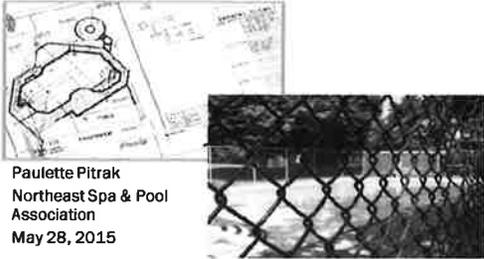


Preventing Drowning and Entrapment through Code Compliance

Connecticut Residential Code Requirements



**Preventing Drowning and Entrapment
through Code Compliance
Connecticut Residential Code Requirements**



Paulette Pitrak
Northeast Spa & Pool
Association
May 28, 2015

February 28, 2014

- ◆ 2013 Amendment to 2005 Building Code with its 2009 and 2011 Amendments
- ◆ Amendment adopts the 2009 International Residential Code and the 2011 National Electrical Code into the State Building Code
- ◆ With CT specific changes

CT State Building Code –

- 2003 International Building Code
- 2009 International Residential Code
- 2003 International Mechanical Code
- 2003 International Plumbing Code
- 2009 International Energy Conservation Code
- 2011 National Electrical Code (NFPA-70)

2009 International Residential Code

Appendix G - Swimming Pools, Spas and Hot Tubs

Appendix G - Swimming Pools, Spas and Hot Tubs

- AG 101 - General
- AG 102 - Definitions
- AG 103 - Swimming Pools
- AG 104 - Spas and Hot Tubs
- AG 105 - Barrier Requirements
- AG 106 - Entrapment Protection for Swimming Pool and Spa Suction Outlets
- AG 107 - Abbreviations
- AG 108 - Standards

2009 IRC - Appendix G

AG101 - General
Design & construction...on the lot of 1 & 2-family dwellings



Section AG 101

AG101.2 Pools in Flood Hazard Areas

AG101.2.1 Designated floodways - Documentation must be submitted which demonstrates construction will not increase flood elevation

AG101.2.2 Pools located where floodways have not been designated, must provide a floodway analysis.....will not increase flood elevation more than 1 foot....

Section AG 102 CT Change Residential Definition

- "residential" means situated on the premises of a detached one-or two-family dwelling or which is an accessory to an individual one-family townhouse.

Section AG 102

AG 102 - Definitions

Swimming Pool:

"Any structure intended for swimming or recreational bathing that contains water over 24 inches deep. This includes in-ground, above-ground, and on-ground swimming pools, hot tubs and spas."



24 inches ??



Section AG 103

AG 103 Swimming Pools

In-ground pools to be designed and constructed in conformance with ANSI/NSPI-5 as listed in AG 108 (*Standard for Residential In-ground Swimming Pools*)

Section AG 103

AG103 - Swimming Pools

AG 103.1 - In-ground Pools

Designed and constructed in conformance with ANSI/NSPI-5

(Standard for Residential In-Ground Swimming Pools)



Section AG 103

AG103 – Swimming Pools

AG 103.2 – Above-Ground and On-Ground Pools shall be designed and constructed in conformance with ANSI/NSPI-4.

(Standard for Aboveground/On-ground Residential Pools)

Section AG 103

AG103 – Swimming Pools

AG 103.3 – Pools in Flood Hazard Areas. In flood hazard areas established by Table R301.2(1), pools in coastal high hazard areas shall be designed and constructed in conformance with ASCE 24

Section AG 104

AG104 - Spas and Hot Tubs

AG104.1 Permanently installed spas and hot tubs designed and constructed in conformance with ANSI/NSPI-3 (Standard for Permanently Installed Residential Spas



Section AG 104

AG104.2 Portable spas and hot tubs

Designed and constructed in conformance with ANSI/NSPI-6

(Standard for Residential Portable Spas)



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Portable Spas and Tubs

- ◆ Important to remember that these are in a section of their own. They are seen more as an appliance and do not have the same requirements as swimming pools.
- ◆ Circulation and suction outlets are engineered by manufacturer.
- ◆ Circulation and suction outlets are engineered by manufacturer in accordance with UL 1563 Section 36 (suction openings).

