

SWIMMING POOL PLAN REVIEW CALCULATIONS, COMPONENTS AND PIPING (April 2021)

(v) beside item # if correct; (X) if need info or not approved for plan review letter.

1. **Pool Type and required turnover rate denominator in minutes**

2. **Pool perimeter** (lengths + widths) _____ FT
(circle perimeter = πd)
3. **Pool surface area** (length X width) _____ SF
(circle area $A = \pi r^2$)
4. **Pool volume** _____ GAL
(length X width X avg. depth X 7.48),
(circular is πr^2 X avg depth X 7.48)
5. **Minimum turnover flow rate** required _____ GPM
(pool volume (Ref #4) ÷ assigned denominator (Ref #1),
Ex. 36,000 ÷ 360 = 100 gpm)
6. **Design flow rate of circulation used for :** Per .2518 (h)

Pool Type and Turnover Rates	
6 Hour Turnover USE (360)	Swimming pool (standing water 0+' but usually 3' min water depth) .2518(b), Water slide landing pool >60,000 gal .2543(b), Scuba pool, .2544(e)(2)
3 Hour Turnover USE (180)	Water slide landing pool <60,000 gal with auto chemical controller .2543(b)
2 Hour Turnover USE (120)	Wading pool (24" max depth).2531(a)(3), Water slide pools <60,000 gal without auto chemical controller .2543(b), Training pools (24-36" depth) .2543(e)(1) Exercise therapy spa >1000 gal .2544(d)(2)
1 Hour Turnover USE (60)	Stand- alone children's activity pool(CAP) .2531(b)(2)
.5 Hour Turnover USE (30)	Recreational spas, all swim spas, hot tubs .2532(1), Interactive Play Attractions (IAPA), Spray grounds .2543(d)(5), Exercise therapy spa <1000 gal .2544(d)(2) Float Tank .2544(b)(4) 2X every hr. not in use and 2X between @ user

Use design flow rate for:

1. Calculating # of inlets
2. Determining Filter Size
3. Determining Pipe Sizes for returns, skimmers, and drains

(Design flow must be > than turnover flow rate #6 > #5)

TDH is assumed at 65 feet of head unless design engineer provided calculated TDH. **Ref NSF.org** to assure NSF Approved.

*Assure specification sheet is provided from the Registered Design Professional with accurate information of circulation pump

Pump Mfg; _____ Model #: _____
_____ GPM at _____ TDH Max flow per curve _____ GPM

7. **Number of inlets required** _____, Plan shows _____ (Design flow in **Ref #6 ÷ 20 GPM**), min 4 for pools, min 2 for wading pools and spas, and no part of pool more than 25 ft. from any inlet AND adjustable as required per .2518(i)(1-4), .2531(a)(2), .2532(3) For spas, uniform location for providing uniform circulation of water .2532(2) Inlet Mfg. & Model # _____

8. **Filter** (sand, DE, cartridge) sized properly per .2519 **Ref NSF.org**

Type Filter	Filter Rate / SF
High-Rate Sand	15 – 20 gpm per sf of filter surface area
Rapid Rate Sand	3 gpm per sf of filter surface area
Vacuum Sand	15 gpm per sf of filter surface area
DE with slurry	2.5 gpm per sf of filter surface area
DE without slurry	2 gpm per sf of filter surface area
Cartridge	.375 gpm per sf of filter surface area

Filter Mfg. & Model # _____
Number of Filters: _____

Design Flow Rate **Ref # 6 ÷ FILTER RATE** listed in chart above = SF of filter surface area required. Refer to filter specification sheet for filter surface area provided. If the filter square footage is not adequate for design flow rate, more than 1 filter will be needed or a different model # required.

