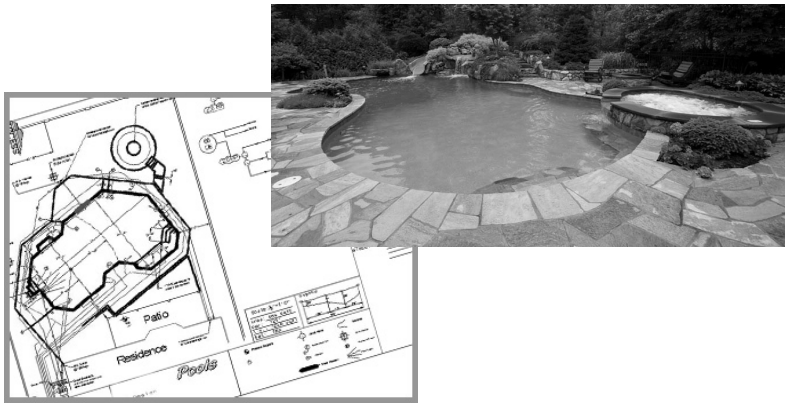
Connecticut Residential Code Requirements for Pools & Spas



Career Development Seminar for Building Officials
Prepared for State DAS / DCS / Office of Education & Data Management
January 2015

Milton Gregory Grew, AIA
architect – building official

Director of Inspections & Permits
Town of East Hartford

Connecticut Code Consultants
www.ctbuildingcodes.com

Grew Design Inc
www.grewdesign.com

Pool SAFELY

Milton Gregory Grew, AIA
architect – building official

Mobile 203-217-1074

Email
mggrew@grewdesign.com

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)**

2015 State Building Code?

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

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

2009 IRC - Appendix G

AG101 – General

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

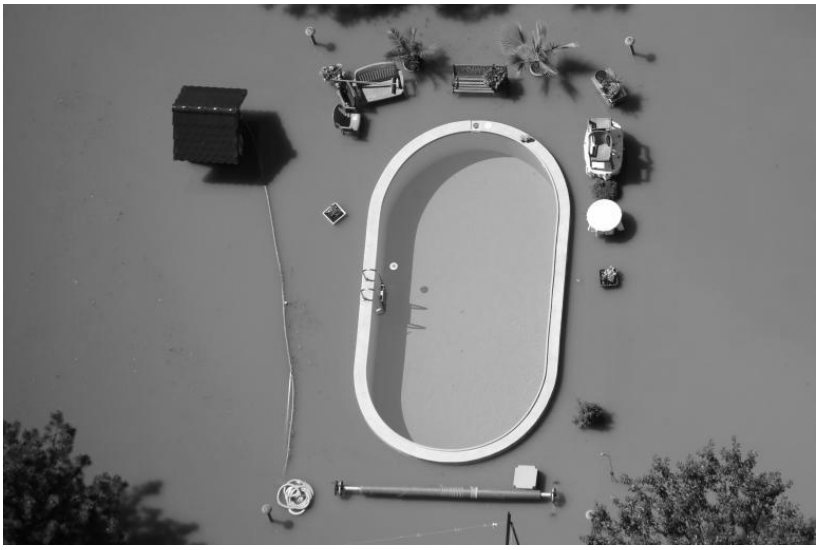
2009 IRC - Appendix G

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 in flood hazard area



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.

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.

Townhouse swimming pool

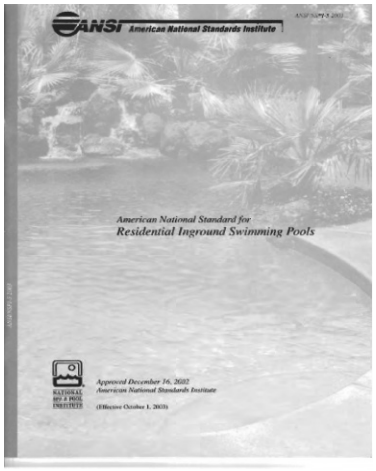
2009 IRC - Appendix G

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



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.

ANSI/APSP-5

5 Pool Dimensions and Tolerances

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

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

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.

