The National Building Regulations require nominal strengths of 7MPa for solid units and 3.5MPa for hollow units for single-storey houses and buildings. You also need to assess the surface texture of the blocks. If it is too coarse, increase the amount of fine material. AfriSam can advise on the most appropriate mix designs to suit available materials.

**Production:**

**Ordering and stockpiling materials:**

Aggregates and cement should be ordered in good time. Stocks should be sufficient to prevent stoppages due to lack of material. As a rough guide, using aggregate cement ratio of 8:1 by loose volume, three and a half bags of cement and a cubic metre of aggregate will be enough to make about 450 standard blocks. The number of blocks produced from the same quantity depends on the size of the blocks and whether they are solid or hollow.

**Batching:**

Rapped cement should be batched by the full bag. Cement supplied in bulk may be weighed (preferable) or batched by volume. It is important to batch all materials accurately. Batching containers such as wheelbarrows, buckets, drums and wooden boxes, should be loosely filled to the brim and struck off flush. To avoid errors, there should be enough containers for a full batch to be made without using any container more than once. Dented or broken containers must not be used. Mix proportions may be adjusted once all properties are understood.

**Mixing:**

**Retempering:**

Concrete masonry units shrink slightly after manufacture. In order to avoid this from happening in the wall, cured blocks should be allowed to dry out for at least seven days before being used for construction. This is after the 7 day curing period. The moulds should be removed carefully so that the fresh blocks are not damaged. Fresh blocks should be protected from the rain and from the drying effects of the sun and wind during the first day with plastic sheets or any available covering.

In some cases, it may be necessary to protect blocks from front damage. Covering with plastic sheeting with the edges held down is normally sufficient. In the South African climate, it is normally sufficient to cover blocks with plastic sheeting to prevent moisture loss, or to spray blocks with water.

**Curing:**

The day after production, blocks should be removed from the production slab and stored in the stacking area, ready for curing. Stocks should be carefully handled to avoid chipping edges and corners.

Curing is the process of maintaining satisfactory moisture content and a favourable temperature in the blocks to ensure hydration of the cement and development of optimum strength.

In the South African climate, it is normally sufficient to cover blocks with plastic sheeting to prevent moisture loss, or to spray blocks with water. Blocks should be cured for at least seven days.

**Quality Control:**

Three aspects should be monitored to ensure quality masonry units, namely: strength, dimensions and shrinkage.

**Strength:**

The quality of blocks should be controlled so that the strengths are adequate to avoid breakages or rejection by customers and the mixes are as economical as possible. In most cases, blocks are tested by the National Building Regulations. Ideally blocks should be regularly tested for strength and mixes, and production processes modified if necessary. Testing is not a practical undertaking. Block strength should be continually assessed to ensure the corners and edges, or even the whole blocks, tend to break in handling. Forcing two blocks together can also be used to assess strength.

**Dimensions:**

The length and width of the units are determined by the mould and will not vary greatly. However, the height can vary and should be monitored using a simple gauge. Units of inconsistent height will lead to difficulties during building and possibly cause rain penetration.

**Shrinkage:**

Concrete masonry units shrink slightly after manufacture. In order to avoid this from happening in the wall, cured blocks should be allowed to dry out for at least seven days before being used for construction. This is after the 7 day curing period.

**Conclusion:**

We hope that this guide is useful in establishing and maintaining a successful brick- or block-making operation. Blocks are a popular and versatile material and AfriSam can help in their manufacture or distribution.

**Further assistance:**

For further assistance, please contact the AfriSam customer service. We hope that this guide is useful in establishing and maintaining a successful brick- or block-making operation. Blocks are a popular and versatile material and AfriSam can help in their manufacture or distribution.

**Contact:**

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The small-scale manufacturing of concrete bricks and blocks for masonry is well suited to small businesses. Production can be done in the open, the process is simple and the equipment is relatively inexpensive.

The aim of this publication is to provide information that is needed in setting up and running a block-yard to manufacture concrete bricks and blocks on a small scale. Aspects dealt with include selecting and establishing a site, selection of equipment, materials for block-making, raw mixes and production. Bricks and blocks are masonry units and are referred to as such in SABS standards. Units may be solid or hollow. The difference between bricks and blocks is size. In this brochure, we refer to blocks throughout, but the same principle applies to bricks.

Selecting a site:  
In selecting a site, consider the following:  

Location:  
This should be considered in relation to the supply of raw materials, market for blocks, location of the labour force, security and availability of services such as roads, water, sewage, electricity.

Access:  
The site must be accessible to trucks delivering materials and collected finished blocks.

Ground slope:  
Ideally, the site should be at least as level as possible. Steep slopes make handling and production difficult. Tensi-fielding a slope is expensive.

