INTERMODAL MATERIÉL
AND
NAUTICAL/NUCLEAR ANALYSIS
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CERTIFICATION TEST REPORT

CERTIFICATION TEST REPORT 15038-1
OF
MECHANICAL STRENGTH TESTS
ON
CLEATS (4 1/2, 6 and 8 INCH)
FOR
ACCON MARINE, INC.

CUSTOMER:

ACCON MARINE, INC.
13665 AUTOMOBILE BLVD.
CLEARWATER, FL 34622

MANUFACTURER
OF TEST ARTICLE: Accon Marine, Inc.

DATE: April 11, 2000

REPORT NO.:	15038-1
IMANNA JOB NO.:	15038
CUSTOMER P.O. NO.:	VERBAL
CONTRACT:	N/A
PAGES IN REPORT:	12

STATE OF FLORIDA

ROBERT L. WHITE, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Robert L White

SUBSCRIBED and sworn to before me this 11th day of April, 2000

David H. Hudgins

David H. Hudgins
Notary Public, State of Florida
Commission No. CC 641256
My Commission Exp. 05/03/2001
1-800-3-NOTARY - Fla. Notary Service & Bonding Co.

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IMANNA LABORATORY, Inc.
TEST BY

Robert L. White
PROJ. ENGINEER

1. SPECIMEN

Eighteen samples of cleats were received for test. The number and type are listed below:

- Size 4½" Qty 6
- Size 6" Qty 6
- Size 8" Qty 6

2. REQUIREMENTS

The Requirements for this effort are to perform vertical pull tests on the received samples.

3. PROCEDURES

Each cleat was mounted to a ¾" thick steel plate in the manner it would be mounted on a boat. The cleats were then subjected to an increasing vertical load to determine the first sign of bending and its ultimate load capability in the direction of pull.

4. RESULTS

CLEAT SIZE	SAMPLE	LOAD AT INITIAL DEFORMATION (LBS)	MAX. LOAD (LBS)	COMMNTS
4 1/2	1	5,901	7,110	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	2	N/A	7,020	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	3	N/A	6,330	BOTTOM OF CLEAT CASING TORE OUT. FAILURE OCCURRED IMMEDIATEL AFTER MAX LOAD
	4	6,019	6,840	BOTTOM OF CLEAT CASING TORE OUT. FAILURE OCCURRED IMMEDIATEL AFTER MAX LOAD
	5	6,324	7,440	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	6	5,850	7,450	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	AVERAGE-->	6,024	7,032	
6	1	9,300	11,130	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	2	10,860	11,430	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	3	9,840	10,890	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	4	9,850	10,770	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	5	9,000	10,200	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	6	9,450	10,740	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	AVERAGE-->	9,717	10,860	
8	1	N/A	10,170	BOTTOM OF CLEAT CASING TORE OUT. FAILURE OCCURRED IMMEDIATEL AFTER MAX LOAD
	2	9,900	11,190	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	3	N/A	12,000	BOTTOM OF CLEAT CASING TORE OUT. FAILURE OCCURRED IMMEDIATEL AFTER MAX LOAD
	4	N/A	9,240	BOTTOM OF CLEAT CASING TORE OUT. FAILURE OCCURRED IMMEDIATEL AFTER MAX LOAD
	5	11,280	13,530	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	6	11,460	12,600	RETAINING PIN PULLED OUT. FAILURE OCCURRED IMMEDIATELY AFTER MAX LOAD
	AVERAGE-->	10,880	11,455	

5. OBSERVATIONS AND COMMENTS

There are basically two kinds of graphs that are directly associated with the two kinds of failure modes and they are shown in the Appendix below.

