TEST REPORT

Lucideon Reference:	18300 (QT-49116/2/RK)/Ref. 1
Project Title:	Balustrade Testing of FH Brundle's Fortitude Railing System with Choice Brackets in Accordance with BS 6180
Client:	FH Brundle 81/82 Middlemore Industrial Estate Middlemore Road Smethwick Birmingham B66 2EP
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1 INTRODUCTION

FH Brundle design and manufacture Fortitude Railings with Choice brackets to be used as architectural features in new and existing buildings.

As part of their product development, they required a programme of testing to determine their products performance in accordance with British and European standards.

All tests were to be carried out to BS 6180:2011 Barriers in and about buildings and UNI 10806 (Italian).

2 TEST ARRANGEMENT

2 No. concrete blocks, of dimensions 2000 mm x 700 mm x 500 mm, were fastened to the laboratory strong-floor.

The Fortitude Railings with Choice brackets were attached to the top surface of said concrete blocks by way of fixings as highlighted in APPENDIX A per manufacturer's instructions and by a representative of FH Brundle.

3 TEST METHOD

A reaction frame consisting of 2 No. steel stanchions and a steel cross-member was fastened to the laboratory strong-floor.

Air bags were attached to the face of the railing and a reaction frame was placed in-front of the airbags.

The reaction frame was braced using scaffold poles from the steel reaction frame previously mentioned.

The air bags were connected to a common manifold which was in turn connected to an air supply regulator. A manometer to record the static pressure within the airbag was connected to the common manifold also.

A calibrated linear voltage displacement transducer (LVDT), to measure the deflection, was attached to the opposite side of the glass panel as the load was applied in the centre width of the panel at 1100 mm from the finished floor height.

For BS 6180 a load was steadily applied up to each loading increment or until a deflection of 25 mm was reached as highlighted within BS 6180. The load at the last increment was then recorded.

Photographs of the test set-up can be seen in the Plates Section of this report.

4 RESULTS

Table 1 – BS 6180 Results

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Fortitude Railings with Choice Brackets
Domestic and residential activities	(i) all areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	✓
Offices and work areas not included elsewhere, including storage areas	(iii) light access stairs and gangways not more than 600 mm wide	0.22	✓
	(iv) light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	X
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	X
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	0.74	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage adjacent to basement/sunken areas	0.74	✓
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	X
	(xi) theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studios; footways or pavements greater than 3 m wide adjacent to sunken areas	3.00	X
	(xii) grandstands and stadia	(Note 1)	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	X
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	(Note 2)	X
	(xv) horizontal loads imposed by vehicles	(Note 2)	X

