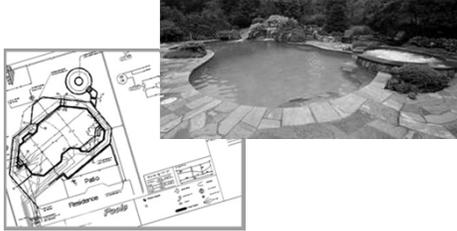


## Connecticut Residential Code Requirements for Pools & Spas



Career Development Seminar for Building Officials  
Prepared for State DAS / DCS / Office of Education & Data Management  
February 2014

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### 2005 Connecticut State Building Code

2014 Amendment (pending – February 28, 2014)

- **2003 International Building Code**
- **2009 International Residential Code**
- 2003 International Existing Building Code
- 2003 International Mechanical Code
- 2003 International Plumbing Code
- 2009 International Energy Conservation Code (*adopted with changes-effective Oct 1, 2011*)
- ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
- 2011 National Electrical Code (NFPA-70)




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### 2016 State Building Code?

2012 International Swimming Pool & Spa Code  
 2012 IBC  
 2012 IRC  
 etc




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### 2009 International Residential Code 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




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### 2009 IRC - Appendix G

AG101 - General

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



Pool SAFETY

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### 2009 IRC - Appendix G

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....

Pool SAFETY

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### Pool in flood hazard area



Pool SAFETY

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### 2009 IRC - Appendix G

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.



Pool SAFETY

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### 2009 IRC - Appendix G

AG 102 - Definitions

#### Residential (*amended*)

Situated on the premises of a detached one- or two-family dwelling or which is accessory to an individual one-family townhouse for the exclusive use of its residents and invited guests.

Pool SAFETY

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### Townhouse swimming pool



Pool SAFETY

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24 inches ??



Pool SAFETY

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## 2009 IRC - Appendix G

### AG103 - Swimming Pools

#### AG 103.1 - In-ground Pools

Designed and constructed in conformance with ANSI/NSPI-5 (or ANSI/APSP-5)

*Standard for Residential In-Ground Swimming Pools*



Pool SAFETY

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## ANSI/APSP-5

### 4 Structural Design

4.1 The structural design and materials used shall be in accordance with generally accepted engineering practices and methods.

*Compare to:*

2003 IBC 3109.9 - Pool structure

The pool structure shall be engineered and designed to withstand the expected forces to which the pool will be subjected.

Pool SAFETY

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**ANSI/APSP-5**

5 Pool Dimensions and Tolerances

- Maximum slope of walls
- Floor slopes
- Diving equipment and minimum water envelope
- Diving platforms




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**ANSI/APSP-5**

6 Entry / Exit

6.1 Required at shallow end if water deeper than 24".

6.1.1 Required at deep end if water depth 5 ft or more.

6.2.1 Treads 10" min., 240 sq in min.

6.2.1.1 If handrail provided, tread can be 8"

6.2.1.1.1 Bottom riser height can vary




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**ANSI/APSP-5**

6 Entry / Exit

6.2 Riser heights can vary but no exceed 12".

6.2.2.1 Coping to top tread not to exceed 12".

6.2.2.2 When stairs in over 48" deep water, bottom tread must be min. 48" below deck, visually set apart, located outside wall of pool.




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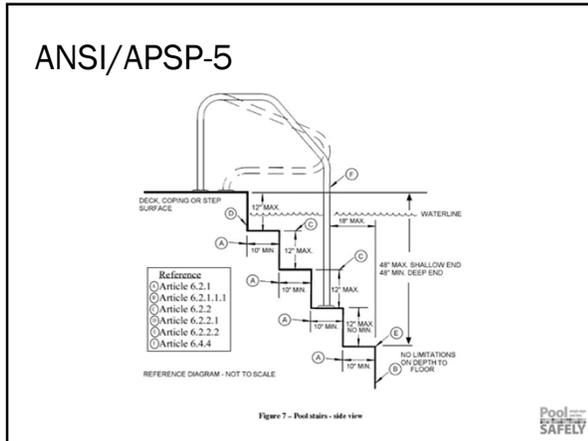
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**ANSI/APSP-5**

