



Portland  
Independent  
Base Bed  
Limestone

## Technical Data Sheet

### Portland Base Bed Limestone

Bowers Quarry, Isle of Portland

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This data sheet was compiled by the Building Research Establishment (BRE). Where possible, data collected in earlier surveys has been used to help interpret the test results. The data sheet was compiled in September 1997 using the results of tests carried out to the proposed European Standards. The work was carried out by BRE as part of a Partners in Technology Programme funded by the Department of the Environment, Transport and the Regions and Albion Stone Quarries Ltd and does not represent an endorsement of the stone by BRE.

### General

The entrance to the quarry is Wide Street in Easton. There are plentiful reserves.

### Petrography

The stone is an open textured oolitic limestone from the Portlandian formation (Jurassic). The stone is formed from ooliths in a micrite (fine grained calcium carbonate) matrix.

#### Expected Durability and Performance

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 Bowers Quarry 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 >50years) then it may be desirable to use a more durable stone (e.g. Portland Whitbed). When using Bowers 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.

### Test Results – Portland Bowers Base Bed Limestone

<b>Safety in Use</b>		
Slip Resistance <sup>(Note 1)</sup>	Wet: 75	Range 73 – 80. Values > 40 are considered safe
Abrasion Resistance <sup>(Note 1)</sup>	24.0	Range 22.7-25.4 Values <23.0 are considered suitable for use in heavily trafficked areas
<b>Strength under load</b>		
1) Compression <sup>(Note 2)</sup>	52.8 MPa	Range 41.3 – 64.3 Loaded perpendicular to the bedding – ambient humidity
2) Bending <sup>(Note 1)</sup>	7.8 MPa	Range 7.3 – 8.2. Loaded perpendicular to the

		bedding – ambient humidity
<b>Porosity and Water Absorption</b>		
1) Porosity <sup>(Note 3)</sup>	15.4%	Range 13.7 – 16.8%
2) Saturation Coefficient <sup>(Note 3)</sup>	0.79	Range 0.71 – 0.83
3) Water Absorption	4.2% (by wt)	
4) Bulk specific gravity	2320 kg/m <sup>3</sup>	
<b>Resistance to Frost</b>		
Freeze/Thaw Test <sup>(Note 1)</sup>	Not determined	
<b>Resistance to Salt</b>		
Sodium Sulphate Crystallisation Test <sup>(Note 3)</sup>	Mean: 62.8% wt loss	Range 17.7 – 89.3

(Test methods Note 1 = prEn1341, Note 2 = prEN 1342, Note 3 = prEn 1341 /BRE 141, Note 4 = BRE 141)

Tests were carried out at BRE between 1993 and March 1997, results from other laboratories have been included in the calculation of means and ranges.)