152

INVESTIGATION OF SELECT LRFD DESIGN FACTORS THROUGH INSTRUMENTATION OF BRIDGE BEARINGS

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PHYSICAL RESEARCH REPORT NO. 152

JUNE 2006

Illinois Department of Transportation
Bureau of Materials and Physical Research
126 East Ash Street / Springfield, Illinois / 62704-4766

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/IL/HRC.2006-2/152		

4. Title and Subtitle	5. Report Date
INVESTIGATION OF SELECT LRFD DESIGN FACTORS THROUGH INSTRUMENTATION OF BRIDGE BEARINGS	June 30, 2006
	6. Performing Organization Code
7. Author(s) Brad Cross, Nader Panahshahi, Brent Vaughn, David Petermeier, Yuen Siow	8. Performing Organization Report N o.
9. Performing Organization Name and Address Southern Illinois University Edwardsville Edwardsville, IL 62026-1800	10. Work Unit (TRAIS)
	11. Contract or Grant No. IHR-38
12. Sponsoring Agency Name and Address **Illinois Department of Transportation** **126 East Ash Street** **Springfield, IL 62704-4766**	13. Type of Report and Period Covered
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

Tests on twelve bridges (six along Interstate 55 and six along Interstate 70/270) were performed to determine the validity of certain provisions for calculating bearing forces in the Load and Resistance Factor Design (LRFD) and the Load Factor Design (LFD) Bridge Specifications. The bridges were selected to be typical of Illinois interstate highway bridges while maintaining a range of parameters to study. These bridges were instrumented on their beam webs with three strain gage rosettes installed on each beam to measure shear stresses caused by loads. Short term tests with a loaded truck in specified locations were performed. Dynamic tests at highway speeds were also completed. Finite element models were also developed and compared to the test results. Long term data to determine the loading trends for these bridges was gathered to compare predicted extreme loads to those computed in LRFD and LFD. Two provisions in particular were investigated since they were judged to have a heavy influence on the design shears: the shear distribution factor, and the design loadings. In the case of distribution factors, the study indicates the LRFD provisions give better approximations of the actual distribution of loads. Results show that for extreme loadings indicate that the shears determined by the LFD Specification were exceeded in up to five of the twelve bridges studied, with the maximum value exceeding the design shear by 91%. The 75-year design shears were lower than the LRFD Specification in all but one case.

17. Key Words	18. Distribution Statement
Load and Resistance Factor Design, Load Factor Design, Bridge Design, Shear Distribution Factor, Weigh-in-motion, Strain Gages, Truck Load Distribution, Truck Loads, Long Term Load Measurement	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	349	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Illinois Department of Transportation

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Final Report

June 2006

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ACKNOWLEDGEMENTS

This work was supported primarily by the Illinois Department of Transportation and the Federal Highway Administration under their research programs. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect those of the Illinois Department of Transportation, or the Federal Highway Administration.

Dave Barrett of Modjeski and Masters verified the design of the field instrumentation and helped prepare the project proposal. His help is gratefully acknowledged.

This work would have been impossible without the incredible support of several students from Southern Illinois University Edwardsville who have contributed substantially to the text, figures, tables, and conclusions in this report. We would like to particularly thank graduate students Ben Erschen, Lalit Maharjan, Rajesh Shrestha, Jewel Shrestha, and Nawin Khatri, and undergraduate students Ashleigh Komnick, Mark Hanselman, and Ashlee Keller for all their hard work.

In addition to the project team, the maintenance crews from the Illinois Department of Transportation went far beyond the call of duty throughout the testing phase of the project. We would like to particularly thank bridge maintenance supervisors Dave Copenbarger and Tim Krumm for their support.

The support and assistance of the IDOT Technical Review Panel for this work was substantial. In particular, Tom Domagalski, Mark Gawedzinski, and Patty Broers offered many valuable suggestions throughout the project.

Campbell Scientific, Inc., supplier of the dataloggers used in this project, were extremely helpful especially regarding programming of the dataloggers. We would also like to acknowledge the support of our ever-helpful department secretary, Joy Tedford, in keeping us organized throughout.

EXECUTIVE SUMMARY

Tests on twelve bridges (six along Interstate 55 and six along Interstate 70/270) were performed to determine the validity of certain provisions for calculating bearing forces in the Load and Resistance Factor Design (LRFD) and the Load Factor Design (LFD) Bridge Specifications. The bridges were selected to be typical of Illinois interstate highway bridges while maintaining a range of parameters to study. These bridges were instrumented on their beam webs with three strain gage rosettes installed on each beam to measure shear stresses caused by loads. Short term tests with a loaded truck in specified locations were performed. Dynamic tests at highway speeds were also completed. Finite element models were also developed and compared to the test results. Long term data to determine the loading trends for these bridges was gathered to compare predicted extreme loads to those computed in LRFD and LFD. Two provisions in particular were investigated since they were judged to have a heavy influence on the design shears: the shear distribution factor, and the design loadings. In the case of distribution factors, the study indicates the LRFD provisions give better approximations of the actual distribution of loads. Results show that for extreme loadings indicate that the shears determined by the LFD Specification were exceeded in up to five of the twelve bridges studied, with the maximum value exceeding the design shear by 91%. The 75-year design shears were lower than the LRFD Specification in all but one case.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii
EXECUTIVE SUMMARY iii
TABLE OF CONTENTS iv
LIST OF FIGURES vi
LIST OF TABLES vii
1. INTRODUCTION 8
1.1 Statement of the Problem 8
1.2 Research Objectives and Scope 8
1.3 Overview of the Report 9
2. PREVIOUS INVESTIGATIONS 11
2.1 Live Loads 11
2.2 Girder Shear Distribution 11
3. FINITE ELEMENT MODELS 15
3.1 Introduction 15
3.2 Selection of Bridges 16
3.2 Steel Bridge Finite Element Models 18
3.3 Concrete Bridge Finite Element Model 22
4. EXPERIMENTAL STUDY OF DISTRIBUTION FACTORS AND SHEARS 28
4.1 Introduction 28
4.2 Instrumentation Installation, Field Data Acquisition and Post-processing 28
4.2 Short term tests 31
4.3 Long term tests 39
4.4 Results 47
5. SUMMARY AND CONCLUSIONS 58
5.1 Summary 58
5.2 Observations and Concluding Remarks 58
5.3 Future Research 60
REFERENCES 61
APPENDICES 64

APPENDIX A – INSTRUMENTATION DIAGRAMS AND GAGE LOCATIONS 65
APPENDIX B – INSTRUMENTATION AND TESTING PHOTOS 70
APPENDIX C – DETERMINATION OF 75-YEAR BRIDGE LOAD 76
APPENDIX D – COMPARISON OF FINITE ELEMENT RESULTS TO FIELD RESULTS (FIRST SIX BRIDGES) 112
APPENDIX E – DYNAMIC TEST RESULTS (FIRST SIX BRIDGES) 131
APPENDIX F – COMPARISON OF SHEAR AND SHEAR DISTRIBUTION FACTORS (FIRST SIX BRIDGES) 157
APPENDIX F – COMPARISON OF SHEAR AND SHEAR DISTRIBUTION FACTORS (FIRST SIX BRIDGES) 158
APPENDIX G – GRAPHICAL COMPARISON OF DISTRIBUTION FACTORS (FIRST SIX BRIDGES) 167
APPENDIX H - SUMMARY OF DISTRIBUTION FACTORS AND DESIGN SHEAR CALCULATIONS (FIRST SIX BRIDGES) 174
APPENDIX I – MODELING PARAMETERS FOR FIRST SIX BRIDGES 182
APPENDIX J – COMPARISON OF FINITE ELEMENT RESULTS TO FIELD RESULTS (SECOND SIX BRIDGES) 184
APPENDIX K – DYNAMIC TEST RESULTS (SECOND SIX BRIDGES) 202
APPENDIX L – COMPARISON OF SHEAR AND SHEAR DISTRIBUTION FACTORS (SECOND SIX BRIDGES) 236
APPENDIX M - GRAPHICAL COMPARISON OF DISTRIBUTION FACTORS (SECOND SIX BRIDGES) 243
APPENDIX N – SUMMARY OF DISTRIBUTION FACTORS AND DESIGN SHEAR CALCULATIONS (SECOND SIX BRIDGES) 250
APPENDIX O – MODELING PARAMETERS FOR SECOND SIX BRIDGES 274
APPENDIX P – TEST TRUCK LOAD PLANS 275
APPENDIX Q – INSTRUMENTED BRIDGE PLANS AND SECTIONS 337

LIST OF FIGURES

Figure 1: LFD vs. LRFD Shear Distribution Factors 12
Figure 2: Non-composite Modeling Technique 19
Figure 3: Finite Element Model of Steel Girder Bridge (SN059-0041) 20
Figure 4: Distribution of Loads 21
Figure 5: Loaded Finite Element Model (SN059-0041) 21
Figure 6: Concrete Bridge Finite Element Model 23
Figure 7: Girder Meshing 25
Figure 8: Strength Development of Concrete 27
Figure 9: Truck Configuration 35
Figure 10: Strain Gage Configuration and Location Steel Beam 37
Figure 11: Gage Configuration for a Concrete Girder 37
Figure 12: Example of Individual Events 40
Figure 13: Distribution of Truck Load for Truck at Y3 Position (SN0068-0046) 49
Figure 14: Distribution Factor vs. Beam Spacing - First Six Bridges 50
Figure 15: Distribution Factor vs. Beam Spacing – Second Six Bridges 51
Figure 16: Distribution Factor vs. Skew Angle – First Six Bridges 52
Figure 17: Distribution Factor vs. Skew Angle – Second Six Bridges 52
Figure 18: Maximum and Specification Distribution Factors by Bridge Number 53
Figure 19: Maximum and Specification Distribution Factors by Bridge Number 54
Figure 20 – Typical strain gage instrumentation equipment layout. 66
Figure 21 – Strain gage instrumentation components. 67
Figure 22 - completed installation (note the Modjeski and Masters verification gages installed to the left of the green strain gage enclosure) 71
Figure 23 - Strain gage installed on steel beam. 72
Figure 24 - Solar panel mounted to side of abutment 73
Figure 25 - Strain gage rosette on precast concrete beam (blue enclosure indicates this rosette was installed for the short-term load tests only.) 74
Figure 26 - Test truck in place for Static Load Tests 75

LIST OF TABLES

Table 1: Instrumented Bridges 17
Table 2: Convergence Study for Girder Elements 24
Table 3: Truck Loads and Wheel Spacings 36
Table 4: Summary of measured and extrapolated shears (with transverse correction factor) 44
Table 5: Summary of measured and extrapolated shears (without transverse correction factor) . 44
Table 6: Comparison of extrapolated shears to LFD and LRFD design shears (impact effects removed, with transverse correction) 45
Table 7: Comparison of extrapolated shears to LFD and LRFD design shears (impact considered, with transverse correction) 45
Table 8: Comparison of extrapolated shears to LFD and LRFD design shears (impact effects removed, no transverse correction) 46
Table 9: Comparison of extrapolated shears to LFD and LRFD design shears (impact considered, no transverse correction) 46

1. INTRODUCTION

1.1 Statement of the Problem

This project investigates the bearing forces and shears for typical Illinois bridges, using both field testing and analysis. Based on a survey of the literature, as well as information presented at Illinois Department of Transportation (IDOT) seminars on Load and Resistance Factor Design (LRFD), using the LRFD Specification for bridges in Illinois can result in bearing shears of up to 40% greater than those calculated using Load Factor Design (LFD). Two factors in the LRFD Specification contribute most strongly to this increase:

- The requirement that the lane loading be considered simultaneously with the truck loading, designated as HL-93, and
- The effect of the revised girder shear distribution factors

This report will examine the suitability of these requirements to bridge design in Illinois, and recommend design deviations for Illinois, when appropriate.

1.2 Research Objectives and Scope

Project Objectives

As stated in the original "Request for Qualifications", there are six objectives of this study:

1) Based on data collection of selected existing bridges, determine shears and reactions from actual loading conditions on department bridges.
2) Compile the data collected into a meaningful format.
3) Analyze the selected bridges to determine the shears and reactions based on LFD and LRFD design procedures.
4) Compare the data collected to the analytical values.
5) Verify the validity of certain provisions in the LRFD Specifications.

6) Identify and recommend modifications to the LRFD Specifications based on items 1 through 4, providing justification for design deviations for Illinois bridges.

Project Scope

An FHWA mandate requires all new bridges to be designed using the AASHTO LRFD Specifications beginning in 2007. Previous research indicates that requiring design per AASHTO LRFD will result in a substantial increase in girder shears and reactions. This research will determine whether this increase in design forces is realistic for Illinois bridges.

Twelve bridges along the Interstate 55 (I-55) and Interstate 270/70 (I-270/70) corridor have been selected and monitored. The candidate structures were chosen to vary as many parameters as possible. Factors such as skew angle, beam material, bearing material, beam spacing, design methodology, age, traffic factors, and environments are some of the factors that were considered when selecting the candidate structures. These structures were instrumented with strain gages and monitored for six months during two different time intervals. Data were collected and analyzed to determine if the LRFD design factors are realistic in terms of actual Illinois loading conditions.

1.3 Overview of the Report

Chapter 1 is the introduction to the project including problem statement, objectives, and scope of work.

Chapter 2 gives the background for the problem including a survey of the literature regarding distribution factors and determination of extreme loadings for bridges. Some of the theory used in the project is also developed and discussed.

Chapter 3 is the analytical portion of the work. In this chapter the finite element models are developed and described and some results shown.

Chapter 4 discusses the experimental portion of the study. Truck load tests are designed and implemented. The procedures for collecting short- and long-term data are described.

Chapter 5 discusses the results of the study. Suggestions for further research are also made.

2. PREVIOUS INVESTIGATIONS

2.1 Live Loads

In Illinois, using the LFD Standard Specifications, the design live load is an HS-20 truck or a lane loading that is not simultaneously applied. In the LRFD procedure, the load has been changed to requiring an HL-93 design truck, applied simultaneously with a lane loading. A tandem axle truck load is specified as well. The HL-93 truck is equivalent to an HS-20 vehicle, but the requirement to add a simultaneous lane loading makes the LRFD procedure result in higher forces for spans longer than about 40 feet. Applying the live load provisions of the LRFD Specification will result in shears that are roughly 20% higher for bridges with 100 foot span lengths (Uehle 1999).

The original HL-93 (truck plus lane load) was based on a study of "grandfather" exclusion loads throughout the United States, which sometimes caused higher moment and shear effects than the standard HS-20 truck. A "notional" load was developed that could include these effects, which ultimately resulted in the HL93 load (Transportation Research Board 1990). The use of these loads was further verified by truck weigh station (NCHRP 1992) and weigh-in-motion studies (Hwang et al. 1991, and Moses et al. 1985) and is thought to represent a good estimate of the extreme (75-year) truck loads for highway bridges in the U.S.

2.2 Girder Shear Distribution

LFD and LRFD Shear Distribution Factors

In the LFD Standard Specifications, shear distribution factors for axle loads are calculated for interior beams (as an example) per AASHTO LFD Table 3.23.1 as S/11 (where S is the girder spacing). In the LRFD Specification, shear distribution factors are calculated per AASHTO LRFD Table 4.6.2.2.3a-1 as

$$0.2 + \frac{S}{12} - \left(\frac{S}{35}\right)^2$$

for an interior concrete or steel I-beam beam with 2 or more lanes loaded. A skew factor is also used in LRFD to increase this distribution for skewed bridges. Aside from skew, both LFD and LRFD distribution factor equations are dependent primarily on the girder spacing, and are applicable for span lengths from 20 feet to 240 feet. As can be seen in Graph 1, the distribution factors for LRFD design are greater than those for LFD design when the girder spacing is less than 11.7 feet. For typical Illinois girder spacings of 7.5 feet, the LRFD distribution factor will equal 0.78, whereas the current LFD Specification would require a distribution factor of 0.68 (a 15% increase in design shears under LRFD for all span lengths) (Uehle 1998, Rensing 2001).

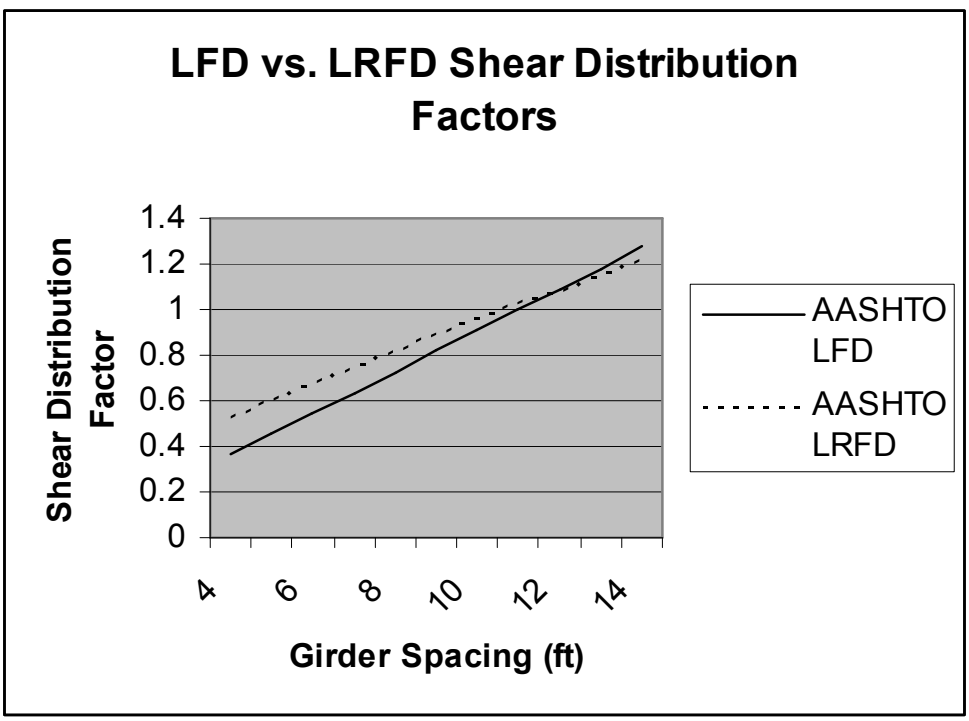

Figure 1: LFD vs. LRFD Shear Distribution Factors

Distribution Factor Research

Transportation Research Record 1290 summarizes the research that are the basis for the moment and shear distribution equations seen in the current *LRFD Specification*. The

study, conducted by Toorak Zokaie, Roy Imbsen, and Timothy Osterkamp, examined the accuracy of the AASHTO live load distribution factors used for bridge design. Researchers analyzed common bridge types, such as beam and slab bridges, multi-cell box girder bridges, slab bridges, multi-box beam bridges, and spread box beam bridges. For each selected test bridge, three levels of analysis were performed. The first and most accurate analysis was conducted using a detailed model of the bridge. This detailed model was created using finite element analysis. The second level of analysis was conducted using graphical methods, nomographs, and influence surfaces. The third level, which proved to be the least accurate, was conducted using simplified formulae similar to the formulas in the AASHTO Bridge Design Specifications. For each bridge type, a database of actual bridges was compiled that included bridges from several states to ensure a national representation. The database included various parameters of the bridge geometry including beam spacing, span length, and slab thickness. Afterwards, an "Average Bridge" was created using the average values of the mentioned parameters. The bridge parameters were varied one at a time for each bridge type and the distribution factors were calculated using each level of analysis. This method would determine the magnitude of the effect of the various parameters. The distribution factors were analyzed using a finite element method and compared to the approximate factors calculated using each level of analysis. The ratio of the approximate distribution factor to the finite element distribution factor was used to evaluate the accuracy of each level of analysis. After all of the analysis was completed, the finite element analysis, although complex, produced the most accurate distribution factors if performed correctly. Due to its complexity and minimal gain in accuracy, finite element analysis is only recommended for bridges with complex geometry where simplified procedures cannot be used. The second level of analysis also produced accurate distribution factors. The simplified formulas used in the third level of analysis produced varied results depending on the formulas. Several formulas were produced from the study and these formulas, which are more complex than the LFD formulas, produce more accurate distribution factors. The simpler LFD formulas were also analyzed in the study and were found to produce inaccurate distribution factors. In more than 40% of the analyzed bridges, the simplified AASHTO formulas produced lower values than those found in analysis. The

unconservative results were more prevalent in bridges with longer spans and wider beam spacing. The authors claim that within the range of applicability for the equations, the LRFD equations give results that are within 5% of a finite element deck analysis (NCHRP 1992, Zokaie 2000). These factors were not calibrated to give results similar to current LFD design standards.

University of Michigan graduate student Junsik Eom and Professor Andrzej S. Nowak, evaluated the accuracy of the AASHTO girder moment distribution factors by comparing them to the actual values found through field-testing (Eom and Nowak 2001). Before the field-testing could begin, the bridges had to be selected based on span, accessibility for testing equipment, traffic volume, skew, and existence of non-typical features. The study was narrowed down to 17 steel girder bridges, which each carried two lanes of traffic. Strain transducers were attached to the bottom flange at the middle of the span. Then, the recorded strain data could be used to calculate the load distribution factors. The maximum GVW of the test trucks for this experiment was 730 kN. Before the trucks went across the bridge, the truck's axle weights were determined at a local weigh station. Strain data was obtained for a single truck at crawling speed and at regular speed. This data was compared to the strain for two trucks side-by-side at crawling speed and at regular speed. The crawling speed was used to simulate static loading. After the data was obtained, the girder distribution factors could be calculated using the strain data. In addition to the field-testing, a finite element analysis of each bridge was conducting using ABAQUS. Finite element analysis was not conducted on three of the bridges due to their irregular shape. For modeling reasons, older simply supported beams could not be considered simply supported because of bearing corrosion. The bearing corrosion creates a bond with the beam and therefore does not act like a simple roller. For each bridge, three types of boundary conditions were considered. The first case was a simply supported beam supported by a pin and a roller. The second case is a statically indeterminate beam supported by two pin connections. The third case is a simply supported beam with elastic springs attached to the top of the beam on the pinned side and the top and bottom of the beam on the side with the roller. The K values for the elastic springs were adjusted until the strain value in the beam matched the strain values

from the field. Afterwards, loadings were applied to the modeled bridges to imitate loadings that occurred in the field. Then, the girder distribution factors calculated from field-testing and finite element analysis were used to evaluate the accuracy of the distribution factors calculated using AASHTO LFD (AASHTO 2002) and the AASHTO LRFD (AASHTO 1998). The AASHTO LRFD distribution factors proved to be more accurate and consistent with the distribution factors from the field-testing and finite element analysis.

Several agencies have expressed concern that the new factors give higher forces. As a result, an NCHRP study (12-62), "Simplified Live-Load Distribution-Factor Equations", is currently in progress to examine the distribution factors in detail, and recommend revisions to the LRFD Specifications. Revisions under consideration are primarily concerned with establishing simpler load distribution equations with narrower ranges of applicability. NCHRP 12-62 does not include new field testing of bridges.

3. FINITE ELEMENT MODELS

3.1 Introduction

Twelve bridges were selected to be representative of interstate highway bridges in Illinois. Detailed three-dimensional finite element models were constructed of all twelve bridges. Ten of these bridges were steel and two were concrete. It was the goal of these finite element studies to predict as accurately as possible, within the limitation of a linear-elastic finite element model, the forces in the beams and at the bearing caused by both the experimental truck load and a design truck. This work was performed prior to the experimental portion of the project (Chapter 4) in order to estimate in advance the strains expected in the actual structures to facilitate the design of the experiments. The development of these models is discussed in this chapter.

3.2 Selection of Bridges

Six bridges along Interstate I-55 and six along Interstate I-270/70 in Illinois were selected for monitoring. The project team chose candidate structures from the IDOT database after meetings with the project technical review panel. Trips were made to examine the potential test structures before the final decisions were made. A wide variety of bridge configurations were included in the sample selection. Bridges were chosen to most typically represent the bridge inventory in Illinois. Some important parameters considered included:

- Beam spacing
- Skew angle
- Span length
- Beam material
- Bearing material
- Bearing type
- Beam type (composite, noncomposite)
- Slab thickness
- Design methodology
- Age
- Traffic factors
- Environments

Bridges were selected to provide as wide a range of these parameters as possible, while still being consistent with typical interstate bridges in Illinois. The bridges selected for this study are shown in Table 1. Plan and section views of the structures can be found in Appendix Q.

First Set of Six Bridges

Structure #	Beams	Spacing (ft)	Beam Size	Spans	Span 1 (ft)	Span 2 (ft)	Span 3 (ft)	Span 4 (ft)	Deck Width (ft)	Skew (deg)	Slab Thickness (in)	Bridge Type	Over	Location and Notes
059-0041	6	7.25	W30 X 99	3	40.1	47.3	40.1	-	42	10	8	Steel	Road	I-55 MP 43
068-0048	6	7.167	42" Welded Plate Girder	3	68.6	86.0	68.6	-	42	0	6.5	Steel	RR	I-55 MP 53
068-0046	7	7.25	54" Welded Plate Girder	3	84.5	113.0	84.5	-	42	59.12	8	Steel	Road/RR	I-55 MP 54
084-0107	6	7.625	W33 x130	3	48.0	57.0	48.0	-	42.1	39.92	8	Steel	Creek	I-55 MP 82
054-0043	9	6.5	48" Prestressed Concrete Girder	3	66.0	67.0	66.0	-	58	0	7.5	Concrete	Creek	I-55 MP 125
059-0040	6	7.25	W30 X 108	3	40.1	47.3	40.1	-	42	10	8	Steel	Road	I-55 MP 43

Second Set of Six Bridges

Structure #	Beams	Spacing (ft)	Beam Size	Spans	Span 1 (ft)	Span 2 (ft)	Span 3 (ft)	Span 4 (ft)	Deck Width (ft)	Skew (deg)	Slab Thickness (in)	Bridge Type	Over	Location and Notes
060-0319	6	7.417	54" Prestressed Concrete Girder	4	54.5	96.0	96.0	54.5	43.2	17	7.5	Concrete	Bike Path/Creek	I-270 Just East of IL 159 Integral Abutment
060-0055	7	5 @ 6.417'; 1 @ 4.5'	W33x141 (6 Old) + W30 X 173 (1 New)	4	57.5	69.0	69.0	57.5	43.2	32.57	7.5	Steel	Road/Bike Path	I-270 Over Old Troy Road
060-0028	7	6.625	W27 X 84	3	35.5	41.5	35.5	-	43.7	0	7	Steel	Creek	I-70 MP 18
003-0001	7	6.33	W24x84	3	40.0	50.0	40.0	-	42	26.5	7	Steel	Creek	I-70 Near MP 39
003-0006	7	6.33	W33x130	4	50.0	50.0	50.0	50	42	0	7	Steel	Creek	I-70 Near MP 39
003-0004	5	8	64" Welded Plate Girder	4	65.0	100.0	100.0	65	36	0	7.5	Steel	Creek	I-70 Near MP 39

Table 1: Instrumented Bridges

3.2 Steel Bridge Finite Element Models

Model Construction

The superstructure and deck of each bridge was modeled using SAP2000. The first step in modeling the bridge was to simplify the structure. Since the primary concern of the project was the distribution of the wheel loads to the bearings, only the superstructure and deck were modeled. Each bridge was modeled so the girders were parallel with the x-axis, and the z-axis was oriented in the vertical direction. Each girder was modeled on multiple rollers and one pin, which represent the support conditions found at the piers and abutments. Roller connections were used to represent expansion bearings and pinned connections were used to represent a fixed pinned bearing. Ideal conditions were assumed in the finite element model, i.e., partial restraint of rollers and pins due to corrosion was not considered. The rollers allowed for movement in the x direction and rotation about the y-axis, while the pin only allowed for rotation about the y-axis. The remaining degrees of freedom were fixed for each support.

The flanges and webs of each girder were modeled individually using shell elements that had six degrees of freedom per node. The thickness of each shell element was identical to the thickness of the web or flange it represented. Each thickness was obtained from the *Manual of Steel Construction Load and Resistance Factor Design* (AISC 2001). The dimensions and location of each girder were obtained from the original design plans provided by IDOT. The concrete deck was modeled as a plate with finite thickness and then it was extruded the thickness of the slab to create a solid element. The solid element had three degrees of freedom per node. Since the only loads applied to the model were vertical loads, the deck will primarily be resisting forces in the z-direction. Therefore, the solid elements should be accurate for the model. The effects of the reinforcing bars in the slab have been ignored.

After all of the girders and concrete deck were modeled, the auto mesh command was used to refine the mesh density of the model. In an attempt to maintain consistent meshing, each shell was roughly meshed to a twelve-inch by twelve-inch element. Each brick element was meshed to similar dimensions. Once all of the elements were meshed to the desired density, the non-composite action of the deck was modeled. The bottom of the slab was offset one half-inch from the top of the beam. Body constraints were applied to the adjacent nodes of the beam and slab. When body constraints are applied to several nodes, these nodes will have the same deflection and rotation in the specified direction. In the design, concrete haunches are used to brace the compression flange. In addition, the slab should deflect indentically to the beam. Therefore, the adjacent nodes were constrained in the y and z directions. The remaining degrees of freedom were kept independent of each other. This modification should capture the non-composite action of the deck. Composite beams were modeled in a simpler way assuming that there was no relative movement in any direction between the top of the beam and the bottom of the haunch. A cross section of the beam and slab illustrating the non-composite modeling technique can be found in Figure 2.

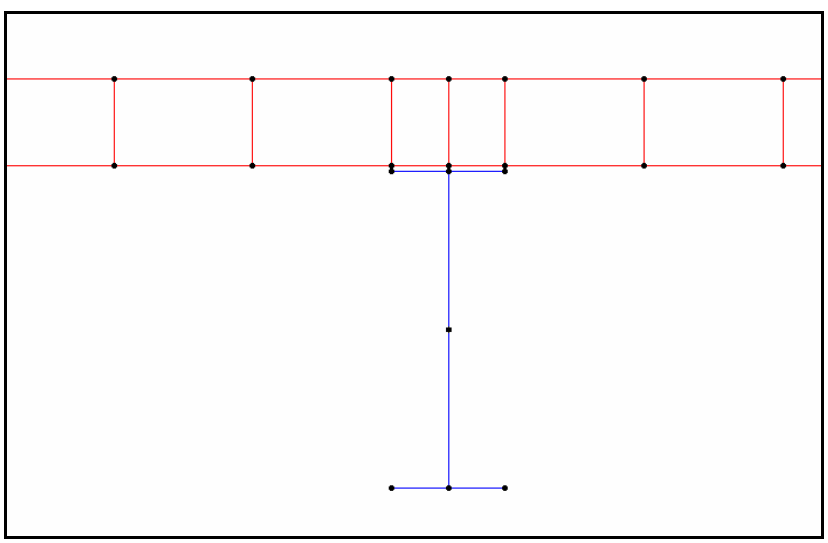

Figure 2: Non-composite Modeling Technique

Additional details were modeled including the steel diaphragms, concrete parapets, and the concrete deck haunches on the end diaphragm. Each diaphragm beam was modeled using a frame element with fixed connections at each end. The diaphragm member in the finite element model has the same properties of the actual beam. To be consistent with

the previous mesh density of the deck, the parapets, rectangular in shape, were modeled directly over the most exterior elements representing the slab. The parapets were composed of solid elements similar to those used for the slab. The abutment edge of the slab was also modeled using solid elements with a similar mesh density. Once the edge was complete, body constraints were used to replicate the deck haunch bearing on the end diaphragm beam. The adjacent nodes of the diaphragm and haunch were only constrained in the z direction. The model of SN059-0041 can be seen in Figure 3.

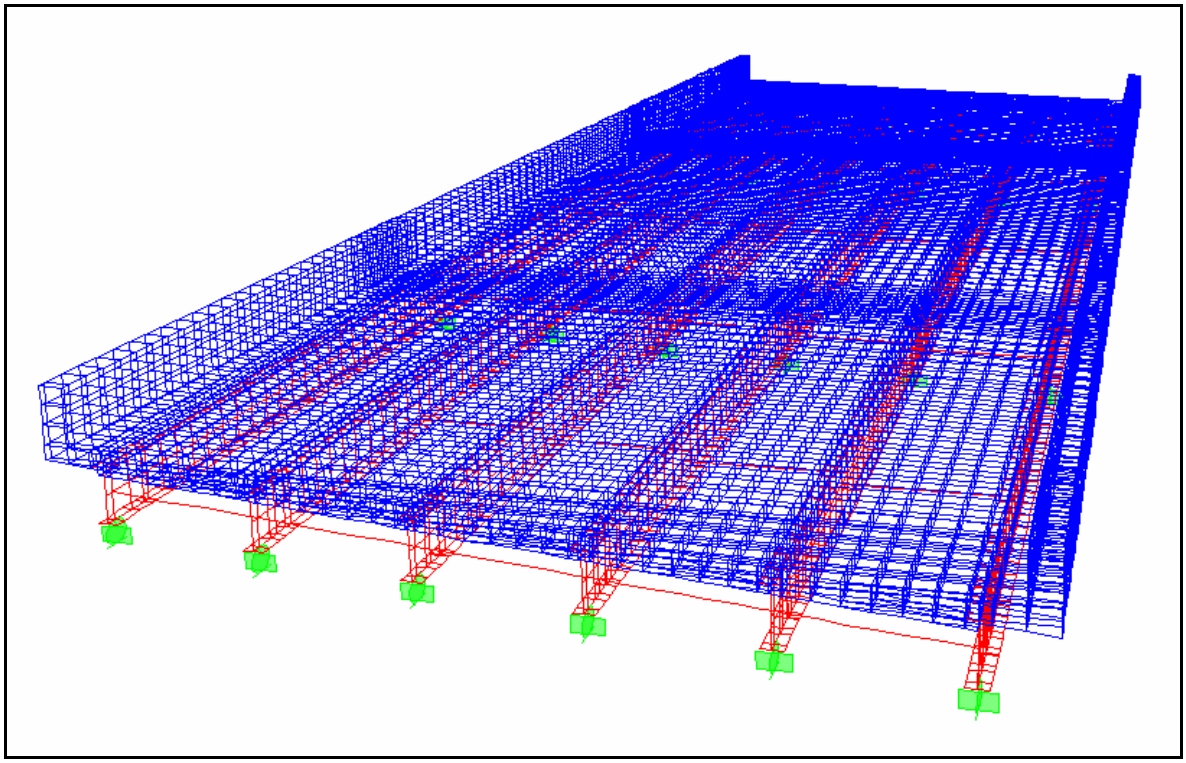

Figure 3: Finite Element Model of Steel Girder Bridge (SN059-0041)

Finite Element Model Analysis

To compare the field test data (Chapter 4) to the finite element analysis data, the axle weights of the truck for each load position had to be entered accurately into SAP2000. The concentrated point loads cannot be applied directly within the solid elements that were selected for the deck. However, joint loads can be applied to any of the eight nodes making up the solid element. Therefore, once the placement of the wheel load was determined, the load was statically distributed to the four nodes making up the top surface of the solid element. Figure 4 shows the formulas used to statically distribute the

wheel loads. Figure 5 illustrates the concentrated point loads making up the test truck load.

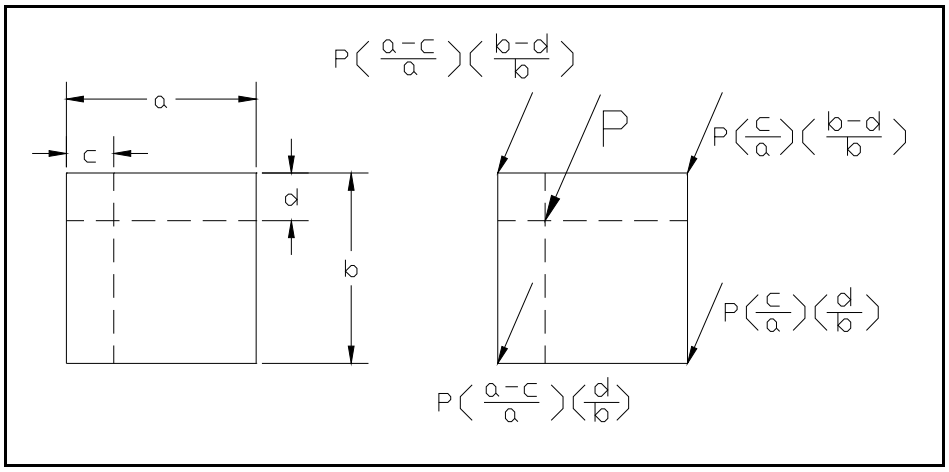

Figure 4: Distribution of Loads

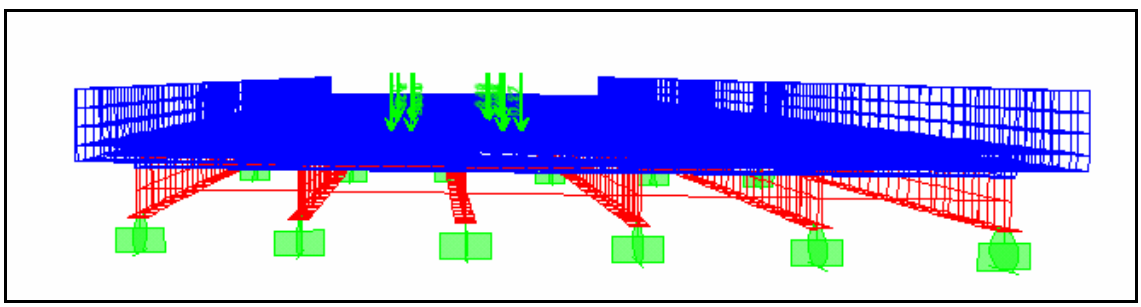

Figure 5: Loaded Finite Element Model (SN059-0041)

A section cut was used to determine the shear in the shells making up the beam web. The section cut was added to the model in the same location where the strain gages were installed in the field. This is used to calculate the value of the shear in the web of the beam, which should be comparable to the computed shear force from the field results. The shear in the beam web for each load position was obtained from the output in the SAP2000. Also the finite element model generated the bearing reaction for each load position at each beam.

3.3 Concrete Bridge Finite Element Model

Two of the structures studied in this project had precast, prestressed-concrete girders. The finite development of the finite element model for these bridges is discussed below, with specific reference to Bridge 054-0043 as an example. Slightly different procedures were used for Bridge 060-0319, where additional rotational spring elements were used to model the bending restraints in the girders at the integral abutments.

Cracking of the Prestressed Concrete Girder

The total combined (axial force and bending moment) stresses at the top and bottom fiber of the prestressed girder section were calculated with the section properties of the girder and the slab. The prestressing force in the girder obtained from the engineering drawings was reduced by 20% to take into account all prestress losses. Design loads were applied to the girder to obtain the maximum moment. The calculated stresses were found to be less than the AASHTO allowable tensile value, $6\sqrt{f_c^{'}}$ (also less than the modulus of rupture $f_r = 7.5\sqrt{f_c^{'}}$), suggesting that there were no cracks in the prestressed girders. This allowed the girders to be modeled as a homogeneous solid. No significant cracks were observed in the actual structures.

Building the Model

The 3D model of the bridge was prepared in SAP 2000, general purpose structural engineering software (Wilson 1999). The girder was continuous for live load over the length of the bridge. A detailed model was prepared for the first span and the rest of the span was modeled with the frame element as shown in the figure below. The slab was modeled using 8-node brick elements while the girders were modeled using 6- and 8-node brick elements. The diaphragms were also modeled using 6- and 8-node brick elements while the parapets were modeled using 8-node solid elements.

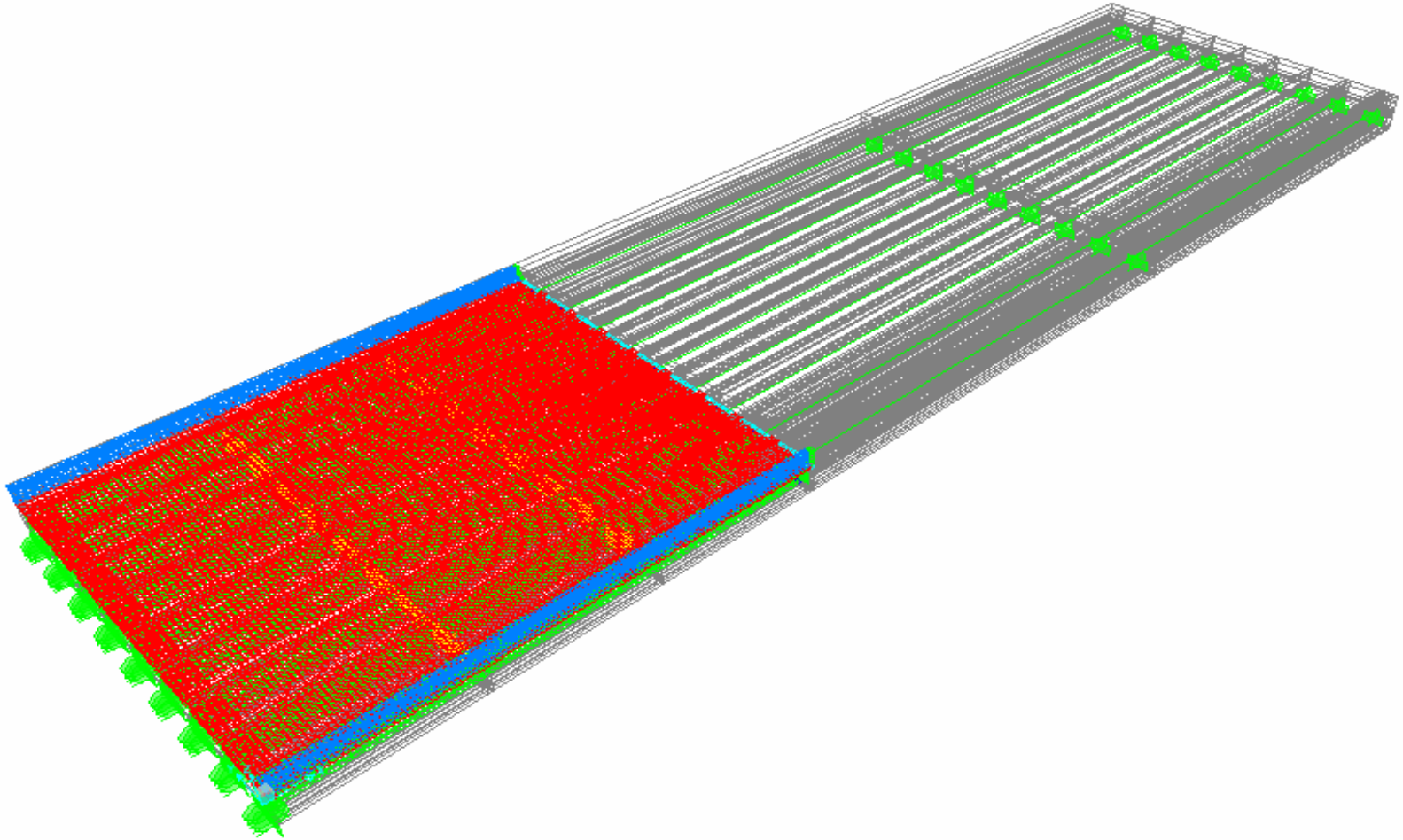

Figure 6: Concrete Bridge Finite Element Model

The cross-sections of the girders were first drawn as shell elements. The shell elements were then extruded to the span length to obtain brick elements. For modeling the slab, the shell elements were drawn on top of the girders and were extruded to the required thickness. The diaphragms were again modeled by first drawing shell elements and extruding them to the required thickness.

Element Meshing and Convergence Study

The finer the mesh, the more accurate are the results obtained from the finite element model. But a finer mesh also takes up a huge amount of disk space and a longer analysis time. So, an optimum mesh size which yields a desired accuracy should be known. A convergence study was performed to identify the optimum mesh size. Results of the convergence study and the optimum mesh size is shown in Table 2.

Mesh Size (in.)	**Load Applied (Kips)**	**Midspan SAP200 Displacement (in.)**	**Variation**
8 X 8 X 4	6	1.680	-
4 X 4 X 2	6	1.686	0.327%

Table 2: Convergence Study for Girder Elements

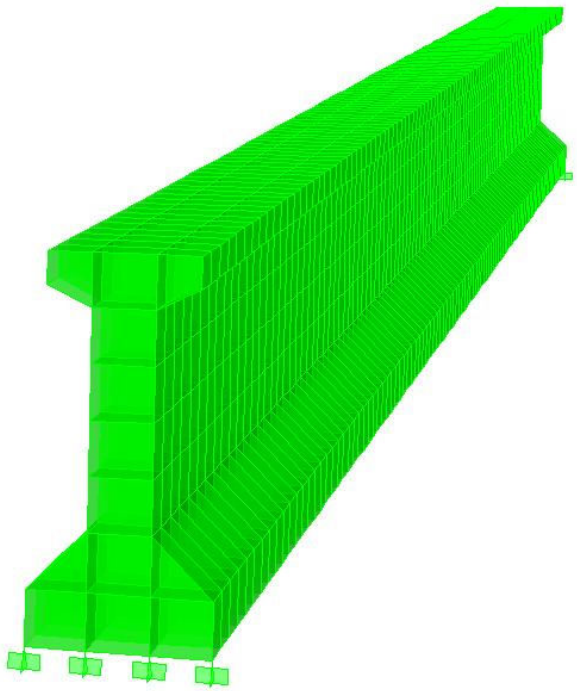

Figure 7: Girder Meshing

When selecting the mesh size, special consideration was also given to the aspect ratios. For proper modeling, any element dimension should not exceed twice the other dimensions (Wilson 1999). Also, the corner angles should be kept between 30^0 and 120^0 (Chandrupatla and Belegundu 2003).

Boundary Conditions

The bridge was modeled such that the longitudinal axis was along the global X direction, the transverse axis along the global Y direction and the vertical axis along the global Z direction. The support at the abutment was assumed to be a roller, support on one of the piers was assumed to be pinned, and for the other pier a roller support was assumed. At the non-integral abutment, the girders of the bridge were restrained against translation in the global Y and Z directions and rotation about the global X and Z axes. At one of the fixed piers the girder was restrained against translation in all global X, Y and Z directions and rotations about the X and Z direction. At the expansion pier, the girders and the diaphragms were restrained against translation in the global Y and Z directions and rotation about the X and Z axes.

Material Properties

From the drawings of the bridge it was found that the concrete compressive strength of the prestressed beam was 5000 psi while that of the slab was 3000 psi. The modulus of elasticity was calculated using the following formula, obtained from ACI 318-02.

$$E_c = 33 \times (145)^{1.5} \times \sqrt{f_c^{'}}$$

where, E_c is the modulus of elasticity of concrete in psi and

$f_c^{'}$ is the compressive strength of concrete in psi.

Since the bridge was more than 30 years old, aging of concrete was also taken into consideration. Concrete gains strength as it ages. From the graph shown in Figure 8, the 28 day design compressive strength of concrete increases by about 20% in 5 years (Neville and Brooks 1987). The modulus of elasticity was calculated based on the compressive strength of the aged concrete was increased by 9.5%. The poisson's ratio of concrete was taken as 0.2. It was found in parametric studies that moderate variations (20%) in the compressive strength of the concrete did not significantly effect the results for the determination of the distribution factor, so the values of the compressive strength were not field verified.

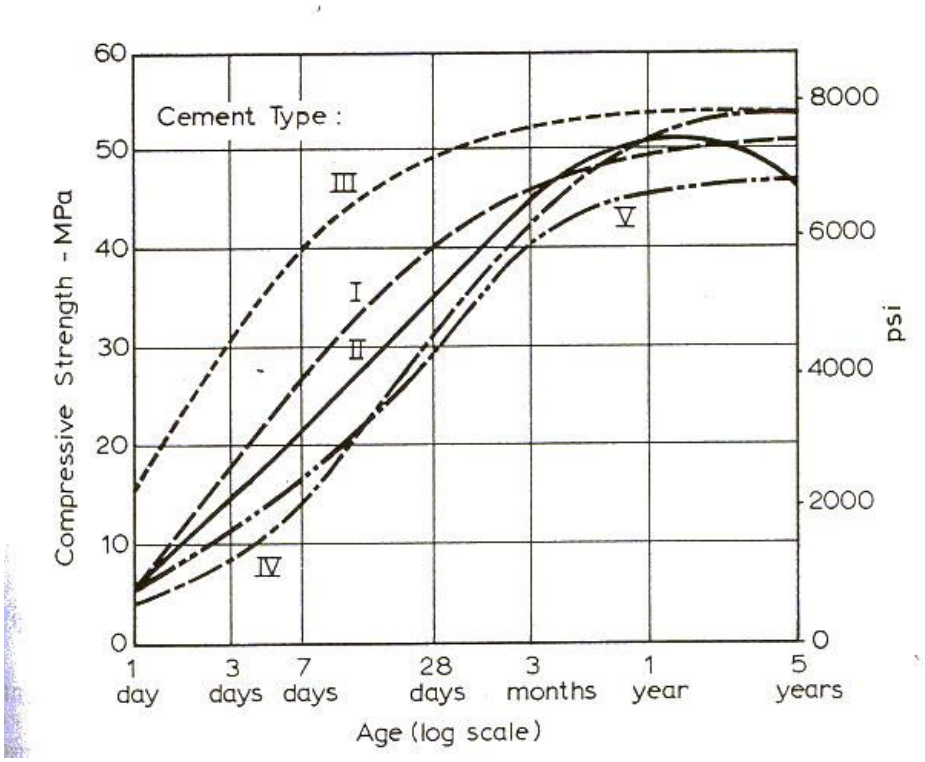

Figure 8: Strength Development of Concrete

(Source: Neville and Brooks 1987)

Finite Element (FE) Model Distribution Factor

Shear forces were determined at one beam depth away from the end of the girder, for all static load test positions, to compare with the field data. The distribution factor corresponding to the maximum force is used for comparison with other data (LRFD, LFD, Dynamic and Static Test). It is important to note that strain gages were attached (in the field) at one beam depth away from the support so that there is no local effect due to the support reaction. Distribution factors were also calculated for the reactions.

Note that the shears in the girders differ from the support reactions in the finite element model. This is due to the influence of the deck, the parapet, the end diaphragms, and the slab haunch on the end diaphragm. All of these were modeled in the finite element study. Since no experiment was performed to directly measure the bearing forces, agreement between the beam shears and the experiment (Chapter 4) are used to validate the finite element model's prediction of the bearing forces. The distribution factors for both the shear in the web and the bearing reactions are shown in the comparisons in Chapter 4 and 5.

4. EXPERIMENTAL STUDY OF DISTRIBUTION FACTORS AND SHEARS

4.1 Introduction

An experimental study was determined to be appropriate to field measure the actual distribution of shears to each girder in the subject bridges. Two distinct phases of testing were designed: a short term study, completed within a day, and a long term study, that collected data over a six-month period. In the next section, the procedures for instrumenting the structure with strain gages is described. In subsequent sections both the short term and long term tests will be explained, and the results discussed.

4.2 Instrumentation Installation, Field Data Acquisition and Post-processing

Bridge selection/ site considerations

In addition to evaluating candidate bridges for the analysis purposes of the project, it was also necessary to determine the practicality of installing the instrumentation at the bridge. Such considerations included safe access to the bridge, including adequate shoulder and/or median space for parking, accessibility for carrying equipment and supplies to and from the instrumentation locations, ability to reach areas on the beams for installing the gages, assessing exposure of the equipment to vandalism, and finding a suitable solar panel mounting surface with sufficient exposure to the sun.

Steel beam preparation

Paint was removed from the steel beams using a chemical paint remover. This method was selected due to the concern for hazardous dust since it was assumed lead-based paint would most likely be encountered. For most of the steel beams, Peel-Away 1, which is a caustic paste, was used. After applying the paste to a 5-inch diameter circular area at each gage location a coated paper was taped over the top of it for about 24 hours. The paper was then peeled away bringing with it the paste and the paint. One beam on one of the bridges tested used a different paint system so another chemical paint remover was used. Final preparation was done following the strain gage manufacturer's instructions which included sanding and detailed cleaning.

Concrete beam

Following initial marking and wash down, preparation for beam installation on concrete beams differed significantly from steel beams. The concrete surface in the gage rosette areas were washed and degreased, then lightly sanded to remove bumps and weathered concrete. Final preparation was done following the strain gage manufacturer's instructions which included sanding and detailed cleaning. A base coat layer of epoxy was applied to the concrete surface in the gage areas.

Strain gage installation

The general arrangement of the strain gages consisted of three triaxial rosettes installed vertically on one side of the the beam web about one beam depth away from the bearing. At selected beams strain gages were installed on opposing sides of the web for observation of torsional effects on the beams.

Strain gages selected for installation on the steel beams were Vishay Measurements Group model CEA-06-125UR-350, general purpose 45 degree single plane rosette, 1/8-inch gage length with three active gage elements. These were bonded to the beams using Vishay Measurements Group AE-10 epoxy for all of the beams on four of the five steel bridges in the first set, and for the long-term beams (Section 4.3) on the five steel bridges in the second set. For the other steel beams Loctite 496 cyanoacrylate adhesive was used. Strain gages selected for the concrete

bridge beams were Vishay Measurements Group model N2A-06-20CBW-350, 2-inch gage length. All of these individual gages were bonded to the beams in a three-active element, 120-degree delta rosette pattern with AE-10 epoxy. After gage wires were soldered to the gages and cleaned, the gages were protected from moisture, weather and mechanical damage using a coating of either AE-10 epoxy or solvent-based polyurethane.

Wiring between the gage pigtail wires and dataloggers was Belden 8723 shielded analog multi-pair cable using three wires per gage with the third wire connected for lead wire resistance compensation.

Datalogger selection/programming

Dataloggers used were Campbell Scientific, Inc. Model CR5000. They provided 20 differential channels and are designed to operate in environmental conditions anticipated for the project. Strain gage bridge completion modules, installed between the strain gages and the dataloggers, were designed and built by Southern Illinois University Edwardsville (SIUE). The dataloggers' program was developed by SIUE using Campbell Scientific's proprietary language. Program features included continuous strain gage monitoring, computation of beam shears, periodic strain gage zeroing and data storage. Long term test data storage was "event driven" to conserve memory by limiting the data stored to a number of records before and after a trigger threshold of computed beam shear was detected. Data was stored on compact flash memory modules that were exchanged in the field every 2 to 3 weeks during the long term test periods. For the short term tests, data was directly downloaded to a laptop.

Datalogger power was provided by one 12-volt, deep-discharge gel cell battery at each site. For the long-term tests, battery recharging was provided by a solar panel mounted to the side of the abutment.

Data Post-processing

Data gathered from the field from each datalogger consisted of a large file (up to several hundred megabytes per field visit) of text–based records each consisting of several fields. The fields included a date/time stamp, record number, shear and data for all strain channels for each of the

two beams monitored. The utilities, written by SIUE using Microsoft Visual Basic Version 6, were developed as modules to implement the following functions for processing the data:

Parser –split the very large multi-day files into daily data files, examined the records and flagged probable "spikes".

Sorter – identified load "events" and determined the maximum daily shear event for each of the two beams, saved the maximum shear event data and the daily beam shear histogram.

Viewer – allowed rapid viewing and archiving of each day's maximum daily shear event in graphical form, and also generated a cumulative beam shear histogram for each beam.

4.2 Short term tests

A test truck program was established to collect data for a series of static, dynamic and rolling load tests. These load tests were performed with a test truck of known weight and axle configuration, and provided a baseline comparison with the analytical shear distribution factors determined by Finite Element Models and the distribution factors defined by the AASHTO Standard and LRFD Bridge Design Specifications.

Test Trucks

The test trucks were provided by IDOT and were heavily loaded with aggregate. Test trucks were weighed at a local weigh station prior to each test to determine the individual axle weights. The axle weights were assumed to be distributed evenly between the two wheels for the front axle and among the eight wheels for the two rear axles. The total weight of the test trucks ranged from 45,000 to 55,000 pounds. A summary of the weight and axle configuration of the test trucks used during testing is included in Table 3.

Static Tests

Static load tests were performed by placing the test truck at predetermined locations along the bridge and recording data with the test truck in a stationary position. Due to the volume of traffic, only one lane of traffic, the driving lane (i.e., right lane), could be closed. Therefore, all of the static load tests were performed within the driving lane and right shoulder, while the passing lane (i.e., left lane) remained open for traffic. However, data was only recorded when no other vehicles were on the test bridge.

Three transverse truck positions were typically used for each load test. The first position placed the truck passenger-side wheels two feet from the face of parapet, per AASHTO LRFD Section 3.6.1.3.1, to maximize lateral load distribution to the exterior girder. The second position placed one of the truck wheel lines directly over an interior girder to maximize the lateral load distribution for the interior girder. The final transverse position for the test truck was centered within the driving lane to represent the distribution of loads for typical traffic.

Multiple longitudinal positions were used along each transverse path. Based on a finite element model study conducted prior to the load tests, the test truck wheels were always positioned at least one beam depth away from the strain gage location in order to avoid local effects caused by the truck wheel load. Generally, it is desirable to place the test truck at the end of the bridge to obtain the maximum shear responses. However, the lateral load distribution changes along the length of the span due to each bridge's specific geometry, the contribution of longitudinal parapet stiffness, interior and end diaphragm stiffness, and the slab haunch onto the end diaphragm at the abutment. Therefore, the test truck was also positioned away from the end of the bridge to better understand the overall behavior of the superstructure. Depending on the length of the span to be tested, four to five longitudinal positions along each transverse path were used.

Individual load test plans were different for each test bridge because of the differences in structure type, construction details and site conditions. See Appendix P for the individual load test plan developed for each test bridge.

Dynamic Tests

Dynamic load tests were performed with the test truck traveling at 55 mph. The same test truck was used for both static and dynamic tests to give an indication of the dynamic effects on each bridge. The transverse truck positions previously described for the static tests were reused, with the exception of the position with the test truck passenger-side wheels two feet from the face of parapet (for safety reasons). An additional transverse position, with the test truck centered within the passing lane, was also included. No traffic lanes were closed during the dynamic load tests. However, by monitoring traffic, and with the aid of traffic control by IDOT crews, data was only recorded when the bridge was clear of all other vehicles.

Slow Rolling Tests

Slow rolling load tests were included in the load test plans for the second set of six bridges. The rolling tests were incorporated to complement the static and dynamic tests and provide further information regarding the dynamic effects of the structures, including the estimation of impact effects. These tests were performed with the test truck traveling at 5 mph. The rolling tests were performed at each of the transverse positions previously described for the static tests, as well as centered within the passing lane when traffic conditions allowed.

Field Load Testing

Twelve interstate highway bridges in Illinois were tested. A group of six bridges along Interstate 55 were tested between December 15, 2004 and February 24, 2005. The load tests for each bridge were typically completed within one day. Completion of the testing for these six bridges took two months because of scheduling problems during the holiday season and due to inclement weather. The second group of six bridges along Interstate 70 and 270 were tested between November 10, 2005 and December 7, 2005 (after the long term testing of the first group of bridges was complete).

Each load test was conducted with the assistance of IDOT personnel. Immediately prior to testing, data loggers were wired to preinstalled strain gage rosettes by SIUE personnel, while the

IDOT traffic control crew closed the driving lane to traffic. After the driving lane was closed, the predetermined transverse and longitudinal load positions were marked on the pavement. These marks identified the location of the driver side front wheel during testing.

Once the preceding preparations were complete, the static load tests were performed. The initial readings for all instrumentation were set to zero while no traffic was on the bridge, including the test truck. The test truck was then driven onto the bridge and stopped at the predetermined positions momentarily for data to be recorded. After the measurements for all longitudinal positions within a transverse load path were recorded, the test truck was driven off the bridge and the instrument readings were reset to zero for the next set of loading positions. This process was repeated until all predetermined static load positions were recorded. The readings for all of the static load test positions were taken when the bridge was clear of all other vehicles.

In order to ensure that all readings were reproducible, data collection for each load position was performed twice. Reproducibility of the data was checked by comparing the strains from the two identical loading positions; in most cases, the strains were within a few percent of each other. Before beginning the rolling and dynamic load tests, the recorded static load test readings were downloaded to a notebook computer for cursory observation. Brief assessments of the field data were important for detecting equipment problems and/or instrumentation malfunctions (e.g., loose wiring or poor strain gage attachment) and helped to avoid the collection of flawed data.

The rolling load tests were conducted following the static tests while the driving lane remained closed. The test truck started off of the bridge and proceeded slowly in order to minimize any impact or dynamic effect on the structure. Traffic within the passing lane was stopped momentarily by the IDOT traffic control crew while the test truck was on the bridge and the readings were taken.

The dynamic load tests were the last to be performed after the traffic control was removed and the driving lane reopened for traffic. However, traffic was cleared using rolling barriers (i.e., two additional trucks) behind the test truck to ensure the bridge was clear of any other vehicles while recording the dynamic load test measurements.

During the rolling and dynamic load tests, the instrumentation was zeroed and each transverse load position was repeated to verify data reproducibility, as previously described for the static load tests. At the end of each test, data was downloaded for brief observation.

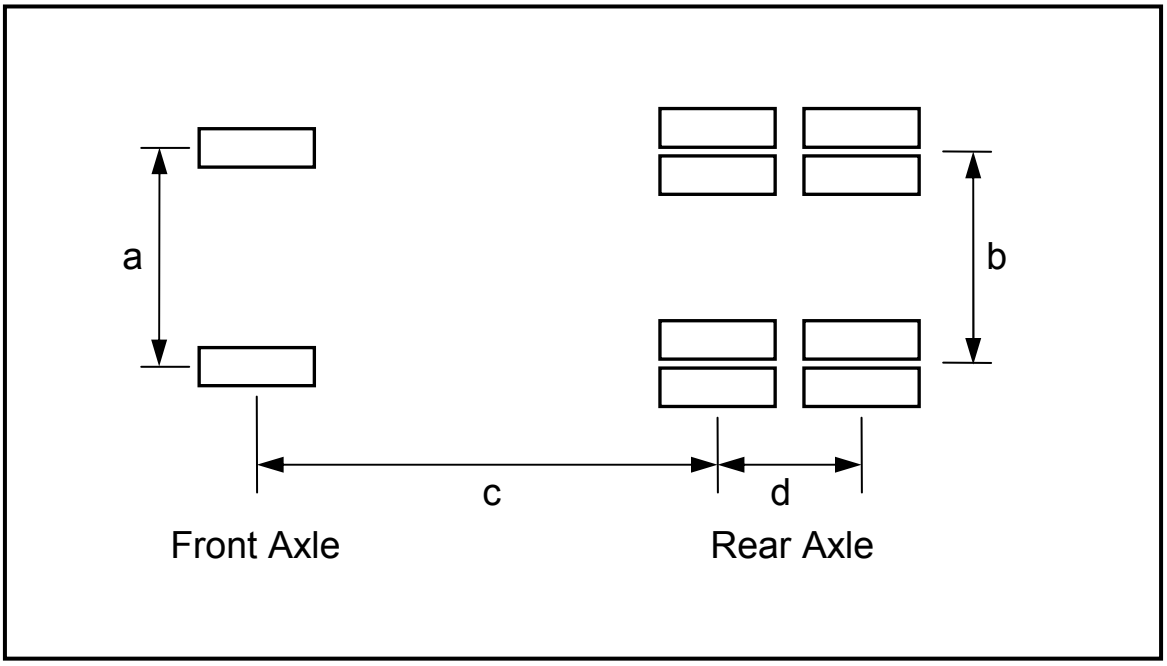

Figure 9: Truck Configuration

Structure	Axle Weight (lbs)		Wheel Spacing (in)		Axle Spacing (in)	
Number	Front	Rear (Combined)	a	b	c	d
059-0041	12,900	33,460	78	72	145	53
068-0048	13,140	31,520	84	72	145	53
068-0046	12,900	33,460	78	78	144	52
084-0107	12,940	41,120	84	72	145	53
054-0043	12,200	35,800	78	78	141	52
059-0040	12,900	33,460	78	72	145	53
060-0319	11,740	35,980	79	72	145	54
060-0056	12,320	32,980	80	73 1/4	144	54
060-0028	11,740	35,980	79	73	145	54
003-0001	10,300	32,880	80	73 1/4	144	54
003-0004	12,320	32,980	80	73 1/4	144	54
003-0006	12,320	32,980	80	73 1/4	144	54

Table 3: Truck Loads and Wheel Spacings

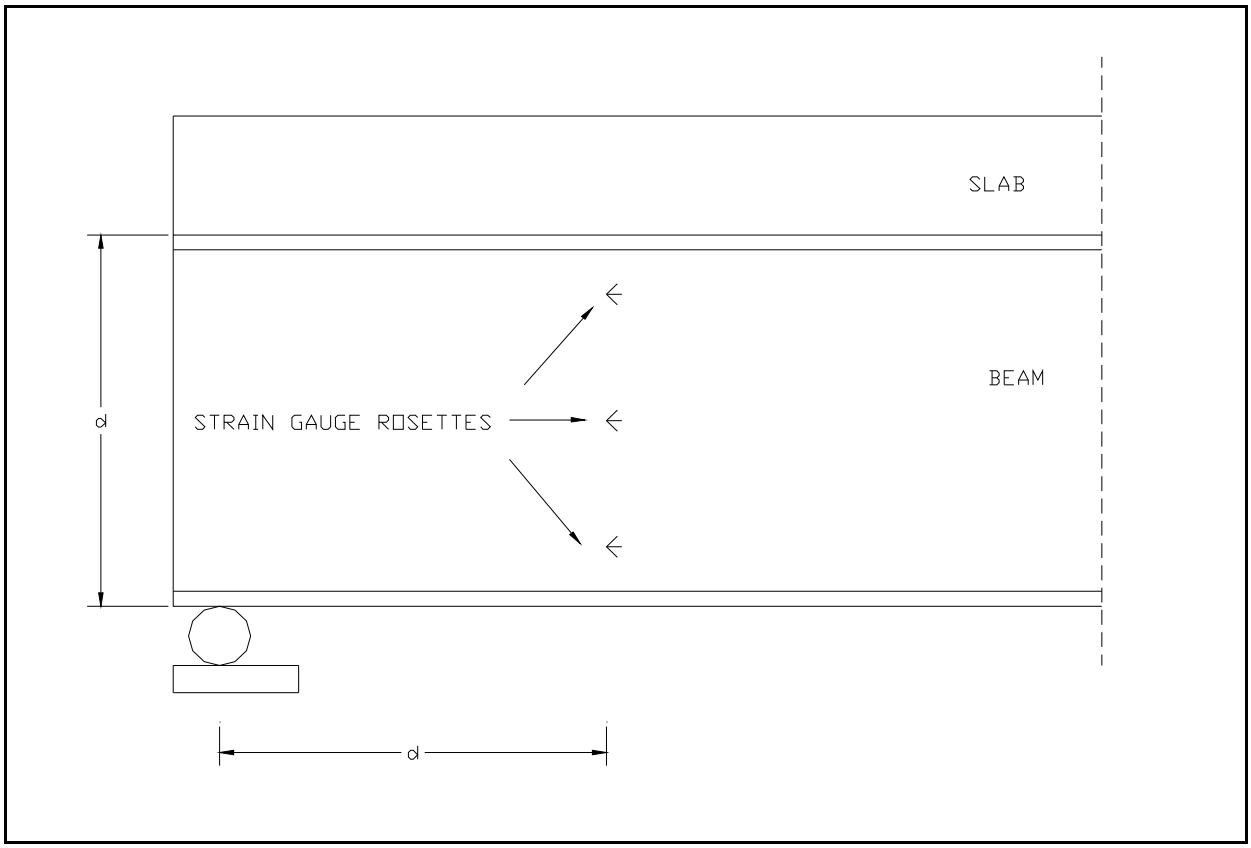

Figure 10: Strain Gage Configuration and Location Steel Beam

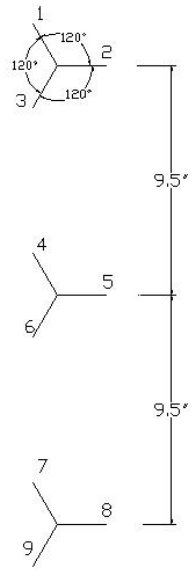

Figure 11: Gage Configuration for a Concrete Girder

Data Analysis – Steel Beams

As shown in Figures 10 and 11, each rosette of strain gages had one horizontal gage and two gages at forty-five degrees to the normal. The shear stress at each strain gage rosette was calculated by multiplying the difference between the strain in the two forty-five degree gages by the shear modulus of steel and thickness of the web. Shear stress in the web of a I-shaped beam (composite or noncomposite) follows a parabolic distribution in the web of the beam between the flanges, with maximum shear stress at the neutral axis for a noncomposite beam. For a composite beam, the distribution is still parabolic but the neutral axis is moved towards the top flange of the beam. A parabolic curve was fit to the three points on the beam where the shear stresses were calculated. The parabolic curve was then integrated over the depth of the beam to obtain the total shear force in the web. The final equation for the web shear follows:

$$F = t_W \cdot G \cdot \left(\frac{1}{1000000}\right) \left(k_1(\varepsilon_9 - \varepsilon_7) + k_2(\varepsilon_6 - \varepsilon_4) + k_3(\varepsilon_3 - \varepsilon_1)\right)$$

F = Shear Force in Beam (kips)
t_w = Thickness of Web (inch)
G = Shear Modulus (11200 ksi)
k_1, k_2, k_3 = Constants of Integration
ε_x = Strains from Load Test Data

The constants k1, k2 and k3 for all the bridges are shown in Appendix I and O.

The total shear through the composite section was then determined by assuming the section was fully composite (no slip between slab and top flange) at the gage location.

Data Analysis – Concrete Beams

Because the shear stress distribution in the precast-prestressed concrete girders was somewhat more complicated than in the steel beams, a different method for calculating the total shear through the cross-section was used. For the three points where gages were installed in each concrete girder, the shear stress equation for prismatic homogenous beams was used to calculate

the shear force, V. The arithmetic average of the shear forces at the three gage locations provided the total shear force in the girder. The final equation was as follows.

$$V = 0.385 \times G \times \{k1(\varepsilon 1 - \varepsilon 3) + k2(\varepsilon 4 - \varepsilon 6) + k3(\varepsilon 7 - \varepsilon 9)\} \times 10^{-6}$$

where, G is the shear modulus of rigidity (ksi),

k1, k2 and k3 are the constants derived from the shear equation and

ε1, ε3, ε5..... ε9 are the strain values obtained from the inclined gages in the girder.

The computations involved in the derivation of the above equation are given in Appendices H and N.

4.3 Long term tests

Methodology

To collect data on the shear forces in girders of each bridge, three strain gage rosettes were utilized. These strains were used to continuously measure the shear forces within two girders per bridge. The shear forces in the girders were simultaneously calculated as the on-site datalogger measured and recorded the strain values. Spikes in the strain measurements resulted within the collected shear force data, which is a common problem with strain gages that record continuously. These spikes can be caused by numerous electrical or mechanical anomalies. A statistical technique of normalizing the strain values to determine unusual variations in each data record was used to filter out the spikes when post-processing to determine the shears.

In order to measure the shear forces in the girders, strain gages were bonded to the webs of two girders below the driving lane of the bridge. Six to nine strain gages were arranged in three rosettes. Each rosette contained three gages in a circular pattern, equally spaced apart. The line of rosettes was positioned such that the distance from the bearing to the center of the rosettes was the same as the depth of the girder. This provided the ability to calculate the shear force in the girder at the line of rosettes.

During the data collection process, dataloggers at each bridge would continuously sample the strain values in both girders. The datalogger would simultaneously calculate the shear force in the web of the girders from the given strain values; all the strain values and shear force for each sample produced a single data record. The shear force and strain values were continuously sampled at a rate of 50 records per second. Although the system only measures the shear force in the web of the girders, a factor was used to calculate total shear forces in order to account for the shear being resisted by the flanges in the "I-beams" and the concrete road deck slab (Section 4.1 and 4.2).

The software incorporated into the datalogger kept a running log of the previous 20 records. When the shear force in either beam exceeded a certain threshold (5-10 kips), the software would begin recording the event starting with the previously stored 20 records. It continued to record until both shear forces dropped below the threshold and an additional 20 records past that point. These strings of records are called "events." An example of several events is shown in Figure 12.

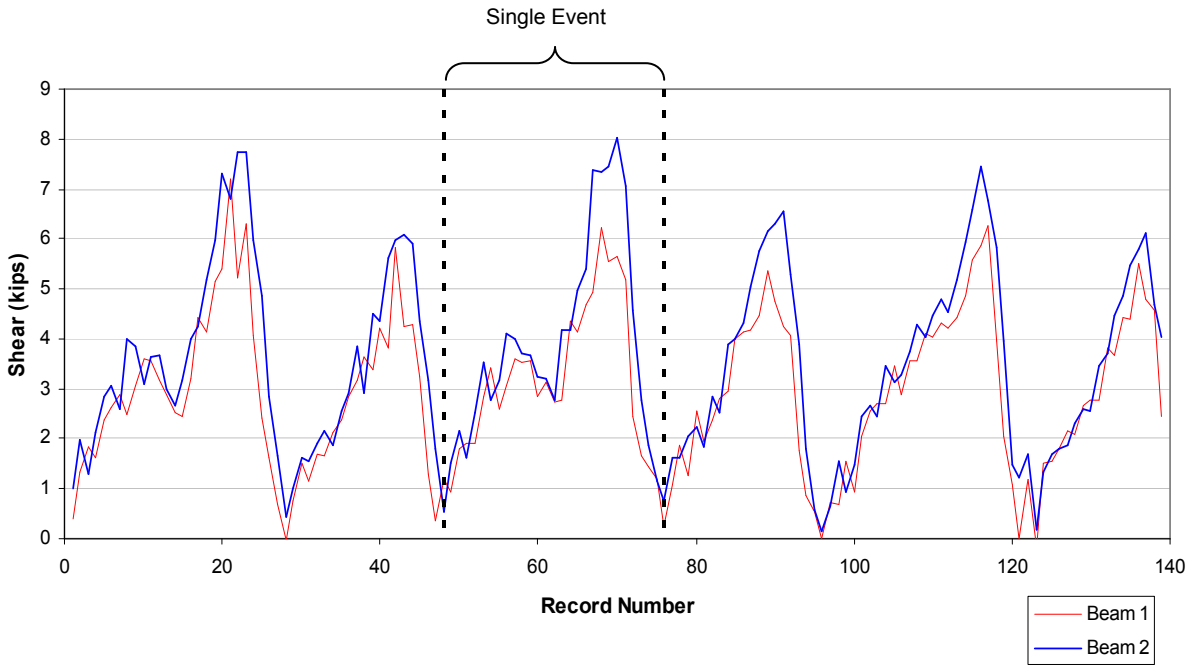

Figure 12: Example of Individual Events

Analysis/Results

After the data was filtered to remove anomalous spikes, it was analyzed and each 'event' was identified using specialized software. An event is the data collected which corresponds to a single truck passing over the bridge or multiple trucks crossing simultaneously. From each event, the maximum shear was identified for each beam separately and all of the maximum shears were compiled into histograms. These were used to extrapolate the six months of collected data to the maximum 75 year load. This load is the single expected maximum load on the girder over the 75 year life span of a bridge. The technique applied, based on NCHRP Report 368 (Nowak 1999) and a paper by O'Connor and O'Brien (2005), assumes that the extreme loads will follow a normal probability distribution function. Our data showed reasonably good correlation with a normal distribution. Using this assumption the six-month data can be extrapolated to a 75-year maximum load. A detailed description and example is located in Appendix C.

A composite section factor was used to adjust for the shear force being resisted by both the flange of the girders and the concrete slab. For the calculation of this factor, it was assumed that the girder acted in a fully composite manner with the slab at the abutment end of the deck. In most cases the slab details prohibited relative movement between the beam and the slab near the bearing (and no relative slip was noticeable) and this assumption is believed to be valid.

A transverse location factor was considered to account for the possibility of trucks passing directly over the girders, which would cause the maximum load. The transverse location factor was calculated based on the experimental results obtained for the bridges in the static tests, dividing the shear in the girder with the wheel over the girder by the shear in the girder with the truck centered in the lane. This factor would be applicable if the measured shear in the girder represented a single truck on the bridge that was centered in its lane. It would not be applicable for the case where the load represents a wheel load directly over the girder. In addition, if multiple vehicles were on the bridge at the same time, it is possible that the load represents all vehicles centered within their lanes, with no clearance for trucks to have wheels directly over a girder. This factor does, however, give an upper bound on what the expected girder force might be.

Both the composite section and the transverse location factors were applied after the extrapolated 75 year shear forces were calculated. The expected 75 year shear force on each girder, which was calculated from the collected data, was compared to the LRFD and LFD specifications.

Impact factors were taken into account in all the results. Experimental impact factors were determined for every bridge based on the highway speed test shears divided by the slow moving (second six bridges) or static (first six bridges). The experimental results were divided by these factors to remove impact effects and compare to LFD and LRFD shears without impact. Raw experimental shears were also used (including impact effects) to compare to LFD and LRFD shears calculated with impact factors.

Tables 4, 6, and 7 detail the results with the transverse correction for the truck location. With impact considered (Table 7), five of the bridges exceed the LFD design shears by 102%-154% when extrapolated to the 75-year loads (Bridges 3, 5, 6, 7, and 8). If impact results are removed from the experiment (Table 6), three of the extrapolated design loads still exceed the LFD design values by l13%-191% (Bridges 5, 7, and 8). Only in one case were the LRFD design shears exceeded when compared to the extrapolated values.

If the measured values are used without a correction for the truck location, the loads are somewhat less, since the truck is generally not directly over the instrumented girder (Tables 5, 8, and 9). Still, for two bridges, extrapolated shears in excess of the LFD design values by 113%-190% were determined when impact effects were removed (Table 8) from the analysis (Bridges 7 and 8). These same two bridges continued to show shears in excess of the LFD design values by 113% to 154% when impact was considered (Table 9). LRFD was exceeded in only one case.

It should be noted that both cases where LRFD was exceeded were on a concrete bridge structure with impact effects removed from design consideration. The experimentally measured impact factor on that bridge was only 1.03. In addition, this structure was instrumented on only one side of the girder for shear for the long term experiment. Both sides were instrumented for the short term test, and it was determined that differences on the shear stress on each side of the girder could cause computed shears to vary as much as 25% depending on the side of the girder

instrumented. It is possible that if torsion effects were fully considered in the long term study that the extrapolated shears could drop below the 116% LRFD design values, but it is unlikely they would drop below the LFD values, since the smallest of these values was still 154% above the LFD design shear. Further study of these results should be performed.

		Correction Factors			Measured Shears (kips)				Corrected Shears (kips)	
		Composite	Transverse Position		Maximum		Extrapolated to 75 Years		Extrapolated to 75 Years	
Bridge #	Structure #		Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	1.269			13.90	10.89	16.86	15.92	21.40	20.20
2	059-0040	1.265		1.375	11.73	16.58	13.97	19.55	17.67	34.00
3	068-0049	1.163		1.275	22.57	22.67	34.12	31.04	39.68	46.03
4	068-0046	1.000			23.94	25.71	28.35	33.44	28.35	33.44
5	084-0107	1.145		2.055	9.40	14.39	15.02	19.10	17.20	44.94
6	054-0043	1.071		1.127	26.02	27.22	34.11	32.15	36.53	38.81
7	060-0319	1.123			35.84	44.38	45.57	58.40	51.18	65.58
8	060-0056	1.216		1.315	19.68	20.03	27.11	24.87	32.97	39.77
9	060-0028	1.260		1.029	14.99	13.47	17.60	17.89	22.18	23.20
10	003-0001	1.281		1.177	9.98	10.63	11.56	13.48	14.81	20.32
11	003-0004	1.102			32.67	27.90	41.03	32.53	45.22	35.85
12	003-0006	1.205			12.92	17.63	14.71	20.78	17.73	25.04

Table 4: Summary of measured and extrapolated shears (with transverse correction factor)

			Measured Shears (kips)				Corrected Shears (kips)			
			Maximum Measured		Extrapolated to 75 Years		Maximum Measured		Extrapolated to 75 Years	
Bridge #	Structure #	Composite Correction Factors	Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	1.269	13.90	10.89	16.86	15.92	17.64	13.82	21.40	20.20
2	059-0040	1.265	11.73	16.58	13.97	19.55	14.84	20.97	17.67	24.73
3	068-0049	1.163	22.57	22.67	34.12	31.04	26.25	26.37	39.68	36.10
4	068-0046	1.000	23.94	25.71	28.35	33.44	23.94	25.71	28.35	33.44
5	084-0107	1.145	9.40	14.39	15.02	19.10	10.76	16.48	17.20	21.87
6	054-0043	1.071	26.02	27.22	34.11	32.15	27.87	29.15	36.53	34.43
7	060-0319	1.123	35.84	44.38	45.57	58.40	40.25	49.84	51.18	65.58
8	060-0056	1.216	19.68	20.03	27.11	24.87	23.93	24.36	32.97	30.24
9	060-0028	1.260	14.99	13.47	17.60	17.89	18.89	16.97	22.18	22.54
10	003-0001	1.281	9.98	10.63	11.56	13.48	12.78	13.62	14.81	17.27
11	003-0004	1.102	32.67	27.90	41.03	32.53	36.00	30.75	45.22	35.85
12	003-0006	1.205	12.92	17.63	14.71	20.78	15.57	21.24	17.73	25.04

Table 5: Summary of measured and extrapolated shears (without transverse correction factor)

Bridge #	Structure #	Code Requirements				Impact Factor (From Experimental Values)	Percent of Code			
		LRFD		LFD			LRFD		LFD	
		Beam 1	Beam 2	Beam 1	Beam 2		Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	40.59	40.59	28.37	28.37	1.37	38%	36%	55%	52%
2	059-0040	45.14	45.14	30.70	30.70	1.19	33%	63%	48%	93%
3	068-0049	52.93	52.93	33.96	33.96	1.38	54%	63%	85%	98%
4	068-0046	75.61	75.61	35.82	35.82	1.21	31%	37%	65%	77%
5	084-0107	57.35	57.35	33.95	33.95	1.02	29%	77%	50%	**130%**
6	054-0043	48.43	48.43	30.39	30.39	1.46	52%	55%	82%	87%
7	060-0319	54.70	54.70	33.56	33.56	1.03	91%	**116%**	**148%**	**190%**
8	060-0056	51.96	41.87	29.27	20.84	1.00	63%	95%	**113%**	**191%**
9	060-0028	37.23	37.23	26.06	26.06	1.30	46%	48%	65%	68%
10	003-0001	41.23	41.23	25.35	25.35	1.51	24%	33%	39%	53%
11	003-0004	61.07	61.07	38.36	38.36	1.25	59%	47%	94%	75%
12	003-0006	44.24	44.24	28.49	28.49	1.36	29%	42%	46%	65%

Table 6: Comparison of extrapolated shears to LFD and LRFD design shears (impact effects removed, with transverse correction)

Bridge #	Structure #	Code Requirements				Percent of Code			
		LRFD		LFD		LRFD		LFD	
		Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	53.99	53.99	36.89	36.89	40%	37%	58%	55%
2	059-0040	60.04	60.04	39.91	39.91	29%	57%	44%	85%
3	068-0049	70.40	70.40	42.88	42.88	56%	65%	93%	**107%**
4	068-0046	100.56	100.56	44.51	44.51	28%	33%	64%	75%
5	084-0107	76.27	76.27	43.88	43.88	23%	59%	39%	**102%**
6	054-0043	64.41	64.41	38.42	38.42	57%	60%	95%	**101%**
7	060-0319	72.76	72.76	42.45	42.45	70%	90%	**121%**	**154%**
8	060-0056	69.10	55.69	37.43	26.65	48%	71%	88%	**149%**
9	060-0028	49.52	49.52	33.88	33.88	45%	47%	65%	68%
10	003-0001	54.84	54.84	32.95	32.95	27%	37%	45%	62%
11	003-0004	81.22	81.22	48.02	48.02	56%	44%	94%	75%
12	003-0006	58.84	58.84	36.56	36.56	30%	43%	48%	68%

Table 7: Comparison of extrapolated shears to LFD and LRFD design shears (impact considered, with transverse correction)

Bridge #	Structure #	Code Requirements				Impact Factor (From Experimental Values)	Percent of Code			
		LRFD		LFD			LRFD		LFD	
		Beam 1	Beam 2	Beam 1	Beam 2		Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	40.59	40.59	28.37	28.37	1.37	38%	36%	55%	52%
2	059-0040	45.14	45.14	30.70	30.70	1.19	33%	46%	48%	68%
3	068-0049	52.93	52.93	33.96	33.96	1.38	54%	49%	85%	77%
4	068-0046	75.61	75.61	35.82	35.82	1.21	31%	37%	65%	77%
5	084-0107	57.35	57.35	33.95	33.95	1.02	29%	37%	50%	63%
6	054-0043	48.43	48.43	30.39	30.39	1.46	52%	49%	82%	78%
7	060-0319	54.70	54.70	33.56	33.56	1.03	91%	**116%**	**148%**	**190%**
8	060-0056	51.96	41.87	29.27	20.84	1.00	63%	72%	**113%**	**145%**
9	060-0028	37.23	37.23	26.06	26.06	1.30	46%	47%	65%	67%
10	003-0001	41.23	41.23	25.35	25.35	1.51	24%	28%	39%	45%
11	003-0004	61.07	61.07	38.36	38.36	1.25	59%	47%	94%	75%
12	003-0006	44.24	44.24	28.49	28.49	1.36	29%	42%	46%	65%

Table 8: Comparison of extrapolated shears to LFD and LRFD design shears (impact effects removed, no transverse correction)

Bridge #	Structure #	Code Requirements				Percent of Code			
		LRFD		LFD		LRFD		LFD	
		Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2	Beam 1	Beam 2
1	059-0041	53.99	53.99	36.89	36.89	40%	37%	58%	55%
2	059-0040	60.04	60.04	39.91	39.91	29%	41%	44%	62%
3	068-0049	70.40	70.40	42.88	42.88	56%	51%	93%	84%
4	068-0046	100.56	100.56	44.51	44.51	28%	33%	64%	75%
5	084-0107	76.27	76.27	43.88	43.88	23%	29%	39%	50%
6	054-0043	64.41	64.41	38.42	38.42	57%	53%	95%	90%
7	060-0319	72.76	72.76	42.45	42.45	70%	90%	**121%**	**154%**
8	060-0056	69.10	55.69	37.43	26.65	48%	54%	88%	**113%**
9	060-0028	49.52	49.52	33.88	33.88	45%	46%	65%	67%
10	003-0001	54.84	54.84	32.95	32.95	27%	31%	45%	52%
11	003-0004	81.22	81.22	48.02	48.02	56%	44%	94%	75%
12	003-0006	58.84	58.84	36.56	36.56	30%	43%	48%	68%

Table 9: Comparison of extrapolated shears to LFD and LRFD design shears (impact considered, no transverse correction)

4.4 Results

Table 10 shows the comparison between finite element results with static and dynamic load test results for Bridge 0068-0046 (similar tables for all twelve bridges can be found in Appendices G and M). The first and second columns show the load position and beam numbers respectively, beam number 1 being the fascia beam on the passing lane side and beam 6 being the fascia beam on the driving lane side. The remaining columns are divided in two parts: the first part (3rd to 7th column) shows shear forces and the second part (column 8 to 12) shows the distribution factors corresponding to the forces shown in columns 3 to 7.

Static and dynamic load test results can not be compared directly because the dynamic test results possibly contain a dynamic impact factor. Those values are put together in the same table to differentiate between static and dynamic test results. There is only one (X5 or X4) load position used in the table instead of illustrating all the data from all load positions because of the fact that either the X4 or X5 position controls for determination of the maximum distribution factor, and other load positions do not govern either shear force or distribution factor. When the truck is at the X5 position, it is closest to the bearings and the load does not distribute as evenly as for the load positions farther (e.g. X1, X2) away from the bearings. This can be seen in the graphs in Appendices G and M.

SN 0068-0046											
		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support		
				Static (X4)	Dynamic test				Static (X4)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	0.295	0.056	0.222			0.009	0.003	0.016		
	Beam 2	-0.177	-0.185	0.046			-0.005	-0.011	0.003		
	Beam 3	0.009	-0.187	0.014			0.000	-0.012	0.001		
	Beam 4	0.465	-0.110	0.511			0.014	-0.007	0.038		
	Beam 5	7.261	4.859	2.578			0.212	0.300	0.190		
	Beam 6	26.432	11.757	10.229			0.771	0.726	0.752		
	Σ	34.285	16.190	13.600							
Y2Run1	Beam 1	0.45	0.073	0.367	0.472	0.001	0.012	0.004	0.022	0.020	0.000
	Beam 2	-0.258	-0.327	0.182	-0.139	-0.267	-0.007	-0.017	0.011	-0.006	-0.012
	Beam 3	0.306	-0.137	0.019	0.135	0.143	0.008	-0.007	0.001	0.006	0.006
	Beam 4	6.859	4.712	3.779	6.084	4.905	0.190	0.247	0.224	0.261	0.221
	Beam 5	24.106	12.250	8.933	13.697	14.367	0.668	0.643	0.529	0.587	0.646
	Beam 6	4.614	2.470	3.603	3.077	3.091	0.128	0.130	0.213	0.132	0.139
	Σ	36.077	19.041	16.881	23.326	22.240					
Y3Run1	Beam 1	0.452	0.060	0.438	1.193	0.901	0.014	0.003	0.025	0.055	0.051
	Beam 2	-0.339	-0.421	0.222	0.645	0.236	-0.010	-0.022	0.013	0.030	0.013
	Beam 3	2.883	1.925	1.300	0.572	0.418	0.087	0.100	0.075	0.026	0.024
	Beam 4	18.24	10.766	7.698	9.240	12.443	0.551	0.559	0.445	0.423	0.708
	Beam 5	12.826	6.715	6.455	8.107	2.845	0.388	0.349	0.373	0.371	0.162
	Beam 6	-0.971	0.210	1.175	2.080	0.735	-0.029	0.011	0.068	0.095	0.042
	Σ	33.091	19.255	17.288	21.837	17.578					
Y4Run1	Beam 1	0.21	-0.053		3.155	2.880	0.011	-0.003		0.141	0.134
	Beam 2	3.819	3.088		6.438	3.845	0.205	0.199		0.288	0.178
	Beam 3	13.827	11.033		8.751	12.677	0.744	0.711		0.392	0.588
	Beam 4	1.015	1.267		1.363	-0.052	0.055	0.082		0.061	-0.002
	Beam 5	0.054	0.261		2.513	1.885	0.003	0.017		0.113	0.087
	Beam 6	-0.336	-0.081		0.113	0.315	-0.018	-0.005		0.005	0.015
	Σ	18.589	15.515		22.332	21.550					

Table 10: Comparison of Shear and Distribution Factor

Graphical Presentation of data

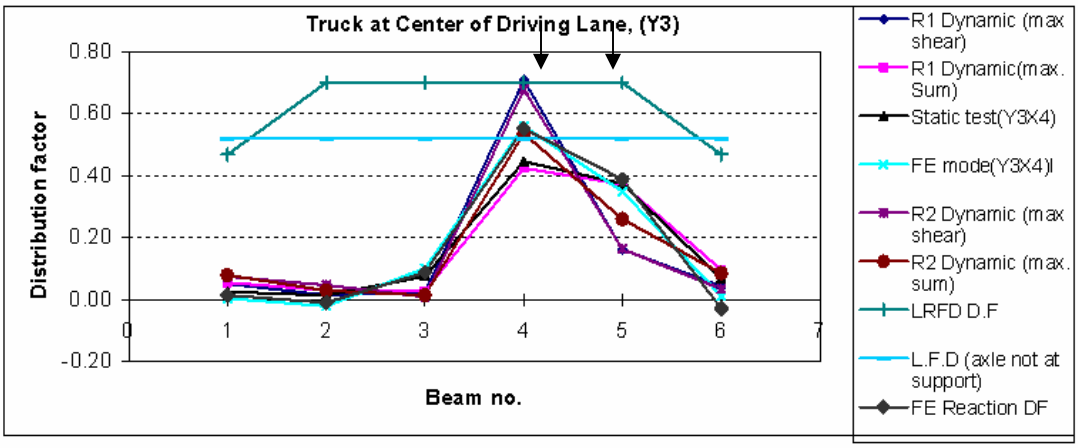

Figure 13: Distribution of Truck Load for Truck at Y3 Position (SN0068-0046)

Figure 13 is a plot of the distribution factors as a function of beam numbers for structure no. 0068-0046 when the test truck is in the Y3 position. Four graphs each representing Y1 to Y4 respectively (Appendices G and M) are prepared for each bridge. Figure 13 shows how the distribution factor varies with each beam and is helpful to investigate how the structure is behaving under the load. R1 and R2 correspond to the first and second run (dynamic tests) of the test truck over the bridge.

