

FRC

FIBER TESTING

**ASTM 1399 TESTING
HPS – POLYPROPYLENE FIBERS**

DOSAGE RATE: 4.0 lbs / cyd
TESTING LAB: STORK – TWIN CITIES TESTING
DATE: MARCH 29, 2004

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	4.0 lbs / cyd
Product:	MATRIX HPS – High Performance Synthetics	Project:	034013
Method:	ASTM: C1399	Date:	March 29, 2004
Lab:	Twin City Testing Corp / St. Paul, MN	Manufacturer	ABC Polymer Industries
Summary	Average Residual Strength = 146 psi		page 1 of 7

INTRODUCTION:

The attached report presents the results of Twin City Testing of 1.5" HPS / Multi Macro concrete fibers at a dosage rate of 4.0 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 HPS / ABC Multi Macro Fibers</u>
Average Residual Strength, MPA (psi)	1.01 (146)

TEST PROCEDURE:

The testing was initiated on May 12, 2004 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

PROJECT NO: 034013

DATE:
PAGE:

March 29, 2004
2 of 7

TESTING OF CONCRETE WITH SYNTHETIC FIBERS

CONCRETE MATERIALS:

Concrete Trial Mixtures

Mix Number	1
Mixture Type	Fiber
Cement Content, kg/m ³ (lbs/yd ³)	306.8 (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)

Materials

Cement	Type I Portland Cement (ASTM:C150)
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 Multi Macro Fibers 1-1/2"

Batch Weights, m³ (yd³)

Mix Number	1
Mixture Type	Fiber
Portland Cement, kg (lbs)	306.8 (517)
Admixture:	
ABC Multi Macro Fibers 1-1/2", kg (lbs) ¹	2.37 (4.0)
Fine Aggregate, kg (lbs)	810.1 (1,365)
Total Coarse Agg., kg (lbs)	1008.9 (1,700)
Water, kg (lbs)	172.1 (290)

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

PROJECT NO: 034013

DATE:

March 29, 2004

PAGE:

3 of 7

TESTING OF CONCRETE WITH SYNTHETIC FIBERS

TEST RESULTS:

Concrete Test Data

Mix Number	1
Mixture Type	Fiber
Slump, mm (in.)	19.1 (3/4)
Air Content, (%)	5.0
Unit Weight, Kg/m ³ (lbs/ft ³)	2277.6 (142.2)
7-Day Compressive Strength, Mpa (psi)	26.82 (3,890)

All of the samples were cast into beam molds. The samples were moist cured for 6 days and tested at 7 days from casting.

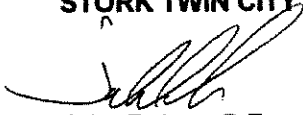
Average Residual Strength – ASTM:C1399

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
G:\2004cme\034013\New\report.doc

ASTM:C1399 Testing of Fiber Reinforced Beams
ABC Multi Macro Fibers 1-1/2"
4.0 lbs/yd³ Dosage Rate
Page: 4 of 7

Material Testing • Non-Destructive Testing
Product Evaluation • Construction Materials

662 Cromwell Avenue
St. Paul, MN 55114
USA

Telephone : (651) 645-3601
Telefax : (651) 659-7348
Website : www.storktct.com

Standard Values

Sample Number	Sample Width, in.	Sample Depth, in.	Test Span, in.	Load at Deflection, lbs.				ARS, psi
				0.02 in.	0.03 in.	0.04 in.	0.05 in.	
1A	4.00	4.05	12.00	601.8	652.9	719.2	743.4	124
1B	4.00	4.05	12.00	956.9	991.8	1017.1	1023.8	182
1C	4.00	4.00	12.00	674.5	721.4	716.5	720.1	133
Average	4.00	4.03	12.00	744.4	788.7	817.6	829.1	146