APSP Standards

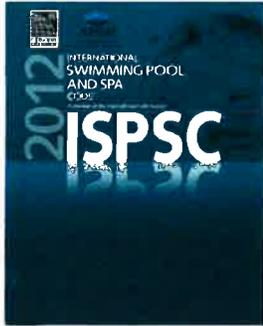


2012 ISPPC Introduction

Page 8

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New ICC Swimming Pool Code



Section AG 105

AG105 - Barrier Requirements

AG105.1 Application. Controls design to protect against drowning by restricting access.

Barriers Required to Prevent Access



AG 105 - Barrier Requirements

**AG105.2 Outdoor swimming pool
in-ground, above ground, on-ground
swimming pool, hot tub or spa**

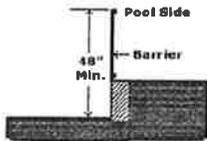
**Must comply with the following
10 items:**

Barrier Requirements – AG 105.2

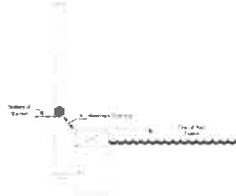
1. Height: 48" min. from outside
2" max. opening at bottom (4" above ground)
2. Openings: 4" sphere cannot pass through
3. Solid barriers: No indentations or protrusions

Barrier Requirements - AG 105.2

1.



When there is a differential in grade, the barrier height is measured on the side away from the pool.



Barrier Requirements-AG 105.2

2.



Barrier Requirements-AG 105.2

3.



Barrier Requirements – AG 105.2

3. No protrusions



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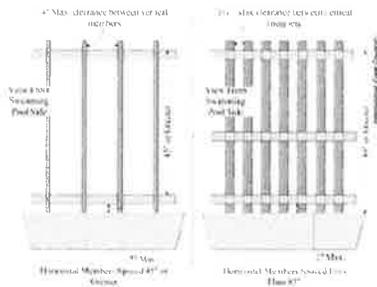
Barrier Requirements – AG 105.2

4. Horizontal & vertical members where horizontal members less than 45" apart (top to top):

Horizontal members on pool side
1-3/4" max. between vertical members

Decorative cutouts in vert. members,
1-3/4" max. openings

Section 305.2.1 Barrier height and clearance



2012 ISPPSC Introduction

Page 25

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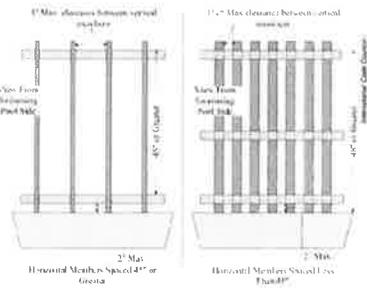
Barrier Requirements AG 105.2

5. Horizontal & vertical members where horizontal members 45" or more apart:

4" max. between vertical members

Decorative cutouts in vert. members, 1-3/4" max. openings

Section AG 105.2 4. and 5.



2012 ISPSC Introduction

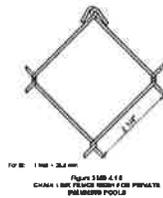
Page 25

Barrier Requirements – AG 105.2

6. Chain link dimensions

Mesh size 2-1/4" square max.

Slats fastened at top or bottom, reduce to 1-3/4"



Doesn't agree with VGB 1406 Model Code language or new ISPSC which state 1-3/4" mesh size

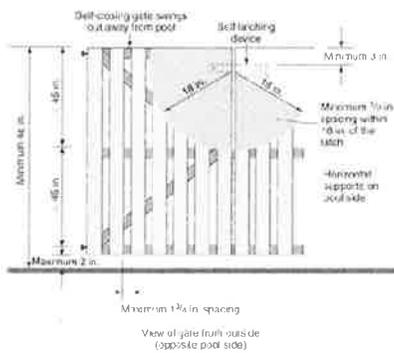
Barrier Requirements

8.



Barrier Requirements

8.