9. **Surface Overflow systems:**

Number of NSF skimmers required: _____ (Pool surface area **Ref #3 ÷ 400sf** or fraction thereof for swimming and wading pools, 1 per 100sf for spas or fraction thereof per .2518(k)(3), .2531(a)(2) and .2532(4)(b), G.S. 130A-282(c)) & protected from air entrapment by auto-fill, fill spout/ hose or flooded suction on the pump per .2518 (l)

Skimmer Mfg. _____ & Model # _____

Max flow for Skimmer provided per NSF Listing. _____ GPM; may require additional skimmers if inadequate.

If Gutter pool with Balance Surge Tank Capacity, plan shows tank capacity: _____ gallons

Ex: 1 gal X (**Ref #3**) = required size of surge tank in gallons.

(This includes capacity of the piping system if submitted. (1 gallon per SF of pool surface area per .2518(k)(2)(b))

CIRCULATION PIPING AND SUCTION OUTLETS

10. Circulation Main Drains: (Drains are prohibited in wading pools <18" deep per APSP 7(5.2.1) ref .2518(j)(3). Main drains are not required if inlets are at the bottom of pool and utilizing 100% properly installed surface overflow.)

PVC Sch. 40 Pipe Sizing Chart per .2518(d)							
pipe size	1"	1.5"	2"	2.5"	3"	4"	6"
Suction PVC pipe @6ft/sec (all drains, skimmers, gutters)	16	38	62	89	138	238	539
Discharge or Returns (inlets) PVC pipe @10ft/sec	27	63	104	149	230	396	899

Number of drains provided: _____

- o in deepest section
- o within 15 ft. from a side wall.
- o connected by T pipe at least 3' apart at center or on different planes of pool structure.
- o max 30' apart
- o Meets APSP-7
- o If no drains provided, provisions for emptying pool completely provided per .2518(j)(1) or .2532(4)(a) for spas.

Circulation main drain pipe size required using pipe sizing chart above: _____ " Plan shows _____ "

Pipe size must be capable of carrying **100% design flow of** circulation pump (Ref #6) per .2518(c)
Any flexible piping on spa shells must meet .2518(d)) In spas, T piping must be the same diameter of the main drain outlet per .2532(4)(a).

11. Max Flow of Circulation Pump used for Drain Cover Approval:

Use Lowest TDH in GPM on curve for pump or engineer's calculated max flow with clean filter: Max Flow _____ GPM
Note: If a multi-speed or variable speed pump is provided, use Max flow of the highest speed for drain cover comparison and approval.

12. Flow rating of main drain covers _____ max GPM per floor/ wall * per .2518(j)(2), **Life span of cover** _____ years:

Cover Mfg. & Model # _____
Cover GPM rating must be higher than max flow of pump. *(Ref #12> Ref #11) .2539 (c)(1-2) **Verify updated listings.**

13. Main drain sump requirements (Refer to drain cover Manufacturer Installation Instructions for recommended mfg. sump(s) OR field-built requirements per .2518(j)(3) and .2539(c)(3) (Per APSP – 16, page 4)

FIELD BUILT SUMPS MUST BE CERTIFIED BY A REGISTERED DESIGN PROFESSIONAL OR ENGINEER per APSP 7, page 4

Manufactured Sump	OR minimum Field Built Sump Measurements
Model #	Letter from Registered Design Professional certifying sump is to be built per manufacturer requirements.

Hydrostatic Relief Valve or Drainage Provided per .2515 (b). Manufacturer and Model # _____

14. Skimmers pipe size required _____ " (Use Suction pipe sizing at bottom of page) Plan shows _____ "

(Pipe must handle **100% of design flow rate** (Ref #6) per.2518(c). **Skimmer equalizer lines are prohibited in new construction.**
Is autofill/ flooded suction provided _____ .2518(l) Auto-fill mfg. # _____

Or gutter system overflow pipe size _____ " Plan shows _____ "

Must handle 100% of design flow per .2518(c) (Ref #6) Use chart below.

15. Inlet return pipe size required _____ " Plan shows _____ "

Must handle 100% design flow of discharge (Ref #6) per .2518(d) and reduction in pipe branches must be sized to handle flow of inlets in each branch.