The distribution factor is maximum for girder No. 4 and 5 for the test truck at center of driving lane (Y3 position). On this graph the LRFD distribution factor is higher than LFD (axle not at support), finite element distribution factors and test distribution factors. From FEM and field test data, it is observed that maximum shear usually occurs at those positions where one of the truck wheels is directly over a beam. As shown in Appendices F and L, Y2 and Y4 positions generally create maximum shear for less skewed bridges. For highly skewed bridges (SN 0068-0046 and SN 0084-0107), the maximum shear force occurs when the test truck is at the obtuse corner of the bridge and one of the truck wheels (heavier wheel) is directly over a girder (for our case, Y1 or Y2 position).

Figures 14 and 15 show the relationship the distribution factors and beam spacings for the first six and second six bridges tested, respectively. Each point represents the maximum distribution factor for a test (e.g. static, dynamic, LRFD etc) and corresponding beam spacing of a bridge.

Figures 16 and 17 are a plot of distribution factors versus skew angle for the bridges. This graph shows how distribution factors changes with the change in skew angle. Table 11 represents graphical data in Figure 14 and Fig 15.

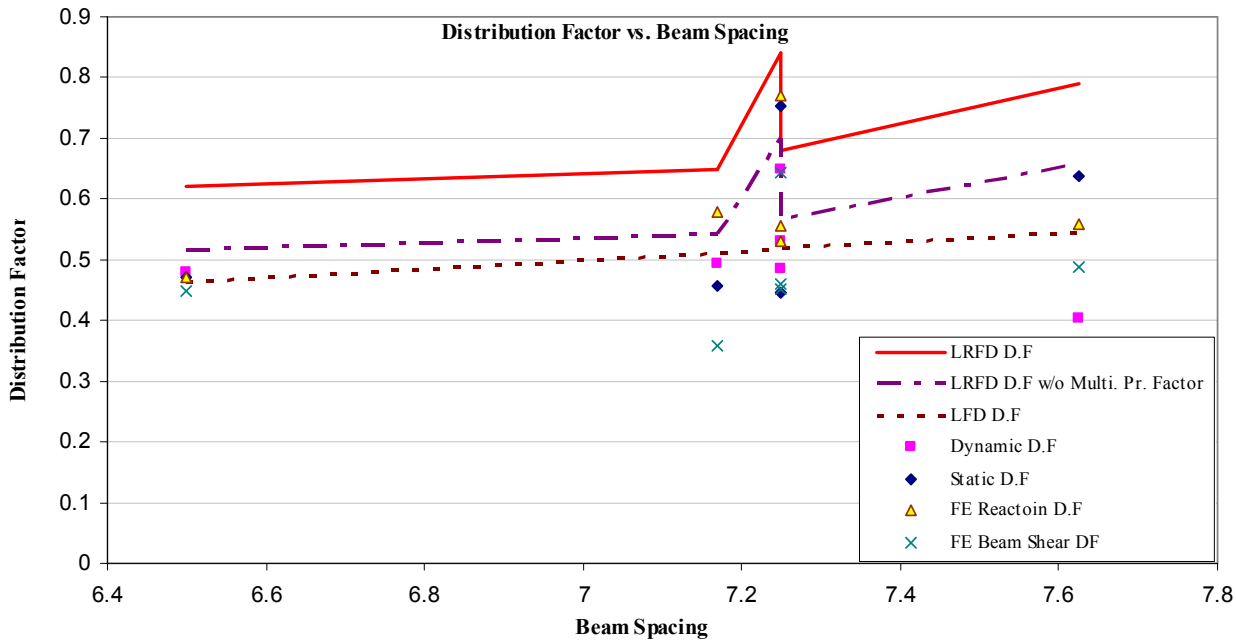

Figure 14: Distribution Factor vs. Beam Spacing - First Six Bridges

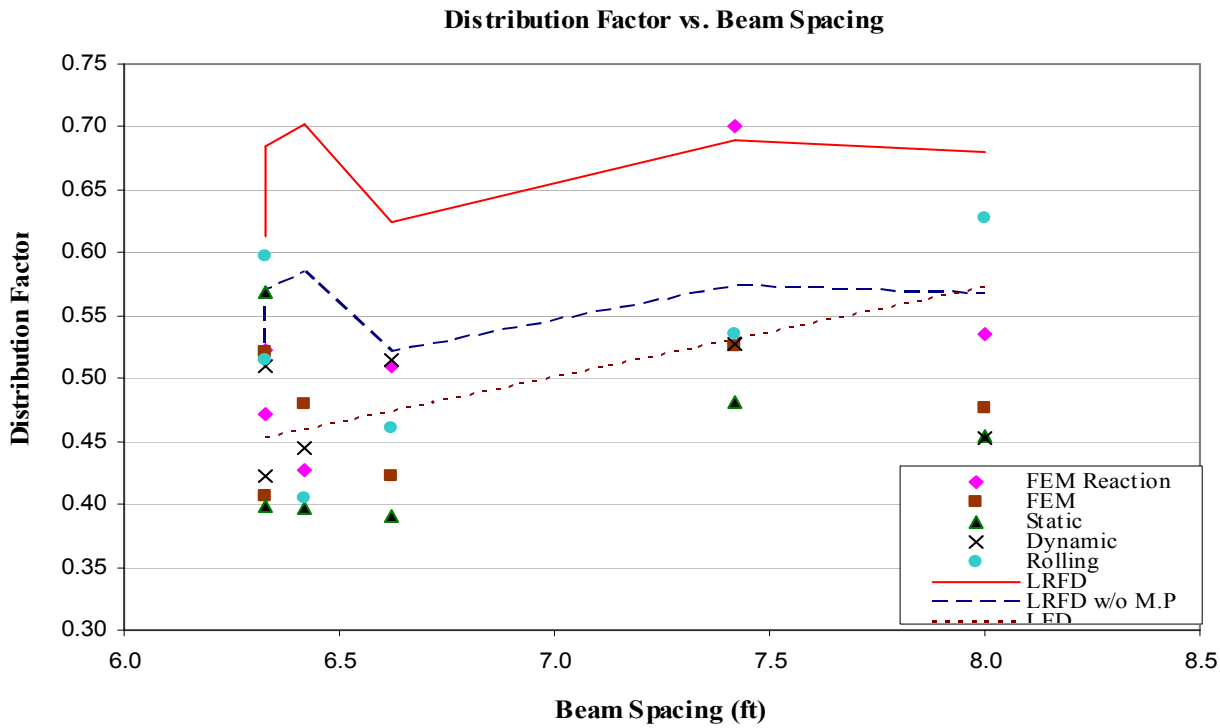

Figure 15: Distribution Factor vs. Beam Spacing – Second Six Bridges

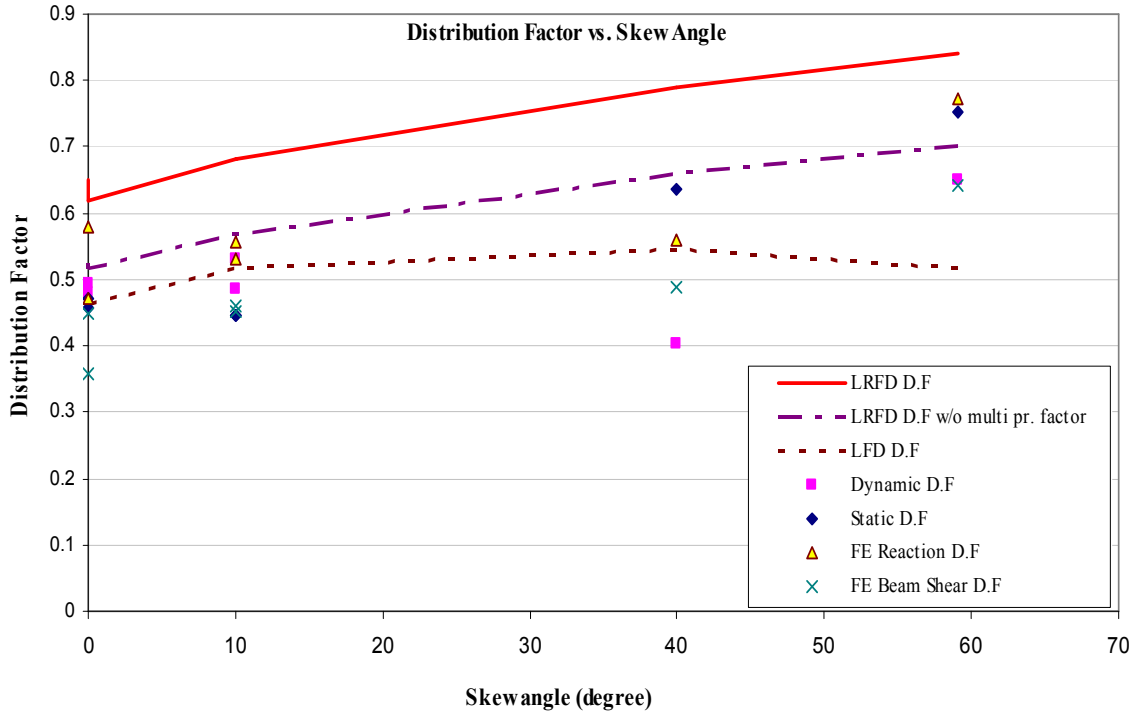

Figure 16: Distribution Factor vs. Skew Angle – First Six Bridges

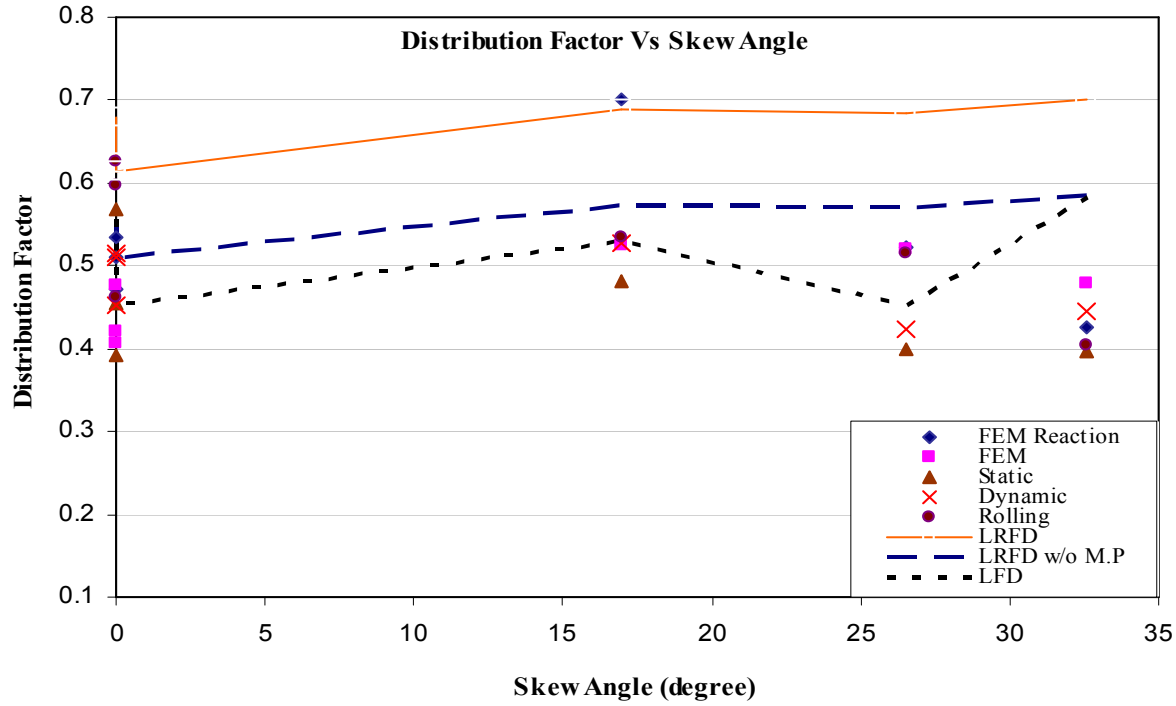

Figure 17: Distribution Factor vs. Skew Angle – Second Six Bridges

S.No (Bridge no.)	Beam Spacing(ft)	Skew (Deg)	Static test max. D.F	Dynamic test max D.F	FE Reaction D.F	FE Beam Shear D.F	LRFD D.F	LRFD D.F w/o multi. Factor	LFD D.F
068-0049	7.17	0	0.456	0.495	0.579	0.357	0.65	0.54	0.512
0054-0043	6.5	0	0.472	0.48	0.47	0.449	0.62	0.52	0.464
059-0040	7.25	10	0.446	0.486	0..531	0.451	0.68	0.57	0.518
059-0041	7.25	10	0.445	0.531	0.557	0.461	0.68	0.57	0.518
0084-107	7.625	39.92	0.637	0.403	0.558	0.487	0.79	0.66	0.544
0068-0046	7.25	59.12	0.752	0.649	0771	0.643	0.84	0.7	0.518

Table 11: Maximum Distribution Factors for First Six Bridges

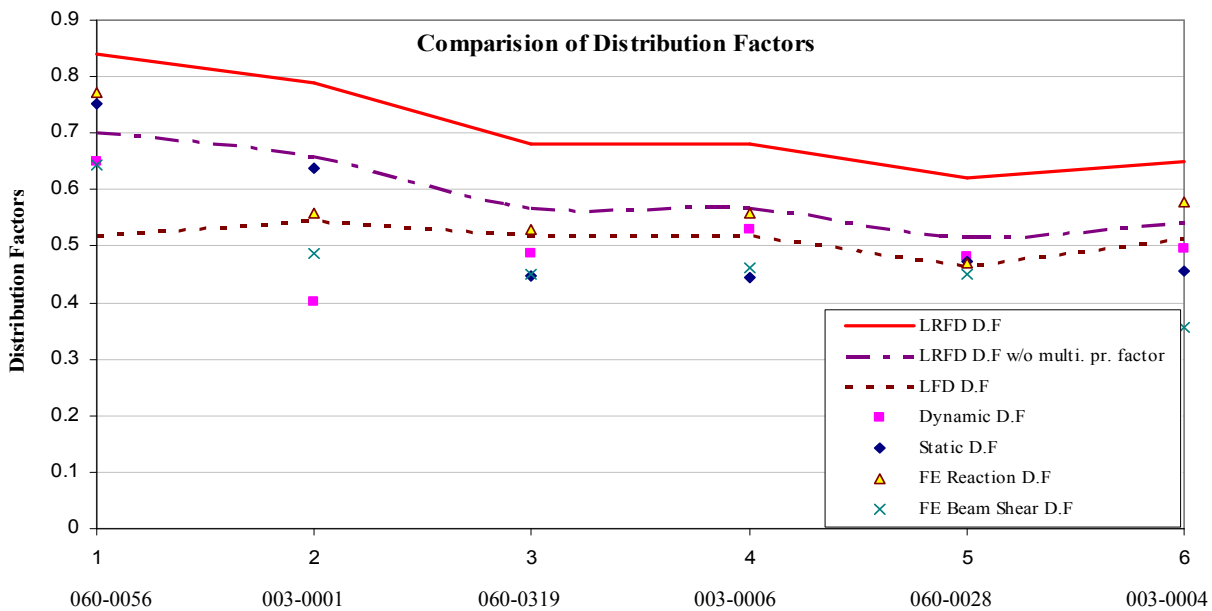

Figure 18: Maximum and Specification Distribution Factors by Bridge Number

Br.No.	Beam Spcng	Skew Angle (degree)	FE Reaction D.F	FE Beam Shear D.F	Static Max. D.F	Dynamic Max D.F	Rolling Max D.F	LRFD D.F	LRFD w/o Mul. Fac.	LFD D.F
060-0056	6.4	32.6	0.427	0.479	0.397	0.444	0.405	0.702	0.585	0.459
003-0001	6.3	26.5	0.523	0.521	0.399	0.423	0.515	0.685	0.571	0.452
060-0319	7.4	17	0.701	0.525	0.481	0.528	0.535	0.689	0.574	0.530
003-0006	6.3	0	0.472	0.406	0.569	0.51	0.597	0.613	0.511	0.453
060-0028	6.6	0	0.51	0.422	0.391	0.515	0.461	0.625	0.521	0.473
003-0004	8.0	0	0.535	0.476	0.454	0.453	0.627	0.68	0.567	0.572

Table 12: Maximum Distribution Factors for Second Six Bridges

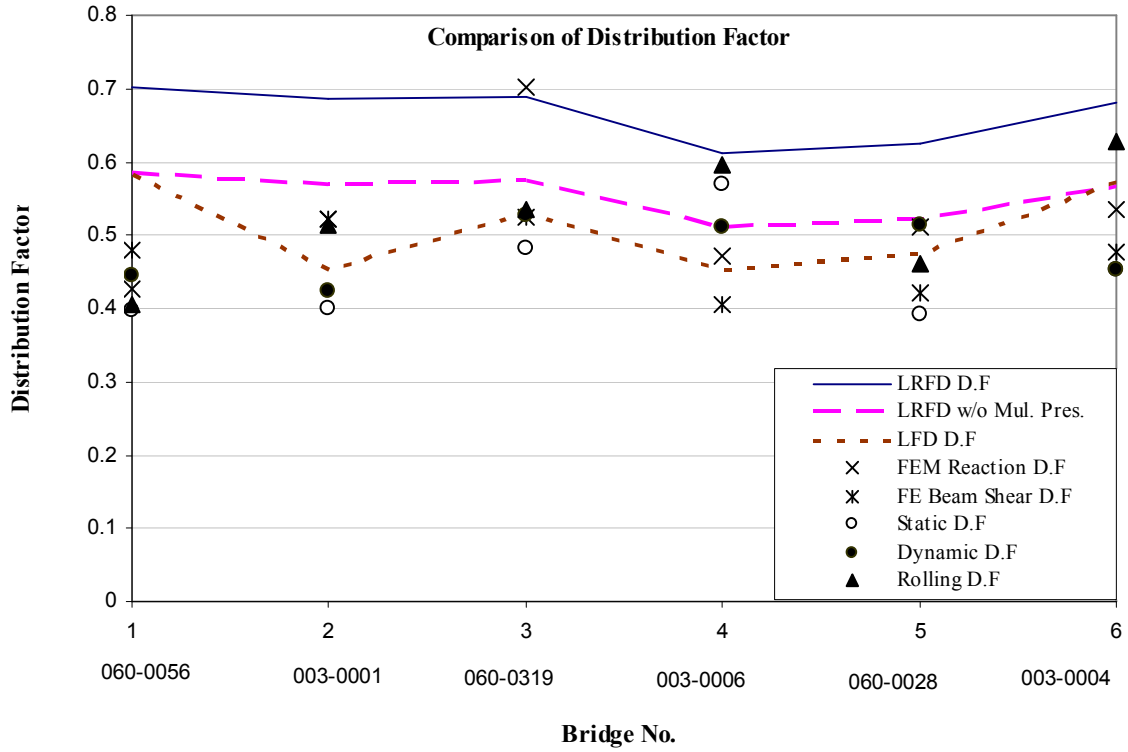

Figure 19: Maximum and Specification Distribution Factors by Bridge Number

Figures 18 and 19 are comparisons of distribution factors for each bridge. The figures are shown to clearly show the maximum distribution factor for each bridge.

Multiple Presence Factor

All the finite element and field results obtained were for a single truck (truck load varies from 45 kips to 55 kips as well as the wheel spacing), single lane condition when there were not any vehicles on the test bridge. The distribution factors thus obtained were then compared with the distribution factors calculated as per the design specifications (LRFD and LFD) and FEM results. A question could be raised whether the field results are directly comparable to the design distribution factors or not, because in the LRFD specification, the equations (LRFD table 4.6.2.2.3a-1) to calculate distribution factors (for one lane loaded) include the multiple presence factor (LRFD art. 3.6.1.1.2) of 1.2 to account for the presence of heavier trucks (heavier than the design truck). This provision

(Multiple Presence Factor) is not specified in the LFD specification for single lanes loaded.

For this paper, test distribution factors are compared with LRFD (with and without multiple presence factor (see Figures 14-19), LFD and FEM distribution factors.

Impact Factor

For the dynamic load test, the test truck speed was approximately 55 mph, so it is obvious that the dynamic load test data includes some increase due to impact. As per LRFD, the impact factor is 33 percent (LRFD art. 3.6.2.1), whereas LFD requires that impact shall be calculated as per the formula, I=50/(L+125) (LFD art.3.8.2), and this value should not be greater than 30%.

Table 4: Calculation of Approximate Impact Factor

S.No	Load Position	Total force				Impact		
		FE model		Static	Dynamic	Dynamic/Static	LFD	LRFD
		Reaction	Shear					
084-107	Y1	34.28	20.84	18.03			0.287	0.33
	Y2	33.99	21.91	13.38	15.69	**1.17**		
	Y3	31.12	20.31	14.01	16.92	**1.21**		
	Y4	35.54	17.91		19.09			
068-0046	Y1	34.29	16.19	13.60			0.236	0.33
	Y2	28.34	19.04	16.88	23.33	**1.38**		
	Y3	33.09	19.26	17.29	21.84	**1.26**		
	Y4	18.59	15.52		22.22			
0059-0040	Y1	25.67	13.85	13.15			0.302	0.33
	Y2	25.29	17.24	11.79	16.05	**1.36**		
	Y3	25.69	17.21	11.27	16.48	**1.46**		
	Y4	25.82	17.29		12.83			
0068-0049	Y1	30.05	21.64	18.03			0.258	0.33
	Y2	29.93	25.93	19.04	22.64	**1.19**		
	Y3	29.87	26.73	18.67	21.31	**1.14**		
	Y4	24.86	21.99		13.34			
0059-0041	Y1	23.70	13.53	7.24			0.313	0.33
	Y2	23.62	18.20	11.20				
	Y3	23.09	18.39	12.05	16.53	**1.37**		
	Y4	25.16	18.68		14.85			
0054-0043	Y1	30.15	23.49	20.83			0.260	0.33
	Y2	29.68	24.66	23.79	24.24	**1.02**		
	Y3	30.15	25.71	25.11	25.70	**1.02**		
	Y4	29.71	25.85		33.45			

Table 13: Calculation of Approximate Impact Factor - First Six Bridges

From Table 13, the impact factor is as high as 46% (1.46) when comparing static and dynamic test results. It should be noted that the impact factors calculated shown in Table 13 are only approximate, since the locations of the loads in the static test may not be exactly in the location of the maximum effect (though they were designed to get as close as possible with analysis). It should be noted that the experimental impact factors computed this way are probably slightly over-estimated. Even with this approximation, the experimentally determined impact factors do not differ substantially from the LFD and LRFD values.

Ideally, to evaluate impact factors, slow moving tests should be compared to those at normal highway speeds. These additional tests were performed for the second set of six bridges and the results are shown in Table 14.

S.No.	Load position	Total force				Impact		
		FEM	Static	Rolling	Dynamic	Dynamic/Rolling	LFD	LRFD
003-0001	Y1	13.368	10.791	11.012			0.311	0.33
	Y2	15.283	11.394	12.161	18.363	1.51		
	Y3	15.830	12.867	14.357	16.029	1.12		
	Y4	16.517		14.355	15.089	1.05		
003-0004	Y1	27.434	22.244	24.223			0.246	0.33
	Y2	28.206	22.648	25.722	32.093	1.25		
	Y3	28.098		26.118	29.113	1.12		
	Y4							
003-0006	Y1	22.108	9.287	11.370			0.278	0.33
	Y2	22.999	13.260	14.458	19.701	1.36		
	Y3	23.431	14.936	16.388	22.008	1.34		
	Y4	23.208			20.195			
060-0028	Y1	25.231	11.742	14.879			0.312	0.33
	Y2	19.509	12.783	17.248	19.261	1.12		
	Y3	20.505	12.839	16.820	21.862	1.30		
	Y4	19.611		17.458	19.392	1.11		
060-0056	Y1	18.602	16.760	20.847			0.274	0.33
	Y2	19.247	18.186	21.543	21.045	0.98		
	Y3	20.075	18.982	23.937	21.155	0.88		
	Y4	18.954			20.545			
060-0319	Y1	26.952	21.684	21.223			0.257	0.33
	Y2	27.430	31.293	32.554	32.296	0.99		
	Y3	27.665	32.796	36.459	35.121	0.96		
	Y4	25.110		29.148	29.900	1.03		

Table 14: Calculation of Approximate Impact Factor - Second Six Bridges

5. SUMMARY AND CONCLUSIONS

5.1 Summary

This project examined two of the contributors to the increase in design shears due to the LRFD Specification: increase in the distribution factor over LFD, and increase in the loading. The static and dynamic short term (one day) tests were targeted at determining experimentally the shear distribution factors, and the long term tests were designed to investigate the magnitudes of loads observed on Illinois bridges and compare them to those calculated in the specification.

5.2 Observations and Concluding Remarks

Discussion of the observations will be organized by the two main areas examined in the research: shear distribution factors and loadings.

Distribution Factors

Both the finite element and the experimental study showed that in some cases the shear distribution factors specified by the LFD Specification were exceeded In most cases the distribution factors specified by LRFD provide a closer approximation to the measured values.

In three experimental cases and two analytical ones the distribution factors using the LRFD equations were exceeded. These occurred in three bridges.

There appear to be dynamic effects, that are separate from the impact effects, that increase the shear distribution to some girders. This can be seen by observing that in general the distribution factors in the dynamic tests are higher than in the slow moving and the static tests. This increase is separate from the concept of the code-computed impact force since it is a result of the *lateral* distribution of the impact force; in other words, dynamic effects cause some beams to experience higher loads while others simultaneously experience lower loads.

In this study bearing reaction forces were only approximated by using a finite element model. In this analytical study the distribution factors for bearing forces was generally higher than those for the girder itself.

The finite element study gave results that were comparable to the experiment in most cases, especially regarding the distribution of loads throughout the bridge.

Extreme Loadings

Girder strains were directly observed and converted to shears over a six-month period for six of the bridges in this project (a second set of six bridges will be added to the final report). The observed data fit the assumption that the extreme loads will have a normal distribution, so the results could be extrapolated to 75 years from the initial 6 month observations. In one case did the observed loading exceed the design shears for the bridges, but the probability of this happening is very small, since the extreme loads represented a 75-year maximum load.

Several assumptions had to be made regarding the extreme loadings. First, the observed loads include an impact factor since the measurements are of the actual bridge in service. Second, the actual location of the load, and the number of vehicles producing it, is unknown.

No load factors were used when calculating the design shears in order to directly compare the code forces to the observed service loads.

For the maximum predicted 75-year extreme load, the LFD specification is exceeded in two bridges by a maximum of 90%. This result assumes that the loads when measured were in the worst possible location (wheels over girders). If the loads were actually caused by a single truck in the center of its lane, the actual girder forces would be higher, and in the worst case (a skewed bridge) the LFD Specification would be exceeded in five bridges by a maximum of 91%. In one case the LRFD design shears were exceeded by

16%, though for that concrete bridge it is possible that torsion effects effected the results and made the shears appear higher than they actually were.

5.3 Future Research

Based on the results of this study, we suggest:

1. Direct measurement of bearing forces is desirable to determine the exact correlation between girder shears and bearing reactions. While we have confidence that our finite element models give a good approximation of the superstructure behavior (based on correlations between the model and direct shear stress observations in the beam webs), direct measurement of bearing forces would enable further validation of the adequacy of the models. We suggest this test be done on one of the twelve bridges already instrumented since a wealth of data already exists on these structures for comparison.

2. For the long-term study, continued observation beyond the period of six-months, for the bridges already instrumented, would be relatively inexpensive and would yield a much better view of the extreme loads for the structures. Since we are dealing with very rare loads, longer lengths of observation will result in much better confidence on the estimation of the 75-year load.

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APPENDICES

APPENDIX A – INSTRUMENTATION DIAGRAMS AND GAGE LOCATIONS

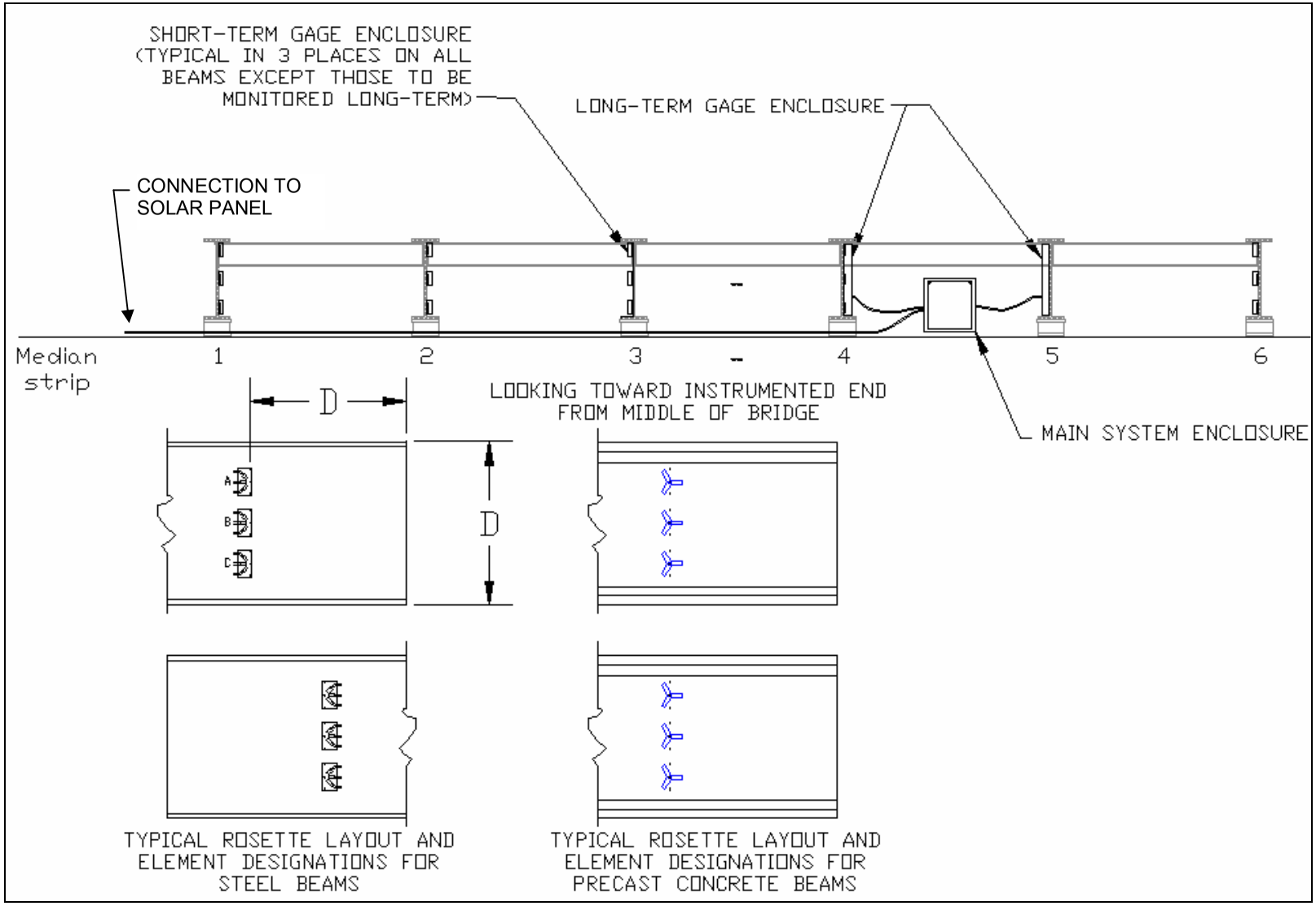


Figure 20 – Typical strain gage instrumentation equipment layout.

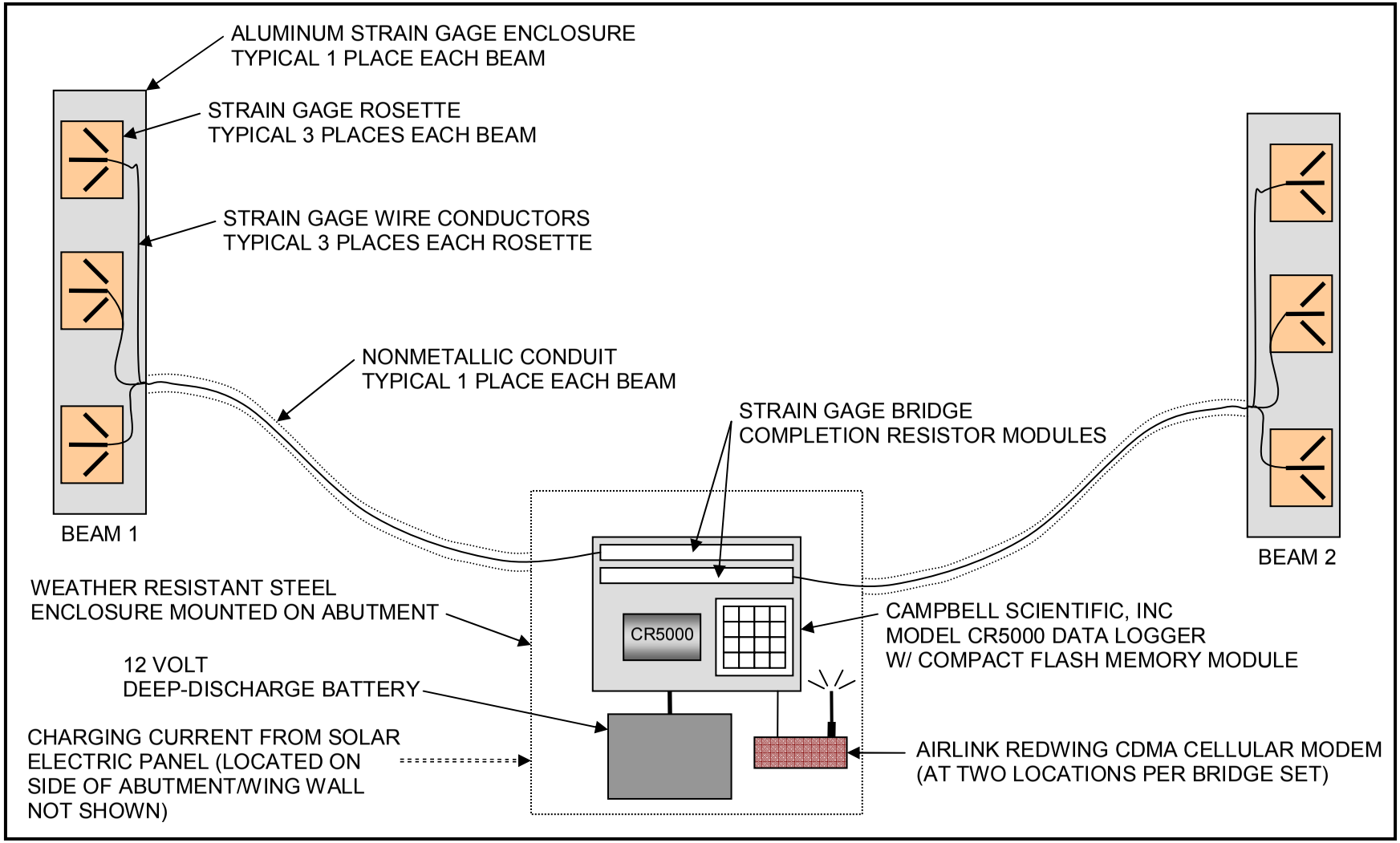


Figure 21 – Strain gage instrumentation components.

Bridge Selection and Strain Gage Locations
June 19, 2006

Table 1 – Bridges and gage rosette locations for Bridge Set 1

Structure No.	Type	Dir	Beams with gages to be installed[1,2]	Long term beams	Beam depth (d), approximate longitudinal location of rosette relative to *end of beam*	Gage vertical spacing, either side of web centerline	Comments
059-0041	Non-composite steel	NB	1,2,3,4,5,6	4,5	29.7”	10.2”	
059-0040	Non-composite steel	SB	1,2,3,4,5,6	4,5	29.8”	10.1”	
068-0049	Non-composite steel	NB	1,2,3,4,5,6	4,5	42.0”	16.0”	
068-0046	Non-composite steel	NB	1,2,3,4,5,6	4,5	54.0”	22.0”	
084-0107	Non-composite steel	NB	1,2,3,4,5,6	4,5	33.1”	11.7”	
054-0043	concrete	NB	1,2,3,4,5,6, 7,8,9	6, 7	54.0”	9.5”	

[1]Beams are numbered from left to right looking toward the abutment from mid-span
[2]Gages are installed at downstream end of the bridge

Table 2 – Bridges and gage rosette locations for Bridge Set 2

Structure No.	Type	Dir	Gages installed[1,2] on beams	Long term beams	Beam depth (d), approximate longitudinal location of rosette relative to ***near edge of bearing plate***	Gage vertical spacing, either side of web centerline	Comments
060-0319	concrete, integral abutment	EB	1,2,3,4[3],5[3],6[3]	4,5	58.5" from near edge of abutment along centerline of web	12.1"	Gages bonded on both on sides of beams 4, 5 and 6.
060-0056	Non-composite steel	EB	1,2,3,4,5,6,7	4,5	33.2" (beams 1-6) 30.5" (beam 7)	11.0" (beams 1-6) 10.0" (beam 7)	
060-0028	Non-composite steel	WB	1,2,3,4,5,6,7	4,5	26.8"	9.0"	Load tests performed a second time after gap between beam and bearing was discovered on a least one beam.
003-0001	Non-composite steel	WB	1,2,3,4,5,6,7	4,5	24.2"	8.0"	
003-0004	Non-composite steel, plate girder	WB	1,2,3,4,5	3,4	d = 65.5" (actually mounted gages 47½" from near edge of bearing to avoid web stiffener)	25.0"	
003-0006	Non-composite steel	WB	1,2,3,4,5[3],6,7	4,5	33.1"	11.0"	Gages bonded to both sides of beam 5.

[1]Beams are numbered from left to right looking toward the abutment from mid-span
[2]Gages are installed at downstream end of the bridge
[3]Gages installed on both faces

APPENDIX B – INSTRUMENTATION AND TESTING PHOTOS

Figure 22 - completed installation (note the Modjeski and Masters verification gages installed to the left of the green strain gage enclosure)

Figure 23 - Strain gage installed on steel beam.

Figure 24 - Solar panel mounted to side of abutment

Figure 25 - Strain gage rosette on precast concrete beam (blue enclosure indicates this rosette was installed for the short-term load tests only.)

Figure 26 - Test truck in place for Static Load Tests

APPENDIX C – DETERMINATION OF 75-YEAR BRIDGE LOAD

The following is a step-by step procedure to extrapolate the maximum shear forces measured throughout a given duration over any given amount of time. This statistical procedure follows the method that was used to help verify the loadings for the LRFD specifications, which is described in the National Cooperative Highway Research Program (NCHRP) Report 368, *Calibration of LRFD Bridge Design Code*.

From the collected data, the number of "events" over a certain time period and peak shear forces per event can be determined, as explained in Chapter 4. For this example, data from Beam 1 of SN 059-0041 is used. The raw data for the 181-day test period is shown below:

Maximum Shear per Event (kips)	Beam 1
5	219,821
6	157,579
7	44,531
8	5,517
9	428
10	72
11	19
12	5
13	3

Table C-1: Maximum Shear forces per events over the entire 181 day test period

The cumulative distribution is then found and the Inverse Standard Normal Distribution Function is then applied to the cumulative distribution, as shown below in Table C-2. The compiled data can also be displayed as a histogram and a cumulative histogram, as shown below in Figure C-1 and C-2.

Maximum Shear per Event (Kips)	Compiled Data	Cumulative Data		Inverse Standard Normal Distribution
5	219,821	219,821	0.513630	0.0341732
6	157,579	377,400	0.881827	1.18417
7	44,531	421,931	0.985878	2.19387
8	5,517	427,448	0.998769	3.02788
9	428	427,876	0.999769	3.5015
10	72	427,948	0.999937	3.83381
11	19	427,967	0.999981	4.12307
12	5	427,972	0.999993	4.34356
13	3	427,975	1.000000	4.57895

Table C-2: Applied Inverse Standard Normal Distribution to the Cumulative Distribution

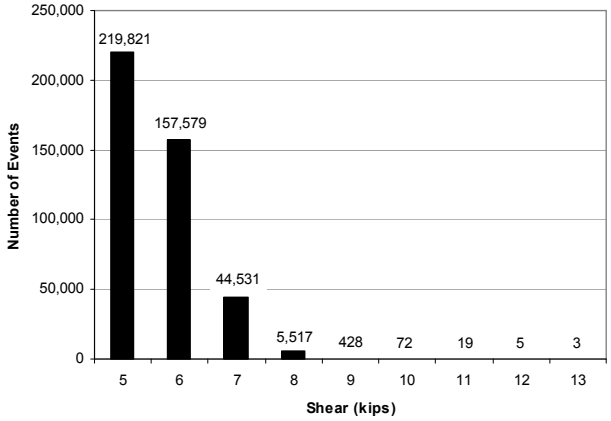


Figure C-1: Complete Histogram

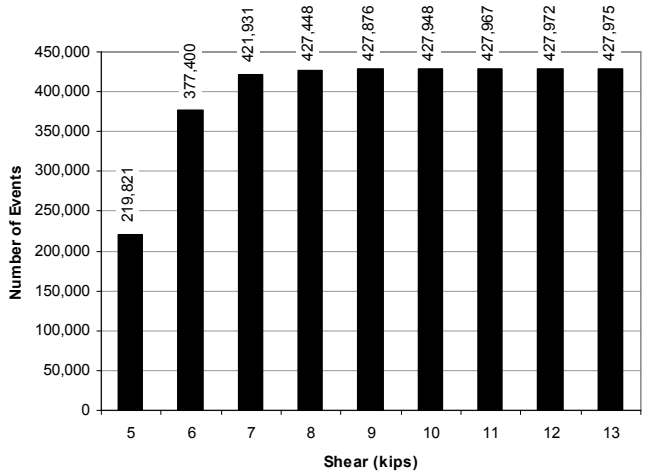


Figure C-2: Complete Cumulative Histogram

A plot of the Inverse Standard Normal Distribution and the shear values is shown below.

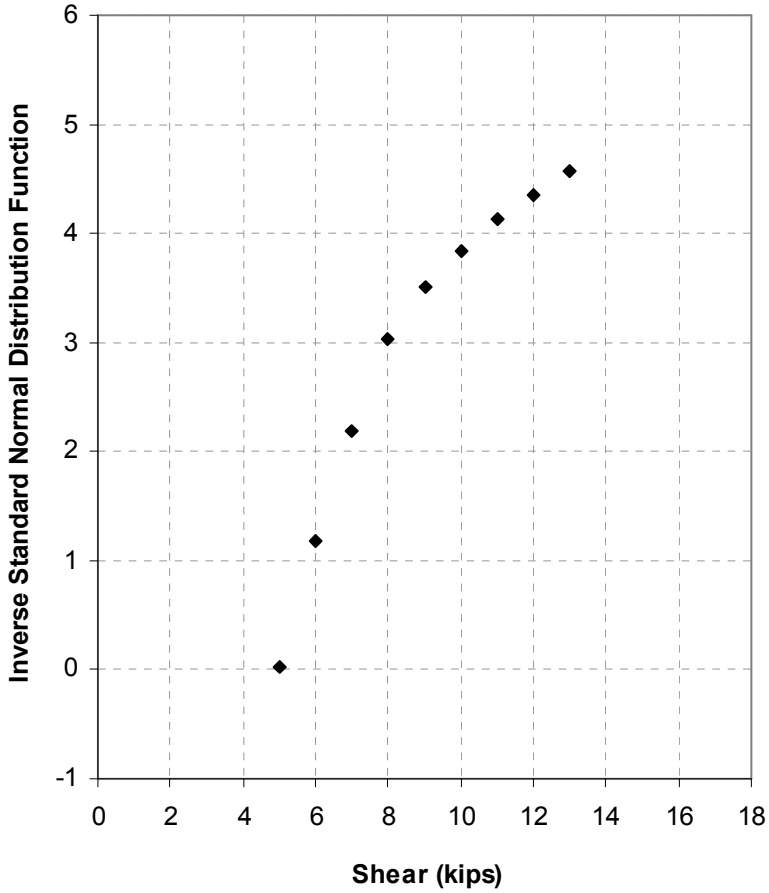


Figure C-3: Plot of the Inverse Standard Normal Distribution Function and the Shear Values

Using the collected data, it is possible to extrapolate the maximum load that any of the instrumented beams will be subjected to over a given period of time. In this example, there were a total of 427,975 events recorded over the 181 day time period. Assuming that there were a constant number of events per day over the entire period, the number of total events in any given period can be determined. For example, by dividing the number of total events by the number of days (427,980 / 181), there were 2,365 events per day. Likewise, dividing the number of total events by the number of days and then multiplying that by the number of days in a year,

(427,980 / 181) x 365, there would be 863,054 events per year. The table below is a summary of random time periods and the corresponding number of events that will occur during that period.

Time Period	Number of Events
1 Day	2,365
1 Week	16,552
1 Month	70,935
6 Months	425,610
1 Year	863,054
5 Years	4,315,218
25 Years	21,576,088
75 Years	64,728,263

Table C-3: Number of events per a given time period

Since there is only one event in which the maximum load occurs during a given time period, the probability is one divided by the number of events in that time span. Using the Inverse Standard Normal Distribution Function on the probability that the maximum load occurring in a given time period is shown below.

		Probability of the Maximum Load Occurring		
Period	**# of Events**	**Calculation**	**Result**	**Inverse Standard Normal Distribution**
1 Day	2,365	1 / 2,365	4.23×10^{-4}	3.33734
1 Week	16,552	1 / 16,552	6.04×10^{-5}	3.84443
1 Month	70,935	1 / 70,935	1.41×10^{-5}	4.18758
6 Months	425,610	1 / 425,610	2.35×10^{-6}	4.57779
1 Year	863,054	1 / 863,054	1.16×10^{-6}	4.72357
5 Year	4,315,218	1 / 4,315,218	2.32×10^{-7}	5.04085
25 Years	21,576,088	1 / 21,576,088	4.63×10^{-8}	5.34049
75 Years	64,728,263	1 / 64,728,263	1.54×10^{-8}	5.53627

Table C-4: Continuation of Table C-3, along with the probability of the maximum load occurring during the given time period and the Inverse Standard Normal Distribution Function

The Inverse Standard Normal Distribution values can be used to plot a horizontal line on the graph, as shown on the graph below. These lines indicate the daily probability that the maximum load in the corresponding time period will occur. Also, a linear regression trendline can be created from the plotted points and extended out to the 75 year line. This intersection point becomes the projected maximum shear that the beam will be subjected to over 75 years. However, it is more appropriate to use a linear regression trendline only on the extreme loads (O'Conner and O'Brien, 2005), since for loadings, only extreme loads approach a normal distribution. Therefore, applying the trendline only on data points higher than the one week line results in higher extrapolated shear values, as represented as a dashed line in the figure below. This line is a better indicator of the extreme distribution and hence the extreme loads. For this example, the expected maximum 75 year load for the measured girder is 13.74 kips, using the whole data set. Using the extreme data values, the expected maximum 75 year load is 16.86 kips.

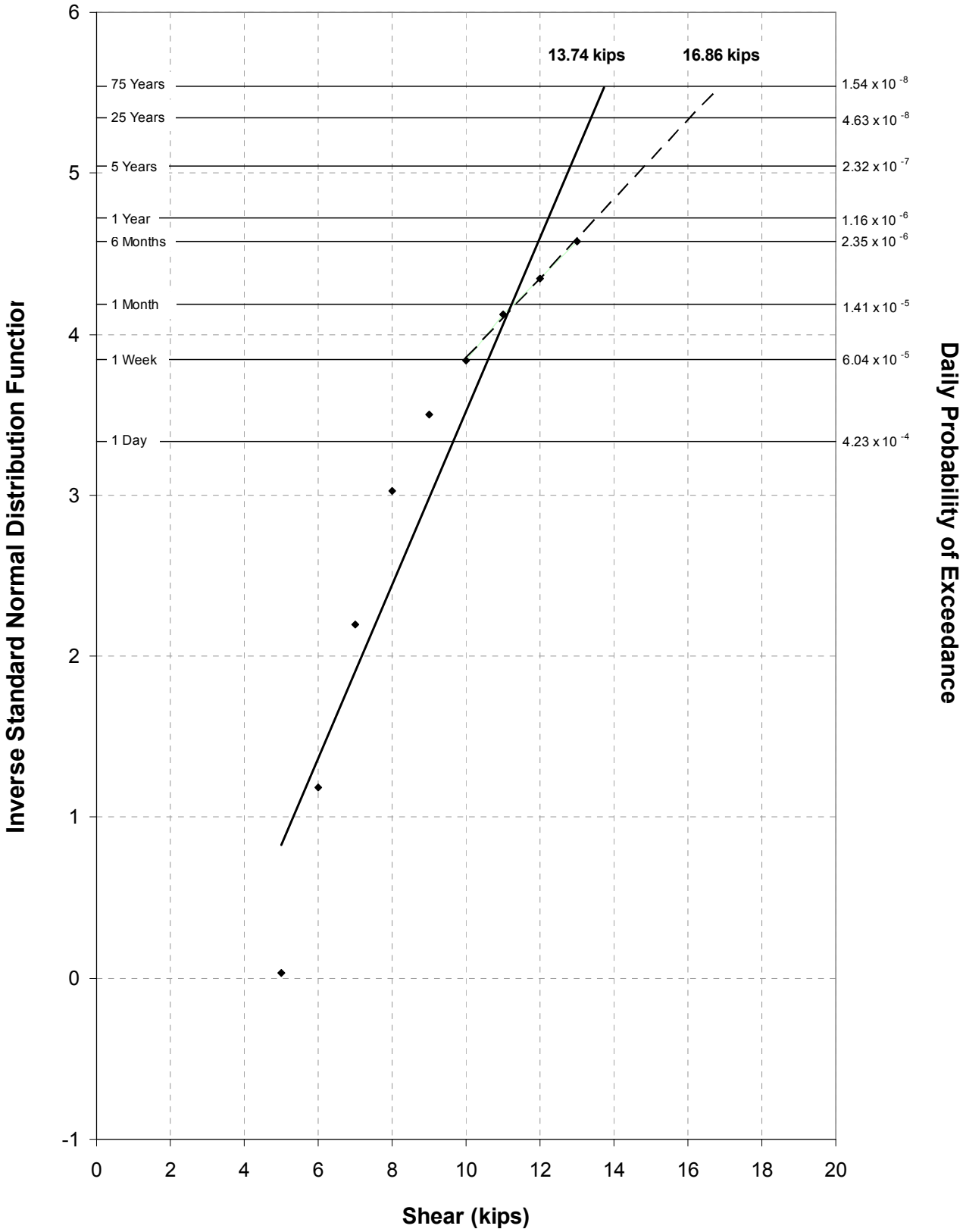


Figure C-4: Continuation of Figure B-3, along with the linear trendlines for entire data set and the extreme values

The collected data was first analyzed for spikes using software that detected anomalously high strains. Spikes, which are rare events, can be caused by mechanical movement of the wiring or electromagnetic interference. Relatively few spikes developed throughout the whole set of collected data, as shown below. While considering each beam separately for each bridge, most of the data contained less than 1% spikes out of the entire records collected for that bridge, of which many had less than 0.1% spikes, and the highest reaching 3.56%.

			Beam 1		**Beam 2**	
Bridge #	**Structure #**	**Total Records Collected**	**Number of Spikes**	**% Spikes**	**Number of Spikes**	**% Spikes**
1	059-0041	15,899,625	3,861	0.02%	93,629	0.59%
2	059-0040	16,382,571	582,553	3.56%	3,910	0.02%
3	068-0049	28,000,235	24,700	0.09%	25,945	0.09%
4	068-0046	40,856,578	6,528,299	15.95%	154,514	0.38%
5	084-0107	9,061,556	48,010	0.53%	2,034	0.02%
6	054-0043	27,927,655	326,071	1.17%	404,388	1.45%
7	060-0319	37,853,962	1,850	0.00%	1,377,017	3.64%
8	060-0056	14,349,068	160,736	1.12%	14,658	0.10%
9	060-0028	18,888,625	79,172	0.42%	16,918	0.09%
10	003-0001	7,820,197	22	0.00%	4,124	0.05%
11	003-0004	37,655,957	289,501	0.77%	513,586	1.36%
12	003-0006	6,109,921	6,228	0.10%	242,963	3.98%

Table C-5: Summary of spikes within data

The data was analyzed in order to identify the maximum shear in each event. The maximum shears per event were used to create a histogram for each beam per bridge, which the software compiled automatically, as described in Chapter 4. The histograms were used to create graphs in order to extrapolate the maximum expected shear values in that beam for a 75 year time span, as described previously. The compiled data for each bridge along with the number of days measured are shown below in Tables C-6 through C-17 and the extrapolated shear graphs are shown below in Figures C-5 though C-28. Summary tables of the results from the graphs are

shown in Tables C-6 and C-7. The extrapolated maximum 75 year shears, calculated from the Figures 4 through 9, are compared to the LRFD and LFD specifications.

Due to various difficulties with the data collection equipment over the six month measuring period, some data was unable to be recorded and therefore the exact number of measured days varies from bridge to bridge. Some examples of these difficulties included memory cards failing and vandalism to the equipment in the field.

Bridge 1 (059-0041)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	219,821	9,610
6	157,579	992
7	44,531	82
8	5,517	10
9	428	3
10	72	3
11	19	1
12	5	0
13	3	0

Number of Days Measured: 181

Table C-6: Complete Event Summary for Bridge 1

Bridge 2 (059-0040)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	211,683	95,264
6	39,953	27,853
7	5,268	4,989
8	507	823
9	47	253
10	6	101
11	3	38
12	0	8
13	0	1
14	0	3
15	0	1
16	0	2

Number of Days Measured: 185

Table C-7: Complete Event Summary for Bridge 2

Bridge 3 (068-0049)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	34,868	50,823
6	54,082	52,395
7	44,798	59,287
8	43,962	55,021
9	56,945	27,875
10	55,178	7,744
11	24,234	1,465
12	4,214	288
13	510	89
14	126	54
15	46	23
16	15	11
17	9	4
18	2	1
19	1	2
20	0	1
21	1	0
22	2	1

Number of Days Measured: 139

Table C-8: Complete Event Summary for Bridge 3

Bridge 4 (068-0046)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	31265	23227
6	39809	33886
7	51754	39878
8	50845	40617
9	49472	49344
10	47757	69699
11	47220	40525
12	41533	13007
13	30596	2819
14	16799	661
15	6607	266
16	2099	128
17	612	57
18	205	33
19	63	21
20	21	16
21	5	4
22	5	8
23	3	1
24	0	3
25	0	3

Number of Days Measured: 137

Table C-9: Complete Event Summary for Bridge 3

Bridge 5 (084-0107)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	7,768	120,144
6	235	51,281
7	38	8,347
8	3	862
9	1	160
10	0	38
11	0	11
12	0	5
13	0	2
14	0	1

Number of Days Measured: 140

Table C-10: Complete Event Summary for Bridge 5

Bridge 6 (054-0043)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	14,513	11,204
6	50,229	19,185
7	42,786	29,284
8	43,523	32,250
9	51,488	31,076
10	45,619	33,369
11	26,084	42,328
12	9,454	45,960
13	2,315	29,751
14	395	9,916
15	85	2,261
16	38	533
17	24	221
18	16	108
19	8	52
20	8	55
21	5	15
22	6	9
23	0	7
24	1	2
25	0	3
26	1	1

Number of Days Measured: 140

Table C-11: Complete Event Summary for Bridge 6

Bridge 7 (060-0319)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
9	40050	32302
10	35693	34630
11	33043	34798
12	32947	35771
13	39618	38108
14	46652	38595
15	38371	32835
16	29979	21613
17	21595	11050
18	8881	4506
19	2543	1693
20	782	714
21	307	403
22	185	275
23	141	163
24	67	127
25	19	107
26	18	73
27	15	58
28	3	66
29	3	29
30	10	26
31	4	11
32	5	10
33	2	8
34	2	5
35	5	1
36	0	3
37	0	2
38	0	1
39	0	1
40	0	4
41	0	4
42	0	0
43	0	2
44	0	1

Number of Days Measured: 167

Table C-12: Complete Event Summary for Bridge 7

Bridge 8 (060-0056)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
8	106106	95696
9	83436	19134
10	15510	3736
11	1577	610
12	333	131
13	143	66
14	53	41
15	36	18
16	15	9
17	8	2
18	7	0
19	1	2
20	0	1
21	1	0

Number of Days Measured: 170

Table C-13: Complete Event Summary for Bridge 8

Bridge 9 (060-0028)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
6	156584	29982
7	54799	4977
8	15911	469
9	4575	70
10	809	16
11	95	6
12	18	4
13	7	2
14	5	0

Number of Days Measured: 165

Table C-14: Complete Event Summary for Bridge 9

Bridge 10 (003-0001)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
5	24336	30006
6	780	2836
7	96	352
8	19	56
9	5	8
10	0	3

Number of Days Measured: 170

Table C-15: Complete Event Summary for Bridge 10

Bridge 11 (003-0004)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
10	95295	64931
11	88498	79994
12	59766	55619
13	31247	24927
14	15690	9258
15	8618	3207
16	5100	1196
17	3458	369
18	2378	174
19	1653	86
20	1026	52
21	584	29
22	286	15
23	146	7
24	42	5
25	23	6
26	8	0
27	2	1
28	5	0
29	3	0
30	0	0
31	2	0
32	1	0

Number of Days Measured: 171

Table C-16: Complete Event Summary for Bridge 11

Bridge 12 (003-0006)

Maximum Shear per Event (kips)	Number of Events	
	Beam 1	Beam 2
6	95327	41938
7	17031	49174
8	2223	28054
9	280	8578
10	60	2799
11	16	1208
12	11	569
13	0	217
14	0	61
15	0	17
16	0	5
17	0	2

