



MORTAR – AVOID COMING UNSTUCK!

The structural integrity of brick veneer depends on the strength of the mortar binding the bricks together. Care is needed to ensure the mortar cures correctly, especially in hot dry weather.

By John Oliver, Building Consultant, Lifetime Promotions Ltd

Recent BRANZ tests have shown that the dowelling effect achieved when mortar sets inside the holes of bricks is structurally significant when veneer is subjected to earthquake forces. In my opinion, the strength and quality of the mortar is even more important for masonry units that do not have holes in them. If a crack occurs in a plastered veneer it is obvious, but it may not be in a face veneer.

Mortar failed despite good bricklaying

Recently the owner of a large 2-storey brick veneer dwelling under construction in the South Island was concerned about the quality of the mortar. The council inspected and approved the mortar, but the owner was still unhappy. A senior inspector revisited the dwelling, placed a 'notice to fix' on the veneer and requested a professional opinion.

On visiting the site, my recommendation was that the veneer had to be removed and relaid. Although the overall quality of the bricklaying was excellent, especially for a veneer that was to be rendered, the mortar strength was estimated at less than 3 MPa and could be easily powdered through the width of the joint. If this had gone undetected, the possible future consequences could have been expensive and potentially dangerous.

So, what went wrong in this case? The veneer had been laid in hot weather with a warm drying wind. It is likely that the moisture had rapidly evaporated from the fresh mortar, not allowing the time and conditions needed for the mortar to cure properly and for hydration to occur. Other factors may also be responsible, but determining what these are is virtually impossible once the mortar has set. No amount of water or chemical additive can strengthen set mortar.



The lack of adhesion of the mortar is evident in these bricks removed from a house.

This should be a wake-up call to the brick and building industry.

Mortar strength – 12.5 MPa or...

NZS 4210:2001 *Masonry construction: Materials and workmanship* calls for a compressive 28-day mortar strength of 12.5 MPa for structural compliance with NZS 3604:1999 *Timber framed buildings*, although this is not intended to apply to veneers.

The standard also states that the strength of mortars for veneers shall follow the requirements of masonry suppliers. Some of these specify a strength of 12.5 MPa, and others rely on the mortar mix compositions listed in Table 2.1 of NZS 4210. This minimum strength needs to be clarified in future revisions of the standard.

On-site strength testing impractical

Once mortar is laid and dried, there is no way of testing its strength for compliance with NZS 4210. Testing requires mortar samples to be taken at the time of mixing and stored for 28 days (at 100% humidity and 21°C) before testing.

In practice, determining the quality of the mortar in a laid-up veneer comes down to common sense, observation and experience. If the mortar is powdery, its quality and strength

should be questioned. Someone must make the call that the veneer has a mortar with the quality and strength to ensure its structural integrity for at least 15 years.

Surprising results from recent testing

In a recent mortar testing programme, cylinders of mortar made on site were collected in accordance with the testing standard. The cylinders were then taken to the laboratory and tested for compressive strength after 28 days. In most cases, these samples were taken from competent bricklayers who had mixed the mortar, normally by volume at 4:1 sand-to-cement.

The results ranged from 4.0 to 9.0 MPa, with an average of 6.7 MPa over all samples mixed at 4:1. This is only half the 12.5 MPa minimum discussed above.

Watch the mix and hot dry weather

More work needs to be done testing mortar used in the field, and additives, volume of water and appropriate methods to ensure correct curing.

Using a formula that can achieve the desired strength is a good start, and either a sand/cement ratio of 3:1 or a 'bagged trade mortar' is recommended. Factory-manufactured mortars are produced under controlled conditions and are batch tested for strength and quality.

Also essential is having enough water in the mix and weather that doesn't cure the mortar too quickly. Temperatures over 27°C and hot drying winds in particular can cause problems.

The initial outlay for bagged mortar is greater than site mix, but its benefits are considerable. For example, a brick veneer can cost up to \$60,000 for a plastered 2-storey dwelling; the small additional amount spent to obtain good quality mortar by specifying and using trade mortars is, in my book, money well spent. ◀