

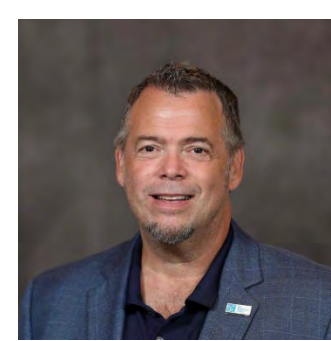


2018/2021 ISPSC Design, Installation and Inspection Principles

Based on the International Swimming Pool and
Spa Code[®] (ISPSC[®])

Gary Anthony Gauthier
International Code Council
Director, PMG Technical Resources
Liaison PMG Membership Council
PMG Liaison Safety 2.0 Technical Training Program (TTP)

Massachusetts, New Hampshire, Connecticut, Maine, Rhode Island, Vermont, New York, New Jersey, Pennsylvania, Delaware, Cayman Islands



Member of the International Code Council PMG Team responsible for developing, coordinating, directing and implementing programs to ensure the successful completion of the Government Relations goals and objectives as they apply to the International Plumbing Code (IPC), International Mechanical Code (IMC), International Fuel Gas Code (IFGC), International Swimming Pool and Spa Code (ISPSC), and the International Private sewage Disposal Code (IPSDC) and related services and programs of the International Code Council.

- Provide subject matter expertise to the Government Relations Staff and other ICC staff. Develop briefing papers, guiding documents, and talking points.
- Develop and assist Government Relations field managers with written and oral testimony that supports adoption of the IPC, IMC, IFGC and ISPSC.
- Represent ICC in federal or state coalitions, task forces, committees, and councils where expertise in IPC, IMC, IFGC and ISPSC subjects is required. Testify on behalf of ICC at public hearings.
- Represent ICC at member meetings, conferences, and trade shows.

Prior to working at the International Code Council, Gary has over 40 years of experience working within the Construction and Plumbing Industry. He is a seasoned Construction Project Manager as well as a Licensed Master Plumber in Massachusetts, New Hampshire, Maine and Vermont. In addition, Gary holds an Unrestricted Construction Supervisor's License (CSL) within the state of Massachusetts and completely understands the significance of code correlation. Lastly, while working with the International Code Council, he is currently an Adult Educational Master Plumbing & Gas Instructor and Continuing Education Instructor in the Commonwealth of Massachusetts.



2021 IPC Essentials



INTERNATIONAL
CODE
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**POOL &
HOT TUB**
ALLIANCE



Objectives

- Upon completion of this seminar, participants will be better able to:
 - Identify the importance, purpose, code enforcement issues and key code sections in the 2018 ISPSC and the **2021** changes.
 - Identify the types and differences of the pools and spas covered by the 2018/2021 ISPSC.
 - Describe the application of the 2018/2021 ISPSC to inspection, plan review and code enforcement.
 - Apply applicable code requirements of the 2018/2021 ISPSC to swimming pools or spas.



THIS COURSE HAS TWO SECTIONS

Section 1 Addresses Basic Code Requirements For Both Residential & Commercial Pools

Section 2 Addresses the Hydraulic Calculations For Both Residential & Commercial For Plan Review & Approval

Pennsylvania Code

Title 34 Chapter 403

§ 403.26. Swimming pools.

(a) A swimming pool, hot tub and spa which is accessory to a one-family or two-family dwelling must comply with the “International Swimming Pool and Spa Code of 2018.”

(b) A swimming pool, hot tub or spa that is not accessory to a one-family or two-family dwelling must comply with the Public Bathing Law (35 P.S. § § 672—680d) and the “International Swimming Pool and Spa Code of 2018.” The accessibility provisions contained in section 307.1.4 (relating to general design requirements) of the “International Swimming Pool and Spa Code of 2021” are adopted.

Authority

The provisions of this § 403.26 amended under section 304(a)(1)—(3) of the Pennsylvania Construction Code Act (35 P.S. § 7210.304(a)(1)—(3)).

Source

https://www.health.pa.gov/topics/Documents/Programs/Permitting-Beach_Manual.pdf#:~:text=Safe%20and%20healthful%20bathing%20places%20are%20great%20assets,construction%20or%20operation%20of%20a%20public%20bathing%20place.%E2%80%9D

The provisions of this § 403.26 amended December 15, 2006, effective December 31, 2006, 36 Pa.B. 7548; amended December 24, 2009, effective December 31, 2009, 39 Pa.B. 7196; amended September 29, 2018, effective October 1, 2018, 48 Pa.B. 6261; amended June 14, 2019, effective June 15, 2019, 49 Pa.B. 3077; amended December 24, 2021, effective December 25, 2021, 51 Pa.B. 7981; amended February 11, 2022, effective February 14, 2022, 52 Pa.B. 971. Immediately preceding text appears at serial pages (407587)



Introduction of PHTA/ICC-2

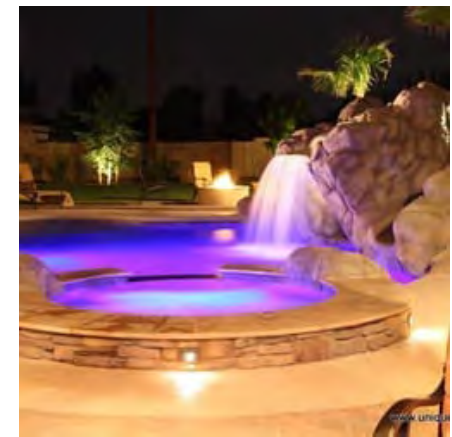
Standard for Public Pool and
Spa Operations and Maintenance

Harmonizes! This standard incorporates many significant aspects of
the *Model Aquatic Health Code* (MAHC).

The background features a teal-colored world map with a grid of latitude and longitude lines. Overlaid on the map are several dark teal geometric shapes, including triangles and lines, creating a modern, abstract design. The text 'Section 1' is centered in a white, bold, sans-serif font.

Section 1

Goal



- The goal of this seminar is to introduce Code Officials to key information in the 2018/2021 International Swimming Pool & Spa Code[®] (ISPSC[®]).
- The **Focus** of this presentation is the technical information recommended for plan review and field inspections for Residential Swimming Pools and Spas/Hot Tubs for new construction/remodeling.



Code Book Layout



- Chapter 1 – Scope and Admin
- Chapter 2 - Definitions
- Chapter 3 - General
- Chapter 4 - Public Pools
- Chapter 5 - Public Spas
- Chapter 6 - Aquatic Recreation
- Chapter 7 - Onground Storable
- Chapter 8 – Residential Pools
- Chapter 9 - Permanent Spas
- Chapter 10 - Portable Spas
- Chapter 11 - Reference Standards



ISPSC Development



- 2010 work begins on the development of the ISPSC
- Other standards referenced:
- ASTM - Alarms, Covers, SVRS
- ASME – SVRS
- NSF – Circulation Components
- UL - Portable Spas
- NFPA – Electrical Code
- APSP/ANSI /ICC Standards incorporated into body of the ISPSC, other APSP/ANSI Standards are referenced.



New CPSC Drain Cover Standard

- CPSC voted to approve portions of the new ANSI/APSP/ICC-16 2017 to update the existing ANSI/APSP-16 2011 as referenced by law in the VGB Act.
- Compliance by JUNE 19, 2021





Key Definitions

Deck

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



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.



Aquatic Recreation Facility



Courtesy of Tolomato Community Development District



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 in the following slides:



Public Swimming Pool

CLASS A, COMPETITION POOL



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Public Swimming Pool

CLASS B, PUBLIC POOL



Courtesy of the City of La Mirada, CA

Public Swimming Pool

CLASS C, SEMI-PUBLIC POOL



International Code Council®



Public Swimming Pool CLASS D-1, WAVE ACTION POOL



Courtesy of Jon Barnes Photography



Public Swimming Pool

CLASS D-2, ACTIVITY POOL



Courtesy of Tolomato Community Development District



Courtesy of Tolomato Community Development District



Public Swimming Pool CLASS D-3, CATCH POOL



Courtesy of Tolomato Community Development District

Public Swimming Pool CLASS D-4, LEISURE RIVER



Courtesy of Tolomato Community Development District

Public Swimming Pool CLASS D-5, VORTEX POOL



Courtesy of Association of Pool & Spa Professionals™

Public Swimming Pool CLASS D-6, INTERACTIVE PLAY ATTRACTION



Courtesy of the City of La Mirada, CA

Class E – Instructional Pool

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



Class F – Public Wading Pool



Public Swimming Pool Diving or Non-Diving

Public pools are either a diving or non diving type.

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



Pool Types-Based on the diving board(s)

Residential Pools Types I-V (addressed in more detail in Chapter 8)

Public Pools Pool Types VI-IX:

- Type VI -10' board 6
 - 26" (2/3 m) over water
- Type VII -12' board 7
 - 30" (3/4 m) over water
- Type VIII -16' board 8
 - 39.4" (1 m) over water
- Type IX -16' board 9
 - 118.1" (3 m) over water
- Type O – non-diving





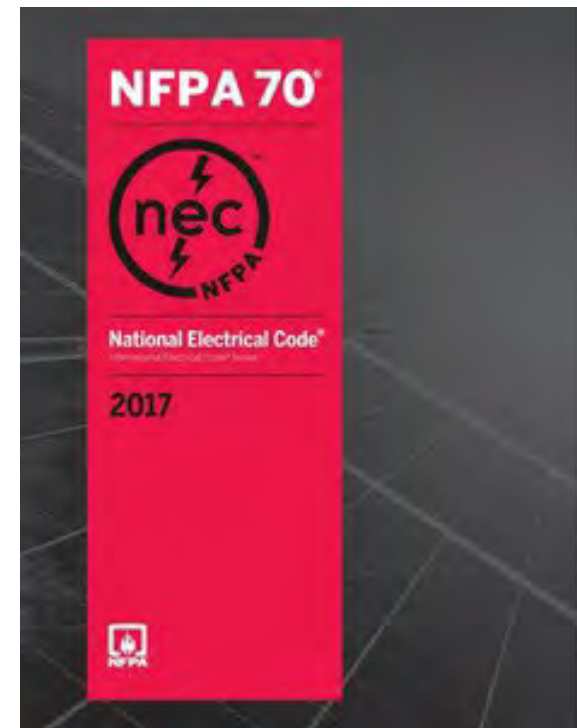
Electrical, Plumbing, Mechanical, & Fuel Gas Requirements

Section 302.1 Electrical

Electrical Requirements for Aquatic Facilities

NFPA 70

National Electric Code

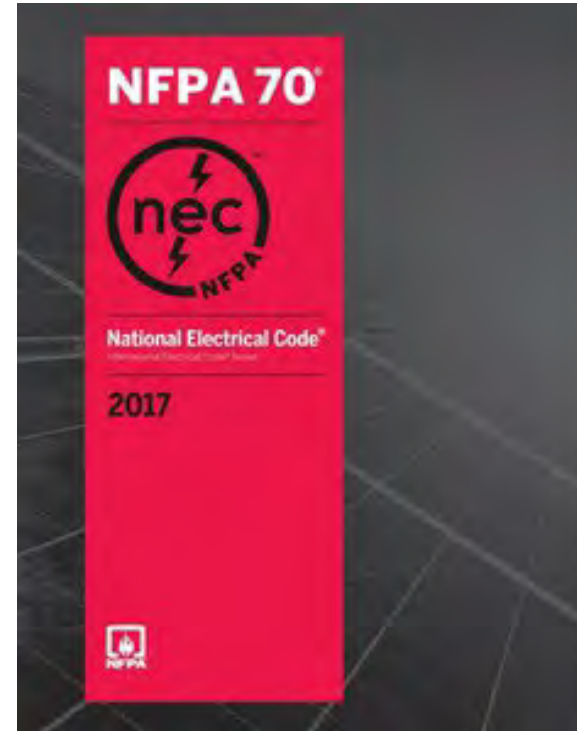


Section 302.1 Electrical

Electrical Requirements for Aquatic Facilities

NFPA 70 | Article 680 National Electric Code

- **Equipotential Bonding** – water to deck (Reason: prevent tingling while sitting on deck with feet in the water)
- **Water Bonding** – water to bonding grid
- **Corrosive Environment-** Only applies to wiring not equipment. Equipment approved for pool or spa use are deemed to comply



Section 302.1 Electrical

- **Electrical Requirements for Aquatic Facilities**
 - NFPA 70 or the International Residential Code as applicable with Section 102.7.1.
 - There is an exception for the internal wiring for portable residential spas and portable residential exercise spas.



Section 302.2 Water Service and Drainage

- Piping and fittings used for water service , makeup, and drainage piping for Pool and Spa shall comply with the **International Plumbing Code**. Fittings shall be approved for installation with the piping installed.



Section 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**.



Section 302.4 Concealed Piping Inspection

- Piping, including **process piping**, that is installed in trenches, shall be inspected prior to backfilling.

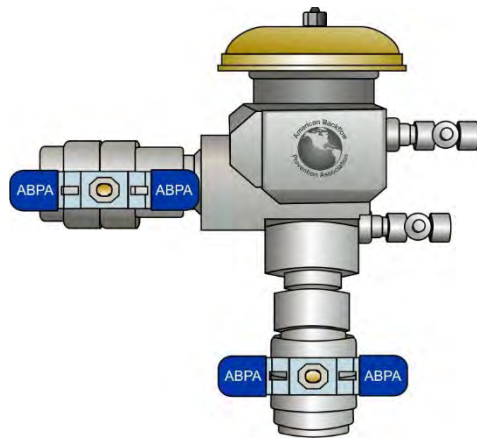


Section 302.5 Backflow Protection

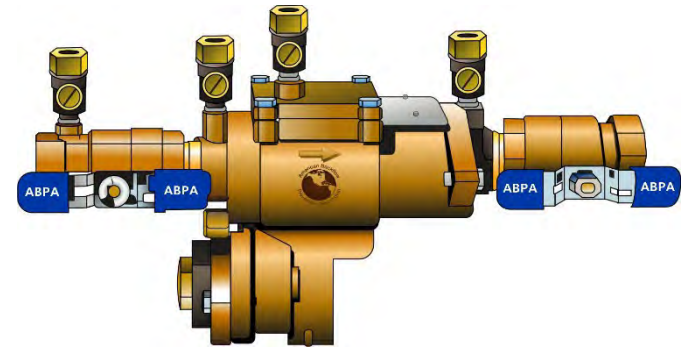
- Water supplies for Pool and Spa shall be protected against backflow in accordance with the **International Plumbing Code** or the **International Residential Code**, as applicable in accordance with Section 102.7.1



Section 302.5 Backflow Protection



Pressure
Vacuum Breaker
Assembly



Reduced Pressure
Principal Backflow
Prevention Assembly



Atmospheric- type
Vacuum Breaker

Section 302.6 Waste Water Discharge.

- Where wastewater from Pool and Spa, backwash from filters and water from deck drains discharge to the building drainage system, the connection shall be through an air gap in accordance with the **International Plumbing Code** or the **International Residential Code**, as applicable in accordance with Section 102.7.1.



Section 302.7 Test

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



Section 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.



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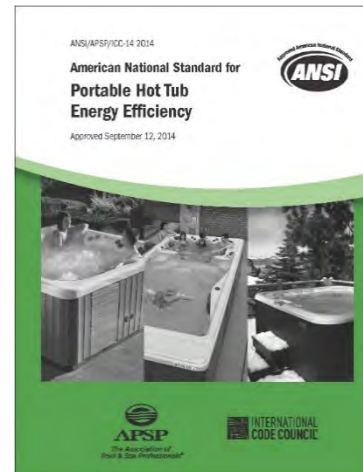
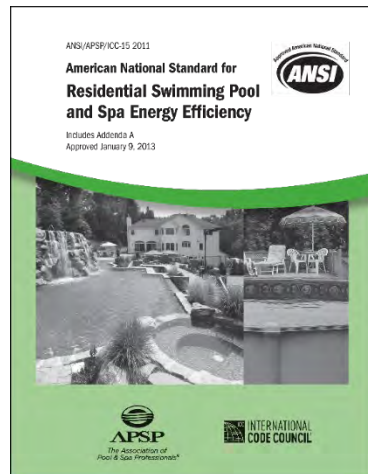
Section 303



Energy Requirements

Section 303 Energy

- The energy requirements for pools and in ground permanently installed spas shall be as specified in Sections 303.2 through 303.4 and **APSP 15**.
- The energy requirements for residential portable electric spas shall comply with **APSP 14**.



ANSI/APSP/ICC-15 2011-Energy

- **303.1** Refers to **ANSI/APSP/ICC-15** -Applies only to Residential Pool Filtration Pumps & Pump Motors- ***Energy Conservation***
 - Does regulate pumps used for other features, such as booster pumps for cleaners, waterfall pumps, etc. and pumps that filter water for the main filter pump are also regulated.
 - Spa Jet pumps are also included



Section 303.1.2 Time switches (5.3.4 APSP-15)

- Time switches or other control methods that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed with or on all heaters and pumps.
- Heaters, pumps and motors that have built-in timers shall be deemed in compliance with this requirement.



Section 303.1.2 (cont.)

- **Exceptions:**
 - Where public health standards require 24-hour pump operation.
 - Pumps that operate waste-heat recovery pool heating systems.
 - Portable residential spas and portable residential exercise spas.



Section 303.1.3 Pool Covers

- Heated pools and inground permanently installed spas shall be provided with a vapor retardant cover or other approved means.
- **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.
- **But what about safety?**



303.3 APSP-15

▪ Objective of Standard

- Provide energy efficiency performance specification for Residential swimming pool filtration and auxiliary systems such as spas or water features.
- Provide efficiency level for Residential pool and spa heaters



APSP-15 Design Requirements

Residential Pools

- Pool filter pump sized for minimum 6 hour turnover
- Timer/controller
- Filtration pipe from pool-to-pump-to-pool
 - 6 feet-per-second all suction pipe
 - 8 feet-per-second all return pipe & backwash valve
- Filter
 - Sized for 6-hour turnover- maximum flow rates
 - Cartridge 0.375 (gpm/ft²)
 - Sand 20 (gpm/ft²)
 - Diatomaceous Earth 2 (gpm/ft²)



APSP-15 Design Requirements

- Calculations for pipe size/filter/proper flow rate will be reviewed at the end of the code review-
- Sample design specifications and sample permit applications will be shown at the end of this code review.



APSP-15 System Equipment

- 5.1.3 Sweep elbows encouraged, not required.
- 5.4.2 When used, filter backwash valves must be 2 inches or the diameter of the return pipe, whichever is greater.
- 5.6 Directional inlet fittings are required.



APSP-15:

System Piping & Circulation

- **5.5.2** For pool filtration pumps a length of straight pipe that is at least 4 pipe diameters shall be installed before the pump.
- **5.5.3** At least 18 inches of horizontal or vertical pipe shall be installed between the filter and the heater or built-in or built-up connections shall be installed to allow for the future addition of solar heating equipment.

Additional APSP-15 Requirements

- Specify controller for multi-speed pumps – must default to low speed within 24 hours.
- Show efficiency rating for heaters.
- Minimum 4 pipe diameters in front of pump.
- Minimum 18 in. pipe after filter for solar.
- Directional return fittings must be used.



APSP-15 Requirements Summary

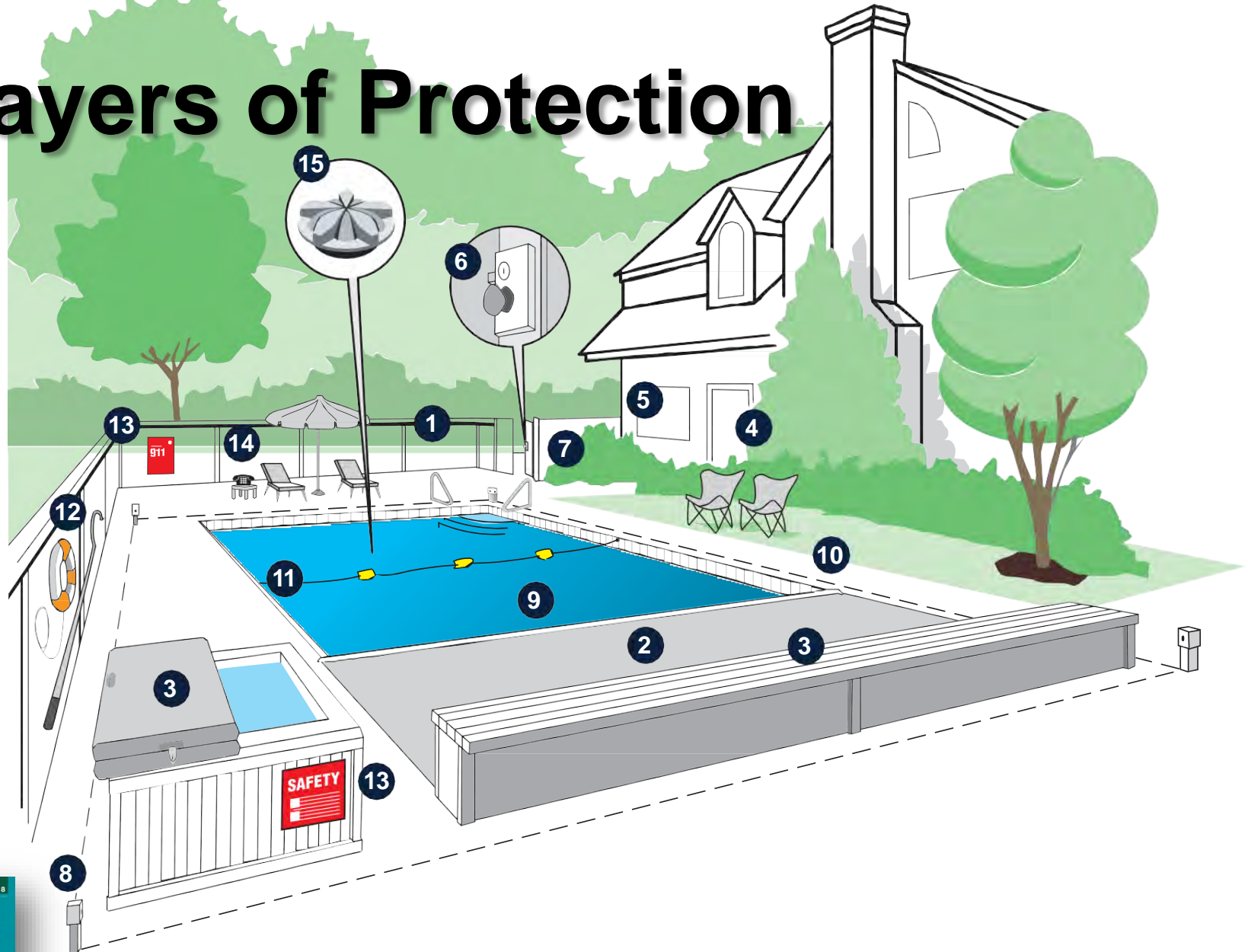
Component	Section	Requirements	Check
Heaters	4.4.1.1	Heater has no pilot light	<input checked="" type="checkbox"/>
	4.4.1.2	Readily accessible on-off switch mounted outside of the heater	<input checked="" type="checkbox"/>
	4.3.1.3	No electric resistance heating unless for inground spa with tight fitting cover with R-6 insulation, or for pool with 60% of documented pool heating from on-site solar or recovered energy.	<input checked="" type="checkbox"/>
	4.3.2	Heater efficiency: gas/oil fired heater efficiency at least 82%, heat pump COP at least 4.0	<input checked="" type="checkbox"/>
Pool systems	5.1.1	Pool filter pump listed in database	<input checked="" type="checkbox"/>
	5.3.1	Pool filter pump with total horsepower 1.0 or more is multi-speed	<input checked="" type="checkbox"/>
	5.3.3	Multi-speed pump controller programmed to default to the filtration flow rate when no auxiliary pool loads are operating within 24 hours and programmed with temporary override capability for servicing.	<input checked="" type="checkbox"/>
	5.3.4	Single-speed pump controller capable of operating pump during off-peak electric demand.	<input checked="" type="checkbox"/>
	5.5.2	Pipe before pump has at least 4 diameters of straight pipe.	<input checked="" type="checkbox"/>
	5.5.3	System installed with solar, or setup for the future addition of solar heating equipment by installing 18 inches of horizontal or vertical pipe after the filter and before a heater, or built-in or built-up connections, or dedicated pipe to and from the pool.	<input checked="" type="checkbox"/>
	5.6	Directional inlets for mixing pool water.	<input checked="" type="checkbox"/>

All Barriers can be compromised!
These requirements are focused on
preventing the unintentional pool
entry of those aged 5 and under

Barrier Requirements



Layers of Protection



Section 305 Barrier Requirements

- This section of the code applies to the design of barriers for Pool and Spa and its restriction of unauthorized access.
- The exceptions for spas and hot tubs with a lockable safety cover and pools with a powered safety cover (**ASTM F 1346**) are not required to have additional barriers.
- Some jurisdictions have adopted the use of WAIVERS from the homeowners- other require a barriers at the preplaster inspection.



Section 305 Barrier Requirements

Some contractors write into their contracts with the homeowner-

“Barriers are the responsibility of the HOMEOWNER”.

Check with your Attorney- this may not be legally Binding.

Once Water is in the pool you have a potential hazard. A barrier must be in place prior to water being place into the pool or spa



Powered Safety Cover (ASTM F 1346)



Courtesy of Association of Pool & Spa Professionals™

Powered Safety Cover (ASTM F 1346)

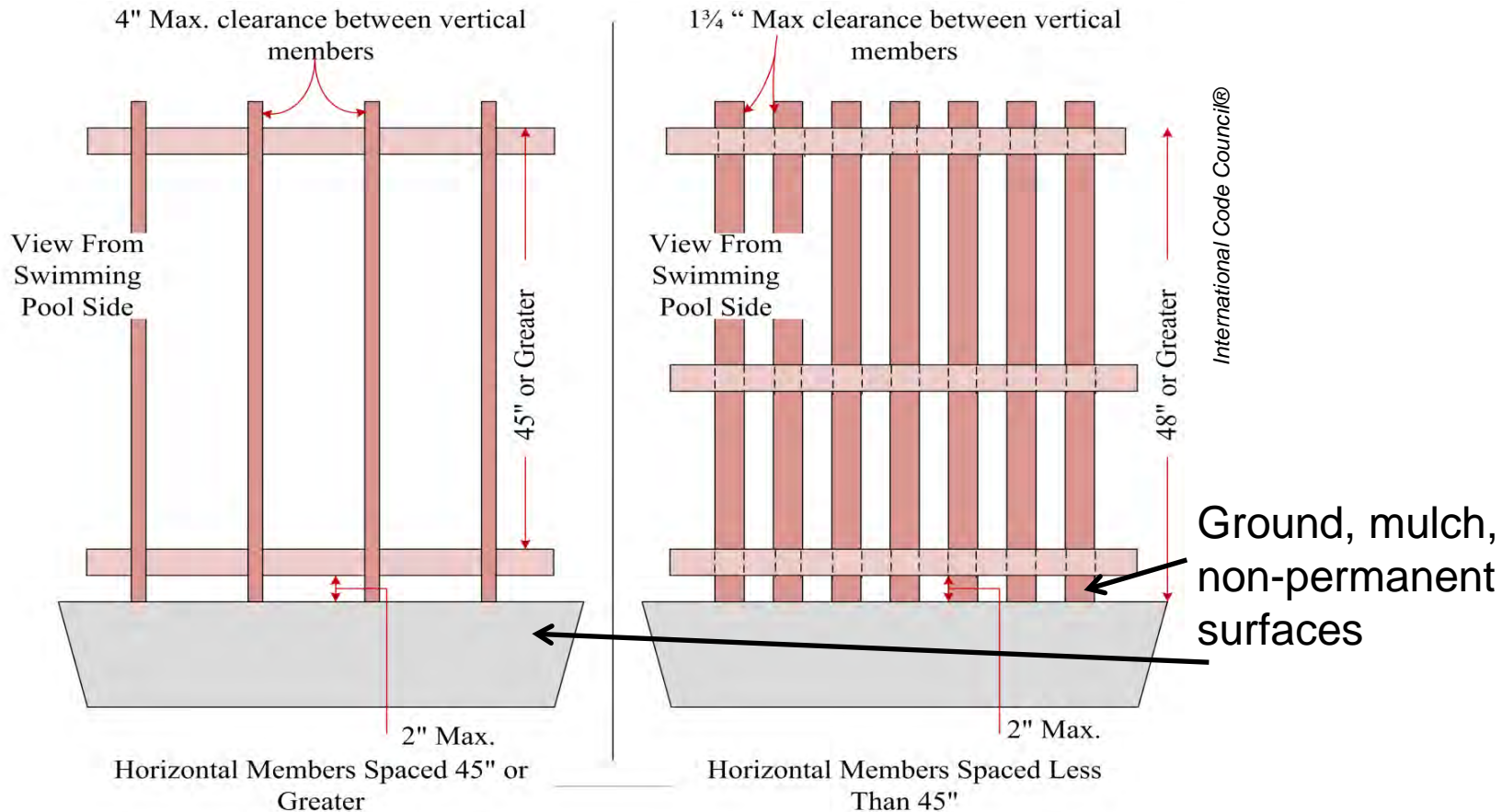


NEW CODE 2021

- 305.1.1 Construction fencing required. The construction sites for in-ground swimming pools and spas shall be provided with construction fencing to surround the site from the time that any excavation occurs up to the time that the permanent barrier is completed. The fencing shall be not less than 4 feet in height.

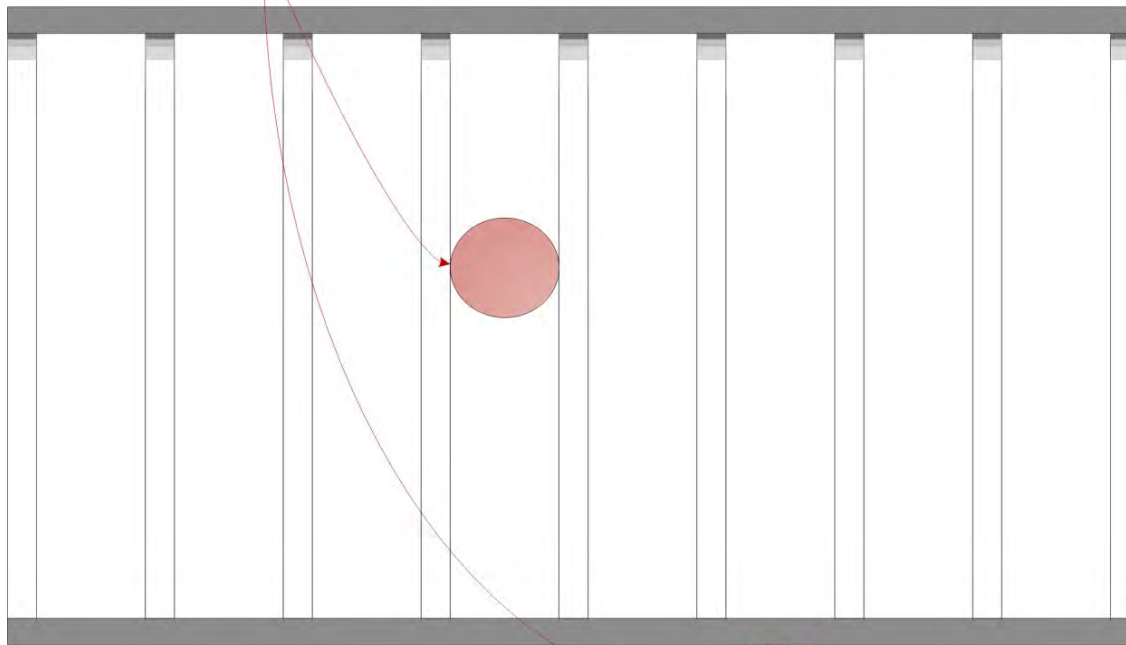


Section 305.2.1 Barrier height and clearance

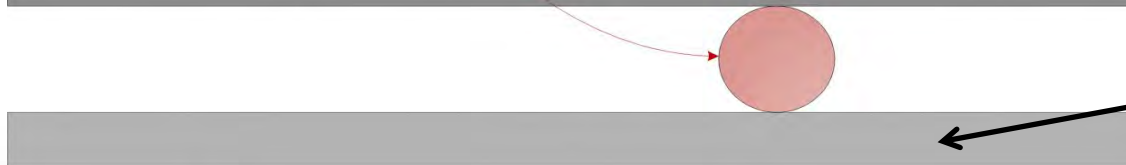


Section 305.2.2 Openings

4" inch sphere cannot pass through



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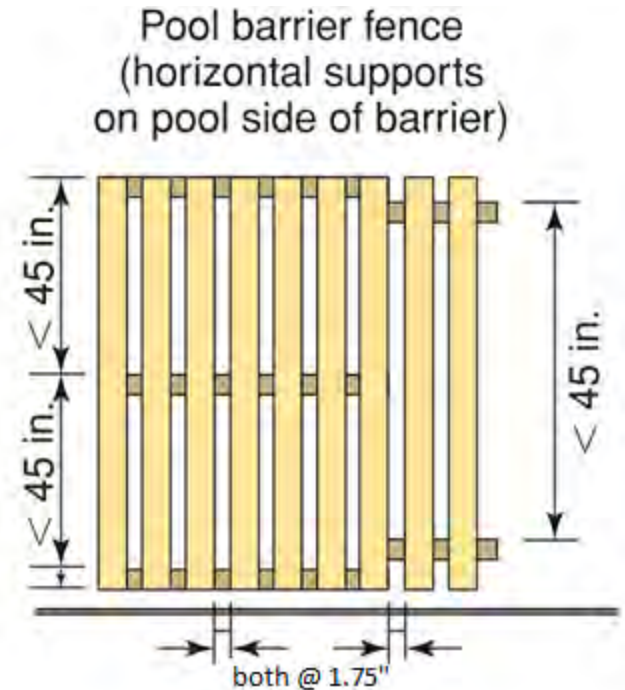
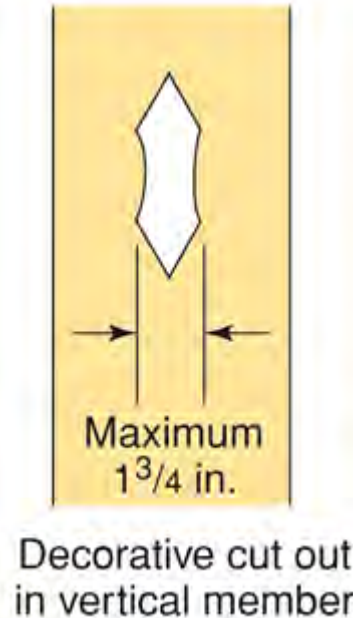
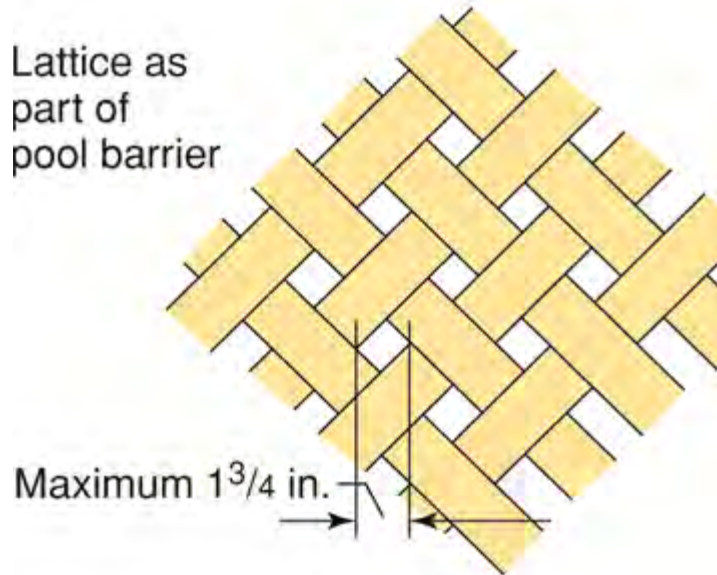


Permanent surface



Section 305.2.1-8

Openings & Spacing



View from outside
the pool area

Section 305.2.4 Mesh Barrier/fence

- No more than 1" above the deck
- Fence cannot be lifted more than 4" from grade or decking
- Does not allow passage of a four inch sphere under any mesh panel
- Panel attachment device shall attach no lower than 45" above grade (hook and eye type latch)
- Gate shall comply with section 305.3
- Deck sleeves-noncorrosive
- Not allowed on top of Ongoing Storable Residential Pools



Courtesy of Association of Pool & Spa Professionals™

Barrier Requirements - Outdoor

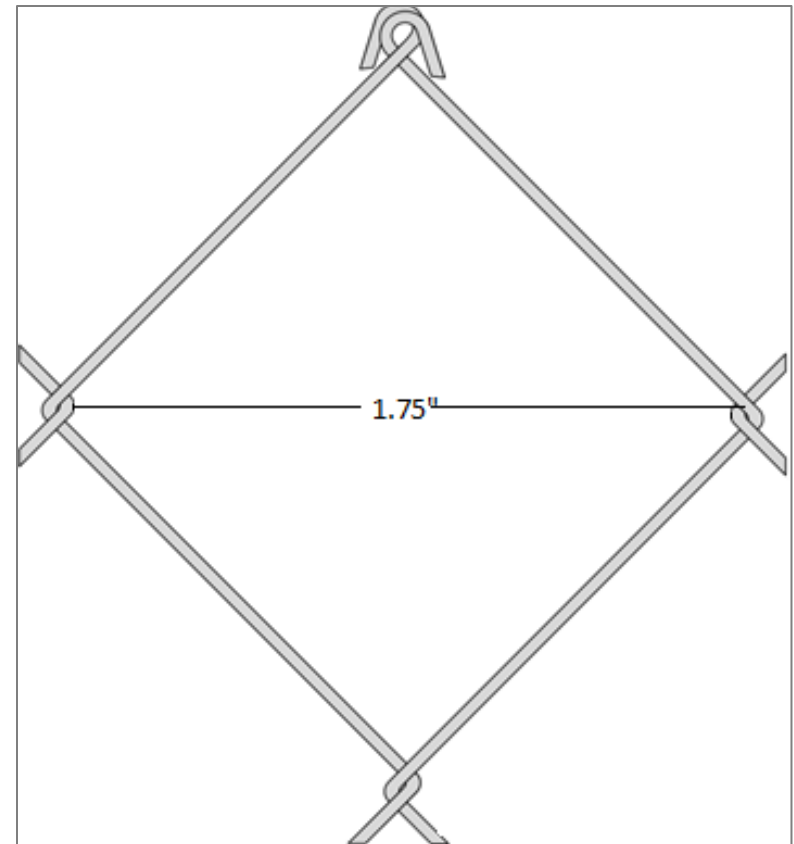
- 305.2.10 Poolside barrier setbacks
 - Pool/spa side of barrier must be at 20 inches from water's edge
 - If a child climbs barrier they would not immediately fall into the water
 - **NEW CODE 2021**

305.2.4.1 Setback for mesh fences. The inside of a mesh fence shall be not closer than 20 inches (508mm) to the nearest edge of the water of a pool or spa.