6.3 Shallow end detail for beach & sloping entries



Pool SAFETY

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**ANSI/APSP-5**

6.4 Handrails  
6.5 Pool ladder design & construction  
6.6 Recessed treads  
6.7 Underwater seats, benches &

Pool SAFETY

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**ANSI/APSP-5**

**7 Decks**

7.1 General requirements  
7.2 Drainage  
7.3 Concrete decks  
7.4 Wood decks  
7.5 Stone, brick, brick pavers, concrete pavers and tile decks  
7.6 Deck steps

Pool SAFETY

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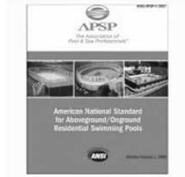
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## 2009 IRC - Appendix G

### AG103 – Swimming Pools

**AG 103.2** – Above-Ground and On-Ground Pools shall be designed and constructed in conformance with ANSI/NSPI-4 (or ANSI/APSP-4)

*Standard for Aboveground/  
Onground Residential  
Swimming Pools*



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### Onground



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### Aboveground



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### 2009 IRC - Appendix G

#### 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



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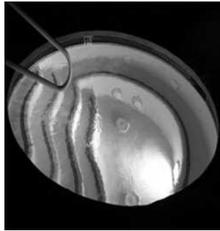
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### 2009 IRC - Appendix G

#### 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)



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### 2009 IRC – Appendix G

#### 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 category 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).



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### 2009 IRC - Appendix G

#### AG105 - Barrier Requirements

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



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### Barriers Required to Prevent Access



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### Barrier Requirements – AG 105

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

Must comply with the following 10 items:



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### Barrier Requirements – AG 105.2

1. Height: 48" min. from outside  
2" max. opening at bottom (4" above ground)
2. Openings: 4" sphere
3. Solid barriers: No indentations or protrusions



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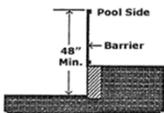
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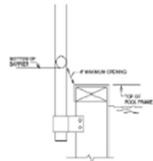
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### Barrier Requirements – AG 105.2

1.



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



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Barrier Requirements-AG 105.2

2.



Pool SAFETY

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Barrier Requirements-AG 105.2

3.



Pool SAFETY

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Barrier Requirements - AG 105.2

3. No protrusions



Pool SAFETY

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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



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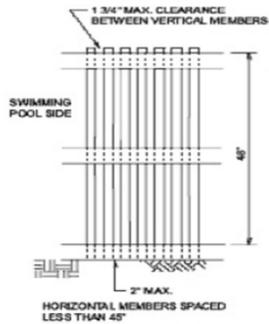
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### Barrier Requirements – AG 105.2

4.



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### 2009 IRC - Appendix G

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



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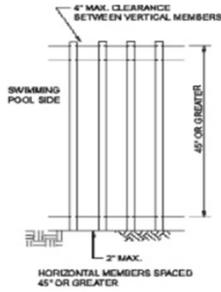
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### Barrier Requirements – AG 105.2

5.




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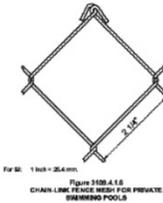
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### Barrier Requirements – AG 105.2

6. Chain link dimensions  
Mesh size 2-1/4" square max.

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



For 1/2" - 2 1/4" mesh  
Figure 2-108 A.1.6  
CHAIN-LINK FENCE MESH FOR PRIVATE SWIMMING POOLS

*Doesn't agree with VGB 1406 Model Code language which states 1-3/4" mesh size*




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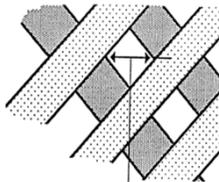
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### Barrier Requirements

7. Diagonal members:  
1-3/4" maximum openings



Barriers formed of diagonal members shall not have openings larger than 1 3/4" (44mm)




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### Barrier Requirements

- 8. Access gates:
  - Comply with 1 - 7
  - Accommodate a locking device
  - Open outward
  - Self-closing, Self-latching
  - Other gates self-latching
  - Release mechanism less than 54" high:
    - Pool side, at least 3" below top of gate,
    - No opening greater than 1/2" within 18"




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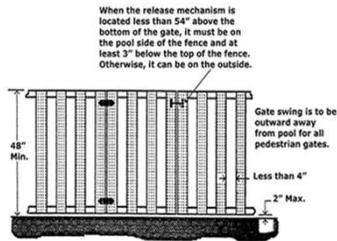
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### Barrier Requirements

8.