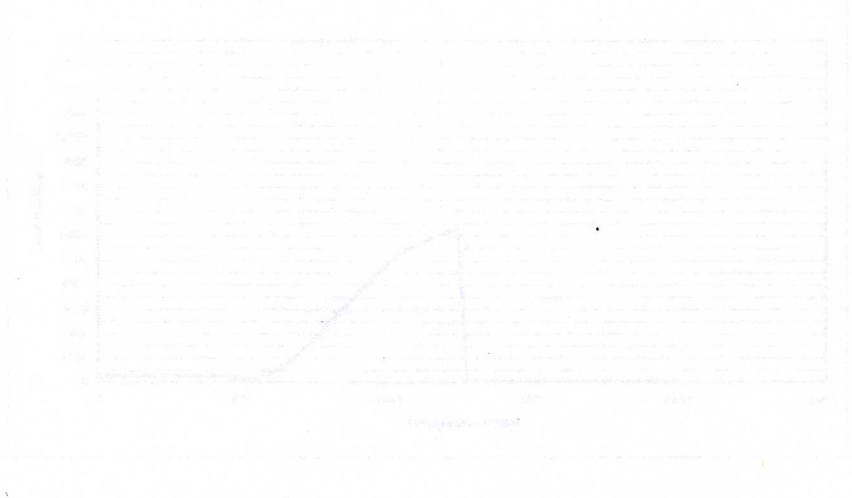
The first failure mode (and the most common failure) was the failure of the retaining pin that normally prevents the pop-up portion of the cleat from coming completely disconnected from the casing. These graphs (i.e. 4 ½ inch, Sample 1, 2, 5, and 6) are slightly rounded near the maximum load value. This is due to the fact that the retaining pin holds its strength without deforming until the maximum strength of the pin is reached. Once the maximum load is reached, the pin starts deforming (this is where the rounded portion of the curve occurs). The ultimate failure is then related to a combination of both the strength of the pin as well as its elongation.

The second failure mode is when the back portion of the cleat casing is completely torn out and the remaining piece stays attached to the threads of the mounting bolt (i.e. 4 ½ inch, Sample 3 and 4). These graphs show virtually no deformation and only a sudden release of the load when the part ultimately fails.

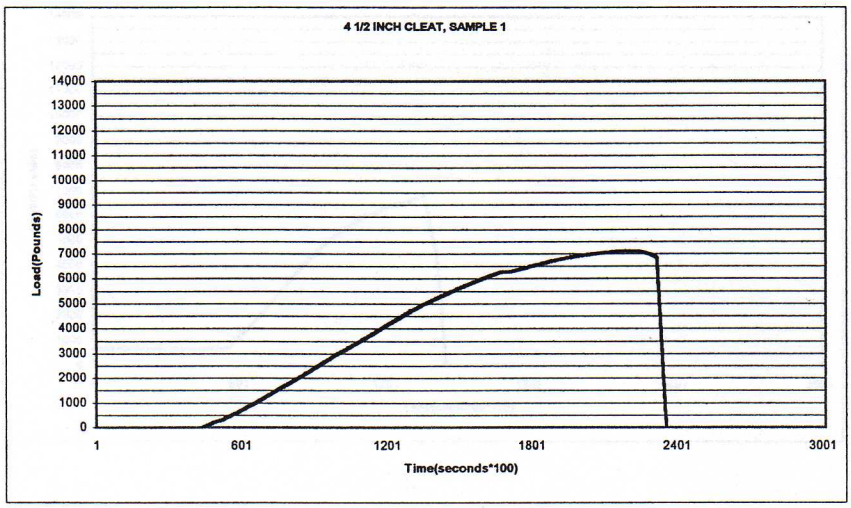
Overall, it was visually difficult to detect any significant deformation of the cleats except in the area of the retaining pin. The retaining pins "started to deform" on average, at 86% of the max. load for the 4 ½ inch cleats, 89% of the max. load for the 6 inch cleats and 95% of the max. load for the 8 inch cleats.

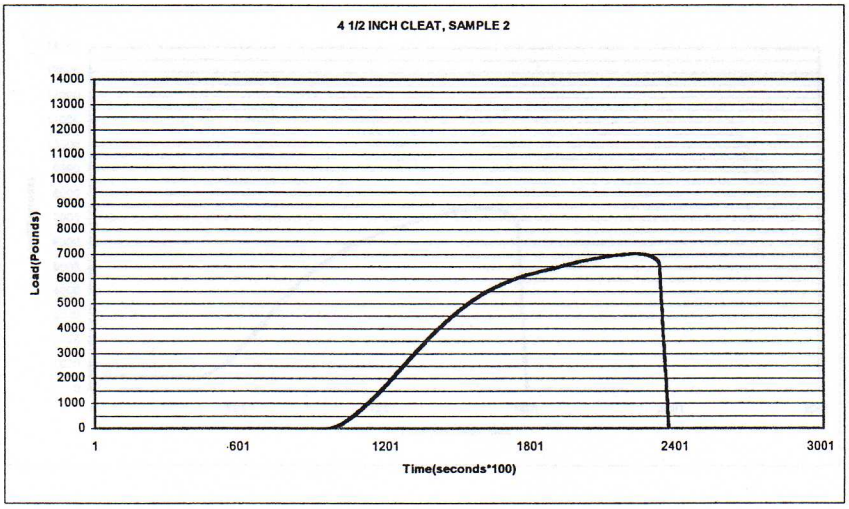
The results presented herein apply only to the test article as prepared and as tested. All equipment used in the performance of these tests was calibrated to standards traceable to the N.I.S.T.

