

# mortar mixes for masonry

Mortar binds bricks and blocks together to give strength and stability to a wall.

Freshly mixed mortar must be soft and plastic so that it spreads easily and makes good contact without becoming too strong. Too strong a mortar may crack and is wasteful and expensive.

## 1. Materials

### 1.1 Cement

Preferred cement types are:

- Common cement complying with SANS 50197-1
- Masonry cement complying with SANS 50413-1; strength class 22,5X.

Cement is sold in 50 kg bags and in bulk.

Cement must be kept in dry storage. If there are hard lumps in the cement that cannot be crumbled by hand, it is not fresh and should not be used. The performance of products claiming conformance with SANS 50413 strength class 12,5X is not supported by independently published data.

### 1.2 Lime

Use only type A2P building lime complying with SANS 523 : 2007. Do not use quick-lime, lime wash or agricultural lime. Lime is sold in 25 kg bags.

Lime should be used if the sand lacks fine material or is single sized, as such sands tend to produce mortar with poor workability unless lime is included in the mix.

Lime also helps the fresh mortar to retain water when it is placed against dry cement bricks or blocks and helps to prevent cracking of the hardened mortar.

For Class I mortar, a maximum of 10 kg of lime is permitted per 50 kg of cement. For Class II mortar, a maximum of 25 kg of lime is permitted per 50 kg of cement.

Do **not** use lime with masonry cement.

### 1.3 Sand

Sand shall either comply with all of the following requirements or, if required in terms of the specification, the requirements of SANS 1090 for mortar sand (natural or manufactured):

- a) sand shall contain no organic material (material produced by animal or plant activities);
- b) sand shall not contain any particles which are retained on a sieve of nominal aperture size 5 mm;
- c) when 2,5 kg of cement is mixed with 12,5 kg of air-dry sand, the mixture shall not require more than 3,0 ℓ of water to be added to reach a consistency suitable for the laying of masonry units; and
- d) when mixed with the cement in accordance with the mix proportions, the sand shall have workability suitable for the laying of masonry units.

**NOTE: Sands which require the addition of more than 3,0 ℓ of water in terms of (c) to reach a consistency suitable for the laying of masonry units, can in some instances be blended with coarse sand (for example, river sand with a particle size of less than 4 mm) to make them comply with the requirements of this test. The proportion of the blended sand can be determined by means of the above-mentioned test on a trial and error basis.**

Some pit sands are suitable. River, dune and beach sands are often too uniform in size (single-sized) to give good results without being blended with another suitable sand.

## 2. Mix proportions

The proportion of each material in the mix should suit the type of work being done. Strength requirements and mix proportions, recommended by C&CI, are given in Table 1.

In general terms the classes of mortar may be used as follows:

### Class I

Highly stressed masonry incorporating high-strength structural units such as might be used in multi-storey loadbearing buildings; reinforced masonry.

### Class II

Normal loadbearing applications, as well as parapets, balustrades, retaining structures, and freestanding and garden walls, and other walls exposed to possible severe dampness.

**Table 1: Mortar strength requirements and mix proportions**

Mortar class	Minimum required compressive strength at 28 days, MPa		Quantity of sand <sup>1</sup> per 50 kg bag of cement, l		Quantities of materials required per m <sup>3</sup> of mortar (not including wastage)			
	Preliminary laboratory tests	Works tests	Common <sup>2</sup> cement 32,5, 42,5	Masonry <sup>3</sup> cement 22,5X	Common <sup>2</sup> cement, bags 32,5, 42,5	Sand m <sup>3</sup>	Masonry <sup>3</sup> cement, bags 22,5X	Sand m <sup>3</sup>
I	14,5	10	130 ℓ	80 ℓ	10,0	1,25	13,5	1,15
II	7	5	200 ℓ	130 ℓ	7	1,35	10	1,25

1. Sand is estimated at a 5% moisture content.  
2. Common cement complying with SANS 50197-1, strength class 32,5 or 42,5.  
3. Masonry cement complying with SANS 50413-1, strength class 22,5X.

NOTE: For 90 - 110 mm thick single leaf walls, 1 m<sup>3</sup> of mortar will be sufficient to lay about 3 700 bricks (190 x 90 x 90 mm) without wastage. See note in section 6 above.

In practice, Class II mortars are used for most applications. Although SANS 10249: refers to a Class III mortar, it is so seldom used that it has been omitted from Table 1.

Other proportions may be used if these can be shown by test to be satisfactory.

### 3. Batching the materials

A builder's wheelbarrow is a convenient measure for large batches; the capacity is 65-l. Steel drums of 20 ℓ or 25 ℓ capacity and buckets are useful for small batches. Check the capacity of drums and buckets when filled to the brim as this is often more than the nominal capacity. To batch, shovel material into the measure and then strike off level with the brim.

### 4. Mixing

Mixing should be done on a clean hard surface such as a smooth concrete floor or a steel sheet. Small batches may be mixed in a wheelbarrow provided that the volume of the batch is no more than half the capacity of the barrow.

If you are working on your own or with one assistant, it is better to mix a number of small batches as they are required than to mix a one-bag batch.

One man – particularly if he is a weekend builder – can probably lay a little more than 60 bricks an hour.

Sand and cement, and lime if used, should be mixed until the colour of the mix is uniform. Then add water in small quantities, mixing after each addition, until the mix is soft and plastic.

### 5. Handling

If mortar is left in the sun before being used, it should be covered with plastic sheeting or a wet sack. Discard mortar that has stiffened so much that it is impossible to restore workability without adding more water.

### 6. Use of mortar

Mortar must not be used after it has started to set, which usually occurs about two hours after it has been mixed.

Do not use too thick a layer of mortar between bricks or blocks; this is wasteful and may lead to cracking.

### 7. Quantities of materials

Quantities of cement and sand required per 50 kg bag of cement and to produce 1 m<sup>3</sup> of mortar are given in Table 1. Quantities required for blocklaying depend on block size and are outside the scope of this leaflet (See C&CI leaflet Quantities for ordering building materials.)

The addition of lime is optional. A maximum of 25 kg is permitted per 50 kg bag of cement when Class II mortar is used and 10 kg, maximum, is permitted per 50 kg bag when Class I mortar is being used. Mix proportions do not need to be adjusted. Only yield will increase by 5 %.

Do **not** use lime with masonry cement.

Note that quantities in the table are approximate and do not allow for wastage, which could typically range from 10 - 20 %.

**NOTE: Concrete bricks and blocks should not be wetted before being laid. Burnt clay bricks should be wetted before being laid.**

**cement & concrete institute**

po box 168, halfway house, 1685

block d, lone creek, waterfall park, bekker road, midrand

tel 011 315 0300 • fax 011 315 0584 • e-mail info@cnci.org.za • website <http://www.cnci.org.za>

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