Section 305.2.7 Chain Link Dimensions

- Maximum opening formed by a chain link fence shall be not more than 1.75 inches (44 mm).
- The fence is provided with slats fastened at the top and bottom which reduces the openings, such openings shall be not more than 1.75 inches (44 mm).



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305.2.9 Clear zone

- There shall be a clear zone of not less than 36 inches (914mm) 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.



305.2.9 Clear zone 2021 code

NEW CODE 2021

305.2.9 Clear zone. Where equipment, including pool equipment such as pumps, filters and heaters, is on the same lot as a pool or spa and such equipment is located outside of the barrier protecting the pool or spa, such equipment shall be located not less than 36 inches (914 mm)



Barrier Requirements - Outdoor

- 305.3 Gates
- Two Types of Gates – Pedestrian & Service

1. Pedestrian

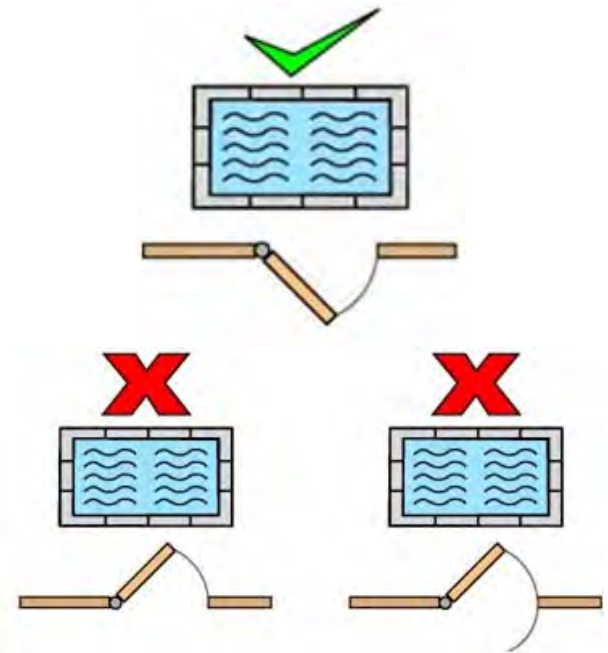
- **open outward/away** from pool/spa
- **Self-closing**
- **Self-latching**

2. Utility or Service Gates

- Must **remain locked** when not in use

- **Double or multiple gates**

- One side must be set stationary
- Other side must have self latching device



Barrier Requirements - Outdoor

NEW CODE 2021

305.3 Doors and gates. Doors and gates in barriers 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 doors and gates shall open outward away from the pool or spa, shall be self-closing and shall have a self-latching device.

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

305.3.2 Double or multiple doors and gates. Double doors and gates or multiple doors and gates shall have not fewer than one leaf secured in place and the adjacent leaf shall be secured with a self-latching device .



Barrier Requirements - Outdoor

305.3.3 Latch release. For doors and gates in barrier, the door and gate latch release mechanisms shall be in accordance with the following:

1. Where door and gate latch release mechanisms are accessed from the outside of the barrier and are not of the self-locking type, such mechanism shall be located above the finished floor or ground surface in accordance with the following:

At public pools and spas, not less than 52 inches (1219 mm) and not greater than 54 inches (1372 mm).

At residential pools and spas, not less 54 inches (1372 mm)

2. Where door and gate latch release mechanisms are of the self-locking type such as where the lock is operated by means of a key, an electronic opener or the entry of a combination into an integral combination lock, the lock operation control and the latch release mechanism shall be located above the finished floor or ground surface in accordance with the following:



Barrier Requirements - Outdoor

NEW CODE 2021

At public pools and spas, not less than 34 inches and not greater than 48 inches (1219 mm).

At residential pools and spas, at not greater than 54 inches (1372 mm).

3. At private pools, where the only latch release mechanism of a self-latching device for a gate is located on the pool and spa side of the barrier, the release mechanism shall be located at a point that is at least 3 inches (76 mm) below the top of the gate.

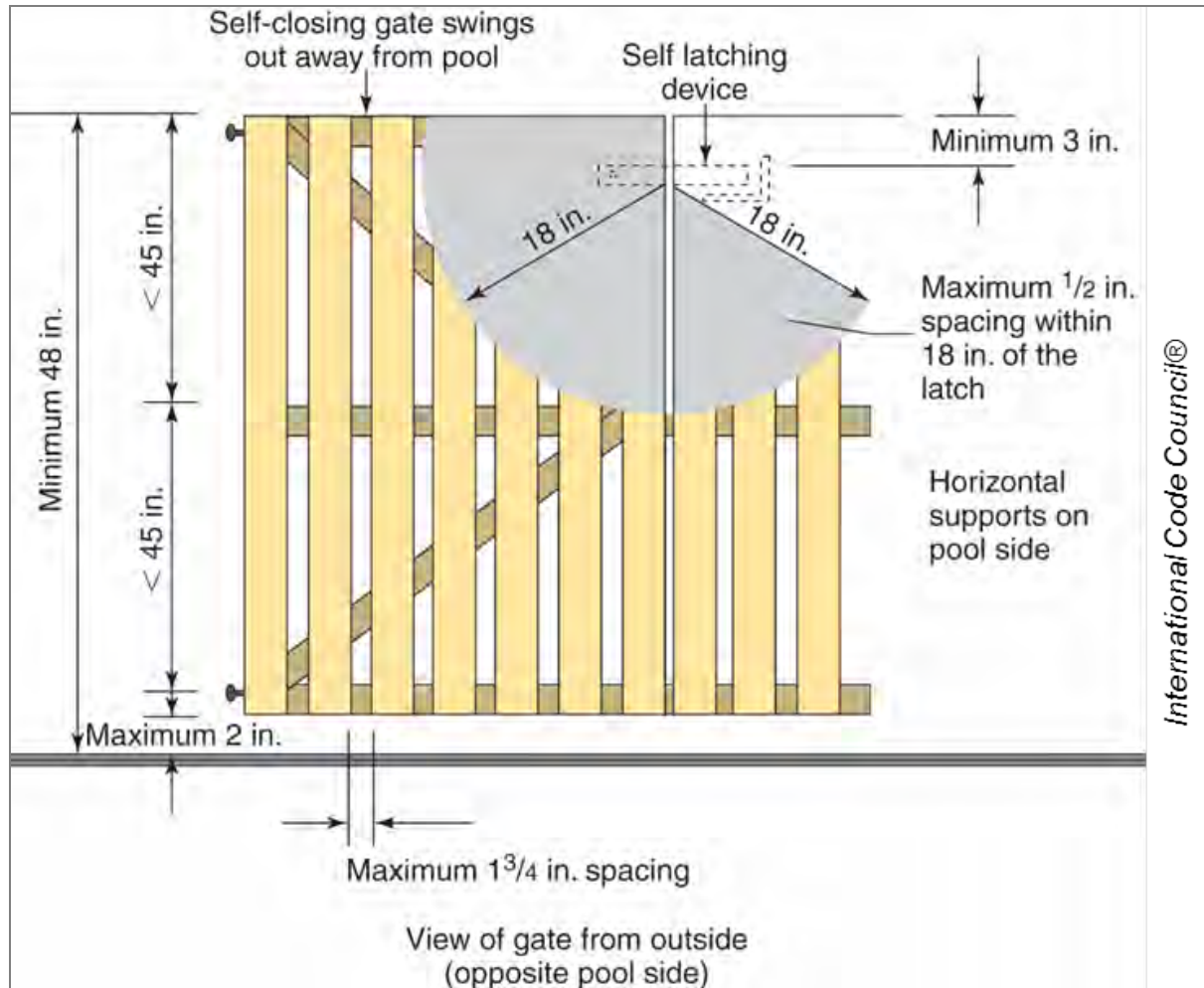


Barrier Requirements - Outdoor

305.3.4 Barriers adjacent to latch release mechanisms. Where a latch release mechanism is located on the inside of a barrier, openings in the door, gate and barrier within 18 inches (457 mm) of the latch, shall not be greater than 1/2 inch (12.7 mm) in any dimension.



Section 305.3 Gates



Structure wall as a barrier. Where a wall of a dwelling or structure serves as part of the barrier and where doors, gates 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, doors and gates 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.

2. In dwellings not required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located at not less than 54 inches (1372 mm) above the finished floor.

3. In dwellings that are 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.

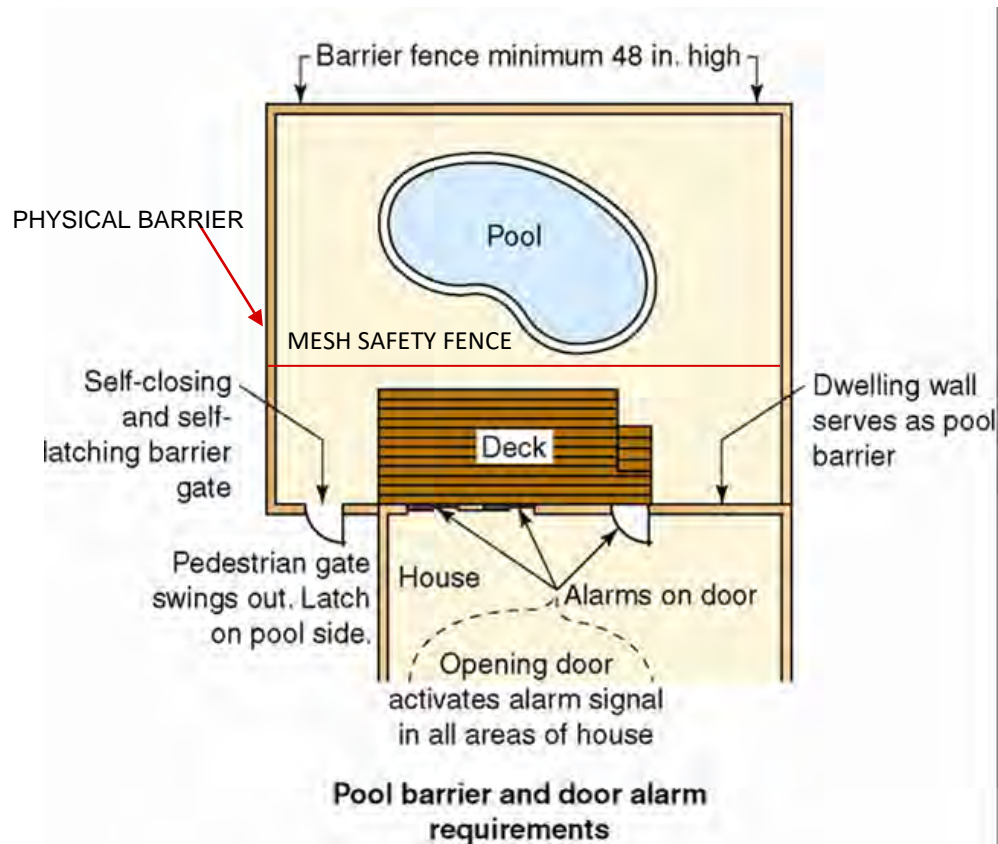
4. In structures other than dwellings, the operable parts of the alarm deactivation switches shall be located not greater than 54 inches (1372 mm) and not less than 48 inches (1220 mm) above the finished floor.

~~2.5.~~ A safety cover that is *listed* and *labeled* in accordance with ASTM F1346 is installed for the pools and spas.

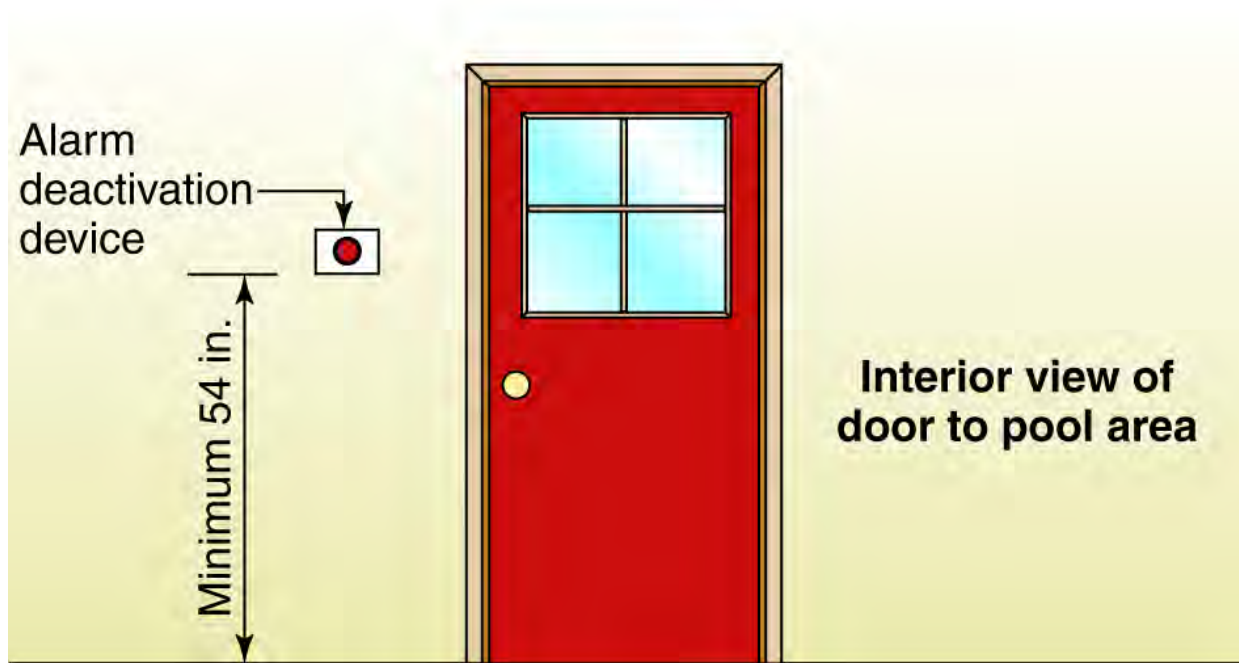
~~3.6.~~ An *approved* means of protection, such as self-closing doors with self-latching devices, is provided. Such means of protection shall provide a degree of protection that is not less than the protection afforded by Item 1 or 2.



305.4 1. Structure Wall as a Barrier



305.4 1. Structure Wall as a Barrier Deactivation Device



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Barrier Requirements - Outdoor

NEW CODE 2021

305.8 Means of Egress. Outdoor public pools provided with barriers shall have means of egress as required by Chapter 10 of the International Building Code.



Self Latching Gate



305.4 1. Structure Wall as a Barrier - Alarms



305.4 2. Structure Wall as a Barrier –Safety Cover- ASTM F1346

- 2. A Safety Cover that is listed and labeled in accordance with ASTM F 1346 is installed for pools and spas



305.4 3. Structure Wall as a Barrier-Approved Self-Closing, Self-Latching Doors

- 3. An approved means of protection, such as self-closing doors with self-latching devices, is provided.

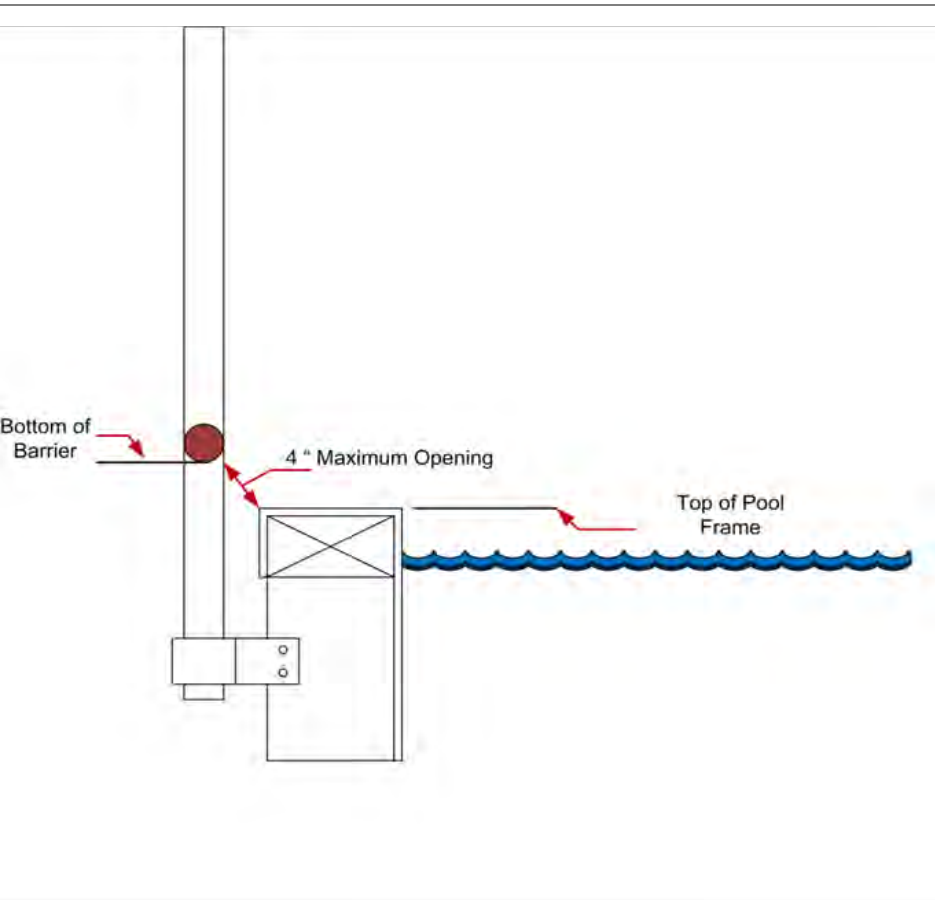


Section 305.5 3.

- For onground storable pools, the ladder shall have a manufacturer's statement of compliance with **APSP4**.



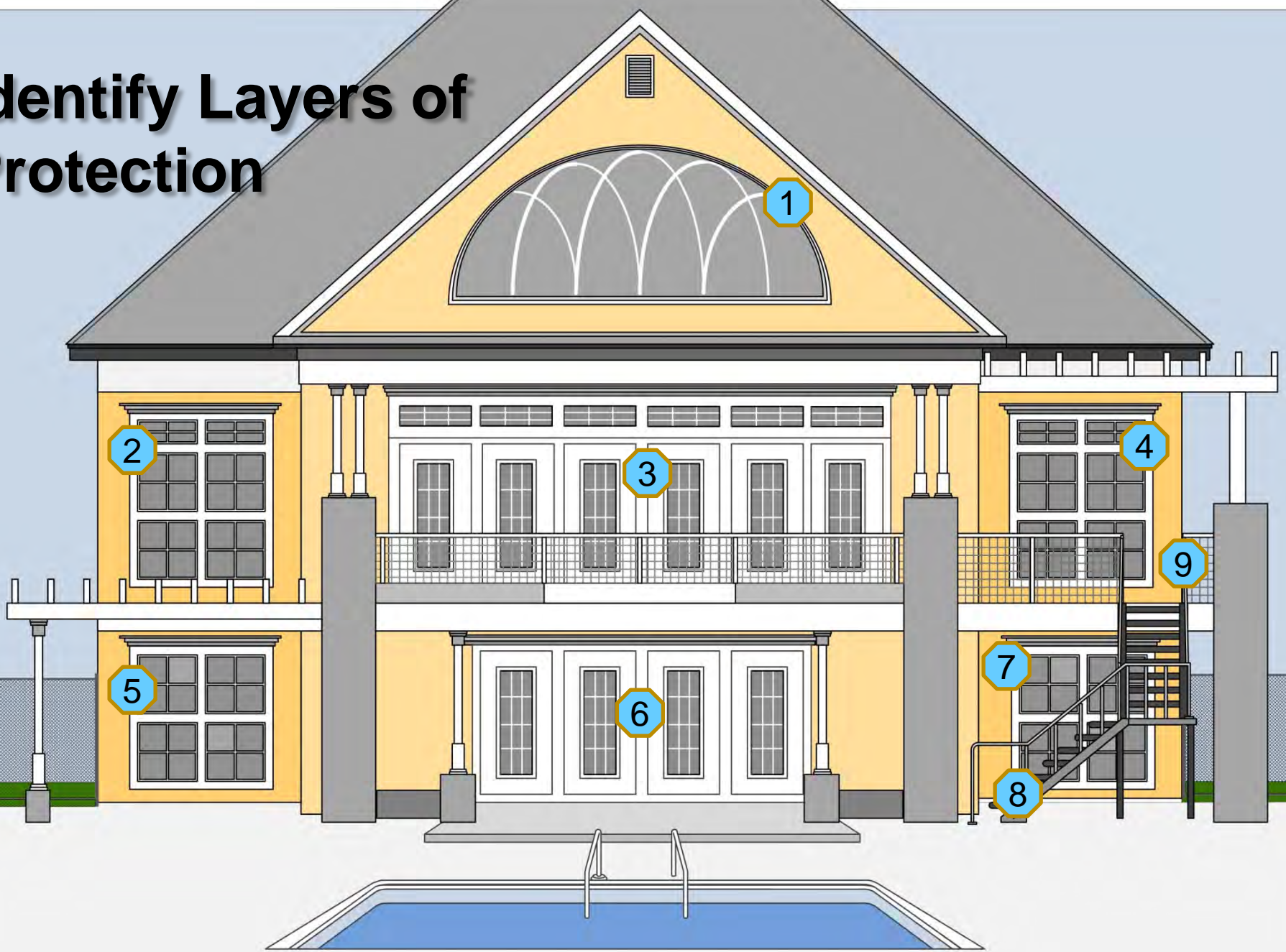
Section 305.5 4. Pool Structure as a Barrier



Structure Wall as a Barrier



Identify Layers of Protection



Section 306



Decks

306.3 Step Risers and Treads

- Step risers for decks of *public* pools and spas:
 - Uniform
 - Height between 3-3/4" (95 mm) and 7-1/2" (191 mm)
 - Tread not less than 11" (279 mm).
- Step risers for decks of *residential* pools and spas:
 - Uniform
 - Height not exceeding 7-1/2" (191 mm).
 - Tread not less than 10" (254 mm).



306.4 Deck Step Handrail

- Steps having 3 or more risers for decks of *public* pools and spas:
 - Shall be provided with a handrail
- Steps having 3 or more risers for decks of Residential pools and spas:
 - Handrail is NOT required



307.1.2.1 GENERAL DESIGN

NEW CODE 2021

307.1.2.1 Munsell Color Value. Finishes shall be not less than 6.5 on the Munsell color value scale.

Exceptions: The following shall not be required to comply with this section:

Competitive lane markings.

Floors of dedicated competitive diving wells.

Step or bench edge markings.

Pools shallower than 24 inches (609.6 mm).

Water line tiles.

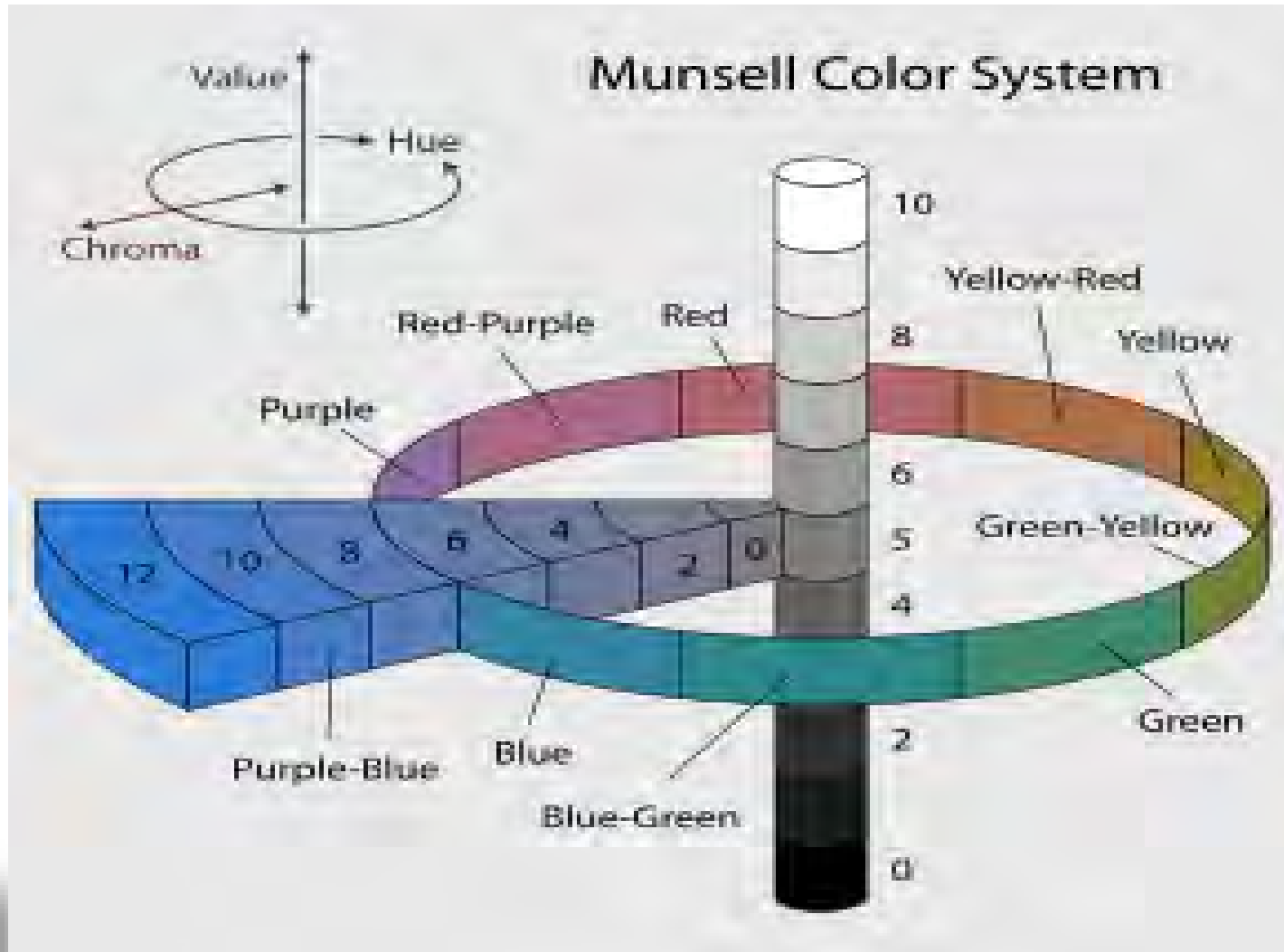
Wave and surf pool depth change indicator tiles.

Depth change indicator tiles where a rope and float line is provided.

Features such as rock formations, as approved



MUNSELL COLOR CHART



307.1.2.1 GENERAL DESIGN

NEW CODE 2021

307.1.4 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. Pool and spa lifts providing an accessible means of entry into the water shall be listed and labeled in accordance with UL 60335-2-1000 and be installed in accordance with ICC A117.1 and NFPA 70.

307.2.5 Plaster. The plastering of pools and permanently installed concrete spas shall be in accordance with APSP/NPC/ICC-12.



Section 310

Suction Entrapment Avoidance



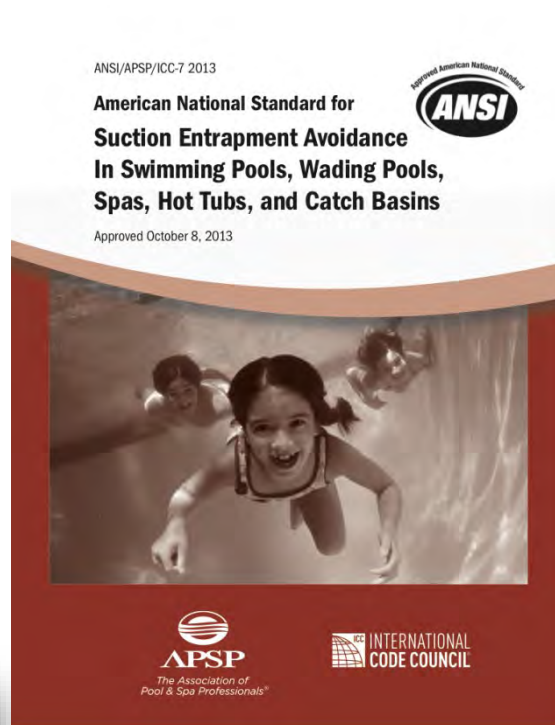
Section 310.1 General

- Suction Entrapment Avoidance for Pool and Spa shall be provided in accordance with ANSI/APSP/ICC-7.
 1. **Exception: Portable** Residential Spas and **Portable** Residential Exercise Spas listed and labeled in accordance with **UL 1563** or **CSA C22.2 No.218.1**
 2. **Exception:** Section 405 provides that **wading pools shall not have suction outlets.** (Skimmers or gutters are required for 100% of Flow).



Suction Entrapment Avoidance

- Entrapment avoidance means shall be provided in accordance with Section 310.



**Section 310.1 refers to
ANSI/APSP/ICC-7**



Suction Entrapment Hazards

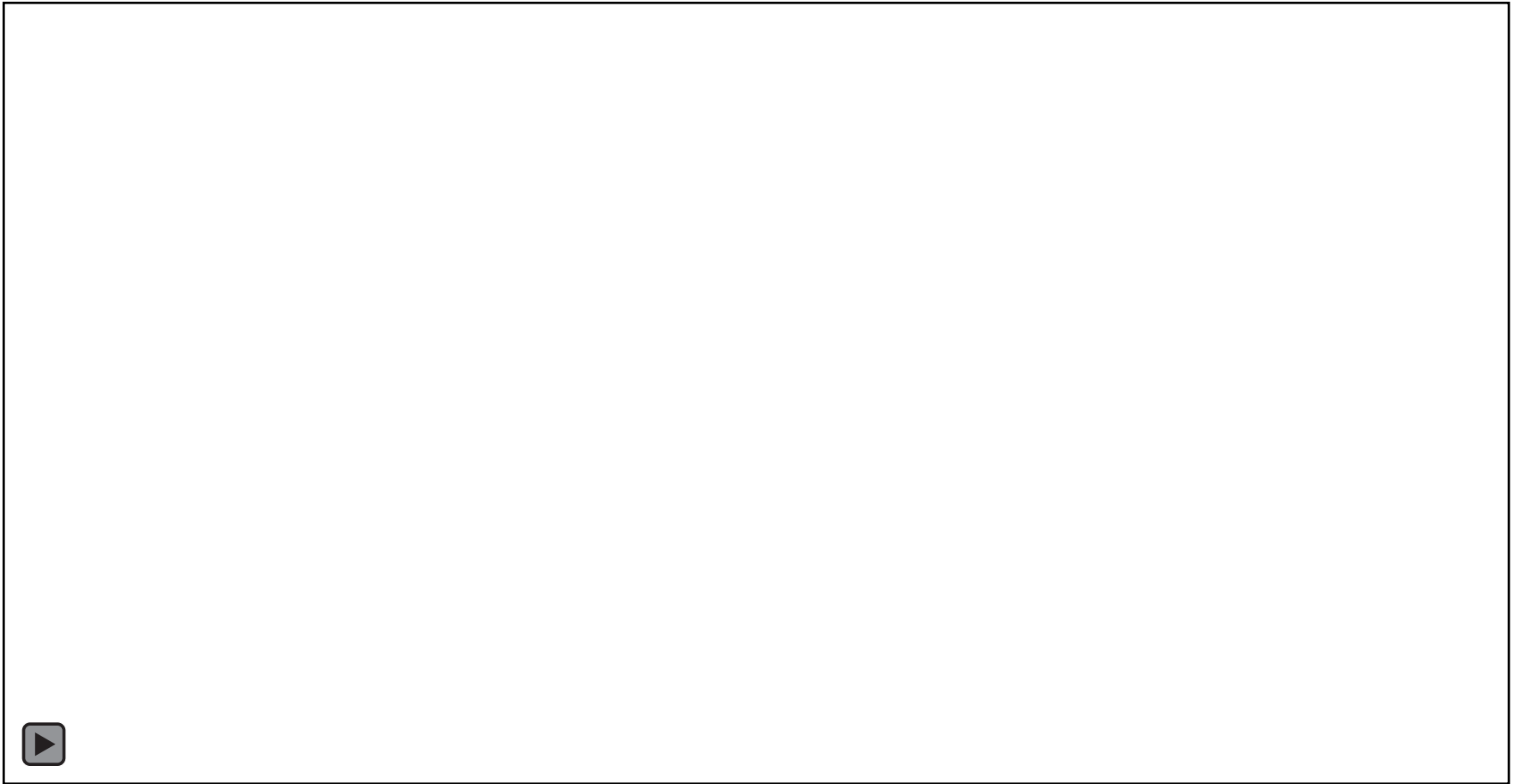
- Hair Entrapment (**Number 1 Type of Entrapment**)
- Body Entrapment
- Limb Entrapment
- Evisceration
- Mechanical Entrapment (non-suction)



APSP-16 Hair Test



APSP-16 Hair Test



Safety Awareness

*There is no backup for a missing or damaged suction outlet cover/grate. If any cover/grate is found to be damaged or missing, the pool or spa shall **be immediately closed** to bathers.*

Limb entrapments have occurred when no water was flowing through the pipe – the opening was exposed.



Suction Entrapment Avoidance

For each Suction Outlet, there are 4 items that must be checked.

1. With the system set for maximum flow, does the **flow exceed the certified limit** for the Suction Outlet Cover(SOFA)?(Flow/velocity is discussed in the last Section- Plan Review)
2. Is the Suction Outlet cover an **Unblockable** design?
3. Is this an **approved Suction Outlet Cover?** (certified to meet **ANSI/APSP/ICC-16**)
4. Is the proper **Sump** installed beneath the Suction Outlet Cover?



Section 310.1 Refer to ANSI/APSP/ICC-7

For **location** of Suction Outlets

- Step 1- Are there Suction Outlets in the pool?
- Step 2- Are the Suction Outlets certified as unblockable?
- Step 3- If not unblockable, there must be at least 2 certified Suction Outlets hydraulically balanced at least 3 feet apart center to center or a certified secondary system installed.



