidance. There shall not be obstructions that can cause the user to be entrapped or injured. Types of entrapment include, but are not limited to, wedge or pinch-type openings and rigid, nongiving cantilevered protrusions.

❖ This section provides overall requirements to make pools and spas safe to use. Entrapment of arms, hands, feet and legs poses significant hazard to the user. The design and construction must consider all possible entrapment potentials.

Chapter 4:
Public Swimming Pools

General Comments

The size of public swimming pools ranges from Olympic-size competition pools for diving or racing to much smaller pools serving neighborhoods or motels. These pools are used by persons who may be unfamiliar with the particular pool site. Such pools can be used by a large number of persons at one time. Public pools are required to have many features that make the pools safer to be used by the general population.

Purpose

This chapter covers a number of important safety topics for public pools including floor slope, diving envelopes, maximum bather loads, decks, depth markings and signage.

SECTION 401
GENERAL

401.1 Public swimming pools. The provisions of this chapter shall apply to public swimming pools. Public swimming pools covered in this chapter include Class A, Class B, Class C and Class E pools.

❖ This chapter regulates all public pools, including public wading pools, except for Class D.

401.2 Scope. The requirements contained in this chapter provide specifications for the design, equipment, operation, warning signs, installation, sanitation, new construction, and alteration of public swimming pools.

❖ This chapter covers the details of public pools.

401.3 General. In addition to the requirements of this chapter, public swimming pools shall comply with the requirements of Chapter 3.

❖ Chapter 3 requirements must be applied along with the requirements of this chapter. Note that Section 301.1.1 states that where differences occur between the provisions of this chapter and the provisions of Chapter 3, the provisions of this chapter control.

401.4 Dimensional tolerances. Finished pool dimensions, for other than Class A pools, shall be held within the construction tolerances shown in Table 401.4. Other dimensions, unless otherwise specified, shall have a tolerance of ± 2 inches (51 mm).

❖ Because Class A pools are used for competitive events, the finished pool dimensions are held to very close tolerances. For other classes of pools, the tolerances in Table 401.4 provide for a reasonable level of quality control so that the actual pool dimensions don't stray too far from the design dimensions. Note that the negative construction tolerances must not apply to the minimum dimensions of the diving water envelopes given in Table 402.12. Of all the tolerances indicated, those for step treads and risers and waterline are most critical, as they directly relate to the safety of the users and sanitary conditions, respectively.

401.4.1 Class A pool tolerances. Dimensional tolerances for Class A pools shall be determined by the authority that governs such pools.

❖ The tolerances for Class A pool dimensions are determined by the sanctioning body for the type of competitive events that are intended to be performed in the pool.

401.5 Floor slope. Except where required to meet the accessibility requirements in accordance with Section 307.9, the slope of the floor in the shallow area of a pool shall not exceed 1 unit vertical in 10 units horizontal (10-percent slope) for Class C pools and 1 unit vertical in 12 units horizontal (8-percent slope) for Class B pools. The slope limit shall apply in any direction to the point of the first slope change, where a slope change exists. The point of the first slope change shall be defined as the point at which the floor slope exceeds 1 unit vertical in 10 units horizontal (10-percent slope) for Class C pools and 1 unit vertical in 12 units horizontal (8-percent slope) for Class B pools.

❖ A Class B pool typically is large in size, outdoors and the land space area that it occupies is more than ample to accept low-sloped, shallow areas of pools. A Class C pool typically is not very large and is commonly installed either inside of a building or in a land space area that is compact in size. The steeper slope for shallow areas in Class C pools allows for a shorter pool length without compromising the safety of the user.

401.6 Dimensions for Class A pools. Class A pools shall be designed and constructed to provide the dimensions determined by the authority that governs such pools.

❖ Class A pool dimensions and their tolerances are determined by the sanctioning body for the type of competitive events that are intended to be performed in the pool. Obviously, where winning or losing some competitive events is determined in 100ths of a second, dimensional tolerances of the swimming pool

TABLE 401.4
CONSTRUCTION TOLERANCES

DESIGN ASPECT	CONSTRUCTION TOLERANCE
Depth–deep area, including diving area	± 3 inches
Depth–shallow area	± 2 inches
Length–overall	± 3 inches
Step treads & risers	± 1/2 inch
Wall slopes	± 3 degrees
Waterline–pools with adjustable weir skimmers	± 1/4 inch
Waterline–pools with nonadjustable skimming systems (gutters)	± 1/8 inch
Width–overall	± 3 inches
All dimensions not otherwise specified herein	± 2 inches

For SI: 1 inch = 25.4 mm, 1 degree = 0.017 radians.

must be accurately controlled so that variations in dimensions such as lane length are small.

SECTION 402
DIVING

402.1 General. This section covers diving requirements for Class B, Class C, and Class E pools. Manufactured and fabricated diving equipment and appurtenances shall not be installed on Type O pools.

❖ Where a pool has provisions for a user to dive from a platform or board into a pool, the body of water needs to have a certain minimum shape to accommodate the trajectory of the diver in the water without the diver hitting the floor or walls of the pool at an unsafe speed. This section covers the requirements for diving for Class B, Class C and Class E pools. A pool that is designated as a Type O pool may not have a body of water of a shape that can accommodate diving.

402.2 Manufactured and fabricated diving equipment. Manufactured and fabricated diving equipment shall be in accordance with Section 808 and shall be designed for swimming pool use.

❖ Although Section 808 is in the permanent residential inground swimming pool chapter, those requirements apply to the public pools covered by this section. Equipment for diving must be specifically designed for swimming pool diving purposes.

402.3 Installation. The installation of manufactured diving equipment shall be in accordance with Sections 402.3 through 402.12. Manufactured diving equipment shall be located in the deep area of the pool so as to provide the minimum dimensions shown in Table 402.12 and shall be installed in accordance with the manufacturer's instructions. Installation and use instructions for manufactured diving equipment shall be provided by the manufacturer and shall specify the minimum water dimensions required for each diving board and diving stand combination. The manufacturer's instructions shall refer to the water envelope type by dimensionally relating their products to Point A on the water envelopes shown in Table 402.12. The diving board manufacturer shall specify which boards fit on the design pool geometry types as indicated in Table 402.12.

❖ The type of diving equipment to be used on a pool drives the design of the pool with respect to the required diving envelope. Diving boards are tested and rated for pool type based on their length, spring characteristic and intended installation height, all of which can affect diver trajectory and velocity. Proper installation in accordance with the manufacturer's instructions is critical to ensure that the user is provided with a body of water in which to safely maneuver and complete the dive. Table 402.12 and the associated Figure 402.12 provide the minimum diving water envelope dimensions for different types of pools intended for diving.

402.4 Slip resistance. Diving equipment shall have slip-resistant walking surfaces.

❖ The need for slip-resistant walking surfaces on diving equipment is especially important to avoid falls onto the diving equipment or onto the deck of a pool.

402.5 Point A. For the application of Table 402.12, Point A shall be the point from which dimensions of width, length and depth are established for the minimum diving water envelope. If the tip of the diving board or diving platform is located at a distance of WA (see Figure 804.1) or greater from the deep end wall and the water depth at that location is equal to or greater than the water depth requirement at Point A, the point on the water surface directly below the center of the tip of the diving board or diving platform shall be identified as Point A.

❖ The location of Point A on the water surface establishes the position of where the outside of the minimum diving water envelope will be in the pool. The pool walls and floor need to be constructed to not encroach on the minimum diving envelope. The minimum diving water envelope is a 3-dimensional space in the water. The actual construction of a pool for diving must not be made to exactly that same shape because other requirements in the code prevent such a design as floor slopes and ladders for egress must be outside the water envelope. Preferably, pools for diving would be designed to be much larger than the minimum diving water envelope because pool users

do not always execute, by error or on purpose, a dive in the intended direction that the envelope assumes. Point A is located directly beneath the forward tip of the diving board, provided that the distance from that point to the deep end wall equals or exceeds the minimum specified for WA for the pool type in question and that the depth at this point equals or exceeds the depth specified at Point A.

402.6 Location of pool features in a diving pool. Where a pool is designed for use with diving equipment, the location of steps, pool stairs, ladders, underwater benches, special features and other accessory items shall be outside of the minimum diving water envelope. See Figure 322.2.

❖ Diving pools must be designed so that the minimum diving water envelope does not have any obstructions placed in it.

402.7 Stationary diving platforms and diving rocks. Where stationary diving platforms and diving rocks are built on site, flush with the wall and located in the diving area of the pool, Point A shall be in front of the wall at the platform or diving rock centerline.

❖ Some designs of diving pools have platforms or rocks placed at the edge of the deep end of the pool to enable diving. In these circumstances, Point A (see Section 402.5) is considered to be directly below the center of the front edge of the platform or rock at the water surface.

402.8 Location of diving equipment. Manufactured and fabricated diving equipment shall be located so that the tip of the board or platform is located directly above Point A as defined by Section 402.5.

❖ This section reinforces that once Point A has been established for a diving pool, the tip of the board or edge of the platform must be installed directly above Point A.

402.9 Elevation. The maximum elevation of a diving board above the *design waterline* shall be in accordance with the manufacturer's instructions.

❖ The diving board is designed and tested by the manufacturer to determine a maximum installation height, to ensure that a diver does not enter the pool at an unsafe velocity, and will have sufficient room within the specified diving envelope to safely maneuver and complete the dive. Installing a diving board higher than the maximum recommended height by the board manufacturer could result in diver injury.

402.10 Platform height above waterline. The height of an *approved* stationary diving apparatus, platform, or diving rock above the *design waterline* shall not exceed the limits of the manufacturer's specifications or the limits of the design prepared by a design professional.

❖ Manufacturers of stationary platforms establish the maximum height that the platform can be above the water, based on the depth of the water below the platform. Where stationary platforms are not manufactured but are field fabricated, the height at which they are installed must not exceed the maximum height that is provided by the platform's design professional.

402.11 Clearance. The diving equipment manufacturer shall specify the minimum headroom required above the tip of the board.

❖ This section applies to manufactured diving equipment, especially springboards and jump boards. The spring of such boards enables the diver to attain a higher altitude above the board than what he or she could jump from a solid surface. The manufacturer of the diving equipment must specify a required head room above the tip of the board so that the diver doesn't hit overhead obstacles.

402.12 Water envelopes. The minimum diving water envelopes shall be in accordance with Table 402.12.

❖ Table 402.12 in conjunction with Figure 402.12 establishes the shape of the body of water that must be accommodated by the pool walls and floor so that diving is practical and relatively safe. Note that the dimensions in the table are minimum dimensions. The tolerances of Table 401.4 do not apply.

402.13 Ladders for diving equipment. Ladders shall be provided with two grab rails or two handrails. There shall be a uniform distance between ladder treads, with a 7-inch (178 mm) minimum distance and a 12-inch (305 mm) maximum distance.

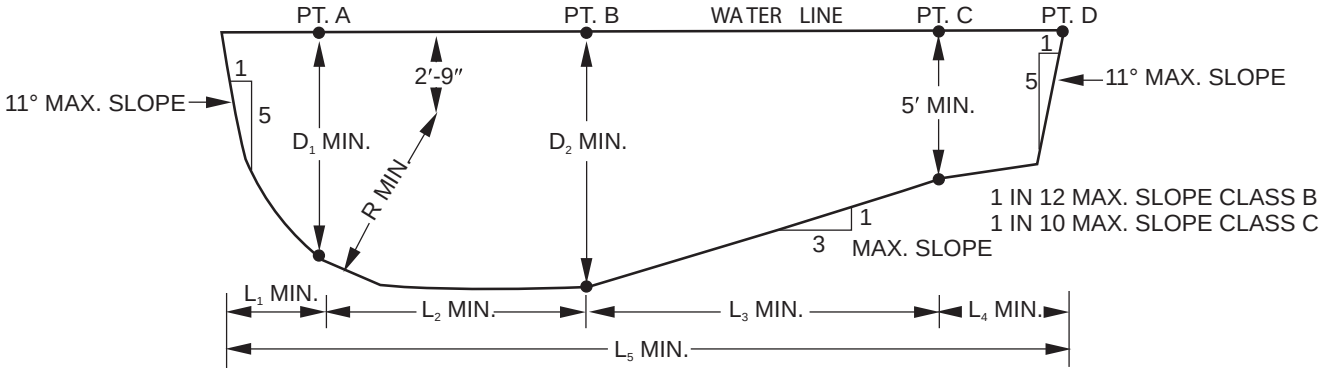
Exception: The distance between treads for the top and bottom riser can vary but shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm).

❖ Uniform tread depth and uniform tread spacing on ladders decrease the probability that a user could slip and fall back onto the deck. Slip-resistant surfaces on

TABLE 402.12
MINIMUM DIVING WATER ENVELOPES
(SEE FIGURE 402.12)

POOL TYPE	MINIMUM DIMENSIONS								MINIMUM WIDTH OF POOL AT:		
	D_1	D_2	R	L_1	L_2	L_3	L_4	L_5	Pt. A	Pt. B	Pt. C
VI	7'-0"	8'-6"	5'-6"	2'-6"	8'-0"	10'-6"	7'-0"	28'-0"	16'-0"	18'-0"	18'-0"
VII	7'-6"	9'-0"	6'-0"	3'-0"	9'-0"	12'-0"	4'-0"	28'-0"	18'-0"	20'-0"	20'-0"
VIII	8'-6"	10'-0"	7'-0"	4'-0"	10'-0"	15'-0"	2'-0"	31'-0"	20'-0"	22'-0"	22'-0"
IX	11'-0"	12'-0"	8'-6"	6'-0"	10'-6"	21'-0"	0	37'-6"	22'-0"	24'-0"	24'-0"

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.



For SI: 1 degree = 0.017 rad, 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 402.12
(MINIMUM DIVING WATER ENVELOPES)
CONSTRUCTION DIMENSIONS FOR WATER ENVELOPES FOR CLASS B AND CLASS C POOLS

ladder treads are especially necessary in a wet environment. Climbing a set of treads is nearly impossible without using two hands on separate grab rails or handrails. The separation between the rails is necessary to provide stability for the ladder user. The exception recognizes that some variation between the top and bottom tread to the surface at the top and bottom of the ladder is possible as the fabrication of ladders is more economically produced with the same tread spacing.

402.14 Springboard fall protection guards. Springboards located at a height greater than 5 feet (1524 mm) above the pool deck shall have a fall protection guard on each side of the springboard. The design and the selection of the materials of construction of the fall protection guards shall be determined by the manufacturer of the springboard support structure. The installation and maintenance of the fall protection guards shall be in accordance with the fall protection guard manufacturer's instructions.

❖ Springboards (diving boards) that are above a deck can be dangerous if someone falls off the springboard before that person has moved out on the board enough to be over the water. Springboard manufacturers will provide the design for guards or might provide the guards along with the springboard.

SECTION 403
BATHER LOAD

403.1 Maximum bather load. The maximum bather load of Class B and Class C pools shall be in accordance with Table 403.1.

❖ Ultimately, the number of bathers in a pool establishes the demand for sanitation and requires a circulation turnover rate to achieve minimum sanitary conditions. The required turnover rates established elsewhere in the code were determined based on a maximum bather load for the pool. Table 403.1 shows how to compute a maximum bather load so that the operator of the pool has some means to decide how many persons can have access to the pool. The table provides the maximum densities of users according to various areas of the pool and is based on the deck area around the pool. The information provides the operator of the pool some means to decide how many persons can have access to the pool at any given time.

SECTION 404
REST LEDGES

404.1 Rest ledges. Rest ledges along the pool walls are permitted. They shall be not less than 4 feet (1220 mm) below the water surface. Where a ledge is provided, the width of the ledge shall be not less than 4 inches (102 mm) and not greater than 6 inches (152 mm).

❖ A rest ledge is a narrow stepping zone that is not less than 4 feet (1219 mm) underwater. Users can stand or put a foot on a rest ledge to help them stay or rest at the side or end of the pool. The resting area can be either a ledge or a recessed area for placing the feet.

SECTION 405
WADING POOLS

405.1 Wading pools. Class F wading pools shall be separate pools with an independent circulation system, shall be physically separated from the main pool and shall be constructed in accordance with Sections 405.2 through 405.6.

❖ Wading pools are intended for use by small children. Children can have accidental bowel movements or could throw up in a wading pool. Keeping the circula-

TABLE 403.1
MAXIMUM BATHER LOAD

POOL/DECK AREA	SHALLOW INSTRUCTIONAL OR WADING AREAS	DEEP AREA (NOT INCLUDING THE DIVING AREA)	DIVING AREA (PER EACH DIVING BOARD)
Pools with minimum deck area	15 sq. ft. per user	20 sq. ft. per user	300 sq. ft.
Pools with deck area at least equal to water surface area	12 sq. ft. per user	15 sq. ft. per user	300 sq. ft.
Pools with deck area at least twice the water surface area	8 sq. ft. per user	10 sq. ft. per user	300 sq. ft.

For SI: 1 square foot = 0.09 square meters.

tion system for wading pools independent from other pools protects the other pools from contamination should an accident happen in the wading pool. The words "physically separated" might or might not mean that a barrier must be between other pools and a wading pool. The code official will have to interpret what "physically separated" means.

405.2 Nonentry areas. The areas where the water depth at the edge of the pool exceeds 9 inches (229 mm) shall be considered as nonentry areas.

❖ Although wading pools are shallow, any water depth at the perimeter of the wading pool that is greater than 9 inches (229 mm) poses an entry hazard, especially for adults carrying small children into the pool. The intent is for users, adult and children, to use the provided stairs or other designated entry points to gradually move into the water.

405.3 Floor slope. The floors of wading pools shall be uniform and sloped with a maximum slope of 1 unit vertical in 12 units horizontal (8-percent slope).

❖ Small children and adults carrying children in wading pools must have sure footing to avoid falls. Requiring uniformity in the slope and a maximum slope ensures the safety of the users. This section does not require wading pool floors to be sloped at, or less than, the maximum slope or to have any slope at all.

405.4 Maximum depth. The water depth shall not exceed 18 inches (457 mm).

❖ Wading pools are intended for use by small children and must be limited in depth for that reason. The 18-inch (457 mm) dimension allows for most adults to sit on the floor of the pool while holding and playing with a child.

405.5 Distance from deck to waterline. The maximum distance from the top of the deck to the waterline shall not exceed 6 inches (152 mm).

❖ Limiting the distance from the waterline to the top of the deck provides a convenient handhold access especially for small children. This allows for an easy entry and exit to or from the pool, provided that the water depth at the perimeter does not exceed 9 inches (229 mm) in accordance with Section 405.2.

405.6 Suction entrapment avoidance. Wading pools shall not have suction outlets. Skimmers or overflow *gutters* shall be installed and shall accommodate 100 percent of the circulation system flow rate.

❖ The best way to avoid suction entrapment in a pool is to not have any suction outlets in the pool. Skimmers or gutters can provide the needed return flow. Return inlets can be arranged low on the wall or on the bottom of the pool to create the necessary circulating effects for sanitation control.

SECTION 406
DECKS AND DECK EQUIPMENT

406.1 General. Decks shall comply with the provisions of Section 306, except as otherwise required in this section.

❖ Section 306 covers the general requirements for decks, but this section has specific requirements for decks around public pools.

406.2 Pool perimeter access. A deck or unobstructed access shall be provided for not less than 90 percent of the pool perimeter.

❖ Where a pool user rescue is necessary, access all around a pool perimeter is especially helpful. However, this section recognizes that it might not be feasible to provide for 100-percent perimeter access in all situations for various reasons. The code is silent as to what is meant by "unobstructed," what width is required for the required access or whether that access can be at an elevation significantly higher or lower than the top of the pool. In many standard public pool designs, there is a wide pool deck around the entire perimeter of the pool. Some "necessary" obstructions at the perimeter of a pool might be permanent lifeguard stands, diving boards, chair lifts (for accessibility) and above-deck pool cover mechanisms. However, public pools of more complex designs having perimeter water features such as fountains, waterfalls and vanishing edges might challenge the designer and code official on how to interpret this section.

Note that this section does not require a pool deck or decking at the perimeter that requires access.

406.3 Deck clearance. Decking not less than 4 feet (1219 mm) in width shall be provided on the sides and rear of any diving equipment. A deck clearance of 4 feet (1219 mm) shall be provided around all other deck equipment.

❖ Users crowding around deck-mounted equipment, such as diving boards, can lead to pushing and shoving, which can result in injuries and falls. Adequate space is needed in diving equipment areas.

406.4 Decks between pools and spas. Decks between pools, spas or any combination of pools and spas, shall have a width of not less than 6 feet (1829 mm).

❖ There needs to be adequate space between adjacent pools and spas to facilitate maintenance of each and room for emergency rescue operations.

406.5 Deck covering. Walking surfaces of decks within 4 feet (1219 mm) of a pool or spa shall be slip resistant.

❖ Slip resistance of a walking surface in wet environments is necessary to avoid injuries to pool and spa users. Next to a pool or spa is even more important because a person could fall into the water unexpectedly and not know how to immediately right themselves or swim. A falling person could also injure other people in the pool and create a multiple-person rescue situation.

406.6 Distances above diving boards. A completely unobstructed minimum distance above the tip of the diving board shall be specified by the diving equipment manufacturer.

❖ This section applies to manufactured diving equipment, especially springboards and jump boards. The spring of such boards enables the diver to attain a higher altitude above the board than what he or she could jump from a solid surface. The manufacturer of the diving board must specify a required head room above the tip of the board so that the diver doesn't hit overhead obstacles.

406.7 Dimensional requirements. Public pools with diving equipment of 39 inches (991 mm) or greater in height, and pools designed for springboard or platform diving, shall comply with the dimensional design requirements of the diving equipment manufacturer or the authority that governs such pools.

❖ This section specifically applies to public pools where the diving equipment is located greater than 39 inches (991 mm) above the design water surface. Diving equipment located greater than this height is found on competition pools that are regulated by a competitive event-sanctioning body that approves such pools and diving equipment for competition.

406.8 Diving equipment. Diving equipment shall be installed in accordance with the manufacturer's specifications.

❖ All of the best plans and all the right diving equipment still requires that the equipment be installed in accordance with the diving equipment manufacturer's instructions.

406.8.1 Label. A label shall be permanently affixed to the diving equipment or jump board in a readily visible location and shall include all of the following:

1. The minimum diving water envelope required for each diving board and diving stand combination.
2. Manufacturer's name and address.
3. Manufacturer's identification and date of manufacture.
4. The maximum allowable weight of the user.

❖ Even though diving equipment and jump boards could be ordered to meet the requirements of the application, the installer has the responsibility to verify that the equipment or the board is what was ordered and that all of the relevant pool dimensions meet or exceed those stated in the code for the pool type specified by the manufacturer. A readily visible label on the equipment or board provides the user and installer with important information about the equipment.

406.8.2 Use instructions. The diving equipment manufacturer shall provide diving equipment use instructions.

❖ The manufacturer of the diving equipment has the responsibility to provide instructions for the safe use of the product.

406.8.3 Tread surface. Diving equipment shall have slip-resistant tread surfaces.

❖ The need for slip-resistant walking surfaces on diving equipment is especially important to avoid falls onto either the diving equipment or the deck of a pool.

406.8.4 Supports for diving equipment. Supports, platforms, stairs, and ladders for diving equipment shall be designed to carry the anticipated loads. Stairs and ladders shall be of corrosion-resistant materials, shall be easily cleanable and shall have slip-resistant treads. Diving stands higher than 21 inches (533 mm), measured from the deck to the top back end of the board, shall be provided with stairs or a ladder. Step treads shall be self-draining.

❖ The first line of this section appears to state the obvious; however, it is there to remind the designer to think about what the anticipated loads will be on the supports, platforms, stairs and ladders. For example, if the diving equipment is rated for a 300-pound (136 kg) user, then all related diving equipment should be designed to accommodate a 300-pound (136 kg) user. Pool water can be aggressive to many metals, so metal stairs and ladders must be made from corrosion-resistant materials. The need for slip-resistant tread surfaces is especially important in order to avoid falls onto either the diving equipment or the deck of a pool. The requirement for treads to be self-draining keeps dirt from accumulating on them or worse, mildew and mold from accumulating and making the surfaces slippery. Where a diving stand is higher than 21 inches (533 mm) above the deck, it is difficult for an adult, much less a child, to step up onto the diving stand. Therefore, stairs or a ladder must be provided.

406.8.5 Guardrails. Diving equipment 39 inches (991 mm) or greater in height shall be provided with a top guardrail. Such guardrail shall extend not less than 30 inches (762 mm) above the diving board and extend to the edge of the pool wall.

❖ Falls from a height of 39 inches (991 mm) or more have a high probability of resulting in serious injury. A guardrail on both sides of diving equipment that is 39 inches (991 mm) or more above the deck provides for safer use of the diving equipment. The requirement that the guardrails extend to the edge of the pool wall does not mean all the way down to the deck but simply to a point directly above the edge of the pool (see Section 402.14).

406.9 Starting blocks. In new construction or substantial alteration, starting blocks intended for competitive swimming shall be located at a water depth of not less than 5 feet (1524 mm).

❖ Diving from starting blocks into water that is shallower than 5 feet (1524 mm) creates a greater risk of injury. It is intended that starting blocks are to be used by swimmers who have received specific training on proper entry from a diving stand and that diving from starting blocks is supervised by a swimming instructor or coach. Diving stands are not intended to be used by the casual user who has not been specifically trained on diving from a stand into what would be considered otherwise, a too shallow water depth for diving.

406.10 Swimming pool slides. Swimming pool slides shall comply with the requirements of 16 CFR, Part 1207. The manufacturer of the slide shall provide installation and use instructions for the slide. Slides shall be installed in accordance with the manufacturer's instructions.

❖ The design of swimming pool slides is regulated by Title 16 of the Code of Federal Regulations, Part 1207, because of the significant number of injuries that were reported to the Consumer Product Safety Commission prior to the enactment of the regulation. The regulation requires that the manufacturer provide instructions for proper installation and safe use of the slide.

406.11 Play and water activity equipment. Play and water activity equipment shall be installed in accordance with the manufacturer's instructions.

❖ Where play and water activity equipment is installed, the manufacturer's instructions must be followed.

SECTION 407
CIRCULATION SYSTEMS

407.1 General. Circulation systems for pools shall comply with Section 311 and the provisions of this section.

❖ Section 311 covers the general requirements for circulation systems. This section provides requirements that are specific to public pools.

407.2 Turnover. Circulation equipment shall be sized to turn over the entire water capacity of the pool as specified in Table 407.2. The system shall be designed to provide the required turnover rate based on the maximum pressure and flow rate recommended by the manufacturer of the filter with clean filter media.

❖ Turnover or turnover rate is determined by dividing the volume of the pool by the flow rate of the circulation system. Table 407.2 indicates the turnover rate for various types of public pools. Wading pools have a high turnover rate because of the greater potential for small children having a toileting accident in the pool.

SECTION 408
FILTERS

408.1 General. Filters shall be designed in accordance with Section 312, except as otherwise required in this section.

❖ Section 312 covers all of the requirements for filters, with the exception of the requirement in Section 408.2.

408.2 Air release warning. The following statement shall be posted in a conspicuous location within the areas of the air release:

> DO NOT START THE SYSTEM AFTER MAINTENANCE WITHOUT FIRST PROPERLY REASSEMBLING THE FILTER AND SEPARATION TANK AND OPENING ALL AIR RELEASE VALVES.

❖ This safety notice is needed in a public pool environment because the volume of filters and separation tanks can be very large, which in turn creates significant potential for injury and damage if tanks are not properly reassembled or the air valves are not opened prior to disassembly. The conspicuous display location is needed because of the number of different persons who could be servicing the equipment.

TABLE 407.2
TURNOVER RATE

SWIMMING POOL CATEGORY	TURNOVER RATE IN HOURS
Class A, B, and C pools	Hours equal $1^1/_2$ times the average depth of pool in feet not to exceed 6 hours
Wading pools	1

For SI: 1 foot = 304.8 mm.

SECTION 409
SPECIFIC SAFETY FEATURES

409.1 Handholds. Handholds shall comply with the provisions of Section 323.

❖ Section 323 covers the requirements for handholds in public pools.

409.2 Depth markers. Depth markers shall be provided in accordance with Sections 409.2.1 through 409.2.8.

❖ Water depth markers around a public pool are necessary to warn the pool user of the depth of water he or she is about to enter (see Commentary Figure 409.2). Sections 409.2.1 through 409.2.8 cover the details for depth marker location and appearance.

FIGURE 409.2
DEPTH MARKERS ON POOL DECK

409.2.1 Where required. Depth markers shall be installed at the maximum and minimum water depths and at all points of slope change. Depth markers shall be installed at water depth increments not to exceed 2 feet (607 mm). Depth markers shall be spaced at intervals not to exceed 25 feet (7620 mm).

❖ Depth markers must be frequently located around the pool so that the pool user is constantly being made aware of the water depth.

409.2.2 Marking of depth. The depth of water in feet (meters) shall be plainly and conspicuously marked on the vertical pool wall at or above the waterline.

Exception: Pools with a vanishing edge and rim flow *gutters*.

❖ Depth markers below or partially below the waterline are difficult to read. Markers must be at or above the waterline for best readability. The exception recognizes that there is not a wall above the waterline on vanishing edge pools and where pools have rim flow (perimeter overflow) gutters, sometimes there is limited vertical space above the gutter. Commentary Figure 409.2.2 shows where wall depth markers were able to be installed on a pool having a perimeter overflow system.

FIGURE 409.2.2
DEPTH MARKER ON WALL OF POOL WITH PERIMETER OVERFLOW SYSTEM

409.2.3 Depth accuracy. Depth markers shall indicate the actual pool depth within ± 3 inches (76 mm), at 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 indication on the depth markers must reflect the actual depth of the water within plus-or-minus 3 inches (76 mm). The depth is to be measured at a point 3 feet (91 cm) out from the wall, except where the depth is greater where the cove radius of a sidewall meets the floor. In that case, the greater depth is posted.

409.2.4 Position on pool wall. Depth markers on the vertical pool wall shall be positioned to be read from the waterside. Depth markers shall be placed so as to allow as much of the numbers to be visible above the waterline as possible.

❖ Depth markers on the pool wall help inform users where the shallow end of the pool is located. Depth markers below or almost completely below the waterline are difficult to read. Markers must be at (bisected by the waterline) or above the waterline for best readability. Commentary Figure 409.2.4 shows depth markers bisected by the waterline.

409.2.5 Position on deck. Depth markers on the deck shall be located within 18 inches (457 mm) of the water edge and positioned to be read while standing on the deck facing the water.

❖ Deck-mounted depth markers inform the pool user of the depth of water he or she is about to enter and must be readable in the position a user would be in when entering the pool (see Commentary Figure 409.2.5).

409.2.6 Horizontal markers. Horizontal depth markers shall be slip resistant.

❖ Depth markers on the deck must not contribute added potential for slips and falls.

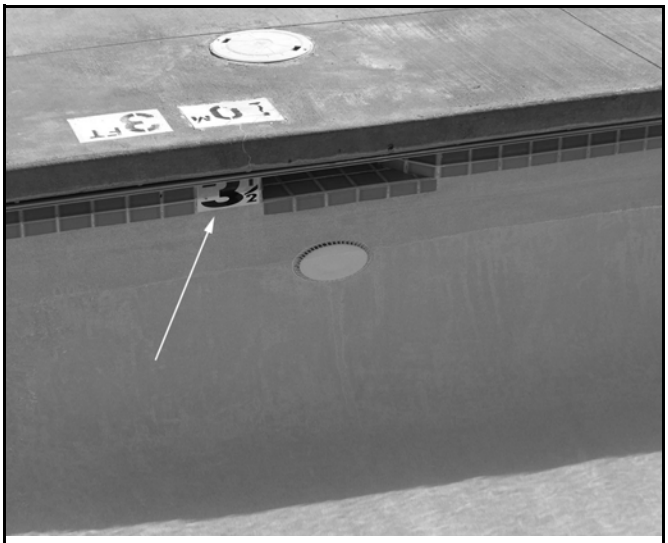


FIGURE 409.2.4
BISECTED DEPTH MARKER ON WALL

feet and inches marking, the marking must be in meters and the abbreviation of "M" used. The order of whether the feet-inches or meter dimension comes first does not matter; however, the code always requires the feet-inch dimension. Note that in Commentary Figure 409.2.4, the wall marker does not have a corresponding meter dimension even though the marker on the pool deck has the meter dimension. This is technically not a code violation as the metric dimension is not required.