Metric Values

Sample Number	Sample Width, mm	Sample Depth, mm	Test Span, mm	Load at Deflection, N				ARS, MPa
				0.51 mm	0.76 mm	1.02 mm	1.27 mm	
1A	101.6	102.9	304.8	2676.9	2904.2	3199.1	3306.8	0.86
1B	101.6	102.9	304.8	4256.5	4411.7	4524.3	4554.1	1.26
1C	101.6	101.6	304.8	3000.3	3208.9	3187.1	3203.1	0.92
Average	101.6	102.4	304.8	3311.2	3508.3	3636.8	3688.0	1.01

Stork TCT Client: ABC Fibers
Stork TCT Project No: 034013
Date Cast: 3/12/04
Date Tested: 3/18/04
Date Reported: 3/29/04
Fiber Type: ABC Multi Macro Fibers 1-1/2"
Fiber Dosage Rate: 4.0 lbs/yd³
Concrete Strength: 3890 psi
Concrete Slump: 3/4 inches
Concrete Air Content: 5.0%
Concrete Unit Weight: 142.2 lbs/ft³

Witnessed By:



John D. Lee, P.E.
Senior Staff Engineer
Construction Materials Department
MN Reg No. 25406



Twin City Testing Corporation

Post Crack Deflection vs. Post Crack Load (ASTM:C1399)
ABC Multi Macro Fibers 1-1/2", Sample 1A (4.0 lb/yd³)
Stork TCT Project Number 034013
March 29, 2004

662 Cromwell Avenue
 Saint Paul, MN 55114
 USA

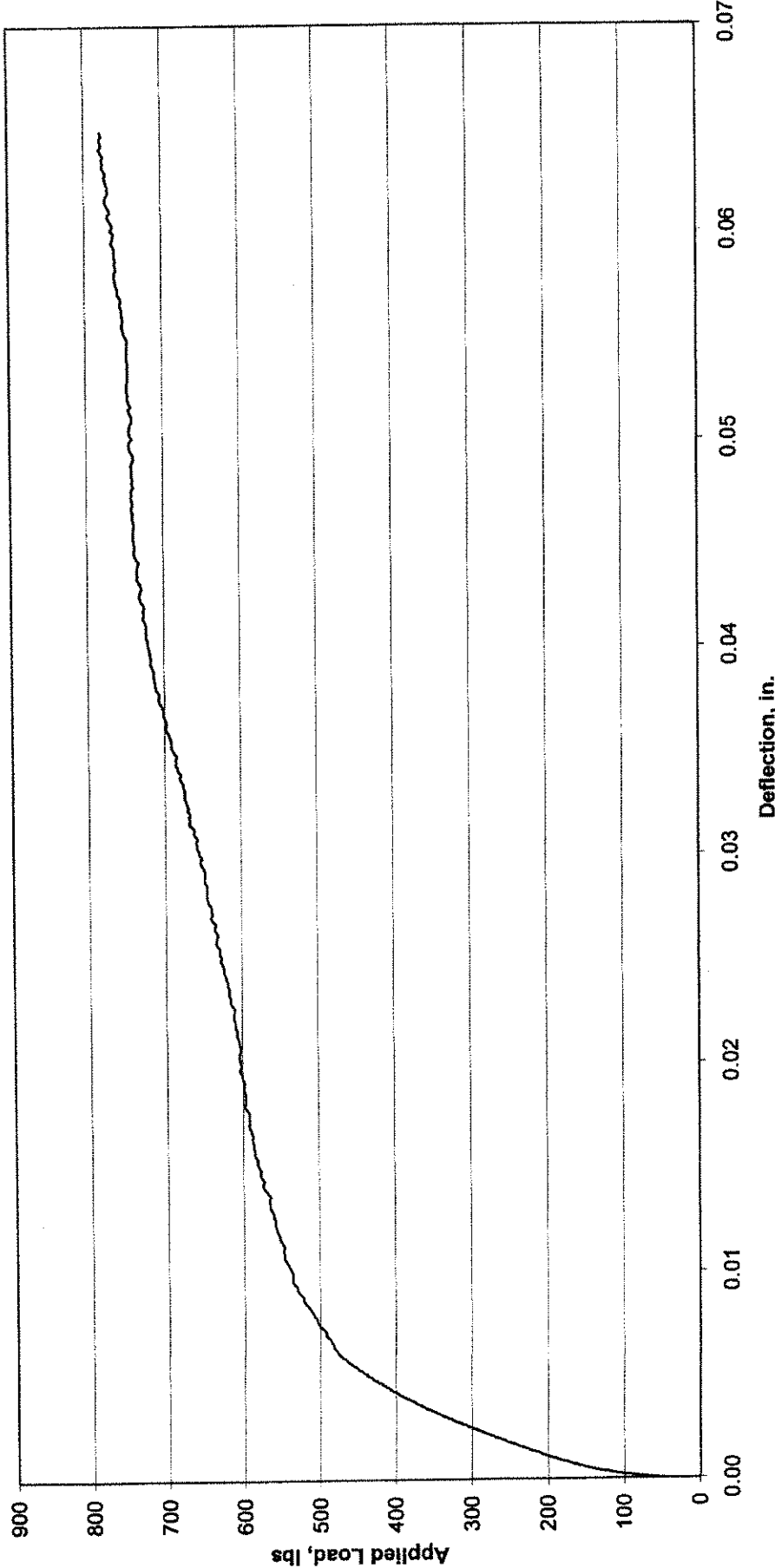
Investigative Chemistry
 Non Destructive Testing
 Metallurgical Analysis

