JORDANS WHITBED

This technical data sheet was initially 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 1596 tests have been carried out from 2006 in accordance with current European standards by the BRE and Sandbergs 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. Section 5.6 in the BS8298 part 2 & 4 set out the calculation for the factor of safety. Table 4 shows the components for this calculation and Albion Stone are happy to assist with interpretation of our data.

Petrography

The stone was classified as a moderately sorted, moderately compacted, clast supported Oosparite Limestone. The clasts were predominantly composed of ooliths, but mollusc shell and echinoderm fragments and quartz were also present. The matrix was composed of sparitic syntaxial carbonate and some micritic carbonate. There was a moderate to high abundance of open voidage space. There was possibly some evidence of sedimentary bedding by the preferred alignment of elongate clasts.

Strength

Compression - BS EN 1926

Lowest Expected Value 37.00 MPa
Highest Expected Value 61.04 MPa
Average: 47.97 MPa from 36 tests

Flexural Strength - BS EN 13161

Lowest Expected Value 3.57 MPa
Highest Expected Value 8.78 MPa
Average: 5.82 MPa from 141 tests

Breaking Load at Dowel Hole - BS EN 13364:2002

Specimen Thickness (mm)	Mean Breaking Load (N)	Lowest Expected Value (N) / Highest Expected Value (N)
75	4,667	3,383 / 6,281
50	2,165	1,469 / 3,081
40	1,348	965 / 1,834
30	667	539 / 817

Durability

Water Absorption - BS EN 13755
Lowest Expected Value 3.18%
Highest Expected Value 9.62%
Average: 5.82% from 139 tests

Density - BS EN 1936
Lowest Expected Value 2,010 kg/m³
Highest Expected Value 2,386 kg/m³
Average: 2,193 kg/m³ from 180 tests

Porosity - BS EN 1936
Lowest Expected Value 12.32%
Highest Expected Value 27.10%
Average: 18.77% from 229 tests

Saturation Coefficient - BS EN 1936
Lowest Expected Value 0.52
Highest Expected Value 0.82
Average: 0.66 from 108 tests

Salt Crystallisation – BS EN 12370
Lowest Expected Value 0.15%
Highest Expected Value 12.77%
Average: 1.76% from 7 tests

Thermal Shock Resistance—BS EN 14066
(% change in elastic modulus)
Lowest Expected Value 0.30%
Highest Expected Value 32.35%
Average: 4.51% from 10 tests

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

Flooring / Paving

Abrasion Resistance - EN 14157
Lowest Expected Value 21.01
Highest Expected Value 25.96
Average: 23.39 from 18 tests

Slip Resistance - TRRL Pendulum Test: Grit 120 (Flooring)
Lowest Expected Value 67
Highest Expected Value 86
Wet Average value 76 from 30 tests
Lowest Expected Value 75
Highest Expected Value 100
Dry Average value 87 from 30 tests

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Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (Pre-thermal testing)
Lowest Expected Value 3.65 MPa
Highest Expected Value 7.31 MPa
Average: 5.25 MPa from 20 tests

Freeze/Thaw—BS EN 12371 & 12372 (Average figure 14-168 cycles)
Lowest Expected Value 1.70 MPa
Highest Expected Value 9.42 MPa
Average: 4.37 MPa from 50 tests

Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (After 14 (20) cycles) For cladding in accordance with EN 1469
Lowest Expected Value 3.30 MPa
Highest Expected Value 7.70 MPa
Average: 5.15 MPa from 20 tests

Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (After 56 cycles) For paving in accordance with EN 1341
Lowest Expected Value 1.80 MPa
Highest Expected Value 10.26 MPa
Average: 4.65 MPa from 17 tests

Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (after 168 cycles) in accordance with EN 771-6
Lowest Expected Value 1.33 MPa
Highest Expected Value 7.84 MPa
Average: 3.48 MPa from 10 tests

Light Reflectance - tested using NCL Colour Scan instrument - Grit 60: Mean Value 57.00

Internal Flooring
Jordans Whitbed 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 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 average crystallisation test results show the stone to be Class B 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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