Selecting Drain Covers and Entrapment Prevention Equipment

Guidelines to comply with the Virginia Graeme Baker Pool and Spa Safety Act

Selecting a New Drain Cover

Selecting a new drain cover that meets the federal law and fits your pool's recirculation system can be done by following a few specific steps. Applying these steps requires a solid understanding of the new standard and your pool's existing water recirculation system. You are encouraged to seek the services of knowledgeable and experienced pool professionals when selecting the new drain covers for your pool.

Depending on the scope of the work needed at your pool to meet the new federal law, a permit may be required. If your facility is in Clark, King, Pierce, Snohomish, or Spokane Counties, contact the local health jurisdiction (www.doh.wa.gov/ehp/wr/contactlist.htm) about what compliance work will require plan review and approval. For all other counties, plan review and approval may be required by the state Department of Health. See www.doh.wa.gov/ehp/wr/guidance-vgbplanreview.pdf for more information.

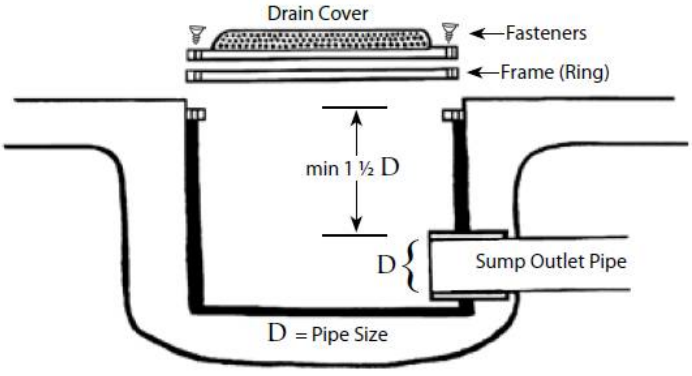
Six Steps to Selecting a New Drain Cover

The following steps will help you select a new drain cover that is right for your pool and meets the requirements of the *Virginia Graeme Baker Pool and Spa Safety Act* and the Washington State Board of Health rules. These steps present the basic information needed to do this. Your pool may have some unique aspects that will affect how you apply this basic information to your search for a new drain cover. You are encouraged to consult with a pool designer or pool professional that is familiar with the new federal law and the *ASME A112.19.8-2007* standard.

Step 1. Drain Outlet Condition and Dimensions

Check the condition and dimensions of your pool's existing suction outlet sump below the main drain cover. This may be best done by a pool professional who can work underwater. For safety, turn off all pumps when underwater working around the suction outlet. If the pool is drained to do this work, be sure that it can be drained without damaging its structural or hydraulic integrity. If the drain cover is removed, securely refasten it before reopening the pool and inspect the cover condition daily, to assure it remains attached.

Drain outlet showing cover, fasteners, frame, and sump.



Not all existing sumps or outlet fittings are acceptable for use with the new covers. For the existing sump to be used with a new cover:

- The sump and connecting frame needs to be in good condition to securely hold the new cover fasteners.
- The sump dimensions, including the location and diameter of the outlet pipe, need to be compatible with the new cover manufacturer's requirements and comply with the *ASME A112.19.8-2007* standard. For more information about sumps, see the *Pool Main Drain Safety* guidance at www.doh.wa.gov/ehp/wr/guidance-maindrainlaw.pdf.

Step 1 continues on next page.

Your pool equipment supplier should be able to help you select a new cover that has been determined by the cover manufacturer to fit your drain sump. A sketch of the existing drain sump, with dimensions that identify the overall sump size and the shortest distance between the sump outlet pipe and the underside of the existing drain cover will be useful. If no cover is available for your existing sump, an engineer may design a field fabricated outlet specifically for your pool. If your pool drain has no sump or the existing sump does not meet the cover manufacturer's requirements, look for a complete outlet fixture (cover, mounting frame, and sump), or have a complete outlet fixture engineered for your pool.