Listed Safety Drain Covers

- Listed suction outlet(s).
 - Suction outlet covers/grates shall be tested and listed by a accredited lab in conformance with ISO 17025 as conforming to **ANSI/APSP/ICC-16** 2017



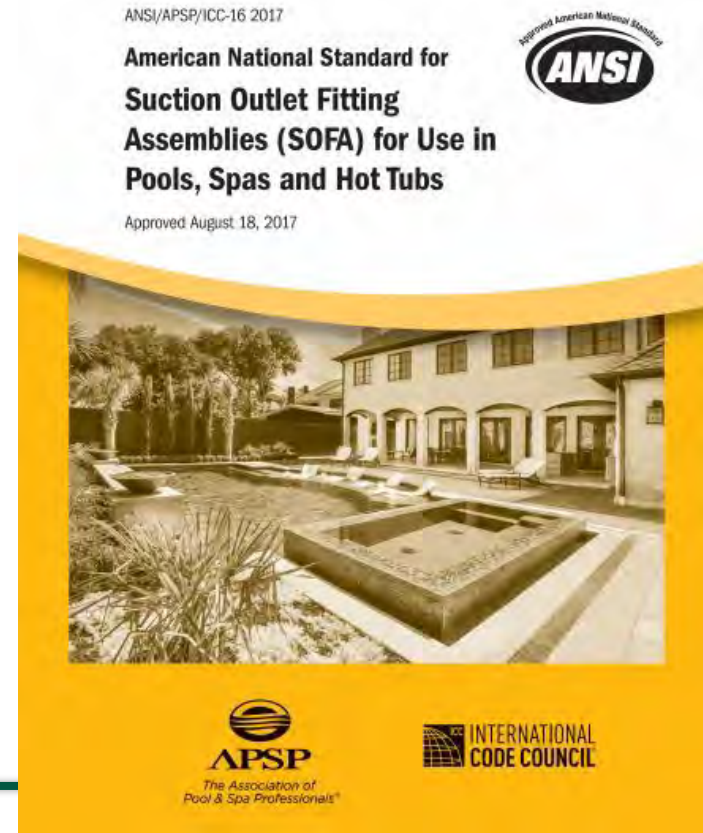
New Federal Law

Listed VGB Safety Covers

Suction Outlet Fitting Assemblies (SOFA)

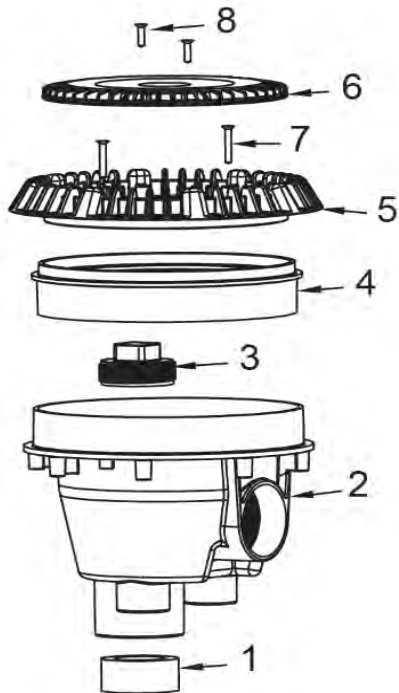
SOFA (Drain Covers) shall be in compliance with ANSI/APSP/ICC-16 2017.

VGB Compliance by
May 24, 2021



VGB Act Drain Covers

- **Definition.** VGBA Drain Covers are defined as all components, including the sump, cover/grate, and hardware. They are also called Suction Outlet Fitting Assemblies



1. 2" Socket x 1-1/2" Socket Pipe Reducer
2. Standard ABS Sump For Adjustable Collar
3. 2" Tapered Threaded Pipe Plug
4. 8" Sump Bucket Adjustable Collar
5. 8" Round Riser Ring
6. 8" Round Anti-Entrapment Cover
7. 10 x 1-1/4" Flat Head Phillips, 316 SS, Qty 2
8. 10 x 3/4" Flat Head Phillips, 316 SS, Qty 2

Code Enforcer Must Verify Covers with Plans and/or Inspection

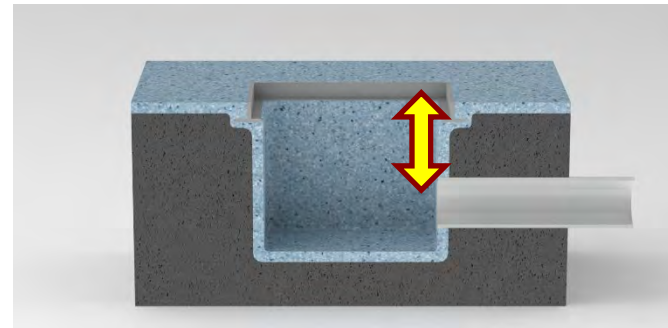
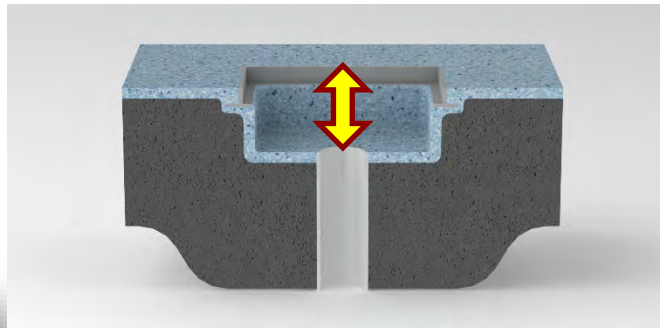
- Permit application can include the Manufacturer, make and model of the drain covers, including the flow rating.
- You may require the covers to be on site at one of the inspection phases.
- The following language embossed on them or permanently marked in a location that is visible when installed.
 - **ANSI/APSP/ICC-16** 2017 and, a flow rating “X GPM”, and “Life: X Years”, and Manufacturer and Model



VGB Act Drain Covers

- Drain Covers must be installed over a sump that is authorized by the Drain Cover manufacturer.
- Sumps can be field-built or manufactured – both options must meet the minimum sump depth specified by the manufacturer, or
 - Alternatively, a sump built in accordance with Figure 2 shall be permitted.

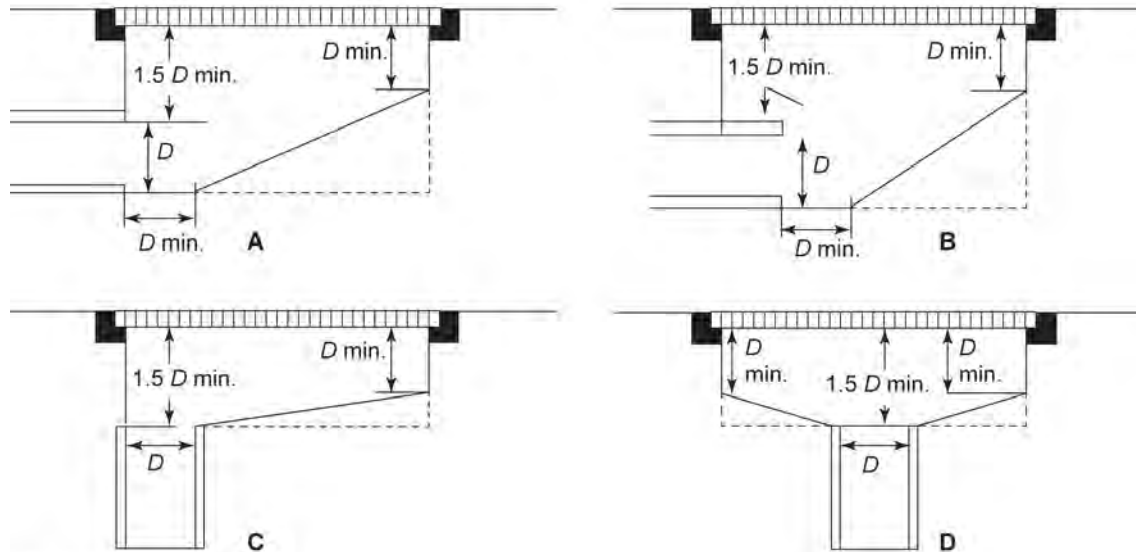
Measuring minimum
sump depths



VGB Act Drain Sump

- Alternatively, a sump built in accordance with Figure 2 shall be permitted.

Figure 2: Field Built Sump



NOTES:

- (a) D = inside diameter of pipe.
- (b) All dimensions shown are minimums.
- (c) A broken line (---) indicates suggested sump configuration.

Required Flow Ratings

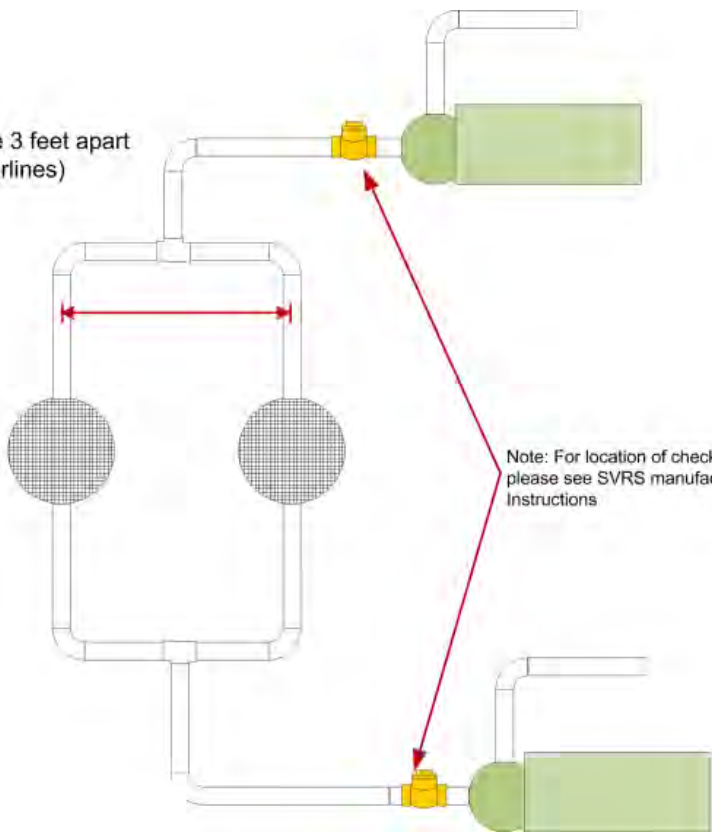
- When used, submerged suction outlet arrangements shall be a single unblockable or dual, or three-or-more blockable ones.
- Single or dual outlets. The flow rating for each listed cover/grate shall be greater than the maximum system flow rate.
- Three or more outlets. For a system with three or more covers/grates, the sum of the flow ratings shall be at least twice the maximum system flow rate.
 - Example: Two (2) 100 GPM cover/grates and one (1) 60 GPM cover/grate would have an allowable maximum system flow rate of 130 GPM $(100 + 100 + 60) / 2 = 130$



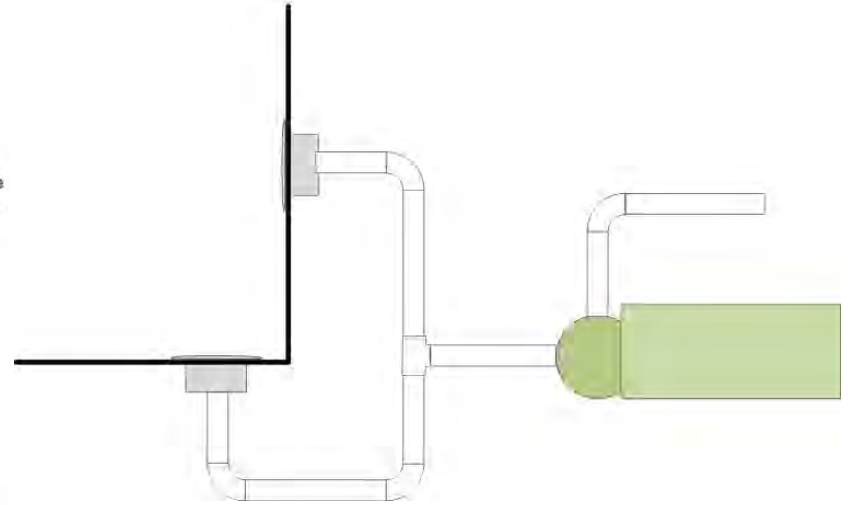
Drain Placement

- **Dual cover/grate separation.** Two covers/grates shall be separated by a minimum of 3 feet measured from center to center of suction pipes 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.
- Be aware of manufacturer's recommendations.

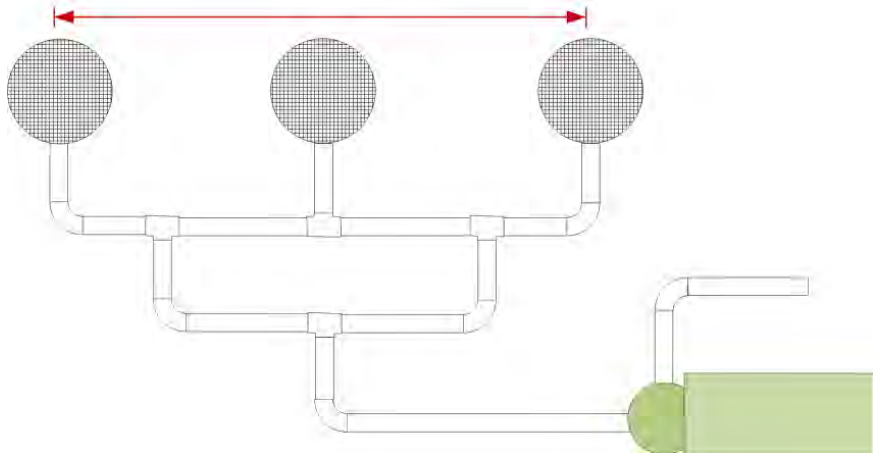
Minimum distance 3 feet apart
(pipe centerlines)



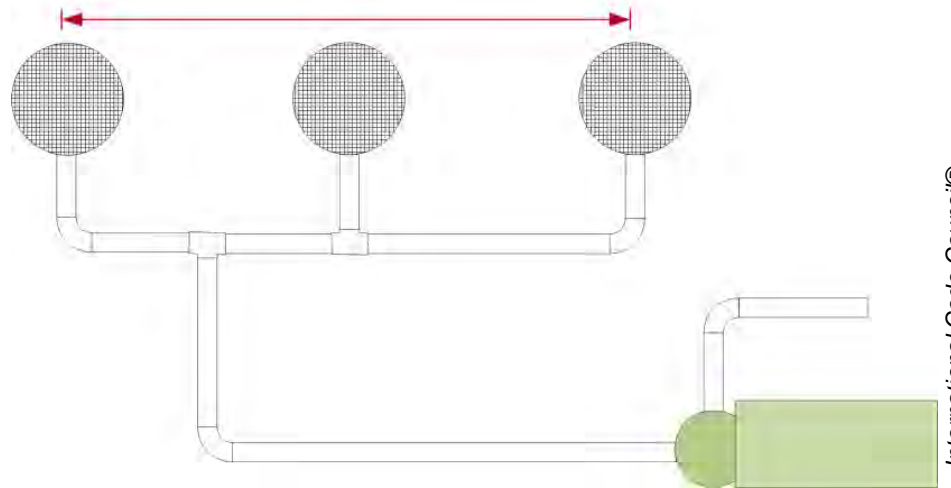
Dual Outlets on Different Planes
(Elevation or Plan View)



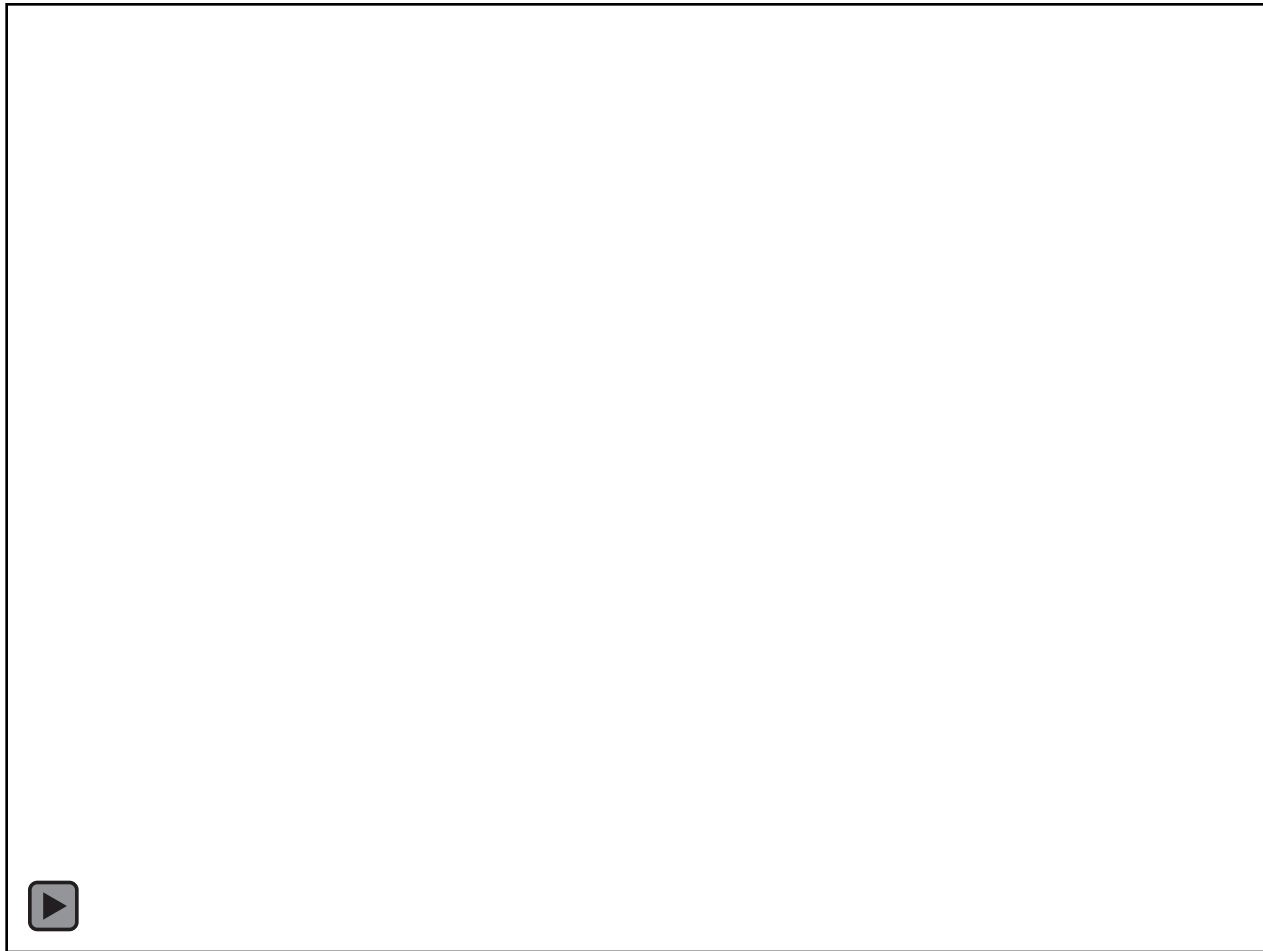
Minimum distance 3 feet between outermost outlets
(pipe centerline)



Minimum distance 3 feet between outermost outlets
(pipe centerline)



Dual Drain Example



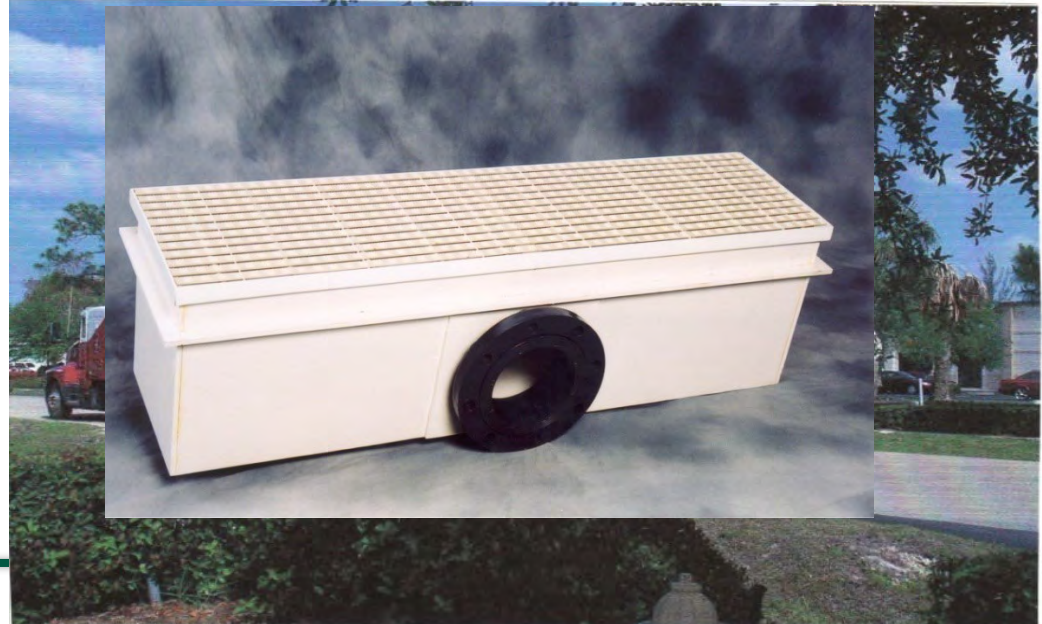
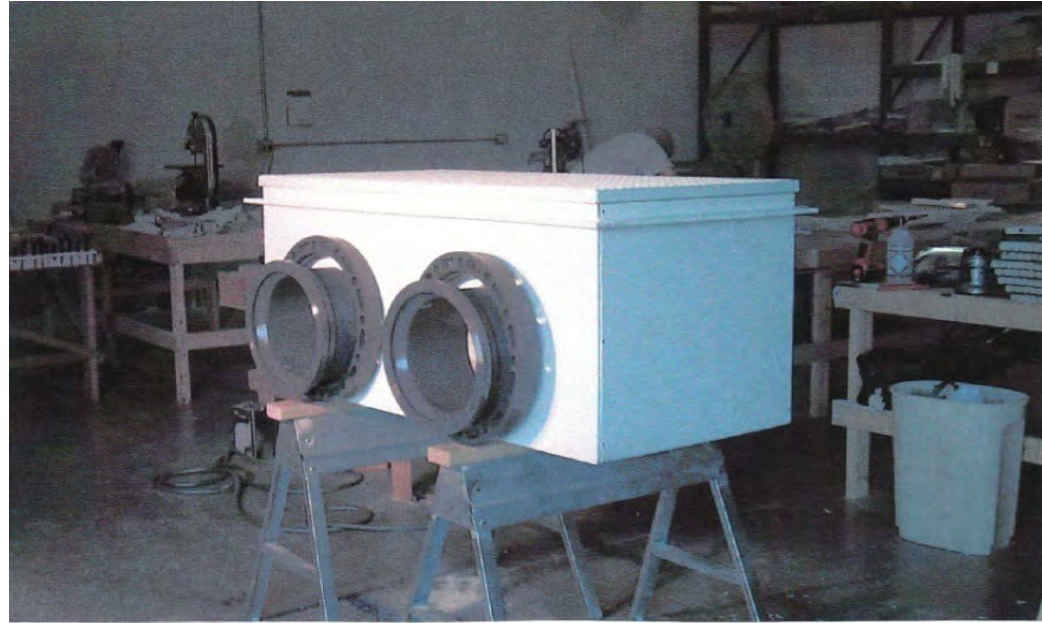
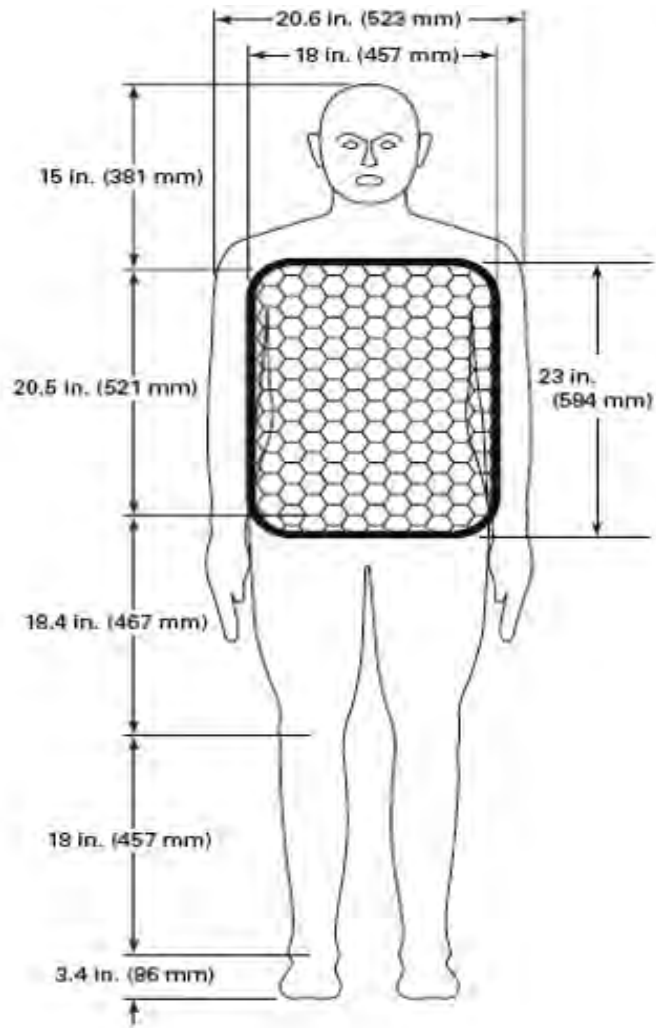
recommendations.



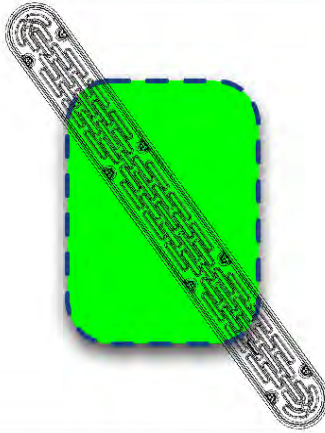
Compliance Options for Existing Single Outlets (Single Main Drain)

- One or more additional listed suction outlet cover/grates;
- Convert suction outlet to return inlet by changing the piping, provided the system piping and skimmer(s) shall be capable of handling the full system flow;
- Engineered vent system;
- Listed manufactured SVRS;
- Permanently disable the single outlet, provided the system piping and skimmer(s) shall be capable of handling the circulation and distribution requirements.

Single Unblockable Drains



Unblockable

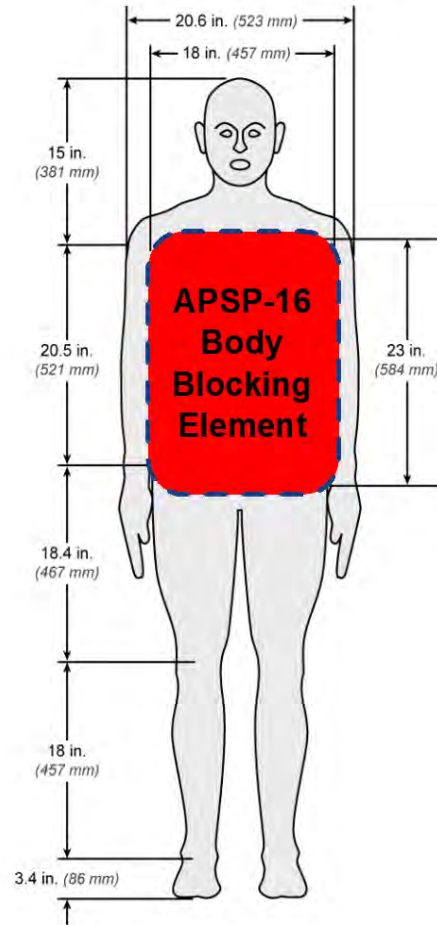


Unblockable Drain:

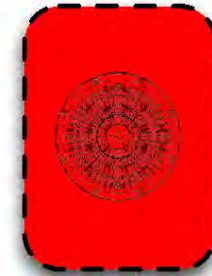
- No Additional Requirements

System Flow Rating:

- Single = Cover Flow Rating
- Multiple = Add All Cover Flow Ratings Together



Blockable



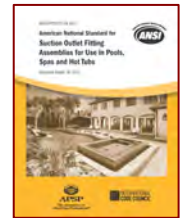
Blockable Drain Requirement:

- Multiple-Drains, or
- SVRS, or
- Suction-Limiting Vent System, or
- Gravity Drainage System, or
- Automatic Pump Shut-off System

System Flow Rating:

- Multiple-Drain Systems:
Subtract Flow Rating of One Cover
- Other Systems = Cover Flow Rating

APSP-16 Body Block Test



Acceptable Drain Options

- Submerged Suction Outlets are **Not Required**
- Dual Drains w/Listed Covers (Limited Velocity)
- Multiple Drains w/Listed Covers (Limited Velocity)
- Single Unblockable Drains w/Listed Covers (Limited Velocity)
- Gravity Flow Systems w/Listed Covers (Except Skimmers)



Verify Drain Placement with Plans & Inspection

- Drain placement details should be shown on the Permit application drawings.
- Field inspection:
 - Measuring for distance between suction pipe centers or observing placement on different planes.
 - For field fabricated sumps, measure from top of pool shell floor to top of suction pipe.

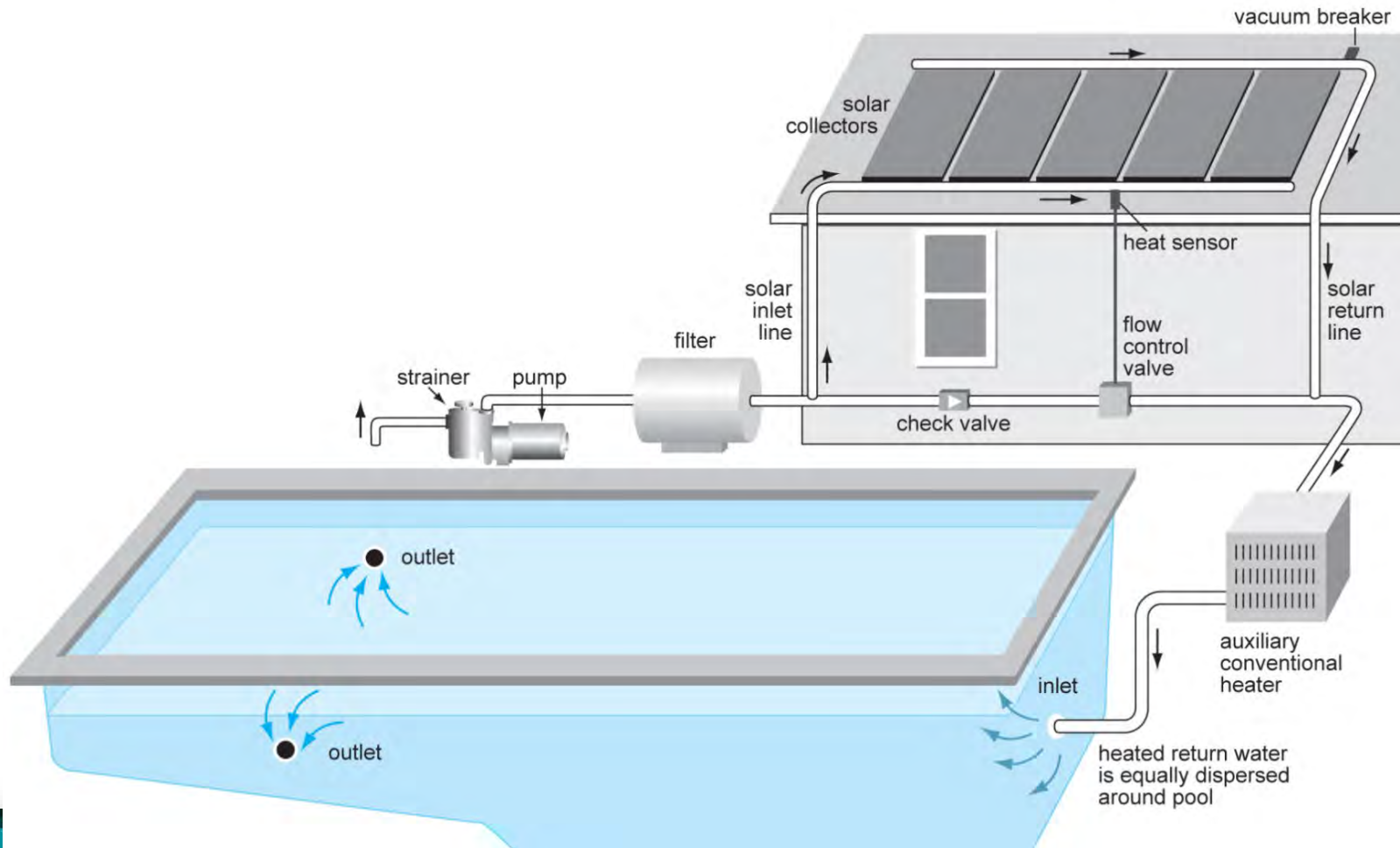


Section 311

Circulation systems



Circulation System components



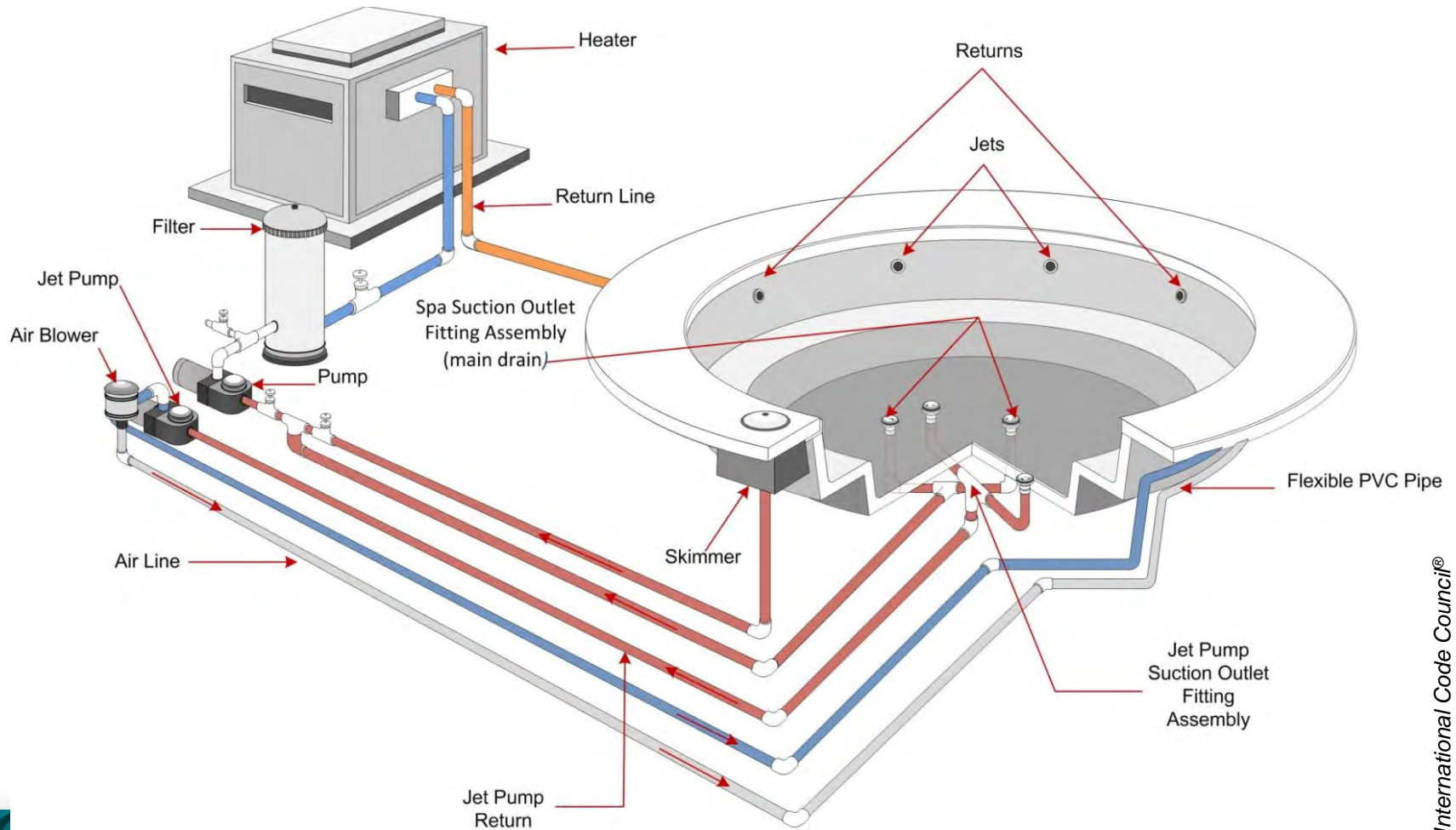
Courtesy of Association of Pool & Spa Professionals™

The Process

- Determine volume
- Calculate filtration flow rate
- Size the piping system and filter
- Select a pump from the APSP 15 database



Pool and Spa Piping



International Code Council®

Section 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.

