

MICROSTRUCTURE ANALYSIS REPORT

Ceram Reference: (135405)/CR1

Client: Birchover Stone Ltd
Capstone House
Dunston Way
Off Dunston Road
Chesterfield
S41 9RD

For the Attention of: Mr Nigel Morton

Date Logged: 22-Oct-2013

Date of Tests: 01-Nov-2013 to 13-Nov-2013

Report Date: 28-Nov-2013

Purchase Order No.: 08091

Please find attached the results for the samples recently submitted for analysis.

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

This report supersedes the report issued on 13 November 2013 Ref: (135405) - Petrographic Examination Report.



Mr Alan Neale
Author

PHYSICAL TESTING REPORT



0013

Birchover Stone Ltd
Capstone House
Dunston Way
Off Dunston Road
Chesterfield
S41 9RD

FAO: Mr Nigel Morton

Report of Tests on: Natural Stone Masonry

Your Reference: Birchover Gritstone

Lucideon Reference: (135405)-22969/CR1

Date Reported: 24-Mar-2014

Order Number: 08091

Date Logged: 22-Oct-2013

Date(s) of Test(s): 19-Nov-2013 to 21-Nov-2013

Determination of Open Porosity and Apparent Density of Natural Stone

BS EN 1936: 2006

	Open Porosity	Apparent Density
No.	%	kg/m ³
1	15.38	2220
2	14.88	2210
3	15.23	2220
4	15.06	2210
5	13.17	2220
6	14.03	2220
Mean	14.63	2220

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

End of Test Report

Mr Simon Hall
Author

**This report supersedes the report dated 06/12/2013 Ref
(135405)-22969 Determination of Open Porosity and Apparent
Density of Natural Stone.**

Page 1 of 1

Description	Customer Reference	Ceram Sample No
Birchover Gritstone	Natural stone masonry units BS EN171-6:2011	(135405)-22969

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1 INTRODUCTION

A pinkish grey Birchover gritstone was submitted for petrographic examination in accordance with BS EN 12407:2007. In order to characterise the provided sample, the rock was examined both in hand specimen (aided with stereomicroscope) and in thin section. The aim of the study was for petrographic classification of the specimen and also to highlight macro and microtextural features and chemical behaviour that may affect its intended uses.

2 RESULTS

Hand Specimen

The locality from where the rock was obtained is Birchover referred from the sample name. A geological age of gritstone in British stratigraphy is Carboniferous. In hand specimen the rock looks pinkish grey (Figure 1, Appendix 1). This colouration is might be associated with secondary alteration of the rock or iron hydroxide cementing the grains. The rock appears to be medium grained with a marked massive texture with no cracks, pores or cavities. The dark minerals between grains might be associated with cementing iron oxide or iron hydroxide. The majority of the minerals forming the specimen are light in colour corresponding to felsic mineral phases.

The grain size is medium to discern any discrete minerals in hand specimen but with aid of hand lenses and stereomicroscope quartz, feldspar, iron oxide and altered mineral phases could be determined.

Thin Section

In thin section the mineral grains forming the rock are homogeneously distributed (Figure 2 and 3, Appendix 1). These minerals show medium and well sorted grain size distribution. The morphology of individual grains in the sample is dominated by sub-angular grain shape. The grains look well packed where they are just touching each other with straight boundaries. This type of relationship gives the rock grain supported fabric. The overall texture shows little matrix, well sorted grains giving maturity to the rock.

The major mineral grains forming the rock are shown in the table below. Quartz dominates the mineralogy followed by feldspars. Occasionally iron oxide or hydroxide cements grains together. Alteration of feldspar into secondary minerals exists.

Table 1 - Mineral Phases Observed under Thin Section in Natural Stone Masonry Units BS EN771-6:2011

Phase	Content
Quartz	78.0 wt%
Alkali feldspars	12.5 wt%
Plagioclase feldspars	8.0 wt%
Alteration products	1.5 wt%
Iron oxides/Iron hydroxides	1.0 wt%

The quartz grains are clear, do not contain inclusions. The quartz grains also do not show undulate extinction which is an indication of lack of strain. These features indicate the stability of the quartz. Two types of feldspars, alkali and plagioclase feldspar exist in the rock. Microcline (alkali feldspar) easily identifiable in the thin section from cross hatch twinning pattern. Another alkali feldspar observed in the thin section is orthoclase which resembles quartz, and occasionally recognised by its dusty and alteration appearance. This type of alteration of feldspars at places to secondary minerals lowers the mechanical stability of the overall rock.

