

REPORT NO. TR-P27004-09-NC

SAFETY COMPLIANCE TESTING FOR FMVSS 223
REAR IMPACT GUARDS

2007 TRANSFREIGHT TECHNOLOGY

NHTSA NO. RIG 009

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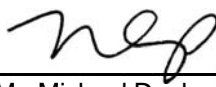
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FINAL REPORT

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16. Abstract Tests were conducted on one Rear Impact Guard, manufactured by 2007 TransFreight Technology in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-223-00 for the determination of FMVSS 223 compliance. The Rear Impact Guard appeared to meet all the requirements of FMVSS 223.			
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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Purpose of Compliance Test	1
2	Compliance Test Data Summary	2
3	Test Data	4
<u>Data Sheet</u>		
1	Inspection Data – FMVSS 223	5
2	Summary of test requirements and results	6
3	Rear Impact Guard Dimensions	14
<u>Appendix</u>		
A	Photographs	A
B	Test Equipment List and Calibration Information	B

LIST OF DATA PLOTS

<u>Data Plot</u>		<u>Page</u>
1	P1 Force vs. Displacement (Pre-Test)	7
2	P1 Displacement vs. Time (Pre-Test)	8
3	P2 Force vs. Displacement (Pre-Test)	9
4	P2 Displacement vs. Time (Pre-Test)	10
5	P3 Force vs. Displacement (Pre-Test)	11
6	P3 Displacement vs. Time (Pre-Test)	12
7	P1 Force vs. Displacement	13
8	P1 Displacement vs. Time	14
9	P2 Force vs. Displacement	15
10	P2 Displacement vs. Time	16
11	P3 Force vs. Displacement	17
12	P3 Displacement vs. Time	18

LIST OF PHOTOGRAPHS

<u>Figure</u>		<u>Page</u>
A-1	Front View, as Received	A-1
A-2	Rear View, as Received	A-1
A-3	Right Side, as Received	A-2
A-4	Left Side, as Received	A-2
A-5	Test Setup	A-3
A-6	Manufacturer's Label	A-3
A-7	Pre-Test, Location P1, Unloaded	A-4
A-8	Pre-Test, Location P1, Loaded	A-4
A-9	Post-Test, Location P1, Loaded	A-5
A-10	Post-Test, Location P1, Unloaded	A-5
A-11	Pre-Test, Location P2, Unloaded	A-6
A-12	Pre-Test, Location P2, Loaded	A-6
A-13	Post-Test, Location P2, Loaded	A-7
A-14	Post-Test, Location P2, Unloaded	A-7
A-15	Pre-Test, Location P3, Unloaded	A-8
A-16	Pre-Test, Location P3, Loaded	A-8
A-17	Post-Test, Location P3, Loaded	A-9
A-18	Post-Test, Location P3, Unloaded	A-9

SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on one rear impact guard assembly, manufactured by TransFreight Technology, to determine compliance with FMVSS 223, "Rear Impact Guards". The purpose of this standard is to reduce the number of deaths and serious injuries that occur when light duty vehicles collide with the rear end of trailers and semi trailers.

All tests were conducted based on the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures, TP-223-00, dated October 20, 1997, and corresponding KARCO Engineering test procedure KTP223, dated October 11, 1998. Detailed procedures for receiving, inspecting, testing and reporting of test results are described in the test procedures and are not repeated in this report.

This report is organized in sections containing pertinent test information and data tables as follows:

- Section 2 - Compliance Test Data Summary
- Section 3 - Test Data
- Appendix A - Photographs
- Appendix B - Test Equipment List and Calibration Information

SECTION 2

COMPLIANCE TEST DATA SUMMARY

A series of guard strength tests were performed on one rear impact guard provided by 2007 TransFreight Technology. The tests were conducted at KARCO Engineering in Adelanto, California on September 5-7, 2007. Summary data is shown on Data Sheet No. 2. The following tests were performed:

- A guard strength test at location P1 (left)
- A guard strength test at location P2 (center)
- A guard strength test at location P3 (left)

One rear impact guard was used for these tests. The guard was loaded at P2 (center), P1 (left) and P3 (left). The guard unit was received as a guard assembly only and was installed on KARCO's hydraulic test stand to reflect normal in service installation.

The test was conducted per the FMVSS 223 test procedure. The significant aspects of the test procedure are described in the following paragraphs.

The test specimen was positioned and rigidly secured to Karco's test fixture. The test frame consists of two wide flange 2444 mm by 690 mm beams to provide rigid mounting surfaces for the rear impact guard assembly. A six-inch bore hydraulic actuator was mounted on a rigid reaction frame and welded in place on the test fixture. The cylinder rod was connected to a force application device consisting of a solid stainless steel sheet measuring 203 mm in height, 203 mm in width, and 25 mm in thickness with a 5 mm radius of curvature on each edge of the contact surface. The force application device was used to apply the required loads to the rear impact guard assembly.

A manually controlled valve was used to maintain the loading rate of displacement between 2 to 9 cm per minute. A load cell and linear displacement transducer were used to record force and displacement respectively. The load cell was positioned between the end of the cylinder rod and the load application device. Photographs of the test specimen and the test setup are shown in Appendix A. Appendix B contains the test equipment list and calibration data.

2.1 GUARD STRENGTH TESTS

The hydraulic impact guard that was received was prepared for the guard strength tests as per procedure. The horizontal member was deflected in a forward direction until the hydraulic unit reached the full extent of the designed travel. The unit was compressed prior to the force application with S6.6 and maintained in this condition throughout the testing.

Guard strength tests on sample 1 at location P1 (left side) were conducted on September 7, 2007. The load force was applied until it met the load requirement of 50,000 Newtons (+0, -2500 N). The maximum load achieved was 47,882 N. The average displacement rate was 53.3 mm/min. The rear impact guard displaced 51.6 mm at the minimum required load and 56.0 mm at maximum load. The rear guard assembly sustained 3.2 mm of permanent deformation. The maximum allowable deformation is 130 mm. The data plots of the force versus displacement and displacement versus time are shown on pages 13 and 14.

Guard strength tests on sample 1 at location P2 (center) were conducted on September 5, 2007. The load force was applied until it met the load requirement of 50,000 Newtons (+0, -2500 N). The maximum load achieved was 47,658 N. The average displacement rate was 48.0 mm/min. The rear impact guard displaced 22.3 mm at the minimum required load and a maximum of 23.6 mm at maximum load. The rear guard assembly sustained 1.2 mm permanent deformation. The maximum allowable deformation is 130 mm. The data plots of the force versus displacement and displacement versus time are shown on pages 15 and 16.

2.2 GUARD STRENGTH TESTS

The guard strength test at P3 was performed on September 7, 2007. The force was applied until the rear impact guard displaced 67.6 mm. The maximum load achieved was 101,591 N. The rear impact guard sustained permanent deformation of 34.5 mm. The maximum allowable deformation of 130 mm was not exceeded. The force requirement for this test was met.

According to test procedure TP-223-00, the Energy Absorption test was not performed since the test article was a hydraulic guard. Hydraulic guards are excluded from the Energy Absorption requirement S5.2.2.

2.3 LABELING INSPECTION

The rear impact guard met the labeling requirements of FMVSS No. 223, Section S5.3, as detailed on page 5, Data Sheet No. 1.

SECTION 3
TEST DATA

The results of FMVSS 223 compliance tests that were conducted on the subject rear impact guard assembly on September 5-7, 2007 to determine compliance with FMVSS 223, "Rear Impact Guards" are presented in this section.

DATA SHEET NO. 1
INSPECTION DATA – FMVSS 223

Trailer Guard Description: 2007 TransFreight Technology NHTSA No.: RIG 009

GENERAL INFORMATION

Inspection Date:	09/05/07 to 09/07/07	Test group No.	RIG 009
Manufacturer	2007 TransFreight Technology	Model	CushionStop 96
Mfr. Date:	Unknown	Test Laboratory	KARCO Engineering, LLC
Laboratory Technicians			Javier Hernandez Mark Kratzke

CROSS SECTIONAL VERTICAL HEIGHT

Vertical Height of Horizontal Member (mm)	100
---	-----

GUARD LABELING

Item	Requirement	
1	Does the guard contain a certification label placed on the forward facing surface of the horizontal member of the guard, 305 mm inboard of the right end of the guard?	Yes
2	Is all the information on the guard label printed in English and in letters that are at least 2.5 mm high?	Yes
3	Does the label contain the guard manufacturer's name and address?	Yes
4	Does the guard label contain the following statement: "Manufactured in _____" (inserting month and year of guard manufacture.)	Yes
5	Does the label contain the letters "DOT"?	Yes

GUARD ATTACHMENT HARDWARE

Is the guard accompanied by all attachment hardware necessary for installation of the guard onto the chassis of the motor vehicle for which it was intended?	Yes
--	-----

INSTALLATION INSTRUCTIONS

Does the guard include printed instructions in English as well as a diagram or schematic depicting proper guard installation?	Yes
---	-----