Barrier Requirements

9. Dwelling wall part of barrier

Meeting one of the following:

9.1 Powered safety cover per ASTM F1346

9.2 Doors accessing pool

Audible alarm for door & screen, 30 sec

Auto reset

Manual deactivation for single opening

Deactivation switch min. 54" high

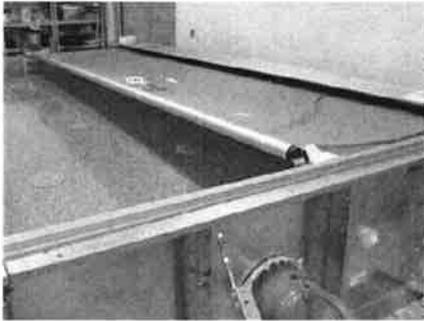
9.3 Other means of protection acceptable of protection not less than 9.1 or 9.2

Barrier Requirements

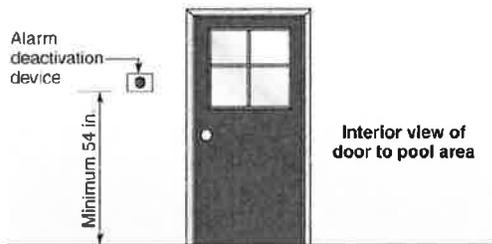
9.



9.1 Power Safety Cover



9.2



Barrier Requirements – AG 105.2

Amended in CT

10. Above-ground structure is used as barrier or mounted on structure the ladder or steps shall be surrounded by a barrier which meets 105.2, Items 1-9



Barrier Requirements – AG105.2 10.



Pool is under 48 inches



Barrier Requirements – AG 105

AG 105.3 Indoor Swimming Pools

Walls surrounding an indoor pool shall comply with AG 105.2, Item 9 (wall of dwelling serves as barrier)



Barrier Requirements – AG 105

AG105.4 Prohibited locations

Pool barriers cannot be climbable from other structures, equipment or objects



Barrier Requirements



AG 105.5 Barrier Exceptions.
Spas and hot tubs with safety cover which complies with ASTM F 1346.

AG 105.6 - Temporary Enclosure

- Must be in place prior to electrical inspection of any in-ground pool
- Min. 48" high
- 4" sphere rule
- Openings with a positive latching device



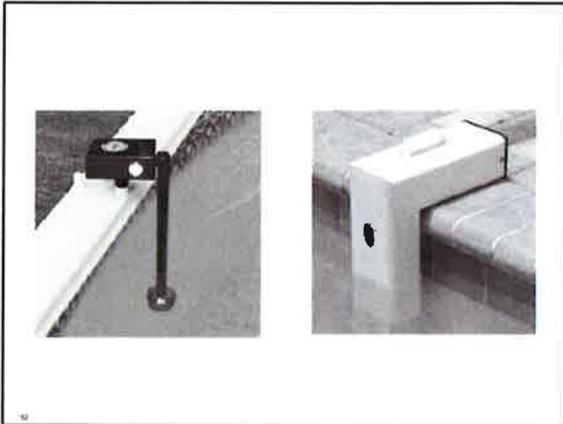
Unacceptable Temporary Enclosure



AG 105.7 – Pool Alarm

- Need for permit and for substantial alteration
- One or more families – residence
- Must be installed with pool
- 50 db alarm when 15 lbs or more enters pool

**Exception: Hot tubs & portable spas exempt



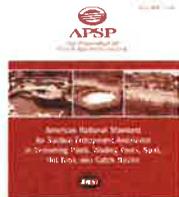
2009 IRC - Appendix G

AG106 - Entrapment Protection for Swimming Pool and Spa Suction Outlets

AG106.1 General. Suction outlets shall be designed and installed in accordance with ANSI/APSP-7. (2006)

AG 106 Entrapment Avoidance

106.1 Suction outlets shall be designed and installed in accordance with ANSI/APSP-7.



ANSI/APSP-7 Table of Contents

1. Scope
2. Normative references (to other standards)
3. Definitions
4. General requirements for suction entrapment avoidance systems and components
5. New construction
6. Existing pools and spas
7. Vacuum release systems

Section 1. Scope

- 1.1 General. This standard covers design and performance criteria for circulation systems including components, devices, and related technology installed to protect against entrapment hazards in residential and public swimming pools, wading pools, spas, hot tubs, and catch basins, hereinafter referred to as "pools and spas."

