

FRC

FIBER TESTING

**AVERAGE RESIDUAL STRENGTH TEST
FIBRILLATED POLYPROPYLENE FIBERS**

DOSAGE RATE: 1.5 lbs / cyd
TESTING LAB: STORK – TWIN CITIES TESTING
DATE: JULY 10, 2002

FRC
FRC INDUSTRIES

107 Bulldog Road • Freeport, FL 32439 • USA
Telephone: (850) 259-0317 • Fax: (850) 835-4700



ENGINEERING TEST COVER PAGE

Test:	ARS – Average Residual Strength Test	Dosage	1.5 lbs / cyd
Product:	MATRIX Fibrillated Fibers	Project:	032059
Method:	ASTM: C1399	Date:	July 10, 2002
Lab:	Twin City Testing Corp / St. Paul, MN	Manufacturer	ABC Polymer Industries
Summary	Average Residual Strength, MPa (psi)	0.42 (61)	average of three samples

INTRODUCTION:

The attached report presents the results of Twin City Testing of fibrillated concrete fibers at a dosage rate of 1.5 lbs per cubic yard. The scope of the testing is as follows:

1. Perform laboratory concrete trial batching of concrete according to ASTM: C1399 for the determination of the Average Residual Strength (ARS)
2. Written Report outlining test results

SUMMARY OF TEST RESULTS:

The following is a summary of the test results:

<u>Test</u>	<u>MATRIX Fibrillated / ABC Fibrillated</u>
Average Residual Strength, MPA (psi)	0.42 (61)

TEST PROCEDURE:

The testing was initiated on May 10, 2002 and subsequent dates using applicable portions of ASTM: C1399-98, "Test Method for Obtaining Average Residual Strength for Fiber reinforced Concrete." The concrete test mixture was derived using the procedure outlined in ASTM: C494 Sections 11-15. The mix design used is included in the Concrete Materials section of this report along with the other pertinent information. Additional ASTM procedures were also used in conjunction with the test program.

FRC Industries

P.O. Box 458 • Freeport, FL 32439 • USA
Telephone: (850) 259-0317 • Fax: (850) 835-4700

TESTING OF CONCRETE WITH SYNTHETIC FIBERS**CONCRETE MATERIALS:****Concrete Trial Mixtures**

Mix Number	1
Mixture Type	Fiber
Cementitious Content ¹ , kg (lbs)	234.5 (517)
Slump, mm (in.)	50.8-76.2 (2-3)
Nominal Coarse Aggregate, mm (in.)	19.2 (3/4)
Air Content, %	n/a
Specified Minimum Compressive Strength, MPa (psi)	27.6 (4,000)

¹Type I Cement and Type C Flyash

Materials

Cementitious Materials	Lehigh Type I Portland Cement (ASTM:C150) Mineral Solutions Type C Flyash (ASTM:C618)
Fine Aggregate	Shiely Aggregates Inc. (Natural Sand Meeting the Requirements of ASTM:C33 and C494)
Coarse Aggregate	Shiely Aggregates Inc. (Limestone Size Number 57 Meeting the Requirements of ASTM:C33 and C494)
Admixtures	ABC Fibrillated Fibers

Batch Weights

Mix Number	1
Mixture Type	Fiber
Portland Cement, kg (lbs)	199.1 (439)
Type C Flyash, kg (lbs)	35.4 (78)
Admixture:	
ABC Fibrillated Fibers, kg (lbs)	0.68 (1.5)
Fine Aggregate, kg (lbs)	648.6 (1,430)
Total Coarse Agg., kg (lbs)	778.8 (1,717)
Water, kg (lbs)	131.5 (290)

Mix numbers 1 was used in casting of the ARS samples.

TESTING OF CONCRETE WITH SYNTHETIC FIBERS**TEST RESULTS:****Concrete Test Data**

Mix Number	1
Mixture Type	Fiber
Slump, mm (in.)	76.2 (3)
Air Content, (%)	1.6
Unit Weight, Kg/m ³ (lbs/ft ³)	2,373.7 (148.2)
14-Day Compressive Strength, Mpa (psi)	27.2 (4,060)

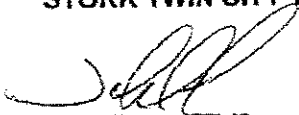
All of the samples were cast into beam molds. The samples were moist cured for 13 days and tested at 14 days from casting.

Average Residual Strength – ASTM:C1399

Please see the attached data sheet.

REMARKS:

The samples were discarded at the completion of testing. If you have any questions about this report, please feel free to contact us at (651) 659-7340.