ANSI/APSP-5

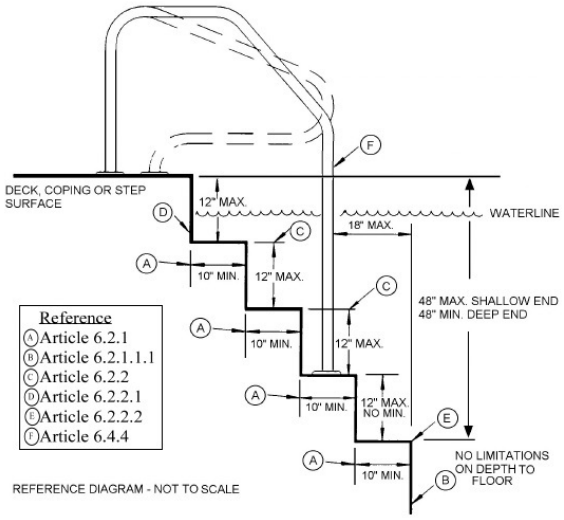


Figure 7 – Pool stairs - side view

Entry / Exit

Pool SAFELY simple steps save lives

Entry / Exit

Pool SAFELY simple steps save lives

ANSI/APSP-5

6.3 Shallow end detail for beach & sloping entries

ANSI/APSP-5

6.4 Handrails

6.5 Pool ladder design & construction

6.6 Recessed treads

6.7 Underwater seats, benches & swimouts

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

ANSI/APSP-5

8 Materials of construction & finishes

9 Circulations systems components & related equipment

10 Water supply

11 Waste water disposal

12 Chemical feeders & ozone generators

13 Electrical rqmts (adopted NEC)

ANSI/APSP-5

14 Instructions for the circulation system, pressure filters & separation tanks

15 Safety features

Appendix I Entrapment avoidance

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

Above-ground

Pool SAFELY simple steps save lives

On-ground

Pool SAFELY simple steps save lives

ANSI/APSP-4

1 Scope

1.1 Design, manufacturing, testing, care & use

1.2 For swimming & wading only. No diving boards, slides or other equipment to be added.

ANSI/APSP-4

3 Codes & compliance

3.2 Any after market or home-built deck, if allowed by manufacturer, shall comply with local code, including load capacity & fencing.

3.3 All decks shall meet local codes & comply with most recent ANSI/APSP-8.

ANSI/APSP-4

6 Pool & component design

Pool manufacturer responsible for structural design & materials

Component manufacturers responsible to ensure components can be protected from damage due to freezing

Vinyl liner manufacturer responsible for brittleness, winterization and thickness

ANSI/APSP-4

7 Instructions & responsibilities

Manufacturers responsible to provide written instruction manuals

7.1.6 Manufacturers shall advise homeowners that the installation must comply with local codes & may require permits for building, electrical, zoning, etc

7.2.3 Must advise that a barrier is necessary

7.3 Installer responsible to follow regulations on setback, barriers, devices, and other conditions.

ANSI/APSP-4

10 Raised decks & fencing

- LL 40 PSF
- Slip resistant
- Guards sim. to IRC

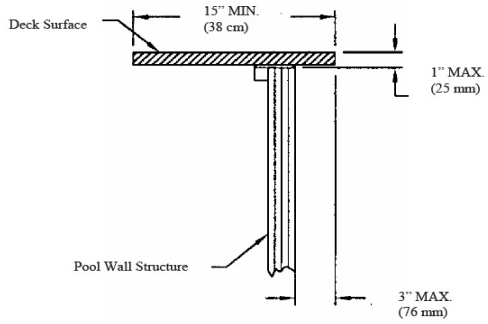


Figure 9 – Typical cantilever deck support

ANSI/APSP-4

11.10 Return inlets & suction outlets

References ANSI/APSP-7 2006 for suction entrapment avoidance

2009 IRC - Appendix G

AG103 – Swimming Pools

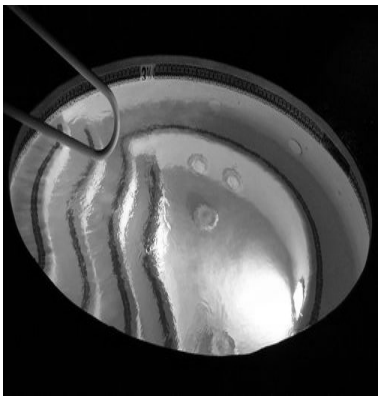
AG 103.3 – Pools in Flood Hazard Areas. In flood hazard areas established by Table R301.2(1), pools in coastal high hazard areas shall be designed and constructed in conformance with ASCE 24

