

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 366 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.

Breaking Load at Dowl tests have been carried out in Type IIb orientation in accordance with BS EN 13364 Part 1, as this reflects the typical orientation of Portland Stone in use.

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.

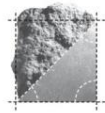
Strength

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 5.88 %

Highest Expected Value 8.92 %

Average: 7.29 % from 29 tests

Density - BS EN 1936

Lowest Expected Value 2055kg/m³

Highest Expected Value 2148kg/m³

Average: 2101 kg/m³ from 31 tests

Porosity - BS EN 1936

Lowest Expected Value 20.53%

Highest Expected Value 23.97%

Average: 22.20% from 36 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/m².sec^{-0.5}

Flooring / Paving

Abrasion Resistance - EN 14157

Lowest Expected Value 18.88

Highest Expected Value 28.05

Average: 23.08 from 6 tests

Slip Resistance - TRRL Pendulum Test: Grit 120 (Flooring)

Lowest Expected Value 63

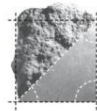
Highest Expected Value 78

Wet Average value 70 from 6 tests

Lowest Expected Value 56

Highest Expected Value 150

Dry Average value 94 from 6 tests



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).

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