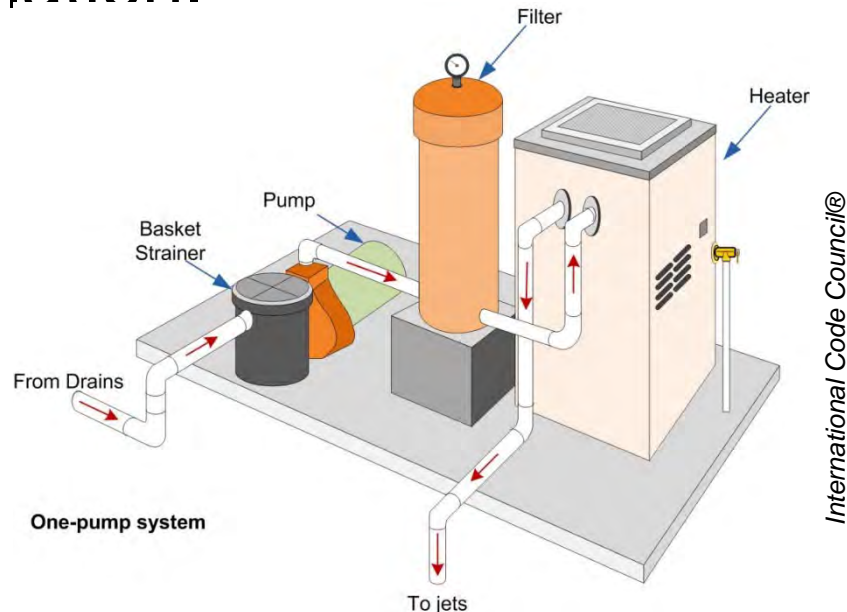
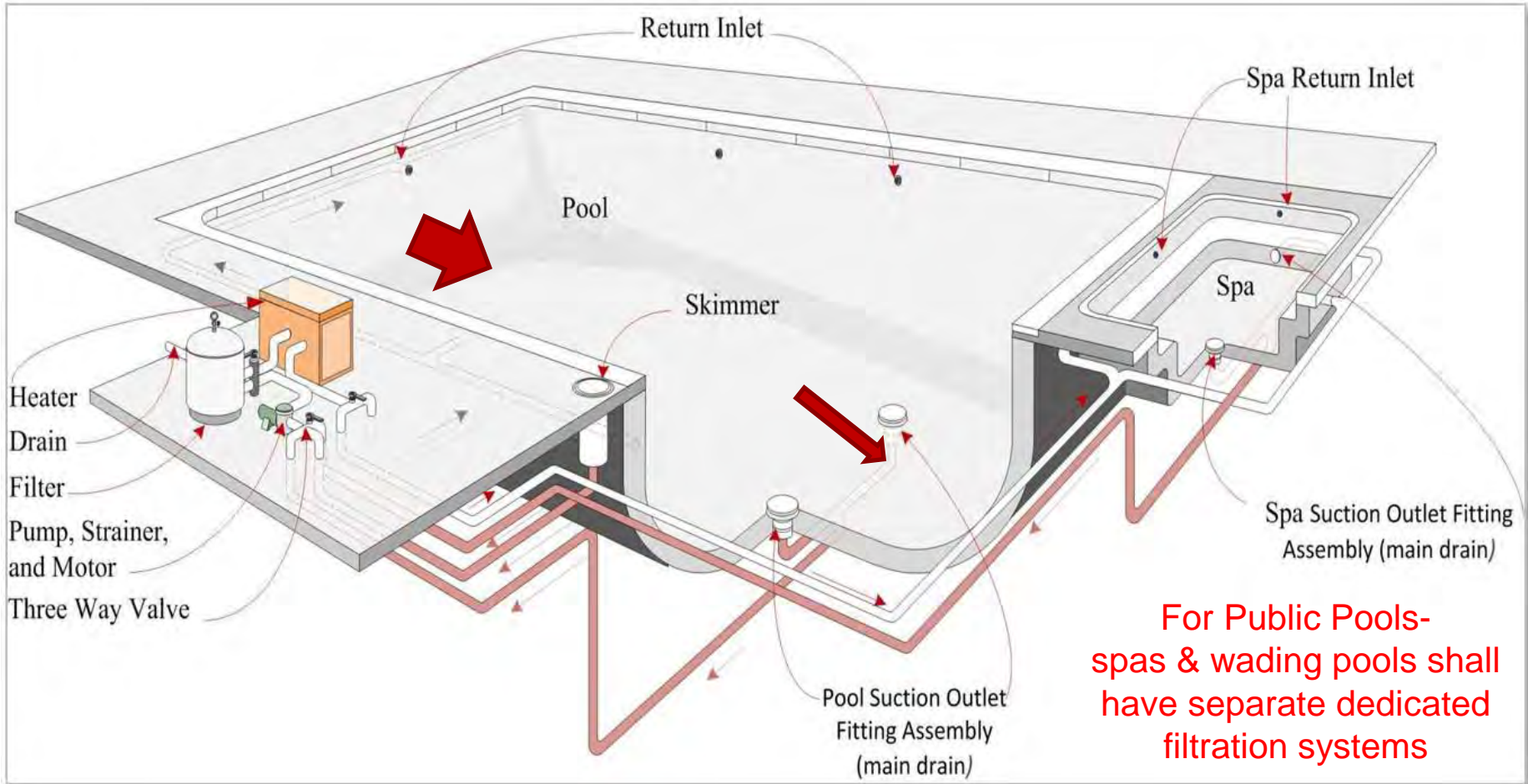


Figure 311.2 - Pool Equipment



Section 311.2.2 Servicing

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



Section 311.3 Water Velocity

Summary:

- Water flow should never exceed recommended maximum velocities for two reasons.
 - High velocities in outlets can exacerbate hair entrapment incidents.
 - High velocities create greater resistance to flow, increasing the total dynamic head in the system, leading to higher amperage draws and increased operating costs.
 - High velocities can increase the chance of evisceration



Section 311.3 Water Velocity (cont.)

- **ANSI/APSP/ICC-15** requires the maximum water velocity in filtration suction piping be limited to 6 feet per second (fps) (1.829 mps).
- 8 fps (2.438 mps) for residential pool returns.
- Sizing charts are available from manufacturers.



Section 311.3 Water Velocity (cont.)

NEW CODE 2021

311.3 Water velocity. The water velocity in suction and return piping shall comply with either Section 311.3.1 or 311.3.2. The water velocity in copper and copper alloy piping shall not exceed 8 fps (2.4 mps). All water velocity shall be based on the design flow rate specified for each recirculation system.

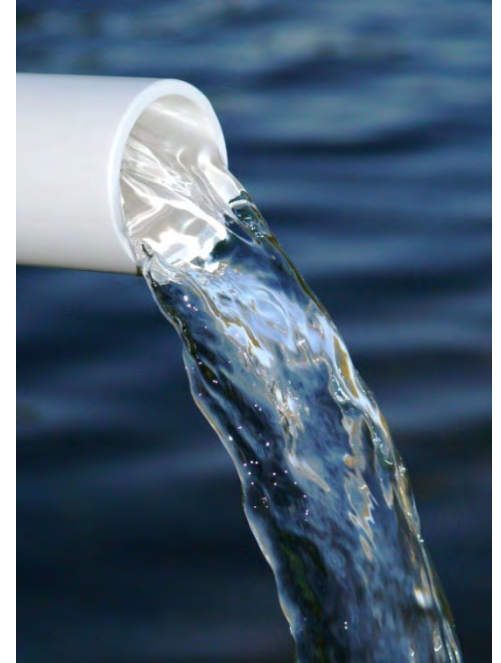
311.3.1 Public pools and spas. For public pools and spas, suction piping water velocity shall not exceed 6 fps (1.8 mps) and return piping water velocity shall not exceed 8 fps (2.4 mps).

311.3.2 Residential pools and spas. For residential pools and spas, the water velocity in suction piping and return piping shall not exceed 8 fps (2.4 mps).



Section 311.4 Piping and Fittings

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



Section 311.4.1 Fittings

- Fittings used in circulation systems shall comply with one of the standards in Table 311.4.1.
- **Exceptions:**
 - Suction outlet fitting assemblies and manufacturer-provided components certified in accordance with **APSP 16**.
 - Skimmers and manufacturer-provided components.
 - *Gutter* overflow grates and fittings installed above or outside of the overflow point of the pool or spa.



Section 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.



Section 311.5 System Draining

- Equipment shall be designed and fabricated to drain the water from the equipment.
- Drainage shall be in accordance with manufacturer's specifications.



Section 311.6 Pressure or Vacuum Gauge

- Gauges shall be provided for public pools in the circulation system. Gauges shall be provided with ready access.
- A pressure gauge shall be located downstream of the pump and between the pump and filter.
- A vacuum gauge shall be located on the suction side of the pump.



Section 311.7 Flow Measurement

- Public swimming pools and wading pools shall be equipped with a flow-measuring device.
- The flow rate measuring device shall indicate gallons per minute and installed to be accurate within plus or minus 10 percent of actual flow



Section 312

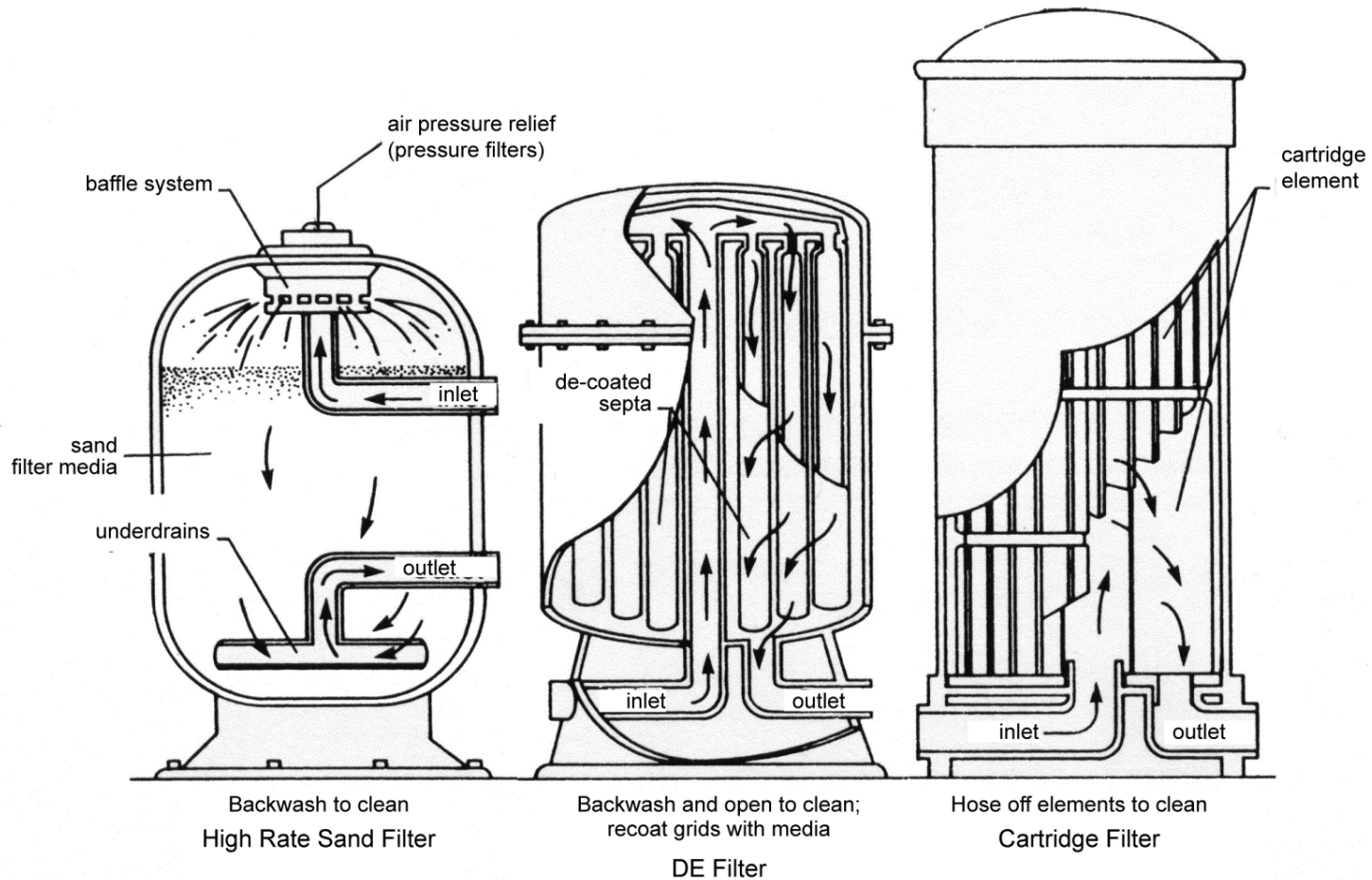


Filters

Section 312 Filters

For pressure-type filters, a means shall be provided to permit the release of internal pressure.

Courtesy of Association of Pool & Spa Professionals™



Section 313

PUMPS AND MOTORS



Section 313 Pump & Motors

- The provisions of this section apply to pumps and motors for all pools and spas.

Exception:

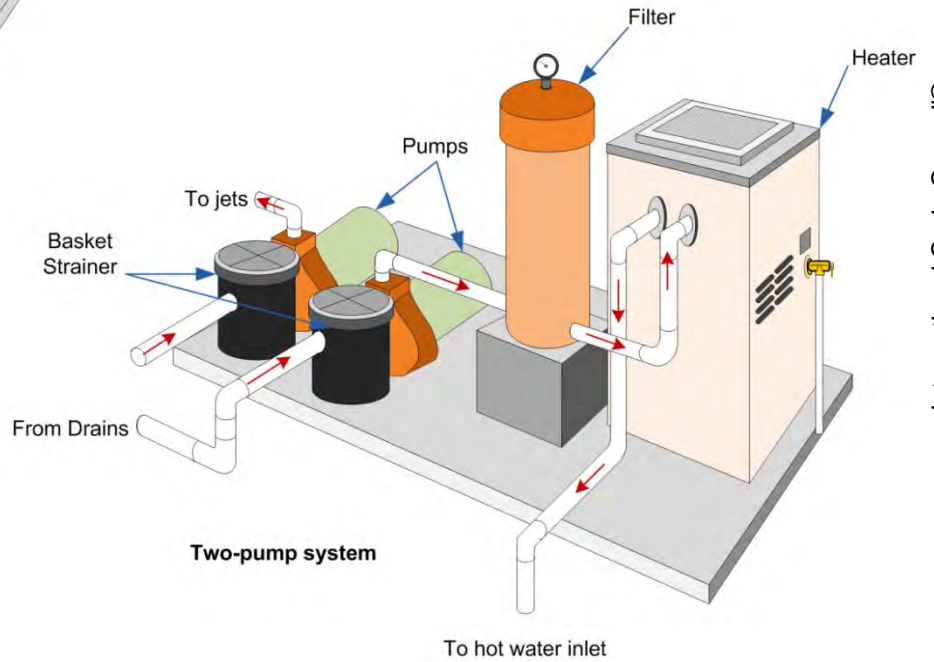
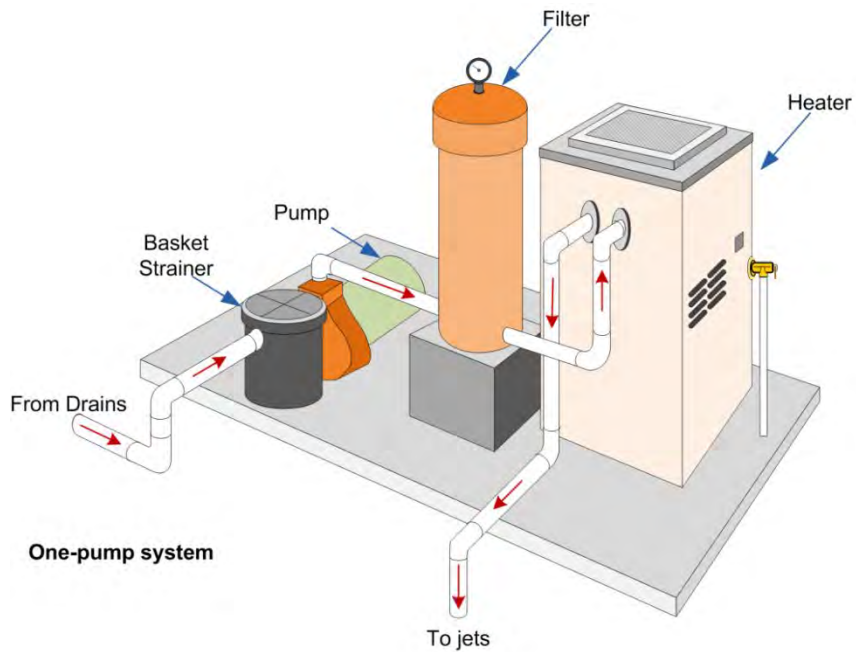
- Portable residential spas and portable residential exercise spas.
- On ground storable pools supplied by the pool manufacture as a kit that includes a pump and motor that is in accordance with Section 704.



Section 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 (TDH) developed by the complete system. To maintain the required flow rate of the pool or spa.





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Section 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.



Section 313 Pump & Motors

- **Section 313.4 Location**

- Pumps and motors shall be accessible for inspection and service in accordance with the manufacturer's specifications.

- **Section 313.5 Safety**

- The design, construction, and installation of pumps and component parts shall be in accordance with the manufacturer's specifications.



Section 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.



Multiport valve
Courtesy of Hayward Pool Products, Inc.



Ball valve
Courtesy of Hayward Pool Products, Inc.



Slide valve
Courtesy of Pentair (Water, Pool and Spa)



3-port valve
Courtesy of Zodiac Pool Care



Gate valve
Courtesy of Dynaquip Controls



Venturi manifold with a check valve
(designed for horizontal or vertical installation only; allows waterflow in one direction only)

Section 313.7 Emergency Shutoff Switch

- An emergency spa shutoff switch shall be provided to disconnect all power to recirculation and jet system pumps and air blowers. Emergency shutoff switches shall be provided with access; located within sight of the spa and located not less than 5 feet (1524 mm) horizontally from the inside walls of the **pool** or spa.
- **Exception:** Onground storable and permanent inground **residential** swimming pools or spas.



Section 313.7 Emergency Shutoff Switch



Section 314

Return and Suction Fittings



Section 314.1 General

- The provisions of this section apply to return and suction fittings for pools and spas.

Exception: Portable residential hot tubs and exercise spas.



Section 314.3 Flow Distribution

The suction outlet fitting assemblies, where installed shall each be designed to accommodate **100 percent** of the circulation turnover rate.

and the skimming system shall each be designed to accommodate **100 percent** of the circulation turnover rate.

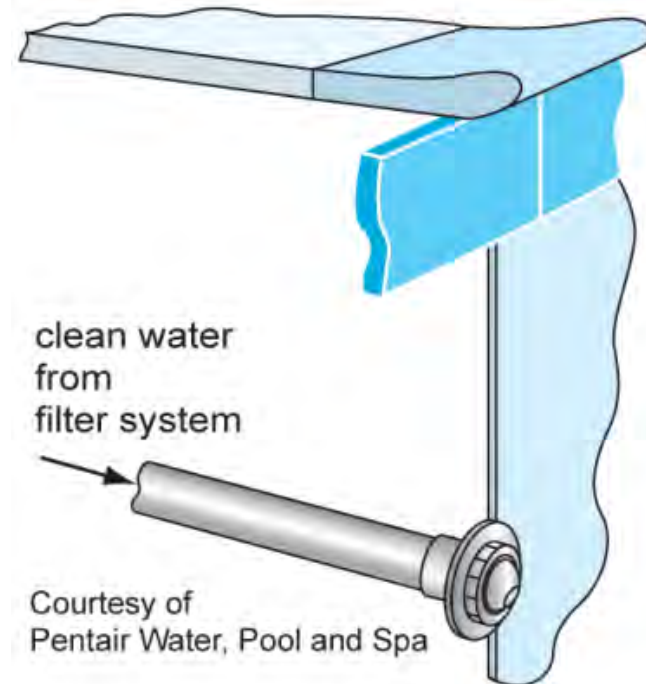


Section 314.4 Return Inlets

One return inlet per 300 sq ft (27.87 sq m) or fraction thereof.

Exception:

- Onground storable pools installed per manufacturer's direction



Section 314.5 Vacuum Fittings

Where installed, Submerged vacuum fittings shall be accessible and shall not be located greater than 12 inches below the water level.

According to section 310- **APSP/ANSI/ICC 7** requires that the fitting have a self-closing, self-latching cover and the piping to the suction fitting have a shutoff valve.



Section 315



Skimmers

Section 315 Skimmers

Perimeter skimming system



International Code Council®



Section 315.1 (Summary)

- The provisions of Section 315 apply to skimmers for all Pools and Spas with the exception of portable residential spas and portable residential exercise spas.



Section 315.2 Required (Summary)

- Requires a surface skimming system be provided for Public Pool and Spa. However there is an exception for
- Public pools designed in accordance with Chapter 6. This chapter covers public pools and water containment systems for aquatic recreation.



315.4.1 Surge Capacity (Summary)

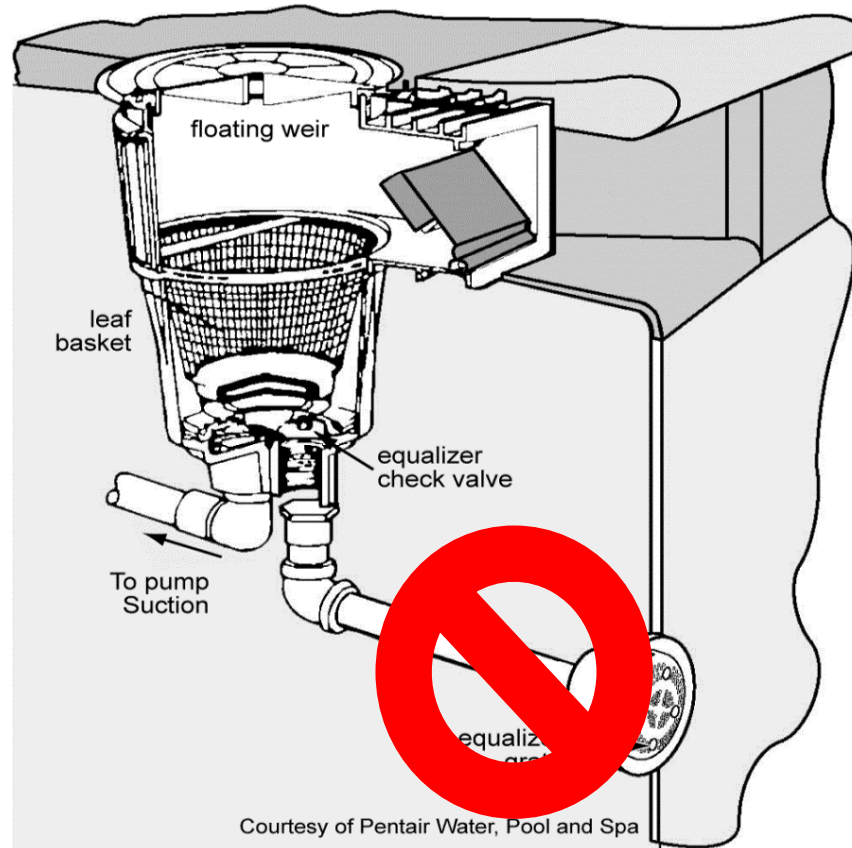
- A perimeter surface skimming system could become “flooded” if a large number of bathers enter the vessel in a short amount of time.

407.3 Continuous water removal. The design of a gutter system shall accommodate continuous removal of water from the pool's upper surface at a rate of not less than 125 percent of the required total recirculation flow rate as determined by the design professional.

407.3.1 Gutter outlets. At a gutter flow condition of not less than 125 percent of the total recirculation flow as determined by the design professional, gutter outlets such as drop boxes, converters, return piping, or flumes shall be designed to prevent flooding of the gutter that would result in skimmed water re-entering the pool.



Section 315.5 Equalizer



Section 316



Heaters

Section 316.2 CERTIFICATION

316.2 Certification. Heaters and hot water storage tanks shall be listed and labeled in accordance with the applicable standard indicated in Table 316.2(1). Hot water heating systems and components shall comply with the applicable standard indicated in Table TABLE 316.2(1)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 pump water heater	UL 1995, AHRI 1160, CSA C22.2 No. 236

<u>SYSTEM</u>	<u>STANDARD</u>
<u>Solar water heater</u>	<u>ICC/APSP 902/SRCC 400</u>



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. Solar water heating systems shall be installed in accordance with Section 316.6.

316.6 Solar water heaters systems. Solar water heating systems utilized for pools and spas shall comply with Sections 316.6.1 through 316.6.3.

316.6.1 Installation. Solar thermal water heaters shall be installed in accordance with the International Mechanical Code or International Residential Code, as applicable in accordance with Section 102.7.1.

316.6.2 Certification of collectors. Solar thermal collectors shall be listed and labeled in accordance with ICC 901/SRCC 100 :



Section 316.4.1 Temperature

- Heaters- A means shall be provided to monitor water temperature.



Courtesy of Association of Pool & Spa Professionals™

Section 316.4.2 Access Prohibited

- For public pools and spas, public access to heater controls shall not be allowed.



International Code Council®

Section 319



Sanitizing Equipment

Section 319 Sanitizing Equipment



Section 319 Sanitizing Equipment

NEW CODE 2021

319.2 Chemical feeders. Public pools and spas shall be equipped with chemical feed equipment such as flow-through chemical feeders, electrolytic chemical generators, mechanical chemical feeders, chemical feed pumps, and automatic controllers that are listed and labeled in compliance with NSF 50.

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.



Section 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.



**Flow Switch
and Cell**

Section 320



Waste Water Disposal

Section 320.1 Backwash Water or Drainage Water

- Shall discharge to:
 - Sanitary sewer
 - Storm sewer
 - Approved disposal system on the premises
 - Other means approved by State or Local Authority



Section 320.1 (cont.)

- Direct connections shall not be made between the end of the backwash line and the disposal system. Drains shall discharge through an air gap.



International Code Council®

Section 320.2 Water Salvage

- Back wash water can return to the pool or spa only after:
 - Water has been filtered to remove particulates
 - Treated to eliminate coliform bacteria & waterborne pathogens
 - And such return has been approved by the state or local authority



Section 320.3 Waste Post Treatment

- Filtered backwash water & drainage water (where necessary)
 - Treated chemically or through the use of settling tanks to eliminate or neutralize chemicals, diatomaceous earth and contaminants in the water that exceeds the limits set by the state or local effluent discharge requirements.



Section 321



Lighting

Section 321 Lighting

NEW CODE 2021

321.2.3 Underwater lighting. Underwater lighting shall provide not less than 8 lumens per square foot

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 provides visibility, without glare, of all areas of the pool, and the requirements of Section 321.2.2 are met or exceeded.



Section 321.4 Residential Pool & Deck Lighting

- The code does not require lighting for residential pools and spas.
- All lighting must be installed to meet the **NEC 70**



Section 322 LADDERS AND RECESSED TREADS

NEW CODE 2021

322.3.1 Wall clearance. There shall be a clearance of not less than 3 inches (76 mm) and not greater than 4 inches (101.6 mm) between the pool wall and the ladder.



Section 324



EQUIPMENT ROOMS

Section 324 EQUIPMENT ROOMS

NEW CODE 2021

324.1 General. The provisions of this section apply to public pools and spas and aquatic recreation facilities.

324.2 Requirements. The equipment area or room floor shall be of concrete or other suitable material having a smooth slip resistant finish and have positive drainage, including a sump drain pump, if necessary. Floors shall have a slope toward the floor drain and/or sump drain pump adequate to prevent standing water at all times. The opening to the equipment room or area shall be designed to provide access for all anticipated equipment. At least one hose bibb with backflow preventer shall be located in the equipment room or be accessible within an adequate distance of the equipment room so that a hose can service the entire room.



Section 324 EQUIPMENT ROOMS

NEW CODE 2021

324.3 Construction. The size of the equipment room or area shall provide working space to perform routine operations and equipment service. Equipment rooms also intended for storage shall have adequate space provided for such storage, without reducing the working spaces. Equipment rooms or areas shall be lighted to provide 30-foot candles (323 lux) of illumination at floor level.

324.4 Electrical. All electrical wiring shall be installed in accordance with NFPA 70.

**324.5 Ventilation. Equipment room ventilation shall address:
Combustion requirements,
Heat dissipation from equipment,
Humidity from surge or balance tanks,
Ventilation to the outside, and
Air quality.**



Section 324 EQUIPMENT ROOMS

324.6 Markings. All piping in the equipment room shall be permanently identified by its use and the pool or spa it serves. Identification shall be provided for:

Main drains and skimmer lines,

Filtered water,

Make-up water,

Chlorine (or disinfection) feeds,

Acid (or pH) feeds,

Compressed air lines,

Gutter lines,

Chemical sample piping, and

Pool heating lines.

All piping shall be marked with directional arrows as necessary to determine flow direction and all valves shall be clearly identified by number with a brass tag, plastic laminate tag or permanently affixed alternate. Valves shall be described as to their function and referenced in the operating instruction manual.



Section 324 EQUIPMENT ROOMS

324.7 Separation from Chemical Storage Spaces. Combustion equipment, air-handling equipment, and electrical equipment shall not be exposed to air contaminated with corrosive chemical fumes or vapors. Spaces containing combustion equipment, air handling equipment, and/or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall not be used as chemical storage spaces at the same time unless the equipment is listed and labeled for use in that atmosphere. Spaces containing combustion equipment, air handling equipment, or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall be isolated from chemical storage space air.

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324.7.1 Doors and openings. A door or doors shall not be installed in a wall between such equipment rooms and an interior chemical storage space. There shall be no ducts, grilles, pass-throughs, or other openings connecting such equipment rooms to chemical storage spaces, except as permitted by the International Fire Code. Spaces containing combustion equipment, air-handling equipment, and/or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall be isolated from indoor aquatic facility air unless the equipment is listed for the atmosphere. There shall be no ducts, grilles, pass-throughs, or other openings connection such spaces to an indoor aquatic facility. Ducts which connect the indoor aquatic facility to the duct connections of air handlers shall not be construed as connecting the air-handler space to the indoor aquatic facility unless HVAC equipment is rated for indoor aquatic facility atmosphere and serves only that indoor aquatic facility. Where building construction leaves any openings or gaps between floors and walls, or between walls and other walls, or between walls and ceilings, such gaps shall be permanently sealed against air leakage.



Section 324 EQUIPMENT ROOMS

324.7.2 Indoor Aquatic Facility Access. Where a door or doors are installed in a wall between an equipment room and an indoor aquatic facility, the floor of the equipment room shall slope back into the equipment room in such a way as to prevent any equipment room spills from running under the door into the indoor aquatic facility. This requirement shall be accomplished by one of the following:

- 1. A floor all of which is at least 4 inches below the level of the nearest part of the indoor aquatic facility floor.**
- 2. A continuous dike not less than 4 inches high located entirely within the equipment room, which will prevent spills from reaching the indoor aquatic facility floor.**



Section 324 EQUIPMENT ROOMS

324.7.2.1 Automatic closer and lock. A door between an equipment room and an indoor aquatic facility shall be equipped with an automatic closer and automatic lock. The door, frame, and automatic closer shall be installed so as to ensure that the door closes completely and latches without human assistance. The automatic lock shall require a key or combination to open from the indoor aquatic facility side. The lock shall be designed and installed to be opened by one hand from the inside of the room under all circumstances, without the use of a key or tool. Such doors shall be equipped with permanent signage warning against unauthorized entry. All sides of such doors shall be equipped with a gasket. The gasket shall be installed to prevent the passage of air, fumes, or vapors when the door is closed.



Section 324 EQUIPMENT ROOMS

324.8 Chemical storage space. A least one space dedicated to chemical storage space shall be provided to allow safe storage of pool and spa chemicals. In all chemical storage spaces, an emergency eyewash station shall be provided. The construction of a chemical storage space shall take into account foreseeable hazards and protect the stored materials against tampering, wild fires, unintended exposure to water and the transfer of fumes into any interior space of a building intended for occupation. Any walls, floors, doors, ceilings, and other building surfaces of an interior chemical storage space shall join each other tightly. If chemicals are to be stored outdoors, they shall be stored in a well-ventilated protective area with an installed barrier to prevent unauthorized access. Exterior chemical storage spaces not joined to a wall of a building shall be completely enclosed by fencing that is at least 6 feet high. Fencing shall be equipped with a self-closing and self-latching gate having a permanent locking device.



Section 324 EQUIPMENT ROOMS

324.8.1 Chemical storage space doors. All doors opening into chemical storage spaces shall be equipped with permanent signage:

- 1. Warning against unauthorized entry, and**
- 2. Specifying the expected hazards, and**
- 3. Specifying the location of the associated safety data sheet forms, and**
- 4. Product chemical hazard NFPA chart.**

Where a single door is the only means of egress from a chemical storage space, the door shall be equipped with an emergency-egress device. Where a chemical storage space door must open to an interior space, spill containment shall be provided to prevent spilled chemicals from leaving the chemical storage space and the door shall not open to a space containing combustion equipment, air-handling equipment, or electrical equipment.



Section 324 EQUIPMENT ROOMS

324.8.1.2 Interior opening. Where a chemical storage space door must open to an interior space, such door shall have all of the following requirements:

1. Constructed of corrosion-resistant materials.
2. Equipped with a corrosion-resistant, automatic lock to prevent unauthorized entry.
 - 2.1. Such lock shall require a key or combination to open from the outside into the chemical storage space.
 - 2.2. Such lock shall be designed and installed as to be capable of being opened by one hand from the inside of the chemical storage space without the use of a key or tool.
3. Supported on corrosion-resistant hinges, tracks, or other supports.
4. Equipped with suitable gaskets or seals on the top and all sides to minimize air leakage between the door and the door frame.
5. Equipped with a floor or threshold seal to minimize air leakage between the door and the floor or threshold.



Section 324 EQUIPMENT ROOMS

6. Equipped with an automatic door closer that will completely close the door and latch without assistance and close the door completely against the specified difference in air pressure.

7. Equipped with a limit switch and an alarm that will sound if the door remains open for more than 30 minutes. The alarm shall have a minimum output level of 85 dbA at 10 feet.



Section 324 EQUIPMENT ROOMS

324.8.2 Interior chemical storage spaces. There shall be no transfer grille, pass-through grille, louver, or other device or opening that will allow air movement from the chemical storage space into any other interior space of a building intended for occupancy or into another chemical storage space. Interior chemical storage spaces that share any building surface with any other interior space shall be equipped with a ventilation system that operates continuously and insures that all air movement is from all other interior space and toward the chemical storage space. Interior chemical storage spaces that share an electrical conduit system with any other interior space shall be equipped with a ventilation system that operates continuously and insures that all air movement is from all other



Section 324 EQUIPMENT ROOMS

interior spaces and toward the chemical storage space. This pressure difference shall be maintained by a continuously operated exhaust system used for no other purpose than to remove air from that one chemical storage space. Where more than one chemical storage space is present, a separate exhaust system shall be provided for each chemical storage space. The exhaust airflow rate shall be the amount specified in the International Mechanical Code. The function of this exhaust system shall be monitored continuously by an audible differential-pressure alarm system which shall sound if the specified differential air pressure is not maintained for a period of thirty minutes. This alarm shall have a minimum output level of 85 dbA at 10 feet and shall require manual reset to silence it.



Section 324 EQUIPMENT ROOMS

324.8.2.1 Air ducts in interior chemical storage spaces. No duct shall allow air movement from the chemical storage space into any other interior space of a building intended for occupation or into any other chemical storage space. Air ducts shall not enter or pass through an interior chemical storage space unless it is a corrosion-resistant duct used for no other purpose than to exhaust air from the chemical storage space. This corrosion-resistant duct must exhaust to the exterior and must end at a point on the exterior of the building, at least 20 feet from any air intake for breathing air, cooling air, or combustion air. A duct used for no other purpose than to supply makeup air to the chemical storage area shall be acceptable. This makeup air supply duct must end at a point on the exterior of the building, at least 20 feet from any air intake for breathing air, cooling air, or combustion air. Any other ducts specifically allowable by the International Mechanical Code where such ducts are corrosion-resistant and joint-free to the extent feasible shall be acceptable.