STORK TWIN CITY TESTING CORPORATION

John D. Lee, P.E.
Senior Staff Engineer
Construction Materials Department
C:\My Documents\032059\1.5 Fibre\report.doc

AVERAGE RESIDUAL STRENGTH - ASTM:C1399

Standard Values

Sample Number	Sample Width, in.	Sample Depth, in.	Test Span, in.	Load in at Deflection, lbs.				Failure	Failure	ARS, psi
				0.02 in.	0.03 in.	0.04 in.	0.05 in.	Load, lbs	Load, psi	
1A	4.01	4.00	12.00	318.3	303.0	304.8	302.6	4679.8	875	57
1B	4.00	4.01	12.00	382.3	397.8	413.2	390.2	3806.7	710	74
1C	4.00	4.01	12.00	313.8	291.2	273.6	250.5	3773.6	704	53
Average	4.00	4.01	12.00	338.1	330.7	330.5	314.4	4086.7	763	61

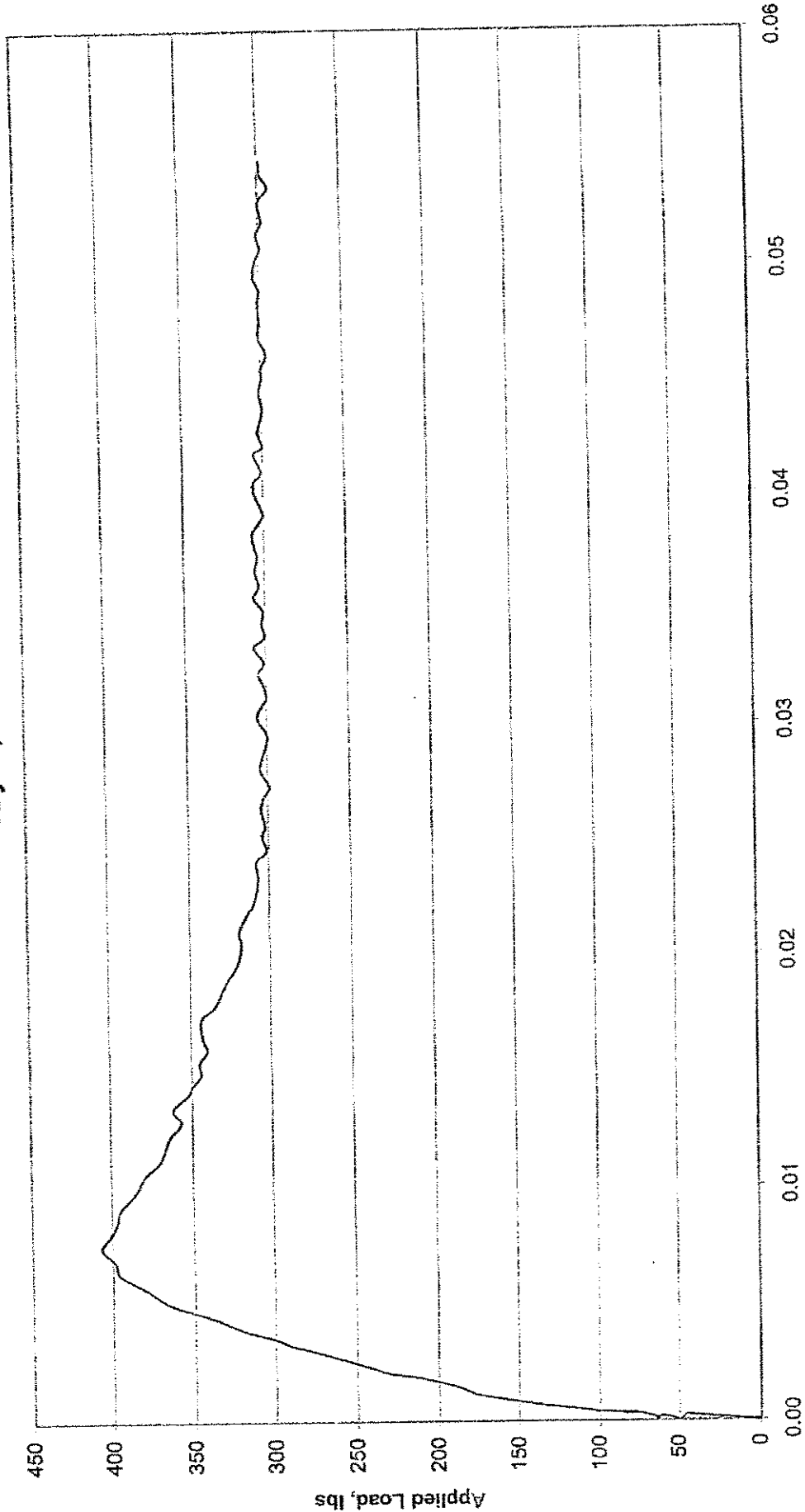
Metric Values

Sample Number	Sample Width, mm	Sample Depth, mm	Test Span, mm	Load in at Deflection, N				Failure	Failure	ARS, MPa
				0.02 in.	0.03 in.	0.04 in.	0.05 in.	Load, N	Load, MPa	
1A	101.9	101.6	304.8	1415.9	1347.8	1355.8	1346.0	20816.7	6.00	0.40
1B	101.6	101.9	304.8	1700.5	1769.5	1838.0	1735.7	16933.0	4.92	0.51
1C	101.6	101.9	304.8	1395.8	1295.3	1217.0	1114.3	16785.7	4.88	0.36
Average	101.7	101.8	304.8	1504.1	1470.9	1470.3	1398.7	18178.5	5.27	0.42