Size:  
The site should be big enough for aggregate stockpiles, cement storage, production, block stacking, staff facilities, offices and on-site access. The details are as below:

Aggregate stockpiles:  
- Aggregate must be stockpiled in such a way that they do not become contaminated by soil, leach, or any other foreign material.
- Aggregate must be kept separate and movement must be able to drain away.
- Ideally, aggregate should be stored on a concrete slab. If this is not possible, the layer or aggregate in contact with the soil should not be used for production.
- Aggregate must not be stockpiled under trees.

Cement:  
Use cement on a firm and flat foundation. Use cement within 3 months of bagging date. The best way to store cement is on a slab. However, for most small-scale block yards, cement is usually delivered in bags. The bags should be stored as follows:
- Store in a weatherproof room.
- Store upright on a pallet or stacker so that the cement does not absorb moisture.
- The storeroom must be big enough to hold at least a week's supply of cement.

Production area:  
The size of the production area depends on the method of producing blocks.
- A stationary machine which forms blocks on pallets, needs a relatively small area, with a space around it for the operator.
- A mobile 'egg-layer' machine needs a fairly large space on which blocks are made.

Stacking area:  
The area, which should be big enough to stack at least two weeks' worth of production, is necessary for curing and drying the blocks. It is normally not necessary to pave this area. To avoid moisture, a layer of aggregate about 70mm thick should be placed over the stacking area.

Staff facilities:  
These should include toilets, ablution facilities and, possibly, change rooms. Facilities should meet minimum requirements of local authorities, if applicable.

Offices:  
It may be necessary to have an office or area where the administration work is done.

On-site access:  
Pathways and runways between the different parts of the yard should be wide enough for forklifts, tractors or trucks and may have to be preserved or covered with aggregate to make them usable in wet weather. Paving will be necessary where tractors are to be used to move blocks.

Construction of a slab (where blocks are made):  

Area:  
A fair size of slab, big enough for at least one day's production, is required. As a guideline, 50m² area is suitable for the production of 1 000 bricks or 200 blocks.

Slope:  
Normally, block production is carried out in the open and the concrete slab should have a minimum slope of at least 1% to ensure proper drainage.

Thickness:  
The minimum thickness of the slab is normally 125mm. However, in case of temperature control or needs using a small hand machine, a thickness of 50mm is possible. Large production machines may require a minimum slab thickness of 100mm.

Concrete:  
For concrete ordered from a ready-mix supplier such as AfriSam, specify a strength of 30MPa at 28 days and 19mm stone. Stamp should be 100MPa if the concrete is to be compacted by machine vibration and 120MPa for hand compaction. A wood-floated finish permits easier removal of blocks.

Water:  
Water that is fit for drinking may be used. Most river and borehole water may be used without problem. When using water, it is best to use AfriSam's High Strength Cement: 

Materials:  
Cement:  
AfriSam's High Strength Cement complies with SANS 50197-1 and is best suited for block-making, provided the correct mix proportions are used.

Aggregates:  
Sand and stone are generally used for solid blocks. Crushed bush or stream gravel may be used in block production. Crushed bush or stone can be used for hollow blocks.

Concrete mixer:  
It is possible to make blocks on a small scale without a concrete mixer. Hand mixing has the advantages of reducing the amount of capital required and providing employment, but may yield limited output and is not always the most efficient. Labour should be shown on a concreter slab or flat steel sheet. Never mix directly on the ground because the result can be contamination of the mix. A permix is the only type of machine mixer suitable for block-yards. Pen mixes, with a forced mixing action, can cope with semi-dry mixes used for making blocks. Drum mixers do not work because they cannot mix semi-dry concrete.

The output of the concreter should match that of the blocks-making machine. A mix of adequate capacity for making hollow units may have sufficient capacity for solid units.

Miscellaneous equipment:  
This includes shovels, buckets, containers and trolleys for moving blocks, shovels, hoes and pipes for clearing the covering blocks while curing.

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It is possible to make blocks on a small scale without a concrete mixer. Hand mixing has the advantages of reducing the amount of capital required and providing employment, but may yield limited output and is not always the most efficient. Labour should be shown on a concreter slab or flat steel sheet. Never mix directly on the ground because the result can be contamination of the mix. A permix is the only type of machine mixer suitable for block-yards. Pen mixes, with a forced mixing action, can cope with semi-dry mixes used for making blocks. Drum mixers do not work because they cannot mix semi-dry concrete.

The output of the concreter should match that of the blocks-making machine. A mix of adequate capacity for making hollow units may have sufficient capacity for solid units.

Trial mixes:  
The aim is to find a mix that will produce blocks that have an acceptable texture and are strong enough, yet as cheap as possible. Because cement is more expensive than aggregates, the lower the cement content, the cheaper the blocks. Cement content influences the strength and, therefore, optimum cement content should be found by trial and error. Look out for breakages at corners and edges of cured blocks. If blocks break when they are handled, they are too brittle. You can also assess strength by pounding two blocks together after they have been cured and dried out. A smooth angular impact gives a good result if both blocks are tough; if one block breaks, both blocks are too weak. Ideally, blocks should be tested in a laboratory for strength.