Number of Days Measured: 163

Table C-17: Complete Event Summary for Bridge 12

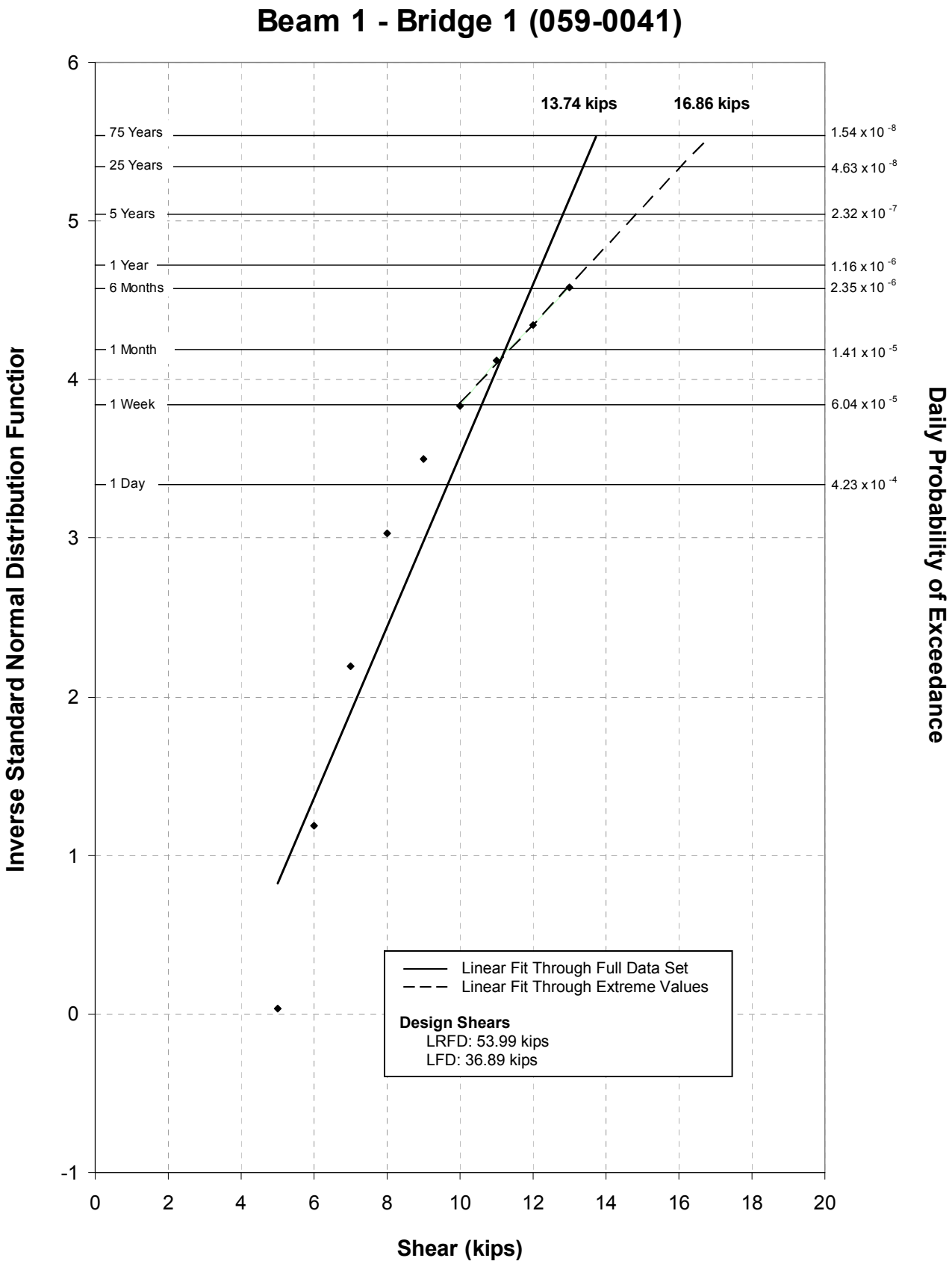


Figure C-5: Extrapolated Shear Force Graph for Beam 1, Bridge 1

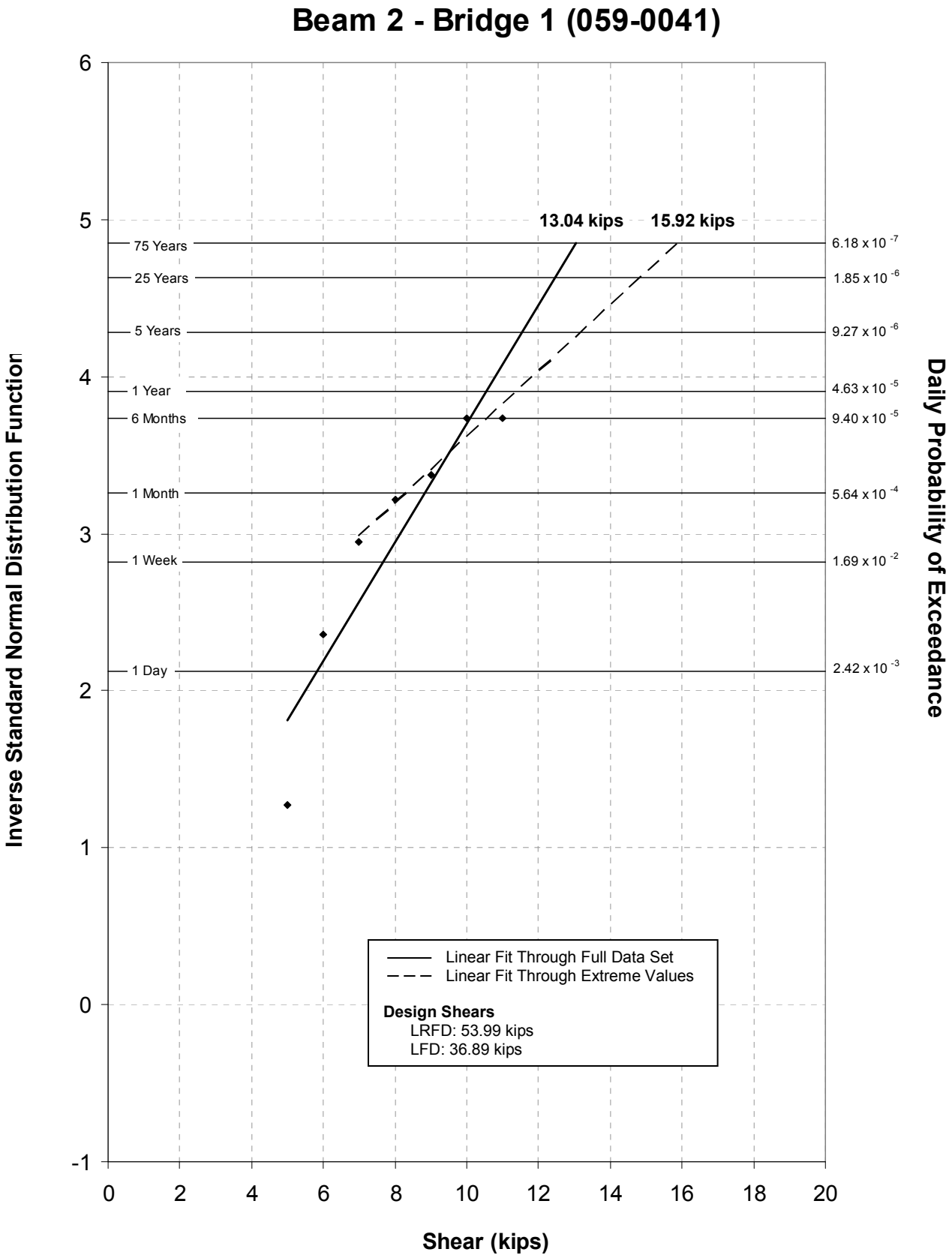


Figure C-6: Extrapolated Shear Force Graph for Beam 2, Bridge 1

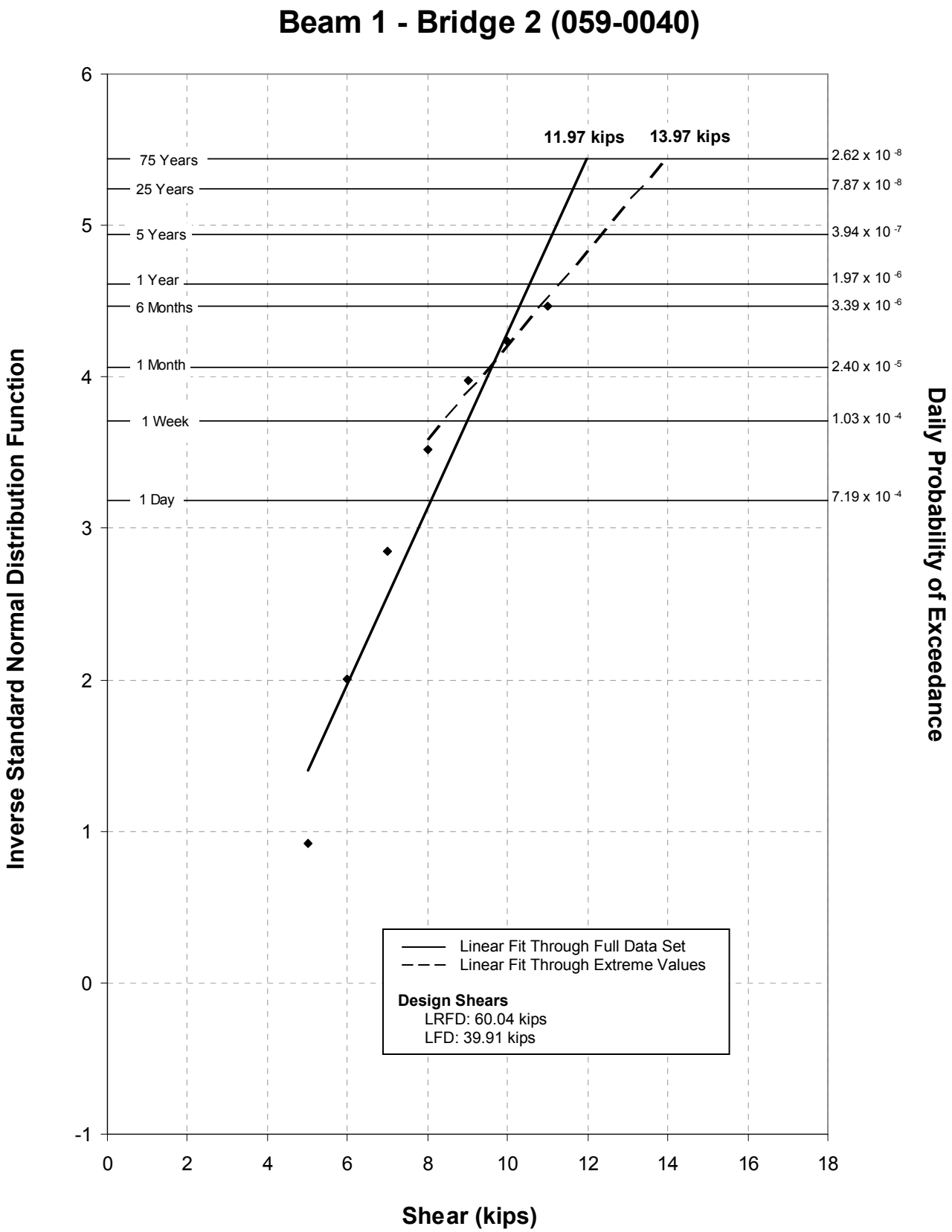


Figure C-7: Extrapolated Shear Force Graph for Beam 1, Bridge 2

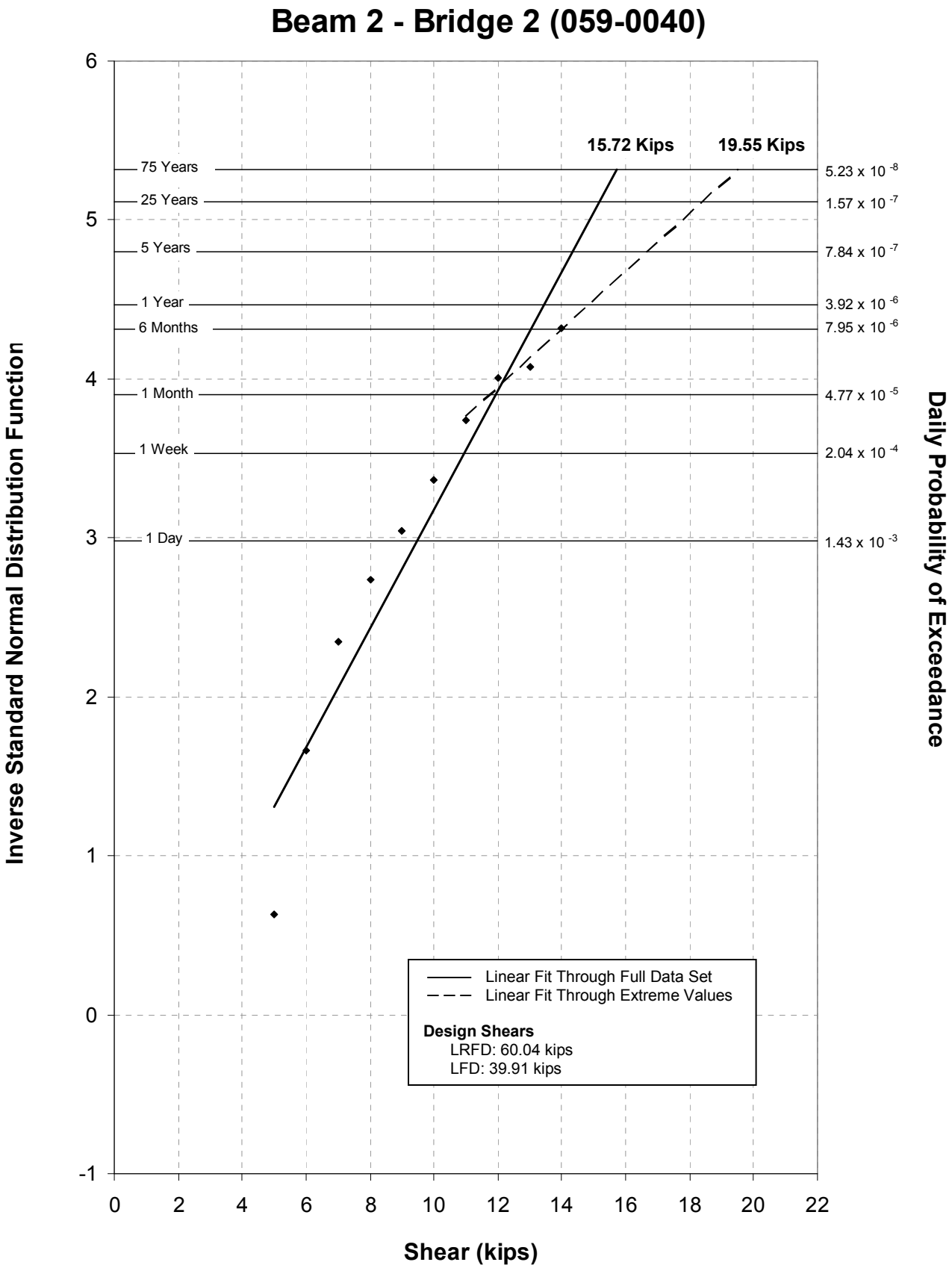


Figure C-8: Extrapolated Shear Force Graph for Beam 2, Bridge 2

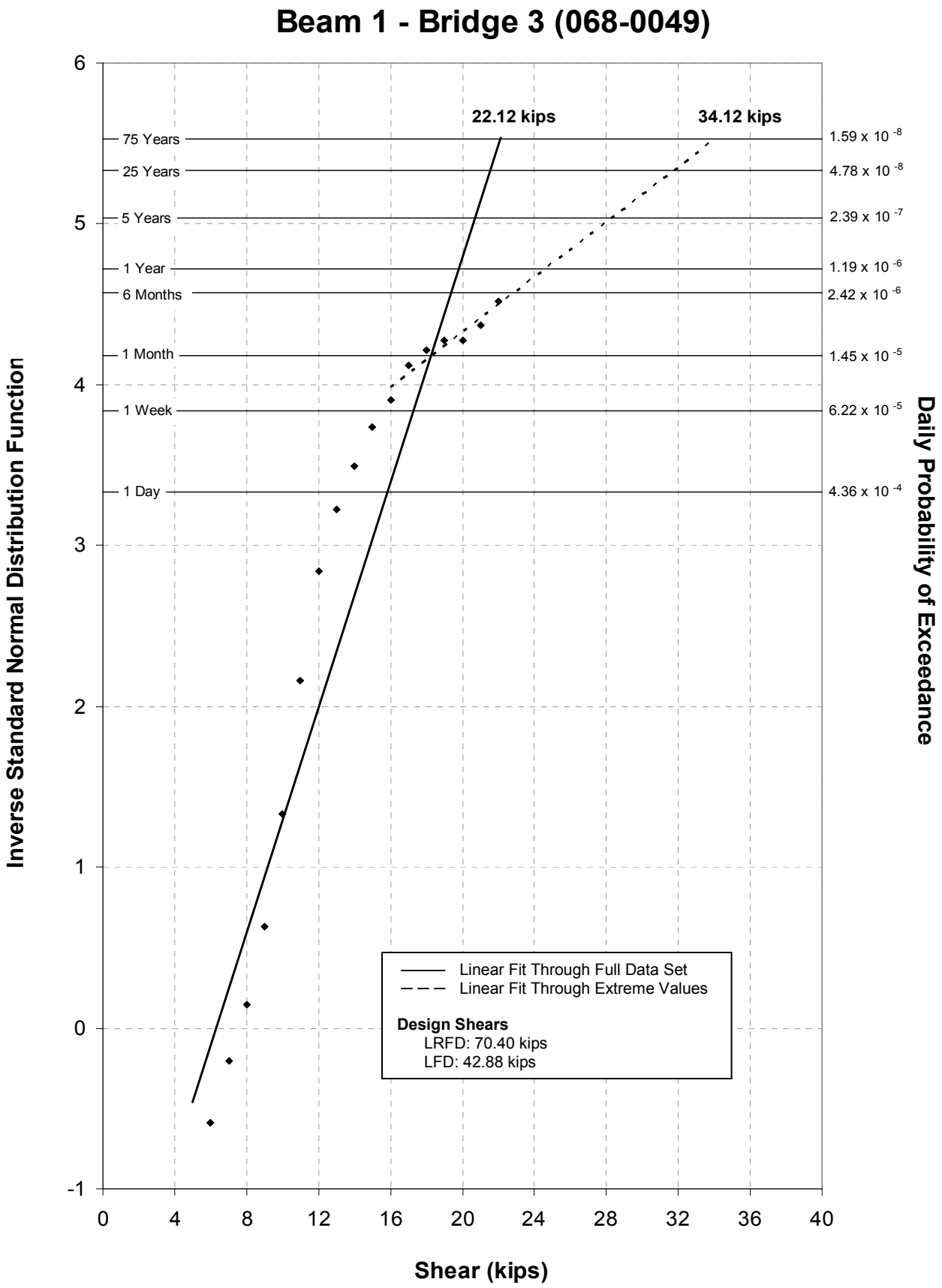


Figure C-9: Extrapolated Shear Force Graph for Beam 1, Bridge 3

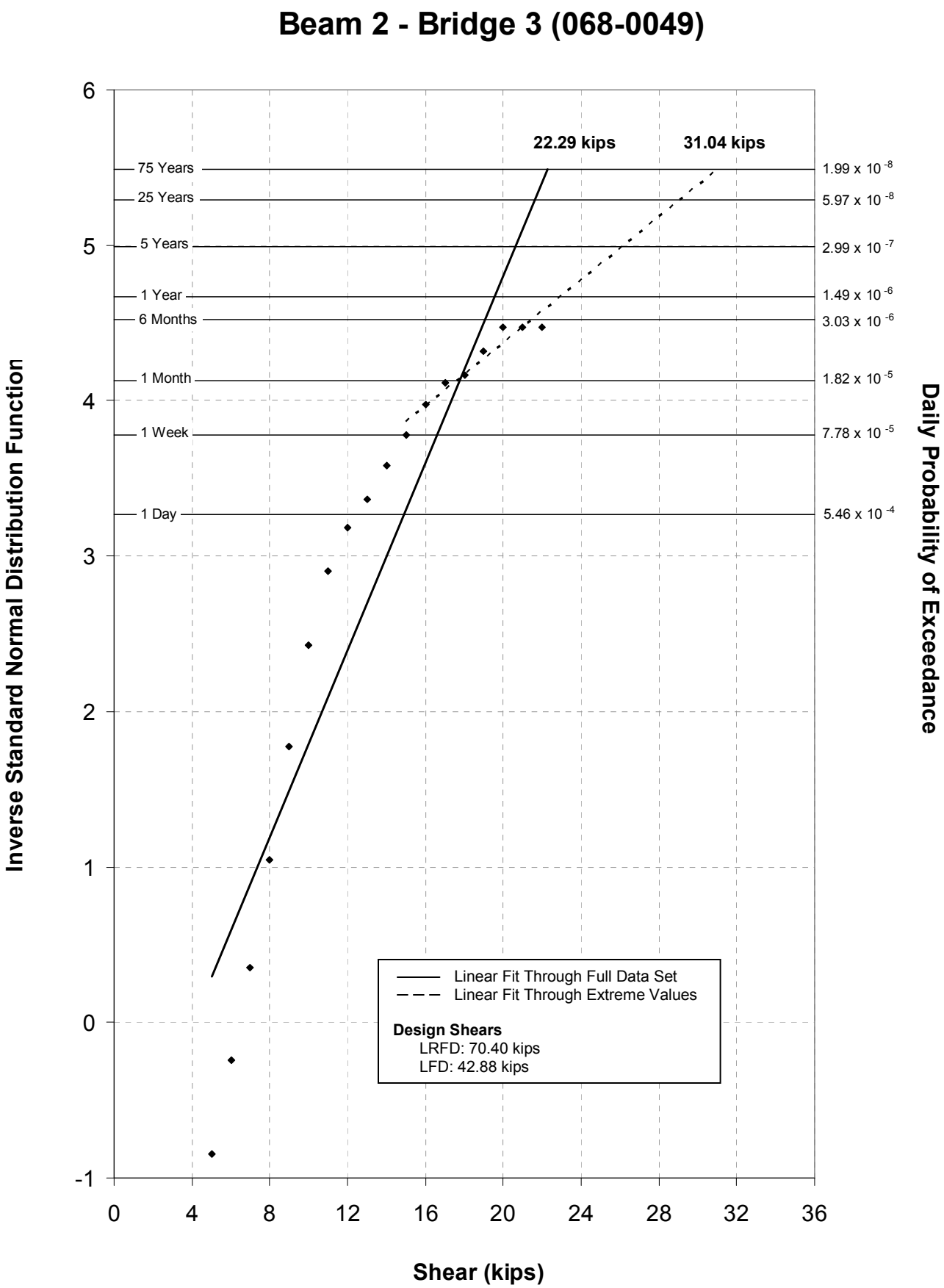


Figure C-10: Extrapolated Shear Force Graph for Beam 2, Bridge 3

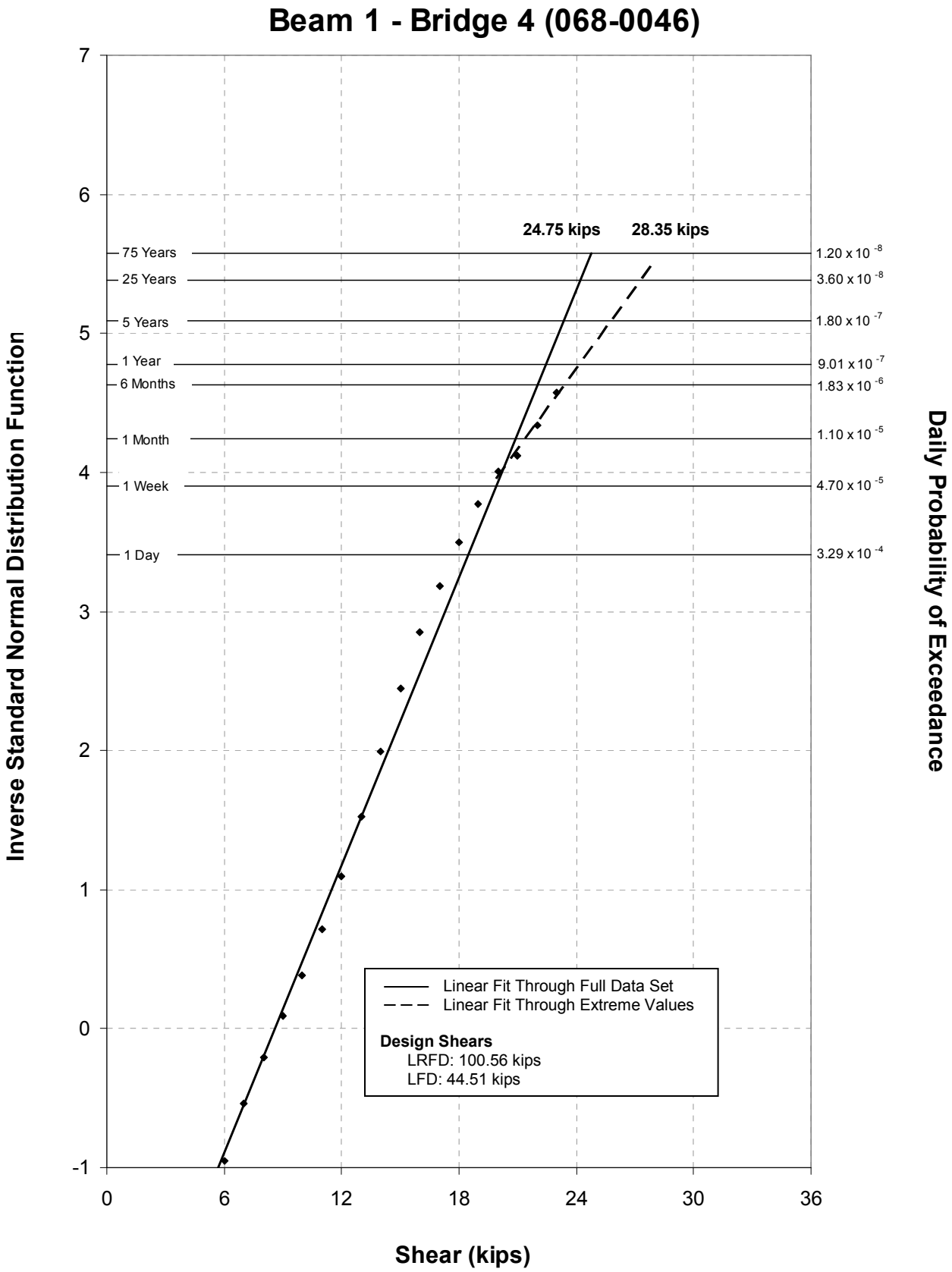


Figure C-11: Extrapolated Shear Force Graph for Beam 1, Bridge 4

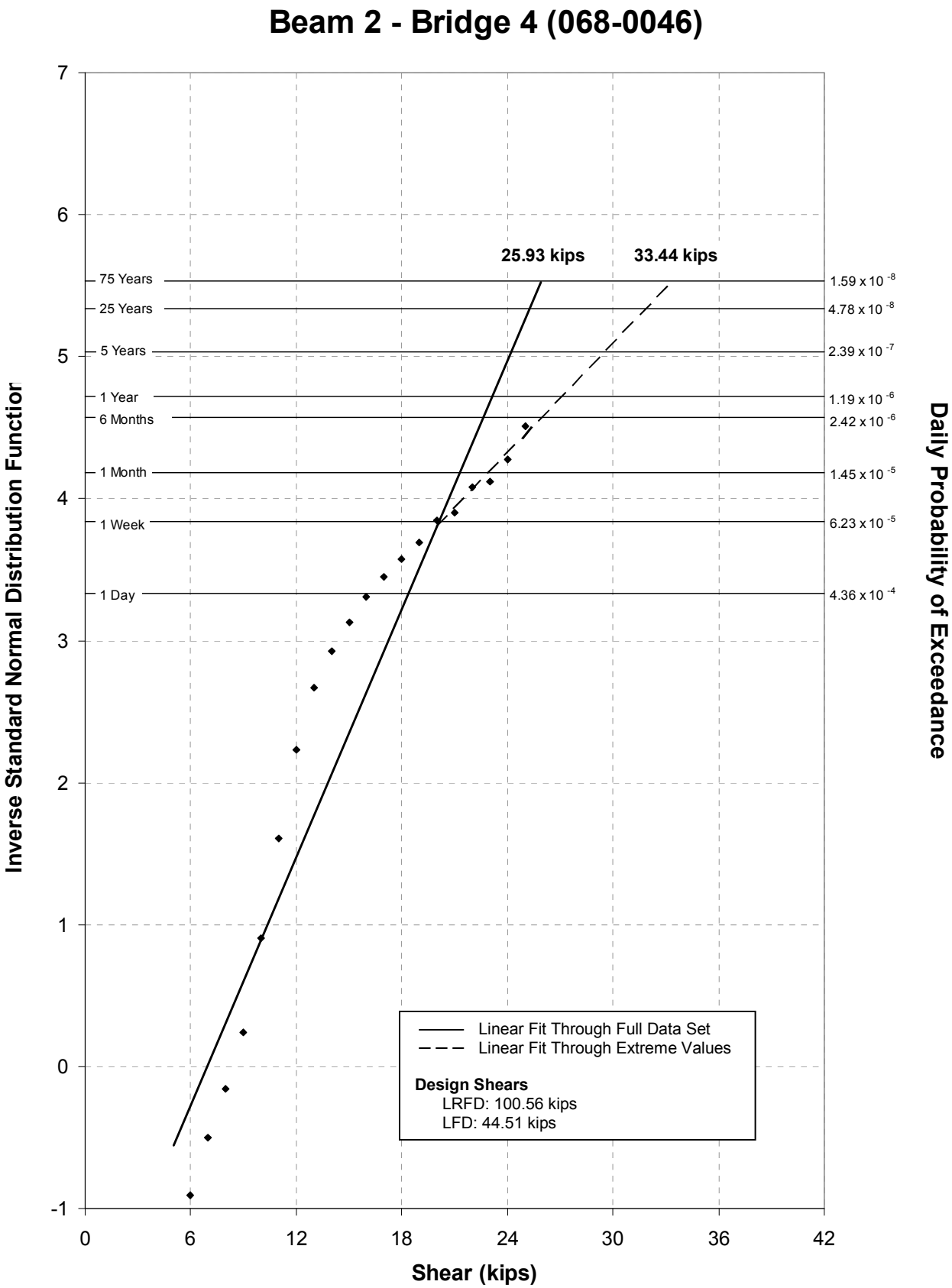


Figure C-12: Extrapolated Shear Force Graph for Beam 2, Bridge 4

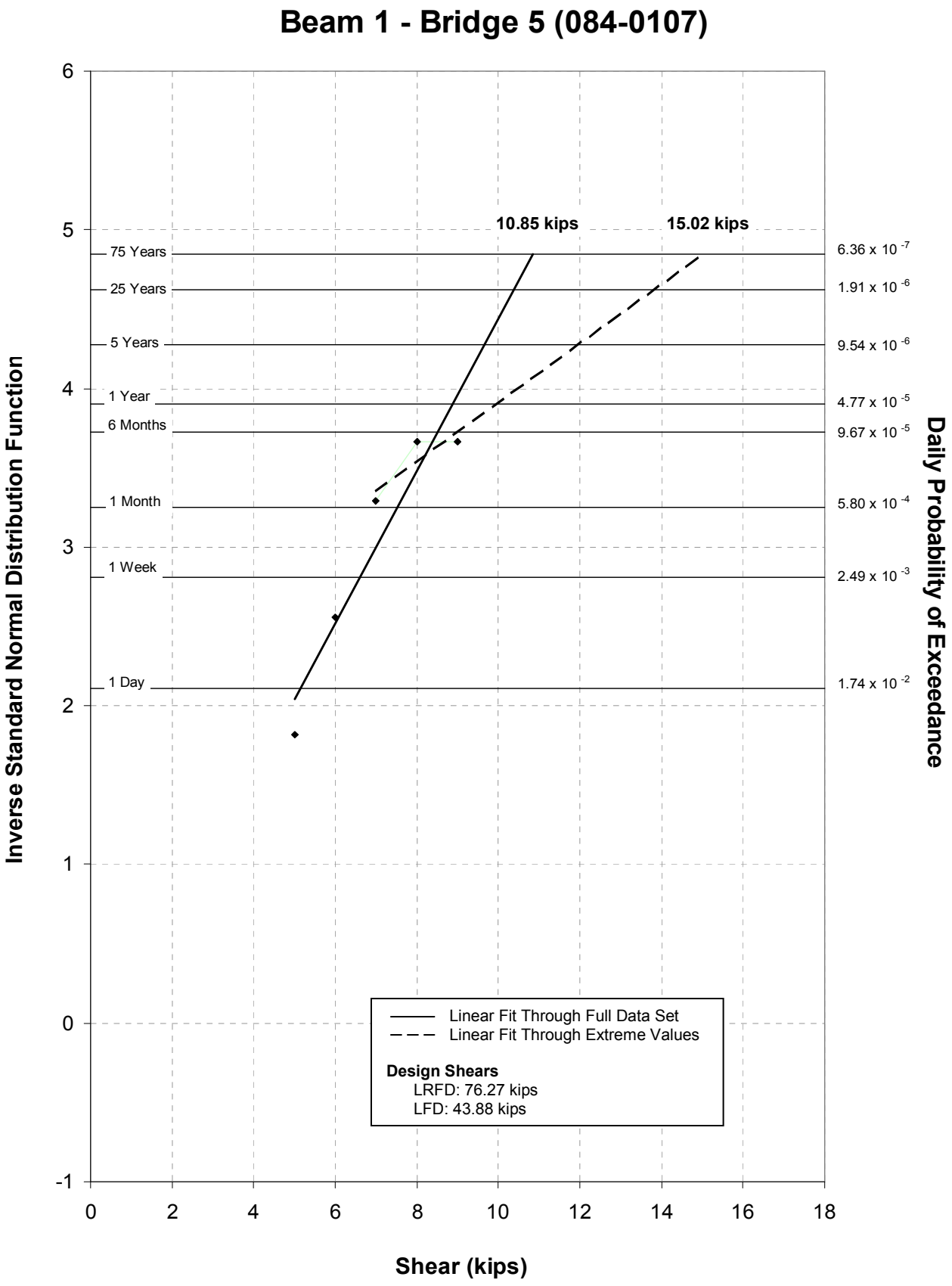


Figure C-13: Extrapolated Shear Force Graph for Beam 1, Bridge 5

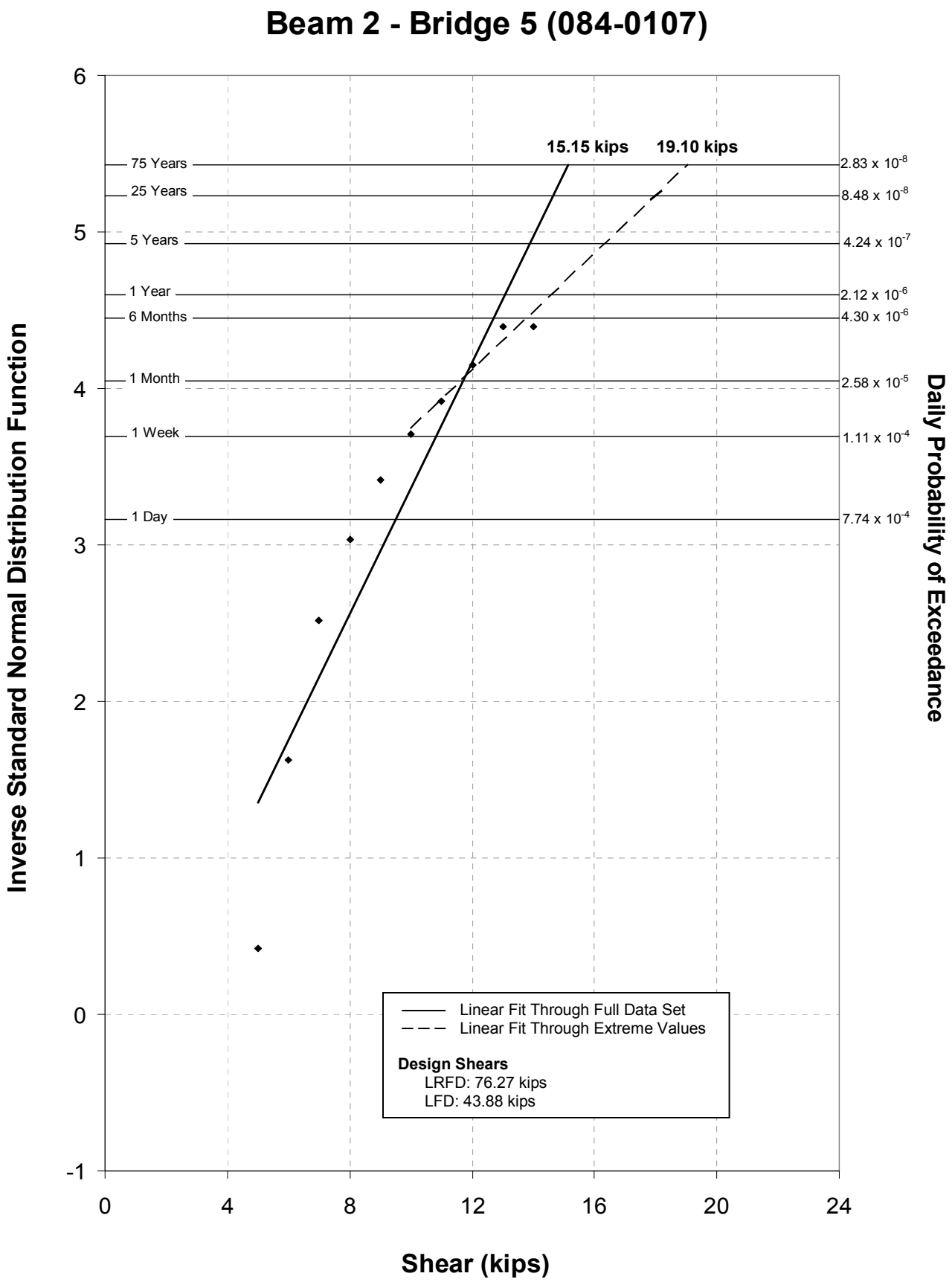


Figure C-14: Extrapolated Shear Force Graph for Beam 2, Bridge 5

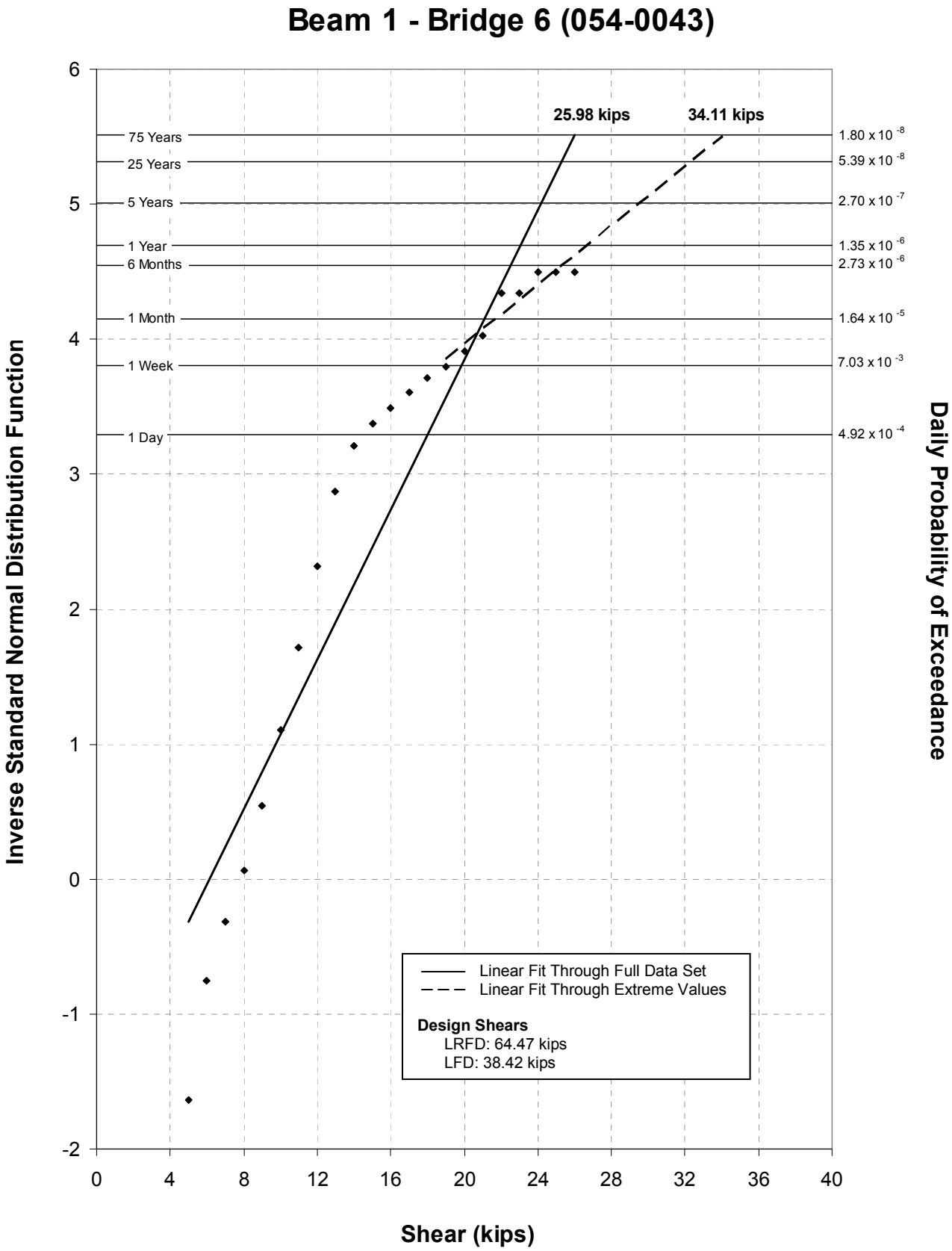


Figure C-15: Extrapolated Shear Force Graph for Beam 1, Bridge 6

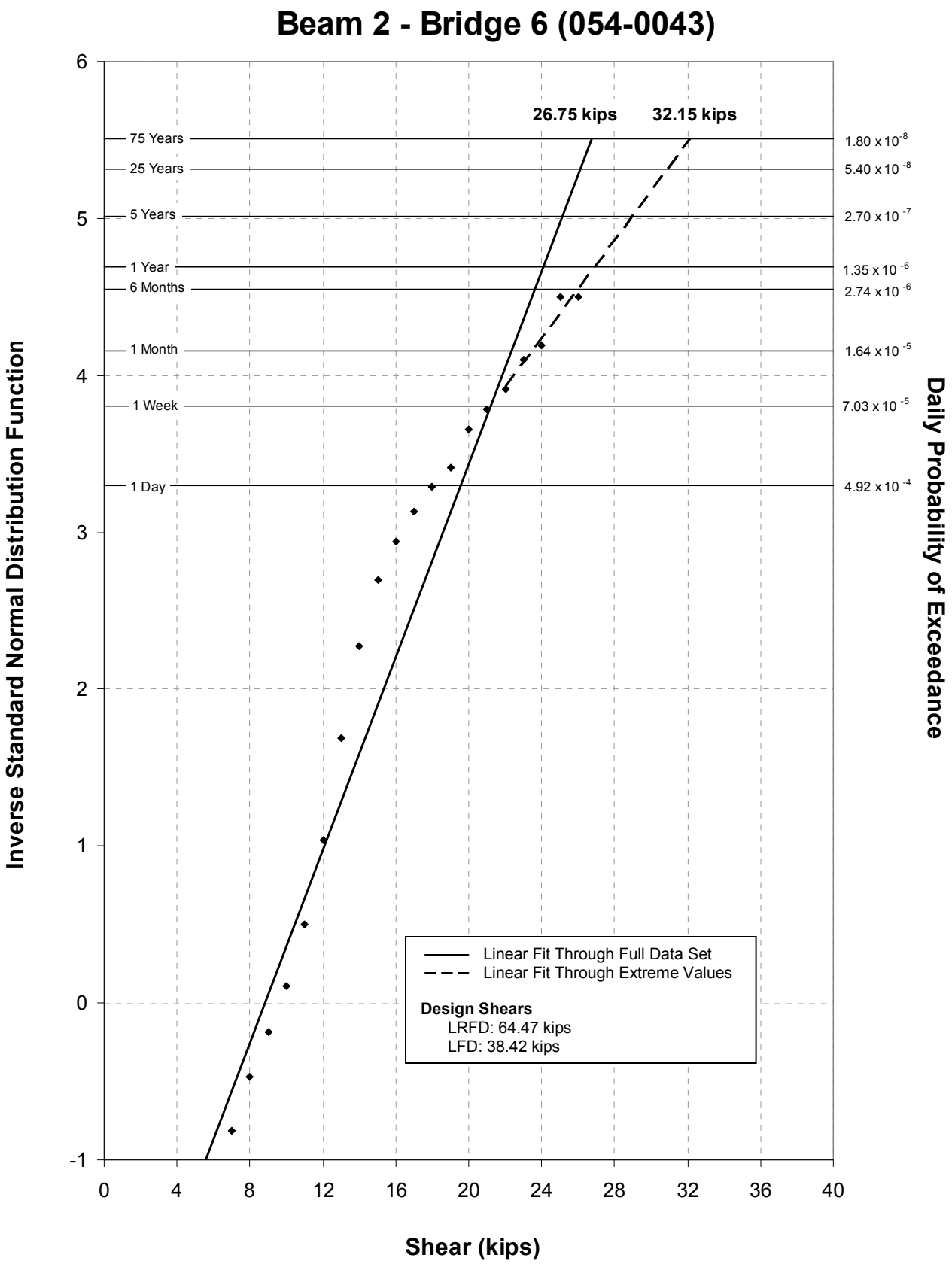


Figure C-16: Extrapolated Shear Force Graph for Beam 2, Bridge 6

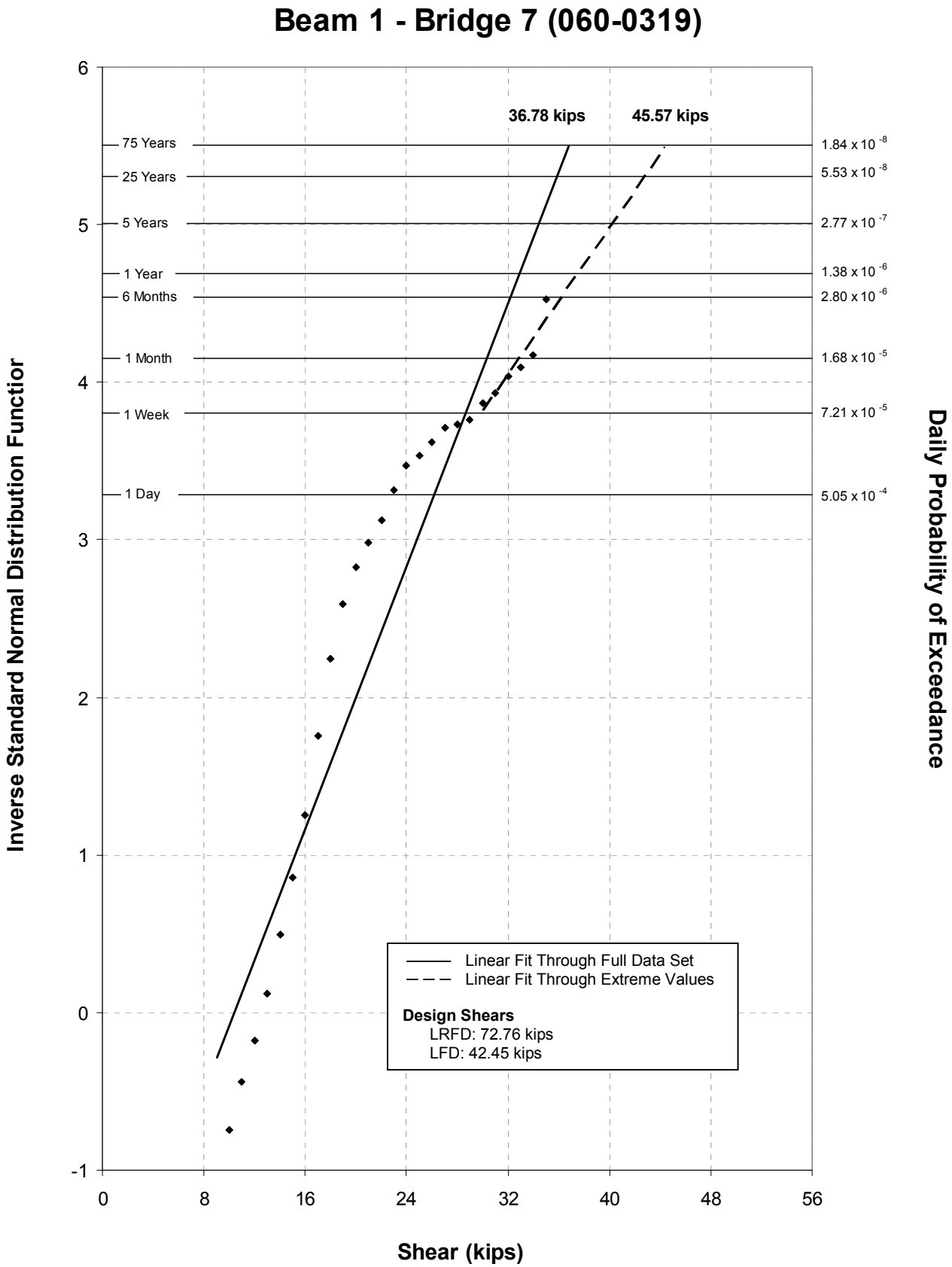


Figure C-17: Extrapolated Shear Force Graph for Beam 1, Bridge 7

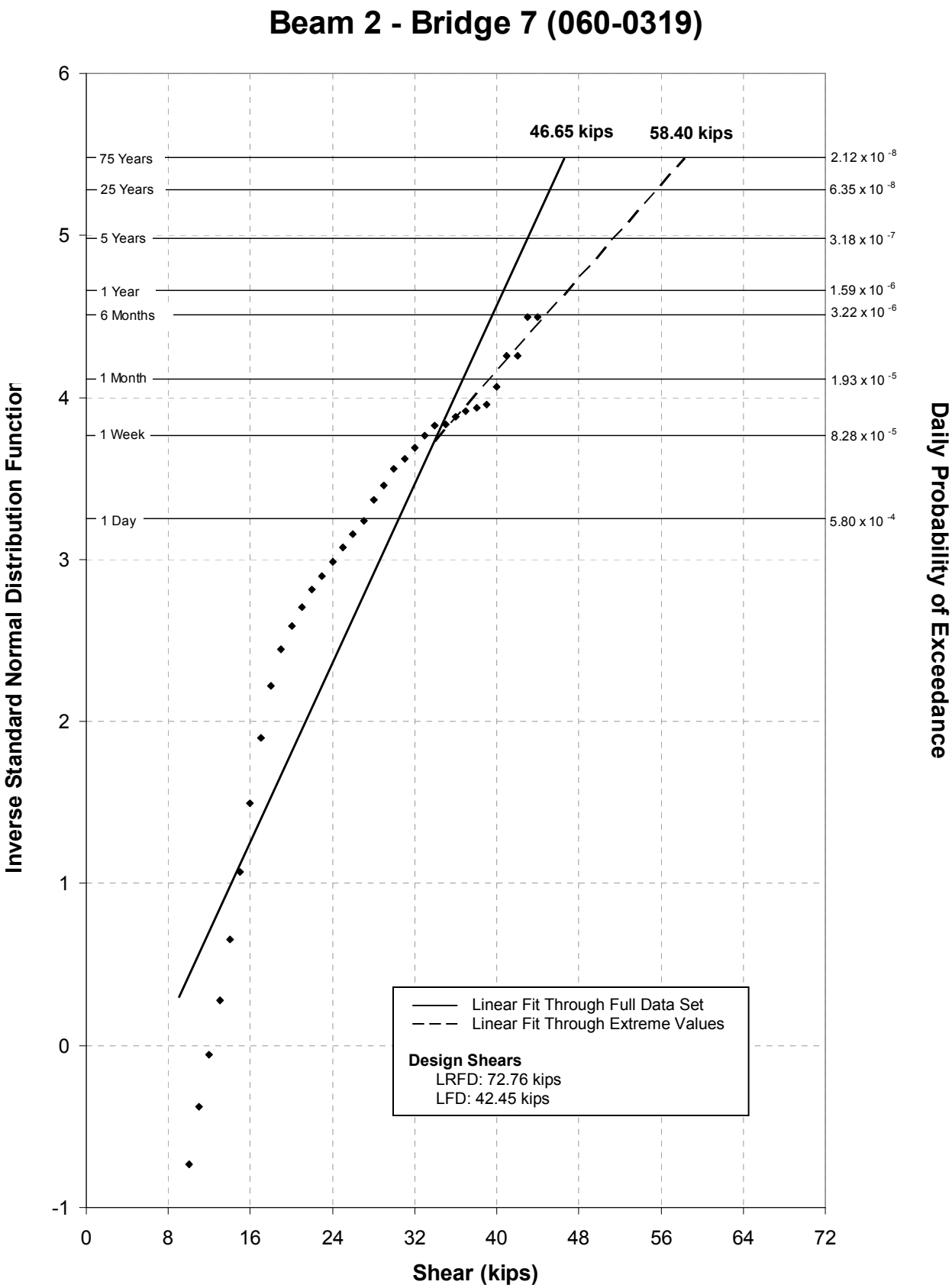


Figure C-18: Extrapolated Shear Force Graph for Beam 2, Bridge 7

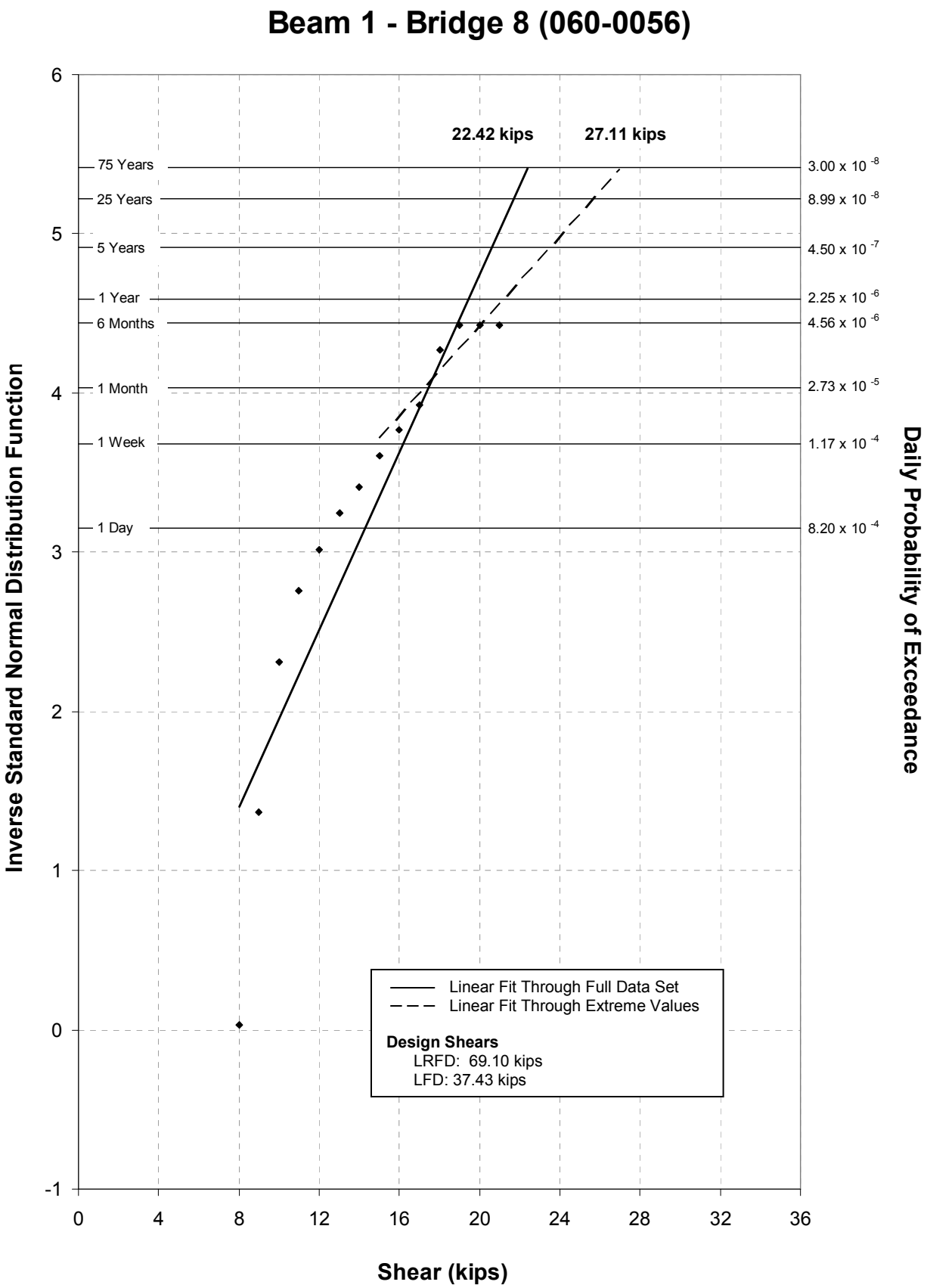


Figure C-19: Extrapolated Shear Force Graph for Beam 1, Bridge 8

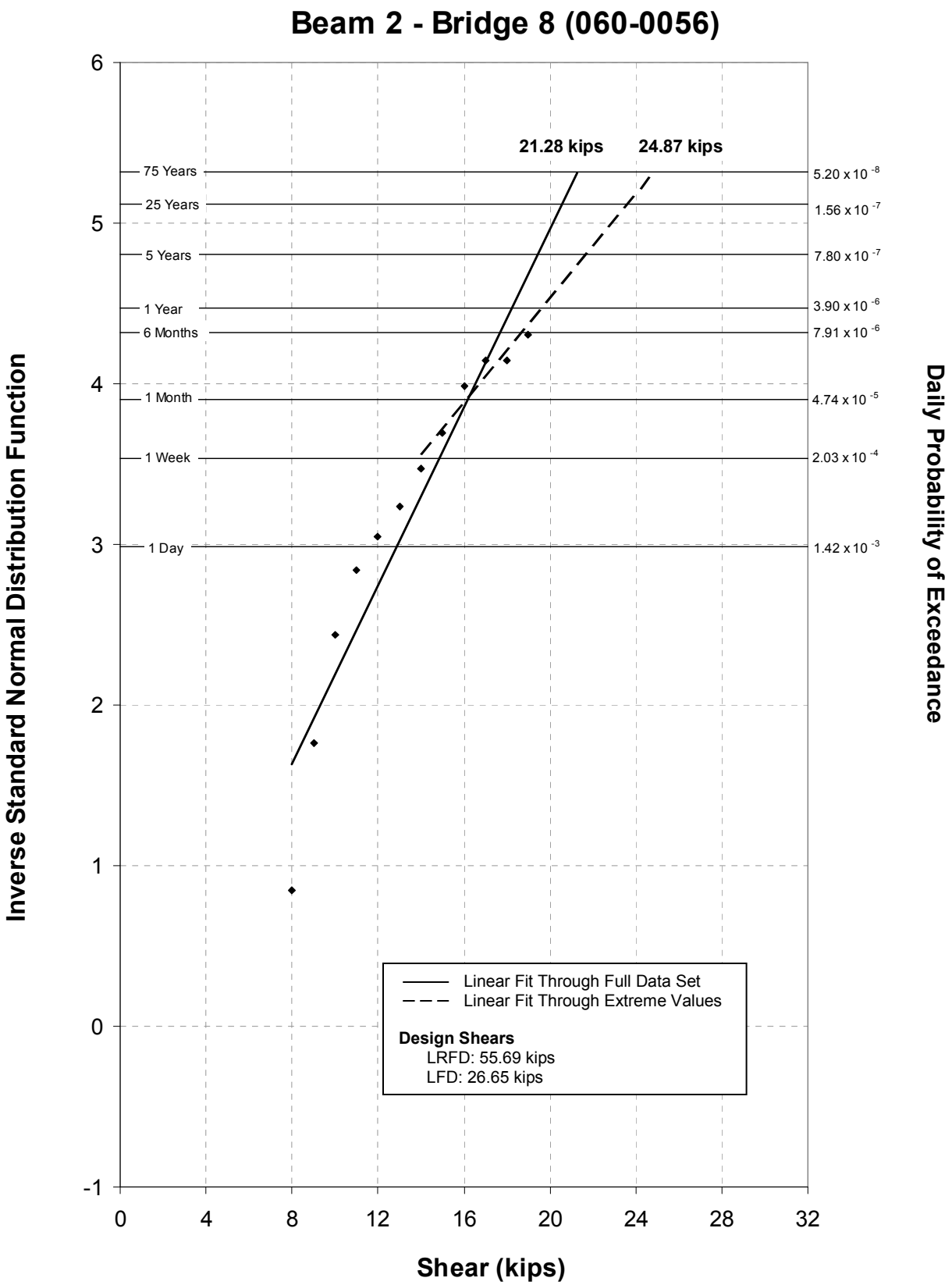


Figure C-20: Extrapolated Shear Force Graph for Beam 2, Bridge 8

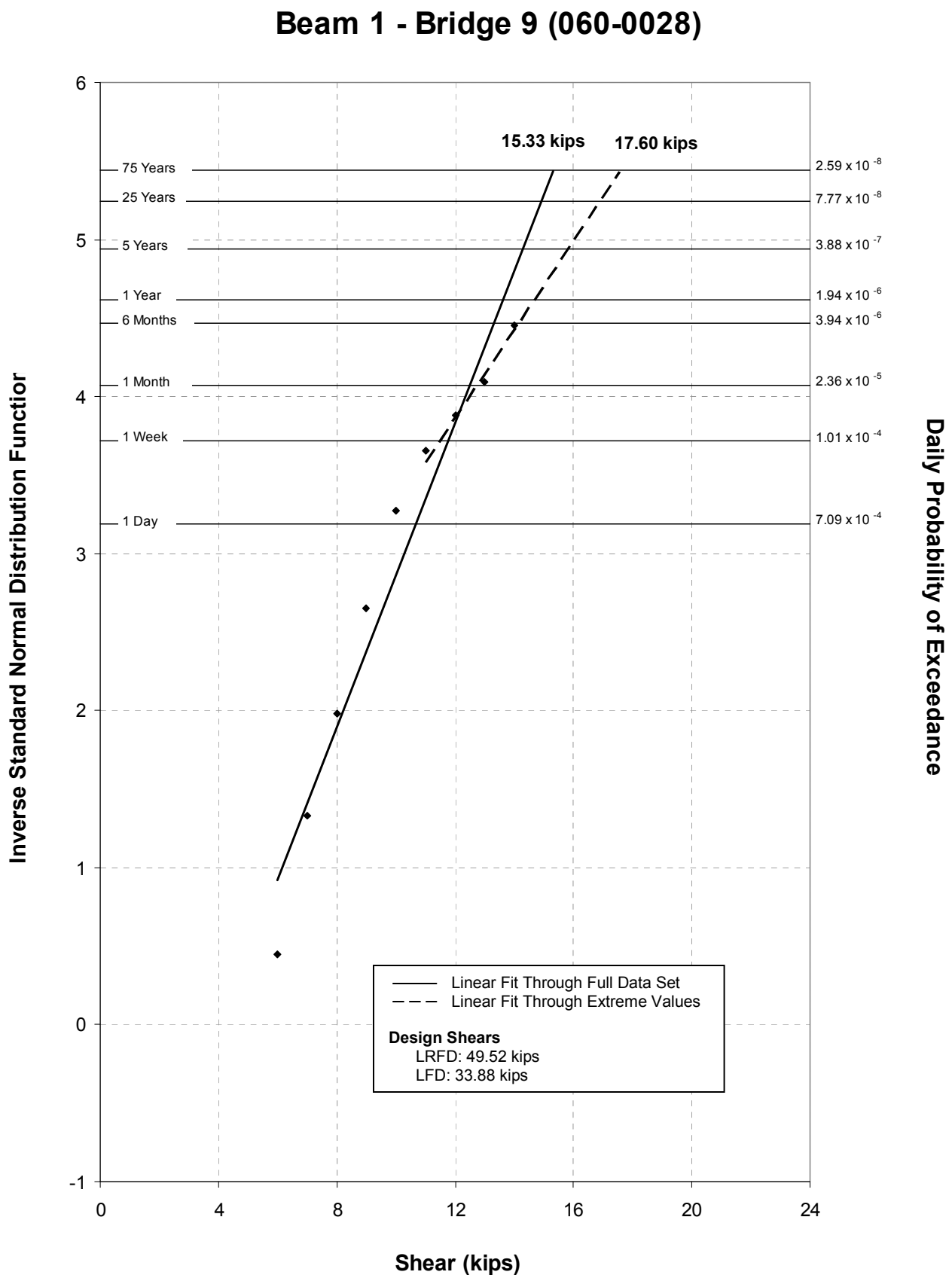


Figure C-21: Extrapolated Shear Force Graph for Beam 1, Bridge 9

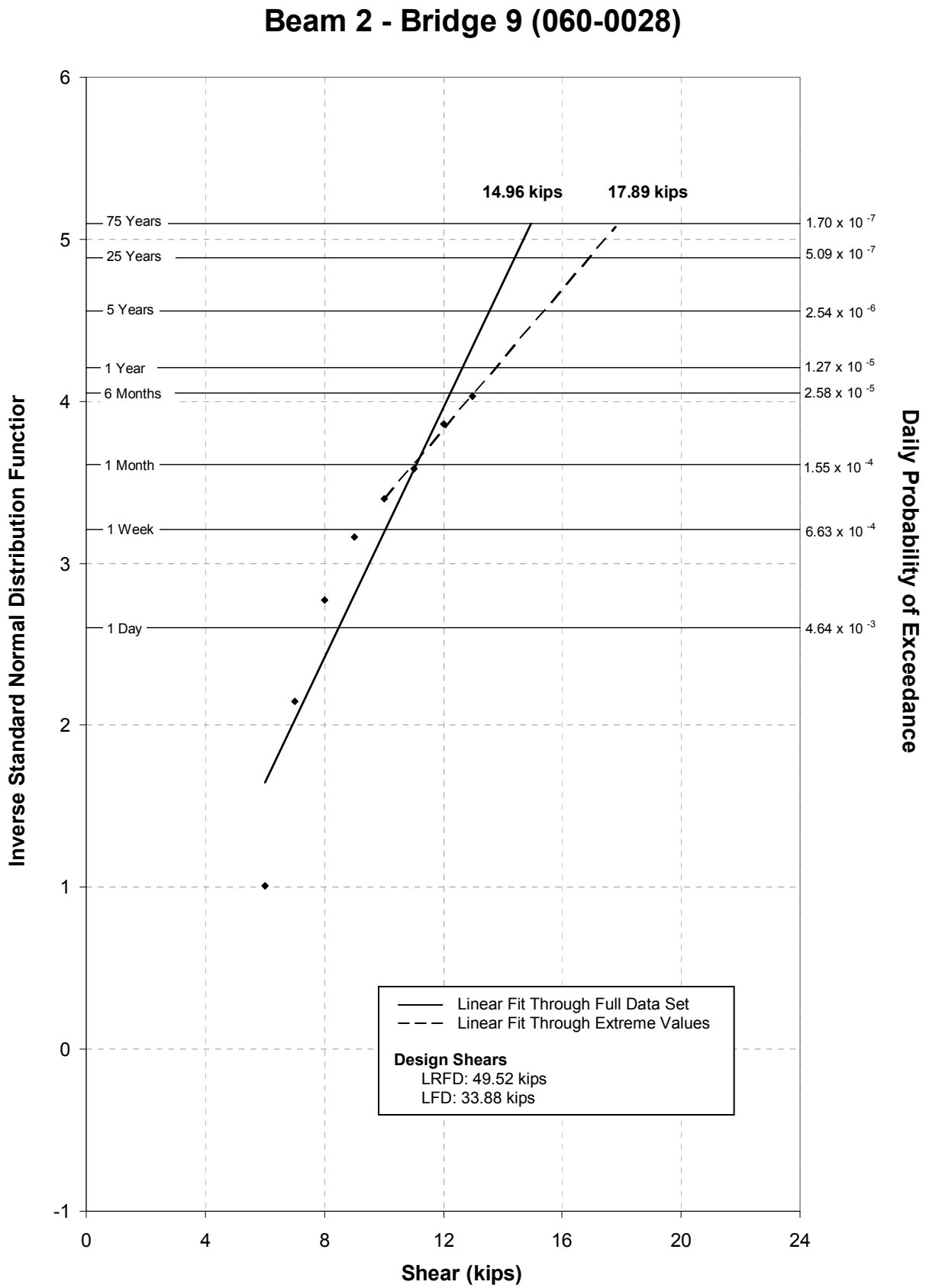


Figure C-22: Extrapolated Shear Force Graph for Beam 2, Bridge 9

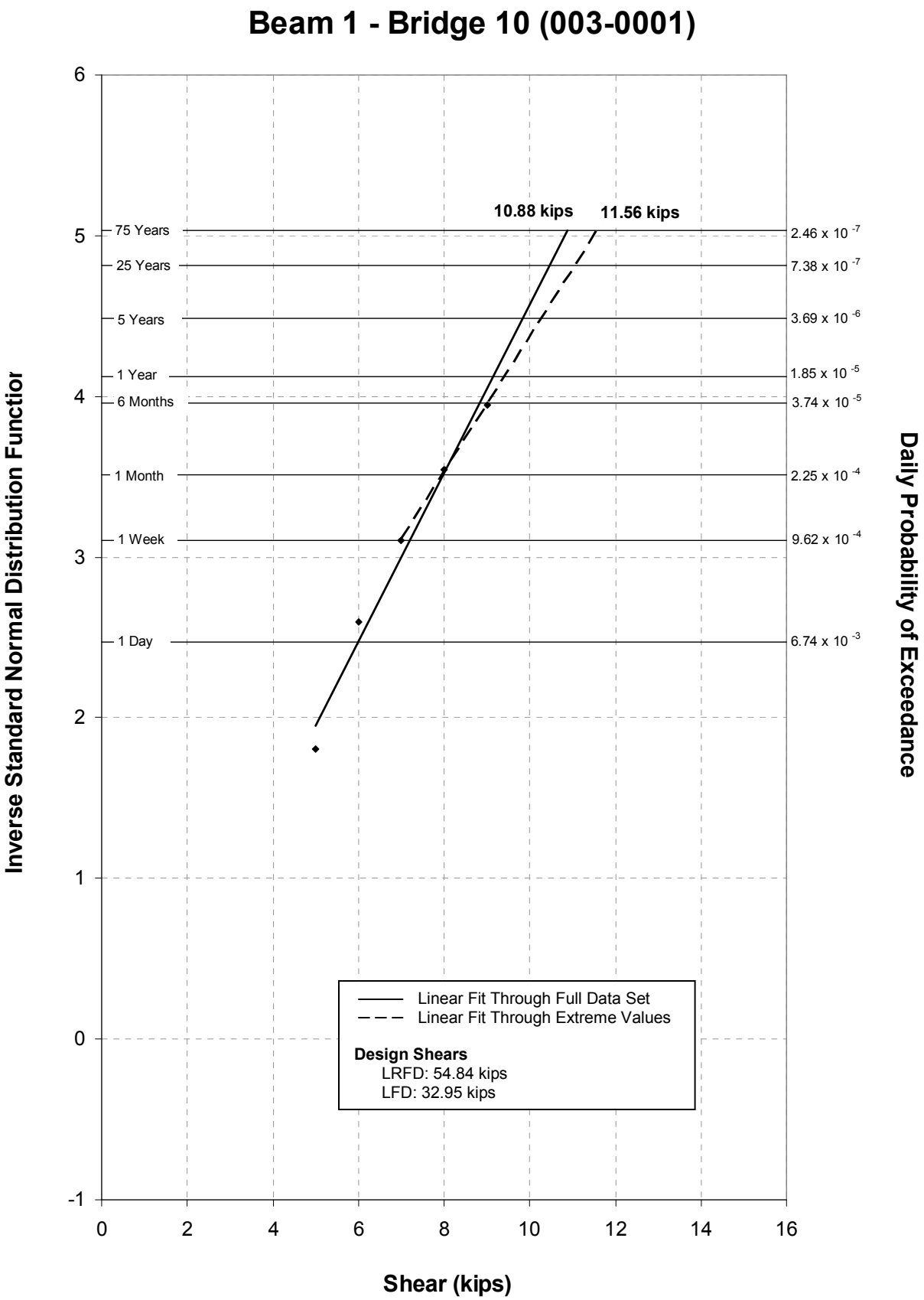


Figure C-23: Extrapolated Shear Force Graph for Beam 1, Bridge 10

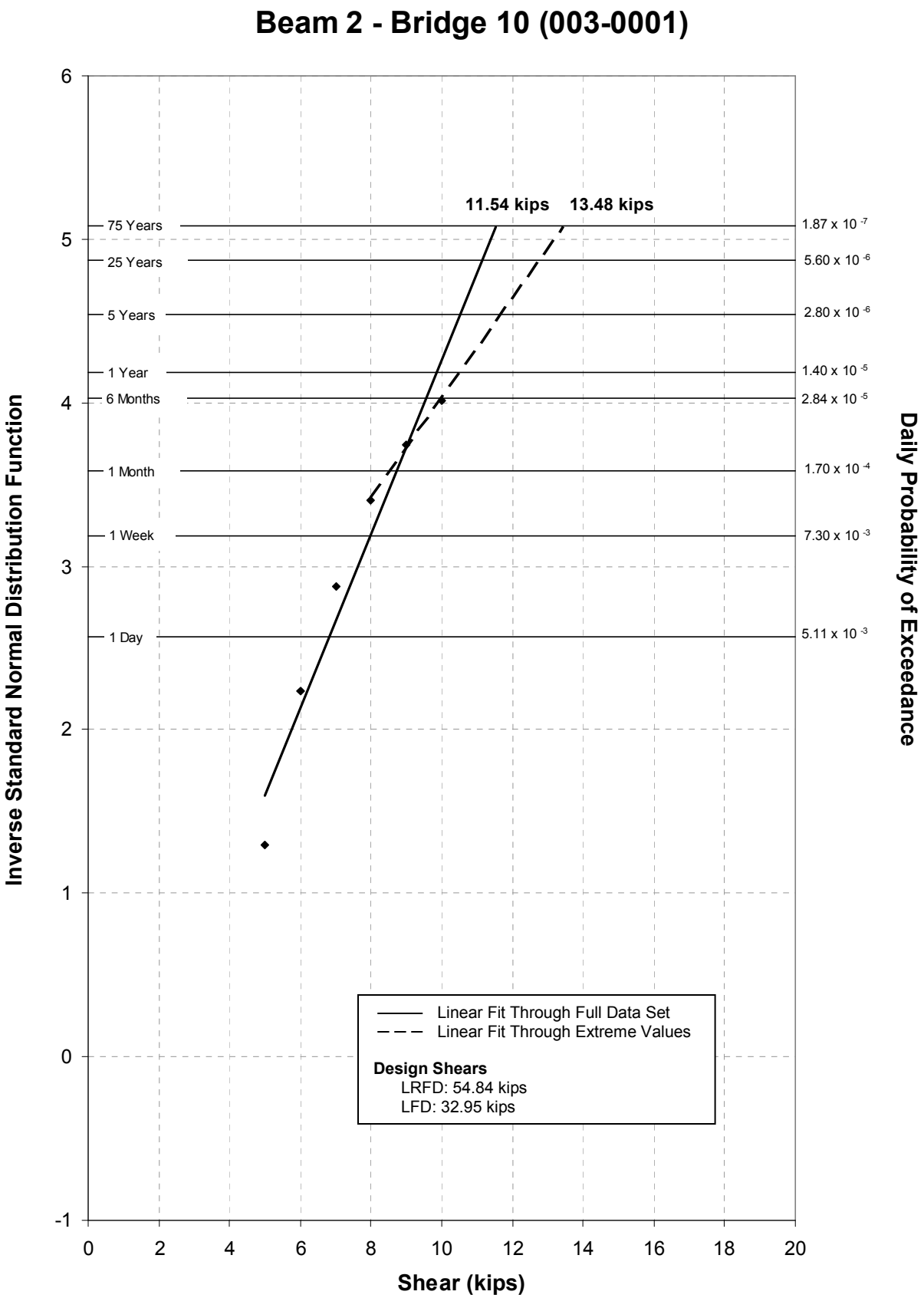


Figure C-24: Extrapolated Shear Force Graph for Beam 2, Bridge 10

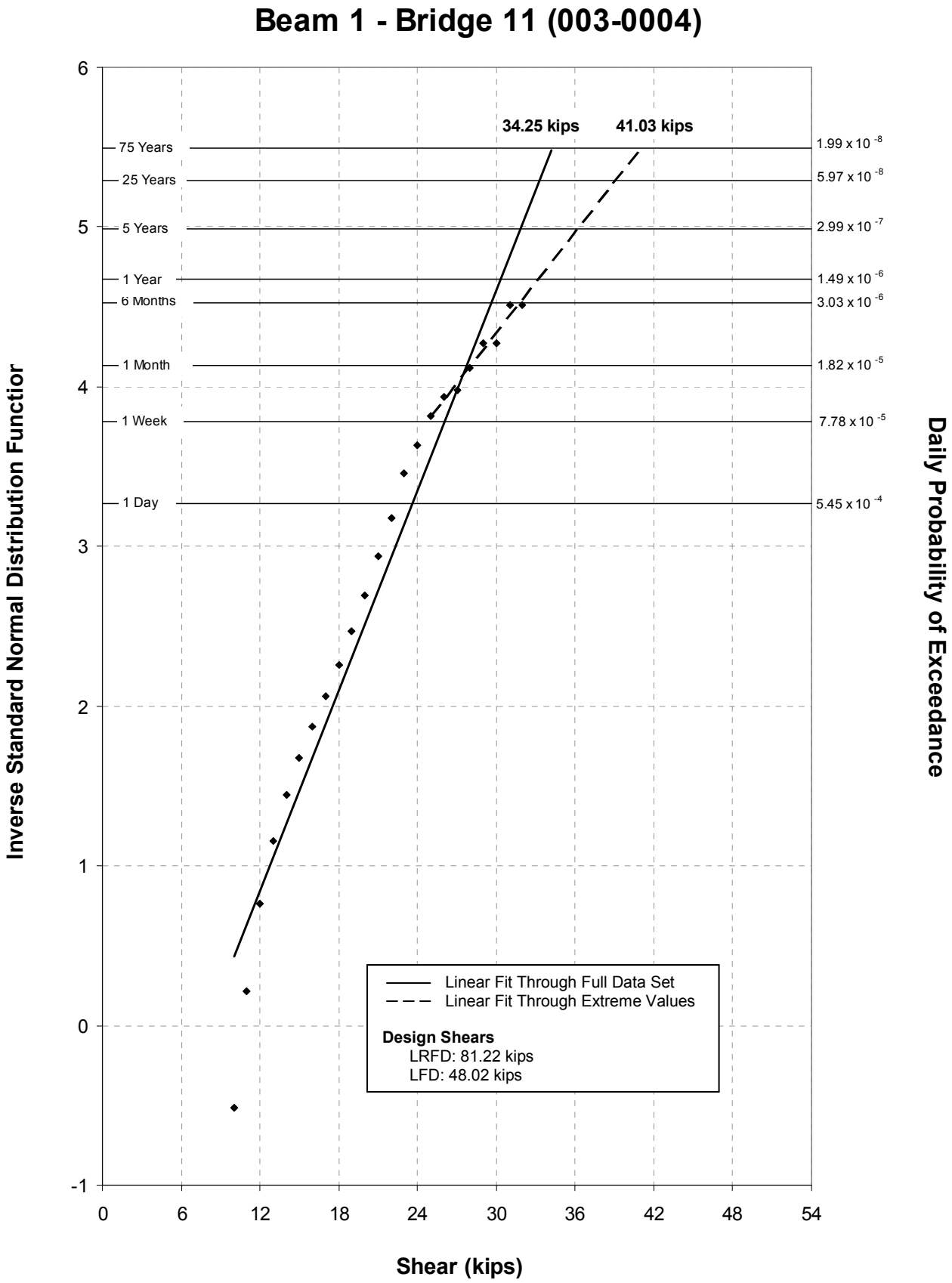


Figure C-25: Extrapolated Shear Force Graph for Beam 1, Bridge 11

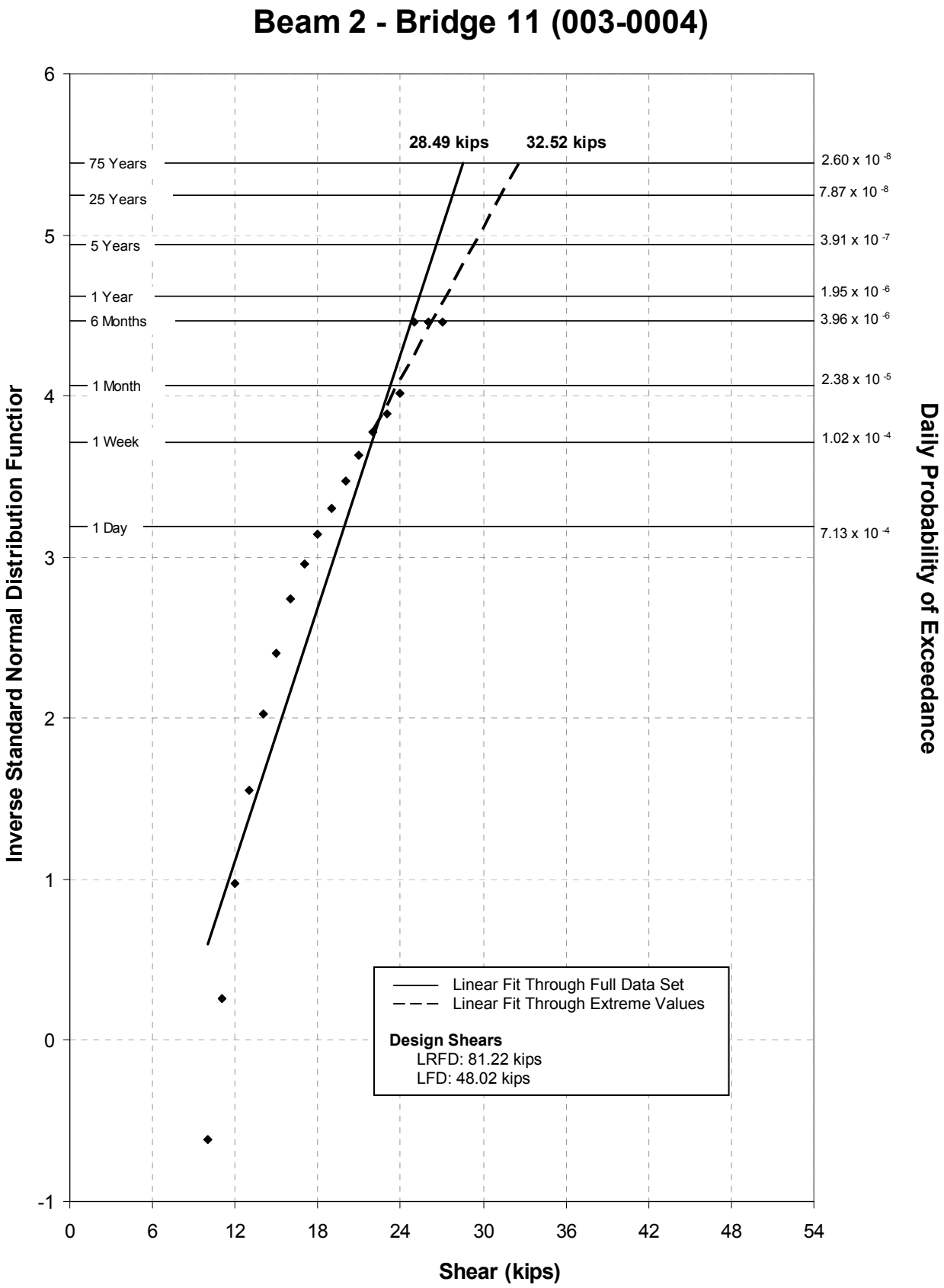


Figure C-26: Extrapolated Shear Force Graph for Beam 2, Bridge 11

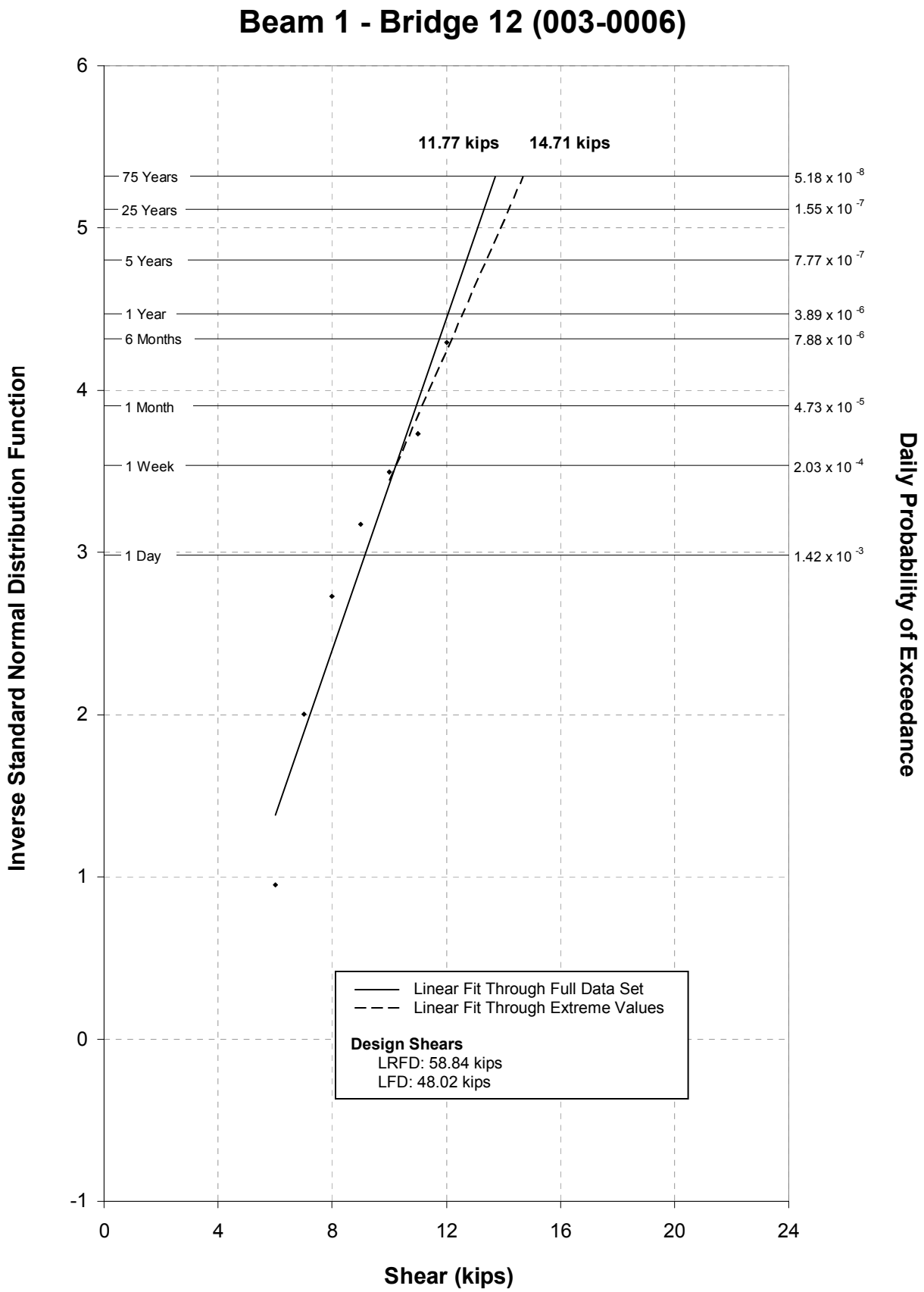


Figure C-27: Extrapolated Shear Force Graph for Beam 1, Bridge 12

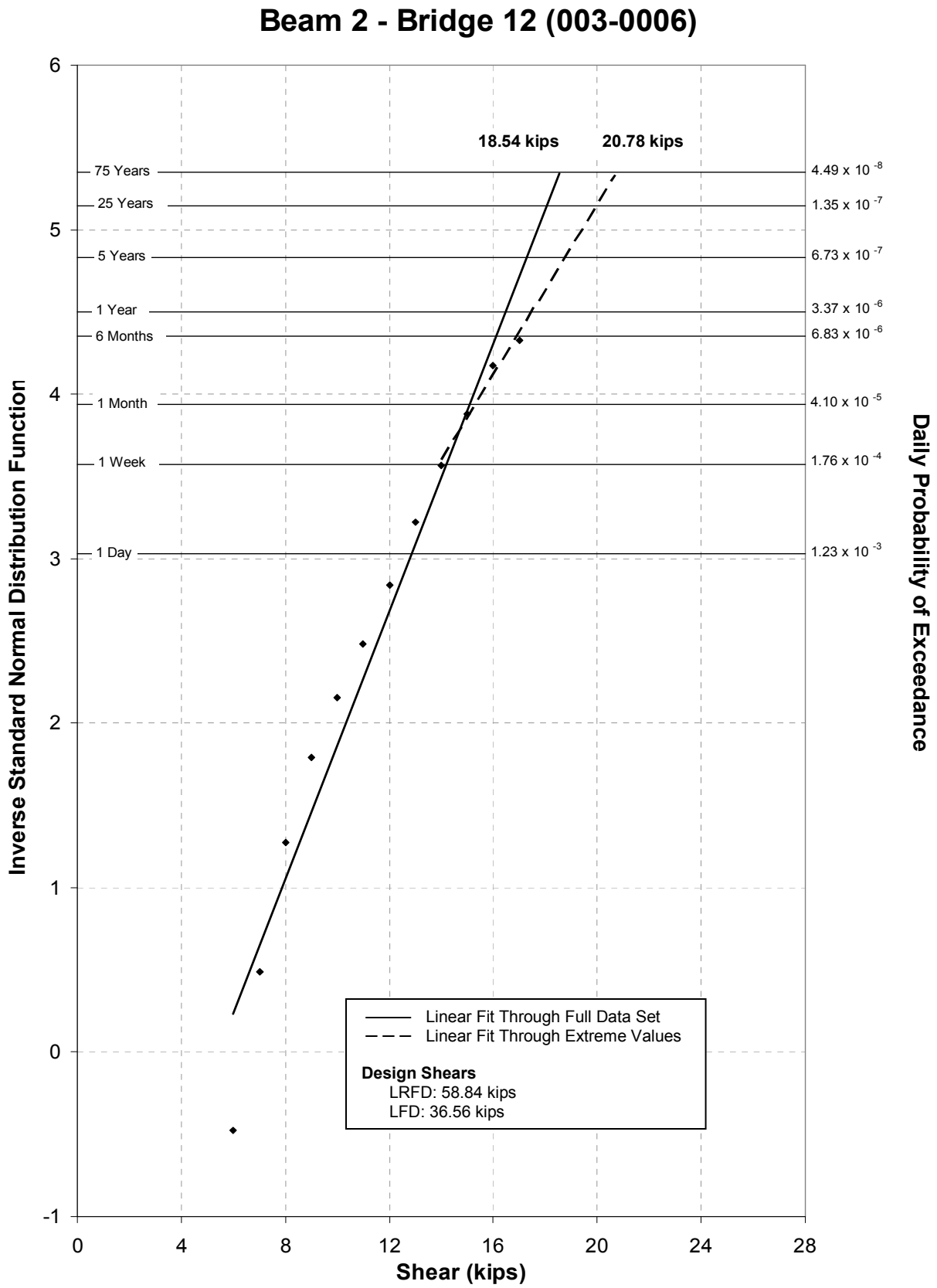


Figure C-28: Extrapolated Shear Force Graph for Beam 2, Bridge 12

APPENDIX D – COMPARISON OF FINITE ELEMENT RESULTS TO FIELD RESULTS (FIRST SIX BRIDGES)

Comparison of Finite Element Results to Field Results							
Structure Number 059-0040 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y1X1	Beam 1	-0.220	-0.046	-0.162	-0.009	-0.024	-0.014
	Beam 2	0.036	0.102	0.310	0.020	0.046	0.002
	Beam 3	0.512	0.395	0.558	0.078	0.083	0.034
	Beam 4	1.895	0.802	1.107	0.158	0.166	0.124
	Beam 5	3.253	0.969	1.206	0.191	0.180	0.213
	Beam 6	9.771	2.857	3.664	0.563	0.548	0.641
	Σ	15.247	5.079	6.683			
Y1X2	Beam 1	-0.252	-0.054	-0.162	-0.007	-0.017	-0.013
	Beam 2	0.031	0.111	0.378	0.015	0.040	0.002
	Beam 3	0.561	0.459	0.570	0.061	0.061	0.028
	Beam 4	2.321	1.105	1.341	0.146	0.143	0.117
	Beam 5	5.269	2.073	2.528	0.274	0.270	0.265
	Beam 6	11.986	3.870	4.713	0.512	0.503	0.602
	Σ	19.916	7.564	9.368			
Y1X3	Beam 1	-0.253	-0.055	-0.171	-0.005	-0.015	-0.010
	Beam 2	0.018	0.105	0.447	0.009	0.039	0.001
	Beam 3	0.534	0.470	0.571	0.042	0.050	0.021
	Beam 4	2.482	1.320	1.534	0.119	0.133	0.100
	Beam 5	7.792	3.863	3.679	0.348	0.320	0.313
	Beam 6	14.344	5.413	5.433	0.487	0.473	0.576
	Σ	24.917	11.116	11.494			
Y1X4	Beam 1	-0.144	-0.033	-0.094	-0.002	-0.007	-0.006
	Beam 2	-0.013	0.045	0.199	0.003	0.015	-0.001
	Beam 3	0.192	0.261	0.307	0.019	0.023	0.007
	Beam 4	1.900	1.400	1.194	0.101	0.091	0.074
	Beam 5	10.094	6.098	5.862	0.440	0.446	0.393
	Beam 6	13.638	6.074	5.687	0.439	0.432	0.531
	Σ	25.667	13.845	13.154			

Table D1

Comparison of Finite Element Results to Field Results

Structure Number 059-0040 **Position: Y2** Date:29 March,2005

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y2X1	Beam 1	-0.464	-0.048	0.312	-0.008	0.035	-0.031
	Beam 2	1.245	0.596	0.929	0.095	0.104	0.083
	Beam 3	2.824	0.980	1.758	0.155	0.196	0.188
	Beam 4	4.619	1.362	2.328	0.216	0.259	0.307
	Beam 5	5.610	2.288	2.246	0.363	0.250	0.373
	Beam 6	1.213	1.128	1.398	0.179	0.156	0.081
	Σ	15.047	6.306	8.970			
Y2X2	Beam 1	-0.589	-0.062	0.206	-0.006	0.019	-0.030
	Beam 2	1.551	0.785	0.916	0.082	0.083	0.079
	Beam 3	4.078	1.636	2.326	0.171	0.211	0.209
	Beam 4	7.248	2.690	3.214	0.280	0.292	0.371
	Beam 5	7.062	3.538	2.744	0.369	0.249	0.361
	Beam 6	0.198	1.005	1.620	0.105	0.147	0.010
	Σ	19.548	9.592	11.025			
Y2X3	Beam 1	-0.623	-0.068	0.201	-0.005	0.017	-0.025
	Beam 2	1.519	0.828	0.925	0.060	0.078	0.062
	Beam 3	4.943	2.353	2.745	0.171	0.232	0.202
	Beam 4	10.323	4.995	3.344	0.363	0.282	0.421
	Beam 5	8.406	4.604	2.957	0.335	0.250	0.343
	Beam 6	-0.041	1.043	1.681	0.076	0.142	-0.002
	Σ	24.527	13.755	11.853			
Y2X4	Beam 1	-0.426	-0.059	0.196	-0.003	0.017	-0.017
	Beam 2	0.767	0.582	0.656	0.034	0.056	0.030
	Beam 3	4.860	3.018	2.858	0.175	0.242	0.192
	Beam 4	12.706	7.740	4.041	0.449	0.343	0.502
	Beam 5	7.992	5.360	2.872	0.311	0.244	0.316
	Beam 6	-0.605	0.598	1.167	0.035	0.099	-0.024
	Σ	25.294	17.239	11.789			

Table D2

Comparison of Finite Element Results to Field Results

Structure Number 059-0040 Position: Y3 Date:29 March,2005

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y3X1	Beam 1	-0.500	-0.072	0.180	-0.011	0.023	-0.033
	Beam 2	0.858	0.488	0.461	0.077	0.059	0.056
	Beam 3	2.397	1.014	1.416	0.160	0.182	0.156
	Beam 4	4.491	1.174	1.811	0.185	0.233	0.293
	Beam 5	6.286	2.377	1.893	0.375	0.244	0.410
	Beam 6	1.785	1.355	2.001	0.214	0.258	0.117
	Σ	15.317	6.336	7.763			
Y3X2	Beam 1	-0.570	-0.085	0.127	-0.009	0.013	-0.028
	Beam 2	0.914	0.551	0.495	0.058	0.050	0.046
	Beam 3	2.868	1.353	1.841	0.142	0.185	0.143
	Beam 4	6.469	2.331	2.728	0.245	0.274	0.322
	Beam 5	8.536	3.801	2.396	0.399	0.241	0.425
	Beam 6	1.855	1.578	2.367	0.166	0.238	0.092
	Σ	20.072	9.529	9.953			
Y3X3	Beam 1	-0.584	-0.090	0.124	-0.007	0.013	-0.023
	Beam 2	0.873	0.559	0.425	0.041	0.044	0.035
	Beam 3	3.087	1.613	2.164	0.118	0.226	0.123
	Beam 4	9.035	4.220	2.820	0.308	0.295	0.360
	Beam 5	11.013	5.736	1.532	0.418	0.160	0.439
	Beam 6	1.655	1.672	2.495	0.122	0.261	0.066
	Σ	25.079	13.710	9.560			
Y3X4	Beam 1	-0.352	-0.062	0.212	-0.004	0.019	-0.014
	Beam 2	0.355	0.309	0.429	0.018	0.038	0.014
	Beam 3	2.363	1.654	1.809	0.096	0.161	0.092
	Beam 4	10.846	6.487	3.478	0.377	0.309	0.422
	Beam 5	11.976	7.665	3.450	0.445	0.306	0.466
	Beam 6	0.499	1.161	1.890	0.067	0.168	0.019
	Σ	25.687	17.214	11.268			
Y4X4	Beam 1	1.551	0.931		0.054		0.060
	Beam 2	10.523	6.033		0.349		0.407
	Beam 3	11.963	7.793		0.451		0.463
	Beam 4	2.195	2.128		0.123		0.085
	Beam 5	0.076	0.446		0.026		0.003
	Beam 6	-0.482	-0.038		-0.002		-0.019
	Σ	25.826	17.293				

Table D3

Comparison of Finite Element Results to Field Results							
Structure Number 059-0041 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y1X1	Beam 1	-0.057	-0.008	-0.145	-0.002	-0.038	-0.006
	Beam 2	-0.032	0.067	0.046	0.016	0.012	-0.003
	Beam 3	0.155	0.334	0.357	0.080	0.094	0.016
	Beam 4	1.072	0.869	0.611	0.208	0.160	0.112
	Beam 5	2.313	1.142	1.362	0.274	0.357	0.242
	Beam 6	6.117	1.769	1.582	0.424	0.415	0.639
	Σ	9.568	4.173	3.814			
Y1X2	Beam 1	-0.078	-0.011	-0.146	-0.002	-0.027	-0.005
	Beam 2	-0.043	0.091	0.026	0.013	0.005	-0.003
	Beam 3	0.200	0.454	0.448	0.066	0.082	0.014
	Beam 4	1.494	1.260	0.965	0.184	0.177	0.102
	Beam 5	4.006	2.191	1.873	0.319	0.343	0.272
	Beam 6	9.129	2.879	2.299	0.419	0.421	0.621
	Σ	14.708	6.864	5.466			
Y1X3	Beam 1	-0.090	-0.013	-0.118	-0.001	-0.018	-0.004
	Beam 2	-0.054	0.102	0.017	0.010	0.003	-0.003
	Beam 3	0.215	0.524	0.488	0.049	0.076	0.011
	Beam 4	1.738	1.553	1.258	0.146	0.196	0.085
	Beam 5	6.450	3.887	1.980	0.366	0.309	0.316
	Beam 6	12.144	4.568	2.792	0.430	0.435	0.595
	Σ	20.403	10.621	6.416			
Y1X4	Beam 1	-0.067	-0.011	-0.103	-0.001	-0.014	-0.003
	Beam 2	-0.048	0.064	0.005	0.005	0.001	-0.002
	Beam 3	0.056	0.373	0.345	0.028	0.048	0.002
	Beam 4	1.555	1.669	1.315	0.123	0.182	0.066
	Beam 5	8.997	5.866	2.384	0.433	0.329	0.380
	Beam 6	13.209	5.571	3.298	0.412	0.455	0.557
	Σ	23.702	13.532	7.243			

Table D4

Comparison of Finite Element Results to Field Results							
Structure Number 059-0041 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y2X1	Beam 1	-0.188	0.013	-0.008	0.002	-0.002	-0.020
	Beam 2	0.250	0.397	0.227	0.065	0.043	0.026
	Beam 3	1.241	1.072	0.973	0.174	0.184	0.131
	Beam 4	3.012	1.559	1.672	0.253	0.315	0.317
	Beam 5	4.171	2.160	1.734	0.351	0.327	0.439
	Beam 6	1.010	0.952	0.704	0.155	0.133	0.106
	Σ	9.496	6.153	5.301			
Y2X2	Beam 1	-0.257	0.017	-0.009	0.002	-0.001	-0.018
	Beam 2	0.327	0.540	0.290	0.055	0.037	0.022
	Beam 3	1.743	1.550	1.425	0.157	0.181	0.119
	Beam 4	4.981	2.793	2.749	0.283	0.349	0.341
	Beam 5	6.578	3.686	2.290	0.373	0.291	0.450
	Beam 6	1.250	1.296	1.135	0.131	0.144	0.085
	Σ	14.622	9.882	7.880			
Y2X3	Beam 1	-0.299	0.018	0.006	0.001	0.001	-0.015
	Beam 2	0.351	0.620	0.315	0.043	0.034	0.017
	Beam 3	2.065	1.915	1.758	0.133	0.187	0.102
	Beam 4	7.587	4.644	3.496	0.322	0.372	0.373
	Beam 5	9.371	5.731	2.557	0.397	0.272	0.461
	Beam 6	1.241	1.503	1.258	0.104	0.134	0.061
	Σ	20.316	14.431	9.390			
Y2X4	Beam 1	-0.225	0.005	0.016	0.000	0.001	-0.010
	Beam 2	0.141	0.442	0.214	0.024	0.019	0.006
	Beam 3	1.867	1.989	1.704	0.109	0.152	0.079
	Beam 4	9.929	6.629	4.813	0.365	0.430	0.420
	Beam 5	11.416	7.794	3.124	0.429	0.279	0.483
	Beam 6	0.526	1.307	1.330	0.072	0.119	0.022
	Σ	23.654	18.166	11.201			

Table D5

Comparison of Finite Element Results to Field Results							
Structure Number 059-0041 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y3X1	Beam 1	-0.208	0.040	0.088	0.006	0.016	-0.023
	Beam 2	0.516	0.577	0.409	0.093	0.073	0.058
	Beam 3	1.765	1.214	1.283	0.196	0.230	0.197
	Beam 4	3.341	1.667	1.670	0.269	0.299	0.373
	Beam 5	3.411	2.069	1.502	0.334	0.269	0.381
	Beam 6	0.124	0.620	0.636	0.100	0.114	0.014
	Σ	8.949	6.187	5.588			
Y3X2	Beam 1	-0.289	0.056	0.182	0.006	0.021	-0.021
	Beam 2	0.695	0.806	0.560	0.080	0.065	0.050
	Beam 3	2.704	1.916	1.953	0.191	0.228	0.193
	Beam 4	5.662	3.123	2.905	0.311	0.339	0.404
	Beam 5	5.172	3.317	2.131	0.330	0.249	0.369
	Beam 6	0.054	0.827	0.832	0.082	0.097	0.004
	Σ	13.998	10.045	8.564			
Y3X3	Beam 1	-0.342	0.063	0.217	0.004	0.021	-0.017
	Beam 2	0.749	0.943	0.622	0.064	0.060	0.038
	Beam 3	3.653	2.722	2.470	0.186	0.239	0.186
	Beam 4	8.795	5.400	3.628	0.369	0.352	0.448
	Beam 5	6.912	4.570	2.431	0.312	0.236	0.352
	Beam 6	-0.136	0.956	0.949	0.065	0.092	-0.007
	Σ	19.631	14.654	10.316			
Y3X4	Beam 1	-0.296	0.034	0.126	0.002	0.010	-0.013
	Beam 2	0.435	0.788	0.488	0.043	0.041	0.019
	Beam 3	4.141	3.343	2.734	0.182	0.227	0.179
	Beam 4	11.752	7.871	5.361	0.428	0.445	0.509
	Beam 5	7.668	5.659	2.416	0.308	0.201	0.332
	Beam 6	-0.611	0.697	0.920	0.038	0.076	-0.026
	Σ	23.089	18.392	12.045			
Y4X4	Beam 1	0.214	0.510		0.027		0.009
	Beam 2	12.378	8.966		0.480		0.492
	Beam 3	12.416	8.616		0.461		0.493
	Beam 4	0.053	0.553		0.030		0.002
	Beam 5	0.141	0.048		0.003		0.006
	Beam 6	-0.039	-0.013		-0.001		-0.002
	Σ	25.163	18.680				

Table D6

Comparison of Finite Element Results to Field Results

Structure Number 068-0046 Position: Y1

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y1X1	Beam 1	0.065	-0.022	0.214	-0.005	0.100	0.006
	Beam 2	-0.066	-0.101	0.103	-0.025	0.048	-0.006
	Beam 3	0.084	-0.090	-0.077	-0.022	-0.036	0.008
	Beam 4	0.248	-0.177	-0.401	-0.044	-0.188	0.024
	Beam 5	-1.041	-1.540	-1.224	-0.381	-0.573	-0.100
	Beam 6	11.125	5.968	3.521	1.478	1.649	1.068
	Σ	10.415	4.038	2.136			
Y1X2	Beam 1	0.146	-0.005	0.315	-0.001	0.071	0.009
	Beam 2	-0.109	-0.147	0.080	-0.022	0.018	-0.007
	Beam 3	0.098	-0.131	0.010	-0.020	0.002	0.006
	Beam 4	0.336	-0.242	-0.327	-0.037	-0.073	0.022
	Beam 5	-0.769	-1.605	-1.182	-0.244	-0.264	-0.049
	Beam 6	15.914	8.700	5.574	1.324	1.247	1.019
	Σ	15.616	6.570	4.470			
Y1X3	Beam 1	0.226	0.016	0.293	0.002	0.039	0.011
	Beam 2	-0.151	-0.184	0.136	-0.019	0.018	-0.007
	Beam 3	0.090	-0.168	-0.033	-0.017	-0.004	0.004
	Beam 4	0.429	-0.254	-0.136	-0.026	-0.018	0.020
	Beam 5	0.396	-0.889	-0.914	-0.090	-0.123	0.018
	Beam 6	20.441	11.407	8.105	1.149	1.088	0.954
	Σ	21.431	9.928	7.450			
Y1X4	Beam 1	0.282	0.038	0.288	0.003	0.025	0.010
	Beam 2	-0.178	-0.201	0.083	-0.014	0.007	-0.006
	Beam 3	0.058	-0.192	0.016	-0.013	0.001	0.002
	Beam 4	0.500	-0.199	0.097	-0.014	0.008	0.018
	Beam 5	2.904	1.069	0.235	0.074	0.020	0.105
	Beam 6	24.143	14.003	10.984	0.965	0.939	0.871
	Σ	27.709	14.518	11.702			
Y1X5	Beam 1	0.295	0.056	0.222	0.003	0.016	0.009
	Beam 2	-0.177	-0.184	0.046	-0.011	0.003	-0.005
	Beam 3	0.009	-0.187	0.014	-0.012	0.001	0.000
	Beam 4	0.465	-0.110	0.511	-0.007	0.038	0.014
	Beam 5	7.261	4.859	2.578	0.300	0.190	0.212
	Beam 6	26.432	11.757	10.229	0.726	0.752	0.771
	Σ	34.285	16.191	13.601			

Table D7

Comparison of Finite Element Results to Field Results							
Structure Number 068-0046 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y2X1	Beam 1	0.207	0.020	0.199	0.004	0.052	0.019
	Beam 2	-0.084	-0.170	0.009	-0.036	0.002	-0.008
	Beam 3	0.250	-0.110	-0.064	-0.024	-0.017	0.023
	Beam 4	0.567	-0.164	-0.076	-0.035	-0.020	0.052
	Beam 5	2.530	1.128	0.200	0.242	0.052	0.231
	Beam 6	7.475	3.965	3.567	0.849	0.930	0.683
	Σ	10.945	4.669	3.835			
Y2X2	Beam 1	0.362	0.052	0.379	0.007	0.057	0.022
	Beam 2	-0.155	-0.262	0.088	-0.034	0.013	-0.009
	Beam 3	0.349	-0.157	-0.185	-0.020	-0.028	0.021
	Beam 4	1.112	0.002	-0.015	0.000	-0.002	0.068
	Beam 5	5.540	3.177	1.319	0.411	0.199	0.336
	Beam 6	9.263	4.910	5.054	0.636	0.761	0.562
	Σ	16.471	7.722	6.640			
Y2X3	Beam 1	0.481	0.076	0.509	0.007	0.049	0.022
	Beam 2	-0.225	-0.336	0.168	-0.029	0.016	-0.010
	Beam 3	0.416	-0.177	-0.162	-0.015	-0.016	0.019
	Beam 4	1.940	0.483	0.417	0.042	0.040	0.088
	Beam 5	9.761	6.331	3.469	0.549	0.333	0.442
	Beam 6	9.735	5.162	6.005	0.447	0.577	0.440
	Σ	22.108	11.539	10.407			
Y2X4	Beam 1	0.536	0.088	0.499	0.005	0.034	0.019
	Beam 2	-0.275	-0.375	0.189	-0.022	0.013	-0.010
	Beam 3	0.443	-0.160	-0.167	-0.010	-0.011	0.016
	Beam 4	3.471	1.667	1.448	0.099	0.098	0.122
	Beam 5	15.652	11.103	7.031	0.661	0.476	0.552
	Beam 6	8.511	4.465	5.778	0.266	0.391	0.300
	Σ	28.338	16.788	14.778			
Y2X5	Beam 1	0.450	0.073	0.367	0.004	0.022	0.012
	Beam 2	-0.258	-0.327	0.182	-0.017	0.011	-0.007
	Beam 3	0.306	-0.137	0.019	-0.007	0.001	0.008
	Beam 4	6.859	4.712	3.779	0.247	0.224	0.190
	Beam 5	24.106	12.250	8.933	0.643	0.529	0.668
	Beam 6	4.614	2.470	3.603	0.130	0.213	0.128
	Σ	36.077	19.041	16.881			

Table D8

Comparison of Finite Element Results to Field Results							
Structure Number 068-0046 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y3X1	Beam 1	0.443	0.096	0.541	0.013	0.077	0.031
	Beam 2	-0.120	-0.288	0.138	-0.040	0.020	-0.008
	Beam 3	0.512	-0.142	-0.322	-0.020	-0.046	0.036
	Beam 4	1.953	0.605	0.427	0.084	0.061	0.137
	Beam 5	7.125	4.716	2.812	0.654	0.401	0.501
	Beam 6	4.306	2.228	3.411	0.309	0.487	0.303
	Σ	14.219	7.215	7.008			
Y3X2	Beam 1	0.601	0.122	0.707	0.011	0.066	0.030
	Beam 2	-0.193	-0.397	0.180	-0.036	0.017	-0.010
	Beam 3	0.779	-0.090	-0.373	-0.008	-0.035	0.039
	Beam 4	3.885	1.864	1.233	0.167	0.116	0.196
	Beam 5	11.096	7.680	5.185	0.690	0.486	0.558
	Beam 6	3.704	1.953	3.739	0.175	0.350	0.186
	Σ	19.872	11.132	10.671			
Y3X3	Beam 1	0.674	0.119	0.723	0.007	0.046	0.026
	Beam 2	-0.251	-0.469	0.250	-0.028	0.016	-0.010
	Beam 3	1.143	0.118	-0.242	0.007	-0.015	0.044
	Beam 4	7.241	4.419	2.947	0.268	0.187	0.279
	Beam 5	14.997	10.840	8.483	0.658	0.539	0.578
	Beam 6	2.138	1.458	3.573	0.088	0.227	0.082
	Σ	25.942	16.485	15.734			
Y3X4	Beam 1	0.648	0.098	0.651	0.005	0.035	0.020
	Beam 2	-0.284	-0.480	0.336	-0.024	0.018	-0.009
	Beam 3	1.611	0.546	0.098	0.027	0.005	0.051
	Beam 4	12.183	8.539	6.052	0.419	0.323	0.383
	Beam 5	17.275	10.790	8.964	0.530	0.479	0.543
	Beam 6	0.390	0.884	2.625	0.043	0.140	0.012
	Σ	31.823	20.377	18.725			
Y3X5	Beam 1	0.452	0.060	0.438	0.003	0.014	0.014
	Beam 2	-0.339	-0.421	0.222	-0.022	0.013	-0.010
	Beam 3	2.883	1.925	1.300	0.100	0.075	0.087
	Beam 4	18.240	10.766	7.698	0.559	0.445	0.551
	Beam 5	12.826	6.715	6.455	0.349	0.373	0.388
	Beam 6	-0.971	0.210	1.175	0.011	0.068	-0.029
	Σ	33.091	19.255	17.288			
Y4X5	Beam 1	0.210	-0.053		-0.003		0.011
	Beam 2	3.819	3.088		0.199		0.205
	Beam 3	13.827	11.033		0.711		0.744
	Beam 4	1.015	1.267		0.082		0.055
	Beam 5	0.054	0.261		0.017		0.003
	Beam 6	-0.336	-0.081		-0.005		-0.018
	Σ	18.589	15.515				

Table D9

Comparison of Finite Element Results to Field Results

Structure Number 068-0049 Position: Y1

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y1X1	Beam 1	-0.698	-0.206	-0.210	-0.031	-0.038	-0.073
	Beam 2	0.491	0.395	-0.041	0.060	-0.007	0.052
	Beam 3	0.946	0.972	0.508	0.148	0.093	0.099
	Beam 4	1.625	1.392	1.199	0.211	0.219	0.171
	Beam 5	1.070	1.393	1.435	0.211	0.262	0.112
	Beam 6	6.088	2.641	2.595	0.401	0.473	0.639
	Σ	9.522	6.587	5.486			
Y1X2	Beam 1	-0.977	-0.314	-0.249	-0.029	-0.027	-0.062
	Beam 2	0.546	0.455	-0.021	0.042	-0.002	0.035
	Beam 3	1.308	1.386	0.735	0.129	0.079	0.084
	Beam 4	2.725	2.375	1.964	0.220	0.210	0.174
	Beam 5	2.168	2.503	2.557	0.232	0.273	0.139
	Beam 6	9.881	4.378	4.369	0.406	0.467	0.631
	Σ	15.651	10.783	9.355			
Y1X3	Beam 1	-1.070	-0.371	-0.240	-0.024	-0.018	-0.047
	Beam 2	0.436	0.382	-0.031	0.024	-0.002	0.019
	Beam 3	1.354	1.517	0.810	0.097	0.060	0.060
	Beam 4	3.777	3.372	2.652	0.216	0.196	0.167
	Beam 5	4.266	4.364	4.057	0.280	0.300	0.189
	Beam 6	13.795	6.332	6.272	0.406	0.464	0.612
	Σ	22.558	15.596	13.519			
Y1X4	Beam 1	-0.906	-0.330	-0.196	-0.015	-0.011	-0.030
	Beam 2	0.258	0.239	-0.003	0.011	0.000	0.009
	Beam 3	0.990	1.225	0.729	0.057	0.040	0.033
	Beam 4	3.996	3.679	2.790	0.170	0.153	0.133
	Beam 5	8.416	7.964	6.600	0.368	0.362	0.280
	Beam 6	17.291	8.860	8.319	0.409	0.456	0.576
	Σ	30.045	21.637	18.239			
Y1X5	Beam 1	-0.449	-0.168	-0.117	-0.009	-0.007	-0.018
	Beam 2	0.093	0.087	-0.039	0.005	-0.003	0.004
	Beam 3	0.324	0.520	0.374	0.027	0.024	0.013
	Beam 4	2.478	2.369	1.689	0.125	0.108	0.097
	Beam 5	9.178	8.422	6.659	0.444	0.424	0.360
	Beam 6	13.867	7.745	7.135	0.408	0.454	0.544
	Σ	25.491	18.975	15.701			

Table D10

Comparison of Finite Element Results to Field Results

Structure Number 068-0049 Position: Y2

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y2X1	Beam 1	-0.472	0.145	0.119	0.020	0.022	-0.050
	Beam 2	1.703	1.276	-0.110	0.176	-0.020	0.180
	Beam 3	1.819	1.551	0.808	0.213	0.150	0.192
	Beam 4	1.742	1.305	1.111	0.180	0.206	0.184
	Beam 5	2.061	1.448	1.933	0.199	0.359	0.218
	Beam 6	2.597	1.544	1.524	0.212	0.283	0.275
	Σ	9.450	7.269	5.385			
Y2X2	Beam 1	-0.862	0.099	0.087	0.008	0.010	-0.056
	Beam 2	2.348	1.828	-0.137	0.148	-0.015	0.151
	Beam 3	3.090	2.703	1.398	0.219	0.155	0.199
	Beam 4	3.335	2.565	2.141	0.208	0.238	0.215
	Beam 5	3.832	2.743	3.152	0.222	0.350	0.247
	Beam 6	3.780	2.393	2.353	0.194	0.262	0.244
	Σ	15.523	12.331	8.994			
Y2X3	Beam 1	-1.135	-0.002	0.007	0.000	0.001	-0.051
	Beam 2	2.467	2.019	-0.175	0.109	-0.013	0.110
	Beam 3	4.318	3.888	2.023	0.210	0.148	0.193
	Beam 4	5.951	4.766	3.814	0.257	0.278	0.265
	Beam 5	6.449	4.825	5.018	0.260	0.366	0.288
	Beam 6	4.369	3.039	3.021	0.164	0.220	0.195
	Σ	22.419	18.535	13.707			
Y2X4	Beam 1	-1.079	-0.078	-0.075	-0.003	-0.004	-0.036
	Beam 2	1.891	1.649	-0.208	0.064	-0.011	0.063
	Beam 3	4.654	4.322	2.483	0.167	0.130	0.155
	Beam 4	10.397	8.786	5.545	0.339	0.291	0.347
	Beam 5	10.272	8.276	8.109	0.319	0.426	0.343
	Beam 6	3.798	2.973	3.190	0.115	0.168	0.127
	Σ	29.933	25.928	19.044			
Y2X5	Beam 1	-0.564	-0.067	-0.171	-0.003	-0.010	-0.022
	Beam 2	0.734	0.716	-0.289	0.031	-0.017	0.029
	Beam 3	2.975	2.858	1.709	0.125	0.102	0.117
	Beam 4	10.594	9.221	5.507	0.405	0.328	0.416
	Beam 5	9.866	8.326	8.005	0.366	0.476	0.388
	Beam 6	1.835	1.722	2.052	0.076	0.122	0.072
	Σ	25.440	22.776	16.812			

Table D11

Comparison of Finite Element Results to Field Results

Structure Number 068-0049 Position: Y3

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y3X1	Beam 1	-0.196	0.342	0.323	0.046	0.065	-0.021
	Beam 2	2.036	1.487	-0.026	0.200	-0.005	0.216
	Beam 3	1.877	1.528	0.874	0.206	0.174	0.200
	Beam 4	1.750	1.292	1.147	0.174	0.229	0.186
	Beam 5	2.269	1.560	1.435	0.210	0.286	0.241
	Beam 6	1.670	1.212	1.260	0.163	0.251	0.178
	Σ	9.406	7.421	5.012			
Y3X2	Beam 1	-0.550	0.366	0.412	0.029	0.047	-0.036
	Beam 2	2.999	2.284	-0.006	0.180	-0.001	0.194
	Beam 3	3.348	2.795	1.590	0.221	0.183	0.217
	Beam 4	3.372	2.556	2.275	0.202	0.262	0.218
	Beam 5	4.029	2.873	2.557	0.227	0.294	0.261
	Beam 6	2.259	1.797	1.861	0.142	0.214	0.146
	Σ	15.457	12.671	8.689			
Y3X3	Beam 1	-0.894	0.271	0.364	0.014	0.027	-0.040
	Beam 2	3.436	2.756	0.018	0.144	0.001	0.154
	Beam 3	5.143	4.414	2.441	0.231	0.184	0.230
	Beam 4	6.157	4.874	4.145	0.255	0.312	0.276
	Beam 5	6.178	4.644	4.057	0.243	0.305	0.276
	Beam 6	2.326	2.130	2.258	0.112	0.170	0.104
	Σ	22.346	19.089	13.284			
Y3X4	Beam 1	-0.961	0.127	0.219	0.005	0.012	-0.032
	Beam 2	2.825	2.422	-0.008	0.091	0.000	0.095
	Beam 3	6.791	6.045	3.498	0.226	0.187	0.227
	Beam 4	11.264	9.555	6.174	0.357	0.331	0.377
	Beam 5	8.307	6.731	6.600	0.252	0.354	0.278
	Beam 6	1.647	1.854	2.183	0.069	0.117	0.055
	Σ	29.873	26.734	18.665			
Y3X5	Beam 1	-0.552	0.015	0.092	0.001	-0.022	-0.022
	Beam 2	1.164	1.114	0.026	0.048	0.002	0.046
	Beam 3	5.552	5.075	2.913	0.217	0.167	0.219
	Beam 4	11.820	10.375	6.578	0.443	0.377	0.465
	Beam 5	6.947	5.953	6.659	0.254	0.382	0.273
	Beam 6	0.477	0.864	1.161	0.037	0.067	0.019
	Σ	25.408	23.396	17.429			
Y4X5	Beam 1	2.904	2.411		0.110		0.117
	Beam 2	10.933	9.218		0.419		0.440
	Beam 3	8.978	7.897		0.359		0.361
	Beam 4	1.959	1.994		0.091		0.079
	Beam 5	0.567	0.546		0.025		0.023
	Beam 6	-0.482	-0.081		-0.004		-0.019
	Σ	24.859	21.985				

Table D12

Comparison of Finite Element Results to Field Results

Structure Number 084-0107 Position: Y1

Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y1X1	Beam 1	-0.608	0.076	-0.015	0.006	-0.001	-0.039
	Beam 2	-0.481	0.602	0.172	0.048	0.016	-0.031
	Beam 3	0.641	2.007	0.422	0.160	0.040	0.041
	Beam 4	4.996	4.199	1.324	0.335	0.126	0.317
	Beam 5	4.491	3.118	4.772	0.249	0.453	0.285
	Beam 6	6.704	2.534	3.864	0.202	0.367	0.426
	Σ	15.743	12.536	10.539			
Y1X2	Beam 1	-0.629	0.085	-0.032	0.005	-0.002	-0.030
	Beam 2	-0.530	0.612	0.190	0.037	0.013	-0.025
	Beam 3	0.174	2.072	0.427	0.124	0.030	0.008
	Beam 4	5.892	5.198	1.521	0.311	0.107	0.277
	Beam 5	7.039	5.164	6.779	0.309	0.479	0.331
	Beam 6	9.349	3.603	5.272	0.215	0.372	0.439
	Σ	21.295	16.734	14.157			
Y1X3	Beam 1	-0.584	0.087	-0.028	0.004	-0.002	-0.021
	Beam 2	-0.500	0.559	0.113	0.026	0.007	-0.018
	Beam 3	-0.340	1.910	0.376	0.090	0.022	-0.012
	Beam 4	6.011	5.633	1.470	0.267	0.088	0.221
	Beam 5	10.505	8.122	7.884	0.385	0.470	0.386
	Beam 6	12.151	4.806	6.975	0.228	0.415	0.446
	Σ	27.243	21.117	16.790			
Y1X4	Beam 1	-0.469	0.077	-0.010	0.004	-0.001	-0.014
	Beam 2	-0.397	0.440	0.058	0.021	0.003	-0.012
	Beam 3	-0.729	1.515	0.217	0.073	0.012	-0.021
	Beam 4	5.003	5.130	1.154	0.246	0.064	0.147
	Beam 5	15.376	7.283	8.271	0.349	0.459	0.450
	Beam 6	15.351	6.395	8.343	0.307	0.463	0.450
	Σ	34.135	20.840	18.033			
Y1X5	Beam 1	-0.170	0.035	-0.005	0.002	0.000	-0.005
	Beam 2	-0.141	0.144	-0.109	0.007	-0.006	-0.004
	Beam 3	-0.507	0.520	0.098	0.025	0.005	-0.015
	Beam 4	0.648	2.182	0.253	0.105	0.014	0.019
	Beam 5	19.127	8.837	4.599	0.424	0.255	0.560
	Beam 6	15.318	6.991	8.466	0.335	0.469	0.449
	Σ	34.275	18.709	13.302			

Table D13

Comparison of Finite Element Results to Field Results

Structure Number 084-0107 Position: Y2

Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y2X1	Beam 1	-1.053	0.173	0.522	0.027	0.092	-0.109
	Beam 2	1.529	2.057	1.332	0.321	0.236	0.158
	Beam 3	4.281	2.952	1.348	0.461	0.239	0.442
	Beam 4	2.979	1.028	1.085	0.160	0.192	0.307
	Beam 5	0.936	-0.058	0.893	-0.009	0.158	0.097
	Beam 6	1.017	0.253	0.465	0.040	0.082	0.105
	Σ	9.689	6.405	5.645			
Y2X2	Beam 1	-1.368	0.201	0.617	0.020	0.075	-0.094
	Beam 2	1.533	2.579	1.581	0.262	0.192	0.105
	Beam 3	6.207	4.493	1.931	0.457	0.234	0.425
	Beam 4	5.184	2.146	1.862	0.218	0.226	0.355
	Beam 5	1.577	0.051	1.726	0.005	0.209	0.108
	Beam 6	1.479	0.371	0.533	0.038	0.065	0.101
	Σ	14.612	9.841	8.250			
Y2X3	Beam 1	-1.513	0.205	0.641	0.015	0.061	-0.075
	Beam 2	1.171	2.804	1.603	0.203	0.152	0.058
	Beam 3	7.779	5.875	2.172	0.426	0.206	0.388
	Beam 4	8.188	3.980	2.466	0.288	0.233	0.408
	Beam 5	2.507	0.428	2.836	0.031	0.268	0.125
	Beam 6	1.921	0.506	0.852	0.037	0.081	0.096
	Σ	20.053	13.798	10.569			
Y2X4	Beam 1	-1.465	0.190	0.630	0.010	0.048	-0.056
	Beam 2	0.593	2.706	1.533	0.148	0.118	0.023
	Beam 3	8.523	6.642	1.851	0.364	0.142	0.328
	Beam 4	12.162	6.820	2.934	0.373	0.226	0.468
	Beam 5	3.874	1.263	4.619	0.069	0.355	0.149
	Beam 6	2.274	0.644	1.442	0.035	0.111	0.088
	Σ	25.961	18.265	13.009			
Y2X5	Beam 1	-0.814	0.110	0.382	0.006	0.029	-0.031
	Beam 2	-0.449	1.599	0.937	0.088	0.072	-0.017
	Beam 3	5.795	5.235	0.983	0.287	0.076	0.223
	Beam 4	16.968	10.667	2.603	0.584	0.200	0.654
	Beam 5	10.427	3.583	7.100	0.196	0.546	0.402
	Beam 6	2.063	0.715	1.371	0.039	0.105	0.079
	Σ	33.990	21.909	13.376			

