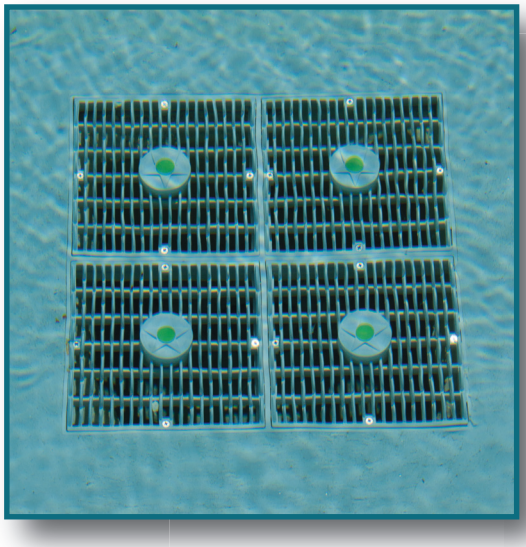
Virginia Graeme Baker Pool & Spa Safety Act

Online Training Course Resource Guide



Healthy Pools. Healthy Bodies.

NATIONAL SWIMMING POOL FOUNDATION®

Pool SAFELY simple steps save lives

The Virginia Graeme Baker Pool & Spa Safety Act

The Virginia Graeme Baker Pool & Spa Safety Act (P&SS Act) was enacted by Congress and signed by President Bush on December 19, 2007. Designed to prevent the tragic and hidden hazard of drain entrapments, eviscerations, and drownings in pools and spas, compliance with the law was mandatory for all public pools after December 19, 2008.

Under the law, all public pools and spas must have a suction fitting that complies with the ASME/ANSI A112.19.8-2007 or successor standard. Single suction outlets (main drains), other than unblockables, must have a minimum of one additionally installed anti-entrapment device or system. A securely fitted and properly flow-rated suction fitting cover is the most critical part of any installation. Even with multiple outlets or other anti-entrapment devices, entrapments can, and have, occurred even when the pump was off.

This important child safety law strives to:

- Enhance the safety of public and private pools and spas
- Reduce child drownings in pools and spas (each year nearly 300 children younger than five)
- Reduce the number of suction entrapment incidents, injuries and deaths
- Educate the public on the importance of constant supervision of children in and around water
- Encourage the use of multiple safety steps at all pools and spas

In its role as the lead agency implementing and enforcing the P&SS Act, the U.S. Consumer Product Safety Commission (CPSC) is working with the pool and spa safety community to encourage the use of multiple safety steps, such as fencing around pools, constant supervision of children and a requirement for the installation of anti-entrapment drain covers and other safety devices as needed, on all public pools and spas.

The P&SS Act mandated the following changes in federal pool and spa regulations for public pools and spa:

- All pool drain covers manufactured, distributed or entered into commerce on or after Dec. 19, 2008, must meet the ASME/ANSI A112.19.8-2007 standard.
- All public pools and spas must be equipped with new ASME/ANSI A112.19.8-2007 compliant drain covers.

It is common to use the terms drain, main drain, outlets, and drain covers interchangeably. One important cautionary note; the ASME/ANSI standard referenced by the P&SS