16. Disinfectant Method: Verify NSF & properly sized per volume of pool? _____ **Ref NSF.org**

Mfg. & Model # _____
If salt system, cell capacity/ # cells _____. If salt generator is primary disinfectant, requires 3 lb/day/10,000 gallons
If pump provided on any disinfectant system, method to prevent operation without circulation pump in operation per .2535(6)

17. Vacuum cleaning system provided per .2518(f) (vacuum ports located on pool wall 6" - <18" below water level.)

(Skimmer vacuums may be used in pools with ≤2 skimmers and negate need for separate vacuum port.) **Vacuum piping**, if separate from skimmer operation may be suction or discharge and should be sized according to manufacturer's requirements. Specifics not mentioned in rules.
If separate vacuum port required, self-closing caps requiring tools provided per .2518 (f)

18. Valves provided to control flow from drains, surface skimmers or surface overflow systems, and vacuuming cleaning system .2518 (c) and (f)

19. **Drainage discharged through air gap** from pool overflow, deck drains and filter backwash per .2513(b)

20. **Lighting Required – Pool Lights** .5 lumens X SF of pool = wattage minimum. Compare to lighting on plans and if night swimming is requested. Nighttime swimming must meet .2524(b).

OTHER POOL CALCULATIONS

21. **Minimum deck width required** _____ ft. per .2522 (a) – (e) & (i) (Ref #3)

Minimum Deck Requirements

	Outdoor Pool	Indoor Pool	Wading Pool	Spa	Interactive Play	Permanent Structure
Deck Clearance	< 1600 sf = 6 ft > 1600sf = 8 ft	5 ft	4 ft	4 ft at least 1/2 around	Not Required	5 ft around diving board, handrail, slide, or other permanent structure
Vertical Clearance	NA	7 ft	7 ft	7 ft	Not Required	13 ft above board See Rule .2517

.2522 (a-e, i), .2543 (10), Special purpose pools such as waterslides and wave pools may vary from the minimum requirements to accommodate features. ADA Chairs – NC Building Code enforced. New constructed pools over 300' perimeter may be required 2 access entries (lift and ramp). Lifts are permitted to infringe on pool decks but cannot block emergency egress corridors required for fire safety. Deck slope 1/4 to 1/2"/ft to drain and slip resistant.

22. **Ladders, steps, stairs, handrails** required _____
 If >2' deep, 1 in shallow end and deep portion. If pool width > 30 ft, 2 ladders are required on either side near the deep end. 1 required every 75' in <5' of water depth. Read all of .2521.

23. **Pool bather load** _____ (Pool surface area (Ref #3) ÷ applicable # in chart below and round down) **POOL DEPTH(s)** _____

Portion of Pools <5 ft	15sf/person per .2529(1)
Portion of Pools >5 ft (-300sqft at diving boards)	24sf/person per .2529(2)
Spas, wading pools, CAP	10sf/person per .2529(3) & .2531(a)(8)
Interactive play attraction splash zone	25sf/person per .2529(4)

24. **Restroom fixtures** based on bather load. (.2526) Use chart for bath houses for male/ female facilities. At hotel, motel, condo, or apartment complex where the farthest unit is more than 300' from the pool as measured along walkways, only a toilet and lavatory are required. Divide Ref #12 equally between men and women.

Men	Toilet	Lavatory	Urinal	Showers	Women	Toilet	Lavatory	Showers
0-50	1	1	0	1	0-50	1	1	1
51-100	1	1	1	1	51-100	2	2	1
101-200	2	2	2	1	101-200	3	3	1
201-300	2	2	2	2	201-300	4	4	2
301-400	3	3	3	2	301-400	5	5	2
401-500	3	3	3	3	401-500	6	6	3
501-750	5	5	5	3	501-750	8	7	3

*If rinse showers are located on pool deck, 1 per every 200 bathers
 *Shower drains are enforced by the building codes department.
 Typically, showers in bathhouses drain to sewer and cold-water showers on pool decks drain to the deck drains.

