BOWERS BASEBED

This technical data sheet was compiled by the Building Research Establishment (BRE) at the request of Albion Stone and is updated by Albion Stone to incorporate current test results. The 2,297 tests have been carried out from 1988 in accordance with current European standards by the BRE on Albion Stone's behalf, or by other accredited testing houses. The early test data that pre-dates the introduction of Euro-codes has been included providing the test methods were very similar. The work carried out by the BRE on this technical data sheet has been undertaken as a paid commission and does not represent an endorsement of the stone by the BRE.

This data includes the Lowest and Highest Expected Values (LEV & HEV) using the statistical calculations from the Euro-codes. We are confident that these results give a good indication of the stones value, but as it is a natural material, we, like other stone producers, are unable to guarantee individual results for specific stones. Instead, we recommend that an appropriate factor of safety is used to ensure satisfactory performance, Cladding Annex 1 of the Technical Manual provides further information, but we suggest that a suitably qualified stone consultant with geological and testing experience is employed to provide further information.

Petrography

Material Description

Cream fine to medium oolitic and bioclastic limestone containing bioclasts (5µm in width by 20µm in length).

Petrographic Details

The rock was a grain supported oobiomicrite made up of predominantly rounded micritic ooliths showing concentric structure and ranging from 50µm to 300µm in diameter, numerous bioclasts up to 5µm by 20µm in size and sporadic irregular quartz grains 100µm nominal size.

There was an apparent pressure adhesion of the grains and some matrix between the ooliths and this results in occasional intergranular voids. Sporadically sparry calcite infilled or partially infilled intergranular spaces or replaced central parts of bioclastic debris. The ooliths consisted of micritic calcite and the bioclasts generally exhibited original aragonitic texture. The rock contained occasional voids 100µm nominal size. The micrite was also microporus with pores beyond the resolution of a transmitted light petrological microscope. No deleterious constituents or features were observed.

Strength

Compression - BS EN 1926

Lowest Expected Value 30.35 MPa
Highest Expected Value 90.49 MPa
Average: 54.99 MPa from 64 tests

Flexural Strength - BS EN 13161
Lowest Expected Value 4.51 MPa
Highest Expected Value 12.37 MPa
Average: 7.79 MPa from 118 tests

Breaking Load at Dowel Hole (at 75mm thick) - BS EN 13364
Lowest Expected Value 2525 N
Highest Expected Value 4772 N
Average: 3517 N from 20 tests

Durability

Water Absorption - BS EN 13755
Lowest Expected Value 3.43%
Highest Expected Value 8.35%
Average: 5.54% from 131 tests

Density - BS EN 1936
Lowest Expected Value 2125 kg/m³
Highest Expected Value 2331 kg/m³
Average: 2226 kg/m³ from 299 tests

Porosity - BS EN 1936
Lowest Expected Value 12.69%
Highest Expected Value 18.46%
Average: 15.41% from 459 tests

Saturation Coefficient - BS EN 1936
Lowest Expected Value 0.67
Highest Expected Value 0.85
Average: 0.76 from 251 tests

Salt Crystallisation - BS EN 12370
Lowest Expected Value 26.25%
Highest Expected Value 100%
Average: 64.00 from 87 tests

Flooring / Paving

Some of these flooring / paving results are not from the Bowers Quarry but the nearby Independent Quarry, but the stones from the two sites are very similar and only Easton Lane separates the sites and at their closest point are only metres away from each other.

Abrasion Resistance - EN 14157
Lowest Expected Value 60
Highest Expected Value 110
Average: 82 from 35 tests

Slip Resistance - TRRL Pendulum Test: Grit 120 (Flooring)
Lowest Expected Value 3492
Highest Expected Value 5950
Wet Average value 4601 from 20 tests
Lowest Expected Value 63
Highest Expected Value 88
Dry Average value 75 from 61 tests

Light Reflectance - tested using NCL Colour Scan instrument - Grit 60: Mean Value **62.20**
(Value from Jordans Basebed test, however these stones are very similar)

Internal Flooring

Bowers Basebed is suitable for all flooring applications up to semi-intensive use such as shops and offices with estimated visitor numbers of 5,000,000 with a service life without significant wear of 20 years. The slip resistance results of over 40 demonstrate that the stone will be safe in all applications.

Technical Summary

Prepared by: Dr T Yates, BRE (Building Research Establishment): **Durability and Weathering**
It is important that the results from the sodium sulphate crystallisation tests are not viewed in isolation. They should be considered with the results from the porosity and water absorption tests and the performance of the stone in existing buildings. Stone from the Portland Basebed is traditionally acknowledged as being less durable than Whitbed but it has been used extensively where a faster rate of weathering is acceptable or where its working qualities were required. It is possible to compare the results for the Basebed Stone from Bowers Mine to those collected from buildings, exposure trials and tests on quarry samples collected by BRE during the last 70 years. This shows that the stone compares well with the traditional view of Portland Basebed. Previous research at BRE has shown that Portland limestone which has a low saturation coefficient (>0.72), a high microporosity (>11.0 of the stone by volume) and an increased amount of micritic matrix will weather more rapidly than Whitbed when used on buildings. The results summarised on these sheets show that most of the samples tested are of this type. The crystallisation test results show the stone to be Class D -E which BRE Report 141 suggests that it is suitable for plain walling and cladding. The results from the other tests suggest that soundest stone may well perform better than this class in the current environment. Where more severe exposure conditions are expected, for example high concentrations of sulphur dioxide or severe frosts, or where a long life is required (for example >50 years) then it may be desirable to use a more durable stone (e.g. Portland Whitbed). When using Bowers Basebed it is especially important that the detailing of the stonework is designed to offer the maximum protection to rainwater and rainwater runoff.
Based on current research it seems likely that the stone would weather at a rate of between 3 and 4 mm per 100 years but it could be greater in severe exposures or on the edges of stonework. (Weathering rates are based on the BRE interpretation of historical data dating from 1932)

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