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

END OF REPORT

PLATES

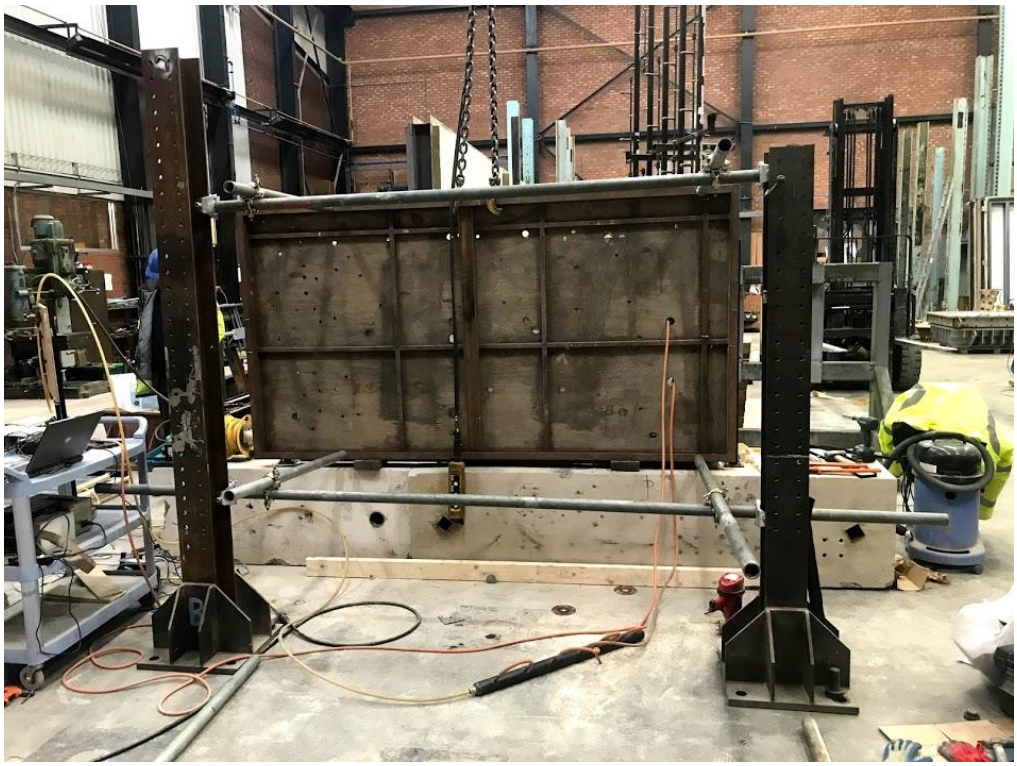


Plate 1 – Typical Test Set-Up UDL



Plate 2 – Typical Test Set-Up 2

