



## JORDANS BASEBED

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. These tests have been carried out 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 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 33.39 MPa

Highest Expected Value 80.76 MPa

**Average: 53.69 MPa from 56 tests**

#### Flexural Strength - BS EN 13161

Lowest Expected Value 4.99 MPa

Highest Expected Value 8.69 MPa

**Average: 6.68 MPa from 116 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	3530 / 5254
50	2596	1088 / 5307
40	1757	758 / 3521
30	618	496 / 762





### **Durability**

#### **Water Absorption - BS EN 13755**

Lowest Expected Value 5.01%

Highest Expected Value 7.34%

**Average: 6.11% from 121 tests**

#### **Density - BS EN 1936**

Lowest Expected Value 2162 kg/m<sup>3</sup>

Highest Expected Value 2326kg/m<sup>3</sup>

**Average: 2243 kg/m<sup>3</sup> from 127 tests**

#### **Porosity - BS EN 1936**

Lowest Expected Value 13.20%

Highest Expected Value 19.20%

**Average: 16.03% from 227 tests**

#### **Saturation Coefficient - BS EN 1936**

Lowest Expected Value 0.74

Highest Expected Value 0.91

**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 0.12%

Highest Expected Value 12.84%

**Average: 1.94% from 10 tests**

#### **Water Absorption by Capillarity - BS EN 1925**

42.66 g/m<sup>2</sup>.sec<sup>-2</sup>

### **Flooring / Paving**

#### **Abrasion Resistance - EN 14157**

Lowest Expected Value 24

Highest Expected Value 28

**Average 26<sub>26</sub> from 6 tests**

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

Lowest Expected Value 63

Highest Expected Value 88

**Wet Average value 75 from 24 tests**

Lowest Expected Value 74

Highest Expected Value 87

**Dry Average value 80 from 24 tests**



**Freeze/Thaw—Flexural Strength - BS EN 12371 & 12372 (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 12371 & 12372 (Average figure 14-168 cycles)**

Lowest Expected Value 9.10 MPa  
Highest Expected Value 11.29 MPa  
**Average: 10.15 MPa from 49 tests**

**Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (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 12371 & 12372 (After 56 cycles) For paving in accordance with EN 1341**

Lowest Expected Value 9.50 MPa  
Highest Expected Value 11.25 MPa  
**Average: 10.34 MPa from 9 tests**

**Freeze/Thaw — Flexural Strength - BS EN 12371 & 12372 (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).

*August 23*