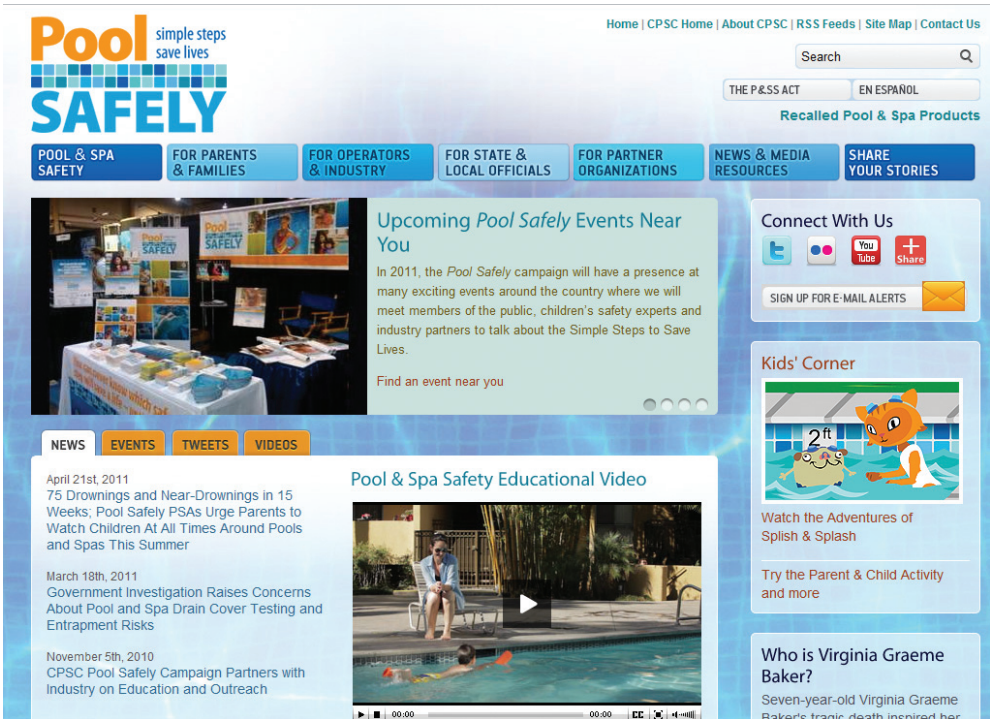


Photo 1: *Visit* ***www.poolsafely.gov*** *for more information and resources related to the Pool & Spa Safety Act.*

Act has a very specific definition of "suction fitting." This definition includes "as all components, including the sump and/or body cover/grate and hardware." Swapping covers will not assure compliance with the P&SS Act.

Requirements for Safety Devices or Systems

The P&SS Act requires all public pools and spas with a single main drain, other than an unblockable drain, or multiple drains less than three feet apart, to add one or more of the following anti-entrapment devices or systems:

1. **Safety vacuum release system (SVRS)**—A safety vacuum release system ceases operation of the pump, reverses the circulation flow or otherwise provides a vacuum release at a suction outlet when a blockage is detected. The SVRS must conform to ASME/ANSI A112.19.17 standard or ASTM F2387 standard.
2. **Suction-limiting vent system**—A suction-limiting vent system with a tamper-resistant atmospheric opening, also called an atmospheric vent, is a pipe teed to the suction side of the circulation system on one end and open to the atmosphere on the opposite end. When a blockage occurs at the main drain, air is introduced into the suction line causing the pump to lose prime and relieving the suction forces at the main drain.
3. **Gravity drainage system**—A gravity drainage system uses a collector tank and has a separate water storage vessel from which the pool circulation pump draws water. Water moves from the pool to the collector tank depending on atmospheric pressure, gravity and the displacement of water by bathers, which removes the need for direct suction at the pool. This type of system is also referred to as a reservoir, surge tank or surge pit. Not all gravity drainage safety systems will serve as surge tanks. Some new systems are designed simply to eliminate direct suction.

Photo 2: *Gravity drainage system collector tank.*

4. **Automatic pump shut-off system**—An automatic pump shut-off system is a device that would sense a drain blockage and automatically shut off the pump system. There is no current standard for this category and the CPSC is requiring conformance to ASME/ANSI A112.19.17 or ASTM F2387 standards.
5. **Drain disablement**—This is the only option that eliminates rather than mitigates the hazard. To satisfy the definition of drain disablement, the drain/outlet would need to be physically removed from the system by filling the sump with concrete, cutting and capping the piping in the equipment room or re-plumbing the section line to create a return line and reverse flow.
6. **Other systems**—Any other system that is determined by CPSC to be equally effective as, or better than, the safety systems listed here.

Note: States are permitted to limit these options or even specify which of the options are allowed as long as they do not make compliance with the Act an impossibility.

Pools and spas that have more than one drain, or those with unblockable drains (see page 6) with covers that are properly sized for the maximum system flow rate and are installed in accordance with the manufacturer's instructions, do not need the additional measures or backup systems listed above.