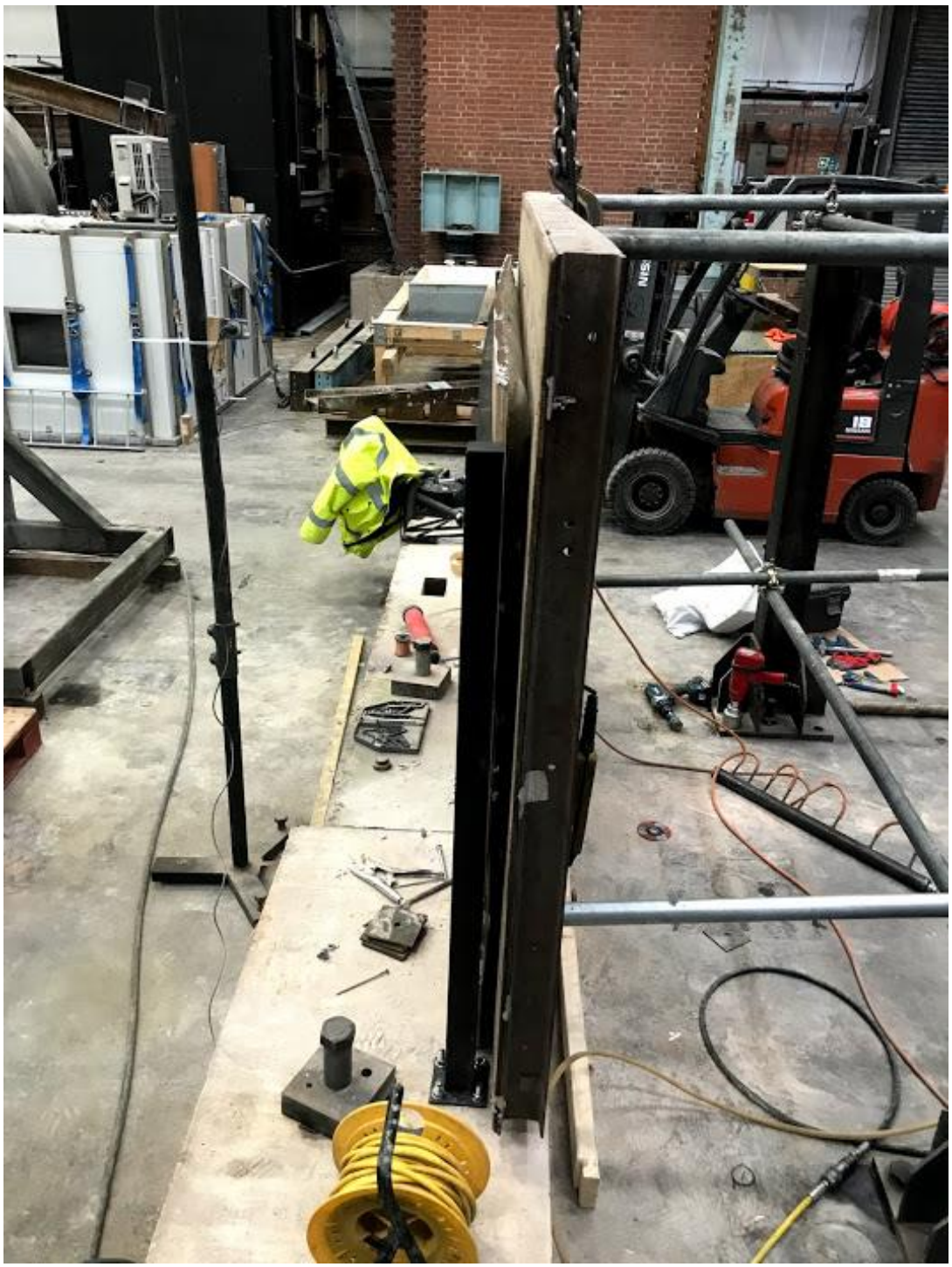
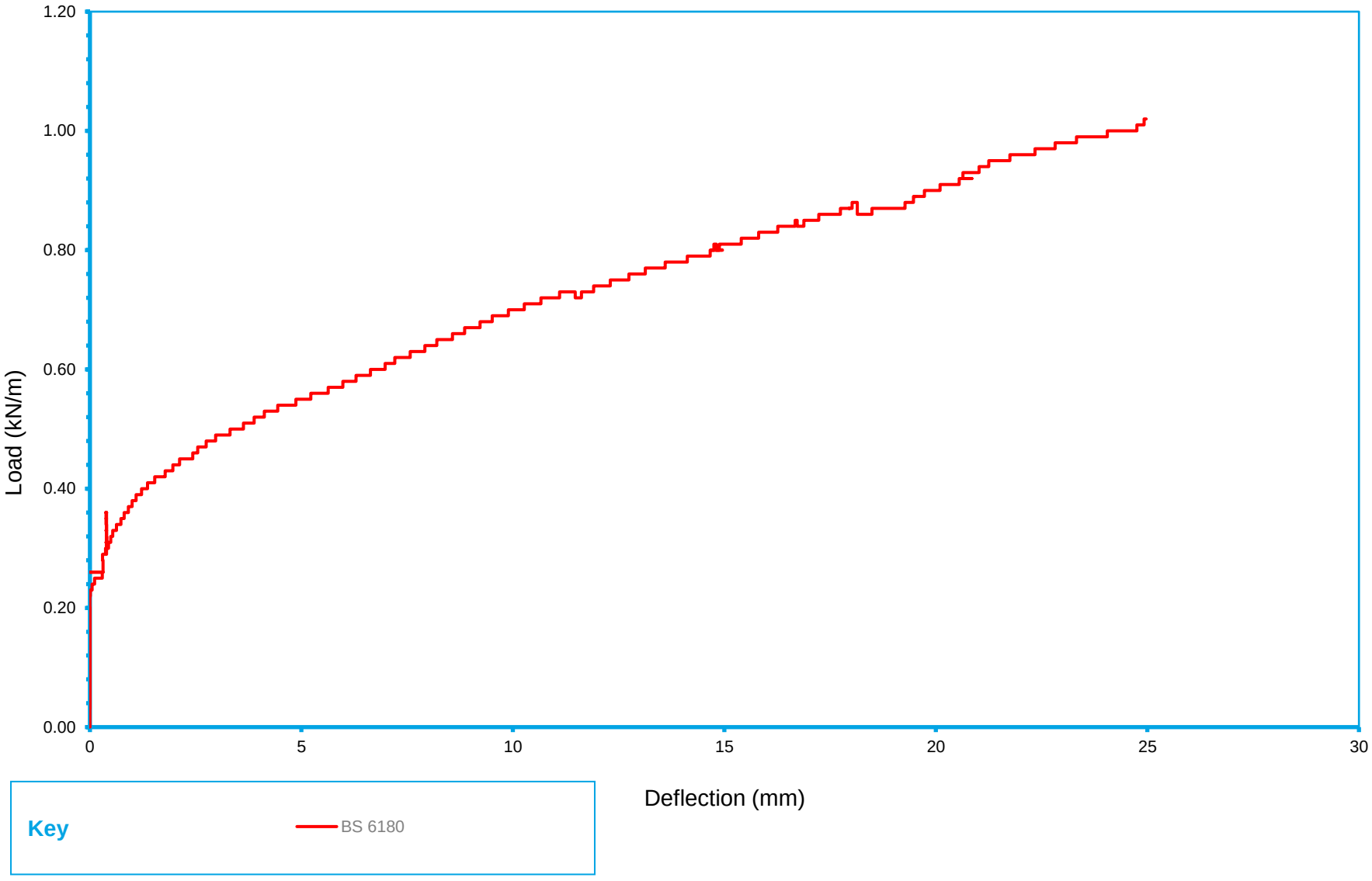


Plate 3 – System under Load

Chart 1 - Load Deflection Curves for UDL Balustrade Testing of FH Brundles Fortitude Railings with Choice Brackets.