Section 324 EQUIPMENT ROOMS

324.8.2.2 Pipes and tubes in interior chemical storage spaces. Pipes and tubes shall not enter or pass through an interior chemical storage space.

Exceptions:

- 1. As required to service devices integral to the function of the chemical storage space, such as pumps, vessels, controls, freeze protection, and safety devices.**
- 2. As required to allow for automatic fire suppression.**
- 3. As required for drainage.**

Piping, tubes, drain bodies, grates, and attachment and restraint devices shall be corrosion-resistant and rated for the chemical environment(s) present including floor drain bodies and grates. All wall penetrations shall be sealed air-tight and commensurate with the rating of the wall assembly. Sealing materials shall be compatible with the wall assembly and the chemical environment(s) present.



Section 324 EQUIPMENT ROOMS

324.8.2.3 Combustion equipment in interior chemical storage. No combustion device or appliance shall be installed in a chemical storage space, or in any other place where it will be exposed to the air from a chemical storage space.

Exceptions: A combustion device or appliance which meets all of the following requirements shall be acceptable:

- 1. The device or appliance is required for one or more processes integral to the function of the room, such as space heat, and**
- 2. The device is listed for such use, and**
- 3. The device as installed is approved.**



Section 324 EQUIPMENT ROOMS

324.9 Ozone rooms. An ozone equipment room shall not be used for storage of chemicals, solvents, or any combustible materials, other than those required for the operation of the recirculation and ozone generating equipment. Rooms which are designed to include ozone equipment shall be equipped with an emergency ventilation system capable of 6 air changes per hour. The exhaust intake shall be located 6 inches from the floor, on the opposite side of the room from the make-up air intake. The emergency ventilation system shall be so arranged as to run on command of an ozone-leak alarm or on command of a manual switch. The manual emergency ventilation switch shall be located outside the room and near the door to the ozone room. Ozone rooms which are below grade shall be equipped with force-draft ventilation capable of 6 changes per hour. The exhaust intake shall be located 6 inches from the floor, on the opposite side of the room from the make-up air intake. Such ventilation shall be so arranged as to:



Section 324 EQUIPMENT ROOMS

1. Run automatically concurrent with the ozone equipment and for at least a time allowing for 15 air changes after the ozone equipment is stopped,
2. Run upon activation of the ozone detection and alarm system, and
3. Run on command of a manual switch.

The manual ventilation switch shall be located outside the room and near the door to the ozone room.

324.9.1 Signage. In addition to the signs on all chemical storage areas, a sign shall be posted on the exterior of the entry door, stating "DANGER - GASEOUS OXIDIZER -- OZONE" in lettering not less than 4 inches high.

Section 324 EQUIPMENT ROOMS

324.9.2 Alarm system. Rooms containing ozone generation equipment shall be equipped with an audible and visible ozone detection and alarm system. The alarm system shall consist of both an audible alarm capable of producing at least 85 decibels at 10 feet distance and a visible alarm consisting of a flashing light mounted in plain view of the entrance to the ozone-equipment room. The ozone sensor shall be located at a height of 18-24 inches above floor level. The ozone sensor shall be capable of measuring ozone in the range of 0-2 ppm. The alarm system shall alarm when the ozone concentration equals or exceeds 0.1 ppm in the room. Activation of the alarm system shall shut off the ozone generating equipment and turn on the emergency ventilation system.

324.10 Gaseous chlorination space. Use of compressed chlorine gas shall be prohibited for new construction and after substantial alteration to existing facilities.



Section 324 EQUIPMENT ROOMS

324.11 Windows. When installed in an interior wall, ceiling, or door of a chemical storage space, such window shall have the following components:

1. Tempered or plasticized glass,
2. A corrosion-resistant frame, and
3. Incapable of being opened or operated.

When installed in an exterior wall or ceiling, such window shall:

1. Be mounted in a corrosion-resistant frame and
2. Be so protected by a roof, eave, or permanent awning as to minimize the entry of rain or snow in the event of window breakage.

324.12 Sealing and blocking materials. Materials used for sealing and blocking openings in an interior chemical storage space shall:

1. Minimize the leakage of air, vapors, or fumes from the chemical storage space,
2. Be compatible for use in the environment, and
3. Commensurate with the fire rating assembly in which they are installed.

Section 324 AIR QUALITY

324.1 General. Indoor public pool and spa air handling system design, construction, and installation shall comply with requirements of the International Mechanical Code or ASHRAE 62.1.



Chapter 4



PUBLIC POOLS

Section 407 CIRCULATION SYSTEMS

407.3.1 Inlets. Effective distribution of treated water shall be accomplished by either a continuous perimeter overflow system with integral inlets or by means of directionally adjustable inlets adequate in design, number, and location.

407.3.2 Adequate mixing. Pools shall have wall or floor inlets or both to provide for adequate mixing. Inlets shall be hydraulically sized to provide the design flow rates for each area of the pool proportional to the turnover rate and the area covered by the inlet.

407.3.3 Floor inlets. Floor inlets shall be required for pools that are greater than 50 feet (15.2 m) width. The spacing between floor inlets shall not exceed 20 feet (6.1 m). Pools having only floor inlets shall have such inlets located within 15 feet (4.6 m) of the perimeter waterline. Where wall inlets are used in combination with floor inlets, the floor inlets shall be located not greater than 25 feet (7.6 m) from the nearest side walls.

407.3.4 Wall inlets. The spacing between wall inlets shall not exceed 20 feet (6.1 m), measured along the perimeter water line.



Section 410 SANITARY FACILITIES

- **SANITARY FACILITIES**
- **410.1 Toilet facilities. Class A and B pools shall be provided with toilet facilities having the required number of plumbing fixtures in accordance with the International Building Code or the International Plumbing Code.**



Section 411 SPECIAL FEATURES

411.2.5 Outlined Edges. The leading horizontal and vertical edges of stair treads shall be outlined with slip-resistant contrasting tile or other permanent marking of not less than 1 inch (25.4 mm) and not greater than 2 inches (50.8 mm).

411.3.3 Surfaces. Beach and sloping entry walking surfaces at water depths up to 36 inches (914 mm) shall be resistant.



Chapter 5 PUBLIC SPAS



PUMPS AND MOTORS

Section 504 EMERGENCY SHUT OFF

504.2 Timer. The operation of the hydrotherapy jets shall be limited by a cycle timer having a maximum setting of 10 -minutes. The cycle timer shall be located not less than 5 feet away, adjacent to, and within sight of the spa.



Chapter 6



AQUATIC RECREATIONAL FACILITIES

Section 609 DRESSING AND SANITARY FACILITIES

609.1 General. Dressing and sanitary facilities shall be provided in accordance with the minimum requirements of the International Building Code and International Plumbing Code and Sections 609.2 through 609.9.609.9.

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

Water area less than 7500 square feet. Facilities that have less than 7500 gross square feet (697 m²) of water area available for bather access shall have dressing facilities and not less than cleansing shower for males, and one cleansing shower for females



Section 609 DRESSING AND SANITARY FACILITIES

Water area 7500 square feet or more. Facilities that have 7500 gross square feet (697 m²) or more of water area available for bather access shall have dressing facilities and not less than one cleansing shower for males, and one cleansing shower for females for every 7500 square feet (697 m²) or portion thereof. Where the result of the fixture calculation is a portion of a whole number, the result shall be rounded up to the nearest whole number.

609.3 Showers. Showers shall be in accordance with Sections 609.3.1 through 609.3.5.

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



Section 609 DRESSING AND SANITARY FACILITIES

Revise as follows:

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

609.4 Soap dispensers. Soap dispensers shall be in accordance with -4.1 Liquid or powder. Soap dispensers shall be provided at each lavatory and cleansing shower. Soap dispensers shall dispense liquid or powdered soap. Reusable cake soap is prohibited. Soap dispensers and soap shall not be provided at rinse showers.

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



Section 610 SPECIAL FEATURES

610.7 Underwater benches. Underwater benches shall comply with this section.

610.7.1 Location. Underwater benches shall only be located in areas where the pool water depth does not exceed 5 ft (1.5 m).

610.7.2 Surface dimensions. Underwater benches shall have an unobstructed surface dimension of not less than 16 inches (406 mm) and not greater than 22 inches (559 mm) in depth measured front to back and not less than 26 inches (660 mm) in width.

610.7.3 Not an entry or exit. Underwater benches shall not be used as an entry or exit for a pool.

Section 610 SPECIAL FEATURES

610.7.4 Depth. The horizontal surface of benches shall be not greater than 20 inches (508 mm) below the waterline.

610.7.5 Color marking. The leading edge of 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.

610.7.6 Slip resistant. The top surface of benches shall be slip resistant.

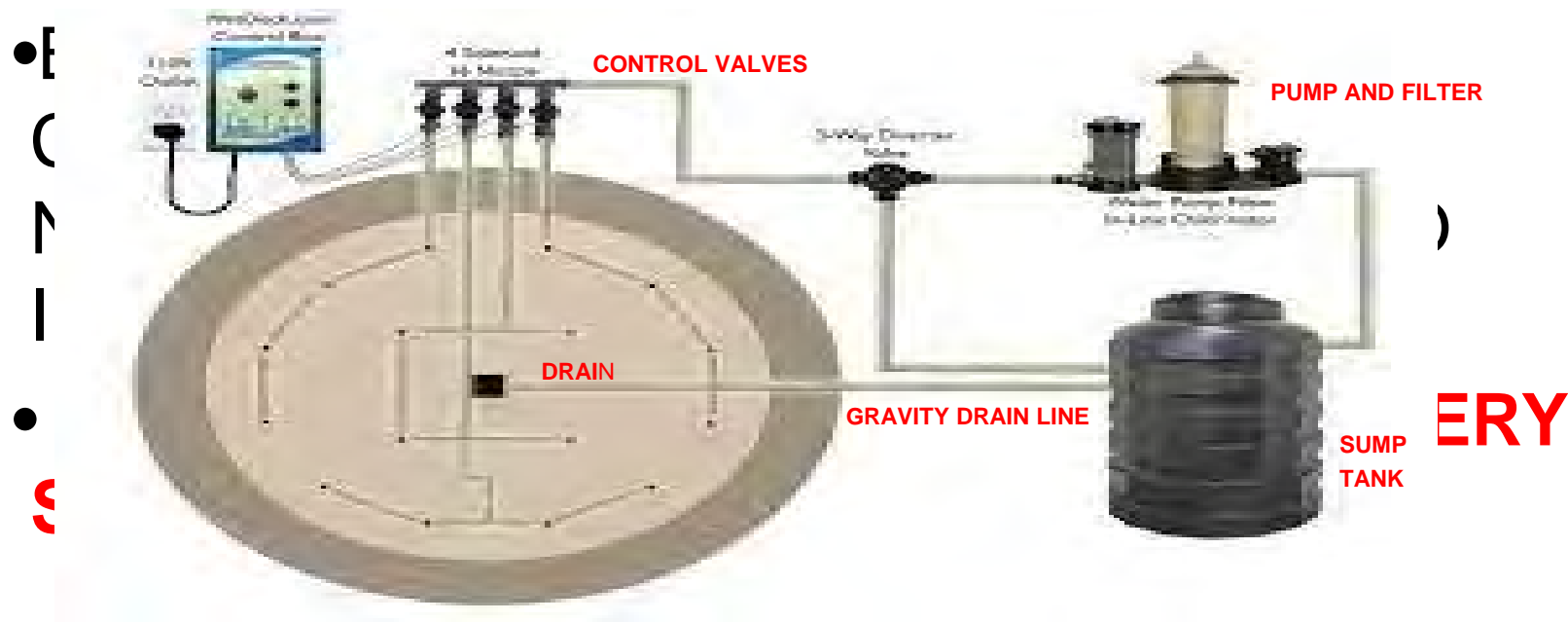


Section 612 INTERACTIVE WATER PLAY FEATURES



DESIGN YOUR FEATURE PAD STUCTURE

- THE MOST SIMPLE PAD LAYOUT IS A CIRCLE, BUT ANY SHAPE WILL WORK



Section 612 INTERACTIVE WATER PLAY FEATURES

612.1 General. Interactive water play features shall comply with Section 612.1 through 612.7.

612.2 Safety hazards. Parts of the interactive water play feature that can be accessed by the users of the feature shall be designed and constructed to not present safety hazards to the users.

612.3 Decking. A deck of not less than 4 feet (1296 mm) in width shall be provided around the perimeter of the interactive water play feature. The deck shall be sloped away from the interactive water play feature.

612.4 Splash pad zone. The splash pad zone shall comply with Section 612.4.1 through 612.4.4.

612.4.1 Surface. Splash pad zone surfaces shall have a slip-resistant and cleanable surface. The manufacturer of manufactured zone surfaces shall certify that such surfacing is suitable for aquatic and chlorinated environments.

Direct suction outlets from interactive water play features shall be prohibited.

Section 612 INTERACTIVE WATER PLAY FEATURES

612.4.2 Slope and water collection. Splash pad zone surfaces shall slope to one or more drain points so that only water from the splash pad zone flows back to a gravity fed collection tank. The slope shall prevent the accumulation or pooling of water and shall not exceed 1/2 inch per foot. Drain openings in the splash pad zone surfaces that can be accessed by users shall not allow a 1/2 inch (12.7 mm) diameter dowel rod to be inserted into the opening. Drain covers in splash pad zone surfaces shall be flat and flush with the zone surface and shall require tools for removal. The manufacturer of such drain covers shall certify that the covers comply with the physical testing and finger-and-limb entrapment requirements in Sections 3 and 6 respectively, of APSP 16.

612.4.3 Nozzles within the interactive water play feature splash pad zone. Nozzles that spray water from the interactive water play feature splash pad zone shall be flush with the zone surface. Openings in such nozzles shall not allow a 1/2 inch (12.7 mm) diameter dowel rod to be inserted into the opening. The water velocity from the orifice of any water nozzle shall not exceed 20 feet (6.1 m) per second.



Section 612 INTERACTIVE WATER PLAY FEATURES

612.4.4 Other nozzles. Nozzles, other than those on walking surfaces within the interactive water play feature splash pad zone, shall be designed to be clearly visible.

612.5 Water sanitation. The water sanitation shall consist of the equipment covered in Sections 612.5.1 through 612.5.5.

612.5.1 Water collection and treatment tank. Interactive water play features shall drain to a collection and treatment tank. The inside of the tank shall be accessible for cleaning and inspection. The access hatch or lid shall be locked or require a tool to open. The tank capacity shall be not less than 1000 gallons or ten times the number of gallons in a minute when all nozzles are operating simultaneously, whichever is greater. The volume water in the tank, at the design water level, shall not decrease more than 15% of that volume when all pumps and discharge piping fill with water to the discharge points of all n to empty all water in the tank for the purposes of servicing or cleaning.



Section 612 INTERACTIVE WATER PLAY FEATURES

612.5.2 Filtration pump. The filtration pump shall be sized to turnover the surge basin capacity in 30 minutes or less. The intake for the pump shall be located to draw water from the lowest elevation in the treatment tank.

612.5.3 Spray nozzle and water feature water disinfection. Spray nozzles and water features shall be supplied by water from the water collection and treatment tank that is equipped with filtration and sanitizing equipment required by Chapter 3 and this Section. Where separate water feature pumps are installed, controls shall prevent those pumps from operation when the filtration pump is not operating.

612.5.4 Disinfection system. In addition to any filtration and sanitizing equipment requirements of Chapter 3 and this Chapter, all water supplied to spray nozzles or other water that can be accessed by a user, shall pass through a secondary disinfection system before discharge to the user. The secondary disinfection system shall be listed and labeled to NSF 50 as having a single-pass, three-log reduction of the cryptosporidium surrogate.



Increased Risk Aquatic Venue

- **Increased Risk Aquatic Venue:** An aquatic venue which has an increased risk of microbial contamination due to its primary users being children under the age of 5 and/ or people more susceptible to infection, such as therapy patients with open wounds. Examples of increased risk aquatic venues include spray pads, wading pools, therapy pools, and other aquatic venues designed primarily for children under the age of 5.





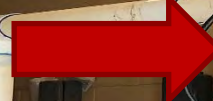
CHEMICAL CONTROLLER

SPLASH PAD

WATER FAN



UV LIGHT



Section 612 INTERACTIVE WATER PLAY FEATURES

612.5.5 Make-up water system. The water collection and treatment tank shall be provided with a make-up water system that is supplied with potable water.

612.6 Operating instructions. In addition to the documentation and instructions requirements of Chapter 1 and 3, the operating instructions for an interactive water play feature shall require that the circulation system be operated continuously for not less than 4 turnovers prior to operation of the pumps for the spray nozzles and other water features systems.

612.7 Lighting. Where a interactive water play feature will be in operation at night or during periods of inadequate natural lighting, artificial lighting shall be provided in accordance with the same requirements for pool deck area lighting in Section 321.2.2.



Chapter 7

Onground Storable Residential Swimming Pools



Section 701.4

- The manufacturer's name and the liner identification number shall be affixed to the liner.
- For aboveground pools without a liner, the manufacturer's name and identification number shall be affixed to the exterior of the pool structure.



Section 702

- 702.1 Pools shall have a means of entry and exit consisting of not less than one ladder or a ladder and staircase combination.
- 702.2.1 Ladders in the pool shall have a physical barrier to prevent children from swimming through the riser openings or behind the ladder. Exception- if ladder manufacturer provides a certification statement that shows compliance with **APSP 4**



EXAMPLE: Ladder Barrier



Section 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.



Chapter 8

Permanent Inground Residential Swimming Pools



Section 803.1

Construction tolerances

- The construction tolerance for the overall length, width and depth of the pool shall be ± 3 inches (76 mm).
- For all other dimensions shall be ± 2 inches (51 mm), unless otherwise specified by the design engineer.

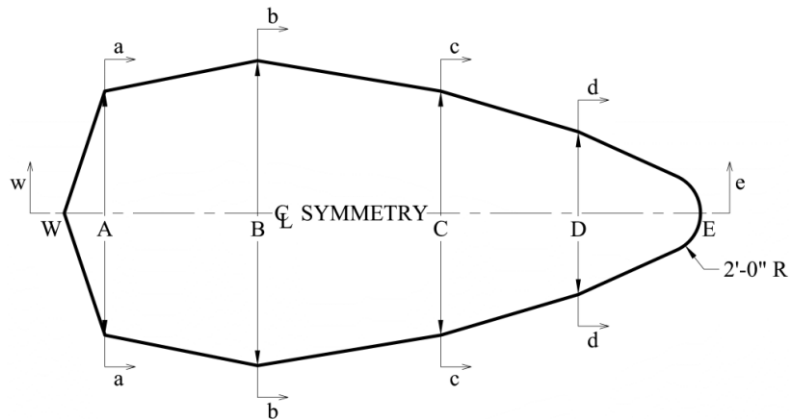


Table 1. Minimum diving water envelope for swimming pools designated types I-V

Pool Types	Minimum Depths at Point				Minimum Widths at Point				Minimum Lengths between Points					
	A	B	C	D	A	B	C	D	WA	AB	BC	CD	DE	WE
0	Manufactured diving equipment is prohibited													
1	6' 0" (1.82 m)	7' 6" (2.29 m)	5' 0" (1.52 m)	2' 9" (838 mm)	10' 0" (3.05 m)	12' 0" (1.52 m)	10' 0" (3.05 m)	8' 0" (2.44 m)	1' 6" (457 mm)	7' 0" (2.13 m)	7' 6" (2.29 m)	Varies	6' 0" (1.82 m)	28' 9" (8.76 m)
2	6' 0" (1.82 m)	7' 6" (2.29 m)	5' 0" (1.52 m)	2' 9" (838 mm)	12' 0" (3.66 m)	15' 0" (4.57 m)	12' 0" (3.66 m)	8' 0" (2.44 m)	1' 6" (457 mm)	7' 0" (2.13 m)	7' 6" (2.29 m)	Varies	6' 0" (1.82 m)	28' 9" (8.76 m)
3	6' 10" (2.08 m)	8' 0" (2.44 m)	5' 0" (1.52 m)	2' 9" (838 mm)	12' 0" (3.66 m)	15' 0" (4.57 m)	12' 0" (3.66 m)	8' 0" (2.44 m)	2' 0" (610 mm)	7' 6" (2.29 m)	9' 0" (2.74 m)	Varies	6' 0" (1.82 m)	31' 3" (9.53 m)
4	7' 8" (2.34 m)	8' 6" (2.59 m)	5' 0" (1.52 m)	2' 9" (838 mm)	15' 0" (4.57 m)	18' 0" (5.49 m)	15' 0" (4.57 m)	9' 0" (2.74 m)	2' 6" (762 mm)	8' 0" (2.44 m)	10' 6" (3.20 m)	Varies	6' 0" (1.82 m)	33' 9" (10.3 m)
5	8' 6" (2.59 m)	9' 0" (2.74 m)	5' 0" (1.52 m)	2' 9" (838 mm)	15' 0" (4.57 m)	18' 0" (5.49 m)	15' 0" (4.57 m)	9' 0" (2.74 m)	3' 0" (914 mm)	9' 0" (2.74 m)	12' 0" (3.66 m)	Varies	6' 0" (1.82 m)	36' 9" (11.2 m)

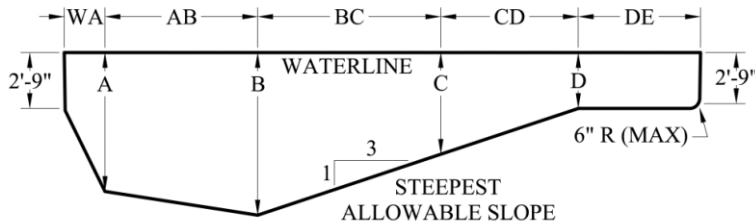
NOTES

1. Minimum length between points CD may vary based upon water depth at point D and the slope between points C and D.
2. Drawings are not to scale.
3. Negative construction tolerances (see para. 5.1.1) shall not be applied to any of the dimensions shown in the Minimum Water Envelopes given in Table 1.
4. Pool types designate minimum water envelope sizes as specified by the diving board manufacturers.

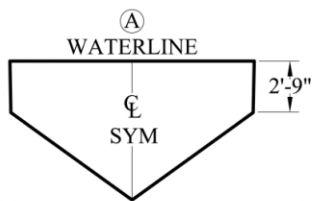


MINIMUM WATER SURFACE SHAPE - PLAN VIEW

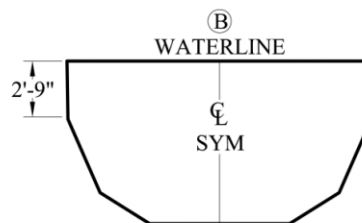
NOTE: 'W' EQUATES TO DEEP END WALL



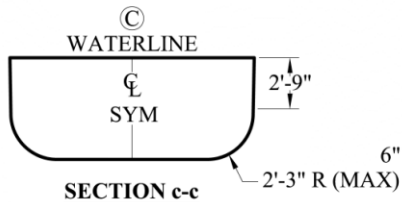
MINIMUM WATER DEPTHS - SECTION w-e



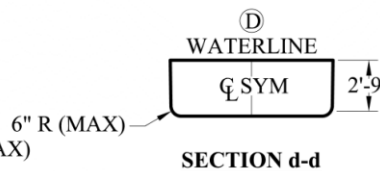
SECTION a-a



SECTION b-b

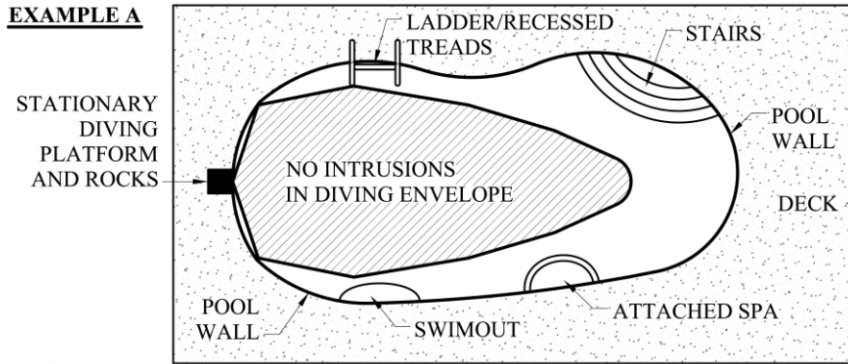


SECTION c-c

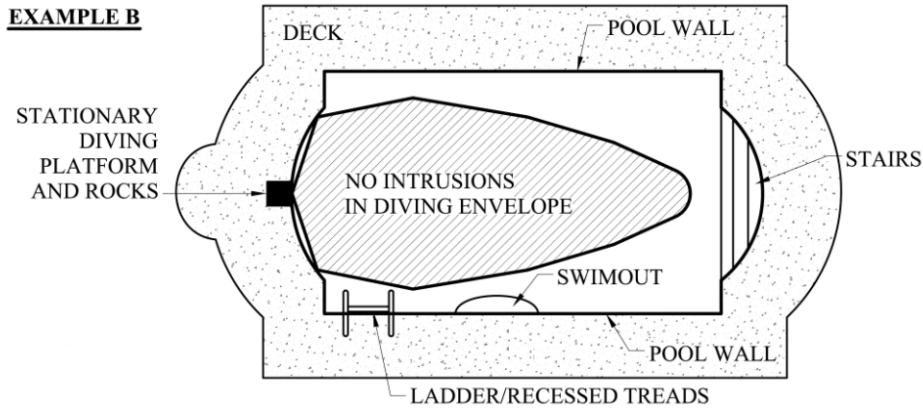


SECTION d-d

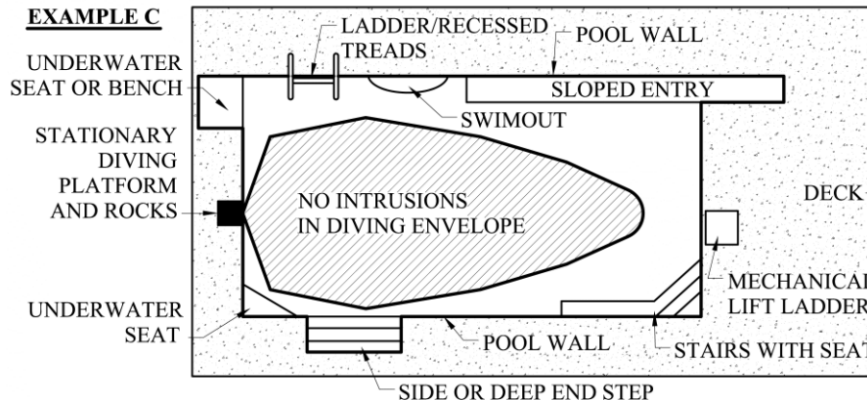
EXAMPLE A



EXAMPLE B



EXAMPLE C



END OF SESSION ONE



The background of the slide is a teal-colored world map. The map is semi-transparent and overlaid with several dark teal geometric shapes, including triangles and lines, creating a modern, technical aesthetic. The text is centered and rendered in a clean, white, sans-serif font.

Section 2

Hydraulic Calculations For Both
Residential & Commercial For
Plan Review & Approval

NEW AND REVISED STANDARDS

- **APSP 5 - RESIDENTIAL SWIMMING POOLS STANDARD**
- **APSP 7 - ENTRAPMENT STANDARD**
- **APSP 15 - ENERGY STANDARD**
- **APSP 16 - SUMP AND DRAIN COVER STANDARD**

THESE STANDARDS ARE NATIONAL CONSENSUS STANDARDS

WHAT MAXIMUM VELOCITY CAN I USE?

APSP 5 RESIDENTIAL STANDARD

9.2 Water Velocity

- The water velocity in the pool piping shall not exceed 8 ft. per second for return piping
- 8 ft. per second for suction piping
- Shall comply with the latest edition of **APSP 7** Standard for suction entrapment avoidance in swimming pools...
- Shall comply with the latest published edition of **APSP 16** Standard Suction Fittings for use in Swimming Pools...

MAX VELOCITY FOR THE CIRCULATION SYSTEM

APSP 15 ENERGY LANGUAGE:

5.5 System piping and circulation

5.5.1 Pool piping and pipe fittings shall be sized according to Table 1, so that the velocity of the water at the maximum *filtration* flow rate does not exceed 8 feet per second (2.44 *meters per second*) in the return line and 6 feet per second (1.83 *meters per second*) in the suction line.

Table 1

Pipe Size	1.5 in.	2 in.	2.5 in.	3 in.	3.5 in.	4 in.	5 in.	6 in.
Nominal gpm @ 6 fps	38	63	90	138	185	238	374	540
Nominal gpm @ 8 fps	51	84	119	184	247	317	499	720

MAX TURNOVER RATE FOR THE CIRCULATION SYSTEM

APSP 15 Residential POOL ENERGY LANGUAGE:

5.2 Maximum filtration flow rate

5.2.1 Depending on the size (volume) of the pool, the pool filtration flow rate shall not be greater than the rate needed to turn over the pool water volume in 6 hours using the equation below or 36 gpm (136.27 Lpm), whichever is greater:

Maximum Filtration Flow Rate (gpm, Lpm) =
pool volume (gallons, liters) ÷ 360

Two Speed Pumps and Variable Speed Pumps
Single Speed less than 1hp are allowed

WHERE DO WE START?

Follow these steps:

- **Calculate pool volume**
- **Determine required turnover**
- **Calculate gallons per minute**

How Much Water do We Have?

5 Steps to Pump Selection

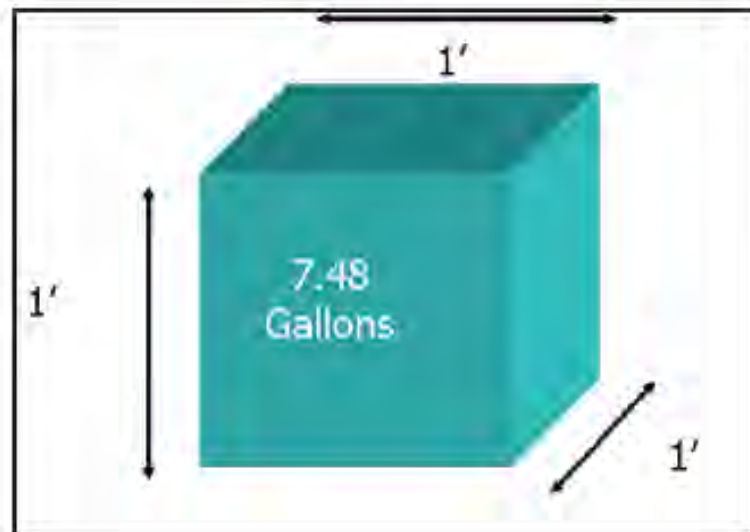
1. Calculate Pool Volume (Gallons)
2. Establish Turnover Rate - Convert to GPM
3. Determine Pipe Size
4. Calculate System Resistance - TDH
5. Select a Pump

Step One - Calculating Pool Gallons:

The first step is to calculate the volume of water we are dealing with.

Pools and spas are constructed in many sizes, shapes, and of different materials. The first thing to remember is that a cubic foot of water is equal to 7.48 gallons.

A cubic foot is a cube that is one foot by one foot by one foot as demonstrated in the picture.



LETS START WITH AN EXAMPLE

WE HAVE A 450 SQ OF POOL AREA WITH AN AVERAGE DEPTH OF 4FT

THEREFORE YOU WOULD HAVE 1800 CUBIC FT OF VOLUME

$1800 \times 7.48 = 13,464$ GALLONS

$13,464 \div 360$ (6 HOUR TURNOVER APSP 15)= 37.4 GPM

37.4 GPM WOULD BE THE MAXIMUM **CIRCULATION** FLOW RATE TO MEET THE ANSI 15 STANDARD

LETS GET STARTED!

FILL OUT THE APSP 15 SECTION OF THE WORKSHEET 5a 5a



APSP-15 & APSP-7 COMPLIANCE DOCUMENTATION AND SIZING CALCULATOR



ANSI/APSP/ICC-15 ENERGY EFFICIENCY COMPLIANCE INFORMATION FOR RESIDENTIAL SWIMMING POOLS			
PROJECT NAME: AND ADDRESS	Kenneth Gregory	CONTRACTOR NAME AND ADDRESS:	Evolution Pools
	493 East 1575 South		
	Washington Utah 84780		
OWNER:	Kenneth Gregory	CONTRACTOR PHONE:	DATE:

This information sheet was prepared by the APSP-15 Residential Swimming Pool and Spa Energy Efficiency Standard Writing Committee of the Pool & Hot Tub Alliance (PHTA). It is not part of the American National Standard ANSI/APSP/ICC-15 2011 but is included for information only.

1. §5.2.1: Calculated pool volume

a. Gallons: 13,464; or

b. Calculated Gallons: _____ (surface area) X _____ (average depth) X 7.48 (gal/ft³) = _____

2. §5.2.1: Calculated filtration flow rate

(Pool volume ÷ 360 or 36gpm whichever is larger)

3. §5.5.1: Pipesizing:

a. Minimum suction pipe diameter

(Enter the smallest pipe size from Table 1 with a 6 fps flow capacity the same or more than item 2.)

b. Minimum suction branch pipe diameter

(Calculate: Item 2. 37 (gpm) ÷ Branch Pipes 1 (quantity) = branch flow rate 37 (gpm). Enter the smallest pipe size from Table 1 with a 6 fps flow capacity the same or more than the calculated suction branch flow rate.)

c. Minimum return pipe diameter

(Enter the smallest pipe size from Table 1 with a 8 fps flow capacity the same or more than item 2.)

d. Minimum return branch pipe diameter

(Calculate: Item 2. 37 (gpm) ÷ Branch Pipes 1 (quantity) = branch flow rate 37 (gpm). Enter the smallest pipe size from Table 1 with a 8 fps flow capacity the same or more than the calculated return branch flow rate.)

4. §5.4.1: Filter type and size:

a. Filter type: (Cartridge, DE, Sand)

b. Minimum filter area

(Calculate: item 2. 37 (gpm) ÷ filter factor 0.375 (gpm/ft²)

Filter factors: Cartridge=0.375, Sand=15, Diatomaceous Earth=2

5. §5.4.2: Backwash valve: Yes, No?

(When using a backwash valve, enter result of item 3c or 2 inches whichever is larger)

Table 1

Pipe Size:	1.5"	2"	2.5"	3"	3.5"	4"	5"	6"
Nominal GPM @ 6 fps	38	63	90	138	185	238	374	540
Nominal GPM @ 8 fps	51	84	119	184	247	317	499	720

6. Single-speed pump selection (when used):

§5.1.1, 5.3.1: For single-speed pumps with a total horsepower 0.99 or less, find and enter a compliant pump from the Pool Pump Database.

a. Pump model

b. Total horsepower

7. Multi speed pump selection (when used):

§5.3.2.1: Pools 17,000 gallons or less, select pump* from the database with a Curve A gpm flow equal to item 2 or less.

§5.3.2.2: Pools 17,001 gallons or more, select pump* from the database with a Curve C gpm flow equal to item 2 or less.

*Multi-speed pumps must have one speed listed that satisfies this requirement.

a. Pump model

b. Pump flow

(§5.3.2.1, 5.3.2.2: Applicable Curve A or C gpm flow listed in database)

1.	<u>13,464</u>	gallons
2.	<u>37</u>	gpm
3a.	<u>1.5</u>	inches
3b.	<u>1.5</u>	inches
3c.	<u>1.5</u>	inches
3d.	<u>1.5</u>	inches
4a.	<u>Cartridge</u>	
4b.	<u>99.7</u>	sq. ft.
5.	<u>2</u>	inches
		(When used)
6a.	_____	
6b.	_____	
		or
7a.	<u>IntelliFlo I1</u>	
7b.	<u>37</u>	gpm

FILL OUT THE APSP 15 SECTION OF THE WORKSHEET

Flow and Friction Loss Per Foot Schedule 40 PVC Pipe

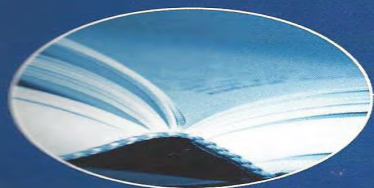
Pipe Size	Velocity - Feet Per Second					
	6 fps		8 fps		10 fps	
1"	16 gpm	0.14'	21 gpm	0.23'	26 gpm	0.35'
1.5"	37 gpm	0.08'	50 gpm	0.14'	62 gpm	0.21'
2"	62 gpm	0.06'	82 gpm	0.10'	103 gpm	0.16'
2.5"	88 gpm	0.05'	117 gpm	0.09'	146 gpm	0.13'
3"	136 gpm	0.04'	181 gpm	0.07'	227 gpm	0.10'
4"	234 gpm	0.03'	313 gpm	0.05'	392 gpm	0.07'
6"	534 gpm	0.02'	712 gpm	0.03'		

NSF/ANSI 50 STANDARD FOR POOL EQUIPMENT

*NSF International Standard /
American National Standard*

NSF/ANSI 50 - 2014

**Equipment for Swimming Pools, Spas,
Hot Tubs and Other Recreational
Water Facilities**



APSP 15 STANDARD FILTER SIZE REQUIRED

APSP 15 READS:

Filters shall be at least the size specified in NSF/ANSI-50 for public pool intended applications based on the maximum *filtration* flow rate through the filter.

