

Mr P Fasey
Baggeridge Brick Plc
Kingsbury Works
Dotshill
Tamworth
B77 4DW

tel: +44 (0)845 026 0902
fax: +44 (0)1782 412331
email: enquiries@ceram.com
web: www.ceram.com

TEST REPORT

Clients Mark	Brick Slip/Steel Panel	Date Received	28.06.00
Your Reference	N/A	Date Tested	13.07.00 to 04.08.00
Lab Reference	SW190a/00; W3286	Date Issued	16.02.11

DETERMINATION OF FREEZE/THAW RESISTANCE OF CLAY MASONRY UNITS

1. SAMPLES RECEIVED

Name	Test Panel I3	Definitions	N/A
Code	WBD1/M07 – 1:1:6 (I3) with SBA	Material	Clay & Steel
Colour	Blue	Size	215x30x65mm (front)
Finish	Smooth	Shape	Special Brick Slips
Making	Extruded	Features	N/A
No. Rec'd.	1 x Test Panel		

2. TEST PROCEDURE

2.1 Introduction

The test has been carried out in accordance with the standard specification for cyclic freezing test, BCRL BM1:1993 developed by CERAM. The test procedure is well established as a reliable and realistic method of classifying clay masonry units for durability according to the designations of F, M and O as per BS3921:1985. However, the test is not a requirement in this standard and at present, manufacturers can provide their own evidence of durability for their products

Following a successful Pan-European intercomparison programme, BCRL BM1:1993 is now going forward for enquiry as *prEN 772-22:1997 'Methods of Test for Masonry Units – Part 22'*. When BSEN 771-1 comes into force clay masonry units will have to be tested for freeze/thaw resistance according to the method described in *prEN772-22*. The test will be in essence the same procedure as BS3921:1985 with some minor modifications and with EN durability designations of F2, F1 and F0 corresponding to F, M and O as per BS3921:1993.

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Brick Classifications according to BS3921: 1985

Bricks classified as 'F' are frost resistant in all building situations and will withstand 100 cycles of the test with no damage.

Bricks classified as 'M' are moderately frost resistant and durable in most building situations but will be damaged by between 10 and 100 cycles of the test.

Bricks classified as 'O' are not frost resistant and will be damaged by up to 10 cycles of the test.

2.2 Sample Preparation

An initial inspection was carried out before testing and any defects found in the mortar joints and brick slips were noted.

2.3 Construction of Test Panel

The test panel was a pre-constructed section of a cladding system comprised of special manufactured brick slips fitted onto a steel backing frame. A cement: lime: sand mortar of 1:1:6 was used to create joints between the brick slips. The dimensions of the test frame were 780 x 579 x 105mm.

2.4 Freeze/Thaw Cycles

The panel was immersed in water for 7 days before installation into the freeze-thaw apparatus which subjects one face of the panel to repeated cycles of freezing and thawing. The remaining face and sides of the panel were insulated with 25mm thick extruded polystyrene foam board.

A freeze-thaw cycle consists of 120 minutes (± 1 min) of freezing to -15°C ($\pm 3^{\circ}\text{C}$) air temperature, 20 minutes (± 0.5 min) heating with re-circulated warm air at $+25^{\circ}\text{C}$ ($\pm 3^{\circ}\text{C}$), 2 minutes water spray and two minutes to drain the spray system after which the cycle starts automatically. This gives 10 cycles every 24 hours and a normal test continues for 100 cycles.

2.5 Assessment of Freeze/Thaw Resistance

The panel was examined after 10 freeze/thaw cycles and was removed and thawed after 50 cycles for a more thorough examination before restarting the test. At the end of 100 cycles the panel was again removed, thawed, photographed (Fig 1) and then examined slip by slip for signs of frost damaged as categorised in Table 1. The results of the assessment are displayed in section 2.6. Additionally, all mortar joints were examined for any signs of frost damage, such as flaking or cracking.

TABLE 1

Categories/Types of Damage	Type
None	0
Crater (e.g. lime-burst)	1
*Hair Crack $\leq 0.15\text{mm}$	2
*Minor crack	3
*Surface crack	4
Through crack	5
Chipping, peeling, scaling	6
Fracture	7
Delamination	8

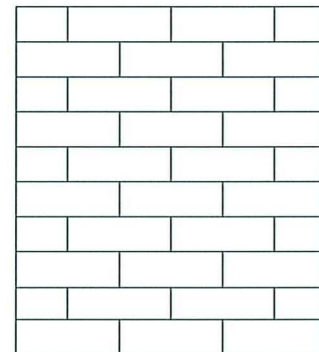
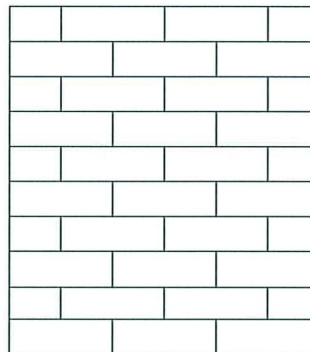
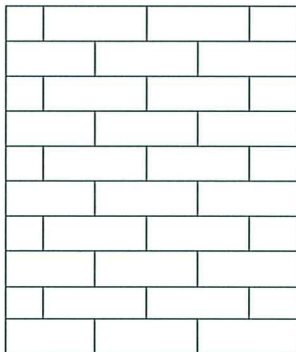
2.6 Results

INCIDENCE OF DAMAGE

After 10 cycles

After 50 cycles

After 100 Cycles



Total No. of Damaged Bricks = 0

Total No. of Damaged Bricks = 0

Total No. of Damaged Bricks = 0

Note: If *hair cracks, *minor cracks or *surface cracks appear to be associated with delamination and this can be confirmed by cutting the brick, then the defect is reported as delamination.

Incipient delamination detected by tapping the face of the panel with a metal rod is reported as **C** at 10 and 50 cycles if delamination is confirmed at 100 cycles.

3. SUMMARY AND CONCLUSIONS

The complete panel withstood 100 freeze/thaw cycles as specified with no evidence of frost damage to either the brick slips or the mortar joints.

The results obtained on this sample show that the brick slips may be classified as 'F' – fully frost resistant according to BS3921:1985, or F2 according to prEN 771-1 'Specification for Masonry Units: Clay Masonry Units' and that the panel as a whole can be regarded as fully frost resistant.

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

This test report is supplement to the test report issued on 20 September 2000.



Mr D Boon
Authorised signatory

(End of Test Report)

Figure 1.