Recorded By: Mark Kratzke

Date: 08/16/07

Approved By: Michael L. Dunlap

Date: 08/16/07

DATA SHEET NO. 2
SUMMARY OF TEST REQUIREMENTS AND RESULTS

Trailer Guard Description: 2007 TransFreight Technology

NHTSA No.: RIG 009

GUARD ENERGY ABSORPTION TEST*

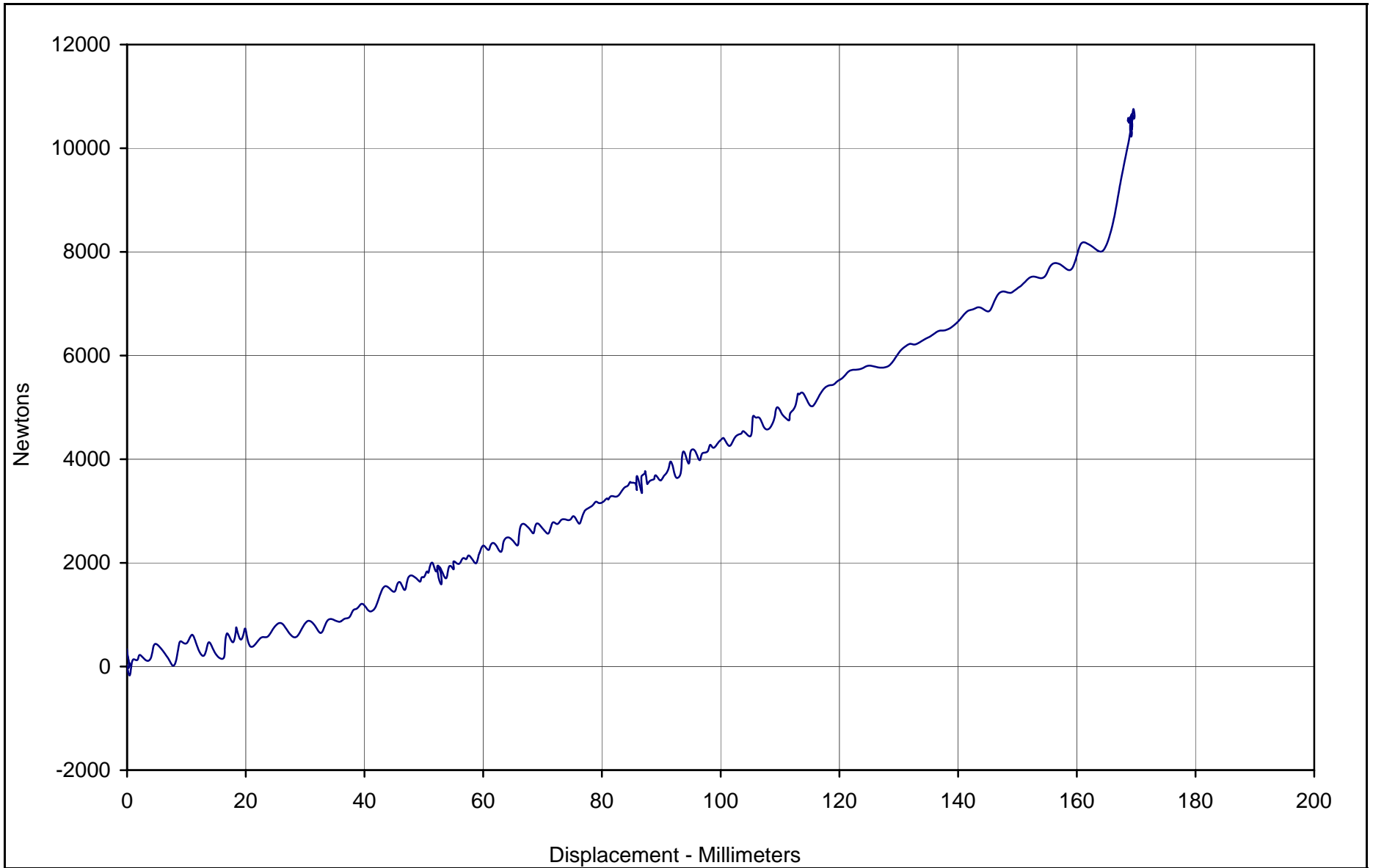
Sample Number	Test Location	Test Date	Requirement	Measured Energy (J)	Maximum Load (N)	Displacements (mm)	
			Energy (J)			At Max. Load	Rate (mm/min)
01	P3 Left Side	9/7/07	>5,650	N/A*	101,591	67.6	53.1

* Not required for hydraulic units

GUARD STRENGTH TEST

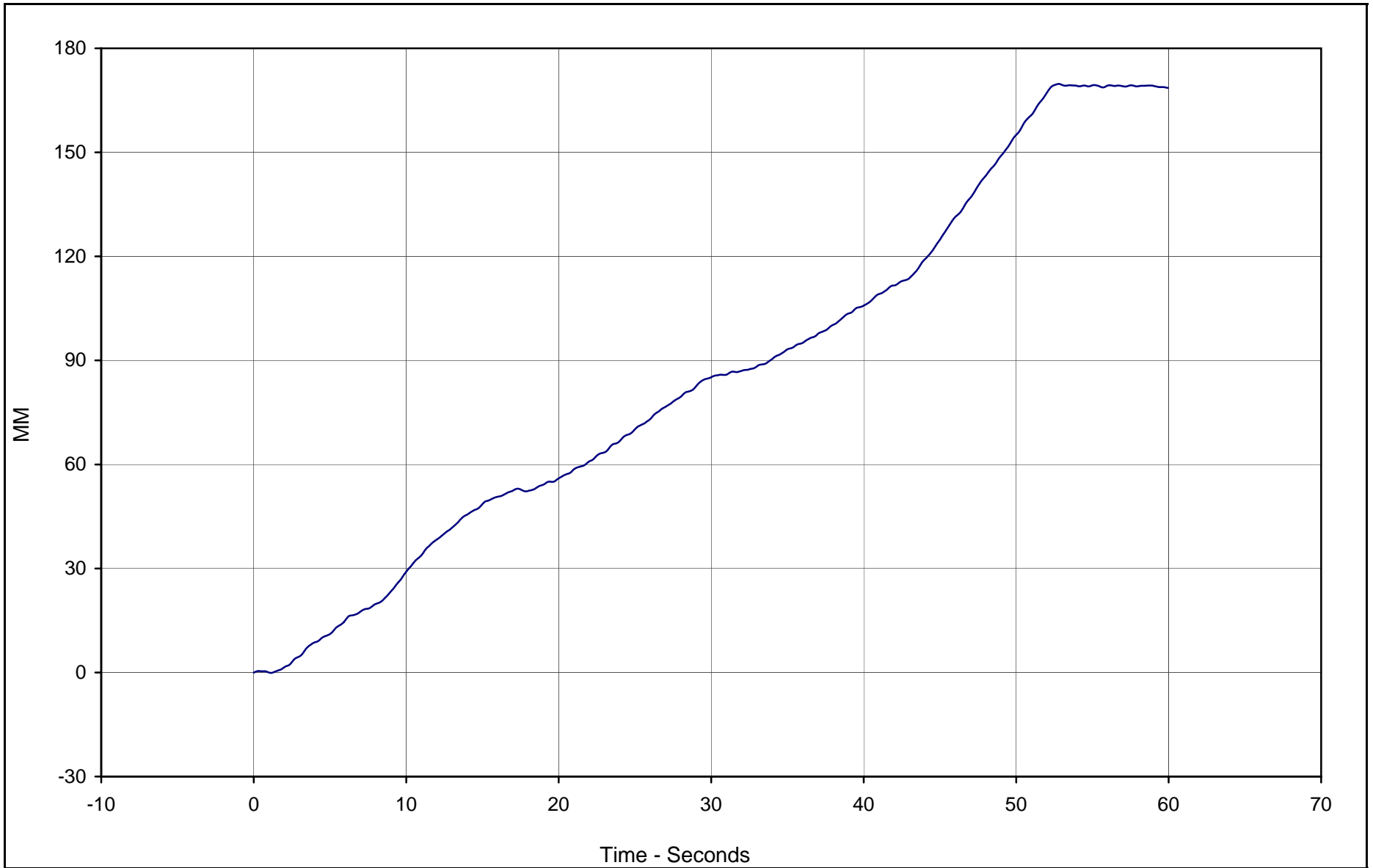
Sample Number	Test Location	Test Date	Requirements		Maximum Load (N)	Displacements (mm)		
			Displ.(mm)	Load (N)		At Reqd. Load	At Max. Load	Rate (mm/min)
01	P1 Left Side	9/7/07	130+0/-5	50,000+0/-2,500	47,882	38.1	38.6	53.3
01	P2 Center	9/5/07	130+0/-5	50,000+0/-2,500	47,658	22.0	22.3	48.0
01	P3 Left Side	9/7/07	130+0/-5	>100,000	101,591	66.1	67.6	53.1

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)