5.4.1.1 The filter factors that shall be used are:

Cartridge 0.375 gpm/ft² 15 Lpm/m²

Sand 15 gpm/ft² 610 Lpm/m²

Diatomaceous Earth 2 gpm/ft² 81 Lpm/m²

FILL OUT THE APSP 15 SECTION OF THE WORKSHEET 5b



APSP-15 & APSP-7 COMPLIANCE DOCUMENTATION AND SIZING CALCULATOR



ANSI/APSP/ICC-15 ENERGY EFFICIENCY COMPLIANCE INFORMATION FOR RESIDENTIAL SWIMMING POOLS			
PROJECT NAME: AND ADDRESS	Kenneth Gregory	CONTRACTOR NAME AND ADDRESS:	Evolution Pools
	493 East 1575 South		
	Washington Utah 84780		
OWNER:	Kenneth Gregory	CONTRACTOR PHONE:	DATE:

This information sheet was prepared by the APSP-15 Residential Swimming Pool and Spa Energy Efficiency Standard Writing Committee of the Pool & Hot Tub Alliance (PHTA). It is not part of the American National Standard ANSI/APSP/ICC-15 2011 but is included for information only.

1. §5.2.1: Calculated pool volume

- a. Gallons: 13,464; or
 b. Calculated Gallons: _____ (surface area) X _____ (average depth) X 7.48 (gal/ft³) = 0

2. §5.2.1: Calculated filtration flow rate

(Pool volume ÷ 360 or 36gpm whichever is larger)

3. §5.5.1: Pipesizing:

a. Minimum suction pipe diameter

(Enter the smallest pipe size from Table 1 with a 6 fps flow capacity the same or more than item 2.)

b. Minimum suction branch pipe diameter

(Calculate: Item 2. 37 (gpm) ÷ Branch Pipes 1 (quantity) = branch flow rate 37 (gpm). Enter the smallest pipe size from Table 1 with a 6 fps flow capacity the same or more than the calculated suction branch flow rate.)

c. Minimum return pipe diameter

(Enter the smallest pipe size from Table 1 with a 8 fps flow capacity the same or more than item 2.)

d. Minimum return branch pipe diameter

(Calculate: Item 2. 37 (gpm) ÷ Branch Pipes 1 (quantity) = branch flow rate 37 (gpm). Enter the smallest pipe size from Table 1 with a 8 fps flow capacity the same or more than the calculated return branch flow rate.)

4. §5.4.1: Filter type and size:

a. Filter type: (Cartridge, DE, Sand)

b. Minimum filter area

(Calculate: item 2. 37 (gpm) ÷ filter factor 0.375 (gpm/ft²)
 Filter factors: Cartridge=0.375, Sand=15, Diatomaceous Earth=2

5. §5.4.2: Backwash valve: Yes, I No?

(When using a backwash valve, enter result of item 3c or 2 inches whichever is larger)

Table 1

Pipe Size:	1.5"	2"	2.5"	3"	3.5"	4"	5"	6"
Nominal GPM @ 6 fps	38	63	90	138	185	238	374	540
Nominal GPM @ 8 fps	51	84	119	184	247	317	499	720

6. Single-speed pump selection (when used):

§5.1.1, 5.3.1: For single-speed pumps with a total horsepower 0.99 or less, find and enter a compliant pump from the Pool Pump Database.

a. Pump model

b. Total horsepower

7. Multi speed pump selection (when used):

§5.3.2.1: Pools 17,000 gallons or less, select pump* from the database with a Curve A gpm flow equal to item 2 or less.

§5.3.2.2: Pools 17,001 gallons or more, select pump* from the database with a Curve C gpm flow equal to item 2 or less.

*Multi-speed pumps must have one speed listed that satisfies this requirement.

a. Pump model

b. Pump flow

(§5.3.2.1, 5.3.2.2: Applicable Curve A or C gpm flow listed in database)

1.	<u>13,464</u>	gallons
2.	<u>37</u>	gpm
3a.	<u>1.5</u>	inches
3b.	<u>1.5</u>	inches
3c.	<u>1.5</u>	inches
3d.	<u>1.5</u>	inches
4a.	<u>Cartridge</u>	
4b.	<u>99.7</u>	sq. ft.
5.	<u>2</u>	inches
		(When used)
6a.	_____	
6b.	_____	
		or
7a.	<u>IntelliFlo I1</u>	
7b.	<u>37</u>	gpm



FILL OUT THE APSP 15 SECTION OF THE WORKSHEET 5c

ANSI/APSP/ICC 15 ENERGY EFFICIENCY COMPLIANCE INFORMATION FOR RESIDENTIAL SWIMMING POOLS

Component	Section	Requirements	Check
Heaters	4.4.1.1	Heater has no pilot light	<input checked="" type="checkbox"/>
	4.4.1.2	Readily accessible on-off switch mounted outside of the heater	<input checked="" type="checkbox"/>
	4.3.1.3	No electric resistance heating unless for inground spa with tight fitting cover with R-6 insulation, or for pool with 60% of documented pool heating from on-site solar or recovered energy.	<input checked="" type="checkbox"/>
	4.3.2	Heater efficiency: gas/oil fired heater efficiency at least 82%, heat pump COP at least 4.0	<input checked="" type="checkbox"/>
Pool systems	5.1.1	Pool filter pump listed in database	<input checked="" type="checkbox"/>
	5.3.1	Pool filter pump with total horsepower 1.0 or more is multi-speed	<input checked="" type="checkbox"/>
	5.3.3	Multi-speed pump controller programmed to default to the filtration flow rate when no auxiliary pool loads are operating within 24 hours and programmed with temporary override capability for servicing.	<input checked="" type="checkbox"/>
	5.3.4	Single-speed pump controller capable of operating pump during off-peak electric demand.	<input checked="" type="checkbox"/>
	5.5.2	Pipe before pump has at least 4 diameters of straight pipe.	<input checked="" type="checkbox"/>
	5.5.3	System installed with solar, or setup for the future addition of solar heating equipment by installing 18 inches of horizontal or vertical pipe after the filter and before a heater, or built-in or built-up connections, or dedicated pipe to and from the pool.	<input checked="" type="checkbox"/>
	5.6	Directional inlets for mixing pool water.	<input checked="" type="checkbox"/>

FILL OUT THE APSP 15 SECTION OF THE WORKSHEET

MASTERTEMP® HEATER HIGH PERFORMANCE HEATER

TRADEGRADE



MasterTemp High Performance Heater

Featured Highlights

- Heats up fast so no long waits before enjoying your pool or spa
- Best-in-class energy efficiency*
- Manual gas shut-off when service is required
- Eco-friendly MasterTemp Heater is certified for low NOx emission and outperforms industry standards
- Rotating digital display allows for easy viewing
- Tough, rustproof exterior handles the heat and weathers the elements
- Certified for outdoor and indoor installations
- For Air Intake Kit order part number 461031

MasterTemp heaters offer all the efficiency, convenience and reliability features you want in a pool heater, plus a lot more. As easy to use as your home heating system, plus, user-friendly LCD display and troubleshoot icons make system operation and monitoring a snap. The compact design and super-quiet operation won't intrude on your poolside leisure time. Heavy-duty (HD) unit with cupro-nickel exchanger stands up to the harshest of applications, like low pH, high flow or heavy use.

Ordering Information

Product	Gas Type	BTU (000's)	Carton Qty./Carton Wt. LBS
MASTERTEMP HEATERS			
460792	Natural	175	1/128
460793	Propane	175	1/128
460730	Natural	200	1/128
460731	Propane	200	1/128
461000	Natural	200 ASME	1/138
461001	Propane	200 ASME	1/138
460732	Natural	250	1/133
460733	Propane	250	1/133
460771	Natural	250 ASME	1/140
460772	Propane	250 ASME	1/140
461020	Natural	250 ASME HD	1/140
460806	Natural	250HD	1/136
460734	Natural	300	1/136
460735	Propane	300	1/136
460736	Natural	400	1/136
460737	Propane	400	1/136
460805	Natural	400HD	1/136
460775	Natural	400ASME	1/149
461021	Natural	400 ASME HD	1/149
460776	Propane	400ASME	1/149

Note:
The MasterTemp High Performance Heater is certified for low NOx emissions.

Standard Copper Heat Exchanger 84% Efficient.

Heavy-Duty (HD) Cupro-Nickel Heat Exchanger 82% Efficient.

FEDERAL LAW IS A MIN OF 82%

CALIFORNIA PROPOSITION 65 WARNING
 ⚠️ WARNING: Cancer and Reproductive Harm.
 ⚠️ AVERTISSEMENT: Peut Causer le Cancer et des Dommages au Système Reproducteur.
 ⚠️ ADVERTENCIA: Cáncer y Daño Reproductivo.
www.p65warnings.ca.gov

WE NEED NOW TO COMPLY WITH APSP 7 ENTRAPMENT

APSP 7 ENTRAPMENT LANGUAGE: 2020 Version

4.4.5.1 Maximum system flow rate–unsecured control systems residential and public pools. The maximum system flow rate is the pump's flow rate at the highest user selectable speed (maximum rpm) 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) are clean (when

WE NEED NOW TO COMPLY WITH APSP 7 ENTRAPMENT

APSP 7 ENTRAPMENT LANGUAGE: the 2020 Version

included), and all pressure-side valves are in the open (maximum flow position). This operating point is determined by one of the following:

- Measuring an existing residential pool with a flow meter accurate to $\pm 5\%$ and installed according to the manufacturer's specifications
- Measuring a public pool with a flow meter accurate to $\pm 5\%$ and installed according to the manufacturer's specifications. The flow meter must be certified in accordance with NSF 50.
- Computing total head loss for a new residential or public pool using complete system TDH calculations and then looking up the flow rate using the manufacturer's certified pump curve, or

WE NEED NOW TO COMPLY WITH APSP 7 ENTRAPMENT

APSP 7 ENTRAPMENT LANGUAGE: the 2020 Version

- **Computing total loss for a new residential or public pool using the Simplified Method TDH calculation, or**
- **Using the maximum flow capacity of a new or replacement pump using the manufacturer's certified pump curve.**
- Measuring an existing pool system TDH at the pump's drain plugs using a pressure and vacuum gauge reading and then looking up the flow rate using the manufacturer's certified pump curve.

WE NEED NOW TO COMPLY WITH APSP 7 ENTRAPMENT

APSP 7 ENTRAPMENT LANGUAGE: the 2020 Version

After the maximum system flow rate is determined, that flow rate must be equal to or less than the SOFA system flow rating, as determined in accordance with Section 4.4.3.

For existing or new construction and renovations using new piping, the design flow rate shall be used to determine the needed pipe size using the velocity requirements as required by the ANSI/APSP/ICC-5 *Standard for Residential Inground Swimming Pools* or the ANSI/APSP/ICC-1 2014 *Standard for Public Swimming Pools* for pipe velocity in all cases.

When completed, calculated maximum flow rate shall be verified by using a vacuum gauge and a pressure gauge to determine the Total Dynamic Head (TDH) loss. That value is applied to the installed manufacturer's pump curve to validate the maximum flow rate value, or by using a flow meter accurate to $\pm 5\%$.

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

Auxiliary GPM:

Step 1 Use the Auxiliary GPM. This is the flow rate needed to operate the auxiliary feature(s).

Calculated Pipe Size:

Step 2 Use the Calculated Pipe Size in the TDH Calculator. Enter the length of pipe (in feet), the quantity of fittings, 3-Way Valves, equipment, and any additional component losses.

TDH Calculator

PIPE	SIZE	Suction Side Loss at 8 fps		Return Side Loss at 8 fps	
		QTY	LOSS	QTY	LOSS
	2.5	20	1.8	20	1.8

90 ELL	SIZE	Suction Side Losses		Return Side Losses	
		QTY	LOSS	QTY	LOSS
	2.5	4	3.42	8	6.84

TEE	SIZE	Suction Side Velocity		Return Side Velocity	
		QTY	LOSS	QTY	LOSS
	2.5	1	0.459	4	1.836

45 ELL	SIZE	Suction Side Velocity		Return Side Velocity	
		QTY	LOSS	QTY	LOSS
	2.5	2	0.558	2	0.558

Suction Side Loss				Return Side Loss			
3-WAY VALVE	SIZE 2.5	Each	0.0	3-WAY VALVE	SIZE 2.5	Each	0.0

Main Drain	X	1.5	0
------------	---	-----	---

Provide A Copy of The Suction Outlet Fitting Assembly "Cut Sheet" With the Documents You Provide to the Building Department Print This Form Along with All Support Documents and Submit Them to the Building Department for Permitting

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

Flow and Friction Loss Per Foot Schedule 40 PVC Pipe

Pipe Size	Velocity - Feet Per Second					
	6 fps		8 fps		10 fps	
1"	16 gpm	0.14'	21 gpm	0.23'	26 gpm	0.35'
1.5"	37 gpm	0.08'	50 gpm	0.11'	62 gpm	0.21'
2"	62 gpm	0.06'	82 gpm	0.10'	103 gpm	0.16'
2.5"	88 gpm	0.05'	117 gpm	0.09'	146 gpm	0.13'
3"	136 gpm	0.04'	181 gpm	0.07'	227 gpm	0.10'
4"	234 gpm	0.03'	313 gpm	0.05'	392 gpm	0.07'
6"	534 gpm	0.02'	712 gpm	0.03'		

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

Auxiliary GPM:

Step 1: Enter the Auxiliary GPM. This is the flow rate needed to operate the auxiliary feature(s).

Calculated Pipe Size:

Step 2: Enter the Calculated Pipe Size in the TDH Calculator. Enter the length of pipe (in feet), the quantity of fittings, 3-Way Valves, equipment, and any additional component losses.

TDH Calculator

PIPE	SIZE	Suction Side Loss at 8 fps			Return Side Loss at 8 fps		
		QTY		LOSS	QTY		LOSS
	2.5	20		1.8	20		1.8

TEE	SIZE	Suction Side Velocity			Return Side Velocity		
		QTY		LOSS	QTY		LOSS
	2.5	1		0.459	4		1.836

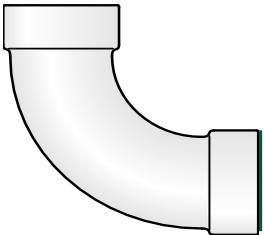
90 ELL	SIZE	Suction Side Losses			Return Side Losses		
		QTY		LOSS	QTY		LOSS
	2.5	4		3.42	8		6.84

45 ELL	SIZE	Suction Side Velocity			Return Side Velocity		
		QTY		LOSS	QTY		LOSS
	2.5	2		0.558	2		0.558

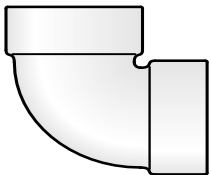
Suction Side Loss				Return Side Loss			
3-WAY VALVE	SIZE 2.5	Each	0.0	3-WAY VALVE	SIZE 2.5	Each	0.0
Main Drain		X 1.5	0				

Provide A Copy of The Suction Outlet Fitting Assembly "Cut Sheet" With the Documents You Provide to the Building Department Print This Form Along with All Support Documents and Submit Them to the Building Department for Permitting

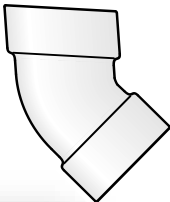
FRICTION LOSS



2" SWEEP 90°
= 5.7 FEET

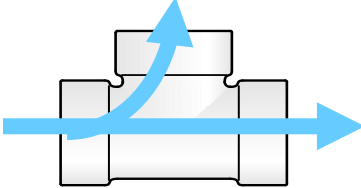


2" STANDARD 90°
= 8.6 FEET

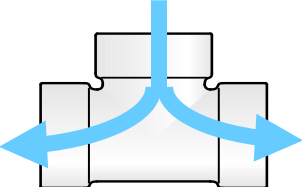


2" 45°
= 2.6 FEET

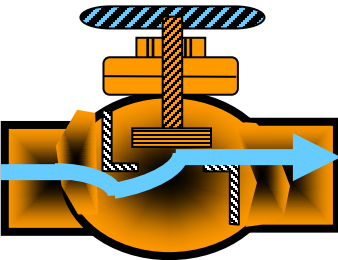
2" TEE'S



LINE FLOW = 4.3'



BRANCH FLOW = 12.0'



2" GLOBE VALVE = 57'



FITTING LOSS CHART

Friction Loss - Equivalent Length (feet of straight pipe)										
Fittings	Nominal Pipe Size (inches)									
	1"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"	10"
90 Degree Elbow Long Sweep	2.5	4.0	5.7	6.9	7.9	12.0	15.5	18.0	22.0	26.0
90 Degree Elbow Standard Sharp Inside	5.3	7.5	8.6	9.5	11.1	13.1	16.1	19.1	24.1	27.1
45 Degree Elbow	1.4	2.1	2.6	3.1	4.0	5.1	6.0	8.0	10.6	13.5
90 Degree Street	6.7	8.6	10.3	11.8	16.8	20.5	25.3	29.5	33.7	37.5
45 Degree Street	2.3	3.5	4.5	5.4	6.6	8.7	10.5	12.1	14.6	16.3
Tee - Straight	1.7	2.7	4.3	5.1	6.2	8.3	10.4	12.5	16.5	17.5
Tee - Branch	6.0	8.0	12.0	15.0	16.0	22.0	26.0	32.7	49.0	57.0
Coupling	1.0	1.3	1.5	2.0	2.8	3.3	3.9	4.5	5.1	5.8
Male / Female Adapter	2.0	3.5	4.5	5.5	6.5	9.0	11.5	14.0	17.1	20.3
Gate Valve - Fully Open	0.6	1.2	1.5	2.0	3.0	3.5	4.0	4.5	5.1	5.7
Swing Check Valve	11.2	15.2	19.1	22.0	27.0	38.0	50.0	70.0	85.5	101.0
Globe Valve - Open	27.0	44.0	57.0	66.0	85.0	110.0	140.0	170.0	201.0	233.0

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

Auxiliary GPM:

Step 1: Enter the Auxiliary GPM. This is the flow rate needed to operate the auxiliary feature(s).

Calculated Pipe Size:

Step 2: Use the Calculated Pipe Size in the TDH Calculator. Enter the length of pipe (in feet), the quantity of fittings, 3-Way Valves, equipment, and any additional component losses.

TDH Calculator

PIPE	Suction Side Loss at 8 fps			Return Side Loss at 8 fps		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	20		1.8	20	



90 ELL	Suction Side Losses			Return Side Losses		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	4		3.42	4.0	

TEE	Suction Side Velocity			Return Side Velocity		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	1		0.459	3	

45 ELL	Suction Side Velocity			Return Side Velocity		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	0		0	0	

Suction Side Loss					Return Side Loss						
3-WAY VALVE	SIZE	2.5	Each	1.	1.1	3-WAY VALVE	SIZE	2.5	Each	1.	1.1
Main Drain			2.	X	1.5	3					

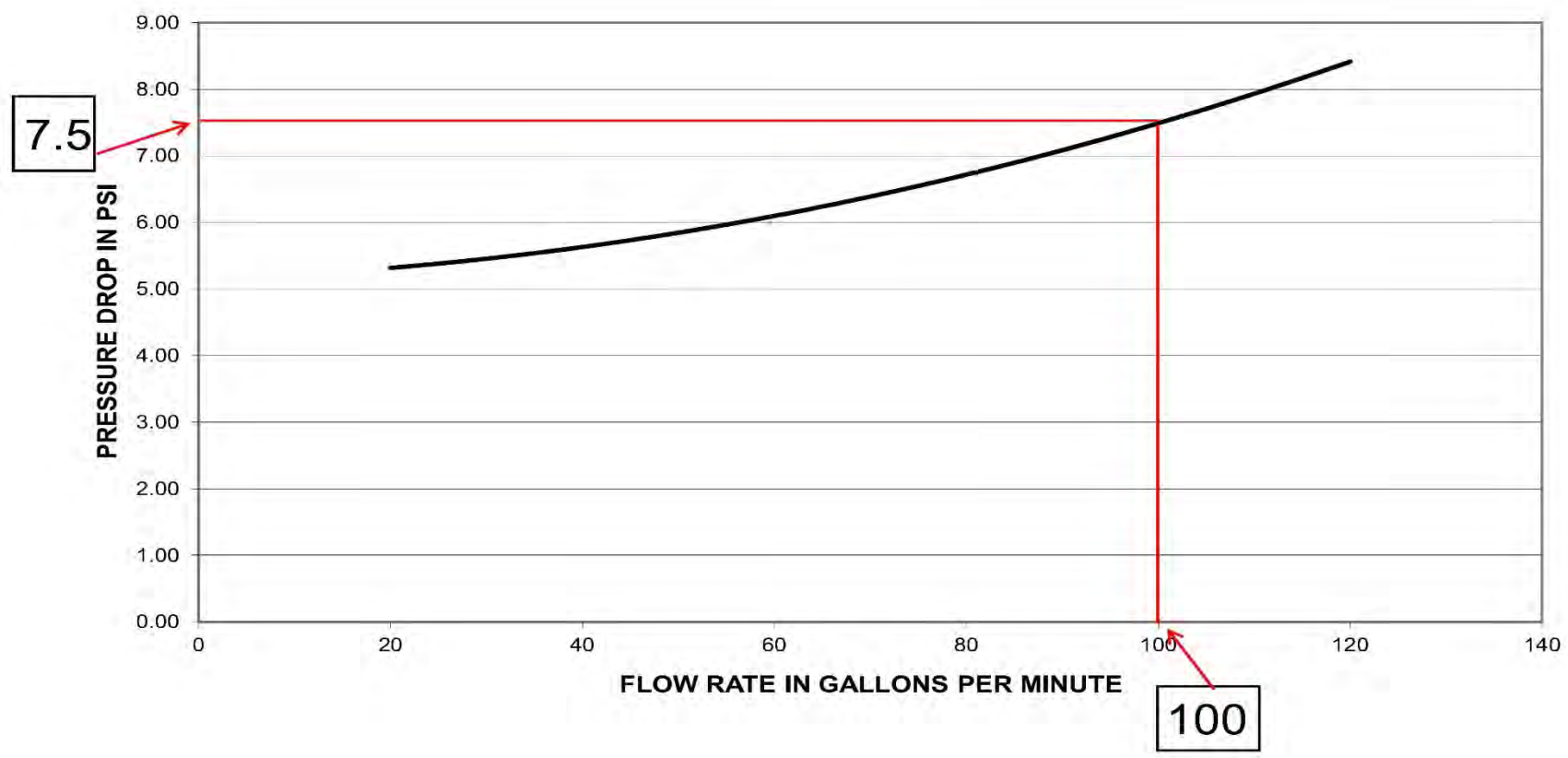
Provide A Copy of The Suction Outlet Fitting Assembly "Cut Sheet" With the Documents You Provide to the Building Department Print This Form Along with All Support Documents and Submit Them to the Building Department for Permitting

Suction Side Summary

Return Side Summary

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

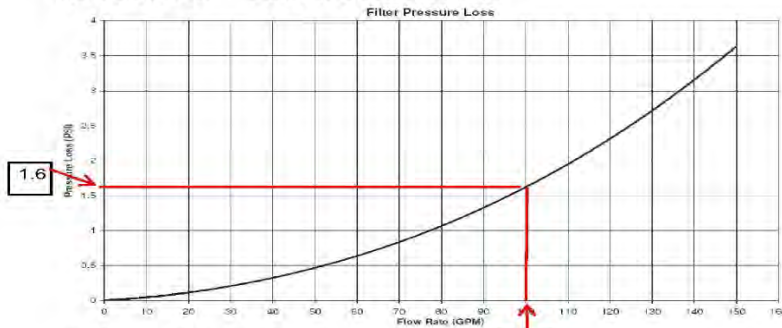
**AVERAGE PRESSURE DROP FOR ALL
Pentair MASTERTEMP & Sta-Rite MAX-E-THERM HEATERS**



FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

3

SECTION 4. TECHNICAL DATA



A. Filter Pressure Loss Chart.

B. Flow Rate Table.

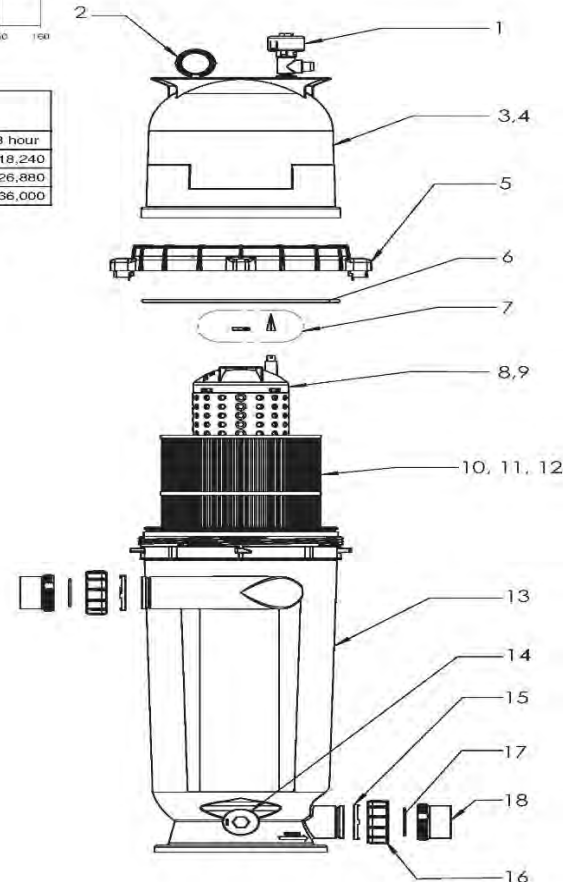
Model #	Product #	sq. ft.	Residential Maximum Cartridge Flow Rates			Commercial Maximum Cartridge Flow Rates				
			GPM	GPH	6 hour	8 hour	GPM	GPH	6 hour	8 hour
CNCRP 100	160354	100	100	6,000	36,000	48,000	38	2,280	13,680	18,240
CNCRP 150	160355	150	150	9,000	54,000	72,000	56	3,360	20,160	26,880
CNCRP 200	160353	200	150	9,000	54,000	72,000	75	4,500	27,000	36,000

- (1) Recommended flow rate for residential is .5 GPM per sq. ft.
- (2) Commercial flow rate is a maximum of .375 GPM per sq. ft. of filter area.

NOTE: Actual system flow will depend on plumbing size and other system components.

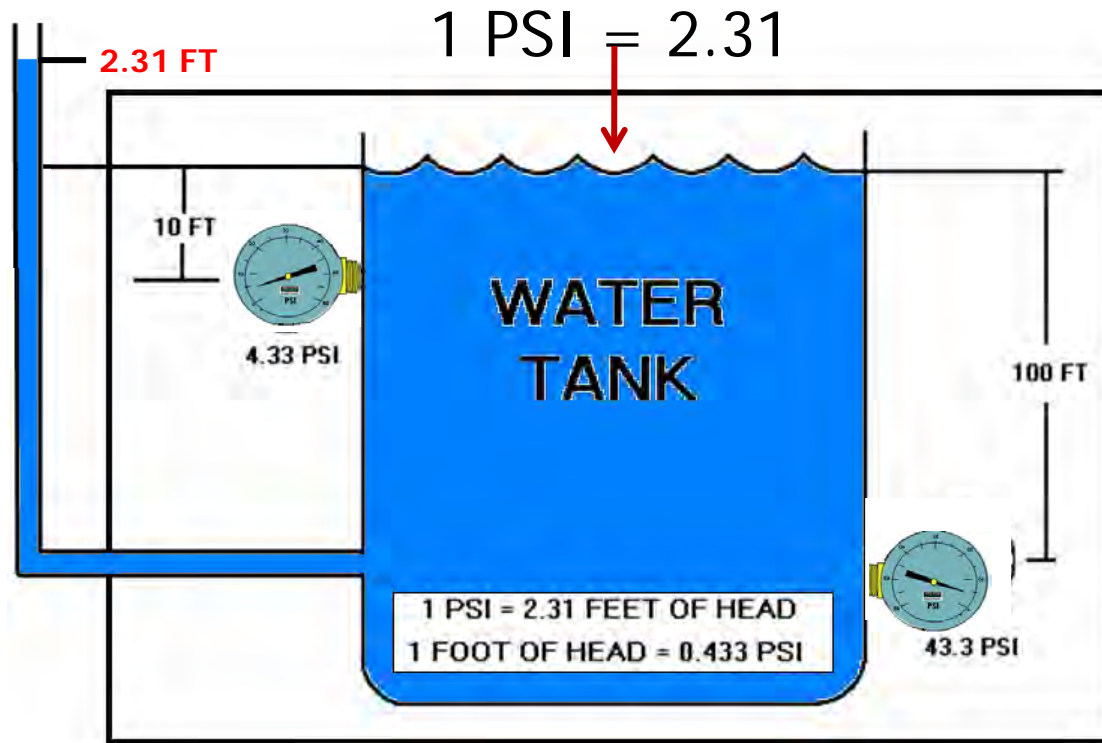
C. Replacement Parts.

Item	Part Number	Description
1	98209800	High Flow manual air relief valve
2	53003201	Pressure Gauge
3	178548	Lid, 100 sq. ft. filter
4	178546	Lid, 150, 200 sq. ft. filter
5	59052900	Locking Ring assembly.
6	87300400	Body O-ring
7	59016200	Air Bleed Sock Kit
8	59053700	Center Core, 100 sq. ft. filter
9	59053800	Center Core, 150, 200 sq. ft. filter
10	R173215	Cartridge Element, 100 sq. ft. filter
11	R173216	Cartridge Element, 150 sq. ft. filter
12	R173217	Cartridge Element, 200 sq. ft. filter
13	178731	Tank Bottom
14	154712	Drain Cap Assembly
15	178732	Union Nut "C" Clip
16	U11-200PS	Union Nut
17	178746	Union Diamond Seal
18	178733	Union, Threaded Half



SAVE THESE INSTRUCTIONS!

FRICTION LOSS



1 foot of head = .433 PSI (1 psi ÷ 2.31 = .433)

CALCULATING TDH ON EXISTING SYSTEM

To convert PSI (Pounds per Sq. Inch) to feet of head multiply it by 2.31 (1 psi = 2.31 feet of head loss)

Filter Loss $1.6 \text{ psi} \times 2.31 = 3.69$

Heater Loss $7.5 \text{ psi} \times 2.31 = 17.33$

$17.33 + 3.69 = 21.02$ Feet of Loss for Heater and Filter

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

Suction Side Loss

Return Side Loss

3-WAY VALVE	SIZE 2.5	Each		0.0	3-WAY VALVE	SIZE 2.5	Each		0.0
--------------------	-----------------	------	--	-----	--------------------	-----------------	------	--	-----

Main Drain		X	1.5	0
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Provide A Copy of The Suction Outlet Fitting Assembly "Cut Sheet" With the Documents You Provide to the Building Department Print This Form Along with All Support Documents and Submit Them to the Building Department for Permitting

Suction Side Summary

Return Side Summary

TDH Suction Side, Pipe, Fittings, Drains, and 3-Way Valves	6.2	TDH Return Side Pipe, Fittings, and 3-Way Valves	11.0
--	-----	--	------

Provide "FLOW LOSS" curves for any equipment to be installed and record those values (in Feet of Head). See samples on page 3.

Filter Loss at Auxiliary Flow Rate	3.7	Heater Loss at Auxiliary Flow Rate	17.3	Chlorinator Loss at Auxiliary Flow Rate	
Ozonator Loss at Auxiliary Flow Rate		UV Loss at Auxiliary Flow Rate		Additional Component Loss	
Additional Component Loss		Additional Component Loss		Additional Component Loss	

Total Additional Equipment Losses	21.0
-----------------------------------	------

Total Calculated Pool TDH	38
----------------------------------	-----------

Maximum Auxiliary Flow Rate of	100	Will Be Provided
--------------------------------	-----	------------------

The Value of the Maximum Auxiliary Flow Rate Must Be Equal or Greater than the Maximum Flow Rate of Your Suction Outlet(s)

Step 3: Using the manufacturer's **full-speed** pump curve?

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

TDH Calculator

PIPE	Suction Side Loss at 8 fps			Return Side Loss at 8 fps		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	20	1.8	20		1.8

90 ELL	Suction Side Losses			Return Side Losses		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	4	3.42	4.0		3.42

TEE	Suction Side Velocity			Return Side Velocity		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	1	0.459	3		1.377

45 ELL	Suction Side Velocity			Return Side Velocity		
	SIZE	QTY	LOSS	QTY		LOSS
	2.5	0	0	0		0

Suction Side Loss					Return Side Loss				
3-WAY VALVE	SIZE 2.5	Each	1.	1.1	3-WAY VALVE	SIZE 2.5	Each	1.	1.1
Main Drain		2.	X 1.5	3					

Provide A Copy of The Suction Outlet Fitting Assembly "Cut Sheet" With the Documents You Provide to the Building Department Print This Form Along with All Support Documents and Submit Them to the Building Department for Permitting

Suction Side Summary		Return Side Summary	
TDH Suction Side, Pipe, Fittings, Drains, and 3-Way Valves	9.8	TDH Return Side Pipe, Fittings, and 3-Way Valves	7.7

Provide "FLOW LOSS" curves for any equipment to be installed and record those values (in Feet of Head). See samples on page 3.

Filter Loss at Auxiliary Flow Rate	3.7	Heater Loss at Auxiliary Flow Rate	17.3	Chlorinator Loss at Auxiliary Flow Rate	
Ozonator Loss at Auxiliary Flow Rate		UV Loss at Auxiliary Flow Rate		Additional Component Loss	
Additional Component Loss		Additional Component Loss		Additional Component Loss	

Total Additional Equipment Losses	21.0
-----------------------------------	------

Total Calculated Pool TDH	38
----------------------------------	-----------



Maximum Auxiliary Flow Rate of	100	Will Be Provided
--------------------------------	-----	------------------

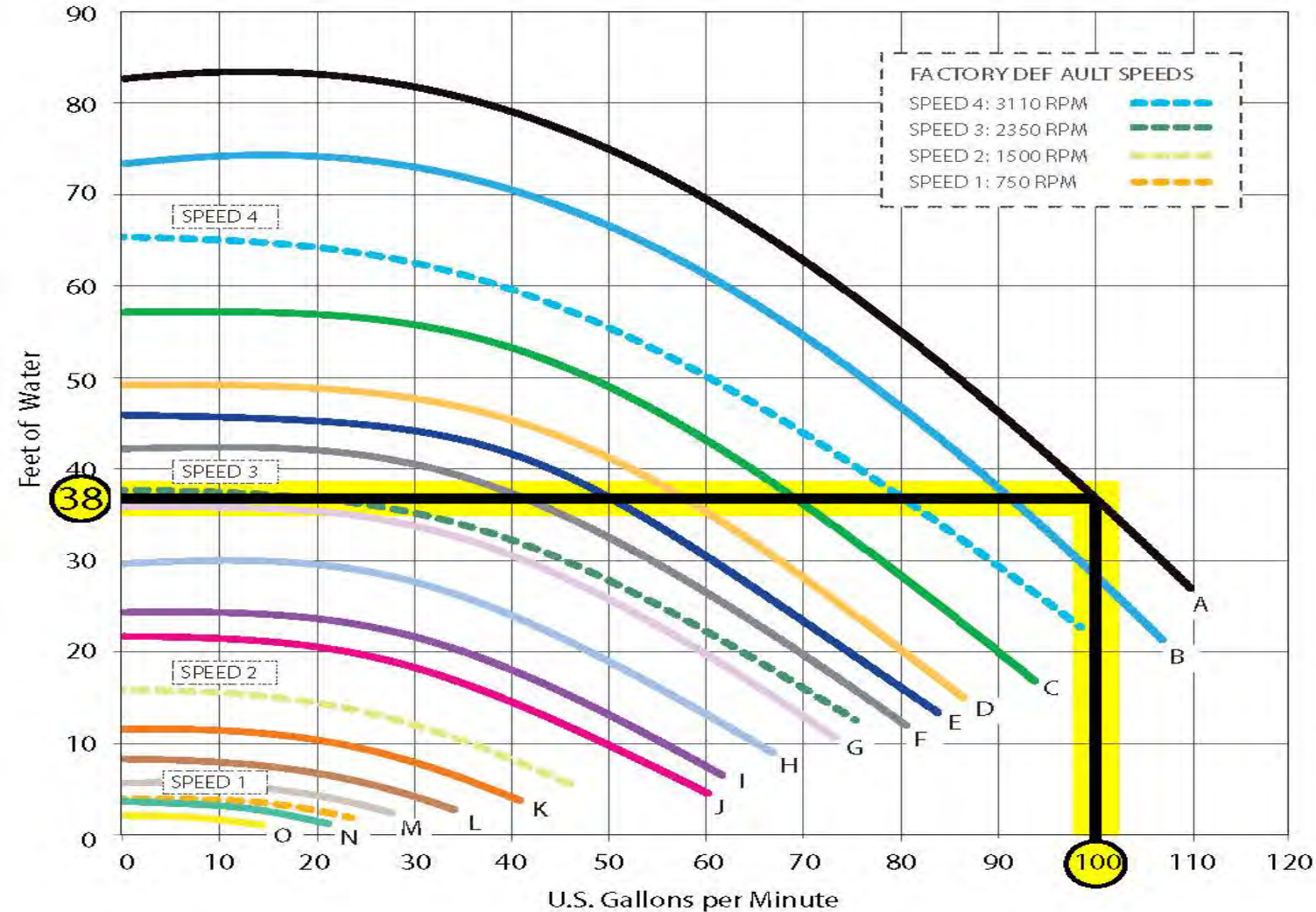
The Value of the Maximum Auxiliary Flow Rate Must Be Equal or Greater than the Maximum Flow Rate of Your Suction Outlet(s)

Step 3: Using the manufacturer's full-speed pump curve?