Table D14

Comparison of Finite Element Results to Field Results

Structure Number 084-0107 Position: Y3

Load Position	Beam	Reaction (k) FE Model (SAP2000)	Shear Force D Away from Support (k) FE Model (SAP2000)	Shear Force D Away from Support (k) Field Results	Shear GDF D Away from Support FE Model (SAP2000)	Shear GDF D Away from Support Field Results	Shear GDF at Bearing FE Model (SAP2000)
Y3X1	Beam 1	-1.312	0.425	1.108	0.049	0.134	-0.096
	Beam 2	4.118	3.779	2.284	0.436	0.277	0.300
	Beam 3	6.143	3.521	2.506	0.406	0.304	0.448
	Beam 4	2.993	0.731	1.355	0.084	0.164	0.218
	Beam 5	0.978	0.030	1.060	0.003	0.129	0.071
	Beam 6	0.806	0.187	-0.069	0.022	-0.008	0.059
	Σ	13.726	8.673	8.244			
Y3X2	Beam 1	-1.685	0.430	1.176	0.034	0.110	-0.088
	Beam 2	4.384	4.503	2.565	0.357	0.239	0.230
	Beam 3	9.050	5.628	3.316	0.446	0.310	0.474
	Beam 4	4.928	1.680	2.083	0.133	0.194	0.258
	Beam 5	1.418	0.150	1.670	0.012	0.156	0.074
	Beam 6	0.999	0.230	-0.100	0.018	-0.009	0.052
	Σ	19.094	12.621	10.710			
Y3X3	Beam 1	-1.843	0.397	1.133	0.023	0.089	-0.074
	Beam 2	3.886	4.720	2.455	0.274	0.193	0.156
	Beam 3	12.127	7.963	3.679	0.462	0.289	0.487
	Beam 4	7.687	3.458	2.638	0.201	0.207	0.308
	Beam 5	1.941	0.427	2.629	0.025	0.206	0.078
	Beam 6	1.122	0.267	0.214	0.015	0.017	0.045
	Σ	24.920	17.232	12.748			
Y3X4	Beam 1	-1.729	0.328	1.042	0.016	0.074	-0.056
	Beam 2	2.786	4.232	2.315	0.208	0.165	0.090
	Beam 3	14.725	8.180	3.698	0.403	0.264	0.473
	Beam 4	11.678	6.360	3.150	0.313	0.225	0.375
	Beam 5	2.515	0.915	3.543	0.045	0.253	0.081
	Beam 6	1.142	0.293	0.260	0.014	0.019	0.037
	Σ	31.117	20.308	14.007			
Y3X5	Beam 1	-0.704	0.139	0.460	0.006	-0.022	-0.022
	Beam 2	-0.429	1.980	0.968	0.088	0.090	-0.013
	Beam 3	13.804	7.412	0.954	0.330	0.089	0.426
	Beam 4	16.423	11.182	2.456	0.497	0.229	0.507
	Beam 5	2.576	1.530	5.536	0.068	0.517	0.080
	Beam 6	0.727	0.237	0.339	0.011	0.032	0.022
	Σ	32.397	22.480	10.714			
Y4X5	Beam 1	0.464	1.184		0.066		0.013
	Beam 2	24.538	9.450		0.528		0.690
	Beam 3	10.313	6.786		0.379		0.290
	Beam 4	0.143	0.384		0.021		0.004
	Beam 5	0.123	0.087		0.005		0.003
	Beam 6	-0.041	0.018		0.001		-0.001
	Σ	35.540	17.909				

Table D15

Comparison of Finite Element Results to Field Results							
Structure Number 054-0043 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y1X1	Beam 1	0.480	0.32	-0.302	0.049	-0.057	0.058
	Beam 2	0.375	0.295	-0.352	0.046	-0.067	0.046
	Beam 3	0.321	0.296	0.232	0.046	0.044	0.039
	Beam 4	0.244	0.271	-0.344	0.042	-0.065	0.030
	Beam 5	0.246	0.308	-0.016	0.048	-0.003	0.030
	Beam 6	0.635	0.609	1.055	0.094	0.200	0.077
	Beam 7	1.237	1.101	0.933	0.170	0.176	0.150
	Beam 8	1.473	1.263	2.162	0.195	0.409	0.179
	Beam 9	3.219	2.014	1.918	0.311	0.363	0.391
	Σ	8.230	6.477	5.286	1.000	1.000	1.000
Y1X2	Beam 1	0.596	0.395	-0.236	0.034	-0.025	0.041
	Beam 2	0.450	0.354	-0.571	0.031	-0.062	0.031
	Beam 3	0.358	0.345	0.316	0.030	0.034	0.024
	Beam 4	0.223	0.304	-0.570	0.027	-0.061	0.015
	Beam 5	0.179	0.357	-0.207	0.031	-0.022	0.012
	Beam 6	0.842	0.872	2.080	0.076	0.224	0.057
	Beam 7	2.277	2.005	1.111	0.175	0.120	0.155
	Beam 8	3.145	2.705	4.222	0.236	0.455	0.215
	Beam 9	6.577	4.12	3.128	0.360	0.337	0.449
	Σ	14.647	11.457	9.273	1.000	1.000	1.000
Y1X3	Beam 1	0.580	0.382	-0.148	0.023	-0.010	0.027
	Beam 2	0.422	0.33	-0.513	0.020	-0.035	0.020
	Beam 3	0.317	0.316	0.423	0.019	0.029	0.015
	Beam 4	0.153	0.271	-0.650	0.016	-0.045	0.007
	Beam 5	0.029	0.321	-0.202	0.019	-0.014	0.001
	Beam 6	0.755	0.915	2.509	0.055	0.172	0.035
	Beam 7	3.255	2.787	1.439	0.167	0.099	0.152
	Beam 8	5.517	4.788	6.369	0.287	0.438	0.257
	Beam 9	10.402	6.569	5.325	0.394	0.366	0.485
	Σ	21.430	16.679	14.552	1.000	1.000	1.000
Y1X4	Beam 1	0.476	0.308	-0.132	0.013	-0.006	0.016
	Beam 2	0.332	0.259	-0.448	0.011	-0.022	0.011
	Beam 3	0.240	0.245	0.442	0.010	0.021	0.008
	Beam 4	0.090	0.206	-0.535	0.009	-0.026	0.003
	Beam 5	-0.102	0.245	0.010	0.010	0.000	-0.003
	Beam 6	0.386	0.765	2.176	0.033	0.104	0.013
	Beam 7	3.990	3.174	1.488	0.135	0.071	0.132
	Beam 8	9.492	8.452	9.470	0.360	0.455	0.315
	Beam 9	15.247	9.837	8.355	0.419	0.401	0.506
	Σ	30.151	23.491	20.826	1.000	1.000	1.000
Y1X5	Beam 1	0.227	0.145	-0.038	0.007	-0.002	0.008
	Beam 2	0.153	0.119	-0.156	0.005	-0.007	0.005
	Beam 3	0.110	0.113	0.293	0.005	0.014	0.004
	Beam 4	0.040	0.094	-0.224	0.004	-0.010	0.001
	Beam 5	-0.096	0.113	0.096	0.005	0.004	-0.003
	Beam 6	-0.097	0.363	1.081	0.016	0.050	-0.003
	Beam 7	2.855	1.993	0.805	0.090	0.038	0.101
	Beam 8	10.583	9.561	10.118	0.431	0.472	0.376
	Beam 9	14.377	9.672	9.459	0.436	0.441	0.511
	Σ	28.152	22.173	21.434	1.000	1.000	1.000

Table A16

Comparison of Finite Element Results to Field Results							
Structure Number 054-0043 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y2X1	Beam 1	0.475	0.323	-0.362	0.049	-0.058	0.058
	Beam 2	0.342	0.282	0.047	0.043	0.008	0.042
	Beam 3	0.238	0.267	-0.091	0.041	-0.015	0.029
	Beam 4	0.236	0.303	0.389	0.046	0.063	0.029
	Beam 5	0.673	0.627	0.551	0.096	0.089	0.082
	Beam 6	1.435	1.187	1.132	0.181	0.183	0.174
	Beam 7	1.641	1.237	1.578	0.189	0.255	0.199
	Beam 8	1.719	1.21	0.289	0.185	0.047	0.209
	Beam 9	1.469	1.118	2.664	0.171	0.430	0.179
	Σ	8.228	6.554	6.198	1.000	1.000	1.000
Y2X2	Beam 1	0.580	0.401	-0.355	0.034	-0.030	0.040
	Beam 2	0.392	0.329	0.023	0.028	0.002	0.027
	Beam 3	0.212	0.297	-0.059	0.025	-0.005	0.014
	Beam 4	0.167	0.352	0.851	0.030	0.073	0.011
	Beam 5	0.901	0.905	0.241	0.077	0.021	0.062
	Beam 6	2.620	2.147	2.802	0.183	0.239	0.179
	Beam 7	3.543	2.708	2.585	0.231	0.221	0.242
	Beam 8	3.755	2.688	1.386	0.229	0.118	0.256
	Beam 9	2.472	1.92	4.230	0.163	0.361	0.169
	Σ	14.642	11.747	11.704	1.000	1.000	1.000
Y2X3	Beam 1	0.579	0.398	-0.296	0.022	-0.017	0.026
	Beam 2	0.359	0.306	-0.092	0.017	-0.005	0.016
	Beam 3	0.143	0.266	0.033	0.015	0.002	0.006
	Beam 4	0.019	0.325	1.032	0.018	0.059	0.001
	Beam 5	0.824	0.972	0.039	0.054	0.002	0.037
	Beam 6	3.717	2.996	4.477	0.167	0.255	0.169
	Beam 7	6.336	5.001	4.082	0.279	0.232	0.288
	Beam 8	6.801	5.059	2.698	0.282	0.154	0.309
	Beam 9	3.254	2.585	5.592	0.144	0.318	0.148
	Σ	22.032	17.908	17.566	1.000	1.000	1.000
Y2X4	Beam 1	0.478	0.318	-0.225	0.013	-0.009	0.016
	Beam 2	0.266	0.231	-0.103	0.009	-0.004	0.009
	Beam 3	0.078	0.195	0.117	0.008	0.005	0.003
	Beam 4	-0.099	0.245	0.998	0.010	0.042	-0.003
	Beam 5	0.436	0.804	-0.074	0.033	-0.003	0.015
	Beam 6	4.235	3.221	5.041	0.131	0.212	0.143
	Beam 7	10.137	8.451	6.392	0.343	0.269	0.342
	Beam 8	10.768	8.446	5.347	0.342	0.225	0.363
	Beam 9	3.381	2.749	6.293	0.111	0.265	0.114
	Σ	29.680	24.660	23.786	1.000	1.000	1.000
Y2X5	Beam 1	0.246	0.152	-0.032	0.006	-0.002	0.009
	Beam 2	0.120	0.105	-0.031	0.004	-0.001	0.004
	Beam 3	0.036	0.088	0.076	0.004	0.004	0.001
	Beam 4	-0.087	0.114	0.516	0.005	0.024	-0.003
	Beam 5	-0.062	0.392	-0.079	0.016	-0.004	-0.002
	Beam 6	2.860	1.944	3.099	0.081	0.147	0.101
	Beam 7	10.960	9.51	6.461	0.396	0.306	0.389
	Beam 8	11.883	9.851	6.621	0.410	0.314	0.421
	Beam 9	2.249	1.846	4.468	0.077	0.212	0.080
	Σ	28.205	24.002	21.101	1.000	1.000	1.000

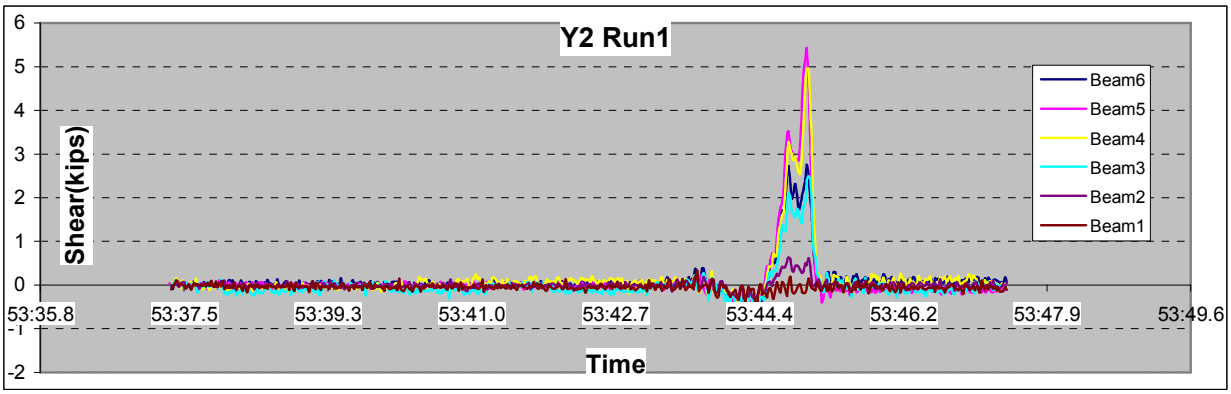
Table A17

Comparison of Finite Element Results to Field Results							
Structure Number 054-0043 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model (SAP2000)	FE Model (SAP2000)	Field Results	FE Model (SAP2000)	Field Results	FE Model (SAP2000)
Y3X1	Beam 1	0.450	0.32	-0.072	0.048	-0.009	0.055
	Beam 2	0.303	0.268	-0.275	0.040	-0.035	0.037
	Beam 3	0.206	0.268	-0.167	0.040	-0.021	0.025
	Beam 4	0.426	0.446	1.548	0.067	0.195	0.052
	Beam 5	1.146	0.981	0.365	0.147	0.046	0.139
	Beam 6	1.614	1.256	2.167	0.188	0.273	0.196
	Beam 7	1.679	1.225	1.564	0.184	0.197	0.204
	Beam 8	1.767	1.271	0.595	0.191	0.075	0.215
	Beam 9	0.632	0.635	2.218	0.095	0.279	0.077
	Σ	8.223	6.670	7.944	1.000	1.000	1.000
Y3X2	Beam 1	0.527	0.395	-0.013	0.033	-0.001	0.036
	Beam 2	0.322	0.305	-0.264	0.025	-0.019	0.022
	Beam 3	0.146	0.302	-0.186	0.025	-0.014	0.010
	Beam 4	0.474	0.595	2.109	0.049	0.155	0.032
	Beam 5	1.903	1.63	0.373	0.136	0.027	0.130
	Beam 6	3.292	2.573	3.961	0.214	0.291	0.225
	Beam 7	3.706	2.782	3.157	0.231	0.232	0.253
	Beam 8	3.505	2.51	0.954	0.209	0.070	0.239
	Beam 9	0.761	0.929	3.528	0.077	0.259	0.052
	Σ	14.636	12.021	13.620	1.000	1.000	1.000
Y3X3	Beam 1	0.511	0.392	0.232	0.021	0.012	0.023
	Beam 2	0.275	0.277	-0.134	0.015	-0.007	0.013
	Beam 3	0.023	0.263	-0.286	0.014	-0.015	0.001
	Beam 4	0.281	0.578	2.313	0.032	0.119	0.013
	Beam 5	2.387	2.044	0.273	0.112	0.014	0.109
	Beam 6	5.502	4.36	5.943	0.238	0.305	0.251
	Beam 7	6.796	5.33	5.424	0.291	0.278	0.310
	Beam 8	5.611	4.053	1.329	0.221	0.068	0.256
	Beam 9	0.553	1.015	4.408	0.055	0.226	0.025
	Σ	21.939	18.312	19.501	1.000	1.000	1.000
Y3X4	Beam 1	0.423	0.319	0.378	0.012	0.015	0.014
	Beam 2	0.197	0.208	-0.132	0.008	-0.005	0.007
	Beam 3	-0.044	0.199	-0.240	0.008	-0.010	-0.001
	Beam 4	0.039	0.486	2.040	0.019	0.081	0.001
	Beam 5	2.255	1.911	0.108	0.074	0.004	0.075
	Beam 6	8.086	6.618	8.274	0.257	0.330	0.268
	Beam 7	11.306	9.374	8.410	0.365	0.335	0.375
	Beam 8	7.657	5.677	2.067	0.221	0.082	0.254
	Beam 9	0.227	0.914	4.201	0.036	0.167	0.008
	Σ	30.145	25.706	25.106	1.000	1.000	1.000
Y3X5	Beam 1	0.223	0.154	0.487	0.006	0.022	0.008
	Beam 2	0.088	0.093	-0.127	0.004	-0.006	0.003
	Beam 3	-0.030	0.086	-0.120	0.004	-0.005	-0.001
	Beam 4	-0.176	0.235	0.975	0.010	0.044	-0.006
	Beam 5	0.965	0.837	-0.124	0.034	-0.006	0.034
	Beam 6	7.787	6.429	7.774	0.262	0.351	0.277
	Beam 7	12.910	11.386	9.752	0.464	0.440	0.458
	Beam 8	6.735	4.958	1.514	0.202	0.068	0.239
	Beam 9	-0.340	0.379	2.032	0.015	0.092	-0.012
	Σ	28.162	24.557	22.165	1.000	1.000	1.000

Table A18

APPENDIX E – DYNAMIC TEST RESULTS (FIRST SIX BRIDGES)

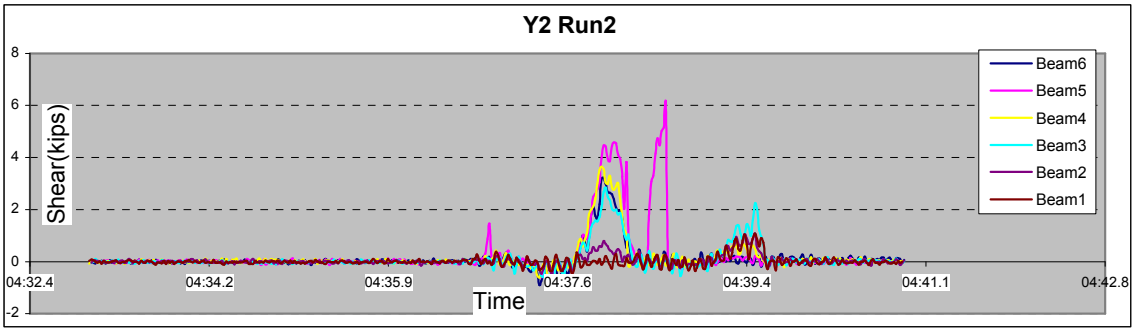
Dynamic Load Test Data (SN:059-0040)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shea	Max D.F
53:44.5	-0.285	0.012	-0.016	0.185	0.194	0.212	0.301	0.704
53:44.6	-0.102	0.058	0.213	0.410	0.428	0.179	1.186	0.361
53:44.6	-0.077	0.079	0.303	0.426	0.369	0.519	1.619	0.321
53:44.6	-0.212	-0.019	0.188	0.453	0.488	0.652	1.549	0.421
53:44.6	-0.314	0.100	0.320	0.719	0.726	0.494	2.046	0.355
53:44.6	-0.110	0.173	0.328	0.656	0.680	0.541	2.268	0.300
53:44.7	0.060	0.254	0.447	0.702	0.697	0.835	2.995	0.279
53:44.7	-0.068	0.216	0.663	1.178	1.094	1.197	4.280	0.280
53:44.7	-0.170	0.314	0.939	1.415	1.521	1.610	5.630	0.286
53:44.7	0.064	0.416	1.367	1.598	1.780	1.708	6.933	0.257
53:44.7	0.021	0.391	1.254	1.659	1.878	1.691	6.894	0.272
53:44.8	-0.089	0.416	1.236	2.173	2.220	1.875	7.832	0.284
53:44.8	-0.247	0.549	1.725	2.843	2.936	2.535	10.342	0.284
53:44.8	0.019	0.630	2.103	3.271	3.451	2.722	12.197	0.283
53:44.8	0.193	0.595	2.001	3.085	3.517	2.318	11.709	0.300
53:44.8	-0.110	0.357	1.649	2.991	3.174	1.985	10.046	0.316
53:44.9	-0.191	0.310	1.645	2.855	3.051	2.122	9.792	0.312
53:44.9	-0.170	0.438	1.551	2.932	2.906	2.318	9.974	0.294
53:44.9	-0.075	0.451	1.743	2.732	2.911	2.062	9.823	0.296
53:44.9	0.002	0.416	1.691	2.579	2.863	1.722	9.272	0.309
53:44.9	0.013	0.343	1.466	2.550	2.855	1.845	9.073	0.315
53:45.0	-0.156	0.276	1.428	3.064	3.294	2.041	9.946	0.331
53:45.0	-0.187	0.318	1.792	3.666	4.151	2.185	11.926	0.348
53:45.0	-0.170	0.493	1.917	4.649	4.842	2.450	14.181	0.341
53:45.0	-0.054	0.455	2.389	4.945	5.194	2.756	15.683	0.331
53:45.0	**0.142**	**0.617**	**2.486**	**4.962**	**5.406**	**2.483**	**16.096**	**0.336**
53:45.1	0.013	0.434	2.427	4.126	4.596	1.999	13.594	0.338
53:45.1	-0.075	0.016	1.735	3.073	3.359	1.504	9.611	0.349
53:45.1	-0.093	-0.023	0.851	1.651	1.748	0.843	4.976	0.351
53:45.1	-0.114	0.023	0.646	0.903	0.938	0.348	2.745	0.342
53:45.1	0.061	0.045	0.301	0.313	0.280	0.302	1.302	0.240
53:45.2	-0.037	0.126	0.174	0.244	-0.006	0.148	0.649	0.376

Table E1

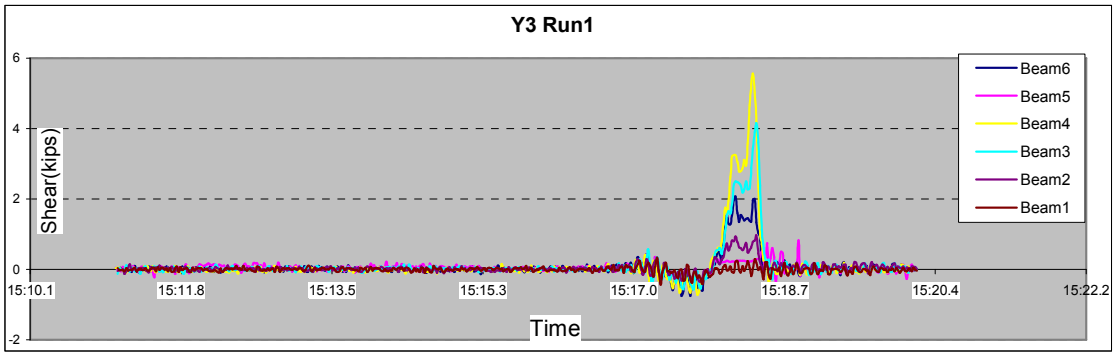
Dynamic Load Test Data (SN:059-0040)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max. D.F
04:37.6	0.1494307	0.0698714	0.1170303	-0.100396	-0.004935	-0.452025	-0.221024	2.045
04:37.7	0.0975529	-0.126611	0.0537285	-0.211471	-0.145427	-0.169529	-0.501757	0.421
04:37.7	-0.328341	-0.365458	-0.27787	-0.173128	-0.029906	-0.029103	-1.203805	0.304
04:37.7	-0.461126	-0.084221	-0.159004	-0.142522	0.0892782	-0.063586	-0.82118	0.562
04:37.7	-0.166409	0.1641923	0.0576181	0.1795807	0.0854963	0.1922297	0.5127084	0.375
04:37.7	0.3498266	0.2490127	0.2109379	0.3618145	0.6667049	0.1671272	2.0054238	0.332
04:37.8	0.1108476	0.2663534	0.54247	0.7738691	0.5929625	0.7115159	2.9980184	0.258
04:37.8	-0.216692	0.08708	0.732495	0.8716247	1.0238982	1.009643	3.508049	0.292
04:37.8	-0.156974	0.1429377	0.6558742	0.5877996	0.9547214	0.7539591	2.9383178	0.325
04:37.8	0.0339212	0.0408427	0.4313293	0.8505021	0.8776751	0.3843723	2.6186426	0.335
04:37.8	-0.110683	0.3087305	0.8263489	1.1054549	1.2027217	0.9038321	4.2364051	0.284
04:37.9	-0.127946	0.3606083	1.3192073	1.822313	1.8121631	1.8327212	7.0190674	0.261
04:37.9	-0.043125	0.5609382	1.4727252	2.0006572	2.4911357	2.1214137	8.6037449	0.290
04:37.9	0.029995	0.428154	1.5744364	2.1233711	2.6045105	1.7597087	8.5201756	0.306
04:37.9	0.0127326	0.420314	1.5494659	2.4166795	2.7764769	1.640405	8.8160738	0.315
04:37.9	-0.07222	0.6033814	1.7144249	2.9900311	3.0489024	2.2077992	10.492319	0.291
04:38.0	0.1069875	0.5649182	2.0793741	3.5251591	3.9701251	3.1754694	13.422033	0.296
04:38.0	**-0.110737**	**0.7958713**	**2.67775**	**3.6480588**	**4.4642722**	**3.2388372**	**14.714053**	**0.303**
04:38.0	-0.008522	0.6843417	2.8522462	3.5557112	4.422027	2.9960712	14.501875	0.305
04:38.0	0.2169886	0.5783327	2.4899346	3.0455954	3.941001	2.6639035	12.935756	0.305
04:38.0	0.0590897	0.4415686	2.3765842	2.9900311	3.8644462	2.645981	12.377701	0.312
04:38.1	-0.131859	0.3818507	2.0371289	3.3100438	4.4391818	2.5863291	12.622675	0.352
04:38.1	-0.255275	0.283562	1.9643438	2.8499765	4.5832601	2.3943186	11.820186	0.388
04:38.1	***0.093693***	***0.385711***	***2.006589***	***2.756069***	***4.534545***	***2.067307***	***11.84391***	***0.383***
04:38.1	0.289989	0.4800318	1.8110899	2.9054748	4.1146755	1.9480571	11.549318	0.356
04:38.1	-0.083974	0.3723623	1.8665344	3.0165495	3.9350965	1.9480571	11.054626	0.356
04:38.2	-0.156974	0.0100875	1.472845	2.3284855	3.2704818	1.6460039	8.5709296	0.382
04:38.2	-0.153126	0.1853809	1.0642423	1.6747311	2.0185123	1.019102	5.8088425	0.347
04:38.2	-0.166475	0.1720202	0.8398294	1.2165296	3.8136708	0.5381593	6.4137345	0.595
04:38.2	0.1321561	0.2623612	1.0219433	1.0366914	1.0106035	0.7634059	4.2271614	0.245
04:38.3	-0.029711	-0.110997	0.0827084	-0.159743	0.5225628	0.0210361	0.3258575	1.604
04:38.3	-0.02419	0.0871998	-0.2106	-0.019808	0.1184145	0.0980286	0.0490451	2.414
04:38.3	0.2978828	0.4030515	0.0537823	0.3273728	0.2336844	0.4597215	1.7754953	0.259
04:38.3	0.195734	0.0408427	0.2819771	0.3657162	0.256822	0.2981066	1.4391987	0.254
04:38.4	-0.050899	-0.263309	-0.026806	-0.155907	-0.079966	-0.021275	-0.598163	0.440
04:38.4	-0.301632	-0.126664	-0.41389	-0.088637	-0.081598	-0.080861	-1.093283	0.379
04:38.4	-0.06824	0.09106	-0.069051	0.1201807	0.0431852	0.1883158	0.3054504	0.617
04:38.4	0.2689202	0.1083346	0.406371	0.1279842	1.9622645	0.1074216	2.981296	0.658
04:38.4	0.0511958	-0.041712	-0.096487	-0.111102	3.0876083	0.07684	2.9663422	1.041
04:38.5	-0.195503	-0.049618	-0.270864	-0.153282	3.3077181	0.0305489	2.6690001	1.239
04:38.5	-0.012502	0.0737193	-0.019867	0.3049738	4.1694613	0.1537665	4.6695523	0.893
04:38.5	0.18796	0.2065695	0.2178776	0.1439164	4.7373092	0.1325779	5.6262106	0.842
04:38.5	0.2476118	-0.151713	-0.088762	-0.114938	4.4760141	-0.144427	4.2237859	1.060
04:38.5	-0.267029	-0.186382	-0.291986	-0.03435	5.0230695	-0.123304	4.1200181	1.219
04:38.6	-0.293738	0.0525429	0.0474029	0.1189043	5.1514361	0.3749133	5.4514612	0.945
04:38.6	0.226477	0.231738	0.0144553	0.2455078	6.0892667	0.2941927	7.1016376	0.857
04:38.6	0.226411	0.0698054	0.1068029	-0.143864	-0.118178	-0.165615	-0.024638	6.722
04:38.6	-0.160954	-0.228693	-0.063738	-0.128257	-0.212445	-0.242542	-1.036629	0.234

Table E2

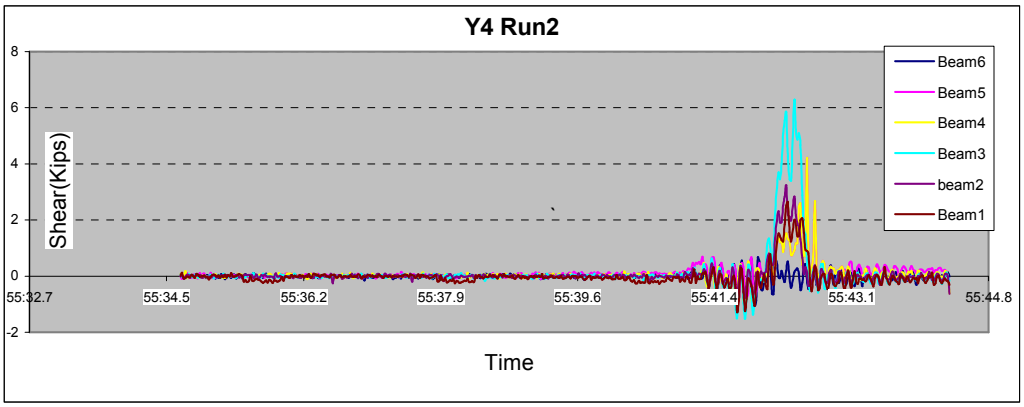
Dynamic Load Test Data(SN:05-0040)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max. D.F
15:17.9	-0.182	-0.081	0.005	-0.088	0.038	0.095	-0.213	0.855
15:17.9	-0.132	0.162	-0.070	0.247	0.131	0.236	0.574	0.430
15:17.9	0.023	0.345	0.417	0.337	0.361	0.134	1.617	0.258
15:17.9	0.034	0.311	0.532	0.448	0.399	0.361	2.085	0.255
15:18.0	-0.012	0.201	0.546	0.498	0.593	0.590	2.415	0.245
15:18.0	-0.118	0.145	0.613	0.621	0.634	0.407	2.301	0.275
15:18.0	-0.072	0.286	0.434	0.554	0.512	0.270	1.984	0.279
15:18.0	0.065	0.337	0.634	0.803	0.708	0.670	3.218	0.250
15:18.0	0.121	0.576	1.098	1.284	1.055	1.199	5.333	0.241
15:18.1	-0.029	0.730	1.514	1.746	1.593	1.528	7.081	0.247
15:18.1	-0.016	0.534	1.657	1.593	1.637	1.297	6.703	0.247
15:18.1	0.086	0.657	1.577	1.946	1.655	1.276	7.197	0.270
15:18.1	-0.076	0.815	1.845	2.621	2.060	1.532	8.797	0.298
15:18.1	-0.084	0.794	2.414	3.204	2.578	1.971	10.877	0.295
15:18.2	0.206	0.935	2.499	3.246	2.862	2.065	11.812	0.275
15:18.2	0.227	0.769	2.474	3.246	2.723	1.592	11.030	0.294
15:18.2	-0.016	0.623	2.447	3.050	2.491	1.344	9.939	0.307
15:18.2	-0.093	0.601	2.384	2.782	2.333	1.549	9.556	0.291
15:18.2	0.090	0.538	2.181	2.786	2.217	1.468	9.279	0.300
15:18.3	-0.045	0.615	2.265	2.876	2.435	1.391	9.537	0.302
15:18.3	0.078	0.748	2.503	3.114	2.640	1.430	10.513	0.296
15:18.3	0.227	0.482	2.269	2.952	2.725	1.455	10.111	0.292
15:18.3	0.044	0.559	2.296	3.577	2.824	1.378	10.677	0.335
15:18.3	-0.199	0.636	2.873	4.656	3.451	1.353	12.771	0.365
15:18.4	0.019	0.777	3.421	5.264	3.693	1.967	15.140	0.348
15:18.4	**0.283**	**0.815**	**3.893**	**5.562**	**3.932**	**1.992**	**16.476**	**0.338**
15:18.4	0.184	0.956	4.151	5.017	3.779	1.334	15.421	0.325
15:18.4	-0.016	0.457	3.609	4.177	2.960	1.038	12.224	0.342
15:18.4	0.061	0.197	2.372	2.358	1.949	0.901	7.837	0.303
15:18.5	-0.080	0.085	1.127	1.049	0.896	0.138	3.216	0.351
15:18.5	-0.280	-0.038	0.600	0.721	0.284	-0.108	1.179	0.612
15:18.5	0.188	0.205	0.307	0.250	0.105	0.151	1.206	0.255
15:18.5	0.202	0.081	0.115	0.309	-0.144	0.313	0.876	0.357
15:18.5	-0.164	0.000	0.269	0.207	0.160	-0.109	0.363	0.740
15:18.6	-0.263	0.025	-0.165	-0.421	-0.228	-0.101	-1.152	0.366
15:18.6	0.026	0.033	-0.283	-0.065	-0.520	-0.083	-0.892	0.583
15:18.6	-0.012	0.187	0.192	0.102	-0.224	0.074	0.319	0.601
15:18.6	-0.012	0.106	0.248	0.165	-0.009	0.215	0.712	0.348
15:18.6	-0.033	-0.056	0.035	-0.115	-0.104	0.180	-0.092	1.244
15:18.7	0.048	0.021	-0.042	-0.128	-0.271	-0.091	-0.463	0.585
15:18.7	-0.199	0.166	-0.050	0.092	-0.402	-0.130	-0.522	0.770
15:18.7	-0.012	0.099	0.073	-0.103	-0.105	0.194	0.145	1.334
15:18.7	0.184	0.068	0.179	-0.009	-0.277	0.253	0.398	0.636
15:18.7	-0.097	0.081	0.209	0.106	-2.229	-0.011	-1.941	1.149
15:18.8	-0.178	0.060	0.069	0.092	-3.126	0.018	-3.064	1.020
15:18.8	-0.072	0.021	0.031	-0.149	-6.481	0.134	-6.516	0.995
15:18.8	0.044	0.047	-0.122	-0.034	-6.685	-0.083	-6.835	0.978
15:18.8	-0.139	0.110	-0.063	0.021	-4.374	-0.028	-4.473	0.978

Table E3

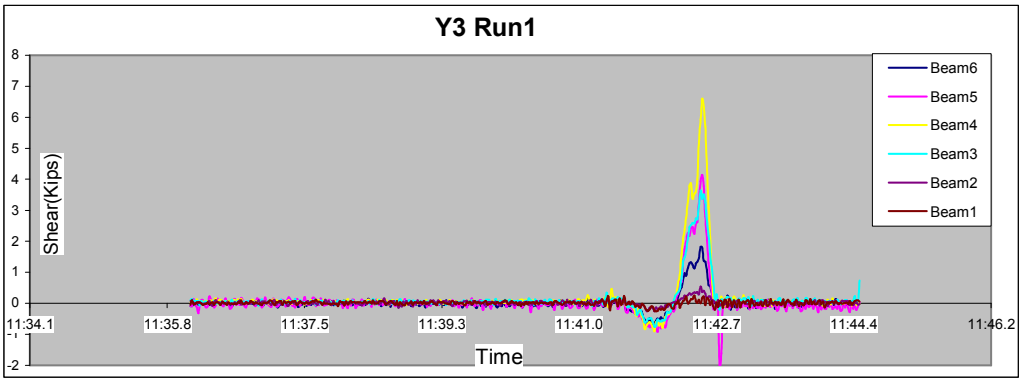
Dynamic Load Test Data(SN:05-0040)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear	Max. D.F
55:42.0	-0.450	0.602	1.167	0.385	0.385	0.130	2.219	0.582
55:42.1	0.614	0.810	1.345	0.782	0.782	0.547	4.879	0.288
55:42.1	0.780	0.644	1.026	0.837	0.837	0.259	4.383	0.246
55:42.1	0.005	0.396	0.398	0.278	0.278	-0.628	0.726	0.779
55:42.1	-0.294	0.430	0.887	0.064	0.064	-0.641	0.511	3.003
55:42.1	0.303	1.349	2.245	0.347	0.347	0.620	5.211	0.449
55:42.2	1.215	1.977	3.150	1.191	1.191	0.441	9.166	0.352
55:42.2	1.521	2.318	3.695	1.391	1.391	-0.036	10.281	0.367
55:42.2	1.423	1.904	3.465	1.208	1.208	-0.074	9.134	0.388
55:42.2	1.282	1.914	3.996	1.289	1.289	0.182	9.952	0.410
55:42.2	1.240	2.518	5.075	0.862	0.862	-0.045	10.512	0.493
55:42.3	1.845	2.831	5.547	1.310	1.310	-0.207	12.636	0.447
55:42.3	**2.510**	**3.223**	**5.833**	**1.528**	**1.528**	**0.207**	**14.828**	**0.399**
55:42.3	2.633	2.215	4.256	1.323	1.323	0.522	12.274	0.353
55:42.3	1.569	2.110	3.453	1.259	1.259	-0.061	9.589	0.368
55:42.3	1.238	1.990	3.397	0.747	0.747	-0.415	7.704	0.454
55:42.4	1.999	2.831	6.239	0.918	0.918	0.143	13.048	0.486
55:42.4	1.807	2.156	5.169	1.166	1.166	0.224	11.688	0.451
55:42.4	1.415	1.882	4.857	1.165	1.165	0.266	10.751	0.461
55:42.4	1.433	1.716	5.091	2.463	2.463	0.087	13.253	0.390
55:42.5	1.978	1.316	4.667	2.594	2.594	-0.488	12.661	0.375
55:42.5	2.055	0.659	2.878	0.414	0.414	-0.232	6.189	0.482
55:42.5	1.544	0.078	1.675	1.398	1.398	0.382	6.474	0.268
55:42.5	0.934	0.317	1.489	0.768	0.768	0.428	4.704	0.332
55:42.5	0.901	0.099	0.567	4.215	4.215	-0.130	9.867	0.437
55:42.6	0.797	-0.340	-0.242	0.384	0.384	-0.449	0.533	2.506
55:42.6	-0.111	-0.329	-0.526	0.001	0.001	-0.130	-1.093	0.402
55:42.6	-0.540	-0.248	-0.232	0.328	0.328	0.168	-0.196	1.314
55:42.6	-0.122	0.132	0.235	0.707	0.707	0.189	1.848	0.433
55:42.6	0.338	0.384	0.099	2.675	2.675	0.084	6.255	0.443
55:42.7	0.172	-0.128	-0.106	0.260	0.260	-0.317	0.143	4.360
55:42.7	-0.489	-0.402	-0.585	0.039	0.039	-0.186	-1.582	0.325
55:42.7	-0.434	-0.184	-0.131	-0.055	-0.055	0.070	-0.789	0.433
55:42.7	-0.047	0.251	0.421	0.231	0.231	0.045	1.134	0.459
55:42.7	0.069	0.153	0.421	0.547	0.547	0.109	1.845	0.335
55:42.8	0.074	-0.043	-0.432	0.424	0.424	0.070	0.517	1.406
55:42.8	-0.225	-0.261	-0.453	0.005	0.005	-0.161	-1.089	0.347
55:42.8	-0.463	-0.219	0.027	-0.084	-0.084	-0.172	-0.996	0.383
55:42.8	-0.246	0.107	-0.016	0.270	0.270	0.049	0.434	1.234
55:42.8	0.082	0.213	0.167	0.329	0.329	0.389	1.510	0.301
55:42.9	0.026	0.016	0.065	0.282	0.282	-0.070	0.600	0.732
55:42.9	-0.276	-0.149	-0.198	0.270	0.270	-0.309	-0.392	0.508
55:42.9	-0.357	-0.223	-0.432	0.082	0.082	0.122	-0.727	0.458
55:42.9	-0.255	-0.163	-0.088	0.197	0.197	0.049	-0.064	0.915
55:42.9	-0.203	0.149	0.172	0.210	0.210	-0.245	0.293	2.700
55:43.0	0.124	0.170	0.078	0.274	0.274	-0.130	0.791	0.476
55:43.0	0.005	-0.047	-0.075	0.341	0.341	0.203	0.768	0.618
55:43.0	-0.361	-0.261	-0.288	0.172	0.172	0.168	-0.398	0.589

Table E4

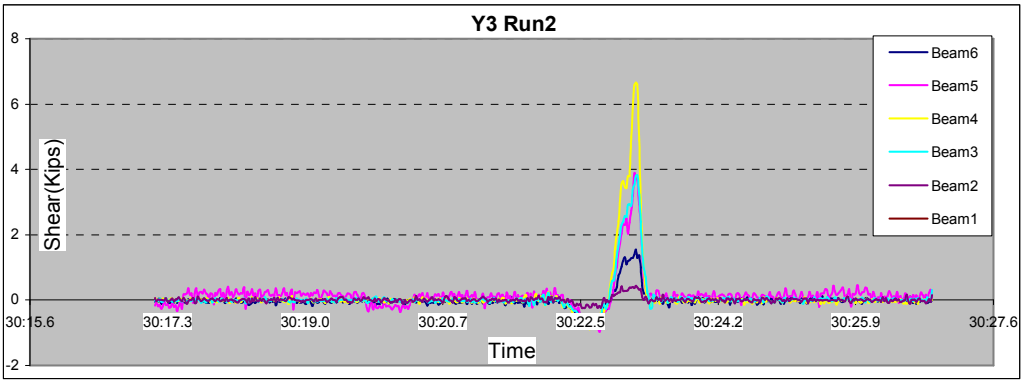
Dynamic Load Test Data(SN:059-0041)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shear	Max. D.F
11:41.7	-0.072	-0.030	-0.368	-0.404	-0.351	-0.358	-1.583	0.255
11:41.7	-0.087	-0.047	-0.285	-0.196	-0.424	-0.391	-1.429	0.296
11:41.8	-0.142	-0.047	-0.201	-0.311	-0.351	-0.282	-1.333	0.263
11:41.8	-0.024	-0.043	-0.344	-0.416	-0.473	-0.265	-1.565	0.303
11:41.8	-0.045	-0.060	-0.444	-0.568	-0.587	-0.463	-2.167	0.271
11:41.8	-0.129	-0.127	-0.622	-0.839	-0.621	-0.534	-2.871	0.292
11:41.8	-0.222	-0.249	-0.576	-0.699	-0.736	-0.646	-3.127	0.235
11:41.9	-0.243	-0.232	-0.496	-0.648	-0.663	-0.629	-2.911	0.228
11:41.9	-0.197	-0.144	-0.496	-0.610	-0.776	-0.484	-2.706	0.287
11:41.9	-0.100	-0.127	-0.482	-0.661	-0.692	-0.667	-2.729	0.254
11:41.9	-0.121	-0.161	-0.627	-0.779	-0.785	-0.721	-3.195	0.246
11:41.9	-0.243	-0.249	-0.766	-0.898	-0.757	-0.629	-3.541	0.253
11:42.0	-0.256	-0.134	-0.715	-0.610	-0.783	-0.565	-3.064	0.256
11:42.0	-0.243	-0.186	-0.521	-0.627	-0.919	-0.489	-2.984	0.308
11:42.0	-0.176	-0.161	-0.563	-0.720	-0.688	-0.548	-2.856	0.252
11:42.0	-0.201	-0.106	-0.593	-0.640	-0.802	-0.451	-2.793	0.287
11:42.0	-0.163	-0.127	-0.538	-0.800	-0.764	-0.522	-2.914	0.275
11:42.1	-0.218	-0.169	-0.555	-0.606	-0.711	-0.557	-2.816	0.252
11:42.1	-0.159	-0.060	-0.517	-0.433	-0.772	-0.323	-2.263	0.341
11:42.1	-0.058	-0.123	-0.275	-0.370	-0.519	-0.278	-1.622	0.320
11:42.1	-0.024	-0.064	-0.310	-0.339	-0.423	-0.303	-1.463	0.289
11:42.1	-0.045	-0.039	-0.268	-0.273	-0.330	-0.268	-1.222	0.270
11:42.2	-0.155	0.012	-0.145	-0.124	-0.117	-0.227	-0.756	0.300
11:42.2	-0.167	0.030	0.062	0.065	-0.272	0.020	-0.262	1.036
11:42.2	-0.020	0.055	0.243	0.255	-0.154	0.096	0.475	0.538
11:42.2	-0.007	0.037	0.306	0.356	0.243	0.083	1.019	0.350
11:42.2	0.090	0.041	0.369	0.661	0.313	0.209	1.684	0.393
11:42.3	-0.146	0.100	0.462	0.922	0.726	0.387	2.452	0.376
11:42.3	-0.024	0.159	0.813	1.602	0.690	0.518	3.758	0.426
11:42.3	0.073	0.150	1.341	2.067	1.274	0.730	5.636	0.367
11:42.3	0.111	0.251	1.476	2.366	1.745	0.967	6.917	0.342
11:42.3	0.216	0.226	1.682	2.755	1.989	0.891	7.760	0.355
11:42.4	-0.007	0.264	2.105	3.304	2.271	1.150	9.088	0.364
11:42.4	0.056	0.323	2.456	3.781	2.172	1.292	10.080	0.375
11:42.4	0.136	0.281	2.515	3.870	2.419	1.323	10.545	0.367
11:42.4	0.132	0.305	2.595	3.371	2.461	1.242	10.106	0.334
11:42.4	0.250	0.348	2.582	3.531	2.243	1.123	10.078	0.350
11:42.5	0.073	0.331	2.734	3.607	2.601	1.280	10.626	0.339
11:42.5	0.014	0.369	2.713	3.988	2.614	1.335	11.034	0.361
11:42.5	0.108	0.289	3.136	5.208	3.245	1.463	13.449	0.387
11:42.5	0.007	0.539	3.633	5.922	3.932	1.817	15.850	0.374
11:42.5	**0.167**	**0.369**	**3.366**	**6.597**	**4.138**	**1.800**	**16.438**	**0.401**
11:42.6	0.216	0.407	3.519	6.323	3.780	1.373	15.619	0.405
11:42.6	-0.062	0.310	3.248	5.701	2.796	1.340	13.332	0.428
11:42.6	0.170	0.150	2.672	4.507	2.128	1.074	10.701	0.421
11:42.6	0.115	0.218	2.185	3.121	1.298	0.591	7.530	0.415
11:42.6	-0.058	0.214	1.598	2.136	0.755	0.556	5.201	0.411
11:42.7	0.073	0.096	1.172	1.052	0.358	0.357	3.108	0.377
11:42.7	-0.083	0.093	0.745	0.263	-0.178	0.138	0.977	0.762

Table E5

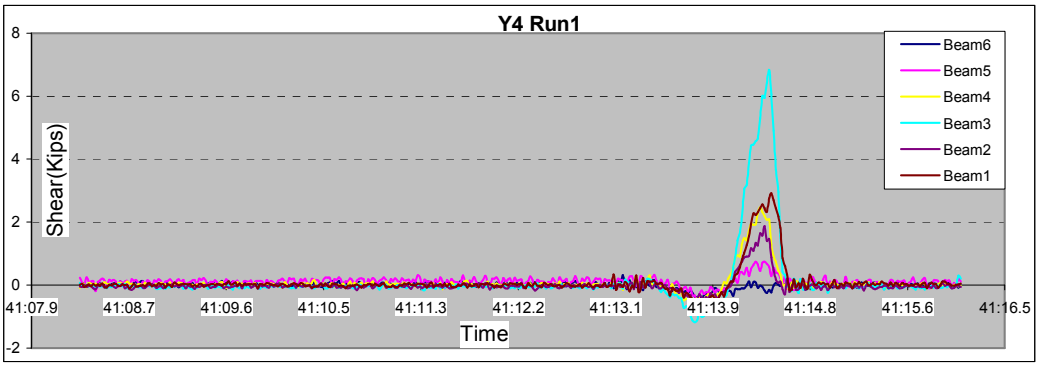
Dynamic Load Test Data(SN:059-0041)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shear	Max. D.F
30:22.4	-0.154	-0.175	-0.323	-0.432	-0.333	-0.394	-1.811	0.238
30:22.4	-0.082	-0.116	-0.369	-0.457	-0.291	-0.339	-1.653	0.276
30:22.4	-0.133	-0.154	-0.479	-0.542	-0.224	-0.325	-1.858	0.292
30:22.5	-0.242	-0.124	-0.689	-0.796	-0.639	-0.525	-3.014	0.264
30:22.5	-0.251	-0.242	-0.615	-0.838	-0.506	-0.686	-3.139	0.267
30:22.5	-0.263	-0.238	-0.627	-0.681	-0.679	-0.670	-3.158	0.216
30:22.5	-0.272	-0.242	-0.640	-0.813	-0.624	-0.665	-3.256	0.250
30:22.5	-0.137	-0.137	-0.682	-0.740	-0.502	-0.627	-2.826	0.262
30:22.6	-0.297	-0.158	-0.716	-0.838	-0.578	-0.585	-3.172	0.264
30:22.6	-0.352	-0.221	-0.852	-0.901	-0.683	-0.729	-3.738	0.241
30:22.6	-0.255	-0.217	-0.682	-0.782	-0.729	-0.771	-3.437	0.228
30:22.6	-0.221	-0.107	-0.564	-0.647	-0.771	-0.686	-2.996	0.257
30:22.6	-0.213	-0.158	-0.619	-0.748	-0.607	-0.538	-2.884	0.259
30:22.7	-0.099	-0.120	-0.678	-0.824	-0.741	-0.470	-2.932	0.281
30:22.7	-0.234	-0.238	-0.742	-0.727	-0.754	-0.504	-3.198	0.236
30:22.7	-0.297	-0.179	-0.560	-0.563	-0.977	-0.601	-3.177	0.307
30:22.7	-0.234	-0.238	-0.488	-0.377	-0.817	-0.470	-2.623	0.311
30:22.7	-0.099	-0.091	-0.200	-0.276	-0.556	-0.275	-1.497	0.371
30:22.8	-0.044	0.069	-0.130	-0.356	-0.336	-0.221	-1.017	0.350
30:22.8	-0.061	-0.057	-0.269	-0.175	-0.344	-0.123	-1.029	0.335
30:22.8	-0.196	-0.002	-0.130	-0.199	-0.198	-0.280	-1.005	0.279
30:22.8	-0.179	-0.066	-0.044	0.096	-0.265	-0.114	-0.573	0.462
30:22.8	-0.074	-0.011	0.336	0.471	-0.076	-0.042	0.603	0.782
30:22.9	-0.040	0.149	0.585	0.822	0.114	0.092	1.722	0.477
30:22.9	-0.019	0.132	0.596	0.982	0.395	0.309	2.396	0.410
30:22.9	0.011	0.170	0.850	1.621	0.796	0.278	3.726	0.435
30:22.9	-0.116	0.191	1.323	1.992	1.003	0.406	4.798	0.415
30:22.9	-0.002	0.229	1.652	2.402	1.500	0.740	6.521	0.368
30:23.0	0.099	0.241	1.982	3.048	1.732	0.846	7.946	0.384
30:23.0	-0.027	0.414	2.315	3.562	2.038	1.029	9.330	0.382
30:23.0	0.040	0.275	2.405	3.638	2.317	1.201	9.875	0.368
30:23.0	0.078	0.288	2.573	3.465	2.299	1.308	10.011	0.346
30:23.0	0.002	0.283	2.556	3.431	2.509	1.096	9.877	0.347
30:23.1	0.057	0.300	2.916	3.798	2.039	1.194	10.303	0.369
30:23.1	0.251	0.376	2.940	3.799	2.371	1.227	10.965	0.346
30:23.1	0.196	0.380	2.885	4.984	2.738	1.282	12.465	0.400
30:23.1	-0.011	0.405	3.396	5.924	3.188	1.291	14.191	0.417
30:23.1	0.011	0.372	3.531	6.573	3.886	1.394	15.767	0.417
30:23.2	**0.328**	**0.435**	**3.798**	**6.652**	**3.771**	**1.546**	**16.530**	**0.402**
30:23.2	-0.023	0.384	3.819	6.598	3.698	1.291	15.767	0.418
30:23.2	0.057	0.317	3.231	4.900	2.921	1.367	12.794	0.383
30:23.2	0.120	0.330	2.400	3.029	2.380	1.000	9.258	0.327
30:23.2	-0.137	0.103	1.555	1.741	1.456	0.453	5.171	0.337
30:23.3	-0.095	0.006	0.982	0.939	0.672	0.209	2.712	0.362
30:23.3	-0.002	0.103	0.719	0.386	0.381	0.199	1.786	0.403
30:23.3	-0.040	0.014	0.267	0.007	0.154	0.123	0.524	0.509
30:23.3	0.103	-0.099	0.103	0.062	0.012	-0.050	0.130	0.793
30:23.3	-0.120	-0.011	-0.259	-0.192	0.187	-0.017	-0.412	0.628
30:23.4	-0.002	0.002	-0.234	-0.175	0.168	0.012	-0.229	1.024

Table E6

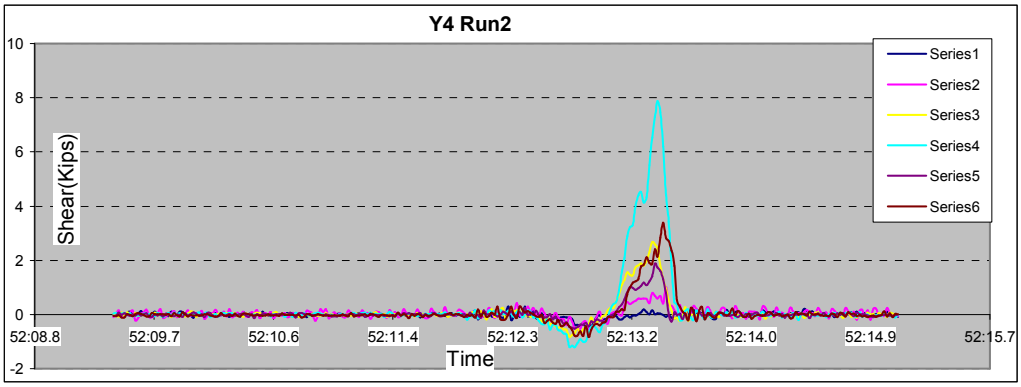
Dynamic Load Test Data(SN:059-0041)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shear	Max. D.F
41:13.7	-0.250	-0.306	-0.684	-0.435	-0.055	-0.185	-1.915	0.357
41:13.7	-0.279	-0.362	-0.688	-0.452	-0.212	-0.240	-2.232	0.308
41:13.7	-0.389	-0.311	-0.962	-0.654	-0.076	-0.159	-2.551	0.377
41:13.7	-0.435	-0.530	-1.115	-0.671	-0.324	-0.245	-3.319	0.336
41:13.8	-0.646	-0.436	-1.174	-0.709	-0.333	-0.363	-3.662	0.321
41:13.8	-0.612	-0.454	-1.115	-0.417	-0.510	-0.385	-3.493	0.319
41:13.8	-0.507	-0.297	-0.865	-0.408	-0.312	-0.347	-2.737	0.316
41:13.8	-0.536	-0.378	-1.001	-0.690	-0.169	-0.427	-3.200	0.313
41:13.8	-0.608	-0.475	-0.979	-0.459	-0.286	-0.330	-3.137	0.312
41:13.9	-0.587	-0.377	-0.899	-0.358	-0.223	-0.282	-2.728	0.330
41:13.9	-0.469	-0.433	-0.789	-0.295	-0.227	-0.321	-2.533	0.311
41:13.9	-0.372	-0.251	-0.718	-0.282	-0.055	-0.325	-2.004	0.358
41:13.9	-0.338	-0.332	-0.566	-0.299	-0.126	-0.185	-1.846	0.307
41:13.9	-0.427	-0.290	-0.816	-0.417	-0.227	-0.084	-2.260	0.361
41:14.0	-0.469	-0.416	-0.823	-0.299	-0.139	-0.142	-2.288	0.360
41:14.0	-0.338	-0.324	-0.667	-0.253	-0.177	-0.227	-1.986	0.336
41:14.0	-0.220	-0.234	-0.600	-0.105	-0.215	-0.245	-1.619	0.371
41:14.0	-0.359	-0.223	-0.402	0.097	-0.097	-0.114	-1.097	0.366
41:14.0	-0.098	-0.130	-0.313	0.051	-0.231	-0.185	-0.904	0.346
41:14.1	-0.025	-0.080	-0.080	0.229	-0.042	-0.168	-0.167	1.005
41:14.1	0.118	-0.021	0.080	0.351	0.037	-0.207	0.359	0.977
41:14.1	0.122	0.185	0.549	0.562	0.147	-0.342	1.222	0.460
41:14.1	0.316	0.433	0.892	0.857	0.219	-0.131	2.586	0.345
41:14.1	0.375	0.509	1.414	0.955	0.068	-0.131	3.191	0.443
41:14.2	0.573	0.639	1.680	0.913	0.404	-0.130	4.079	0.412
41:14.2	0.823	0.744	2.187	1.305	0.409	-0.105	5.363	0.408
41:14.2	1.025	0.874	3.056	1.496	0.350	-0.104	6.696	0.456
41:14.2	1.274	0.904	3.174	1.419	0.555	-0.007	7.320	0.434
41:14.2	1.560	0.929	3.889	1.744	0.295	0.116	8.533	0.456
41:14.3	1.932	1.173	4.425	1.947	0.510	-0.071	9.914	0.446
41:14.3	2.282	1.093	4.463	1.905	0.636	0.090	10.469	0.426
41:14.3	2.227	1.337	4.568	1.936	0.749	0.086	10.903	0.419
41:14.3	2.317	1.264	4.654	2.294	0.653	-0.088	11.093	0.419
41:14.3	2.433	1.648	5.303	2.468	0.450	-0.016	12.285	0.432
41:14.4	2.555	1.576	6.008	2.323	0.716	-0.059	13.118	0.458
41:14.4	2.437	1.878	5.939	2.188	0.745	-0.169	13.019	0.456
41:14.4	2.324	1.408	6.426	2.069	0.670	-0.250	12.647	0.508
41:14.4	2.755	1.467	6.827	2.081	0.573	-0.148	13.555	0.504
41:14.4	**2.911**	**0.874**	**6.054**	**1.301**	**0.283**	**-0.228**	**11.196**	**0.541**
41:14.5	2.692	0.478	4.901	0.917	0.548	-0.016	9.519	0.515
41:14.5	2.439	0.176	3.655	0.727	0.400	0.069	7.465	0.490
41:14.5	2.168	0.065	2.962	0.472	0.378	0.009	6.056	0.489
41:14.5	1.814	0.115	1.568	0.337	0.226	-0.028	4.031	0.450
41:14.5	0.859	-0.137	0.426	-0.008	0.013	0.030	1.183	0.726
41:14.6	0.594	-0.286	0.319	0.017	0.302	0.022	0.968	0.614
41:14.6	0.337	0.206	0.041	-0.038	-0.118	-0.078	0.349	0.965
41:14.6	-0.153	-0.215	-0.123	-0.151	0.205	0.081	-0.356	0.605
41:14.6	-0.143	-0.025	-0.170	0.089	0.087	-0.104	-0.266	0.641
41:14.6	0.185	0.034	0.211	-0.084	-0.164	-0.147	0.035	6.026

Table E7

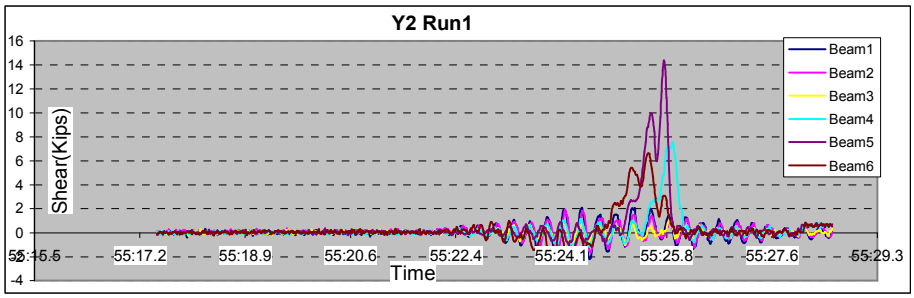
Dynamic Load Test Data(SN:059-0041)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shear	Max. D.F
52:12.7	-0.401	-0.336	-0.703	-0.551	-0.167	-0.082	-2.240	0.314
52:12.7	-0.307	-0.285	-0.733	-0.564	-0.386	-0.104	-2.380	0.308
52:12.7	-0.442	-0.441	-1.189	-0.825	-0.076	-0.103	-3.077	0.387
52:12.7	-0.564	-0.479	-1.139	-0.749	-0.257	-0.163	-3.352	0.340
52:12.7	-0.780	-0.521	-1.206	-0.686	-0.487	-0.379	-4.059	0.297
52:12.8	-0.776	-0.462	-1.046	-0.499	-0.546	-0.379	-3.708	0.282
52:12.8	-0.614	-0.365	-0.903	-0.677	-0.508	-0.412	-3.479	0.260
52:12.8	-0.797	-0.378	-1.004	-0.551	-0.281	-0.311	-3.323	0.302
52:12.8	-0.429	-0.306	-0.986	-0.457	-0.261	-0.476	-2.916	0.338
52:12.8	-0.835	-0.437	-0.653	-0.343	-0.525	-0.367	-3.160	0.264
52:12.9	-0.565	-0.247	-0.451	-0.107	-0.501	-0.445	-2.316	0.244
52:12.9	-0.387	-0.298	-0.417	-0.322	-0.352	-0.255	-2.032	0.205
52:12.9	-0.341	-0.180	-0.539	-0.259	-0.055	-0.082	-1.456	0.370
52:12.9	-0.401	-0.214	-0.649	-0.204	0.114	-0.018	-1.371	0.473
52:12.9	-0.307	-0.239	-0.375	-0.061	-0.223	-0.189	-1.394	0.269
52:13.0	-0.273	-0.264	-0.282	-0.023	-0.286	-0.163	-1.290	0.221
52:13.0	-0.092	-0.083	-0.104	0.158	-0.327	-0.205	-0.654	0.501
52:13.0	-0.092	-0.033	0.216	0.251	0.013	-0.044	0.312	0.807
52:13.0	-0.092	0.009	0.385	0.255	0.080	-0.027	0.611	0.631
52:13.0	0.106	0.106	0.465	0.488	0.107	-0.061	1.211	0.403
52:13.1	0.110	0.270	0.892	0.741	0.002	-0.167	1.848	0.483
52:13.1	0.203	0.379	1.580	1.092	-0.032	-0.179	3.043	0.519
52:13.1	0.165	0.564	2.091	1.282	0.343	-0.099	4.346	0.481
52:13.1	0.752	0.832	2.893	1.557	0.464	-0.039	6.459	0.448
52:13.1	0.988	1.013	3.222	1.460	0.381	-0.104	6.960	0.463
52:13.2	1.173	0.983	3.307	1.446	0.451	-0.032	7.329	0.451
52:13.2	1.225	0.916	4.029	1.755	0.508	-0.039	8.393	0.480
52:13.2	1.326	0.979	4.404	1.814	0.590	0.025	9.138	0.482
52:13.2	1.773	1.067	4.523	1.883	0.586	0.079	9.912	0.456
52:13.2	1.836	1.174	4.129	1.810	0.595	0.189	9.733	0.424
52:13.3	2.115	1.080	4.337	1.974	0.574	0.097	10.177	0.426
52:13.3	1.903	1.220	5.515	2.296	0.418	0.004	11.356	0.486
52:13.3	1.865	1.408	6.523	2.672	0.792	0.156	13.416	0.486
52:13.3	2.410	1.870	7.296	2.591	0.683	0.004	14.854	0.491
52:13.3	2.135	1.736	7.874	2.439	0.596	0.042	14.821	0.531
52:13.4	2.836	1.613	7.465	1.797	0.689	0.032	14.431	0.517
52:13.4	3.384	1.298	6.194	1.303	0.415	-0.010	12.583	0.492
52:13.4	2.827	0.793	4.404	0.953	1.010	-0.072	9.914	0.444
52:13.4	**2.713**	**-0.002**	**3.416**	**0.526**	**0.354**	**-0.022**	**6.984**	**0.489**
52:13.4	2.368	-0.260	1.769	0.139	0.321	-0.112	4.225	0.560
52:13.5	1.802	0.085	0.452	-0.145	0.162	-0.142	2.215	0.814
52:13.5	0.524	-0.012	0.389	-0.103	0.036	-0.082	0.751	0.697
52:13.5	0.287	0.007	-0.209	-0.234	0.354	0.037	0.241	1.467
52:13.5	0.114	-0.165	-0.185	-0.044	0.017	-0.077	-0.339	0.544
52:13.5	0.013	0.048	0.132	0.272	0.170	0.100	0.735	0.371
52:13.6	-0.210	-0.189	0.187	-0.221	-0.105	0.044	-0.494	0.447
52:13.6	0.255	0.165	-0.118	-0.044	0.040	-0.027	0.271	0.939
52:13.6	0.123	0.064	-0.198	0.028	0.316	0.165	0.499	0.634
52:13.6	-0.248	-0.218	0.160	-0.019	0.216	0.003	-0.106	2.336

Table E8

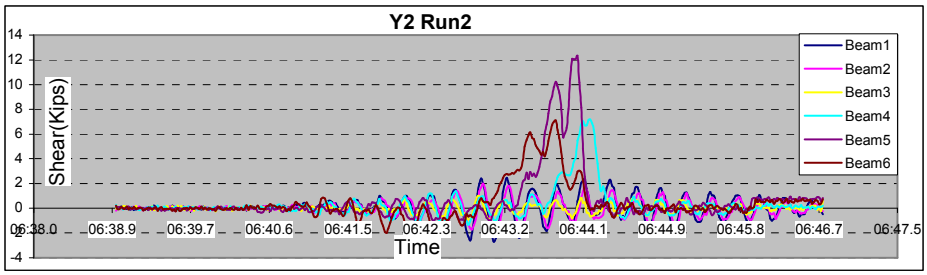
Dynamic Load Test Data (SN:068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
55:24.8	-1.053281	0.100102	0.143101	-0.509403	-0.820934	0.679848	-1.460566	0.721146
55:24.8	-1.507383	-0.752633	-0.455679	-0.822979	-0.574982	0.400591	-3.713065	0.405967
55:24.9	-1.5584	-1.162148	-0.489864	-0.874275	-0.261299	0.536054	-3.809932	0.409036
55:24.9	-1.524109	-1.324058	-0.430003	-0.797251	-0.083752	0.959453	-3.199721	0.476325
55:24.9	-0.538797	-1.03421	-0.284966	-0.611	0.306367	0.849044	-1.313562	0.787333
55:24.9	0.232215	-0.488381	-0.105064	-0.247015	0.501237	1.678378	1.571369	1.068099
55:24.9	0.892161	0.364141	-0.122444	0.083991	0.594403	2.177646	3.989899	0.54579
55:25.0	1.423477	0.679797	0.399589	0.439864	0.467371	2.373102	5.783201	0.410344
55:25.0	1.508786	0.909971	0.476363	0.448082	0.602834	2.491357	6.437393	0.387013
55:25.0	1.491954	0.969751	0.433881	0.473624	0.18774	2.338652	5.895602	0.396677
55:25.0	1.466278	1.029532	0.502332	0.278861	0.374285	2.474202	6.12549	0.403919
55:25.0	0.92616	0.67142	0.159907	0.159941	0.391502	2.245885	4.554815	0.493079
55:25.1	0.489289	1.021155	0.382397	-0.009388	-0.193674	2.270093	3.959873	0.573274
55:25.1	0.138062	0.424109	-0.002509	-0.255339	-0.125943	2.650973	2.829352	0.936954
55:25.1	-0.522071	0.168153	-0.224999	-0.322964	-0.03267	2.424265	1.489713	1.627337
55:25.1	-0.84733	-0.462866	-0.541535	-0.874275	0.323203	2.870771	0.467969	6.134534
55:25.1	-1.138696	-1.034104	-1.028996	-0.848627	0.916704	3.050271	-0.083449	13.64543
55:25.2	-0.924422	-1.093991	-0.780724	-0.721702	1.365556	3.219599	1.064316	3.025042
55:25.2	-0.452781	-1.034104	-0.686678	-0.602782	1.95887	3.836367	3.018892	1.270786
55:25.2	0.32666	-0.573185	-0.319258	-0.162067	2.365719	4.666324	6.304192	0.740194
55:25.2	1.05479	0.116829	0.023273	0.304295	2.568912	5.206847	9.274948	0.561388
55:25.2	1.894385	0.773656	0.399776	0.846714	2.747133	5.419328	12.08099	0.448583
55:25.3	2.057015	1.379266	0.852972	0.973852	2.628	5.403155	13.29426	0.406428
55:25.3	1.911658	1.481396	0.596191	0.804523	2.687513	5.190006	12.67129	0.409588
55:25.3	2.040182	1.421722	0.331326	0.838389	2.627787	5.089528	12.34893	0.412143
55:25.3	0.960558	0.867515	-0.010806	0.651844	2.68762	4.810269	9.967001	0.48262
55:25.3	0.292182	0.364141	-0.319258	0.185482	2.80606	4.82578	8.154387	0.591802
55:25.4	0.223812	-0.053457	-0.447489	0.058344	3.027057	4.386426	7.194692	0.609675
55:25.4	-0.067448	-0.20691	-0.4216	-0.001063	3.561259	3.938773	6.80301	0.578975
55:25.4	-0.213352	-0.258207	-0.404115	-0.034929	4.145172	3.871148	7.105718	0.583357
55:25.4	-0.590361	-0.530836	-0.626605	-0.187608	4.865437	3.937999	6.868026	0.708419
55:25.4	-0.598871	-0.684369	-0.455679	0.066668	5.815986	4.572649	8.716384	0.667248
55:25.5	-0.350199	-0.530836	-0.430003	0.338161	6.747154	5.308979	11.08326	0.60877
55:25.5	0.129553	-0.616505	-0.335851	0.829497	7.570137	6.062524	13.63935	0.555022
55:25.5	0.583548	-0.215367	-0.088365	1.016042	8.680354	6.469958	16.44617	0.527804
55:25.5	1.209203	0.458	0.382397	1.855307	8.841305	6.627977	19.37419	0.456345
55:25.5	1.620585	0.901594	0.373994	2.134831	9.501682	6.595176	21.12786	0.449723
55:25.6	2.022829	1.27703	0.562112	2.498922	9.94208	6.002318	22.30529	0.445727
55:25.6	1.809076	1.387537	0.373994	2.456732	9.934391	5.351221	21.31295	0.46612
55:25.6	1.474495	1.165846	0.083054	2.61763	9.349697	4.632564	19.32329	0.483856
55:25.6	0.917943	0.688174	0.143314	2.710902	8.492849	3.811741	16.76492	0.506584
55:25.6	0.523475	0.270282	-0.293263	2.634953	6.502144	2.864232	12.50182	0.520096
55:25.7	-0.093337	-0.053457	-0.233295	2.499003	5.967811	2.305371	10.3921	0.574265
55:25.7	-0.119013	-0.147023	-0.19911	2.778207	6.544174	1.814541	10.67178	0.613223
55:25.7	-0.221861	-0.300849	-0.156735	2.778633	8.035861	1.349113	11.48416	0.699734
55:25.7	-0.496102	-0.104754	-0.010912	3.37256	9.670991	1.737064	14.16885	0.682553
55:25.7	-0.564579	-0.462679	0.23736	3.974172	11.77432	2.288216	17.24681	0.682696
55:25.8	-0.444458	-0.300849	-0.139143	4.72833	13.54406	3.007834	20.39578	0.664062
55:25.8	***0.001109***	***-0.26658***	***0.143208***	***4.905962***	***14.36685***	***3.091314***	***22.24186***	***0.645938***
55:25.8	**0.472377**	**-0.138753**	**0.134911**	**6.084071**	**13.69772**	**3.076505**	**23.32683**	**0.587209**
55:25.8	0.960558	0.295984	0.219688	7.017438	11.26385	2.727303	22.48482	0.500953
55:25.8	1.269171	0.492079	0.792899	7.11676	9.085251	1.907201	20.66336	0.439679
55:25.9	1.457662	0.85019	0.938615	7.195356	6.001694	1.415991	17.85951	0.402887
55:25.9	1.191744	0.935673	1.075356	7.126478	3.415942	1.112132	14.85732	0.479661
55:25.9	1.251898	1.00383	0.912833	7.092104	1.543883	0.68812	12.49267	0.567701
55:25.9	0.446595	0.841814	0.468146	7.574746	0.908192	0.52701	10.7665	0.703547

Table E9

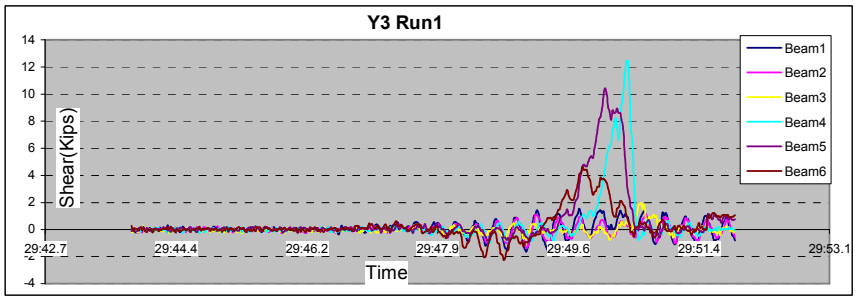
Dynamic Load Test Data (SN:068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
06:43.0	-1.672306	-0.881414	-0.883085	-0.509101	-1.014248	0.273362	-4.686793	0.453594
06:43.1	-2.306577	-1.299092	-0.720563	-0.568508	-0.666699	0.714235	-4.847204	0.599546
06:43.1	-2.717852	-1.921734	-0.540661	-0.983495	-0.217554	0.848177	-5.533118	0.599555
06:43.1	-2.409239	-1.896032	-0.463994	-0.966952	0.070588	1.12869	-4.53694	0.681165
06:43.1	-1.706785	-1.606078	0.066629	-0.754866	0.290999	1.364791	-2.345311	1.268692
06:43.1	-1.004143	-1.316231	0.143402	-0.424721	0.418137	1.838248	-0.345308	3.811762
06:43.2	0.101183	-0.549004	0.519825	0.007669	0.53695	2.126231	2.742855	0.568077
06:43.2	1.33514	0.355508	0.588195	0.431655	0.579141	2.439008	5.728647	0.362481
06:43.2	1.943442	0.969308	0.707917	0.66039	0.257133	2.692939	7.231129	0.327165
06:43.2	2.474758	1.557765	0.545501	0.643173	0.214943	2.760911	8.197051	0.300195
06:43.2	2.063564	1.81364	0.305738	0.406114	-0.031009	2.727898	7.285944	0.32922
06:43.3	1.386891	1.634299	-0.095974	0.439979	-0.192013	2.753198	5.92638	0.397494
06:43.3	0.546669	0.960745	-0.241611	-0.034414	-0.082198	2.852902	4.002093	0.570342
06:43.3	-0.532688	0.142088	-0.429915	-0.127687	-0.124281	2.811353	1.738869	1.026465
06:43.3	-1.329482	-0.463415	-0.472503	-0.602374	0.163861	2.971742	0.267828	2.343963
06:43.3	-2.186643	-1.222478	-0.55804	-0.661594	0.290999	3.099119	-1.238636	9.163073
06:43.4	-2.39218	-1.546298	-0.309981	-0.814273	0.969447	3.065921	-1.027363	87.42254
06:43.4	-2.126382	-1.708314	-0.309874	-0.788732	1.536732	3.259858	-0.136713	12.49566
06:43.4	-1.337911	-1.478353	-0.027524	-0.636052	2.189639	3.937499	2.647298	1.079566
06:43.4	-0.558137	-1.017328	0.263337	-0.593862	2.316352	5.004833	5.415194	0.780153
06:43.4	0.444194	-0.318152	0.383084	0.100861	2.893835	5.534609	9.038431	0.551342
06:43.5	1.180834	0.705056	0.417269	0.50771	2.359181	5.901048	11.0711	0.488858
06:43.5	1.455075	0.93523	0.297228	1.041804	2.936406	6.146679	12.81242	0.445011
06:43.5	1.592215	0.93523	0.1774	1.11786	2.630647	5.689313	12.14267	0.432889
06:43.5	1.515229	1.080306	0.271553	0.982397	2.792077	5.58699	12.22855	0.422343
06:43.5	1.240801	1.00328	0.27174	0.634849	2.537536	5.071606	10.75981	0.431266
06:43.6	0.761049	0.832994	0.237554	0.2873	2.842573	4.842925	9.804395	0.448237
06:43.6	0.177876	0.577118	0.229151	0.338489	3.350726	4.648268	9.321628	0.450343
06:43.6	-0.524285	0.176167	-0.035927	0.194321	4.071471	4.33477	8.216517	0.495523
06:43.6	-1.415231	-0.369663	-0.318384	-0.433045	4.689147	4.54763	6.700453	0.699825
06:43.6	-1.620849	-1.026383	-0.660702	-0.305907	6.021534	4.200001	6.607694	0.911291
06:43.7	-1.835229	-1.537921	-0.720669	0.228186	6.800406	4.732415	7.667189	0.886949
06:43.7	-1.338098	-1.606078	-0.455697	0.440086	7.672943	5.436265	10.14942	0.755998
06:43.7	-0.507013	-1.264827	0.091838	0.549901	8.588343	6.129335	13.58758	0.632073
06:43.7	0.418518	-0.685318	0.331707	1.03348	9.063885	6.737513	16.89979	0.536331
06:43.7	1.180834	0.125148	0.545607	1.465409	9.784042	6.99275	20.09379	0.486919
06:43.8	**1.900748**	**1.020712**	**0.648162**	**2.084237**	**10.2247**	**7.083676**	**22.96224**	**0.445283**
06:43.8	1.849103	1.344558	0.519825	2.524765	9.84361	6.333061	22.41492	0.439154
06:43.8	1.523738	1.156733	0.203369	2.736851	9.350693	5.673218	20.6446	0.452936
06:43.8	1.026527	0.93523	0.143402	2.872527	8.122194	4.554034	17.65391	0.460079
06:43.8	0.409902	0.397964	-0.147458	2.898068	5.757921	3.394821	12.71122	0.452979
06:43.9	0.16115	0.261649	-0.053306	2.804796	6.036991	2.582911	11.79419	0.511861
06:43.9	-0.366094	-0.369663	-0.318384	2.677657	6.487896	2.202616	10.31403	0.629036
06:43.9	-0.7518	-0.250102	-0.498286	2.677018	8.031036	1.744098	10.95196	0.733296
06:43.9	-0.940211	-0.93263	-0.523961	2.685982	10.48766	1.507784	12.28462	0.853723
06:43.9	-1.19718	***-0.82153***	***-0.80652***	***3.159495***	***12.08137***	***1.670415***	***14.08605***	***0.857683***
06:44.0	-0.948614	-1.350309	-0.532471	3.780671	12.04137	2.008279	14.99892	0.802816
06:44.0	-0.408896	-0.983543	-0.361545	4.076711	12.08137	2.389187	16.79328	0.719417
06:44.0	0.568093	-0.429443	0.160781	5.465066	12.32617	2.964725	21.05539	0.585416
06:44.0	1.313243	-0.06257	0.520012	5.940765	10.17346	3.032003	20.91691	0.486375
06:44.0	2.041773	0.807292	0.836361	6.787501	8.129737	2.914149	21.51681	0.377832
06:44.1	2.230264	1.353015	0.434262	7.024348	4.832532	2.236323	18.11074	0.387855
06:44.1	2.366924	1.907499	0.49423	6.718492	2.554646	1.255	15.29679	0.439209
06:44.1	1.561808	1.480766	-0.335656	6.720835	1.384727	0.476235	11.28871	0.595359
06:44.1	0.987797	0.969202	-0.369948	7.126139	0.384271	0.154733	9.252194	0.770211
06:44.1	-0.014974	0.219194	-0.660702	7.167316	0.002857	-0.133435	6.580257	1.089215

Table E10

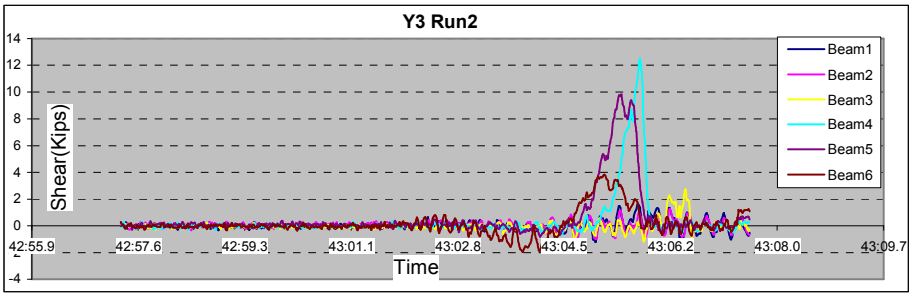
Dynamic Load Test Data (SN:068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
29:49.5	1.115842	0.593945	0.07614	-0.056305	-0.002077	1.056218	2.783764	0.400839
29:49.5	1.158643	0.875523	0.170292	0.011427	0.35369	1.445238	4.014812	0.359976
29:49.5	1.072813	0.833067	-0.07798	0.249054	0.743997	1.504564	4.325515	0.347835
29:49.5	0.370065	0.525788	-0.018013	0.223513	0.871135	1.876961	3.849449	0.487592
29:49.6	0.20733	0.457631	-0.240502	0.291244	1.014922	2.215705	3.946329	0.56146
29:49.6	-0.358252	0.065734	-0.120755	0.164106	1.099683	2.376496	3.227012	0.736438
29:49.6	-0.743771	-0.215843	-0.154753	0.13024	1.209604	2.596507	2.821984	0.9201
29:49.6	-0.838216	-0.608498	-0.035005	0.13024	1.481097	2.926413	3.05603	0.957586
29:49.6	-0.726418	-0.650954	0.007583	-0.14939	1.048601	2.477986	2.007408	1.234421
29:49.7	-0.418432	-0.616981	-0.308766	-0.403667	1.057493	2.266087	1.575734	1.438115
29:49.7	-0.264099	-0.65933	-0.368734	-0.445857	1.074142	2.182026	1.518148	1.437295
29:49.7	0.233218	-0.113607	-0.317169	-0.293364	1.353959	2.190244	3.053281	0.717341
29:49.7	0.747181	-0.079529	-0.120568	-0.335935	1.930243	2.511745	4.653138	0.539796
29:49.7	0.961535	0.363958	-0.154753	-0.09017	2.201629	2.943655	6.225855	0.472811
29:49.8	1.201257	0.543113	0.067737	0.08805	2.430365	3.425761	7.756282	0.441676
29:49.8	1.544055	0.901118	0.230073	0.418195	3.354091	4.060119	10.50765	0.386396
29:49.8	1.158536	0.901118	0.07614	0.816826	4.083054	4.204633	11.24031	0.374067
29:49.8	0.721186	0.543033	0.35841	0.986155	4.651439	4.627731	11.88795	0.391273
29:49.8	0.344096	-0.019748	-0.08657	1.113293	4.803532	4.423811	10.57841	0.454088
29:49.9	-0.006944	-0.147686	-0.154753	0.97783	4.676554	4.415619	9.76062	0.479125
29:49.9	-0.289881	-0.275517	-0.248799	0.816826	4.67618	4.382046	9.060856	0.516086
29:49.9	-0.418325	-0.505691	-0.445507	1.130509	5.031628	3.873868	8.666482	0.580585
29:49.9	-0.52939	-0.565471	-0.616326	1.359138	5.303681	3.654096	8.605727	0.616297
29:49.9	-0.37519	-0.573848	-0.479585	1.333597	5.405704	3.104259	8.414936	0.642394
29:50.0	0.241621	-0.420209	-0.402919	1.02002	5.286864	2.562747	8.288126	0.637884
29:50.0	0.721293	-0.190141	-0.163236	1.070996	6.015426	2.782865	10.2372	0.587605
29:50.0	0.901568	0.040032	-0.214801	1.511817	6.516001	2.833867	11.58848	0.562282
29:50.0	1.252795	0.23594	-0.248905	1.732121	7.364473	3.180909	13.51733	0.544817
29:50.0	1.329595	0.236021	0.187485	2.368131	8.12602	3.171991	15.41924	0.527005
29:50.1	1.415611	0.611164	0.178508	2.580031	8.304722	3.832023	16.92206	0.490763
29:50.1	1.21861	0.705023	0.007583	3.18103	8.897599	3.713503	17.72335	0.502027
29:50.1	1.329595	0.645056	0.024962	3.943859	9.948035	3.738964	19.63047	0.506765
29:50.1	0.772937	0.381203	-0.291387	4.520462	10.42273	3.629255	19.4352	0.536281
29:50.1	0.215759	0.005954	-0.282984	5.326157	10.10018	3.476869	18.84194	0.536048
29:50.2	0.267403	-0.471612	-0.471209	5.919977	9.0506	3.062096	17.35725	0.52143
29:50.2	0.053023	-0.403455	-0.753453	6.147699	8.727632	2.596613	16.36806	0.533211
29:50.2	0.361556	-0.676762	-0.676786	6.335257	8.099679	1.936368	15.37931	0.526661
29:50.2	0.05313	-0.395185	-0.403025	7.342035	8.795576	1.268011	16.66054	0.527929
29:50.2	0.078805	-0.557094	-0.513771	7.638342	8.599907	0.971864	16.21805	0.530268
29:50.3	0.233218	-0.343781	-0.094973	8.233126	8.68354	0.94651	17.65764	0.491772
29:50.3	0.712783	0.040032	0.007583	7.495375	8.9304	1.53913	18.7253	0.476916
29:50.3	1.064197	0.363772	0.341604	6.647358	8.59091	1.648732	18.65657	0.460476
29:50.3	1.389642	0.551383	0.29004	8.062675	8.617464	2.114401	21.02561	0.409856
29:50.3	**1.192535**	**0.645349**	**0.572497**	**9.240197**	**8.107417**	**2.080455**	**21.83845**	**0.423116**
29:50.4	0.909891	0.321423	0.35841	10.03716	7.481304	1.834984	20.94317	0.479257
29:50.4	1.098382	0.253452	0.298443	11.47096	5.489897	1.67398	20.28512	0.565487
29:50.4	1.00423	0.372826	0.538312	12.35853	4.227782	1.115518	19.6172	0.629984
29:50.4	***0.901381***	***0.236127***	***0.418377***	***12.44318***	***2.845538***	***0.73461***	***17.57921***	***0.707835***
29:50.4	0.412653	0.363958	0.307419	10.86767	2.353741	0.345484	*14.65092*	*0.741774*
29:50.5	0.05313	-0.339217	-0.026602	7.672316	1.599911	-0.17038	8.789157	0.87293
29:50.5	-0.178083	-0.245358	0.041768	6.587686	1.447232	-0.196028	7.457217	0.883397
29:50.5	-0.426728	-0.433076	0.51253	3.748715	0.472504	-0.526074	3.34787	1.119731
29:50.5	-0.384034	-0.595093	0.572497	1.180811	0.116737	0.083496	0.974415	1.211815
29:50.5	-0.015454	-0.219656	1.059852	0.206483	0.049006	0.193098	1.273329	0.832347
29:50.6	0.113097	-0.05764	1.795399	-0.742784	-0.010401	0.226964	1.324635	1.355392
29:50.6	0.71297	0.138455	1.880962	-0.640806	0.277741	0.565495	2.934816	0.640913
29:50.6	1.00423	0.360145	1.941035	-0.556346	0.184468	0.42162	3.355154	0.578524
29:50.6	1.218504	0.787092	1.538937	-0.141253	0.176037	0.371132	3.950449	0.38956
29:50.6	1.355457	0.897598	1.786996	-0.369988	-0.052591	0.523004	4.140477	0.431592
29:50.7	1.064304	1.110831	0.692325	0.265596	0.464179	0.37935	3.976586	0.279343