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*)



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)

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 in accordance with UL 1563 Section 36 (suction openings).
- UL 1563 - Electric Spas, Equipment Assemblies, and Associated Equipment

2009 IRC - Appendix G

AG105 - Barrier Requirements

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

Barriers Required to Prevent Access

State Bldg Code Interpretation I-22-12

Question:

Would the installation of a replacement fence for an existing swimming pool that is a required barrier under Section AG105.2 require a building permit? I realize that Section R105.2 would normally exempt most fences from the permit requirement.

Answer:

Yes. Section AG105, of the 2003 International Residential Code portion of the 2005 State Building Code, controls the design of barriers for residential swimming pools, spas and hot tubs in order to provide protection against potential drowning by restricting access to swimming pools, spas and hot tubs. If someone were to use a fence as a "barrier", then Section R105.2, of the above code, would not apply and a building permit would be required for the barrier.

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:

Barrier Rqmts – AG 105.2

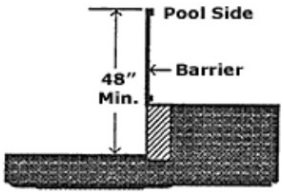
1. Height: 48" min. from outside
   2" max. opening at bottom (4" above ground)

2. Openings: 4" sphere

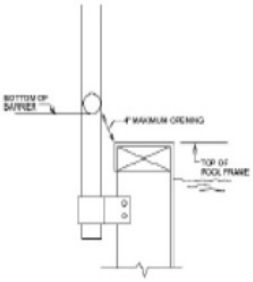
3. Solid barriers: No indentations or protrusions

Barrier Rqmts – 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

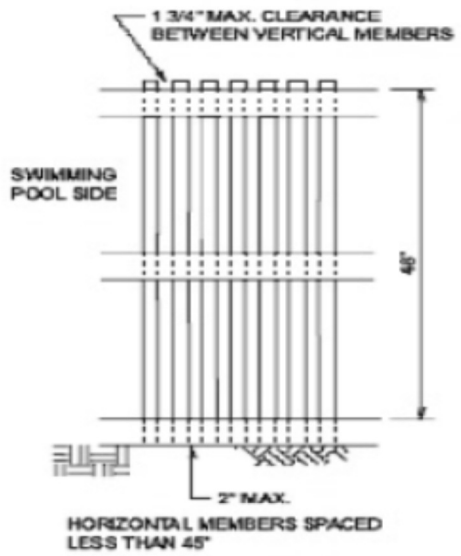
Barrier Requirements –AG105.2

4. Horizontal & vertical members where horizontal members less that 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

Barrier Requirements – AG105.2

4.



Barrier Requirements – AG105.2

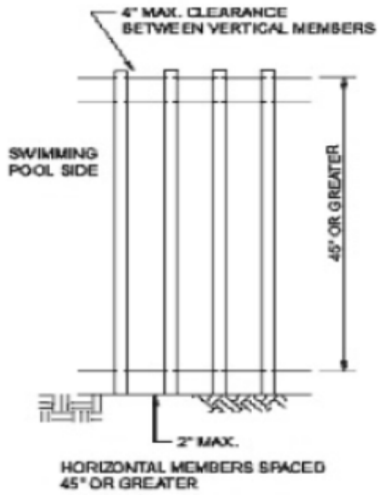
5. Horizontal & vertical members where horizontal members 45" or more apart:

4" max. between vertical members

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

Barrier Requirements – AG105.2

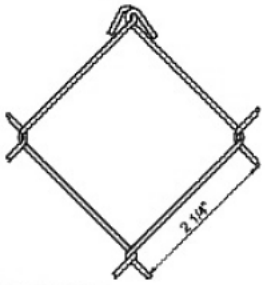
5.



