



# HOW TO SIZE AND SELECT VGBA 2017 COMPLIANT DRAIN SYSTEMS



**VGBA HAS CHANGED  
WE HAVE YOU COVERED**



# WHAT IS THE VIRGINIA GRAEME BAKER ACT?

The goal of the Virginia Graeme Baker Pool & Spa Safety Act (VGBA) is to eliminate the hazard of swimming pool and spa drain entrapment.

The VGBA is a federal law enacted by Congress and signed by the President on December 19, 2007. The effective date was December 19, 2008. Congress directed the U.S. Consumer Product Safety Commission (CPSC) to protect the public "against unreasonable risks of injuries associated with consumer products." Drain covers are classified as "consumer products" that are regulated by the U.S. Consumer Safety Product Standard ANSI/APSP/ICC-16 2017.

## IMPORTANT UPDATES TO VGBA

On May 24, 2021, ANSI/APSP/ICC-16 2017 became the successor drain cover standard to all previous versions of the ASME/ANSI A112.19.8-2007, VGB 2008, and ANSI/APSP-16 2011 standards (collectively known as the VGB 2008 standards). **Manufactured product certified to the newest version will be marked with VGBA 2017.**

### Flow rates may have changed

Drain covers manufactured after May 24, 2021 may have different flow rates than before. Some models will have more flow ratings, which are based on pipe size, sump depth, and other factors.

### A drain cover's manufacturing date now determines which documentation to use

You must know when a drain cover was manufactured to know which documentation to use. *It's best practice to follow the included instructions.*

### VGBA 2017 is a rolling change

Drain covers manufactured before May 24, 2021 that comply with a VGB 2008 standard can still be used, sold, and installed after that date, but must be installed according to their included instructions. These products remain compliant until they expire, are damaged, or if improperly installed.

## HOW TO TELL IF AN AQUASTAR DRAIN COVER WAS MANUFACTURED BEFORE OR AFTER MAY 24, 2021

Use the chart below to identify when an AquaStar drain cover was manufactured.

### HOW TO IDENTIFY VGB 2008 COVERS

(Use VGB 2008 Documentation)



Example

#### VGB 2008 Compliance Stamp

##### On Some Products

Compliance button or emboss that says "VGB 2008"



Example

#### Manufacturing Date

##### On Some Products

Dated **BEFORE** "May 24, 2021"

#### Embossed Words

##### On All Products

One, or more of the following:  
"ASME/ANSI A112.19.8 (2007, 2008a, or 2009b), ANSI/APSP-16 2011, VGB 2008"

**Embossed Words**

### HOW TO IDENTIFY VGBA 2017 COVERS

(Use VGBA 2017 Documentation)



Example

#### VGBA 2017 Compliance Stamp

##### On Some Products

Compliance button or emboss that says "VGBA 2017"



Example

#### Manufacturing Date

##### On All Products

Dated **AFTER** "May 24, 2021"

#### Embossed Words

##### On All Products

The following: "VGBA 2017"

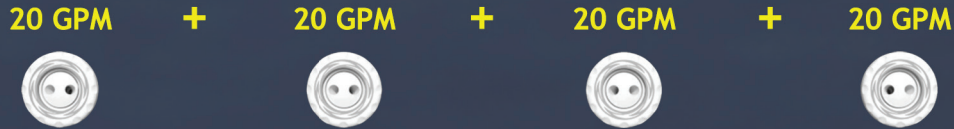
**Embossed Words**

# HOW TO SIZE AND SELECT VGBA 2017 COMPLIANT DRAIN SYSTEMS

## STEP 1 - DETERMINE THE DESIGN FLOW RATE

When sizing a VGBA 2017 compliant suction system, **determine the design flow rate that is needed for the system to function properly.** The design flow rate is driven by turnover rate, the needs of a water feature, or spa jets.