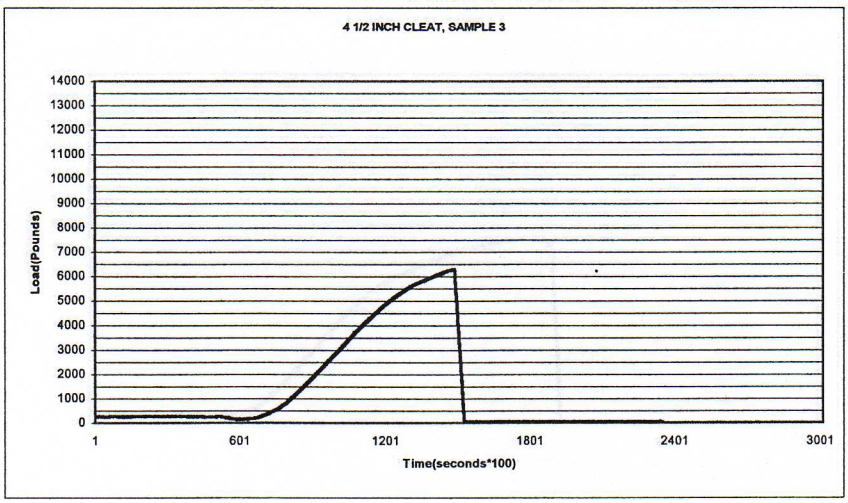
APPENDIX

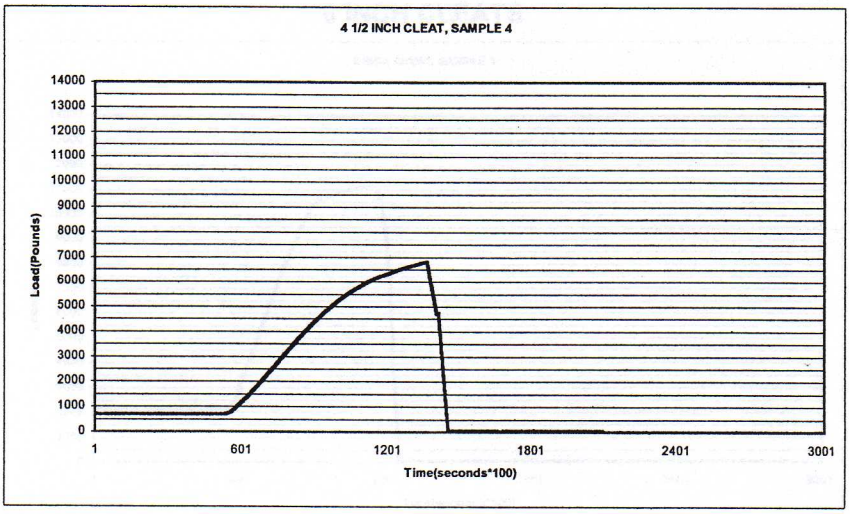


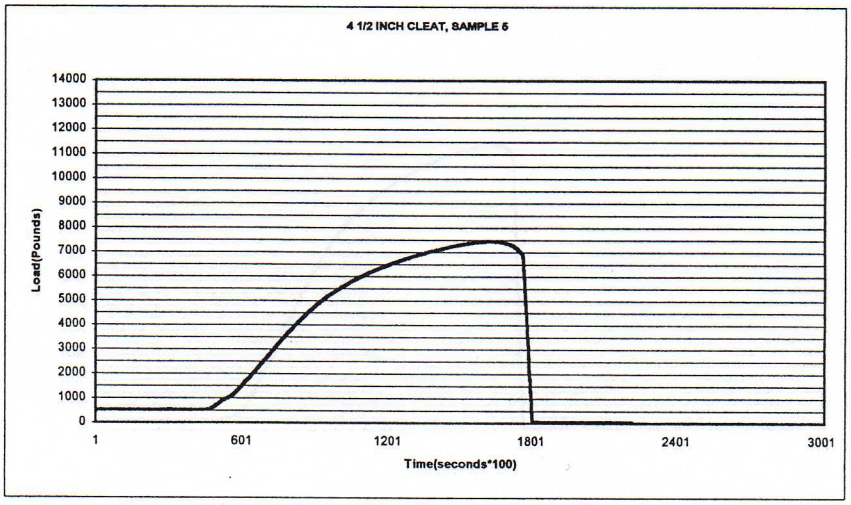
4 ½ INCH CLEATS

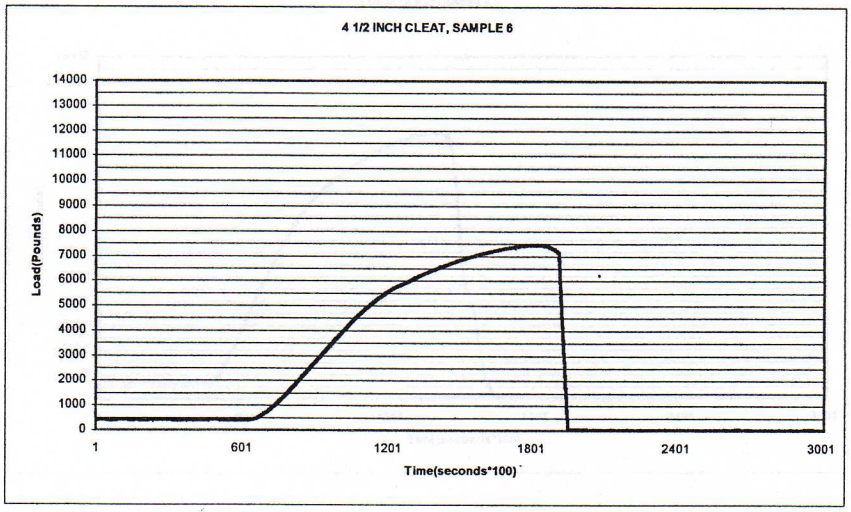




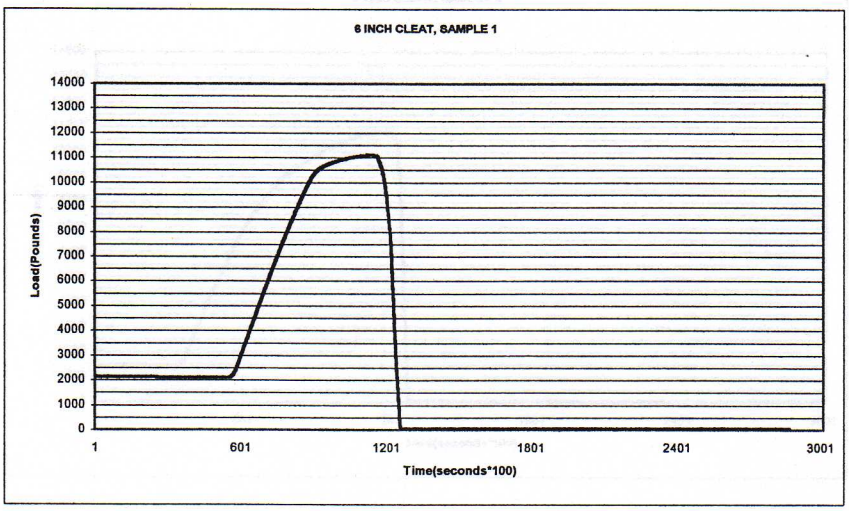


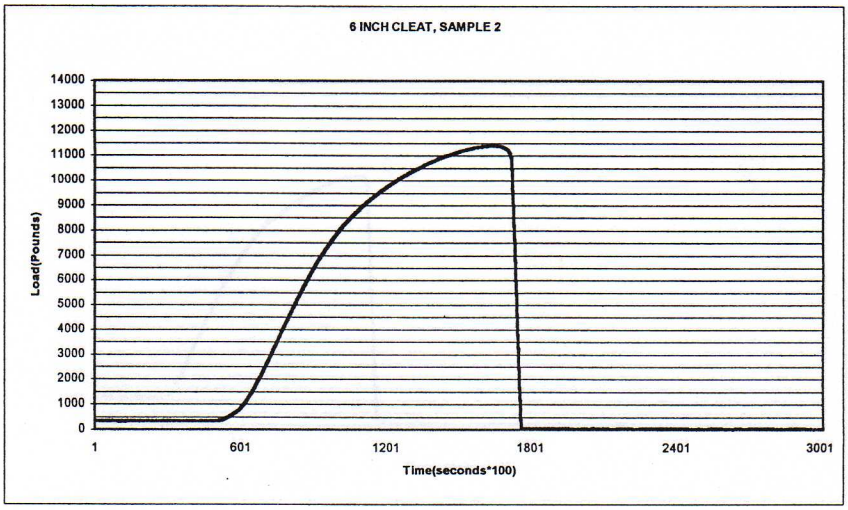

4 1/2 INCH CLEAT, SAMPLE 4
