

Your guide to concreting

Cement products applications



Concrete is one of the most versatile and easy-to-use building materials available. By following a few simple guidelines, builders and DIY enthusiasts can make their own concrete and make a success of their building projects.

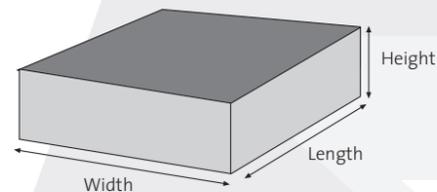
The right materials for concrete

The following materials required to make high quality concrete are available from leading builders' merchants stocking AfriSam Cement:

- High quality AfriSam Cement products, which carry the SABS mark and comply with SANS 50197-1.
- Clean coarse sand, free of leaves, grass, twigs or other foreign matter. Sand should be fairly coarse, with particle sizes ranging from fine dust up to about 5 mm.
- Clean stone with sizes of 26,5 mm, 19 mm, 13,2 mm or 9,5 mm. Stone sizes of 26,5 mm can be used for thick sections such as foundations, deep suspended slabs and industrial floors thicker than 120 mm. 19 mm Stone can be used for floors, paths, patios and driveways. Stone sizes of 13,2 mm or 9,5 mm can be used for thin concrete sections such as thin suspended slabs, precast items such as lintels, flagstones and other items with section thicknesses ranging from 40 mm to 50 mm.
- Clean drinkable water.

Determining the right quantity of concrete

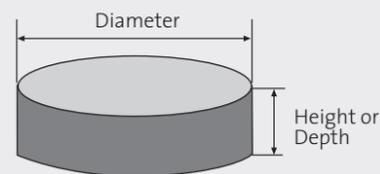
Concrete is either poured into formwork or ground excavations. The calculation for the volume of concrete required for square or rectangular sections is carried out as follows:



Volume of concrete
= Width x Length x Height

Estimate the amount of concrete you need for foundations by measuring the length, width and height of the excavated trenches and not off plan.

The calculation for the volumes of circular sections is carried out as follows:



Volume of Concrete
= (Diameter)² x 0.8 x Height or Depth

Suggested thickness of concrete

Structural concrete members are designed for specific thicknesses. Typical thicknesses for unreinforced concrete elements are given in the table below.

Element	Thickness (mm)
Precast flagstones	40
Paths, patios, floors, driveways	80
Footings for garden walls	200
House foundations	200

Concrete strength

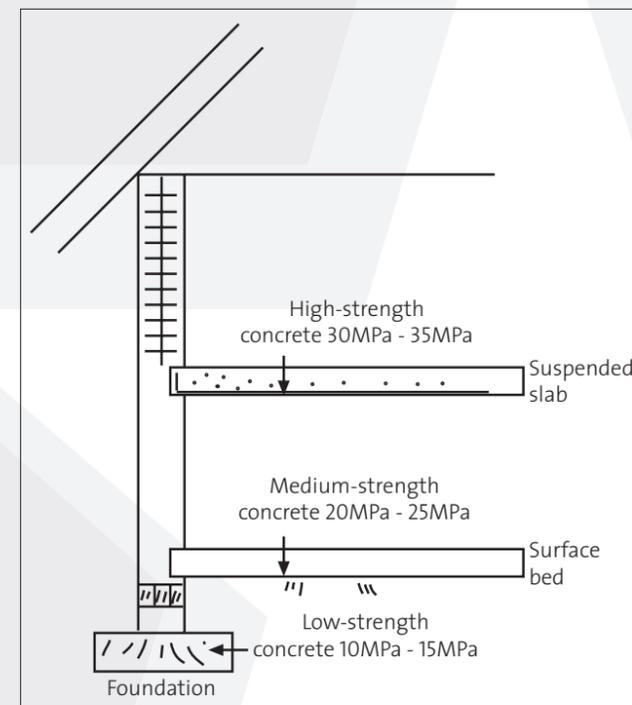
The strength of the concrete depends on mix proportions and should suit the work being done.

It should be noted that concrete strength depends on the following factors:

- The type and amount of cement added to the mix.
- The amount of water added to the mix.
- The type of sand.
- The type of aggregate.
- Effective curing.

Note: Only enough water should be added to ensure adequate workability. Adding too much water reduces the concrete strength.

Different applications require different strengths of concrete. Three different strength categories with typical applications are outlined below.



Preparing areas before pouring concrete

Foundations

Prior to pouring foundations, make sure that the trenches are damp but with no standing water. This will place the concrete in a self-curing environment with three sides prevented from drying out by the soil. The sub-base for foundations, surface beds and ground slabs should be well compacted.