**EXAMPLE** - If a system consists of four spa jets that require 20 GPM each, the design flow rate would be 80 GPM.



**DESIGN FLOW RATE = 80 GPM**

## STEP 2 - DO NOT EXCEED 6 OR 8 FPS AT DESIGN FLOW RATE

When sizing a VGBA 2017 compliant suction system, **ensure that the water through the piping can meet the design flow rate without exceeding a velocity of 6 or 8 fps.**

Use a **Maximum GPM Capacities of Pipes Chart** to find the maximum GPM for different pipe sizes and velocities of water.

**Most modern standards prohibit the velocity of water through piping to exceed 6 or 8 fps in swimming pools or spas.** Exceeding 10 fps can cause pump cavitation, poor performance, and wasted energy.

*Note that drain cover VGBA maximum flow ratings typically exceed 10 fps.*

**Maximum GPM Capacities of Pipes Chart**

Pipe Size	PVC SCHEDULE 40		
	6 fps	8 fps	10 fps
1½"	38	51	64
2"	63	84	105
2½"	90	119	149
3"	138	184	230
4"	238	317	397
5"	374	499	624
6"	540	720	900
8"	936	1247	1559
10"	1475	1966	2458
12"	2093	2791	3488

Source: ASTM D1785 nominal pipe sizes

**EXAMPLE** - If the design flow rate is 80 GPM, using the chart we can see we need to use at least 2.5" piping, which has a maximum GPM of 90 GPM at 6 fps to meet our design flow rate of 80 GPM. **See highlighted region on Maximum GPM Capacities of Pipes Chart.**

## STEP 3 - CALCULATE THE SYSTEM'S TOTAL DYNAMIC HEAD

When sizing a VGBA 2017 compliant suction system, **calculate the total dynamic head (TDH) of the system.**

Calculating TDH will later help us determine the maximum system flow rate using a pump's performance curve.

**Total dynamic head** is the amount of pressure differential created by a pump as it operates.

A simplified or full TDH calculation may be used to determine TDH. Note that different calculations can result in higher or lower TDH values than the system's *actual* TDH. **See the example below for more information.**

### EXAMPLE - HOW TDH CALCULATIONS CAN IMPACT DETERMINING A SYSTEM'S MAXIMUM FLOW RATE

**RESULTS IN HIGHER** than *actual* maximum system flow rating

**CAN RESULT IN LOWER** than *actual* maximum system flow rating

**Simplified TDH Calculation** - This method is from ANSI/APSP/ICC-7 2020 and it only uses the distance between the water and the pump without the friction loss of pipe fittings, valves, or equipment. When using the TDH result with a pump's performance curve, it may result in a higher than maximum system flow rating.

**Full TDH Calculation** - Full TDH is required by most public pool and spa codes, followed by field verification using a properly installed flow meter. When using the TDH result with a pump's performance curve, it can result in a flow rate lower than what will be delivered by the pumping system because PVC irrigation head loss charts overestimate losses to assure a higher than calculated flow rate is delivered.

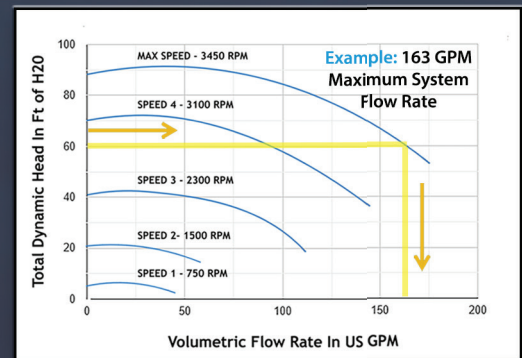
## STEP 4 - DETERMINE THE MAXIMUM SYSTEM FLOW RATE

When sizing a VGBA 2017 compliant suction system, review the pump's model-specific performance curve. Pump curves show a pump's capacity to produce flow (GPM) in relation to the system's operating TDH.

To find the system's actual maximum system flow rate, find the system's measured or calculated TDH on the graph and move across to the curve intersection and down to the flow rate.

**IMPORTANT** - When selecting and sizing a VGBA 2017 compliant suction system, ensure that the VGBA 2017 flow rating exceeds the maximum system flow rate, and not just the design flow rate.