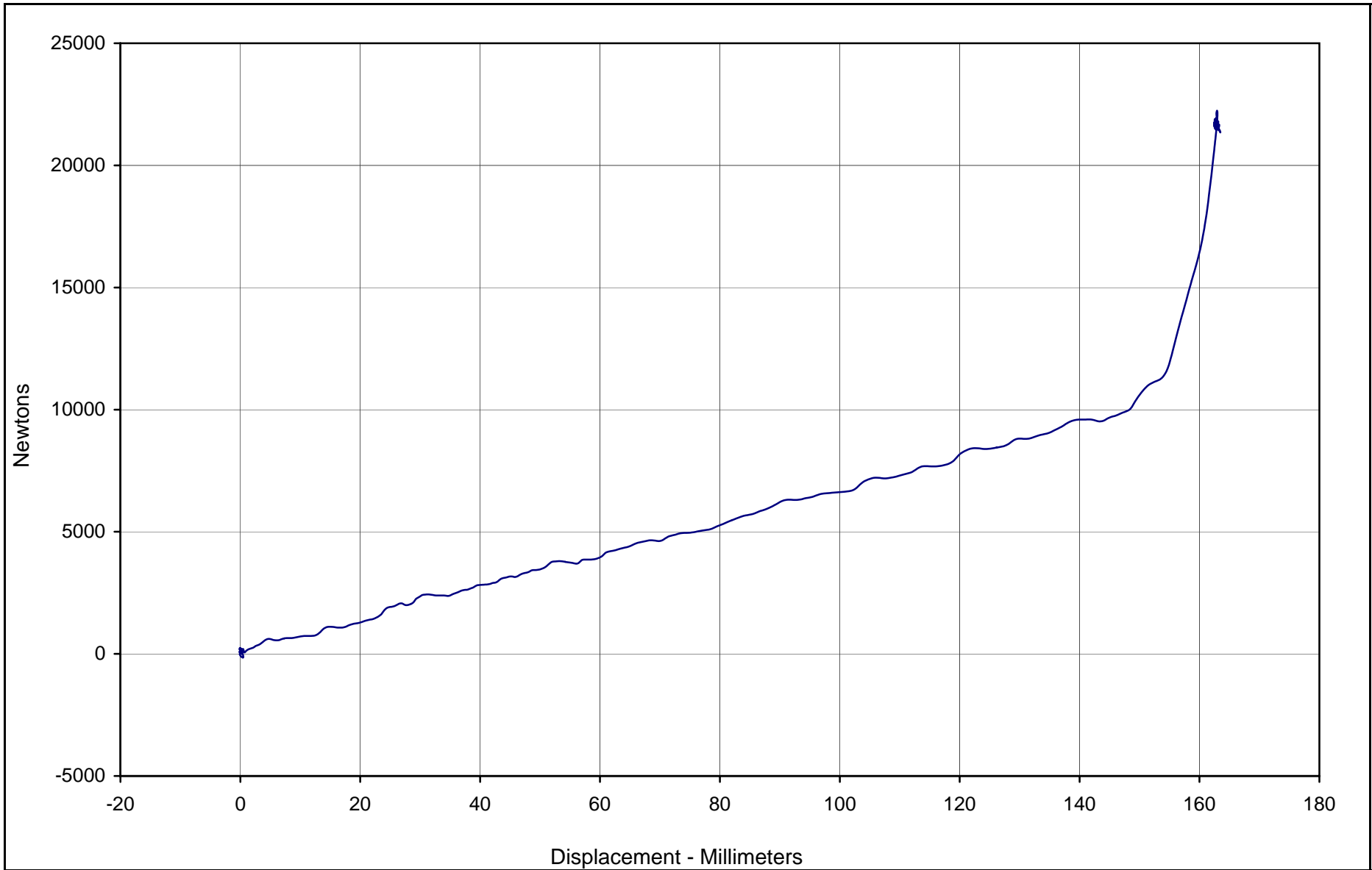
Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Load (N)	Displacements (mm)	
						At 47.5kN	At Max.
2007 TransFreight Technology	9/7/07	P1 Left Side	Force vs. Displ.	01	10,755	N/A	169.5

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)



Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/7/07	P1 Left Side	Displ. vs. Time	01	169.7	N/A	N/A

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)

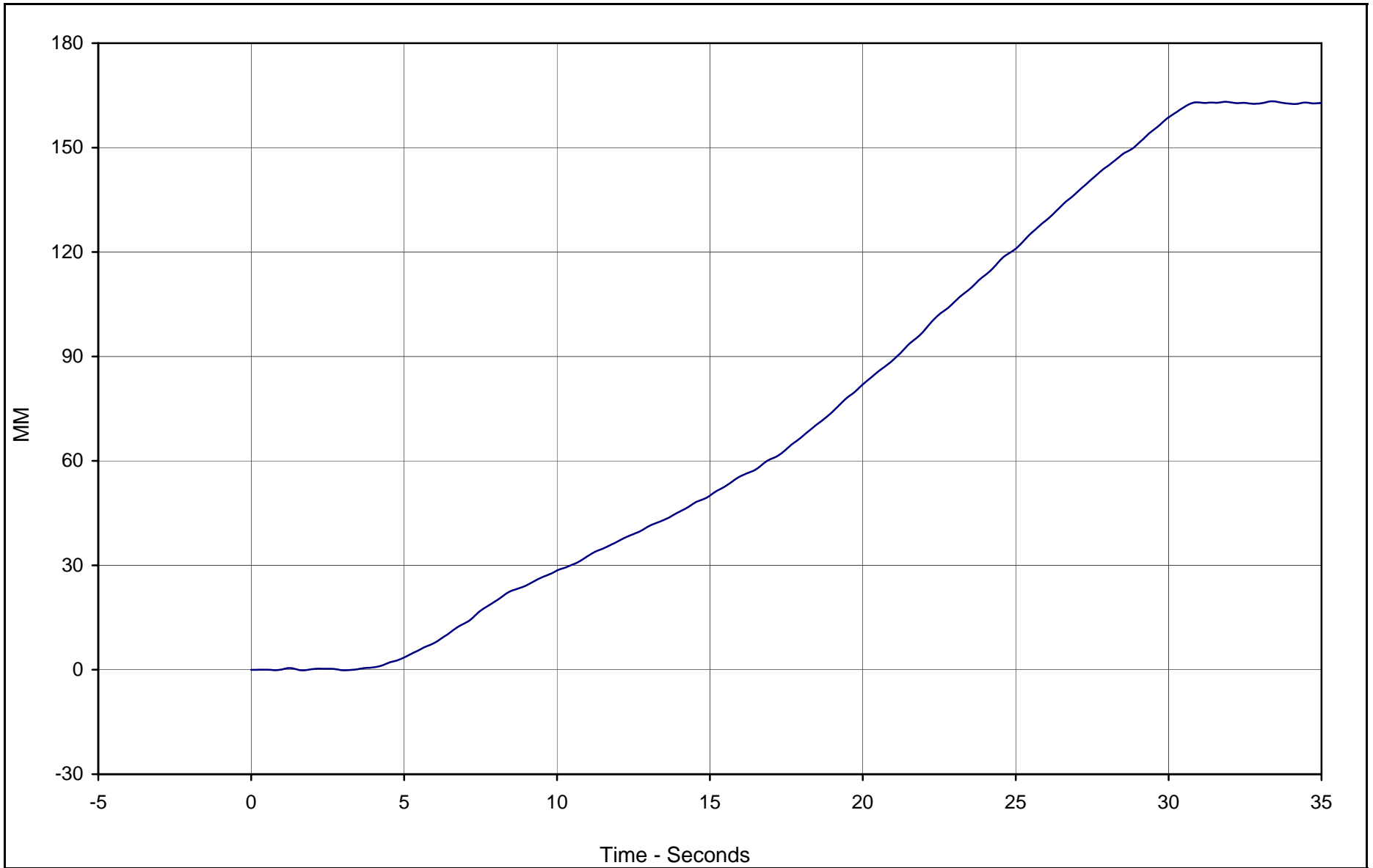


9

TR-P27004-09-NC

Trailer Guard Description	Test Date	Location	Curve Description	Sample Number	Maximum Load (N)	Displacements (mm)	
						At 47.5kN	At Max.
2007 TransFreight Technology	9/5/07	P2 Center	Force vs. Displ.	01	22,240	N/A	162.9

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)