409.3 No diving symbol. Where the pool depth is 5 feet (1524 mm) or less, the "No Diving" symbol shall be displayed. The symbol shall be placed on the deck at intervals of not greater than 25 feet (7620 mm) and directly adjacent to a depth marker. Additional signage shall be in accordance with NEMA Z535.

❖ Where pool depths are 5 feet (1524 mm) or less, diving (from the poolside) is prohibited and thus the "No Diving" symbol (pictograph) must be installed on the deck (see Commentary Figure 409.3).

FIGURE 409.2.5
DEPTH MARKER ON POOL DECK

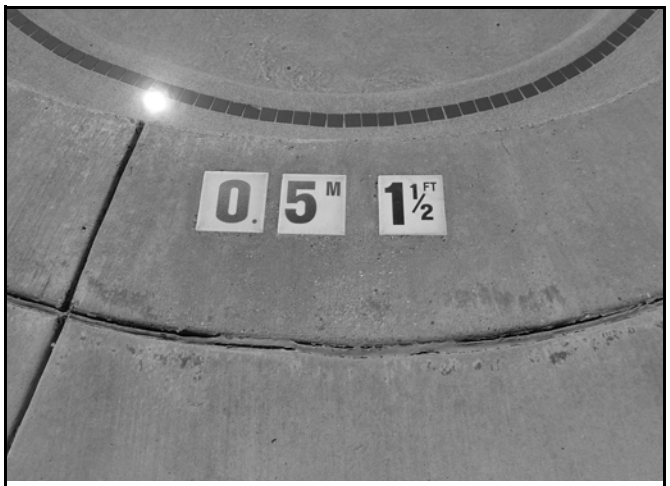


FIGURE 409.3
DEPTH MARKER ON POOL DECK

409.2.7 Uniform distribution. Depth markers shall be distributed uniformly on both sides and both ends of the pool.

❖ Uniform distribution of the depth markers, on both sides and at the ends of the pool, is necessary to maintain a clear and distinct message about pool water depths.

409.2.8 Numbers and letters. Depth markers shall be not less than 4 inches (102 mm) in height. The color of the numbers shall contrast with the background on which they are applied and the color shall be of a permanent nature. The lettering shall spell out the words "feet" and "inches" or abbreviate them as "Ft." and "In." respectively. Where displayed in meters in addition to feet and inches, the word meter shall be spelled out or abbreviated as "M."

❖ Numbers and letters of depth markers must be not less than 4 inches (102 mm) tall for readability at a distance. Where metric dimensions are added to the

409.4 Lifesaving equipment. Public pool Classes A, B, and C shall be provided with lifesaving equipment in accordance with Sections 409.4.1 through 409.4.3. Such lifesaving equipment shall be visually conspicuous and conveniently located at all times.

❖ Sections 409.4.1 though 409.4.3 cover the requirements for lifesaving equipment. The equipment must not be stowed away in a closet or equipment room, as it must be readily available for use by anyone at anytime.

409.4.1 Accessory pole. A swimming pool accessory pole not less than 12 feet (3658 mm) in length and including a body hook shall be provided.

❖ A pole not less than 12 feet (3658 mm) long with an attached body hook is a mainstay of pool safety equipment. The body hook allows the rescuer the opportunity to snag a bather who is struggling under-

water. Note that some jurisdictions prohibit the use of metallic (conductive) poles for public pools. Commentary Figure 409.4.1 shows a body hook on a metallic pole, resting in brackets on the wall of a public pool building.

FIGURE 409.4.1
BODY HOOK HANGING ON POOL BUILDING WALL

409.4.2 Throwing rope. A throwing rope attached to a ring buoy or similar flotation device shall be provided. The rope shall be not less than $^1/_4$ inch (6.4 mm) in diameter and shall have a length of not less than $1^1/_2$ times the maximum width of the pool or 50 feet (15 240 mm), whichever is less. A ring buoy shall have an outside diameter of not less than 15 inches (381 mm).

❖ A 15-inch (381 mm) ring buoy with a rope attached is another mainstay of pool safety equipment. The rescuer can throw the buoy to a bather who is struggling at the surface of the water and use the rope to pull the bather to the side of the pool. Commentary Figure 409.4.2 shows a prominently displayed ring buoy with attached rope.

FIGURE 409.4.2
RING BUOY WITH ATTACHED ROPE

409.4.3 Emergency response units. Pools covered by this chapter shall be provided with first aid equipment, including a first aid kit. First aid equipment and kits shall be located in an accessible location.

❖ A first aid kit is a basic necessity for any public operated pool and must be accessible at all times. Generally, first aid kits have bandaids, bandages, antiseptic creams, tweezers, eye washes, sting remedies and elastic wraps for sprains. Other first aid equipment that could be valuable to have on hand is a backboard, oxygen mask with canister and neck brace. The items that are required in the first aid kit are not specified by the code. The health authority that governs the operation of the public pool usually has a set list of the minimum requirements for different sizes of the pool and whether or not the pool is manned by trained lifeguards. Note that the code does not require that the first aid kit be provided with "ready access" (i.e., not behind a cabinet door). The first aid kit could be in a cabinet or a room that would require opening of a door (locked or unlocked).

SECTION 410
DRESSING AND SANITARY FACILITIES

410.1 Dressing and sanitary facilities. Dressing and sanitary facilities shall be provided for Class A and B pools as required by the *International Building Code* and *International Plumbing Code*.

❖ The *International Building Code*® (IBC®) provides the occupant density for pools and decks surrounding pools and the *International Plumbing Code*® (IPC®) provides the number and type of plumbing fixtures required.

SECTION 411
SPECIAL FEATURES

411.1 Entry and exit. Pools shall have not less than two means of entry and exit that are located so as to serve both ends of a pool. Pool lifts, transfer walls and transfer systems that provide for pool entry and exit by persons with physical disabilities in accordance with Section 307.9 shall not be counted as the means of entry or exit that is required by this section.

❖ A pool must have an entry and exit to serve each end of the pool to facilitate users getting in and out of the pool. This section does not require that the entry and exit be only on the "end walls" of the pool but generally "near" the ends.

Entry and exit means for accessibility design cannot count for the entry or exit required by this section. Users of the accessibility designed entries and exits could be restricted from using an entry or exit or could be injured by others who do not need the use of that type of entry and exit.

411.1.1 Natural entry. Where areas have water depths of 24 inches (607 mm) or less at the pool wall, such areas shall be

considered as providing their own natural mode for entry and exit.

Exception: Wading pools as outlined in Section 405.

❖ In shallow water depths, pool users are typically capable of entering and exiting the pool without the use of ladders or stairs. A 24-inch (607 mm) or less water depth is considered to be shallow enough for this purpose. The exception recognizes that wading pools have a different requirement for a shallow area that can be entered and exited without the use of ladders or steps. This section does not allow for a reduction in the required two entries and exits required by Section 411.1.

411.1.2 Shallow area. A means of entry and exit shall be provided in shallow areas of pools and shall consist of pool stairs, a ramp or a beach entry.

❖ In a shallow area of a pool, the required entry and exit could be satisfied by stairs, a ramp or a beach entry.

411.1.3 Deep area. The means of entry and exit in the deep area of pools shall consist of one of the following:

1. Steps/stairs.
2. Ladders.
3. Grab rails with recessed treads.
4. Ramps.
5. Beach entries.
6. Swimouts.
7. Other designs that provide the minimum utility as specified in this code.

❖ They are many options for providing entries and exits for the deep area of a pool. The last item on the list leaves the code open for other possibilities that are not on the list.

411.1.4 Pools greater than 30 feet wide. Swimming pools greater than 30 feet (9144 mm) in width shall be provided with entries and exits on each side of the deep area of the pool. The entries and exits on the sides of the deep area of a pool shall be located not more than 82 feet (25 m) apart.

❖ Pools over 30 feet (9144 mm) wide would be challenging for the user to exit the deep area if there was only one means provided for exiting on a long wall of a pool.

411.1.5 Diving envelope. Where the pool is designed for use with diving equipment, the entries and exits, pool stairs, ladders, underwater benches, special features and other accessories shall be located outside of the minimum diving water envelope indicated in Figure 322.2.

❖ The minimum diving envelope encompasses the shape that a diver's trajectory will most likely travel in the water. The minimum diving envelope must not have any obstructions that encroach on the diving water envelope.

411.1.6 Treads. Treads shall have slip-resistant surfaces.

❖ The need for slip-resistant walking surfaces is important in order to avoid falls.

411.2 Pool stairs. The design and construction of stairs extending into the pool in either shallow or deep water, including recessed pool stairs, shall comply with Sections 411.2.1 through 411.2.4.

❖ Stairs into the pool are regulated by Sections 411.2.1 through 411.2.4. See Commentary Figure 411.2 for an example of stairs in the shallow end of a pool.

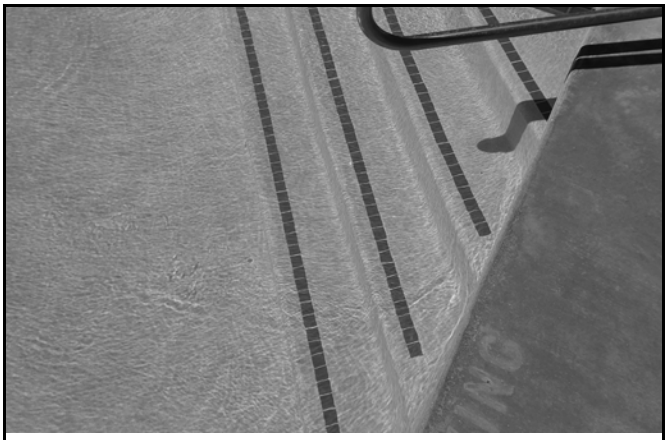


FIGURE 411.2
SHALLOW END STAIRS

411.2.1 Tread dimensions and area. Treads shall be not less than 24 inches (607 mm) at the leading edge. Treads shall have an unobstructed surface area of not less than 240 square inches (0.154 m^2) and an unobstructed horizontal depth of not less than 10 inches (254 mm) at the center- line.

❖ The width of the leading edge tread must be at least 24 inches (607 mm) so that the user can easily find the beginning of the stairs. The center of the tread must be at least 10 inches (254 mm) deep at the centerline so an adult foot can be firmly placed on the step. The area of the step must be at least 240 square inches (154 838 mm^2) so that the step is visible underwater.

411.2.2 Risers. Risers, except for the bottom riser, shall have a uniform height of not greater than 12 inches (305 mm) measured at the centerline. The bottom riser height is allowed to vary to the floor.

❖ A uniform riser height is necessary to reduce the potential for falls when using the steps. A maximum step height of 12 inches (305 mm) is at the limit where users start to have difficulty in using the stairs comfortably. Greater distances increase the risk of injury. In order to enable the stairs to be adaptable to the specific dimension of the pool, it is necessary to allow for variation in the bottom riser only.

411.2.3 Top tread. The vertical distance from the pool coping, deck, or step surface to the uppermost tread shall be not greater than 12 inches (305 mm).

❖ The top tread height of the stairs cannot be greater than 12 inches (305 mm), as greater top tread heights create difficulty for persons entering and exiting the top of the stairs.

411.2.4 Bottom tread. Where stairs are located in water depths greater than 48 inches (1219 mm), the lowest tread shall be not less than 48 inches (1219 mm) below the deck and shall be recessed in the pool wall.

❖ This section requires that staircases for entry and exit from water depths greater than 48 inches (1219 mm) be completely recessed into the pool wall. A set of stairs protruding from the wall in the deep end of the pool would be a hazard to swimmers.

411.3 Shallow end detail for beach and sloping entries. Sloping entries used as a pool entrance shall have a maximum slope of 1 unit vertical in 10 units horizontal (10-percent slope).

❖ Ramps and slopes into pools must not have a slope of greater than one unit vertical in ten units horizontal so that they can be easily navigated.

411.3.1 Benches and steps. Where benches are used in conjunction with sloping entries, the vertical riser distance shall not exceed 12 inches (305 mm). Where steps are used in conjunction with sloping entries, the requirements of Section 411.2 shall apply.

❖ Some ramp designs have one or more benches along the side of the ramp at the pool wall. The benches must not be higher than 12 inches (305 mm) so a user can easily step on top of the bench from the ramp surfaces. The benches must be built as if they were stairs.

411.3.2 Vertical drops. A vertical drop exceeding 12 inches (305 mm) within a sloping entry shall be provided with a handrail.

❖ The side of the ramp along the open side of the pool will have a dropoff to the floor of the pool. Where the dropoff exceeds 12 inches (305 mm), the edge of the ramp must have a handrail so that ramp users do not walk off the edge.

411.3.3 Surfaces. Beach and sloping entry surfaces shall be of slip-resistant materials.

❖ Ramps and other sloping surfaces must be slip resistant to reduce the potential for falls.

411.4 Pool ladder design and construction. The design and construction of ladders shall comply with Section 322.

❖ Where ladders are used for entry and exit into pools, they must comply with the requirements of Section 322.

411.5 Underwater seats, benches, and swimouts. The design and construction of underwater seats, benches, and *swimouts* shall comply with Sections 411.5.1 and 411.5.2.

❖ Sections 411.5.1 and 411.5.2 regulate the design and construction of underwater seats, benches and swimouts.

411.5.1 Swimouts. Swimouts, located in either the deep or shallow area of a pool, shall comply with all of the following:

1. The horizontal surface shall be not greater than 20 inches (508 mm) below the waterline.
2. An unobstructed surface shall be provided that is equal to or greater than that required for the top tread of the pool stairs in accordance with Section 411.2.
3. Where used as an entry and exit access, swimouts shall be provided with steps that comply with the pool stair requirements of Section 411.2.
4. The leading edge shall be visibly set apart.

❖ A swimout is a rest area that is recessed into the pool wall so that it is not an obstruction in the main pool area. The depth of the swimout must not be greater than 20 inches (508 mm) below the waterline. The area of the swimout must not be less than 240 square inches (154 838 mm^2) so that there is ample room for a user to sit and rest. If the swimout is intended to be a required entry and exit to the pool, then stairs to the swimout must be provided. The edge of the swimout where the water becomes deeper must be made visible with a contrasting color.

411.5.2 Underwater seats and benches. Underwater seats and benches, whether used alone or in conjunction with pool stairs, shall comply with all of the following:

1. The horizontal surface shall be not greater than 20 inches (508 mm) below the waterline.
2. An unobstructed surface shall be provided that is not less than 10 inches (254 mm) in depth and not less than 24 inches (607 mm) in width.
3. Underwater seats and benches shall not be used as the required entry and exit access.
4. Where underwater seats are located in the deep area of the pool where manufactured or constructed diving equipment is installed, such seats shall be located outside of the minimum diving water envelope for diving equipment.
5. The leading edge shall be visually set apart.
6. The horizontal surface shall be at or below the waterline.
7. A tanning ledge or sun shelf used as the required entry and exit access shall be located not greater than 12 inches (305 mm) below the waterline.

❖ Underwater seats and benches are rest areas along the wall of the pool. The depth of these features must not be greater than 20 inches (508 mm) below the waterline. The area of these features must not be less than 10 inches by 24 inches (254 mm by 607 mm) so that there is ample room for a user to sit and rest. These features must not be used as a required entry and exit to the pool. If there is diving equipment in the pool, then these features must be located outside the minimum diving envelope. The edge of these features, where the water becomes deeper, must be made visible with a contrasting color.

Where these features are intended for a sunning shelf or a tanning ledge, the depth must not be greater than 12 inches (305 mm) below the waterline to enable them to be used for sunning.

SECTION 412
SIGNAGE

412.1 Safety signage. Safety signage advising on the danger of diving into *shallow areas* and on the prevention of drowning shall be provided as required by the authority that governs such pools. Safety signage shall be as shown in Figure 412.1 or similar thereto.

❖ One or more signs, must be installed in the pool area to remind users of two very basic cautionary messages for all pools. The sign shown in Code Figure 412.1 is one example of a sign that has been widely accepted and used for several decades. Other signs may be used, provided they are comparable in wording and message. Commentary Figure 412.1 shows a typical "No Diving" sign that would usually be considered "similar thereto" to Code Figure 412.1 for pools other than wading pools. In the opinion of this writer; however, the sign shown in the photo seems to be especially lacking the message required by the right side of Code Figure 412.1, given the fact that the sign is next to a wading pool. The decision of how signage complies with the intent of Code Figure 412.1 is up to the code official.

For SI: 1 inch = 25.4 mm.

FIGURE 412.1
SAFETY SIGN

412.2 Emergency telephone signs. A sign indicating the location of the nearest landline telephone that can be used to call emergency services shall be posted within sight of the main entry into a pool facility. The sign shall indicate the telephone numbers, including area code, that can be called for emergency services including, but not limited to, police, fire, ambulance and rescue services. If "9-1-1" telephone service is available for any of those services, "9-1-1" shall be indicated next to the telephone number for such services. The sign shall include the street address and city where the pool is located. The nearest landline telephone indicated by the sign shall be one that can be used free of charge to call for emergency services. A sign with the telephone number and address information required by this section shall be posted within sight of the landline telephone.

❖ It is sometimes taken for granted that there will always be a working telephone somewhere within the vicinity of a public pool. Although it might seem unlikely that there would not be someone nearby who has a cellular telephone, there are areas where some cellular telephones will not work or 9-1-1 service is not available. Cell phones, if pool users think about bringing one along, can be too easily dropped or kicked into the water, especially during an emergency situation. Connection to the correct local emergency services through cellular phones can also be time-consuming depending on the signal routing. Commentary Figure 412.2 shows a telephone box that is known to have a hard-wired (land line) telephone inside. This telephone box was mounted at the entrance to the toilet facilities of the public pool. All the entry gates had signage indicating the location of the phone; however, this section only indicates that the sign has to be at the "main" gate.

Once the correct emergency services are reached, the caller has to identify the location. In most cases, pool users will be unfamiliar with the street address, the town or even the proper name for the facility. Detailed signage provides the needed information in the correct locations to reduce delays in getting help.

The code does not require that the landline telephone be located in the pool area (within the perime-

FIGURE 412.1
NO DIVING SIGN

FIGURE 412.2
TELEPHONE

ter of the barrier for the pool), right outside the pool barrier or be inside of a red box or, for that matter, in any kind of box. The telephone could be on a table or a wall anywhere, including "down the road." The only requirements are that the access to the telephone not be restricted such as in someone's house or a business that would be locked during pool use and that the telephone be allowed to be used free of charge. Although outdoor pay telephones are becoming less common, they do offer landline telephone access in a rugged package. Such telephones can be set up to facilitate emergency calling without fees.

412.3 Sign placement. Signs shall be positioned for effective visual observation by users as required by the authority that governs such pools.

❖ The sign(s) required by Sections 412.1 and 412.2 must be located in accordance with the authority that governs the operation of pools.

412.4 Emergency shutoff switch. Signs shall be posted that clearly indicate the location of the pump emergency shutoff switch. Such switch shall be clearly identified as the pump emergency shutoff switch.

❖ The emergency pump shutoff switch must be marked clearly so that users and observers clearly understand its location and function (see Commentary Figure 313.7).

Chapter 5:
Public Spas and Public Exercise Spas

General Comments

Although there is not a limit on the size of a public spa, most spas usually accommodate about 16 persons. As exercise spas are intended to be used by a single person for swimming, such spas are relatively small. All spas share common features and require designs that provide for safe use by persons who may not be familiar with a particular spa site.

Purpose

The purpose of this chapter is to regulate certain features of spa design such as floor slope, water depth, suction fittings, heaters, temperature control and signage so that safety is ensured for the users.

SECTION 501
GENERAL

501.1 Scope. This chapter shall govern the design, installation, construction and repair of public spas and exercise spas regardless of whether a fee is charged for use.

❖ The absence of a fee for entry or use does not alter the public nature of the spa or allow for an exemption from this chapter. Commentary Figures 501.1(1) and 501.1(2) show public spas.

501.2 General. In addition to the requirements of this chapter, public spas and public exercise spas shall comply with the requirements of Chapter 3.

❖ Chapter 3 has many details and references to requirements that must be adhered to for public spas and exercise spas, including, but not limited to, barriers, circulation and lighting.

SECTION 502
MATERIALS

502.1 Pumps and motors. Pumps and motors shall be *listed* and *labeled* for use in spas.

❖ Pumps and motors must be built for the specific conditions for spa service. The listing and labeling requirement ensures that these pumps and motors are built to standards and that periodic inspection of the manufactured product occurs.

SECTION 503
STRUCTURE AND DESIGN

503.1 Water depth. The maximum water depth for spas shall be 4 feet (1219 mm) measured from the *design waterline* except for spas that are designed for special purposes and *approved* by the authority having jurisdiction. The water

FIGURE 501.1(1)
PUBLIC SPA

FIGURE 501.1(2)
PUBLIC SPA

depth for exercise spas shall not exceed 6 feet 6 inches (1981 mm) measured from the *design waterline*.

❖ A spa that is not an exercise spa is built for sitting or reclining by the users. There is no need for such a spa to be deeper than 4 feet (1219 mm). However, spas with greater depths can be constructed where approved. Exercise spas are allowed to be deeper to allow users to perform vertical exercise routines.

503.2 Multilevel seating. Where multilevel seating is provided, the maximum water depth of any seat or sitting bench shall be 28 inches (711 mm) measured from the *design waterline* to the lowest measurable point.

❖ Seats located more than 28 inches (711 mm) below the waterline cannot be safely used by many people.

503.3 Floor slope. The slope of the floor shall not exceed 1 unit vertical in 12 units horizontal (8.3-percent slope). Where multilevel floors are provided, the change in depth shall be indicated.

❖ A floor slope of one unit vertical in 12 units horizontal can be walked on with little difficulty. If the floor has abrupt changes in elevation, the change needs to be indicated, usually by a change in color at the leading edge of the higher floor level.

SECTION 504
PUMPS AND MOTORS

504.1 Emergency shutoff switch. One emergency shutoff switch shall be provided to disconnect power to circulation and jet system pumps and air blowers. Emergency shutoff switches shall be accessible, located within sight of the spa and shall be located not less than 5 feet (1524 mm) but not greater than 10 feet (3048 mm) horizontally from the inside walls of the spa.

❖ For electrical safety, it is important that the shutoff switch is located more than 5 feet (1524 mm) from the spa so that it cannot be reached by someone who is in the spa. The shutoff switch needs to be no farther than 10 feet (3048 mm) from the spa so that it can easily be found by those in the area.

504.1.1 Alarms. Emergency shutoff switches shall be provided with an audible alarm rated at not less than 80 decibel sound pressure level and a light near the spa that will operate continuously until deactivated when the shutoff switch is operated. The following statements shall appear on a sign that is posted in a location that is visible from the spa:

ALARM INDICATES SPA PUMPS OFF. DO NOT USE SPA WHEN ALARM SOUNDS AND LIGHT IS ILLUMINATED UNTIL ADVISED OTHERWISE.

❖ Visual and auditory signals are necessary to indicate to users that there is a problem with the spa or exercise spa and it is necessary to get out of the spa. An emergency shutoff switch must be located near the spa so that it can be found and activated when there is an emergency. A sign needs to be located near the spa so that users will know what the noise and light mean. There is not a code requirement for the light to flash, be of any specific color, or to be of any specific size (wattage or illuminance). There is not a code requirement for the type of noise. A siren, klaxon, buzzer or bell are commonly used.

SECTION 505
RETURN AND SUCTION FITTINGS

505.1 Return fittings. Return fittings shall be provided and arranged to facilitate a uniform circulation of water and maintain a uniform sanitizer residual throughout the entire spa or exercise spa.

❖ The positioning of return fittings is essential for even distribution of the sanitizing agent and for the movement of debris in order to maintain a clear and safe body of water.

505.2 Suction fittings. Suction fittings shall be in accordance with Sections 505.2.1 through 505.2.4.

❖ Sections 505.2.1 through 505.2.4 cover the requirements for suction fittings. Suction fittings are sometimes referred to as suction outlet fittings or drain covers.

505.2.1 Testing and certification. Suction fittings shall be *listed* and *labeled* in accordance with APSP 16.

❖ Suction fittings for spas must be designed and tested in accordance with APSP 16. A third-party certification agency must perform the testing, list the product and perform periodic inspection to ensure that the products continue to meet the standard.

505.2.2 Installation. Suction fittings shall be sized and installed in accordance with the manufacturer's specifications. Spas and exercise spas shall not be used or operated if the suction outlet cover is missing, damaged, broken or loose.

❖ Proper sizing and installation of suction fittings are keys to providing the level of safety necessary to prevent suction entrapment of spa users. Because missing and broken suction outlet covers have been a leading cause of user entrapment in spas, the Virginia Graeme Baker Pool and Spa Safety Act, a U.S. federal law, mandates that all public spas have compliant suction outlet fittings while in operation and if any of these fittings are broken, loose or missing, the unit must be shut down until the fittings can be replaced or repaired.

505.2.3 Outlets per pump. Suction fittings shall be provided in accordance with Section 310.

❖ Section 310 requires that suction fittings be in accordance with APSP 7.

505.2.4 Submerged vacuum fittings. *Submerged vacuum fittings* shall be in accordance with Section 310.

❖ Section 310 requires that submerged vacuum fittings be in accordance with APSP 7.

SECTION 506
HEATER AND TEMPERATURE REQUIREMENTS

506.1 General. This section pertains to fuel-fired and electric appliances used for heating spa or exercise spa water.

❖ Fuel-fired and electric water-heating appliances used for heating spa water are covered by this section.

506.2 Water temperature controls. Components provided for water temperature controls shall be suitable for the intended application.

❖ Water temperature control components must be designed for the intended purpose of controlling spa water temperature.

506.2.1 Water temperature regulating controls. Water temperature regulating controls shall comply with UL 873 or UL 372. A means shall be provided to indicate the water temperature in the spa.

Exception: Water temperature regulating controls that are integral to the heating appliance and *listed* in accordance with the applicable end use appliance standard.

❖ Water temperature regulating controls built to these standards ensure safety and reliability. Spas must also have a temperature indicator for the temperature of the water in the spa. The exception allows for controls that are integral to but not in compliance with the standards indicated in the section, but are in compliance with the standards covering the appliance.

506.2.2 Water temperature limiting controls. Water temperature limiting controls shall comply with UL 873 or UL 372. Water temperature at the heater return outlet shall not exceed 140°F (60°C).

❖ Water temperature limiting controls built to these standards ensure safety and reliability. Water temperatures greater than 140°F (60°C) at the heater return outlet could result in excessive temperature at the entrance to the spa.

SECTION 507
WATER SUPPLY

507.1 Water temperature. The temperature of the incoming makeup water shall not exceed 104°F (40°C).

❖ Water temperatures greater than 104°F (40°C), even for a short duration, can be harmful to the spa users.

SECTION 508
SANITIZING, OXIDATION EQUIPMENT AND CHEMICAL FEEDERS

508.1 Automatic controllers. Where an automatic controller is installed on a spa or hot tub for public use, the controller shall be installed with an automatic pH and an oxidation reduction potential controller *listed* and *labeled* in compliance with NSF 50.

❖ This section does not require automatic controllers for spas; but, where they are installed, they must be in compliance with NSF 50. The design of such controllers must be examined by a third-party agency and the production of the controller must be periodically monitored for ensuring quality control.

SECTION 509
SAFETY FEATURES

509.1 Instructions and safety signs. Instructions and safety signage shall comply with the requirements of the local jurisdiction. In the absence of local requirements, safety signs and instructions shall comply with UL 1563 or CSA C22.2 No. 218.1.

❖ State or local health codes typically require conspicuous placement of safety signage and instructions, including the risk associated with running, use of alcohol, prolonged exposure and use of spas by children and pregnant women. Where state or local health codes do not require signage, the requirements within UL 1563 or CSA 22.2 No. 218.1 have requirements for safety signage.

509.2 Operational signs. Operational signs shall include, but not be limited to, the following messages as required by the local jurisdiction:

1. Do not allow the use of or operate spa if the suction outlet cover is missing, damaged or loose.
2. Check spa temperature before each use. Do not enter the spa if the temperature is above 104°F (40°C).
3. Keep breakable objects out of the spa area.
4. Spa shall not be operated during severe weather conditions.
5. Never place electrical appliances within 5 feet (1524 mm) of the spa.
6. No diving.

❖ Observation of these rules is essential for the safety of users in and around spas. Such signs should be clearly visible in the area of the spa.

509.3 Depth markers. Public spas shall have permanent depth markers with numbers not less than 4 inches (102 mm) in height that are plainly and conspicuously visible from obvious points of entry and in conformance to this section.

❖ A 4-inch (102 mm) number height offers readability by approaching spa users who have decided not to wear their glasses in the spa.

509.3.1 Number. There shall be not less than two depth markers for each spa, regardless of spa size or shape.

❖ Having at least two depth markers provides a greater probability for the user to see one of the markers if the other is obscured by bathers or objects.

509.3.2 Spacing. Depth markers shall be spaced at not more than 25-foot (7620 mm) intervals and shall be uniformly located around the perimeter of the spa.

❖ Spas with large perimeters need to have depth markers at not less than 25-foot (7620 mm) intervals around the perimeter.

509.3.3 Marking. Spas and exercise spas shall have the maximum water depth clearly marked on the required surfaces and such markers shall be positioned on the deck within 18 inches (457 mm) of the *design waterline*. Depth markers shall be positioned to be read while standing on the deck facing the water.

❖ The depth marking needs to reflect the greatest depth within the spa and not the depth that is at the spa wall. The marking must be within 18 inches (457 mm) of the waterline. The marking needs to be oriented to be read by a person entering the spa.

509.3.4 Slip resistant. Depth markers in or on the deck surfaces shall be slip resistant.

❖ Most surfaces are more slippery when wet. Depth markers on the deck must have surfaces that are treated or configured to be slip resistant.

509.4 Clock. Public facilities shall have a clock that is visible to spa users.

❖ Prolonged use of a spa may cause injury or illness. The presence of a clock enables users to monitor their use and exposure (see Commentary Figure 509.4). The code does not specify the size or type of clock; or how far the clock is from the edge of the spa. Common sense dictates that the clock time be discernible by someone using the spa and having average visual acuity.

FIGURE 509.4
CLOCK FOR SPA USERS

Chapter 6:
Aquatic Recreation Facilities

General Comments

Aquatic recreation facilities offer many water activities in conjunction with pools that are located within these facilities. Unlike a standard public pool (as covered by Chapter 4), aquatic recreation facility pools serve different purposes and have special requirements to accommodate how they are used. Aquatic recreation pools include wave action pools, activity pools, catch pools, leisure rivers, vortex pools and interactive play attraction pools.

Purpose

The purpose of this chapter is provide requirements for floor slopes, handholds, lifelines, barriers, toilet facilities and signage so that the users of these facilities will have a safe experience.

SECTION 601
GENERAL

601.1 Scope. This chapter covers public pools and water containment systems used for aquatic recreation. This chapter provides specifications for the design, equipment, operation, signs, installation, sanitation, new construction, and rehabilitation of public pools for aquatic play. This chapter covers Class D-1 through Class D-6 public pools whether they are provided as stand-alone attractions or in various combinations in a composite attraction.