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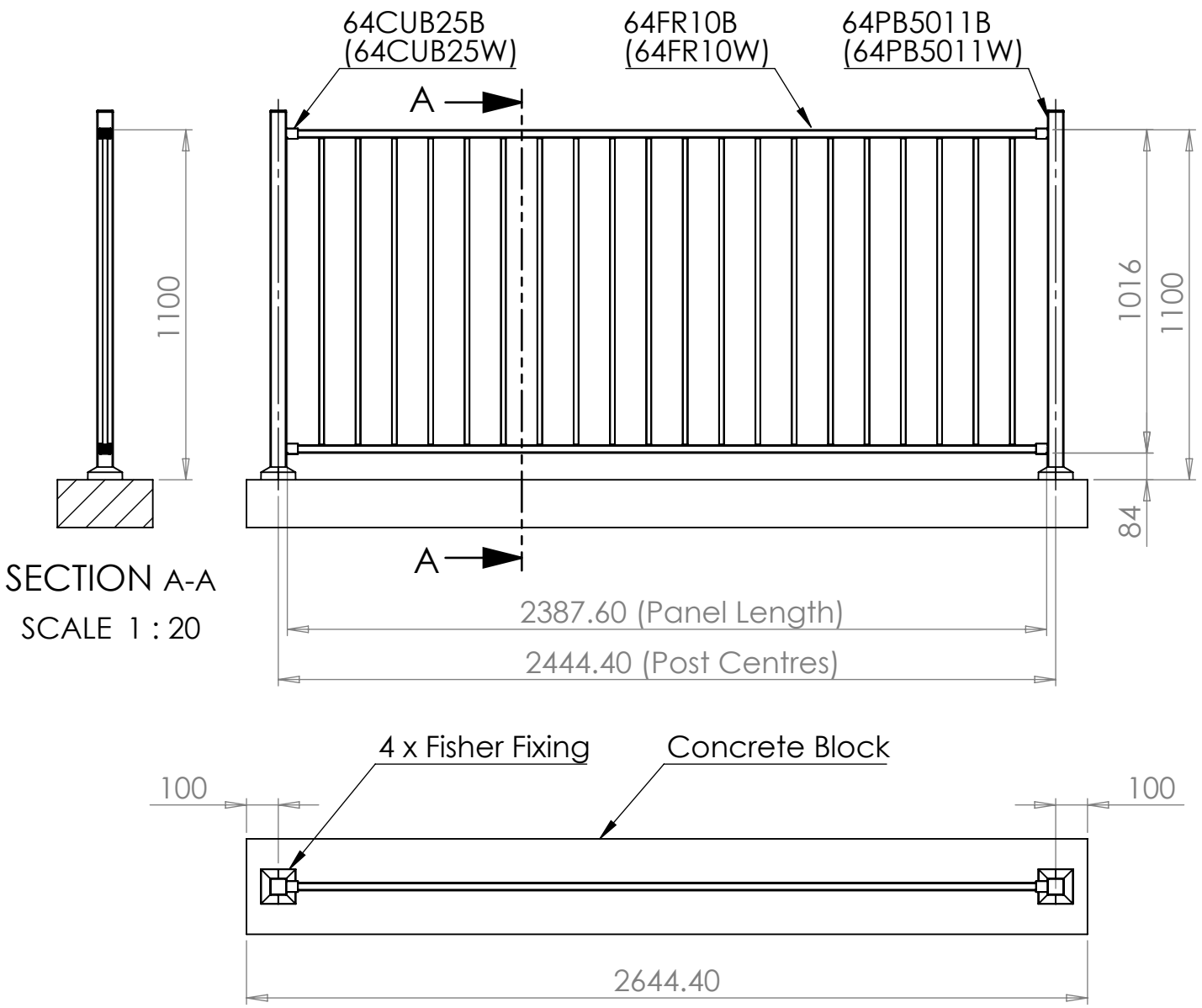
APPENDIX A - Figure
TEST REPORT NUMBER - TR16-001

PRODUCT RANGE - FORTITUDE™ - TRADITIONAL

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ALL DIMENSIONS ARE IN MILLIMETERS

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CHECKED			



SECTION A-A
SCALE 1 : 20

Load testing of Fortitude™ - Traditional Railing system, which comprises of 2 posts, 1 railing panel & 4 choice universal brackets

Carry out load testing in accordance with BS 6180:2011 Barriers in and about buildings, and EC1-1991-1-1:2002 UK National Annex to Eurocode 1: Actions on structures – Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.

Carry out load testing in accordance with UNI 10806:1999
Prefabricated Railing Systems - Determination of the mechanical strength under static load.

These tests will allow FH Brundle Fortitude™ - Traditional Railing system to be classified for use in accordance with the Code of Practice included within the standards.

Test In Accordance	Parts Required	Foundation Material	Fischer Innovative Solutions Fixings www.fischer.co.uk
BS EN 6180:2011 UNI 10806:1999	2 x 64PB5011B (64PB5011W) 1 x 64FR10B (64FR10W) 4 x 64CUB25B (64CUB25W)	C35 with glass fibres, aggregate size 20mm slump 100	507560 - FBN II 10 x 106 - 316