Formwork

Ensure that the formwork is clean and adequately supported to retain the mass of the concrete.

Reinforcing

Make sure that the steel reinforcing is adequately secured to ensure that it does not move while placing the concrete.

Mixing concrete

Concrete can be mixed by hand or by using a concrete mixer. Make sure that the quantities of each ingredient are accurately measured. This can be done by simply using a clean bucket or tin and filling it to the same level each time. This ensures that the concrete mix remains consistent throughout. It is preferable to batch cement in whole bags.

Mixing by hand

Concrete should be mixed on a flat, clean, hard surface (concrete slab or steel sheet).

- Spread the sand in a layer about 100 mm thick and then spread the cement on top, mixing the two thoroughly together until they form an even colour.
- Pile the mixture into a heap and make a hollow in the middle.
- Pour in water slowly in small quantities and mix until a smooth paste is formed. Too much water will produce a weak concrete. Too little will make the mix difficult to place properly.
- Add the correct amount of stone and mix until every stone particle is coated. If the mix becomes too stiff to place easily, add a little more water and mix it thoroughly.

Mixing with a concrete mixer

The size of the concrete batch should suit the size of the mixer being used. If too little is mixed, time will be wasted, while mixing too much could cause spilling and poor mixing results.

- Measure quantities of each ingredient.
- First add the stone and some water, then the cement, then the sand.
- Mix and add more water until the right consistency is reached.
- Mix until the concrete becomes a uniform colour and texture.
- Empty the mixer completely when you discharge each batch.
- Clean mixer thoroughly on completion.

Selecting the type of cement

The difference between All Purpose Cement and High Strength Cement is the role of strength development.

High Strength Cement should be used in applications where high early strength is required. e.g. early removal of framework and precast applications.

For normal concrete applications there is a slight difference in mix proportions as shown on the right and the selection of cement will depend on economics.

<p>N.B: For all mixes indicated, the 50 kg bag of All Purpose Cement or Eco Building Cement is referred to.</p>		=		=		=	
	<p>2 x 50 kg = 2 x 50 kg = 5 x 20 kg</p>						

High-strength concrete: 30 MPa

High-strength concrete should be used for suspended structural beams and slabs, precast items such as flagstones and heavy-duty floors such as workshop floors.

Batching by wheelbarrow

All Purpose Cement or Eco Building Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	2 Wheelbarrows	2 Wheelbarrows	0,22 m ³

All Purpose Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	2 1/2 Wheelbarrows	2 1/2 Wheelbarrows	0,26 m ³

Medium-strength concrete: 25 MPa

Medium-strength concrete is suitable for reinforced foundations and slabs, light-duty house floors, paths, patios, steps, driveways and garage floors.

Batching by wheelbarrow

All Purpose Cement or Eco Building Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	2 1/2 Wheelbarrows	2 1/2 Wheelbarrows	0,26 m ³

High Strength Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	3 Wheelbarrows	3 Wheelbarrows	0,3 m ³

Low-strength concrete: 15 MPa

Low-strength concrete is suitable for unreinforced foundations for houses and free-standing walls.

Batching by wheelbarrow

All Purpose Cement or Eco Building Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	3 1/2 Wheelbarrows	3 1/2 Wheelbarrows	0,35 m ³

High Strength Cement	Coarse sand	Stone	Approximate yield
			
2 Bags (1=50 kg)	4 Wheelbarrows	4 Wheelbarrows	0,39 m ³

Moving and placing the concrete

Time limits

The time that elapses between the start of mixing a batch and when that batch is placed and compacted should ideally not exceed 45 minutes. Should concrete not be placed immediately after batching, cover it with plastic sheets or wet sacking so that it does not dry out in the sun or wind. Concrete not placed and compacted within this time, or which has stiffened to a degree that its workability (consistency) cannot be restored fully by turning it over a couple of times with spades, should be discarded. This is because the hydration process would be in an advanced stage and retempering of the concrete would weaken it.



Moving the concrete

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. Do not let the concrete stand so long that it stiffens before it is placed.

Retempering

The concrete mix should be used within a maximum of two hours of being mixed and must **never** be retempered by mixing in additional water, as this reduces the resultant strength of the mix.

Placing the concrete

Place 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. Work the concrete right into the corners and along the edges of the form or hole with a spade or trowel.

Compacting concrete

Concrete is compacted to expel entrapped air, resulting in the achievement of maximum density, strength and impermeability. Compaction can be done with or without mechanical vibration.

Hand compaction

Methods of hand compaction include rodding, tamping or spading. To complete the compaction, use a wooden beam. First use a chopping action to remove entrapped air, then a sawing action to achieve the desired level.