INTELLIFLO® i1

VARIABLE SPEED PUMP

Performance Curves



CURVE	SPEED
A	3450 RPM
B	3250 RPM
C	2850 RPM
D	2650 RPM
E	2550 RPM
F	2450 RPM
G	2250 RPM
H	2050 RPM
I	1850 RPM
J	1725 RPM
K	1250 RPM
L	1050 RPM
M	850 RPM
N	650 RPM
O	450 RPM

FILL OUT THE APSP 5/7 SECTION OF THE WORKSHEET

STARGUARD® MAIN DRAINS MAIN DRAIN FRAME AND GRATE

StarGuard Main Drains comply with provisions of the ANSI/APSP-16 2011 standard and the Virginia Graeme Baker Pool and Spa Safety Act. High quality StarGuard main drains are available in white, black, gray, and dark gray as well as a variety of configurations to fit most residential inground pool or spa installations. StarGuard main drains have an industry leading 15.35 square inches of open area for water flow and allow flow rates up to 72 GPM at 1-1/2 ft./sec.

CALIFORNIA PROPOSITION 65 WARNING

⚠ **WARNING:** Cancer and Reproductive Harm.
⚠ **AVERTISSEMENT:** Peut Causer le Cancer
et des Dommages au Système Reproducteur.
⚠ **ADVERTENCIA:** Cáncer y Daño Reproductivo.
www.p65warnings.ca.gov

Featured Highlights

- Improved 8 in. Round Main Drain
- Available in Multiple Colors
- Compliant with the Virginia Graeme Baker Act

Ordering Information

Product	Description	Flow Rate Floor (GPM)	Flow Rate Wall (GPM)	Open Area (Sq. In.)
8 IN. STARGUARD COVER WITH LONG RING				
500108	8 in. StarGuard cover w/ long ring (single), white	144	112	15.35
500100	8 in. StarGuard cover w/ long ring (single), black	144	112	15.35
500101	8 in. StarGuard cover w/ long ring (single), dark gray	144	112	15.35
500102	8 in. StarGuard cover w/ long ring (single), gray	144	112	15.35
500140	8 in. StarGuard cover w/ long ring (2 pack), white	144	112	15.35
500141	8 in. StarGuard cover w/ long ring (2 pack), black	144	112	15.35
500142	8 in. StarGuard cover w/ long ring (2 pack), dark gray	144	112	15.35
500143	8 in. StarGuard cover w/ long ring (2 pack), gray	144	112	15.35
8 IN. STARGUARD COVER WITH SHORT RING AND COVER				
500103	8 in. StarGuard cover w/ short ring (single), white	144	112	15.35
500104	8 in. StarGuard cover w/ short ring (single), black	144	112	15.35
500105	8 in. StarGuard cover w/ short ring (single), dark gray	144	112	15.35
500106	8 in. StarGuard cover w/ short ring (single), gray	144	112	15.35
500144	8 in. StarGuard cover w/ short ring (2 pack), white	144	112	15.35
500145	8 in. StarGuard cover w/ short ring (2 pack), black	144	112	15.35
500146	8 in. StarGuard cover w/ short ring (2 pack), dark gray	144	112	15.35
500147	8 in. StarGuard cover w/ short ring (2 pack), gray	144	112	15.35
8 IN. STARGUARD DRAIN WITH 2 IN. SIDE AND 1-1/2 IN. BOTTOM PORTS ABS SUMP WITH RING AND COVER				
500110	8 in. StarGuard drain w/ 2 in. side & 1-1/2 in. bottom ports ABS sump w/ ring & cover (2 pack), white	144	112	15.35
500111	8 in. StarGuard drain w/ 2 in. side & 1-1/2 in. bottom ports ABS sump w/ ring & cover (2 pack), black	144	112	15.35
500113	8 in. StarGuard drain w/ 2 in. side & 1-1/2 in. bottom ports ABS sump w/ ring & cover (2 pack), dark gray	144	112	15.35
500114	8 in. StarGuard drain w/ 2 in. side & 1-1/2 in. bottom ports ABS sump w/ ring & cover (2 pack), gray	144	112	15.35

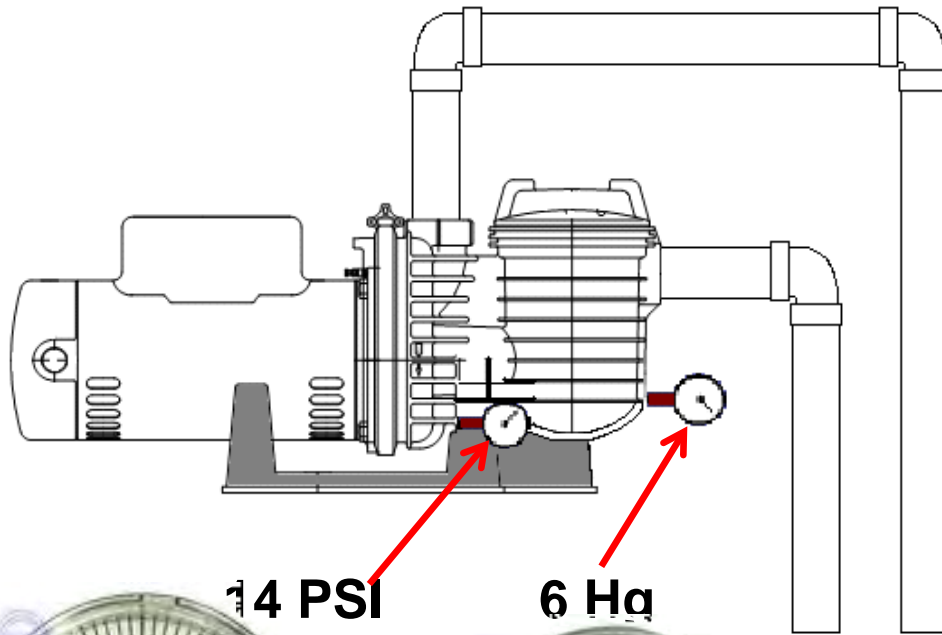
VERIFY OUR TDH VALUE IS CORRECT

HOW DO WE DO THIS? With an operating pool-

1. PLACE A VACUUM GAUGE ON THE SUCTION SIDE OF THE PUMP
2. PLACE A PRESSURE GAUGE ON THE PRESSURE SIDE OF THE PUMP
3. RECORD THE READING ON BOTH GAUGES WITH PUMP RUNNING
4. COMPARE THE READING TO THE TDH CHART TO DETERMINE THE TDH.

YOUR READING MUST BE EQUAL TO OR GREATER THAN THE CALCULATED VALUE

CALCULATING TDH ON EXISTING SYSTEM



To convert PSI (Pounds per Sq. Inch) to feet of head multiply it by 2.31

To convert Hg (vacuum) to feet of head multiply it by 1.13



$$\begin{aligned} \text{Pressure head} &= 14 \times 2.31 = 32.34 \\ \text{Suction head} &= 6 \times 1.13 = \underline{6.78} \\ \text{Total} &= 39.12 \end{aligned}$$

267 CALCULATING TDH ON EXISTING SYSTEM WITH A CHART

Find the PSI reading from the gauge on the vertical left hand column

Find the Hg reading from the gauge on the top horizontal row

The TDH is located in the box where the two intersect

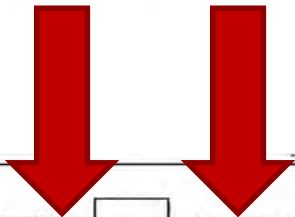
		Inches Mercury (Vacuum Gauge)									
		0	2	4	6	8	10	12	14	16	18
PSI (Pressure Gauge)	0	0.0	2.3	4.5	6.8	9.0	11.3	13.6	15.8	18.1	20.3
	1	2.3	4.6	6.8	9.1	11.4	13.6	15.9	18.1	20.4	22.7
	2	4.6	6.9	9.1	11.4	13.7	15.9	18.2	20.4	22.7	25.0
	3	6.9	9.2	11.5	13.7	16.0	18.2	20.5	22.8	25.0	27.3
	4	9.2	11.5	13.8	16.0	18.3	20.5	22.8	25.1	27.3	29.6
	5	11.5	13.8	16.1	18.3	20.6	22.8	25.1	27.4	29.6	31.9
	6	13.9	16.1	18.4	20.6	22.9	25.2	27.4	29.7	31.9	34.2
	7	16.2	18.4	20.7	23.0	25.2	27.5	29.7	32.0	34.3	36.5
	8	18.5	20.7	23.0	25.3	27.5	29.8	32.0	34.3	36.6	38.9
	9	20.8	23.1	25.3	27.6	29.8	32.1	34.3	36.6	38.9	41.1
	10	23.1	25.4	27.6	29.9	32.1	34.4	36.7	38.9	41.2	43.4
	11	25.4	27.7	29.9	32.2	34.5	36.7	39.0	41.2	43.5	45.8
	12	27.7	30.0	32.2	34.5	36.8	39.0	41.3	43.5	45.8	48.1
	13	30.0	32.3	34.6	36.8	39.1	41.3	43.6	45.9	48.1	50.4
	14	32.3	34.6	36.9	39.1	41.4	43.6	45.9	48.2	50.4	52.7
	15	34.6	36.9	39.2	41.4	43.7	45.9	48.2	50.5	52.7	55.0
	16	37.0	39.2	41.5	43.7	46.0	48.3	50.5	52.8	55.0	57.3
	17	39.3	41.5	43.8	46.1	48.3	50.6	52.8	55.1	57.4	59.6
	18	41.6	43.8	46.1	48.4	50.6	52.9	55.1	57.4	59.7	61.9
	19	43.9	46.2	48.4	50.7	52.9	55.2	57.4	59.7	62.0	64.2
	20	46.2	48.5	50.7	53.0	55.2	57.5	59.8	62.0	64.3	66.5
	21	48.5	50.8	53.0	55.3	57.6	59.8	62.1	64.3	66.6	68.9
	22	50.8	53.1	55.3	57.6	59.9	62.1	64.4	66.6	68.9	71.2
	23	53.1	55.4	57.7	59.9	62.2	64.4	66.7	69.0	71.2	73.5
	24	55.4	57.7	60.0	62.2	64.5	66.7	69.0	71.3	73.5	75.8
	25	57.8	60.0	62.3	64.5	66.8	69.1	71.3	73.6	75.8	78.1
	26	60.1	62.3	64.6	66.8	69.1	71.4	73.6	75.9	78.1	80.4
	27	62.4	64.6	66.9	69.2	71.4	73.7	75.9	78.2	80.5	82.7
	28	64.7	66.9	69.2	71.5	73.7	76.0	78.2	80.5	82.8	85.0
	29	67.0	69.3	71.5	73.8	76.0	78.3	80.5	82.8	85.1	87.3
	30	69.3	71.6	73.8	76.1	78.3	80.6	82.9	85.1	87.4	89.6
	31	71.6	73.9	76.1	78.4	80.7	82.9	85.2	87.4	89.7	92.0
	32	73.9	76.2	78.4	80.7	83.0	85.2	87.5	89.7	92.0	94.3
	33	76.2	78.5	80.7	83.0	85.3	87.5	89.8	92.0	94.3	96.6
	34	78.5	80.8	83.1	85.3	87.6	89.8	92.1	94.4	96.6	98.9
35	80.9	83.1	85.4	87.6	89.9	92.2	94.4	96.7	98.9	101.2	

FILL OUT THE APSP 1 SECTION OF THE WORKSHEET

COMMERCIAL POOL WORKSHEET

Flow Calculations:
Pool water volume 74,800 / 360 = 208 gpm - this is the calculated flow rate

2500 SQ FT X 4 FT = 10,000 CUBIC FT
10,000 X 7.48 = 74800



Filter Factors (GPM/SF): Cartridge (0.375) D E (2.0) Sand (15)

Filter Size: $\frac{208}{\text{(Flow Rate)}} / \frac{15}{\text{(Filter Fact)}} = \frac{14 \text{ SQ}}{\text{(Filter Size)}}$ TR 140 (2 EACH)
(Filter Make and Model)

Pump Controls:

Filtration pump has no auxiliary load- standard time clock

Filtration pump with auxiliary load-Control model for low speed default within 24 hrs

Heater Model: NONE
(Make, Model and Size)

Gas Heater Efficiency Rating _____ (No Pilot Light)

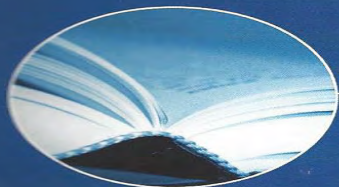
Heater Pump Efficiency C.O.P. _____

NSF/ANSI 50 STANDARD FOR POOL EQUIPMENT

*NSF International Standard /
American National Standard*

NSF/ANSI 50 - 2014

**Equipment for Swimming Pools, Spas,
Hot Tubs and Other Recreational
Water Facilities**



NSF 50 STANDARD FILTER SIZE REQUIRED

NSF/APSP 50 READS:

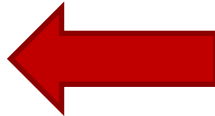
Filters shall be at least the size specified in NSF/ANSI-50 for public pool intended applications based on the maximum *filtration* flow rate through the filter.

5.4.1.1 The filter factors that shall be used are:

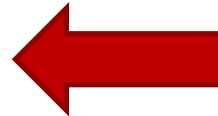
Cartridge 0.375 gpm/ft² 15 Lpm/m²



Sand 15 gpm/ft² 610 Lpm/m²



Diatomaceous Earth 2 gpm/ft² 81 Lpm/m²



TRITON® II SIDE MOUNT FILTERS
 TRITON® II VALVE OPTIONS



Product	Model	Effective Filtration Area (Sq. Ft.)	GPM	GPD	Pea Gravel Req'd (Lbs.)	Sand Req'd (Lbs.)	All Sand Req'd (Lbs.)	Ctn Qty.	Ctn Wt. (Lbs.)	
										(In Gal.)
SAND FILTERS										
140236	TR 40	1.92			50	125	175	1	25	
140249	TR 50	2.46			50	175	225	1	34	
140264	TR 60	3.14			75	250	325	1	40	
140210	TR 100	4.91	74	35,520	150	450	600	1	65	
140243	TR 140	7.06	106	50,880	275	650	925	1	75	

TRITON II VALVE OPTIONS¹

261173	1-1/2 in. MPV, for sand filters (SM 10-3)	1	6
263079	2 in. PVC Slide valve w/o plumbing, for D.E. & sand filters	1	3
261049	2 in. HiFlow valve, no plumbing	1	7
261050	2 in. HiFlow w/ plumbing, for sand filters	1	11
261055	2 in. MPV, for sand filters (SM 20-3)	1	10
263064	Push Pull 7-1/2 in. Center Valve, Almond PVC	1	5
263080	Valve for Sand and Quad D.E., inlet port on top, Pentair 2 in. unions glued on XF Valve	1	10

¹ Valves must be purchased separately.

Note: Operating Limits – maximum continual operating pressure of 50 PSI. Maximum operating water temperature (internal filter) 104°F (40°C).

See page 411–412 for replacement parts.

FILL OUT THE APSP 1 SECTION OF THE WORKSHEET

COMMERCIAL POOL WORKSHEET

Flow Calculations:

Pool water volume 74,800 / 360 = 208 gpm - this is the calculated flow rate

2500 SQ FT X 4 FT = 10,000 CUBIC FT

10,000 X 7.48 = 74800



Filter Factors (GPM/SF): Cartridge (0.375) D E (2.0) Sand (15)

Filter Size: $\frac{208}{\text{(Flow Rate)}} / \frac{15}{\text{(Filter Fact)}} = \frac{14 \text{ SQ}}{\text{(Filter Size)}}$

TR 140 (2 EACH)
(Filter Make and Model)

Pump Controls:

Filtration pump has no auxiliary load- standard time clock

Filtration pump with auxiliary load-Control model for low speed default within 24 hrs

Heater Model:

NONE
(Make, Model and Size)

Gas Heater Efficiency Rating _____ (No Pilot Light)

Heater Pump Efficiency C.O.P. _____

APSP 7 STANDARD FOR ENTRAPMENT

ANSI/APSP/ICC-7 2013

**American National Standard for
Suction Entrapment Avoidance
In Swimming Pools, Wading Pools,
Spas, Hot Tubs, and Catch Basins**



Approved August 26, 2013




APSP
*The Association of
Pool & Spa Professionals®*

 **INTERNATIONAL
CODE COUNCIL**

WE NEED NOW TO COMPLY WITH APSP 7

APSP 7 ENTRAPMENT LANGUAGE: 2020 Version

4.4.5.2 Maximum system flow rate–secured control systems for public pools. The maximum system flow rate is the flow rate for the pump(s) at its highest operating speed (maximum rpm) with the lowest operating system resistance (TDH) as defined by the Registered Design Professional.

- For new construction and renovations using new piping, the designed flow rate shall be used to determine the needed pipe size using the velocity requirements as required in the ANSI/APSP/ICC-1 2014 *Standard for Public Swimming Pools* for pipe velocity in all cases.

The intended SOFA system flow rating shall be equal to or greater than the maximum system flow rate determined by the design professional.

- When completed, the calculated maximum system flow rate shall be verified by using a vacuum gauge and a pressure gauge to determine the Total Dynamic Head (TDH) loss. That value is applied to the installed manufacturer's pump curve

WE NEED NOW TO COMPLY WITH APSP 7

APSP 7 ENTRAPMENT LANGUAGE: 2020 Version

to validate the maximum system flow rate value, or by using a flow meter accurate to $\pm 5\%$ and installed according to manufacturer's instructions.

The maximum system flow rating shall be verified after installing new or replacement pumps.

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 flow meters must be certified in accordance with NSF 50.

WE NEED NOW TO COMPLY WITH APSP 7

APSP 7 ENTRAPMENT LANGUAGE:

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.

APPLIES ONLY TO A COMMERCIAL POOL

WE NEED NOW TO COMPLY WITH APSP 7

APSP 7 ENTRAPMENT LANGUAGE:


This operating point is determined by one of the following:

- Measuring with flow meter accurate to $\pm 10\%$ 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.

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

ANSI 5 & ANSI 7 Compliance Work Sheet

Determine Simplified TDH:

1. Distance from pool to pump in feet: 29 FT 
2. Friction loss (in suction pipe) in 4IN inch pipe per 1 ft. @ 208 gpm = .87 (from pipe flow friction loss chart)
3. Friction loss (in return pipe) in 3IN inch pipe per 1 ft. @ 208 gpm = 2.9 (from pipe flow friction loss chart)

Determine Simplified TDH (CONTINUED):

4. $\frac{\text{Length of Suct. Pipe}}{\text{Length of Suct. Pipe}} \times \frac{\text{Fr of head 1 ft of Pipe}}{\text{Fr of head 1 ft of Pipe}} = \frac{\text{TDH Suct. Pipe}}{\text{TDH Suct. Pipe}}$
5. $\frac{\text{Length of Return Pipe}}{\text{Length of Return Pipe}} \times \frac{\text{Fr of head 1 ft of Pipe}}{\text{Fr of head 1 ft of Pipe}} = \frac{\text{TDH Return Pipe}}{\text{TDH Return Pipe}}$

TDH in Piping 3.7

Floor / Heater loss in TDH 28

All other losses 13.3

Total Dynamic Head (TDH): **45.0**

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

Velocity - Feet per Second								
Pipe Size	5 FPS	6 FPS	7 FPS	8 FPS	9 FPS	10 FPS	11 FPS	12 FPS
1.0"	13 gpm	15 gpm	18 gpm	20 gpm	23 gpm	26 gpm	28 gpm	31 gpm
1-1/2"	31 gpm	37 gpm	43 gpm	50 gpm	56 gpm	62 gpm	68 gpm	74 gpm
2.0"	52 gpm	62 gpm	72 gpm	82 gpm	92 gpm	103 gpm	113 gpm	123 gpm
2-1/2"	73 gpm	88 gpm	102 gpm	117 gpm	131 gpm	146 gpm	161 gpm	176 gpm
3.0"	113 gpm	137 gpm	159 gpm	181 gpm	203 gpm	227 gpm	249 gpm	271 gpm
4.0"	196 gpm	234 gpm	274 gpm	313 gpm	353 gpm	392 gpm	430 gpm	469 gpm
5.0"	308 gpm	369 gpm	430 gpm	492 gpm	554 gpm	615 gpm	677 gpm	738 gpm
6.0"	445 gpm	534 gpm	623 gpm	712 gpm	800 gpm	890 gpm	978 gpm	1068 gpm
8.0"	772 gpm	926 gpm	1080 gpm	1234 gpm	1389 gpm	1544 gpm	1698 gpm	1852 gpm
10"	1216 gpm	1462 gpm	1704 gpm	1948 gpm	2192 gpm	2434 gpm	2678 gpm	2922 gpm

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

Velocity - Feet per Second								
Pipe Size	5 FPS	6 FPS	7 FPS	8 FPS	9 FPS	10 FPS	11 FPS	12 FPS
1.0"	13 gpm	15 gpm	18 gpm	20 gpm	23 gpm	26 gpm	28 gpm	31 gpm
1-1/2"	31 gpm	37 gpm	43 gpm	50 gpm	56 gpm	62 gpm	68 gpm	74 gpm
2"	52 gpm	62 gpm	72 gpm	82 gpm	92 gpm	102 gpm	113 gpm	123 gpm
2-1/2"	73 gpm	88 gpm	102 gpm	117 gpm	131 gpm	146 gpm	161 gpm	176 gpm
3.0"	113 gpm	136 gpm	159 gpm	181 gpm	203 gpm	227 gpm	249 gpm	271 gpm
4.0"	196 gpm	234 gpm	274 gpm	313 gpm	353 gpm	392 gpm	430 gpm	469 gpm
5.0"	308 gpm	369 gpm	430 gpm	492 gpm	554 gpm	615 gpm	677 gpm	738 gpm
6.0"	445 gpm	534 gpm	623 gpm	712 gpm	800 gpm	890 gpm	978 gpm	1068 gpm
8.0"	772 gpm	926 gpm	1080 gpm	1234 gpm	1389 gpm	1544 gpm	1698 gpm	1852 gpm
10"	1216 gpm	1462 gpm	1704 gpm	1948 gpm	2192 gpm	2434 gpm	2678 gpm	2922 gpm

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

Flow and Friction Loss Per Foot Schedule 40 PVC Pipe

Pipe Size	Velocity - Feet Per Second					
	6 fps		8 fps		10 fps	
1"	16 gpm	0.14'	21 gpm	0.23'	26 gpm	0.35'
1.5"	37 gpm	0.08'	50 gpm	0.14'	62 gpm	0.11'
2"	62 gpm	0.05'	82 gpm	0.10'	100 gpm	0.06'
2.5"	88 gpm	0.04'	117 gpm	0.09'	140 gpm	0.05'
3"	130 gpm	0.03'	181 gpm	0.07'	227 gpm	0.10'
4"	234 gpm	0.03'	313 gpm	0.05'	392 gpm	0.07'
6"	534 gpm	0.02'	712 gpm	0.03'		

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

ANSI 5 & ANSI 7 Compliance Work Sheet

Determine Simplified TDH:

1. Distance from pool to pump in feet: 29 FT
2. Friction loss (in suction pipe) in 4IN inch pipe per 1 ft. @ 208 gpm = .87 (from pipe flow/friction loss chart)
3. Friction loss (in return pipe) in 3IN inch pipe per 1 ft. @ 208 gpm = 2.9 (from pipe flow/friction loss chart)

Determine Simplified TDH (CONTINUED):

4. $\frac{\text{Length of Suct. Pipe}}{\text{Fr. of each ft. of Pipe}} = \text{TDH Suct. Pipe}$
5. $\frac{\text{Length of Return Pipe}}{\text{Fr. of each ft. of Pipe}} = \text{TDH Return Pipe}$



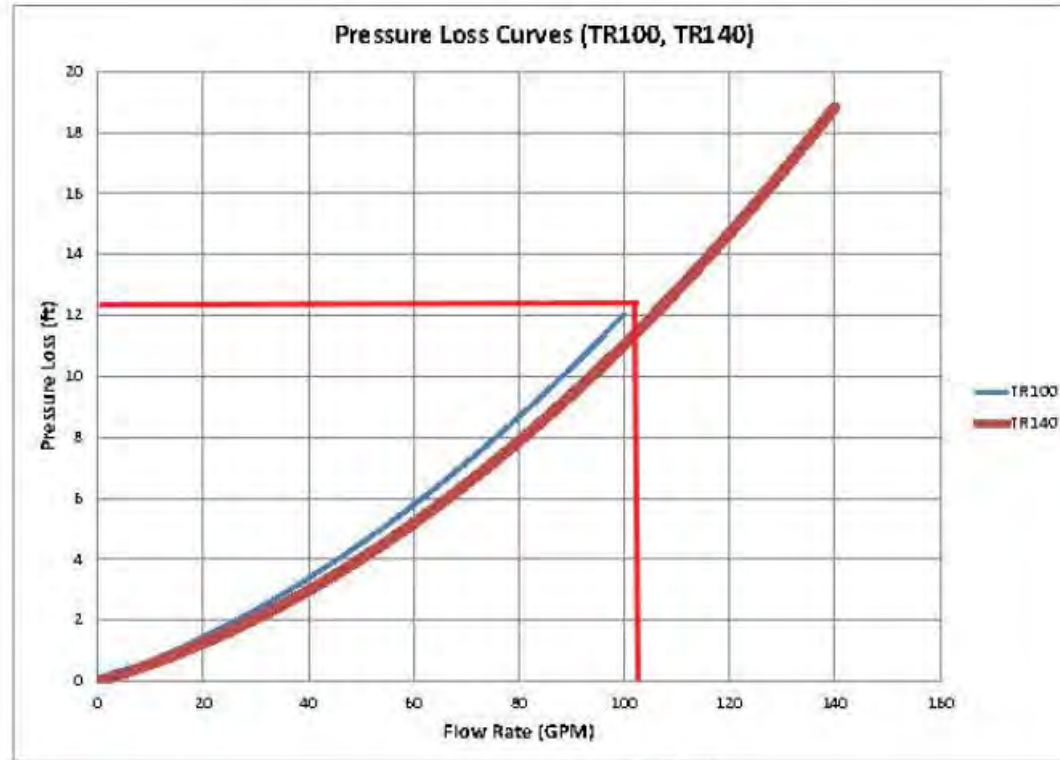
TDH in Piping 3.7
 Filter / Heater loss in TDH 28
 All other losses 13.3
 Total Dynamic Head (TDH): **45.0**

Section 5 Replacement Parts

Pressure Drop Curve for the Triton® Series Fiberglass Sand Filters

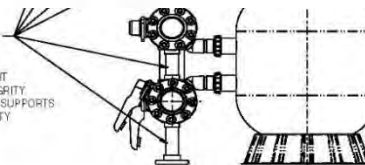


12.2

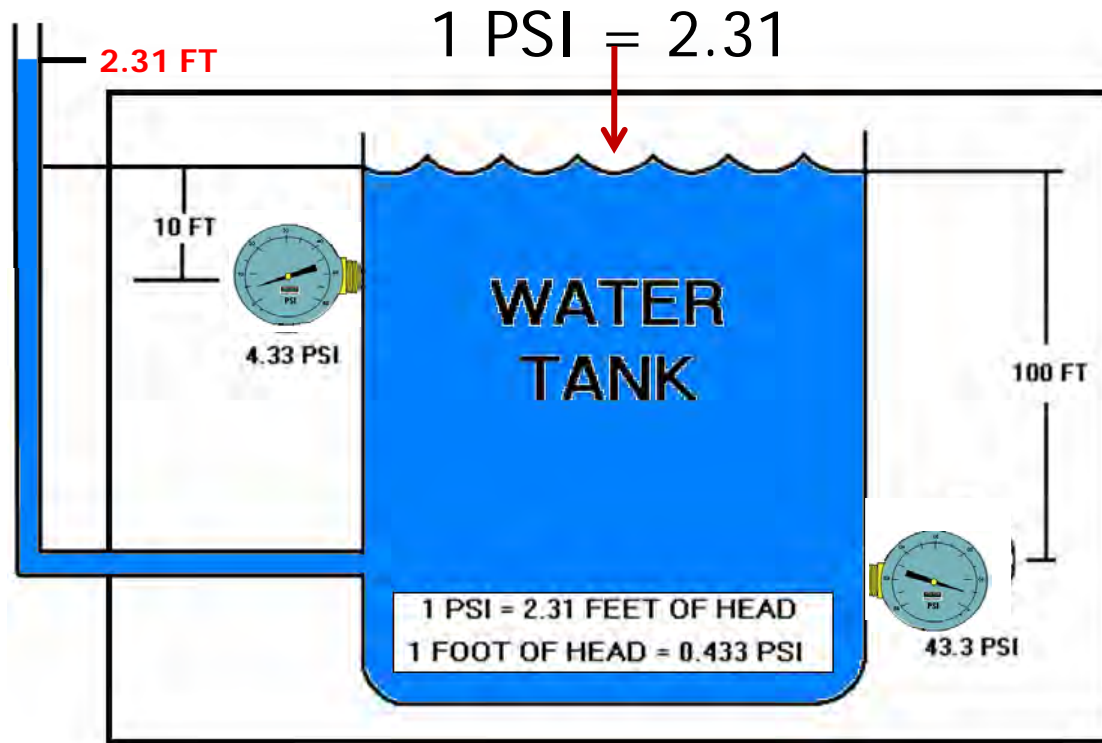


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CAUTION: PENTAIR RECOMMENDS THE USE OF A TANDEM FILTER PLUMBING KIT(S) OR SOME SORT OF PLUMBING SUPPORT TO ASSURE PLUMBING INTEGRITY FAILURE TO INCLUDE THESE SUPPORTS COULD VOID YOUR WARRANTY



FRICITION LOSS



1 foot of head = .433 PSI (1 psi ÷ 2.31 = .433)

CALCULATING TDH ON EXISTING SYSTEM

To convert PSI (Pounds per Sq. Inch) to feet of head

multiply it by 2.31 (1 psi = 2.31 feet of head loss)

Filter Loss $12.2 \text{ psi} \times 2.31 = 28.1$

Loss for Filter = 28

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

ANSI 5 & ANSI 7 Compliance Work Sheet

Determine Simplified TDH:

1. Distance from pool to pump in feet: 29 FT
2. Friction loss (in suction pipe) in 4IN inch pipe per 1 ft. @ 208 gpm = .87 (from pipe flow/friction loss chart)
3. Friction loss (in return pipe) in 3IN inch pipe per 1 ft. @ 208 gpm = 2.9 (from pipe flow/friction loss chart)

Determine Simplified TDH (CONTINUED):

4. $\frac{\text{Length of Suct. Pipe}}{\text{Length of Suct. Pipe}} \times \frac{\text{Fr of each ft of Pipe}}{\text{Fr of each ft of Pipe}} = \frac{\text{TDH Suct. Pipe}}{\text{TDH Suct. Pipe}}$
5. $\frac{\text{Length of Return Pipe}}{\text{Length of Return Pipe}} \times \frac{\text{Fr of each ft of Pipe}}{\text{Fr of each ft of Pipe}} = \frac{\text{TDH Return Pipe}}{\text{TDH Return Pipe}}$

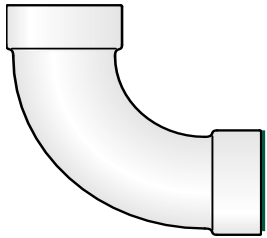
TDH in Piping: 3.7

 Filter / Heater loss in TDH: 28

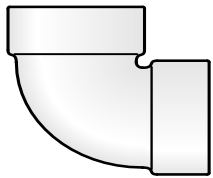
All other losses: 13.3

Total Dynamic Head (TDH): **45.0**

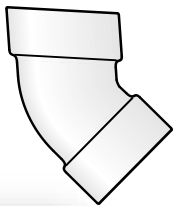
FRICTION LOSS



2" SWEEP 90°
= 5.7 FEET

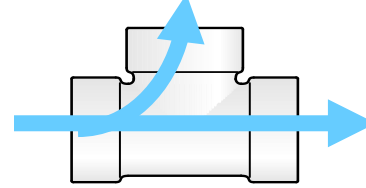


2" STANDARD 90°
= 8.6 FEET

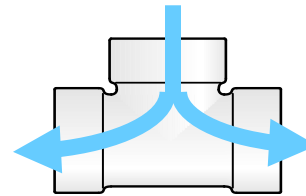


2" 45°
= 2.6 FEET

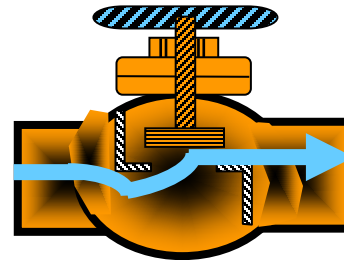
2" TEE'S



LINE FLOW = 4.3'



BRANCH FLOW = 12.0'



2" GLOBE VALVE = 57'

FITTING LOSS CHART

Friction Loss - Equivalent Length (feet of straight pipe)										
Fittings	Nominal Pipe Size (inches)									
	1"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"	10"
90 Degree Elbow Long Sweep	2.5	4.0	5.7	6.9	7.9	12.0	15.5	18.0	22.0	26.0
90 Degree Elbow Standard Sharp Inside Radius	5.3	7.5	8.6	9.5	11.1	13.1	16.1	19.1	24.1	27.1
45 Degree Elbow	1.4	2.1	2.6	3.1	3.7	4.3	6.0	8.0	10.6	13.5
90 Degree Street	6.7	8.6	10.3	12.8	15.1	17.4	25.3	29.5	33.7	37.5
45 Degree Street	2.3	3.5	4.5	5.4	6.3	7.2	10.5	12.1	14.6	16.3
Tee - Straight	1.7	2.7	4.3	5.1	6.2	8.3	10.4	12.5	16.5	17.5
Tee - Branch	6.0	8.0	12.0	15.0	16.0	22.0	26.0	32.7	49.0	57.0
Coupling	1.0	1.3	1.5	2.0	2.8	3.3	3.9	4.5	5.1	5.8
Male / Female Adapter	2.0	3.5	4.5	5.5	6.5	9.0	11.5	14.0	17.1	20.3
Gate Valve - Fully Open	0.6	1.2	1.5	2.0	3.0	3.5	4.0	4.5	5.1	5.7
Swing Check Valve	11.2	15.2	19.1	22.0	27.0	38.0	50.0	70.0	85.5	101.0
Globe Valve - Open	27.0	44.0	57.0	66.0	85.0	110.0	140.0	170.0	201.0	233.0