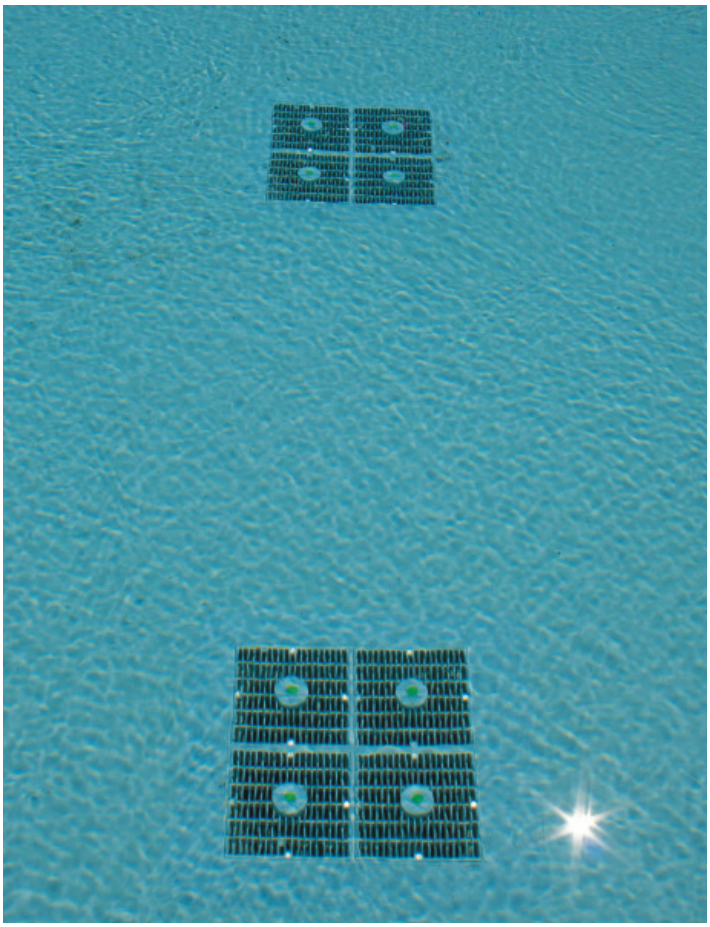


Photo 3: *Dual main drains more than 3 ft .apart.*

Five Forms of Entrapment

The P&SS Act is designed to reduce the risk of five forms of entrapment (see page 182 of the NSPF® Pool & Spa Operator™ handbook). The following entrapment categories are the result of analysis of all reported cases of entrapment to CPSC. It is important to note that not all entrapments are caused by suction. Excessive water flow through a cover (certified or not) can entangle and knot hair. Alternatively the entrapment can be the result of physically becoming stuck in an outlet or submerged pipe. In this case flow is not required, such as in the case of mechanical entrapment. The entrapment categories are:

1. **Body:** A body part, often the torso or bottom, covers a drain and is held down by the force of the suction
2. **Hair:** Long hair is caught or entangled in a cover with excessive flow
3. **Limbs:** Arms, legs, feet or fingers are lodged in a pipe, equalizer, vacuum port or uncovered sump
4. **Mechanical:** Jewelry, bathing suits or other materials are entangled in a drain cover
5. **Evisceration/disembowelment:** When suction draws out the intestines and organs

TURNOVER AND FLOW RATES

To understand entrapment and ways in which it can be minimized we need to study flow rates a little closer. Approved drain covers have specific flow rates that must not be exceeded. The current industry standard is a six hour turnover rate, which is based on sequential dilution studies. A faster turnover rate results in a greater flow rate measured in gallons per minute (gpm). Other, non-circulation suction outlets (e.g. for spa therapy jets) must also be properly sized to handle the full flow rate of the attached pump.

Approved drain covers are rated in gallons per minute. Once the true flow rate of a pool system is known, the drain cover can be properly sized.

Flow rate can be determined by:

- Flow meters installed on the return line back to the pool
- Total dynamic head measurement and pump curve

Flow Meters

Flow meters must be installed correctly and also be calibrated. Flow meters come in a variety of types, digital or analog. It can be a device mounted on return line back to the pool with a metered reading on the side of the flow meter. This type of flow meter should be properly sized for the design flow rate and must be capable of measuring from ½ to at least 1 ½ times the design flow rate. The clearances upstream and downstream from the flow meter must comply with the manufacturer's installation specifications. Pipe fittings such as tees, elbows, etc., can interfere with flow and result in inaccurate flow measurements. Because of this, flow meter manufacturers specify the flow meter be installed with a minimum amount of straight pipe before and after the meter. Typically the requirement is ten times the pipe diameter of equivalent straight pipe before the flow meter and four or five times the pipe diameter of equivalent straight pipe after the flow meter. Some flow meters do not have these straight pipe requirements.

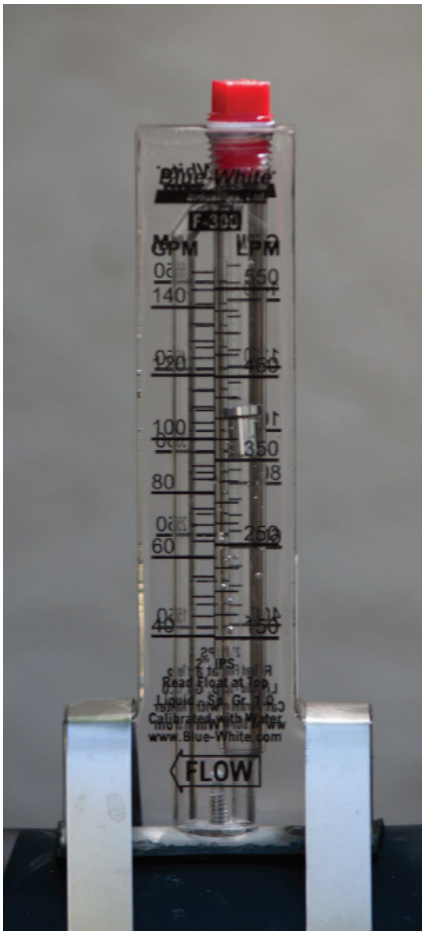


Photo 4: *Flow meters must be installed correctly and calibrated regularly.*

Health departments are accepting the use of magnetic flow meters to determine the maximum flow rate for the pumping system. With all recirculation valves fully opened and with a clean filter, strainer and skimmer baskets, the