Table E11

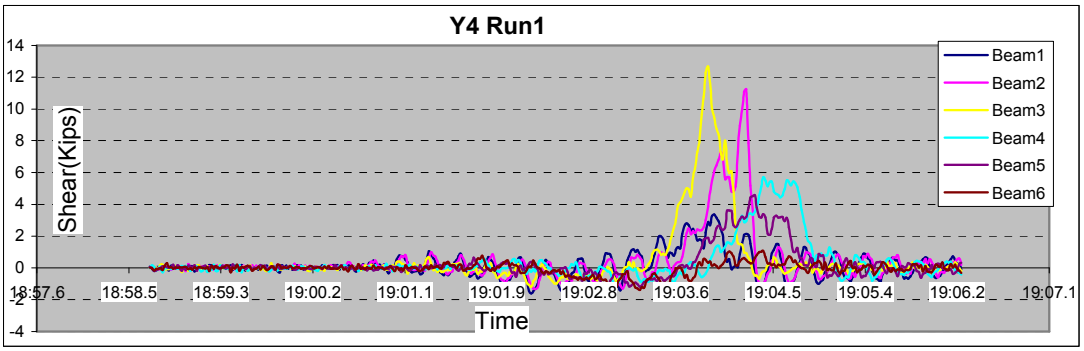
Dynamic Load Test Data (SN:068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
43:04.8	0.099162	0.220045	0.298767	-0.489372	0.482714	1.693869	2.305186	0.734808
43:04.8	-0.191804	0.151888	0.059085	-0.226984	0.855803	1.829846	2.477834	0.738486
43:04.8	-0.286144	0.083731	-0.137623	-0.30304	1.050673	2.066479	2.474077	0.835253
43:04.8	-0.191804	-0.231738	-0.419893	0.264546	1.432087	1.880334	2.733531	0.687877
43:04.9	-0.063467	-0.214494	-0.231482	0.552688	1.635849	2.083208	3.762303	0.553706
43:04.9	0.253762	0.049546	-0.154509	0.739233	1.169487	2.498496	4.556014	0.548395
43:04.9	0.776235	0.271156	0.2388	0.256221	1.389897	2.142509	5.074817	0.422184
43:04.9	0.639281	0.757098	0.272985	-0.023303	1.262759	2.269353	5.178174	0.438254
43:04.9	0.219497	0.62916	0.144835	-0.091034	1.423763	2.28649	4.61271	0.495693
43:05.0	-0.251958	0.381875	-0.111841	-0.362234	2.000047	2.4472	4.103089	0.596429
43:05.0	-1.02289	-0.359676	-0.488344	-0.150147	1.966181	2.480773	2.425897	1.022621
43:05.0	-1.02289	-0.897022	-0.684945	-0.082709	2.635737	2.887383	2.835553	1.018278
43:05.0	-1.211381	-0.965073	-0.736509	0.036024	3.229557	3.395455	3.748072	0.90592
43:05.0	-0.629261	-0.956696	-0.19759	0.298518	3.296649	3.462493	5.274113	0.656507
43:05.1	-0.097652	-0.018505	0.0249	0.281382	3.711716	3.675405	7.577246	0.48985
43:05.1	0.604909	0.297151	0.555442	0.340708	4.043255	3.521339	9.362805	0.431842
43:05.1	0.741943	0.595482	0.39292	0.60377	4.67756	3.640712	10.65239	0.439109
43:05.1	0.484868	0.467251	0.204615	0.993509	5.085849	3.622991	10.85908	0.46835
43:05.1	0.544835	0.305341	-0.077549	1.061134	5.356188	3.69996	10.88991	0.491849
43:05.2	0.322132	0.151888	-0.419893	1.442548	5.222005	3.84396	10.56264	0.494384
43:05.2	0.28776	-0.137879	-0.462375	1.307086	4.906668	3.75886	9.66012	0.50793
43:05.2	0.484868	-0.035643	-0.171808	1.146188	5.229795	3.496437	10.14984	0.515259
43:05.2	0.270408	0.151888	0.0249	1.146082	5.026868	3.38657	10.00672	0.502349
43:05.2	0.073487	0.305341	0.076464	1.095106	5.746707	2.761016	10.05812	0.57135
43:05.3	0.039302	0.185967	0.170617	1.120541	6.271537	2.667958	10.45592	0.599807
43:05.3	-0.312032	-0.189283	-0.291742	1.45144	6.804988	2.70057	10.16394	0.669523
43:05.3	-0.783381	-0.675332	-0.684758	2.027724	7.754737	2.795309	10.4343	0.743197
43:05.3	-0.637371	-0.811647	-0.548417	2.222594	8.10239	3.32783	11.65538	0.695163
43:05.3	-0.097758	-0.905293	-0.744912	2.536277	8.67035	3.446883	12.90555	0.671831
43:05.4	0.630772	-0.240115	-0.26596	3.163643	8.763144	3.379258	15.43074	0.567902
43:05.4	1.118846	0.203105	0.427105	3.163643	9.349086	3.395242	17.65703	0.529482
43:05.4	1.504365	0.910844	0.39292	3.892525	9.754865	2.981081	19.4366	0.501881
43:05.4	1.367598	1.158343	0.375541	4.053423	9.694019	3.073367	19.72229	0.491526
43:05.4	0.741836	0.876659	0.016497	4.935252	9.812515	2.887222	19.26998	0.509212
43:05.5	0.416391	0.467251	-0.368409	5.519789	9.129187	2.744502	17.90871	0.509762
43:05.5	-0.055038	-0.112178	-0.522529	6.435829	8.899778	2.422246	17.06811	0.521427
43:05.5	-0.337895	-0.675332	-0.839065	6.943689	8.19593	2.117294	15.40462	0.532044
43:05.5	-0.063467	-0.393755	-0.642357	7.071414	8.255178	1.558726	15.78574	0.522952
43:05.5	-0.06336	-0.445158	-0.248475	7.316938	7.977492	1.643487	16.18092	0.493018
43:05.6	0.185285	-0.223362	-0.017688	7.358541	8.45074	1.135841	16.88936	0.500359
43:05.6	0.459006	0.17759	-0.04347	8.248403	9.137263	1.262686	19.24148	0.474873
43:05.6	0.502328	0.083731	-0.231775	8.704965	9.399367	1.431695	19.89031	0.47256
43:05.6	0.287947	-0.078099	-0.360113	7.840166	9.059664	1.618133	18.3677	0.493239
43:05.6	0.733433	-0.180335	-0.55682	8.774546	8.983605	1.871823	19.62625	0.457734
43:05.7	1.042259	0.024137	-0.291742	10.01249	7.729142	1.998854	20.51514	0.488054
43:05.7	1.221401	0.092108	-0.111841	10.41907	7.076769	1.880227	20.57773	0.506327
43:05.7	**1.632996**	**0.586918**	**0.281575**	**11.04452**	**5.34765**	**1.736573**	**20.63023**	**0.535356**
43:05.7	1.530121	0.996326	0.059085	11.90995	4.36505	1.304743	20.16528	0.590617
43:05.7	***1.367492***	***0.850957***	***0.144835***	***12.52009***	***3.000022***	***0.610845***	***18.49424***	***0.676972***
43:05.8	0.630665	0.527138	-0.205993	11.76528	2.347595	-0.159002	14.90568	0.789315
43:05.8	0.125131	-0.052584	-0.616681	10.7387	1.771311	-0.16792	11.79795	0.910217
43:05.8	-0.35462	-0.265817	-1.172899	7.594749	1.177811	-0.192948	6.786275	1.119134
43:05.8	-0.534709	-0.81154	-0.907435	6.316448	0.601527	-0.184543	4.479748	1.410001
43:05.8	0.287867	-0.80327	-0.360006	4.290269	0.339033	0.018225	3.772118	1.137363
43:05.9	0.381913	-0.445158	-0.137623	2.256459	-0.025546	0.425107	2.455153	0.919071
43:05.9	1.118952	0.117809	0.153238	1.366031	0.754207	0.280506	3.790743	0.36036

Table E12

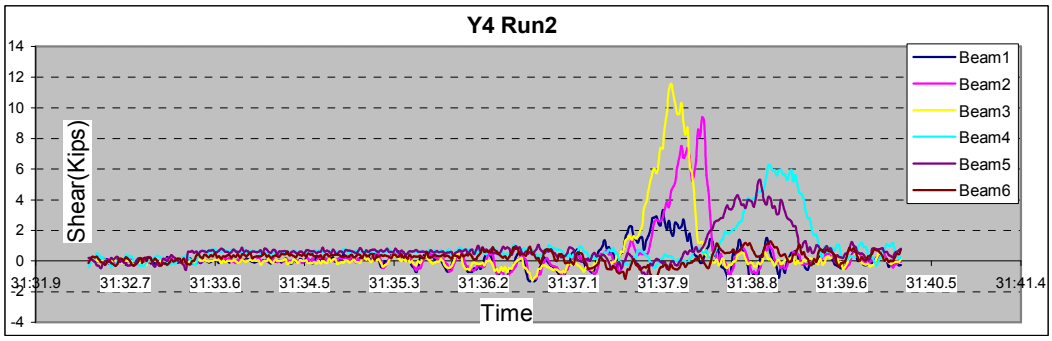
Dynamic Load Test Data (068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
19:03.4	0.890986	-0.375837	1.109377	-0.492635	-0.657126	-0.336429	0.138336	8.019426
19:03.4	1.490966	0.323339	1.160942	-0.348848	-0.827022	-0.565678	1.233698	1.208534
19:03.4	1.970718	0.809388	1.066976	-0.154085	-0.657126	-0.692842	2.343028	0.841099
19:03.5	1.970531	0.971404	0.827107	-0.154192	-0.59772	-1.005593	2.011538	0.979614
19:03.5	1.77353	0.90306	0.904453	-0.187951	-0.784265	-1.055894	1.552933	1.142051
19:03.5	1.336553	0.869168	0.810407	-0.069324	-0.767616	-0.93748	1.241709	1.076382
19:03.5	0.633912	0.383306	1.135053	-0.154379	-0.665638	-1.487698	-0.155443	9.570667
19:03.5	0.959463	-0.026102	1.520172	-0.196356	-0.530175	-0.954404	0.772598	1.96761
19:03.6	0.916955	-0.281871	1.990828	-0.781345	-0.513339	-0.489349	0.841878	2.364745
19:03.6	0.779375	0.110106	2.529666	-0.882942	-0.521664	-0.277401	1.73714	1.456225
19:03.6	1.156278	0.271935	3.034427	-0.670856	-0.31847	-0.032757	3.440557	0.881958
19:03.6	1.302288	0.365794	3.949956	-0.442307	0.037784	-0.00575	5.207765	0.758474
19:03.6	1.224941	0.391496	4.121229	-0.28141	0.139381	0.019711	5.615348	0.733922
19:03.7	2.141963	0.689827	4.378782	-0.416766	0.181571	-0.133555	6.841822	0.640002
19:03.7	2.690111	1.483155	4.779601	-0.22171	0.037784	-0.624685	8.144256	0.586868
19:03.7	2.801723	2.199763	5.011642	0.159304	0.164625	-0.446625	9.890433	0.506716
19:03.7	2.699141	2.481127	4.949994	0.252577	-0.02192	-0.768659	9.592261	0.51604
19:03.7	2.347727	2.122551	4.49781	0.379528	-0.02192	-0.836283	8.489413	0.529814
19:03.8	2.450389	2.319217	5.703906	0.159304	0.334521	-0.641414	10.32592	0.552387
19:03.8	2.185098	2.191279	6.269994	0.210387	0.385036	-0.513396	10.7284	0.58443
19:03.8	1.747748	2.404021	7.293815	-0.086647	0.690395	0.119468	12.1688	0.599387
19:03.8	1.790442	2.361672	7.952	-0.400037	0.994999	0.357041	13.05612	0.609063
19:03.8	1.721965	2.370049	9.667017	-0.569259	1.300357	0.146104	14.63623	0.660485
19:03.9	1.224754	2.565851	10.75051	-0.501634	1.775044	0.569096	16.38362	0.656174
19:03.9	2.20358	3.001068	12.28411	-0.349142	1.842775	0.491945	19.47433	0.630784
19:03.9	***2.880252***	***3.844481***	***12.67736***	***-0.05211***	***1.885285***	***0.314685***	***21.54996***	***0.588278***
19:03.9	2.691654	4.757396	11.62395	0.490017	1.571282	0.408331	21.54263	0.539579
19:03.9	3.266212	5.482567	10.03344	0.718833	1.65623	0.128274	21.28555	0.471373
19:04.0	3.368873	6.113666	9.451196	1.082844	1.901809	0.221812	22.1402	0.426879
19:04.0	***3.154787***	***6.437805***	***8.750662***	***1.362555***	***2.512866***	***0.112745***	***22.33142***	***0.391854***
19:04.0	2.923387	6.829702	8.364768	1.388202	2.655407	-0.007162	22.1543	0.377569
19:04.0	2.452039	7.290621	7.302831	1.006788	2.513292	0.111037	20.67661	0.353193
19:04.0	2.074842	7.068557	6.823987	1.117384	2.385408	0.239003	19.70918	0.358643
19:04.1	0.764192	5.576107	8.030083	1.346012	2.538407	0.459707	18.71451	0.429083
19:04.1	0.395612	5.704364	6.593175	1.600395	3.614386	0.900048	18.80798	0.350552
19:04.1	0.558135	5.677984	5.968623	1.574854	3.607687	1.026093	18.41338	0.324146
19:04.1	-0.075843	4.82574	6.079343	1.481581	3.581133	0.933007	16.82496	0.361329
19:04.1	0.052788	4.825554	4.960356	1.659802	2.690447	0.712169	14.90112	0.332885
19:04.2	0.138724	5.123885	2.470326	2.201926	2.562881	0.145116	12.64286	0.405279
19:04.2	0.036062	7.298997	1.55493	2.702261	2.75855	0.171485	14.52229	0.502607
19:04.2	0.858638	8.927736	1.477584	2.930783	3.037727	0.408705	17.64117	0.506074
19:04.2	1.544367	9.951238	1.443399	3.294695	3.232384	0.569176	20.03526	0.496686
19:04.2	2.05841	11.05916	0.981227	2.879594	3.106258	0.61879	20.70344	0.53417
19:04.3	2.143426	11.23793	0.938745	2.939001	3.191526	0.491945	20.94257	0.536607
19:04.3	2.092595	7.85283	0.647885	3.379181	3.784354	0.365233	18.12208	0.433329

Table E13

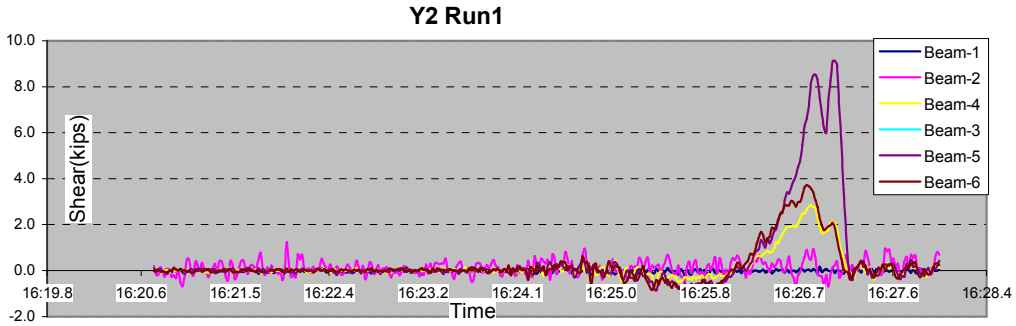
Dynamic Load Test Data(SN"068-0046)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Tot. Shear	Max D.F
31:37.6	1.502269	0.113762	1.329633	-0.10324	0.051955	-1.138726	1.755653	0.855675
31:37.6	1.879359	0.523277	1.449567	-0.204837	0.492776	-0.538846	3.601297	0.521856
31:37.6	2.256555	0.966764	1.637685	-0.170971	0.433369	-0.537994	4.585409	0.492116
31:37.6	2.230693	1.418548	1.389706	-0.052157	0.28069	-0.115109	5.152371	0.432945
31:37.6	1.614174	1.000656	1.61209	0.261526	0.068604	0.123639	4.680689	0.344858
31:37.7	1.373825	0.616843	1.474776	0.168253	-0.041317	-0.24102	3.35136	0.440053
31:37.7	1.219412	0.386963	1.603793	0.710671	-0.355	-0.215531	3.350308	0.4787
31:37.7	1.502269	0.523277	1.928545	0.710671	-0.346676	-0.546024	3.772063	0.511271
31:37.7	1.536561	0.437795	2.287776	0.609074	-0.787497	-0.470555	3.613154	0.63318
31:37.7	0.73966	0.455227	3.44328	0.498585	-0.77028	-0.375896	3.990576	0.862853
31:37.8	1.347856	0.429525	3.836349	0.354798	-0.990691	-0.409655	4.568181	0.839798
31:37.8	1.613254	0.548979	4.510435	0.261526	-0.643142	-0.291028	6.000023	0.751736
31:37.8	2.007909	1.128674	5.146016	-0.086023	-0.193997	-0.824696	7.177884	0.716927
31:37.8	2.779027	1.836333	5.769909	-0.170971	-0.261728	-1.003955	8.948616	0.644782
31:37.8	2.838995	2.56057	6.035227	-0.459113	-0.015776	-1.011428	9.948475	0.606648
31:37.9	2.898962	2.689468	5.734815	-0.272568	0.128011	-1.044813	10.13387	0.565905
31:37.9	2.479258	2.621098	6.45397	-0.086023	0.077496	-0.698705	10.84709	0.594995
31:37.9	2.324951	2.611974	7.395494	0.134388	-0.049642	-0.411815	12.00535	0.616017
31:37.9	3.327176	2.859473	7.334755	0.168253	-0.126265	-0.360067	13.20332	0.555523
31:37.9	2.555844	3.37101	8.766433	0.422529	-0.075183	-0.249077	14.79156	0.592665
31:38.0	2.084789	3.865463	9.721884	0.329257	-0.499355	-0.308484	15.19355	0.639869
31:38.0	2.624428	3.524398	11.17537	0.320932	-0.448273	-0.555422	16.64144	0.671539
31:38.0	***1.862006***	***4.573495***	***11.55993***	***0.295391***	***-0.06686***	***-0.27526***	***17.94871***	***0.644054***
31:38.0	1.673514	4.820701	10.95432	0.134388	-0.007452	-0.470129	17.10534	0.640403
31:38.0	2.487767	5.084953	10.30519	0.032791	-0.227862	-0.520751	17.16209	0.600463
31:38.1	2.410154	6.160071	9.602788	0.015574	-0.295594	-0.537032	17.35596	0.553285
31:38.1	2.144756	6.723226	9.610952	0.108846	-0.066859	-0.444455	18.07647	0.531683
31:38.1	**2.264878**	**7.507419**	**10.31063**	**0.134388**	**0.179093**	**-0.172614**	**20.2238**	**0.509827**
31:38.1	2.710364	6.731976	9.081876	0.007249	0.484452	-0.139175	18.87674	0.481115
31:38.1	2.033772	6.919321	8.259003	-0.009967	0.619914	-0.369731	17.45231	0.473233
31:38.2	1.313751	7.380042	8.687034	-0.162647	0.467235	-0.156472	17.52894	0.495582
31:38.2	1.802585	6.782248	6.239418	0.117171	0.687646	-0.115081	15.51399	0.43717
31:38.2	0.876614	5.281261	5.762452	0.295391	0.65378	-0.089727	12.77977	0.450904
31:38.2	0.473636	5.562838	4.657353	0.676806	0.628239	0.003333	12.0022	0.463485
31:38.2	0.336682	6.612042	2.613555	0.744537	0.916381	0.164095	11.38729	0.580651
31:38.3	0.23402	8.56556	1.235587	0.64294	0.619914	0.071892	11.36991	0.753353
31:38.3	-0.091425	8.11359	1.184515	0.803944	0.662105	0.384054	11.05678	0.733811
31:38.3	-0.083022	9.392967	1.252886	0.591858	0.848649	0.163937	12.16727	0.771986
31:38.3	0.277262	9.135455	0.559927	0.549668	1.060736	-0.124179	11.45887	0.797239
31:38.3	0.739554	5.6054	0.371622	0.702347	1.458799	-0.352275	8.525447	0.65749
31:38.4	0.945611	4.616335	0.465775	0.295391	1.806241	-0.469968	7.659386	0.602703
31:38.4	1.42547	2.944918	0.149319	0.210443	1.976511	-0.157245	6.549415	0.449646
31:38.4	1.271163	0.685187	-0.124735	0.278175	2.137141	0.401349	4.64828	0.45977
31:38.4	0.379924	0.915852	-0.098846	0.498585	2.527679	0.689706	4.912899	0.514499
31:38.4	0.91124	0.105385	0.089352	0.863351	2.618979	1.138932	5.727238	0.457285
31:38.5	0.611136	0.074191	-0.278855	0.998813	2.681053	0.951587	5.037926	0.532174
31:38.5	-0.305699	0.483519	-0.107356	1.329713	2.782224	0.756929	4.939331	0.56328

Table E14

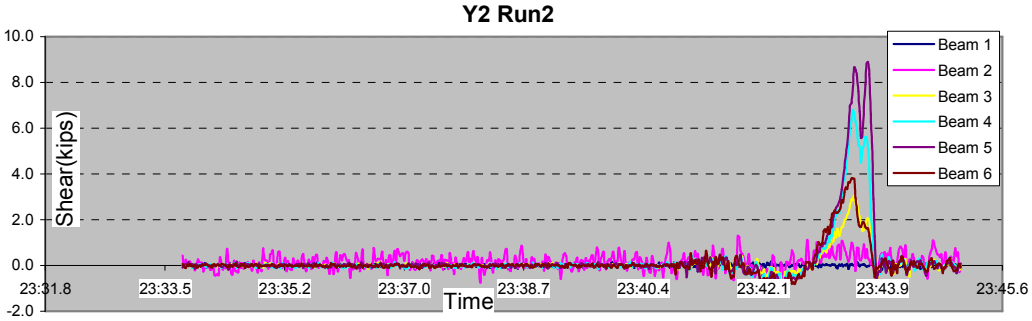
Dynamic Load Test Data(SN:0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total shear	Max. D.F
16:26.3	-0.011	0.375	0.633	0.720	0.840	1.156	3.712	0.311
16:26.3	-0.049	0.662	0.645	0.908	0.939	1.444	4.549	0.317
16:26.3	-0.031	0.500	0.625	1.015	1.321	1.684	5.114	0.329
16:26.4	0.046	0.276	0.692	0.861	1.187	1.531	4.593	0.333
16:26.4	-0.076	0.362	0.786	1.062	1.006	1.235	4.375	0.282
16:26.4	-0.046	0.136	0.865	1.000	1.411	1.397	4.762	0.296
16:26.4	0.049	-0.046	0.771	1.062	1.190	1.483	4.509	0.329
16:26.4	-0.128	0.314	0.818	1.334	1.395	1.853	5.587	0.332
16:26.5	-0.036	0.157	0.944	1.435	1.711	1.806	6.017	0.300
16:26.5	0.068	0.271	1.216	1.777	1.800	1.941	7.073	0.274
16:26.5	-0.012	0.495	1.194	2.039	2.184	2.221	8.121	0.273
16:26.5	0.033	0.421	1.429	2.217	2.448	2.497	9.043	0.276
16:26.5	0.042	-0.041	1.594	2.531	2.535	2.583	9.245	0.279
16:26.6	-0.072	-0.047	1.735	2.999	3.058	2.839	10.512	0.291
16:26.6	0.039	0.242	1.881	2.999	3.393	2.831	11.386	0.298
16:26.6	-0.075	0.611	1.889	3.263	3.354	2.832	11.874	0.282
16:26.6	-0.037	-0.076	1.913	3.340	3.650	3.040	11.829	0.309
16:26.6	0.005	-0.330	1.933	3.469	3.898	2.953	11.929	0.327
16:26.7	-0.070	-0.733	1.901	4.048	4.138	2.792	12.076	0.343
16:26.7	-0.010	-0.160	2.047	4.276	4.513	2.985	13.650	0.331
16:26.7	0.097	-0.073	2.245	4.823	4.781	2.996	14.868	0.324
16:26.7	0.082	0.306	2.473	5.463	5.471	3.288	17.083	0.320
16:26.7	-0.040	0.585	2.477	5.813	6.283	3.619	18.737	0.335
16:26.8	0.027	0.907	2.666	6.241	6.598	3.705	20.144	0.328
16:26.8	0.047	0.563	2.796	6.630	7.194	3.666	20.895	0.344
16:26.8	-0.025	0.475	2.843	6.367	8.159	3.568	21.387	0.381
16:26.8	**0.069**	**0.936**	**2.762**	**6.174**	**8.481**	**3.410**	**21.832**	**0.388**
16:26.8	0.013	0.562	2.725	5.718	8.509	3.062	20.590	0.413
16:26.9	-0.096	-0.180	2.287	5.214	8.284	2.752	18.261	0.454
16:26.9	0.176	-0.218	1.910	5.120	7.523	2.288	16.799	0.448
16:26.9	-0.060	-0.260	1.626	5.065	6.827	1.960	15.159	0.450
16:26.9	0.012	-0.667	1.652	5.231	6.175	1.754	14.157	0.436
16:26.9	0.074	-0.190	1.713	5.721	5.997	1.834	15.149	0.396
16:27.0	0.000	-0.696	1.767	5.993	7.374	1.921	16.360	0.451
16:27.0	-0.031	-0.167	2.067	5.694	8.261	1.980	17.803	0.464
16:27.0	0.066	0.145	2.087	5.667	9.106	2.070	19.140	0.476
16:27.0	***-0.116***	***0.223***	***2.056***	***4.494***	***9.120***	***1.869***	***17.646***	***0.517***
16:27.0	0.017	0.390	1.784	2.891	8.914	1.349	15.345	0.581
16:27.1	-0.013	-0.295	1.268	1.713	7.132	0.903	10.708	0.666
16:27.1	-0.049	-0.168	0.855	0.909	5.576	0.518	7.640	0.730
16:27.1	-0.133	0.151	0.586	0.225	3.523	0.052	4.403	0.800
16:27.1	-0.004	0.675	0.136	-0.106	1.969	-0.045	2.625	0.750
16:27.1	-0.013	0.362	-0.111	-0.408	0.405	-0.085	0.149	2.712
16:27.2	-0.083	-0.025	-0.037	-0.136	-0.138	-0.393	-0.812	0.483
16:27.2	0.004	0.246	-0.186	-0.291	-0.414	-0.251	-0.892	0.464
16:27.2	0.036	-0.038	-0.300	0.158	-0.102	0.061	-0.184	1.625
16:27.2	-0.034	-0.026	0.097	0.576	0.085	0.131	0.829	0.695
16:27.2	0.035	0.186	0.299	0.398	0.249	0.293	1.459	0.273

Table E15

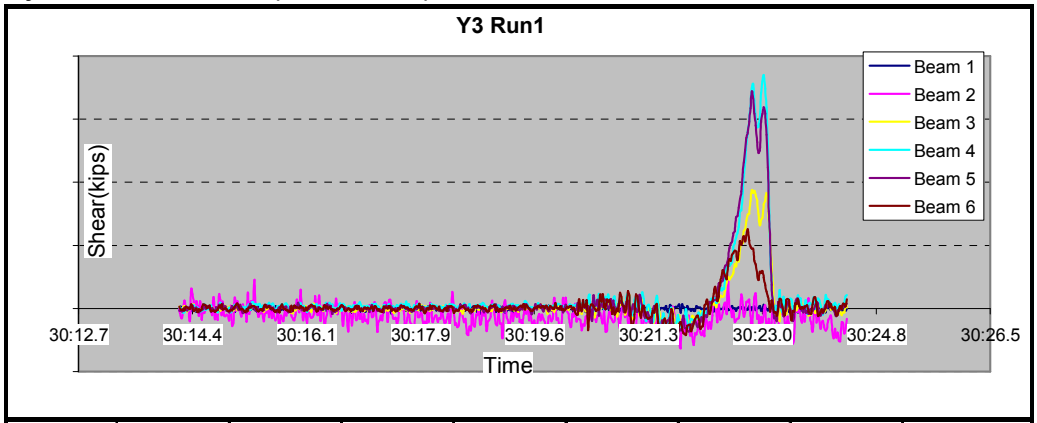
Dynamic Load Test Data (SN:0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max. D.F
23:42.9	0.051	0.649	0.150	0.024	0.130	0.317	1.320	0.491
23:42.9	-0.024	0.506	0.146	0.188	0.118	0.483	1.416	0.357
23:42.9	-0.004	1.015	0.064	0.185	0.363	0.687	2.309	0.439
23:42.9	-0.082	0.509	0.358	0.412	0.607	1.007	2.812	0.358
23:43.0	0.072	0.167	0.355	0.531	0.592	0.915	2.632	0.348
23:43.0	-0.065	0.110	0.509	0.605	0.887	0.932	2.979	0.313
23:43.0	0.045	0.415	0.603	0.833	0.832	0.987	3.715	0.266
23:43.0	0.030	0.370	0.689	0.746	0.974	1.483	4.293	0.346
23:43.0	0.018	0.536	0.741	0.727	0.962	1.582	4.566	0.347
23:43.1	0.050	0.387	0.575	0.813	1.183	1.456	4.464	0.326
23:43.1	0.019	0.739	0.788	1.222	1.379	1.684	5.831	0.289
23:43.1	0.012	0.327	0.808	1.006	1.391	1.404	4.948	0.284
23:43.1	-0.008	0.524	1.099	1.536	1.726	1.772	6.649	0.266
23:43.1	0.056	0.823	1.013	1.281	1.684	2.255	7.112	0.317
23:43.2	0.033	0.446	1.067	1.682	2.128	2.292	7.649	0.300
23:43.2	0.036	0.337	1.465	2.055	2.345	2.416	8.655	0.279
23:43.2	-0.069	0.259	1.238	2.184	2.515	2.307	8.435	0.298
23:43.2	-0.121	0.815	1.604	2.439	2.617	2.303	9.657	0.271
23:43.2	0.041	0.900	1.285	2.283	2.783	2.382	9.674	0.288
23:43.3	-0.019	0.263	1.470	2.644	2.997	2.516	9.871	0.304
23:43.3	0.046	1.071	1.686	2.931	3.322	2.866	11.923	0.279
23:43.3	-0.044	0.990	1.690	3.634	3.777	2.756	12.804	0.295
23:43.3	0.031	0.738	2.002	3.779	4.280	3.201	14.031	0.305
23:43.3	0.008	0.575	2.034	4.094	4.844	3.403	14.956	0.324
23:43.4	0.078	0.355	2.211	4.742	5.278	3.343	16.007	0.330
23:43.4	-0.146	0.176	2.308	5.123	5.967	3.638	17.067	0.350
23:43.4	0.032	0.415	2.585	5.980	6.960	3.618	19.591	0.355
23:43.4	0.075	0.993	2.887	6.401	7.121	3.809	21.285	0.335
23:43.4	0.015	0.855	2.845	6.789	7.813	3.816	22.133	0.353
23:43.5	**0.006**	**0.477**	**3.065**	**6.648**	**8.662**	**3.784**	**22.642**	**0.383**
23:43.5	0.001	-0.228	2.691	6.282	8.568	2.961	20.275	0.423
23:43.5	0.156	0.771	2.805	5.968	8.308	2.449	20.458	0.406
23:43.5	0.069	0.763	2.360	5.267	7.607	1.905	17.972	0.423
23:43.5	-0.042	0.263	2.138	5.205	6.723	1.711	15.998	0.420
23:43.6	0.025	0.223	1.866	4.494	5.581	1.692	13.880	0.402
23:43.6	0.028	0.458	1.519	5.051	5.669	1.873	14.599	0.388
23:43.6	0.068	0.931	1.571	5.271	6.926	1.873	16.640	0.416
23:43.6	-0.007	0.320	1.653	5.625	7.899	1.679	17.170	0.460
23:43.6	-0.050	0.718	2.016	5.566	8.833	1.618	18.700	0.472
23:43.7	***-0.030***	***0.325***	***2.051***	***5.134***	***8.899***	***1.612***	***17.991***	***0.495***
23:43.7	-0.012	0.247	1.962	4.218	8.351	1.310	16.076	0.519
23:43.7	0.113	0.035	1.512	2.378	6.623	0.880	11.542	0.574
23:43.7	0.148	0.314	1.134	1.681	5.226	0.431	8.934	0.585
23:43.7	-0.014	-0.081	0.951	0.662	2.906	-0.033	4.392	0.662
23:43.8	-0.156	-0.276	0.486	-0.048	1.277	-0.522	0.762	1.676
23:43.8	0.019	-0.268	0.175	-0.083	-0.622	-0.101	-0.879	0.707
23:43.8	0.064	-0.052	-0.537	-0.387	-0.381	-0.135	-1.429	0.376
23:43.8	-0.028	0.150	-0.151	-0.292	-0.227	-0.034	-0.583	0.501

Table E16

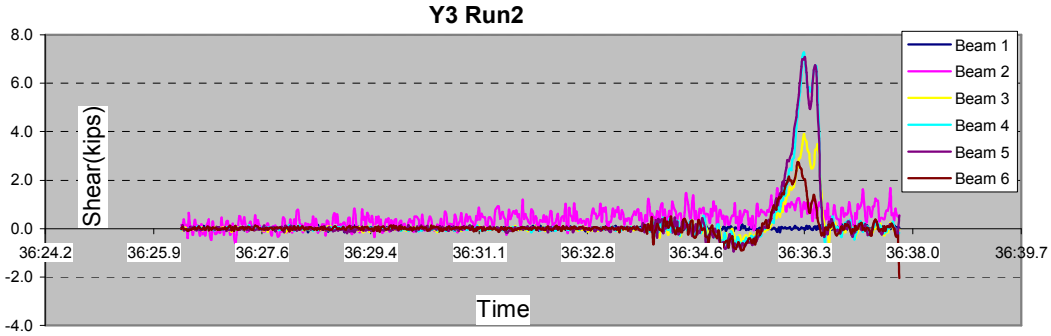
Dynamic Load Test Data (SN:0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max. D.F
30:22.3	0.021	-0.636	0.027	0.299	0.163	0.008	-0.117	5.449
30:22.3	-0.053	-0.218	0.205	0.312	0.211	0.236	0.692	0.450
30:22.3	-0.096	0.215	0.114	0.346	0.265	0.461	1.306	0.353
30:22.3	0.069	0.352	0.171	0.339	0.270	0.685	1.885	0.363
30:22.3	-0.029	-0.128	0.040	0.166	0.278	0.501	0.827	0.605
30:22.4	-0.108	-0.430	0.272	0.237	0.518	0.228	0.718	0.722
30:22.4	0.058	0.204	0.190	0.430	0.782	0.390	2.054	0.381
30:22.4	-0.024	-0.346	0.406	0.779	0.715	0.819	2.348	0.349
30:22.4	-0.012	-0.297	0.386	0.571	0.861	1.000	2.510	0.399
30:22.4	-0.015	-0.118	0.359	0.633	0.876	1.221	2.956	0.413
30:22.5	0.057	0.118	0.413	0.614	1.211	1.132	3.545	0.342
30:22.5	-0.028	0.180	0.638	1.101	1.365	1.025	4.282	0.319
30:22.5	0.054	-0.161	0.851	1.341	1.385	0.926	4.396	0.315
30:22.5	-0.055	0.928	1.001	1.346	1.593	1.335	6.148	0.259
30:22.5	-0.035	0.051	0.915	1.341	1.909	1.568	5.748	0.332
30:22.6	-0.035	0.001	0.984	1.408	2.055	1.504	5.916	0.347
30:22.6	0.081	-0.274	1.028	1.482	2.117	1.697	6.132	0.345
30:22.6	-0.014	-0.064	1.135	1.942	2.390	1.753	7.142	0.335
30:22.6	0.006	-0.437	1.387	2.063	2.457	1.839	7.315	0.336
30:22.6	-0.073	-0.370	1.340	2.249	2.894	1.800	7.839	0.369
30:22.7	0.018	-0.319	1.587	2.398	2.926	1.529	8.138	0.360
30:22.7	0.040	-0.303	1.486	2.586	3.194	1.811	8.814	0.362
30:22.7	-0.010	-0.045	1.859	3.073	3.469	2.140	10.486	0.331
30:22.7	0.052	0.449	2.143	3.120	3.710	2.017	11.491	0.323
30:22.7	-0.038	0.105	2.069	3.687	4.321	2.207	12.351	0.350
30:22.8	0.030	-0.259	2.465	4.221	4.628	2.293	13.378	0.346
30:22.8	-0.048	-0.123	2.514	4.609	5.018	2.120	14.090	0.356
30:22.8	-0.033	0.210	2.781	5.218	5.413	2.321	15.911	0.340
30:22.8	-0.038	0.200	2.979	5.599	5.582	2.510	16.833	0.333
30:22.8	0.069	0.281	3.001	5.953	5.917	2.160	17.381	0.343
30:22.9	-0.058	-0.241	3.406	6.433	6.351	1.966	17.857	0.360
30:22.9	0.037	-0.606	3.750	6.982	6.879	1.899	18.940	0.369
30:22.9	**-0.055**	**-0.123**	**3.668**	**7.115**	**6.662**	**1.894**	**19.162**	**0.371**
30:22.9	0.070	0.358	3.735	6.574	6.171	1.509	18.416	0.357
30:22.9	-0.053	0.469	3.584	6.007	5.795	1.390	17.193	0.349
30:23.0	0.004	-0.315	3.423	5.748	5.274	1.100	15.233	0.377
30:23.0	0.016	-0.215	2.983	5.767	4.929	0.898	14.379	0.401
30:23.0	0.079	-0.741	2.628	6.054	5.011	1.166	14.197	0.426
30:23.0	-0.068	-0.270	2.808	6.833	5.941	1.127	16.372	0.417
30:23.0	0.002	-0.439	2.880	7.202	6.163	1.182	16.990	0.424
30:23.1	***0.117***	***-0.140***	***3.290***	***7.395***	***6.379***	***0.981***	***18.022***	***0.410***
30:23.1	0.042	0.092	3.409	6.970	6.178	0.732	17.423	0.400
30:23.1	-0.018	-0.614	3.653	6.384	5.499	0.544	15.448	0.413
30:23.1	-0.057	-0.472	3.495	5.182	4.467	0.382	12.997	0.399
30:23.1	-0.044	-0.320	2.810	3.766	3.083	0.239	9.534	0.395
30:23.2	0.108	-0.618	2.149	1.728	2.102	-0.099	5.369	0.400
30:23.2	0.069	-0.445	1.414	0.916	0.750	0.243	2.947	0.480

Table E17

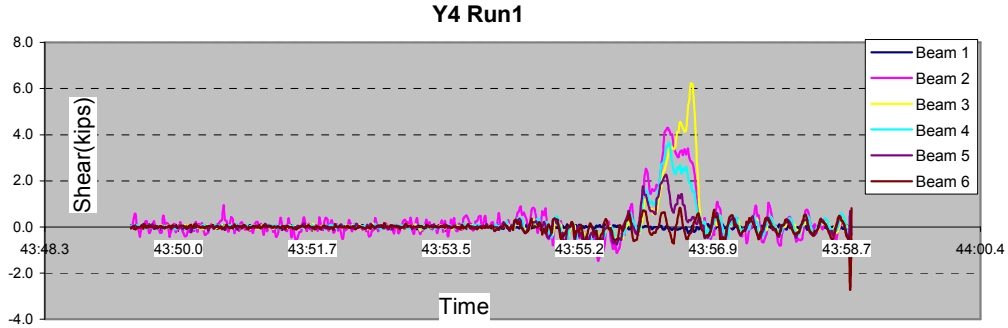
Dynamic Load Test Data (SN:0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max D.F
36:35.7	0.013	0.766	-0.054	0.050	0.272	0.036	1.083	0.707
36:35.7	-0.014	0.688	0.006	0.156	0.362	0.039	1.237	0.556
36:35.7	0.031	0.952	0.025	0.211	0.319	0.315	1.853	0.514
36:35.8	-0.032	1.371	0.179	0.324	0.413	0.655	2.911	0.471
36:35.8	-0.012	0.960	0.230	0.273	0.645	0.765	2.860	0.336
36:35.8	0.032	0.802	0.250	0.245	0.686	0.958	2.974	0.322
36:35.8	0.005	0.708	0.463	0.661	0.989	0.851	3.677	0.269
36:35.8	-0.077	1.301	0.428	0.713	1.250	0.784	4.398	0.296
36:35.9	-0.129	1.656	0.656	0.992	0.962	1.107	5.243	0.316
36:35.9	0.042	0.947	0.656	0.737	1.198	1.288	4.868	0.265
36:35.9	-0.155	0.970	0.482	0.718	1.458	1.253	4.727	0.309
36:35.9	0.066	0.870	0.836	1.153	1.513	1.327	5.766	0.262
36:35.9	0.028	0.897	0.695	1.165	1.920	1.461	6.167	0.311
36:36.0	0.021	1.083	1.093	1.814	1.761	1.419	7.191	0.252
36:36.0	0.048	0.820	1.014	1.358	2.250	1.711	7.201	0.312
36:36.0	0.013	0.702	1.262	1.782	2.511	1.837	8.107	0.310
36:36.0	0.018	1.013	1.385	1.868	2.814	1.919	9.016	0.312
36:36.0	0.023	1.014	1.404	2.371	2.786	2.152	9.750	0.286
36:36.1	0.050	0.874	1.719	2.482	2.928	1.998	10.051	0.291
36:36.1	-0.040	1.083	1.605	2.422	3.089	1.966	10.126	0.305
36:36.1	-0.020	0.991	1.672	2.851	3.315	1.829	10.637	0.312
36:36.1	0.027	0.983	1.738	2.930	4.000	1.958	11.636	0.344
36:36.1	0.111	0.761	2.003	3.431	4.307	2.077	12.691	0.339
36:36.2	0.037	1.052	2.389	4.147	4.587	2.387	14.598	0.314
36:36.2	0.026	1.236	2.530	4.634	5.112	2.750	16.288	0.314
36:36.2	-0.049	1.251	2.893	5.216	5.534	2.695	17.540	0.316
36:36.2	-0.021	1.037	2.905	5.637	6.109	2.521	18.188	0.336
36:36.2	0.046	0.477	3.200	6.346	6.696	2.454	19.218	0.348
36:36.3	0.014	0.768	3.491	7.073	6.988	2.167	20.500	0.345
36:36.3	**0.024**	**1.086**	**3.901**	**7.277**	**6.981**	**2.038**	**21.307**	**0.342**
36:36.3	-0.055	0.835	3.705	6.767	7.070	2.026	20.347	0.347
36:36.3	0.108	1.064	3.567	6.267	6.440	1.561	19.007	0.339
36:36.3	-0.007	0.616	3.248	5.847	5.821	1.206	16.731	0.349
36:36.4	0.106	0.993	3.109	5.839	5.107	0.677	15.832	0.369
36:36.4	0.046	1.045	2.720	5.666	4.931	0.650	15.057	0.376
36:36.4	-0.030	0.781	2.488	5.719	5.253	1.032	15.243	0.375
36:36.4	-0.065	0.318	2.499	6.092	5.999	1.174	16.016	0.380
36:36.4	0.049	0.799	2.629	6.532	6.582	1.395	17.986	0.366
36:36.5	0.086	1.210	3.236	6.740	6.747	1.124	19.143	0.352
36:36.5	-0.048	0.446	3.283	6.701	6.487	0.864	17.732	0.378
36:36.5	0.104	0.745	3.480	5.842	5.106	0.437	15.714	0.372
36:36.5	-0.007	1.072	2.961	4.150	3.737	0.154	12.067	0.344
36:36.5	-0.002	0.930	2.206	2.193	1.962	0.012	7.302	0.302
36:36.6	0.151	1.142	1.394	0.814	0.870	-0.283	4.088	0.341
36:36.6	-0.003	0.718	0.712	0.127	0.185	-0.181	1.558	0.461

Table E18

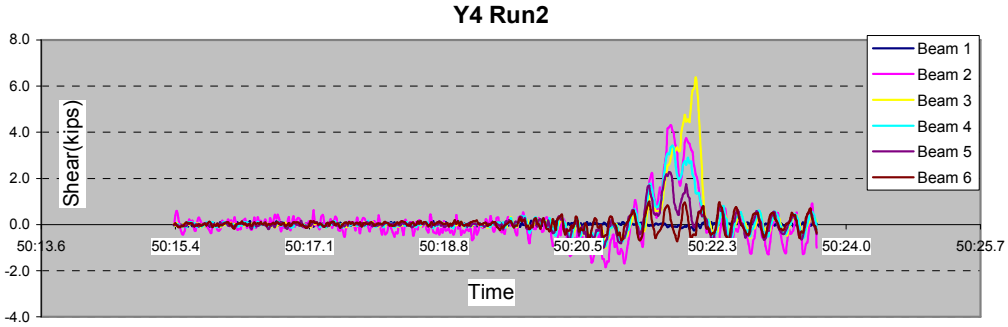
Dynamic Load Test Data (SN: 0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max D.F
43:55.9	-0.073	0.842	0.389	0.614	0.241	0.345	2.359	0.357
43:55.9	0.025	0.982	0.337	0.394	0.134	-0.233	1.639	0.599
43:55.9	0.070	0.069	0.147	0.225	-0.019	-0.600	-0.108	5.559
43:55.9	0.073	-0.122	0.046	0.064	-0.216	-0.573	-0.728	0.787
43:55.9	-0.014	-0.202	-0.061	-0.074	-0.295	-0.538	-1.183	0.455
43:56.0	0.041	-0.328	-0.159	-0.230	-0.007	-0.183	-0.867	0.378
43:56.0	0.125	0.064	-0.273	-0.195	0.402	0.050	0.173	2.325
43:56.0	0.030	0.930	0.078	0.460	1.065	0.432	2.995	0.356
43:56.0	-0.009	1.181	0.486	1.215	1.750	0.708	5.331	0.328
43:56.0	0.029	2.036	1.094	1.628	1.408	0.708	6.903	0.295
43:56.1	0.034	2.514	1.227	1.581	1.392	0.640	7.389	0.340
43:56.1	0.037	2.297	1.027	1.475	1.072	0.191	6.100	0.377
43:56.1	-0.009	1.770	0.881	1.007	0.837	-0.131	4.354	0.406
43:56.1	0.009	1.449	0.731	1.042	0.690	-0.310	3.611	0.401
43:56.1	-0.089	1.630	0.775	1.089	0.698	-0.325	3.778	0.431
43:56.2	-0.029	1.560	0.542	0.948	0.636	-0.230	3.426	0.455
43:56.2	0.003	1.632	0.802	1.062	0.569	-0.257	3.810	0.428
43:56.2	-0.017	1.825	0.649	1.022	1.226	-0.097	4.609	0.396
43:56.2	-0.010	1.631	1.069	1.668	1.313	-0.022	5.649	0.295
43:56.2	0.045	2.065	1.487	2.091	1.785	0.305	7.779	0.269
43:56.3	0.041	2.672	1.791	2.720	1.904	0.589	9.717	0.280
43:56.3	-0.102	3.216	2.347	2.786	2.030	0.620	10.898	0.295
43:56.3	-0.100	4.101	2.468	2.967	2.192	0.621	12.250	0.335
43:56.3	**0.038**	**4.201**	**2.772**	**3.485**	**2.259**	**0.293**	**13.048**	**0.322**
43:56.3	-0.059	4.306	3.005	3.494	2.011	0.025	12.782	0.337
43:56.4	-0.031	4.191	3.398	3.650	1.514	-0.163	12.559	0.334
43:56.4	-0.078	4.001	3.457	3.237	0.990	-0.364	11.243	0.356
43:56.4	-0.130	4.010	3.462	2.829	0.745	-0.640	10.277	0.390
43:56.4	-0.060	3.466	3.363	2.425	0.636	-0.707	9.122	0.380
43:56.4	-0.054	3.232	3.552	2.299	0.958	-0.077	9.910	0.358
43:56.5	-0.117	3.089	4.122	2.559	0.998	0.199	10.850	0.380
43:56.5	-0.102	3.023	4.127	2.512	1.368	0.534	11.462	0.360
43:56.5	-0.080	3.252	4.557	2.675	1.241	0.822	12.467	0.366
43:56.5	-0.049	3.324	4.408	2.314	1.420	0.459	11.876	0.371
43:56.5	-0.040	3.120	4.302	2.539	0.986	0.050	10.956	0.393
43:56.6	-0.090	3.366	4.132	2.433	0.904	-0.191	10.553	0.391
43:56.6	-0.020	3.157	4.241	2.606	0.375	-0.501	9.858	0.430
43:56.6	-0.257	3.401	5.136	2.205	0.201	-0.505	10.181	0.504
43:56.6	-0.192	3.013	5.501	1.918	0.308	-0.317	10.231	0.538
43:56.6	***-0.143***	***2.851***	***6.222***	***1.891***	***0.296***	***-0.253***	***10.864***	***0.573***
43:56.7	0.061	2.748	6.173	1.525	0.422	-0.132	10.796	0.572
43:56.7	-0.199	2.512	5.476	1.559	0.410	0.192	9.950	0.550
43:56.7	-0.167	1.954	4.278	1.168	0.206	0.305	7.745	0.552
43:56.7	0.001	1.262	2.730	0.696	0.132	0.506	5.326	0.513
43:56.7	-0.098	0.531	1.439	0.300	0.415	0.574	3.160	0.455
43:56.8	-0.042	0.395	0.547	0.460	0.363	0.219	1.942	0.282
43:56.8	-0.017	0.201	0.318	0.198	0.048	-0.114	0.633	0.501
43:56.8	-0.035	-0.073	0.187	0.186	0.052	-0.183	0.134	1.390

Table E19

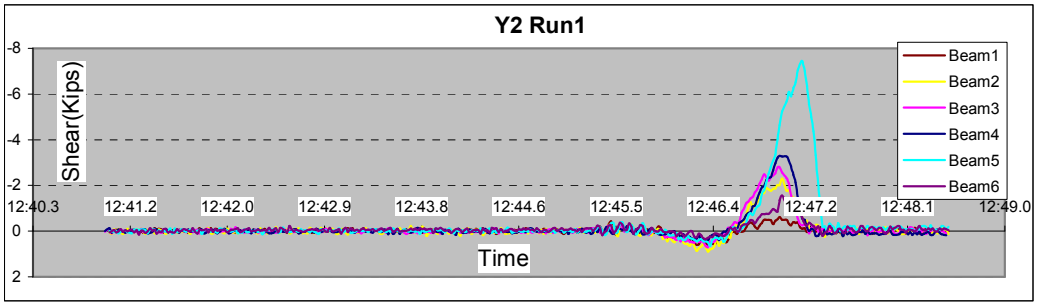
Dynamic Load Test Data (SN:0068-0049)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shea	Max D.F
50:21.3	0.007	1.065	0.508	0.624	0.296	0.363	2.862	0.372
50:21.3	0.000	0.682	0.240	0.391	0.051	-0.161	1.203	0.567
50:21.3	-0.029	-0.244	-0.016	0.082	-0.138	-0.528	-0.874	0.605
50:21.3	0.061	-0.567	-0.001	0.003	-0.421	-0.682	-1.608	0.424
50:21.4	0.083	-0.744	-0.308	-0.218	-0.302	-0.591	-2.079	0.358
50:21.4	-0.034	-0.948	-0.303	-0.136	0.063	-0.296	-1.654	0.573
50:21.4	0.023	0.236	-0.288	-0.091	0.433	0.209	0.522	0.830
50:21.4	0.042	0.549	-0.009	0.510	1.036	0.512	2.640	0.393
50:21.4	-0.025	0.745	0.669	1.146	1.604	0.831	4.970	0.323
50:21.5	-0.065	1.747	1.160	1.727	1.684	0.993	7.246	0.241
50:21.5	-0.021	2.035	1.410	1.774	1.317	0.650	7.165	0.284
50:21.5	-0.043	2.213	1.036	1.515	1.061	0.115	5.897	0.375
50:21.5	-0.037	1.262	1.039	1.126	0.500	-0.193	3.698	0.341
50:21.5	0.036	0.986	0.614	0.792	0.430	-0.576	2.283	0.432
50:21.6	0.026	0.298	0.587	0.745	0.465	-0.449	1.672	0.446
50:21.6	-0.007	1.098	0.594	0.792	0.383	-0.335	2.525	0.435
50:21.6	0.021	1.612	0.587	0.985	0.580	-0.256	3.528	0.457
50:21.6	0.032	1.342	0.708	1.091	1.262	-0.121	4.314	0.311
50:21.6	-0.024	1.949	1.130	1.806	1.577	0.095	6.533	0.298
50:21.7	0.039	2.606	1.689	2.356	1.947	0.626	9.264	0.281
50:21.7	-0.032	3.093	2.130	2.905	2.168	0.764	11.028	0.280
50:21.7	-0.115	4.154	2.547	3.071	2.101	0.831	12.590	0.330
50:21.7	-0.071	4.201	2.604	3.051	2.270	0.678	12.732	0.330
50:21.7	-0.029	4.314	2.891	3.331	2.215	0.189	12.911	0.334
50:21.8	-0.098	4.090	3.297	3.420	1.892	-0.079	12.522	0.327
50:21.8	-0.088	3.931	3.356	3.287	1.088	-0.308	11.266	0.349
50:21.8	-0.082	3.421	3.217	2.698	0.733	-0.477	9.510	0.360
50:21.8	-0.102	3.157	3.335	2.163	0.545	-0.717	8.381	0.398
50:21.8	-0.020	2.144	3.178	1.963	0.418	-0.489	7.194	0.442
50:21.9	-0.090	1.684	3.187	2.007	0.815	-0.173	7.431	0.429
50:21.9	-0.153	2.067	4.080	2.183	1.102	0.186	9.466	0.431
50:21.9	-0.124	2.784	4.403	2.608	1.318	0.851	11.841	0.372
50:21.9	**-0.071**	**3.563**	**4.754**	**2.744**	**1.393**	**0.953**	**13.337**	**0.356**
50:21.9	-0.099	3.745	4.464	2.588	1.748	0.730	13.176	0.339
50:22.0	-0.015	3.576	4.559	2.898	1.263	0.328	12.609	0.362
50:22.0	-0.184	3.484	4.450	2.658	1.110	-0.209	11.309	0.394
50:22.0	-0.124	3.235	5.239	2.717	0.373	-0.720	10.720	0.489
50:22.0	-0.137	3.146	5.790	2.178	0.070	-0.469	10.578	0.547
50:22.0	-0.250	2.541	5.909	2.017	-0.109	-0.429	9.678	0.611
50:22.1	***-0.162***	***2.165***	***6.366***	***1.369***	***0.025***	***-0.449***	***9.314***	***0.684***
50:22.1	0.050	2.033	5.930	1.337	0.219	0.106	9.675	0.613
50:22.1	-0.041	1.599	4.961	1.374	0.541	0.524	8.957	0.554
50:22.1	-0.156	0.929	3.555	1.035	0.557	0.524	6.444	0.552
50:22.1	0.049	0.429	2.349	0.713	0.365	0.710	4.614	0.509
50:22.2	0.077	0.482	1.187	0.329	0.427	0.780	3.282	0.362
50:22.2	0.089	0.370	0.404	0.270	0.325	0.174	1.632	0.248
50:22.2	-0.005	-0.355	0.243	-0.069	0.196	-0.174	-0.163	2.178
50:22.2	0.079	0.139	0.236	0.218	-0.176	-0.137	0.360	0.654

Table E20

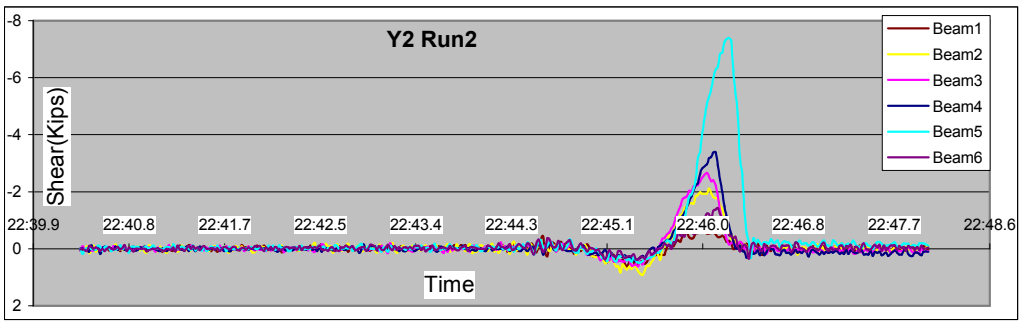
Dynamic Load Test Data(SN:084-0107)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Sum	Max D.F
12:46.5	-0.488	-0.346	-0.159	-0.021	-0.353	-0.151	-1.518	0.321
12:46.5	-0.394	-0.206	-0.113	-0.021	-0.142	-0.058	-0.934	0.422
12:46.5	-0.160	-0.299	0.145	0.096	-0.002	0.154	-0.066	4.550
12:46.5	-0.019	0.122	0.122	0.026	0.162	0.061	0.473	0.342
12:46.6	-0.043	0.121	0.285	0.096	0.162	0.131	0.753	0.379
12:46.6	-0.113	0.332	0.402	0.143	0.045	-0.009	0.800	0.503
12:46.6	0.004	0.332	0.355	0.096	-0.025	0.014	0.777	0.458
12:46.6	-0.020	0.122	0.426	0.354	0.115	0.224	1.220	0.349
12:46.6	0.004	0.473	0.800	0.424	0.208	0.295	2.204	0.363
12:46.7	0.168	0.683	0.987	0.517	0.349	0.295	2.998	0.329
12:46.7	0.331	1.058	1.221	0.705	0.699	0.365	4.378	0.279
12:46.7	0.378	1.268	1.291	0.798	0.792	0.481	5.009	0.258
12:46.7	0.332	1.034	1.432	0.822	0.699	0.458	4.777	0.300
12:46.7	0.191	1.198	1.502	1.079	0.909	0.341	5.220	0.288
12:46.8	0.097	1.291	1.690	1.126	1.072	0.505	5.781	0.292
12:46.8	0.238	1.479	1.853	1.453	1.166	0.622	6.810	0.272
12:46.8	0.355	1.689	2.087	1.687	1.633	0.738	8.190	0.255
12:46.8	0.495	1.666	2.274	1.921	1.797	0.739	8.891	0.256
12:46.8	0.495	1.900	2.484	1.968	2.100	0.762	9.710	0.256
12:46.9	0.495	1.830	2.367	2.225	2.520	0.762	10.199	0.247
12:46.9	0.472	1.759	2.227	2.342	2.824	0.855	10.479	0.270
12:46.9	0.308	1.853	2.367	2.365	3.081	0.972	10.946	0.281
12:46.9	0.448	1.876	2.437	2.669	3.361	0.902	11.693	0.287
12:46.9	0.518	2.017	2.532	2.973	4.039	0.855	12.934	0.312
12:47.0	0.612	2.017	2.789	3.207	4.646	1.346	14.617	0.318
12:47.0	**0.495**	**2.298**	**2.789**	**3.301**	**5.255**	**1.556**	**15.693**	**0.335**
12:47.0	0.495	1.759	2.554	3.277	5.673	1.159	14.918	0.380
12:47.0	0.331	1.806	2.320	3.276	6.095	1.182	15.011	0.406
12:47.1	0.261	1.572	2.085	3.089	5.907	1.346	14.260	0.414
12:47.1	0.401	1.479	1.571	2.832	6.258	1.159	13.701	0.457
12:47.1	0.355	1.431	1.336	2.458	6.515	1.042	13.137	0.496
12:47.1	0.378	1.245	0.963	2.131	7.052	1.066	12.834	0.549
12:47.1	0.168	1.105	0.541	1.476	7.309	0.972	11.570	0.632
12:47.2	***0.097***	***0.589***	***0.308***	***1.032***	***7.450***	***0.598***	***10.074***	***0.740***
12:47.2	0.121	0.449	0.261	0.541	7.008	0.318	8.698	0.806
12:47.2	-0.043	0.449	0.285	0.495	6.351	0.248	7.785	0.816
12:47.2	0.051	0.122	0.191	0.167	5.557	0.365	6.452	0.861
12:47.2	0.004	0.099	-0.089	0.003	4.997	0.294	5.308	0.941
12:47.3	0.051	0.028	0.121	0.097	4.366	0.225	4.887	0.893
12:47.3	-0.020	0.262	0.215	0.050	3.315	0.085	3.906	0.849
12:47.3	0.097	0.239	0.145	-0.208	2.053	0.202	2.528	0.812
12:47.3	0.168	-0.042	0.005	-0.207	1.119	-0.009	1.033	1.084
12:47.3	0.051	-0.042	-0.136	-0.067	0.184	-0.219	-0.229	0.956
12:47.4	-0.090	-0.253	0.145	-0.161	0.208	-0.079	-0.230	1.101
12:47.4	-0.067	0.005	0.075	0.050	0.021	-0.009	0.075	0.997
12:47.4	-0.020	0.145	0.051	-0.138	0.325	0.224	0.588	0.552
12:47.4	0.168	-0.089	-0.042	-0.091	0.232	0.108	0.285	0.812
12:47.4	0.027	0.122	0.028	-0.138	0.162	-0.079	0.122	1.324
12:47.5	-0.090	-0.066	-0.019	-0.091	-0.049	-0.056	-0.370	0.245

Table E21

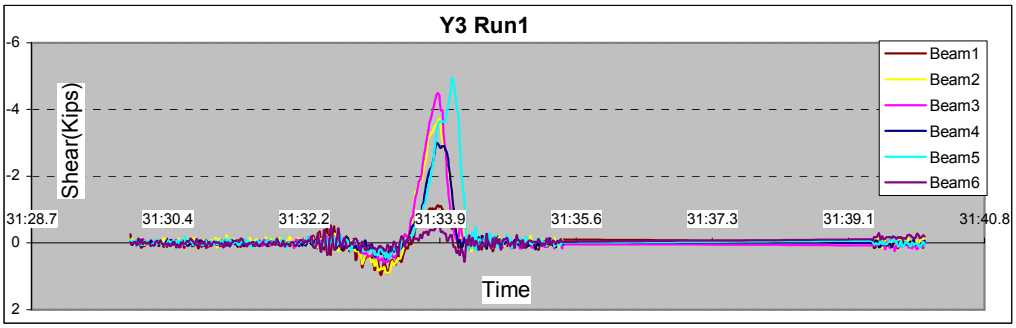
Dynamic Load Test Data (SN:084-0107)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Sum	Max D.F
22:45.7	0.223	0.758	1.085	0.685	0.590	0.230	3.572	0.304
22:45.8	0.293	1.039	1.296	0.896	0.777	0.558	4.859	0.267
22:45.8	0.247	1.179	1.483	1.013	0.847	0.465	5.234	0.283
22:45.8	0.434	1.226	1.741	1.153	1.081	0.464	6.099	0.285
22:45.8	0.551	1.437	1.787	1.270	1.080	0.440	6.566	0.272
22:45.8	0.574	1.459	1.835	1.458	1.454	0.651	7.431	0.247
22:45.9	0.410	1.577	2.021	1.621	1.805	0.744	8.179	0.247
22:45.9	0.364	1.600	1.998	1.832	1.898	0.838	8.529	0.234
22:45.9	0.387	1.577	2.185	2.042	2.109	0.511	8.810	0.248
22:45.9	0.527	1.834	2.208	2.229	2.436	0.628	9.862	0.247
22:45.9	0.551	1.881	2.231	2.299	3.183	1.001	11.146	0.286
22:46.0	0.598	1.974	2.372	2.627	3.393	0.908	11.871	0.286
22:46.0	0.691	1.927	2.489	2.813	4.024	0.861	12.806	0.314
22:46.0	0.527	1.928	2.654	2.953	5.052	1.235	14.349	0.352
22:46.0	0.527	2.114	2.536	3.164	5.309	1.211	14.862	0.357
22:46.1	0.551	1.951	2.372	3.210	5.589	1.071	14.744	0.379
22:46.1	0.574	1.811	2.395	3.374	5.987	1.329	15.470	0.387
22:46.1	**0.504**	**1.764**	**2.208**	**3.374**	**6.289**	**1.375**	**15.513**	**0.405**
22:46.1	0.410	1.788	1.834	2.930	6.382	1.422	14.766	0.432
22:46.1	0.410	1.530	1.342	2.416	6.827	1.212	13.736	0.497
22:46.2	0.457	1.389	0.944	1.994	6.874	1.025	12.683	0.542
22:46.2	0.387	1.132	0.640	1.481	7.248	0.815	11.702	0.619
22:46.2	0.247	0.968	0.360	1.153	7.341	0.838	10.906	0.673
22:46.2	***0.270***	***0.688***	***0.149***	***0.826***	***7.388***	***0.488***	***9.807***	***0.753***
22:46.2	0.177	0.336	0.196	0.522	7.295	0.440	8.966	0.814
22:46.3	-0.011	0.430	0.219	0.265	6.220	0.371	7.495	0.830
22:46.3	0.013	0.243	0.125	0.031	5.449	0.418	6.280	0.868
22:46.3	0.153	0.220	0.126	0.008	4.772	0.113	5.392	0.885
22:46.3	0.200	0.126	0.245	0.101	3.229	-0.096	3.805	0.849
22:46.3	0.013	0.032	0.175	-0.086	2.599	0.067	2.801	0.928
22:46.4	-0.034	0.150	0.011	-0.110	1.337	0.137	1.491	0.897
22:46.4	0.176	0.079	-0.012	-0.320	0.566	0.067	0.557	1.017
22:46.4	-0.011	-0.131	0.011	-0.180	0.240	-0.353	-0.424	0.833
22:46.4	-0.104	0.009	-0.082	-0.133	-0.321	0.067	-0.564	0.569
22:46.4	-0.128	-0.015	0.082	-0.180	0.357	0.207	0.323	1.104
22:46.5	0.036	0.079	-0.129	-0.156	0.170	0.091	0.091	1.858
22:46.5	0.177	-0.014	-0.036	-0.063	0.310	0.044	0.417	0.743
22:46.5	-0.011	-0.201	0.035	-0.227	0.193	-0.050	-0.260	0.871
22:46.5	-0.221	0.009	-0.082	-0.016	0.146	-0.073	-0.238	0.931
22:46.5	-0.081	-0.085	0.035	-0.227	0.239	0.161	0.042	5.721
22:46.6	0.106	-0.014	-0.176	-0.110	0.216	0.044	0.066	3.251
22:46.6	-0.034	0.033	0.011	0.030	0.192	-0.002	0.230	0.836
22:46.6	-0.081	0.032	0.058	-0.016	0.333	0.091	0.417	0.798
22:46.6	0.083	0.056	0.081	-0.016	0.215	0.115	0.534	0.403
22:46.6	0.036	0.056	0.011	-0.180	0.216	0.091	0.230	0.938
22:46.7	0.036	0.056	-0.082	-0.203	0.286	0.021	0.114	2.514
22:46.7	-0.081	-0.038	-0.082	-0.227	0.052	-0.050	-0.426	0.533
22:46.7	-0.080	-0.084	-0.082	-0.086	0.192	0.114	-0.027	3.173
22:46.7	0.060	0.033	-0.036	-0.040	0.262	0.091	0.370	0.709

Table E22

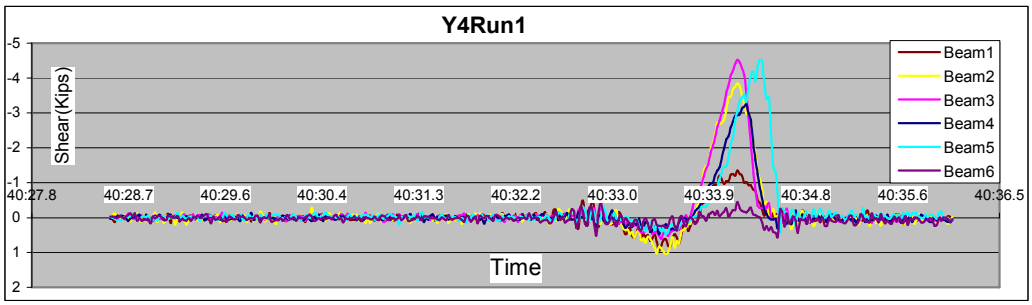
Dynamic Load Test Data (SN:084-0107)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Sum	Max D.F
31:33.5	0.003	0.220	0.349	0.206	0.122	0.173	1.073	0.325
31:33.5	-0.044	0.384	0.700	0.394	0.239	0.056	1.729	0.405
31:33.5	0.050	0.758	0.793	0.511	0.239	0.079	2.430	0.327
31:33.6	0.237	1.086	1.121	0.557	0.356	0.150	3.507	0.320
31:33.6	0.494	1.530	1.378	0.628	0.566	0.126	4.723	0.324
31:33.6	0.775	1.530	1.542	0.721	0.683	0.126	5.378	0.287
31:33.6	0.611	1.740	1.823	0.862	0.730	0.079	5.845	0.312
31:33.6	0.541	1.881	1.917	0.745	0.753	0.243	6.079	0.315
31:33.7	0.588	1.927	2.174	1.096	0.847	0.149	6.780	0.321
31:33.7	0.635	2.185	2.525	1.213	1.103	0.312	7.973	0.317
31:33.7	0.775	2.419	2.782	1.540	1.197	0.313	9.025	0.308
31:33.7	0.705	2.653	3.086	1.821	1.430	0.336	10.031	0.308
31:33.7	0.962	3.168	3.367	2.031	1.687	0.242	11.457	0.294
31:33.8	1.032	3.214	3.648	2.195	1.851	0.383	12.323	0.296
31:33.8	1.009	3.308	3.812	2.265	2.178	0.383	12.955	0.294
31:33.8	1.032	3.331	3.999	2.406	2.341	0.383	13.493	0.296
31:33.8	0.985	3.495	4.186	2.686	2.785	0.383	14.521	0.288
31:33.8	1.055	3.518	4.396	2.990	3.182	0.500	15.641	0.281
31:33.9	***1.125***	***3.635***	***4.490***	***2.966***	***3.532***	***0.524***	***16.273***	***0.276***
31:33.9	**1.079**	**3.705**	**4.398**	**2.895**	**3.626**	**0.593**	**16.296**	**0.270**
31:33.9	1.102	3.448	3.975	2.849	3.626	0.336	15.336	0.259
31:33.9	1.009	3.051	3.976	2.896	3.650	0.336	14.918	0.267
31:33.9	0.845	2.863	3.133	2.896	3.626	0.290	13.652	0.266
31:34.0	0.704	2.629	2.734	2.778	3.673	0.266	12.784	0.287
31:34.0	0.728	2.348	1.868	2.661	3.976	0.055	11.637	0.342
31:34.0	0.565	1.834	1.050	1.960	4.443	0.219	10.071	0.441
31:34.0	0.425	1.623	0.746	1.493	4.933	0.219	9.440	0.523
31:34.1	0.448	1.062	0.442	1.026	4.795	-0.108	7.664	0.626
31:34.1	0.261	0.828	0.184	0.581	4.491	-0.131	6.215	0.723
31:34.1	0.168	0.547	0.091	0.230	4.047	-0.295	4.789	0.845
31:34.1	-0.136	0.244	0.138	-0.003	3.789	-0.224	3.807	0.995
31:34.1	-0.090	0.150	0.466	0.090	2.995	-0.365	3.246	0.923
31:34.2	-0.183	0.127	0.419	-0.120	2.108	-0.201	2.149	0.981
31:34.2	-0.020	0.384	0.068	-0.073	1.664	-0.295	1.727	0.963
31:34.2	0.121	0.267	0.138	0.137	1.197	-0.552	1.308	0.915
31:34.2	0.004	-0.061	0.185	-0.027	-0.064	0.079	0.116	1.595
31:34.2	-0.020	0.080	-0.166	-0.051	-0.181	-0.061	-0.399	0.454
31:34.3	-0.184	0.150	-0.049	-0.051	0.123	0.219	0.209	1.050
31:34.3	-0.019	-0.248	-0.025	0.019	-0.158	-0.084	-0.515	0.481
31:34.3	-0.089	-0.201	0.115	-0.027	0.309	0.149	0.256	1.211
31:34.3	-0.090	0.033	0.092	0.043	-0.181	-0.084	-0.187	0.967
31:34.3	-0.113	0.127	-0.142	-0.004	0.473	0.056	0.397	1.192
31:34.4	0.028	-0.037	-0.001	-0.097	-0.228	0.009	-0.327	0.697
31:34.4	-0.043	0.103	-0.002	0.160	0.099	-0.202	0.116	1.375
31:34.4	-0.136	-0.037	-0.025	0.019	0.099	-0.108	-0.188	0.724
31:34.4	-0.184	-0.014	0.092	0.206	-0.017	0.033	0.117	1.772
31:34.4	0.074	0.243	0.092	0.160	-0.041	-0.037	0.490	0.496
31:34.5	0.191	0.173	0.045	0.043	0.263	-0.108	0.607	0.433
31:34.5	0.027	0.033	0.045	-0.168	0.146	0.266	0.350	0.760

Table E23

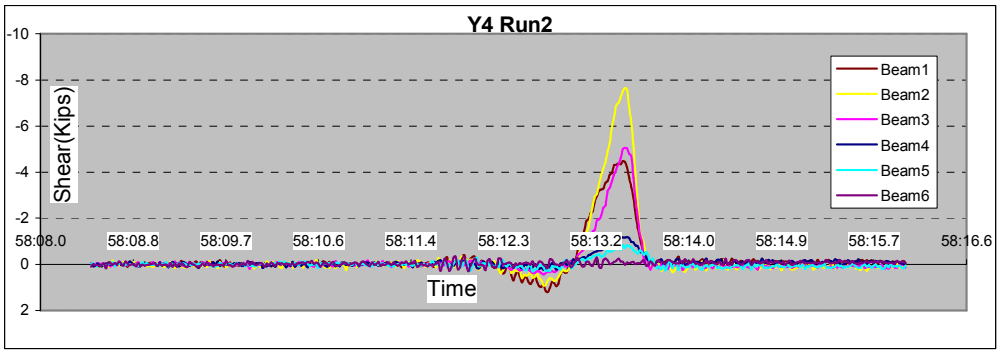
Dynamic Load Test Data (SN:084-0107)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Sum	Max D.F
40:33.7	-0.101	-0.294	0.069	-0.031	-0.177	-0.252	-0.787	0.374
40:33.7	-0.382	-0.177	-0.071	-0.101	-0.154	-0.041	-0.927	0.413
40:33.7	-0.242	-0.178	0.046	-0.054	-0.084	0.006	-0.506	0.478
40:33.7	-0.101	0.010	0.280	0.016	-0.014	-0.041	0.149	1.874
40:33.8	-0.125	0.080	0.490	0.180	0.033	-0.181	0.477	1.028
40:33.8	-0.125	0.337	0.443	0.250	0.057	-0.087	0.875	0.507
40:33.8	0.086	0.548	0.771	0.320	0.150	0.170	2.044	0.377
40:33.8	0.343	0.805	0.958	0.460	0.313	0.053	2.932	0.327
40:33.8	0.436	1.343	1.192	0.437	0.313	0.029	3.751	0.358
40:33.9	0.459	1.484	1.403	0.694	0.313	-0.088	4.266	0.348
40:33.9	0.600	1.484	1.519	0.881	0.407	0.076	4.967	0.306
40:33.9	0.787	1.975	1.871	0.975	0.453	0.122	6.184	0.319
40:33.9	0.904	2.139	2.058	0.999	0.687	0.170	6.956	0.307
40:33.9	0.950	2.373	2.292	1.209	0.827	0.076	7.727	0.307
40:34.0	0.927	2.723	2.596	1.350	0.874	0.193	8.663	0.314
40:34.0	1.208	2.676	2.784	1.443	1.107	0.052	9.271	0.300
40:34.0	0.973	2.792	3.228	1.958	1.458	0.170	10.578	0.305
40:34.0	1.043	3.097	3.578	2.238	1.458	0.263	11.677	0.306
40:34.1	1.043	3.447	3.789	2.332	1.715	0.029	12.354	0.307
40:34.1	1.230	3.471	4.070	2.588	2.112	0.122	13.593	0.299
40:34.1	1.253	3.682	4.211	2.752	2.299	0.216	14.413	0.292
40:34.1	1.207	3.751	4.398	2.916	2.789	0.216	15.278	0.288
40:34.1	**1.347**	**3.846**	**4.515**	**2.940**	**3.046**	**0.450**	**16.143**	**0.280**
40:34.2	1.254	3.752	4.445	2.963	3.350	0.262	16.026	0.277
40:34.2	1.207	3.518	4.281	3.127	3.420	0.192	15.744	0.272
40:34.2	0.996	3.238	4.093	3.173	3.514	0.168	15.183	0.270
40:34.2	1.020	2.979	3.555	3.243	3.327	0.146	14.269	0.249
40:34.2	0.926	2.980	2.851	2.986	3.771	0.216	13.730	0.275
40:34.3	0.926	2.769	2.151	2.799	4.050	0.287	12.982	0.312
40:34.3	0.809	2.230	1.425	2.214	4.190	0.099	10.968	0.382
40:34.3	0.763	1.833	0.792	1.653	3.911	0.076	9.027	0.433
40:34.3	0.505	1.342	0.347	1.255	4.331	0.029	7.808	0.555
40:34.3	0.412	1.108	0.277	0.857	4.518	0.005	7.177	0.629
40:34.4	0.225	0.827	0.277	0.554	4.496	-0.135	6.244	0.720
40:34.4	0.061	0.359	0.324	0.226	3.864	-0.345	4.489	0.861
40:34.4	0.201	0.454	0.277	0.110	3.396	-0.252	4.187	0.811
40:34.4	0.061	0.055	0.418	-0.008	3.443	-0.368	3.601	0.956
40:34.4	0.155	0.149	-0.026	-0.054	2.392	-0.275	2.341	1.022
40:34.5	0.038	0.243	-0.026	-0.054	1.434	-0.415	1.220	1.176
40:34.5	0.108	0.008	-0.049	-0.031	1.318	-0.438	0.916	1.439
40:34.5	0.038	0.056	-0.002	-0.312	0.640	-0.555	-0.136	4.086
40:34.5	-0.079	-0.085	-0.003	0.179	-0.435	0.238	-0.185	2.356
40:34.5	-0.103	0.149	-0.143	-0.008	0.265	0.168	0.328	0.809
40:34.6	-0.009	-0.202	-0.026	-0.102	0.172	-0.253	-0.419	0.604
40:34.6	-0.079	-0.038	0.255	-0.172	0.149	0.121	0.235	1.083
40:34.6	-0.032	0.056	-0.096	-0.008	-0.062	-0.158	-0.301	0.526
40:34.6	-0.079	-0.319	0.021	-0.195	0.195	-0.088	-0.465	0.686
40:34.6	0.038	-0.202	-0.073	0.016	0.219	0.028	0.026	8.485
40:34.7	-0.033	0.149	0.021	0.203	-0.225	-0.090	0.026	7.900

Table E24

Dynamic Load Test Data (SN:084-0107)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Sum	Max D.F
58:12.8	-0.293	-0.254	0.042	0.058	-0.052	-0.013	-0.511	0.572
58:12.9	-0.339	-0.278	-0.075	0.104	0.135	0.079	-0.373	0.910
58:12.9	-0.339	-0.301	-0.075	-0.035	0.205	0.172	-0.373	0.910
58:12.9	0.012	-0.184	0.019	0.058	0.018	0.010	-0.067	2.740
58:12.9	0.152	0.003	0.136	0.011	-0.168	-0.131	0.002	77.514
58:12.9	0.058	0.167	0.066	0.222	-0.075	-0.014	0.424	0.524
58:13.0	0.222	0.050	0.159	0.151	0.018	0.150	0.750	0.296
58:13.0	0.620	0.284	0.393	0.198	0.089	0.266	1.850	0.335
58:13.0	1.135	0.938	0.581	0.292	0.229	-0.084	3.090	0.367
58:13.0	1.462	1.267	0.697	0.315	0.158	-0.084	3.816	0.383
58:13.1	1.883	1.383	0.814	0.269	0.182	0.103	4.635	0.406
58:13.1	1.953	1.617	1.049	0.409	0.275	0.103	5.407	0.361
58:13.1	2.211	2.109	1.142	0.432	0.252	-0.037	6.108	0.362
58:13.1	2.304	2.553	1.423	0.502	0.345	-0.061	7.067	0.361
58:13.1	2.749	2.928	1.493	0.549	0.369	0.151	8.238	0.355
58:13.2	2.959	3.067	1.914	0.573	0.392	0.290	9.195	0.334
58:13.2	3.193	3.512	1.961	0.619	0.439	-0.107	9.617	0.365
58:13.2	3.240	3.863	2.125	0.619	0.322	-0.154	10.015	0.386
58:13.2	3.286	4.167	2.452	0.690	0.369	0.173	11.136	0.374
58:13.2	3.544	4.448	2.570	0.830	0.462	0.244	12.099	0.368
58:13.3	3.614	4.893	3.178	0.830	0.696	0.174	13.386	0.366
58:13.3	3.895	5.267	3.318	0.947	0.532	0.009	13.969	0.377
58:13.3	3.965	5.945	3.599	1.041	0.579	0.033	15.162	0.392
58:13.3	4.293	6.366	3.880	1.064	0.626	0.104	16.333	0.390
58:13.3	4.316	6.882	4.114	1.111	0.696	0.150	17.269	0.399
58:13.4	4.387	6.997	4.348	1.041	0.882	0.244	17.899	0.391
58:13.4	4.339	7.255	4.606	1.181	0.625	0.125	18.132	0.400
58:13.4	**4.480**	**7.512**	**5.004**	**1.158**	**0.836**	**0.103**	**19.092**	**0.393**
58:13.4	4.433	7.652	5.051	1.158	0.719	-0.015	18.999	0.403
58:13.4	***4.199***	***7.582***	***5.028***	***1.181***	***0.836***	***0.079***	***18.905***	***0.401***
58:13.5	3.754	6.786	4.793	1.134	0.789	0.057	17.314	0.392
58:13.5	3.357	6.155	4.699	0.971	0.742	0.080	16.004	0.385
58:13.5	2.888	5.149	3.761	0.947	0.602	0.103	13.450	0.383
58:13.5	2.163	3.837	2.779	0.807	0.555	0.009	10.151	0.378
58:13.5	1.602	2.668	2.100	0.783	0.462	0.056	7.671	0.348
58:13.6	1.157	1.428	1.328	0.549	0.602	0.033	5.097	0.280
58:13.6	0.760	1.147	0.976	0.526	0.532	0.126	4.067	0.282
58:13.6	0.456	0.867	0.087	0.479	0.416	0.173	2.478	0.350
58:13.6	0.479	0.213	0.322	0.291	0.532	-0.060	1.777	0.299
58:13.6	0.105	0.143	0.018	0.175	0.369	-0.037	0.772	0.477
58:13.7	0.152	-0.114	-0.216	0.128	0.042	0.126	0.118	1.287
58:13.7	0.128	0.097	0.019	0.198	0.252	0.034	0.728	0.346
58:13.7	0.128	0.143	0.019	0.058	0.019	-0.061	0.307	0.467
58:13.7	0.128	-0.091	-0.027	0.104	-0.169	0.150	0.095	1.572
58:13.7	0.175	0.003	-0.168	0.151	-0.075	0.150	0.236	0.740
58:13.8	0.012	-0.278	0.019	0.221	-0.215	0.103	-0.139	2.007
58:13.8	0.082	-0.137	-0.004	0.011	-0.052	0.079	-0.021	6.435
58:13.8	0.128	0.050	-0.051	0.081	-0.262	0.033	-0.020	13.106
58:13.8	0.175	0.003	-0.191	0.034	-0.005	0.174	0.190	0.920

Table E25

APPENDIX F – COMPARISON OF SHEAR AND SHEAR DISTRIBUTION FACTORS (FIRST SIX BRIDGES)

Comparision of Shear and Sher Distribution Factors

SN 0059-0040											
25-May-06		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support		
				Static (X4)	Dynamic test				Static (X4)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	-0.144	-0.033	-0.094			-0.006	-0.002	-0.007		
	Beam 2	-0.013	0.045	0.199			-0.001	0.003	0.015		
	Beam 3	0.192	0.261	0.307			0.007	0.019	0.023		
	Beam 4	1.9	1.400	1.194			0.074	0.101	0.091		
	Beam 5	10.094	6.098	5.862			0.393	0.440	0.446		
	Beam 6	13.638	6.074	5.687			0.531	0.439	0.432		
	Σ	25.667	13.845	13.155							
Y2Run1	Beam 1	-0.426	-0.059	0.196	0.142	0.142	-0.017	-0.003	0.017	0.009	0.009
	Beam 2	0.767	0.582	0.656	0.617	0.617	0.030	0.034	0.056	0.038	0.038
	Beam 3	4.86	3.018	2.858	2.486	2.486	0.192	0.175	0.242	0.155	0.155
	Beam 4	12.706	7.740	4.041	4.961	4.961	0.502	0.449	0.343	0.309	0.309
	Beam 5	7.992	5.360	2.872	5.405	5.405	0.316	0.311	0.244	0.337	0.337
	Beam 6	-0.605	0.598	1.167	2.438	2.438	-0.024	0.035	0.099	0.152	0.152
	Σ	25.294	17.239	11.789	16.049	16.049					
Y2Run2	Beam 1	"			-0.111	-0.111	"			-0.008	-0.008
	Beam 2				0.796	0.796				0.054	0.054
	Beam 3				2.678	2.678				0.182	0.182
	Beam 4				3.648	3.648				0.248	0.248
	Beam 5				4.464	4.464				0.303	0.303
	Beam 6				3.239	3.239				0.220	0.220
	Σ				14.714	14.714					
Y3Run1	Beam 1	-0.352	-0.062	0.212	0.283	0.283	-0.014	-0.004	0.019	0.017	0.017
	Beam 2	0.355	0.309	0.429	0.815	0.815	0.014	0.018	0.038	0.049	0.049
	Beam 3	2.363	1.654	1.809	3.893	3.893	0.092	0.096	0.161	0.236	0.236
	Beam 4	10.846	6.487	3.478	5.562	5.562	0.422	0.377	0.309	0.338	0.338
	Beam 5	11.976	7.665	3.450	3.932	3.932	0.466	0.445	0.306	0.239	0.239
	Beam 6	0.499	1.161	1.890	1.992	1.992	0.019	0.067	0.168	0.121	0.121
	Σ	25.687	17.214	11.268	16.477	16.477					
Y4Run2	Beam 1	1.551	0.931		2.510	2.000	0.060	0.054		0.169	0.156
	Beam 2	10.523	6.033		3.223	2.831	0.407	0.349		0.217	0.221
	Beam 3	11.963	7.793		5.835	6.238	0.463	0.451		0.393	0.486
	Beam 4	2.195	2.128		1.528	0.918	0.085	0.123		0.103	0.072
	Beam 5	0.076	0.446		1.528	0.703	0.003	0.026		0.103	0.055
	Beam 6	-0.482	-0.038		0.207	0.143	-0.019	-0.002		0.014	0.011
	Σ	25.826	17.293		14.831	12.833					

Table F1

Comparision of Shear and Shear Distribution Factors

Sn.0059-0041											
25-May-06		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support		
				Static (X4)	Dynamic test				Static (X4)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	-0.067	-0.011	-0.103			-0.003	-0.001	-0.014		
	Beam 2	-0.048	0.064	0.005			-0.002	0.005	0.001		
	Beam 3	0.056	0.373	0.345			0.002	0.028	0.048		
	Beam 4	1.555	1.669	1.315			0.066	0.123	0.182		
	Beam 5	8.997	5.866	2.384			0.380	0.433	0.329		
	Beam 6	13.209	5.571	3.298			0.557	0.412	0.455		
	Σ	23.702	13.532	7.244							
Y2	Beam 1	-0.225	0.005	0.016			-0.010	0.000	0.001		
	Beam 2	0.141	0.442	0.214			0.006	0.024	0.019		
	Beam 3	1.867	1.989	1.704			0.079	0.109	0.152		
	Beam 4	9.929	6.629	4.813			0.420	0.365	0.430		
	Beam 5	11.416	7.794	3.124			0.483	0.429	0.279		
	Beam 6	0.526	1.307	1.330			0.022	0.072	0.119		
	Σ	23.654	18.166	11.201							
Y3Run1	Beam 1	-0.296	0.034	0.126	0.167	0.167	-0.013	0.002	0.010	0.010	0.010
	Beam 2	0.435	0.788	0.488	0.369	0.369	0.019	0.043	0.041	0.022	0.022
	Beam 3	4.141	3.343	2.734	3.366	3.366	0.179	0.182	0.227	0.205	0.205
	Beam 4	11.752	7.871	5.361	6.597	6.597	0.509	0.428	0.445	0.401	0.401
	Beam 5	7.668	5.659	2.416	4.138	4.138	0.332	0.308	0.201	0.252	0.252
	Beam 6	-0.611	0.697	0.920	1.800	1.800	-0.026	0.038	0.076	0.110	0.110
	Σ	23.089	18.392	12.045	16.438	16.438					
Y3Run2	Beam 1	"			0.328	0.328	"			0.020	0.020
	Beam 2				0.435	0.435				0.026	0.026
	Beam 3				3.798	3.798				0.230	0.230
	Beam 4				6.653	6.653				0.402	0.402
	Beam 5				3.771	3.771				0.228	0.228
	Beam 6				1.546	1.546				0.094	0.094
	Σ				16.530	16.530					
Y4Run1	Beam 1	0.214	0.510		2.555	2.555	0.009	0.027		0.195	0.195
	Beam 2	12.378	8.966		1.576	1.576	0.492	0.480		0.120	0.120
	Beam 3	12.416	8.616		6.008	6.008	0.493	0.461		0.458	0.458
	Beam 4	0.053	0.553		2.323	2.323	0.002	0.030		0.177	0.177
	Beam 5	0.141	0.048		0.716	0.716	0.006	0.003		0.055	0.055
	Beam 6	-0.039	-0.013		-0.059	-0.059	-0.002	-0.001		-0.004	-0.004
	Σ	25.163	18.680		13.118	13.118					
Y4Run2	Beam 1	"			2.410	2.135	"			0.162	0.144
	Beam 2				1.870	1.736				0.126	0.117
	Beam 3				7.296	7.873				0.491	0.531
	Beam 4				2.590	2.438				0.174	0.165
	Beam 5				0.683	0.595				0.046	0.040
	Beam 6				0.003	0.042				0.000	0.003
	Σ				14.852	14.819					

Table

Comparision of Shear and Shear Distribution Factors

SN 0068-0046											
		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support		
				Static (X4)	Dynamic test				Static (X4)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	0.295	0.056	0.222			0.009	0.003	0.016		
	Beam 2	-0.177	-0.185	0.046			-0.005	-0.011	0.003		
	Beam 3	0.009	-0.187	0.014			0.000	-0.012	0.001		
	Beam 4	0.465	-0.110	0.511			0.014	-0.007	0.038		
	Beam 5	7.261	4.859	2.578			0.212	0.300	0.190		
	Beam 6	26.432	11.757	10.229			0.771	0.726	0.752		
	Σ	34.285	16.190	13.600							
Y2Run1	Beam 1	0.45	0.073	0.367	0.472	0.001	0.012	0.004	0.022	0.020	0.000
	Beam 2	-0.258	-0.327	0.182	-0.139	-0.267	-0.007	-0.017	0.011	-0.006	-0.012
	Beam 3	0.306	-0.137	0.019	0.135	0.143	0.008	-0.007	0.001	0.006	0.006
	Beam 4	6.859	4.712	3.779	6.084	4.905	0.190	0.247	0.224	0.261	0.221
	Beam 5	24.106	12.250	8.933	13.697	14.367	0.668	0.643	0.529	0.587	0.646
	Beam 6	4.614	2.470	3.603	3.077	3.091	0.128	0.130	0.213	0.132	0.139
	Σ	36.077	19.041	16.881	23.326	22.240					
Y2Run2	Beam 1	"			1.901	-1.197	"			0.083	-0.085
	Beam 2				1.021	-0.822				0.044	-0.058
	Beam 3				0.648	-0.807				0.028	-0.057
	Beam 4				2.084	3.159				0.091	0.224
	Beam 5				10.225	12.081				0.445	0.858
	Beam 6				7.084	1.670				0.308	0.119
	Σ				22.962	14.084					
Y3Run1	Beam 1	0.452	0.060	0.438	1.193	0.901	0.014	0.003	0.025	0.055	0.051
	Beam 2	-0.339	-0.421	0.222	0.645	0.236	-0.010	-0.022	0.013	0.030	0.013
	Beam 3	2.883	1.925	1.300	0.572	0.418	0.087	0.100	0.075	0.026	0.024
	Beam 4	18.24	10.766	7.698	9.240	12.443	0.551	0.559	0.445	0.423	0.708
	Beam 5	12.826	6.715	6.455	8.107	2.845	0.388	0.349	0.373	0.371	0.162
	Beam 6	-0.971	0.210	1.175	2.080	0.735	-0.029	0.011	0.068	0.095	0.042
	Σ	33.091	19.255	17.288	21.837	17.578					
Y3Run2	Beam 1	"			1.633	1.368	"			0.079	0.074
	Beam 2				0.587	0.851				0.028	0.046
	Beam 3				0.282	0.145				0.014	0.008
	Beam 4				11.044	12.520				0.535	0.677
	Beam 5				5.347	3.000				0.259	0.162
	Beam 6				1.737	0.610				0.084	0.033
	Σ				20.629	18.493					
Y4Run1	Beam 1	0.21	-0.053		3.155	2.880	0.011	-0.003		0.141	0.134
	Beam 2	3.819	3.088		6.438	3.845	0.205	0.199		0.288	0.178
	Beam 3	13.827	11.033		8.751	12.677	0.744	0.711		0.392	0.588
	Beam 4	1.015	1.267		1.363	-0.052	0.055	0.082		0.061	-0.002
	Beam 5	0.054	0.261		2.513	1.885	0.003	0.017		0.113	0.087
	Beam 6	-0.336	-0.081		0.113	0.315	-0.018	-0.005		0.005	0.015
	Σ	18.589	15.515		22.332	21.550					
Y4Run2	Beam 1	"			2.265	1.860	"			0.112	0.104
	Beam 2				7.507	4.570				0.371	0.255
	Beam 3				10.310	11.559				0.510	0.644
	Beam 4				0.134	0.295				0.007	0.016
	Beam 5				0.179	-0.067				0.009	-0.004
	Beam 6				-0.172	-0.275				-0.009	-0.015
	Σ				20.223	17.942					

