Benex - Resistant to Salt Attack (Exposure Grade)

What is Salt attack?

Salt attack is the damage that is caused by salt residue that is left behind and crystallises in the pores of materials such as stones and other masonry materials, the salt is transferred through water that may be carried in the various surrounds of the material.

When the water evaporates the salt residuals are deposited in the pores of the masonry material. Overtime this reoccurrence of wetting and drying of the pores cause a slow increase of salt in the pores and capillaries of the material resulting in a more concentrated salt remnant. It is at this time when the crystals will form. As the crystals grow, granules from the masonry will expand, thus exerting internal forces and stresses. The internal forces that the salt crystals exert may lead to eventual damage to the stone or masonry material.

Benex has been independently evaluated by the CSIRO using standard AS/NZS 4456.10:2003 for testing masonry units for resistance to salt attack.

Test procedure
Specimens of 50 mm long, 25 mm wide and 40 mm high taken from three Benex hollow blocks (H1, H2 and H3) were subjected to cycles of soaking in salt solution (14% NaCl), oven drying and cooling as recommended by method B of AS/NZS 4456.10:2003.
The weather exposed surface of the Benex block is quite different to its interior, unlike for common masonry units.

Therefore, in addition, a separate series of specimens, from both solid and hollow samples, were prepared by applying Vaseline to cover the interior cut surfaces before been subjected to salt exposure. Hence, only the exterior face of the masonry unit of the test sample would be exposed to salt solution.

All the specimens were exposed to a total of 40 cycles and the weight changes of the specimens after each cycle was recorded.

Results

The change of weight of the specimens prepared from hollow Benex block during the salt exposure cycles is shown in the following graph. These specimens showed a gradual increase in weight with the exposure up to about 35 cycles. No significant change in weight was observed with Vaseline treated specimens (H1 V and H2 V). Also, no solid deposits were found in the solutions.

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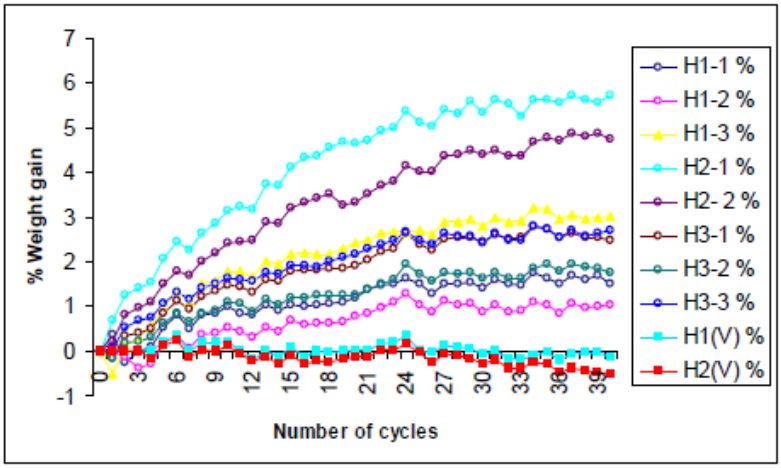
*All testing was conducted by the CSIRO and a copy of the full report entitled "Structural Performance of Benex Masonry" October 2007 can be made available from Benex on request.



Percentage weight change of specimens taken from hollow blocks (Vaseline treated samples contain "V" in the name)

Discussion

The procedure used in this work is the recommended standard method to determine the resistance to salt attack of materials other than stone (method B). The gradual increase in weight of the non-Vaseline treated samples indicates absorption and diffusion of salt through the specimens. This was also clearly visible by the salt deposits found on the surface, towards the end of the treatment cycles.

It is normally believed that salt depositions (crystallization) within the cement phase can lead to expansions and crack formations. However, there was no visible deterioration signs/cracks with any of the specimens studied. Therefore, it is possible that the polystyrene embedded medium in the tested specimens can withstand against any resistance/expansion created by salt deposits. A detailed analysis of the microstructure may help in establishing the mechanism that takes place in these samples.

The results of the Vaseline applied specimens also show that salt absorption does not occur or is minimal through the external surfaces of solid and hollow Benex units, which is the case in real life applications.

As per AS/NZS 4456.10:1997, the hollow Benex blocks can be graded as "exposure" type.

Conclusions

1. As per AS/NZS 4456.10:2003 method B, both solid and hollow samples of Benex blocks seem to be resistant to salt attack.
2. Salt diffusion occurs only through open (cut) surfaces of the specimens. Capped surfaces seem to be impermeable towards salt movement.
3. Both solid and hollow Benex blocks can be categorized as "Exposure Grade" as per AS/NZS 4456.10:1977. Hence, they can be used in aggressive environments such as severe marine environments and aggressive soils; as per Clause 5.2.5 of AS 3700-2001.

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