RELATIONSHIP BETWEEN FLOW RATE AND TURNOVER RATE

Flow Rate

Pool volume ÷ turnover rate in hours ÷ 60 min/hr = flow rate in gpm

Turnover Rate

Pool volume ÷ flow rate ÷ 60 min/hr = turnover rate in hours

maximum flow can be determined. If the maximum flow exceeds the flow rating on the drain cover, it may be possible to adjust valves that will limit flow through a pipe to a certain level. The flow rating of the cover must exceed the maximum achievable flow by the pump, as installed.

Total Dynamic Head

Total Dynamic Head (TDH) is a measure of a system's resistance to flow. Each pool will have its own unique flow rate based on the piping and fittings used. The same pump, on different pools, can produce significantly different flow rates. It is the resistance to flow in circulation systems that dictate the flow rate, not just the pump size. Particular caution should be used with pool codes that specify requirements in horse power ratings. Each circulation system is unique based on pipe length and diameter, number of fittings, filters, heaters, bypasses, and feeders. The resistance in the circulation system impacts the flow rate so measuring the TDH can prove valuable. The best time to measure the TDH is when the pool is filled with water and the filter media is clean.

Historically, TDH was used to properly size the circulation system's turnover. Many state health and building codes specify a TDH and the pump needs to meet turnover at that TDH. Today with the increased focus on energy efficiency, systems are being built with much lower TDH (less resistance). Lower TDH (as built) would result in more flow than the specified higher number. For this reason, specified TDH should never be used to size suction outlet covers. TDH can be measured directly with a gauge or using the pressure and vacuum gauges on either side of the pump. The vacuum gauge is found on suction side of the pump and measures vacuum in **inches of mercury (Hg)**. The pressure gauge is found on the discharge side of the pump and is measured in **pounds per square inch (psi)**. Both of these measurements are converted to feet of head. Pressure head is calculated by multiplying psi by 2.31, and vacuum head is calculated by multiplying Hg by 1.13. These two values are then added together to give total feet of head.

For example:

1. 21 psi X 2.31 = 48.5 feet of head
2. 6 Hg X 1.13 = 6.8 feet of head
3. Total TDH = 48.5 + 6.8 = 55 feet of head

The TDH conversion value of 55 feet of head can now be used to determine flow rate. Feet of head can be converted to flow rate by going to the pump performance curve supplied by the manufacturer. As the resistance to flow increases, flow rate decreases.

Take your calculated TDH of 55 on the vertical scale of the graph and move horizontally across until it intersects with the pump curve. From there follow vertically down to the horizontal axis to determine the flow rate. In this example the flow rate is 80 gpm (see illustration 1).

If the cover was rated at 100 GPM, then this flow rate of 80 GPM would be below the rating of the cover and compliant. What if we measured the pressure at 10 psi instead of 21 psi? This for example could be the difference between a clean and dirty filter. Now, when we calculate TDH, using 10 psi in place of 21 psi, we see that it has

Cover Rating = 100 GPM

55 TDH → 80 GPM
30 TDH → 110 GPM

80 GPM < **100 GPM** < 110 GPM

✔ **Pass** ✘ **Fail**

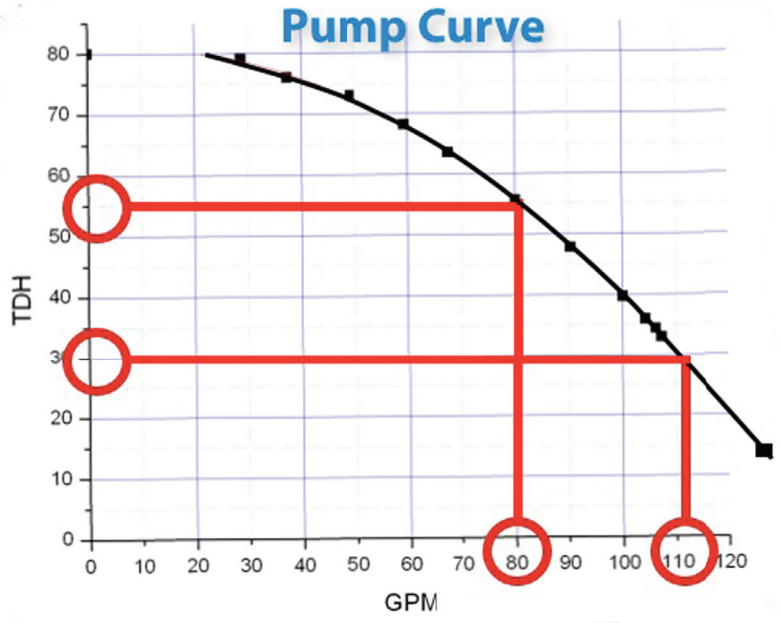


Illustration 1: *Hypothetical pump performance curve. For illustration purposes only.*

dropped to 30 feet of head. Using the same pump/pump curve we find the flow rate is now 110 GPM and the cover would not be sufficiently rated. This example also serves to illustrate the difference between a health code specified TDH (55) and field verified TDH (30). Some newer systems can be even lower in measured TDH.