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

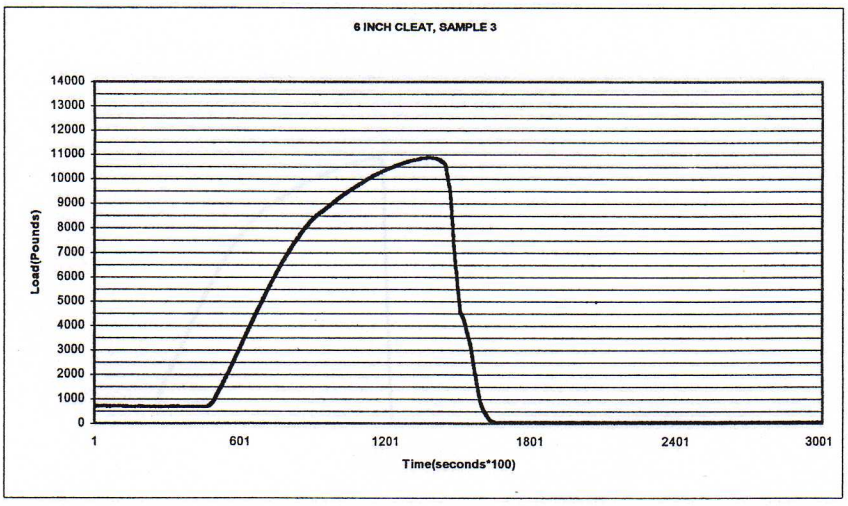

4 1/2 INCH CLEAT, SAMPLE 5
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

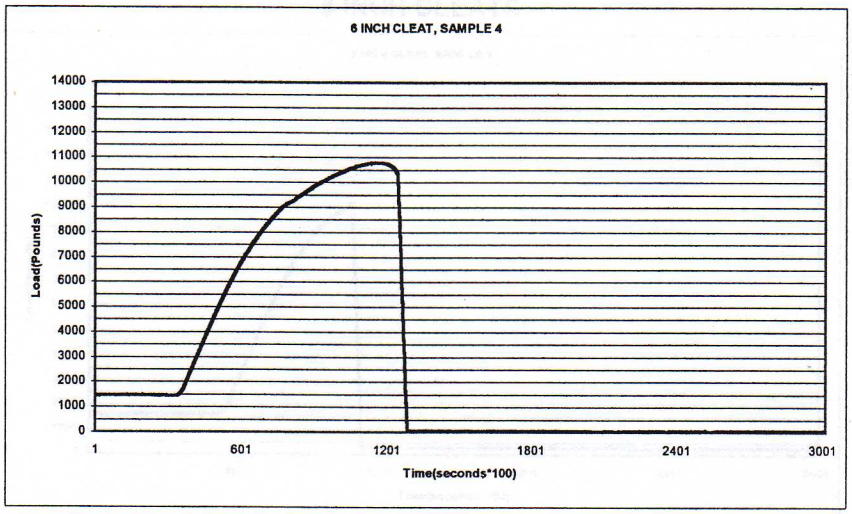

4 1/2 INCH CLEAT, SAMPLE 6
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