Section 1.2 Alternative Methods

The provisions of this standard are not intended to prevent the use of any alternative material, system, or method of construction, provided any such alternative meets the intent and requirements of this standard and is approved by the authority having jurisdiction.

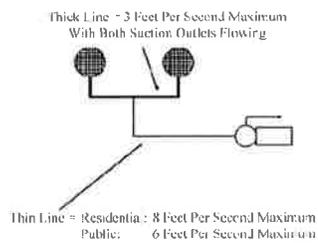
Section 1.3 Exception

Commercial water parks and their associated suction systems are outside the scope of the standard.

Section 4. General Requirements

- 4.1 Codes
- 4.2 Electrical components
- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.4 Water Velocity

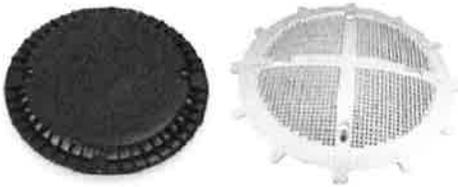


Section 4. General Requirements

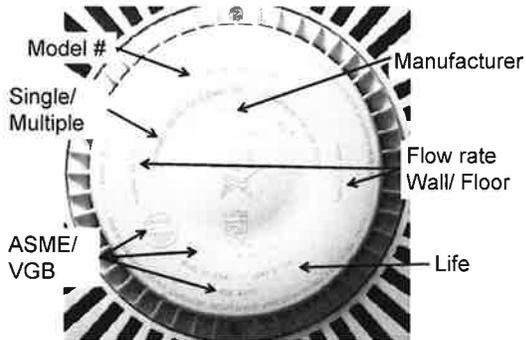
- 4.1 Codes
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- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.5 Listed Suction Outlets

Must comply with AMSE/ANSI A112.19.8



How to Tell if Cover Complies



CPSC Voluntary Drain Cover Recall

May 2011 and revised March 2012

Remedy:

Pool owners/operators and consumers who have one of the recalled pool or spa drain covers should immediately contact the manufacturer to receive a replacement or retrofit, depending on their make and model.

Except for kiddie pools, wading pools and in-ground spas, retrofit or replacement of installed covers are not required in pools with multiple drain systems or gravity drainage systems or for covers installed before December 19, 2008.

Section 4. General Requirements

- 4.1 Codes
- 4.2 Electrical components
- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.6 Min. Flow Rating for Each Cover

In dual and multiple submerged suction outlets (drains) each outlet must have the ability to handle 100% of the system's flow rate.

Check maximum flow rate capacity for each cover for submerged outlets (wall and floor).

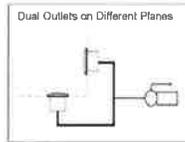
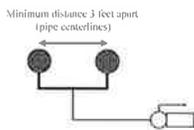
Section 4. General Requirements

- 4.1 Codes
- 4.2 Electrical components
- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.7 Dual Cover/Grate Separation

Separated by a minimum of 3 feet (center to center) of suction pipes, or

Located on two different planes
(bottom/vertical wall) (separate vertical walls)

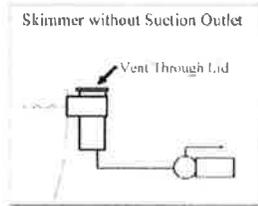


Section 4. General Requirements

- 4.1 Codes
- 4.2 Electrical components
- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.8 Skimmers

Vented to atmosphere through openings in lid, through a separate vent pipe, or incorporate an equalizer line

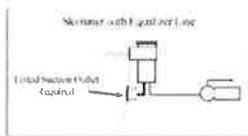


Section 4.8 Skimmers

Section 4.8.1

Equalizer lines, when used, shall be located on the wall with the center no more than 18 inches below the maximum operating level.