All pool gates must be self-latching and equipped with locking devices. Pedestrian gates must also be self-closing.

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### 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




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### Barrier Requirements

9.



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### Power Safety Cover



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### Barrier Requirements

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



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### Barrier Requirements



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### Pool is under 48 inches



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### 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)



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### Barrier Requirements – AG 105

#### AG105.4 Prohibited locations

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



Pool SAFETY

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### Barrier Requirements



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

Pool SAFETY

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### 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



Pool SAFETY

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### AG 105.7 – Pool Alarm

Be on building 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

Exempt: Hot tubs & portable spas



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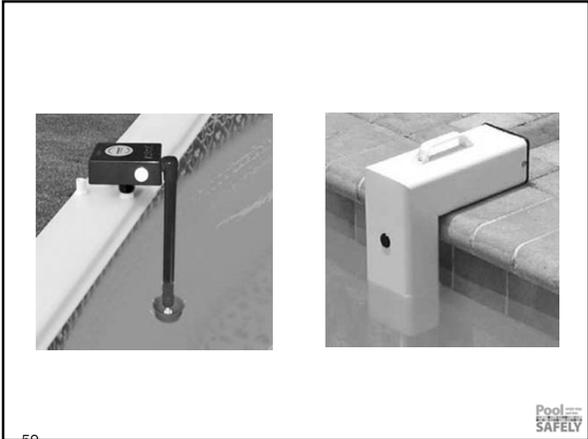
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### 2009 IRC - Appendix G

#### 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)



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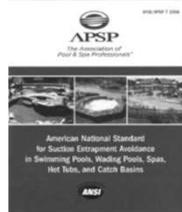
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## AG 106 Entrapment Avoidance

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



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## 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



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## 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."



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### 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.



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### Section 1.3 Exception

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



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### 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



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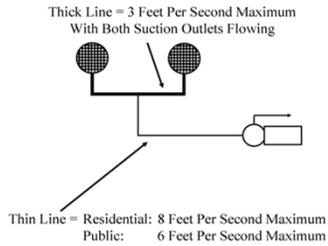
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### Section 4.4 Water Velocity



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### 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



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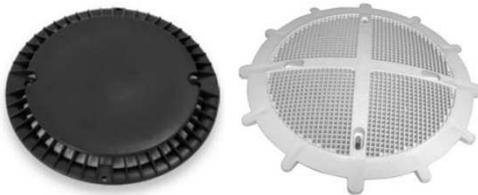
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### Section 4.5 Listed Suction Outlets

Must comply with AMSE/ANSI A112.19.8



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### 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




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### 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).




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### 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




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### 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)




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### 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




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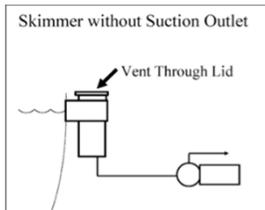
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### Section 4.8 Skimmers

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




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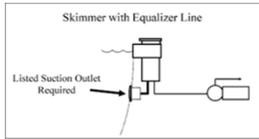
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### Section 4.8 Skimmers

#### 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



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### 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



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### 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.



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### 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




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### 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




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### Suction Outlets (Main Drains)

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




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### Section 5.2 Submerged Outlets Optional

Pools without main drains

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



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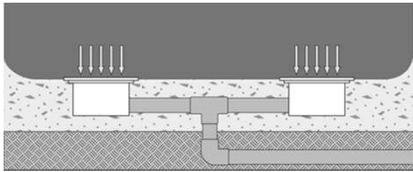
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### Section 5.3 Dual Outlets