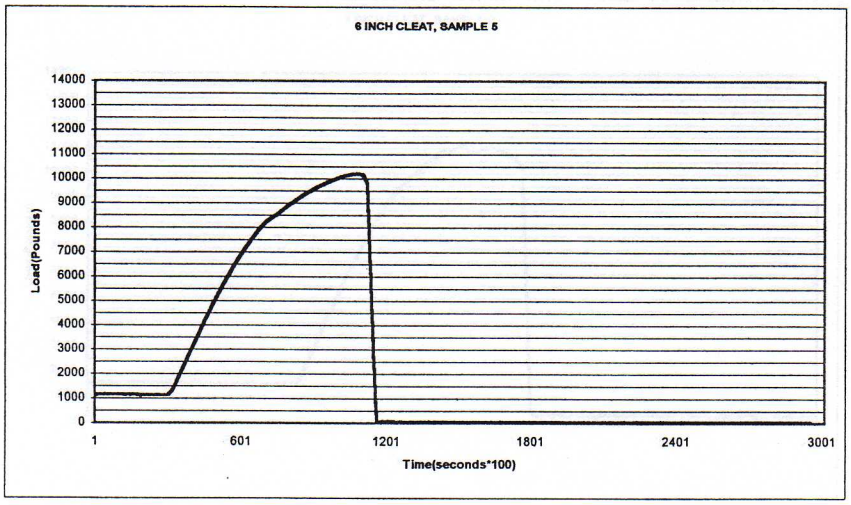
6 INCH CLEATS

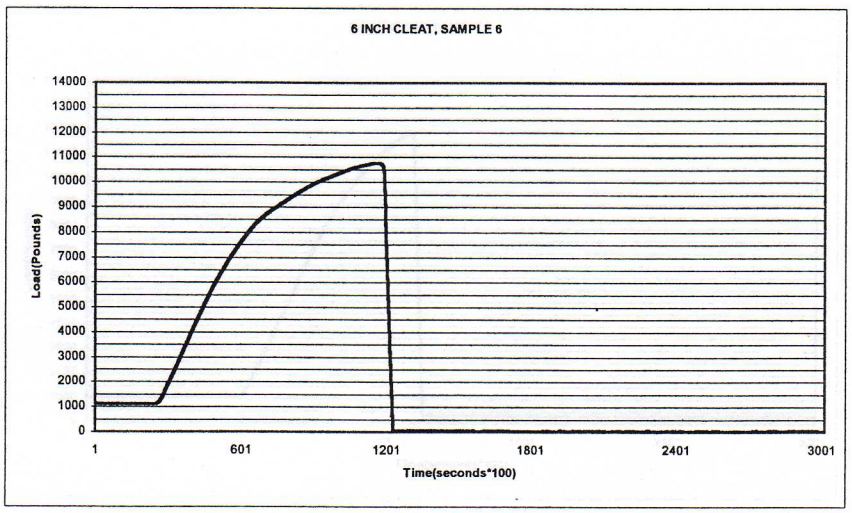




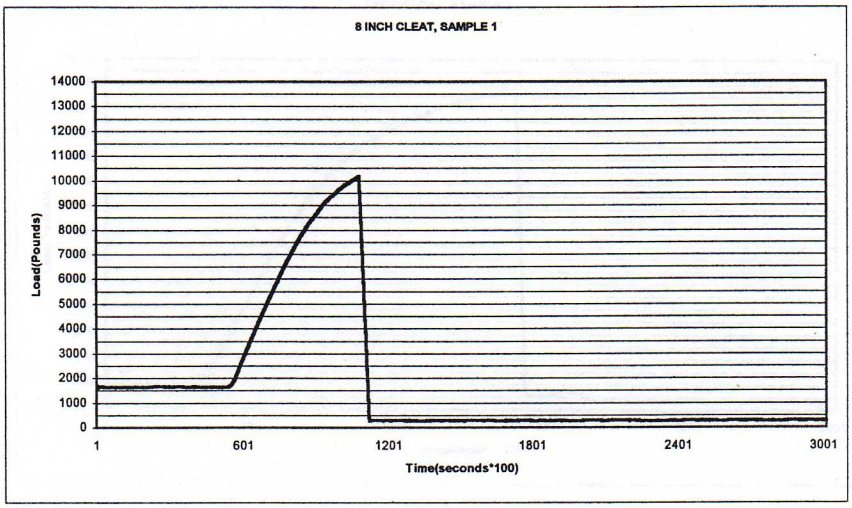


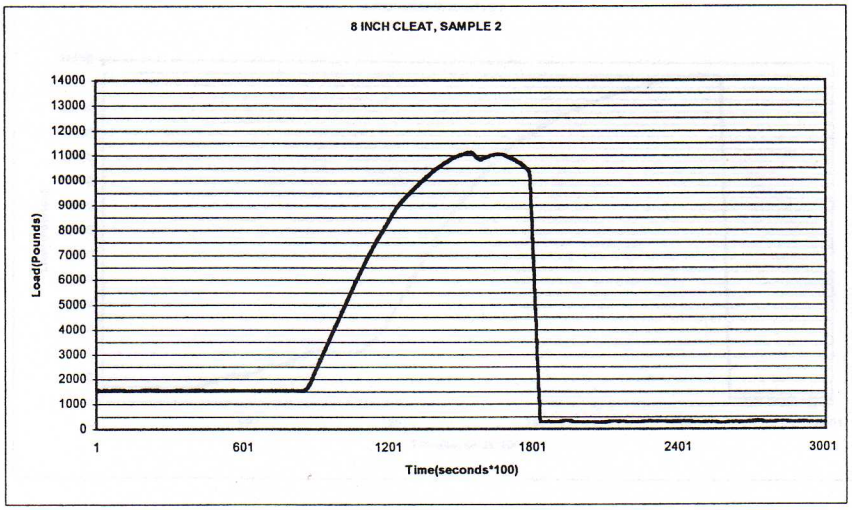

6 INCH CLEAT, SAMPLE 4
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

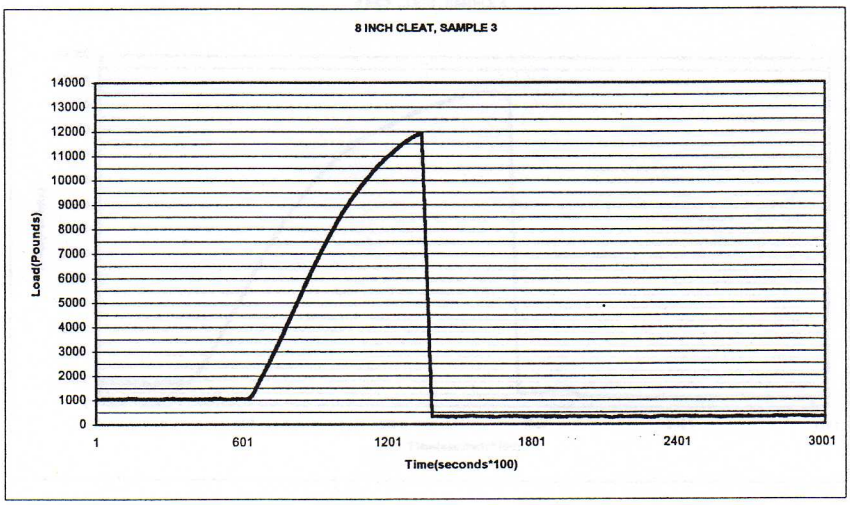