TDH CALCULATOR SHEET PRINT OUT

TDH CALCULATOR

GALLONS = **74800** **TURNOVER RATE HRS. = 6** = GPM NEEDED **208.00**
 WATER FEATURE /SPA REQR'D = GPM NEEDED **0**
 TOTAL GPM NEEDED **208**

BEFORE PROCEEDING - SEE PIPE SIZING TABLE (PAGE2) TO USE THE CORRECT PIPE AND FITTING SIZE IN RELATIONSHIP TO THE VELOCITY AND GPM NEEDED

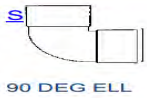
SUCTION SIDE VELOCITY → **8** RETURN SIDE VELOCITY → **10**

STATIC LIFT

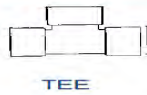


	QTY	1.5	1.5	QTY	10
1"	0	0	0	0	0
1 1/2"	0	0	0	0	0
2"	0	0	0	0	0
2 1/2"	0	0	0	0	0
3"	0	0	0	29	2.03
4"	29	0	1.45	0	0
6"	0	0	0	0	0
8"	0	0	0	0	0

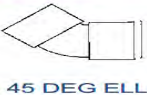
NOTE:
 FLEX PIPE IS 40%
 MORE RESTRICTIVE
 THAN RIGID PIPE
 (SEE PAGE 2)



1"	0	X 5.3 =	0	0	X 5.3 =	0
1 1/2"	0	X 7.5 =	0	0	X 7.5 =	0
2"	0	X 8.6 =	0	0	X 8.6 =	0
2 1/2"	0	X 9.5 =	0	0	X 9.5 =	0
3"	0	X 11.1 =	0	16	X 11.1 =	8.848
4"	4	X 13.1 =	2.28	0	X 13.1 =	0
6"	0	X 19.1 =	0	0	X 19.1 =	0
8"	0	X 24.1 =	0	0	X 24.1 =	0



1"	0	X 6.0 =	0	0	X 6.0 =	0
1 1/2"	0	X 8.0 =	0	0	X 8.0 =	0
2"	0	X 12.0 =	0	0	X 12.0 =	0
2 1/2"	0	X 15.0 =	0	0	X 15.0 =	0
3"	0	X 16.0 =	0	4	X 16.0 =	4.592
4"	2	X 22.0 =	2.2	0	X 22.0 =	0
6"	0	X 32.7 =	0	0	X 32.7 =	0
8"	0	X 49.0 =	0	0	X 49.0 =	0



1"	0	X 1.4 =	0	0	X 1.4 =	0
1 1/2"	0	X 2.1 =	0	0	X 2.1 =	0
2"	0	X 2.6 =	0	0	X 2.6 =	0
2 1/2"	0	X 3.1 =	0	0	X 3.1 =	0
3"	0	X 4.0 =	0	2	X 4.0 =	0.56
4"	2	X 5.1 =	0.51	0	X 5.1 =	0
6"	0	X 8.0 =	0	0	X 8.0 =	0
8"	0	X 10.6 =	0	0	X 10.6 =	0

TDH FOR PIPE AND FITTING → **8.12** → **17.23**

TDH FOR PIPE, FITTING PLUS LIFT → **9.62** PIPE AND FITTING TDH → **17.23**

SKIMMER 2" 0 X 3.0 = **0** FILTER **28**
 MAIN DRAIN* 0 X 1.5 = **0** HEATER LOST FROM DATA SHEET **0**

3-WAY VALVE 1 1/2"	EACH	0	0	3-WAY VALVE 1 1/2"	0	0
3-WAY VALVE 2"	EACH	0	0	3-WAY VALVE 2"	0	0
3-WAY VALVE 2.5"	EACH	1	1.08	3-WAY VALVE 2.5"	0	0
3-WAY VALVE 3"	EACH	0	0	3-WAY VALVE 3"	1	1.2
3-WAY VALVE 4"	EACH	1	0.6	3-WAY VALVE 4"	0	0
3-WAY VALVE 6"	EACH	0	0	3-WAY VALVE 6"	0	0
3-WAY VALVE 8"	EACH	0	0	3-WAY VALVE 8"	0	0

SUCTION CLEANER* NO X 9.0 = **0** SALT GENERATOR **0.0000**
 (*SEE NOTE PAGE 3) YES OR NO (YES OR NO) EXIT LOSS **0**

TDH SUCTION SIDE → **10** TDH DISCHARGE SIDE → **46**
 TDH FOR C → **45** TOTAL GPM NEEDED → **208**
 SEE PUMP CURVES FROM MANUFACTURE TO DETERMINE PUMP SIZE

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

ANSI 5 & ANSI 7 Compliance Work Sheet

Determine Simplified TDH:

1. Distance from pool to pump in feet: 29 FT
2. Friction loss (in suction pipe) in 4IN inch pipe per 1 ft. @ 208 gpm = .87 (from pipe flow/friction loss chart)
3. Friction loss (in return pipe) in 3IN inch pipe per 1 ft. @ 208 gpm = 2.9 (from pipe flow/friction loss chart)

Determine Simplified TDH (CONTINUED):

$$4. \frac{\text{Length of Suct. Pipe}}{\text{Length of Suct. Pipe}} \times \frac{\text{Fr of head l of Pipe}}{\text{Fr of head l of Pipe}} = \frac{\text{TDH Suct. Pipe}}{\text{TDH Suct. Pipe}}$$

$$5. \frac{\text{Length of Return Pipe}}{\text{Length of Return Pipe}} \times \frac{\text{Fr of head l of Pipe}}{\text{Fr of head l of Pipe}} = \frac{\text{TDH Return Pipe}}{\text{TDH Return Pipe}}$$

TDH in Piping 3.7

Filter / Heater loss in TDH 28

All other losses 13.3

  Total Dynamic Head (TDH): **45.0**

Filter Pump Database

APSP Appliance Efficiency Pool Pump Database (Last Revised: Feb. 14, 2014)											
1	A	B	C	D	E	F	G	H	I	J	K
2	Manufacturer Name	Brand Name	Model Number	Sneed RPM	Motor Design	Curve-A gpm ↓ HP	Curve-A Power ↓ lts	Curve-A Energy ↓ ltor	Curve-C gpm ↓ HP	Curve-C Power ↓ lts	Curve-C Energy ↓ ltor
299	AquaPro Systems	Sunrunner	SUNP2200	3450	Dual-speed	65	1868	2.09	87	2095	2.48
300	AquaPro Systems	Sunrunner	SUNP2200U	3450	Dual-speed	65	1803	2.20	85	1927	2.65
301	Speck Pumps	Speck Pumps	A91-I	3450	Single-speed	45	770	3.50	55	792	4.16
302	AquaPro Systems	Sunrunner	SUNP2250U	1725	Dual-speed	32	405	4.74	43	440	5.86
303	Zodiac Pool Systems, Inc.	Jandy Pro Series	SWF125	1725	Single-speed	37	579	3.90	53	659	4.81
304	AquaPro Systems	Sunrunner	SUNPVS125	3450	Multi-speed	57	1270	2.68	74	1316	3.38
305	AquaPro Systems	Sunrunner	SUNPVS125	2600	Multi-speed	43	578	4.41	55	600	5.50
306	AquaPro Systems	Sunrunner	SUNPVS125	1725	Multi-speed	28	205	8.20	36	210	10.30
307	Zodiac Pool Systems, Inc.	Jandy Pro Series	PHPF 0.50	3450	Single-speed	54	1360	2.38	70	1225	3.41
308	Hayward	Hayward	SP2307X102	3450	Dual-speed	51	1005	3.04	64	1023	3.75
309	Hayward	Hayward	SP2307X102	1725	Dual-speed	25	271	5.54	32	274	7.01
310	Hayward	Hayward	SP2310X152	3450	Dual-speed	53	1210	2.63	68	1243	3.28
311	Hayward	Hayward	SP2310X152	1725	Dual-speed	25	299	5.02	32	304	6.32
312	Hayward	Hayward	SP2315X202	3450	Dual-speed	59	1485	2.38	78	1595	2.93
313	Hayward	Hayward	SP2315X202	1725	Dual-speed	29	391	4.45	37	408	5.44
314	Pentair Aquatic Systems	Pentair IntelliFlo i1 Variable Speed Pump	011008	3450	Variable-Speed	65	1619	2.41	82	1687	2.92
315	Pentair Aquatic Systems	Pentair IntelliFlo i1 Variable Speed Pump	011008	1725	Variable-Speed	33	263	7.53	41	274	8.98
316	Pentair Aquatic Systems	Pentair IntelliFlo i1 Variable Speed Pump	011008	700	Variable-Speed	13	72	10.83	17	70	14.57
317	Pentair Aquatic Systems	Pentair IntelliFlo i1 Variable Speed Pump	011008	450	Variable-Speed	9	57	9.47	11	59	11.19
318	Speck Pumps	Speck Pumps	Badu EcoM3 V	3450	Variable-speed	54	1149	2.81	72	1236	3.49
319	Speck Pumps	Speck Pumps	Badu EcoM3 V*	2600	Variable-speed	41	529	4.65	54	552	5.86
320	Speck Pumps	Speck Pumps	Badu EcoM3 V**	1725	Variable-speed	28	191	8.79	38	195	11.69
321	Speck Pumps	Speck Pumps	Badu EcoM3 V***	1000	Variable-speed	16	63	15.23	21	64	19.68
322	Speck Pumps	Speck Pumps	A91	3450	Single-speed	40	663	3.61	49	667	4.40
323	Fluidra	PSX	P280(high speed)	3075	Variable-speed	53	1032	3.08	67	1044	3.85
324	Fluidra	PSX	P280(low speed)	1375	Variable-speed	24	126	11.24	30	127	14.08
325	Fluidra	PSX	P280(mid speed)	2000	Variable-speed	35	308	6.90	43	316	8.24

WHISPERFLOXF[®]

HIGH PERFORMANCE PUMPS (CONT'D)

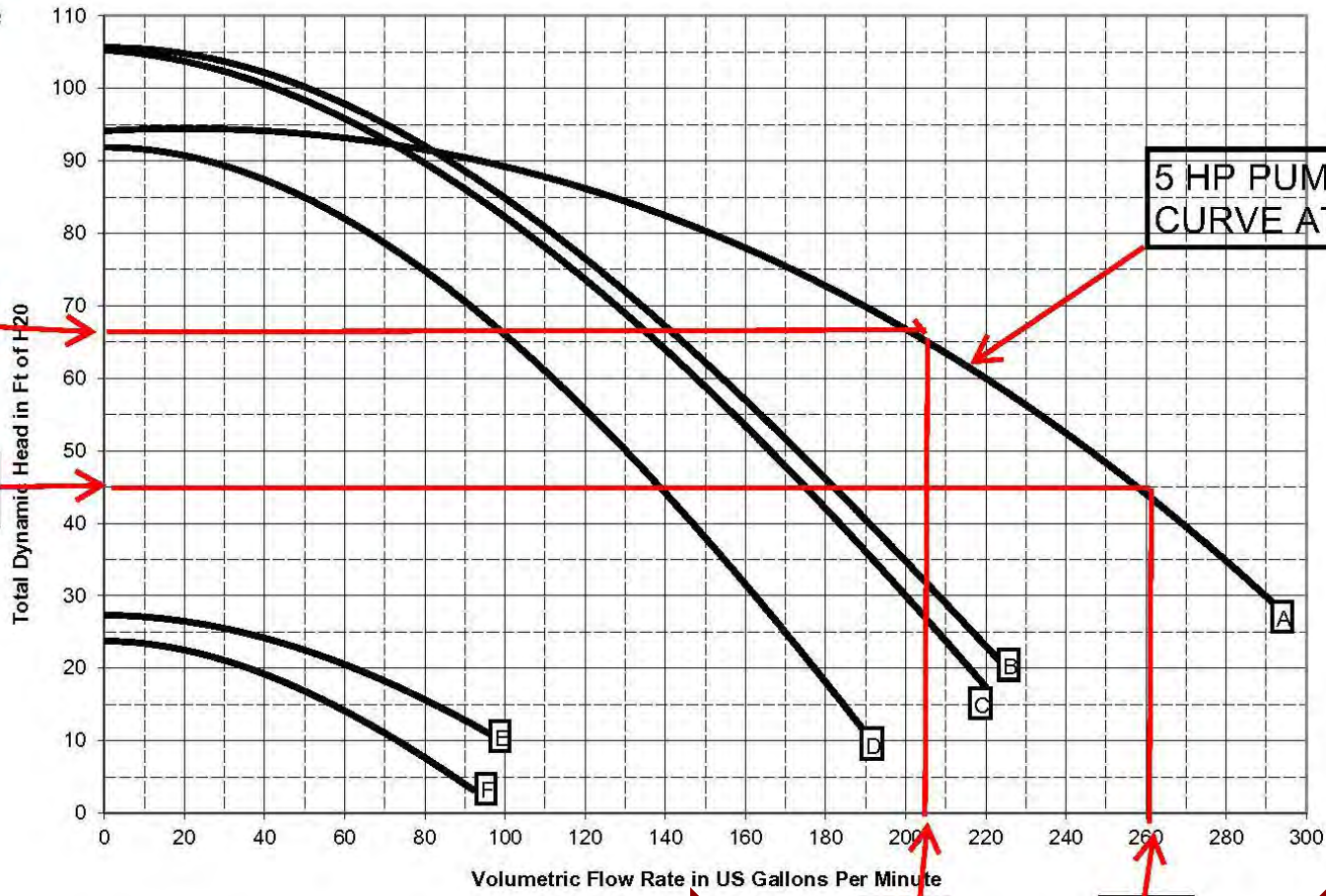
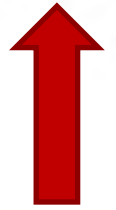
Dimensions and Performance

1 & 2-Speed
Performance
Curve



68

45



208

260



32" CHANNEL DRAIN FLAT GRATE ANTI-ENTRAPMENT SUCTION OUTLET COVER AND PVC THREE-PORT MANUFACTURED SUMP



**VGB CERTIFIED
SPECIFICATIONS**

Floor Flow Rating
316 GPM at 3.9 fps

Wall Flow Rating
208 GPM at 2.6 fps

Sump Depth
Use sump included

Open Area
25.9 in²

FEATURES

All components meet or exceed ANSI/APSP 16-2011 and NSF/ANSI 50-2009a national standards and ASTM G154 UV testing exposure

Three ports: bottom 2½" OD, 2" ID S/S; inside 2" threaded FPT; two 2" threaded plugs included
Strong PVC sump does not require transitional glue

Designed for use with 2" hydrostatic relief valve part #HVxxx (see page 103)

Disposable plastic pre-gunite/plaster insert keeps debris out and retains sump shape during construction

#316 stainless steel screws

Manufactured from superior UV-resistant engineered polymers







Online product support including downloadable CAD files, General Certificate of Conformity, third-party certificate, installation instructions and more

Replace drain cover every five years from the date of installation

4 per case

U.S. patent 20140157510

STANDARD COLORS

-  32CDFL101 – White
-  32CDFL102 – Black
-  32CDFL103 – Light Gray
-  32CDFL104 – Blue
-  32CDFL105 – Dark Gray
-  32CDFL108 – Tan

Also available as sump only p/n 32CDPxxx
4 per case

Also available cover only without sump/frame p/n 32CDFLNFxxx
24 per case

VGB 2008 Compliant

Unblockable!

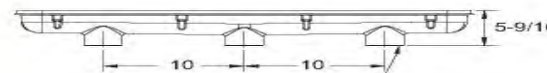
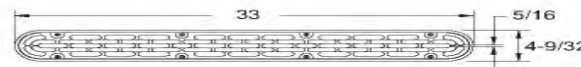
NEW Improved water stop and sump design



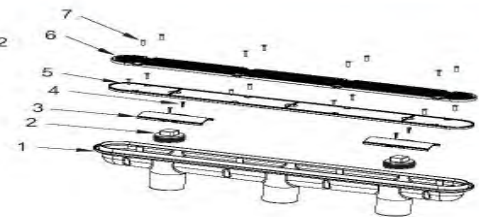
NEW Water Stop and Textured Sump



With sump (concrete pools)
Part # 32CDFLxxx



2-1/2" Spigot x 2" Socket x 2" NPT



1. 32" Three-Port PVC Sump
2. 2" Tapered Threaded Pipe Plug, Qty 2
3. Port Divider
4. 8 x 1/2 Pan Head Phillips, 316 SS, Qty 4
5. 32" Channel Drain Plaster Shield
6. 32" Channel Drain Flush Cover
7. 10 x 3/4" Flat Head Phillips, 316 SS, Qty 16
Plaster Shield And Screws To Be Removed After Gunite/Plaster Application

FILL OUT THE APSP 1/7 SECTION OF THE WORKSHEET

Determine Pipe Sizes:

SUCTION

4

inch to keep velocity @

6

fps max. at

208

gpm System Flow Rate.

RETURN

3

inch to keep velocity @

10

fps max. at

208

gpm System Flow Rate.

Pump Selection: as Listed on Curve A C (circle one)

Filtration Pump

XFET-20 5 HP

Maximum Flow Rate

208

gpm

Main Drain Cover

AQUASTAR
32 CPANFG

(Make and Model)

Determine the Number and Type of Required In-Floor Suction Outlets:

Check all that apply.



3'-0"



2

suction outlets @

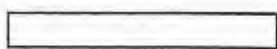
gpm max. flow



3

suction outlets @

gpm max. flow



AQUASTAR

channel drain @

208

gpm w/

3

ports

Section 311.3 Water Velocity

- **Summary:** Water flow should never exceed recommended maximum velocities through the circulation system for two reasons.
- High Water Velocities can be very dangerous due to the “water hammer” effect in entrapment situations.
- Excess water flow thru the suction outlet cover offers increased dangers due to “hair entrapment”



APSP 1 STANDARD COMMERCIAL POOLS

ANSI/APSP/ICC-1 2014

American National Standard for Public Swimming Pools

Approved August 28, 2013




APSP
The Association of
Pool & Spa Professionals®

 **ICC** INTERNATIONAL
CODE COUNCIL®

ANSI 1 TOLERANCES

Table 6.2 Construction Tolerances	
Design Requirements	Construction Tolerance Allowed
Length – overall	± 3 in. (± 76 mm)
Width – overall	± 3 in. (± 76 mm)
Depth – deep area	± 3 in. (± 76 mm)
Depth – shallow area	± 2 in. (± 51 mm)
Step treads & risers	$\pm 1/2$ in. (± 13 mm)
Waterline – pools with adjustable weir skimmers	$\pm 1/4$ in. (± 6 mm)
Waterline – pools with non-adjustable skimming systems (gutters)	$\pm 1/8$ in. (± 3 mm)
All dimensions not otherwise specified in this standard	± 2 in. (± 51 mm)
Competitive pools – Class A pools – All dimensional requirements	As governed by authority having jurisdiction

ANSI 1 TOLERANCES

Figure 6.2.2: Construction dimensions for water envelopes for Class B and C pools

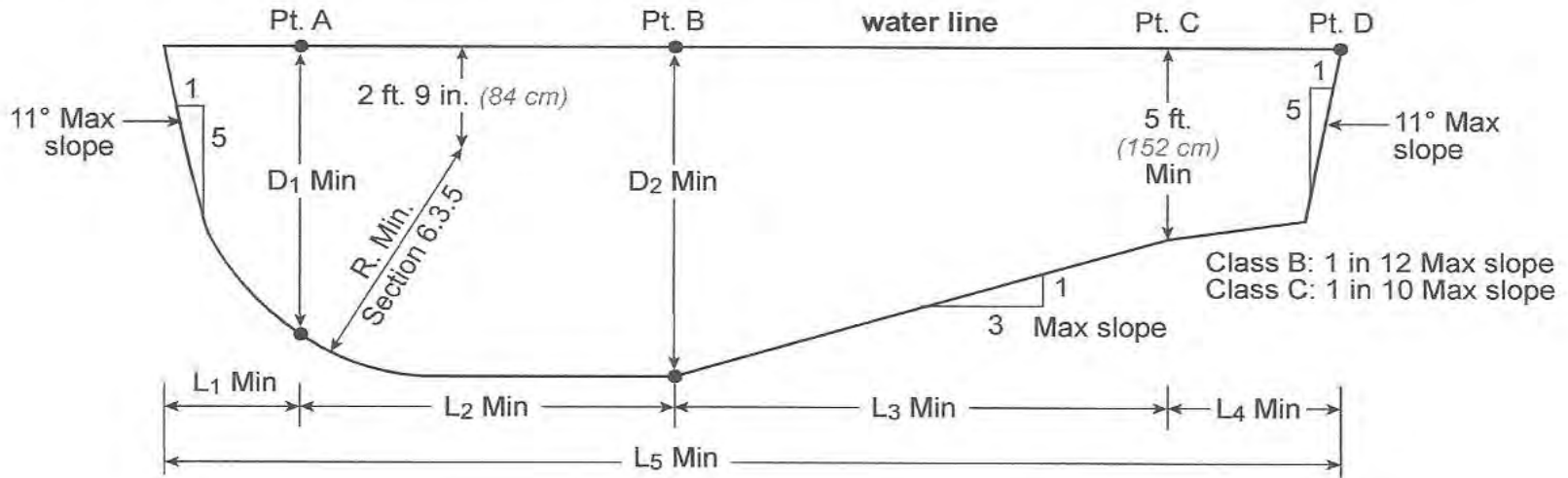


Table 6.2.2: Minimum Diving Water Envelopes

Pool Type	Minimum Dimensions								Minimum Width of Pool at:		
	D1	D2	R	L1	L2	L3	L4	L5	Pt. A	Pt. B	Pt. C
VI	7' -0" (213 cm)	8' -6" (259 cm)	5' -6" (168 cm)	2' -6" (76 cm)	8' -0" (244 cm)	10' -6" (320 cm)	7' -0" (213 cm)	28' -0" (853 cm)	16' -0" (488 cm)	18' -0" (549 cm)	18' -0" (549 cm)
VII	7' -6" (229 cm)	9' -0" (274 cm)	6' -0" (183 cm)	3' -0" (91 cm)	9' -0" (274 cm)	12' -0" (366 cm)	4' -0" (122 cm)	28' -0" (853 cm)	18' -0" (549 cm)	20' -0" (610 cm)	20' -0" (610 cm)
VIII	8' -6" (259 cm)	10' -0" (305 cm)	7' -0" (213 cm)	4' -0" (122 cm)	10' -0" (305 cm)	15' -0" (457 cm)	2' -0" (610 mm)	31' -0" (945 cm)	20' -0" (610 cm)	22' -0" (671 cm)	22' -0" (671 cm)
IX	11' -0" (335 cm)	12' -0" (366 cm)	8' -6" (259 cm)	6' -0" (183 cm)	10' -6" (320 cm)	21' -0" (640 cm)	0' -0" (0 cm)	37' -6" (11.4 m)	22' -0" (671 cm)	24' -0" (732 cm)	24' -0" (732 cm)

Note 1: Negative tolerances (see Section 6.2) shall not be applied to any of the dimensions shown in this table.

Note 2: Pool types dictate the minimum water envelope dimensions as specified by the diving board manufacturers.

APSP 1 EXITS

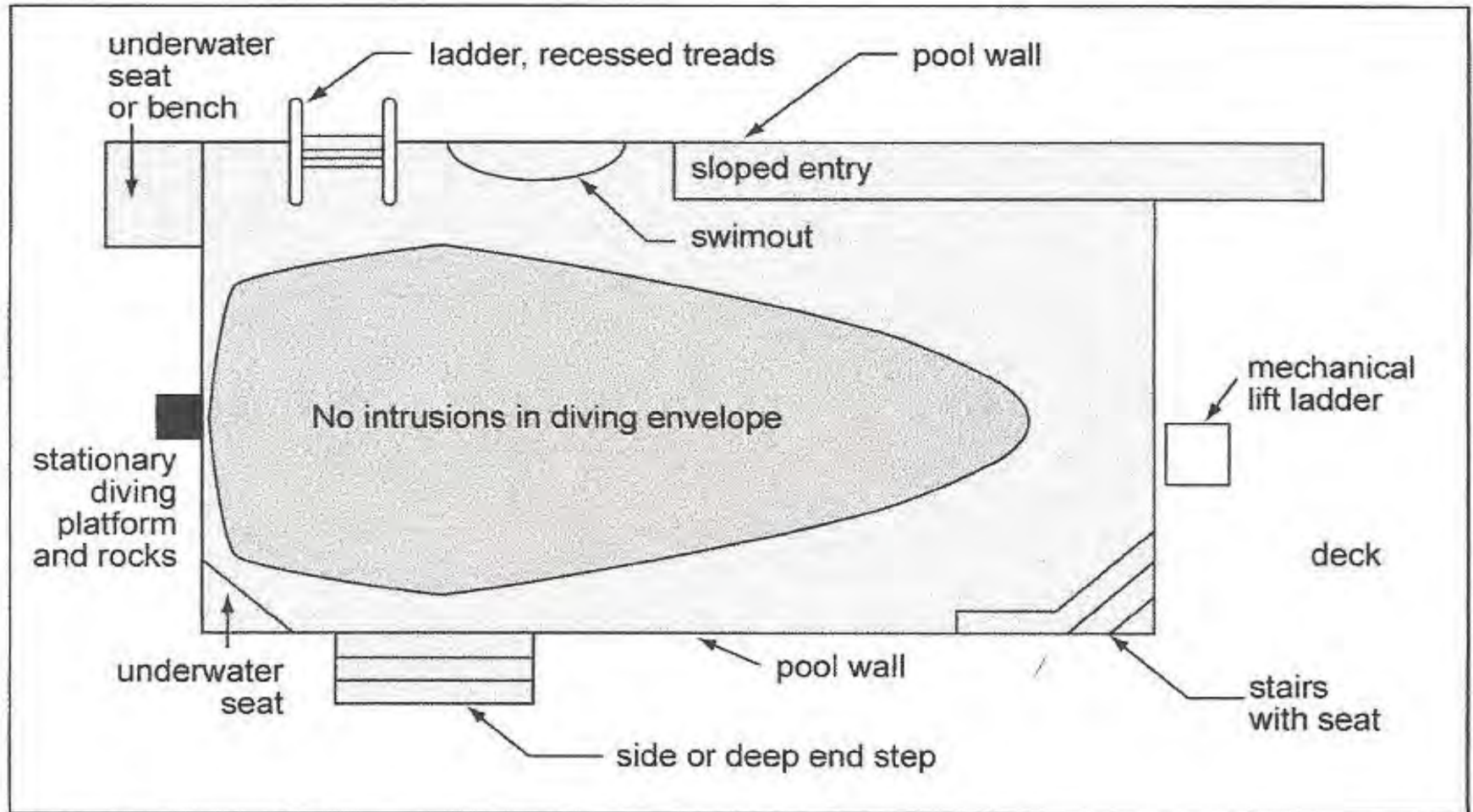
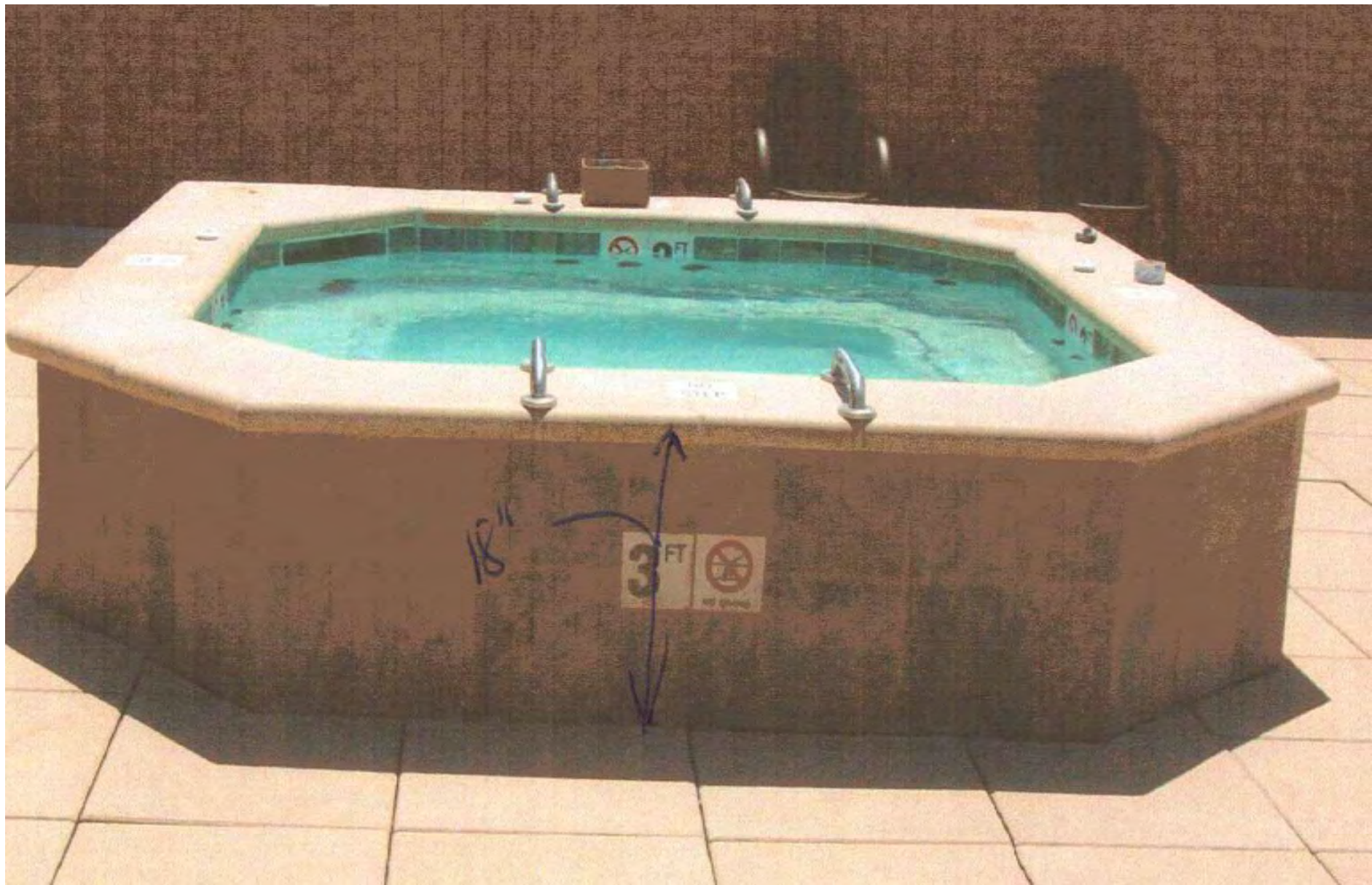


Figure 23.1.5: Minimum diving water envelope

TRANSFER WALL TO COMPLY WITH ADA



APSP 1 EXITS

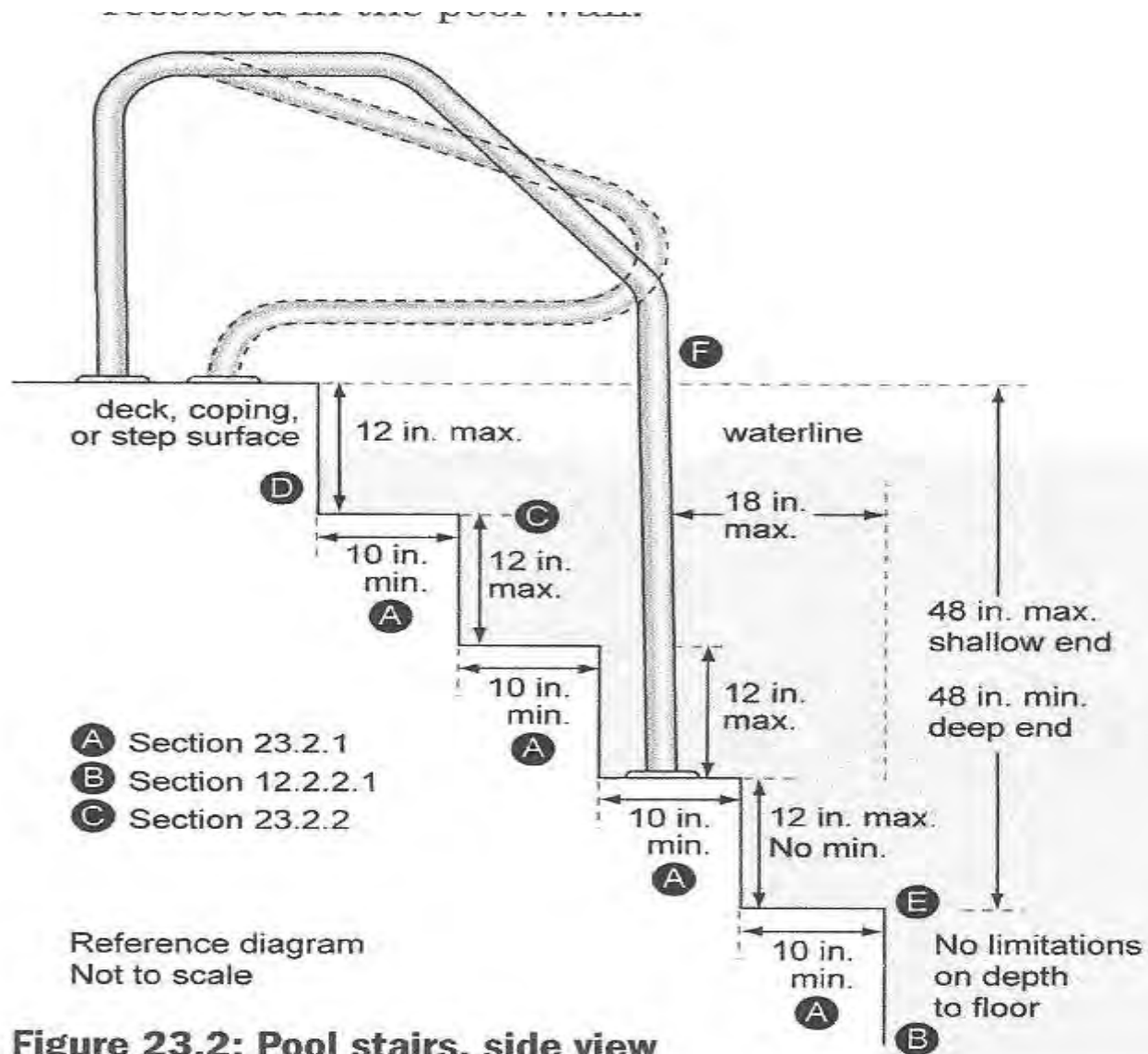


Figure 23.2: Pool stairs, side view

WHAT ABOUT HEATERS AND BOILERS

ASME certification is required for Commercial Installations, however it is not strictly controlled in many States. I have seen many HMAC installations with standard plastic header heaters. This all depends on local municipality inspector and regulatory enforcement.

- ASME stands for American Society of Mechanical Engineers and it is an old water heaters and boilers standard where commercially installed water heaters/boilers must be designed to withstand minimum 3 times rated WATER PRESSURE in the heat exchanger / manifold pressure vessel . Our heaters are rated for 50 PSI maximum operating water pressure, and we control this by installing water pressure switch. ASME inspector comes to our facility two times per week and he pressurizes our heater exchanger and manifold to 150 PSI for certain amount of time to make sure it passes ASME test. After this he provides ASME certificate with each heater he tested. We provide the copy of the certificate inside the user manual for each ASME heater.

WHAT ABOUT HEATERS AND BOILERS

CSD-1 is a BOILER STANDARD for designing BOILERS used in a CLOSED LOOP pressurized systems like in-floor heating systems. Pool and Spa heaters are EXEMPT from CSD-1 standard compliance. CSD-1 has two sections for boilers below 400,000 Btu /hr and for over 400,000 BTU/hr. BOILERS that comply with this standard MUST have certain additional safety devices installed on the heater like FLOW SWITCH (instead of pressure switch) , Temperature and Pressure Gage, in some cases circulating pump etc.

BOILER is something that is used in closed loop system where water flow is in constantly closed loop and never relieved. Example of this is in-floor heating

So Let's Recap, Why ARE We Here?

- To Talk Safety
- <https://youtube./Je293ebR5Bg>
- To work together as an Industry for solutions
- Focus on consumer awareness
- To provide critical solutions to our industry
- To provide you with accurate information about APSP 5, APSP 15, APSP 7, APSP 16

Katie Taylor Abby's Mother





Gary Gauthier

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Summary/Question & Answer/Discussion



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