Comparision of Shear and Shear Distribution Factors

Sn.0068-0049											
25-May-06		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support		
				Static (X4)	Dynamic test				Static (X4)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	-0.906	-0.330	-0.196			-0.030	-0.015	-0.011		
	Beam 2	0.258	0.239	-0.003			0.009	0.011	0.000		
	Beam 3	0.99	1.225	0.729			0.033	0.057	0.040		
	Beam 4	3.996	3.679	2.790			0.133	0.170	0.153		
	Beam 5	8.416	7.964	6.600			0.280	0.368	0.362		
	Beam 6	17.291	8.860	8.319			0.576	0.409	0.456		
	Σ	30.045	21.637	18.239							
Y2Run1	Beam 1	-1.079	-0.078	-0.075	0.069	0.013	-0.036	-0.003	-0.004	0.003	0.001
	Beam 2	1.891	1.649	-0.208	0.936	0.562	0.063	0.064	-0.011	0.043	0.027
	Beam 3	4.654	4.322	2.483	2.762	2.725	0.155	0.167	0.130	0.127	0.132
	Beam 4	10.397	8.786	5.545	6.174	5.718	0.347	0.339	0.291	0.283	0.278
	Beam 5	10.272	8.276	8.109	8.481	8.509	0.343	0.319	0.426	0.388	0.413
	Beam 6	3.798	2.973	3.190	3.409	3.062	0.127	0.115	0.168	0.156	0.149
	Σ	29.933	25.928	19.044	21.831	20.589					
Y2Run2	Beam 1	"			0.006	-0.030	"			0.000	-0.002
	Beam 2				0.477	0.325				0.021	0.018
	Beam 3				3.065	2.051				0.135	0.114
	Beam 4				6.648	5.134				0.294	0.285
	Beam 5				8.662	8.899				0.383	0.495
	Beam 6				3.784	1.612				0.167	0.090
	Σ				22.642	17.991					
Y3Run1	Beam 1	-0.961	0.127	0.219	-0.055	0.117	-0.032	0.005	0.012	-0.003	0.006
	Beam 2	2.825	2.422	-0.008	-0.123	-0.140	0.095	0.091	0.000	-0.006	-0.008
	Beam 3	6.791	6.045	3.498	3.668	3.290	0.227	0.226	0.187	0.191	0.183
	Beam 4	11.264	9.555	6.174	7.115	7.395	0.377	0.357	0.331	0.371	0.410
	Beam 5	8.307	6.731	6.600	6.662	6.379	0.278	0.252	0.354	0.348	0.354
	Beam 6	1.647	1.854	2.183	1.894	0.981	0.055	0.069	0.117	0.099	0.054
	Σ	29.873	26.734	18.665	19.162	18.022					
Y3Run2	Beam 1	"			0.024	0.024	"			0.001	0.001
	Beam 2				1.086	1.086				0.051	0.051
	Beam 3				3.901	3.901				0.183	0.183
	Beam 4				7.277	7.277				0.342	0.342
	Beam 5				6.981	6.981				0.328	0.328
	Beam 6				2.038	2.038				0.096	0.096
	Σ				21.307	21.307					
Y4Run1	Beam 1	2.904	2.411		0.038	0.061	0.117	0.110		0.003	0.006
	Beam 2	10.933	9.218		4.201	2.748	0.440	0.419		0.322	0.254
	Beam 3	8.978	7.897		2.772	6.173	0.361	0.359		0.212	0.572
	Beam 4	1.959	1.994		3.485	1.525	0.079	0.091		0.267	0.141
	Beam 5	0.567	0.546		2.259	0.422	0.023	0.025		0.173	0.039
	Beam 6	-0.482	-0.081		0.293	-0.132	-0.019	-0.004		0.022	-0.012
	Σ	24.859	21.985		13.048	10.796					
Y4Run2	Beam 1	"			-0.071	-0.162	"			-0.005	-0.017
	Beam 2				3.563	2.165				0.267	0.232
	Beam 3				4.754	6.366				0.356	0.684
	Beam 4				2.744	1.369				0.206	0.147
	Beam 5				1.393	0.025				0.104	0.003
	Beam 6				0.953	-0.449				0.071	-0.048
	Σ				13.337	9.314					

Comparision of Shear and Shear Distribution Factors

		Sn.0084-107									
25-May-06		Forces					Distribution factors				
		FE Model		Field Results			FE Model		Field Results		
		Reaction	Shear D away in Beam (X5 Position)	Shear D Away from support			Reaction	Shear D away in Beam (X5 Position)	Shear D Away from support		
				Static (X5)	Dynamic test				Static (X5)	Dynamic test	
					Max. Sum	Max. Shear				Max. Sum	Max. Shear
Y1	Beam 1	-0.17	0.035	-0.005			-0.005	0.002	0.000		
	Beam 2	-0.141	0.144	-0.109			-0.004	0.008	-0.008		
	Beam 3	-0.507	0.520	0.098			-0.015	0.028	0.007		
	Beam 4	0.648	2.182	0.253			0.019	0.117	0.019		
	Beam 5	19.127	8.836	4.599			0.558	0.472	0.346		
	Beam 6	15.318	6.991	8.466			0.447	0.374	0.636		
	Σ	34.275	18.708	13.302							
Y2Run1	Beam 1	-0.814	0.110	0.382	0.495	0.097	-0.024	0.005	0.029	0.032	0.010
	Beam 2	-0.449	1.599	0.937	2.298	0.589	-0.013	0.073	0.070	0.146	0.058
	Beam 3	5.795	5.235	0.983	2.789	0.308	0.170	0.239	0.073	0.178	0.031
	Beam 4	16.968	10.667	2.603	3.301	1.032	0.499	0.487	0.195	0.210	0.102
	Beam 5	10.427	3.583	7.100	5.255	7.450	0.307	0.164	0.531	0.335	0.740
	Beam 6	2.063	0.715	1.371	1.556	0.598	0.061	0.033	0.102	0.099	0.059
	Σ	33.99	21.909	13.376	15.693	10.074					
Y2Run2	Beam 1	"			0.504	0.270	"			0.032	0.028
	Beam 2				1.764	0.688				0.114	0.070
	Beam 3				2.208	0.149				0.142	0.015
	Beam 4				3.374	0.826				0.217	0.084
	Beam 5				6.289	7.387				0.405	0.753
	Beam 6				1.375	0.488				0.089	0.050
	Σ				15.513	9.806					
Y3Run1	Beam 1	-1.729	0.328	1.042	1.709	1.125	-0.056	0.016	0.074	0.101	0.069
	Beam 2	2.786	4.232	2.315	3.705	3.635	0.090	0.208	0.165	0.219	0.223
	Beam 3	14.725	8.180	3.698	4.397	4.490	0.473	0.403	0.264	0.260	0.276
	Beam 4	11.678	6.360	3.150	2.895	2.966	0.375	0.313	0.225	0.171	0.182
	Beam 5	2.515	0.915	3.543	3.625	3.532	0.081	0.045	0.253	0.214	0.217
	Beam 6	1.142	0.293	0.260	0.593	0.524	0.037	0.014	0.019	0.035	0.032
	Σ	31.117	20.308	14.007	16.924	16.272					
Y3Run2	Beam 1	"			1.347	1.347	"			0.083	0.083
	Beam 2				3.845	3.845				0.238	0.238
	Beam 3				4.515	4.515				0.280	0.280
	Beam 4				2.939	2.939				0.182	0.182
	Beam 5				3.045	3.045				0.189	0.189
	Beam 6				0.449	0.449				0.028	0.028
	Σ				16.140	16.140					
Y4Run2	Beam 1	0.464	1.184		4.480	4.433	0.013	0.066		0.235	0.233
	Beam 2	24.538	9.450		7.512	7.652	0.690	0.528		0.393	0.403
	Beam 3	10.313	6.786		5.004	5.051	0.290	0.379		0.262	0.266
	Beam 4	0.143	0.384		1.158	1.158	0.004	0.021		0.061	0.061
	Beam 5	0.123	0.087		0.836	0.719	0.003	0.005		0.044	0.038
	Beam 6	-0.041	0.018		0.103	-0.015	-0.001	0.001		0.005	-0.001
	Σ	35.54	17.909		19.092	18.999					

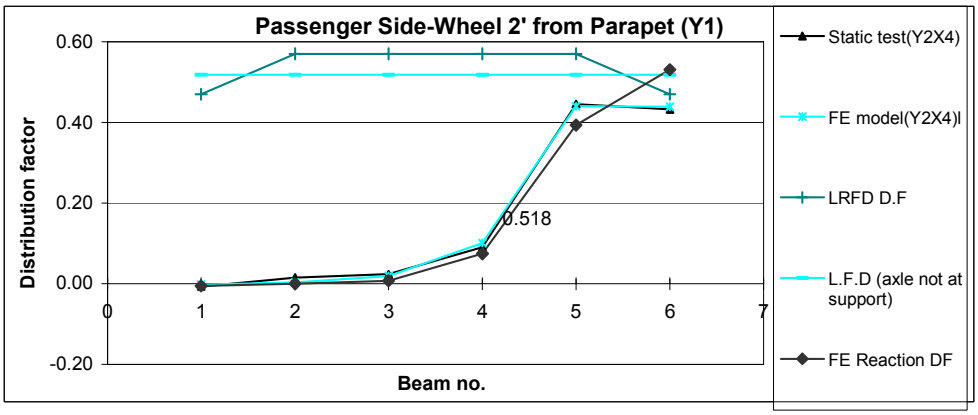
Comparision of Shear and Shear Distribution Factors

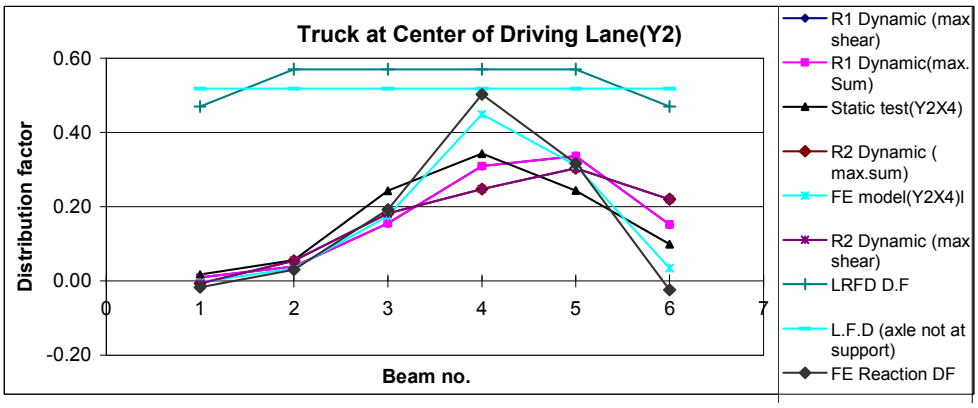
Sn.054-0043											
		Forces					Distribution Factors				
		FE Model		Field Results			FE Model		Field Results		
				Shear D away from support					Shear D away from support		
					Dynamic					Dynamic test	
		Reaction	shear D away in beam (X4 position)	Static(X4)	Max. Sum	Max. Shear	Reaction	Shear D away in Beam (X4 position)	Static(X4)	Max. Sum	Max. Shear
Y2Run1	Beam 1	0.478	0.318	-0.225	1.051	1.051	0.016	0.013	-0.009	0.050	0.050
	Beam 2	0.266	0.231	-0.103	-0.179	-0.179	0.009	0.009	-0.004	-0.008	-0.008
	Beam 3	0.078	0.195	0.117	0.911	0.911	0.003	0.008	0.005	0.043	0.043
	Beam 4	-0.099	0.245	0.998	0.729	0.729	-0.003	0.010	0.042	0.034	0.034
	Beam 5	0.436	0.804	-0.074	-0.293	-0.293	0.015	0.033	-0.003	-0.014	-0.014
	Beam 6	4.235	3.221	5.041	3.801	3.801	0.143	0.131	0.212	0.179	0.179
	Beam 7	10.137	8.451	6.392	8.188	8.188	0.342	0.343	0.269	0.386	0.386
	Beam 8	10.768	8.446	5.347	6.993	6.993	0.363	0.342	0.225	0.330	0.330
	Beam 9	3.381	2.749	6.293	0.000	0.000	0.114	0.111	0.265	0.000	0.000
	S	29.680	24.660	23.786	21.201	21.201					
Y2Run2	Beam 1				1.430	1.430				0.059	0.059
	Beam 2				-0.306	-0.306				-0.013	-0.013
	Beam 3				1.391	1.391				0.057	0.057
	Beam 4				1.268	1.268				0.052	0.052
	Beam 5				-0.753	-0.753				-0.031	-0.031
	Beam 6				3.190	3.190				0.132	0.132
	Beam 7				11.643	11.643				0.480	0.480
	Beam 8				6.381	6.381				0.263	0.263
	Beam 9				0.000	0.000				0.000	0.000
	S				24.244	24.244					
Y3Run1	Beam 1	0.423	0.319	0.378	1.656	1.656	0.014	0.012	0.015	0.066	0.066
	Beam 2	0.197	0.208	-0.132	0.338	0.338	0.007	0.008	-0.005	0.013	0.013
	Beam 3	-0.044	0.199	-0.240	1.858	1.858	-0.001	0.008	-0.010	0.074	0.074
	Beam 4	0.039	0.486	2.040	1.646	1.646	0.001	0.019	0.081	0.066	0.066
	Beam 5	2.255	1.911	0.108	-0.906	-0.906	0.075	0.074	0.004	-0.036	-0.036
	Beam 6	8.086	6.618	8.274	9.428	9.428	0.268	0.257	0.330	0.375	0.375
	Beam 7	11.306	9.374	8.410	10.330	10.330	0.375	0.365	0.335	0.411	0.411
	Beam 8	7.657	5.677	2.067	0.759	0.759	0.254	0.221	0.082	0.030	0.030
	Beam 9	0.227	0.914	4.201	0.000	0.000	0.008	0.036	0.167	0.000	0.000
	S	30.145	25.706	25.106	25.109	25.109					
Y3Run2	Beam 1				2.155	2.222				0.083	0.086
	Beam 2				0.070	-0.337				0.003	-0.013
	Beam 3				2.805	2.871				0.108	0.112
	Beam 4				2.016	2.266				0.078	0.088
	Beam 5				-0.349	-0.828				-0.013	-0.032
	Beam 6				8.906	9.209				0.343	0.358
	Beam 7				9.046	9.083				0.348	0.354
	Beam 8				1.318	1.207				0.051	0.047
	Beam 9				0.000	0.000				0.000	0.000
	S				25.968	25.693					
Y4Run1	Beam 1	0.046	0.191		3.301	3.301	0.002	0.007		0.112	0.112
	Beam 2	0.069	0.312		1.988	1.988	0.002	0.012		0.067	0.067
	Beam 3	0.811	0.847		2.967	2.967	0.027	0.033		0.100	0.100
	Beam 4	6.626	5.096		9.531	9.531	0.223	0.197		0.323	0.323
	Beam 5	12.823	11.263		5.819	5.819	0.432	0.436		0.197	0.197
	Beam 6	7.979	6.503		4.923	4.923	0.269	0.252		0.167	0.167
	Beam 7	1.291	1.05		2.830	2.830	0.043	0.041		0.096	0.096
	Beam 8	0.082	0.389		-1.813	-1.813	0.003	0.015		-0.061	-0.061
	Beam 9	-0.019	0.197		0.000	0.000	-0.001	0.008		0.000	0.000
	S	29.708	25.848		29.546	29.546					
Y4Run2	Beam 1				3.932	3.932				0.118	0.118
	Beam 2				2.391	2.391				0.071	0.071
	Beam 3				4.317	4.317				0.129	0.129
	Beam 4				9.832	9.832				0.294	0.294
	Beam 5				6.080	6.080				0.182	0.182
	Beam 6				5.042	5.042				0.151	0.151
	Beam 7				3.060	3.060				0.092	0.092
	Beam 8				-1.208	-1.208				-0.036	-0.036
	Beam 9				0.000	0.000				0.000	0.000
	S				33.446	33.446					

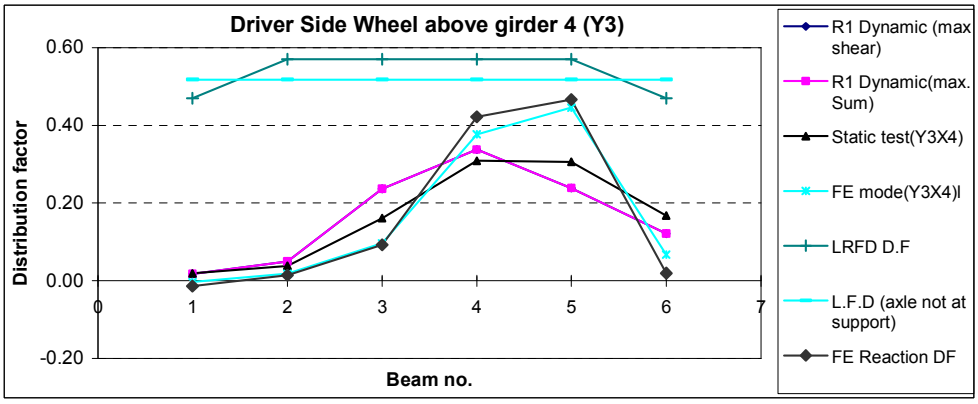
APPENDIX G – GRAPHICAL COMPARISON OF DISTRIBUTION FACTORS (FIRST SIX BRIDGES)

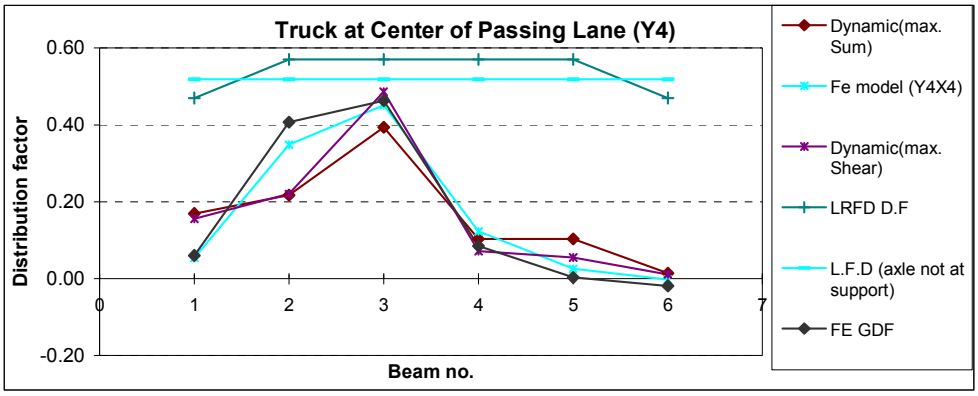
Graphical Comparison of Distribution Factors

Sn0059-0040



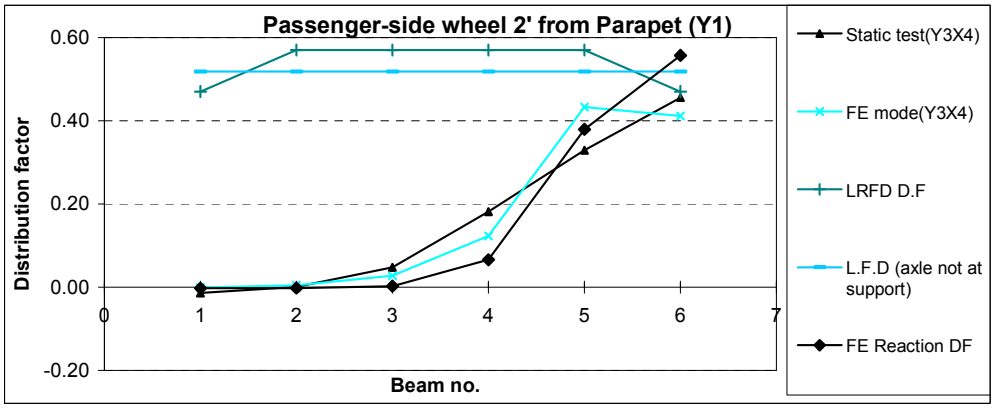


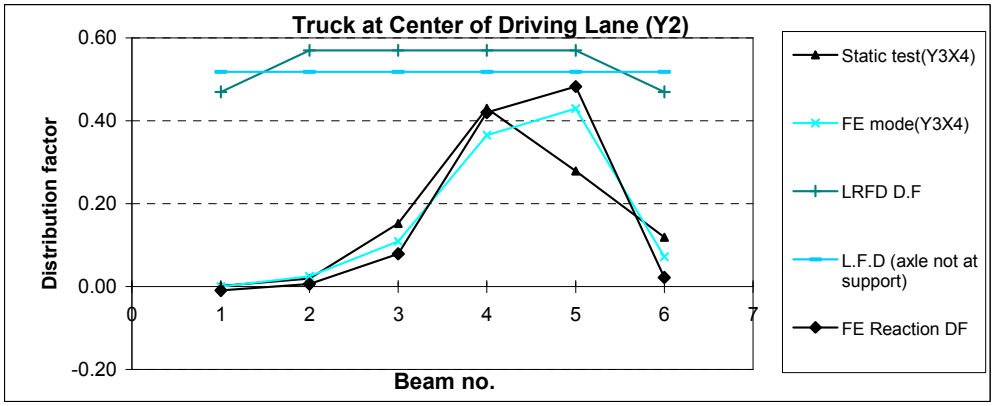


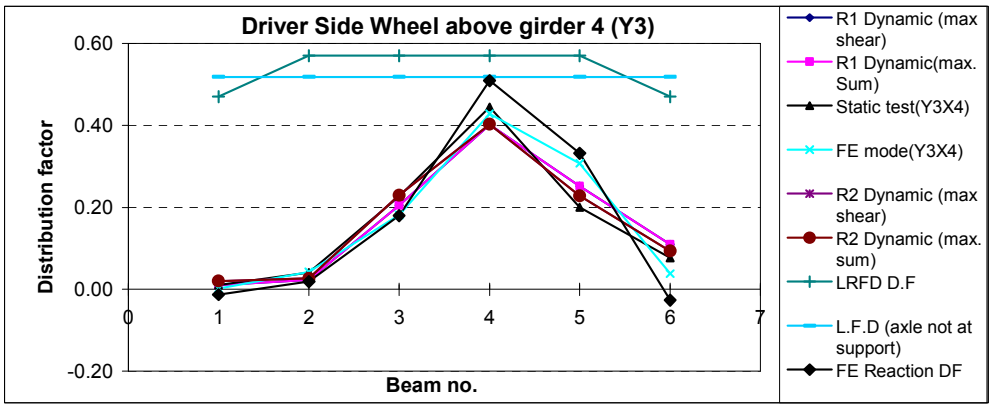


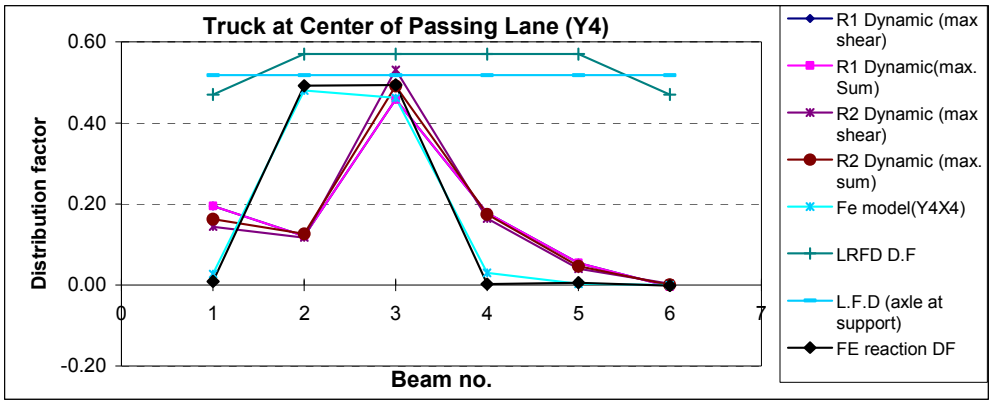
Graphical Comparison of Distribution Factors

Sn.0059-0041



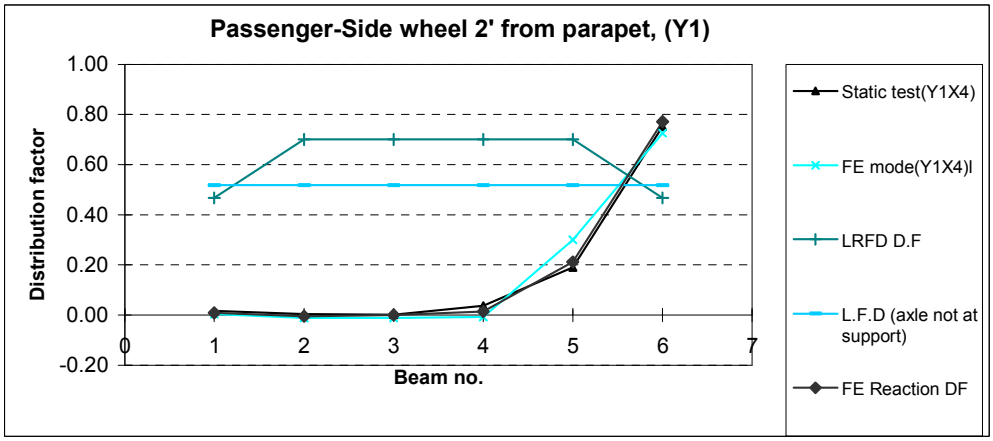


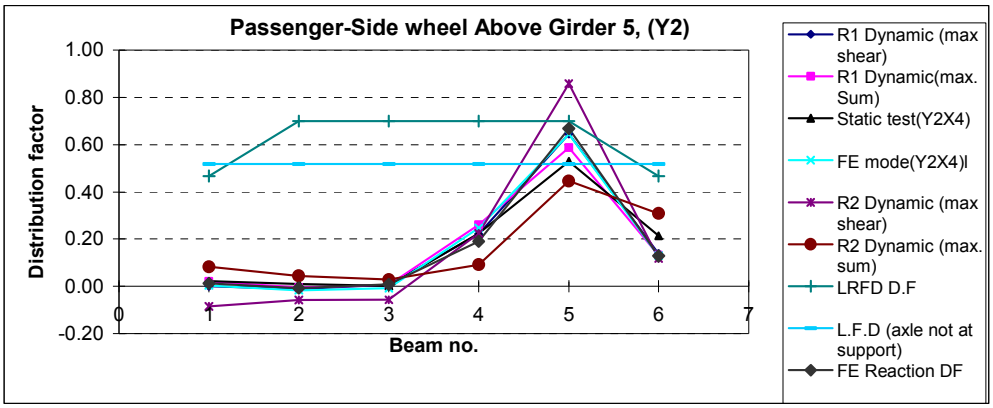


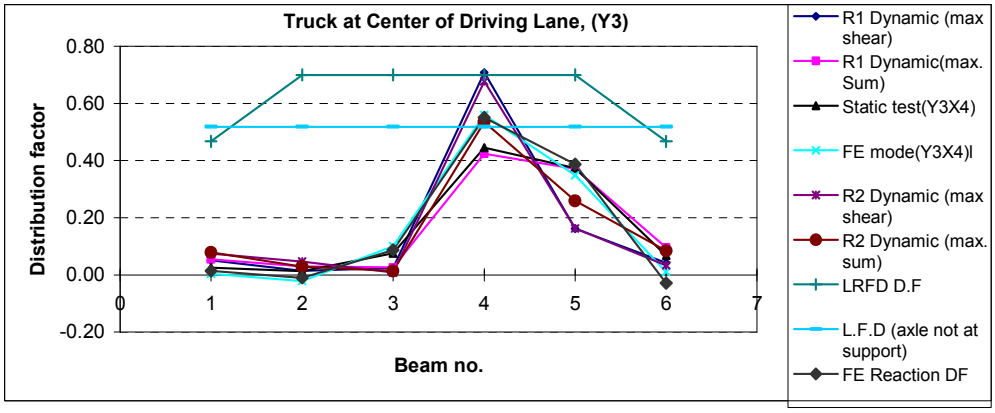


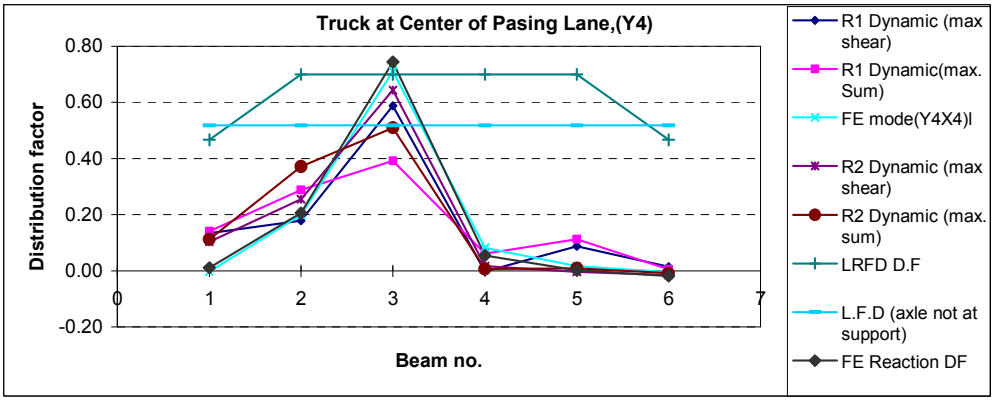
Graphical Comparison of Distribution Factors

Sn.0068-0046



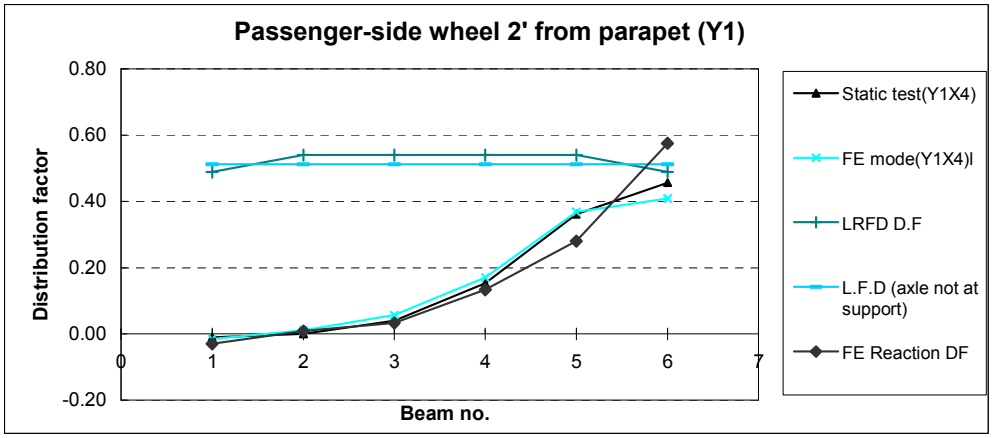


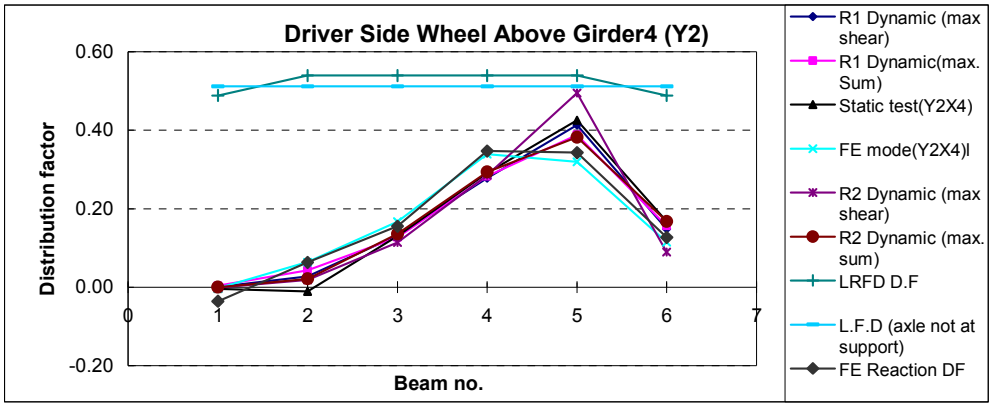


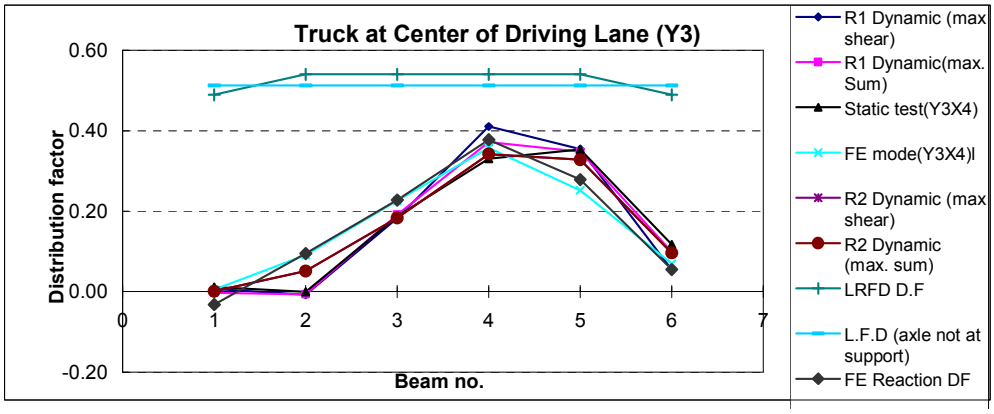


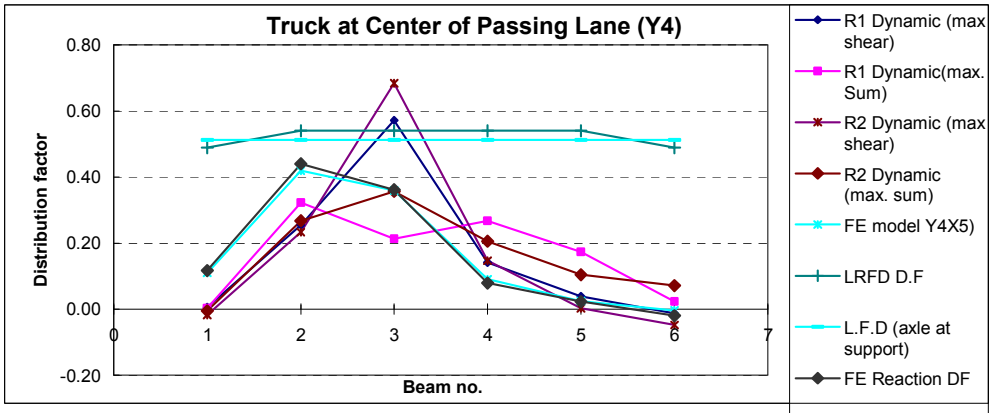
Graphical Comparison of Distribution Factors

Sn.0068-0049



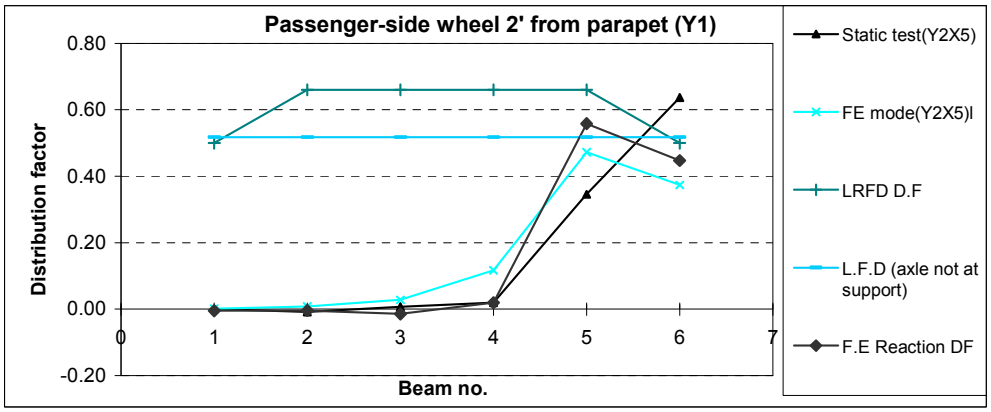


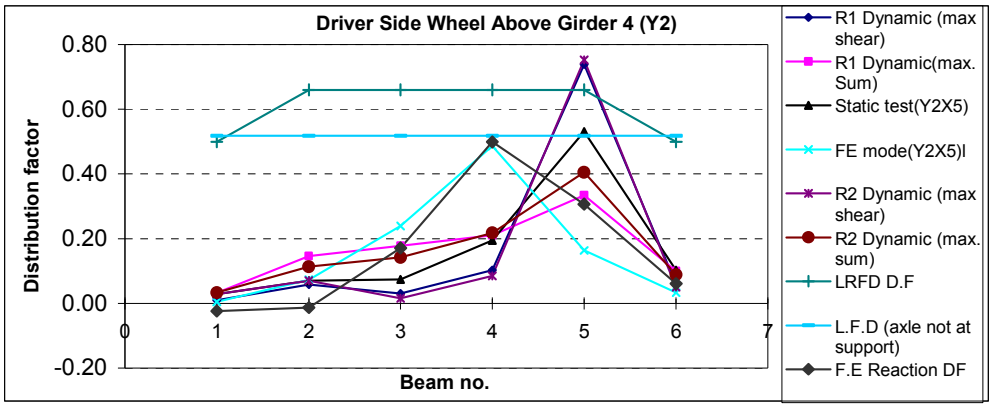


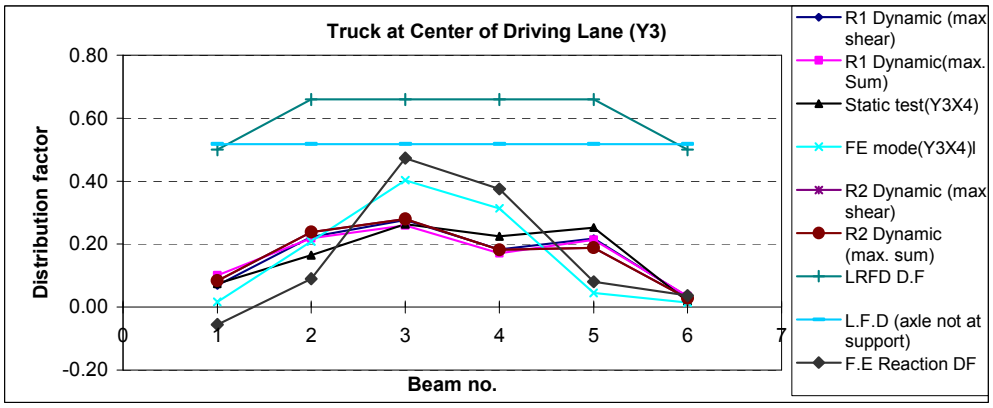


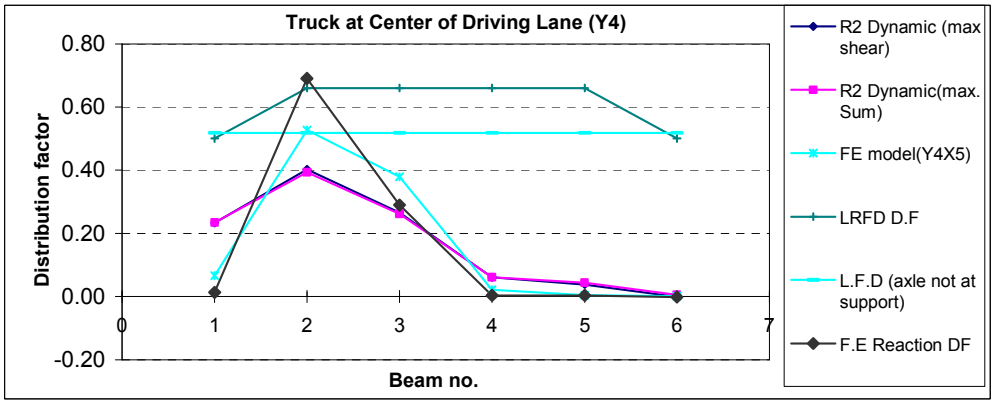
Graphical Comparison of Distribution Factors

Sn.0084-107



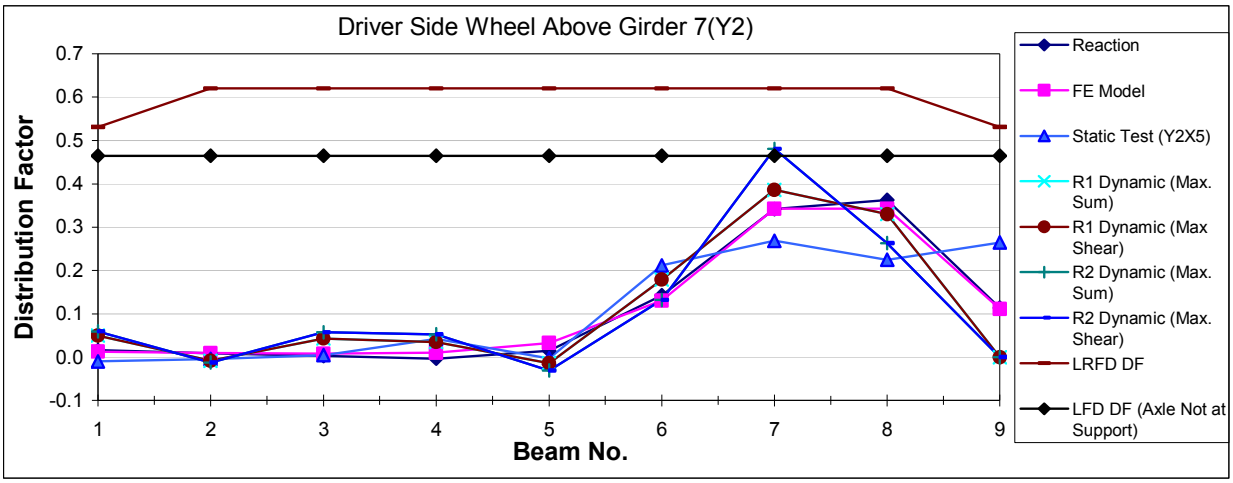


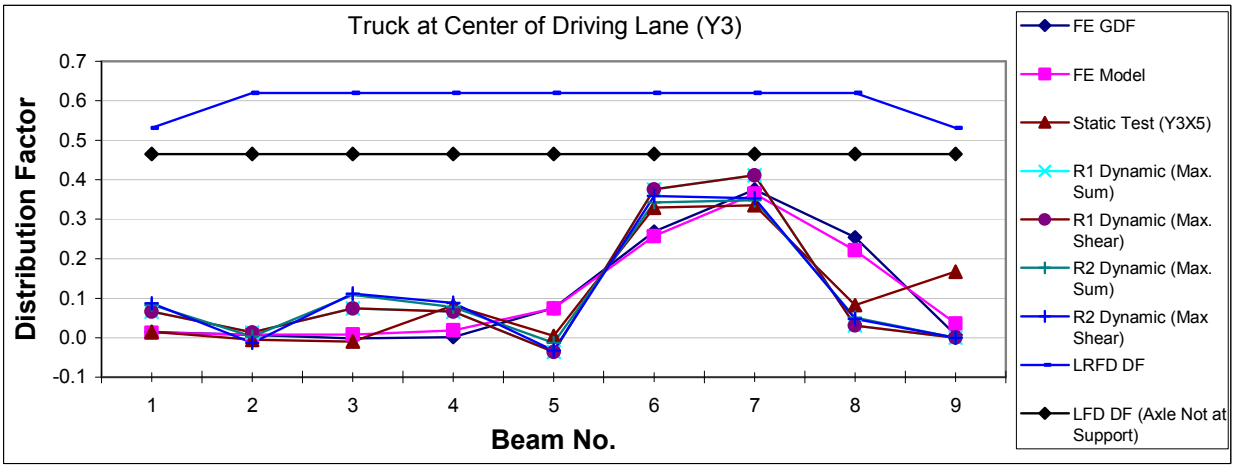


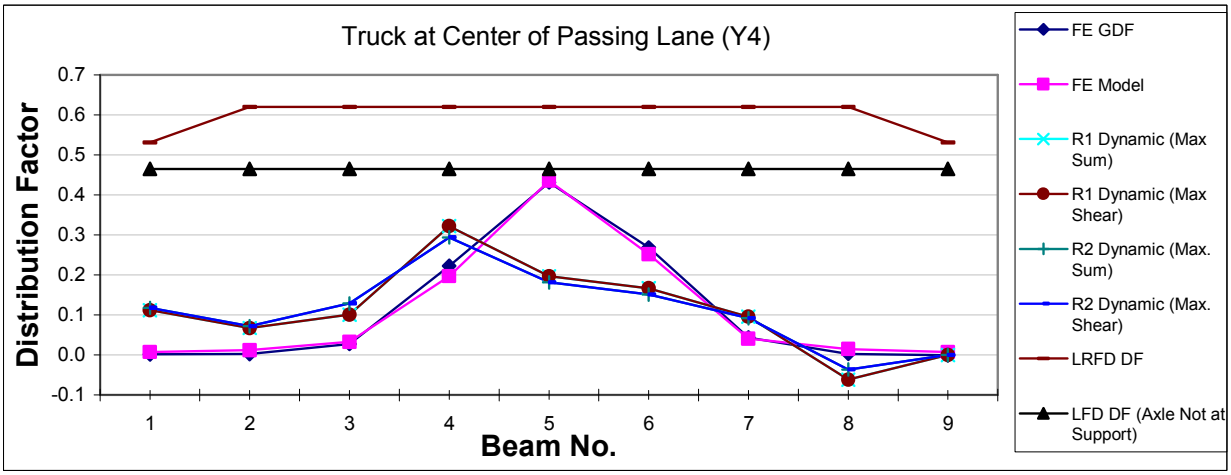


Graphical Comparison of Distribution Factors

054-0043







APPENDIX H - SUMMARY OF DISTRIBUTION FACTORS AND DESIGN SHEAR CALCULATIONS (FIRST SIX BRIDGES)

Summary of Distribution Factors and Design Shear

One-Way Traffic

LRFD Design						
Bridge SN #	1 059-0041	2 068-0048	3 068-0046	4 084-0107	5 054-0043	6 059-0040
Spacing (ft)	7.25	7.17	7.25	7.63	6.50	7.25
V_{truck} (k)	48.683	56.468	58.746	53.327	56.45	51.235
V_{tandem} (k)	47.101	48.576	49.515	47.968	48.84	47.554
V_{lane} (k)	9.802	20.343	25.691	14.362	19.51	11.968
Interior Beam Distribution Factor	**0.761**	**0.755**	**0.761**	**0.788**	**0.707**	**0.761**
One design lane loaded	0.650	0.647	0.650	0.665	0.620	0.650
Two or more design lanes loaded	0.761	0.755	0.761	0.788	0.707	0.761
Exterior Beam Distribution Factor	**0.559**	**0.586**	**0.559**	**0.600**	**0.531**	**0.559**
One design lane loaded	0.559	0.586	0.559	0.600	0.531	0.559
Two or more design lanes loaded	0.541	0.553	0.540	0.564	0.512	0.541
Web Thickness (in)	0.520	0.438	0.625	0.580	7.500	0.545
Deck Overhang (in)	13.5	16.000	13.500	14.250	15.000	13.5
L (ft)	32.208	68.583	84.500	48.333	67.604	40.083
θ (degrees)	10	0	59.12	39.92	0	10
IDOT Simplified Skew Factor	1.035	1.000	1.334	1.167	1.000	1.035
Skew Correction Factor	1.039	1.000	1.288	1.181	1.000	1.040
One design lane loaded(skew corrected)	0.675	0.647	0.837	0.785	0.620	0.676
Corrected Interior Beam DF	0.791	0.755	0.981	0.931	0.707	0.792
Design Shear (k)	**46.25**	**58.01**	**82.80**	**62.99**	**53.72**	**50.05**

Table E1

LFD Design						
Bridge SN #	1 059-0041	2 068-0048	3 068-0046	4 084-0107	5 054-0043	6 059-0040
Axle at support DF	1.62	1.60	1.62	1.69	1.46	1.62
Axle not at support DF	1.32	1.30	1.32	1.39	1.18	1.32
Axle not at support DF (one lane loaded)	1.04	1.02	1.04	1.09	0.93	1.04
$V_{support}$ (k)	16.28	16.13	16.32	16.19	16.24	16.227
$V_{notsupport}$ (k)	8.07	12.13	13.08	10.51	11.98	9.431
V_{point} (k)	26.45	26.21	26.52	26.31	26.39	26.368
Truck Loading (k)	37.01	41.69	43.69	41.90	37.89	38.73
Lane Loading (k)	23.89	30.33	34.41	28.19	27.12	25.27
Design Shear (k)	**37.01**	**41.69**	**43.69**	**41.90**	**37.89**	**38.73**

Table E2

Summary of Distribution Factors and Design Shear

Design Shear Summary (Two Way Traffic)

LRFD Design						
Bridge SN #	1 059-0041	2 068-0048	3 068-0046	4 084-0107	5 054-0043	6 059-0040
Spacing (ft)	7.25	7.17	7.25	7.63	6.50	7.25
V_{truck} (k)	49.228	60.559	63.666	55.931	60.42	52.931
V_{tandem} (k)	47.101	48.576	49.515	47.968	48.84	47.554
V_{lane} (k)	9.802	20.343	25.691	14.362	19.51	11.968
Interior Beam Distribution Factor	**0.761**	**0.755**	**0.761**	**0.788**	**0.707**	**0.761**
One design lane loaded	0.650	0.64667	0.650	0.665	0.620	0.650
Two or more design lanes loaded	0.761	0.75529	0.761	0.788	0.707	0.761
Exterior Beam Distribution Factor	**0.559**	**0.586**	**0.559**	**0.600**	**0.531**	**0.559**
One design lane loaded	0.559	0.586	0.559	0.600	0.531	0.559
Two or more design lanes loaded	0.541	0.553	0.540	0.564	0.512	0.541
Web Thickness (in)	0.520	0.438	0.625	0.580	7.500	0.545
Deck Overhang (in)	13.5	16.000	13.500	14.250	15.000	13.5
L (ft)	32.208	68.583	84.500	48.333	67.604	40.083
θ (degrees)	10	0	59.12	39.92	0	10
IDOT Simplified Skew Factor	1.035	1.000	1.334	1.167	1.000	1.035
Skew Correction Factor	1.039	1.000	1.288	1.181	1.000	1.040
One design lane loaded(skew corrected)	0.675	0.647	0.837	0.785	0.620	0.676
Corrected Interior Beam DF	0.791	0.755	0.981	0.931	0.707	0.792
Design Shear (k)	**46.68**	**61.10**	**87.58**	**65.41**	**56.52**	**51.39**

Table E3

LFD Design						
Bridge SN #	1 059-0041	2 068-0048	3 068-0046	4 084-0107	5 054-0043	6 059-0040
Axle at support DF	1.62	1.60	1.62	1.69	1.46	1.62
Axle not at support DF (2 or more lanes)	1.32	1.30	1.32	1.39	1.18	1.32
$V_{support}$ (k)	16.28	16.13	16.32	16.19	16.24	16.227
$V_{notsupport}$ (k)	8.07	12.13	13.08	10.51	11.98	9.431
$V_{notsupport4}$ (k)	0.38	2.07	2.48	1.34	1.99	0.895
V_{point} (k)	26.45	26.21	26.52	26.31	26.39	26.368
Truck Loading (k)	37.51	44.39	46.95	43.76	40.25	39.91
Lane Loading (k)	23.89	30.33	34.41	28.19	27.12	25.27
Design Shear (k)	**37.51**	**44.39**	**46.96**	**43.76**	**40.25**	**39.91**

Table E4

Live Load Shear by LRFD

Input data

Spacing of girder	$S := 7.25$ ft	
Modulus of elasticity of beam	$E_B := 29000$ Ksi	
Modulus of elasticity of deck	$E_D := 2900$ Ksi	
Thickness of slab	$t_s := 8.0$ in	
Span of the bridge	$L := 84.5$ ft	
Overall depth of the beam	$d := 58.76$ in	
Skew angle	$\theta := 1.031$ radians	(59.12 degree)
Girder C.L to edge of roadway	$d_e := 1.125$ ft	

Cross sectional dimension of the girder

Width of the flange	$b_{f1} := 14$ in	$b_{f2} := 12$ in
Thickness of the flange	$t_{f1} := .875$ in	$t_{f2} := .75$ in
Thickness of the web	$t_w := .625$ in	$d_w := 54$ in
Area of cross section	$A := 55$ in^2	

Calculated shear by SAP2000

$V_{truck1} := 58.746$ Kips (Oneway traffic)

$V_{truck2} := 63.666$ Kips (Twoway traffic)

$V_{tandem} := 49.515$ Kips

$V_{lane} := 25.691$ Kips

Calculation of skew factor

Modular ratio $n := \frac{E_B}{E_D}$ $n = 10.000$

Moment of Inertia

$$I := \left[b_{f1} \cdot \frac{t_{f1}^3}{12} + b_{f1} \cdot t_{f1} \cdot \left(\frac{d_w}{2} + \frac{t_{f1}}{2} \right)^2 + b_{f2} \cdot \frac{t_{f2}^3}{12} + b_{f2} \cdot t_{f2} \cdot \left(\frac{d_w}{2} + \frac{t_{f2}}{2} \right)^2 \right] + t_w \cdot \frac{d_w^3}{12}$$

$I = 24168.970$ in^4

Eccentricity between centroid of deck and girder $e_g := \frac{t_s}{2} + \frac{d}{2}$ $e_g = 33.380$ in

Longitudinal stiffness parameter $k_g := n \cdot \left(I + A \cdot e_g^{\,2} \right)$ $k_g = 854513.121$

Skew factor (LRFD Table 4.6.2.2.3c)

$$S_k := 1 + 0.2 \left(12 \cdot L \cdot \frac{t_s^{\,3}}{k_g} \right)^{0.3} \cdot \tan(\theta) \qquad S_k = 1.287$$

<u>Computation of live load distribution factor and live load shear using LRFD</u>

Interior beam distribution factor for shear (LRFD Table 4.6.2.2.3a-1)

Check for validity of LRFD approximate equations.

$3.5 \le S \le 16.0$

$20 \le L \le 240$

$4.5 \le t_s \le 12.0$

$10,000 \le K_g \le 7,000,000$

$N_b \ge 4$

One design lane loaded

$$Df1 := 0.36 + \frac{S}{25.0} \qquad Df1 = 0.650$$

Two or more design lane loaded

$$Df2 := 0.2 + \frac{S}{12} - \left(\frac{S}{35} \right)^2 \qquad Df2 = 0.761$$

Exterior beam distribution factor for shear (LRFD Table 4.6.2.2.3b-1)

One design lane loaded : Use lever rule

Using lever rule,

$$Df1ext := 1.2 \cdot \frac{(S + d_e - 5)}{S} \qquad Df1ext = 0.559$$ (For S+de > 8')

multiple presense factor,m = 1.2 (LRFD Table 3.6.1.1.2-1)

Two or more design lane loaded

$$Df2ext := (0.6) \cdot Df2 + \frac{d_e \cdot Df2}{10} \qquad Df2ext = 0.542$$

Shear distribution factor,

Interior dist. factor $DF := \max(Df1, Df2)$ $\qquad DF = 0.761$

Exterior dist. Factor $DFe := \max(Df1ext, Df2ext)$ $\qquad DFe = 0.559$

Corrected shear DF = Skew correction factor X shear DF

$$DFc := S_k \cdot \max(DF, DFe) \qquad DFc = 0.980$$

Maximum design shear for one way and two way traffic

$$V_{u1} := DFc \cdot (\max(V_{truck1}, V_{tandem}) + V_{lane}) \qquad V_{u1} = 82.755 \quad \text{Kips}$$

$$V_{u2} := DFc \cdot (\max(V_{truck2}, V_{tandem}) + V_{lane}) \qquad V_{u2} = 87.578 \quad \text{Kips}$$

Maximum design shear,

$$V_u := \max(V_{u1}, V_{u2})$$

$$V_u = 87.578 \quad \text{Kips}$$

Live Load Shear by LFD

Input data

Spacing of girder, $S = 7.250$ ft

Calculated shear by SAP2000 analysis

HS20-44 Truck Loading

Shear from first axle, $V_s := 16.32$ Kips

Shear from second axle, $V_{ns16} := 13.08$ Kips

Shear from third axle, $V_{ns4} := 2.48$ Kips

HS20-44 Lane Loading

Shear from uniform load, $V_{lane} = 25.691$ Kips

Shear from point load, $V_p := 26.52$ Kips

Calculations

Axle at support, $DF_s := 1 + \frac{(S-4)}{S} + \frac{(S-6)}{S}$ $DF_s = 1.621$ (LFD Art. 3.23.1.2) (For 6'<S<10')

Axle not at support, $DF_{ns} := \frac{S}{5.5}$ $DF_{ns} = 1.318$ (LFD Table 3.23.1)

One way traffic

Design shear using HS20-44 Truck loading

$Vtr1 := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns}$ $Vtr1 = 43.691$ Kips

Design shear using HS20-44 lane loading

$Vla := V_p \cdot \frac{DF_{ns}}{2} + V_{lane} \cdot \frac{DF_{ns}}{2}$ $Vla = 34.412$ Kips

Design shear,

$V_1 := \max(Vtr1, Vla)$ $V_1 = 43.691$ Kips

Two way traffic

Design shear using HS20-44 Truck loading

$Vtr2 := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns} + V_{ns4} \cdot DF_{ns}$ $Vtr2 = 46.961$ Kips

Design shear,

$V_2 := \max(Vtr2, Vla)$ $V_2 = 46.961$ Kips

Design shear computed using LFD

$V_{uL} := \max(V_1, V_2)$ $\qquad$ $V_{uL} = 46.961$ Kips

APPENDIX I – MODELING PARAMETERS FOR FIRST SIX BRIDGES

Table - Finite Element Model Descriptions

Structure No	Model Execution time (mins.)	Number of Frame Elements	Number of Shell elements	Number of Solid Elements	File Size (MB)
0068-0046	31	411	13536	14842	33.5
0059-0040	8	105	5052	6941	16.0
0059-0041	5.5	70	3996	5921	12.1
0068-0049	12.5	125	11088	12610	30.5
0084-0107	8	105	5626	7793	15.6

Table Constants for Shear Equation for Different Bridges

Bridge No	Beam Depth	tw	gage spacing	Y	K1,K3	K2
0068-0046	54	0.625	22	5	14.8168	25.9915
0059-0040	29.8	0.545	10.14	4	10.7248	8.3804
0059-0041	29.7	0.520	10.18	4	10.5318	8.5864
0068-0049	42	0.4375	16	5	13.8648	16.2708
0084-0107	33.1	0.580	11.70	4	11.0471	10.9957

note:
Y: dist. from the exterior strain gage rosette to the interior face of the flange

APPENDIX J – COMPARISON OF FINITE ELEMENT RESULTS TO FIELD RESULTS (SECOND SIX BRIDGES)

Comparison of Finite Element Results to Field Results							
Structure Number 003-0001 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y1X1	Beam 1	-0.063	-0.002	-0.012	0.000	-0.003	-0.010
	Beam 2	-0.026	0.029	0.023	0.008	0.005	-0.004
	Beam 3	-0.129	0.118	0.247	0.034	0.058	-0.021
	Beam 4	0.596	0.639	0.745	0.187	0.173	0.098
	Beam 5	2.100	1.300	1.127	0.380	0.262	0.345
	Beam 6	1.475	0.804	1.071	0.235	0.249	0.242
	Beam 7	2.137	0.535	1.093	0.156	0.255	0.351
	S	6.090	3.423	4.294			
Y1X2	Beam 1	-0.117	-0.014	0.086	-0.002	0.013	-0.011
	Beam 2	-0.045	0.037	0.118	0.006	0.017	-0.004
	Beam 3	-0.211	0.165	0.319	0.026	0.047	-0.019
	Beam 4	0.750	0.940	0.885	0.149	0.129	0.068
	Beam 5	3.655	2.341	1.548	0.372	0.226	0.330
	Beam 6	3.044	1.795	1.799	0.285	0.263	0.275
	Beam 7	3.997	1.028	2.098	0.163	0.306	0.361
	S	11.073	6.292	6.853			
Y1X3	Beam 1	-0.129	-0.020	0.105	-0.002	0.012	-0.008
	Beam 2	-0.062	0.030	0.125	0.003	0.014	-0.004
	Beam 3	-0.299	0.163	0.422	0.017	0.046	-0.018
	Beam 4	0.599	1.093	0.964	0.113	0.106	0.036
	Beam 5	5.194	3.298	2.023	0.340	0.222	0.308
	Beam 6	5.513	3.488	2.378	0.360	0.261	0.327
	Beam 7	6.043	1.636	3.109	0.169	0.341	0.358
	S	16.859	9.688	9.126			
Y1X4	Beam 1	-0.077	-0.020	0.148	-0.002	0.014	-0.003
	Beam 2	-0.042	0.011	0.080	0.001	0.007	-0.002
	Beam 3	-0.191	0.076	0.219	0.006	0.020	-0.009
	Beam 4	-0.392	0.591	0.503	0.045	0.047	-0.018
	Beam 5	5.627	3.605	1.753	0.274	0.162	0.252
	Beam 6	9.970	6.700	3.893	0.509	0.361	0.446
	Beam 7	7.472	2.208	4.195	0.168	0.389	0.334
	S	22.367	13.171	10.791			

Table -A1

Comparison of Finite Element Results to Field Results							
Structure Number 003-0001 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	0.011	0.049	-0.082	0.013	-0.022	0.002
	Beam 2	-0.114	0.094	0.209	0.025	0.056	-0.019
	Beam 3	0.358	0.514	0.635	0.134	0.171	0.060
	Beam 4	1.817	1.250	1.159	0.327	0.312	0.305
	Beam 5	1.997	1.102	0.989	0.288	0.267	0.336
	Beam 6	1.063	0.582	0.414	0.152	0.112	0.179
	Beam 7	0.818	0.231	0.386	0.060	0.104	0.137
	S	5.950	3.822	3.710			
Y2X2	Beam 1	-0.007	0.064	-0.118	0.009	-0.018	-0.001
	Beam 2	-0.189	0.132	0.390	0.019	0.060	-0.017
	Beam 3	0.405	0.767	0.859	0.108	0.132	0.037
	Beam 4	3.160	2.231	1.760	0.315	0.271	0.291
	Beam 5	4.023	2.312	2.076	0.327	0.320	0.371
	Beam 6	2.104	1.180	0.895	0.167	0.138	0.194
	Beam 7	1.358	0.394	0.631	0.056	0.097	0.125
	S	10.854	7.080	6.493			
Y2X3	Beam 1	-0.028	0.059	-0.150	0.005	-0.017	-0.002
	Beam 2	-0.271	0.126	0.427	0.011	0.047	-0.016
	Beam 3	0.221	0.889	1.145	0.081	0.127	0.013
	Beam 4	4.407	3.082	2.049	0.280	0.228	0.266
	Beam 5	6.957	4.220	2.848	0.383	0.316	0.420
	Beam 6	3.625	2.115	1.685	0.192	0.187	0.219
	Beam 7	1.667	0.513	0.995	0.047	0.111	0.101
	S	16.578	11.004	8.999			
Y2X4	Beam 1	-0.036	0.010	-0.233	0.001	-0.020	-0.002
	Beam 2	-0.178	0.050	0.148	0.003	0.013	-0.008
	Beam 3	-0.520	0.483	0.707	0.032	0.062	-0.023
	Beam 4	4.394	3.160	1.684	0.207	0.148	0.198
	Beam 5	11.380	7.399	4.543	0.484	0.399	0.513
	Beam 6	5.808	3.659	3.253	0.239	0.286	0.262
	Beam 7	1.316	0.522	1.292	0.034	0.113	0.059
	S	22.164	15.283	11.394			

Table –A2

Comparison of Finite Element Results to Field Results							
Structure Number 003-0001 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y3X1	Beam 1	-0.041	0.096	0.069	0.025	0.018	-0.007
	Beam 2	0.228	0.405	0.704	0.104	0.179	0.040
	Beam 3	1.518	1.109	0.995	0.286	0.253	0.269
	Beam 4	1.853	1.062	1.044	0.274	0.266	0.329
	Beam 5	1.142	0.670	0.642	0.173	0.163	0.203
	Beam 6	0.563	0.408	0.242	0.105	0.062	0.100
	Beam 7	0.370	0.127	0.236	0.033	0.060	0.066
	S	5.633	3.877	3.932			
Y3X2	Beam 1	-0.084	0.141	0.119	0.019	0.017	-0.008
	Beam 2	0.245	0.616	1.041	0.085	0.145	0.023
	Beam 3	2.570	1.920	1.739	0.264	0.243	0.245
	Beam 4	3.787	2.251	2.084	0.309	0.291	0.362
	Beam 5	2.317	1.390	1.412	0.191	0.197	0.221
	Beam 6	1.025	0.749	0.411	0.103	0.057	0.098
	Beam 7	0.614	0.217	0.352	0.030	0.049	0.059
	S	10.474	7.284	7.158			
Y3X3	Beam 1	-0.160	0.142	0.102	0.012	0.010	-0.010
	Beam 2	0.082	0.699	1.300	0.061	0.132	0.005
	Beam 3	3.406	2.575	2.094	0.226	0.213	0.211
	Beam 4	6.615	4.115	2.729	0.361	0.277	0.410
	Beam 5	4.063	2.522	2.596	0.221	0.264	0.252
	Beam 6	1.489	1.097	0.741	0.096	0.075	0.092
	Beam 7	0.651	0.252	0.283	0.022	0.029	0.040
	S	16.146	11.402	9.845			
Y4X4	Beam 1	-0.134	0.048	-0.034	0.003	-0.003	-0.006
	Beam 2	-0.435	0.376	0.904	0.024	0.070	-0.020
	Beam 3	2.859	2.386	1.832	0.151	0.142	0.131
	Beam 4	10.813	7.138	4.175	0.451	0.324	0.497
	Beam 5	6.736	4.414	4.388	0.279	0.341	0.309
	Beam 6	1.669	1.298	1.291	0.082	0.100	0.077
	Beam 7	0.265	0.170	0.311	0.011	0.024	0.012
	S	21.773	15.830	12.867			

Table –A3

Comparison of Finite Element Results to Field Results							
Structure Number 003-0004 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y1X1	Beam 1	-1.86	-0.882	-0.226	-0.050	-0.015	-0.091
	Beam 2	1.371	1.141	0.886	0.065	0.058	0.067
	Beam 3	3.699	3.423	3.408	0.194	0.223	0.181
	Beam 4	6.235	5.651	4.156	0.321	0.272	0.305
	Beam 5	10.995	8.29	7.041	0.470	0.461	0.538
	S	20.440	17.623	15.266			
Y1X2	Beam 1	-2.01	-0.967	-0.268	-0.042	-0.013	-0.075
	Beam 2	1.308	1.129	0.725	0.049	0.036	0.049
	Beam 3	4.473	4.063	4.072	0.176	0.200	0.167
	Beam 4	8.616	7.787	6.730	0.338	0.330	0.321
	Beam 5	14.441	11.015	9.106	0.478	0.447	0.538
	S	26.828	23.027	20.365			
Y1X3	Beam 1	-1.91	-0.911	-0.305	-0.034	-0.014	-0.061
	Beam 2	1.05	0.976	0.751	0.037	0.034	0.033
	Beam 3	4.742	4.126	4.593	0.155	0.207	0.151
	Beam 4	10.713	9.712	7.517	0.365	0.338	0.340
	Beam 5	16.902	12.736	9.656	0.478	0.435	0.537
	S	31.497	26.639	22.212			
Y1X4	Beam 1	-1.801	-0.849	-0.188	-0.031	-0.008	-0.054
	Beam 2	0.879	0.876	0.534	0.032	0.024	0.026
	Beam 3	4.744	3.968	4.314	0.145	0.194	0.141
	Beam 4	11.772	10.391	7.490	0.379	0.337	0.351
	Beam 5	17.951	13.048	10.094	0.476	0.454	0.535
	S	33.545	27.434	22.244			
Y1X5	Beam 1	-0.959	-0.413	-0.369	-0.018	-0.024	-0.034
	Beam 2	0.126	0.328	0.323	0.015	0.021	0.004
	Beam 3	3.25	2.341	3.054	0.104	0.200	0.114
	Beam 4	11.064	9.673	6.219	0.431	0.408	0.387
	Beam 5	15.094	10.531	6.015	0.469	0.395	0.528
	S	28.575	22.460	15.243			

Table-A4

Comparison of Finite Element Results to Field Results							
Structure Number 003-0004 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	0.051	0.602	0.608	0.034	0.043	0.002
	Beam 2	2.87	2.421	0.608	0.137	0.043	0.140
	Beam 3	4.508	3.881	4.061	0.220	0.289	0.221
	Beam 4	5.775	4.882	4.246	0.277	0.302	0.283
	Beam 5	7.229	5.839	4.528	0.331	0.322	0.354
	S	20.433	17.625	14.051			
Y2X2	Beam 1	-0.253	0.487	0.599	0.020	0.031	-0.009
	Beam 2	3.496	2.856	0.599	0.119	0.031	0.126
	Beam 3	6.921	5.983	6.072	0.249	0.310	0.250
	Beam 4	8.961	7.659	7.134	0.319	0.364	0.324
	Beam 5	8.549	6.998	5.191	0.292	0.265	0.309
	S	27.674	23.983	19.595			
Y2X3	Beam 1	-0.478	0.343	0.362	0.013	0.016	-0.015
	Beam 2	3.399	2.689	0.362	0.098	0.016	0.108
	Beam 3	8.252	7.072	7.770	0.258	0.350	0.262
	Beam 4	11.427	10.027	8.391	0.366	0.378	0.363
	Beam 5	8.904	7.257	5.312	0.265	0.239	0.283
	S	31.504	27.388	22.198			
Y2X4	Beam 1	-0.576	0.284	0.295	0.010	0.013	-0.017
	Beam 2	3.279	2.527	0.295	0.090	0.013	0.098
	Beam 3	9.053	7.424	8.202	0.263	0.362	0.270
	Beam 4	12.903	10.907	8.660	0.387	0.382	0.384
	Beam 5	8.9	7.064	5.194	0.250	0.229	0.265
	S	33.559	28.206	22.648			
Y2X5	Beam 1	-0.63	0.076	0.025	0.003	0.001	-0.022
	Beam 2	1.84	1.209	0.025	0.051	0.001	0.064
	Beam 3	8.342	6.588	7.097	0.277	0.389	0.292
	Beam 4	13.059	11.36	7.988	0.477	0.438	0.457
	Beam 5	5.967	4.563	3.086	0.192	0.169	0.209
	S	28.578	23.796	18.221			

Table-A5

Comparison of Finite Element Results to Field Results							
Structure Number 003-0006 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing
		FE Model	FE Model	Field Results	FE Model	Field Results	FE Model
Y1X1	Beam 1	-0.325	-0.148	0.013	-0.017	0.003	-0.030
	Beam 2	-0.143	-0.078	0.123	-0.009	0.024	-0.013
	Beam 3	0.058	0.208	0.065	0.025	0.013	0.005
	Beam 4	0.921	0.933	0.667	0.110	0.131	0.085
	Beam 5	2.069	1.721	0.519	0.203	0.102	0.190
	Beam 6	2.55	2.243	2.451	0.265	0.481	0.235
	Beam 7	5.732	3.591	1.258	0.424	0.247	0.528
	S	10.862	8.470	5.096			
Y1X2	Beam 1	-0.391	-0.176	-0.009	-0.012	-0.001	-0.021
	Beam 2	-0.202	-0.117	0.209	-0.008	0.024	-0.011
	Beam 3	-0.035	0.201	0.141	0.014	0.016	-0.002
	Beam 4	1.138	1.241	0.927	0.084	0.106	0.060
	Beam 5	3.561	2.984	1.032	0.203	0.118	0.188
	Beam 6	5.27	4.434	4.378	0.301	0.501	0.278
	Beam 7	9.627	6.168	2.053	0.419	0.235	0.508
	S	18.968	14.735	8.731			
Y1X3	Beam 1	-0.376	-0.168	-0.053	-0.009	-0.005	-0.016
	Beam 2	-0.206	-0.123	0.229	-0.007	0.022	-0.009
	Beam 3	-0.09	0.165	0.127	0.009	0.012	-0.004
	Beam 4	1.038	1.215	0.865	0.067	0.084	0.044
	Beam 5	4.241	3.574	1.252	0.196	0.121	0.181
	Beam 6	7.319	6.048	5.586	0.332	0.539	0.312
	Beam 7	11.532	7.494	2.358	0.412	0.228	0.492
	S	23.458	18.205	10.364			
Y1X4	Beam 1	-0.328	-0.145	-0.162	-0.007	-0.017	-0.012
	Beam 2	-0.191	-0.116	0.212	-0.005	0.023	-0.007
	Beam 3	-0.119	0.12	0.126	0.005	0.014	-0.004
	Beam 4	0.783	1.06	0.690	0.048	0.074	0.028
	Beam 5	4.717	3.988	1.172	0.180	0.126	0.168
	Beam 6	9.996	8.216	5.284	0.372	0.569	0.355
	Beam 7	13.281	8.985	1.966	0.406	0.212	0.472
	S	28.139	22.108	9.287			
Y1X5	Beam 1	-0.135	-0.06	-0.163	-0.003	-0.018	-0.005
	Beam 2	-0.084	-0.055	0.181	-0.002	0.019	-0.003
	Beam 3	-0.067	0.033	0.066	0.001	0.007	-0.002
	Beam 4	0.007489	0.339	0.520	0.015	0.056	0.000
	Beam 5	3.452	2.93	0.986	0.133	0.106	0.123
	Beam 6	12.326	9.891	5.047	0.447	0.543	0.438
	Beam 7	11.524	8.417	1.657	0.381	0.178	0.410
	S	27.023	21.495	8.293			

Table-A6

Comparison of Finite Element Results to Field Results							
Structure Number 003-0006 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	-0.566	-0.221	0.107	-0.026	0.018	-0.052
	Beam 2	0.201	0.229	0.459	0.027	0.079	0.018
	Beam 3	1.045	1.004	0.645	0.116	0.111	0.096
	Beam 4	2.267	1.813	0.951	0.210	0.164	0.209
	Beam 5	2.716	1.935	0.615	0.224	0.106	0.250
	Beam 6	2.833	1.956	2.070	0.227	0.358	0.261
	Beam 7	2.373	1.908	0.940	0.221	0.163	0.218
	S	10.869	8.624	5.787			
Y2X2	Beam 1	-0.71	-0.276	0.132	-0.018	0.013	-0.037
	Beam 2	0.15	0.228	0.630	0.015	0.060	0.008
	Beam 3	1.245	1.29	0.924	0.085	0.088	0.066
	Beam 4	3.685	3.018	1.421	0.199	0.135	0.194
	Beam 5	5.57	4.089	1.462	0.269	0.139	0.293
	Beam 6	5.773	4.069	4.281	0.268	0.407	0.304
	Beam 7	3.271	2.778	1.656	0.183	0.158	0.172
	S	18.984	15.196	10.506			
Y2X3	Beam 1	-0.692	-0.267	0.073	-0.014	0.006	-0.029
	Beam 2	0.098	0.193	0.587	0.010	0.046	0.004
	Beam 3	1.125	1.248	0.969	0.066	0.076	0.048
	Beam 4	4.206	3.491	1.582	0.185	0.124	0.179
	Beam 5	7.582	5.679	2.189	0.300	0.172	0.323
	Beam 6	7.781	5.588	5.390	0.296	0.423	0.332
	Beam 7	3.36	2.977	1.939	0.157	0.152	0.143
	S	23.460	18.909	12.730			
Y2X4	Beam 1	-0.613	-0.234	-0.022	-0.010	-0.002	-0.022
	Beam 2	0.05	0.146	0.592	0.006	0.045	0.002
	Beam 3	0.868	1.084	1.015	0.047	0.077	0.031
	Beam 4	4.434	3.702	1.480	0.161	0.112	0.157
	Beam 5	10.096	7.796	2.524	0.339	0.190	0.358
	Beam 6	10.189	7.586	5.628	0.330	0.424	0.362
	Beam 7	3.145	2.919	2.044	0.127	0.154	0.112
	S	28.169	22.999	13.260			
Y2X5	Beam 1	-0.256	-0.095	-0.064	-0.004	-0.005	-0.009
	Beam 2	0.006556	0.044	0.270	0.002	0.020	0.000
	Beam 3	0.096	0.366	0.543	0.016	0.041	0.003
	Beam 4	2.802	2.394	1.191	0.104	0.090	0.099
	Beam 5	11.66	9.318	3.002	0.405	0.226	0.414
	Beam 6	11.361	8.885	5.591	0.386	0.422	0.403
	Beam 7	1.351	1.561	1.455	0.068	0.110	0.048
	S	27.021	22.473	11.989			

Table-A7

Comparison of Finite Element Results to Field Results							
Structure Number 003-0006 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y3X1	Beam 1	-0.679	-0.163	0.243	-0.019	0.036	-0.062
	Beam 2	1.021	0.831	0.956	0.094	0.141	0.094
	Beam 3	2.147	1.753	1.092	0.199	0.161	0.197
	Beam 4	2.766	1.977	0.974	0.225	0.144	0.254
	Beam 5	2.794	1.97	0.740	0.224	0.109	0.257
	Beam 6	2.557	1.797	1.855	0.204	0.274	0.235
	Beam 7	0.272	0.639	0.903	0.073	0.134	0.025
	S	10.878	8.804	6.763			
Y3X2	Beam 1	-0.934	-0.241	0.190	-0.016	0.017	-0.049
	Beam 2	1.178	1.029	1.339	0.066	0.117	0.062
	Beam 3	3.315	2.781	1.984	0.179	0.173	0.175
	Beam 4	5.459	4.016	1.855	0.259	0.161	0.288
	Beam 5	5.679	4.134	1.737	0.266	0.151	0.299
	Beam 6	4.202	3.063	3.148	0.197	0.274	0.221
	Beam 7	0.082	0.75	1.232	0.048	0.107	0.004
	S	18.981	15.532	11.484			
Y3X3	Beam 1	-0.947	-0.249	0.144	-0.013	0.010	-0.040
	Beam 2	1.055	0.98	1.351	0.051	0.097	0.045
	Beam 3	3.63	3.092	2.264	0.160	0.162	0.155
	Beam 4	7.289	5.466	2.520	0.283	0.180	0.310
	Beam 5	7.729	5.748	2.622	0.297	0.188	0.329
	Beam 6	4.83	3.604	3.686	0.186	0.264	0.206
	Beam 7	-0.105	0.686	1.373	0.035	0.098	-0.004
	S	23.481	19.327	13.960			
Y3X4	Beam 1	-0.869	-0.233	0.217	-0.010	0.015	-0.031
	Beam 2	0.83	0.84	1.323	0.036	0.089	0.029
	Beam 3	3.59	3.096	2.358	0.132	0.158	0.127
	Beam 4	9.511	7.383	2.656	0.315	0.178	0.338
	Beam 5	10.28	7.888	2.996	0.337	0.201	0.365
	Beam 6	5.13	3.902	3.969	0.167	0.266	0.182
	Beam 7	-0.304	0.555	1.416	0.024	0.095	-0.011
	S	28.168	23.431	14.936			
Y3X5	Beam 1	-0.371	-0.098	-0.057	-0.004	-0.004	-0.013
	Beam 2	0.161	0.288	0.730	0.012	0.049	0.006
	Beam 3	1.833	1.7	1.607	0.073	0.108	0.065
	Beam 4	10.497	8.477	2.444	0.362	0.164	0.373
	Beam 5	12.02	9.56	3.677	0.408	0.246	0.427
	Beam 6	3.321	2.636	2.816	0.113	0.189	0.118
	Beam 7	-0.448	0.147	0.917	0.006	0.061	-0.016
	S	27.013	22.710	12.134			

Table-A8

Comparison of Finite Element Results to Field Results							
Structure Number 060-0028 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y1X1	Beam 1	-0.130	-0.056	-0.194	-0.017	-0.059	-0.025
	Beam 2	-0.054	-0.028	-0.004	-0.008	-0.001	-0.010
	Beam 3	-0.007	0.051	0.143	0.015	0.044	-0.001
	Beam 4	0.356	0.341	0.473	0.102	0.144	0.069
	Beam 5	0.991	0.772	0.663	0.231	0.201	0.192
	Beam 6	1.665	0.984	0.916	0.295	0.278	0.322
	Beam 7	2.343	1.273	1.295	0.381	0.393	0.454
	S	5.164	3.337	3.292			
Y1X2	Beam 1	-0.275	-0.117	-0.228	-0.014	-0.030	-0.022
	Beam 2	-0.101	-0.054	0.030	-0.007	0.004	-0.008
	Beam 3	-0.016	0.105	0.188	0.013	0.025	-0.001
	Beam 4	0.669	0.668	0.943	0.082	0.123	0.053
	Beam 5	2.225	1.749	1.364	0.215	0.178	0.177
	Beam 6	4.226	2.624	2.293	0.323	0.298	0.336
	Beam 7	5.854	3.148	3.093	0.388	0.403	0.465
	S	12.582	8.123	7.684			
Y1X3	Beam 1	-0.280	-0.121	-0.244	-0.009	-0.021	-0.013
	Beam 2	-0.137	-0.072	-0.007	-0.005	-0.001	-0.006
	Beam 3	-0.092	0.089	0.170	0.006	0.014	-0.004
	Beam 4	0.634	0.766	1.301	0.054	0.111	0.029
	Beam 5	3.408	2.639	1.877	0.187	0.160	0.156
	Beam 6	8.300	5.401	3.871	0.384	0.330	0.380
	Beam 7	9.999	5.376	4.761	0.382	0.406	0.458
	S	21.832	14.078	11.730			
Y1X4	Beam 1	-0.174	-0.079	-0.323	-0.003	-0.027	-0.004
	Beam 2	-0.112	-0.065	-0.049	-0.003	-0.004	-0.003
	Beam 3	-0.178	0.026	0.024	0.001	0.002	-0.004
	Beam 4	-0.009	0.494	1.046	0.020	0.089	0.000
	Beam 5	4.849	3.599	1.752	0.143	0.149	0.119
	Beam 6	18.684	12.094	4.635	0.479	0.395	0.459
	Beam 7	17.671	9.162	4.657	0.363	0.397	0.434
	S	40.731	25.231	11.742			

Table-A9

Comparison of Finite Element Results to Field Results							
Structure Number 060-0028 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	-0.076	-0.022	-0.197	-0.006	-0.061	-0.015
	Beam 2	-0.037	0.009	0.006	0.003	0.002	-0.007
	Beam 3	0.149	0.195	0.225	0.055	0.070	0.029
	Beam 4	0.800	0.659	0.833	0.187	0.258	0.157
	Beam 5	1.278	0.890	0.844	0.253	0.261	0.251
	Beam 6	1.926	0.945	0.670	0.268	0.207	0.379
	Beam 7	1.048	0.848	0.854	0.241	0.264	0.206
	S	5.088	3.524	3.236			
Y2X2	Beam 1	-0.156	-0.044	-0.211	-0.005	-0.026	-0.012
	Beam 2	-0.070	0.021	0.065	0.002	0.008	-0.006
	Beam 3	0.269	0.391	0.483	0.044	0.060	0.021
	Beam 4	1.716	1.419	1.664	0.161	0.206	0.137
	Beam 5	3.400	2.419	2.093	0.275	0.258	0.270
	Beam 6	4.932	2.639	2.030	0.300	0.251	0.392
	Beam 7	2.480	1.952	1.974	0.222	0.244	0.197
	S	12.571	8.797	8.098			
Y2X3	Beam 1	-0.175	-0.054	-0.268	-0.003	-0.022	-0.008
	Beam 2	-0.142	-0.003	0.053	0.000	0.004	-0.007
	Beam 3	0.190	0.434	0.636	0.028	0.051	0.009
	Beam 4	2.258	1.881	2.378	0.120	0.191	0.103
	Beam 5	6.704	4.960	2.698	0.317	0.217	0.307
	Beam 6	9.446	5.578	4.028	0.357	0.324	0.433
	Beam 7	3.555	2.835	2.904	0.181	0.234	0.163
	S	21.836	15.631	12.428			
Y2X4	Beam 1	-0.071	-0.026	-0.318	-0.001	-0.025	-0.002
	Beam 2	-0.089	-0.019	0.023	-0.001	0.002	-0.003
	Beam 3	-0.151	0.147	0.333	0.008	0.026	-0.005
	Beam 4	1.166	1.070	2.209	0.055	0.173	0.041
	Beam 5	10.236	7.112	3.316	0.365	0.259	0.359
	Beam 6	14.525	8.996	4.824	0.461	0.377	0.510
	Beam 7	2.891	2.229	2.396	0.114	0.187	0.101
	S	28.507	19.509	12.783			

Table-A10

Comparison of Finite Element Results to Field Results							
Structure Number 060-0028 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y3X1	Beam 1	-0.052	0.032	-0.040	0.008	-0.012	-0.010
	Beam 2	0.215	0.210	0.237	0.055	0.068	0.042
	Beam 3	0.771	0.650	0.435	0.171	0.125	0.152
	Beam 4	1.266	0.874	1.066	0.230	0.306	0.249
	Beam 5	1.356	0.902	0.831	0.237	0.238	0.267
	Beam 6	1.372	0.802	0.625	0.211	0.179	0.270
	Beam 7	0.154	0.331	0.331	0.087	0.095	0.030
	S	5.082	3.801	3.486			
Y3X2	Beam 1	-0.098	0.073	0.005	0.008	0.001	-0.008
	Beam 2	0.404	0.422	0.513	0.044	0.059	0.032
	Beam 3	1.659	1.404	1.258	0.148	0.146	0.132
	Beam 4	3.399	2.395	2.231	0.252	0.259	0.270
	Beam 5	3.791	2.611	2.216	0.275	0.257	0.302
	Beam 6	3.149	1.904	1.579	0.201	0.183	0.251
	Beam 7	0.263	0.678	0.820	0.071	0.095	0.021
	S	12.567	9.487	8.622			
Y3X3	Beam 1	-0.204	0.045	-0.001	0.003	0.000	-0.009
	Beam 2	0.342	0.468	0.604	0.028	0.048	0.016
	Beam 3	2.200	1.872	1.782	0.112	0.142	0.101
	Beam 4	6.760	4.960	3.704	0.296	0.295	0.310
	Beam 5	7.966	5.685	3.005	0.339	0.240	0.365
	Beam 6	4.832	2.978	2.375	0.178	0.189	0.221
	Beam 7	-0.058	0.754	1.075	0.045	0.086	-0.003
	S	21.838	16.762	12.545			
Y3X4	Beam 1	-0.128	0.000	-0.162	0.000	-0.013	-0.004
	Beam 2	-0.087	0.161	0.310	0.008	0.024	-0.003
	Beam 3	1.142	1.066	1.489	0.052	0.116	0.040
	Beam 4	10.297	7.101	4.759	0.346	0.371	0.361
	Beam 5	13.543	9.265	3.672	0.452	0.286	0.475
	Beam 6	4.324	2.621	2.064	0.128	0.161	0.152
	Beam 7	-0.574	0.291	0.707	0.014	0.055	-0.020
	S	28.517	20.505	12.839			

Table-A11

Comparison of Finite Element Results to Field Results							
Structure Number 060-0056 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y1X1	Beam 1	-0.406	-0.108	0.015	-0.016	0.002	-0.041
	Beam 2	-0.167	0.075	0.000	0.011	0.000	-0.017
	Beam 3	0.424	0.66	0.468	0.096	0.067	0.042
	Beam 4	2.189	1.802	1.043	0.262	0.149	0.219
	Beam 5	2.525	1.702	1.921	0.247	0.274	0.252
	Beam 6	4.817	1.918	1.989	0.279	0.284	0.481
	Beam 7	0.628	0.83	1.578	0.121	0.225	0.063
	S	10.010	6.879	7.015			
Y1X2	Beam 1	-0.48	-0.131	0.017	-0.011	0.001	-0.027
	Beam 2	-0.243	0.057	0.012	0.005	0.001	-0.014
	Beam 3	0.229	0.704	0.476	0.058	0.039	0.013
	Beam 4	2.958	2.552	1.197	0.211	0.099	0.168
	Beam 5	5.046	3.564	3.516	0.294	0.290	0.287
	Beam 6	7.974	3.216	3.843	0.265	0.317	0.454
	Beam 7	2.072	2.159	3.055	0.178	0.252	0.118
	S	17.556	12.121	12.116			
Y1X3	Beam 1	-0.461	-0.13	-0.010	-0.009	-0.001	-0.021
	Beam 2	-0.249	0.042	-0.018	0.003	-0.001	-0.011
	Beam 3	0.07	0.628	0.393	0.042	0.027	0.003
	Beam 4	2.92	2.616	1.108	0.173	0.076	0.134
	Beam 5	6.636	4.816	4.335	0.319	0.299	0.306
	Beam 6	9.354	3.829	4.992	0.253	0.344	0.431
	Beam 7	3.446	3.307	3.717	0.219	0.256	0.159
	S	21.716	15.108	14.517			
Y1X4	Beam 1	-0.408	-0.121	-0.022	-0.007	-0.001	-0.016
	Beam 2	-0.23	0.026	-0.038	0.001	-0.002	-0.009
	Beam 3	-0.068	0.511	0.267	0.027	0.016	-0.003
	Beam 4	2.49	2.505	0.987	0.135	0.059	0.095
	Beam 5	8.383	4.976	4.745	0.267	0.283	0.321
	Beam 6	10.463	6.283	6.546	0.338	0.391	0.401
	Beam 7	5.478	4.422	4.274	0.238	0.255	0.210
	S	26.108	18.602	16.760			
Y1X5	Beam 1	-0.195	-0.067	-0.020	-0.004	-0.001	-0.008
	Beam 2	-0.119	0.001455	0.026	0.000	0.002	-0.005
	Beam 3	-0.147	0.202	0.029	0.011	0.002	-0.006
	Beam 4	0.746	1.209	0.404	0.067	0.026	0.030
	Beam 5	8.273	6.387	3.874	0.354	0.253	0.336
	Beam 6	8.432	6.492	7.278	0.360	0.475	0.343
	Beam 7	7.603	3.794	3.724	0.211	0.243	0.309
	S	24.593	18.018	15.314			

Table-A12

Comparison of Finite Element Results to Field Results							
Structure Number 060-0056 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	-0.74	-0.167	0.019	-0.024	0.003	-0.076
	Beam 2	0.2	0.469	0.304	0.068	0.042	0.021
	Beam 3	1.627	1.553	1.473	0.226	0.204	0.168
	Beam 4	3.169	2.318	2.048	0.338	0.284	0.327
	Beam 5	2.402	1.45	1.374	0.211	0.191	0.248
	Beam 6	0.85	0.483	1.029	0.070	0.143	0.088
	Beam 7	2.183	0.761	0.957	0.111	0.133	0.225
	S	9.691	6.867	7.205			
Y2X2	Beam 1	-0.919	-0.21	0.023	-0.017	0.002	-0.053
	Beam 2	0.04	0.492	0.220	0.040	0.018	0.002
	Beam 3	1.896	2.011	1.664	0.162	0.138	0.110
	Beam 4	5.485	4.138	3.130	0.334	0.259	0.319
	Beam 5	5.244	3.436	3.373	0.277	0.279	0.305
	Beam 6	2.084	1.302	2.245	0.105	0.186	0.121
	Beam 7	3.365	1.228	1.443	0.099	0.119	0.196
	S	17.195	12.397	12.099			
Y2X3	Beam 1	-0.895	-0.21	0.021	-0.014	0.001	-0.042
	Beam 2	-0.044	0.44	0.227	0.028	0.015	-0.002
	Beam 3	1.679	1.965	1.627	0.127	0.108	0.080
	Beam 4	6.446	4.946	3.493	0.320	0.231	0.305
	Beam 5	7.208	4.923	4.847	0.319	0.321	0.342
	Beam 6	3.035	1.981	3.086	0.128	0.204	0.144
	Beam 7	3.672	1.399	1.812	0.091	0.120	0.174
	S	21.101	15.444	15.113			
Y2X4	Beam 1	-0.807	-0.197	0.024	-0.010	0.001	-0.031
	Beam 2	-0.117	0.359	0.198	0.019	0.011	-0.005
	Beam 3	1.24	1.797	1.446	0.093	0.080	0.048
	Beam 4	7.269	5.614	3.433	0.292	0.189	0.283
	Beam 5	9.945	7.126	6.837	0.370	0.376	0.387
	Beam 6	4.424	3.019	4.262	0.157	0.234	0.172
	Beam 7	3.775	1.529	1.985	0.079	0.109	0.147
	S	25.729	19.247	18.186			
Y2X5	Beam 1	-0.403	-0.113	-0.006	-0.006	0.000	-0.017
	Beam 2	-0.098	0.144	0.082	0.008	0.005	-0.004
	Beam 3	0.087	0.817	0.708	0.043	0.041	0.004
	Beam 4	5.676	4.463	2.101	0.237	0.122	0.233
	Beam 5	11.392	8.611	7.809	0.458	0.452	0.468
	Beam 6	5.228	3.726	5.037	0.198	0.292	0.215
	Beam 7	2.435	1.162	1.547	0.062	0.090	0.100
	S	24.317	18.810	17.277			