6 INCH CLEAT, SAMPLE 5
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

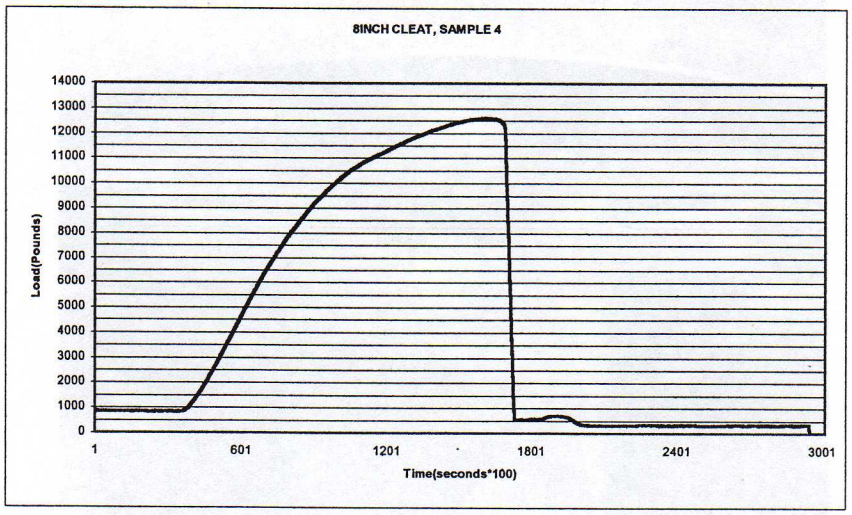

6 INCH CLEAT, SAMPLE 6
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

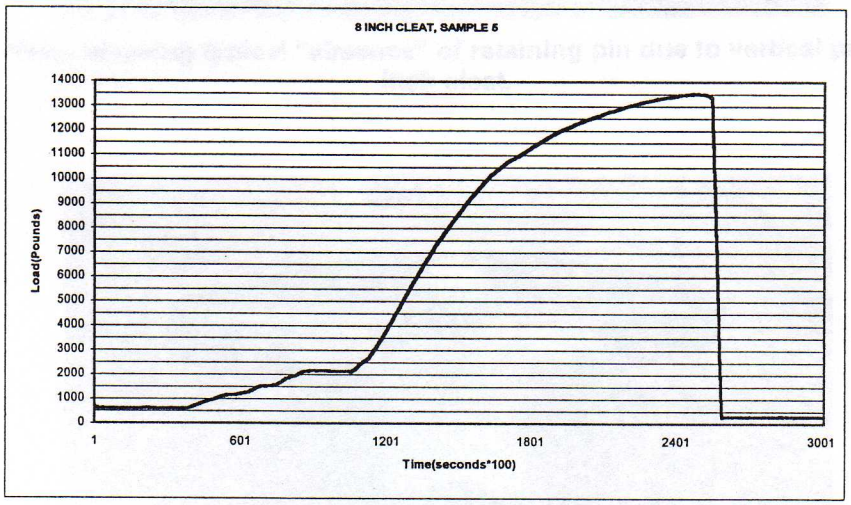
8 INCH CLEATS








8INCH CLEAT, SAMPLE 4
