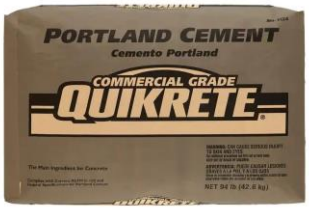
How to Make a Porous Concrete Slab

This instruction manual will guide the user through the necessary steps to create a porous concrete slab of dimensions 76” x 40” x 3” (193 cm x 101 cm x 7.6 cm; GSAP toilet digester bed dimensions are 78” x 42” x 36” or 198 cm x 106 cm x 91 cm) with a water-cement ratio of 0.275. This water-cement ratio was found to be the optimal ratio to allow the flow of liquid through the concrete, with a mix design of one part cement to three parts gravel (coarse aggregate).

Note: While this ratio proved to be the most effective of the options analyzed during experimentation, it is not recommended to solely utilize porous concrete as a filtration device, especially in cases where solids would enter the voids and cause clogging. It is recommended that the user implements a type of mesh, such as window screening material, above the porous concrete slab to assist with filtration, if it is available. If a mesh or other porous barrier is not available for use, the porous concrete will clog quickly and require frequent unclogging maintenance. The maintenance requirements for the cleaning of porous concrete, such as pressure washing, are far more strenuous than maintenance requirements for cleaning mesh, where the user could use low pressure water to clear out any solid material in the mesh.

Necessary components: 165 lbs. (approximately 75 kg) portland cement, 496 lbs. (approximately 225 kg) 3/8 in. gravel, 5.5 gal. (20.625 liters) water.

Portland Cement:	3/8 in. Gravel:	Water:
		

Necessary equipment: Mold of dimensions 76” x 40” x 3” (193 cm x 101 cm x 7.6 cm; height can be larger; instructions can be found on the last page of this document), trowel or shovel, large bucket (or other mixing vessel), scale (to measure the weight of each component; if an electronic scale is unavailable, the user can weigh components in smaller batches on a typical scale), containers for each component to be weighed in, and plastic lining with dimensions larger than the mold.

Mold: 	Trowel or Shovel: 	Mixing Vessel: 
Weighing Containers: 	Scale: 	Plastic lining: 

Instructions:

Step 1: Weigh the containers being used to weigh the components. Next, weigh out the necessary amount of each component, ensuring to subtract the weight of the container that the component is being weighed in.

Image to the left is gravel being weighed, but the scale number does not reflect the weight needed for a slab with dimensions 76” x 40” x 3” (193 cm x 101 cm x 7.6 cm).

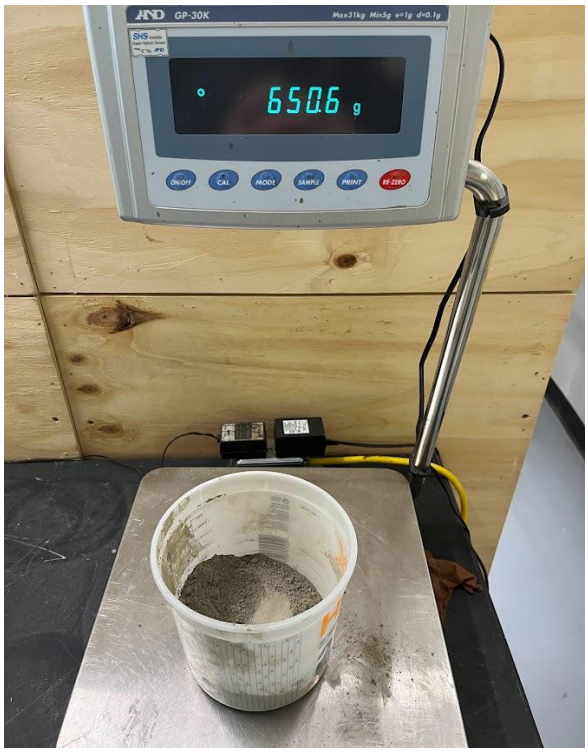
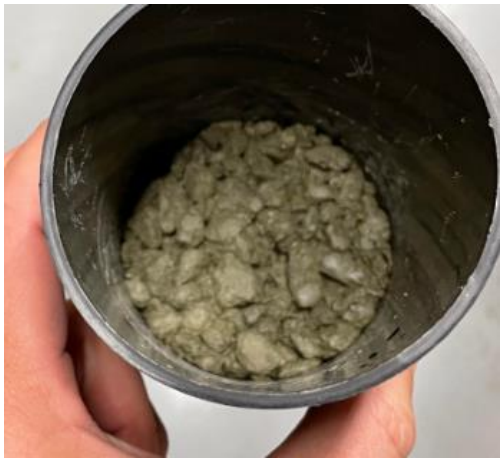


Image to the left is cement being weighed, but the scale number does not reflect the weight needed for a slab with dimensions 76” x 40” x 3” (193 cm x 101 cm x 7.6 cm).