Pump Model-Specific Performance Curve



**EXAMPLE** - See the example pump curve pictured above. If the total dynamic head of the system is 60, the maximum flow potential of our pump is 163 GPM at max speed (which is greater than our example design flow rate of 80 GPM). Select a VGBA compliant system with a flow rating higher than 163 GPM.

## STEP 5 - SELECT A BLOCKABLE OR UNBLOCKABLE DRAIN SYSTEM

When selecting and sizing a VGBA 2017 compliant suction system, choosing a blockable or unblockable drain system will affect how the flow rating is calculated.

**Unblockable Suction Outlet Fitting Assembly (SOFA):** The VGBA defines an unblockable drain as a suction outlet fitting assembly that, when installed according to the manufacturer's instructions, cannot be shadowed by an 18 in. x 23 in. Body Blocking Element.

All VGBA 2017 compliant drain covers are marked either "Blockable or Unblockable."

### EXAMPLE - HOW TO CALCULATE FLOW RATINGS FOR BLOCKABLE AND UNBLOCKABLE SOFAS

Blockable	Dual-Drain VGBA Rating	Three-Drain VGBA Rating
	3 feet minimum $170 + 170 = 170 \text{ GPM}$	3 feet minimum $170 + 170 + 170 = 340 \text{ GPM}$

- For blockable SOFAs, assume one is blocked; the VGBA flow rating is the sum of the unblocked SOFAs.
- Blockable SOFAs must have two SOFAs distanced at least 36" apart on center.
- Blockable SOFAs rise above the pool floor. Flush options are NOT available.

Unblockable	Unblockable VGBA Rating
	No minimum separation $200 + 200 + 200 = 600 \text{ GPM}$

- When using two or more unblockable drains, the system flow rating is the sum of the flow ratings.
- Unblockable drain covers have no minimum separation, separate 36" when possible.
- Unblockable SOFAs may be flush with the floor.

The 18" x 23" dimension represents the dimensions of a 99th percentile male.

Dimensions for the APSP-16 Body Blocking Element and the 99th percentile male silhouette:

- Element width: 20.6 in. (523 mm)
- Element height: 23 in. (584 mm)
- Male torso width: 18 in. (457 mm)
- Male torso height: 15 in. (381 mm)
- Male torso depth: 20.5 in. (521 mm)
- Male torso depth (lower): 18.4 in. (467 mm)
- Male torso depth (lower): 18 in. (457 mm)
- Male torso depth (lower): 3.4 in. (86 mm)

## STEP 6 - DETERMINE THE SUMP DEPTH (GREATER OR LESS THAN 16")

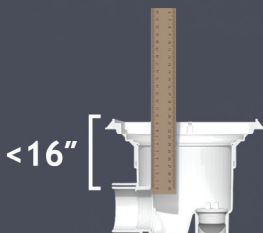
When selecting and sizing a VGBA 2017 compliant suction system, the pipe depth of a suction outlet fitting assembly now determines if you can use the highest tested flow rating.

**Sump Depth:** The space between the finished surface of the pool and the suction pipe opening. If a pipe is coming into a sump at the side, the measurement must be taken from the inside diameter of the pipe.

Changes in pipe size, pipe orientation, and/or sump depth result in a different SOFA model.

Each configuration in which a drain cover may be installed must be tested and given a flow rating.

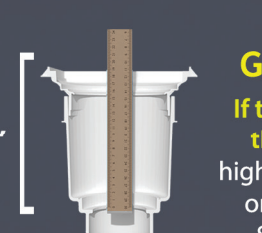
### EXAMPLE - HOW SUMP DEPTH IMPACTS FLOW RATINGS



**< 16"**

**SUMP DEPTHS  
LESS THAN 16"**

If the sump depth is less than 16" you must install the cover using one of the provided configurations on the SOFA Specifications Sheet and use the associated flow rate.