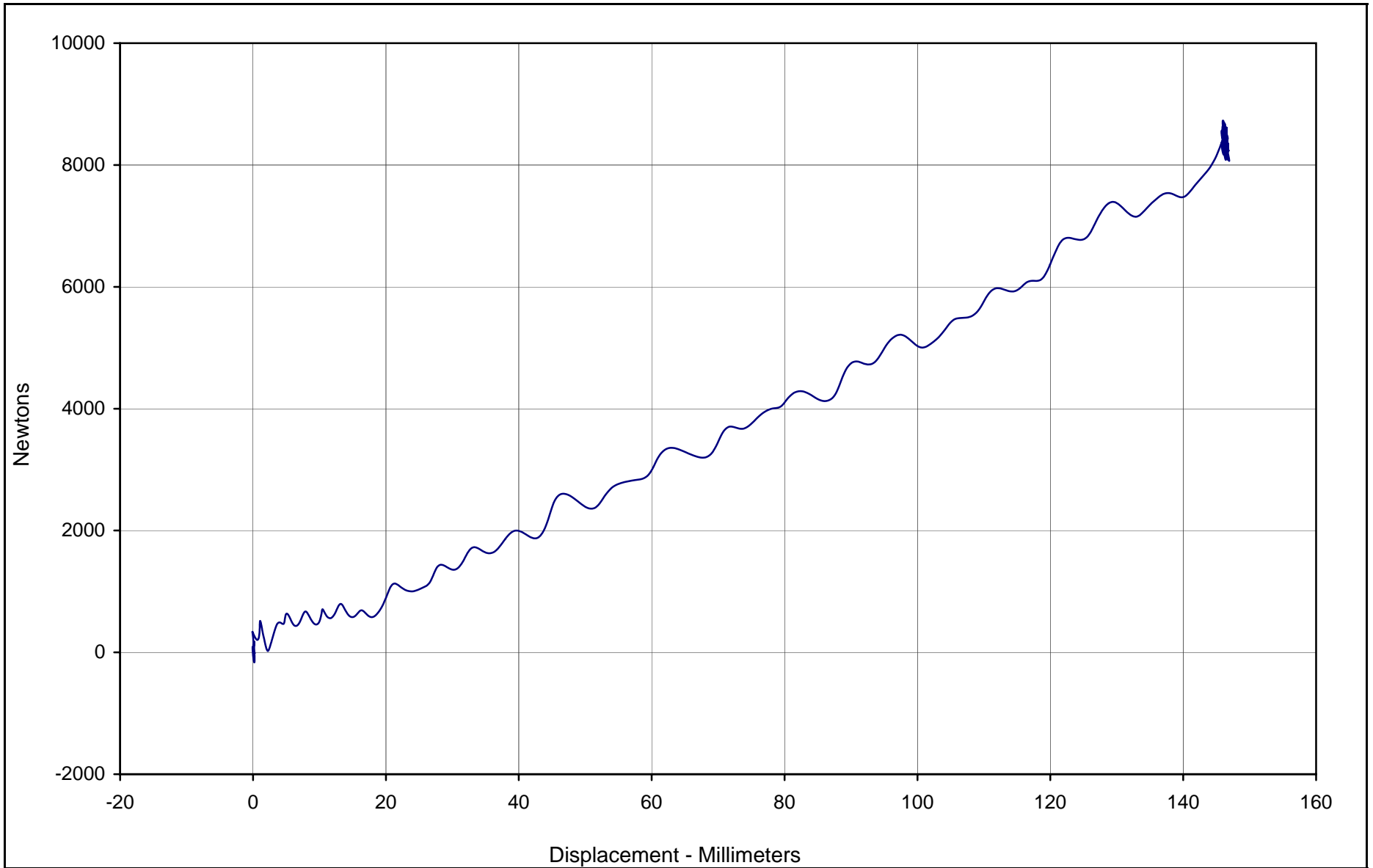


10

TR-P27004-09-NC

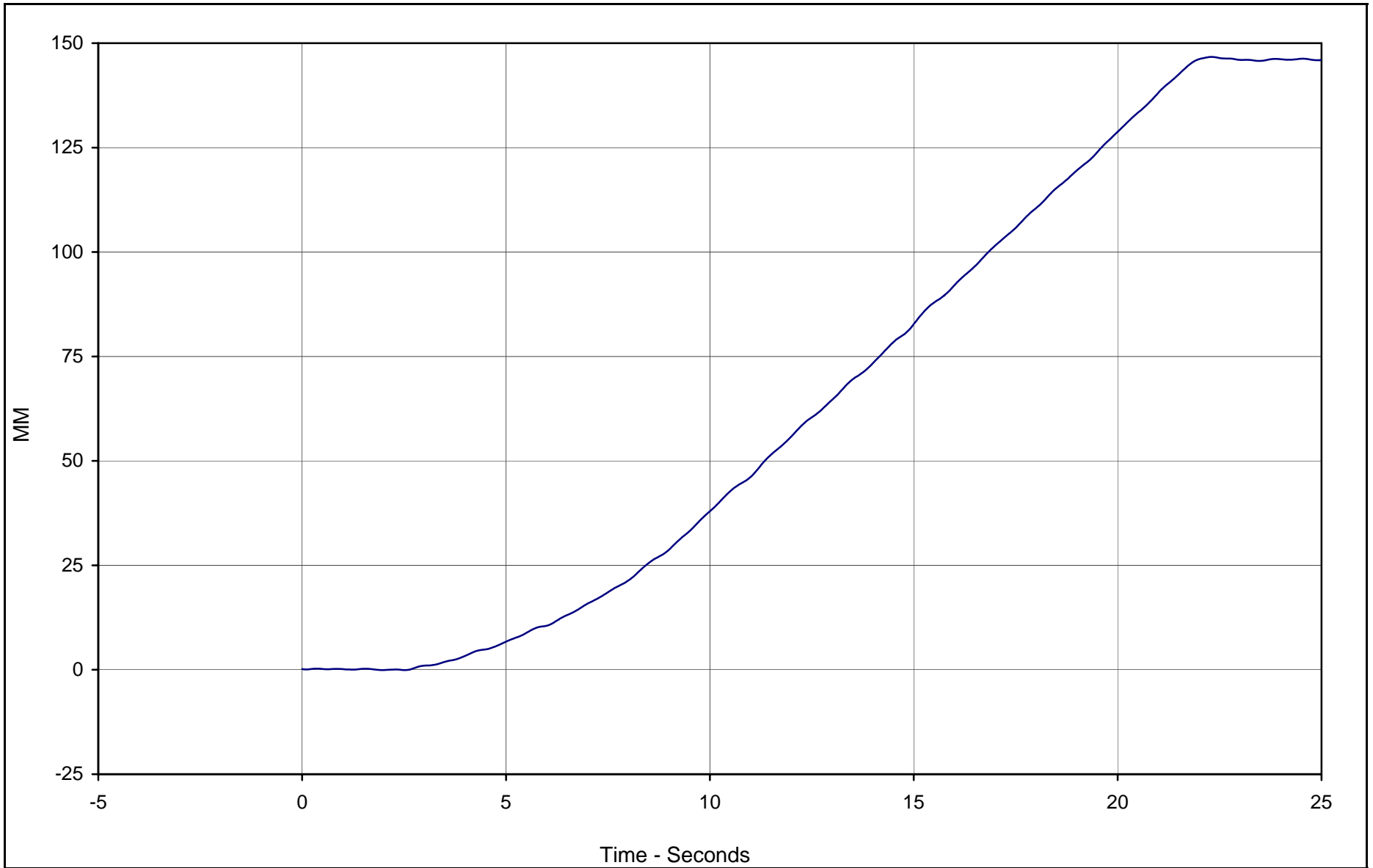
Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/5/07	P2 Center	Displ. vs. Time	01	163.5	N/A	N/A

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)



Trailer Guard Description	Test Date	Location	Curve Description	Sample Number	Maximum Load (N)	Displacements (mm)	
						At 47.5kN	At Max.
2007 TransFreight Technology	9/7/07	P3 Left Side	Displ. vs. Time	01	8,729	N/A	146.0

FMVSS 223 REAR IMPACT GUARD (PRE-TEST)

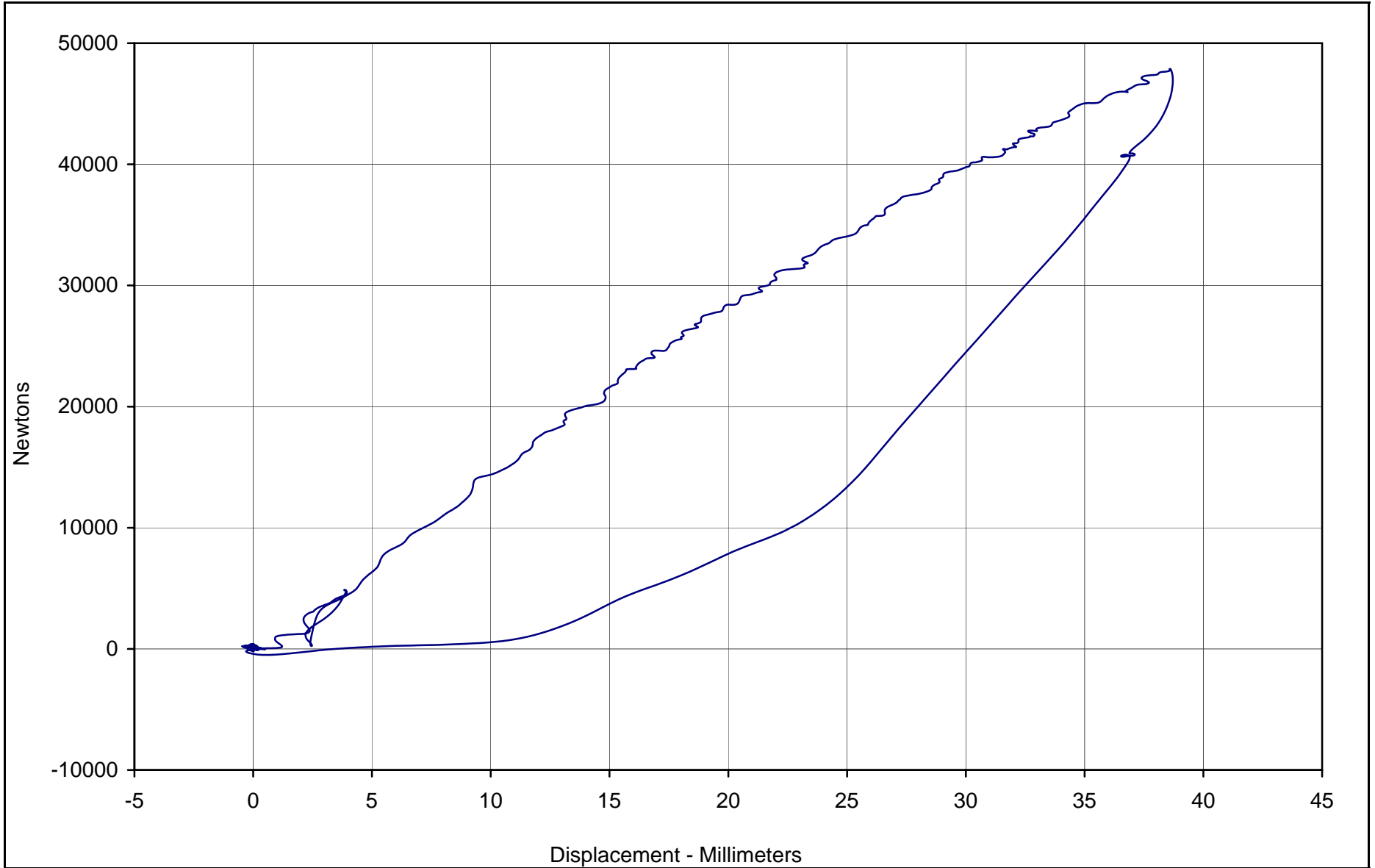


12

TR-P27004-09-NC

Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/7/07	P3 Left Side	Displ. vs. Time	01	146.9	N/A	N/A