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 SI: 1 inch = 25.4 mm.

Figure 3109.4.1.6
CHAIN-LINK FENCE MESH FOR PRIVATE SWIMMING POOLS

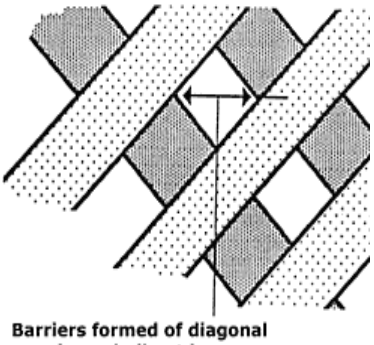
Doesn’t agree with VGB 1406 Model Code language which states 1-3/4” mesh size

State Bldg Code Interpretation I-21-08

Question:
"While Section AG105.2 does not address a pool barrier made up only of horizontal members, Section AG105.2, Item #6, does address chain link mesh size of 2-1/4 inches square. Is a pool barrier made up of horizontal members to the height of 48 inches with a 3/4 inch space between the members a code compliant barrier?"
(A photograph is included illustrating the pool barrier composed of horizontal and vertical members with horizontal members not located on the swimming pool side.)
Answer:
Section AG105.2, Item #4 requires the barriers horizontal members, where the distance between the tops of the members is less than 45 inches, to have all horizontal members be located on the swimming pool side of the barrier.

Barrier Requirements – AG 105.2

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



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

Barrier Requirements – AG 105.2

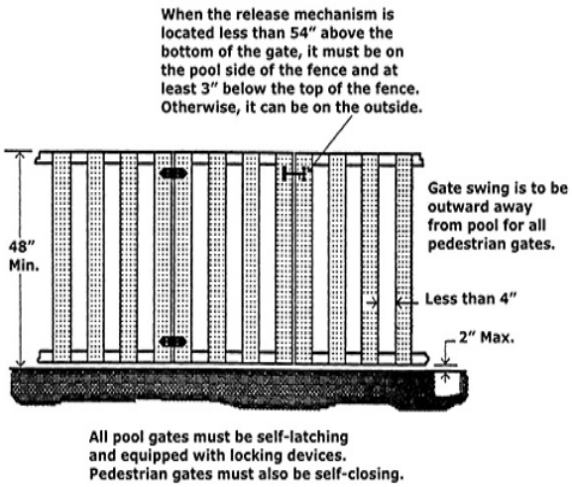
8. Access gates:

Comply with 1 — 7, plus

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

Barrier Requirements – AG 105.2

8.



Barrier Requirements – AG 105.2

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

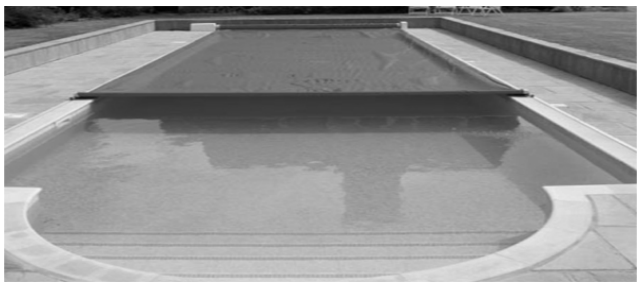
Deactivation switch min. 54" high

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

Barrier Requirements – AG 105.2

9.