Protected by a listed suction outlet cover/grate



Section 4. General Requirements

- 4.1 Codes
- 4.2 Electrical components
- 4.3 DANGER
- 4.4 Water velocity
- 4.5 Listed suction outlets
ASME/ANSI A112.19.8
- 4.6 Minimum flow rating for each cover/grate
- 4.7 Dual cover/grate separation
- 4.8 Skimmers
- 4.9 Wall vacuum fittings

Section 4.9 Wall Vacuum Fittings

When used, vacuum cleaner fitting(s) shall be located in an accessible position(s) at least 6 inches and no greater than 18 inches below the water level and the self closing, self latching fitting shall comply with IAPMO SPS 4.

In addition the vacuum piping shall be equipped with a valve to remain in the closed position when not in use.

Section 5. New Construction

- 5.1 General
- 5.2 Submerged suction outlets are optional
- 5.3 Dual outlets
 - 5.3.2 Dual outlet separation
- 5.4 Three-or-more outlets
- 5.5 Single unblockable suction outlet
- 5.6 Single outlet swim jet system

Section 5. New Construction

- 5.7 Single outlet - alternative suction system
- 5.8 Gravity flow systems
 - 5.8.6 Fully submerged gravity outlet
 - 5.8.7 Partially submerged gravity outlet
- 5.9 Outlet sumps in series
- 5.10 Other means. See 1.2

Suction Outlets (Main Drains)

ICC codes and Pool and Spa Safety Act refers to main drains, but new language is submerged suction outlets

Section 5.2 Submerged Outlets Optional

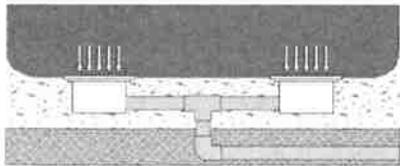
Pools without main drains

Skimmers or overflow systems must provide for 100 % of required system flow

Section 5.3 Dual Outlets

Listed outlets

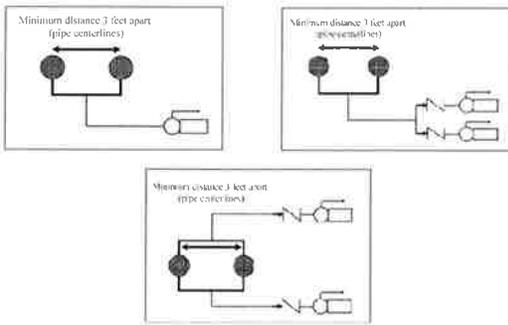
Tee feeding from common line between the suction outlets shall be located approximately midway between the outlets



Dual Outlets



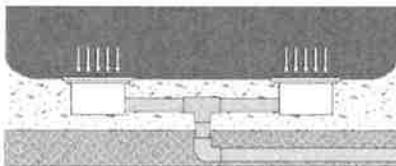
Section 5.3 Dual Outlets



Section 5.3 Dual Outlets

5.3.1

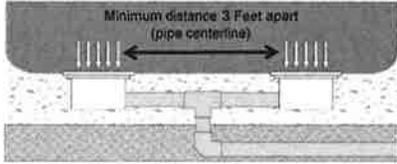
Flow rating of each cover/grate shall be at least equal to the system's maximum flow rate



Section 5.3 Dual Outlets

5.3.2 Dual outlet separation

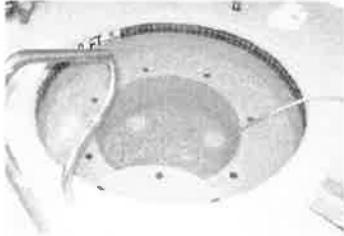
Minimum of 3 feet measured from center to center of the suction pipe. Or located on separate planes.



