Boksburg Tel (010) 447 7100
Midrand Tel (010) 446 6745

TIP NO. 8

Quantum Readymix Concrete

A PRACTICAL GUIDE TO PRODUCING ECONOMICAL MORTARS AND PLASTERS

All cities throughout the world were built using the natural materials that were closest to where the building activity was taking place at the time. Johannesburg's problem in this regard has been more exacerbated due to it not being built on a river. As the natural materials have been worked out better materials have had to be sourced further and further from both Pretoria and Johannesburg. Pretoria's location was determined by the fact that it had a spring that produced abundant water and as such very little natural sand was available.

Today the best available sand for the manufacture of mortar and plasters is to be found in the Vaal area some 100km from Gauteng. Consequently, and depending on the nature of construction, contractors are being tempted to use progressively poorer sands closer to Johannesburg in order to minimise the cost of transport. Chances are being taken often with poor results.

In addition, the range of cements used can only confuse. Any cement from a Masonry cement 22,5x (and even a 12,5) to a 52,5R is useable but with very different performance characteristics both from a perspective of quality as well as economics. The most common cement used to produce brick mortar is a 32,5N (normal) but if correctly used higher performing cements could be somewhat more economical (See Table) The best recommended cement for plaster would be a 32,5R. The "R" denotes rapid with a 2-day strength requirement of 10 Mpa. The N cements have no such 2-day requirement. Plasters are particular susceptible to cracking and a cement that gains strength quickly will resist the forces that lead to cracking. Rapid cements are better able to resist cold temperatures as well as drying out conditions, don't forget a plaster is only some 15-20 mm thick at best. Adverse conditions would typically be a north facing wall plastered on a summer's day with a high wind factor.

It is not recommended that masonry cements be used. Not only have they been sporadically produced, they are not economical and invariably used with the poorer sands one is forced to use, they produce inferior mortar. They are subject to being incorrectly used with grave consequences. Mixes are hardly ever adjusted to accommodate this weaker cement and inferior mortar is to be expected. Whilst masonry cement may contain additives to make harsher sands useable, their use is subject to them needing to be more closely managed. Used in plaster they will be disastrous.

Table 2 depicts the economic difference. The standard cements used are generally a 32,5N or R but if one is able to derive the benefit of using, AND MANAGING the higher cement grades cost benefits can be derived.

SAND SELECTION

Sand for mortars are very different to sands used for plaster as they do not need to be as well graded and they can tolerate a higher clay/silt content. Sand with excessive "fines" will have a high-water demand and produce an inferior "putty" like mortar.

A quick on site test to determine as to whether or not the sand is suspect is to dry out about 10kg of sand on site and to do the following assessment.

Sand

Use a good quality plaster sand.

A SIMPLE TEST FOR SAND.

Step 1

Mix 1Litre of cement with 5Litres of **dry** sand.

Step 2

Add 1 Litre of Water.

- If after Step 2 the sand is wet enough, the SAND is "**GOOD**".
- If not, add another 0,5 litre of water.
- If the mix is wet enough the sand is "**OK**".
- **If not** : try another sand.

Sieve Size mm	Recommended grading		Typical envelope for currently used brick mortar sand
	Plaster sand	Brick mortar sand	
4,75	100	100	100
2,36	90 - 100	100	100
1,18	70 – 100	100	90 – 100
0,6	40 - 100	100	70 – 100
0,3	5 - 65	5 - 75	35 -90
0,15	0 – 20	0 - 25	10 - 45
0,075	0 – 10	0 - 10	3 - 25

CEMENT SELECTION

Cement

Below is a list of the cements most often used to produce mortars. For practical purposes, a Cement 32,5 N or R is recommended. Further information on cement can be found from the Quantum folder where more detailed information is available.

Cost comparison of various cements based on equal performance

Table 2

CEMENT TYPE	MIX RATIO Cement : sand	Proportions/M³			Cement Cost / bag Rand	Mortar cost/ m³ Rand	Cost Comparison
		Cement Kg	Sand Kg (dry)	Water litres			
Masonry Cement 12,5	1 : 1,5	635	1170	355	55	840	Control Mix + 60%
Masonry Cement 22,5x	1 : 3,5	360	1450	340	65	640	Control Mix+ 20%
Cement 32,5 N or R	1 : 6	225	1570	335	75	525	Control Mix
Cement 42,5 N or R	1 : 7	200	1625	320	80	515	Control Mix - 3%
Cement 52,5 N or R	1 : 8	175	1650	315	85	495	Control Mix - 5%

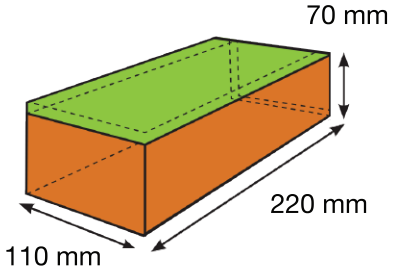
BRICK SELECTION

Bricks

It is assumed that bricks to be used comply with relevant specifications (cement or clay bricks). Should one have the freedom of choice solid bricks will use far less mortar than perforated bricks and ideally bricks with a frog may be a better compromise as they will have a better bond but use only marginally more mortar (depending on the depth of the frog).

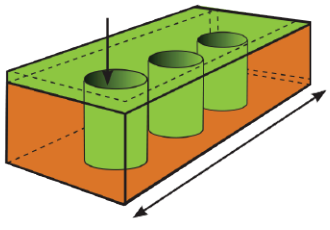
Solid Bricks vs Perforated Bricks

Often overlooked is the amount of extra mortar required when laying bricks with frogs or perforated cavities. Illustrated below are examples of how mortar quantities can escalate.



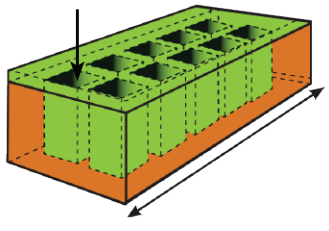
Amount of mortar required to cover one horizontal surface = **387ml**

150ml x 3 = 450ml



Amount of mortar required to cover one horizontal surface plus an additional 3 cavities = **887ml (230% extra)**

53mm x10 = 530ml



Amount of mortar required to cover one horizontal surface plus all wafer cavities = **910ml (235% extra)**

WASTAGE & YIELD

- A wheelbarrow of damp sand does not produce a w/barrow of mortar that has to be transported as it would otherwise spill.
- Non absorbent brick surfaces should be treated with a bonding liquid or a splatterdash coat before plastering.
- Absorbent brickwork should be pre wetted before plastering.
- The volume of standard builders wheelbarrow is 65 litres and is equivalent to 2 bags of cement ie A 1;6 mix is therefore 2 bags of cement to 6 FULL wheelbarrows of sand.