TCT Client: ABC Fibers
 TCT Project Number: 032059
 Date: 7/10/02
 Fiber Type: ABC Fibrillated Fibers
 Fiber Dosage Rate: 1.5 lbs/yd
 Concrete Strength: 4060 psi @ 14 Days
 Concrete Slump: 3 inches
 Concrete Air Content: 1.6%
 Concrete Unit Weight: 148.2 lbs/yd

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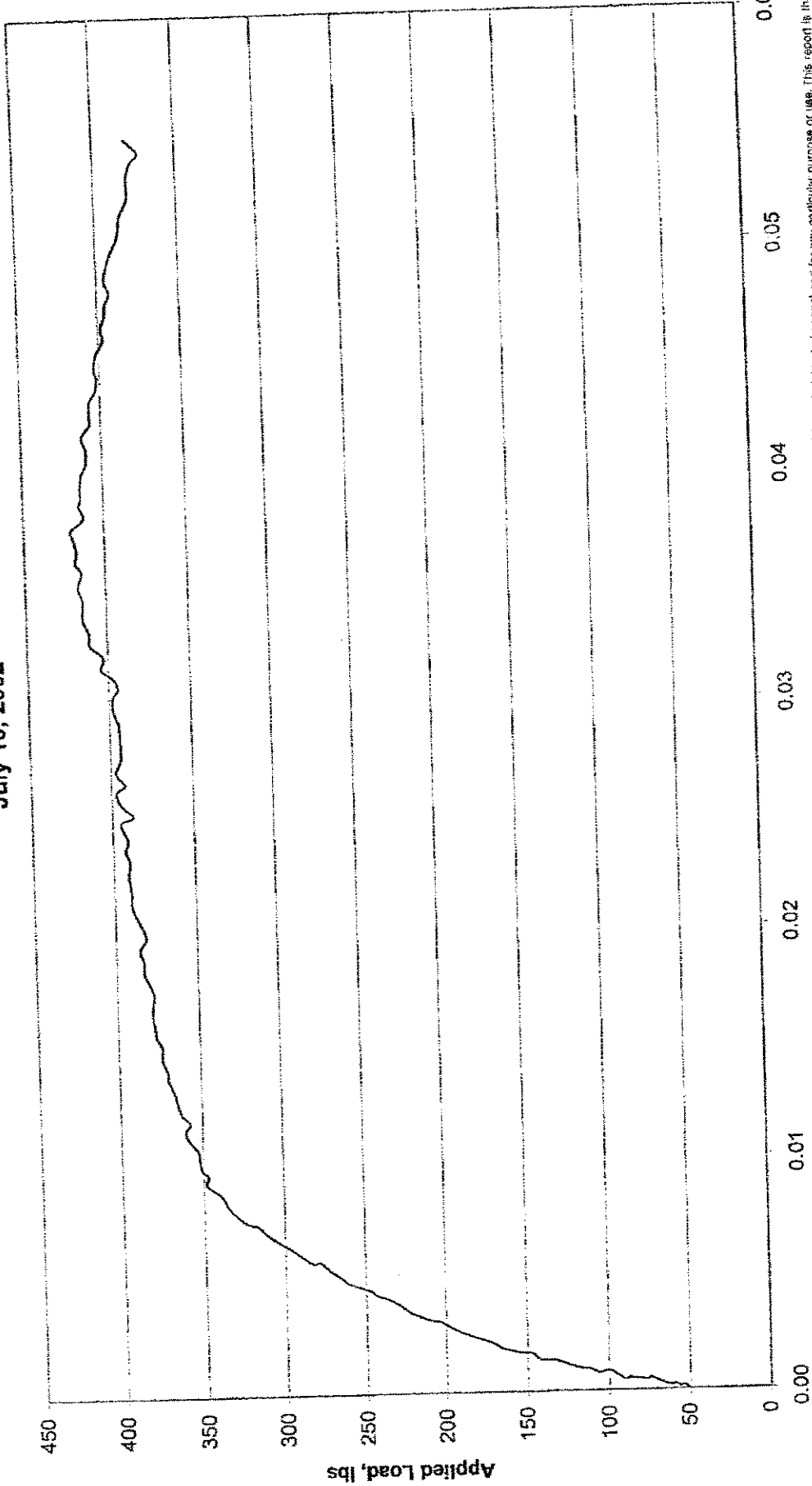
Post Crack Deflection vs. Post Crack Load (ASTM:C1399)
ABC Fibers, Sample 1A (Fibrillated Fiber 1.5 lb/yd3)
TCT Project Number 032059
July 10, 2002