Section 5.3 Dual Outlets

5.3.2 Dual outlet separation

Minimum of 3 foot of separation measured center to center of the suction pipes

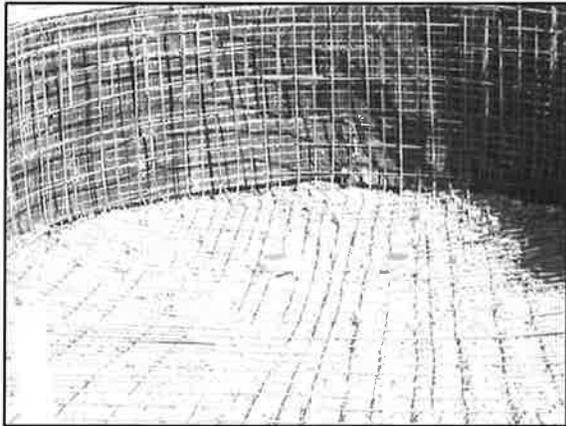


Section 5.3 Dual Outlets

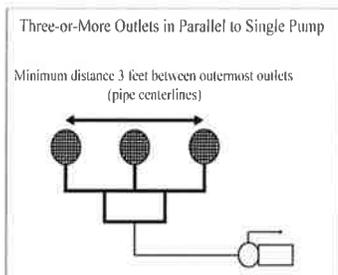
5.3.2 Dual outlet separation

Can be on different planes

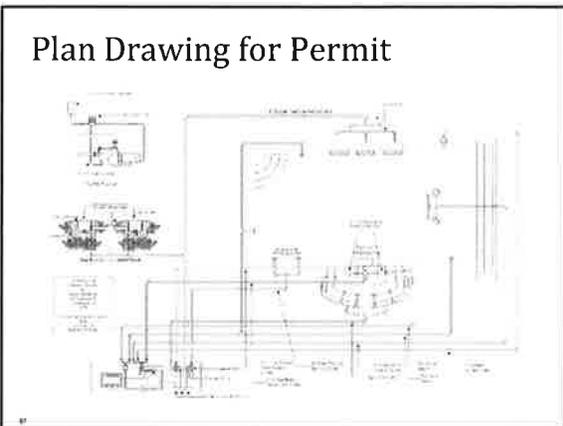




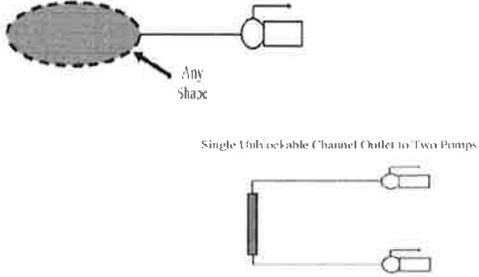
Section 5.4 Three or More Outlets



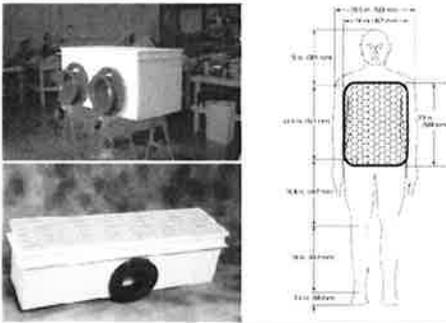
Plan Drawing for Permit



Section 5.5 Single Unblockable Suction Outlet



Section 5.5 Single Unblockable Suction Outlet



Section 5.6 Single Outlet Swim Jet System



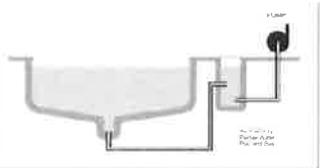
Section 5.7

Single Outlet – Alternative Suction System

11

Section 5.8 Gravity Flow Systems

- Flow from a pool or spa to a vented reservoir may be partially or fully submerged
- 5.8.6 Fully submerged gravity outlet
- 5.8.7 Partially submerged gravity outlet



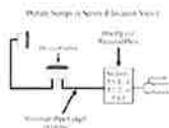
12

Section 5.9 Outlet Sumps in Series

Must have listed suction outlet covers/ grates

Between outlet and pump there shall be one of the listed options:

- One additional suction outlet located a min. of 18 inches from the tee in the suction line to the pump(s); or
- An engineered vent system (7.2); or
- Listed SVRS in accordance with 7.1



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Section 7 Vacuum Release Systems

NOTE: All vacuum release systems shall be tested on a single suction outlet with a listed safety cover in place. These devices/systems are not considered "backup" systems as there is no known suction vacuum release system that will completely protect against four of the five known hazards and presenting vacuum release systems as "backup" systems would promote a false sense of security among the users of these devices/systems.

2009 IRC Appendix G

AG 107 Abbreviations (new)

APSP - Association of Pool and Spa Professionals

ASCE - American Society of Civil Engineers

2009 IRC Appendix G

AG 108 Standards (new)

ANSI/APSP-7-06 Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs and Catch Basins

ASCE/SEI-24-05 Flood Resistant Design and Construction

QUESTIONS?