FMVSS 223 REAR IMPACT GUARD

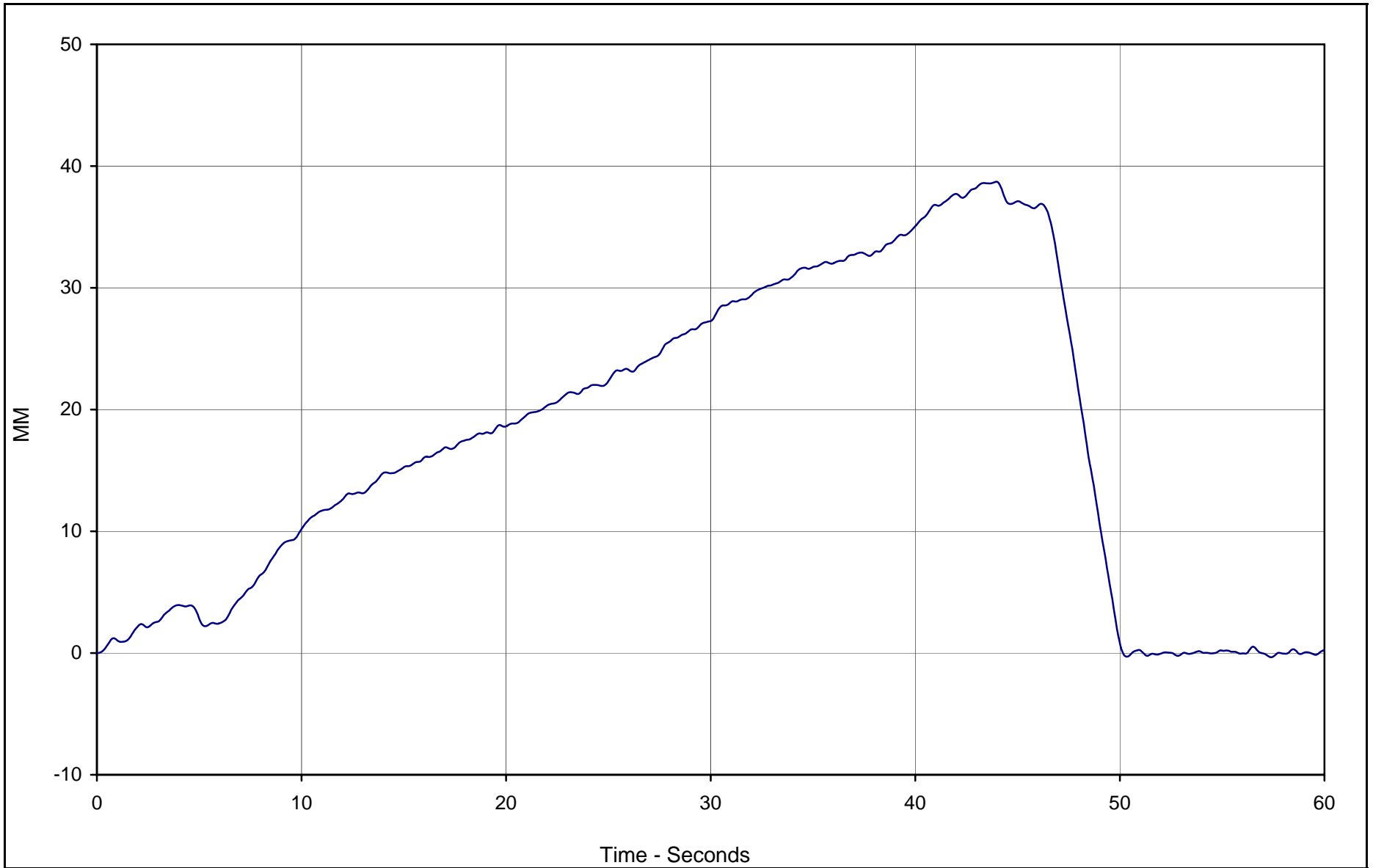


13

TR-P27004-09-NC

Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Load (N)	Displacements (mm)	
						At 47.5kN	At Max.
2007 TransFreight Technology	9/7/07	P1 Left Side	Force vs. Displ.	01	47,882	38.1	38.6

FMVSS 223 REAR IMPACT GUARD

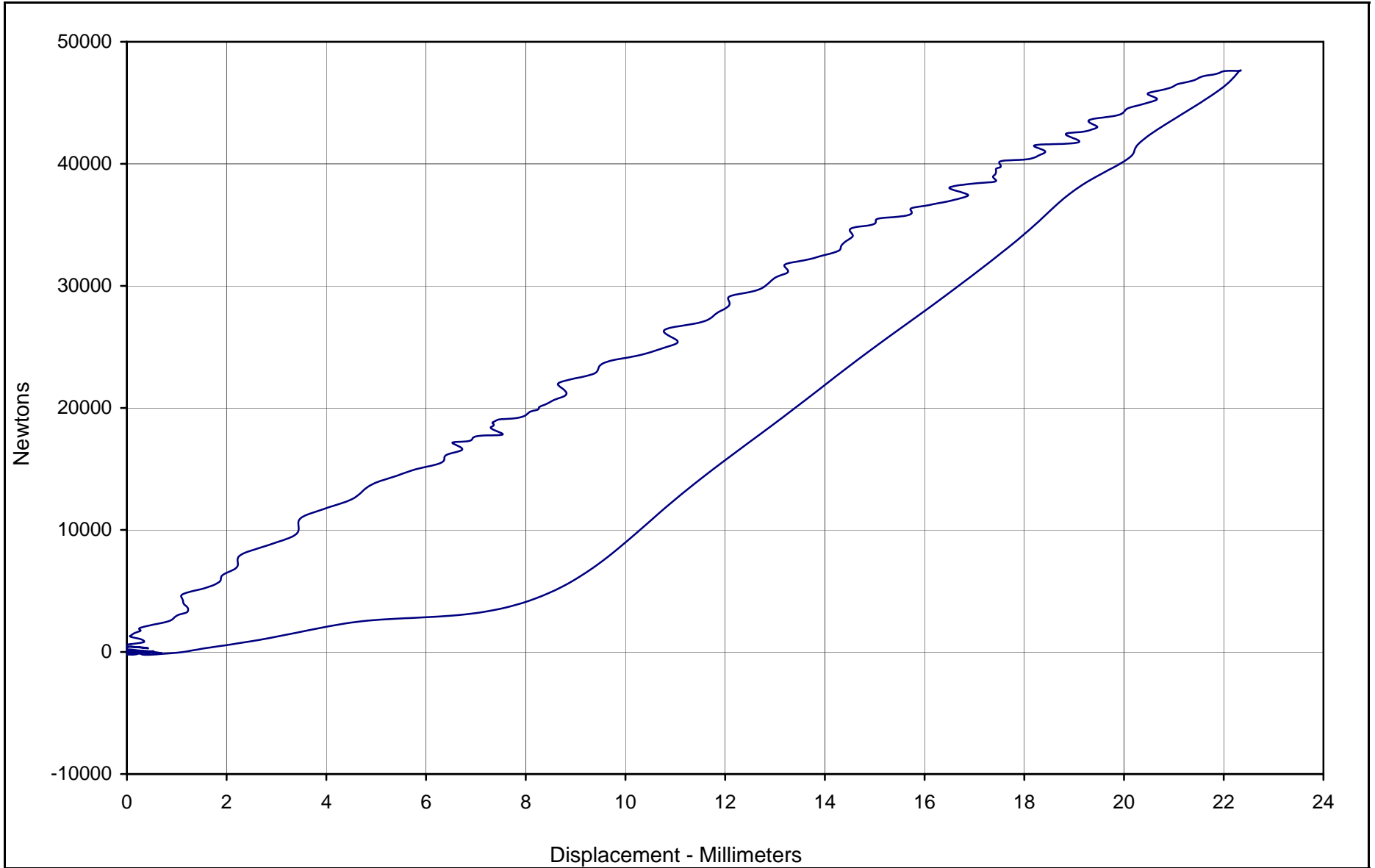


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TR-P27004-09-NC

Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/7/07	P1 Left Side	Displ. vs. Time	01	38.7	44.0	53.3

