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## BRITISH BOARD OF AGREMENT TEST REPORT No 1724

### Tests on Weber & Broutin Mulsifix High Build 30 Repair Mortar

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Approved by:  
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Date: 18-October-2000

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(Technical Manager)

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On behalf of the British Board of Agrément

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Test Report No 1724

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**Client:** Weber & Broutin United Kingdom Ltd  
 Dickens House  
 Moulden Road  
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 MK45 5BY

**Job No:** T1/31046

**Report by:** M J Stonehill

**Work periods:** September to December 1999 and July to August 2000

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## 1 INTRODUCTION

The tests reported here were commissioned by Weber & Broutin United Kingdom Ltd to examine the performance of Mulsifix High Build 30 Repair Mortar. Weber & Broutin's order numbers F34486 and F38743 refer.

## 2 SAMPLES

Moulded test pieces were made at the BBA by a technician from Weber & Broutin using material having manufacturing Batch Nos 170799 FW9 and 050600 FW76. Test pieces were given the following sample references:

W & B ref	BBA ref/batch	Quantity	Description
170799 FW9	T1/30280/2	4	Mortar dumb-bell 70 mm x 25 mm x 25 mm
050600 FW76	T1/31046/1	6	Mortar cube 40 mm x 40 mm x 40 mm
050600 FW76	T1/31046/2	6	Mortar prism 160 mm x 40 mm x 40 mm
050600 FW76	T1/31046/3	2	Mortar prism 500 mm x 100 mm x 100 mm
050600 FW76	T1/31046/4	2	Mortar prism 285 mm x 25 mm x 25 mm
050600 FW76	T1/31046/5	1	Mortar slab 400 mm x 250 mm x 50 mm
050600 FW76	T1/31046/6	2	Mortar disc 100 mm diameter x 50 mm

Moulded specimens were covered with damp hessian and polythene sheet for 24 hours. After de-moulding they were stored in a controlled temperature and humidity environment of  $23 \pm 2^\circ\text{C} / 55 \pm \% \text{RH}$ .

## 3 COMPRESSIVE STRENGTH

### 3.1 Method

In accordance with BS 4551-1 : 1988 – *Methods of testing mortars, screeds and plasters* : Section 12, using 40 mm cube specimens (BBA ref/batch T1/31046/1) and a loading rate of  $9 \text{ kN min}^{-1}$ . Specimens were tested 7 days and 28 days after moulding and were tested dry.

### 3.2 Results

Curing time (days)	No	Compressive strength ( $\text{N mm}^{-2}$ )
7	1	30.7
	2	29.7
	3	25.0
	Mean	28.5
28	1	45.2
	2	41.3
	3	39.0
	Mean	41.8

## 4 FLEXURAL STRENGTH

### 4.1 Method

In accordance with BS 4551-1 : 1988 – *Methods of testing mortars, screeds and plasters* : Section 12, using 160 mm by 40 mm by 40 mm prisms (BBA ref/batch T1/31046/2). Specimens were tested 7 days and 28 days after moulding and were tested dry.

### 4.2 Results

Curing time (days)	No	Flexural strength (N mm <sup>-2</sup> )
7	1	4.70
	2	4.74
	3	4.69
	Mean	4.71
28	1	7.31
	2	8.25
	3	6.54
	Mean	7.37

## 5 TENSILE STRENGTH

### 5.1 Method

In accordance with BS 6319 : 1985 – *Testing of resin and polymer/cement compositions for use in construction*. Method for measurement of tensile strength using dumb-bell specimens (BBA ref/batch T1/30280/12). Specimens were tested 28 days after moulding and were tested dry.

