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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

SI Concrete Systems

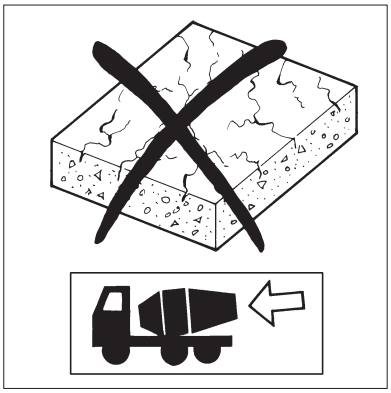
Certificate No 92/2857

DETAIL SHEET 5

*Second issue**

FIBERMESH INFORCE E3

Product



- *THIS DETAIL SHEET RELATES TO FIBERMESH INFORCE E3, 12 mm TO 19 mm LONG COLLATED FIBRILLATED POLYPROPYLENE FIBRES MADE UP OF 25 INDIVIDUAL FIBRE CONFIGURATIONS.*
- *This Detail Sheet covers its use in concrete at an addition rate of 0.9 kgm^{-3}.*
- *Fibermesh InForce e3 was formerly known as Fibermesh 6891 MD.*

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations, general information relating to the product, and the Conditions of Certification *respectively.*

Note: Certain words have a precise definition as given in section 8.6 of the Front Sheets.

Technical Specification

1 Description

Fibermesh InForce e3 is made up of 25 individual fibre configurations of 12 mm to 19 mm long fibrillated polypropylene fibres, that are used to control the extent of plastic shrinkage cracking and plastic settlement in concrete. It may be used in all situations where a critical surface finish is necessary and in particular to enhance the residual strength of concrete.

Technical Investigations

The following is a summary of the technical investigations carried out on Fibermesh InForce e3.

2 Tests

2.1 All tests were conducted using the mix designs given in Table 1.

Table 1 Test mix designs(1)

Component	Quantity (kgm^{-3})		
	Mix 1	Mix 2	Mix 3
Portland cement (to BS 12, class 42.5N)	351(2)	316(2)	325(2)
water	226	228	170
sand (5 mm)	712	618	633
gravel (5 mm to 20 mm)	956	1128	1158
Fibermesh InForce e3 fibres	0.9	0.9	0.9
Silica fume	3.3	—	—

(1) Plain concrete control mixes were the same but did not include the fibres.

(2) Typical cement content used in concrete floor slab construction.

2.2 Results of the plastic and hardened concrete tests, conducted by an independent laboratory with BBA approval, are summarised in Tables 2 and 3.

Table 2 Plastic concrete test results

Test (units)	Method(1)	Mix design	Results	
			Fibermesh InForce e3 concrete	Plain concrete
Air content (%)	BS 1881-106	2	1.4	1.5
Slump (mm)	BS 1881-102	2	90	80
Compacting factor	BS 1881-103	2	0.99	0.99
Bleeding rate (ml cm^{-2})	ASTM C 232-71, 6 hours	2	0.16	0.24
Flow (mm)	BS 1881-105	2	445	395
Change in height (%)	ASTM C 827-87	2	−1.65	−1.80
Resistance to plastic cracking of rings (mean crack width) (mm)	FCB (Trondheim Norway) test specification	1	0.39	3.09
Resistance to plastic cracking of slabs (crack area) (mm^2)	Modified Kraai test specification	1	42	356

(1) Test documents are detailed in the *Bibliography*.

Table 3 Hardened concrete test results

Test (units)	Method[1]	Mix design	Results	
			Fibermesh InForce e3 concrete	Plain concrete
Initial surface absorption test ($mlm^{-2}s^{-1}$):	BS 1881-208 (65 mm thick slab non-crazed area)	2		
air dried				
10 min			3.43	>3.6
20 min			1.41	1.61
water cured				
10 min			1.74	2.38
20 min			0.56	0.75
Permeability of cores ($mlm^{-2}s^{-1}$)	Covercrete Absorption Test (Dundee University specification)	2	0.86	0.93
Water absorption (%)	BS 1881-122	2	2.11	2.23
Impact resistance (blows to first crack)	ASTM D 1557-87	2	4 (28 days)	3 (28 days)
Flexural strength (Nmm^{-2}) (beams):	BS 1881-118	2	Mean	Mean
1 day			1.8	1.4
3 days			2.9	3.2
7 days			3.6	3.6
28 days			5.2	4.5
Compressive strength (Nmm^{-2}) (equivalent cube method):	BS 1881-119	2	Mean	Mean
1 day			8.0	6.5
3 days			14.5	15.0
7 days			19.0	23.0
28 days			37.5	37.0
Cube compressive strength Nmm^{-2})	BS 1881-116	2	Mean	Mean
1 day			6.0	6.0
3 days			13.0	14.5
7 days			25.0	24.0
28 days			40.0	39.0
Freeze/thaw resistance[2] (after 100 cycles):	BS 5075-2	see footnote (2)		
% change in length			0.069	0.404
flexural strength strength (Nmm^{-2})			0.8	0.4
compressive strength (Nmm^{-2})			46.0	45.0
Surface hardness	BS 1881-202 (rebound hammer)	2	35	32
Abrasion resistance:	A'Court	2		
reduction in rate of abrasion (%)	BS 784		1	—
Residual strength (Nmm^{-2})	ASTM C 1399	3	0.43	0.05

(1) Test documents are detailed in the *Bibliography*.

(2) Mix design to specification given in BS 5075-2 : 1982.

Bibliography

BS 12 : 1991 *Specification for Portland cement*

BS 784 : 1953 *Methods of test for chemical stoneware*

BS 1881-5 : 1970 *Testing concrete — Methods of testing hardened concrete for other than strength*
BS 1881-102 : 1983 *Testing concrete — Methods for determination of slump*
BS 1881-103 : 1993 *Testing concrete — Method for determination of compacting factor*
BS 1881-105 : 1984 *Testing concrete — Method for determination of flow*
BS 1881-106 : 1983 *Testing concrete — Methods for determination of air content of fresh concrete*
BS 1881-116 : 1983 *Testing concrete — Method for determination of compressive strength of concrete cubes*
BS 1881-118 : 1983 *Testing concrete — Method for determination of flexural strength*
BS 1881-119 : 1983 *Testing concrete — Method for determination of compressive strength using portions of beams broken in flexure (equivalent cube method)*
BS 1881-122 : 1983 *Testing concrete — Method for determination of water absorption*
BS 1881-202 : 1986 *Testing concrete — Recommendations for surface hardness testing by rebound hammer*
BS 1881-208 : 1996 *Testing concrete — Recommendations for the determination of the initial surface absorption of concrete*

BS 5075-2 : 1982 *Concrete admixtures — Specification for air-entraining admixtures*

ASTM C 232-71 *Standard Test Methods for Bleeding of Concrete*

ASTM C 827-87 *Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures*

ASTM C 1399-98 *Test Method for obtaining Average Residual Strength for Fiber-Reinforced Concrete*

ASTM D 1557-87 (Reapproved 1990) *Standard Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 kg) Rammer and 18 in (457 mm) Drop*

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

On behalf of the British Board of Agrément

Date of Second issue: 14th November 2002

Chief Executive

**Original Detail Sheet issued 14th February 2000. This amended version includes change of Certificate holder and product name, and a correction to the information on freeze/thaw testing.*

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