FMVSS 223 REAR IMPACT GUARD

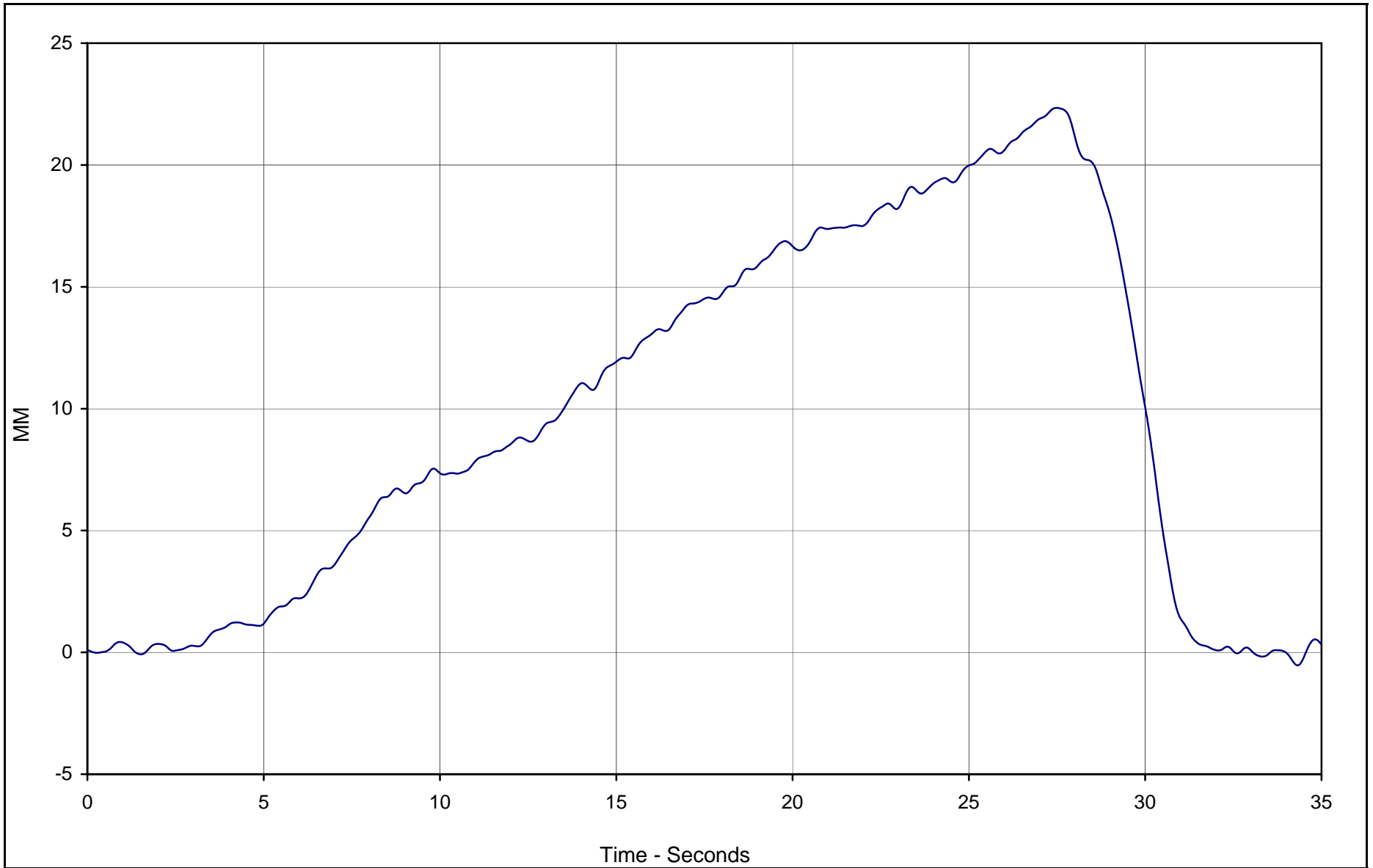


15

TR-P27004-09-NC

Trailer Guard Description	Test Date	Location	Curve Description	Sample Number	Maximum Load (N)	Displacements (mm)	
						At 47.5kN	At Max.
2007 TransFreight Technology	9/5/07	P2 Center	Force vs. Displ.	01	47,658	22.0	22.3