Step 2. Recirculation System Flow Rate

Determine the flow rate of the pool's recirculation system. The Recirculation System Flow Rate is the sum of maximum flows from all pumps on the outlet drain system in gallons per minute (gpm). For recirculation systems with more than one pump, such as a spa pool with one pump for the pool treatment and another for the hydrotherapy jets, the recirculation system flow rate is the combination of flow from both pumps. For more information about how to determine the maximum flow of your pool's recirculation system, see Page 5.

Step 3. ASME/VGB Compliant Drain

Look for a drain cover that has been tested by a nationally recognized testing laboratory to meet the *ASME A112.19.8-2007* product performance standard. Look for markings on the cover or packaging, or in the product literature, displaying "*VGB-2008*" or "*ASME A112.19.8-2007*."

Step 4. Drain Rating for Location and Use

Look for a drain cover that is rated for the drain location and the type of drain system in your pool. Manufactured covers will be rated for use and location. This information will be either on the cover or packaging, or in the product literature. For example, if the drain is on the bottom of the pool and is part of a multiple drain system, you'll need to select a cover that is rated for use on the bottom of the pool with multiple drains. The system of drains, piping, and pumps is often more complex than one might think when observing the number and location of drains, particularly with spas and hot tubs. You are encouraged to consult with a pool professional to determine if you need a drain cover rated for multiple or single drain application.

Step 5. Matching Recirculating Flow to ASME Standards (Federal Law)

New drain covers are rated for the maximum water flow they can handle while meeting the *ASME A112.19.8-2007* product performance standard. Look for maximum flow rate markings on the cover or flow rating information on the packaging or in the product literature.

The number of drain outlets on your pool's recirculation system is a factor in determining the minimum flow rating needed for the new cover. Minimum cover rating needed varies depending on number of drains, and is identified as a percentage of the Recirculation System Flow Rate.

	Number of Drains Per Recirculation System				
	1	2	3	4	5
Minimum Cover Rating must be at least equal to the % of Recirculation System Flow Rate indicated, depending on number of drains.	100%	100%	50%	33%	25%

The design goal for multiple drain systems is to use drain covers that can handle the entire flow of the recirculation system when one of the covers is blocked. For example, if your spa pool's recirculation system has two drains connected together with two pumps—one for the pool treatment and one for the hydrotherapy jets, with a combined water flow of 100 gallons per minute—each of the two drain covers need to be rated to handle 100 gpm. If your spa pool had three drains connected together with the same two pumps, each of the three drain covers would need to be rated to handle 50 gpm.

Step 6. Matching Recirculation System Flow to Velocity (State Rule)

In addition to the requirements of the federal law, Washington State requires that the speed of water flow (velocity) through the drain cover not exceed 1.5 feet per second (fps). The velocity of water flow through the cover is determined by relating the flow (gpm) and the amount of open area in the cover. Your pool equipment supplier or the cover manufacturer should be able to identify the amount of open area in the cover.

This step—calculating the water velocity through the drain cover—will identify if the open area of the cover will allow the volume of water circulating through the cover to not exceed the maximum velocity allowed by Washington State. If the calculation returns a velocity value equal to or less than 1.5 fps, the cover is acceptable. If not, a different cover with a larger open area will be needed.

For more information about how to identify the speed of water through the drain cover see Page 5.

Existing Pools with Dual Drains: In Washington State, before the effective date of the *Virginia Graeme Baker Pool and Spa Safety Act*, the velocity of water flow through the drain cover on dual drain pools was calculated by combining the open area of both drain covers. The federal law restricts this approach to systems with three or more drains when determining the flow rating required for new drain covers. This change affects selection of drain covers to meet the state rule of 1.5 fps. In response to this situation, pools with dual drains built before December 18, 2008 may split the maximum system flow between each drain cover solely for the purpose of calculating the rate of water flow through the drain cover and achieving the 1.5 fps requirement. See the example for existing pools with dual drains on Page 6 for details on this provision.

Replacing Outlet Covers on Equalizer Lines: According to the Consumer Product Safety Commission, all equalizer lines need new covers that meet *ASME A112.19.8-2007*. Until covers intended for this application that meet the *ASME A112.19.8-2007* standard become available, it may be necessary to temporarily plug the equalizer line. If the equalizer line is plugged, either temporarily or permanently, alternative pump protection, such as a remote water level controller is needed.