Power Safety Cover

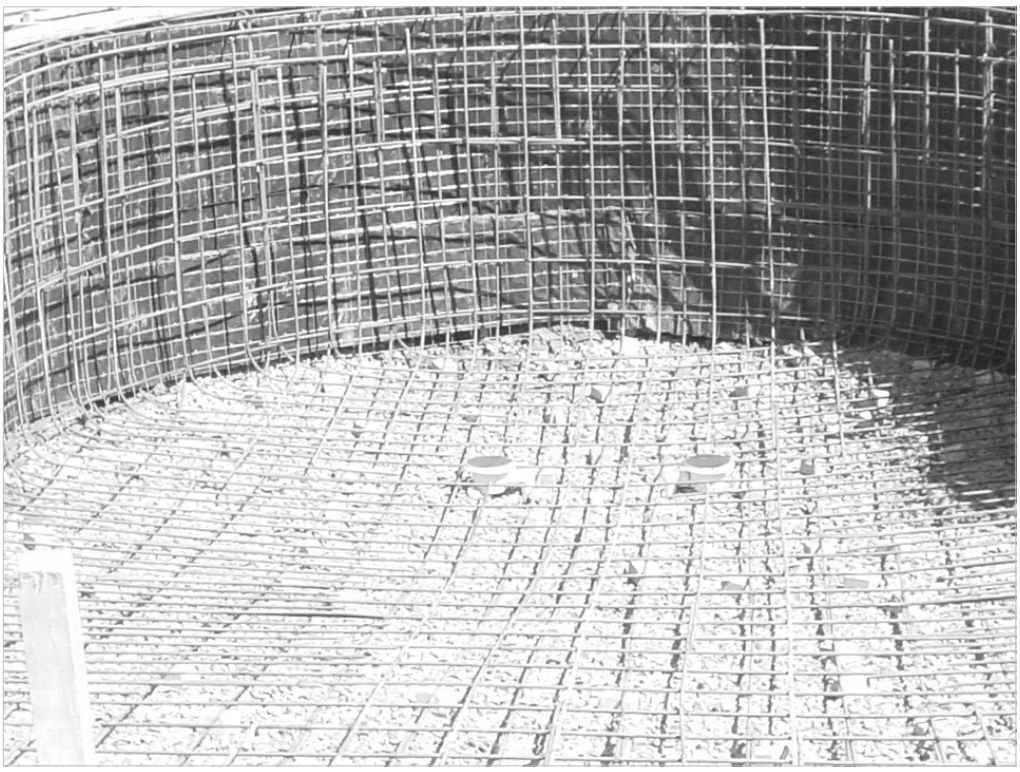


Barrier Requirements – AG 105.2

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

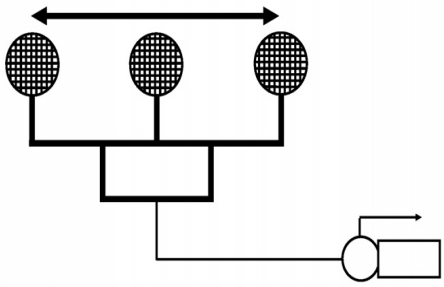
Pool is under 48 inches



Section 5.4 Three or More Outlets

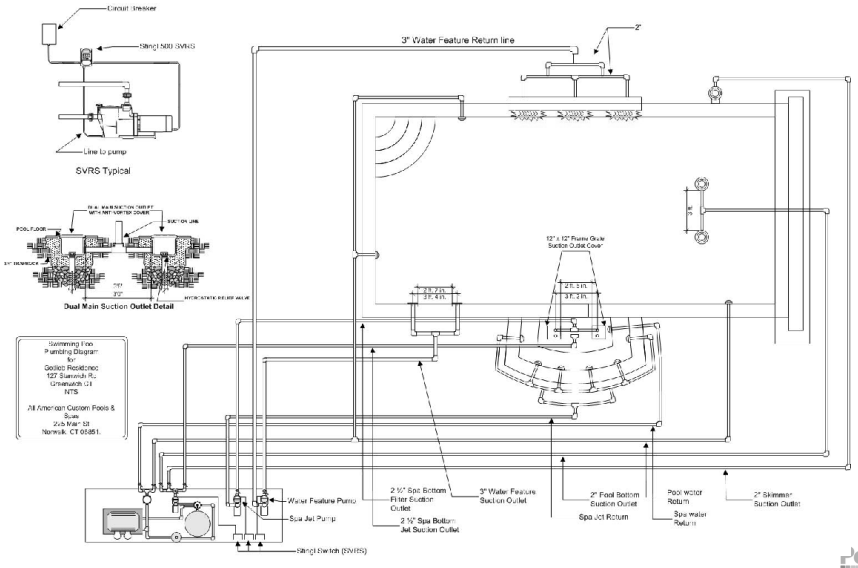
Three-or-More Outlets in Parallel to Single Pump

Minimum distance 3 feet between outermost outlets
(pipe centerlines)