If flow rate is less than the flow rate specified on the suction drain cover, then the pool and cover would be in compliance with the P&SS Act. However, if the measured TDH or flow rate gives you a higher flow rate than the cover specifies, then this would not be in compliance. In the design phase of a swimming pool the TDH estimated is based on pipe and fitting size and dimensions. The flow is typically underestimated so that you will still have enough flow to meet the desired turnover rate, which is typically six hours. If flow ends up being greater than desired, you either have a faster turnover rate, or, the flow can be regulated by using the valves of the pool system. Because the design calculated TDH usually underestimates flow it is not recommended that it be used to determine flow for cover sizing. The suction fitting should be sufficiently sized for the maximum flow rate and any valve position. Alternatively, a permanently installed flow restriction plate can be used to bring excessive flow into compliance with the installed suction fittings. The measured TDH, pump curve, and flow meter readings should all have comparable flow rates and should be used to size the drain cover.

Total Dynamic Head Measuring Meter

Gauges are now available on the market and can directly measure the pool or spa circulation system's exact TDH. Once the TDH is known, you can use the pump's performance curve to determine to flow rate.

P&SS ACT COMPLIANCE AND INSPECTION

Compliance with the P&SS Act, which references the ASME/ANSI A112.19.8-2007 standard, requires that suction fittings be tested and that they are installed in accordance to the standard, i.e. the manufacturer's instructions. The manufacturer's instructions should be retained per the ASME/ANSI A112.19.8-2007 standard.

Suction fitting labeling should include:

- Flow rate in gallons per minute (gpm)
- Lifespan or number of years
- Whether is it a wall and/or floor mount drain cover
- Whether it is designed to be used as a single or multiple drain cover
- Manufacturer's name
- Model number
- The drain cover can be certified, in writing, by a registered design professional
- ASME/ANSI A112.19.8-2007 or VGB 2008 label (drain covers manufactured after Nov. 12, 2008, may have the "VGB 2008" marking. Some covers may not have these labels, but all covers should have an accompanying certificate stating that they meet the standard. All owner/operators should keep the certificates on hand at all times.)

Proper installation: When inspecting any suction fittings, make sure they are installed correctly. This includes the drain covers (floor and wall) and skimmer equalizer line fittings. CPSC staff has ruled that the skimmer equalizer lines, usually located beneath the skimmer openings, are submerged suction outlets and must be covered with covers or grates meeting ASME/ANSI A112.19.8-2007 standard. Although not covered by the P&SS Act, vacuum fittings should be installed with covers.