Table-A13

Comparison of Finite Element Results to Field Results							
Structure Number 060-0056 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y3X1	Beam 1	-0.951	-0.07	0.315	-0.010	0.043	-0.103
	Beam 2	1.981	1.723	1.233	0.246	0.167	0.214
	Beam 3	2.943	2.209	2.425	0.315	0.328	0.319
	Beam 4	2.507	1.615	1.590	0.230	0.215	0.271
	Beam 5	1.625	1.057	1.011	0.151	0.137	0.176
	Beam 6	0.862	0.436	0.650	0.062	0.088	0.093
	Beam 7	0.271	0.039	0.169	0.006	0.023	0.029
	S	9.238	7.009	7.393			
Y3X2	Beam 1	-1.447	-0.143	0.349	-0.011	0.027	-0.087
	Beam 2	2.442	2.305	1.352	0.179	0.105	0.147
	Beam 3	5.273	4.061	3.846	0.315	0.299	0.317
	Beam 4	5.338	3.619	3.712	0.281	0.288	0.321
	Beam 5	3.223	2.204	2.168	0.171	0.168	0.194
	Beam 6	1.512	0.821	1.170	0.064	0.091	0.091
	Beam 7	0.292	0.033	0.278	0.003	0.022	0.018
	S	16.633	12.900	12.873			
Y3X3	Beam 1	-1.538	-0.171	0.360	-0.010	0.023	-0.074
	Beam 2	2.263	2.297	1.202	0.141	0.076	0.109
	Beam 3	6.387	4.989	4.316	0.306	0.272	0.308
	Beam 4	7.334	5.125	5.150	0.315	0.325	0.354
	Beam 5	4.272	3.016	3.076	0.185	0.194	0.206
	Beam 6	1.791	1.017	1.437	0.062	0.091	0.086
	Beam 7	0.235	0.021	0.307	0.001	0.019	0.011
	S	20.744	16.294	15.849			
Y3X4	Beam 1	-1.485	-0.185	0.302	-0.009	0.016	-0.059
	Beam 2	1.803	2.123	1.033	0.106	0.054	0.072
	Beam 3	7.286	5.769	4.318	0.287	0.227	0.290
	Beam 4	9.857	7.151	6.995	0.356	0.368	0.393
	Beam 5	5.536	4.043	4.396	0.201	0.232	0.221
	Beam 6	1.963	1.167	1.683	0.058	0.089	0.078
	Beam 7	0.146	0.0066	0.257	0.000	0.014	0.006
	S	25.106	20.075	18.982			
Y3X5	Beam 1	-0.822	-0.137	0.129	-0.007	0.007	-0.035
	Beam 2	0.392	1.007	0.394	0.052	0.022	0.016
	Beam 3	5.95	4.787	2.742	0.246	0.151	0.250
	Beam 4	11.119	8.429	7.899	0.434	0.434	0.467
	Beam 5	5.748	4.396	5.463	0.226	0.300	0.241
	Beam 6	1.486	0.968	1.435	0.050	0.079	0.062
	Beam 7	-0.049	-0.016	0.118	-0.001	0.007	-0.002
	S	23.824	19.434	18.180			

Table-A14

Comparison of Finite Element Results to Field Results							
Structure Number 060-0319 Position: Y1							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y1X1	Beam 1	0.354	-0.053	-0.063	-0.004	-0.005	0.023
	Beam 2	-0.299	-0.057	0.036	-0.004	0.003	-0.019
	Beam 3	0.008	0.347	0.601	0.026	0.047	0.001
	Beam 4	0.922	1.866	1.636	0.140	0.128	0.059
	Beam 5	2.916	4.098	4.806	0.307	0.376	0.187
	Beam 6	11.732	7.149	5.771	0.536	0.451	0.750
	S	15.633	13.350	12.785			
Y1X2	Beam 1	0.418	-0.051	-0.077	-0.003	-0.004	0.018
	Beam 2	-0.396	-0.077	0.059	-0.004	0.003	-0.017
	Beam 3	-0.120	0.327	0.532	0.017	0.031	-0.005
	Beam 4	1.321	2.285	1.860	0.116	0.107	0.058
	Beam 5	4.827	6.519	6.886	0.330	0.396	0.212
	Beam 6	16.674	10.770	8.137	0.545	0.468	0.734
	S	22.724	19.773	17.396			
Y1X3	Beam 1	0.435	-0.046	-0.088	-0.002	-0.004	0.016
	Beam 2	-0.423	-0.079	0.008	-0.003	0.000	-0.016
	Beam 3	-0.204	0.291	0.512	0.013	0.026	-0.008
	Beam 4	1.508	2.316	1.789	0.100	0.091	0.057
	Beam 5	6.119	8.028	8.163	0.345	0.415	0.231
	Beam 6	19.071	12.751	9.298	0.548	0.472	0.719
	S	26.506	23.261	19.681			
Y1X4	Beam 1	0.428	-0.039	-0.166	-0.001	-0.008	0.014
	Beam 2	-0.426	-0.075	0.009	-0.003	0.000	-0.014
	Beam 3	-0.293	0.248	0.355	0.009	0.016	-0.010
	Beam 4	1.671	2.175	1.573	0.081	0.073	0.055
	Beam 5	7.729	9.813	9.487	0.364	0.438	0.254
	Beam 6	21.325	14.830	10.425	0.550	0.481	0.701
	S	30.434	26.952	21.684			
Y1X5	Beam 1	0.252	-0.018	-0.080	-0.001	-0.004	0.008
	Beam 2	-0.266	-0.040	-0.014	-0.001	-0.001	-0.009
	Beam 3	-0.345	0.126	0.050	0.005	0.002	-0.011
	Beam 4	1.425	0.966	0.702	0.036	0.032	0.047
	Beam 5	9.053	10.778	9.804	0.400	0.452	0.297
	Beam 6	19.186	14.415	7.956	0.535	0.367	0.630
	S	29.305	26.227	18.418			

Table-A15

Comparison of Finite Element Results to Field Results							
Structure Number 060-0319 Position: Y2							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model (SAP2000)
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y2X1	Beam 1	0.243	-0.233	0.121	-0.017	0.006	0.016
	Beam 2	0.251	0.536	0.921	0.039	0.045	0.016
	Beam 3	1.715	2.244	4.072	0.163	0.198	0.111
	Beam 4	3.224	4.084	5.572	0.296	0.272	0.208
	Beam 5	5.620	4.945	6.874	0.359	0.335	0.363
	Beam 6	4.416	2.204	2.958	0.160	0.144	0.285
	S	15.469	13.780	20.517			
Y2X2	Beam 1	0.271	-0.253	0.113	-0.012	0.004	0.012
	Beam 2	0.208	0.526	0.938	0.026	0.035	0.009
	Beam 3	2.449	2.833	4.750	0.140	0.178	0.108
	Beam 4	5.553	6.742	7.817	0.333	0.293	0.246
	Beam 5	8.925	7.958	9.868	0.393	0.370	0.395
	Beam 6	5.210	2.457	3.158	0.121	0.119	0.230
	S	22.616	20.263	26.643			
Y2X3	Beam 1	0.283	-0.240	0.049	-0.010	0.002	0.011
	Beam 2	0.146	0.472	0.846	0.020	0.029	0.006
	Beam 3	2.774	2.944	4.745	0.124	0.162	0.105
	Beam 4	7.073	8.421	9.115	0.355	0.311	0.268
	Beam 5	10.847	9.780	11.569	0.412	0.395	0.411
	Beam 6	5.291	2.360	2.940	0.099	0.100	0.200
	S	26.414	23.737	29.264			
Y2X4	Beam 1	0.293	-0.212	0.088	-0.008	0.003	0.010
	Beam 2	0.059	0.396	0.712	0.014	0.023	0.002
	Beam 3	3.035	2.868	4.444	0.105	0.142	0.100
	Beam 4	8.883	10.382	10.454	0.378	0.334	0.293
	Beam 5	12.949	11.887	13.226	0.433	0.423	0.427
	Beam 6	5.117	2.109	2.370	0.077	0.076	0.169
	S	30.336	27.430	31.293			
Y2X5	Beam 1	0.241	-0.092	0.044	-0.003	0.001	0.008
	Beam 2	-0.129	0.164	0.280	0.006	0.009	-0.004
	Beam 3	2.494	1.538	2.217	0.056	0.071	0.082
	Beam 4	10.224	11.622	10.460	0.424	0.334	0.337
	Beam 5	13.443	12.483	10.470	0.455	0.335	0.443
	Beam 6	2.996	0.847	0.790	0.031	0.025	0.099
	S	29.269	26.562	24.261			

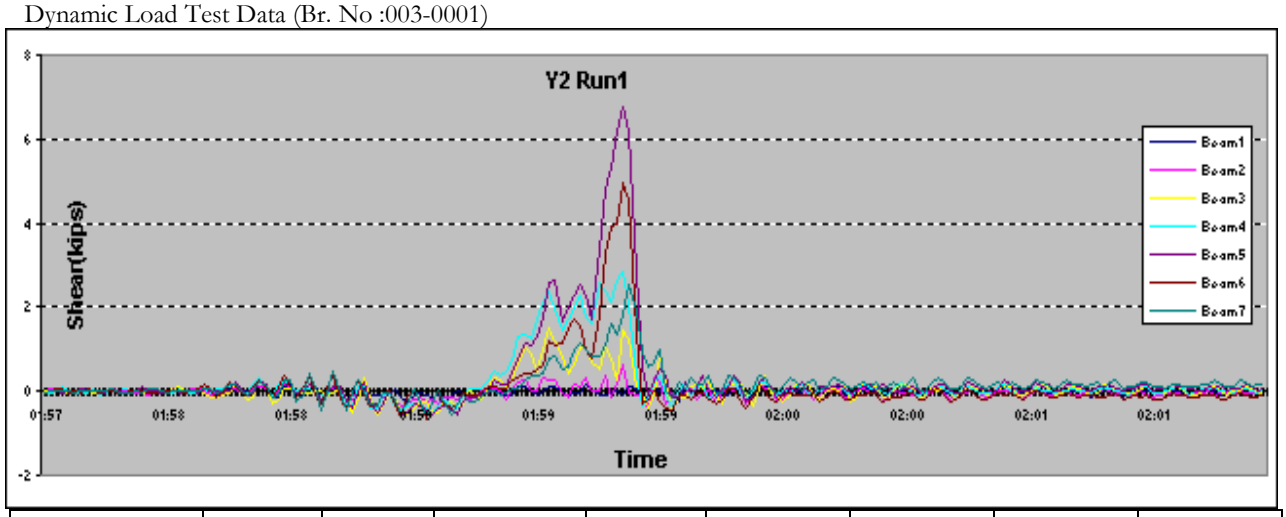
Table-A16

Comparison of Finite Element Results to Field Results							
Structure Number 060-0319 Position: Y3							
Load Position	Beam	Reaction (k)	Shear Force D Away from Support (k)		Shear GDF D Away from Support		Shear GDF at Bearing FE Model
		FE Model	FE Model	Field Results	FE Model	Field Results	
Y3X1	Beam 1	0.228	-0.246	0.163	-0.018	0.007	0.015
	Beam 2	0.631	1.030	1.781	0.074	0.080	0.041
	Beam 3	2.267	3.003	5.375	0.216	0.243	0.146
	Beam 4	4.051	4.586	6.249	0.330	0.282	0.260
	Beam 5	6.240	4.480	5.980	0.322	0.270	0.401
	Beam 6	2.150	1.051	2.581	0.076	0.117	0.138
	S	15.567	13.904	22.129			
Y3X2	Beam 1	0.203	-0.279	0.151	-0.014	0.005	0.009
	Beam 2	0.741	1.077	1.805	0.053	0.063	0.033
	Beam 3	3.526	4.216	6.758	0.207	0.237	0.155
	Beam 4	6.938	7.882	9.217	0.387	0.324	0.305
	Beam 5	9.181	6.524	8.069	0.320	0.283	0.404
	Beam 6	2.128	0.962	2.485	0.047	0.087	0.094
	S	22.717	20.382	28.485			
Y3X3	Beam 1	0.187	-0.267	0.094	-0.011	0.003	0.007
	Beam 2	0.730	0.984	1.661	0.041	0.053	0.028
	Beam 3	4.224	4.744	7.283	0.199	0.233	0.159
	Beam 4	8.824	10.062	10.915	0.421	0.350	0.333
	Beam 5	10.629	7.561	9.068	0.317	0.290	0.401
	Beam 6	1.928	0.799	2.198	0.033	0.070	0.073
	S	26.522	23.883	31.220			
Y3X4	Beam 1	0.181	-0.234	0.124	-0.008	0.004	0.006
	Beam 2	0.669	0.813	1.362	0.029	0.042	0.022
	Beam 3	4.948	5.172	7.500	0.187	0.229	0.163
	Beam 4	11.053	12.749	12.902	0.461	0.393	0.363
	Beam 5	11.977	8.533	9.160	0.308	0.279	0.393
	Beam 6	1.620	0.632	1.747	0.023	0.053	0.053
	S	30.448	27.665	32.796			
Y3X5	Beam 1	0.167	-0.083	-0.032	-0.003	-0.001	0.005
	Beam 2	0.285	0.216	0.520	0.008	0.016	0.009
	Beam 3	4.809	4.102	5.003	0.148	0.153	0.158
	Beam 4	12.863	15.173	12.356	0.548	0.377	0.422
	Beam 5	10.711	6.543	5.483	0.237	0.167	0.352
	Beam 6	0.543	0.146	0.758	0.005	0.023	0.018
	S	29.378	26.097	24.088			

Table-A17

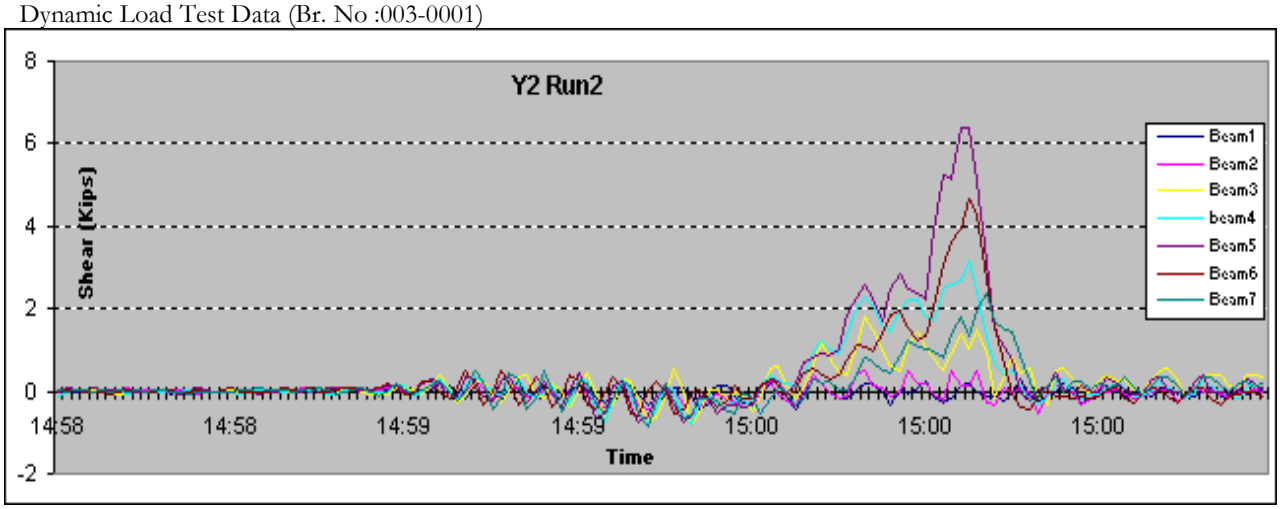
APPENDIX K – DYNAMIC TEST RESULTS (SECOND SIX BRIDGES)

Dynamic Load Test Data (Br. No :003-0001)



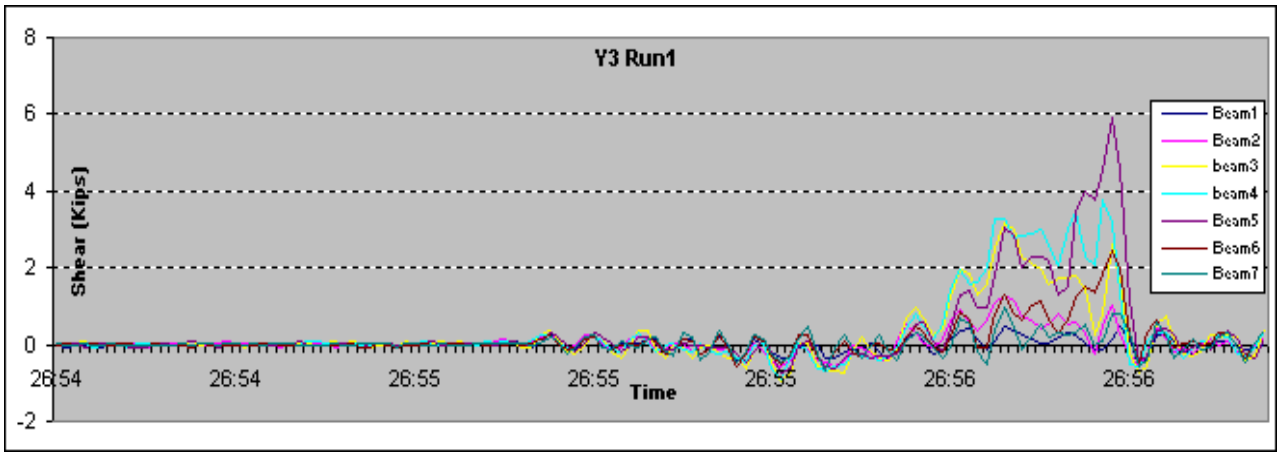
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total shear
01:58.8	-0.282	-0.153	-0.242	-0.212	-0.373	-0.321	-0.239	-1.823
01:58.8	-0.084	-0.145	-0.257	-0.368	-0.465	-0.421	-0.574	-2.314
01:58.8	-0.002	-0.195	-0.398	-0.417	-0.565	-0.312	-0.316	-2.205
01:58.8	-0.026	-0.103	-0.282	-0.071	-0.233	-0.030	-0.080	-0.824
01:58.8	-0.101	-0.195	0.056	0.070	-0.165	-0.088	-0.248	-0.670
01:58.9	-0.084	-0.269	-0.084	0.045	-0.157	-0.088	-0.223	-0.861
01:58.9	-0.109	-0.004	-0.192	0.079	-0.099	-0.063	-0.139	-0.528
01:58.9	0.006	0.012	0.139	0.285	-0.024	0.129	-0.014	0.534
01:58.9	0.023	0.087	0.304	0.458	0.293	0.136	0.003	1.305
01:58.9	-0.026	0.003	0.279	0.367	0.168	0.053	-0.098	0.747
01:59.0	-0.093	-0.178	0.130	0.483	0.159	0.053	-0.056	0.500
01:59.0	-0.068	0.054	0.262	0.748	0.434	0.245	0.070	1.744
11:01:59	0.098	0.236	0.676	1.302	0.768	0.311	0.078	3.469
01:59.0	0.106	0.294	1.049	1.352	1.125	0.420	0.279	4.625
01:59.0	-0.010	-0.013	0.867	1.261	1.117	0.429	0.346	3.997
01:59.1	-0.109	0.021	0.461	1.707	1.294	0.528	0.371	4.272
01:59.1	0.006	0.310	0.966	2.112	1.766	0.619	0.421	6.201
01:59.1	0.131	0.278	1.486	2.376	2.598	1.210	0.790	8.869
01:59.1	0.139	0.277	1.214	1.987	2.649	1.111	0.823	8.200
01:59.1	-0.026	-0.029	0.834	1.434	1.657	1.127	0.513	5.510
01:59.2	-0.067	-0.153	0.404	1.690	2.017	1.493	0.581	5.965
01:59.2	-0.043	0.145	0.635	1.971	2.299	1.734	0.973	7.715
01:59.2	-0.017	0.095	1.040	2.293	2.541	1.542	1.123	8.619
01:59.2	0.147	0.326	1.048	1.748	2.274	1.010	0.991	7.545
01:59.2	0.032	0.012	0.677	1.608	1.733	0.770	0.831	5.662
01:59.3	-0.084	0.021	0.535	2.600	3.373	1.810	0.848	9.102
01:59.3	-0.117	0.384	1.074	2.376	4.821	3.283	1.082	12.903
01:59.3	-0.034	-0.170	0.784	2.112	5.295	3.923	1.592	13.502
01:59.3	0.015	0.153	0.271	2.651	6.220	3.997	1.376	14.683
01:59.3	**-0.117**	**0.641**	**1.430**	**2.848**	**6.753**	**4.972**	**1.835**	**18.363**
01:59.4	0.090	-0.021	1.264	2.072	6.170	4.564	2.561	16.700
01:59.4	0.081	-0.070	0.131	0.434	2.823	1.411	1.927	6.736
01:59.4	-0.316	-0.162	-0.059	-0.335	0.574	-0.285	0.956	0.372
01:59.4	-0.118	-0.401	-0.423	-0.145	-0.116	-0.220	0.563	-0.859
01:59.4	0.073	0.302	-0.076	0.235	0.261	0.031	0.672	1.497

Dynamic Load Test Data (Br. No :003-0001)



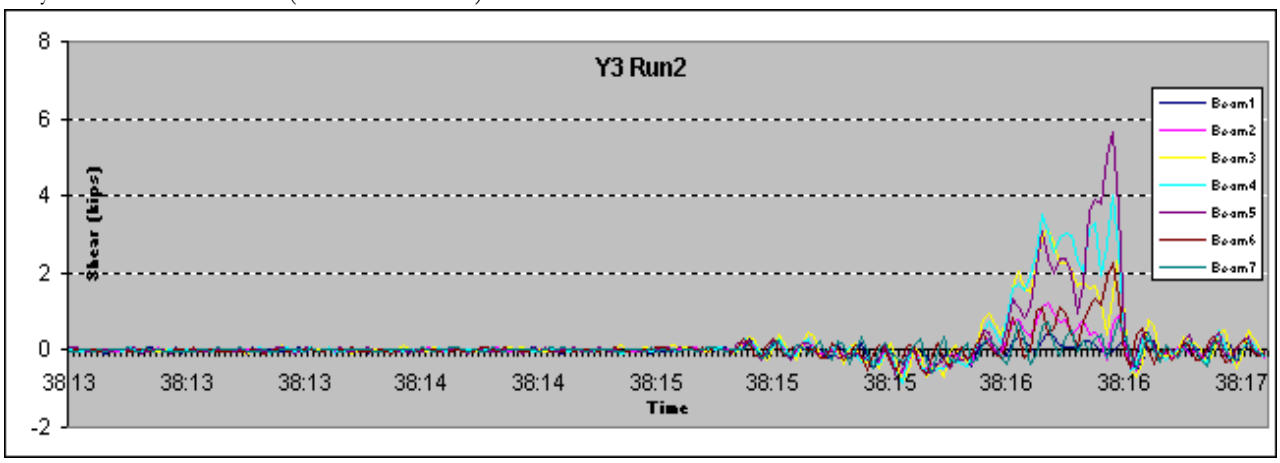
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total shear
14:59.6	-0.282	-0.153	-0.242	-0.212	-0.373	-0.321	-0.239	-1.823
14:59.6	-0.084	-0.145	-0.257	-0.368	-0.465	-0.421	-0.574	-2.314
14:59.6	-0.002	-0.195	-0.398	-0.417	-0.565	-0.312	-0.316	-2.205
14:59.6	-0.026	-0.103	-0.282	-0.071	-0.233	-0.030	-0.080	-0.824
14:59.6	-0.101	-0.195	0.056	0.070	-0.165	-0.088	-0.248	-0.670
14:59.7	-0.084	-0.269	-0.084	0.045	-0.157	-0.088	-0.223	-0.861
14:59.7	-0.109	-0.004	-0.192	0.079	-0.099	-0.063	-0.139	-0.528
14:59.7	0.006	0.012	0.139	0.285	-0.024	0.129	-0.014	0.534
14:59.7	0.023	0.087	0.304	0.458	0.293	0.136	0.003	1.305
14:59.7	-0.026	0.003	0.279	0.367	0.168	0.053	-0.098	0.747
14:59.8	-0.093	-0.178	0.130	0.483	0.159	0.053	-0.056	0.500
14:59.8	-0.068	0.054	0.262	0.748	0.434	0.245	0.070	1.744
14:59.8	0.098	0.236	0.676	1.302	0.768	0.311	0.078	3.469
14:59.8	0.106	0.294	1.049	1.352	1.125	0.420	0.279	4.625
14:59.8	-0.010	-0.013	0.867	1.261	1.117	0.429	0.346	3.997
14:59.9	-0.109	0.021	0.461	1.707	1.294	0.528	0.371	4.272
14:59.9	0.006	0.310	0.966	2.112	1.766	0.619	0.421	6.201
14:59.9	0.131	0.278	1.486	2.376	2.598	1.210	0.790	8.869
14:59.9	0.139	0.277	1.214	1.987	2.649	1.111	0.823	8.200
14:59.9	-0.026	-0.029	0.834	1.434	1.657	1.127	0.513	5.510
15:00.0	-0.067	-0.153	0.404	1.690	2.017	1.493	0.581	5.965
15:00.0	**-0.043**	**0.145**	**0.635**	**1.971**	**2.299**	**1.734**	**0.973**	**7.715**
11:15:00	**-0.017**	**0.095**	**1.040**	**2.293**	**2.541**	**1.542**	**1.123**	**8.619**
15:00.0	0.147	0.326	1.048	1.748	2.274	1.010	0.991	7.545
15:00.0	0.032	0.012	0.677	1.608	1.733	0.770	0.831	5.662
15:00.1	-0.084	0.021	0.535	2.600	3.373	1.810	0.848	9.102
15:00.1	-0.117	0.384	1.074	2.376	4.821	3.283	1.082	12.903
15:00.1	-0.034	-0.170	0.784	2.112	5.295	3.923	1.592	13.502
15:00.1	0.015	0.153	0.271	2.651	6.220	3.997	1.376	14.683
15:00.1	-0.117	0.641	1.430	2.848	6.753	4.972	1.835	18.363
15:00.2	0.090	-0.021	1.264	2.072	6.170	4.564	2.561	16.700
15:00.2	0.081	-0.070	0.131	0.434	2.823	1.411	1.927	6.736
15:00.2	-0.316	-0.162	-0.059	-0.335	0.574	-0.285	0.956	0.372
15:00.2	-0.118	-0.401	-0.423	-0.145	-0.116	-0.220	0.563	-0.859
15:00.2	0.073	0.302	-0.076	0.235	0.261	0.031	0.672	1.497

Dynamic Load Test Data (Br. No :003-0001)



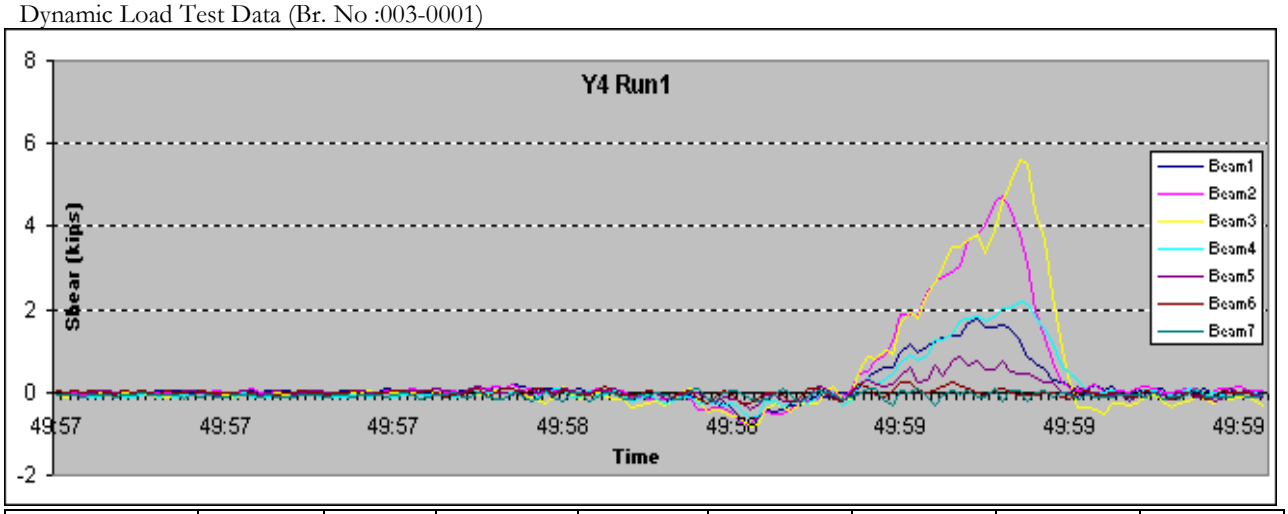
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total shear
26:55.7	-0.418	-0.408	-0.417	-0.286	-0.300	-0.137	-0.193	-2.160
26:55.7	-0.178	0.080	-0.194	-0.063	-0.267	-0.161	-0.384	-1.167
26:55.7	0.161	0.527	0.700	0.441	0.089	0.205	0.075	2.197
26:55.7	0.325	0.320	0.990	0.779	0.532	0.463	0.308	3.717
26:55.7	0.070	0.030	0.699	0.458	0.557	0.296	0.225	2.335
26:55.8	-0.228	-0.084	0.236	0.151	0.082	-0.087	-0.050	0.019
26:55.8	-0.145	0.138	0.401	0.516	-0.184	-0.195	-0.327	0.205
26:55.8	0.161	0.652	1.245	1.458	0.432	0.197	-0.083	4.061
26:55.8	0.376	0.932	1.973	1.953	1.289	0.861	0.701	8.086
26:55.8	0.401	0.535	1.832	1.557	1.421	0.621	0.551	6.918
26:55.9	0.127	0.361	1.269	1.633	0.948	-0.054	-0.209	4.076
26:55.9	-0.120	0.635	1.567	2.028	0.964	-0.062	-0.518	4.494
26:55.9	0.112	1.089	2.519	3.260	1.797	0.820	0.352	9.949
26:55.9	0.483	1.271	3.173	3.268	3.079	1.278	0.969	13.522
26:55.9	0.384	1.155	2.974	2.796	2.821	0.795	0.467	11.392
26:56.0	0.260	0.759	2.262	2.829	2.038	0.612	-0.133	8.627
26:56.0	0.153	0.643	2.097	2.889	2.305	1.020	0.201	9.307
11:26:56	0.029	0.420	1.948	2.996	2.288	1.153	0.535	9.368
26:56.0	0.029	0.543	1.585	2.600	2.164	0.612	0.217	7.749
26:56.0	0.185	0.800	1.734	2.070	1.298	0.296	0.301	6.685
26:56.1	0.285	0.502	1.734	3.005	1.530	0.612	0.251	7.918
26:56.1	0.226	0.569	1.766	3.500	3.413	1.252	0.335	11.061
26:56.1	0.029	0.328	1.477	2.301	3.986	1.527	0.518	10.166
26:56.1	-0.112	-0.226	0.236	2.070	3.769	1.344	0.000	7.081
26:56.1	-0.121	0.461	0.798	3.775	4.543	1.860	0.093	11.409
26:56.2	**0.120**	**1.007**	**2.602**	**3.161**	**5.918**	**2.443**	**0.778**	**16.029**
26:56.2	0.451	0.279	1.625	1.327	4.611	2.027	0.803	11.124
26:56.2	0.135	-0.250	-0.186	-0.492	1.139	0.245	0.284	0.875
26:56.2	-0.584	-0.589	-0.723	-0.584	-0.484	-0.470	-0.569	-4.003
26:56.2	-0.360	-0.309	-0.574	0.077	-0.302	0.321	-0.384	-1.531
26:56.3	0.227	0.460	0.509	0.309	0.366	0.662	0.593	3.126
26:56.3	0.252	0.163	0.774	0.284	0.424	0.179	0.266	2.342
26:56.3	0.086	-0.168	0.153	-0.080	0.256	-0.104	-0.368	-0.225
26:56.3	-0.121	-0.101	-0.243	-0.361	-0.201	0.055	-0.109	-1.082
26:56.3	-0.244	-0.226	-0.301	-0.073	-0.086	0.063	0.125	-0.742
26:56.4	0.036	-0.019	-0.169	0.102	0.007	-0.012	-0.134	-0.188

Dynamic Load Test Data (Br. No :003-0001)



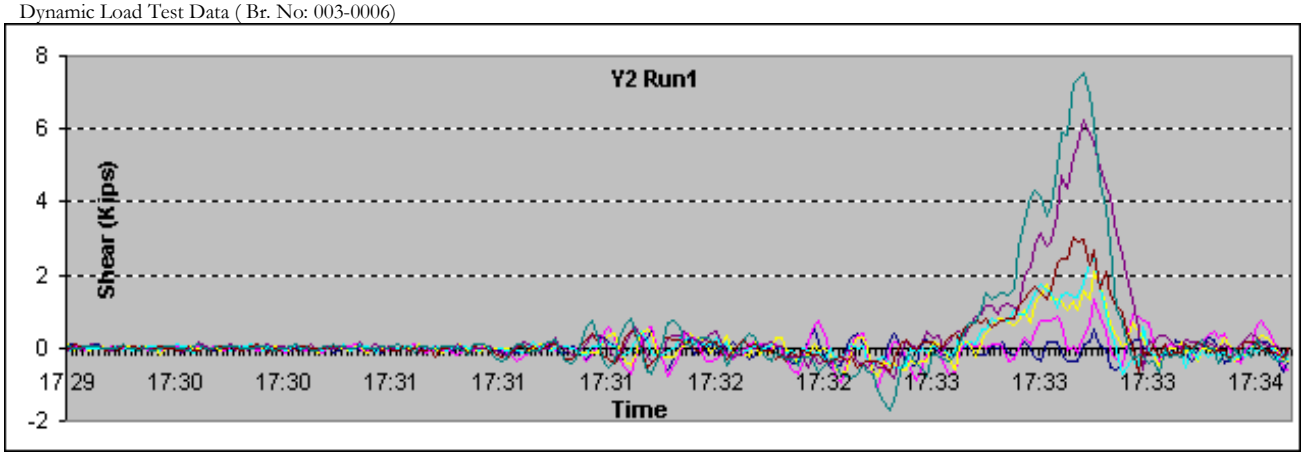
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total shear
38:15.7	-0.418	-0.408	-0.417	-0.286	-0.300	-0.137	-0.193	-2.160
38:15.7	-0.178	0.080	-0.194	-0.063	-0.267	-0.161	-0.384	-1.167
38:15.7	0.161	0.527	0.700	0.441	0.089	0.205	0.075	2.197
38:15.7	0.325	0.320	0.990	0.779	0.532	0.463	0.308	3.717
38:15.7	0.070	0.030	0.699	0.458	0.557	0.296	0.225	2.335
38:15.8	-0.228	-0.084	0.236	0.151	0.082	-0.087	-0.050	0.019
38:15.8	-0.145	0.138	0.401	0.516	-0.184	-0.195	-0.327	0.205
38:15.8	0.161	0.652	1.245	1.458	0.432	0.197	-0.083	4.061
38:15.8	0.376	0.932	1.973	1.953	1.289	0.861	0.701	8.086
38:15.8	0.401	0.535	1.832	1.557	1.421	0.621	0.551	6.918
38:15.9	0.127	0.361	1.269	1.633	0.948	-0.054	-0.209	4.076
38:15.9	-0.120	0.635	1.567	2.028	0.964	-0.062	-0.518	4.494
38:15.9	0.112	1.089	2.519	3.260	1.797	0.820	0.352	9.949
38:15.9	0.483	1.271	3.173	3.268	3.079	1.278	0.969	13.522
38:15.9	0.384	1.155	2.974	2.796	2.821	0.795	0.467	11.392
38:16.0	0.260	0.759	2.262	2.829	2.038	0.612	-0.133	8.627
38:16.0	0.153	0.643	2.097	2.889	2.305	1.020	0.201	9.307
11:38:16	0.029	0.420	1.948	2.996	2.288	1.153	0.535	9.368
38:16.0	0.029	0.543	1.585	2.600	2.164	0.612	0.217	7.749
38:16.0	0.185	0.800	1.734	2.070	1.298	0.296	0.301	6.685
38:16.1	0.285	0.502	1.734	3.005	1.530	0.612	0.251	7.918
38:16.1	0.226	0.569	1.766	3.500	3.413	1.252	0.335	11.061
38:16.1	0.029	0.328	1.477	2.301	3.986	1.527	0.518	10.166
38:16.1	-0.112	-0.226	0.236	2.070	3.769	1.344	0.000	7.081
38:16.1	**-0.121**	**0.461**	**0.798**	**3.775**	**4.543**	**1.860**	**0.093**	**11.409**
38:16.2	0.120	1.007	2.602	3.161	5.918	2.443	0.778	16.029
38:16.2	0.451	0.279	1.625	1.327	4.611	2.027	0.803	11.124
38:16.2	0.135	-0.250	-0.186	-0.492	1.139	0.245	0.284	0.875
38:16.2	-0.584	-0.589	-0.723	-0.584	-0.484	-0.470	-0.569	-4.003
38:16.2	-0.360	-0.309	-0.574	0.077	-0.302	0.321	-0.384	-1.531
38:16.3	0.227	0.460	0.509	0.309	0.366	0.662	0.593	3.126
38:16.3	0.252	0.163	0.774	0.284	0.424	0.179	0.266	2.342
38:16.3	0.086	-0.168	0.153	-0.080	0.256	-0.104	-0.368	-0.225
38:16.3	-0.121	-0.101	-0.243	-0.361	-0.201	0.055	-0.109	-1.082
38:16.3	-0.244	-0.226	-0.301	-0.073	-0.086	0.063	0.125	-0.742
38:16.4	0.036	-0.019	-0.169	0.102	0.007	-0.012	-0.134	-0.188

Dynamic Load Test Data (Br. No :003-0001)



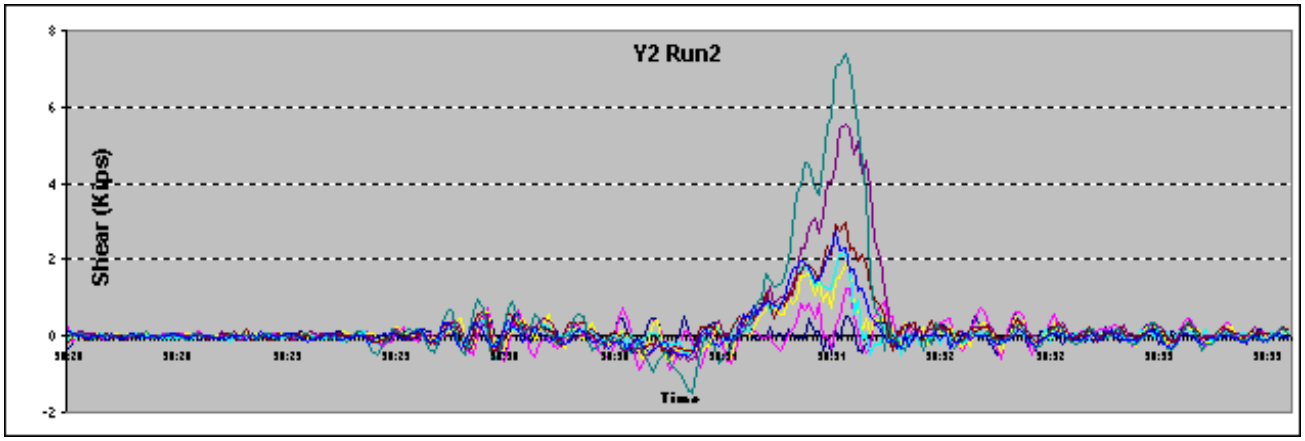
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total shear
49:58.4	-0.116	-0.049	-0.018	0.035	0.115	-0.001	0.000	-0.034
49:58.4	-0.099	0.009	0.166	-0.032	-0.076	-0.175	-0.058	-0.266
49:58.4	0.000	-0.107	-0.158	-0.313	-0.209	-0.200	-0.151	-1.138
49:58.4	-0.058	0.009	-0.141	-0.213	-0.126	-0.009	-0.117	-0.655
49:58.5	0.075	0.464	0.471	0.167	0.216	0.182	-0.066	1.508
49:58.5	0.364	0.489	0.834	0.323	0.290	0.166	0.109	2.576
49:58.5	0.480	0.737	0.794	0.208	0.174	-0.042	0.100	2.451
49:58.5	0.587	0.903	1.034	0.299	0.140	-0.109	-0.208	2.646
49:58.5	0.612	1.208	0.918	0.447	0.174	0.041	-0.300	3.101
49:58.6	0.935	1.853	1.671	0.679	0.416	0.232	0.026	5.810
49:58.6	1.166	1.870	1.936	0.919	0.589	0.232	0.001	6.713
49:58.6	0.943	1.845	1.770	0.762	0.224	0.033	0.068	5.643
49:58.6	1.118	2.449	2.373	0.885	0.307	0.008	-0.100	7.040
49:58.6	1.207	2.656	2.647	1.258	0.657	0.033	-0.342	8.115
49:58.7	1.315	2.821	2.985	1.242	0.400	0.166	-0.074	8.854
49:58.7	1.382	2.920	3.515	1.399	0.773	0.258	0.034	10.280
49:58.7	1.374	3.070	3.498	1.713	0.832	0.133	-0.042	10.578
49:58.7	1.688	3.650	3.671	1.771	0.640	0.082	0.034	11.535
49:58.7	1.771	3.798	3.805	1.828	0.765	-0.034	-0.133	11.800
49:58.8	1.572	3.996	3.341	1.729	0.541	-0.051	-0.100	11.029
49:58.8	1.557	4.567	3.896	1.820	0.565	0.058	0.076	12.538
49:58.8	**1.605**	**4.715**	**4.582**	**2.011**	**0.765**	**0.100**	**-0.208**	**13.571**
49:58.8	1.531	4.434	5.045	2.011	0.482	-0.016	0.018	13.503
49:58.8	**1.250**	**3.822**	**5.616**	**2.159**	**0.432**	**-0.059**	**0.051**	**13.271**
49:58.9	0.861	3.094	5.482	2.135	0.458	-0.076	-0.225	11.729
49:58.9	0.679	1.977	4.366	1.844	0.323	-0.051	-0.033	9.104
49:58.9	0.530	1.341	3.680	1.538	0.257	-0.034	0.018	7.330
49:58.9	0.281	0.770	2.315	1.199	0.233	-0.034	-0.108	4.657
49:58.9	0.231	0.257	1.041	0.605	-0.009	-0.117	0.009	2.017
49:59.0	0.149	0.117	0.230	0.439	-0.026	-0.166	-0.058	0.684
49:59.0	-0.133	0.033	-0.389	0.274	0.132	-0.016	-0.141	-0.240
11:49:59	0.033	0.084	-0.373	0.035	-0.033	0.049	-0.041	-0.247
49:59.0	0.198	0.182	-0.440	-0.040	-0.017	-0.059	-0.101	-0.276
49:59.0	0.017	-0.025	-0.505	0.010	-0.083	-0.059	-0.133	-0.778
49:59.1	0.157	0.050	-0.249	0.025	-0.059	-0.026	-0.117	-0.218

Dynamic Load Test Data (Br. No: 003-0006)



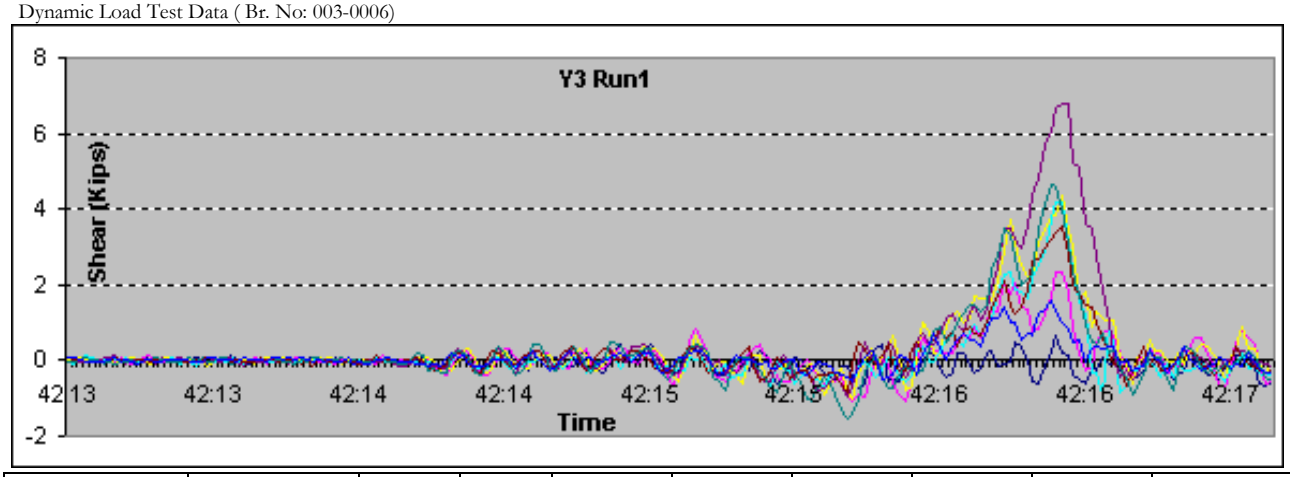
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
17:32.8	-0.257	-0.714	-0.325	-0.158	0.165	0.263	-0.351	-0.043	-1.421
17:32.8	-0.122	-0.629	-0.624	-0.124	0.380	0.393	-0.196	0.364	-0.559
17:32.8	-0.070	-0.116	0.024	0.310	0.466	0.213	0.157	0.602	1.586
17:32.8	0.068	0.132	0.144	0.037	0.345	0.545	0.478	0.767	2.515
17:32.8	-0.011	0.106	0.169	0.141	0.568	0.580	0.667	0.852	3.072
17:32.9	-0.121	0.021	-0.240	0.079	0.887	0.733	0.667	0.569	2.596
17:32.9	-0.215	0.080	0.169	0.532	0.947	0.690	1.090	0.885	4.178
17:32.9	-0.189	0.012	0.383	0.486	1.178	0.792	1.513	0.815	4.988
17:32.9	0.024	0.080	0.571	0.829	1.187	0.596	1.357	1.004	5.647
17:32.9	-0.028	0.097	0.827	0.715	0.920	0.690	1.470	0.729	5.421
17:33.0	0.143	0.045	0.784	0.768	1.187	0.724	1.531	0.962	6.144
17:33.0	-0.155	-0.356	0.674	0.777	1.239	0.801	1.471	0.945	5.395
12:17:33	-0.216	-0.322	0.613	1.041	1.092	0.810	1.616	1.281	5.916
17:33.0	-0.069	-0.074	0.759	0.920	1.024	1.154	2.712	1.657	8.082
17:33.0	0.161	0.276	1.049	0.929	1.977	1.347	3.490	1.759	10.988
17:33.1	-0.037	0.132	0.691	1.228	2.217	1.570	4.145	1.922	11.869
17:33.1	-0.231	0.455	1.210	1.480	2.793	1.671	4.326	1.750	13.455
17:33.1	-0.385	0.721	1.442	1.772	3.119	1.508	4.136	1.535	13.849
17:33.1	0.153	0.720	1.740	1.581	2.776	1.320	3.601	1.363	13.254
17:33.1	0.185	0.747	1.330	1.491	2.904	1.587	3.878	1.509	13.631
17:33.2	0.177	0.857	1.313	1.087	3.659	2.304	4.878	1.887	16.163
17:33.2	-0.132	0.695	1.254	1.447	4.699	2.422	5.915	2.161	18.462
17:33.2	-0.359	-0.091	1.057	1.504	4.382	2.449	5.862	2.298	17.101
17:33.2	-0.333	0.029	1.253	1.417	5.223	3.029	7.217	2.618	20.452
17:33.2	-0.385	-0.134	1.066	1.365	5.550	2.925	7.363	2.282	20.033
17:33.3	**0.101**	**0.319**	**1.544**	**1.824**	**6.236**	**2.966**	**7.517**	**2.171**	**22.679**
17:33.3	0.151	0.618	1.313	2.339	5.876	2.253	6.966	1.585	21.101
17:33.3	0.510	1.361	2.073	2.476	5.591	2.680	6.104	1.207	22.002
17:33.3	0.047	0.848	1.672	1.667	4.975	1.614	4.540	0.932	16.296
17:33.3	0.015	0.430	1.134	0.974	4.415	2.099	3.823	0.913	13.803
17:33.4	-0.565	-0.098	0.630	0.492	4.143	1.463	2.780	0.734	9.579
17:33.4	-0.580	-0.312	0.332	-0.023	3.171	1.159	1.089	0.588	5.426
17:33.4	-0.395	-0.492	0.049	-0.707	2.581	0.997	0.693	0.564	3.289

Dynamic Load Test Data (Br. No: 003-0006)



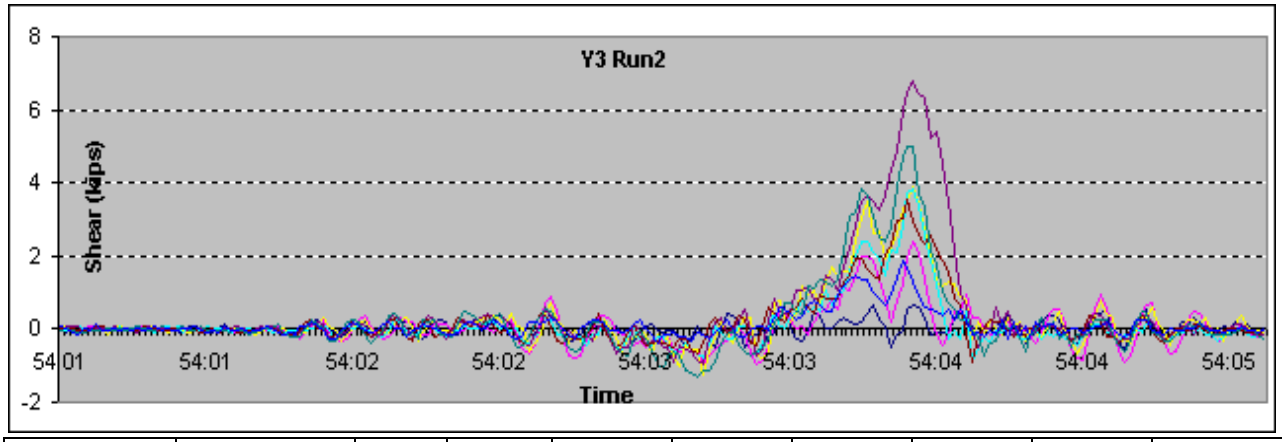
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
30:30.7	-0.059	-0.048	0.113	0.158	0.329	0.517	0.031	0.067	1.107
30:30.7	0.274	0.268	0.267	0.160	0.286	0.322	0.125	0.558	2.259
30:30.7	0.316	0.089	0.020	0.125	0.303	0.629	0.410	0.462	2.355
30:30.7	-0.043	0.132	0.182	0.543	0.379	0.432	0.573	0.772	2.970
30:30.7	-0.111	0.054	0.456	0.662	0.663	0.920	0.894	0.598	4.136
30:30.8	-0.025	-0.048	0.566	0.781	0.706	0.790	0.971	0.840	4.581
30:30.8	-0.025	-0.022	0.677	0.941	0.981	1.142	1.635	0.855	6.183
30:30.8	0.249	-0.005	0.932	0.626	1.282	0.789	1.437	0.899	6.209
30:30.8	0.008	-0.219	0.804	0.875	0.871	0.457	1.290	0.812	4.897
30:30.8	0.078	-0.398	0.548	0.737	0.998	0.850	1.359	0.753	4.924
30:30.9	-0.076	-0.219	0.592	0.934	0.973	0.774	1.497	0.977	5.452
30:30.9	0.155	0.071	1.034	0.959	0.981	1.133	1.990	1.390	7.713
30:30.9	0.043	0.174	0.873	1.360	1.333	1.073	2.802	1.732	9.389
30:30.9	-0.034	0.320	0.984	1.526	1.600	1.551	3.673	1.817	11.436
30:30.9	-0.050	0.832	1.591	1.827	2.321	1.620	3.940	1.953	14.033
30:31.0	-0.041	0.670	1.565	1.782	2.295	1.842	4.535	1.902	14.549
30:31.0	0.443	0.831	1.650	1.748	2.853	1.858	4.475	1.824	15.681
12:30:31	0.042	0.473	1.078	1.280	3.059	1.659	3.854	1.385	12.829
30:31.0	0.145	0.831	1.488	1.476	2.690	1.455	3.697	1.489	13.271
30:31.0	-0.393	-0.040	0.891	1.305	3.128	1.943	4.544	1.720	13.098
30:31.1	-0.059	0.038	1.112	1.251	4.055	2.352	5.509	2.055	16.313
30:31.1	-0.451	-0.304	0.754	1.242	4.021	2.130	5.787	2.268	15.447
30:31.1	0.164	0.302	1.462	1.683	4.443	2.925	7.064	2.725	20.768
30:31.1	-0.043	0.447	1.530	2.138	5.456	2.742	7.125	2.227	21.621
30:31.1	**0.487**	**1.215**	**1.914**	**2.183**	**5.533**	**2.946**	**7.374**	**2.288**	**23.941**
30:31.2	0.485	1.216	1.761	1.724	5.412	2.271	7.055	1.660	21.584
30:31.2	0.162	0.568	0.728	0.579	4.752	2.323	6.295	1.738	17.145
30:31.2	-0.401	0.096	0.754	0.972	5.104	1.982	5.465	1.167	15.139
30:31.2	-0.442	-0.314	0.113	-0.103	4.252	2.112	4.613	1.222	11.453
30:31.2	-0.185	-0.450	0.446	0.056	4.615	1.914	3.757	0.892	11.046
30:31.3	-0.137	-0.262	0.053	-0.512	3.841	1.316	1.532	0.508	6.339
30:31.3	0.392	0.533	0.437	-0.196	2.528	0.978	0.720	0.405	5.798
30:31.3	0.314	0.780	0.344	-0.198	2.030	0.779	0.486	0.155	4.691

Dynamic Load Test Data (Br. No: 003-0006)



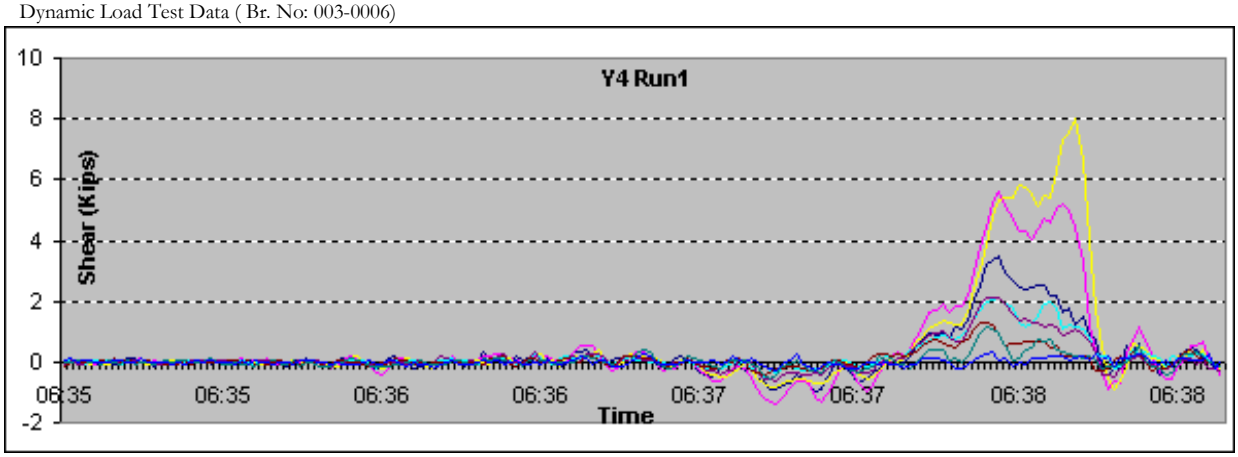
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
42:15.8	-0.183	0.259	0.147	0.223	0.688	0.836	0.872	0.374	3.216
42:15.8	-0.412	0.216	0.967	0.612	1.136	0.595	0.458	0.048	3.619
42:15.8	-0.345	0.207	1.198	0.638	1.264	0.784	0.725	0.375	4.846
42:15.8	0.211	0.489	1.316	0.526	0.920	0.348	1.010	0.572	5.393
42:15.8	0.201	0.643	0.984	0.341	0.774	0.784	1.208	0.734	5.669
42:15.9	-0.088	0.608	1.103	0.758	1.298	0.894	1.442	0.546	6.561
42:15.9	-0.328	0.898	1.726	0.943	1.495	0.714	1.458	0.530	7.437
42:15.9	-0.207	0.617	1.632	0.740	1.058	0.654	1.277	0.366	6.138
42:15.9	0.220	1.087	1.667	0.919	1.324	0.981	1.442	0.858	8.496
42:15.9	0.252	1.274	1.590	1.056	1.925	1.408	2.416	1.149	11.070
42:16.0	-0.148	1.308	2.077	1.753	2.457	1.690	2.744	1.141	13.022
42:16.0	-0.113	2.094	2.904	2.270	3.470	2.116	3.513	1.390	17.644
12:42:16	-0.029	1.778	3.750	2.329	3.513	1.490	3.305	1.029	17.166
42:16.0	0.465	2.033	3.084	1.895	3.195	1.243	2.727	1.018	15.660
42:16.0	0.387	1.421	2.511	1.793	2.955	1.398	1.993	0.563	13.021
42:16.1	0.038	1.351	2.197	1.614	3.565	1.851	2.165	0.718	13.499
42:16.1	-0.549	0.754	2.204	2.182	4.338	2.613	2.304	0.667	14.514
42:16.1	-0.624	0.848	3.135	2.538	4.844	2.671	3.410	1.210	18.032
42:16.1	-0.122	1.257	3.433	2.845	5.678	2.985	4.151	1.338	21.564
42:16.1	0.260	1.675	3.799	3.707	6.031	3.181	4.660	1.580	24.892
42:16.2	**0.661**	**2.358**	**3.825**	**4.158**	**6.657**	**3.384**	**4.574**	**1.313**	**26.930**
42:16.2	0.224	2.325	4.355	4.180	6.811	3.552	4.030	1.022	26.498
42:16.2	**0.166**	**1.838**	**3.450**	**3.165**	**6.813**	**2.813**	**3.080**	**0.856**	**22.182**
42:16.2	-0.371	0.813	3.006	2.413	5.230	2.002	2.346	0.503	15.944
42:16.2	-0.497	0.172	1.667	1.589	5.112	1.745	1.786	0.571	12.145
42:16.3	-0.617	-0.288	1.811	1.244	3.600	1.474	0.931	-0.049	8.105
42:16.3	-0.183	-0.136	0.907	-0.332	3.464	1.383	0.474	0.306	5.885
42:16.3	-0.260	0.497	1.274	-0.314	2.759	1.032	0.405	0.392	5.786
42:16.3	0.081	0.745	1.105	-0.878	1.866	0.588	0.725	0.332	4.563
42:16.3	-0.115	0.812	1.018	0.960	0.982	0.192	0.197	0.358	4.405
42:16.4	-0.097	0.659	1.061	0.465	0.132	-0.094	0.302	0.349	2.776
42:16.4	-0.278	0.208	0.071	-0.833	-0.466	-0.012	-0.215	-0.106	-1.630
42:16.4	0.005	-0.193	-0.109	-0.667	-0.290	-0.660	-0.422	0.005	-2.331

Dynamic Load Test Data (Br. No: 003-0006)



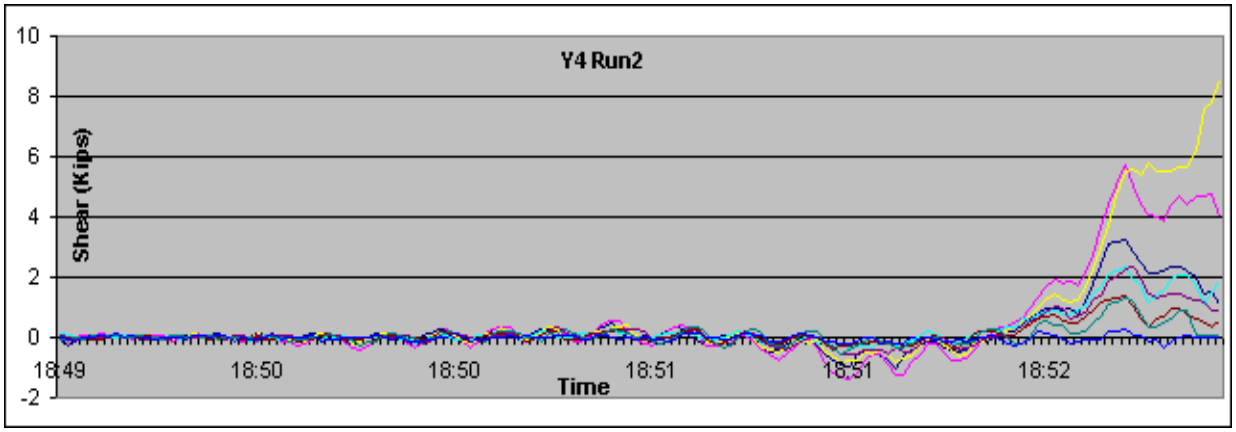
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
54:03.0	-0.067	0.222	0.725	0.438	0.827	0.407	0.184	0.300	3.036
54:03.0	0.273	0.486	0.784	0.055	0.476	0.228	0.330	0.606	3.239
12:54:03	0.580	0.410	0.315	0.014	0.433	0.168	0.711	0.519	3.151
54:03.0	0.067	0.247	0.178	0.296	0.466	0.502	0.702	0.441	2.898
54:03.0	-0.280	0.034	0.426	0.481	1.042	0.612	0.512	0.235	3.061
54:03.1	-0.332	0.076	1.150	0.796	1.085	0.835	0.435	0.348	4.395
54:03.1	-0.008	-0.129	0.947	0.505	1.162	0.578	1.168	0.655	4.879
54:03.1	0.494	0.195	1.057	0.583	0.750	0.450	1.150	0.776	5.456
54:03.1	0.357	0.477	0.699	0.498	0.904	0.921	1.350	0.638	5.845
54:03.1	0.026	0.547	1.321	1.052	1.480	0.860	1.288	0.486	7.059
54:03.2	0.027	0.786	1.672	0.683	1.326	0.852	1.202	0.468	7.016
54:03.2	0.180	0.529	1.484	0.925	1.043	0.843	1.331	0.961	7.296
54:03.2	0.291	1.144	1.612	1.059	1.677	1.288	2.151	1.208	10.431
54:03.2	0.222	1.076	1.586	1.588	2.210	1.483	3.101	1.345	12.611
54:03.2	0.145	1.442	2.450	1.961	2.811	1.937	3.178	1.493	15.417
54:03.3	0.170	2.015	3.012	2.369	3.507	1.935	3.843	1.371	18.221
54:03.3	0.427	1.980	3.490	2.393	3.669	1.661	3.653	1.355	18.628
54:03.3	0.638	1.887	2.611	2.078	3.498	1.465	3.075	0.981	16.234
54:03.3	0.264	1.331	2.653	1.908	3.249	1.379	2.514	0.820	14.120
54:03.3	0.060	0.827	1.953	1.482	3.659	2.031	2.394	0.638	13.044
54:03.4	-0.476	0.187	2.202	2.186	4.375	2.252	2.790	0.952	14.467
54:03.4	-0.151	0.751	2.628	2.124	4.890	2.953	3.886	1.422	18.502
54:03.4	-0.025	1.212	3.285	2.840	5.971	3.010	4.715	1.889	22.899
54:03.4	0.536	1.946	3.516	3.728	6.445	3.522	4.991	1.681	26.365
54:03.4	**0.665**	**2.399**	**3.917**	**3.854**	**6.813**	**2.963**	**4.974**	**1.311**	**26.896**
54:03.5	0.597	2.100	3.422	3.368	6.460	2.579	3.722	0.976	23.222
54:03.5	0.290	1.339	2.754	2.579	6.324	2.351	3.301	0.620	19.558
54:03.5	-0.145	0.554	2.030	1.874	5.240	2.576	2.140	0.545	14.814
54:03.5	-0.110	-0.172	1.287	1.255	5.388	2.165	1.762	0.473	12.047
54:03.5	-0.100	-0.428	1.177	0.493	4.538	1.858	1.062	0.383	8.984
54:03.6	-0.084	-0.171	1.271	-0.262	3.465	1.605	0.738	0.518	7.080
54:03.6	0.316	0.477	1.219	-0.042	2.150	0.841	0.564	0.279	5.804
54:03.6	0.400	0.511	0.861	-0.241	1.010	0.671	0.270	0.536	4.019

Dynamic Load Test Data (Br. No: 003-0006)



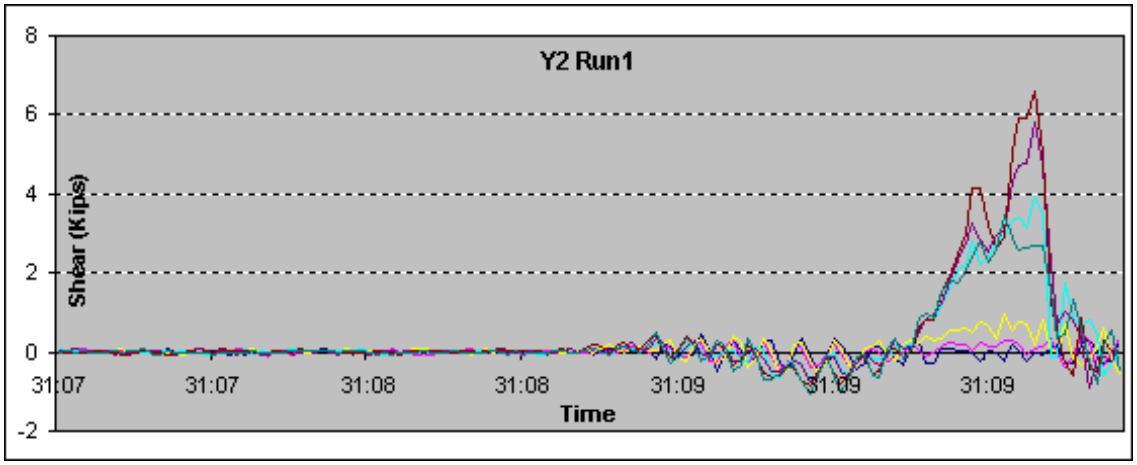
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
06:37.5	-0.080	0.226	0.131	0.222	0.001	0.184	0.131	-0.079	0.736
06:37.5	-0.081	0.320	-0.022	0.229	0.148	0.236	-0.049	-0.079	0.702
06:37.5	-0.013	0.209	0.140	0.170	0.114	0.193	-0.093	-0.218	0.503
06:37.6	0.192	0.405	0.260	0.401	0.319	0.287	-0.213	-0.104	1.547
06:37.6	0.508	0.839	0.661	0.477	0.534	0.355	0.002	-0.053	3.324
06:37.6	0.755	1.173	0.806	0.587	0.698	0.560	0.184	0.119	4.882
06:37.6	0.943	1.617	1.104	0.672	0.878	0.689	0.417	0.127	6.447
06:37.6	0.858	1.694	1.215	0.842	0.939	0.724	0.400	0.154	6.826
06:37.7	0.978	1.899	1.361	0.892	1.016	0.637	0.409	0.033	7.225
06:37.7	0.790	1.617	1.285	0.808	0.784	0.544	0.071	-0.027	5.871
06:37.7	1.130	1.847	1.242	0.722	0.698	0.475	0.098	-0.192	6.020
06:37.7	1.071	1.830	1.233	0.869	0.654	0.706	0.019	-0.209	6.173
06:37.7	1.387	2.172	1.643	1.072	1.049	0.775	0.228	-0.113	8.211
06:37.8	2.044	2.940	2.410	1.438	1.436	1.108	0.521	0.051	11.949
06:37.8	2.505	3.733	3.042	1.684	1.891	1.278	0.926	0.188	15.248
06:37.8	3.195	4.459	3.810	1.990	2.123	1.304	1.169	0.249	18.300
06:37.8	3.348	5.228	4.784	2.057	2.123	1.243	1.082	0.309	20.174
06:37.8	**3.502**	**5.629**	**5.304**	**2.117**	**2.081**	**0.952**	**0.943**	**0.042**	**20.569**
06:37.9	2.922	5.143	5.433	1.905	1.882	0.558	0.521	0.094	18.458
06:37.9	2.633	4.732	5.398	1.741	1.566	0.619	0.088	-0.156	16.621
06:37.9	2.429	4.322	5.850	1.296	1.367	0.576	0.098	-0.043	15.894
06:37.9	2.419	4.296	5.730	1.167	1.419	0.654	0.375	-0.062	15.997
06:37.9	2.453	4.014	5.577	1.287	1.308	0.654	0.477	0.112	15.881
06:38.0	2.530	4.406	5.106	1.502	1.298	0.688	0.711	0.111	16.352
06:38.0	2.555	4.696	5.476	1.932	1.187	0.679	0.676	0.104	17.305
1:06:38	2.180	4.612	5.391	2.009	1.213	0.491	0.771	0.164	16.830
06:38.0	2.155	5.073	6.269	1.803	1.136	0.509	0.426	0.190	17.561
06:38.0	1.660	5.166	7.309	1.082	0.869	0.200	0.330	0.207	16.823
06:38.1	1.737	4.969	7.524	1.203	0.938	0.200	0.245	0.085	16.901
06:38.1	**1.208**	**4.421**	**8.026**	**1.153**	**1.067**	**0.183**	**0.167**	**0.137**	**16.362**
06:38.1	1.523	3.363	6.662	1.076	0.852	0.202	0.159	0.197	14.034
06:38.1	0.902	1.228	4.023	0.797	0.688	0.105	0.227	0.034	8.004
06:38.1	0.715	0.343	1.797	0.255	0.320	-0.252	0.047	0.266	3.490

Dynamic Load Test Data (Br. No: 003-0006)



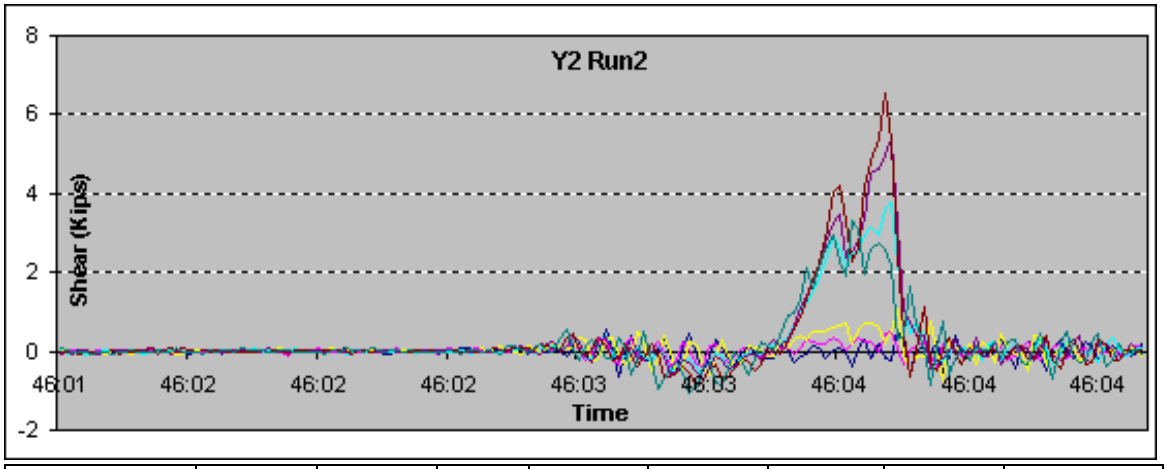
Time	Beam1	Beam2	Beam3	Beam4	Beam5a	Beam5b	Beam6	Beam7	Total shear
18:51.4	-0.160	-0.080	0.226	0.131	0.222	0.001	0.184	0.131	0.655
18:51.4	-0.118	-0.081	0.320	-0.022	0.229	0.148	0.236	-0.049	0.663
18:51.5	-0.313	-0.013	0.209	0.140	0.170	0.114	0.193	-0.093	0.408
18:51.5	-0.407	0.192	0.405	0.260	0.401	0.319	0.287	-0.213	1.244
18:51.5	-0.466	0.508	0.839	0.661	0.477	0.534	0.355	0.002	2.912
18:51.5	-0.407	0.755	1.173	0.806	0.587	0.698	0.560	0.184	4.357
18:51.5	-0.270	0.943	1.617	1.104	0.672	0.878	0.689	0.417	6.050
18:51.6	-0.169	0.858	1.694	1.215	0.842	0.939	0.724	0.400	6.503
18:51.6	-0.058	0.978	1.899	1.361	0.892	1.016	0.637	0.409	7.134
18:51.6	0.078	0.790	1.617	1.285	0.808	0.784	0.544	0.071	5.977
18:51.6	0.182	1.130	1.847	1.242	0.722	0.698	0.475	0.098	6.393
18:51.6	0.224	1.071	1.830	1.233	0.869	0.654	0.706	0.019	6.606
18:51.7	0.420	1.387	2.172	1.643	1.072	1.049	0.775	0.228	8.745
18:51.7	0.607	2.044	2.940	2.410	1.438	1.436	1.108	0.521	12.505
18:51.7	0.787	2.505	3.733	3.042	1.684	1.891	1.278	0.926	15.847
18:51.7	0.940	3.195	4.459	3.810	1.990	2.123	1.304	1.169	18.991
18:51.7	0.940	3.348	5.228	4.784	2.057	2.123	1.243	1.082	20.805
18:51.8	0.905	3.502	5.629	5.304	2.117	2.081	0.952	0.943	21.433
18:51.8	0.966	2.922	5.143	5.433	1.905	1.882	0.558	0.521	19.330
18:51.8	0.785	2.633	4.732	5.398	1.741	1.566	0.619	0.088	17.563
18:51.8	1.153	2.429	4.322	5.850	1.296	1.367	0.576	0.098	17.090
18:51.8	1.793	2.419	4.296	5.730	1.167	1.419	0.654	0.375	17.852
18:51.9	2.391	2.453	4.014	5.577	1.287	1.308	0.654	0.477	18.160
18:51.9	3.073	2.530	4.406	5.106	1.502	1.298	0.688	0.711	19.314
18:51.9	3.174	2.555	4.696	5.476	1.932	1.187	0.679	0.676	20.375
18:51.9	**3.242**	**2.180**	**4.612**	**5.391**	**2.009**	**1.213**	**0.491**	**0.771**	**19.909**
18:51.9	2.833	2.155	5.073	6.269	1.803	1.136	0.509	0.426	20.205
18:52.0	2.450	1.660	5.166	7.309	1.082	0.869	0.200	0.330	19.067
18:52.0	2.151	1.737	4.969	7.524	1.203	0.938	0.200	0.245	18.967
1:18:52	2.125	1.208	4.421	8.026	1.153	1.067	0.183	0.167	18.351
18:52.0	2.219	1.523	3.363	6.662	1.076	0.852	0.202	0.159	16.057
18:52.0	2.321	0.902	1.228	4.023	0.797	0.688	0.105	0.227	10.291
18:52.1	2.355	0.715	0.343	1.797	0.255	0.320	-0.252	0.047	5.579

Dynamic Load Test Data (Br.No : 060-0028)



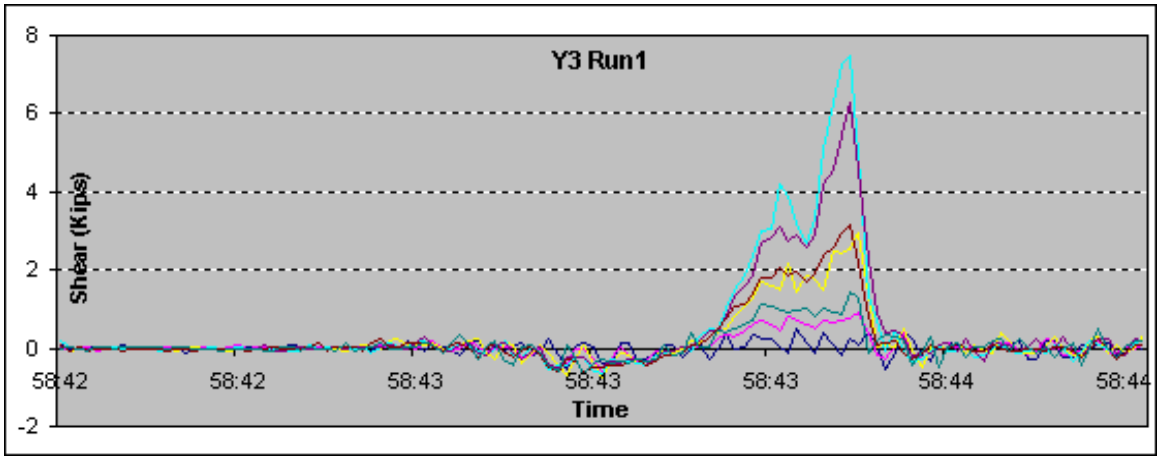
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
31:09.2	-0.069	-0.249	-0.044	-0.111	-0.101	0.015	0.094	-0.465
31:09.2	-0.193	-0.178	-0.230	0.113	0.286	0.072	0.343	0.212
31:09.2	-0.308	-0.047	0.175	0.131	0.082	-0.145	-0.167	-0.279
31:09.2	0.180	0.200	0.313	0.184	0.131	0.056	0.082	1.146
31:09.2	0.249	0.013	0.239	0.474	0.478	0.656	0.860	2.969
31:09.3	-0.295	-0.102	0.370	0.815	0.805	0.820	0.953	3.367
31:09.3	-0.276	-0.026	0.315	0.792	0.961	0.832	0.841	3.438
31:09.3	0.099	0.128	0.334	1.202	1.225	1.511	1.528	6.026
31:09.3	0.109	0.232	0.528	1.598	1.811	1.903	1.809	7.990
31:09.3	0.007	0.204	0.564	2.059	2.331	2.461	1.772	9.398
31:09.4	0.014	0.197	0.624	2.203	2.754	3.025	2.086	10.903
31:09.4	-0.002	0.057	0.493	2.814	3.249	4.163	2.438	13.211
31:09.4	-0.248	0.224	0.767	2.227	2.850	4.137	2.816	12.771
31:09.4	0.042	0.144	0.675	2.429	2.526	3.230	2.250	11.295
31:09.4	0.005	0.149	0.350	2.719	2.966	2.658	2.571	11.417
31:09.5	-0.232	0.303	0.972	2.950	3.059	2.889	3.491	13.432
31:09.5	0.205	0.287	0.560	3.307	4.299	5.071	2.920	16.649
31:09.5	0.026	0.165	0.751	3.399	4.711	5.923	2.592	17.566
31:09.5	-0.224	-0.084	0.688	3.134	4.775	5.900	2.643	16.832
31:09.5	**-0.002**	**0.073**	**0.194**	**3.926**	**5.790**	**6.580**	**2.699**	**19.261**
31:09.6	-0.074	0.157	0.815	3.510	4.729	5.009	2.692	16.838
31:09.6	0.090	0.324	0.012	-0.103	2.206	1.292	1.567	5.388
31:09.6	0.205	-0.035	0.012	-0.103	0.692	0.565	0.331	1.667
31:09.6	-0.276	-0.407	0.723	1.750	1.005	-0.301	0.452	2.946
31:09.6	-0.281	-0.146	-0.198	0.840	0.788	-0.572	1.355	1.786
31:09.7	0.173	0.466	-0.334	0.668	0.361	0.870	0.580	2.784
31:09.7	0.288	0.274	-0.171	0.836	-0.906	-0.435	-0.223	-0.337
31:09.7	0.027	-0.531	0.140	0.449	-0.133	-0.504	-0.817	-1.369
31:09.7	-0.348	-0.356	0.627	-0.570	-0.129	0.275	0.163	-0.337
31:09.7	-0.195	-0.045	-0.111	-0.296	-0.229	0.037	0.539	-0.299
31:09.8	0.235	0.337	-0.608	-0.042	0.103	-0.017	-0.496	-0.488

Dynamic Load Test Data (Br.No : 060-0028)



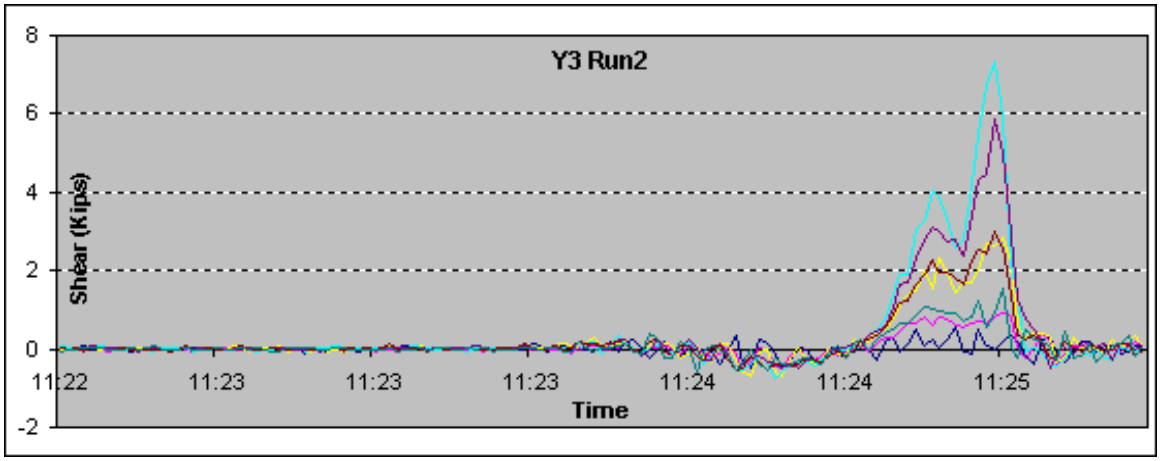
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
46:03.3	-0.3430	-0.1256	-0.3817	-0.3791	-0.3651	-0.4396	-0.0178	-2.0518
46:03.3	-0.0440	0.0726	-0.2111	-0.1255	-0.1584	-0.1521	-0.2786	-0.8972
46:03.3	0.1586	0.0333	0.1095	0.0029	-0.0587	-0.2841	-0.5837	-0.6222
46:03.3	-0.0119	-0.1256	0.1023	-0.0657	-0.0659	-0.4719	-0.1533	-0.7920
46:03.3	-0.1038	-0.1344	0.0425	-0.0657	-0.2537	-0.3281	0.2402	-0.6030
46:03.4	-0.1797	-0.1139	-0.1353	0.1092	0.1129	0.0606	0.1149	-0.0312
46:03.4	-0.1753	0.0289	-0.1004	0.2128	0.2934	0.0445	0.0147	0.3186
46:03.4	0.1470	0.0887	0.2174	0.1690	0.1218	-0.0875	0.4009	1.0573
46:03.4	0.0202	0.0975	0.0790	0.3396	0.3051	0.2322	0.9343	2.0079
46:03.4	-0.2788	-0.0863	0.3122	0.6413	0.6321	0.6238	0.9579	2.8023
46:03.5	-0.1448	0.0682	0.3719	1.0555	1.1045	0.8645	1.3441	4.6638
46:03.5	-0.0513	0.2797	0.3005	1.2260	1.4064	1.3558	2.0913	6.6085
46:03.5	0.1121	0.2360	0.5192	1.4813	1.8025	1.7797	1.5931	7.5238
46:03.5	0.0916	0.1645	0.5237	1.8340	2.0576	2.2226	2.1148	9.0088
46:03.5	-0.1841	0.2039	0.5236	2.2553	2.7601	2.8621	2.5761	10.9970
46:03.6	0.0157	0.3234	0.6111	2.9231	3.2587	4.0397	2.9298	14.1016
46:03.6	0.1076	0.2520	0.6388	2.6213	3.4876	4.2040	2.2564	13.5678
46:03.6	-0.0396	0.0522	0.6825	2.1867	2.3963	3.2961	1.8864	10.4606
46:03.6	-0.3779	0.2011	0.2102	2.4608	2.5518	2.2472	3.3160	10.6092
46:03.6	0.0623	0.3555	0.5557	2.5206	2.7791	2.5698	3.0949	11.9379
46:03.7	0.2665	0.2171	0.6870	2.9480	3.3540	4.1572	1.9497	13.5795
46:03.7	-0.1592	0.2271	0.7102	3.1767	4.5333	4.8201	2.6085	15.9168
46:03.7	0.1730	-0.0353	0.5790	2.9652	4.6096	5.3922	2.7456	16.4294
46:03.7	**-0.1724**	**0.4298**	**0.1781**	**3.6374**	**4.9984**	**6.5610**	**2.6085**	**18.2407**
46:03.7	-0.2423	0.4867	0.5208	3.7774	5.4105	5.3656	2.1590	17.4779
46:03.8	0.5390	0.0698	1.0469	2.2072	3.1662	2.4991	0.2727	9.8009
46:03.8	0.1630	-0.3166	-0.0610	1.1662	1.0455	0.4591	0.3919	2.8481
46:03.8	-0.6010	0.0405	-0.5201	0.4519	0.7653	-0.6362	1.6329	1.1334
46:03.8	0.0434	0.1457	-0.1164	0.6867	0.3927	0.0542	0.7132	1.9194
46:03.8	0.0844	0.2315	-0.1397	0.4692	0.3943	1.1475	0.0337	2.2209
46:03.9	-0.0119	-0.1111	0.7451	-0.4112	-0.4515	-0.2970	-0.8608	-1.3984

Dynamic Load Test Data (Br.No : 060-0028)



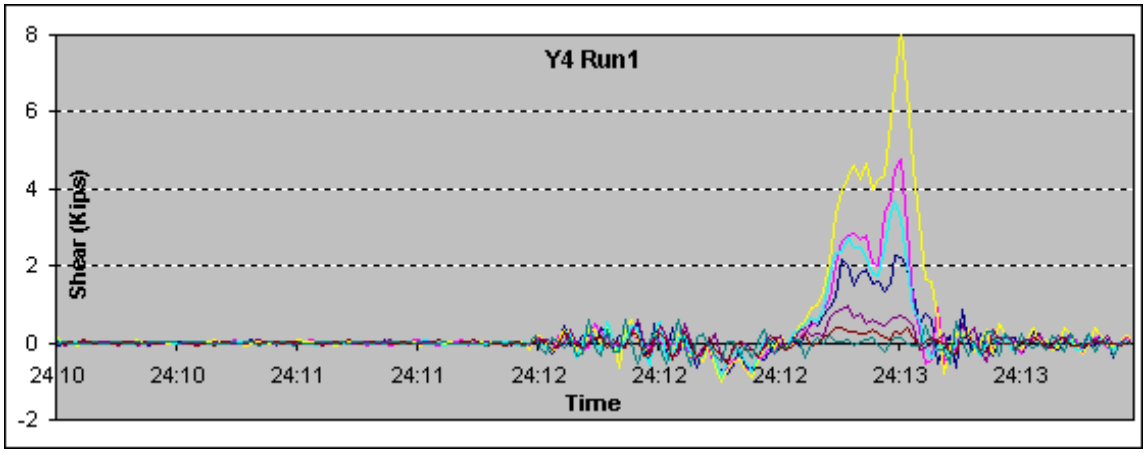
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
58:43.1	-0.1052	-0.0739	-0.1701	-0.1547	-0.2670	-0.3099	-0.2763	-1.3571
58:43.1	0.1019	-0.0667	-0.0666	-0.1065	-0.0954	-0.1779	0.0729	-0.3383
58:43.1	0.0582	-0.0739	-0.1248	-0.0672	-0.0748	-0.1807	-0.1806	-0.6439
58:43.1	-0.2364	-0.1193	-0.0112	0.0275	0.0366	-0.1411	-0.1437	-0.5876
58:43.1	-0.0410	0.1010	0.2119	-0.0628	0.0483	0.0862	0.3853	0.7290
58:43.2	0.1456	0.0136	0.1156	0.3104	0.2126	0.0995	0.0405	0.9378
58:43.2	-0.2801	0.0296	0.4772	0.4970	0.4310	0.2755	0.0125	1.4427
58:43.2	-0.0454	0.2278	0.4101	0.4737	0.4472	0.4911	0.4295	2.4341
58:43.2	0.3410	0.3562	0.5093	1.0219	0.8109	0.7579	0.3780	4.1753
58:43.2	-0.0133	0.2732	0.8199	1.4914	1.3111	1.0587	0.4855	5.4265
58:43.3	0.0100	0.4626	1.0779	1.8325	1.5969	1.1217	0.5946	6.6962
58:43.3	0.3483	0.5938	1.2878	2.3807	1.8654	1.3740	0.6993	8.5492
58:43.3	0.2331	0.6885	1.7047	3.0207	2.6676	1.7934	1.1325	11.2406
58:43.3	0.2652	0.6171	1.5895	3.0556	2.8319	1.8168	1.0956	11.2718
58:43.3	0.0421	0.4437	1.4992	4.2002	3.1060	2.0764	0.9719	12.3395
58:43.4	-0.1373	0.7936	2.1887	3.8823	2.7160	1.8726	0.9321	12.2481
58:43.4	0.5027	0.7250	1.4306	3.1985	2.8787	1.9372	0.9646	11.6373
58:43.4	0.1412	0.5954	1.8797	2.6913	2.6013	1.6731	0.9970	10.5791
58:43.4	-0.1007	0.5179	1.7412	3.3241	2.8860	1.9049	0.8348	11.1082
58:43.4	0.4153	0.6973	1.4948	5.0722	4.2090	2.3610	1.0206	15.2702
58:43.5	0.0975	0.6580	2.4555	6.2865	4.5638	2.5883	0.8997	17.5493
58:43.5	-0.1533	0.6929	2.4511	7.2721	5.4322	2.9388	0.8392	19.4730
58:43.5	**0.2331**	**0.7527**	**2.5270**	**7.4848**	**6.2611**	**3.1632**	**1.4404**	**21.8622**
58:43.5	0.0726	0.9072	2.9716	4.9144	4.5493	2.1483	1.2562	16.8196
58:43.5	0.3876	0.3795	1.3913	1.3369	2.2526	0.7930	-0.1482	6.3928
58:43.6	0.0786	-0.1891	0.0325	0.7041	0.9223	0.0773	0.1731	1.7989
58:43.6	-0.5542	-0.2605	0.0602	-0.0700	0.4060	0.1536	0.3618	0.0969
58:43.6	-0.1096	0.1055	0.0297	0.4372	0.4338	0.2125	0.2851	1.3943
58:43.6	0.4357	0.3956	0.5020	-0.1503	0.2805	-0.1411	0.2011	1.5235
58:43.6	0.2608	-0.0623	-0.0578	-0.3297	-0.2097	-0.2614	-0.4577	-1.1177
58:43.7	-0.1722	-0.2970	-0.4819	-0.2743	-0.0704	-0.1116	-0.0642	-1.4716

Dynamic Load Test Data (Br.No : 060-0028)