THANK YOU!

**Supplemental Material on
Swimming Pool Flow Rates
and Velocity**

**Velocity and
Flow Rate Review**

Velocity and Rate of Flow

Velocity is stated in feet per second (fps)

Rate of flow is stated in gallons per minute (gpm)

The quantity of water traveling through the circulation system is referred to as the gallons per minute and the speed (velocity) of the water is calculated in feet per second.

Velocity and Rate of Flow

GPM is increased or decreased by horse power of pump

FPS is increased or decreased by the size of the piping and/or open area water is flowing through

Velocity and Rate of Flow

Recommended maximum velocity:

6 fps public pools/8 fps residential pools*

3 fps in branch piping during normal operation; 6 fps in branch suction piping when one of a pair is blocked*

Do not exceed these recommended maximums—

- › Risk of suction entrapment
- › Would erode pipe and fittings

* ANSI/APSP-7 Standard for Suction Entrapment Avoidance

Velocity and Rate of Flow

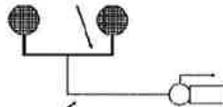
The open area of a main drain cover will vary from manufacturer to manufacturer, but will be listed in the specifications for each cover.

Each cover will also list the maximum gallons safely permitted through the cover

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Water Velocity

Thick Line = 3 Feet Per Second Maximum
With Both Suction Outlets Flowing



Thin Line = Residential: 8 Feet Per Second Maximum
Public: 6 Feet Per Second Maximum

Maximum System Flow Rate

The maximum system flow rate shall be determined by one of the following:

- TDH calculation for the circulation system of each pump; or
- Simplified TDH calculation (see definition); or
- The maximum flow capacity of the new or replacement pump,

which shall be limited by the criteria of the maximum velocity requirements

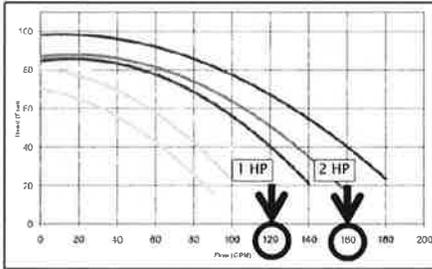
The Calculations

Total dynamic head (TDH): The sum of all resistances in a complete operating system (pipe, fittings, valves, filter, heater, etc.)

Simplified TDH calculation: A method of determining the maximum system flow rate using hydraulic calculations based on the lowest possible total dynamic head (TDH) for a circulation system. For example, using the shortest distance between the pool and the pump, omitting the calculations for fittings/valves, and using the best performance ratings for filters and heaters.

Maximum System Flow

Using Maximum Pump Flow is Most Conservative



The Process for the Contractor

- 1) Determine the pool (spa) volume in gallons.
- 2) Determine the required (or desired) flow rate in gpm.
- 3) Size piping based on achieving the specified flow rate and velocities
- 4) Calculate the Resistance in the system (TDH)
- 5) Select pump using pump curve to deliver the specified flow rate

Verify velocity with plans submittal

Builder specifies flow rate & pipe size with plans submittal.
Chart shows pipe size required per flow rate specified.

Pipe Size	6 fps (branch)	8 fps (trunk)	10 fps (return)
Sch. 40 PVC	GPM	GPM	GPM
1½ in.	38	51	64
2 in.	63	84	105
2½ in.	90	119	149
3 in.	138	184	230
4 in.	238	317	397
6 in.	540	720	900

Verify Covers With Plans and/or Inspection

Permit application can include the Manufacturer, make and model of the drain covers, including the flow ratings.

You may require the covers to be on site at one of the inspection phases. They will have the following language embossed on them or permanently marked in a location that is visible when installed.

Verify Covers With Plans and/or Inspection

Confirm:

- ASME A112.19. 8 2007
- Flow rating "X GPM" appropriate,
- Designed for location (floor/wall)
- Life: "X Years", and
- Manufacturer and Model.

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.

Field inspection; for field fabricated sumps, measure from top of pool shell floor to top of suction pipe.