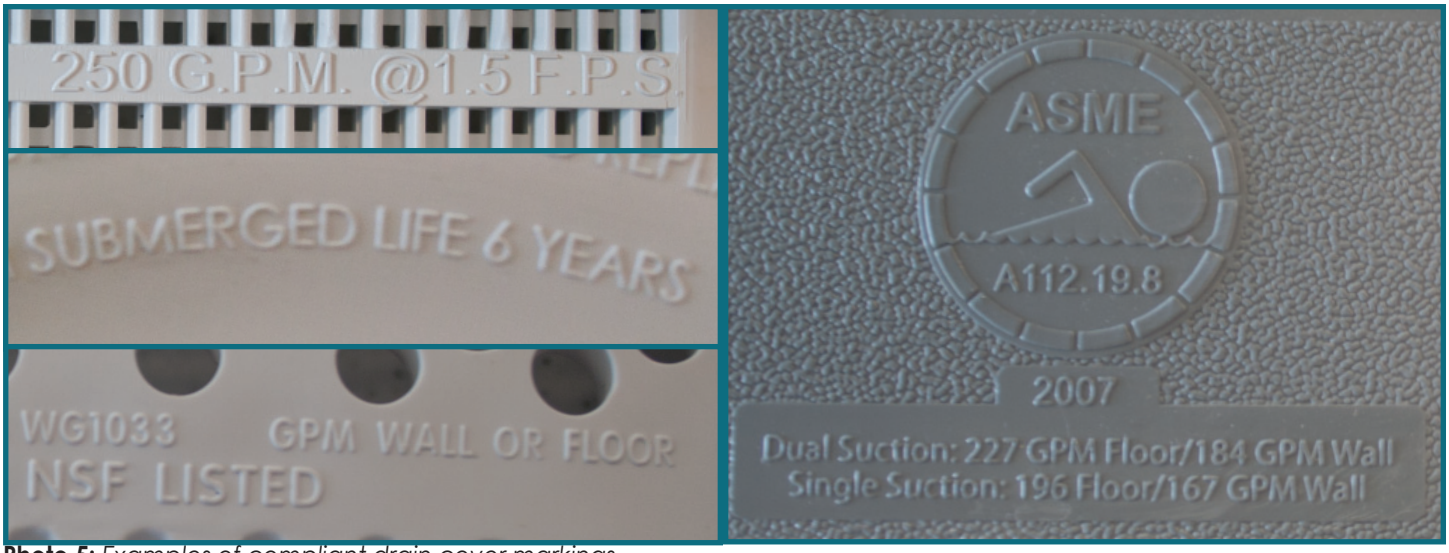


Photo 5: *Examples of compliant drain cover markings.*

Unblockable Drains

An unblockable drain includes a suction outlet defined as all components, including the sump and/or body, cover/grate, and hardware such that its perforated (open) area cannot be shadowed by the area of the 18 in. x 23 in. Body Blocking Element of ASME/ANSI A112.19.8-2007 and that the rated flow through the remaining open area (beyond the shadowed portion) cannot create a suction force in excess of the removal force values in Table 1 of the ASME/ANSI A112.19.8-2007 standard.

A drain cover that is larger than 18 in. x 23 in. may be placed over a smaller sump to replace a smaller cover of a blockable size, if allowed by the manufacturer. This unblockable cover must be compliant with the ASME/ANSI A112.19.8-2007 standard and must be secured as directed by the manufacturer

All suction outlet covers, manufactured or field-fabricated, shall be certified as meeting the applicable requirements of the ASME/ANSI A112.19.8-2007 standard. The cover manufacturer should be consulted – the certification for use should include instructions and/or sump requirements. Depending on the cover's shape/design and flow requirements, the large cover installed over the smaller sump may be acceptable.

Sumps

CPSC staff recognizes and supports the technical requirement of the ASME/ANSI A112.19.8-2007 standard, which calls for field-built sumps to have a depth, when measured from the bottom of the cover to the top of the outlet piping, of 1.5 times the diameter of the piping. However, the P&SS Act does not require pool owners/operators to replace their sump. If a new, compliant drain cover can be safely secured onto a pre-existing sump, while properly controlling the flow rate, then it meets the intent of the law. If a professional engineer determines that additional engineering work needs to be done to the sump to bring it into compliance with the standard and ensure a secure connection with a new cover, then that work should be carried out. Finally, if a professional engineer determines that a new drain cover cannot be safely placed on a pre-existing sump, then the sump should be removed and replaced with a new, compliant sump that is compatible with the compliant drain cover.

Many regulators have misinterpreted a diagram that appears in the ASME/ANSI A112.19.8-2007 standard (figure 2, page 5) depicting sumps. This sump does accurately depict sump configurations for suction fittings that do not explicitly specify sump size and pipe clearance