### 5.2 Results

No	Tensile strength (N mm <sup>-2</sup> )
1	3.02
2	2.77
3	2.46
4	2.58
Mean	2.71

## 6 DRYING SHRINKAGE

### 6.1 Method

Two specimens 285 mm by 25 mm by 25 mm (BBA ref/batch T1/31046/4) were cast using moulds as described in ASTM C-490. The ends of each cast prism included steel inserts having conical depressions into which stainless steel ball-bearings could be located. Prisms were de-moulded after 24 hours and initial length measurements made using a frame mounted gauge according to the following procedure. An invar rod was placed in the frame and the electronic gauge set to zero. Each specimen was mounted in the frame with a ball-bearing in each end. Gauge readings were taken with the specimen in two orientations. Specimens were stored in air at  $23 \pm 2^\circ\text{C}$  /  $55 \pm 5\%$  RH and further measurements were made 7 days and 28 days after the initial measurement.

Change is reported as a percentage of the initial measurement and as micro-strain.

### 6.2 Results

Interval	Specimen No	Length (mm)	Difference from initial length (mm)	Drying shrinkage	
				(%)	Micro-strain
Initial	1	282.002	–	–	–
	2	281.820	–	–	–
7 days	1	281.976	0.026	0.009	92.19
	2	281.796	0.024	0.009	85.16
28 days	1	281.954	0.048	0.017	170.21
	2	281.772	0.048	0.017	170.32

## 7 INITIAL SURFACE ABSORPTION

### 7.1 Method

In accordance with BS 1881 : 1996 – *Recommendations for the determination of the initial surface absorption of concrete* using a 400 mm by 250 mm by 50 mm slab (BBA ref/batch T1/31046/5). The slab was tested six weeks after moulding using an 85 mm diameter cap.

### 7.2 Results

No	Initial surface absorption ( $\text{m l m}^{-2} \text{ s}^{-1}$ )
	10 minutes
1	0.02
2	0.03
3	0.02
Mean	0.02

The specimen was too impermeable to be sensitive to a longer term test.

## 8 DYNAMIC MODULUS OF ELASTICITY

### 8.1 Method

In accordance with BS 1881 : 1990 – *Recommendations for the measurement of dynamic modulus of elasticity* using 500 mm by 100 mm by 100 mm prisms (BBA ref/batch T1/31046/3). Prisms were tested 28 days after moulding. This test was performed by Messrs Sandberg.

### 8.2 Results

No	Dynamic modulus of elasticity (kN mm <sup>-2</sup> )
1	15.5
2	15.5
Mean	15.5

## 9 CARBON DIOXIDE DIFFUSION RESISTANCE

### 9.1 Method

This test was carried out by Taywood Engineering Ltd using their In-House Test Procedure – TP 1303/90/4672 using a 100 mm diameter by 50 mm thick mortar disc (BBA ref/batch T1/31046/6). The specimen was cured for approximately 28 days at  $23 \pm 2$  °C /  $60 \pm 5$  % RH. The specimen was sealed into a circular steel chamber such that both faces were exposed. Oxygen (100%) at a known pressure and flow rate was passed over the outer face of the specimen and helium gas was passed over the opposite face at the same pressure and flow rate. The helium gas stream was continuously monitored by gas chromatography to analyse for oxygen. Equilibrium conditions were achieved after approximately 24 hours and the steady state flow of oxygen was calculated from the percentage of oxygen in the helium stream.

The diffusion coefficient for oxygen (DO<sub>2</sub>) was calculated using Fick's law of diffusion and the equivalent Carbon dioxide diffusion coefficient was determined. The equivalent concrete thickness was determined using information contained in Concrete Society Technical Report No 31.

Further test and calculation details are contained in Taywood Engineering Ltd's Certificate of Test No 6049.

### 9.2 Results

Sample thickness = 5.01 cm

Oxygen diffusion coefficient =  $1.40 \times 10^{-4}$  cm<sup>2</sup>s<sup>-1</sup>.

Carbon dioxide diffusion coefficient (calculated) =  $4.42 \times 10^{-5}$  cm<sup>2</sup>s<sup>-1</sup>.

Equivalent concrete thickness Sc = 98 cm.