Telephone
 Toll Free
 Telefax
 Website

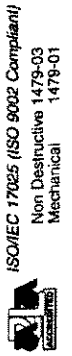
Geotechnical
 Failure Analysis
 Materials Testing

Construction Materials
 Product Evaluation
 Welder Qualification

:(651) 645-3601
 :(888) 645-TEST
 :(651) 659-7348
 :www.twincitytesting.com



Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes including Federal Law Title 18, Chapter 47



Stork Twin City Testing Corporation is an operating unit of Stork Materials Technology B.V., Amsterdam, The Netherlands, which is a member of the Stork group.

Post Crack Deflection vs. Post Crack Load (ASTM:C1399)

ABC Multi Macro Fibers 1-1/2", Sample 1B (4.0 lb/yd³)

Stork TCT Project Number 034013

March 29, 2004

662 Cromwell Avenue
Saint Paul, MN 55114
USA

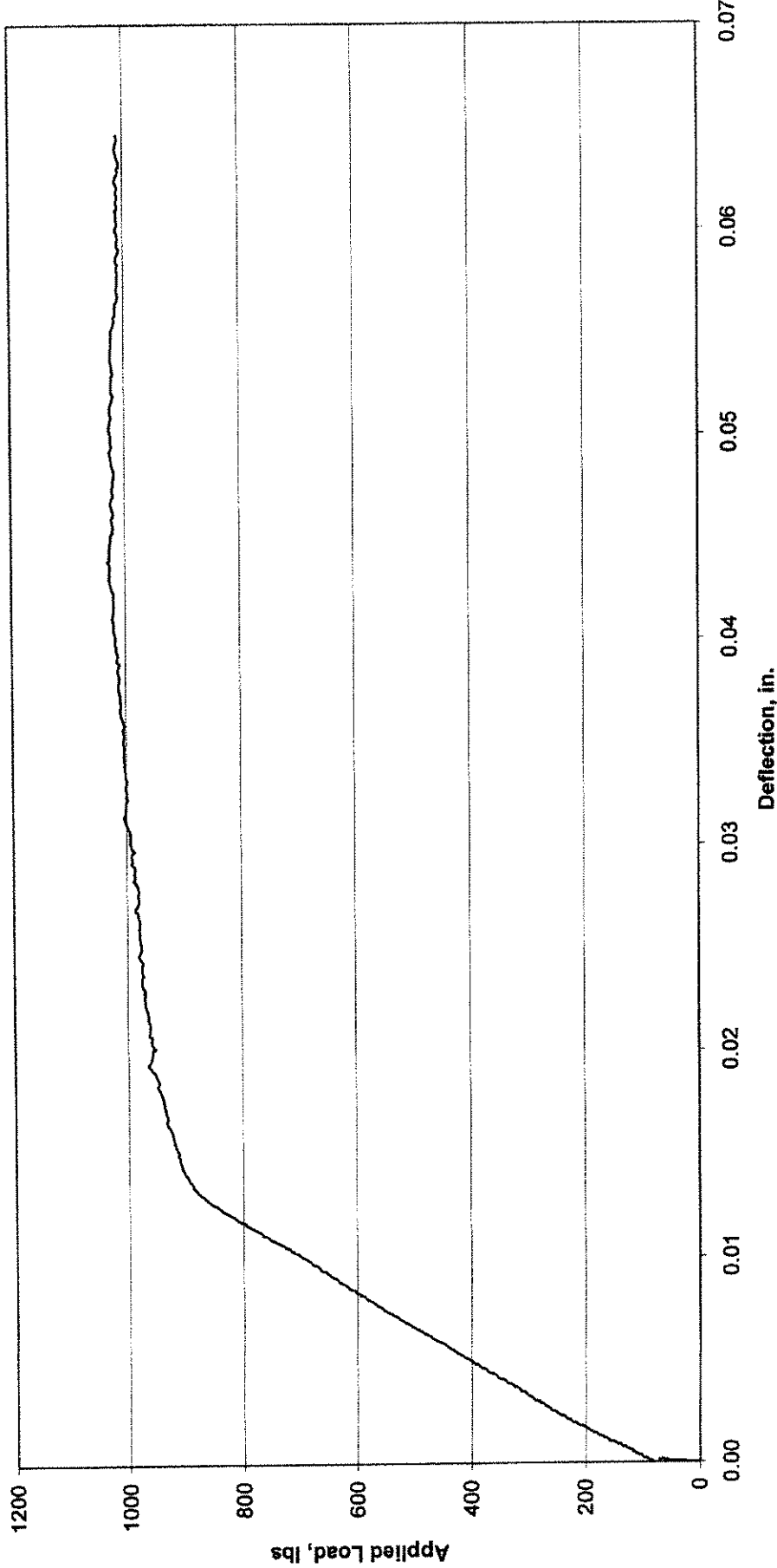
Telephone
Toll Free
Telefax
Website

:(651) 645-3601
:(888) 645-TEST
:(651) 659-7348
:www.twincitytesting.com

Investigative Chemistry
Non Destructive Testing
Metallurgical Analysis

Geotechnical
Failure Analysis
Materials Testing

Construction Materials
Product Evaluation
Welder Qualification



Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes including Federal Law Title 18, Chapter 47

Post Crack Deflection vs. Post Crack Load (ASTM:C1399)

ABC Multi Macro Fibers 1-1/2", Sample 1C (4.0 lb/yd³)