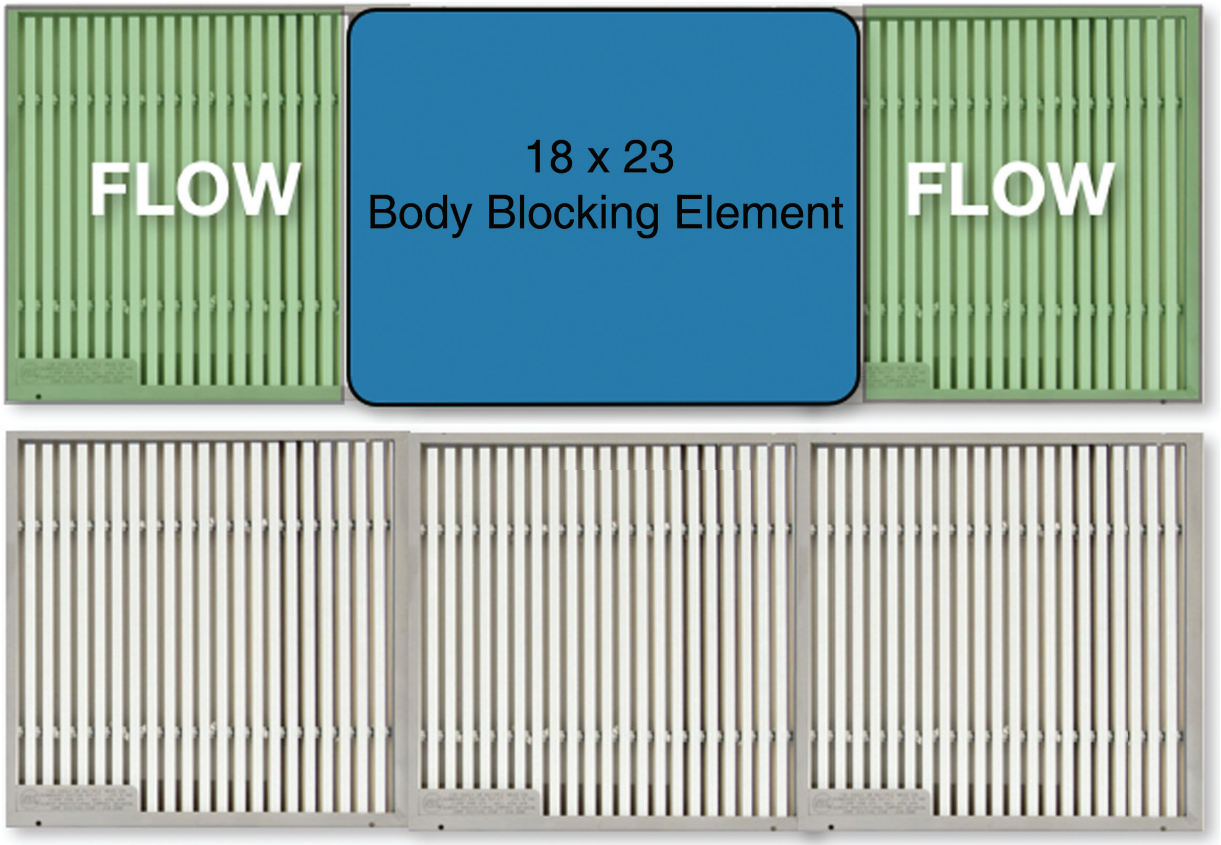


Illustration 2: *This photo shows an unblockable drain with and without an 18 x 23 body blocking element. Flow through the remaining open area (beyond the shadowed portion) cannot create a suction force in excess of the removal force values in Table 1 of the ASME/ANSI A112.19.8-2007 standard.*

dimensions. If a different sump configuration (or no sump at all) is used in the manufacturer's installation instructions, installation should follow specified dimensions, not the ASME diagram.

It is important to have the manufacturer's instructions when conducting an inspection to ensure that the installation was carried out as per the instructions. They should also be retained by the facility. The drain fasteners (screws) should be observed before each use of the facility. The inspector should also verify the separation between multiple drains to ensure they are at least three feet apart, center to center.

Retrofitting new covers on old sumps and frames that do not match means the facility is not in compliance. You must not drill new holes in the old frame to attach a new cover, unless it is part of a manufacturer's supplied kit. It may require that the old sump or mounting frame be removed and the new one for the new cover be cemented in place before the new cover can be installed. A proper inspection and installation requires verification of the cover, attachment hardware, and sump/frame.

When inspecting a pool that is filled with water it may be very difficult to see the drain to verify that the drain covers and sump are both compliant. It may also be difficult to see that the drain cover is secure in place with the recommended fasteners. This is especially the case in deep pools. Getting a close up view of the underwater suction outlet is ideal, which would eliminate any glare and reflections. Be certain to turn off the pump before diving down for an underwater inspection of the cover and sump. Alternatively, a waterproof video camera attached to the end of a pole can be used to record the outlet for later viewing.

Warning

Under the law, all public pools and spas must have ASME/ANSI A112.19.8-2007 or successor standard compliant drain covers installed. No pool or spa is safe if a drain cover is broken, missing, or cracked. Under these circumstances the pool or spa should be closed until repairs can be made.

Enforcement of the P&SS Act

The P&SS Act also strengthened the CPSC's civil and criminal penalty authority, giving the agency the ability to shut down pools or spas that are not in compliance with the law. Visit www.poolsafely.gov/pool-spa-safety-act to download the entire Pool & Spa Safety Act.

Both CPSC and State Attorneys General are empowered to enforce the Pool and Spa Safety Act. The CPSC is looking to State Health and Building Officials to assist in enforcing the Act. State Law can be more restrictive than the federal law as long as the state does not make compliance a physical impossibility.