Installing Covers, Maintaining Records, and Verifying Compliance

After successfully selecting replacement covers for your pool's suction outlets, be sure to retain all supporting information you have used to identify the correct cover, including product literature and recirculation system flow calculations. You are encouraged to have the new main drain cover and necessary supporting components (such as fasteners, installation frames, or brackets) installed by a pool professional who understands the new federal law and the *ASME A112.19.8-2007* standard. A *Compliance Verification Form* (www.doh.wa.gov/ehp/wr/vgbform.pdf) can assist you with demonstrating that your pool complies with the *Virginia Graeme Baker Pool and Spa Safety Act*. Check with your local health jurisdiction or the Consumer Product Safety Commission to see if they have a preferred document or information about maintaining records.

Additional Entrapment Prevention Equipment

The need for additional entrapment prevention equipment depends on the design of your pool's recirculation system and the number of drains it has. If your pool's recirculation system has only one drain, you need to install additional entrapment prevention equipment. See the equipment options below that meet both the federal law and Washington State requirements. If your pool's recirculation system has two or more drains, additional entrapment prevention equipment may be required, depending on how the multiple drain system was designed and installed.

- Any design that places multiple drains closer than 3 feet between the centerlines of the main drain covers are, according to the Consumer Product Safety Commission, so similar in entrapment potential to a single drain that additional entrapment prevention systems are required to comply with the federal law.
- Likewise, multiple drain systems that allow any individual drain to be the sole source of suction are considered single drain systems and require additional entrapment prevention systems. There are various ways to evaluate multiple drains to confirm that no single drain can become a sole source of suction, such as:
    - Using a remote camera.
    - Snaking the pipes between the drain sumps and the pump(s).
    - Isolating different sumps and observing flow patterns.
    - Sending air or water down the main drain line from the pump strainer basket.
    - Using dyes or other materials to observe flow patterns.

Whatever method is used to evaluate multiple drain systems, be sure to document the findings as part of your permanent records.

Drain systems that balance the suction load between multiple drains do not require additional entrapment prevention equipment.

Entrapment Prevention Approved by Federal Law and Washington State

Currently, there are several options available that meet both the federal law and Washington State requirements. These include:

- Safety vacuum release system and alarm.
- Gravity drainage system.
- Second main drain.
- Suction limiting vent system and drain.
- Drain disablement.
- Unblockable drain with shut-off switch and alarm.

Information about these options can be found in the *Single Main Drain Guidelines* at www.doh.wa.gov/ehp/wr/guidance-singlemaindrain.pdf.

Special Note about Unblockable Drains: Placement of an unblockable drain cover on a blockable sump (sump with dimensions less than 18" by 23") will not qualify as an unblockable drain. The federal law allows the use of an "unblockable" drain meeting the *ASME A112.19.8-2007* standard on a single main drain without any additional entrapment prevention equipment. This provision is, however, less protective than current Washington State requirements and policy. Entrapment events across the nation have identified drain cover or fastener fatigue, resulting in a broken or missing cover, as the major contributor to entrapment-related injury and death. Relying on a cover to provide the sole measure of entrapment prevention, even one of "unblockable" design meeting the *ASME A112.19.8-2007* standard, presents a level of risk that Washington State finds unacceptable.

Washington State requires that all water recreation facilities with single main drain systems, including those with an "unblockable" drain meeting the *ASME A112.19.8-2007* standard, have additional entrapment prevention equipment. An automatic or manual emergency shut-off switch and alarm, or any of the entrapment prevention approaches mentioned above, will meet the Washington State requirements.

Additional System Flow Information

Determining Maximum Flow Rate of the Recirculation System

Approved Engineering Plans: If a copy of the approved engineering plans is available, it should provide design and layout details of the recirculation system. If the recirculation pump has been replaced since construction of the pool and a pump different than the approved plans specified was used, an engineer will need to evaluate the existing pump and recirculation system.

