TECHNICAL NOTE #11

Remedial Practice to Safeguard Face Bricks & Mortar Joints from Sea Spray Attack

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REMEDIAL PRACTICE TO SAFEGUARD FACE BRICKS & MORTAR JOINTS FROM SEA SPRAY ATTACK

INTRODUCTION

The best indicator of a products durability performance is at least 5 years in the exposure zone concerned. Prior knowledge of local conditions proportionate to the performance of the selected material and its intended use can circumvent potential damage caused by external elements in the long term.

The same principles apply to brickwork. When choosing face brick, make sure that the material is strong, hardwearing and weather-resistant, so as to withstand the local exposure conditions.

IDENTIFIED EXPOSURE ZONES

Parts of Southern Africa have specific climate and outdoor conditions. To facilitate the correct specification and use of construction materials SANS 10249 (SABS 0249): Masonry Walling has grouped these areas into four exposure zones.

EXPOSURE ZONES OF SOUTHERN AFRICA SANS 10249 (SABS 0249) : Masonry Walling	
Zone 1 Protected	All inland areas more than 30 km from the coastline.
Zone 2 Moderate	The 30 km zone along the coast, but excluding the sea spray zone.
Zone 3 Severe	The sea spray zone, such as the seaward sides of Durban Bluff and other exposed headland areas, i.e. the 15km coastal zone from Mtunzini northwards to the Mozambique border, including Richards Bay and the coastal belt of Namibia.
Zone 4 Very Severe	Areas such as Walvis Bay where moisture from sea mist and high ground water tables, soluble sulphates in the soil, and/or rapid temperature changes combine to create severe exposure and weathering conditions, also industrial areas where high acid or alkaline discharges occur.

Optimising Exposed Brickwork

The recommended Exposure Zone to which each product is suited should be indicated by the manufacturer, as well as the building professional or contractor specifying the product. Best practice and the implementation of the following measures prior to construction can further enhance the performance of exposed brickwork:

- Understanding and consideration of the seasonal macro and micro climatic conditions impacting on the site
- Orientation of the building structure to take best advantage of the sun's energy through the seasons
- Design and detailing of the building envelope with adequate eaves, overhangs, guttering and flashings to limit the potential negative effects of the weather elements on exposed surfaces
- Emphasis placed on quality of materials, mortar mixes, joint profiling and pointing, sealants and placement of damp-proofing
- Assurance from the supplier that the bricks are fit for purpose for the climatic zone.

Face Brick Exposure in Sea Spray Zones

Certain face bricks may not be suited to external conditions in Zones 3 and 4. Failure to comply with the recommendations of the manufacturer and/or building professional, particularly in these sea spray areas, could result in surface weathering and spalling (disintegration) of the bricks, mortar joints and or both in the long term, as can be seen in the case studies.

Case Study 1

The house is 26 years old and to protect these surfaces from the sea climate and prevent possible damp penetration a water based sealant was used, that dries to a slight sheen finish. The owner is concerned that a number of brick are disintegrating?

A water based sealant had been applied to the external face brickwork some years previously. The objective had been to protect the face brickwork from the harshness of the coastal zone weather. The owner was later told that this sealant prevents the walls from "breathing" since it forms a film on the surface, and wanted to know if this sealant is going to cause problems in the future and does it need to be removed.



An Assessment was provided by Chris Dickinson, technical specialist at the CBA:

"Looking at the photos of the brickwork, there is no significant deterioration of the external economic face bricks over the 26 years of exposure to what must be a sea spray zone in a coastal area.

"Overall the quality of the bricks and brickwork workmanship looks good. In my experience any face bricks not exhibiting any signs of flaking/disintegration after 26 years of exposure in a coastal zone are unlikely to fail in the future.

"What the photos show is typical of sodium chloride, sea spray zone attack where the dissolved sodium chloride crystallises ~~out~~ inside the pore structure of the fired clay face brick and progressively breaks down the pore structure just below the surface of the brick due to the salt crystals forming and imposing significant pressures on the pore structure.

THE USE OF SEALANTS

"Ideally, external face bricks DO need to allow liquid water, with soluble salts present, to come to the surface during the drying process, permitting the salt crystals present to deposit on the surface i.e. brickwork is allowed to breathe.

"The application of a water-based sealant, whilst not desirable, might in this instance not be a significant factor in the deterioration of individual face bricks. I would recommend that the remedial work of replacing the low number of flaking face bricks be carried out, and observe the face bricks performance over time,

"If there are less than 200 external face bricks affected, I would recommend that a suitably reputable local building contractor be requested to quote on the following:

- Either remove the remaining portion of flaking brick and replace with a matching brick, or cut a suitable brick slip [face brick surface of a matching brick cut to a depth of 20mm] to fit into the volume available.
- Replace with a suitably matched well burnt face brick sourced from a local brick maker or builders merchant.
- Re-point with a 1:3 mortar mix and a well-polished half round joint.

INTERNAL DAMP

It will be difficult to identify the external point of ingress of damp, but this should be attempted, and the problem resolved. Should it is not possible to identify the external cause and eliminate the water ingress past the external skin of brickwork, then call in a suitably qualified waterproofing/painting contractor and request a quote for the ~~on~~ damp-proofing of the internal areas where there are sign of damp. This might involve injecting sealants into the available spaces between the internal and external skins of brickwork.

CASE STUDY 2:

A sea facing house built 15 years ago, some 300 metres from the beach with a SE elevation is situated in the most severe of sea spray zones, Exposure Zone 4. Inspection of the exterior walling showed that the brickwork and mortar joints had mostly performed well considering 15 years of rigorous exposure, taking into account the following surface deterioration experienced:

The extent of surface weathering of the face bricks was estimated at 2-3% which is relatively low considering the extreme sea spray conditions.

The degree of surface spalling caused by consistent salt water exposure was estimated at less than 2 mm. This is considered to be relatively low for 15 years exposure.

Disintegration of the mortar joints and 2-3% incidence of face bricks with surface disintegration is generally confined to the weather and sea facing SE elevation.

REMEDIAL PRACTICE FOR SEA SPRAY ATTACK ON BRICKWORK

1. Providing that the elevations (other than the SE elevation) are visually and aesthetically acceptable, remedial work could be confined to the SE elevation.

2. A suitably well fired clay face brick, that matches up to the colour and texture of the existing face brickwork needs to be identified. See *www.claybrick.org* for details of Clay Brick manufacturers in your area.

3. Identify those face bricks with more than 20% surface deterioration, to have the face chiselled back by 25 mm with a 20 mm matching brick slip mortared into place. It is likely that bricks exhibiting less than 20% surface spalling after 15 years will show negligible deterioration in the future. Alternatively, if such bricks are at a window/door reveal or corner, carefully remove the whole brick and mortar and install a replacement brick.

4. All the SE elevation horizontal and vertical square raked joint mortar joints, not suited to Exposure Zone 4, will have to be chiselled/raked back by 20-25 mm and re-pointed to cover the deteriorating joints, so as to avoid a patchy effect on the face brickwork due to the replacement face brick slips. In the event that the mortar joint deterioration appears more extensive than the face brick spalling, it must be attended to.

5. The re-pointing mortar must be a Class 1 mortar, 1 part cement : 4 parts clean, well graded mortar sand.

6. The mortar joint profile must be either a polished weather struck joint or half round well-polished bucket handle profile, so as to create a low porosity joint that minimises future ingress of salt spray, thereby protecting both the joints and face bricks.

For further information:
The Clay Brick Association of South Africa
Website: www.claybrick.org