❖ This chapter covers all Class D pools (see Chapter 2, "Public swimming pool," Class D definitions). The focus of Class D pools is fun derived from the motion of the water in the pool or use of equipment that uses pool water to entertain. Note that the code does not regulate amusement equipment such as inner tube rides, interactive play attractions and body slides.

601.2 Combinations. Where combinations of Class D-1 through Class D-6 pools exist within a facility, each element in the facility shall comply with the applicable code sections as if the element functioned as a part of a freestanding pool of Class D-1 through Class D-6.

❖ An aquatic recreation facility could have numerous independent Class D pools within the facility. This section indicates that these independent pools be treated as if they were connected together, serving as one pool. The primary purpose of this section is to not require individual barrier systems for each independent pool. Once the user enters the aquatic recreation facility, the user (or supervising adult) accepts the risk of using the pools in the facility in the same manner as they accept the risk of using one pool inside the barrier system for an aquatic recreation facility.

601.3 General. In addition to the requirements of this chapter, aquatic recreation facilities shall comply with the requirements of Chapter 3.

❖ Chapter 3 contains requirements applicable to all pools and spas, including aquatic recreation facilities. Commentary Figure 601.3 shows a typical aquatic recreation facility.

FIGURE 601.3
AQUATIC RECREATION FACILITY
(Photo courtesy of Tolomato Community Development District - Novatee)

SECTION 602
FLOORS

602.1 Floor slope. In water depths of less than 5 feet (1524 mm), the floor slope shall be not greater than 1 unit vertical in

12 units horizontal (8.3-percent slope) except where the function of the attraction requires greater slopes in limited areas.

Exception: The slope of the floor in Class D-3 pools shall not exceed 1 unit vertical in 7 units horizontal (14-percent slope).

❖ A floor slope of one unit vertical in 12 units horizontal is gradual enough that the slip hazard is very low, thus reducing the risk of drowning for small children and nonswimmers. The exception recognizes that catch pools are often placed where there is limited space, so the floor slope must be steeper. Even though this floor slope is greater (and the slip hazard greater), catch pools are not designed to be very deep.

SECTION 603
MARKINGS AND INDICATORS

603.1 Markings. Markings in areas of deep water shall comply with Section 409.2 except where the function of the pool dictates otherwise.

❖ Where the water depth is greater than 5 feet (1.52 m), depth markers must be installed according to Section 409.2.

603.2 Class D-2 pools. Where a Class D-2 pool has a bather-accessible depth greater than $4^1/_2$ feet (1372 mm), the floor shall have a distinctive marking at the $4^1/_2$ feet (1372 mm) water depth.

❖ Bathers in a Class D-2 pool need to be aware of the point at which they begin to enter the deep end of the pool. A demarcation on the floor at the $4^1/_2$-foot (1372 mm) point provides this awareness.

603.3 Shallow-to-deep-end rope and float line. Where a pool has a water depth ranging from less than 5 feet (1524 mm) to greater than 5 feet (1524 mm), a rope and float line shall be located 1 foot (305 mm) horizontally from the 5-foot (1524 mm) depth location, toward the shallow end of the pool.

❖ Bathers in a pool that has shallow-to-deep water depths need to be aware of the point at which they begin to enter the deep end of the pool. A rope and float line across the pool before the water becomes deep provides such awareness.

603.4 Nozzles. Pools having nonflush propulsion nozzles in the floor shall have a distinctive marking at the location of such nozzles.

❖ Protrusions on the pool floor can be a trip hazard. Nonflush water propulsion nozzles must have a distinctive marking so that the bather can be aware of their presence. Although suction outlet fittings on the pool floor will not be flush with the floor, they are large enough to be easily noticed and avoided. Return inlet nozzles are much smaller and cannot be readily seen without some type of distinctive markings.

SECTION 604
CIRCULATION SYSTEMS

604.1 General. A circulation system consisting of pumps, piping, return inlets and suction outlets, filters, and other necessary equipment shall be provided for complete circulation of water with the pool.

❖ All pools within an aquatic recreation facility must be provided with a circulation system that filters the water within the pool.

604.2 Turnover. Circulation system equipment shall be designed to turn over 100 percent of the nominal pool water volume in the amount of time specified in Table 604.2. The system shall be designed to give the required turnover time based on the manufacturer's recommended maximum pressure and flow of the filter in clean media condition.

❖ Turnover time is the amount of time required to circulate the entire volume of the pool. Table 604.2 indicates the maximum turnover times for each class of pool. Note that the turnover time is based on the filter media being in clean condition. Turnover time is calculated by dividing the volume of the pool by the filtration pump flow rate. For example, a pool with 10,000 gallons (37 854 L) of water has a filtration pump that circulates 36 gallons per minute (136.3 L/m) and provides for a 4.6-hour turnover rate.

604.2.1 24-hour circulation required. Circulation systems shall circulate treated and filtered water for 24 hours a day.

❖ Twenty-four-hour-a-day circulation of pool water is required to maintain exceptional clarity of water.

TABLE 604.2
TURNOVER TIME

CLASS OF POOL	MAXIMUM TURNOVER TIME[a] (hours)
D-1	2
D-2 with less than 24 inches water depth	1
D-2 with 24 inches or greater water depth	2
D-3	1
D-4	2
D-5	1
D-6	1

For SI: 1 inch = 25.4 mm.

a. Pools with a sand bottom require a 1-hour turnover time.

604.2.2 Reduced circulation rate. The circulation rate shall be permitted to be reduced during periods that the pool is closed for use provided that acceptable water clarity conditions are met prior to reopening the pool for public use. The reduced circulation rate shall not be zero.

❖ The turnover rates indicated in Table 604.2 are based on the maximum occupant load allowed for the pool. When the pool is not occupied (the facility is closed), turnover time can be increased (in other words, the filtration pump circulation rate reduced). Reduction in the pump circulation rate reduces power consumption. The only limits to how low the circulation rate can be is that it can't be zero and the clarity of water at the time of opening the facility for use must be acceptable. Clarity of water is often determined by the deployment of a secchi disk in the deepest part of the pool. The pattern on the secchi disk must be easily discernable by the observer at the poolside.

604.3 Surface skimming systems. Surface skimming systems shall be in accordance with Table 604.3.

❖ Table 604.3 indicates which types of skimming systems are allowed to be used for the different classes of pools. The type of skimming system for a pool must be appropriate for the class of pool. This table indicates which types of skimming systems are appropriate.

604.3.1 Class D-5 pool skimmers. The installation of skimmers in the side areas of Class D-5 pools shall be prohibited.

❖ Class D-5 pools are vortex pools. The water in vortex pools moves in a circular pattern. Skimmers in the side walls of such pools could be a hazard if a bather uses the skimmer as a handhold and other bathers could be propelled into the stationary bather.

SECTION 605
HANDHOLDS AND ROPES

605.1 Handholds. Handholds shall be provided in accordance with Section 323.

Exception: Handholds shall not be provided for wave action and action rivers.

❖ Section 323 covers the requirements for handholds in all pools and spas. The exception recognizes that handholds in wave action or action river pools could create an increased risk of injury from bathers who are propelled past or against the person holding on.

605.2 Rope and float line. A rope and float line shall be provided for all of the following situations:

1. Separation of activity areas.
2. Identification of a break in floor slope at water depths of less than 5 feet (1524 mm).
3. Identification of a water depth greater than $4^1/_2$ feet (1372 mm) in constant floor slope in Class D-2 pools.

Exception: Class D-1 pools or any other pool where the designer indicates that such a line is not required or that the line would constitute a hazard.

❖ A rope and float line provides bather awareness at the water surface that the condition of the pool such as water depth, floor slope or activity changes on the other side of the rope and float line. The exception to Item 3 recognizes that a rope and float line could create a hazard in pools where the motion of the water would interfere with involuntary bather movements.

605.2.1 Location. The rope and float line shall be located 1 foot (305 mm) toward the shallow end in each location.

❖ The rope and float assembly on the shallow side of a slope break or 5-foot (1525 mm) depth is intended to alert bathers and supervisors of an approaching change in slope or depth.

605.3 Caisson wall rope and float line. For Class D-1 pools, a rope and float line shall be installed to restrict bather access to the wave pool caisson wall. The location of the rope and float line shall be in accordance with the wave equipment manufacturer's instructions.

❖ A wave pool cassion wall could be a hazard to wave pool users because the wave action could propel the user against the wall. A rope and float line provides a demarcation line that safety supervisors can use to enforce prohibiting users from being too close to the wall.

605.4 Fastening. Rope and float lines shall be securely fastened to wall anchors made of corrosion-resistant materials. Wall anchors shall be of the recessed type and shall not have projections that will constitute a hazard when the rope and float line is removed.

❖ Corrosion-resistant anchors for rope and float lines are necessary to ensure that the anchor will not

TABLE 604.3
SURFACE SKIMMING SYSTEMS

CLASS OF POOL	SURFACE SKIMMING SYSTEM
D-1	Zero-depth trench located at static water level or other skimming systems
D-2	Auto skimmer, zero-depth trench or gutters
D-3	Auto skimmer, zero-depth trench or perimeter device
D-4	Single or multiple skimmer devices for skimming flow
D-5	Skimmers prohibited in side area
D-6	Auto skimmer, zero-depth trench, or gutter

degrade and not provide a suitable anchor point for the line. The requirement for recessed anchors is necessary to prevent injury to a bather should he or she come in contact with a protruding wall anchor.

605.5 Size. Rope and float lines shall be not less than $^5/_8$ inch (15.9 mm) in diameter and shall be made of polypropylene material.

❖ Polypropylene rope material is rot and decay resistant in a pool environment. The $^5/_8$-inch (16 mm) diameter provides for adequate strength and an easy handhold.

SECTION 606
DEPTHS

606.1 Class D-6 depth. The captured or standing water depth in Class D-6 pools shall be not more than 12 inches (305 mm).

❖ The 12-inch (305 mm) depth of a Class D-6 interactive pool allows for children to engage in play activities.

606.2 Spray pools. The water depths in spray pools shall be not more than 6 inches (152 mm).

❖ The 6-inch (152 mm) depth of a spray pool allows for small children to engage in play activities.

SECTION 607
BARRIERS

607.1 Barriers. Multiple pools and spas within a single complex shall be permitted without barriers where a barrier separates the single complex from the surrounding property in accordance with Section 305.

❖ It is not necessary to separate multiple pools and spas within a single facility. Once the user enters the aquatic recreation facility, the user (or supervising adult) accepts the risk of using the pools in the facility in the same manner as they accept the risk of using one pool inside the barrier system for an aquatic recreation facility. Note that where wading pools exist, Section 405.1 requires that a wading pool be "physically separated" from a main pool. The words might or might not mean that a barrier is to be between other pools and a wading pool. The code official will have to interpret what "physically separated" means.

SECTION 608
NUMBER OF OCCUPANTS

608.1 Occupant load. The occupant load for the pools or spas in the facility shall be calculated in accordance with Table 608.1. The occupant load shall be the combined total of the number of users based on the pool or spa water surface area and the deck area surrounding the pool or spa. The deck area occupant load shall be based on the occupant load calculated where a deck is provided or based on an assumed 4-foot-wide (1219 mm) deck surrounding the entire perimeter of the pool or spa, whichever is greater.

❖ Occupant loads for pools and spas in recreation facilities are based on an occupant density for the pool plus the occupant density for the deck area adjacent to the pool or spa. Where the deck area adjacent to the pool or spa is smaller than the area of a 4-foot-wide (1219 mm) deck around the entire perimeter of the pool or spa, the area of the 4-foot-wide (1219 mm) deck must be used for occupant load calculation. Table 608.1 indicates the occupant densities to be used for calculating the occupant load. For example, if the shallow area of a pool is 1000 square feet (93 m^2), the number of occupants allowed for the area would be 1000 divided by 8 square feet (0.743 m^2) per user, which equals 125 occupants.

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

❖ The aquatic recreation facility's maximum occupant load is not based only on the occupant load of the pools and spas. There typically are also areas for picnicking, food courts and other activities that are not involved with the pools and spas.

SECTION 609
TOILET ROOMS AND BATHROOMS

609.1 General. Toilet and bath facilities shall be in accordance with Sections 609.2 through 609.9.

❖ Sections 609.2 through 609.9 cover the requirements for toilet and bath facilities in aquatic recreation facilities. Although this code does not specify the location of toilet facilities with respect to pools, the requirements of IRC Chapter 4 could apply.

TABLE 608.1
OCCUPANT LOAD

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

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

609.2 Number of fixtures. Pools shall have toilet facilities with the number of fixtures in accordance with Section 609.2.1 or 609.2.2.

❖ The number of plumbing fixtures required in aquatic recreation facilities is based on whether the facility is small or large. A small facility is one where the water surface area that can be accessed by bathers is less than 7500 square feet (697 m^2). A large facility is one where the water surface area is 7500 square feet (697 m^2) or greater.

609.2.1 Water area less than 7500 square feet. Facilities that have less than 7500 gross square feet (697 m^2) of water area available for bather access shall have not less than one water closet for males, one urinal for males, one lavatory for males, one shower for males, two water closets for females, one lavatory for females and one shower for females.

❖ A facility where the water surface area that can be accessed by bathers is less than 7,500 square feet (697 m^2) is considered small. All small facilities require the same number of plumbing fixtures.

609.2.2 Water area 7500 square feet or more. Facilities that have 7500 gross square feet (697 m^2) or more of water area available for bather access shall have not less than 0.7 water closet for males, one urinal for males, 0.85 lavatory for males, one shower for males, two water closets for females, one lavatory for females and one shower for females for every 7500 square feet (697 m^2) or portion thereof. Where the result of the fixture calculation is a portion of a whole number, the result shall be rounded up to the nearest whole number.

❖ A facility where the water surface area that can be accessed by bathers is 7500 square feet (697 m^2) or greater is considered large. The plumbing fixture requirements are based on the increments of 7500-square-foot (697 m^2) areas. For example, given a facility with 20,000 square feet (1858 m^2) of water area, the male plumbing fixture requirements would be 2.1 water closets (round to three), three urinals, 2.55 lavatories (round to three) and three showers. The female plumbing fixture requirements would be six water closets, three lavatories and three showers.

609.3 Showers. Showers shall be in accordance with Sections 609.3.1 through 609.3.5.

❖ Sections 609.3.1 through 609.3.5 cover the requirements for showers in aquatic recreation facilities. Commentary Figure 609.3 shows one type of deck shower.

609.3.1 Deck shower. Not less than one shower and not greater than half of the total number of showers required by Section 609.2 shall be located on the deck of or at the entrance of each pool.

❖ Deck showers are necessary so that bathers who have been sun tanning (using suntan lotions) can rinse themselves off before entering the pool. They are also convenient for bathers who exit the pool and want to rinse themselves of chlorinated pool water. The code does not specify the location of the shower on the deck or the proximity of the shower to the entrance of a pool. The overall intent is to make deck showers available to persons who are entering and exiting the pool.

609.3.2 Anti-scald device. Where heated water is provided to showers, the shower water supply shall be controlled by an anti-scald device.

❖ Although this code section is not specific about what type of anti-scald device is required, Chapter 4 of the *International Plumbing Code*® (IPC®) has specific requirements for shower valves.

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

❖ Water heaters and thermostatically controlled mixing valves must not be capable of being accessed by bathers, as unauthorized tampering could result in dangerous shower water temperatures. This is not to say that the bather using the shower should not have a control that can alter the temperature of the shower to a lower temperature at which they feel more comfortable (see Section 609.3.5).

609.3.4 Flow rate. Each showerhead shall have a water flow of not less than 2 gallons per minute (7.6 lpm).

❖ The flow from shower heads must be sufficient to be useful in washing and rinsing. Flows lower than 2 gallons per minute (gpm) (7.6 lpm) might not allow anti-scald shower mixing valves to properly operate to prevent temperature fluctuations from occurring. The IPC also regulates the maximum flow allowed through showerheads.

609.3.5 Temperature. At each showerhead, the heated shower water temperature shall be not less than 90°F (32°C) and not greater than 120°F (49°C).

❖ The IPC requires that shower water temperature not exceed 120°F (49°C). Most users cannot withstand

FIGURE 609.3
POOL DECK SHOWER

shower water that is 120°F (49°C). Where the user has control of the temperature of the shower water, he or she can adjust the temperature to their preference. Where the user cannot adjust the shower water temperature (such as where a master thermostatic mixing valve is used to control the water temperature), the temperature discharged by the shower is usually recommended to be not greater than 104°F (40°C).

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

❖ Sections 609.4.1 and 609.4.2 regulate soap dispensers.

609.4.1 Liquid or powder. Soap dispensers shall be provided in each toilet facility. Soap dispensers shall dispense liquid or powdered soap. Reusable cake soap is prohibited.

❖ Soap dispensers are necessary in the area where lavatories are located. In accordance with the IPC, lavatories are required to be located in the same room as the water closets. Bar soap is prohibited because it can transmit bacteria to the next user and is too easily lost or stolen. This leaves liquid or powdered soap as the only type of soap that can be used.

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

❖ A soap dispenser with a glass reservoir would create a hazard if dropped on the floor and users enter the facility in only their bare feet. Only plastic or metal soap dispensers must be used.

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

❖ Toilet tissue needs to be in a dispenser so that it does not end up on the floor. There is not a code requirement for toilet paper holders to be of the locked type to prevent toilet paper rolls from theft.

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

❖ A standard mirror is typically made of glass. However, glass mirrors could be broken, creating a hazard to the toilet facility user who could be bare foot. Mirrors made of stainless steel or acrylic are shatter resistant.

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

❖ Women have special needs for disposal of sanitary napkins. Receptacles for sanitary napkin disposal must be located at each water closet and in the female-only shower area.

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

❖ Women need to have access to sanitary napkins in case they find themselves needing one but did not bring one with them to the aquatic recreation facility.

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

❖ A baby-changing table in a toilet facility is a convenience for both male and female caretakers. Because toilet facilities having less than two water closets are small, those facilities are not required to have changing tables.

SECTION 610
SPECIAL FEATURES

610.1 Locations. Entry and exit locations shall be in accordance with Table 610.1. The primary means of entry and exit shall consist of ramps, beach entries, pool stairs, or ladders.

❖ Table 610.1 indicates the allowable points of entry and exit to and from various Class D pools. The primary means of entry and exit must be a ramp, a beach entry, stairs or ladders. Most entry and exit locations for Class D pools are determined by the pool designer. Only Class D-1 and D-3 pools have specific requirements.

610.2 Secondary entry and exit means. Where secondary means of entry and exit are provided, they shall consist of one of the following:

1. Steps.
2. Stairs.
3. Ladders with grab rails.
4. Recessed treads.
5. Ramps.
6. Beach entries.

TABLE 610.1
ENTRY AND EXIT LOCATIONS

CLASS OF POOL	ENTRY AND EXIT LOCATIONS
D-1	Entry at beach end only; exit at beach end, sides or end wall
D-2	Entry and exit determined by the pool designer
D-3	Entry prohibited from deck areas; exit by ladders, steps or ramps as determined by pool designer
D-4	Entry and exit determined by the pool designer
D-5	Entry and exit determined by the pool designer
D-6	Entry and exit determined by the pool designer

7. Swimouts.
8. Designs that provide the minimum utility as specified in this code.

❖ Secondary entries and exits are in addition to the primary means of entry and exit for a pool. Pool operators may wish to restrict the use of certain entry and exit means for safety. For example, it is common industry practice to restrict entry and exit in Class D-1 (wave action pools), Class D-3 (catch pools), Class D-4 (leisure rivers) and Class D-5 (vortex pools) to specifically marked entry and exit points. All prohibited entry and exit points are typically blocked by a barrier and posted with signage directing the user towards acceptable entry and exit points.

Where ladders are installed on the sidewalls of Class D-1 pools, such ladders typically are posted as emergency only exits to keep bathers from attempting to use the ladder as an exit or as a handhold.

As Table 610.1 indicates, bather entry into Class D-3 (catch pools) from the deck is prohibited. This means that entry to the pool is only possible through the slide that the catch pool serves.

610.3 Provisions for diving. Where diving facilities are part of the attraction or pool complex, entries, exits, pool stairs, ladders, underwater benches, special features, and other accessories shall be located outside of the minimum diving water envelope in accordance with Figure 322.2.

❖ If an aquatic recreation facility allows diving into pools, the minimum diving water envelope must not be encroached on by any feature of the pool such as, but not limited to, ladders, swimouts, steps and water features.

610.4 Beach entry, zero-depth entry, and sloping entries. The shallow end for beach entries and sloping entries shall be in accordance with Sections 610.4.1 through 610.4.4 or the regulations of the local jurisdiction.

❖ Sections 610.4.1 through 610.4.4 cover the requirements for shallow end beach entry and sloping entry. Local jurisdictions could have other requirements.

610.4.1 Maximum entry slope. The slope of sloping entries used as a pool entry shall not exceed 1 unit vertical in 12 units horizontal (8.3-percent slope).

❖ A floor slope of one unit vertical in 12 units horizontal is gradual enough that the slip hazard is very low, thus reducing the risk of falls.

610.4.2 Benches. Where benches are used in conjunction with sloping entries, the vertical riser height shall not exceed 12 inches (305 mm).

❖ A maximum riser height of 12 inches (305 mm) for benches allows the benches to be easily stepped onto and off of.

610.4.3 Steps. Where steps are used in conjunction with sloping entries, all of the requirements of Section 610.5 shall apply.

❖ Steps used as part of sloping entries must comply with Section 610.5.

610.4.4 Slip-resistant surfaces. Beach and sloping entry walking surfaces at water depths up to 18 inches (457 mm) shall be slip resistant.

❖ The sloped walking surfaces must be slip resistant to reduce the potential for falls. Where the water depth is 18 inches (457 mm) or greater, walking surfaces are not required to be slip resistant as the water will cushion falls.

610.5 Pool steps. The design and construction of steps for stairs into the shallow end and recessed pool stairs shall be in accordance with Sections 610.5.1 through 610.5.6.

❖ Shallow end stair and recessed stair requirements are covered by Sections 610.5.1 through 610.5.6.

610.5.1 Uniform height of 9 inches. Except for the bottom riser, risers at the centerline shall have a maximum uniform height of 9 inches (229 mm). The bottom riser height shall be permitted to vary from the other risers.

❖ Step riser heights that are greater than 9 inches (229 mm) are difficult to climb. Lower height risers are easier to climb, especially if carrying items such as inner tubes or body slide mats. The bottom riser height might have to vary from the other riser heights.

610.5.2 Distance from coping or deck. The vertical distance from the pool coping, deck, or step surface to the uppermost tread shall be not greater than 9 inches (229 mm).

❖ The distance from the top step to the top of the deck or top of the pool coping must not be greater than 9 inches (229 mm), as greater heights are difficult to climb.

610.5.3 Color to mark leading edge. The leading edge of steps shall be distinguished by a color contrasting with the color of the steps and the pool floor.

❖ Steps that are underwater are difficult for the user to see where the step begins. A contrasting color on the leading edge of each step provides visual assistance to the user (see Commentary Figure 610.5.3).

610.5.4 Stairs in water depths over 48 inches. Stairs that are located in water depths greater than 48 inches (1219 mm) shall have the lowest tread located below the deck at a distance of not less than 48 inches (1219 mm) below the deck.

❖ Where stairs are in a water depth greater than 48 inches (1219 mm), the bottom step of the stairs needs to be at least 48 inches (1219 mm) below the top of the deck.

610.5.5 Tread horizontal depth. Treads shall have an unobstructed horizontal depth of not less than 11 inches (279 mm).

❖ Step treads are required to have a depth of not less than 11 inches (279 mm) so that an adult can place his or her foot completely on the step.

610.5.6 Tread surface area. Treads shall have an unobstructed surface area of not less than 240 square inches (.017 m^2).

❖ Step treads are required to have an area of not less than 240 square inches (0.017 m^2) so that it is easy

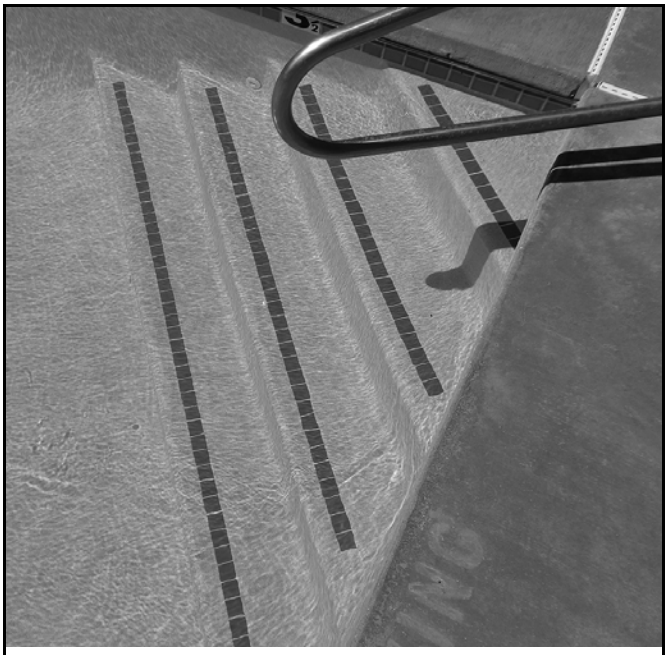


FIGURE 610.5.3
MARKING OF LEADING EDGE OF STEPS

for the user to find the step and have an area large enough to stand with both feet on the step.

610.6 Swimouts. Swimouts shall be located completely outside of the water current or wave action of the pool or spa and can be located in shallow or deep areas of water.

❖ Swimouts are a refuge point for swimmers. They must be located outside of wave action or water currents that are in the main part of the pool.

610.6.1 Surface area. An unobstructed surface equal to or greater than that required for the top tread of the pool stairs shall be provided in accordance with Sections 610.5.5 and 610.5.6.

❖ A swimout must meet the requirements of Sections 610.5.5 and 610.5.6.

610.6.2 Step required. Where a swimout is used as an entry and exit access point, it shall be provided with a step that meets the pool stair requirements (see Section 610.5).

❖ If the swimout is intended to be used as an entry and exit to the pool, then one or more steps must be provided from the swimout to the top of the deck or top of the coping. The steps must comply with Section 610.5.

610.6.3 Maximum depth. The horizontal surface of a swimout shall be not greater than 20 inches (508 mm) below the waterline.

❖ The top surface of a swimout cannot be greater than 20 inches (508 mm) below the waterline.

610.6.4 Color marking. The leading edge of a swimout shall be visually set apart by a stripe having a width of not less than $^3/_4$ inch (19 mm) and not greater than 2 inches (51 mm). The stripe shall be of a contrasting color to the adjacent surfaces.

❖ A contrasting color on the leading edge of a swimout provides visual assistance to the user. The color stripe on the leading edge must be $^3/_4$ inch (19 mm) to 2 inches (50 mm) wide.

610.7 Underwater seats and benches. Underwater seats and benches shall comply with this section.

❖ Sections 610.7.1 through 610.7.6 cover the requirements for underwater seats and benches.

610.7.1 Prohibited location. Underwater seats shall not be located in the diving water envelope.

❖ This section reinforces the intent of Section 322.2.

610.7.2 Surface dimensions. Underwater seats shall have an unobstructed surface dimension of not less than 10 inches (254 mm) measured front to back and not less than 24 inches (610 mm) in width.

❖ Underwater seats and benches must be large enough for an adult to sit as well as place their hands on the seat or bench for assistance in getting on and off the seat or bench.

610.7.3 Not an entry or exit. Underwater seats and benches shall not be used as an entry or exit for a pool but can be located in shallow or deep areas of water.

❖ An underwater seat or bench typically will be located too far below the top of the pool deck or coping to be useful as a step. Therefore, entry and exit to and from the pool from an underwater seat or bench is prohibited.

610.7.4 Depth. The horizontal surface of seats and benches shall be not greater than 20 inches (508 mm) below the waterline.

❖ The top surface of an underwater bench or seat cannot be greater than 20 inches (508 mm) below the waterline.

610.7.5 Color marking. The leading edge of seats and benches shall be visually set apart by a stripe having a width not less than $^3/_4$ inch (19 mm) and not greater than 2 inches (51 mm). The stripe shall be of a contrasting color to the adjacent surfaces.

❖ A contrasting color on the leading edge of an underwater bench or seat provides visual assistance to the user. The color stripe on the leading edge must be $^3/_4$ inch (19 mm) to 2 inches (50 mm) wide.

610.7.6 Slip resistant. The top surface of seats and benches shall be slip resistant.

❖ An underwater seat or bench would be difficult to stay seated on if the surface of the seat was not slip resistant.

610.8 Objects permitted. The design, construction, and operation of decorative objects and structures intended for climbing, walking, and hanging on by a bather are not covered by this code.

❖ Play equipment and play structures placed in pools are not covered by the code.

610.8.1 Floating devices. Floating devices not intended to be mobile shall be anchored in a manner to restrict movement to the range established by the designer. The anchoring of such floating devices shall be configured to minimize the possibility of entrapment of bathers, bodies, hair, limbs, and appendages should they come in contact with any element of the floating device or its anchors.

❖ Pool wall or floor anchor fittings and restraints that are installed to keep floating devices in position must be configured to minimize the possibility of entrapment of bathers. This includes entanglement of entire bodies, limbs and hair.

SECTION 611
SIGNAGE

611.1 Posting of signs. Signs stating rules, instructions, and warnings shall be posted. Signs for suction entrapment warning in accordance with Section 310 shall be posted. Signs shall be placed so that they squarely face approaching traffic. The center of the message panel shall be located not less than 66 inches (1676 mm) above the walking surface.

❖ Signs inform and alert users to proper and safe use of the facilities. For maximum exposure to the users, signs need to face the flow of users coming into the facility or attraction with the center of the sign being located not less than 66 inches (1676 mm) above the walking surface.

611.2 Prohibited mounting. Signs shall not be mounted on fences and gates alongside of guest walkways and staircases.

❖ Mounting of signs on fences and gates that are parallel to the flow of guest traffic is prohibited, as these locations are not visually prominent to the guest.

611.3 Message delivery. Messages delivered on signs shall comply with all of the following:

1. Messages shall be pertinent to the activity being performed or to be performed.
2. Messages shall be specific by providing details about the activity.
3. Messages shall be short and concise.
4. Messages shall be direct without humor or embellishments.

❖ The design of signs must convey the intended message so that the guest can quickly understand and remember the thoughts conveyed by the message. The four "rules" of this section cover the basic parameters that must be used to design signs.

611.4 Text font and size. The message text shall be in a clear, bold font such as Arial. The character height shall be proportional to 1 inch (25 mm) for 10 feet (3048 mm) of intended viewing distance but not less than 1 inch (25 mm).

❖ The size and shape of the text on a sign needs to be such that the text can be clearly read from a distance.

611.5 Distinct sign classes. Facility signs shall be categorized into four sign classes in accordance with Sections 611.5.1 through 611.5.4.

❖ Signs have distinct purposes and can be categorized into four types that are covered by Sections 611.5.1 through 611.5.4.

611.5.1 General information. General information signs shall be posted facility-wide and shall not be attraction specific.

❖ General information signs might include hours of operation and general facility safety rules such as "no running" and "no glass containers" (see Commentary Figure 611.5.1).

FIGURE 611.5.1
GENERAL FACILITY RULE SIGN

611.5.2 Directional signs. Directional signs shall identify the location of services and attractions in the park and shall include directional arrows. Directional signs shall be posted at various crossroads in the facility.

❖ Directional signs might include pointing the way to toilet facilities, specific attractions and food establishments (see Commentary Figure 611.5.2).

611.5.3 Rule signs. Rule signs shall inform guests of the qualifications that they must meet to allow them to participate on a specific ride or attraction. Rules shall include, but are not limited to, limits for weight and height, proper attire and ride (and ride vehicle) stipulations. Rule signs shall be located at a point where the guests make the initial commitment to participate on the ride.