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)


8 INCH CLEAT, SAMPLE 5
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

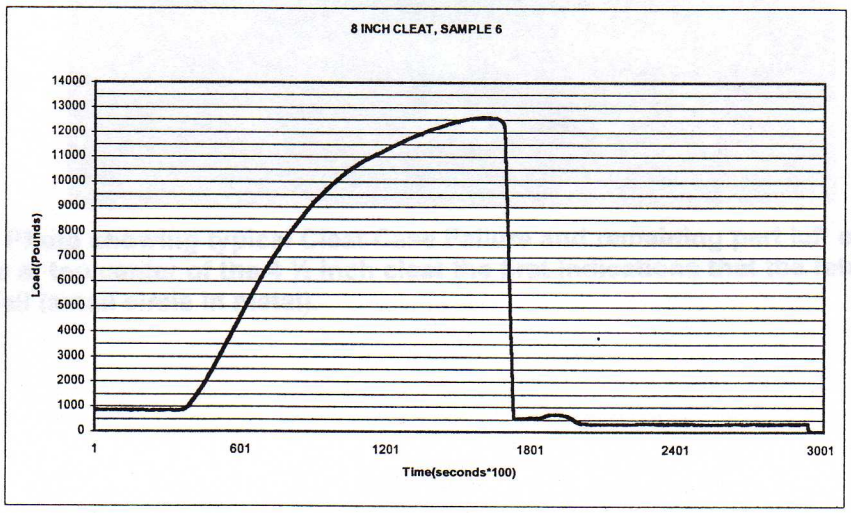

8 INCH CLEAT, SAMPLE 6
Load(Pounds)
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1
601
1201
1801
2401
3001
Time(seconds*100)

Figure 1. Photo showing typical "absence" of retaining pin due to vertical pull failure in 6 inch cleat.

Figure 2. Photo showing typical Cleat Case Failure and remaining part left on threaded bolt. Note at top center of the 4 ½ inch cleat the first indications that the retaining pin is about to fail (small circle in metal).