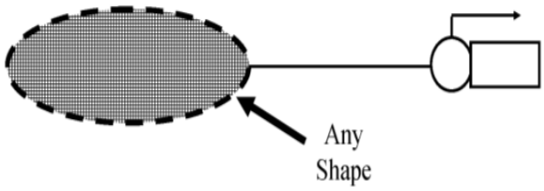


Pool SAFELY

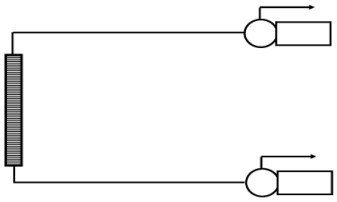
Plan Drawing for Permit



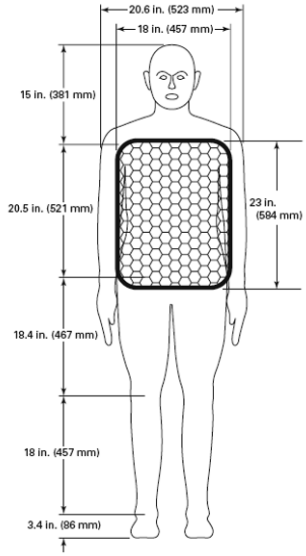
Section 5.5 Single Unblockable Suction Outlet



Single Unblockable Channel Outlet to Two Pumps



Section 5.5 Single Unblockable Suction Outlet



Section 5.6 Single Outlet Swim Jet System

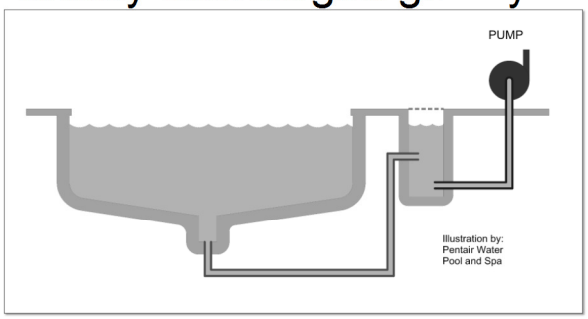
Section 5.7

Single Outlet – Alternative Suction System

Single outlet alternative suction systems consist of a single listed suction outlet cover/grate utilizing a venturi-driven system for circulating water. Such systems shall be tested and listed by a nationally recognized testing laboratory as conforming to the most recent edition of ASME/ANSI A112.19.17 and ASTM F 2387-04.

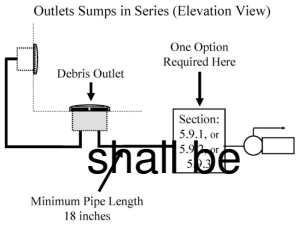
Section 5.8 Gravity Flow Systems

- 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



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

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

ANSI/NSPI (APSP) Standards

Resources

Northeast Spa & Pool Association – NESPA

www.nespspool.org

609-689-9111

Association of Pool & Spa Professionals

www.apsp.org

Consumer Product Safety Commission

Virginia Graeme Baker Pool & Spa Safety Act

www.poolsafely.gov

Electrical

E4203.1 Swimming pools- receptacle outlets location: Receptacles shall not be located less than six feet from the inside wall of any pool or other body of water specifically identified in each of the following sections: NEC 680.22, 680.34, 680.43, 680.62, 680.71