❖ Rules signs are specific to a particular ride or attraction. Such signs inform the guest of what the ride or attraction is about, the qualifications for participation (height and weight) and the limitations for use (no

FIGURE 611.5.2
DIRECTIONAL SIGN

glasses, no pregnant women or no impaired guests). These signs are placed at the entry of the ride or attraction to head off conflicts at the dispatch platform of the ride or attraction. It gives the guest an opportunity to decide to not use the ride or attraction early on and not at the top of a series of staircases where they either change their mind or are denied use of the attraction and are forced to walk back down the steps against the flow of traffic.

611.5.4 Instructional signs. Instructional signs shall inform guests of specific instructions for the use of the ride. Instructions shall include, but are not limited to, riding posture, prohibited activity, and user exit requirements at the ride termination. Instructional signs shall be located along the queue approaching the ride dispatch area.

❖ Instructional signs are all about how to use the ride or attraction. Instructional signs at dispatch should rarely restate the rules. The focus is on delivering clear and simple instructions so the rider can have a fun and safe experience.

611.6 Materials. Sign panels shall be durable for the weather conditions and shall be resistant to damage from guests. The message surface shall be clean and smooth and shall readily accept paint or pre-cut lettering adhesives.

❖ Signs will not be effective if the lettering is extremely faded or fragmented either by weather or guest damage.

611.7 Shape and size consistency. The panel shape and size for each class of signs shall be the same. Where the total message to be indicated is larger than what can be placed upon one sign, multiple signs of the same size shall be used to display the message.

❖ Uniformity of signs of the same class offers further clarification in the mind of a sign reader. For example, rules signs might have the shape of an eight-sided hexagon (like a stop sign) so that readers will actually stop for a moment, take in the message and then make a decision to proceed ahead or divert to another ride or attraction.

611.8 Pictograms. Pictograms shall always be accompanied by text indicating the same message. Pictograms shall be designed to illustrate one clear and specific meaning to all individuals.

❖ Even the best, well-thought-out pictograms could be interpreted differently by different people. Words accompanying the pictogram ensure that the message is clear. Pictograms are not a required item but can be very helpful if well considered and of simple art. Commentary Figure 611.8 shows a pictogram.

FIGURE 611.8
EXAMPLE OF A PICTOGRAM

611.9 Theming or artwork. Theming or artwork applied to signs shall not invade the message panel. Signs shall have a distinct border.

❖ Facility sign design often includes graphic artwork that makes the signs "tie in" to the facility's overall theme. For example, an aquatic recreation facility might have a logo that is used on all advertising and signs. Such logos and other graphic artwork must be outside of the message panel of the sign. The message panel should have a distinct border to distinguish the message portion of the sign from the graphics portion of the sign.

611.10 Shallow water. Safety signs shall be in accordance with Section 412.

❖ Safety signs must comply with Section 412.

611.11 Cold water. Where a pool could have a water temperature below 70°F (21°C), a cold water warning sign shall be posted at the point of entry to the pool or at the attraction using such water.

❖ Some guests might have an aversion to being in contact with cold water. Where water temperature of a pool is below 70°F (21°C), signs must be posted to alert guests that the water is cold.

Chapter 7: Onground Storable Residential Swimming Pools

General Comments

Onground storable pools for residential use are extremely popular as they have a relatively low initial cost of ownership (as compared to permanent inground residential pools) and can be disassembled and moved to another location. While these kinds of pools have special unique requirements for equipment, overall they are still required to comply with Chapter 3, except as specifically noted.

Purpose

The purpose of this chapter is to regulate the unique features of onground storable pools including, but not limited to, floor slopes, ladders, stairs, decks and circulation systems.

SECTION 701 GENERAL

701.1 Scope. This chapter describes certain criteria for the design, manufacturing, and testing of *onground storable pools* intended for *residential* use. This includes portable pools with flexible or nonrigid side walls that achieve their structural integrity by means of uniform shape, support frame or a combination thereof, and that can be disassembled for storage or relocation. This chapter includes what has been commonly referred to in past standards or codes as onground or above-ground pools.

❖ Onground storable pools are sometimes referred to as onground pools or above-ground pools. This chapter applies to onground storable pools that are installed for residential use. Onground storable pools can be of the type that has metal or fiberglass walls that support an internal liner or of the type that has flexible walls that contain the water by the nature of their shape and top edge reinforcement. All onground pools are designed with the intention to be disassembled/taken down and moved to another location or stored. Pools with rigid walls typically remain erected throughout the year, even though winter conditions could occur. Flexible wall pools are sometimes taken down and moved to storage during the winter months [see Commentary Figure 202(4)].

701.1.1 Permanent inground residential swimming pool. This chapter does not apply to permanent inground *residential* pools, as defined in Chapter 8.

❖ None of the special provisions for these factory-manufactured pools that can be disassembled and reassembled, apply to permanent inground residential pools.

701.2 General. In addition to the requirements of this chapter, onground storable *residential* swimming pools shall comply with the requirements of Chapter 3.

❖ The requirements of Chapter 3 apply to onground storable pools, except where specific exceptions in Chapter 3 exempt such pools from a requirement.

701.3 Floor slopes. Floor slopes shall be uniform and in accordance with Sections 701.3.1 through 701.3.4.

❖ In between transition points of the slope in the floor, floor slopes need to be uniform so that the bather has some expectation of where the floor is when walking. An uneven floor makes walking difficult and could result in stumbles and falls. Sections 701.3.1 through 701.3.4 cover the requirements for floor slopes.

701.3.1 Shallow end. The slope of the floor from the shallow end wall towards the deep area shall not exceed 1 unit vertical in 7 units horizontal (14-percent slope) to the point of the first slope change.

❖ A floor slope of one unit vertical in seven units horizontal in the shallow end of onground storable pools provides for an adequate walking surface that allows bathers to feel comfortable.

701.3.2 Transition. The slope of the floor from the point of the first slope change towards the deepest point shall not exceed 1 unit vertical in 3 units horizontal (33-percent slope).

❖ The slope of the floor at the transition point from shallow to deep water needs to be controlled so that the bathers are not startled by an abrupt change in slope.

701.3.3 Adjacent. The slope adjacent to the shallow area shall not exceed 1 unit vertical in 3 units horizontal (33-percent slope) and the slope adjacent to the side walls shall not exceed 1 unit vertical in 1 unit horizontal (100-percent slope).

❖ Where the floor meets the sidewall, the slope of the floor cannot be greater than one unit vertical in one unit horizontal so that bathers will not stub their toes when approaching the sidewall.

701.3.4 Change point. The point of the first slope change shall be defined as the point at which the shallow area slope exceeds 1 unit vertical in 7 units horizontal (14-percent slope) and is not less than 6 feet (1889 mm) from the shallow end wall of the pool.

❖ The transition point where the shallow end of the pool becomes the deep end of the pool must be at least 6 feet (1889 mm) from the shallow end wall.

701.4 Identification. For onground storable *residential* pools with a vinyl liner, the manufacturer's name and the liner identification number shall be affixed to the liner. For onground storable *residential* pools without a liner, the manufacturer's name and identification number shall be affixed to the exterior of the pool structure.

❖ For onground storable pools that have vinyl liners, the liner manufacturer's name and liner identification number must be affixed to the liner so that the customer has access to the information for replacement purposes. Some onground storable pools do not have liners so the information about the pool needs to be on the exterior of the pool structure.

701.5 Installation. *Onground storable pools* shall be installed in accordance with the manufacturer's instructions.

❖ Manufacturer's instructions must be followed when installing onground storable pools because the manufacturer knows how the product was designed to be installed for safe operation and reliable service. Installation instructions and other important safety related information, including NO DIVING signs, are provided by the manufacturer, although in some cases, typically with flexible or inflatable pools, the signage is embossed on the exterior of the pool. It is the contractor's responsibility (where one is used) to deliver all product or component manuals, instructions, and accompanying signage and other literature to the owner/operator at or before the completion of the project. Signage must be installed in accordance with the manufacturer's instructions as part of the installation.

SECTION 702
LADDERS AND STAIRS

702.1 Ladders and stairs. Pools shall have a means of entry and exit consisting of not less than one ladder or a ladder and staircase combination.

❖ Onground storable pools will have a wall height above ground that requires a ladder or ladder/staircase arrangement to enable bathers to enter and exit the pool safety.

702.2 Type A and Type B ladders. Type A, double access, and Type B, limited access, A-frame ladders shall comply with Sections 702.2.1 through 702.2.7. See Figure 702.2.

❖ Type A and Type B A-frame ladders are defined in Chapter 2. Detailed requirements for A-frame ladders are covered in Sections 702.2.1 through 702.2. Figure 702.2 illustrates a Type A, A-frame ladder with a top platform. A Type B ladder would have some type of panel installed on one side of the ladder so the steps on the outside of the pool could not be used when the pool is closed.

702.2.1 Barrier required. Ladders in the pool shall have a physical barrier to prevent children from swimming through the riser openings or behind the ladder.

Exception: Barriers for ladders shall not be required where the ladder manufacturer provides a certification statement that the ladder complies with the ladder entrapment test requirements of APSP 4.

❖ Figure 702.2 does not show barriers that are required to prevent children from swimming between the ladder and the pool wall or between the risers. The manufacturer of the ladder can certify that the ladder meets the ladder entrapment standard of APSP 4 and in that situation, barriers on the ladder are not required. If a manufacturer does not want to make such certification, then the ladder has to be supplied with barriers. Such barriers can be of any configuration that restricts access to the openings of the ladder.

702.2.2 Platform. Where an A-frame ladder has a platform between the handrails, the platform shall have a width of not less than 12 inches (305 mm) and a length of not less than 12 inches (305 mm). The platform shall be at or above the highest ladder tread. The walking surface of the platform shall be slip resistant.

❖ Some A-frame ladders could be designed with a top platform (see Figure 702.2). The platform must be at least 12 inches by 12 inches (305 mm by 305 mm) so that an adult can have adequate space to place his or

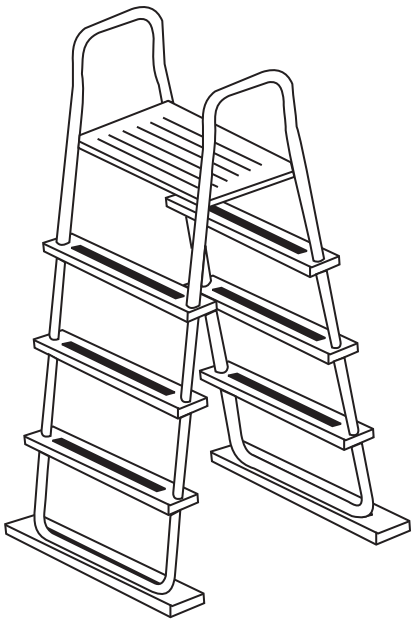


FIGURE 702.2
TYPICAL A-FRAME LADDER, TYPES A AND B

her feet. The platform must be slip resistant to reduce the potential for falls into the pool or onto the ground.

702.2.3 Handrails or handholds. A-frame ladders shall have two handrails or handholds that serve all treads. The height of the handrails and handholds shall be not less than 20 inches (508 mm) above the platform or uppermost tread, whichever is higher.

❖ Two handrails are required for a ladder because climbing a ladder is nearly impossible without using two hands on separate handholds or handrails. The handrails must rise up above the top tread of the ladder by at least 20 inches (508 mm) so that the user can steady themselves on the top rung (step).

702.2.4 Diameter. The outside diameter of handrails and handholds shall be not less than 1 inch (25 mm) and not greater than 1.9 inches (48 mm).

❖ The A-frame type of ladder is designed to be able to be removed and installed by one able adult while at the same time providing basic access from grade to pool. If the ladder was made to comply with the general handrail requirements (larger diameter tube) in Chapter 3, the ladder would be difficult to remove and install on a frequent basis (perhaps multiple times in a day). Thus, a heavier ladder would not be removed and the safety of the pool would be compromised because access would not be limited as intended (by the removal of the ladder).

702.2.5 Clear distance. The clear distance between ladder handrails shall be not less than a space of 12 inches (305 mm).

❖ The required clear distance between A-frame ladder handrails specifies the required usable tread width for the ladder. Too narrow of tread width would make standing on a tread unstable for the user.

702.2.6 Treads. Ladder treads shall have a horizontal uniform depth of not less than 2 inches (51 mm).

❖ Two inches (51 mm) is the minimum tread depth for comfort to the arch of an adult foot. Lesser tread depth imparts too much pressure per square inch on an adult foot.

702.2.7 Riser height. Risers, other than the bottom riser, shall be of uniform height that is not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The bottom riser height shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The vertical distance from the platform or top of the pool structure to the uppermost tread shall be the same as the uniform riser heights.

❖ Uniformity of riser heights reduces the potential for the user's foot missing the tread or stubbing their toe into the tread. Either event could cause the user to fall from the ladder. The indicated range of riser heights is climbable by both adults and children. The height of the bottom riser is required to be variable; the ladder might have to be shortened to accommodate differences in elevation between the top of the pool and the ground outside of the pool.

702.3 Type C staircase ladders (ground to deck). Type C staircase ladders shall comply with Sections 702.3.1 through 702.3.6. See Figure 702.3.

❖ The Type C staircase ladder is defined in Chapter 2. Detailed requirements for Type C staircase ladders are covered in Sections 702.3.1 through 702.3.6. Figure 702.3 illustrates a Type C staircase ladder.

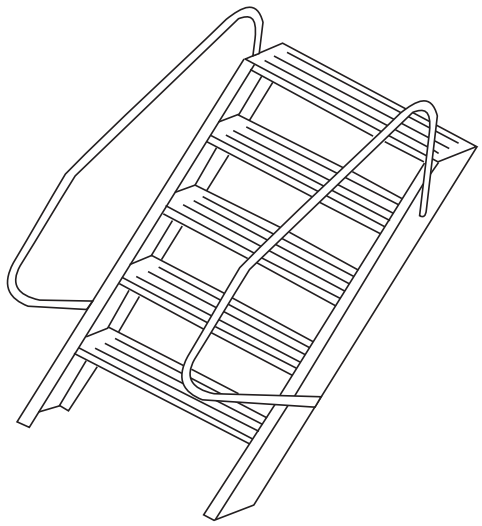


FIGURE 702.3
TYPICAL STAIRCASE LADDER, TYPE C

702.3.1 Handrails or handholds. Staircase ladders shall have not less than two handrails or handholds that serve all treads. The height of the handrails and handholds shall be not less than 20 inches (508 mm) above the platform or uppermost tread, whichever is higher.

❖ Because a staircase user is somewhat unsteady when transferring their weight from one foot to the other when ascending or descending stairs, there is a significant potential for falls if handrails or handholds are not provided for the user to steady himself or herself. Because staircase ladder treads are at least 19 inches (483 mm) wide, handrails or handholds need to be on both sides of the staircase ladder. The handrails or handholds must be at least 20 inches (508 mm) above the uppermost tread (or platform) so the user can easily reach the handrail or handhold before stepping off the top tread (or platform) down to the next tread.

702.3.2 Diameter. The outside diameter of handrails and handholds shall be not less than 1 inch (25 mm) and not greater than 1.9 inches (48 mm).

❖ A too-small handrail diameter is difficult to grip for adults with large hands. Too large of a handrail diameter is difficult to grip for children. The dimension range has been an onground storable pool industry standard for decades.

702.3.3 Treads. Ladder treads shall have a horizontal uniform depth of not less than 4 inches (102 mm).

❖ Four inches (102 mm) is a comfortable tread depth for user's placement of the ball of the foot on the tread. Lesser tread depth imparts too much pressure per square inch on the ball of an adult foot.

702.3.4 Riser height. Risers, other than the bottom riser, shall be of uniform height that is not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The bottom riser height shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The vertical distance from the platform or top of the pool structure to the uppermost tread shall be the same as the uniform riser heights.

❖ Uniformity of riser heights reduces the potential for the user's foot missing the tread or stubbing their toe into the tread. Either event could cause the user to fall. The indicated range of riser heights is climbable by both adults and children. The exception allows for the height of the bottom riser to vary, as the overall height of the staircase ladder might have to be shortened (at the bottom) to adjust for a difference in elevation between the top of the pool wall (or a platform) and the ground surface.

702.3.5 Top step. The top step of a staircase ladder shall be flush with the deck or 7 inches (178 mm) to 12 inches (305 mm) below the deck level.

❖ Staircase ladders are sometimes used in conjunction with the decks that are installed around the pool perimeter. The top tread (or platform) of a staircase ladder must either be flush with the top of the deck or must be located below the deck by a distance that equals the uniform riser height of the staircase ladder. In other words, the deck surface is really serving as the top tread of a set of stairs and needs to be located at the same riser height as the other steps in the set of stairs so that users do not stumble and fall at the top step (see the last sentence of Section 702.3.4).

702.3.6 Width. Steps shall have a minimum unobstructed width of 19 inches (483 mm) between the side rails.

❖ A step width of 19 inches (483 mm) provides for adequate width for an adult to use the stairs safely.

702.4 Type D in-pool ladders. Type D in-pool ladders shall be in accordance with Sections 702.4.1 through 702.4.7. See Figure 702.4.

❖ The Type D in-pool ladder is defined in Chapter 2. Detailed requirements for Type D in-pool ladders are covered in Sections 702.4.1 through 702.4.7. Figure 702.4 illustrates a Type D in-pool ladder.

702.4.1 Clearance. There shall be a clearance of not less than 3 inches (76 mm) and not greater than 6 inches (152 mm) between the pool wall and the ladder.

❖ The minimum clearance indicated provides adequate toe clearance for an adult foot that is placed on the ladder rung. The maximum clearance indicated significantly reduces the potential that a child could be trapped between the backside of the ladder and the pool wall.

702.4.2 Handrails or handholds. Ladders shall be equipped with two handrails or handholds that extend above the platform or deck not less than 20 inches (508 mm).

❖ Two handrails are required for a ladder because climbing a ladder is nearly impossible without using two hands on separate handholds or handrails. The handrails must rise up above the platform or deck by at least 20 inches (508 mm) so that the user can steady themselves on the top rung (step).

702.4.3 Clear distance. The clear distance between ladder handrails shall be not less than 12 inches (305 mm).

❖ The required clear distance between Type D in-pool ladder handrails specifies the required useable tread width for the ladder. Too narrow of tread width would make standing on a tread unstable for the user.

702.4.4 Diameter. The outside diameter of handrails and handholds shall be not less than 1 inch (25 mm) and not greater than 1.9 inches (48 mm).

❖ A too-small handrail diameter is difficult to grip for adults with large hands. Too large of a handrail diameter is difficult to grip for children.

702.4.5 Riser height. Risers, other than the bottom riser, shall be of uniform height that is not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The bottom riser height shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm).

❖ Uniformity of riser heights reduces the potential for the user's foot missing the tread or stubbing their toe into the tread. Either event could cause the user to fall. The indicated range of riser heights is climbable by both adults and children. The height of the bottom riser is allowed to vary as the height of a Type D lad-

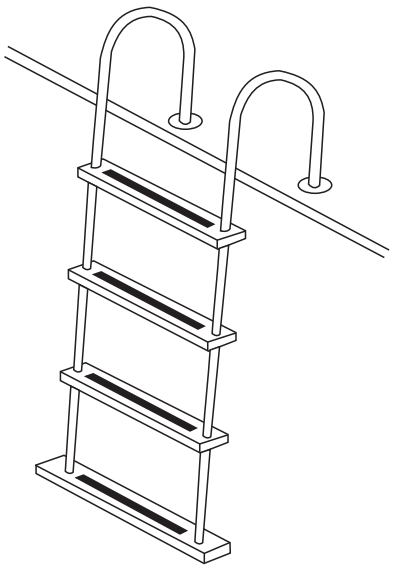


FIGURE 702.4
TYPICAL IN-POOL LADDER, TYPE D

der is selected so that the bottom rung of the ladder is above the floor of the pool. That distance above the floor could vary from pool to pool.

702.4.6 Top tread. The vertical distance from the pool coping, deck, or step surface to the uppermost tread shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm) and uniform with other riser heights.

❖ The handrails of Type D in-pool ladders are designed to be attached to the deck around the pool (see Figure 702.4). The top tread of the ladder must be located below the deck by a distance that equals the uniform riser height of the other rungs of the ladder so that users do not stumble and fall at the top step.

702.4.7 Tread depth. Ladder treads shall have a horizontal uniform depth of not less than 2 inches (51 mm).

❖ Two inches (51 mm) is the minimum tread depth for comfort to the arch of an adult foot. Lesser tread depth imparts too much pressure per square inch on an adult foot.

702.5 Type E protruding in-pool stairs. Type E protruding in-pool stairs shall be in accordance with Sections 702.5.1 through 702.5.7. See Figure 702.5.

❖ The Type E in-pool staircase is defined in Chapter 2. Detailed requirements for Type E in-pool staircases are covered in Sections 702.5.1 through 702.5.7. Figure 702.5 illustrates a Type E in-pool staircase.

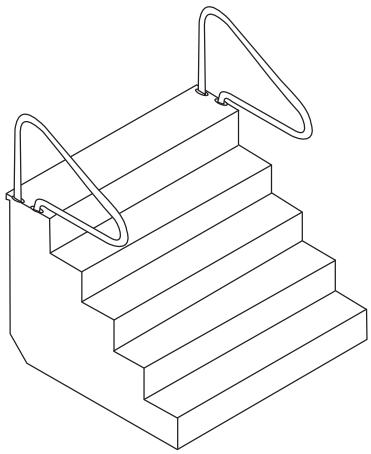


FIGURE 702.5
TYPICAL IN-POOL STAIRCASE, TYPES E AND F

702.5.1 Barrier required. In-pool stairs shall have a physical barrier to prevent children from swimming through the riser openings or behind the in-pool stairs.

❖ Staircases in the pool need to be designed so that a child cannot swim between the staircase and the pool wall or swim between the risers of the staircase. These areas could entrap a child (or even an adult) if not protected.

702.5.2 Handrails or handholds. In-pool stairs shall be equipped with not less than one handrail or handhold that serves all treads with a height of not less than 20 inches (508 mm) above the platform or uppermost tread, whichever is higher.

❖ Only one handrail or handhold is required for an in-pool staircase. The handrail or handhold must rise up above the platform or deck by at least 20 inches (508 mm) so that the user can steady themselves on the top step before descending the staircase.

702.5.3 Removable handrails. Where handrails are removable, they shall be installed such that they cannot be removed without the use of tools.

❖ Requiring the use of tools reduces the risk that the handrails will become loose or missing. Tools include typical hand tools, such as screwdrivers, wrenches or pliers.

702.5.4 Leading edge distance. The leading edge of handrails shall be 18 inches (457 mm) ± 3 inches (± 76 mm), horizontally from the vertical plane of the bottom riser.

❖ Users of the staircase need to be able to reach the handrail before they step onto the bottom step of the staircase. The 18-inch (457 mm) dimension provides adequate access for most users.

702.5.5 Diameter. The outside diameter of handrails and handholds shall be not less than 1 inch (25 mm) and not greater than 1.9 inches (48 mm).

❖ A too-small handrail diameter is difficult to grip for adults with large hands. Too large of a handrail diameter is difficult to grip for children. The dimension range has been an onground storable pool industry standard for decades.

702.5.6 Tread width and depth. Treads shall have an unobstructed horizontal depth of not less than 10 inches (254 mm) and an unobstructed surface area of not less than 240 square inches (0.15 m^2).

❖ A 10-inch (254 mm) tread depth is adequate for most adults to place their feet securely on the steps of the staircase.

702.5.7 Uniform riser height. Risers, other than the bottom riser, shall be of uniform height that is not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The bottom riser height shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The vertical distance from the pool coping, deck or step surface to the uppermost tread of the stairs shall be the same as the uniform riser heights.

❖ Uniformity of riser heights reduces the potential for the user's foot missing the tread or stubbing their toe into the tread. Either event could cause the user to fall. The indicated range of riser heights is climbable by both adults and children. The height of the bottom riser is allowed to vary, as the bottom riser height is the only variable that can be changed where all other riser heights are fixed. The top step to the top of the deck, pool coping or step surface must be located at the same height as the riser height for the other steps in the staircase.

702.6 Type F recessed in-pool stairs. Type F recessed in-pool stairs shall be in accordance with Sections 702.6.1 through 702.6.7. See Figure 702.5.

❖ The Type F recessed in-pool staircase is defined in Chapter 2. Detailed requirements for Type F recessed in-pool staircases are covered in Sections 702.6.1 through 702.6.7. Figure 702.5 illustrates a Type F recessed in-pool staircase.

702.6.1 Barrier required. In-pool stairs shall have a physical barrier to prevent children from swimming through the riser openings or behind the in-pool stairs.

❖ Staircases in the pool need to be designed so that a child cannot swim between the staircase and the pool wall or swim between the risers of the staircase. These areas could entrap a child (or even an adult) if not protected.

702.6.2 Handrails or handholds. In-pool stairs shall be equipped with not less than one handrail or handhold that serves all treads with a height of not less than 20 inches (508 mm) above the platform or uppermost tread, whichever is higher.

❖ Only one handrail or handhold is required for a recessed in-pool staircase. The handrail or handhold must rise up above the platform or deck by at least 20 inches (508 mm) so that the user can steady themselves on the top step before descending the staircase.

702.6.3 Removable handrails. Where handrails are removable, they shall be installed such that they cannot be removed without the use of tools.

❖ Requiring the use of tools reduces the risk that the handrails will become loose or missing. Tools include typical hand tools, such as screwdrivers, wrenches or pliers.

702.6.4 Leading edge distance. The leading edge of handrails shall be 18 inches (457 mm) ± 3 inches (± 76 mm), horizontally from the vertical plane of the bottom riser.

❖ Users of the staircase need to be able to reach the handrail before they step onto the bottom step of the staircase. The 18-inch (457 mm) dimension provides adequate access for most users.

702.6.5 Diameter. The outside diameter of handrails and handholds shall be not less than 1 inch (25 mm) and not greater than 1.9 inches (48 mm).

❖ A too-small handrail diameter is difficult to grip for adults with large hands. Too large of a handrail diameter is difficult to grip for children. The dimension range has been an onground storable pool industry standard for decades.

702.6.6 Tread width and depth. Treads shall have an unobstructed horizontal depth of not less than 10 inches (254 mm) at all points and an unobstructed surface area of not less than 240 square inches (0.15 m^2).

❖ A 10-inch (254 mm) tread depth is adequate for most adults to place their feet securely on the steps of the staircase.

702.6.7 Uniform riser height. Risers, other than the bottom riser, shall be of uniform height that is not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The bottom riser height shall be not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The vertical distance from the pool coping, deck or step surface to the uppermost tread of the stairs shall be the same as the uniform riser heights.

❖ Uniformity of riser heights reduces the potential for the user's foot missing the tread or stubbing their toe into the tread. Either event could cause the user to fall. The indicated range of riser heights is climbable by both adults and children. The height of the bottom riser is allowed to vary, as the bottom riser height is the only variable that can be changed where all other riser heights are fixed. The top step to the top of the deck, pool coping or step surface must be located at the same height as the riser height for the other steps in the staircase.

SECTION 703
DECKS

703.1 General. Decks provided by the pool manufacturer shall be installed in accordance with the manufacturer's instructions. Decks fabricated on-site shall be in accordance with the *International Residential Code*.

❖ Decks for onground storable residential pools can be provided by the pool manufacturer. Because the manufacturer designed the deck, they know how the deck needs to be installed to provide for a safe installation. Other decks that are field fabricated must comply with the deck requirements of the *International Residential Code*® (IRC®).

703.2 Cantilevered. The top surface of a cantilevered deck shall be not greater than 1 inch (25 mm) higher than the top of the pool wall. See Figure 703.4. The top surface of a noncantilevered deck shall be not higher than the top of the pool wall.

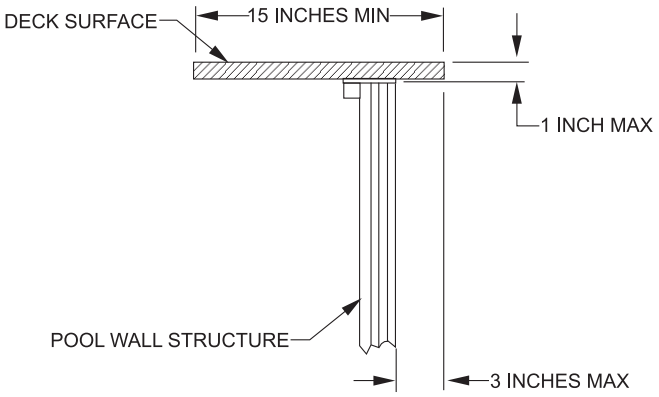
❖ A cantilevered deck is where the deck structure relies on the pool structure for support.

703.3 No gaps. Decks that are installed flush with the top rail of the pool shall have all gap openings between the deck and top rails closed-off or capped.

❖ Gaps between the deck and the top rail could cause a toe to become caught and cause the user of the pool to fall.

703.4 Extension over pool. Where a deck extends inside the top rail of the pool, it shall extend not more than 3 inches (76 mm) beyond the inside of the top rail of the pool in accordance with Figure 703.4 and shall have a smooth finish.

❖ The deck must not cover the water surface too much because this could obscure visibility into the water for someone who is watching others swim.



For SI: 1 inch = 25.4 mm.

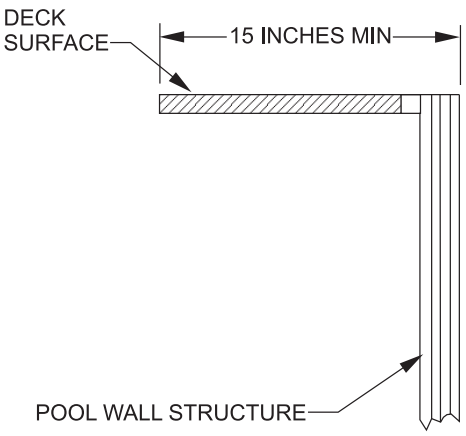
FIGURE 703.4
TYPICAL CANTILEVERED DECK SUPPORT

703.5 Slip resistant. The deck walking surface shall be slip resistant.

❖ The presence of water on a walking surface significantly increases the slip potential. Special attention must be given to markers and insignias to make sure that they do not present an increased slip hazard.

703.6 Walk-around decks. Walk-around decks shall have a level walking surface of not less than 15 inches (381 mm) in width, as measured from the inside edge of the pool top rail to the outside of the pool walk-around. See Figure 703.6.

❖ A walking surface of at least 15 inches (381 mm) allows for convenience and safety of the user.



For SI: 1 inch = 25.4 mm.

FIGURE 703.6
WALK-AROUND DECK WIDTH

SECTION 704
CIRCULATION SYSTEM

704.1 General. A circulation system consisting of pumps, hoses, tubing, piping, return inlets, suction outlets, filters and other related equipment that provides for the circulation of water throughout the pool shall be located so that such items cannot be used by young children as a means of access to the pool.

❖ The installer must not put the circulation equipment where children could climb on the equipment to gain access to the pool.

704.2 Installation and support. Circulation equipment shall be installed, mounted and supported in accordance with the manufacturer's instructions.

❖ For circulation systems to operate as intended and have reasonable life, the system needs to be supported as the manufacturer intended.

704.3 Draining the system. In climates subject to freezing, circulation system equipment shall be designed and fabricated to drain the pool water from the equipment and exposed piping, by removal of drain plugs and manipulating valves or by other methods in accordance with the manufacturer's instructions.

❖ Some onground storable pools are intended to remain erected during periods of the year where freezing conditions are possible. Circulation equipment for those pools must have means for draining water from the equipment and piping so that remaining water does not freeze and damage the components and piping. Other onground storable pools are drained, folded up and stored along with the circulation equipment.

704.4 Turnover. A pump including a motor shall be provided for circulation of the pool water. The equipment shall be sized to provide a turnover of the pool water not less than once every 12 hours. The system shall be designed to provide the required turnover rate based on the manufacturer's specified maximum flow rate of the filter, with a clean media condition of the filter. The system flow shall not exceed the filter manufacturer's maximum filter flow rate.