FMVSS 223 REAR IMPACT GUARD

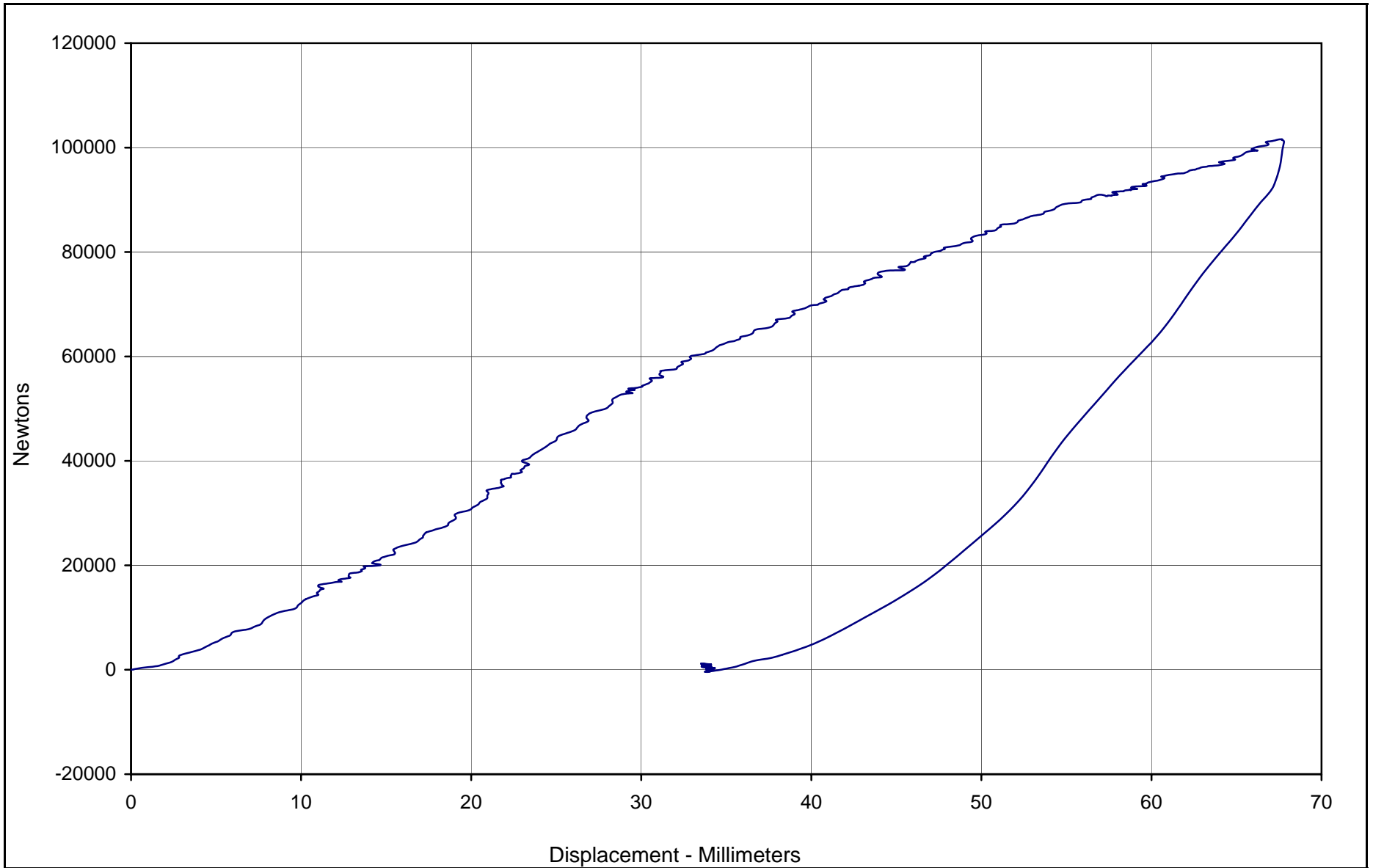


16

TR-P27004-09-NC

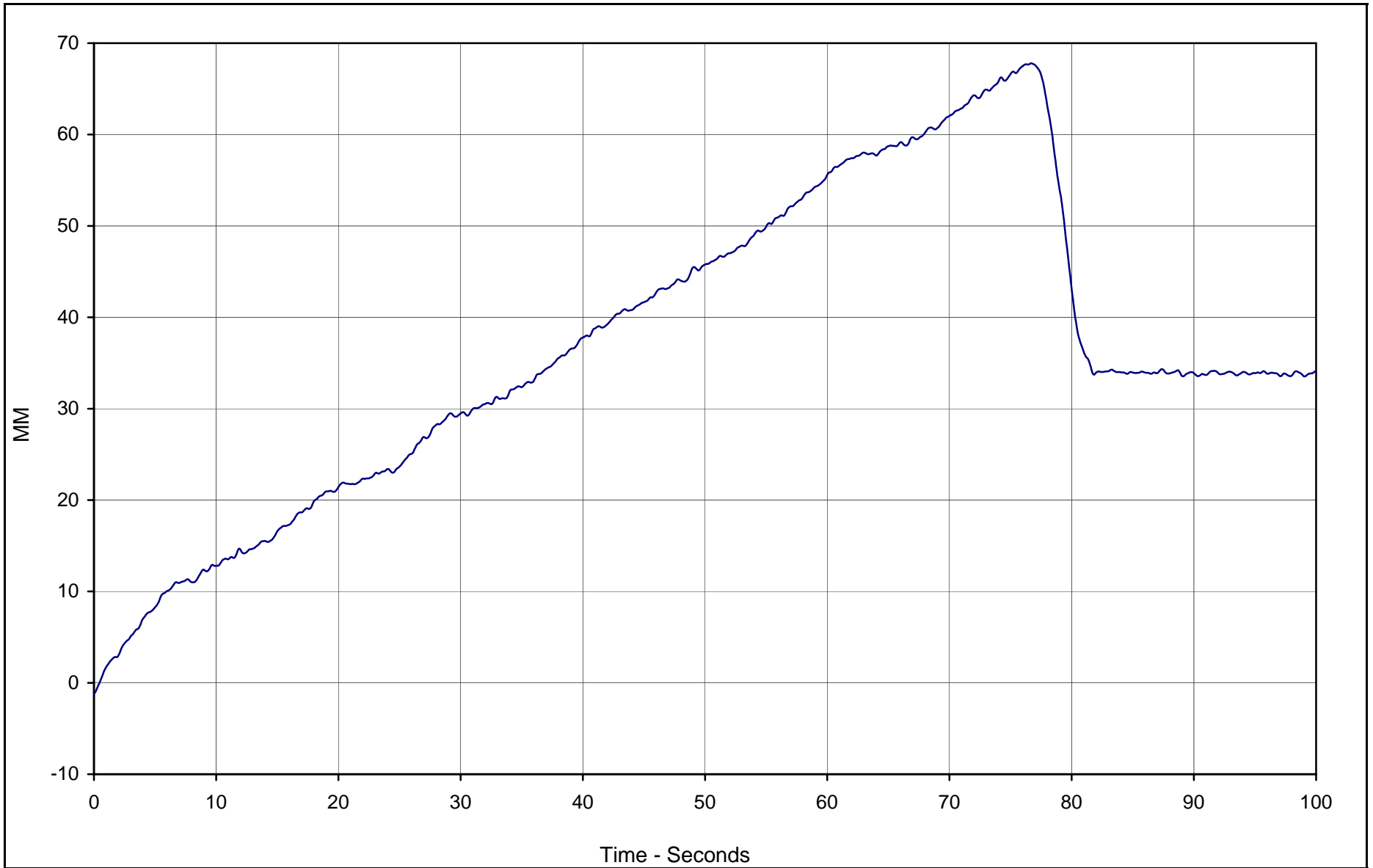
Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/5/07	P2 Center	Displ. vs. Time	01	22.3	27.5	48.0

FMVSS 223 REAR IMPACT GUARD



Trailer Guard Description	Test Date	Location	Curve Description	Sample Number	Measured Energy (J)	Maximum Load (N)	Displacements (mm)	
							At 100kN	At Max.
2007 TransFreight Technology	9/7/07	P3 Left Side	Force vs. Displ.	01	N/A*	101,591	66.1	67.6

FMVSS 223 REAR IMPACT GUARD



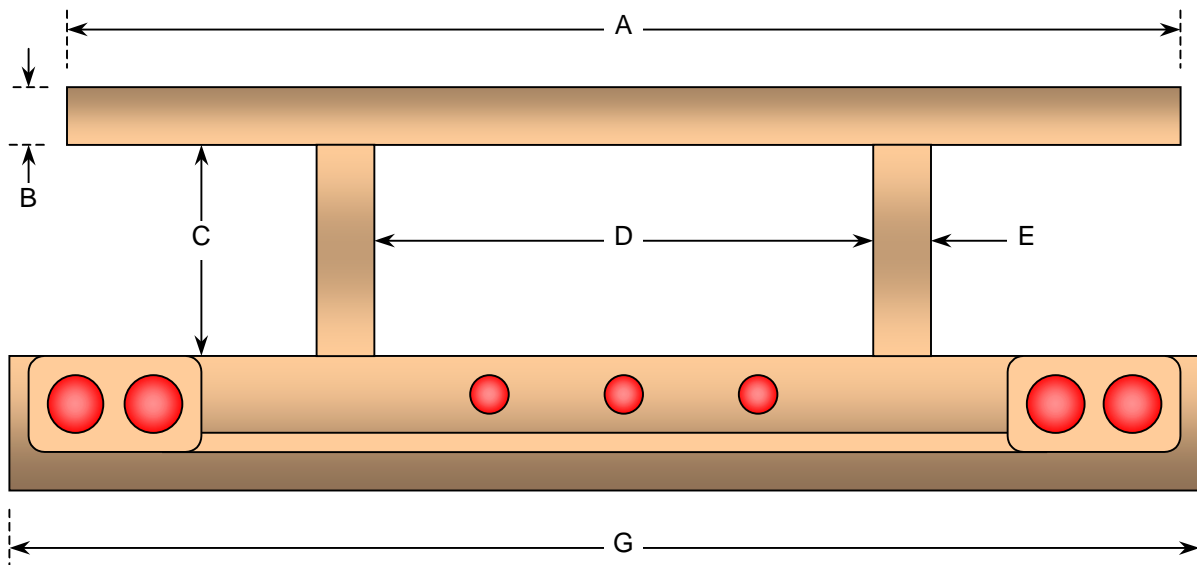
Trailer Guard Description	Test Date	Test Location	Curve Description	Sample Number	Maximum Displ.(mm)	Time at Max. (sec)	Displ. Rate (mm/min)
2007 TransFreight Technology	9/7/07	P3 Left Side	Displ. vs. Time	01	67.8	76.7	53.1

DATA SHEET NO. 3
REAR IMPACT GUARD DIMENSIONS

Trailer Guard Description: 2007 Transfreight Technology NHTSA No.: RIG 009

REAR GUARD OVERALL DIMENSIONS

Item	Measurement Description	Value (mm)
A	Horizontal Member Maximum Width	2390
B	Horizontal Member Vertical Cross-Section	100
C	Vertical Support Member Height	580
D	Vertical Support Member Inside Separation	1030
E	Vertical Support Member Maximum Width	102
F	Rear Floor Thickness	n/a
G	Rear Floor Cross-Member Width	n/a



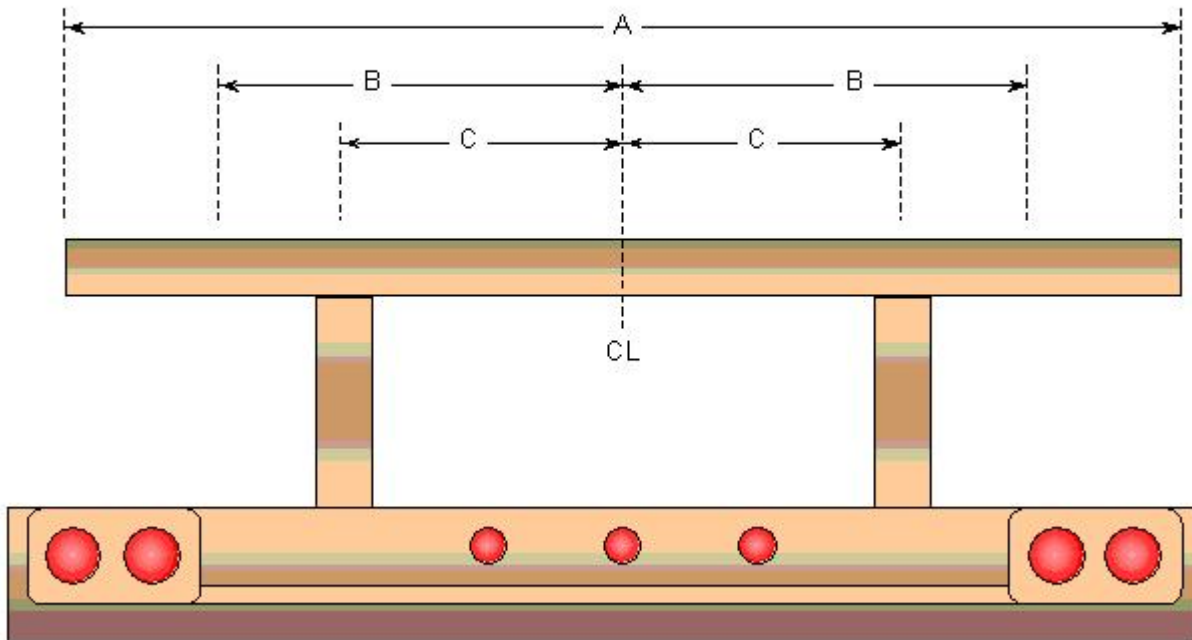
Guard Assembly Rear View

DATA SHEET NO. 3...(CONTINUED)
REAR IMPACT GUARD DIMENSIONS

Trailer Guard Description: 2007 Transfreight Technology NHTSA No.: RIG 009

TEST LOCATION DIMENSIONS

Item	Measurement Description	Value (mm)
A	Horizontal Member Width (reference)	2390
B	3/8 Horizontal Member Width, P1 Location	896
C	P3 Location (between 355 mm and 635 mm from the centerline)	635
CL	P2 Location at Centerline	1195