25. **Chemical storage room** minimum size: _____ sf (min 5sf for 10Kgal + 1sf @ additional 3000gal per .2534(2))

Separate Feature Pump(s) In a water recreation attraction with surge containers, features such as water slides, waves, rapids, lazy rivers, interactive play features can be included in main circulation system **if** the drain(s) and pipe(s) are sized to handle the flow of all pumps without exceeding flow velocities in .2518 per .2543 (d) (3). .2531(b)(1) requires separate feature pumps in children’s activity pools so they can be turned off at times.

- 26. Features such as waterfalls and decorative fountains located ON pool decks** must meet the following per .2515(g)(1-6):
- not occupy more than 20% or the pool perimeter in **Ref #2**
 - if located next to water > 5’, feature shall not be more than 20’ wide
 - not encourage climbing above deck level with handholds and footholds.
 - walkway provided to permit free access around decorative feature as wide as the lesser of 5 feet or required deck width in .2522(e)
 - shall not obstruct the view of any part of the pool from any seating area
 - Moving water must be separate from pool re-circulation system.
 - Feature Drain: Prohibited in new stand-alone wading pools <18” unless inaccessible per .2518(j)(3) and new APSP-7 currently. Configuration must meet APSP-7 page 6.**

- 27. Fountains installed within swimming pools must meet the following per .2516(f)(1-5):**
- be located in water <18” in depth
 - must be recommended by manufacturer for use in public pools (not residential)
 - shall be installed in accordance with manufacturer’s instructions
 - shall be separate from the circulation system
 - shall not releasee water at a velocity > 10’ per second above water.

28. Feature(s) Design Flow provided on plan _____ GPM @ _____ TDH in FT
 Feature Pump Mfg. & Model # _____ **Ref NSF.org**
 How much flow is required of all of the features? Ex: 4 bubblers use 10 GPM each = 40 GPM

29. Feature pump suction pipe size required _____ ” (Use pipe sizing chart below) per .2518 (d)
 (Pipe size must be capable of carrying **100% design flow (Ref #37)** of feature pump provided per .2518(c).
 Any flexible piping on spa shells meets .2518(d)

30. Max flow of feature pump _____ gpm (Use least TDH at end of pump curve or engineer calculated TDH) .2543 (d)(3)
 (Only in a water recreation attraction park, if a feature pump connects to main drains, add both flows for Total maximum flow for sizing VGB cover):
 max flow of feature pump _____ GPM + max flow of circulation pump _____ GPM = Total maximum flow of both pumps _____ GPM

31. Feature Drain Covers & SUMPS – (Not allowed in wading pools less than 18” deep unless inaccessible to bather)
 Cover Mfg. & Model # _____ **Life Span of Cover** _____ years
 Maximum Flow of Drain Cover: _____ GPM floor/ wall
 Cover rating must be higher than max feature pump flow per *.2539(c)(2).

32. Feature drain sump (Use VGB drain cover Manufacturer Installation Instructions provided for single or double drain cover to verify sump requirements per .2518(j)(3) and .2539(c)(3)

Manufactured Sump	OR minimum Field Built Sump Measurements
Model #	Letter from Registered Design Professional certifying sump to be built per requirements per APSP 7 page 4 and APSP – 16, page 4

33. Feature return pipe size required _____ ” (Use chart below.)
 (Pipe size must carry 100% discharge design flow of feature pump provided (**Ref #26**). Check branch pipe sizes for flow to each feature.)

pipe size	1”	1.5”	2”	2.5”	3”	4”	6”
Suction PVC pipe @6ft/sec (all drains, skimmers, gutters)	16	38	62	89	138	238	539
Discharge or Returns (inlets) PVC pipe @10ft/sec	27	63	104	149	230	396	899