❖ Turnover or turnover rate is determined by dividing the volume of the pool by the flow rate of the circulation system. For example, a 10,000-gallon (37 854 L) pool with a 36-gallon-per-minute (gpm) (136.3 lpm) filtration pump with filter will have a 4.6-hour turnover rate. In other words, it will take 4.6 hours for the entire volume of the pool to be filtered one time.

704.5 Piping and fittings. The process piping of the circulation system, including but not limited to hoses, tubing, piping, and fittings, shall be made of nontoxic material and shall be capable of withstanding an internal pressure of not less than $1^1/_2$ times the rated pressure of the pump. Piping on the suction side of the pump shall not collapse when flow into such piping is blocked.

❖ Section 302.3 has an exception that allows for circulation system components for onground storable pools to not meet NSF 50. However, that does not

mean that just any component in these systems is suitable. This section requires two criteria for components: nontoxicity and ability to withstand the pressure of service. These simple criteria keep the cost of the product affordable while at the same time, provide for a safe circulation system.

704.6 Filters. Pressure-type filters shall have an automatic internal means or a manual external means to relieve accumulated air pressure inside the filter tank. Filter tanks composed of upper and lower tank lids that are held in place by a perimeter clamp shall have a perimeter clamp that provides for a slow and safe release of air pressure before the clamp disengages the lids.

❖ Pressure-type filters can retain pressure long after the circulation pump is shut off. The section requires safety mechanisms to prevent a filter from being completely opened when pressure is still on the filter.

704.6.1 Automatic internal air relief. Filter tanks incorporating an automatic internal air relief as the principal means of air release shall be designed with a means to provide for a slow and safe release of pressure.

❖ A manual air release on a filter tank allows for the user to adjust the rate at which pressure is released, hopefully in a responsible manner. Where the air release is automatic, the mechanism is required to control the pressure release in a safe manner.

704.6.2 Separation tank. A separation tank used in conjunction with a filter tank shall have a manual air release or the tank shall be designed to provide for a slow and safe release of pressure when the tank is opened.

❖ Separation tanks are similar to filters with regard to holding pressure after the pump is shut off. Thus, a separation tank has same requirements for safe release of pressure.

704.7 Pumps. Pool pumps shall be tested and certified by a nationally recognized testing laboratory in accordance with UL 1081.

❖ An exception in Section 313.1 allows for pumps and motors that are supplied as part of the "kit" with an onground storable pool package to not comply with the requirements in Section 313. Pool pumps for onground storable pools are only required to be tested and certified to UL 1081.

704.7.1 Cleanable strainer. Where a pressure-type filter is installed, a cleanable strainer or screen that captures materials such as solids, debris, hair and lint shall be provided upstream of the circulation pump.

❖ A strainer is only required where a pressure-type filter is installed. Although Section 313 requires a strainer for all pool circulation systems, Exception 2 of Section 313.1 removes this requirement for onground storable pools.

704.7.2 Accessible pumps and motors. Pumps and motors shall be accessible for inspection and service in accordance with the pump and motor manufacturer's instructions.

❖ For proper servicing which increases longevity, a pump and motor has to be in the right environment and in a location where the user can maintain them.

704.7.3 Pump shutoff valves. An accessible means of shut off of the suction and discharge piping for the pump shall be provided for maintenance and removal of the pump.

❖ As most pumps are below the water line of the pool, valves are needed to shut off the water to the pump so the pool does not require draining to replace or repair the pump.

704.8 Outlets and return inlets. Outlets or suction outlets and return inlets shall be provided and arranged to produce uniform circulation of water so that sanitizer residual is maintained throughout the pool. Where installed, submerged suction outlets shall conform to APSP 16.

❖ The pool manufacturer typically decides how many inlets and outlets are necessary and where placement should be to achieve proper circulation of the pool water. Many onground storable pools have one or more skimmers as the only outlets for the pool. Where a suction outlet is needed for a pool, the outlet is required to comply with the standard for suction outlets. (APSP 16)

704.9 Surface skimmer systems. The surface skimming system provided shall be designed and constructed to skim the pool surface when the water level is maintained between the minimum and maximum fill level of the pool.

❖ A surface skimming system is always necessary to provide for clear, properly filtered water.

704.9.1 Coverage where used as a sole outlet. Where surface skimmers are used as the only pool water outlet system, not less than one skimmer shall be provided for each 800 square feet (74.3 m^2), or fraction thereof, of the water surface area.

❖ The section states the minimum number of skimmers required based on water surface area. A 30-foot-diameter (9.1 m) pool has about 700 square feet (65 m^2) of water surface area. Thus only one skimmer is required for a 30-foot-diameter (9.1 m) pool. Note that the minimum skimmer coverage is the same as for any other type of residential pool (see Table 315.3)

704.9.2 Coverage where used in combination with other outlets. Where surface skimmers are not the only outlet for pool water, they shall be considered to cover only that fraction of the 800 square feet (74.3 m^2).

❖ Outlets, other than surface skimmers, might be present. For example, there might be a water overflow along one portion of the pool wall. In this situation, one skimmer covers 50 percent of the water surface area and the overflow outlet covers the other 50 percent of the area.

704.9.3 Location and venting. Skimmers shall be equipped with a vent that serves as a vacuum break.

❖ A vacuum break is necessary to prevent the skimmer from causing a siphon that would drain the pool to the lowest level of the skimmer.

SECTION 705
SAFETY SIGNS

705.1. Signs to be installed prior to final inspection. Safety signage such as "NO DIVING" signs and other safe use instruction signs that are provided by the pool and ladder manufacturer shall be posted in accordance with the manufacturer's instructions prior to final inspection.

❖ It is not enough that the pool manufacturer supplies the safety signage. The signs are only effective when they are posted.

705.2 Safety signs for ladders. Safety signage for ladders shall be in accordance with Sections 705.2.1 through 705.2.3.2.

❖ Advisements on how to use each type of ladder are necessary to encourage safe use and significantly reduce the potential for accidents.

705.2.1 A-frame ladders. Safety signage for A-frame ladders shall be in accordance with Sections 705.2.1.1 through 705.2.1.4.1. The words on the signage shall be readable by persons standing in the pool and standing outside of the pool as applicable for the required location of each sign.

❖ Signage has to be readable by the pool users who are about to use the ladders. This could mean that some signs would have to be facing a user who is in the pool.

705.2.1.1 No diving warning. A-frame ladders shall have the following words posted on the in-pool side of the ladder and on the pool entry side of the ladder: "NO DIVING." The location of the words shall be above the elevation of the design water level of the pool.

❖ The designated entry and exits point(s) of an onground storable pool are the best locations to warn the user that diving is prohibited. Children frequently attempt to dive from a ladder as it is the easiest way to climb above the water surface.

705.2.1.2 Entrapment warning. A-frame ladders shall have the following words posted on the pool side of the ladder: "TO PREVENT ENTRAPMENT OR DROWNING DO NOT SWIM THROUGH, BEHIND, OR AROUND LADDER."

❖ Even though A-frame ladders are either designed to reduce entrapment or are equipped with blocking material and means to reduce entrapment, users still need to be warned to stay away from A-frame ladders while swimming.

705.2.1.3 Type A, A-frame ladders. Type A double access A-frame ladders shall have the following words posted on the ladder: "REMOVE AND SECURE LADDER WHEN POOL IS NOT OCCUPIED."

❖ The Type A ladder is made to be removed to limit access to the pool. The signage reminds the responsible person to remove the ladder.

705.2.1.4 Type B, A-frame ladders. Type B limited access A-frame ladders shall have the following words posted on the ladder: "SECURE LADDER WHEN POOL IS NOT OCCUPIED."

❖ The Type B ladder is made to be "secured" to limit access to the pool. "Secured" means to close off with the ladder manufacturer-supplied cover or blocking mechanism to limit access to the pool. The signage reminds the responsible person to "secure" the ladder.

705.2.1.4.1 Swing up or slide up secured ladders. Type B limited access A-frame ladders that utilize swing-up or slide-up sections for limiting access to the pool shall have the following words posted on the ladder as applicable for the type of securing method:

1. "WHEN POOL IS NOT OCCUPIED, SWING UP AND SECURE."
2. "WHEN POOL IS NOT OCCUPIED, LIFT OFF."
3. "WHEN POOL IS NOT OCCUPIED, SLIDE UP AND SECURE."

❖ Some Type B ladders are made having "swing up," "lift off" or integral sliding cover capability. Specific signage is required for those special types of Type B ladders.

705.2.2 Type C staircase ladders. Type C staircase ladders that swing up to limit access to the pool or that are removed to limit access to the pool shall have the following words posted on the ladder: "WHEN NOT IN USE SWING UP AND SECURE OR REMOVE."

❖ Some Type C ladders are "swing up" or removal types. Special signage is required for those types where the ladder is the primary access limitation for the pool.

705.2.3 Type D in-pool ladder. Safety signage for Type D in-pool ladders shall be in accordance with Sections 705.2.3.1 and 705.2.3.2. The words on the signage shall be readable by persons standing in the pool or standing outside the pool as applicable for the required location of each sign.

❖ Signage has to be readable by the pool users who are about to use the ladders. This could mean that some signs would have to be facing a user who is in the pool.

705.2.3.1 No diving warning. Type D in-pool ladders shall have the following words posted on the in-pool side of the ladder and on the pool entry side of the ladder: "NO DIV-

ING." The location of the words shall be above the elevation of the design water level of the pool.

❖ The designated entry and exit point(s) of an onground storable pool are the best locations to warn the user that diving is prohibited. Children frequently attempt to dive from a ladder as it is the easiest way to climb above the water surface.

705.2.3.2 Entrapment warning. Type D in-pool ladders shall have the following words posted on the ladder: "WARNING: TO PREVENT ENTRAPMENT OR DROWNING, DO NOT SWIM THROUGH, BEHIND, OR AROUND LADDER."

❖ Even though Type D ladders are designed to reduce entrapment or are equipped with blocking material and means to reduce entrapment, users still need to be warned to stay away from ladders while swimming.

Chapter 8: Permanent Inground Residential Swimming Pools

General Comments

By some estimates, there are over 7 million permanent inground residential swimming pools in the United States alone. This far surpasses the number of public pools in the United States. Permanent inground residential pools are designed with a variety of shapes and water depths. The design possibilities are endless. However, no matter the shape or size of the pool, certain criteria for the design must be followed to provide for safe use of the pool.

Purpose

The purpose of this chapter is to regulate the design and installation of permanent inground residential swimming pools. Features such as steps, diving water envelopes, floor slopes, underwater benches and circulation systems have detailed requirements and restrictions. These regulations, in addition to those found in Chapter 3, control the installation of permanent inground residential swimming pools.

SECTION 801 GENERAL

801.1 Scope. The provisions of this chapter shall govern permanent inground *residential* swimming pools. Permanent inground *residential* swimming pools shall include pools that are partially or entirely above grade. This chapter does not cover pools that are specifically manufactured for aboveground use and that are capable of being disassembled and stored. This chapter covers new construction, modification and repair of inground *residential* swimming pools.

❖ Even though the chapter title and this section implies that permanent residential pools are always "in the ground," there are some arrangements where permanent residential pools are partially "in the ground," "on the ground" or even far above the ground. The latter two arrangements are rare as compared to millions of the "site constructed in an excavation" pools that have been built and will continue to be built in the future. The possibilities for permanent residential pool designs are endless. This chapter offers the widest latitude for design conceptualization by the future pool owner while at the same time, regulating important design aspects for safety in the residential-use environment.

Permanent inground residential pools are not necessarily completely site constructed. They can be fabricated, by the manufacturer, in part or whole, brought to the site, and lowered into an excavation or placed in its permanent location. Ancillary equipment packages (filters, pumps, blowers, water features, etc.) can be fabricated by a manufacturer, shipped to the jobsite and connected to the pool itself. The key point to make is that even though built in a factory and jobsite assembled, permanent inground residential pools are not manufactured with the intent to be disassembled, stored or reassembled elsewhere. Once installed, permanent inground residential pools will be as permanent as any other permanent building structure, until the pool structure is demolished.

801.2 General. Permanent inground *residential* pools shall comply with the requirements of Chapter 3.

❖ All requirements of Chapter 3 apply to residential pools except where the code exempts residential pools from complying with specific sections of the code. Note that Section 301.1.1 states that where there are differences between the provisions of this chapter and the provisions of Chapter 3, the provisions of Chapter 8 apply.

SECTION 802 DESIGN

802.1 Materials of components and accessories. The materials of components and accessories used for permanent inground *residential* swimming pools shall be suitable for the environment in which they are installed. The materials shall be capable of fulfilling the design, installation and the intended use requirements in the *International Residential Code*.

❖ A pool environment can be harsh on many materials because of the exposure to sanitizing chemicals and sunlight.

802.2 Structural design. The structural design and materials shall be in accordance with the *International Residential Code*.

❖ See the commentary to Section 307.4.

SECTION 803
CONSTRUCTION TOLERANCES

803.1 Construction tolerances. The construction tolerance for dimensions for the overall length, width and depth of the pool shall be ± 3 inches (76 mm). The construction tolerance for all other dimensions shall be ± 2 inches (51 mm), unless otherwise specified by the design engineer.

❖ In typical building construction, dimensional tolerances are usually much smaller than those given in this section. However, in the construction of inground pools, it is much more difficult to control the overall dimensions of the vessel because of the way that the materials are placed on the reinforcing framework. A tolerance of plus or minus 3 inches (76 mm) provides adequate construction allowance for the length, width and depth of the pool. Other construction dimensions are allowed to vary within plus or minus 2 inches (51 mm). The design engineer for the pool could specify closer tolerances.

SECTION 804
DIVING WATER ENVELOPES

804.1 General. The minimum diving water envelopes shall be in accordance with Table 804.1 and Figure 804.1. Negative construction tolerances shall not be applied to the dimensions of the minimum diving water envelopes given in Table 804.1.

❖ Diving water envelopes may vary, within tolerances, to create larger water envelopes, but may not vary to create a smaller diving water envelope. In other words, the dimensions in Table 804.1 are absolute minimums.

TABLE 804.1. See below.

❖ The basis for the information in this table comes from *Diving Safety in Swimming Pools: A Report to the National Swimming Pool Foundation*—written by Richard Stone, PhD, and published in 1980.

SECTION 805
WALLS

805.1 General. Walls in the shallow area and deep area of the pool shall have a wall-to-floor transition point that is not less than 33 inches (838 mm) below the *design waterline*. Above the transition point, the walls shall be within 11 degrees (0.19 rad) of vertical.

❖ See Chapter 2 for the definition of "Design waterline." The wall-to-floor transition point all around the pool must be at least 33 inches (838 mm) below the design waterline and the wall above the transition point must be within 11 degrees (0.19 rad) of vertical, so that a bather jumping in at the side of the pool has a low probability of hitting the side of the pool. Note that Section 807.2 allows for the depth of the shallow area of pools to be less than 33 inches (838 mm) where steps, beach entries or architectural features are installed in the shallow end of the pool.

SECTION 806
OFFSET LEDGES

806.1 Maximum width. Offset ledges shall be not greater than 8 inches (203 mm) in width.

❖ Offset ledges are for standing or walking along the walls of a pool. The ledges must not be more than 8 inches (1067 mm) wide so that they do not create an obstruction for someone jumping into the pool, right alongside the wall. See the commentary to Section 807.1.

806.2 Reduced width required. Where an offset ledge is located less than 42 inches (1067 mm) below the *design waterline*, the width of such ledge shall be proportionately less than 8 inches (203 mm) in width so as to fall within 11 degrees of vertical as measured from the top of the *design waterline*.

❖ Offset ledges must become narrower than the allowable 8 inches (203 mm), where the depth of the ledge is less than 42 inches (1067 mm) below the design waterline. Therefore, the width of the offset ledge is

TABLE 804.1
MININUM DIVING WATER ENVELOPE FOR SWIMMING POOLS DESIGNATED TYPES I-V[b]

POOL TYPE	MINIMUM DEPTHS AT POINT FEET-INCHES				MINIMUM WIDTHS AT POINT FEET-INCHES				MINIMUM LENGTHS BETWEEN POINTS FEET-INCHES					
	A	B	C	D	A	B	C	D	WA	AB	BC	CD	DE	WE
I	6-0	7-6	5-0	2-9	10-0	12-0	10-0	8-0	1-6	7-0	7-6	Note a	6-0	28-9
II	6-0	7-6	5-0	2-9	12-0	15-0	12-0	8-0	1-6	7-0	7-6	Note a	6-0	28-9
III	6-10	8-0	5-0	2-9	12-0	15-0	12-0	8-0	2-0	7-6	9-0	Note a	6-0	31-3
IV	7-8	8-0	5-0	2-9	15-0	18-0	15-0	9-0	2-6	8-0	10-6	Note a	6-0	31-3
V	8-6	9-0	5-0	2-9	15-0	18-0	15-0	9-0	3-0	9-0	12-0	Note a	6-0	36-9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. The minimum length between points C and D varies based on water depth at point D and the floor slope between points C and D.

b. See Figure 804.1 for location of points.

equal to water depth times the tangent of 11 (0.19 rad) or 0.194. For example, at a 36-inch (914 mm) depth, the offset ledge width can only be 36 (0.194) = 7 inches (178 mm).

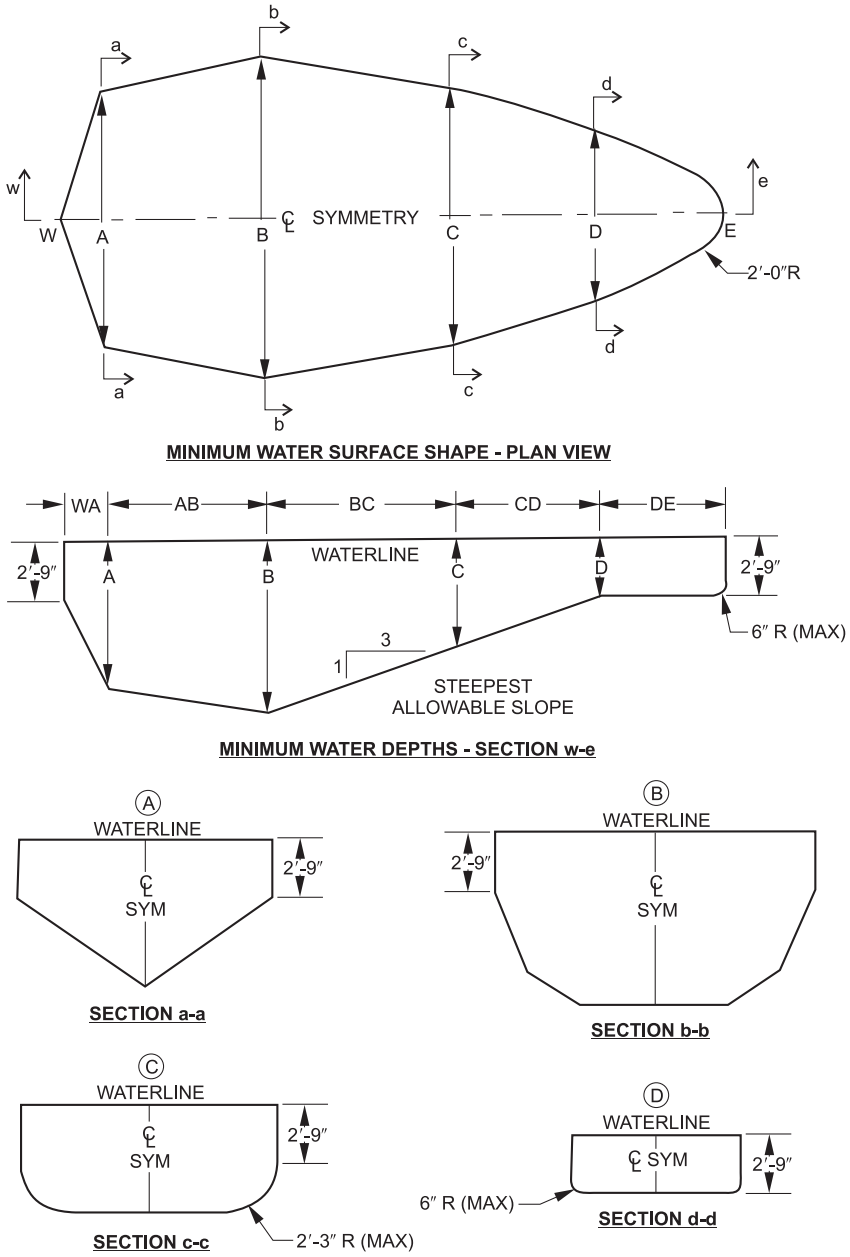
SECTION 807
POOL FLOORS

807.1 Floor slopes. Floor slopes shall be in accordance with Sections 807.1.1 through 807.1.3.

❖ Sections 807.1 through 807.1.3 cover the requirements for floor slopes.

807.1.1 Shallow end. The slope of the floor from the beginning of the shallow end to the deep area floor slope transition point, indicated in Figure 804.1 as Point E to Point D, shall not exceed 1 unit vertical in 7 units horizontal.

❖ A gradual slope of one unit vertical to seven units horizontal in the shallow end of a pool is easily walkable by most bathers with little fear that they will slip and slide into the deep end. The rope and float line required by Section 811.1 is an indicator to alert bathers that they are getting close to the transition point to the deep end of the pool.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 804.1
MINIMUM DIVING WATER ENVELOPE

807.1.2 Shallow to deep transition. The shallow to deep area floor slope transition point, indicated in Figure 804.1 as Point D, shall occur at a depth not less than 33 inches (838 mm) below the *design waterline* and at a point not less than 6 feet (1829 mm) from the beginning of the shallow end, indicated in Figure 804.1 as Point E, except as specified in Section 809.7.

❖ The change in the floor slope at the shallow-to-deep end transition point must be at a water depth of not less than 33 inches (838 mm) and located not less than 6 feet (1829 mm) from the shallow end pool wall.

807.1.3 Deep end. The slope of the floor in the deep end, indicated in Figure 804.1 as Point B to Point D, shall not exceed a slope of 1 unit vertical in 3 units horizontal (33-percent slope).

❖ After the shallow to deep end transition point, the deep end floor slope from Point B to Point D in Figure 804.1 must not be greater than one unit vertical in three units horizontal. Slopes steeper than this can create a serious slip and fall hazard when walking from the shallow to the deep area.

807.2 Shallow end water depths. The design water depth as measured at the shallowest point in the shallow area shall be not less than 33 inches (838 mm) and not greater than 4 feet (1219 mm). Shallow areas designed in accordance with Sections 809.6, 809.7 and 809.8 shall be exempt from the minimum depth requirement.

❖ The floor of the shallow end of the pool must be at least 33 inches (838 mm) deep, but not more than 4 feet (1219 mm) deep, so that children and nonswimmers have a relatively safe area for enjoyment of the pool. The minimum depth of the pool can be less than 33 inches (838 mm) where beach entries, steps or architectural features are installed in the shallow end.

SECTION 808
DIVING EQUIPMENT

808.1 Manufactured and fabricated diving equipment. Manufactured and fabricated diving equipment shall be in accordance with this section. Manufactured and fabricated diving equipment and appurtenances shall not be installed on a Type O pool.

❖ Manufactured diving equipment includes diving boards and jump boards. Fabricated diving equipment includes built-on-site platforms, diving rocks, cavern roofs, etc. Where a pool is not designed in accordance with the minimum diving water envelope dimensions of Table 804.1, the pool is a nondiving pool and diving equipment, manufactured or fabricated, must not be installed on the pool.

808.2 Manufactured diving equipment. Manufactured diving equipment shall be designed for swimming pool use.

❖ Manufacturers of diving equipment will typically specify pool type based on testing and evaluation by the manufacturer of the specific equipment design and performance. Two types of manufactured diving equipment are shown in Commentary Figure 808.2.

808.3 Installation. Where manufactured diving equipment is installed, the installation shall be located in the deep area of the pool so as to provide the minimum dimensions as shown in Table 804.1 and shall be installed in accordance with the manufacturer's instructions.

❖ Manufactured diving equipment must be located such that the entry point from diving is into the deep area of the pool. Section 808.6 covers the precise location for placement of diving equipment. Diving equipment must be installed in accordance with the manufacturer's instructions.

808.4 Labeling. Manufactured diving equipment shall have a permanently affixed label indicating the manufacturer's name and address, the date of manufacture, the minimum diving envelope and the maximum weight limitation.

❖ Identification of the manufacturer of diving equipment and the specifics concerning the equipment must be on the board so that the owner can replace the board with the same model (or manufacturer's replacement model), report any manufacturing defects and obtain any written instructions about the use of the board.

808.5 Slip resistant. Diving equipment shall have slip-resistant walking surfaces.

❖ The walking surfaces of diving equipment must not be so smooth that the user will lose traction, slip and fall onto the pool deck or onto the board.

808.6 Point A. For the application of Table 804.1, Point A shall be the point from which all dimensions of width, length and depth are established for the minimum diving water envelope. If the tip of the diving board or diving platform is located at a distance of WA or greater from the deep end wall and the water depth at that location is equal to or greater than the water depth requirement at Point A, then the point on the water surface directly below the center of the tip of the diving board or diving platform shall be identified as Point A.

❖ The location of Point A on the water surface establishes where the pool walls and floor need to be constructed to provide the minimum diving water envelope.

808.7 Location of pool features in a diving pool. Where a pool is designed for use with diving equipment, the location of steps, pool stairs, ladders, underwater benches, special features and other accessory items shall be outside of the minimum diving water envelope as indicated in Figure 322.2.

❖ No features or equipment of the pool are allowed to encroach into the diving water envelope.

808.8 Stationary diving platforms and diving rocks. Stationary diving platforms and diving rocks built on-site shall be permitted to be flush with the wall and shall be located in the diving area of the pool. Point A shall be in front of the wall at the platform or diving rock centerline.

❖ Where platforms or rocks are installed on a pool, some designs place them at the edge of the deep end of the pool. In these circumstances, Point A (see Sec-

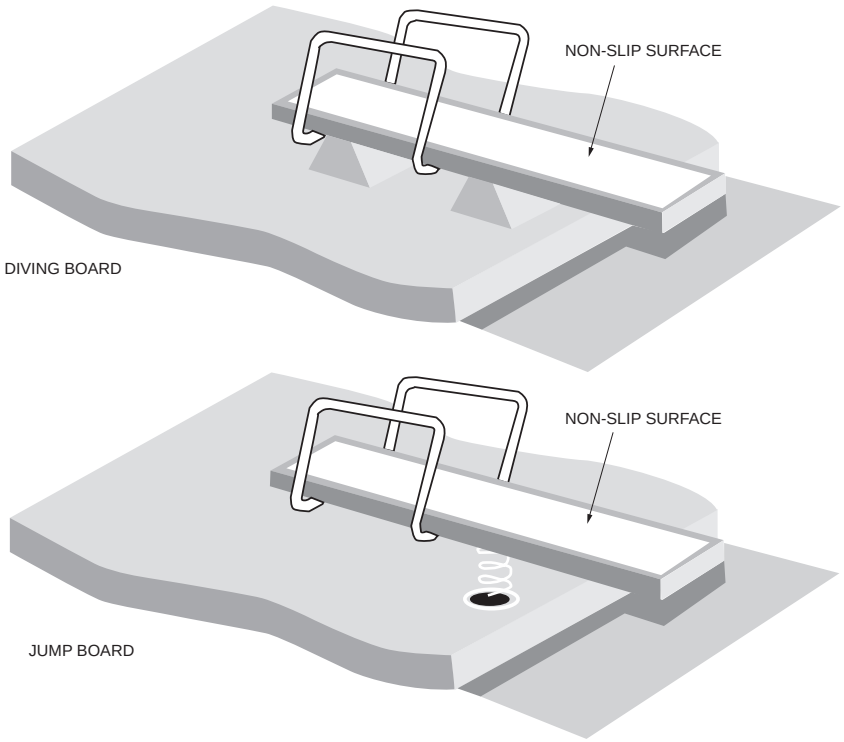


FIGURE 808.2
MANUFACTURED DIVING EQUIPMENT
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

tion 808.6) is considered to be directly below the center of the front edge of the platform or rock.

808.9 Location. The forward tip of manufactured or fabricated diving equipment shall be located directly above Point A as defined by Section 808.6.

❖ All measurements for the diving water envelope are derived from Point A, as referenced in Section 808.6.

808.10 Elevation. The maximum elevation of a diving board above the *design waterline* shall be in accordance with the manufacturer's instructions.

❖ Diving boards are designed and tested by the manufacturer to determine a maximum installation height to ensure that a diver does not enter the pool at too great a velocity. Given this maximum entry velocity, the specified diving water envelope for the diving board should provide sufficient room for the diver to maneuver safely and recover from the dive. Installing a diving board higher than the maximum allowable by the board manufacturer will result in a higher entry velocity and a distance which could result in diver injury.

808.11 Minimum water envelope. Manufactured diving equipment installation and use instructions shall be provided by the diving equipment manufacturer and shall specify the minimum water dimensions required for each diving board and diving stand combination. The board manufacturer shall indicate the water envelope type by dimensionally relating their products to Point A on the water envelopes as shown in Figure 804.1 and Table 804.1. The board manufacturer shall specify which boards fit on the design pool geometry types as indicated in Table 804.1.

❖ The type of diving equipment to be used on a pool drives the design of the pool with respect to the diving water envelope required. Diving boards are tested by the manufacturer who typically selects a pool type based on the board's length, spring characteristic and intended installation height. These factors can affect diver trajectory and velocity of entry into the water. Installation in accordance with the manufacturer's instructions is critical to ensure that the equipment is provided with a sufficient body of water in which the diver can safely maneuver and recover from the dive. Table 804.1 and the associated Figure 804.1 provide the minimum diving envelope dimensions for different types of pools intended for diving.

808.12 Platform height above waterline. The height of a stationary diving platform or a diving rock above the *design waterline* shall not exceed the dimensions in Table 808.12.

❖ Manufactured or fabricated diving platforms or diving rocks must be installed in accordance with Table 808.12.

TABLE 808.12
DIVING PLATFORM OR APPURTENANCE HEIGHT ABOVE DESIGN WATERLINE

POOL TYPE	HEIGHT INCHES
I	42
II	42
III	50
IV	60
V	69

For SI: 1 inch = 25.4 mm.

808.13 Headroom above the board. The diving equipment manufacturer shall specify the minimum headroom required above the board tip.

❖ This section applies to manufactured diving equipment, especially springboards and jump boards. The spring of such boards enables the diver to attain a higher altitude above the board than what he or she could jump from a solid surface. The manufacturer of the diving equipment must specify a required head room above the tip of the board so that the diver doesn't hit overhead obstacles.

SECTION 809
SPECIAL FEATURES

809.1 Slides. Slides shall be installed in accordance with the manufacturer's instructions.

❖ The manufacturer knows how the slide is intended to be used and must provide instructions that address the required installation details for ensuring safe use of the slide.

809.2 Entry and exit. Pools shall have a means of entry and exit in all shallow areas where the design water depth of the shallow area at the shallowest point exceeds 24 inches (610 mm). Entries and exits shall consist of one or a combination of the following: steps, stairs, ladders, treads, ramps, beach entries, underwater seats, benches, swimouts and other *approved* designs. The means of entry and exit shall be located on the shallow side of the first slope change.

❖ Shallow areas of pools are required to have a water depth of at least 33 inches (838 mm) (see Section 807.2). A means of entry and exit must be provided because it is too difficult to enter and exit at the side of the pool at the 33-inch (838 mm) depth. A number of means of exit/entry can be used.

809.3 Secondary entries and exits. Where water depth in the deep area of a pool exceeds 5 feet (1524 mm), a means of entry and exit shall be provided in the deep area of the pool.

❖ The means of entry and exit from the deep end of a pool include, but are not limited to, ladders, swimouts and recessed stairs.