Guard Assembly Rear View

APPENDIX A
PHOTOGRAPHS



Figure 1. Front View, as Received



Figure 2. Rear View, as Received



Figure 3. Right Side, as Received



Figure 4. Left Side, as Received



Figure 5. Test Setup

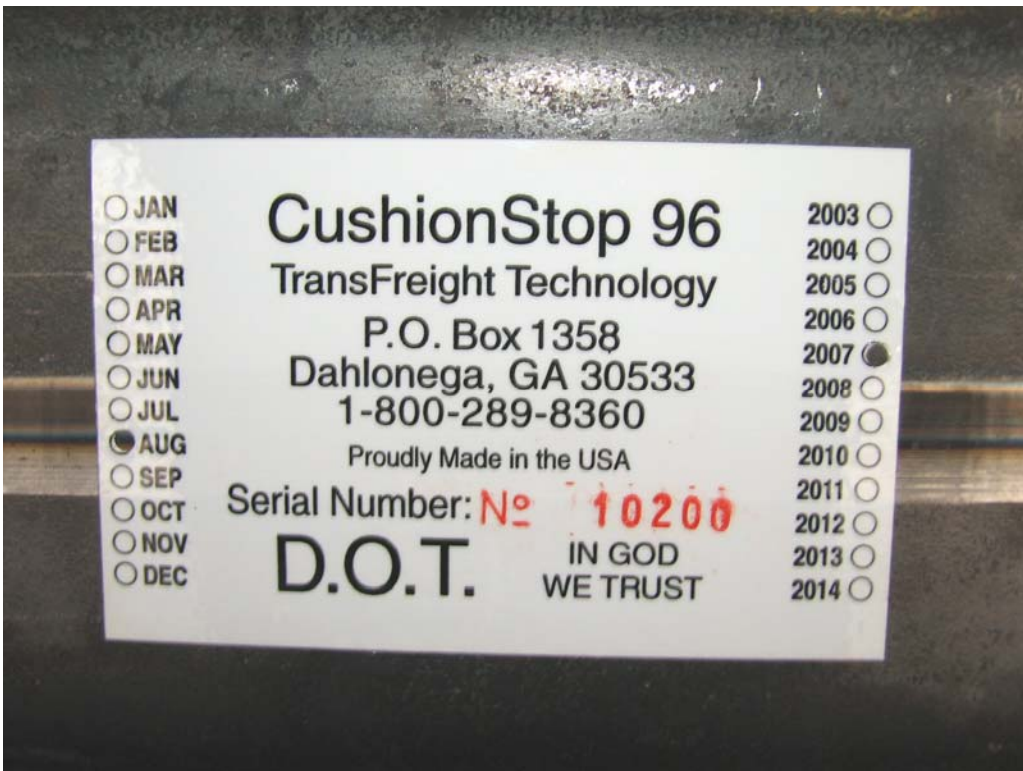


Figure 6. Manufacturer's Label

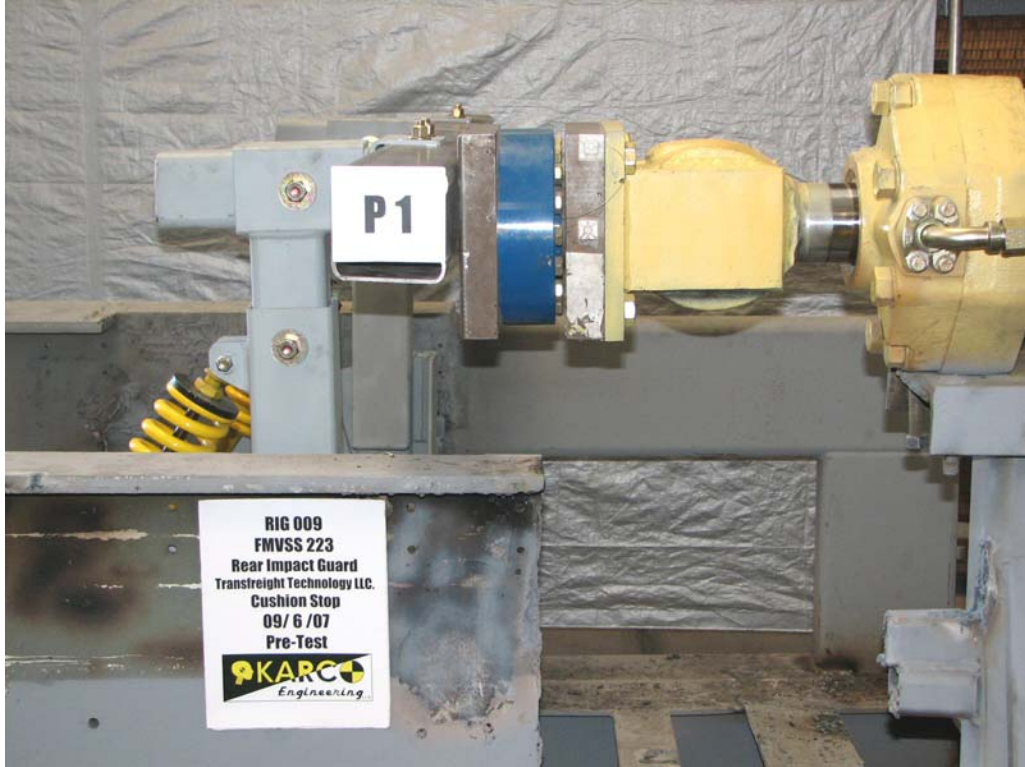


Figure 7. Pre-Test, Location P1, Unloaded



Figure 8. Pre-Test, Location P1, Loaded

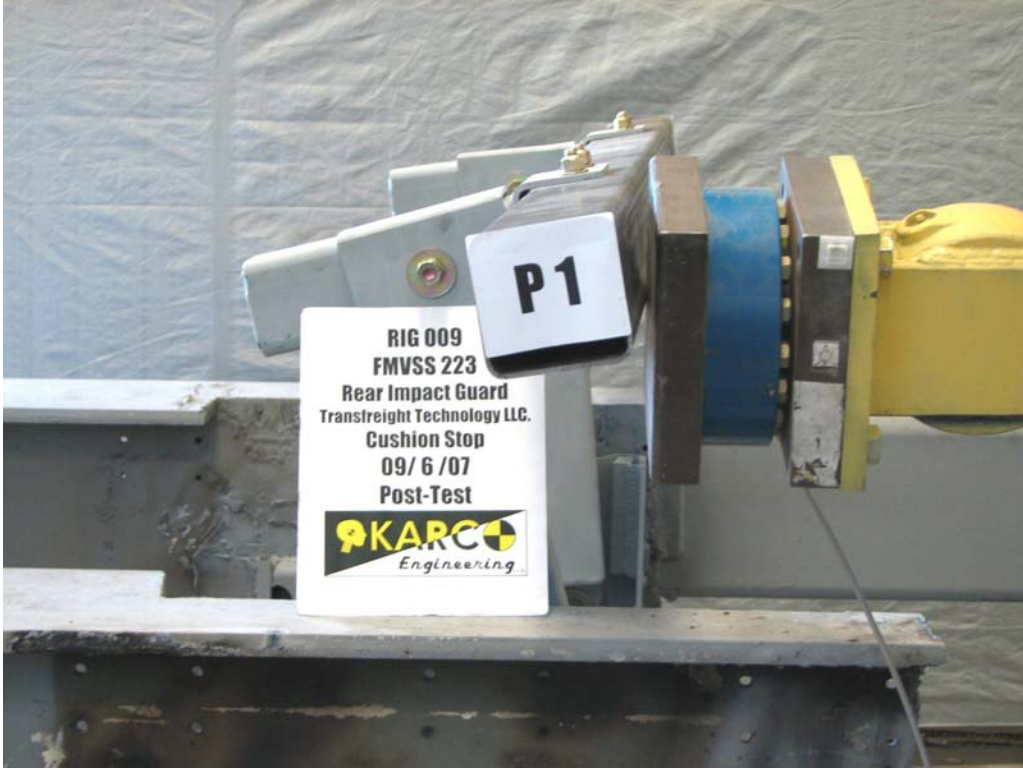


Figure 9. Post-Test, Location P1, Loaded



Figure 10. Post-Test, Location P1, Unloaded



Figure 11. Pre-Test, Location P2, Unloaded



Figure 12. Pre-Test, Location P2, Loaded



Figure 13. Post-Test, Location P2, Loaded



Figure 14. Post-Test, Location P2, Unloaded



Figure 15. Pre-Test, Location P3, Unloaded



Figure 16. Pre-Test, Location P3, Loaded



Figure 17. Post-Test, Location P3, Loaded



Figure 18. Post-Test, Location P3, Unloaded

APPENDIX B

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

Fmvss 223 Rear Impact Guards
Test Equipment List
9/5/07
2007 TransFreight Technology

Description	Manufacturer	Model No.	Serial No.	Limit	Accuracy	Cal. Date	Due Cal.
Hydraulic Pump	Lincoln	T-3825-C	2460952	8 gpm @ 2700 psi			
Computer	Panasonic	CF-48	T0819ZA	N/A			
TDAS	DTS	TDAS1	DM0103	N/A	SAE J211	11/28/06	11/28/07
Load Cell	Interface	1232AF	120774	444 kN	± 1.0%	9/1/07	8/31/08
Displacement Xdcr.	Celesco	PTX101-0030	J0654653	76 CM	± 1.0%	9/1/07	8/31/08

B-1

TR-P27004-09-NC