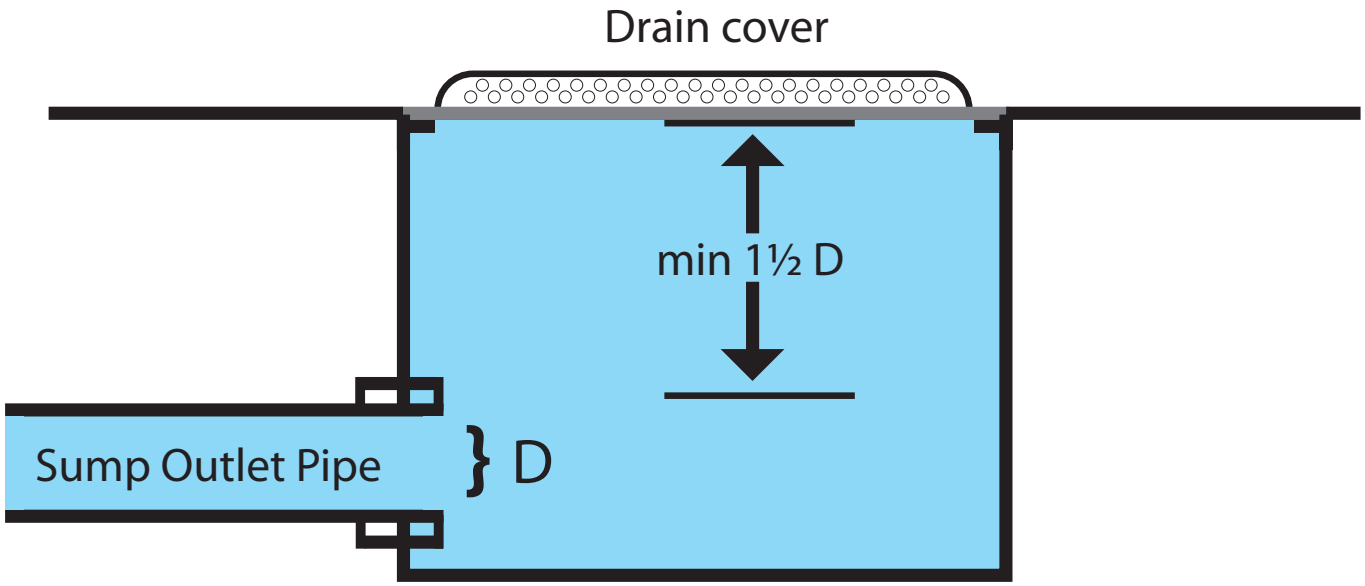


Illustration 3: *Field-built sumps must have a depth, when measured from the bottom of the cover to the top of the outlet piping, of 1.5 times the diameter of the piping.*

Virginia Graeme Baker Pool and Spa Safety Act
Compliance Inspection Form

PART I - Pool Management Information

INSPECTOR NAME		INSPECTION DATE
FACILITY NAME		POOL LICENSE / PERMIT NUMBER
ADDRESS	PHONE NUMBER	
CITY	STATE	ZIP CODE
CONTACT NAME	TITLE	
CONTACT ADDRESS		
CITY	STATE	ZIP CODE
EMAIL ADDRESS	FAX #	

PART II - POOL / SPA Information

POOL LOCATION	INDOOR	OUTDOOR	WATER PARK	OTHER
POOL TYPE	SWIMMING POOL	WADING POOL	SPA ☐ HOT TUB ☐	OTHER
WATER FEATURES (If any)	SPRAY	SLIDE	HYDRO-JET	OTHER
VOLUME OF POOL (Gallons)	MFGR, MAKE, MODEL NUMBER, HORSE POWER OF PUMP			

PART III - Inspection Check List

DESCRIPTION	DATA	COMPLIANT	NON-COMPLIANT	COMMENTS
Determine if the pool has suction outlets (If it does not, the inspection is complete)				
Measured TDH:				
Drain sump measurements:				
Drain cover data: Check the manufacturer's instructions and certification paperwork; look for markings such as the standard, lifespan, flowrate, wall or floor mount, etc.				
If there are suction outlets, main drains, vacuum fittings, etc, determine the total flow rate generated by all pumps in the system				
Are the drain covers, blockable or unblockable, compliant with the P&SS Act?				
If all the covers are blockable, do they need a secondary anti-entrapment device and is one present?				
If there are multiple floor drains, are they at least three feet apart, center to center? If not, is there a secondary anti-entrapment device or system?				

PART III - Inspection Check List (Continued)

DESCRIPTION	DATA	COMPLIANT	NON-COMPLIANT	COMMENTS
Are the drain cover flow rate specifications equal to or greater than the flow rate of the system?				
Is the drain cover secure and attached to the sump according to the manufacturer's instructions?				
If there is a vacuum line present with a compliant cover, CPSC recommends that it be covered whenever the pool is in use.				
Do the skimmer equalizer fittings have compliant covers?				

PART IV - Comments

If pool is not in full compliance, provide a description of actions or steps needed to bring pool or spa into compliance with the Virginia Graeme Baker Pool and Spa Safety Act.

COMMENTS

Inspector - Print Name	Inspector - Signature	Inspection Date