

Concrete at Home and on the farm

There are many small concrete projects that the home-owner can confidently tackle.

Concrete is made by mixing portland cement, sand, stone and water. The potential strength of concrete depends largely on the proportion of each ingredient in the mix.

Concrete hardens as a result of the chemical reaction between the cement and water; if concrete is allowed to dry out too rapidly it will not develop its full strength. This is why concrete should be “cured”.

What materials do I need?

Use cement with a SABS mark showing that it complies with SANS 50197-1.

The sand and stone must be free of leaves, grass, compost, clay lumps, etc. Sand should be fairly coarse, with particles ranging from about 5-mm to dust.

Mix proportions are given for stone sizes of 26,5 mm or 19 mm. These sizes are most commonly available and are the most economical.

Any water that is fit to drink is suitable.

Note that fertilizer, sugar, oil, etc, are harmful to fresh concrete.

How thick should the concrete be?

Minimum thicknesses are:

Paths, patios, floors, driveways – 80 mm.

Footings for garden walls – 200 mm (width should be 600 mm).

How much concrete do I need?

Calculate the volume of concrete required. First measure the area to be concreted.

For rectangular shapes, volume = length × width × thickness.

For circular shapes, volume = diameter × diameter × 0,8 × thickness.

What mix proportions should I use?

The strength of the concrete depends on mix proportions and should suit the work being done. Mix proportions and quantities are given in the table overleaf. These proportions are based on the use of grade 32,5 cement. Higher grades will produce higher strengths; lower grades should not be used.

High-strength concrete should be used for precast items such as flagstones, and heavy-duty floors such as workshops.

Medium-strength concrete is suitable for light-duty floors, paths, patios and steps, driveways and carport floors.

Low-strength concrete is suitable for footings for walls.

How should I measure the ingredients?

Use a bucket or tin of convenient size for batching all the solid ingredients.

Fill the container accurately each time so that the quality of concrete does not vary from one batch to the next.

Check that the container is clean before you start.

How should I mix the concrete?

Concrete can be mixed by hand if quantities are small, or in a concrete mixer powered by electricity or a petrol engine.

Mixing by hand

Very small batches of up to about 25 ℓ of mixed concrete can be mixed in a wheelbarrow.

Bigger batches should be mixed on a concrete slab or steel plate. Do not mix directly on the ground as water may be drawn out of the concrete or soil mixed into it.

Measure and mix batches of a convenient size (as much as can be mixed in about 15 minutes).

Spread the sand in a layer about 100 mm thick. Spread the cement on top of this and mix the two thoroughly.

Now make a heap with the mix and make a hollow in the middle. Add water in small quantities and mix it in. Keep on adding and mixing in water until the consistence of the mix is rather like that of thin porridge.

Next measure the right amount of stone and mix this well into the mortar (sand-cement paste) until each particle

	Stone Size mm	Mix proportions by volume			Approx.* yeild of batch	Quantities for 1 m ³ ** of concrete (approx.)		
		Cement	Sand	Stone		Cement 50 kg bags	Sand m ³	Stone m ³
		High-strength concrete	26,5 or 19	1		2	2	3
Medium-strength concrete	26,5 or 19	1	2,5	2,5	4	7,7	0,62	0,62
Low-strength concrete	26,5 or 19	1	3,5	3,5	5,25	5,8	0,65	0,65

* Batching container units (for example, a 1:2:2 mix batched in a 10-ℓ bucket will yield 30 ℓ of concrete per batch).

** 1 m³ = 1 000 ℓ.

of stone is well coated with mortar. If the mix is too stiff to be placed easily, add a little more water and mix it in thoroughly.

If too much water is added, the mix will be slushy and the concrete will be weak.

If not enough water has been added, the concrete will be difficult to place and compact, which will also reduce its strength.

Using a concrete mixer

The batch size should suit the mixer – underfilling the mixer wastes time while overfilling results in spillage and poor mixing.

Measured quantities of materials are added in the following order: first the stone and about half a measure of water, then the cement, then the sand, and finally more water until the right consistence is reached.

When all the materials have been added, continue to mix until colour and consistence are uniform. Discharge each batch completely.

Moving the concrete to the job

The concrete can be moved in buckets or wheelbarrows. If it is jolted too much the stone will settle at the bottom. If this happens, remix the concrete before placing it.

Don't let the concrete stand so long that it stiffens before it is placed. Cover concrete with plastic sheets or wet sacking so that it does not dry out in the sun or wind.

Placing the concrete

Dump the concrete as close to its final position as possible. If concrete is placed on the ground, the soil should be thoroughly damp, but without any standing water, when the concrete is placed.

The concrete should be well compacted. Work the concrete right into the corners and along the edges with a spade or trowel. To compact concrete slabs, use a wooden beam that spans the slab. First use a chopping action and then a sawing action. Next, wood-float the concrete to obtain an even, but rough surface. Very smooth, steel-trowelled surfaces on outdoor paving may be slippery and dangerous.

How do I cure the concrete?

By keeping the concrete damp. Once it has stiffened, either cover it with plastic sheeting that is held down firmly along its edges, or cover it with hessian or sacking that is kept wet. Curing should continue for 7 days. Good curing also helps to limit cracking of the concrete.

Joints and panel sizes

Concrete slabs should be divided into panels to limit random cracking. The distance between joints should be about 2,5 m in concrete 80 mm thick, and 3,5 m in concrete 100 mm thick.

Panels should be more or less square and each panel must be completed in one operation.

Cement & Concrete Institute

PO Box 168, Halfway House, 1685

Tel (011) 315-0300 • Fax (011) 315-0584

e-mail info@cnci.org.za • website <http://www.cnci.org.za>