



JORDANS 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 381 tests have been carried out 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

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

Strength

Compression - BS EN 1926

Lowest Expected Value 30.17 MPa

Highest Expected Value 81.67 MPa

Average: 51.43 MPa from 46 tests

Flexural Strength - BS EN 13161

Lowest Expected Value 5.04 MPa

Highest Expected Value 8.74 MPa

Average: 6.73 MPa from 106 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 | 4329 | 3795 / 4888 |
| 60 | 2074 | 1576 / 2689 |
| 50 | 1637 | 1276 / 2075 |
| 40 | 1138 | 825 / 1537 |
| 30 | 618 | 496 / 762 |



Durability

Water Absorption - BS EN 13755

Lowest Expected Value 4.93%

Highest Expected Value 7.56%

Average: 6.14% from 115 tests

Density - BS EN 1936

Lowest Expected Value 2,150 kg/m³

Highest Expected Value 2,336 kg/m³

Average: 2,242 kg/m³ from 121 tests

Porosity - BS EN 1936

Lowest Expected Value 12.88%

Highest Expected Value 19.67%

Average: 16.02% from 221 tests

Saturation Coefficient - BS EN 1936

Lowest Expected Value 0.73

Highest Expected Value 0.92

Average: 0.82 from 106 tests

Salt Crystallisation - BS EN 12370

Lowest Expected Value 15.34%

Highest Expected Value 70.82%

Average: 34.63% from 6 tests

Thermal Shock Resistance - BS EN 14066

Lowest Expected Value 0.00%

Highest Expected Value 13.0%

Average: 1.94% from 10 tests

Water Absorption by Capillarity - BS EN 1925

42.66g/m².sec⁻²

Flooring / Paving

Abrasion Resistance - EN 14157

Lowest Expected Value 24

Highest Expected Value 28

Average 26 from 6 tests

Slip Resistance - BS EN 1341 TRRL Pendulum Test: Grit 120 (Flooring)

Lowest Expected Value 63

Highest Expected Value 75

Wet Average value 68.8 from 12 tests

Lowest Expected Value 79

Highest Expected Value 88

Dry Average value 83.0 from 12 tests

Freeze/Thaw—Flexural Strength - BS EN 12372 & 14066 (Pre-thermal testing)

Lowest Expected Value 7.53 MPa

Highest Expected Value 11.66 MPa

Average: 9.43 MPa from 20 tests

Freeze/Thaw—Flexural Strength BS EN 12372 & 14066 (Average figure 14-168 cycles)

Lowest Expected Value 8.45 MPa

Highest Expected Value 11.08 MPa

Average: 9.95 MPa from 50 tests

Freeze/Thaw — Flexural Strength - BS EN 12372 & 14066 (After 14 (20) cycles) For cladding in accordance with EN 1469

Lowest Expected Value 8.90 MPa

Highest Expected Value 11.53 MPa

Average: 10.15 MPa from 20 tests

Freeze/Thaw — Flexural Strength - BS EN 12372 & 14066 (After 56 cycles) For paving in accordance with EN 1341

Lowest Expected Value 9.51 MPa

Highest Expected Value 11.24 MPa

Average: 10.34 MPa from 9 tests

Freeze/Thaw — Flexural Strength - BS EN 12372 & 14066 (after 168 cycles) in accordance with EN 771-6

Lowest Expected Value 9.10 MPa

Highest Expected Value 10.75 MPa

Average: 9.90 MPa from 10 tests

Determination of Load Capacity of FZP-Anchors (Fischer under cut Anchors) - pull out testing on 50mm thick

Lowest Expected Value 3824 N

Highest Expected Value 5132 N

Average: 4440 N from 10 tests

Light Reflectance - tested using NCL Colour Scan instrument - Grit 60

Mean Value 62.20

Internal Flooring

Jordans 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 Jordans 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. Jordans Whitbed). When using Jordans 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).

April 2019

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