Stonehills Whitbed

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 338 tests have been carried out from 2017 in accordance with current European standards by the BRE on Albion Stone's behalf, or by other accredited testing houses. 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, 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

In thin section the stone was dominated by the presence of micritic ooliths (nominal 60%) with lesser volumes of peloids, bioclasts and lithoclasts/intraclasts. The bioclasts were often fragmented and typically elongate in shape, observed at up to approximately 20mm in length. The ooliths were generally in range 0.5mm down and usually showed a nucleus consisting of sparite crystal, bioclasts fragment, quartz grain or intraclast particle. Some showed a clear concentric structure. The majority of the ooliths showed a micritic composition. Some particles were composed of micrite with no structure (peloids) but others showed a pre-existing fabric including cement and were considered to be lithoclasts. Bioclasts were fragmented making accurate identification problematic, but sectional pieces of molluscs and bryozoa were noted. Pore spaces were observed throughout the section at a level of nominally 18 to 20%, with some being filled by sparite cement which often occurred as single large crystals.
Based on the mineralogy identified in thin section and the texture seen in hand specimen, the stone has been given the classification of Oolitic limestone.

Strength

Compression - BS EN 1926

Lowest Expected Value 25.05 MPa
Highest Expected Value 52.11 MPa
Average: 36.72 Mpa from 20 tests

Flexural Strength - BS EN 12371 & 12372

Lowest Expected Value 4.93 MPa
Highest Expected Value 7.67 MPa
Average: 6.18 MPa from 10 tests

Breaking Load at Dowel Hole - 50mm BS EN 13364
Lowest Expected Value 1793 N
Highest Expected Value 4482 N
Average: 2919 N from 27 tests

Durability

Water Absorption - BS EN 13755
Lowest Expected Value 5.91 %
Highest Expected Value 9.20 %
Average: 7.43 % from 23 tests

Density - BS EN 1936
Lowest Expected Value 2052kg/m³
Highest Expected Value 2138kg/m³
Average: 2095 kg/m³ from 25 tests

Porosity - BS EN 1936
Lowest Expected Value 21.12%
Highest Expected Value 23.88%
Average: 22.47% from 30 tests

Salt Crystallisation – BS EN 12370
Lowest Expected Value 0%
Highest Expected Value 0%
Average: 0.08% from 7 tests *All samples gained weight*

Water Absorption by Capillarity - BS EN 1925
23.08 $g/m^2.sec^{-0.5}$

Flooring / Paving

Abrasion Resistance - EN 14157
Lowest Expected Value 63
Highest Expected Value 78
Average: 70 from 6 tests

Slip Resistance - TRRL Pendulum Test: Grit 120 (Flooring)
Lowest Expected Value 4039
Highest Expected Value 6800
Wet Average value 5285 from 16 tests
Lowest Expected Value 1691
Highest Expected Value 3248
Dry Average value 2376 from 16 tests

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Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (Pre-thermal testing)
Lowest Expected Value 4.93 MPa
Highest Expected Value 7.67 MPa
Average: 6.18 MPa from 10 tests

Freeze/Thaw—BS EN 12371 & 12372 (Average figure 14-168 cycles)
Lowest Expected Value 3.06 MPa
Highest Expected Value 7.70 MPa
Average: 4.98 MPa from 20 tests

Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (After 14 (20) cycles) For cladding in accordance with EN 1469
Lowest Expected Value 4.53 MPa
Highest Expected Value 7.62 MPa
Average: 5.91 MPa from 10 tests

Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (After 56 cycles) For paving in accordance with EN 1341
Lowest Expected Value 2.89 MPa
Highest Expected Value 5.56 MPa
Average: 4.05 MPa from 10 tests

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 Whitbed is traditionally acknowledged as generally being a very durable building stone and it has been used extensively in many towns and cities in the UK. Comparing the results for the Whitbed Stone from Jordans Mine to those collected from buildings, exposure trials and tests on quarry samples collected by BRE during the last 70 years shows that this stone compares very well with the traditional view of Portland Whitbed. Previous research at BRE has shown that Portland limestone which has a low saturation coefficient (<0.72), a low microporosity (<11.0 of the stone by volume) and an open oolitic structure generally performs well over long periods when used on buildings. The results summarised on these sheets show that the limited number of samples tested meet these criteria. The average crystallisation test results show the stone to be Class C which BRE Report 141 suggests is suitable for most uses including where exposure conditions are to be more severe, for example high concentrations of sulphur dioxide or severe frosts, or where a long life is required (for example >50 years). In all cases it is important that the detailing of the stonework is designed to offer the maximum protection from rainwater and rainwater runoff.
Based on current research it seems likely that the stone would weather at a rate of between 1 and 2 mm per 100 years but it could be greater in severe exposures. (Weathering rates are based on the BRE interpretation of historical data dating from 1932).

November 24