809.4 Over 30 feet in width. Pools over 30 feet (9144 mm) in width at the deep area shall have an entry and exit on both sides of the deep area of the pool.

❖ Pools that are very wide need to have an entry/exit means at both sides of the deep area so that the bather is not challenged by having to traverse too far of a distance just to get out of the pool.

809.5 Pool stairs. The design and construction of stairs into the shallow end and recessed pool stairs shall conform to Sections 809.5.1 through 809.5.3.

❖ Sections 809.5.1 through 809.5.4 cover the requirements for stairs and recessed stairs.

809.5.1 Tread dimension and area. Treads shall have a minimum unobstructed horizontal depth of 10 inches (254 mm) and a minimum unobstructed surface area of 240 square inches (0.15 m^2).

❖ A minimum tread depth provides for the entire placement of an adult foot. The minimum area of the step provides enough space for an adult to stand comfortably with both feet on the step.

809.5.2 Riser heights. Risers, other than the top and bottom riser, shall have a uniform height of not greater than 12 inches (305 mm). The top riser height shall be any dimension not exceeding 12 inches (305 mm). The bottom riser height shall be any dimension not exceeding 12 inches (305 mm). The top and bottom riser heights shall not be required to be equal to each other or equal to the uniform riser height. Riser heights shall be measured at the horizontal centerline of the stairs.

❖ The bottom riser of stairs in the shallow area of a pool can vary in height from the floor because the floor could be sloped or uneven. The top riser of stairs in the pool can vary in height from the deck because it is often difficult to know the exact elevation of deck when the pool steps are being constructed. Also, in renovations of the pool deck, overlays (such as tile or special surfacing) would impact the top riser dimension triggering special reconstruction of the pool stairs. Just as long as the riser heights at the top and bottom of the stairs do not exceed 12 inches (305 mm), a residential user will easily become accustomed to a top and bottom riser height that are different from all of the other risers.

809.5.3 Additional steps. In design water depths exceeding 48 inches (1219 mm), additional steps shall not be required.

❖ Steps could be installed in the deep area of the pool [areas where the water depth is greater than 48 inches (1219 mm)].

809.6 Beach and sloping entries. The slope of beach and sloping entries used as a pool entrance shall not exceed 1 unit vertical in 7 units horizontal (14-percent slope).

❖ The slope of the floor for beach entries to a pool cannot be greater than the maximum slope allowed for the shallow area of the pool.

809.7 Steps and sloping entries. Where steps and benches are used in conjunction with sloping entries, the vertical riser distance shall not exceed 12 inches (305 mm). For steps used in conjunction with sloping entries, the requirements of Section 809.6 shall apply.

❖ Regardless of how steps and benches are used with sloping entries, the riser height of the step or bench must not exceed 12 inches (305 mm).

809.8 Architectural features. Surfaces of architectural features shall not be required to comply with the 1 unit vertical in 7 units horizontal (14-percent slope) slope limitation.

❖ Architectural features are not intended to be used by bathers, so they are not restricted to a floor slope of one unit vertical in seven units horizontal. These architectural features include items such as vanishing edge walls (see Commentary Figure 809.8).

FIGURE 809.8
SLOPED VANISHING EDGE WALL
(Photo courtesy of Swim, Inc.)

809.9 Maximum depth. The horizontal surface of underwater seats, benches and swimouts shall be not greater than 20 inches (508 mm) below the design waterline.

❖ Underwater seats, benches and swimouts must not be more than 20 inches (508 mm) below the design waterline so that when bathers sit on them, their heads remain above water.

SECTION 810
CIRCULATION SYSTEMS

810.1 Turnover rate. The circulation system equipment shall be sized to provide a turnover of the pool water not less than once every 12 hours. The system shall be designed to provide the required turnover rate based on the manufacturer's specified maximum flow rate of the filter, with a clean media condition of the filter.

❖ Turnover at least once every 12 hours is essential to maintaining water clarity and quality. Filter manufacturer instructions may call for a faster turnover.

810.2 Strainer required. Pressure filter systems shall be provided with a strainer located between the pool and the circulation pump.

❖ The strainer basket at the inlet of a typical pool pump complies with this requirement. If the pump used does not incorporate a strainer basket, one must be installed in the piping from the pool into the pump.

SECTION 811
SAFETY FEATURES

811.1 Rope and float. In pools where the point of first slope break occurs, a rope and float assembly shall be installed across the width of the pool. The rope assembly shall be located not less than 1 foot (305 mm) and not greater than 2 feet (610 mm) towards the shallow side of the slope break. Rope anchoring devices shall be permanently attached to the pool wall, coping or deck. Rope ends shall attach to the rope anchor devices so that the rope ends can be disconnected from the rope anchor device.

❖ The rope and float assembly on the shallow side of a slope break is intended to indicate an approaching significant change in slope which might create a slip hazard into deeper water. Slope break is a break in the angle or slant of the pool floor, typically found in vinyl liner pools with a hopper and potentially in pools designed for diving.

Pools with constant slope floors or gently curving floors from shallow to deep areas do not incorporate a slope break and do not require a rope and float assembly. Commentary Figure 811.1 illustrates various slope breaks.

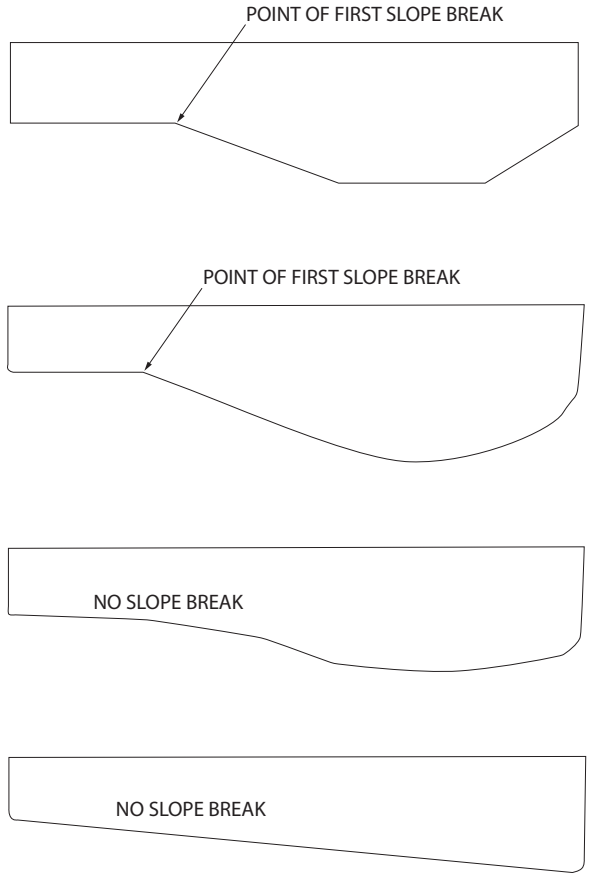


FIGURE 811.1
ILLUSTRATION OF SLOPE BREAK

Chapter 9: Permanent Residential Spas and Permanent Residential Exercise Spas

General Comments

Permanent residential spas and permanent residential exercise spas are popular permanent additions to an existing residential property as they can be used year round in just about any climate. As with permanent inground residential swimming pools, the design shape and size possibilities are endless. These spas are sometimes installed in conjunction with inground residential swimming pools

Purpose

The purpose of this chapter is to regulate the design and construction of permanent residential spas and permanent residential exercise spas to provide for a safe spa experience for the user. This chapter points the reader to Chapters 3 and 5 for the details of the requirements for spas.

SECTION 901 GENERAL

901.1 Scope. This chapter shall govern the design, installation, construction and repair of permanently installed *residential* spas and exercise spas intended for *residential* use.

❖ Permanent residential spas and permanent residential exercise spas can be installed as a stand-alone spa or in conjunction with a residential pool (see Commentary Figure 901.1).

901.2 General. Permanent *residential* spas and permanent *residential* exercise spas shall comply with Chapter 5 except that Sections 504.1, 504.1.1, 508.1 and 509 shall not apply. Such spas shall comply with the requirements of Chapter 3.

❖ Spas covered by this chapter are not much different than the public spas covered by Chapter 5, so all of the requirements of Chapter 5 apply, with the exception of Sections 504.1, 504.1.1, 508.1 and 509.

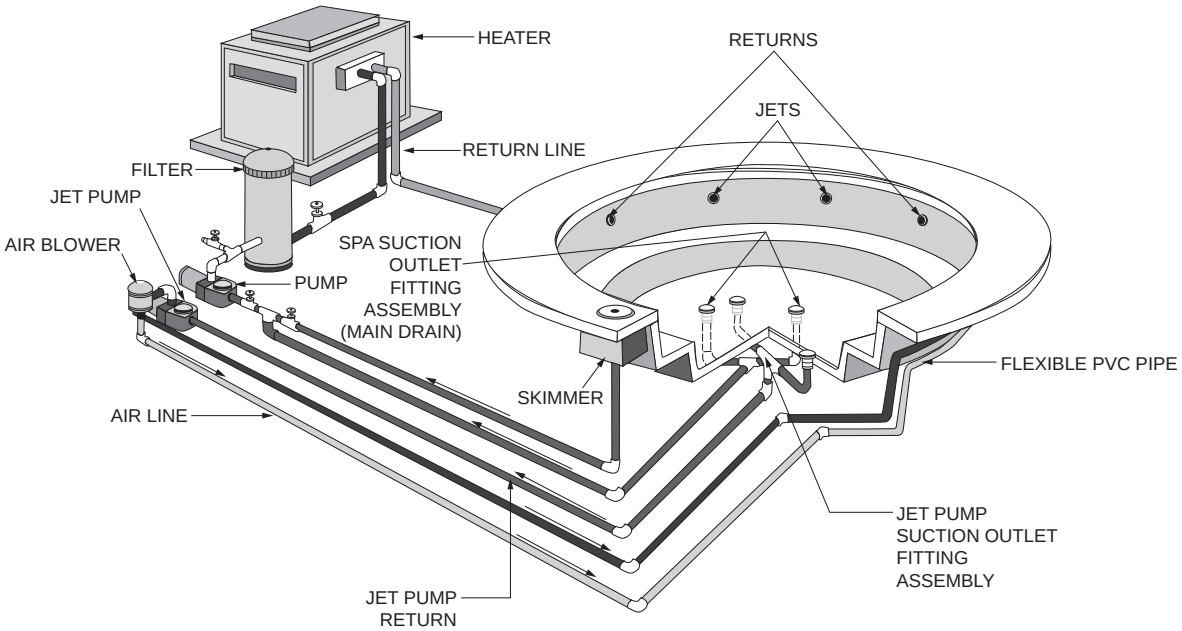


FIGURE 901.1
PERMANENT RESIDENTIAL SPA
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

SECTION 902
SAFETY FEATURES

902.1 Instructions and safety signage. Instructions and safety signage shall comply with the manufacturer's recommendations and the requirements of the local jurisdiction.

❖ Permanent residential spas and permanent residential exercise spas can be complete factory-built units that are intended to be permanently installed. The manufacturer of these complete units may include instructions and safety signage. If not, the local jurisdiction might require safety signage.

Chapter 10: Portable Residential Spas and Portable Residential Exercise Spas

General Comments

Portable residential spas are a very popular addition to many homes as they are relatively inexpensive (as compared to their permanent counterpart) and can be moved to another location if need be. The factory-built nature of these spas ensures high-quality and safe construction, as they are built in accordance with specific product standards.

Purpose

This chapter regulates portable residential spas and portable residential exercise spas by requiring them to be listed and labeled to standards applicable to those products. In addition to those standards, the spas must also comply with the requirements of Chapter 3, except where specifically noted.

SECTION 1001 GENERAL

1001.1 Scope. This chapter shall govern the installation, alteration and repair of portable *residential* spas and portable exercise spas intended for *residential* use.

❖ See Chapter 2 for the definitions of portable residential spas and portable residential exercise spas to better understand the scope of this chapter. This chapter applies to spas that are self-contained, as well as those that have the circulation equipment provided separately from the spa unit itself. Whether self-contained or nonself-contained, the units covered by this chapter are designed to be able to be moved from one location to another.

1001.2 General. In addition to the requirements of this chapter, portable *residential* spas and portable *residential* exercise spas shall also comply with the requirements of Chapter 3.

❖ The requirements of Chapter 3 apply to portable residential spas or portable residential exercise spas, except where such spas are specifically excluded in the sections of Chapter 3. For example, the internal wiring of portable residential spas or portable residential exercise spas is excluded from the requirement of Section 302.1.

1001.3 Listing. Equipment and appliances shall be *listed* and *labeled*, and installed as required by the terms of their approval, in accordance with the conditions of the listing, the manufacturer's instructions and this code. Manufacturer's instructions shall be available on the job site at the time of inspection.

❖ Listing and labeling of portable residential spas and portable residential exercise spas are based on testing of the complete unit, including on product labeling and instructions. The process is administered by an independent third-party testing agency. Improper installation can affect the ability of the spa to perform the intended function or provide the intended level of safety. Therefore, it is imperative that the manufacturer's instructions be strictly followed. The code official must have access to the installation instructions in order to verify that the product is installed in accordance with the listing. The product cannot be modified in any manner beyond that which is allowed by the instructions provided.

1001.4 Certification. Factory-built portable spas and portable exercise spas installed in *residential* applications shall be *listed* and *labeled* in compliance with UL 1563 or CSA C22.2 No. 218.1.

❖ This section requires that the spas covered by this chapter comply with UL 1563 or CSA 22.2 No 218.1. Compliance is determined by a third-party certification agency, which lists the spa as complying with the standard and affixes a label to the unit. The standards require testing of all components of the appliance and inspection of the instructions for the unit. No modifications to the appliance are allowed, other than those indicated by the manufacturer's instructions.

1001.5 Installation. Spa equipment shall be supported to prevent damage from misalignment and settling in accordance with the manufacturer's instructions.

❖ The spa manufacturer's instructions will provide details for adequate support and restraint for the spa and related equipment. As the manufacturer's instructions are part of the listing and labeling for the spa, those support details must be followed. For example, the spa manufacturer could require a concrete pad of a minimum thickness to accommodate the heavy load of the spa with water and occupants.

1001.6 Access. Electrical components that require placement or servicing shall be accessible.

❖ Electrical components such as switches, heating elements, motors, bulbs and sensors will need replacement, adjustment or inspection. The spa

manufacturer's instructions will indicate how to gain access to these components. The installer of the spa must make sure that the access points for these components can be reached after the spa is in its intended position. For example, the installer must not place a spa with a spa equipment access panel facing and next to a wall. Factory-built portable electric spas or exercise spas must be installed in accordance with the manufacturer's instructions.

1001.7 Instructions and safety signage. Instructions and safety signage shall comply with UL 1563 or CSA C22.2 No. 218.1, the manufacturer's recommendations, and the requirements of the local jurisdiction.

❖ UL 1563 and CSA C22.2 No. 218.1 have specific requirements for the manufacturer to supply instructions and safety signage to make sure that users are properly informed. The manufacturer might provide, or the jurisdiction might require, additional signage.

Chapter 11: Referenced Standards

General Comments

This chapter lists the standards that are referenced in various sections of the code. The standards are listed herein by the promulgating agency, the standard identification, the date and title, and the section or sections of the code that reference the standard. The application of the referenced standards is as specified in Section 102.7.

It is important to understand that not every document related to building design and construction is qualified to be a "referenced standard." The International Code Council® (ICC®) has adopted a criteria that standards referenced in the *International Codes*® (I-Codes®) and standards intended for adoption into the I-Codes must meet to qualify as a referenced standard. The policy is summarized as follows:

- Code references: The scope and application of the standard must be clearly identified in the code text.
- Standard content: The standard must be written in mandatory language and be appropriate for the subject covered. The standard must not have the effect of requiring proprietary materials or prescribing a proprietary testing agency.
- Standard promulgation: The standard must be readily available and developed and maintained in a consensus process such as ASTM or ANSI.

The ICC Code Development Procedures, of which the standards policy is a part, are updated periodically. A copy of the latest version can be obtained from the ICC offices.

Once a standard is incorporated into the code through the code development process, it becomes an enforceable part of the code. When the code is adopted by a jurisdiction, the standard also is part of that jurisdiction's adopted code. It is for this reason that the criteria were developed. Compliance with this policy means that documents incorporated into the code are developed through the use of a consensus process, written in mandatory language and do not mandate the use of proprietary materials or agencies. The requirement for a standard to be developed through a consensus process is vital because it means that the standard will be representative of the most current body of available knowledge on the subject as determined by a broad spectrum of interested or affected parties without dominance by any single interest group. A true consensus process has many attributes, including but not limited to:

- An open process that has formal (published) procedures that allow for the consideration of all viewpoints;
- A definitive review period that allows for the standard to be updated or revised;
- A process of notification to all interested parties; and
- An appeals process.

Many available documents related to design, installation and construction, though useful, are not "standards" and are not appropriate for reference in the code. Often, these documents are developed or written with the intention of being used for regulatory purposes and are unsuitable for use as a regulation because of extensive use of recommendations, advisory comments and nonmandatory terms. Typical examples of such documents include installation instructions, guidelines and practices.

The objective of ICC's standards policy is to provide regulations that are clear, concise and enforceable—thus the requirement for standards to be written in mandatory language. This requirement is not intended to mean that a standard cannot contain informational or explanatory material that will aid the user of the standard in its application. When it is the desire of the standard's promulgating agency for such material to be included, however, the information must appear in a nonmandatory location, such as an annex or appendix, and be clearly identified as not being part of the standard.

Overall, standards referenced by the code must be authoritative, relevant, up to date and, most importantly, reasonable and enforceable. Standards that comply with the ICC standards policy fulfill these expectations.

Purpose

As a performance-oriented code, the code contains numerous references to documents that are used to regulate materials and methods of construction. The references to these documents within the code text consist of the promulgating agency's acronym and its publication designation (e.g., ASME A112.1.2) and a further indication that the document being referenced is the one that is listed in Chapter 11. Chapter 11 contains all of the information that is necessary to identify the specific referenced document. Included is the following information on a document's promulgating agency (see Commentary Figure 11):

- The promulgating agency (i.e., the agency's title);
- The promulgating agency's acronym; and
- The promulgating agency's address. For example, a reference to an ASME standard within the code indicates that the document is promulgated by the

- American Society of Mechanical Engineers (ASME), which is located in New York City. Chapter 11 lists the standards agencies alphabetically for ease of identification.

Chapter 11 also includes the following information on the referenced document itself (see Commentary Figure 11):

- The document's publication designation;
- The document's edition year;
- The document's title;
- Any addenda or revisions to the document that are applicable; and
- Every section of the code in which the document is referenced.

For example, a reference to ASME A112.1.2 indicates that this document can be found in Chapter 11 under the heading ASME. The specific standards designation is A112.1.2. For convenience, these designations are listed in alphanumeric order. Chapter 11 identifies that ASME A112.1.2 is titled *Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)*; the applicable edition (i.e., its year of publication) is 2004; and it is referenced in one section of the code (Section 318.2).

The key aspect of the manner in which standards are referenced by the code is that a specific edition of a specific standard is clearly identified. In this manner, the requirements necessary for compliance can be readily determined. The basis for code compliance is, therefore, established and available on an equal basis to the code official, the contractor, the designer and the owner.

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards must be as specified in Section 102.7.

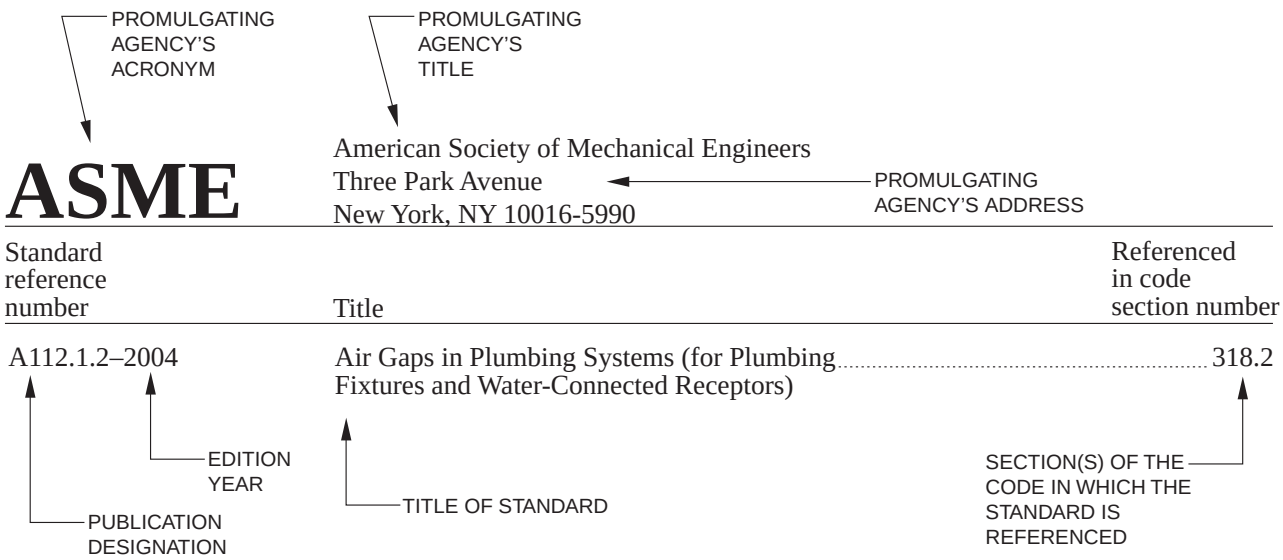


FIGURE 11
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.7.

AHRI

Air Conditioning, Heating and Refrigeration Institute
2111 Wilson Boulevard, Suite 500
Arlington, VA 22201

Standard reference number	Title	Referenced in code section number
1160(I-P)—09	Performance Rating of Heat Pump Pool Heaters	Table 316.2

ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

Standard reference number	Title	Referenced in code section number
A108/A118/A136.1—2009	Specifications for Installation of Ceramic Tile	Table 307.4
Z21.56a/CSA 4.7—2013	Gas Fired Pool Heaters	Table 316.2

APSP

The Association of Pool & Spa Professionals
2111 Eisenhower Avenue
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
ANSI/APSP/ICC 4—12	Standard for Aboveground/Onground Residential Swimming Pools	702.2.1
ANSI/APSP/ICC 7—13	American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins	310.1
ANSI/APSP/ICC 14—11	American National Standard for Portable Electric Spa Energy Efficiency	303.2
ANSI/APSP/ICC 15a —2013	American National Standard for Residential Swimming Pool and Spa Energy Efficiency	303.3
ANSI/APSP/ICC 16—11	American National Standard for Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs	202, 311.4.1, 311.4.4, 505.2.1

ASCE/SEI

American Society of Civil Engineers
Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191-4400

Standard reference number	Title	Referenced in code section number
ASCE 24—13	Flood Resistant Design & Construction	304.3

ASME

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

Standard reference number	Title	Referenced in code section number
A112.1.2—2004	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)	318.2
ASME B16.15—2011	Cast Bronze Threaded Fittings	Table 311.4.1

ASTM

ASTM International
100 Barr Harbor
West Conshohocken, PA 19428-2959

Standard reference number	Title	Referenced in code section number
A182—13	Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service	Table 311.4.1
A240—13a	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications	Table 307.4
A312—13a	Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes	Table 311.4
A403—13	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings	Table 311.4.1
B88—09	Standard Specification for Seamless Copper Water Tube	Table 311.4
B447—12a	Specification for Welded Copper Tube	Table 311.4
D1527—99(2005)	Specifications for Acrylonitrile Butadiene Styrene (ABS) Plastic Pipe, Schedules 40 and 80	Table 311.4, Table 311.4.1
D1593—09	Non-rigid vinyl chloride plastic film and sheeting	Table 307.4
D1785—12	Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	Table 311.4
D2241—09	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).	
D2464—06	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	Table 311.4.1
D2466—06	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	Table 311.4.1
D2467—06	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	Table 313.4.1
D2672—96a(2009)	Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement	Table 311.4
D2846/D2846M—09be1	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems	Table 311.4, Table 311.4.1
F437—09	Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80	Table 311.4.1
F438—09	Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	Table 311.4.1
F439—12	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80	Table 311.4.1
F1346—91(2010)	Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs	305.1, 305.4

CPSC

Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 30814-4408

Standard reference number	Title	Referenced in code section number
16 CFR Part 1207—04	Safety Standard for Swimming Pool Slides	406.10

CSA

CSA Group
8501 East Pleasant Valley
Cleveland, OH 44131-5516

Standard reference number	Title	Referenced in code section number
B137.2—13	Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Application	Table 311.4, Table 311.4.1
B137.3—13	Rigid Polyvinylchloride (PVC) Pipe and Fitting and Pressure Applications	Table 311.4, Table 311.4.1
B137.6—13	Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing, and Fitting for Hot- and Cold-Water Distribution Systems	Table 311.4, Table 311.4.1
C22.2 No. 108—01 (R2010)	Liquid Pump	313.8
C22.2 No. 218.1—M89 (R2011)	Spas, Hot Tubs and Associated Equipment	302.3, 309.1, 310.1, 313.8, Table 316.2, 317.2, 509.1, 1001.4, 1001.7
C22.2 No. 236—11	Cooling Equipment	Table 316.2
Z21.56a/CSA 4.7—2013	Gas Fired Pool Heaters	Table 316.2

IAPMO

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

Standard reference number	Title	Referenced in code section number
IAPMO Z124.7—2012	Prefabricated Plastic Spa Shells	Table 307.4

ICC

International Code Council, Inc.
500 New Jersey Avenue, NW
6th Floor
Washington, DC 20001

Standard reference number	Title	Referenced in code section number
IBC—15	International Building Code®	201.3, 304.2, 306.1, 307.2, 307.4, 307.8, 307.9, 410.1
IECC—15	International Energy Conservation Code®	201.3, 316.4
IFC—15	International Fire Code®	201.3
IFGC—15	International Fuel Gas Code®	201.3, 316.4
IMC—15	International Mechanical Code®	201.3, 316.4
IPC—15	International Plumbing Code®	201.3, 302.2, 302.5, 302.6, 306.8, 306.8.1, 318.2, 410.1
IRC—15	International Residential Code®	102.7.1, 201.3, 302.1, 302.5, 302.6, 304.2, 306.1, 306.3, 306.8, 306.8.1, 307.2, 307.4, 307.8, 307.9, 316.4, 318.2, 321.2.1, 321.4, 703.1, 802.1, 802.2

NEMA

National Electrical Manufacturers Association
1300 North 17th Street
Suite 1752
Rosslyn, VA 2209

Standard reference number	Title	Referenced in code section number
NEMA Z535—2006	ANSI/NEMA Color Chart	409.3

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269

Standard reference number	Title	Referenced in code section number
NFPA 70—2014	National Electrical Code	302.1, 316.4, 321.2.1, 321.4

NSF

NSF International
789 Dixboro Road
Ann Arbor, MI 48105

Standard reference number	Title	Referenced in code section number
NSF 14—2011	Plastics Pumping Systems Components and Related Materials	302.3, 311.4
NSF 50—2012	Equipment for Swimming Pools, Spas, Hot Tubs, and other Recreational Water Facilities	302.3, 309.2, Table 316.2, 508.1

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

Standard reference number	Title	Referenced in code section number
372—2007	Automatic Electrical Controls for Household and Similar Use—Part 2: Particular Requirements for Burner Ignition Systems and Components—with revisions through July 25, 2012	506.2.1, 506.2.2
873—2007	Temperature-Indicating and Regulating Equipment—with revisions through July 25, 2012	506.2.1, 506.2.2
1004-1—12	Standard for Rotating Electrical Machines General Requirements—with revisions through June 23, 2011	313.8
1081—2008	Standard for Swimming Pool Pumps, Filters and Chlorinators—with revisions through May 2013	313.8
1261—2001	Standard for Electric Water Heaters for Pools and Tubs—with revisions through July 2012	Table 316.2
1563—2009	Standard for Electric Hot Tubs, Spas and Associated Equipment—with revisions through July 2012	302.3, 309.1, 310.1, 313.8, Table 316.2, 317.2, 509.1, 1001.4, 1001.7
1995—2011	Heating and Cooling Equipment.	Table 316.2
2017—2008	General-Purpose Signaling Devices and Systems—with revisions through May 2011	305.4

INDEX

J

L

M

N

O

P

R

S

T

U

V

W

ANSI/APSP/ICC-7 2013

American National Standard for

Suction Entrapment Avoidance In Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins

Approved October 8, 2013

APSP
The Association of Pool & Spa Professionals®

ICC INTERNATIONAL CODE COUNCIL®

ANSI/APSP/ICC-7 2013

American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs And Catch Basins

SECRETARIAT:

Association of Pool & Spa Professionals
2111 Eisenhower Avenue
Alexandria, VA 22314
703 838-0083
www.APSP.org

Approved October 8, 2013
American National Standards Institute

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standard developer. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity.

Consensus requires that all views and objections be considered and that a concerted effort be made toward their resolution. The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved this standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard.

Important Notice about this Document

This voluntary standard has been developed under the published procedures of the American National Standards Institute (ANSI). The ANSI process brings together volunteers representing varied viewpoints and interests to achieve consensus.

APSP does not write the standards. Rather, APSP facilitates a forum for its members, and others interested in pool and spa design and safety, to develop standards through the consensus procedures of the American National Standards Institute (ANSI). While the APSP administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

In issuing and making this document available, the APSP is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the APSP undertaking to perform any duty owed by any person or entity to someone else. The APSP disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication of, use of, or reliance on this document.

The APSP has no power, nor does it undertake, to police or enforce compliance with the contents of this document. The APSP does not list, certify, test, or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the APSP. Any certification of products stating compliance with requirements of this document is the sole responsibility of the certifier or maker of the statement. The APSP, its members, and those participating in its activities do not accept any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials, or for the accuracy and completeness of the text.

Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstance. It is assumed and intended that spa users will exercise appropriate personal judgment and responsibility and that public spa owners and operators will create and enforce rules of behavior and warnings appropriate for their facility.

Copyright Notice

Foreword

This Foreword is not part of the American National Standard ANSI/APSP/ICC-7 2013. It is included for information only.

The *ANSI/APSP/ICC-7 2013 Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs And Catch Basins* was approved by ANSI on October 8, 2013.

The objective of this voluntary standard is to provide recommended minimum guidelines for suction entrapment avoidance in the design, equipment, operation, and installation of new and existing swimming pools, wading pools, spas, hot tubs, and catch basins for builders, installers, pool operators, and service professionals. It is intended to meet the needs for incorporation into national or regional building codes, and also for adoption by state and/or local municipalities as a local code or ordinance. It is understood that for the sake of applicability and enforceability, the style and format of the standard may need adjustment to meet code or ordinance style of the jurisdiction adopting this document.

The design recommendations and construction practices in this standard are based upon sound engineering principles, research, and field experience that, when applied properly, contribute to the delivery and installation of a safe product.

The words "safe" and "safety" are not absolutes. While the goal of this standard is to design and construct a safe, enjoyable product, it is recognized that risk factors cannot, as a practical matter, be reduced to zero in any human activity. This standard does not replace good judgment and personal responsibility. In permitting use of the pool, spa, swim spa or portable spa by others, owners must consider the skill, attitude, training and experience of the expected user.

As with any product, the specific recommendations for installation and use provided by the manufacturer should be carefully observed.

This standard was prepared by the This standard was prepared by the APSP-7 Suction Entrapment Avoidance Standard Writing Committee of the Association of Pool and Spa Professionals (APSP) in accordance with American National Standards Institute (ANSI) Essential Requirements: Due process requirements for American National Standards.

Consensus approval was achieved by a ballot of the balanced APSP Standards Consensus Committee and through an ANSI Public Review process. The ANSI Public Review provided an opportunity for additional input from industry, academia, regulatory agencies, safety experts, state code and health officials, and the public at large.