**> 16"**

**SUMP DEPTHS  
GREATER THAN 16"**

If the sump depth is greater than 16" you may use the highest flow rating (GPM) listed on the SOFA Specifications Sheet with any size pipe.

## STEP 7 - SELECT A DRAIN SYSTEM WITH A VGBA FLOW RATING THAT IS HIGHER THAN THE MAXIMUM SYSTEM FLOW RATE

When selecting a VGBA 2017 compliant suction system, look up a drain cover's flow rating by using AquaStar's VGBA 2017 Product Specifications that are available online. Specifications can be accessed by scanning QR codes that can be found on AquaStar's product instructions, cut-sheets, and catalogs or by visiting [www.aquastarpoolproducts.com/flowcode](http://www.aquastarpoolproducts.com/flowcode).

AquaStar utilizes an extended SOFA model number for specifying the critical sump dimensions and pipe details.

The installation must conform to the minimum/maximum requirements, including the SOFA dimension defined in Figure 1 below. The installed sump may be manufactured or field-built and it may be larger/deeper than Figure 1.

Please see the example *How To Read AquaStar SOFA Model Numbers* below.

### EXAMPLE - HOW TO READ AQUASTAR SOFA MODEL NUMBERS

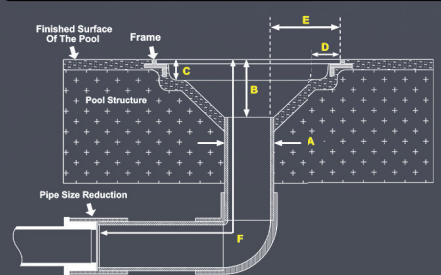
**Example SOFA Model Number**

A10RCFR-10X A-# X B# C# D# E# F#

- model number
- w - wall orientation
- f - floor orientation
- nominal pipe size, inches
- b - bottom pipe exit
- s - side pipe exit

critical sump dimensions, inches

**FIGURE 1 – SOFA MODEL & FLOW PATH  
Critical Sump Dimensions**



- A. Specified PVC Pipe Size
- B. Minimum Sump Depth
- C. Minimum Ledge Depth
- D. Maximum Ledge Width
- E. Minimum Pipe Offset
- F. Minimum Length Before Reduction

**EXAMPLE SPECIFICATION LISTING**

SOFA Model No.	Pipe Size (Nominal)	Pipe Depth (Minimum)	Orientation (Wall / Floor)	Flow Rating (GPM)
A10RCFR-10f_A-2b.5_B0_C0_D0_E0_F16	2.5"	0"	Floor (f)	119
A10RCFR-10f_A-3b_B0_C0_D0_E0_F16	3"	0"	Floor (f)	138
A10RCFR-10f_A-2.5b_B3_C0.4_D0.5_E3.75_F16	2.5" (b)	3"	Floor (f)	170
A10RCFR-10f_A-2,1.5b_B3_C0.4_D0.5_E1.5_F16	2" + 1.5" (b)	3"	Floor (f)	200
A10RCFR-10w_A-3b_B0_C0_D0_E1.5_F16	3"	0	Wall (w)	119

Note: "SOFA Model No" nomenclature; bottom pipe = (b), side pipe = (s). See Fig 1 for capital letters A through E

**Example:** The SOFA Model Number for installing an A10RCFRxxx on the floor over a 2" and 1.5" pipe that is located on the bottom of a 3" minimum sump in this example would be:

**A10RCFR-10f\_A-2,1.5b\_B3\_C0.4\_D0.5\_E1.5\_F16**

If the sump depth is greater than 16" you may use the highest flow rating (GPM) listed on the SOFA Specifications Sheet with any size pipe. See the highlighted area in the example specification listing.



For more information, please call  
877-768-2717 or visit  
[www.aquastarpoolproducts.com](http://www.aquastarpoolproducts.com)



[info@aquastarpoolproducts.com](mailto:info@aquastarpoolproducts.com)  
877.768.2717 FAX: 877.276.POOL(7665)  
[www.aquastarpoolproducts.com](http://www.aquastarpoolproducts.com)