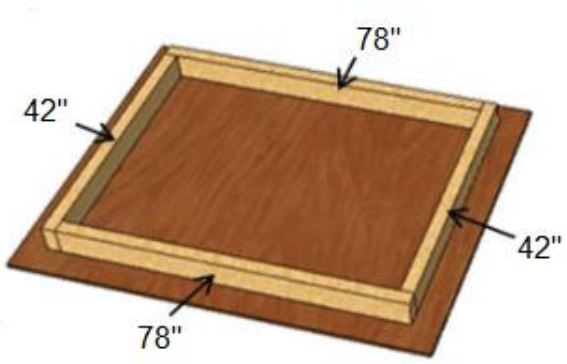
	Image to the left is a cylindrical sample mold being weighed, but the scale number does not reflect the appropriate weight of a mold needed for a slab with dimensions 76” x 40” x 3” (193 cm x 101 cm x 7.6 cm).
	**Step 2:** Pour the 3/8 in. gravel into a large bucket (or other mixing vessel), along with half of the water. Mix with the trowel until all the gravel is moistened. Image to the left depicts the gravel after it has been mixed with the water.

	**Step 3:** Slowly, over the course of 3-5 minutes, add all the portland cement to the mixture while stirring. Image to the left shows cement being added to the mix.
	**Step 4:** Add the other half of the water to the mixture and stir with the trowel until the consistency of the mixture is uniform throughout (no dry patches or large clumps of cement paste). Image to the left illustrates the texture of the mixed, uncured porous concrete.
	**Step 5:** Line the mold with plastic or other water--resistant lining. Image to the left illustrates the process of lining a mold. The mold used will have larger dimensions than the one depicted. The transparency of the plastic lining used is not relevant.
	**Step 6:** Pour the mixture into the mold and level the surface of the concrete by lightly shaking the mold, or lightly patting down raised areas with the trowel, shovel, or other tool useful for spreading and leveling.

	**Step 7:** Cover the mixture in the mold with the plastic lining and allow the mixture to cure for 14 - 28 days. At 14 days, the concrete will be able to perform filtration, but cure for 28 days for stronger concrete. After the curing process is complete, remove the porous concrete slab from the mold. Image to the left reflects what the texture of the concrete should resemble after the curing process.

How to Make a Wooden Mold for a Porous Concrete Slab

Required: 2x4s, two 78” long and two 42” long. Plywood minimum dimensions 80” x 44”.

	On the large piece of plywood, nail the 2x4s in a rectangular fashion, meeting end to end, also known as butt jointing, as shown on the left.

Sources for images:

Cement: https://www.homedepot.com/p/94-lb-Portland-Cement-112494/100570364

Gravel: https://braensupply.com/3-8%E2%80%B3-clean-crushed-stone/

Water: https://www.istockphoto.com/photos/filling-water-bucket

Shovel: https://www.istockphoto.com/photo/black-spade-survival-equipment-isolated-on-white-background-gm1267937369-372103359?utm_source=unsplash&utm_medium=affiliate&utm_campaign=srp_photos_top&utm_content=https%3A%2F%2Funsplash.com%2Fs%2Fphotos%2Fshovel&utm_term=shovel%3A%3A%3A

Wheelbarrow: https://www.acehardware.com/departments/lawn-and-garden/gardening-tools/wheelbarrows-carts-and-hand-trucks/7331739?x429=true&gclid=Cj0KCQiArsefBhCbARIsAP98hXTu3yUJjvczqFGm-lO8XLcvMtoiq1qYVAeQckR4JPM8qsIFp0v_R-kaAllyEALw_wcB&gclsrc=aw.ds

Large Buckets: https://www.homedepot.com/p/The-Home-Depot-5-Gal-Homer-Bucket-3-Pack-05GLHD2/100672960?source=shoppingads&locale=en-US&srsltid=Ad5pg_Fa7pA1vjaFNX8d7b15uqby5m05s5XMWtPnGCU7Qobi8VFx8GJgnec

Scale: https://www.adamequipment.com/aeblog/balances-in-materials-testing-for-construction

Lining: https://farmplasticsupply.com/black-plastic-sheeting-10mil-10x100?gclid=Cj0KCQiArsefBhCbARIsAP98hXQRXf-wgRWBJYcNGjlHuCiYVrF2OjjTKwQcQBLrwMTNJWxCz5bVungaAo-LEALw_wcB

Image of lined mold: https://soapdelinews.com/2013/06/how-to-make-a-soap-mold-for-cold-process-soap.html

Wooden mold photo and 3D model image:

> Global Sustainable Aid Project. (2014). GSAP Microflush Toilet Locally sourced and fabricated Rural Pour Flush Model Instructions, pg. 10. Pawtucket; Global Sustainable Aid Project.