Suggestions for improvement of this standard should be sent to The Association of Pool and Spa Professionals, 2111 Eisenhower Avenue, Alexandria, VA 22314.

This standard is published in partnership with the International Code Council (ICC). ICC develops and publishes the *International Building Code (IBC)* and *International Residential Code (IRC)*, which are adopted as the basis for the building codes used in most states and jurisdictions within the United States. Additionally, APSP and ICC have collaborated to develop the first comprehensive model swimming pool and spa code, known as the *International Swimming Pool and Spa Code*. This landmark document incorporates and references material from ANSI/APSP standards and ICC's model codes, to create a stand-alone code that is consistent with codes and standards from both organizations.

These codes and standards are the result of a joint effort between ICC and APSP as a service to both the swimming pool and spa community, and building code professionals. It is the hope of both organizations that they will lead to enhanced safety for pool and spa users around the world.

Organizations Represented

Consensus approval in accordance with ANSI procedures was achieved by ballot of the following APSP Standards Consensus Committee. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

Producers

All American Custom Pools & Spas, Inc . . . John Romano
Custom Pools, Inc . . . . . Scott Heusser
Gary Pools, Inc . . . . . Leif Zars
Hayward Industries . . . . . John O'Hare
HornerXpress South Florida . . . . . Bill Kent
Master Spas Inc . . . . . Nathan Coelho
Rosebrook Carefree Pools, Inc . . . . . John Bently
Trilogy Pools Div. of Viking Pools LCC . . . . . Ted Baudendistel
S.R. Smith, LLC . . . . . Bill Svendsen
Van Kirk & Sons, Inc . . . . . Don Cesarone

General Interest

American Hotel & Lodging Association . . . . Tony Mendez
American Red Cross . . . . . Connie Harvey
Chesapeake Aquatic Consultants, LLC . . . . Frank Goldstein
Con-Serv Associates Inc. . . . . Wally James
Conroe Independent School District, TX . . . Louis Sam Fruia
Don Witte Consultant. . . . . Don Witte
National Environmental Health Association (NEHA) . . . . . Florence Higgins
Walt Disney Parks and Resorts. . . . . Michael Beatty
World Waterpark Association . . . . . Rick Root
YMCA of the USA. . . . . Albert Tursi

Government/User

City of Martinsville, VA . . . . . Kris Bridges
City of Mount Dora, FL. . . . . Tom Allen
Fairfax County, VA . . . . . Marc Mordue
Green Oak Charter Township . . . . . Wayne Jewell
Illinois Department of Public Health . . . . . Justin DeWitt
International Code Council. . . . . Lee Clifton
New Jersey Dept. of Community Affairs Division of Codes and Standards . . . . . Thomas Pitcherello
North Carolina Building Office Office of State Fire Marshall. . . . . Helen DiPietro
Oregon Public Health Division . . . . . Stephen Keifer
Washington State Dept. of Health . . . . . Gary Fraser
U.S. Consumer Product Safety Commission Mark Eilbert*
*non-voting

In accordance with American National Standards Institute (ANSI) procedures, this document will be reviewed periodically. The Association of Pool & Spa Professionals welcomes your comments and suggestions, and continues to review all APSP standards, which include:

ANSI/APSP/ICC-1 2013 Standard for Public Swimming Pools
ANSI/APSP-2 1999 Standard for Public Spas
ANSI/APSP-3 1999 Standard for Permanently Installed Residential Spas
ANSI/APSP/ICC-4 a 2013 Standard for Aboveground/Onground Residential Swimming Pools
ANSI/APSP/ICC-5 2011 Standard for Residential Inground Swimming Pools
ANSI/APSP/ICC-6 2013 Standard for Residential Portable Spas and Swim Spas
ANSI/APSP/ICC-7 2013 Standard for Suction Entrapment Avoidance in Recreational Aquatic Vessels
ANSI/APSP/ICC-8 2005 (R2013) Model Barrier Code for Residential Swimming Pools, Spas and Hot Tubs
ANSI/APSP-9 Standard for Aquatic Recreation Facilities (in progress)
ANSI/APSP-11 2009 Standard for Water Quality in Public Pools and Spas
ANSI/APSP/ICC-14 2011 Standard for Portable Electric Spa Energy Efficiency
ANSI/APSP/ICC-15-a 2013 Standard for Residential Pool and Spa Energy Efficiency
ANSI/APSP-16 2011 Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs
APSP 2013 Workmanship Standards for Swimming Pools and Spas

Contents

Sections

Appendices

Figures

APSP-7 Writing Committee

Zodiac Pool Systems	Shajee Siddiqui, Chairman
Afras Industries, Inc.	Reza Afshar
Aquatic Development Group	Jim Dunn
Fail Safe Products, LLC	Michael L. Wolfe
Gary Pools	Leif Zars
H_2O Flow Controls	Paul Hackett
Latham International	Michael Tinkler
Newport Controls LLC	Lee West
Pentair Aquatic Systems	Steve Barnes
Professional Pool Solutions, LCC	Maria Bella
Regal Beloit Corporation	Howard Richardson
Stingl Products	David Stingl
Swim, Inc.	Dan Johnson
Vac-Alert	Paul Pennington
Vacless	Hassan Hamza
Walt Disney	Andrea Crabb
Waterway Plastics	Ray Mirzaei

Observers

Custom Molding Products, Inc.	Angelo Pugliese
IAPMO R & T Lab	Tony Zhou
International Code Council (ICC)	Lee Clifton
ICC Alternate	Maribel Campos
Intex Recreation Corp.	Matthew (Chip) Whalen
Master Spas Inc.	Nathan Coelho
Tropical Pools Inc.	Adam Alstott
U.S. Consumer Product Safety Commission	Mark Eilbert*
Vak Pak	Alex Fletcher
Watkins Manufacturing	Mike McAgue

* Non-voting

Also Contributing

Consultant	Ray Cronise
Hayward Pool Products	Robert Rung

APSP Staff

Bernice Crenshaw, Director, Technical and Standards
Carvin DiGiovanni, Senior Director, Technical and Standards

American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs And Catch Basins

1 Scope

1.1 General. This standard covers design and performance criteria for circulation systems including components, devices, and related technology installed to protect against entrapment hazards in residential and public swimming pools, wading pools, inground spas, infinity edge basins, (infinity edge type pools) and catch Pools, and Aquatic Recreation Facilities.

1.1.1 Portable Factory Built Electric Spas/Hot Tubs. Suction entrapment avoidance guidelines for portable electric spas/hot tubs are not covered by this standard they are covered by UL 1563, Electric Spas, equipment Assemblies, and Associated Equipment.[6]

1.1.2 This standard applies to new and, when retrofitting, existing installations.

1.1.3 DANGER! SUCTION ENTRAPMENT HAZARD: To avoid serious injury or death, the pool or spa shall be closed to bathers if any suction outlet cover/grate is missing, broken, or incorrectly installed. There is no backup for a missing, damaged or incorrectly installed suction outlet cover/grate. See Appendix C.

1.2 Alternative methods. The provisions of this standard are not intended to prevent the use of any alternative material, system, or method of construction, provided any such alternative meets the intent and requirements of this standard, follows manufacturer's product specific instructions and is approved by the authority having jurisdiction.

2 Normative references

The following standards contain provisions that, through reference in this text, constitute provisions of this standard.

ANSI/APSP-16 2011, Suction fittings for swimming and wading pools, spas, hot tubs and whirlpool bathtub appliances[1]

ANSI/ASME A112.19.17-2010, Manufactured safety vacuum release systems (SVRS) for residential and commercial swimming pool, spa, hot tub and wading pool suction systems[2]

ASTM F 2387-12, Standard specification for manufactured safety vacuum release systems, swimming pools, spas and hot tubs[3]

IAPMO SPS-4 2009, Special use suction fittings for swimming pools, spas and hot tubs (for suction side automatic swimming pool cleaners)[4]

NFPA 70-2011, National Electrical Code, Article 680, Swimming pools, fountains, and similar installations[5]

UL 1563 2009, Electric Spas, Equipment Assemblies, and Associated Equipment.[6]

3 Definitions

alternative method: A substitute way of achieving the same goal or purpose.

anti-entrapment cover: See CERTIFIED SUCTION OUTLET COVER/GRATE.

anti-vortex cover: An outlet cover designed to prevent air entrainment from the surface of the water. This term is no longer used to describe CERTIFIED SUCTION OUTLET COVER/GRATE.

approved safety outlet cover: See CERTIFIED SUCTION OUTLET COVER/GRATE.

automatic pump shut-off system (APSS): A pump motor control or other device capable of turning off, stopping, or otherwise incapacitating a pump(s) in response to a condition (i.e., high vacuum, low flow, low current, etc.) that would indicate that a suction entrapment event has occurred.

branch piping: All pipe and fittings, including the "run" of the junction tee, located between multiple suction outlets fitting (see *Figures 1* and *9–14*).

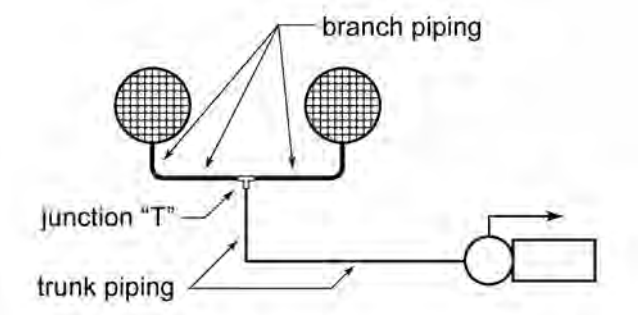


Figure 1. Branch piping

1. Association of Pool & Spa Professionals (APSP) , 2111 Eisenhower Avenue, Alexandria, VA 22314 (703) 838-0083, www.APSP.org.
2. American Society of Mechanical Engineers (ASME), 3 Park Avenue, 20th Floor, New York, NY 10016, (212) 591-8562, www.asme.org
3. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428, (610) 832-9500, www.astm.org
4. International Association of Plumbing and Mechanical Officials (IAPMO), 5001 E. Philadelphia St., Ontario, CA 91761. (909) 472-4100, www.iapmo.org
5. National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, (617) 770-3000, www.nfpa.org
6. Underwriters Laboratories Inc. (UL), 333 Pfingston Road, Northbrook, IL 60062-2096. (847) 272-8800, www.ul.com

catch pool: The pool at the discharge of a waterslide or similar aquatic facility or a body of water supplied by gravity overflow from another pool or vessel.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

certified: The published certification by an ILAC approved laboratory that a device, system, or alternate method has been tested and certified to be in conformance with the full intent of a standard.

certified automatic pump shut-off system APSS: An automatic pump shut-off system tested and certified in accordance with Section 4.3.2 of this standard which requires compliance with ANSI/ASME A112.19.17 or ASTM F2387.

certified safety cover: See CERTIFIED SUCTION OUTLET COVER/GRATE.

certified safety outlet cover: See CERTIFIED SUCTION OUTLET COVER/GRATE.

certified suction outlet cover/grate: A manufactured suction outlet or field fabricated outlet that has been Certified in accordance with Section 4.3.1 of this standard which requires compliance with ANSI/APSP-16[7].

certified SVRS: A manufactured safety vacuum release system tested and certified in accordance with Section 4.3.2 of this standard which requires compliance with ANSI/ASME A112.19.17 or ASTM F 2387.

check valve: A mechanical device in a pipe that permits the flow of water in one direction only.

closed pool: A pool in which access to bathers is prohibited. This may be accomplished by locking gates and doors, by posting notices, conspicuously placed "Barricade" tape. Pool circulation systems may be in operation when closed.

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

debris removal system: A system comprised of a large opening suction outlet, large diameter pipe and a debris collection basket, typically located in the deck or the pump basket. Because of unique challenges passing debris through the suction outlet cover/grate and suction piping, these systems are designed specifically for debris removal and are commonly sold as kits with detailed installation requirements to address suction safety.

drain: See MAIN DRAIN.

effluent: The outflow of water from a filter, pump, or pool

engineer: A Licensed Professional Engineer (P.E.).

equalizer line: 1. A pipe with a Certified suction outlet cover/grate located below the waterline and connected to the body of a skimmer to prevent air from being drawn into the pump if the water level drops below the skimmer weir. 2. A pipe connecting two bodies of water with Certified Suction Outlet Fitting Assemblies to equalize water levels.

feet of head: The measure of resistance in a hydraulic system based on the equivalent to the height of a column of water that causes the same resistance (100 feet of head = 43 pounds per square inch).

field built sump: A sump built below or behind the suction outlet cover/grate of a design specified by the cover/grate manufacturer to control flow distribution through the open area of the cover/grate. Field built sumps may be formed, cut or carved out of the gunite or concrete material of the pool structure. They are to be constructed so as to accommodate suitable fastening means to attach the cover/grate. They must conform to the requirements of APSP/ANSI-16.

field fabricated outlet(s): These are site specific unblockable suction outlet fitting assemblies defined per ANSI/APSP-16 as being intended as but not limited to a single suction outlet and are limited to 1.5 ft/sec *(0.46 m/s)* of flow velocity through the open area of the cover/grate unless rated at a lower flow rate by the Registered Design Professional. They are to be of such a size that the 18 in. × 23 in. × 4 in. corner radii *(457 mm × 584 mm × 102 mm)* blocking element will not cause a differential pressure that could cause body entrapment.

flow rate: The quantity of water flowing through a pipe within a specified time, such as the number of gallons flowing past a point in one minute; abbreviated as GPM or *liters/minute, Lpm* (1 GPM = *3.7854 L/min*).

flow rating: The maximum allowable flow rate through a cover/grate.

GPM: Abbreviations for gallons per minute.

gravity drainage: See VENTED RESERVOIR.

gutter: Overflow trough at the perimeter wall of a pool or at the bottom of a vanishing edge wall of a pool that is a component of the circulation system or flows to waste.

hydrostatic relief valve: A valve to allow rising groundwater to enter an empty pool to prevent flotation.

incorrectly installed: not installed in strict conformance with manufacturers product specific instructions.

infinity edge basin: a basin designed to receive the water that flows over the "infinity edge" of a pool and/or spa during the circulation pump cycle and/or feature pump operational time.

influent: The water entering a filter or other device

inlet: See RETURN INLET.

junction tee: A tee between suction outlet fittings, which joins their flow into a trunk line to the pump.
NOTE: This usage is different from the standard usage in the piping industry. The trunk line is connected to the single branch of the tee fitting and the two branch lines from the outlets are connected to the run of the tee fitting.

main drain: An obsolete term for suction outlet, which is a fitting, fitting assembly, cover/grate, and related components that provide a localized low-pressure area for the transfer of water from a swimming pool, wading pool, spa, or hot tub.

manifold: A branch pipe arrangement that connects several influent pipes into one chamber or pump, or one chamber into several effluent pipes.

7. The Consumer Product Safety Commission has voted unanimously to approve ANSI/APSP-16 2011 as the successor standard to the ANSI/ASME A112.19.8 suction outlet cover standard mandated by the Virginia Graeme Baker Pool and Spa Safety Act. The Commission determined that the new standard, ANSI/APSP-16 2011, was in the public interest, and incorporated this standard into its regulations. This means that, effective September 6, 2011, suction outlet covers manufactured, distributed, or entered into commerce in the United States must conform to the requirements of ANSI/APSP-16 2011.

maximum system flow rate: For purposes of this suction entrapment avoidance standard, maximum system flow rate is defined as the maximum potential flow when all available system flow is directed through the submerged suction outlet(s). See Section 4.4.9 for specific procedures required to determine the system specific, maximum system flow rate.

operating point: The condition at which the pump will operate. It is the intersection of the pump curve and system curve.

overflow system: An outlet with flow across a fixed or movable weir and where there is a free surface interface with atmosphere.

P.E.: See ENGINEER.

parallel: A piping arrangement allowing flow through multiple paths.

pump: A mechanical device, usually powered by an electric motor that causes hydraulic flow and pressure for the purpose of filtration, heating, and circulation of pool and spa water. Typically a centrifugal pump is used for pools, spas, and hot tubs.

pump curve, pump performance curve: A graph that represents the pressure rise of a pump plotted against flow rate. See SYSTEM CURVE AND OPERATING POINT.

Registered Design Professional: an individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

retrofit: The act of adding a component or accessory to the pool and spa that was not part of the original installation—for example, replacing a non-certified suction outlet cover/grate with one that is Certified. See also Section 6.5.

return inlet: The aperture or fitting through which the water under pressure returns into the pool or spa.

safety drain cover: See CERTIFIED SUCTION OUTLET s/GRATE.

safety vacuum release system (SVRS): A system capable of providing vacuum release at a suction outlet in case of a high vacuum occurrence due to a suction outlet flow blockage. Methods may include, but are not necessarily limited to, venting the suction line to atmosphere and/or turning off the circulation pump, or reversing the circulation flow.

secured control system: Any means that reasonably prevents unauthorized access to pump and valve control systems by persons who could make adjustments resulting in flow rates above which the system has been stamped and sealed in accordance with this standard by the Registered Design Professional responsible for this system.
NOTE: Secured control systems include, but are not limited to; equipment rooms not accessible to unqualified persons, control systems that are protected by passwords not available to unqualified persons, and valves with adjustment handles locked.

single outlet, alternative suction systems: A single Certified suction outlet cover/grate and an alternative suction system, including a venturi-driven system, turbine driven system, or any other mechanical means of circulating water without the use of a centrifugal pump.

skimmer: A device installed in the wall of a body of water that permits the removal of floating debris and surface water.

static lines: Piping that connects two bodies of water to maintain equal levels (example—a static line from a collector tank to a pool so that the auto-fill device in the collection tank can be adjusted to maintain the proper water level in the pool.)

suction: The flow of fluid into a partial vacuum or region of lower pressure. The gradient between this region and the ambient pressure will propel matter towards the low-pressure area.

suction-limiting gravity flow systems: See VENTED RESERVOIR.

suction-limiting system: A safety vacuum release system, vent system, gravity drainage/flow system, vented reservoir, automatic pump shut-off system, properly spaced multiple suction outlets, or other methods capable of limiting the duration of a high-vacuum occurrence and/or the magnitude of the vacuum at a suction outlet cover/grate in case of suction flow blockage.

suction outlet: Indicates a fitting, fitting assembly, cover/grate, sump, and related components that provide a localized low-pressure area for the transfer of water from a swimming pool, wading pool, spa, or hot tub. See also CERTIFIED SUCTION OUTLET COVER/GRATE.

suction system piping: All piping on the suction side of the system between the pool and the pump.

sump: The vessel between the suction outlet cover/grate and suction outlet piping. This may be manufactured or field built.

sumps in series: An arrangement of outlets such that effluent of one sump is influent to another sump. It is commonly used in piping submerged suction outlet(s) to skimmer body(ies).

swim jet system: Combination fitting or fittings that incorporate(s) a suction outlet and inlet designed to move a large volume of water at high velocity in a single direction.

system curve: A graph that shows the pressure difference required to induce flow through the entire piping system. It is plotted with head pressure on the vertical axis of the chart and flow rate on the horizontal axis of the chart (see *Figure 2*).

tee: A fitting in the shape of a "T" used to connect branch pipes. The trunk pipe is perpendicular to the two branch pipes.

testing: For the purposes of this standard, "testing" means the physical activity of performing an evaluation in accordance with the procedures and protocols defined by this standard and/or a referenced standard.

total dynamic head (TDH): The sum of the difference in elevation between the source and destination and the friction losses in a piping system. It has units of pressure (such as psi) but is commonly given in feet of head. Since friction losses depend on flow rate, TDH must be specified for a particular flow rate.

trunk line: piping from a junction tee to a suction source, such as a pump or vented reservoir.

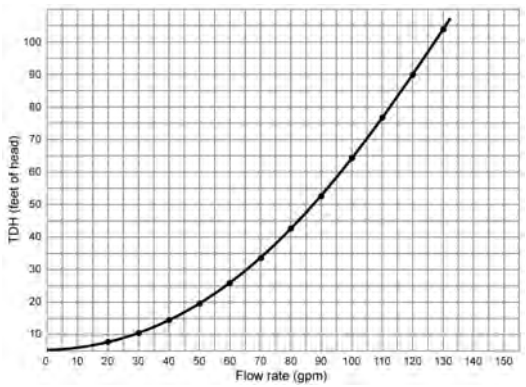


Figure 2. A system curve

unblockable: A suction outlet defined as all components, including the sump and/or body, cover/grate, and hardware such that its perforated (open) area cannot be shadowed by the area of the 18 × 23 in. *(457 × 584 mm)* Body Blocking Element of ANSI/APSP-16, and that the rated flow through the remaining open area cannot create a suction force in excess of the removal force values in *Table 1* of that standard. All suction outlet covers, manufactured or field-fabricated, are to be certified as meeting the applicable requirements of the ANSI/APSP-16 (see *Figures 3a* and *3b*).

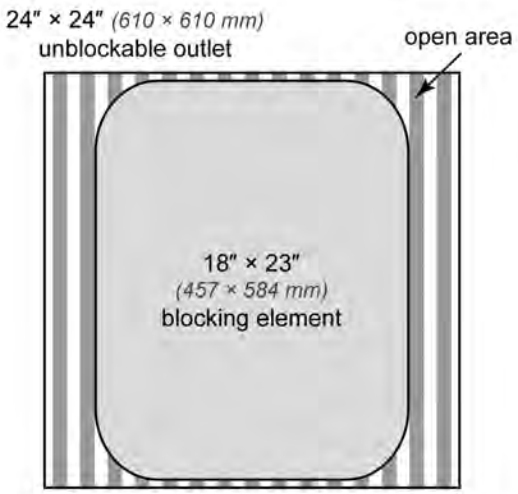


Figure 3a. Example of unblockable suction outlet

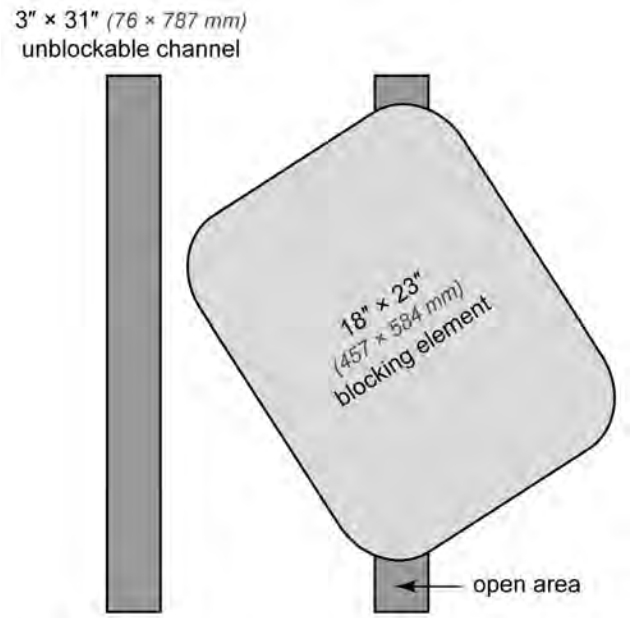


Figure 3b. Example of unblockable suction outlet

vacuum: A condition in which the pressure inside an outlet or suction pipe is lower than pool pressure.

vanishing edge: A design feature incorporated into a pool wall wherein the water flows over the wall (edge) into a catch gutter or catch pool, creating the illusion that the water vanishes.

vent: A vent to the atmosphere that connects to the suction pipe between the pool and the pump. When a high vacuum event occurs, air from the vent pipe replaces the water in the suction pipe thereby breaking the vacuum.

vented reservoir: A receptacle or container incorporated as part of a circulation system that is vented to atmosphere and receives water from the pool/spa or water feature by force of gravity, from which the pump draws its water supply. Systems including vented reservoirs are commonly referred to as *gravity flow systems, gravity feed systems,* or *gravity drainage systems.* Vented reservoirs include, but are not limited, to the following: catch pools, surge tanks, collector tanks, skimmers open to the atmosphere, atmospheric vent, gutters, overflow gutters, or perimeter gutter systems.

wading pool: A separate pool designed for use by small children with an independent circulation system and a maximum water depth of 18 in. *(457 mm)*.

wall vacuum fitting: A fitting in the wall of a pool intended to provide a point of connection of suction for suction side cleaners.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

4 General requirements for suction entrapment avoidance systems and components

4.1 DANGER! To avoid serious injury or death, the pool or spa shall be closed to bathers if any suction outlet cover/grate is missing, broken, or incorrectly installed. There is no backup for a missing, damaged or incorrectly installed suction outlet cover/grate.

4.2 Codes. Pools and spas covered by this standard shall be constructed and operated to comply with all applicable codes governing safety and environmental regulations.

4.2.1 Electrical components. All associated electrical components installed in and/or adjacent to the circulation system shall comply with the requirements of the *National Electrical Code,* Article 680, Swimming pools, fountains, and similar installations, or the applicable revision and any state or local codes.

4.3 Certifications

4.3.1 Suction outlet certification

4.3.1.1 Manufactured suction outlet fitting assembly(ies). When used, fully submerged suction outlet fitting assembly(ies) including cover/grate and associated fittings, fasteners and components shall be tested and certified by a third-party test lab accredited by the International Laboratory Accreditation Cooperation (ILAC) to test and certify products as conforming to ANSI/APSP-16.

4.3.1.2 Field fabricated suction outlet(s). When used, field fabricated suction outlet cover/grate, sump, fasteners and assemblies shall be Certified by a Registered Design Professional as conforming to ANSI/APSP-16.

4.3.2 Manufactured Safety Vacuum Release Systems (SVRS) and Automatic Pump Shut-off Systems (APSS). When used, SVRS and APSS devices shall be tested and certified by a third-party test lab accredited by the International Laboratory Accreditation Cooperation (ILAC) to test and certify products as conforming to ASME/ANSI A112.19.17, ASTM F 2387 or any successor standards recognized by the U.S. Consumer Product Safety Commission (CPSC).

NOTE: As of the publication date of this standard, automatic pump shut-off systems do not have a performance standard to which they can be certified, as a result the U.S. Consumer Product Safety Commission (CPSC) states APSS are to be tested and certified in accordance with one of the SVRS standards.

NOTICE: Operating conditions. Systems are tested for operation, in accordance with current standards, at room temperature. For substantially varying environmental conditions, including freezing, heat, salt spray, and humidity, confirm suitability with the SVRS manufacturer prior to installation and use.

CAUTION: Incompatible configurations. Some suction vacuum release systems may be incompatible with certain system configurations. The designer or installer shall confirm suitability with the SVRS manufacturer prior to installation and use. Incompatible configurations may include check valves; two or more suction outlets, hydrostatic relief valves, skimmers, solar systems, elevated or submerged pump suction, multilevel bodies of water, and water features.

4.4 Performance requirements for suction outlets and suction-limiting systems

NOTE: Suction-limiting systems protect against body entrapment but are not considered "backup" systems as there is no known suction-limiting system that will completely protect against the remaining four (evisceration, limb, hair, mechanical) of the five known hazards and presenting suction-limiting systems as "backup" systems would promote a false sense of security among the users of these devices/systems.

4.4.1 Submerged suction outlets are optional. Fully submerged suction outlets (main drains) are not required in pools and spas. Surface skimming or overflow systems shall be permitted to provide 100 percent of the flow.

4.4.2 Field built sumps. Field built sumps shall be built in accordance with the suction outlet fitting assembly manufacturer's instructions or as may be site specific designed by a Registered Design Professional.

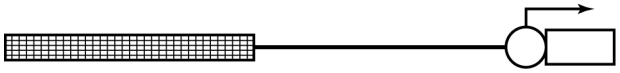


Figure 4. Single unblockable channel outlet to single pump.

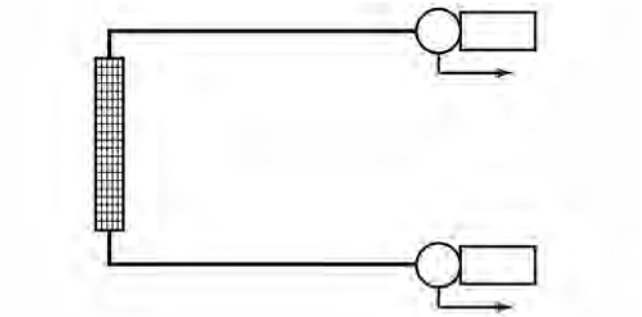


Figure 5. Single unblockable channel outlet to two pumps.

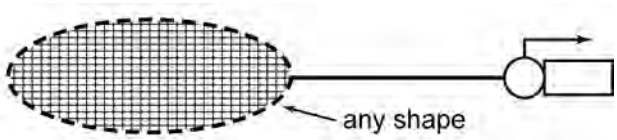


Figure 6. large unblockable outlet of any shape to single pump.

4.4.3 Unblockable outlets–single. A fully submerged unblockable outlet shall have a flow rating equal to or greater than the maximum system flow as determined in accordance with Section 4.4.9 (see *Figures 4, 5,* and *6*).

4.4.4 Unblockable outlets–multiple. Fully submerged unblockable outlets shall have a combined flow rating equal to or greater than the maximum system flow as verified in accordance with Section 4.4.9.

4.4.5 Blockable outlets–dual. When the secondary source of water for a blockable outlet is another submerged suction outlet assembly, each shall have a flow rating equal to or greater than the maximum system flow as determined in accordance with Section 4.4.9.

4.4.6 Blockable outlets–three, or more. When the secondary source of water for a blockable outlet is two or more submerged suction outlet assemblies, the flow rating of the set shall be determined by combining the flow rating of all outlets, minus the flow rating of one. The combined flow rating of the set shall be equal to or greater than the maximum system flow as determined in accordance with Section 4.4.9. If the flow ratings of all outlets are not equal, subtract the flow rating of the outlet with the highest flow rating.

4.4.7 Blockable outlets–multiple separation. For new construction see Section 5.3. For existing pools and spas see Section 6.9.

4.4.9 Maximum system flow rate. The maximum system flow rate shall be determined according to control system type where facilities with unsecured control systems use the options in 4.4.9.1 and facilities with secured control systems use the options in 4.4.9.2:

4.4.9.1 Maximum system flow rate–unsecured control systems. The maximum system flow rate is the pump's flow rate at the highest user selectable speed while the system is configured to operate at the lowest achievable system TDH when all flow is from the submerged suction system (skimmers off), the filter(s) is clean (when included), and all pressure-side valves are in the open (maximum flow) position. This operating point is determined by one of the following:

- Measuring with flow meter accurate to ±10% and installed according to the manufacturers specification, or
- Computing using complete system TDH calculations and then looking up the flow rate using the manufacturers certified pump curve, or
- Measuring system TDH at the pump's drain plugs and then looking up the flow rate using the manufacturer's certified pump curve.

4.4.9.2 Maximum system flow rate–secured control systems. The maximum system flow rate is the flow rate for the pump at its highest operating speed with the lowest operating system resistance as defined by the Registered Design Professional. It applies to new or replacement pumps. Measurements shall be made with a properly sized flow meter accurate to ±10% and installed according to manufacturer's instructions.

NOTE: The flow meter must be installed in accordance with the manufacturer's specific instructions. Careful consideration must be given to pipe diameter and the required straight pipe distances between the flow meter and other fittings such as, but not limited to, elbows, tees, valves etc.
No offset or estimation is to be allowed for flow meters that are not installed in accordance with the manufacturer's instructions. The manufacturer's claims must be NIST[8] traceable and verified by a third party.

4.5 Skimmers. Skimmers shall be vented to the atmosphere through openings in the lid, or through a separate vent pipe (see *Figure 7*).

4.5.1 Skimmer equalizer lines. Skimmer equalizer lines shall not be used on new construction. Existing equalizer(s) shall comply with all submerged suction outlet requirements of this standard (see *Figure 8*).

