SANDBERG

REPORT 57193/G

TESTING OF

BIRCHOVER SANDSTONE

Sandberg LLP
5 Carpenters Place
Clapham High Street
London SW4 7TD

Tel: 020 7565 7000
Fax: 020 7565 7101
email: mail@sandberg.co.uk
web: www.sandberg.co.uk

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CONSULTING ENGINEERS
INVESTIGATION INSPECTION
MATERIALS TESTING

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5 Carpenters Place
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TESTING OF

BIRCHOVER SANDSTONE

Birchover Stone Limited
Birchover Quarry
Main Road
Birchover
Derbyshire
DE4 2BN

This report comprises
3 pages of text
Table 1 of 2 sheets

For the attention of Ms Caroline Windle

10 June 2016

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Reference: Instructions from Ms Caroline Windle of Birchover Stone Limited.
Purchase Order no. : 06468 dated 31 May 2016.

1. INTRODUCTION

We were instructed to undertake testing of natural stone, advised to be Birchover sandstone, in order to establish fixing failure load characteristics.

2. SAMPLES

Test specimens prepared ready for test were received from Szerelmey Limited at Sandberg laboratories on 3 June 2016, as follows.

Sandberg Reference	Specimen Size	Test
	Birchover sandstone	
G44062	5 no. 200 x 200 x 50mm ; each with dowels installed in two opposing edges	Breaking load st dowel hole, negative, dry
G4063	5 no. 200 x 200 x 50mm ; each with dowels installed in two opposing edges	Breaking load st dowel hole, negative, wet

3. TEST METHOD AND RESULTS

3.1 Breaking load at dowel hole

Specimens were tested utilising a calibrated loading apparatus in accordance with the method in BS EN 13364 : 2002, except that testing was also carried out in a saturated condition.

Note : Water saturation is a modification to BS EN 13161 : 2008 test method. (specimens placed in water for at least 48 hours at 22±2°C) .

The slabs were tested with the load applied in an unknown bedding orientation (Type 0) in both oven dried and saturated conditions.

The load was applied evenly until failure occurred and the load at failure recorded.

The results are presented in Table 1 of this report and are summarised as follows.

Sandberg Reference	Orientation / Condition	Breaking load at dowel hole (kN)	
		Range	Mean
G44062	Unknown (Type 0), dry	2.33 - 3.65	2.95
G44063	Unknown (Type 0), wet	1.34 - 2.52	1.93

Statistical evaluation of the test results in accordance with the methods in BS EN 13364: 2002 Annex A (normative) produced the following:-

	Lowest Expected Value (kN)
Unknown (Type 0), dry	2.23
Unknown (Type 0), wet	1.21

4. **REMARKS**

These results conclude the requested programme of testing. Please do not hesitate to contact us if we can be of any further assistance in this matter.

Birchover Stone Limited
Birchover Quarry
Main Road
Birchover
Derbyshire
DE4 2BN

for Sandberg LLP

For the attention of Ms Caroline Windle

D J Ellis
Partner

DJE/Geoman/ws

10 June 2016

File: 57193g.rep.wpd

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report.

Tests reported on sheets not bearing the UKAS logo in this report/certificate are not included in the UKAS accreditation schedule for this laboratory.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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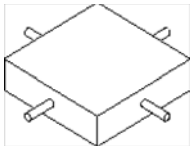
Table/Sheet
1/1

DETERMINATION OF BREAKING LOAD AT DOWEL HOLE

BS EN 13364 : 2002



Fixing Type : Dowel (ss 6mm dia.) with resin
Fixing Location : 50mm thickness ; Centre of edge
Load Orientation : Unknown (Type 0)
Test Condition : Oven dried

Rock Name	Birchover			Tested By/Date	MB / 07.06.16
Rock Type	Sandstone			Checked By/Date	HO / 08.06.16
Specimen Reference (with dowel)	Simulated Wind Loading [1]	Failure Load (kN)	Max. distance from hole centre to fracture edge (mm)	Distance from hole to fracture face (mm)	Observations
G44062 a	Negative	3.65	67.07	19.73	Normal half cone failure
G44062 b	Negative	3.27	46.60	22.13	Normal half cone failure
G44062 c	Negative	2.77	48.12	21.89	Normal half cone failure
G44062 d	Negative	3.13	36.15	20.85	Normal half cone failure
G44062 e	Negative	2.33	37.33	21.47	Normal half cone failure
G44062 f	Negative	2.48	52.29	21.62	Normal half cone failure
G44062 g	Negative	2.87	38.68	21.20	Normal half cone failure
G44062 h	Negative	3.04	48.35	23.12	Normal half cone failure
G44062 j	Negative	2.90	43.05	23.66	Normal half cone failure
G44062 k	Negative	2.11	37.19	22.15	Normal half cone failure
Mean		2.95			
Std. Dev.		0.38			
Var. Coef.		0.13			

[1] Relative to finished face

Lowest Expected Value (kN) : 2.23

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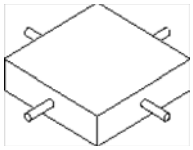
1/2

DETERMINATION OF BREAKING LOAD AT DOWEL HOLE

BS EN 13364 : 2002



Fixing Type : Dowel (ss 6mm dia.) with resin
Fixing Location : 50mm thickness ; Centre of edge
Load Orientation : Unknown (Type 0)
Test Condition : Saturated

Note : Water saturation is a modification to BS EN 13161 : 2008 test method. (specimens placed in water for at least 48 hours at 22±2°C) .

Rock Name	Birchover			Tested By/Date	MB / 07.06.16
Rock Type	Sandstone			Checked By/Date	HO / 08.06.16
Specimen Reference (with dowel)	Simulated Wind Loading [1]	Failure Load (kN)	Max. distance from hole centre to fracture edge (mm)	Distance from hole to fracture face (mm)	Observations
G44063 a	Negative	2.22	49.19	22.21	Normal half cone failure
G44063 b	Negative	1.98	82.33	23.51	Normal half cone failure
G44063 c	Negative	1.72	65.25	21.73	Normal half cone failure
G44063 d	Negative	1.40	71.27	23.55	Normal half cone failure
G44063 e	Negative	2.24	76.08	24.58	Normal half cone failure
G44063 f	Negative	2.07	63.72	22.19	Normal half cone failure
G44063 g	Negative	2.13	89.49	24.26	Normal half cone failure
G44063 h	Negative	2.52	43.48	23.34	Normal half cone failure
G44063 j	Negative	1.64	89.63	21.51	Normal half cone failure
G44063 k	Negative	1.34	73.66	21.41	Normal half cone failure
Mean		1.93			
Std. Dev.		0.39			
Var. Coef.		0.20			

[1] Relative to finished face

Lowest Expected Value (kN) : 1.21

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