Stork TCT Project Number 034013

March 29, 2004

662 Cromwell Avenue
Saint Paul, MN 55114
USA

Investigative Chemistry
Non Destructive Testing
Metallurgical Analysis

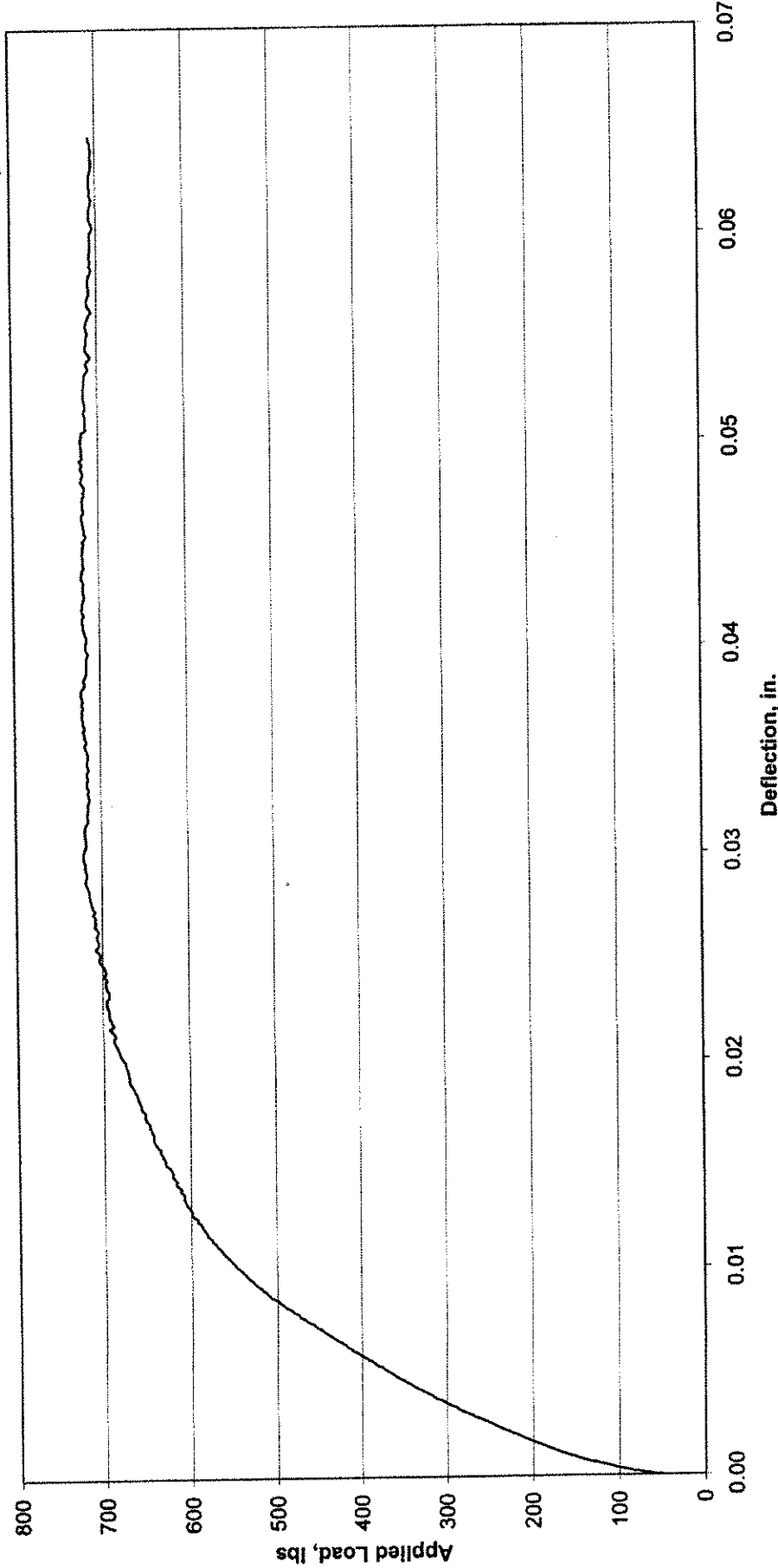
Telephone
Toll Free
Teletax
Website

Geotechnical
Failure Analysis
Materials Testing

Construction Materials
Product Evaluation
Welder Qualification

:(651) 645-3601
:(888) 645-TEST
:(651) 659-7348
:www.twincitytesting.com

Page: 7 of 7



Information and statements in this report are derived from material, information and/or specifications furnished by the client and exclude any expressed or implied warranties as to the fitness of the material tested or analyzed for any particular purpose or use. This report is the confidential property of our client and may not be used for advertising purposes. This report shall not be reproduced except in full, without written approval of this laboratory. The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes including Federal Law Title 18, Chapter 47.

ISO/IEC 17025 (ISO 9002 Compliant)
Non Destructive 1479-03
Mechanical 1479-01

Stork Twin City Testing Corporation is an operating unit of Stork Materials Technology B.V., Amsterdam, The Netherlands, which is a member of the Stork group.