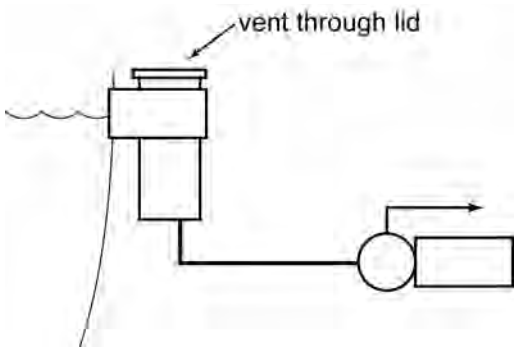


Figure 7. Skimmer, vent through lid

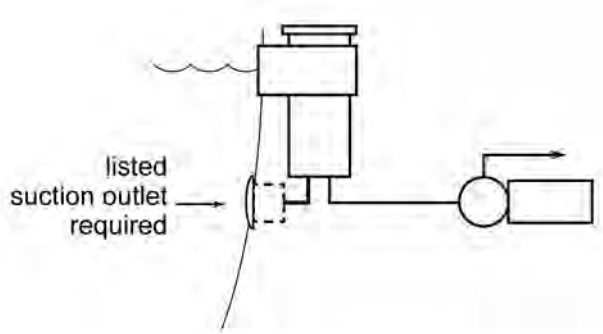


Figure 8. Skimmer with equalizer

4.6 Wall vacuum fitting(s). When used, vacuum cleaner fitting(s) shall be located in an accessible position(s) no greater than 12 inches *(305 mm)* below the water level and the self closing, self latching fitting shall comply with IAPMO SPS 4. In addition, the vacuum piping shall be equipped with a valve to remain in the closed position when not in use.

NOTICE: SPS-4 requires tools to remove, but due to incompatible components, there have been multiple cases of removal upon each usage, sometimes resulting in loss of components, and the essential safety feature. Make sure that the attachment of a vacuum hose in normal usage never leads to removal of the self-closing self-latching feature.

5 New construction

5.1 General. Methods to avoid entrapment in circulation systems, swim jet systems, alternative suction systems, and debris removal systems are shown in Sections 5.2 through 5.5.

5.2 Submerged suction outlets are optional. See Section 4.4.1.

5.2.1 Wading Pools. Due to the unique hazard presented by submerged suction outlets in wading pools, submerged suction outlets are prohibited in wading pools in all areas accessible to the bather.

8. National Institute of Standards and Technology

5.3 Submerged suction outlets. When used, fully submerged suction outlet fitting assemblies and systems shall be certified in accordance with Section 4.3.1. Dual or multiple outlets piped in a single suction system through a common suction line to a pump(s) shall not be capable of being isolated by valves.

5.3.1 Blockable outlets–dual separation. Dual outlets shall be separated by a minimum of 3 feet *(914 mm)* measured from center to center of the suction outlet cover/grate (see *Figures 9, 10,* and *11)* or located on two (2) different planes, i.e., one (1) on the bottom and one (1) on the vertical wall, or one (1) each on two (2) separate vertical walls. (See *Figures 12* and *15*). Suction outlets shall not be installed in seating areas.

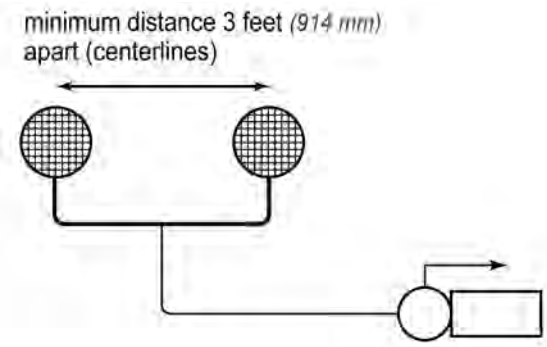


Figure 9. Dual outlets in parallel to one pump

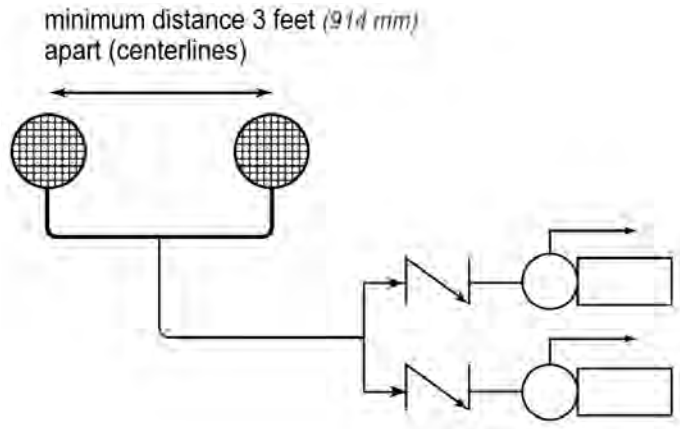


Figure 10. Dual outlets in parallel to dual pumps

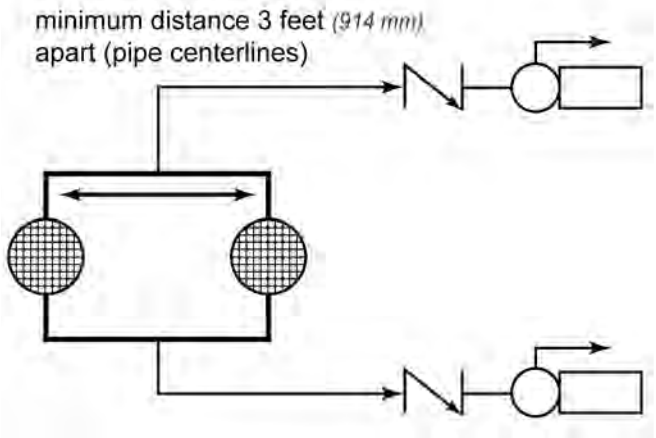


Figure 11. Dual parallel outlets to two pumps

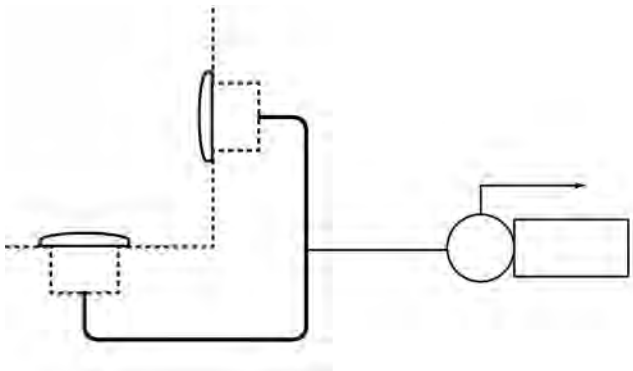


Figure 12. Dual outlets on different planes

5.3.2 Multiple Blockable Separation. Three or more submerged outlets are subject to the separation requirement of 5.3.1 only on the most widely spaced of the group. (See *Figure 13* or *14*.)

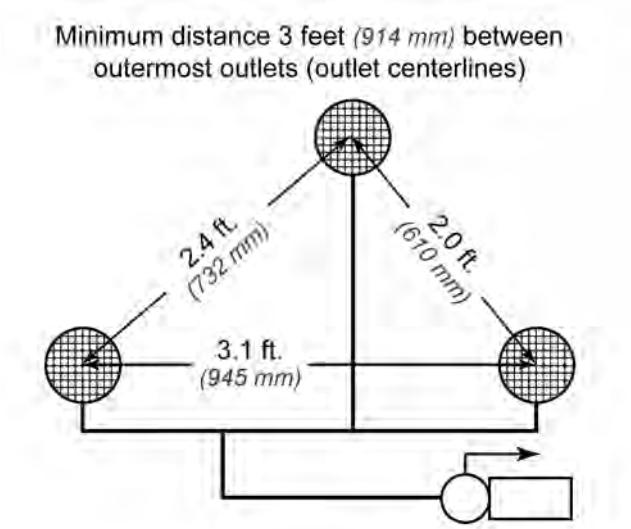


Figure 13. Three or more outlets to (a) single pump(s)

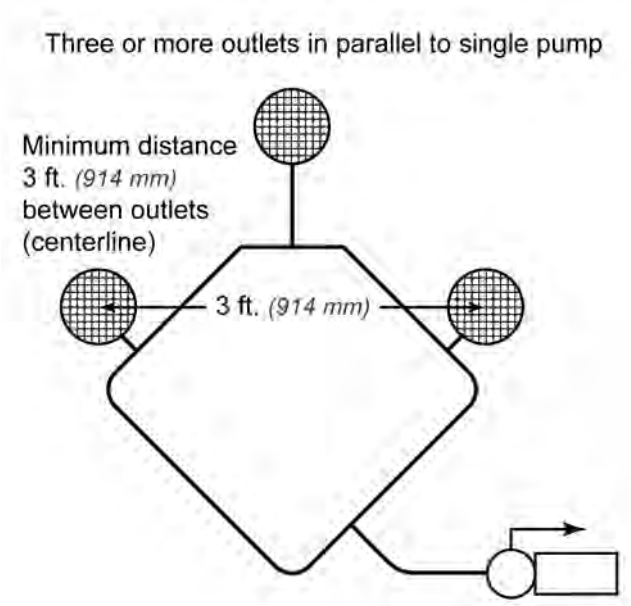


Figure 14. Three or more outlets in parallel, looped piping

5.4 Outlet sumps in series. Two manufactured sumps or field-fabricated sumps, with certified suction outlet covers/grates, piped in series, are typically intended for debris removal. Between the debris suction outlet and the pump, there shall be one of the options certified (see *Figure 15*). The manufacturer of such debris removal systems shall test and approve for the purpose at least one of these.

5.4.1 One (1) additional suction outlet (not in series) with Certified suction outlet cover/grate located a minimum of 18 inches *(457 mm)* from the suction outlet fitting assembly in the suction line to the pump(s); or

5.4.2 Engineered suction-limiting vent system; or

5.4.3 Certified manufactured SVRS or APSS.

5.5 Other means. See Section 1.2.

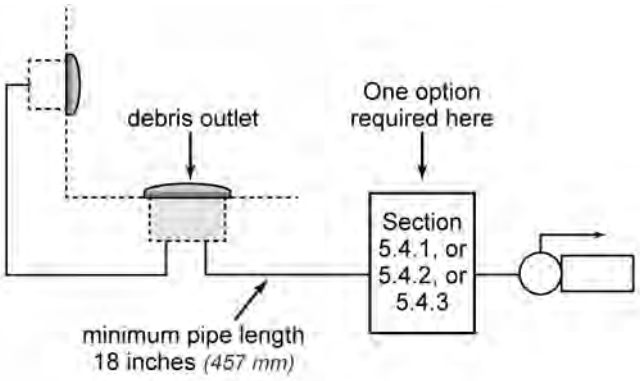


Figure 15. Sumps in series

6 Existing pools and spas

6.1 DANGER! To avoid serious injury or death, the pool or spa shall be closed to bathers if any suction outlet cover/grate is missing, broken, or incorrectly installed. There is no backup for a missing, damaged or incorrectly installed suction outlet cover/grate. See Appendix C.

6.2 Certified Suction Outlet Covers/Grates. When used, fully submerged suction outlet fitting assemblies, cover/grate and associated fitting, fasteners and assemblies shall be certified in accordance with Section 4.3.1, not exceed their installed life in years as indicated by the Certified manufactured or field fabricated outlet documentation, and located in accordance with Section 5.3.

6.3 Wading Pools. Due to the unique hazard presented by submerged suction outlets in wading pools, it is recommended that, whenever possible, the submerged suction outlet(s) be permanently disabled, or converted to a return fitting(s) in accordance with 6.6.1, provided the system piping and skimmer(s)/overflow gutters are capable of handling the required full system flow

6.4 Evaluation for compliance. All suction outlets, suction entrapment avoidance systems, and related components shall be evaluated and brought into compliance by a person who is licensed or qualified by the authority having jurisdiction.

6.5 Retrofitting suction system piping or outlets. When retrofitting, the retrofit installations shall be permitted to utilize a portion of the existing facility and add or replace other elements. The retrofit shall be in accordance with applicable sections of this standard.

6.6 Existing installations–single blockable outlets. The options of Sections 6.6.1 through 6.6.3 shall be permitted.

6.6.1 Convert suction outlet to return inlet by changing the piping and installing an appropriate floor (or wall) inlet(s), designed and/or approved by the manufacturer for that purpose, provided the system piping and skimmer(s) shall be capable of handling the full system flow, in accordance with Section 4.4.9.

6.6.2 Permanently disable the single outlet, provided the system piping and skimmer(s) shall be capable of handling the minimum system flow in accordance with Section 4.4.9. Methods shall include, but not be limited to: permanently plug or cap the suction outlet, or permanently disconnect it from pool pump suction.

6.6.3 When retrofitting existing installations with a single blockable suction outlet, the system shall be retrofitted with either a Certified unblockable suction outlet or a Certified blockable suction outlet cover/grate and at least one of the following:

- Manufactured SVRS or APSS in accordance with Section 4.3.2; or
- Suction-limiting vent system; or
- Gravity drainage/flow system; or
- One or more additional certified suction outlet cover/grate certified in accordance with Section 4.3.1 and located in accordance with Section 5.3.
- Other system approved by the CPSC.

6.7 Existing skimmer equalizer lines. Existing equalizer lines, when used, shall be retrofitted to comply with Section 4.5.

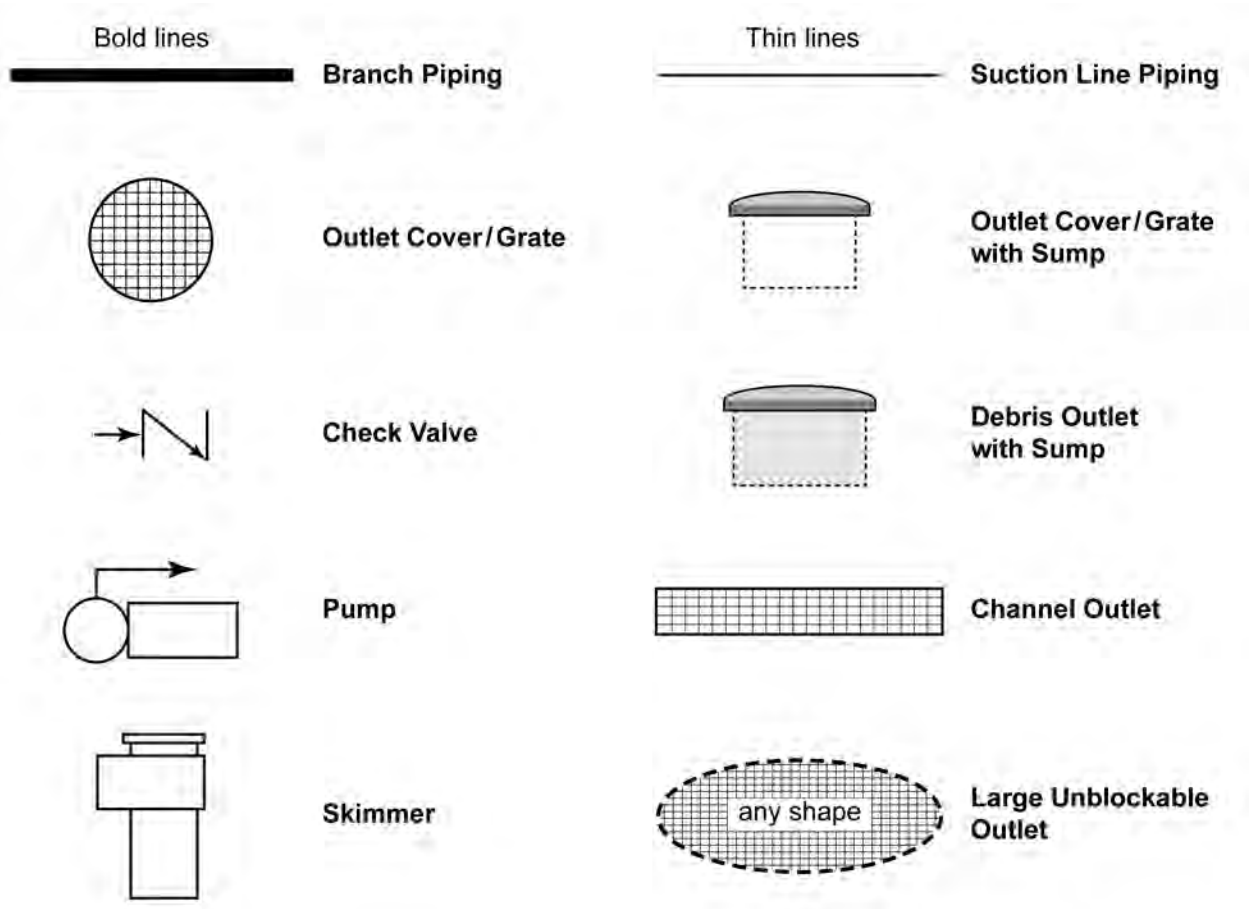
6.8 Existing single blockable outlet piped through skimmer. A single blockable suction outlet piped through a skimmer shall comply with Section 6.6.

6.9 Existing installation–two or more outlets flowing through a common line to pump(s). When retrofitting existing installations, each submerged suction outlet shall comply with Sections 4.3.1 and 4.4.9.

6.9.1 Multiple outlet separation. When existing blockable outlets do not comply with Section 5.3, including applicable subsections 5.3.1 and 5.3.2; the system shall be considered a single blockable outlet system, requiring compliance with Section 6.6.

6.10 Winterization. CAUTION shall be exercised when pools are reopened. All winterizing plugs shall be removed, suction outlet cover/grates shall be secured in place in accordance with manufacturer's instructions, and any safety systems shall be functioning in accordance with manufacturer's instructions.

Appendix A: Symbols



Appendix B: Field Checklist for Identifying Suction Entrapment Hazards

This Appendix is not part of the American National Standard ANSI/APSP/ICC-7 2013 but is included for information only. Additional copies of the ANSI/APSP/ICC-7 standard and this Appendix can be purchased by contacting APSP Member Services at 703.838.0083, ext. 301.

Introduction

This field checklist for identifying suction entrapment hazards provides information and a systematic process that will help identify and eliminate suction entrapment hazards in swimming pools, wading pools, spas, hot tubs, and catch basins. This information and system is intended to address the hazards of hair entrapment, limb entrapment, body suction entrapment, evisceration/disembowelment, and mechanical entrapment. It does not replace or supersede the information in the body of the ANSI/APSP/ICC-7 standard. These guidelines are intended for use in inspecting, maintaining, and upgrading residential and public swimming pools, wading pools, spas, hot tubs, and catch basins. They are appropriate for use by service companies, builders, installers, facility owners/operators, home inspection specialists, parks and recreation personnel, and others who are responsible for pool and spa safety.

Reference numbers next to each block are used to facilitate telephone discussion. Mark the tracking boxes with an × to clearly document the current condition and actions needed and/or taken.

> ⚠ **DANGER: To avoid serious injury or death, close the pool or spa to bathers if any suction outlet cover/ grate is missing, broken or inoperative.**

Company _____

www. _____

Address _____

City _____

State _____ Zip _____

Date _____ Phone _____

Inspected by _____

Pool _____

Pump System _____

Address _____

City _____

State _____ Zip _____

Date _____ Phone _____

Owner/Operator _____

EVALUATION / ACTIONS TAKEN

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

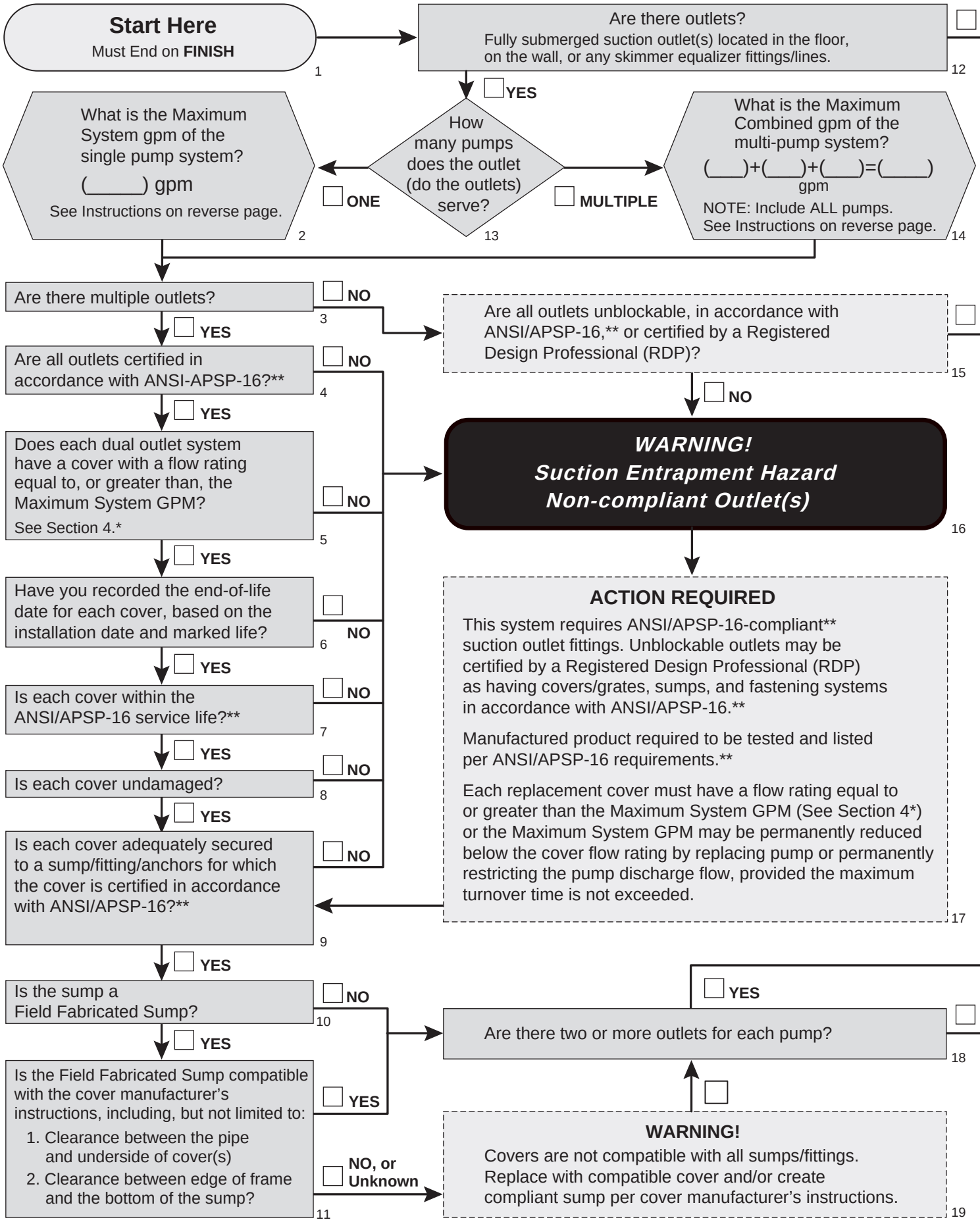
Inspector _____
(Print Name)

_____
(Signature) (Date)

Owner/Operator _____
(Print Name)

_____
(Signature) (Date)

The provisions described herein are not intended to prevent the use of any alternative configuration or system, provided any such alternative meets the intent and requirements of these Guidelines.



* Unless explicitly noted, all section numbers refer to ANSI/APSP/ICC-7 2013. ** All references to ANSI/APSP-16 mean ANSI/APSP-16

Pump/System: Date:

 Revised Date 10-29-13S

NO

VACUUM FITTING 20

Is there a dedicated vacuum cleaner fitting? 24

☐ NO

☐ YES

Is there a fitting lid (cover) tested and listed by an Independent Testing Laboratory in accordance with IAPMO-SPS 4? 25

☐ YES

☐ NO

Install or replace with fitting lid tested to IAPMO-SPS 4. 26

☐

FINISH ☐ 27

YES

APSP

The Association of Pool & Spa Professionals®

OCTOBER, 2013

WARNING! Suction Entrapment Hazard
Choose at Least One Option 28

Install ANSI/APSP-16-compliant** multiple outlets with adequate flow ratings, and with center-to-center distance between the covers of at least 36 inches, *or* with the outlets on separate planes. See Sections 5.3* and 5.4.* 29 ☐

Convert single suction outlet to return inlet by changing the piping, provided that the system piping and skimmer(s) are capable of handling the full system flow. 30 ☐

Convert to a gravity flow system. 31 ☐

Install an engineered vent system. 32 ☐

Install and test per manufacturer's installation instructions, a manufactured safety vacuum release system (SVRS) in accordance with Section 4.3.2.* 33 ☐

Permanently disable the single outlet. Verify that the overflow and skimmers are capable of handling the required system flow and that minimum turnover rates are achieved. 34 ☐

Complete ☐ **GO TO VACUUM FITTING** 21

☐ YES

Is the center-to-center distance between the covers at least 36 inches, or are the outlets on separate planes? 22

☐ NO

☐ NO

NO

Is the single outlet...

A. an equalizer line piped through the second port of a skimmer?

B. unblockable?

C. a combination outlet/inlet incorporated into a single fitting?

D. a venturi-driven system? 23

☐ YES

Complete ☐ **GO TO VACUUM FITTING** 35

or ASME A112.19.8 2007 or VGB 2008.

Finding the Maximum Flow Rate of an Existing System

Preparation:

1. Open all valves to their full open position for pool or spa circulation. (For secured systems, do not adjust valves.)
2. Remove eyeball fittings from return inlets (when removable by hand).
3. Clean skimmer and pump baskets. Turn off skimmer to isolate outlet, if possible.
4. Backwash or clean sand filter/DE grids, or remove cartridge.

When inspecting existing installations, the maximum possible flow rate of suction system must be determined as explained in 4.4.9.*.

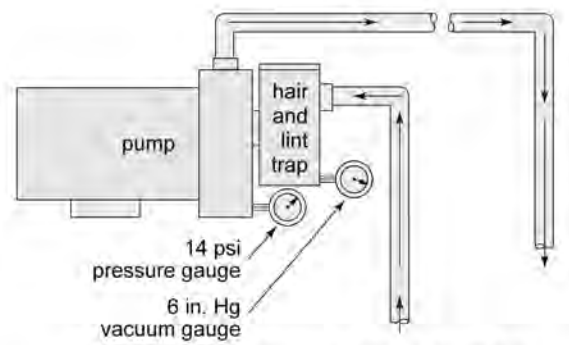
Pump Method 1: Measure flow rate with a flow meter accurate to ±10% (see Section 4.4.9).*

Pump Method 2: Calculate using pressure and vacuum gauge readings (see diagram below).

1. Install a vacuum gauge as close to the bottom of the strainer basket as possible.
2. Install a pressure gauge as close to the pump discharge as possible.
   NOTE: It may be necessary to use an NPT[9] × barb fitting with a short section of plastic tubing connected to a gauge if gauges cannot be screwed into drain holes provided in pump.
3. Multiply vacuum reading by 1.13 and record.
4. Multiply pressure reading by 2.31 and record.
5. Add results of steps 3 and 4 together to get the approximate Total Dynamic Head (TDH) in feet of head.
6. Using the published curve for the pump, find the Total Dynamic Head calculated above on the vertical axis, and read the flow rate on the horizontal axis.
7. This will give you the maximum flow rate within approx. 10%.

Pressure head: gauge psi × 2.31 = feet of water
Suction head: gauge inches Hg × 1.13 = feet of water

EXAMPLE: If the pressure gauge reads 14 psi and the vacuum gauge reads 6 inches of mercury (Hg), the approximate Total Dynamic Head (TDH) of the system would be 39.12 feet.



Gravity Flow Calculation

$$\text{Flow (gpm)} = \sqrt{\frac{1786 \times [\text{D (inch)}]^5 \times \text{H (inch)}}{\text{L (inch)} + [55 \times \text{D (inch)}]}}$$

(Where 55 D accounts for energy loss of stream)

EXAMPLE: Gravity flow through 2" IPS Schedule 40 PVC pipe with an inside diameter of 2.067" with 32.0 feet of pipe and 2 elbows of equivalent length of 6.0 feet. The top of the pipe opening into the collector tank is 8" below pool water level.

$$\text{Flow (gpm)} = \sqrt{\frac{1786 \times [2.067]^5 \times 8}{[32 + (2 \times 6)] \times 12 + [55 \times 2.067]}} = 29 \text{ gpm}$$

Cover/Grate Audit

Existing Pump _____ (Manufacturer) _____ (Model)

Pool Volume _____ (Gallons)

Filter _____ (Manufacturer) _____ (Model) _____ (Size (Sq. Ft.))

Existing Cover _____ (Manufacturer) _____ (Model) _____ (GPM)

Pressure _____ (PSI) Vacuum _____ (Inches of Hg)

TDH _____ (Feet of water) System Flow _____ (GPM) (from Pump Curve)

Maximum Flow _____ (GPM)

New Cover _____ (Manufacturer) _____ (Model) _____ (GPM)

Replacement Date _____/_____/ _____

Maximum Drawdown _____ (Calculated)

_____ (Measured) _____ (Measured) _____ (Measured) _____ (Measured)

NOTE: Check cover manufacturer's installation instructions for the following items per ANSI/APSP-16.**

☐ Cover compatible with sump
☐ Attachments (hardware/screws)
☐ Field fabricated sump as specified by cover manufacturer

APSP
The Association of Pool & Spa Professionals®

8. National Pipe Thread

Appendix C: Entrapment Avoidance Warning Sign

This appendix is not part of the American National Standard ANSI/APSP/ICC-7 2013. It is included for information only.

WARNING

Drowning Hazard

Avoid Drain Covers

Avoid Body Entrapment

Avoid Evisceration

Avoid Hair Entanglement

Avoid Finger Entrapment

- **Never play or swim near drains (submerged suction fittings). Your body or hair may be trapped, causing permanent injury or drowning.**
- **Never enter the pool or spa if a drain cover (suction fitting cover) is loose, broken, or missing.**
- **Immediately notify the pool/spa owner or operator if you find a drain cover (suction fitting cover) loose, broken, or missing.**

For further information contact The Association of Pool & Spa Professionals.

Visit the U.S. Consumer Product Safety Commission website at www.cpsc.gov to read their entrapment guidelines: "Guidelines for Entrapment Hazards: Making Pools and Spas Safer 2005" Also visit: www.poolsafely.gov and www.APSP.org

IMPORTANT SAFETY NOTE: If you choose to display this warning device as a sign, please make sure that it conforms to ANSI/NEMA Z535.4-2011 Standard for Product Safety Signs and Labels, or latest revision.

Appendix D: Sources of Material

This Appendix is not part of the American National Standard ANSI/APSP/ICC-8 2005 (R2013). It is included for information only.

ANSI American National Standards Institute
25 West 43rd Street
New York NY 10036
Tel: 212-642-4900
Fax: 212-398-0023
www.ansi.org

APSP Association of Pool & Spa Professionals
(formerly National Spa and Pool Institute)
2111 Eisenhower Avenue
Alexandria VA 22314
Tel: 703-838-0083
Fax: 703-549-0493
www.APSP.org

ASTM International Standards Worldwide
(formerly American Society of Testing & Materials)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Tel: 610-832-9500
Fax: 610-832-9555
www.astm.org

IAPMO International Association of Plumbing and Mechanical Officials
5001 E. Philadelphia Street
Ontario, CA 91761
Tel: 909-595-8449
Fax: 909-472-4150
www.iapmo.org

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy MA 02269
Tel: 617-770-3000
Fax: 617-770-0700
www.nfpa.org

UL Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook IL 60062-2096
Tel: 847-272-8800
Fax: 877-272-8129
www.ul.com

(Approved by the American National Standards Institute October 8, 2013)

ANSI/APSP/ICC-7 2013

American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins

Familiarity with the ANSI/APSP/ICC standards is essential for anyone who builds, manufactures, sells, or services pools, spas or hot tubs.

APSP
The Association of Pool & Spa Professionals®

2111 Eisenhower Avenue
Alexandria VA 22314-4695

703.838.0083
memberservices@APSP.org
APSP.org