Listed outlets

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



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### Dual Outlets



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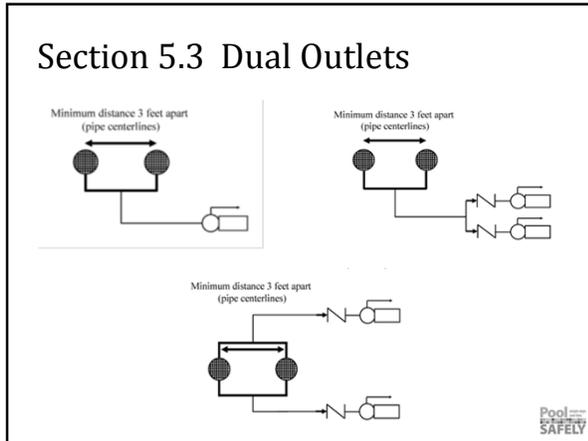
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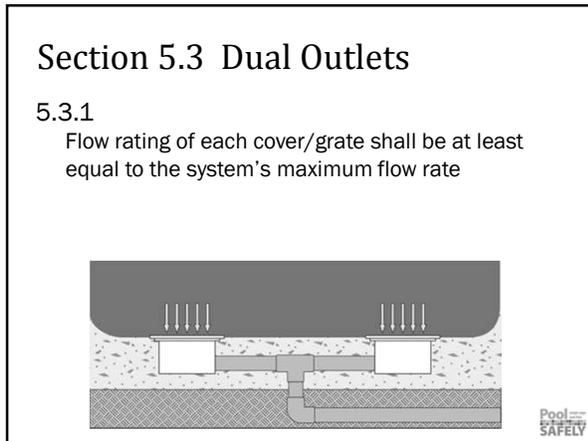
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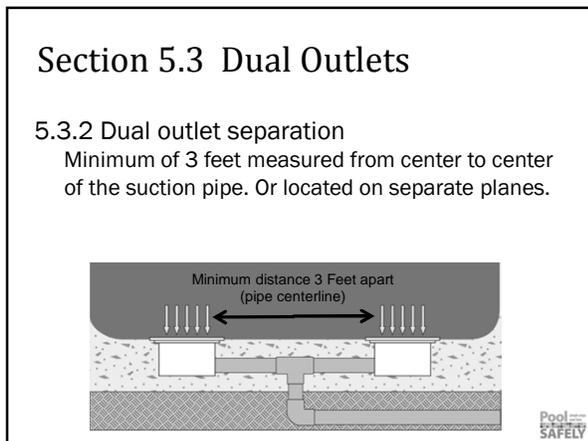
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### Section 5.3 Dual Outlets

#### 5.3.2 Dual outlet separation

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



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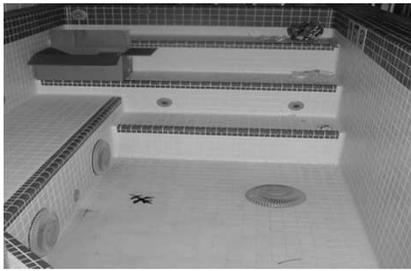
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### Section 5.3 Dual Outlets

#### 5.3.2 Dual outlet separation

Can be on different planes



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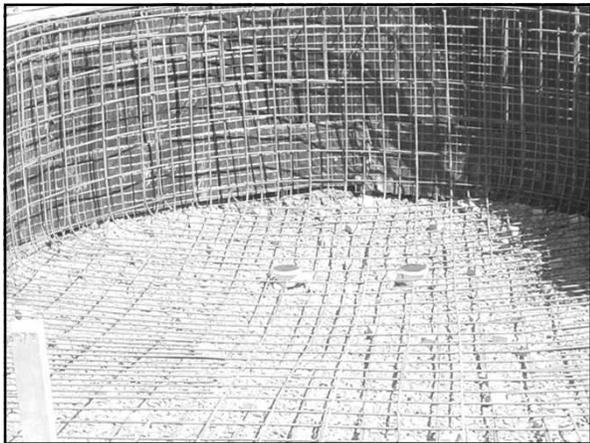
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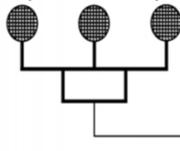
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### Section 5.4 Three or More Outlets

Three-or-More Outlets in Parallel to Single Pump

Minimum distance 3 feet between outermost outlets (pipe centerlines)



Pool SAFETY

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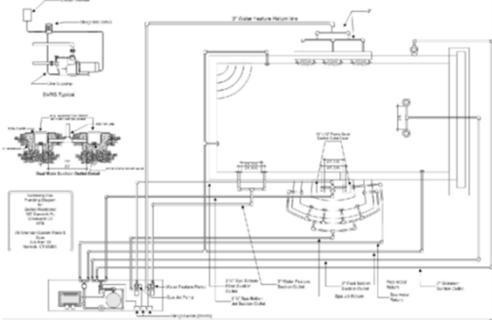
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### Plan Drawing for Permit