Based on the constituent mineralogy the rock can be named as sub-arkose arenite (a classification of sandstone). The rock can be classified as compositionally mature as it is dominated by quartz. Compositionally mature sandstones are less to disintegrate.

3 CONCLUSIONS

The rock type is a sub-arkose arenite (sandstone), dominated by medium grained quartz followed by feldspars. The texture of the rock emphasises well sorted and compositionally mature sandstone. The feldspars are altered to secondary minerals at places imparting slight instability to the general rock mass.

APPENDIX 1

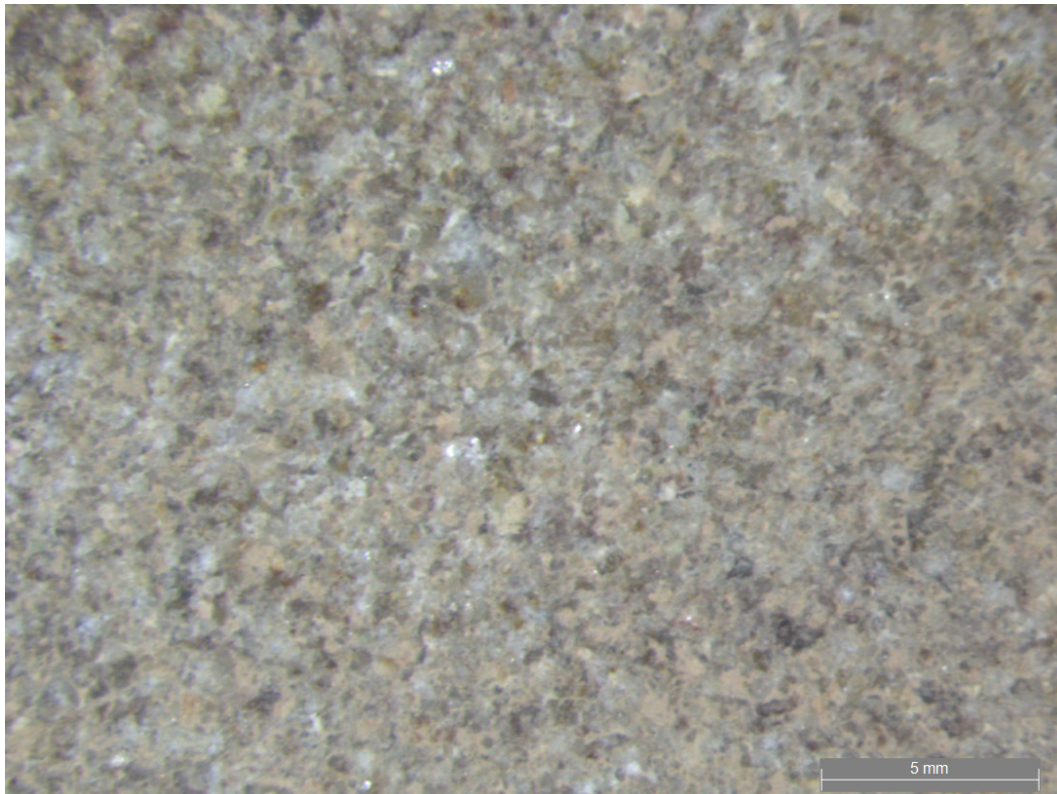


Figure 1 - Photomicrograph of Birchover Gritstone under Stereomicroscope

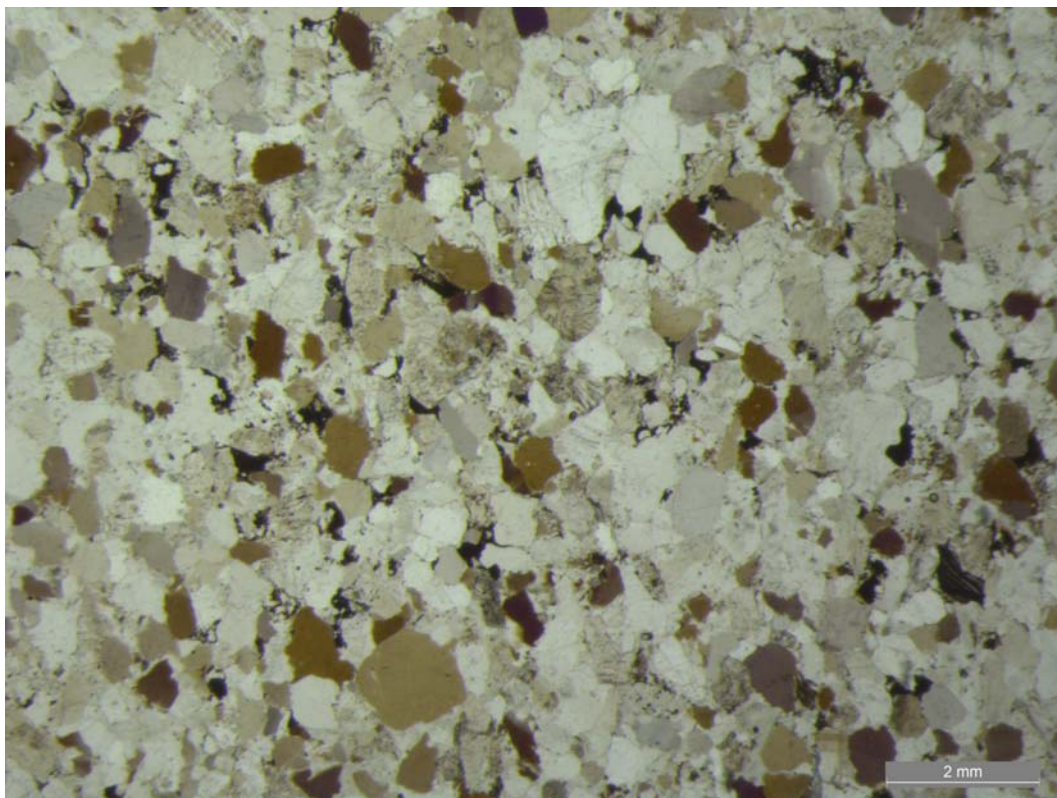
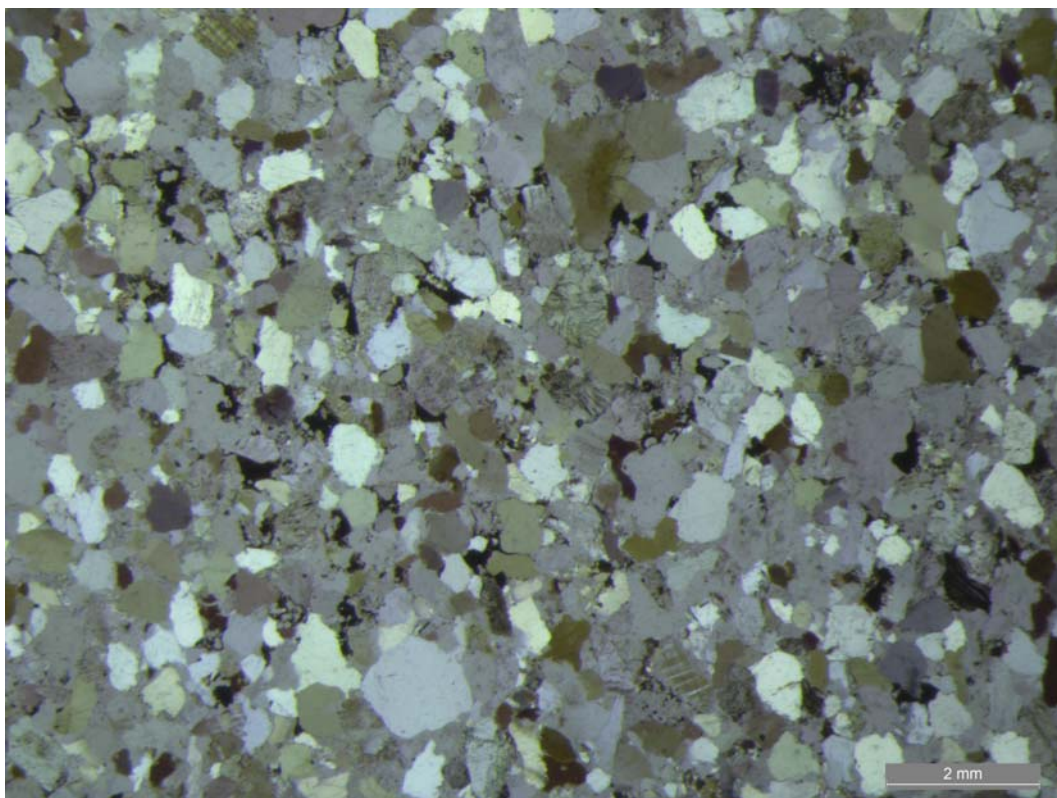