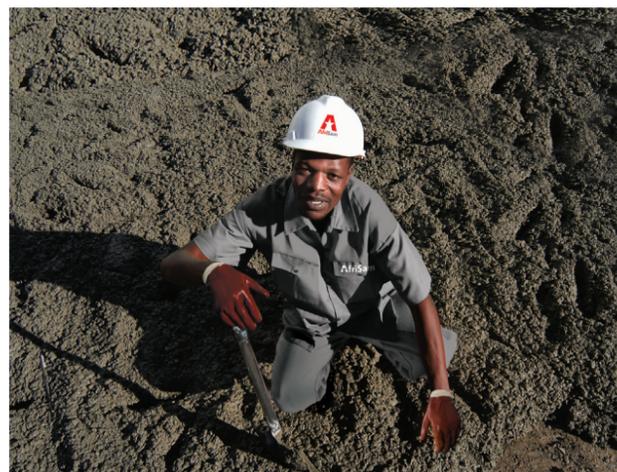
Mechanical compaction

Mechanical vibration is the most effective way of compacting concrete. The most common mechanical compaction equipment includes the vibrating beam and poker vibrators. With all methods of vibration the following precautions should be observed:

- Forms should be tight-fitting to avoid loss of grout.
- Depths in vertical sections should be shallow enough to allow complete compaction of each layer.
- All areas should be thoroughly vibrated but not over-vibrated. A vibration time of 10 to 15 seconds in each area should normally be sufficient. The vibrator should be inserted at about 400 mm intervals.

Finishing concrete

Three types of surface finish are described below, the choice being made according to circumstances. At no stage should neat cement, or mixtures of cement and sand, be applied to the surface to soak up bleed water.



Ordinary non-slip

The surface is left as finished with wooden floats. Over-working should be avoided.

Steel-trowelled

If a hard, smooth finish is required, the surface should be steel-trowelled. Steel trowels must not start until:

- Bleeding of the mix has ceased.
- All bleed water on the surface has evaporated or been removed.
- The surface has started to stiffen.

Only then should steel trowels be applied, using considerable pressure on the tools. Several trowellings spread over a period of up to two hours may be required. For large areas, power-operated machines should be used. Trowelling should continue until the surface has attained an even, fine matt finish. Only if a "polished" finish is specifically required should trowelling be continued thereafter. Small amounts of water flicked on with a brush may be applied to the surface to aid finishing but, as this tends to weaken the surface, it should be done as little as possible and only where trowelling alone is not producing the desired results.

Note: Planning of the work should take into account that the delay period before steel trowelling can start is likely to be two to three hours and longer in cold weather. During the delay period, drying of the mix - as opposed to evaporation of bleed water - must be avoided as it may lead to cracking.

Hard non-slip

The surface should be steel-trowelled as above and subsequently lightly textured with carpet-faced floats or soft brushes.

Curing concrete

Immediately after the completion of surface finishing, the work should be covered with plastic sheeting which is kept in place for not less than seven days. To avoid the (temporary) variations in colour which tend to occur when plastic sheeting is laid directly on wet concrete surface, the sheeting may be supported clear of the surface by timber battens for the first 24 hours of curing. Wind must not be allowed to blow under the sheeting. Inadequate curing will result in weak concrete.

Light foot traffic may be allowed over new work 24 hours after finishing, provided that the plastic sheeting is not damaged or displaced.

Conclusion

Provided sufficient attention is paid to the selection of materials, mix proportions, placing, compaction, finishing and curing of the concrete, the results should be strong, durable, look good and last a lifetime. For further assistance in this regard, please contact AfriSam Customer Service.

A detailed 'Safety Data Sheet' and 'Guide to the safe use of cement and concrete' is available on request.

Every effort has been made to ensure accuracy of data and information presented and no liability is accepted for errors or omissions.

Acknowledgements:
Sand Cement Floor Screeds
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Committed to sustainable development

AfriSam is committed to sustainable development, which includes legal compliance, the optimal use of resources, waste reduction, reduced use of fossil fuels, the minimisation of environmental degradation and pollution, employee training and stakeholder engagement.

CO₂ rated cement

AfriSam introduced a CO₂ rating system on all its cement products, which indicates the Carbon Footprint of each product relative to the world average as calculated by the World Business Council for Sustainable Development (WBCSD). This is now printed on each and every cement bag that AfriSam produces, to enable consumers to make informed and responsible decisions on the products they purchase.

Delivering on quality in a responsible way

With the increasing environmental awareness of our customers, we not only offer quality products but customer peace of mind through our commitment to sound environmental stewardship.



Reducing our
Carbon Footprint