Engineer Design Analysis: If a copy of the approved engineering plans cannot be obtained, an engineer may provide an analysis of the current pump and recirculation system to determine the maximum flow rate. Engineering calculation may include:

- Determination of total dynamic head (TDH) for the system.
- Determination of simplified TDH calculation. This method finds the maximum system flow rate using hydraulic calculation based on the lowest possible total dynamic head for a circulation system.

Field Test Methods: See *American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins, ANSI/APSP-7 2006* for field methods on determining maximum flow rate of the system. These field methods include calculations with pressure and vacuum readings or using the maximum pump flow rate specified by the manufacturer. The calculations also measure flow with a 5-gallon bucket and stopwatch.

Identifying Speed of Water Flow through the Drain Cover

Use the following equation, where V = velocity; Q = flow; and A = open area. $V_{fps} = Q_{cfs} / A_{ft^2}$

To use this formula:

- Convert the flow rate needed for the drain cover on your recirculation system, from gallons per minute (gpm) to cubic feet per second (cfs), by dividing the flow rate by 448.8 and then,
- Convert square inches of open area of the drain cover to square feet. Divide the number of square inches of open area in the drain cover by 144.

Example for New Construction (Water recreation facilities built after December 18, 2008):

A spa pool recirculation system has two drains connected together on the suction side of two pumps—one for the pool treatment and one for the hydrotherapy jets, with a combined water flow of 100 gallons per minute. Each of the two drain covers would need to be rated to handle 100 gpm. The selected drain cover has 24 square inches of open area and each is rated for 120 gpm.

Convert the needed flow rate from gpm to cfs:
100 gpm / 448.8 = 0.22 cfs

Convert the open area from square inches to square feet (ft^2):
24 square inches / 144 = 0.17 ft^2

Calculate the velocity through the drain cover:
V = 0.22 cfs / 0.17 ft^2
V = 1.29 fps

The selected drain cover meets the Washington State design requirement of velocity through the drain cover equal to or less than 1.5 fps. If the calculation result for the drain cover selected for your pool exceeds the 1.5 fps rate, look for other available drains.

Identifying Speed of Water Flow continues on next page.

Example for Existing Pools with Dual Drains (Special circumstances for pools built before December 18, 2008): Compliance with the state requirement that flow velocity through the drain cover be less than or equal to 1.5 fps may be determined by splitting the total maximum flow between each drain cover. This allowance pertains only to determining compliance with Washington State rule for maximum flow velocity through the cover. It does not replace or otherwise modify the federal law requirement that each drain cover be rated at 100% of the maximum Recirculation System Flow Rate.

A swimming pool built in 2005 with two main drains and a maximum recirculation system flow of 80 gpm. The drain covers selected are rated at 88 gpm flow, meeting the federal law (ASME standard). Using the option to split the flows, 50% for each drain, divide the system flow rate by two. Then complete the calculations to determine the flow velocity and compare the result to the state requirement. Maximum flow rate is 80 gpm for the recirculation system. The new drain covers each have 8.8 square inches of open area and are rated at 88 gpm.

Split recirculation system flow in half:
80gpm/2 = 40 gpm

Convert the flow from gpm to cfs:
40 gpm / 448.8 = 0.09 cfs

Convert the open area from square inches to square feet (ft^2):
8.8 square inches / 144 = 0.06 ft^2

Calculate the velocity through the drain cover:
V = 0.09 cfs / 0.06 ft^2
V = 1.5 fps

The selected drain cover meets the federal law with a flow rating at or above 100% of the maximum recirculation system flow for each drain and meets the Washington State requirement of velocity through the drain cover equal to or less than 1.5 fps.

If the calculation result for the drain cover selected for your pool exceeds the 1.5 fps rate, look for other available drains. If no larger drains are available, it may be necessary to submit a variance request. Contact your regulating health department that provides the facility an operating permit, www.doh.wa.gov/ehp/wr/contactlist.htm.

More water recreation facility guidelines are at www.doh.wa.gov/ehp/wr/rules.htm.