Figure 2 - Photomicrograph of Birchover Gritstone under Plane Polarised Light



**Figure 3 - Photomicrograph of Birchover Gritstone under Stereomicroscope.
Note homogenous distribution and well sorted grains.**

NOTE: The results given in this report apply only to the samples that have been tested.

END OF REPORT

From 1 February 2014 Lucideon will be the new name
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PHYSICAL TESTING ANALYSIS REPORT

Description: Determination of Dimensions

Test Method: BS EN 771-6: 2011 (BS EN 13373:2003)

Ceram Reference: (135405)-22969

Client: Birchover Stone Ltd
Capstone House
Dunston Way
Off Dunston Road
Chesterfield
S41 9RD

For the Attention of: Mr Nigel Morton

Date Logged: 22-Oct-2013

Date of Tests: 08-Nov-2013 to 15-Nov-2013

Report Date: 06-Dec-2013

Purchase Order No.: 08091

Please find attached the results for the sample(s) recently submitted for analysis.

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Mr Simon Hall
Author

Ceram Reference: (135405)-22969
 Customer Reference: Birchover Gritstone
 Description: Natural Stone Masonry



Determination of Geometric Characteristics
(BS EN 13373: 2003)

Length (mm)				Width (mm)			
No	1	2	3	No	1	2	3
1	100.7	100.6	100.6	1	100.5	100.6	100.8
2	100.4	100.6	100.6	2	100.4	100.6	100.6
3	100.7	100.7	100.6	3	100.6	100.4	100.6
4	100.8	100.7	100.7	4	100.5	100.5	100.6
5	100.4	100.5	100.6	5	100.3	100.4	100.5
6	100.3	100.4	100.3	6	100.4	100.4	100.5
Mean	100.6	100.6	100.6	Mean	100.5	100.5	100.6

Thickness (mm)								
No	1	2	3	4	5	6	7	8
1	99.4	99.5	99.4	99.5	99.4	99.6	99.6	99.5
2	100.1	100.2	100.1	100.2	100.6	99.9	99.1	99.7
3	99.7	99.4	99.7	100.1	100.1	100.2	100.2	100.1
4	100.2	100.1	100.4	100.3	100.2	100.2	100.1	100.6
5	100.4	100.3	100.2	100.1	100.1	100.3	100.3	100.2
6	99.6	99.7	100.1	100.4	100.3	100.3	100.3	100.2
Mean	99.9	99.9	100.0	100.1	100.1	100.1	99.9	100.1

Flatness (mm)								
No	1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0

No	Squareness of Face (mm)			Squareness of Edge (mm)		
	Corner 1	Corner 2	Difference	Edge 1	Edge 2	Edge 3
1	89	90	1	0	0	0
2	90	90	0	0	0	0
3	89	89	0	0	0	0
4	90	90	0	0	0	0
5	90	90	0	0	0	0
6	89	90	1	0	0	0
Mean	90	90	0	0	0	0

End of Test Report

PHYSICAL TESTING REPORT



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