Pool SAFETY

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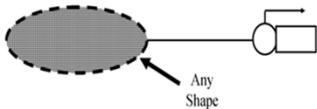
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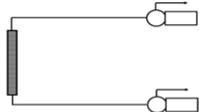
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### Section 5.5 Single Unblockable Suction Outlet



Single Unblockable Channel Outlet to Two Pumps



Pool SAFETY

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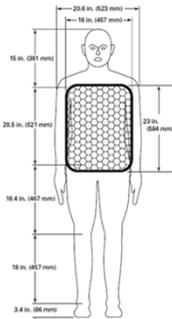
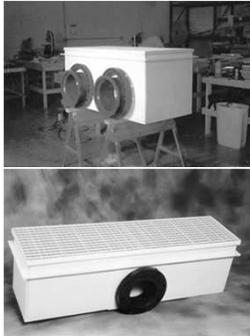
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### Section 5.5 Single Unblockable Suction Outlet



Pool SAFETY

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### Section 5.6 Single Outlet Swim Jet System



Pool SAFETY

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### Section 5.7 Single Outlet - Alternative Suction System

Pool SAFETY

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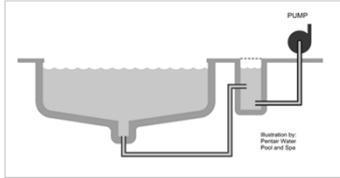
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### Section 5.8 Gravity Flow Systems

- 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




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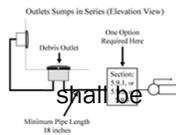
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### Section 5.9 Outlet Sumps in Series

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.




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## 2009 IRC Appendix G

AG 107 Abbreviations (new)

APSP - Association of Pool and Spa Professionals

ASCE – American Society of Civil Engineers



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## 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



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## ANSI/NSPI (APSP) Standards



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**Resources**  
Northeast Spa & Pool Association – NESPA  
[www.nespspool.org](http://www.nespspool.org)  
609-689-9111  
Association of Pool & Spa Professionals  
[www.apsp.org](http://www.apsp.org)  
Consumer Product Safety Commission  
Virginia Graeme Baker Pool & Spa Safety Act  
[www.poolsafely.gov](http://www.poolsafely.gov)



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**Questions?**

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**Thank You!**

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Supplemental Material on  
Swimming Pool Flow Rates and  
Velocity

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Velocity and  
Flow Rate Review

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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.



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### 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



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### 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



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### 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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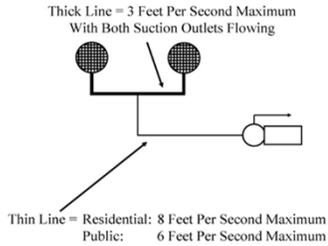
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## Water Velocity




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## 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




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## 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.




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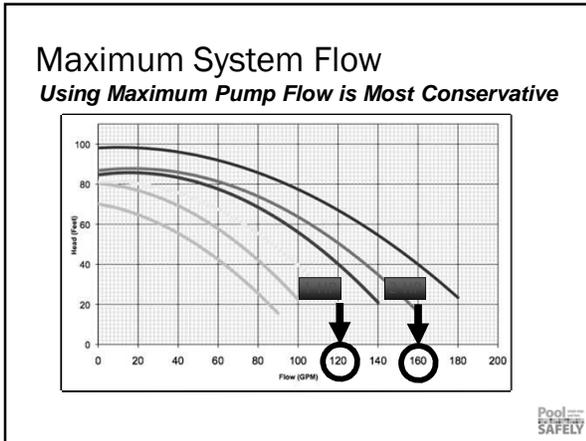
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- ### The Process for the Contractor
- 1) Determine the pool (spa) volume in gallons.
  - 2) Determine the required (or desired) flow rate in gpm.
  - 3) Size piping based on achieving the specified flow rate and velocities
  - 4) Calculate the Resistance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

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### 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

Pool SAFELY

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### 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.



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### 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.



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### 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.



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