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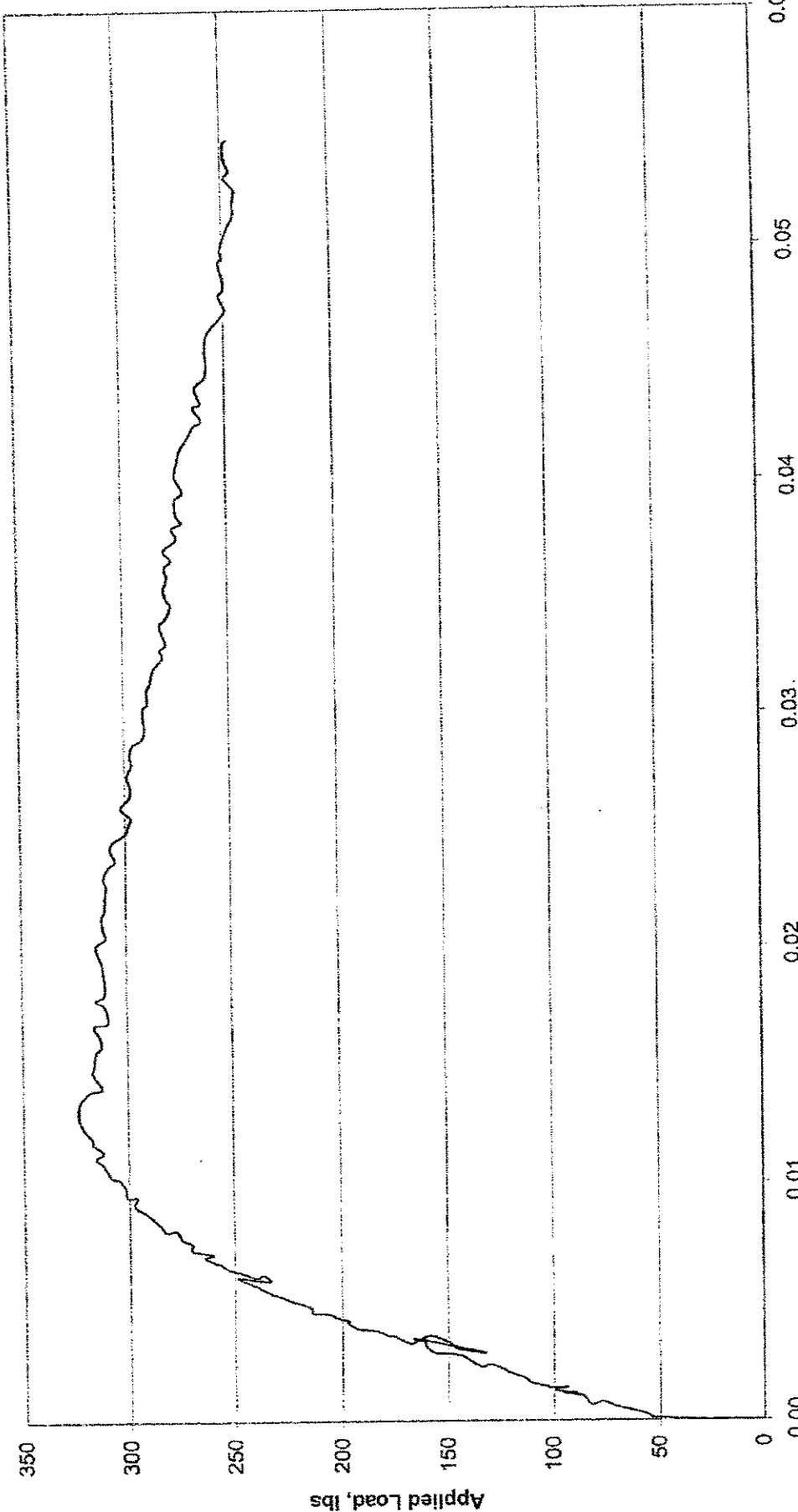
Post Crack Deflection vs. Post Crack Load (ASTM:C1399)
ABC Fibers, Sample 1B (Fibrillated Fiber 1.5 lb/yd3)
TCT Project Number 032059
July 10, 2002



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Post Crack Deflection vs. Post Crack Load (ASTM:C1399)
ABC Fibers, Sample 1C (Fibrillated Fiber 1.5 lb/yd3)
TCT Project Number 032059
July 10, 2002



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Deflection, in