Electrical

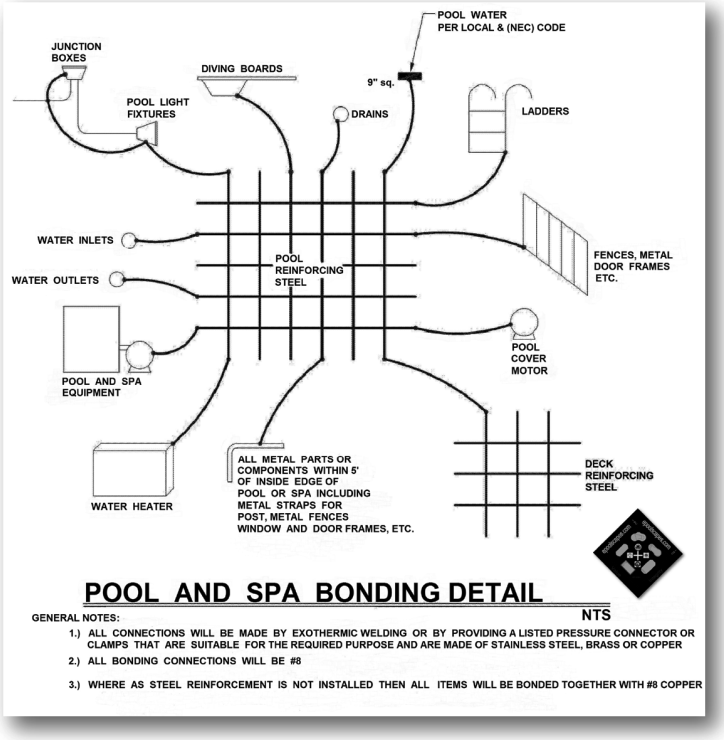
E4203.1.3 Swimming pools-GFCI protection: All 15 and 20 amp, 125 or 240 v, single phase outlets supplying pool pump motors require GFCI protection whether supplied by a receptacle and cord connection or hard wired to the branch circuit outlet.

Electrical

E4204.2 Swimming pools- bonded parts: At least one #8 AWG copper conductor must be secured within or under the pool perimeter surface.

Electrical

E4204.3 Swimming pools- pool water: The pool water shall be intentionally bonded by means of a conductive surface area not less than 9 square inches installed in contact with the pool water. This bond shall be permitted to consist of parts that are required to be bonded in Section E4204.2.



Equipotential Bonding

Connecting various pool components together with bare copper wire to make them the same potential.

The purpose of equipotential bonding is to equalize the pressure (or voltage) around the pool so your body doesn't create the circuit between areas of differing potential which would result in getting shocked.

This is done by creating a “bonding grid”

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

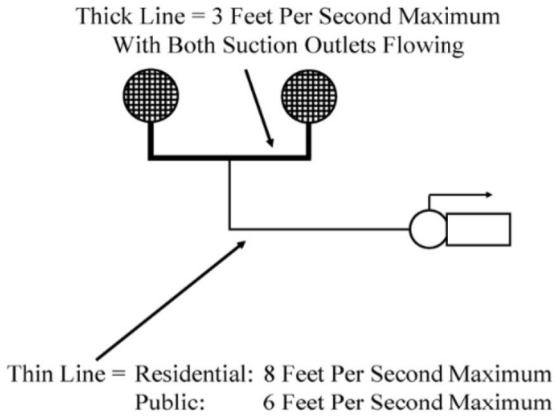
* ANSI/APSP-7 Standard for Suction Entrapment Avoidance

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

Water Velocity



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

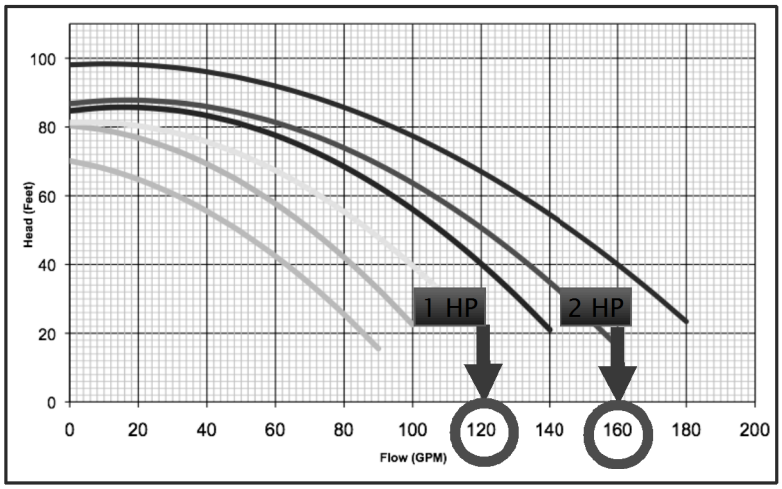
The Calculations

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

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.

Pool SAFELY simple steps save lives