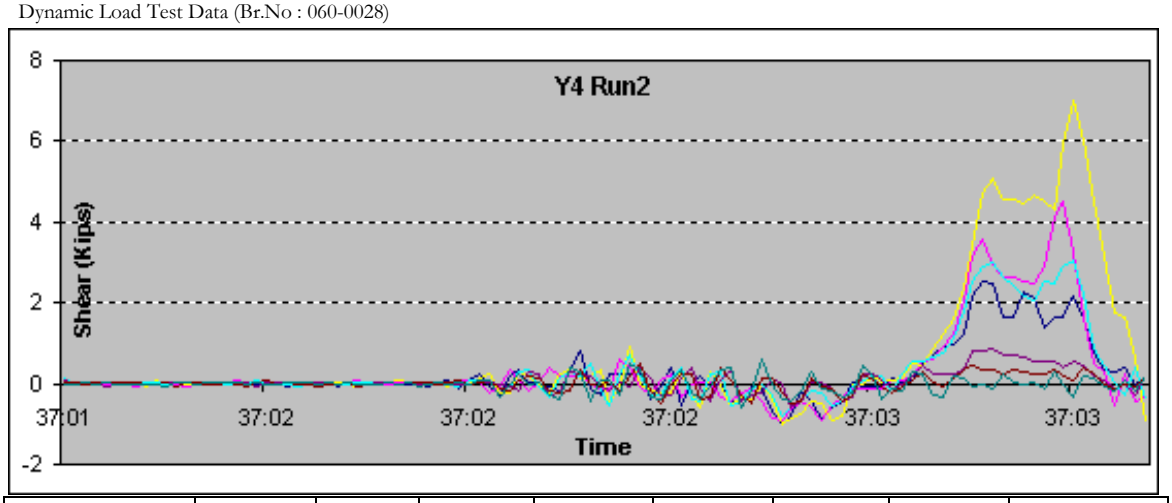
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
11:24.2	0.0395	-0.0430	0.0077	-0.1276	-0.0884	-0.1540	-0.0596	-0.4254
11:24.2	0.0118	-0.1582	-0.1147	-0.0882	-0.0371	-0.0822	0.0731	-0.3955
11:24.2	-0.0640	-0.0795	-0.1280	-0.0357	0.0246	-0.1746	-0.2482	-0.7054
11:24.2	-0.0845	-0.0081	0.2336	0.0707	0.1199	-0.0382	0.1128	0.4062
11:24.2	0.1386	0.1159	0.1505	0.0402	0.0480	0.1730	0.2410	0.9073
11:24.3	-0.0435	-0.0474	0.2131	0.3448	0.3193	0.2214	-0.0271	0.9805
11:24.3	-0.2739	0.1436	0.5237	0.4876	0.4719	0.3300	0.2528	1.9358
11:24.3	0.1984	0.2997	0.4756	0.7777	0.5466	0.5734	0.4179	3.2894
11:24.3	0.3020	0.3157	0.7862	1.3624	1.0674	0.8770	0.4856	5.1963
11:24.3	-0.0801	0.4658	1.1024	1.8873	1.6334	1.1689	0.6552	6.8329
11:24.4	0.1547	0.6335	1.3941	1.9106	1.6774	1.2057	0.6552	7.6312
11:24.4	0.5002	0.6684	1.4656	3.0551	2.3403	1.6324	0.8438	10.5057
11:24.4	0.0760	0.7997	2.0005	3.2388	2.8110	1.9243	1.0722	11.9225
11:24.4	0.2422	0.6087	1.5530	4.0522	3.0839	2.2630	1.0045	12.8074
11:24.4	0.0279	0.8290	2.3343	3.8817	3.0031	1.9683	0.9558	13.0001
11:24.5	0.2582	0.7720	1.9451	3.2898	2.7552	1.9549	0.8998	11.8751
11:24.5	0.5688	0.6131	1.4567	2.5739	2.7875	1.8128	0.9250	10.7379
11:24.5	-0.0640	0.5372	1.7192	2.7854	2.3608	1.6630	0.6877	9.6893
11:24.5	-0.1005	0.6524	1.6871	4.1967	3.4270	2.2819	0.8349	12.9795
11:24.5	0.4974	0.7282	2.0254	5.4431	4.2865	2.5242	1.2166	16.7214
11:24.6	0.1037	0.6380	2.6754	6.7493	4.4758	2.4228	0.5741	17.6392
11:24.6	**-0.0042**	**0.7924**	**2.6173**	**7.3119**	**5.8690**	**3.0139**	**0.9071**	**20.5075**
11:24.6	0.1984	0.9104	2.8460	5.9371	5.0212	2.6061	1.5631	19.0823
11:24.6	0.3296	0.7997	2.2308	2.1658	2.8961	1.3639	0.0731	9.8590
11:24.6	0.1663	0.0168	0.6156	1.3596	1.2947	0.3696	-0.2202	3.6023
11:24.7	-0.2024	-0.2119	0.3167	-0.0794	0.7359	0.2448	0.4946	1.2982
11:24.7	-0.3630	0.0328	0.3997	0.0241	0.4836	0.3211	0.2175	1.1160
11:24.7	0.2626	0.3783	0.3881	-0.1276	0.1300	0.2097	0.1850	1.4262
11:24.7	0.2931	0.1685	0.3122	-0.4498	-0.5018	-0.2069	0.0082	-0.3765
11:24.7	-0.1471	-0.3697	-0.3467	-0.4293	-0.1130	-0.1657	-0.2600	-1.8315

Dynamic Load Test Data (Br.No : 060-0028)



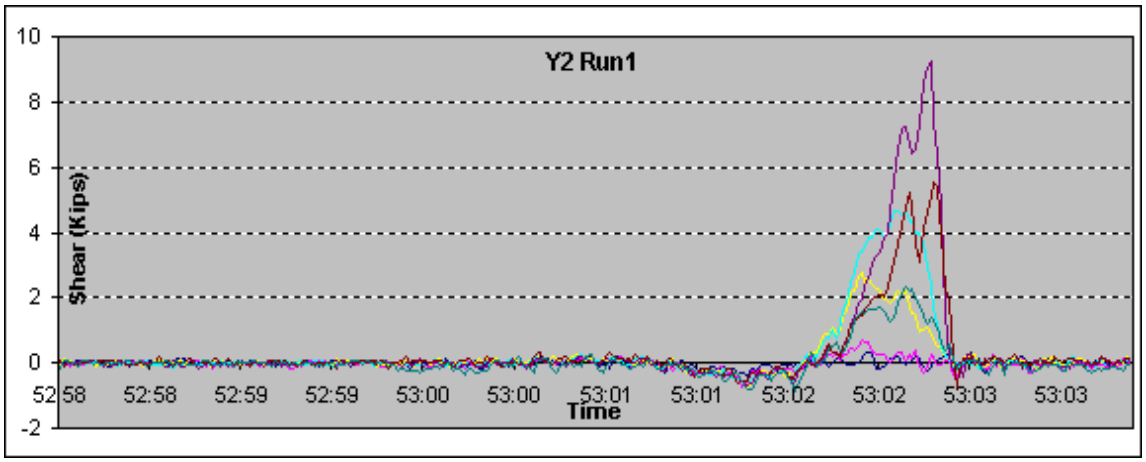
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
24:12.3	-0.6020	-0.4253	-0.4991	-0.2926	-0.1041	-0.0800	0.0555	-1.9476
24:12.3	-0.1076	-0.4325	-0.4349	-0.2007	0.0397	0.0476	-0.3100	-1.3986
24:12.3	-0.6662	-0.6368	-0.7162	-0.5025	-0.0366	-0.1931	-0.0536	-2.8050
24:12.3	-0.6662	-0.7242	-0.8840	-0.7329	-0.1642	-0.2003	-0.3705	-3.7422
24:12.3	-0.3716	-0.4181	-0.4598	-0.3292	-0.3725	-0.3323	0.0348	-2.2487
24:12.4	-0.4270	-0.3378	-0.0545	0.1010	0.0029	-0.1006	0.3634	-0.4526
24:12.4	-0.2404	-0.1075	-0.0734	-0.0812	0.1789	0.0871	-0.1052	-0.3415
24:12.4	0.1533	-0.2110	-0.1243	0.0529	0.0909	0.1384	-0.2601	-0.1600
24:12.4	-0.1369	-0.0200	0.2124	0.1725	0.1817	-0.1168	-0.0536	0.2393
24:12.4	-0.0422	-0.1629	-0.0617	-0.1847	-0.1129	-0.1608	-0.1096	-0.8348
24:12.5	0.1228	-0.0798	-0.0180	0.2367	0.0191	-0.0845	0.0818	0.2781
24:12.5	-0.0727	0.0880	0.4515	0.3402	0.2669	0.0754	0.1070	1.2564
24:12.5	0.2086	0.2746	0.5739	0.4786	0.4179	0.2631	-0.3749	1.8419
24:12.5	0.5718	0.4539	0.8946	0.6813	0.2112	-0.0845	-0.0626	2.6658
24:12.5	0.4595	0.5603	0.9748	0.5705	0.2391	-0.0405	0.1467	2.9105
24:12.6	0.6942	0.8388	1.3364	0.8563	0.2068	0.1473	-0.0257	4.0540
24:12.6	0.9173	1.1217	2.1237	1.7660	0.6630	0.2470	0.2027	7.0414
24:12.6	1.1609	2.0314	3.3308	2.3258	0.8301	0.3863	0.0510	10.1163
24:12.6	2.1609	2.6277	3.9228	2.3668	0.8491	0.4113	0.0466	12.3850
24:12.6	2.0269	2.7838	4.3237	2.7632	0.9694	0.3071	0.0717	13.2458
24:12.7	1.4699	2.8303	4.6326	2.5008	0.6747	0.2793	-0.0654	12.3222
24:12.7	1.7805	2.6875	4.2390	2.5008	0.7494	0.2470	0.0421	12.2462
24:12.7	1.9029	2.8071	4.6487	2.2355	0.4870	0.2470	0.0628	12.3909
24:12.7	1.5297	2.0867	3.9970	1.7821	0.6101	0.3439	0.1143	10.4637
24:12.7	1.6011	2.0241	4.2346	1.7588	0.4825	0.2308	-0.0816	10.2503
24:12.8	1.3387	3.3508	4.3397	2.4542	0.4547	0.1545	-0.2378	11.8548
24:12.8	1.5225	3.6819	5.7495	3.3624	0.5822	0.0871	0.0141	14.9997
24:12.8	2.2645	4.5157	6.7555	3.6658	0.6396	0.3144	0.1188	18.2742
24:12.8	**2.1974**	**4.7533**	**8.1548**	**3.2211**	**0.6981**	**0.2442**	**0.1232**	**19.3922**
24:12.8	1.9743	3.0141	6.6066	2.0473	0.6145	0.3951	-0.0139	14.6381
24:12.9	1.2966	1.0286	4.5668	0.8811	0.4518	0.1311	-0.0581	8.2979

Dynamic Load Test Data (Br.No : 060-0028)



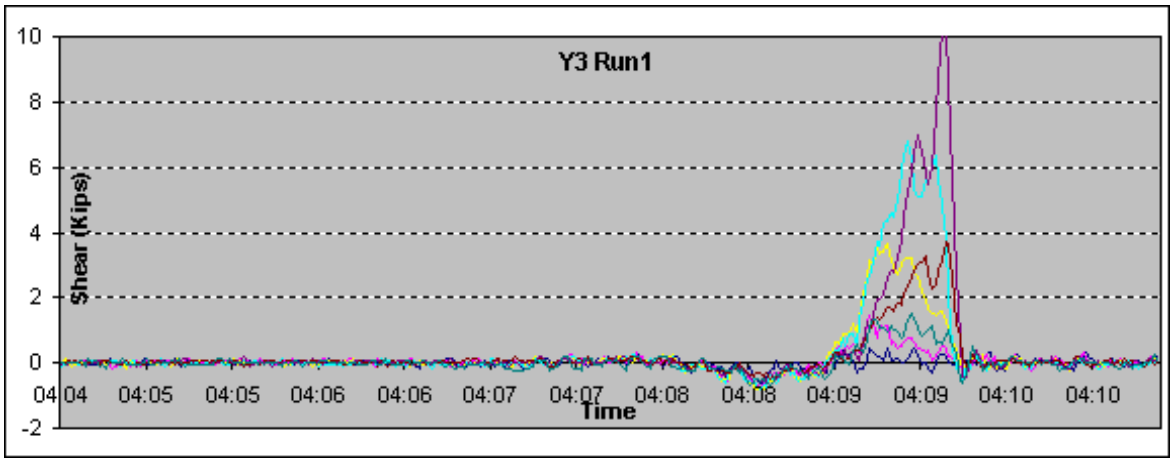
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
37:02.7	-0.9873	-0.9081	-1.0176	-0.7874	-0.0250	-0.2447	-0.3740	-4.3441
37:02.7	-0.8140	-0.6662	-0.8470	-0.5687	-0.5865	-0.5087	-0.4608	-4.4518
37:02.7	-0.1578	-0.4519	-0.7318	-0.4097	-0.4618	-0.4368	-0.2016	-2.8515
37:02.7	-0.4596	-0.6080	-0.4461	-0.2027	0.0440	0.1235	0.2775	-1.2713
37:02.7	-0.8344	-0.9097	-0.4971	-0.2464	0.0368	-0.0965	-0.1294	-2.6768
37:02.8	-0.5908	-0.5277	-0.8980	-0.5570	-0.1437	-0.1361	-0.1882	-3.0415
37:02.8	-0.4524	-0.3555	-0.7961	-0.4302	-0.4545	-0.4324	-0.3136	-3.2347
37:02.8	0.0199	-0.1296	-0.0248	-0.0714	-0.3593	-0.2842	-0.2503	-1.0996
37:02.8	-0.0615	-0.1368	-0.0131	0.0714	0.2479	0.2232	0.4292	0.7603
37:02.8	-0.0571	-0.1047	0.1779	0.1938	0.2406	0.1001	0.1964	0.7470
37:02.9	-0.0980	-0.1296	0.0394	0.2026	0.0574	-0.0804	-0.3651	-0.3736
37:02.9	0.1207	0.0731	0.0832	-0.2187	-0.1231	-0.2475	-0.1411	-0.4535
37:02.9	0.0244	0.0747	0.1574	0.2652	-0.0423	-0.0525	-0.1720	0.2548
37:02.9	0.0858	0.1694	0.5074	0.5409	0.1732	0.0912	0.2921	1.8600
37:02.9	0.4895	0.5514	0.4548	0.5481	0.4401	0.3157	0.2479	3.0475
37:03.0	0.7287	0.6068	0.8866	0.6356	0.2172	0.0149	-0.2973	2.7925
37:03.0	0.8964	0.9246	1.2349	0.7685	0.2245	-0.0759	-0.3196	3.6533
##########	0.9562	1.2397	1.5716	1.1007	0.2612	0.1118	0.1656	5.4068
37:03.0	1.2259	2.0547	2.3545	1.8239	0.3682	0.3346	0.1315	8.2933
37:03.0	2.1766	3.1467	3.4027	2.5514	0.8317	0.4549	-0.0969	12.4670
37:03.1	2.5221	3.5492	4.7089	2.9202	0.8127	0.3229	-0.0365	14.7995
37:03.1	2.4944	2.9324	5.0776	3.0033	0.8595	0.3552	-0.1484	14.5740
37:03.1	1.6444	2.6555	4.5776	2.6461	0.6997	0.2555	0.2199	12.6988
37:03.1	1.6517	2.6262	4.5704	2.4391	0.7114	0.3508	0.0077	12.3572
37:03.1	2.2480	2.5503	4.4508	2.1766	0.6645	0.2717	-0.0454	12.3166
37:03.2	2.1007	2.4733	4.6768	2.0863	0.5648	0.2628	0.0268	12.1915
37:03.2	1.3776	2.9079	4.4902	2.5309	0.5281	0.2204	-0.1265	11.9285
37:03.2	1.6400	4.1600	4.3052	2.4667	0.5676	0.3274	0.2921	13.7591
37:03.2	1.6240	4.5172	5.9380	2.9158	0.4122	0.1792	-0.0202	15.5662
37:03.2	**2.1621**	**3.2795**	**7.0095**	**3.0659**	**0.5648**	**0.0706**	**-0.3578**	**15.7947**
37:03.3	1.5730	1.6261	6.0267	2.2175	0.4518	0.4198	0.1964	12.5114

Dynamic Load Test Data (Br.No : 060-0056)



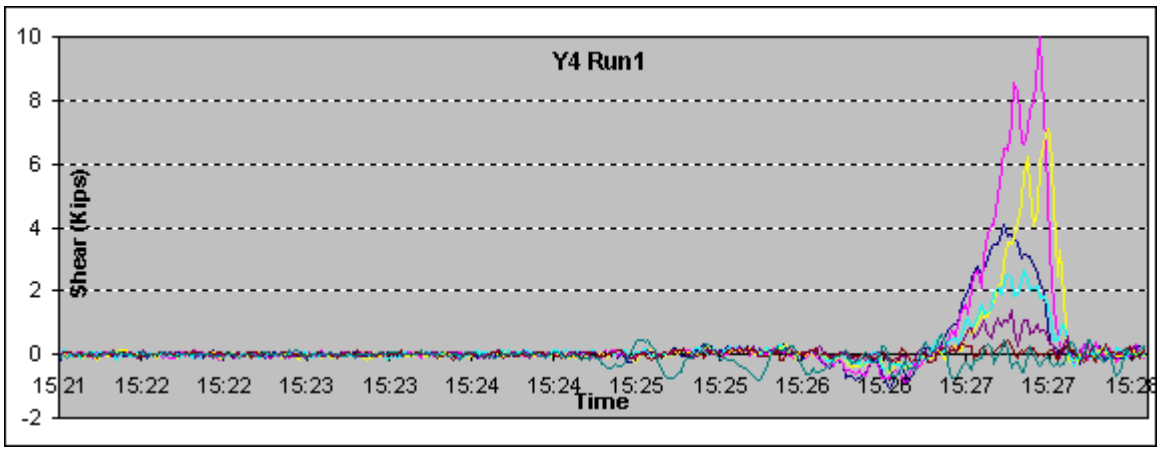
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
53:02.1	-0.0911	0.2491	0.8853	0.7587	0.5855	0.5785	0.4742	3.4401
53:02.2	0.0250	0.2152	1.0664	1.0219	0.3141	0.3452	0.5133	3.5010
53:02.2	0.1514	0.2869	0.8957	0.7457	0.3417	0.2901	0.6176	3.3292
53:02.2	0.0693	0.0887	1.0221	1.1887	0.1359	0.2180	0.4139	3.1366
53:02.2	0.0693	0.2465	1.4417	1.6251	0.4858	0.5234	0.3372	4.7290
53:02.2	-0.0637	0.2426	1.5850	1.8610	0.7296	0.6506	0.5182	5.5233
53:02.3	-0.0533	0.4707	2.1752	2.4343	1.1451	1.1237	0.7937	8.0895
53:02.3	-0.0402	0.4159	2.2404	2.7548	1.3614	1.2613	1.3020	9.2956
53:02.3	-0.0194	0.4916	2.6326	3.3620	1.8384	1.3779	1.4504	11.1335
53:02.3	0.1579	0.7302	2.7968	3.4102	1.9551	1.4265	1.5775	12.0541
53:02.3	0.2675	0.6454	2.4892	3.5431	2.4217	1.6217	1.4944	12.4831
53:02.4	0.2949	0.6076	2.6560	3.8362	2.6078	1.7554	1.6215	13.3795
53:02.4	0.2675	0.3038	2.3902	3.8740	3.0089	1.9546	1.6492	13.4482
53:02.4	-0.1797	0.2595	2.2808	4.0682	3.2631	2.0097	1.6165	13.3180
53:02.4	-0.1837	0.2869	2.2404	4.0134	3.4244	2.0988	1.7323	13.6124
53:02.4	-0.1145	0.2804	1.9707	3.8323	3.8123	1.9992	1.5562	13.3365
53:02.5	0.0145	0.0783	1.9159	3.9861	3.9460	2.3151	1.4064	13.6622
53:02.5	0.1241	0.0170	1.8612	4.2896	4.6288	2.6099	1.2630	14.7937
53:02.5	0.1410	0.2256	1.9667	4.6584	5.5489	3.0870	1.4114	17.0391
53:02.5	0.2231	0.3103	2.1896	4.6375	6.5411	3.6336	1.8040	19.3393
53:02.5	0.0315	0.3482	2.1140	4.5046	7.1964	4.2168	2.1071	20.5186
53:02.6	**-0.0637**	**0.0444**	**2.2026**	**4.6375**	**7.2240**	**4.6939**	**2.3059**	**21.0445**
53:02.6	0.0184	0.2764	1.7896	4.3717	6.7508	5.2325	2.2228	20.6624
53:02.6	0.0797	0.1265	1.5133	4.3717	6.3969	4.7935	2.2455	19.5273
53:02.6	0.1958	0.3860	1.4352	3.9522	6.5581	3.6296	2.0077	18.1646
53:02.6	0.1554	-0.0991	0.9778	3.9965	7.3065	3.0805	1.7599	17.1776
53:02.7	-0.1080	-0.2868	1.0013	3.6720	8.5595	4.0726	1.4618	18.3724
53:02.7	-0.2410	-0.1160	1.0560	2.9763	9.0772	4.5943	1.2303	18.5771
53:02.7	**-0.1080**	**0.2660**	**0.9062**	**2.4134**	**9.2529**	**5.1080**	**1.4014**	**19.2398**
53:02.7	-0.0089	0.2152	0.7629	1.6356	7.3956	5.5104	1.3020	16.8127
53:02.7	0.0797	-0.0717	0.5374	1.2264	6.3550	5.4042	1.1096	14.6407

Dynamic Load Test Data (Br.No : 060-0056)



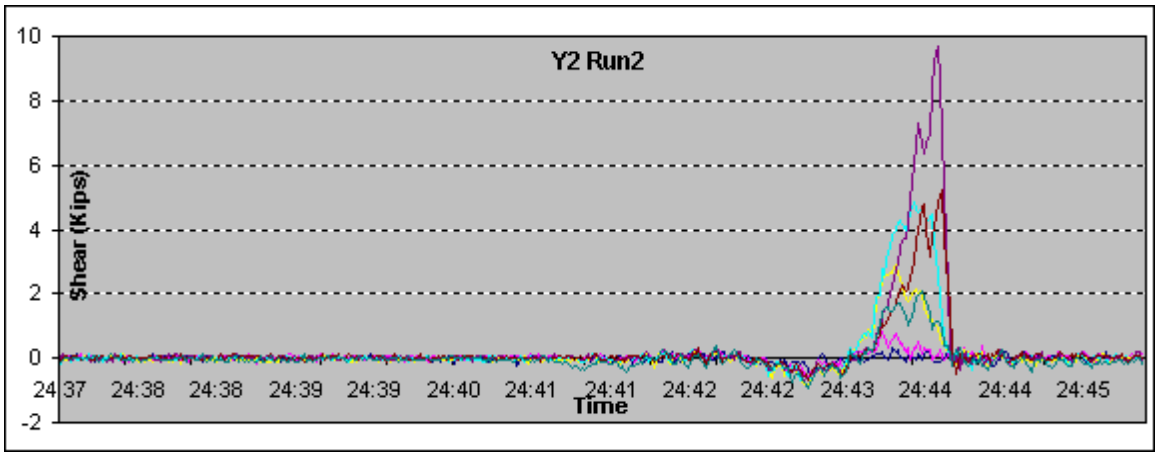
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
04:08.7	0.2517	0.4373	0.8833	0.8864	0.1647	0.1187	-0.0443	2.6977
04:08.7	0.0639	0.5599	1.2312	0.8590	0.3770	0.3139	0.3922	3.7971
04:08.7	-0.2881	0.4060	0.9549	0.5281	0.2197	0.4070	0.5520	2.7796
04:08.7	-0.1617	0.3382	1.3471	1.3059	0.0756	0.4136	0.4349	3.7536
04:08.7	-0.1552	0.6146	2.1080	1.8961	0.6653	0.6128	0.3518	6.0936
04:08.8	0.0978	1.2014	2.5588	2.5919	1.2459	0.8290	0.7054	9.2302
04:08.8	0.4290	1.4334	3.1556	2.6740	1.0087	0.9522	1.0752	10.7281
04:08.8	0.3129	1.1844	2.9953	3.0766	1.4687	1.2681	1.3067	11.6127
04:08.8	0.2204	0.7372	3.5959	3.7007	1.9497	1.4228	1.2740	12.9007
04:08.8	0.2243	1.1466	3.3432	3.5743	1.9392	1.3612	1.0589	12.6476
04:08.9	0.0874	1.0684	3.4253	4.3117	2.0900	1.4778	1.0702	13.5308
04:08.9	0.4355	1.1401	3.6363	4.3521	2.6536	1.7006	0.9318	14.8500
04:08.9	0.0704	0.5664	3.1386	4.5710	2.8148	1.6390	1.1143	13.9145
04:08.9	0.0704	0.6211	2.9510	4.4994	2.7767	1.5604	1.0149	13.4939
04:08.9	0.1148	0.4673	2.7152	4.9488	3.1883	1.8383	0.9595	14.2321
04:09.0	0.0157	0.5155	3.0018	5.8296	3.7859	1.7767	0.7771	15.7023
04:09.0	0.0261	0.6655	3.1386	6.3547	4.4792	2.1672	0.8488	17.6801
12:04:09	0.1656	0.7815	3.1894	6.8225	5.2551	2.3599	1.3067	19.8807
04:09.0	0.3195	0.7372	3.2376	6.3169	5.8659	2.6758	1.5168	20.6697
04:09.0	0.4290	0.6485	2.7595	5.3241	6.4046	2.8199	1.3620	19.7476
04:09.1	0.2412	0.4438	2.6266	5.0752	6.9576	3.0257	1.0639	19.4341
04:09.1	-0.0287	0.3825	2.2240	5.0961	6.4740	3.0598	0.8211	18.0288
04:09.1	-0.0052	0.3512	1.9816	5.6798	5.8554	3.2590	0.9268	18.0487
04:09.1	-0.1617	0.3617	1.6572	5.5156	5.4989	2.7374	1.0312	16.6403
04:09.1	-0.2921	0.0514	1.5452	6.0068	5.9485	2.2878	1.1306	16.6781
04:09.2	-0.0730	0.2078	1.4422	6.3482	7.6195	2.3769	0.5520	18.4736
04:09.2	0.2138	0.3238	1.4969	5.6550	8.7283	2.8580	0.6614	19.9373
04:09.2	**0.2686**	**0.4881**	**1.5960**	**4.8707**	**10.2041**	**3.1594**	**0.5683**	**21.1552**
04:09.2	**0.2034**	**0.4712**	**1.3471**	**3.7684**	**10.2801**	**3.7466**	**0.8225**	**20.6392**
04:09.2	0.0261	0.1948	1.0878	2.1072	8.6051	3.6509	1.0362	16.7081
04:09.3	-0.0834	0.1270	0.7295	0.4525	5.6496	2.6417	0.5293	10.0462

Dynamic Load Test Data (Br.No : 060-0056)



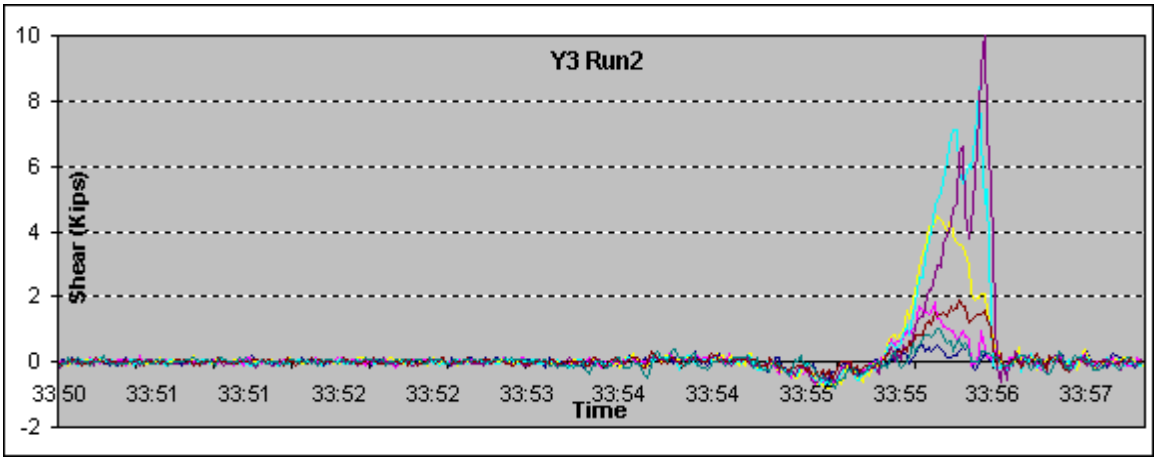
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
15:26.6	1.8113	1.5828	0.6754	1.0040	0.6047	0.2472	-0.2256	5.6997
15:26.6	1.9482	1.2581	0.7913	1.1369	0.7934	0.2747	-0.3137	5.8889
15:26.6	2.3237	2.0743	0.6545	0.7955	0.8105	0.2577	-0.5075	6.4087
15:26.6	2.5623	2.5007	0.6923	0.9389	0.5116	-0.0962	-0.2093	6.9002
15:26.6	2.7436	2.6272	0.9346	1.1304	0.6388	-0.0477	-0.1490	7.8779
15:26.7	2.5493	2.0808	1.3581	1.5668	0.8930	0.1790	-0.1036	8.5236
15:26.7	2.6210	3.1018	1.1222	1.2424	1.0542	0.2852	0.1932	9.6202
15:26.7	3.0474	3.7916	1.2108	1.3310	0.6427	-0.0031	0.3040	10.3243
15:26.7	3.4333	4.1019	1.4532	1.4340	0.5326	0.0139	0.1932	11.1621
15:26.7	3.4438	4.0784	1.6851	1.9864	0.8210	0.0584	-0.2924	11.7807
15:26.8	3.4711	4.9794	2.1424	2.0580	1.1368	0.1751	-0.0332	13.9297
15:26.8	3.8427	5.8569	2.1867	1.9147	0.8930	0.3193	0.1265	15.1399
15:26.8	4.0957	6.4919	2.9242	2.3108	1.0477	0.2367	0.4197	17.5267
15:26.8	3.7306	6.4411	3.4974	2.5531	1.0202	0.4634	0.1492	17.8551
15:26.8	3.7919	7.3147	3.4427	2.3720	1.3806	0.2787	-0.4358	18.1448
15:26.9	3.5833	8.5847	3.6264	1.8365	0.8380	0.0689	-0.3250	18.2128
15:26.9	3.5324	8.3017	4.1762	1.9082	0.2678	-0.0923	-0.2207	17.8735
15:26.9	2.9991	6.6458	4.7769	2.3447	0.8209	0.1135	-0.5678	17.1331
15:26.9	3.1465	6.5975	5.6876	2.6756	1.0647	0.0584	-0.5842	18.6462
15:26.9	3.1086	7.0448	6.2609	2.3069	1.1093	0.1751	-0.0382	19.9674
15:27.0	3.1191	7.6733	5.2003	2.0033	0.6663	0.1240	0.2876	19.0739
15:27.0	2.8153	7.9119	4.0290	2.0789	0.7043	0.1856	-0.0155	17.7094
15:27.0	2.5219	9.2914	4.6062	2.1466	0.9271	-0.0622	-0.3300	19.1011
15:27.0	**2.2924**	**10.0085**	**6.0628**	**1.7988**	**0.6873**	**0.0414**	**-0.3464**	**20.5449**
15:27.0	1.9782	7.7658	6.6296	1.8092	0.7489	-0.0477	-0.1539	18.7300
15:27.1	0.9611	5.0889	7.1273	1.5056	0.5496	0.0584	-0.0822	15.2089
15:27.1	0.4187	3.3000	6.9084	1.2529	0.2954	0.1515	-0.2647	12.0622
15:27.1	0.2753	1.4458	4.7834	0.4581	0.2888	0.0519	-0.3364	6.9670
15:27.1	0.1449	0.5788	2.4733	0.4620	-0.3049	-0.2024	-0.2320	2.9198
15:27.1	-0.0832	0.2919	3.2851	0.7617	0.0110	0.1200	-0.3364	4.0500
04:09.3	-0.0834	0.1270	0.7295	0.4525	5.6496	2.6417	0.5293	10.0462

Dynamic Load Test Data (Br.No : 060-0056)



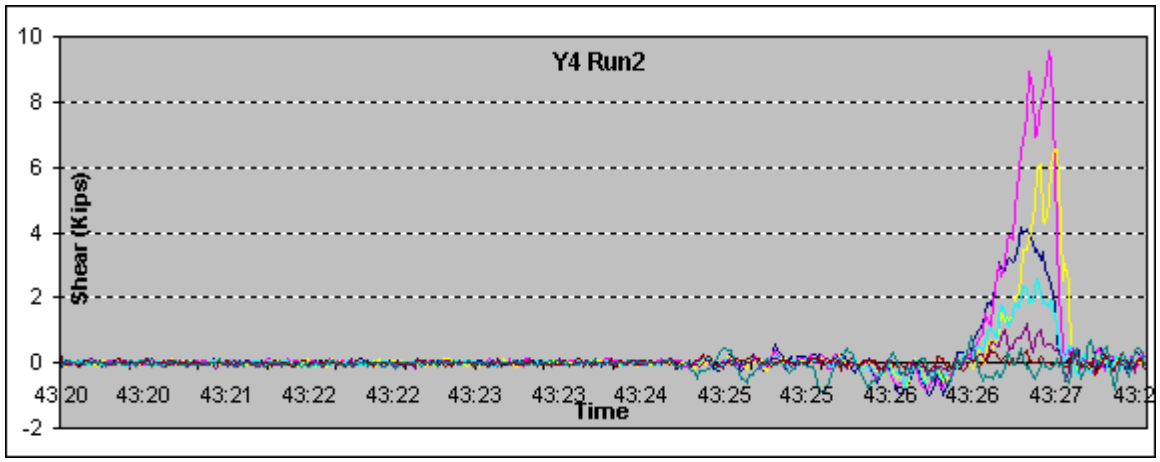
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
24:43.3	-0.0047	0.1811	0.9979	1.3746	0.2900	0.2309	0.3536	3.4233
24:43.3	0.1557	0.2528	1.7418	1.9205	0.7776	0.5874	0.6013	6.0370
24:43.3	0.1218	0.7104	1.9946	1.9817	0.8392	0.7250	1.0593	7.4319
24:43.3	0.1726	0.8095	2.4310	2.7973	1.2651	1.0919	1.4128	9.9804
24:43.3	0.0292	0.6831	2.5027	2.5654	1.5194	1.0303	1.5008	9.8309
24:43.4	-0.0490	0.3414	2.6082	3.3393	1.6151	1.2020	1.5775	10.6345
24:43.4	0.0227	0.5396	2.6799	3.3980	2.0200	1.3016	1.4618	11.4236
24:43.4	0.3369	0.5800	2.6186	3.8136	2.2127	1.4628	1.4731	12.4979
24:43.4	0.2209	0.7339	2.8740	3.9908	2.7789	1.6686	1.6279	13.8949
24:43.4	0.2378	0.6348	2.6525	4.2266	2.9781	2.0120	1.6769	14.4187
24:43.5	-0.0151	0.4575	2.4922	4.2540	3.4106	2.0670	1.7046	14.3708
24:43.5	-0.0151	0.4575	2.2330	4.1380	3.6504	2.2702	1.5335	14.2675
24:43.5	-0.0999	0.2254	1.8135	3.9843	3.7120	2.0946	1.3020	13.0319
24:43.5	0.1661	0.3036	1.7965	4.2435	4.1315	2.1561	1.0152	13.8126
24:43.5	-0.0764	-0.0784	1.8030	4.5302	4.9034	2.5546	1.1309	14.7673
24:43.6	0.0227	0.3076	2.1066	4.8337	6.0567	2.9766	1.5285	17.8324
24:43.6	-0.0764	0.3141	2.1678	4.6631	6.5679	3.5768	1.8920	19.1052
24:43.6	**0.1048**	**0.5123**	**2.0011**	**4.5640**	**7.3097**	**3.9477**	**1.9474**	**20.3870**
24:43.6	-0.0595	0.1537	2.0792	4.6253	6.6884	4.6685	2.0794	20.2351
24:43.6	0.0605	0.3245	1.5438	4.5028	6.3726	4.7682	1.8757	19.4480
24:43.7	0.1765	0.2632	1.4721	4.2227	6.7015	3.9451	1.7826	18.5638
24:43.7	0.1492	0.2423	1.2128	4.3595	6.9663	3.1312	1.4128	17.4741
24:43.7	0.0396	-0.0406	1.1750	4.4924	8.2809	3.7865	0.8832	18.6170
24:43.7	-0.1207	0.0037	1.0422	3.5817	9.1695	4.0368	1.0869	18.8001
24:43.7	**-0.1142**	**0.0755**	**0.9431**	**2.6735**	**9.7016**	**4.8127**	**1.1586**	**19.2508**
24:43.8	-0.1207	0.2358	0.7282	1.8658	8.6137	5.0630	1.0592	17.4450
24:43.8	-0.0699	0.0650	0.4754	1.2378	6.9729	5.2006	0.9549	14.8367
24:43.8	-0.0386	-0.0301	0.4480	0.7023	5.3149	3.7695	0.3862	10.5522
24:43.8	0.1765	0.0715	0.1823	0.1837	2.2743	2.2833	0.3586	5.5302
24:43.8	0.1048	0.2971	0.2409	0.1056	0.3280	1.5559	0.0781	2.7105
24:43.9	0.1283	0.1367	-0.2477	-0.2358	-0.0769	0.3475	-0.2477	-0.1956

Dynamic Load Test Data (Br.No : 060-0056)



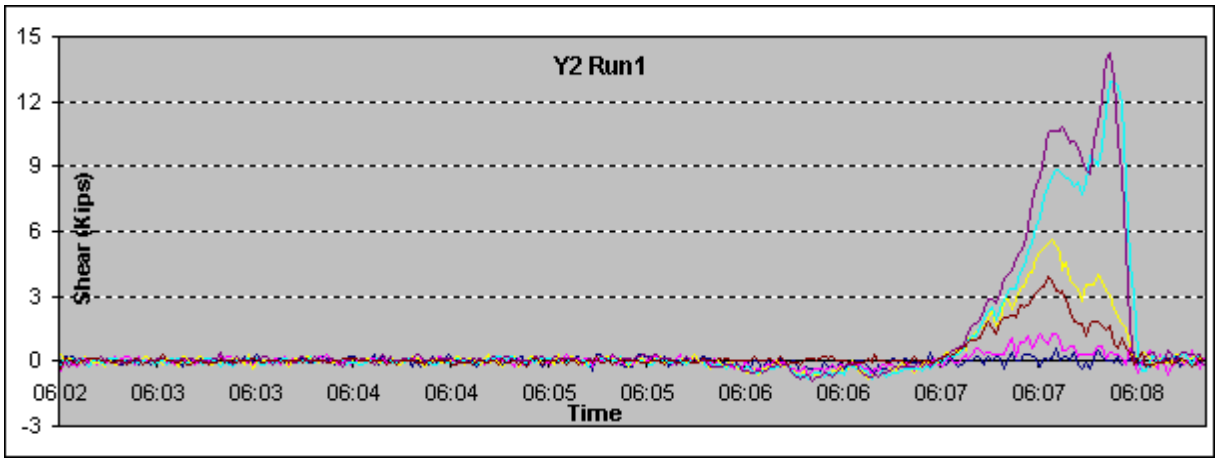
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
33:55.5	0.4440	1.6826	2.8621	2.5650	1.3062	0.8252	0.5435	10.2285
33:55.5	0.5261	1.5561	3.4184	2.6092	1.3888	0.8488	0.6705	11.0181
33:55.5	0.3553	1.5014	3.4966	3.2164	1.7217	1.1686	0.8026	12.2626
33:55.5	0.4375	1.4570	4.1415	3.7519	2.2158	1.2958	0.8466	14.1461
33:55.5	0.3006	1.5014	4.0151	3.9603	2.2053	1.1136	0.7749	13.8712
33:55.6	0.4440	1.8260	4.2744	4.7212	2.6549	1.5120	0.9183	16.3509
33:55.6	0.4883	1.3449	4.4451	4.9532	2.9602	1.3914	1.0013	16.5845
33:55.6	0.3618	1.2693	4.3396	5.1746	2.9091	1.4635	0.9737	16.4916
33:55.6	0.3553	1.0476	4.2848	5.5160	3.5749	1.5186	0.7536	17.0508
33:55.6	0.1402	1.0202	3.9773	6.1505	3.8908	1.3784	0.5548	17.1122
33:55.7	0.1128	0.9694	4.3838	6.9114	4.1962	1.6798	0.6378	18.8913
33:55.7	0.2119	0.9316	3.9370	7.1264	4.6942	1.5802	0.3184	18.7996
33:55.7	0.2119	0.7165	3.6399	7.0886	4.8790	1.6352	0.5711	18.7422
33:55.7	0.3175	0.7334	3.6021	5.8534	6.4203	1.8790	0.6705	19.4763
33:55.7	0.4544	0.9381	3.5239	5.4951	6.6340	1.7073	0.4227	19.1756
33:55.8	0.3658	0.7882	3.3090	5.6763	4.5671	1.7283	0.5988	17.0333
33:55.8	0.4336	0.6721	2.9402	6.0176	3.7637	1.1962	0.4114	15.4348
33:55.8	0.0346	-0.1232	2.1455	5.9460	4.1556	1.2578	-0.0075	13.4087
33:55.8	-0.2627	-0.0450	1.9201	6.8462	5.5894	1.3639	0.0252	15.4371
33:55.8	-0.0645	0.2797	1.9305	8.4397	7.6838	1.4740	-0.0075	19.7357
33:55.9	**0.0620**	**0.9759**	**2.0673**	**6.8567**	**8.9839**	**1.4570**	**0.3070**	**20.7098**
33:55.9	**0.2458**	**0.4401**	**2.0738**	**4.8736**	**10.1032**	**1.5697**	**0.3070**	**19.6132**
33:55.9	0.1571	0.1363	1.5045	5.2736	6.9970	1.2617	0.2566	15.5868
33:55.9	0.0411	0.0815	1.2113	1.5031	5.5448	1.0966	0.1686	9.6470
33:55.9	0.1949	0.2434	0.5520	-0.1412	3.3665	0.4231	0.1388	4.7776
33:56.0	0.1740	0.3530	0.3642	-0.2428	-0.1945	-0.0264	0.1161	0.5436
33:56.0	-0.1129	-0.0669	0.2065	-0.1711	-0.6230	0.2790	-0.0763	-0.5647
12:33:56	-0.1806	-0.2481	-0.1856	-0.0174	0.0153	-0.1601	-0.1154	-0.8920
33:56.0	-0.1532	-0.2103	-0.1413	-0.2324	-0.5339	-0.1090	-0.1204	-1.5005
33:56.0	-0.0476	0.1313	-0.2065	-0.2050	-0.0018	-0.0539	-0.0877	-0.4712
24:43.9	0.1283	0.1367	-0.2477	-0.2358	-0.0769	0.3475	-0.2477	-0.1956

Dynamic Load Test Data (Br.No : 060-0056)



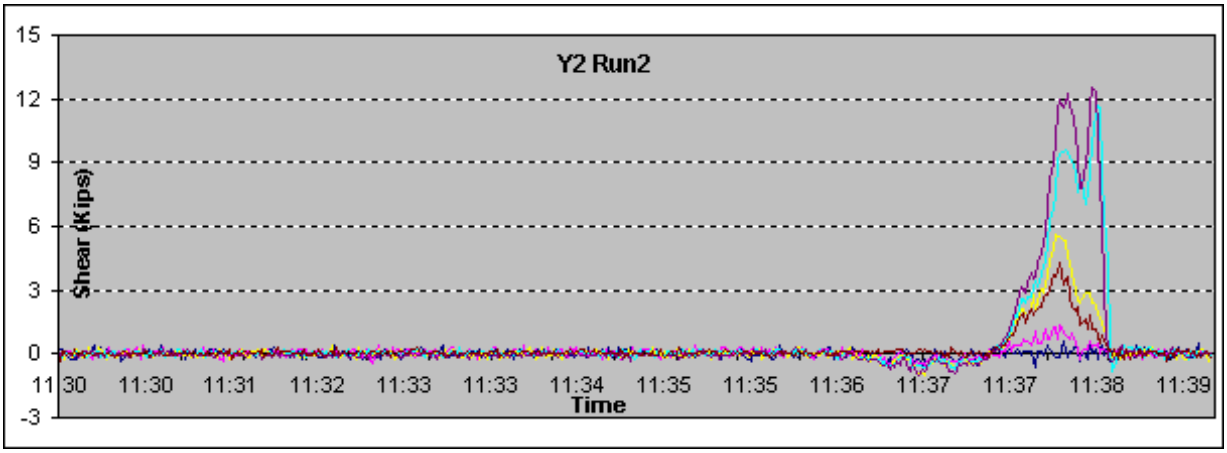
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Beam7	Total Shear
43:26.6	1.1817	0.8658	0.0224	0.3600	0.2429	-0.0116	-0.5628	2.0984
43:26.6	1.5063	1.5112	0.0224	0.5411	0.1498	0.0565	-0.3527	3.4347
43:26.6	1.8440	1.3339	0.4901	0.9671	0.1458	0.0736	-0.4357	4.4189
43:26.6	1.7763	1.1631	0.7012	1.1040	0.6544	0.4104	-0.4244	5.3850
43:26.6	2.0357	1.8320	0.4628	0.9437	0.6609	0.3279	-0.4634	5.7995
43:26.7	2.6394	2.6821	0.6986	0.7561	0.5377	0.2663	-0.2419	7.3382
43:26.7	3.0801	3.0302	0.9644	1.2916	0.5168	0.1221	-0.4130	8.5921
43:26.7	2.9093	2.6482	1.5885	1.7385	0.7540	0.0670	-0.4244	9.2811
43:26.7	2.8141	3.0576	1.2784	1.5782	1.0253	0.1902	-0.1376	9.8063
43:26.7	3.0617	3.7149	1.3692	1.1756	0.7783	0.1117	0.2987	10.5102
43:26.8	3.2052	3.9366	1.3314	1.1144	0.3903	-0.0665	0.2710	10.1824
43:26.8	3.0956	3.7697	1.4135	1.4349	0.4689	0.1051	-0.0271	10.2607
43:26.8	3.1817	4.6980	1.9321	1.8479	0.7232	0.0331	-0.0271	12.3889
43:26.8	3.6524	5.8520	2.1745	1.7319	0.7573	0.1287	0.2483	14.5451
43:26.8	4.1270	6.4661	2.6761	1.9912	0.7783	0.2454	0.4748	16.7588
43:26.9	3.9731	6.7021	3.4605	2.3182	0.8884	0.2729	0.1489	17.7641
43:26.9	4.0827	7.6070	3.4435	2.2674	1.2068	0.4105	-0.1542	18.8637
43:26.9	3.9184	8.9069	3.7914	1.8375	0.8228	0.0947	-0.1379	19.2337
43:26.9	3.7306	8.3580	4.4090	1.9131	0.3182	0.0291	-0.3530	18.4050
43:26.9	3.3994	6.9237	4.7673	2.2336	0.6171	0.0396	-0.5127	17.4680
43:27.0	3.4372	7.0124	5.9752	2.5710	0.8674	0.0396	-0.3743	19.5285
43:27.0	**3.1569**	**7.9850**	**6.0990**	**2.1619**	**1.0115**	**0.2178**	**-0.0925**	**20.5397**
12:43:27	3.3720	8.3136	4.3686	1.8270	0.5725	0.1287	0.0949	18.6775
43:27.0	2.8974	8.5079	4.2761	1.8479	0.5070	-0.0535	-0.1038	17.8790
43:27.0	**2.5832**	**9.5627**	**4.8807**	**1.7215**	**0.5685**	**0.0121**	**-0.1755**	**19.1533**
43:27.1	2.4228	9.3176	6.1224	1.9534	0.6066	-0.0770	-0.1755	20.1703
43:27.1	1.7983	5.9954	6.5380	1.4492	0.3969	-0.0600	-0.0271	16.0907
43:27.1	0.9208	3.9326	6.5172	1.1587	0.4519	0.1537	0.1390	13.2738
43:27.1	0.2858	2.1581	5.6169	0.6023	0.2972	-0.0154	-0.1379	8.8071
43:27.1	0.0603	0.5022	2.5184	0.0499	-0.0973	-0.0390	-0.0108	2.9838
43:27.2	0.0264	0.1437	3.0435	0.1659	-0.5363	-0.0941	-0.4687	2.2803

Dynamic Load Test Data (Br.No : 060-0319)



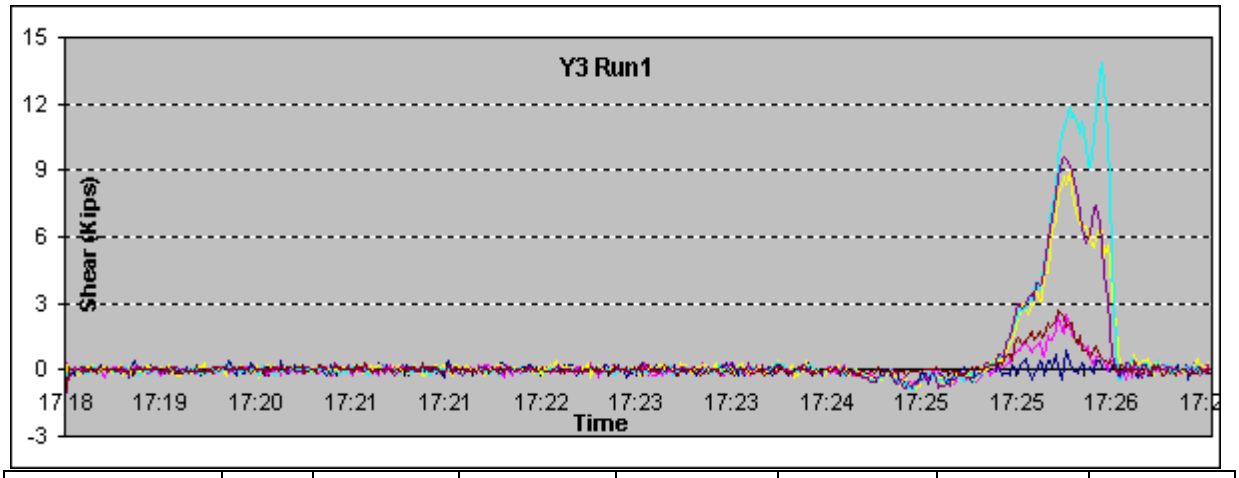
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
06:07.2	0.060	0.839	3.304	4.084	5.029	2.555	15.872
06:07.2	0.273	0.891	3.464	4.411	5.327	2.492	16.858
06:07.2	0.273	1.123	3.998	5.017	6.175	2.601	19.187
06:07.2	0.215	0.578	4.150	5.526	7.280	2.875	20.624
06:07.2	0.112	0.894	4.789	6.190	8.092	3.189	23.266
06:07.3	-0.209	1.299	5.078	6.620	8.558	3.348	24.694
06:07.3	0.151	0.941	5.275	7.634	9.508	3.472	26.981
06:07.3	0.076	0.773	5.384	8.112	10.574	3.921	28.840
06:07.3	0.126	1.251	5.618	8.517	10.663	3.699	29.874
06:07.3	0.602	1.305	5.315	8.840	10.681	3.288	30.031
06:07.4	0.046	0.984	5.070	8.793	10.611	3.187	28.691
06:07.4	0.157	0.523	4.177	8.672	10.804	3.215	27.549
06:07.4	0.178	0.462	4.552	8.441	10.537	2.835	27.003
06:07.4	0.010	0.707	3.764	8.338	10.109	2.329	25.257
06:07.4	0.431	0.687	3.582	8.129	10.152	1.874	24.855
06:07.5	-0.180	0.231	3.348	8.234	9.838	1.755	23.226
06:07.5	-0.336	0.274	2.775	7.714	9.360	1.743	21.530
06:07.5	-0.091	0.274	3.577	8.255	8.837	1.141	21.993
06:07.5	-0.336	0.274	3.558	9.528	8.689	1.708	23.421
06:07.5	0.138	0.294	3.550	9.343	10.178	1.807	25.309
06:07.6	0.547	0.699	3.990	9.018	10.932	1.805	26.991
06:07.6	0.189	0.696	3.761	9.863	12.131	1.600	28.240
06:07.6	**0.065**	**0.158**	**3.229**	**11.632**	**13.926**	**1.419**	**30.429**
06:07.6	**0.014**	**0.407**	**3.098**	**12.962**	**14.262**	**1.674**	**32.416**
06:07.6	-0.096	0.283	2.385	12.900	13.061	0.833	29.365
06:07.7	0.178	0.286	2.083	12.714	10.284	0.609	26.154
06:07.7	-0.185	0.168	1.741	11.958	8.674	1.116	23.471
06:07.7	0.065	-0.174	1.518	8.242	5.305	0.630	15.585
06:07.7	0.068	0.586	0.799	4.551	1.671	0.425	8.099
06:07.7	0.363	0.112	0.116	3.045	-0.016	-0.114	3.506
06:07.8	-0.180	-0.494	0.256	0.242	-0.137	0.116	-0.196

Dynamic Load Test Data (Br.No : 060-0319)



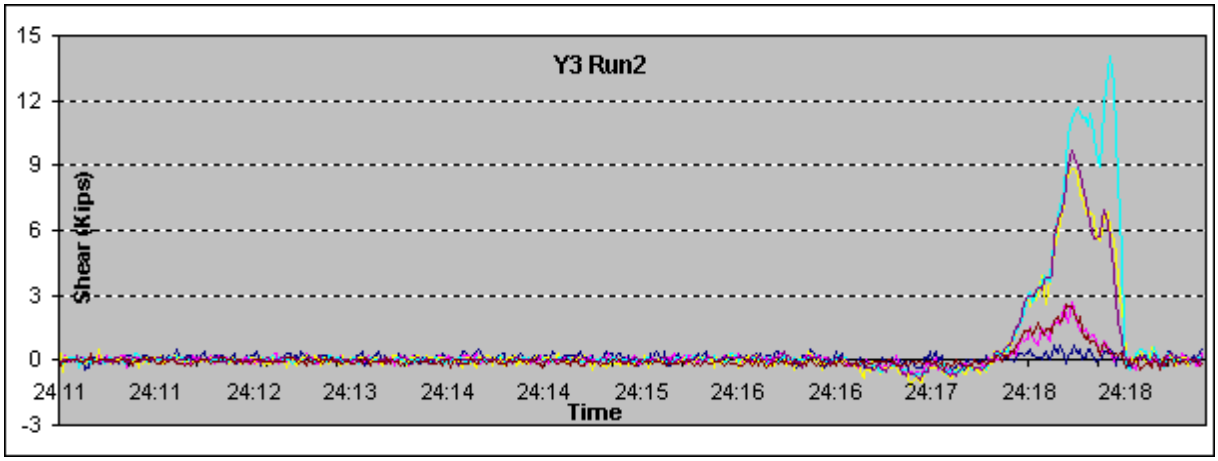
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
11:37.6	0.155	0.695	2.082	2.543	3.097	1.885	10.457
11:37.6	0.158	0.620	1.922	2.436	2.868	1.488	9.493
11:37.6	0.089	0.614	1.871	2.717	3.338	1.765	10.394
11:37.7	0.092	0.386	2.098	2.651	3.785	2.083	11.096
11:37.7	-0.222	0.577	2.744	3.148	3.528	1.851	11.626
11:37.7	-0.610	1.091	2.027	3.400	3.634	2.068	11.611
11:37.7	0.115	0.504	2.515	3.112	4.307	2.098	12.650
11:37.7	0.125	0.511	3.110	3.688	4.794	2.212	14.438
11:37.8	-0.025	0.793	2.916	4.129	5.148	2.564	15.526
11:37.8	0.155	1.201	3.305	4.389	5.772	2.780	17.603
11:37.8	0.384	0.675	3.633	5.269	6.827	2.805	19.594
11:37.8	0.186	0.686	4.404	6.258	8.166	3.097	22.798
11:37.8	0.065	1.272	4.941	6.888	8.919	3.687	25.772
11:37.9	-0.153	1.264	5.658	7.522	10.214	3.668	28.173
11:37.9	-0.199	0.672	5.545	9.152	11.355	3.853	30.378
11:37.9	**-0.201**	**1.334**	**5.530**	**9.364**	**11.949**	**4.320**	**32.296**
11:37.9	0.610	1.053	5.359	9.481	11.610	3.238	31.351
11:37.9	0.147	0.873	5.298	9.556	11.799	3.410	31.083
11:38.0	-0.194	0.794	4.570	9.504	12.253	3.593	30.521
11:38.0	0.131	0.697	4.411	9.263	11.707	2.765	28.975
2:11:38	0.092	0.938	3.852	9.109	11.455	2.237	27.684
11:38.0	0.390	0.612	2.981	8.597	10.446	2.003	25.028
11:38.0	0.257	0.229	2.623	7.605	9.210	2.243	22.167
11:38.1	-0.326	-0.214	2.432	8.195	7.800	1.363	19.250
11:38.1	0.147	0.086	2.634	8.136	7.791	1.486	20.280
11:38.1	-0.109	0.257	2.904	7.063	8.912	1.661	20.687
11:38.1	-0.272	0.262	2.860	7.622	9.784	1.130	21.386
11:38.1	0.474	0.600	2.904	8.576	11.543	1.799	25.896
11:38.2	**0.070**	**0.312**	**2.378**	**9.902**	**12.511**	**1.182**	**26.354**
11:38.2	0.213	0.455	2.316	11.311	12.358	1.162	27.816
11:38.2	-0.215	0.502	1.787	11.687	10.312	0.912	24.984

Dynamic Load Test Data (Br.No : 060-0319)



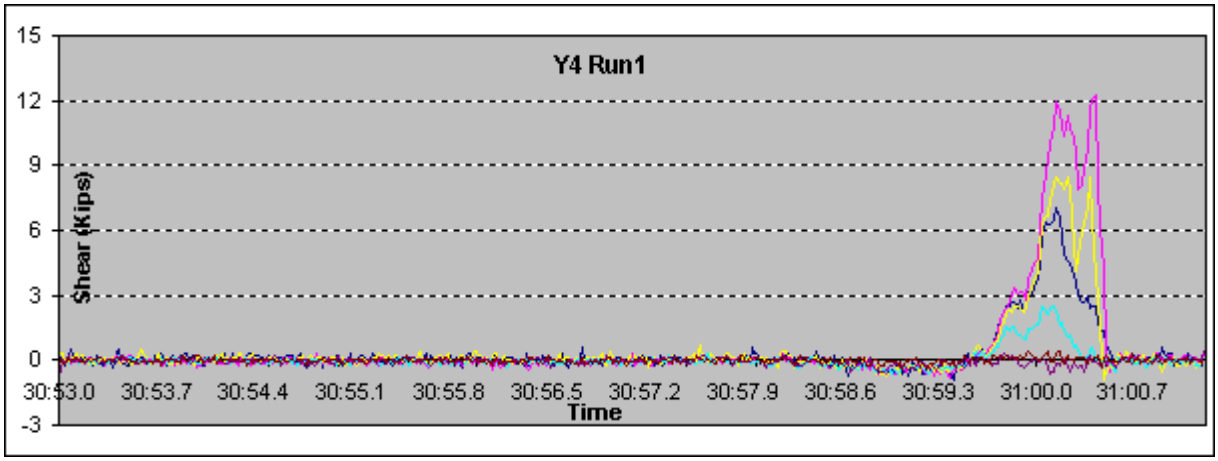
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
17:25.6	0.539	1.193	2.851	2.807	3.000	1.302	11.692
17:25.6	0.071	1.032	2.512	3.175	3.234	1.480	11.505
17:25.6	-0.480	0.794	2.992	3.177	3.463	1.710	11.657
17:25.6	-0.159	0.988	3.105	3.506	3.155	1.393	11.987
17:25.6	-0.033	1.083	3.631	4.043	3.914	1.456	14.093
17:25.7	0.368	1.298	3.088	3.592	3.855	1.714	13.916
17:25.7	0.297	0.783	3.174	4.044	3.884	1.431	13.613
17:25.7	-0.232	0.565	4.297	4.843	4.597	1.590	15.661
17:25.7	0.402	1.571	4.355	5.524	5.803	2.072	19.726
17:25.7	0.426	1.372	5.407	6.773	6.357	1.965	22.300
17:25.8	0.079	1.380	6.345	7.398	6.732	2.033	23.968
17:25.8	0.687	1.877	6.661	8.076	7.980	2.183	27.465
17:25.8	0.115	2.389	7.958	9.464	8.616	2.657	31.199
17:25.8	-0.457	1.830	8.255	10.631	9.412	2.451	32.122
17:25.8	0.189	1.640	8.741	10.895	9.557	2.357	33.379
17:25.9	0.861	2.469	8.357	11.170	9.482	1.972	34.312
17:25.9	**0.313**	**2.085**	**8.914**	**11.860**	**9.245**	**2.161**	**34.579**
17:25.9	0.002	1.554	8.079	11.395	8.964	2.136	32.131
17:25.9	-0.036	1.527	7.589	11.496	8.595	1.422	30.592
17:25.9	-0.165	1.212	6.827	11.127	7.745	1.201	27.947
17:26.0	0.060	1.146	6.701	10.630	7.034	1.564	27.136
17:26.0	0.313	1.083	6.519	11.238	6.464	0.903	26.521
#########	0.013	0.979	6.497	10.187	5.743	0.885	24.303
17:26.0	0.017	1.028	6.216	9.344	5.974	0.772	23.351
17:26.0	0.134	0.627	5.869	9.123	6.094	0.641	22.489
17:26.1	-0.157	0.257	5.512	10.418	7.256	0.842	24.128
17:26.1	0.366	0.560	5.927	11.884	7.378	1.082	27.198
17:26.1	0.384	0.615	6.459	13.297	6.588	0.724	28.068
17:26.1	**0.112**	**0.546**	**6.324**	**13.909**	**5.672**	**0.460**	**27.023**
17:26.1	0.071	0.380	5.182	12.960	4.353	0.425	23.371
17:26.2	0.250	-0.032	5.667	10.576	3.209	0.313	19.983

Dynamic Load Test Data (Br.No : 060-0319)



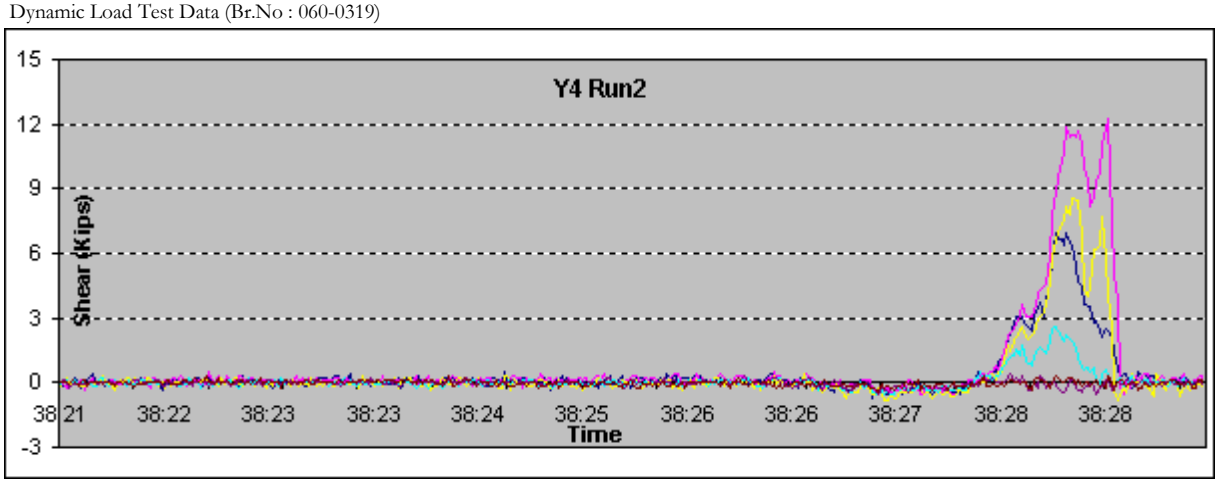
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
24:17.8	0.128	0.773	2.771	2.989	3.205	1.492	11.357
24:17.8	0.171	0.737	3.003	3.345	3.354	1.751	12.362
24:17.8	0.067	1.444	3.881	3.500	3.287	1.386	13.565
24:17.8	0.268	1.385	3.336	3.910	3.675	1.125	13.698
24:17.8	0.432	1.205	2.607	3.772	3.795	1.443	13.255
24:17.9	0.073	0.867	3.772	3.668	3.804	1.463	13.647
24:17.9	0.202	1.627	4.190	4.790	3.898	1.297	16.002
24:17.9	0.700	1.622	5.132	5.422	5.633	1.841	20.350
24:17.9	0.326	1.801	5.793	6.686	6.481	2.043	23.130
24:17.9	0.730	1.685	6.444	7.076	6.688	1.773	24.396
24:18.0	0.286	2.511	7.091	7.863	7.295	2.009	27.053
24:18.0	-0.119	2.093	8.330	9.054	8.198	2.627	30.184
#########	0.199	1.740	8.456	10.449	9.019	2.529	32.390
24:18.0	**0.303**	**2.658**	**8.853**	**11.154**	**9.649**	**2.505**	**35.121**
24:18.0	0.650	2.445	8.865	11.290	9.370	2.199	34.819
24:18.1	0.292	1.615	8.564	11.645	9.050	1.700	32.867
24:18.1	0.490	1.444	7.605	11.539	8.631	2.026	31.737
24:18.1	-0.016	1.304	7.610	11.238	8.179	1.358	29.673
24:18.1	0.144	1.436	6.762	11.214	7.341	1.019	27.916
24:18.1	0.537	1.134	7.015	10.859	6.930	1.212	27.688
24:18.2	0.521	1.084	6.742	11.354	6.405	0.780	26.887
24:18.2	0.001	1.156	6.704	10.448	5.638	0.860	24.806
24:18.2	-0.085	0.980	5.745	9.555	5.645	0.769	22.609
24:18.2	0.031	0.244	5.537	8.954	5.692	0.177	20.635
24:18.2	0.113	0.376	5.866	10.162	6.509	0.729	23.756
24:18.3	0.378	0.913	6.663	11.792	6.934	0.832	27.512
24:18.3	0.361	0.555	6.855	13.272	6.369	0.552	27.966
24:18.3	**0.474**	**0.379**	**5.956**	**14.095**	**5.496**	**0.285**	**26.686**
24:18.3	0.355	-0.034	5.609	12.737	4.180	0.234	23.082
24:18.3	-0.291	0.142	4.812	10.403	2.884	0.273	18.224
24:18.4	0.232	0.247	3.705	8.359	1.798	0.183	14.525

Dynamic Load Test Data (Br.No : 060-0319)



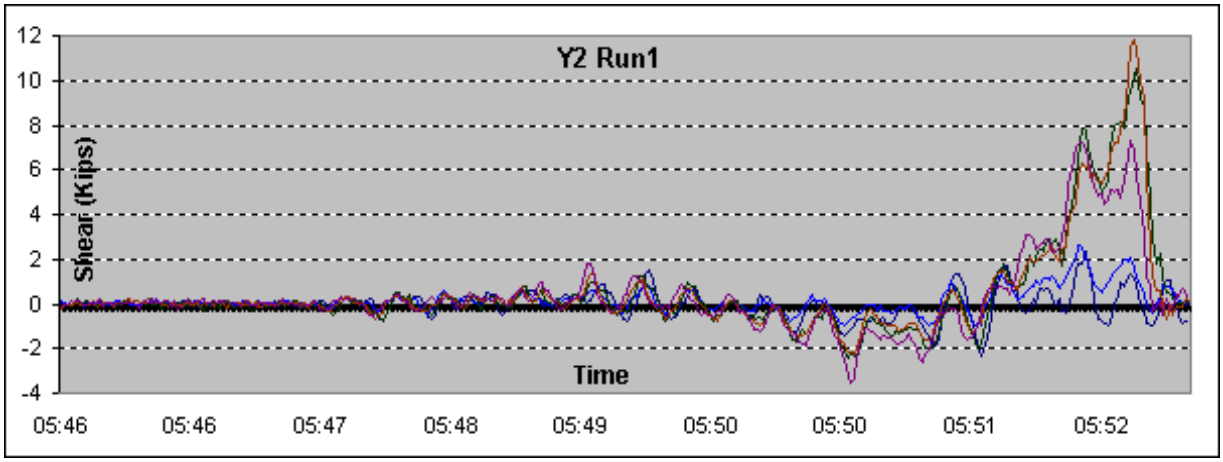
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
30:59.9	2.639	3.314	2.504	1.532	0.037	0.109	10.136
30:59.9	2.396	3.025	2.510	1.127	-0.107	-0.015	8.936
30:59.9	2.744	3.199	2.380	1.149	-0.275	0.209	9.407
30:59.9	2.240	3.072	2.212	0.972	-0.366	-0.006	8.123
30:59.9	2.491	2.823	2.446	1.014	-0.272	0.191	8.694
31:00.0	3.192	3.727	3.038	1.474	-0.115	0.380	11.697
31:00.0	3.016	4.154	3.206	1.437	-0.059	0.205	11.961
2:31:00	3.374	4.501	3.622	1.504	0.099	0.168	13.269
31:00.0	3.698	4.672	3.992	1.630	-0.074	-0.009	13.909
31:00.0	4.617	6.102	5.249	1.952	-0.071	-0.002	17.847
31:00.1	5.803	7.404	6.309	2.458	0.174	0.112	22.259
31:00.1	6.344	8.650	6.620	2.337	-0.102	0.309	24.158
31:00.1	6.259	9.223	6.656	2.096	-0.379	0.380	24.233
31:00.1	6.270	10.120	7.427	2.377	-0.636	-0.048	25.510
31:00.1	6.476	10.696	8.118	2.487	-0.494	-0.018	27.266
31:00.2	**7.043**	**11.999**	**8.421**	**2.305**	**-0.175**	**0.307**	**29.900**
31:00.2	6.539	11.531	8.187	1.618	-0.257	0.436	28.054
31:00.2	5.717	10.935	8.207	1.783	-0.063	-0.037	26.543
31:00.2	4.994	10.340	7.895	1.394	0.024	-0.186	24.461
31:00.2	4.581	11.276	8.433	1.120	-0.253	0.246	25.403
31:00.3	4.507	10.767	7.884	1.141	-0.558	0.041	23.782
31:00.3	3.920	10.294	5.318	0.619	-0.080	-0.063	20.009
31:00.3	3.721	9.739	4.102	0.739	-0.246	0.172	18.226
31:00.3	2.987	7.939	4.768	0.411	-0.315	0.147	15.937
31:00.3	2.647	8.047	5.907	0.168	-0.297	0.159	16.631
31:00.4	2.641	8.876	6.351	0.087	-0.501	0.164	17.619
31:00.4	2.958	9.828	7.054	0.058	-0.011	-0.163	19.726
31:00.4	2.396	11.522	8.491	0.479	0.217	0.048	23.153
31:00.4	2.515	12.065	6.511	0.625	-0.072	0.050	21.693
31:00.4	**2.457**	**12.289**	**3.879**	**-0.047**	**-0.102**	**0.110**	**18.587**
31:00.5	1.750	8.018	2.891	-0.134	-0.192	0.177	12.510

Dynamic Load Test Data (Br.No : 060-0319)



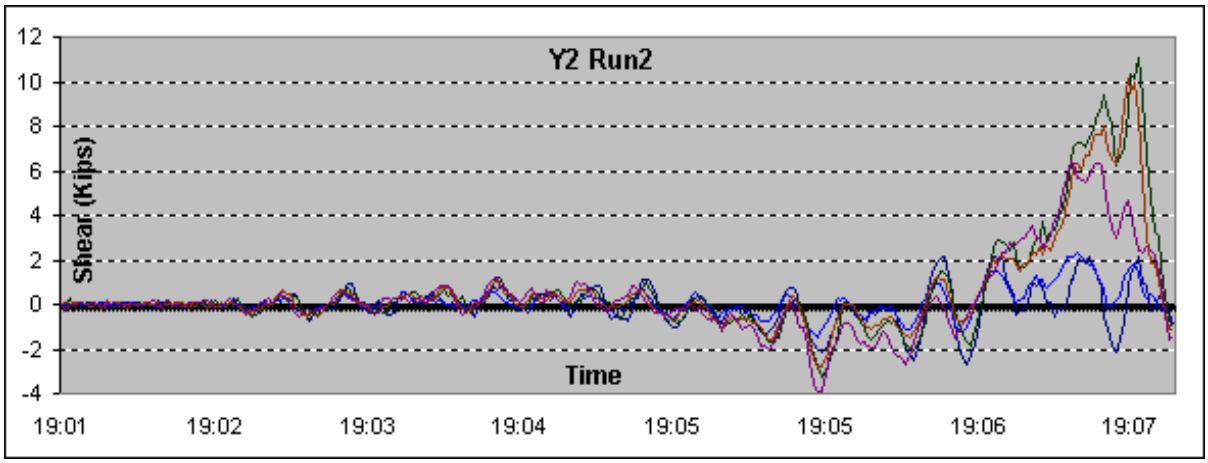
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Beam6	Total Shear
38:27.8	2.691	3.033	2.098	1.071	-0.089	0.044	8.847
38:27.8	2.613	3.099	2.064	0.857	-0.354	-0.246	8.034
38:27.8	2.380	3.048	2.193	0.806	-0.311	-0.309	7.806
38:27.8	3.089	3.212	2.314	1.188	0.042	0.147	9.993
38:27.9	3.485	4.108	2.956	1.548	-0.261	0.185	12.021
38:27.9	3.709	4.335	3.069	1.669	0.316	0.130	13.228
38:27.9	3.027	4.476	3.292	1.461	0.089	0.053	12.399
38:27.9	3.959	4.581	3.666	1.339	-0.229	0.061	13.377
38:27.9	4.536	5.892	4.678	1.947	-0.190	-0.220	16.643
38:28.0	5.722	7.661	5.912	2.534	0.071	-0.048	21.852
38:28.0	6.962	8.834	6.606	2.590	-0.068	0.319	25.245
38:25:0	6.651	9.533	7.030	2.434	-0.219	0.216	25.646
38:28.0	6.701	10.268	7.363	2.109	-0.412	0.017	26.046
38:28.0	6.340	10.615	7.523	1.932	-0.413	0.027	26.025
38:28.1	**6.932**	**11.908**	**8.218**	**2.236**	**-0.362**	**0.136**	**29.067**
38:28.1	6.544	11.433	7.799	1.975	0.010	0.191	27.952
38:28.1	6.413	11.511	8.526	1.949	0.191	0.208	28.797
38:28.1	5.419	11.390	8.468	1.603	-0.139	-0.027	26.713
38:28.1	4.629	11.687	8.480	1.195	-0.352	0.131	25.769
38:28.2	4.524	11.090	6.952	0.781	-0.395	-0.112	22.839
38:28.2	3.628	9.999	4.294	0.593	-0.221	-0.058	18.236
38:28.2	3.556	9.389	4.013	0.653	-0.171	0.059	17.500
38:28.2	3.512	8.148	4.491	0.519	-0.037	-0.120	16.514
38:28.2	2.762	8.663	6.193	0.723	-0.197	0.057	18.200
38:28.3	2.860	9.302	6.145	0.156	-0.537	0.114	18.039
38:28.3	2.389	9.760	6.416	-0.160	-0.293	-0.123	17.989
38:28.3	2.082	11.035	7.676	0.434	-0.196	-0.026	21.005
38:28.3	2.489	11.777	5.849	0.636	0.125	-0.246	20.631
38:28.3	**2.434**	**12.251**	**4.086**	**0.310**	**0.123**	**0.293**	**19.497**
38:28.4	2.073	7.441	2.601	0.043	-0.313	-0.013	11.833
38:28.4	1.427	5.026	-0.372	-0.224	-0.124	-0.313	5.421

Dynamic Load Test Data (Br.No:003-0003)



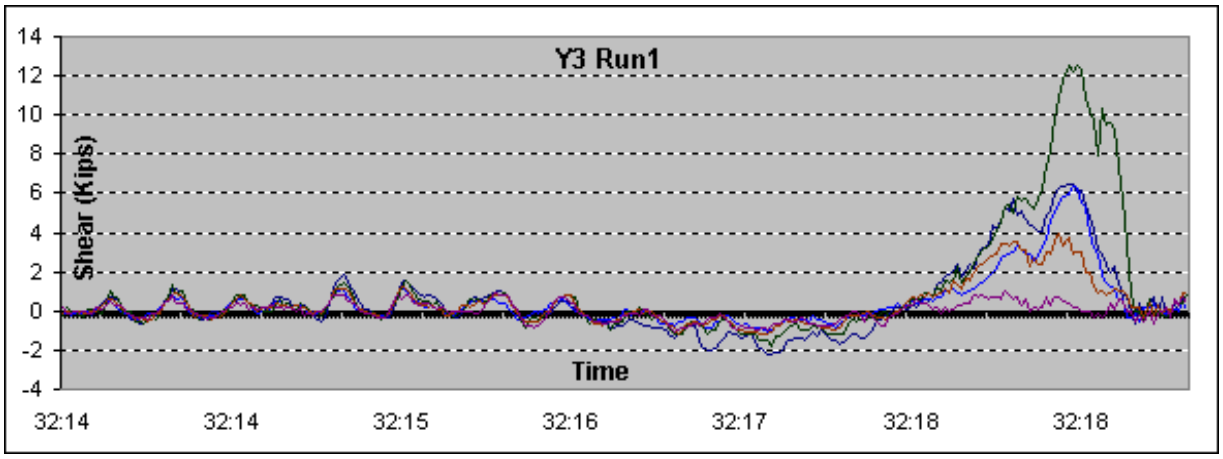
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Total Shear
05:51.9	1.8187	2.5448	7.8598	6.2642	7.2519	25.7394
05:51.9	2.3543	2.0910	7.7964	6.1283	6.9690	25.3391
05:51.9	1.6828	1.8007	7.0158	6.1917	6.4942	23.1852
05:51.9	1.0565	1.2109	6.2717	5.4656	5.6999	19.7046
05:51.9	0.1035	0.8389	5.8996	5.8468	5.2613	17.9502
05:52.0	-0.7040	0.6849	5.6181	5.4928	4.7958	15.8876
05:52.0	-0.8222	0.4668	4.9830	5.3477	4.8781	14.8533
11:05:52	-0.8944	0.7210	5.2284	5.6019	4.4214	15.0782
05:52.0	-1.0038	0.9387	5.4638	6.0373	4.6772	16.1131
05:52.0	-0.8311	1.0385	7.0250	6.6547	5.0604	18.9477
05:52.1	-0.0236	1.4106	7.9232	7.1808	4.9967	21.4876
05:52.1	0.3489	1.6191	8.0775	7.2626	5.0697	22.3777
05:52.1	0.9294	1.7101	8.1140	7.8976	4.7776	23.4288
05:52.1	0.7843	1.9639	7.8414	8.2970	5.4441	24.3306
05:52.1	1.1928	1.8733	9.2663	10.0487	6.6766	29.0578
05:52.2	1.3015	2.0821	9.4660	11.5186	7.3249	31.6932
05:52.2	**1.1383**	**1.6736**	**10.1468**	**11.8093**	**6.9872**	**31.7552**
05:52.2	**0.9114**	**1.1111**	**10.5734**	**11.3918**	**5.7729**	**29.7606**
05:52.2	-0.0869	0.8569	9.2752	10.0122	4.6497	24.7071
05:52.2	-0.0961	0.4034	8.9123	9.1954	3.0429	21.4579
05:52.3	-0.8856	-0.0777	6.9613	5.8191	1.2077	13.0248
05:52.3	-0.9493	-0.2408	4.6202	2.3983	0.7603	6.5886
05:52.3	-0.9762	-0.4132	2.9779	1.2275	-0.2806	2.5354
05:52.3	-0.6587	-0.0592	1.8248	0.6377	-0.1164	1.6283
05:52.3	-0.0236	0.4035	2.2786	0.5648	0.1027	3.3260
05:52.4	0.7386	0.8842	1.1352	-0.0158	-0.4815	2.2607
05:52.4	1.0838	0.8208	0.5181	-0.7146	0.2124	1.9205
05:52.4	1.0293	0.6757	0.3733	-0.0250	-0.3536	1.6997
05:52.4	0.4936	0.6484	0.3365	-0.4969	-0.1345	0.8471
05:52.4	-0.0777	0.2038	-0.0533	-0.1794	0.4589	0.3524

Dynamic Load Test Data (Br.No:003-0003)



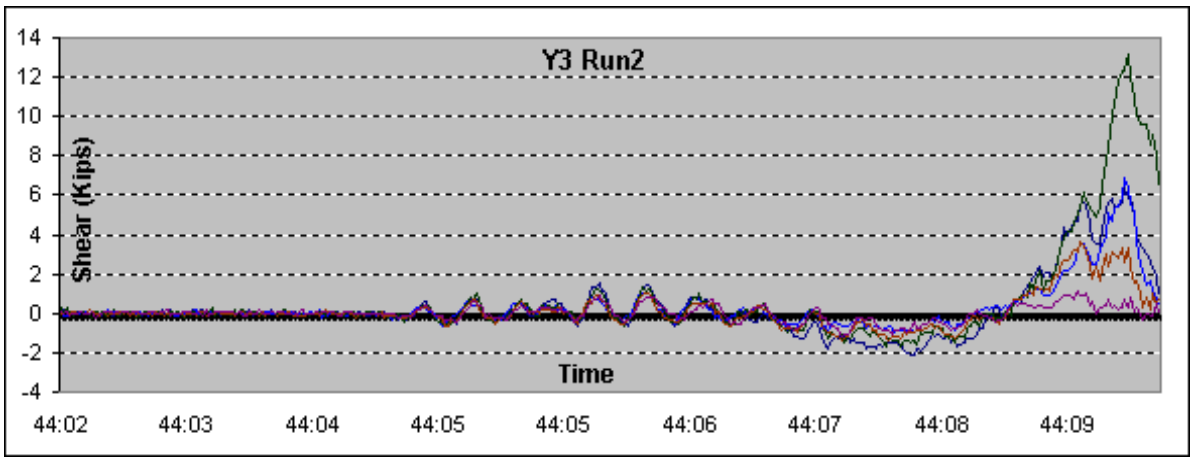
Time	Beam1	Beam2	Beam3	Beam4	Beam5	Total Shear
19:06.5	0.7549	1.1134	3.6933	2.2010	2.5535	10.3161
19:06.5	0.0742	0.7414	2.8674	2.5639	2.8274	9.0742
19:06.5	0.0834	0.9049	3.2667	2.4460	3.0650	9.7660
19:06.5	-0.5970	1.0862	3.3849	3.0085	3.8501	10.7327
19:06.5	-0.2073	1.3311	3.9294	3.3353	4.0691	12.4577
19:06.6	-0.2161	1.6671	4.3921	3.5895	5.0825	14.5151
19:06.6	0.1379	2.0933	5.1723	4.6239	5.7034	17.7308
19:06.6	1.0725	2.1570	6.4429	5.2682	6.4247	21.3653
19:06.6	1.1270	2.1751	7.0692	6.2845	6.3335	22.9893
19:06.6	1.9890	2.3383	7.2869	6.3206	5.6852	23.6200
19:06.7	2.1614	2.0933	7.2324	6.0668	5.5848	23.1387
19:06.7	1.8711	1.9754	7.0600	6.7292	5.5117	23.1474
19:06.7	2.0980	1.7305	7.5319	6.6566	5.7582	23.7752
19:06.7	1.6442	1.7305	7.8226	7.5006	6.2605	24.9582
19:06.7	1.1723	1.2133	8.6028	7.6642	6.2875	24.9400
19:06.8	0.7096	0.9683	8.8205	7.5824	6.2605	24.3413
19:06.8	-0.5248	0.6776	9.4372	7.9725	5.4661	23.0286
19:06.8	-1.1599	-0.0749	8.5387	6.9741	4.3063	18.5843
19:06.8	-1.7677	-0.0661	8.0583	6.4750	3.4575	16.1570
19:06.8	-2.1217	0.1789	6.2068	6.3571	2.9827	13.6038
19:06.9	-1.5957	0.4150	6.5608	7.2283	3.5305	16.1390
19:06.9	-0.8243	1.2766	7.0504	8.9431	4.3616	20.8074
19:06.9	0.7004	1.4763	8.7840	10.1142	4.6169	25.6919
19:06.9	**1.4173**	**1.6940**	**10.3180**	**9.4968**	**4.2974**	**27.2234**
19:06.9	1.6895	1.8756	10.1636	9.9691	3.2566	26.9544
19:07.0	**2.1341**	**1.3584**	**11.1070**	**8.5802**	**2.4623**	**25.6420**
19:07.0	0.9093	0.6415	9.3104	5.6037	2.3526	18.8175
11:19:07	0.8187	0.3060	6.5880	3.0899	2.5898	13.3924
19:07.0	-0.2341	0.4780	4.8275	1.8831	2.4441	9.3986
19:07.0	-0.0982	0.2514	3.2575	1.8831	2.2340	7.5277

Dynamic Load Test Data (Br.No:003-0003)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Total Shear
32:17.9	2.1049	0.9083	1.7182	1.6108	0.3504	6.6926
32:17.9	2.3771	1.0081	1.9267	1.5835	0.4416	7.3371
32:17.9	2.1410	1.1532	2.4712	2.0101	0.7885	8.5641
32:17.9	2.9397	1.3710	2.7979	2.3007	0.6973	10.1066
32:17.9	3.2572	1.4800	3.1247	2.3914	0.8159	11.0692
32:18.0	3.2753	1.7157	3.3424	2.6456	0.5602	11.5391
32:18.0	4.3281	1.9607	3.6599	2.8360	0.7062	13.4910
32:18.0	4.1465	2.1423	4.1318	2.8813	0.6699	13.9718
32:18.0	4.6276	2.7048	4.4858	3.3805	0.6151	15.8137
32:18.0	5.2991	2.8047	5.3113	3.4077	0.9894	17.8123
32:18.1	5.0722	2.9225	5.3751	3.3079	0.8159	17.4937
32:18.1	5.6985	3.0043	5.0391	3.5168	0.6151	17.8737
32:18.1	4.8725	3.3126	5.8831	3.5168	0.7429	18.3280
32:18.1	5.1087	3.1134	5.6565	3.0810	0.2955	17.2551
32:18.1	4.6821	2.8588	5.7560	3.0902	0.5969	16.9840
32:18.2	4.4099	2.8592	5.4296	2.2643	-0.0421	14.9208
32:18.2	4.3008	2.6050	5.1662	2.6544	0.2133	14.9397
32:18.2	4.0286	2.8500	5.7471	2.4275	0.0672	15.1204
32:18.2	4.0105	3.3218	6.2098	2.3822	0.2225	16.1469
32:18.2	4.8818	3.6394	7.3621	3.0537	0.7337	19.6706
32:18.3	5.0995	4.6918	8.1880	2.8813	0.3048	21.1654
32:18.3	5.9526	4.9821	9.8030	3.5436	0.6792	24.9605
32:18.3	6.2882	5.4179	10.8105	3.9614	0.6699	27.1479
32:18.3	6.3973	5.7899	11.7543	3.2987	0.4872	27.7273
32:18.3	**6.4338**	**5.9078**	**12.5072**	**3.7433**	**0.4416**	**29.0337**
32:18.4	6.4879	6.3705	12.1897	2.9539	0.1858	28.1878
32:18.4	**6.0160**	**6.2526**	**12.5341**	**3.0445**	**0.2318**	**28.0790**
32:18.4	6.1976	5.4905	12.3164	2.9631	0.0216	26.9892
32:18.4	5.4262	5.2816	10.9099	1.9648	0.0216	23.6042
32:18.4	4.8365	3.9389	10.2203	1.9195	0.0035	20.9187

Dynamic Load Test Data (Br.No:003-0003)



Time	Beam1	Beam2	Beam3	Beam4	Beam5	Total Shear
44:08.5	2.8014	1.5486	2.6726	1.8976	0.6402	9.5603
44:08.5	3.5274	1.9475	3.5622	2.6144	0.8597	12.5112
44:08.5	4.3622	2.1291	3.8072	2.6509	0.8960	13.8453
44:08.5	3.9809	2.1836	4.1431	2.6962	0.8685	13.8724
44:08.5	4.3802	2.3560	4.1155	3.0410	0.7774	14.6701
44:08.6	4.6708	2.4831	4.6327	3.1773	0.6858	15.6497
44:08.6	4.6344	3.2000	5.0597	3.1228	1.0876	17.1044
44:08.6	5.5148	3.4449	5.3772	3.6764	0.9234	18.9367
44:08.6	5.5962	3.5175	6.1666	3.3858	0.9234	19.5895
44:08.6	5.4783	3.1815	5.7035	3.1043	1.0513	18.5190
44:08.7	4.6071	2.8732	5.4041	2.5238	0.3848	15.7930
44:08.7	3.7544	2.5284	5.1595	1.7977	0.5672	13.8072
44:08.7	3.5547	2.5284	4.8781	2.3875	-0.0444	13.3042
44:08.7	3.4456	3.2453	5.4133	1.6618	0.2751	14.0411
44:08.7	4.2170	3.5263	6.5928	2.2969	0.2933	16.9263
44:08.8	5.2967	3.8984	7.6997	3.0229	0.3663	20.2840
44:08.8	5.5962	5.0779	8.4258	2.3787	0.6584	22.1369
44:08.8	5.8596	4.7331	10.0319	3.0682	0.2751	23.9679
44:08.8	5.4422	5.2868	10.6036	2.9684	0.3481	24.6491
44:08.8	5.3697	5.4500	11.7739	2.8505	0.1747	25.6187
44:08.9	5.6599	5.9671	12.3091	3.3766	0.3389	27.6516
44:08.9	6.3768	6.9197	12.3640	2.5783	0.7499	28.9888
44:08.9	**5.8416**	**6.4751**	**13.1895**	**3.2859**	**0.3207**	**29.1129**
44:08.9	5.9233	5.4772	12.0553	2.3967	0.8322	26.6848
44:08.9	4.8432	5.1958	10.9208	1.5527	0.0560	22.5686
44:09.0	3.9721	3.7260	10.0860	1.6526	0.2388	19.6754
44:09.0	3.3911	2.4920	9.6145	0.9719	0.0104	16.4799
44:09.0	3.3094	2.3019	9.5873	0.2550	-0.3732	15.0803
44:09.0	3.0099	1.4034	9.5873	0.8267	0.0193	14.8466
44:09.0	2.6743	1.6757	8.5072	0.2277	-0.0811	13.0037

APPENDIX L – COMPARISON OF SHEAR AND SHEAR DISTRIBUTION FACTORS (SECOND SIX BRIDGES)

Sn.003-0001		Comparision of Shear and Shear Distribution Factors													
8-Jun-06		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max. sum	Max.Shear	Max. Sum	Max. Shear				Max.Sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	-0.077	-0.020	0.148	0.001	-0.040			-0.003	-0.002	0.014	0.000	-0.004		
	Beam 2	-0.042	0.011	0.080	-0.002	0.007			-0.002	0.001	0.007	0.000	0.001		
	Beam 3	-0.191	0.076	0.219	0.126	0.126			-0.009	0.006	0.020	0.012	0.013		
	Beam 4	-0.392	0.591	0.503	0.675	0.436			-0.018	0.045	0.047	0.064	0.045		
	Beam 5	5.627	3.605	1.753	2.079	1.480			0.252	0.274	0.162	0.197	0.151		
	Beam 6	9.970	6.700	3.893	3.695	3.171			0.446	0.509	0.361	0.349	0.324		
	Beam 7	7.472	2.208	4.195	4.005	4.594			0.334	0.168	0.389	0.379	0.470		
	S	22.367	13.171	10.791	10.578	9.773									
Y1Run2	Beam 1	-0.061	-0.016	0.148	0.084	0.034			-0.003	-0.001	0.014	0.008	0.004		
	Beam 2	-0.036	0.007	0.080	-0.002	-0.042			-0.002	0.001	0.007	0.000	-0.005		
	Beam 3	-0.114	0.056	0.219	0.334	0.285			-0.005	0.004	0.020	0.030	0.031		
	Beam 4	-0.381	0.545	0.503	0.644	0.279			-0.017	0.041	0.047	0.058	0.031		
	Beam 5	5.379	3.559	1.753	2.145	1.346			0.240	0.266	0.162	0.195	0.147		
	Beam 6	10.142	6.962	3.893	3.807	2.534			0.453	0.521	0.361	0.346	0.277		
	Beam 7	7.444	2.255	4.195	4.000	4.701			0.333	0.169	0.389	0.363	0.515		
	S	22.373	13.368	10.791	11.012	9.137									
Y2Run1	Beam 1	-0.036	0.010	-0.233	-0.011	-0.011	-0.117	-0.117	-0.002	0.001	-0.020	-0.001	-0.001	-0.006	-0.006
	Beam 2	-0.178	0.050	0.148	0.181	0.181	0.641	0.641	-0.008	0.003	0.013	0.015	0.015	0.035	0.035
	Beam 3	-0.520	0.483	0.707	0.876	0.876	1.430	1.430	-0.023	0.032	0.062	0.072	0.072	0.078	0.078
	Beam 4	4.394	3.160	1.684	2.318	2.318	2.848	2.848	0.198	0.207	0.148	0.191	0.191	0.155	0.155
	Beam 5	11.380	7.399	4.543	4.950	4.950	6.753	6.753	0.513	0.484	0.399	0.407	0.407	0.368	0.368
	Beam 6	5.808	3.659	3.253	2.782	2.782	4.972	4.972	0.262	0.239	0.286	0.229	0.229	0.271	0.271
	Beam 7	1.316	0.522	1.292	1.065	1.065	1.835	1.835	0.059	0.034	0.113	0.088	0.088	0.100	0.100
	S	22.164	15.283	11.394	12.161	12.161	18.363	18.363							
Y2Run2	Beam 1	-0.036	0.010	-0.233	0.016	0.007	0.180	0.131	-0.002	0.001	-0.020	0.001	0.001	0.011	0.008
	Beam 2	-0.178	0.050	0.148	0.267	0.177	0.154	0.153	-0.008	0.003	0.013	0.022	0.015	0.009	0.009
	Beam 3	-0.520	0.483	0.707	0.791	0.824	1.009	1.382	-0.023	0.032	0.062	0.065	0.070	0.060	0.084
	Beam 4	4.394	3.160	1.684	2.306	2.330	3.154	2.699	0.198	0.207	0.148	0.191	0.198	0.187	0.164
	Beam 5	11.380	7.399	4.543	4.753	4.797	6.391	6.399	0.513	0.484	0.399	0.393	0.407	0.378	0.388
	Beam 6	5.808	3.659	3.253	2.908	2.809	4.662	3.954	0.262	0.239	0.286	0.241	0.238	0.276	0.240
	Beam 7	1.316	0.522	1.292	1.050	0.833	1.337	1.779	0.059	0.034	0.113	0.087	0.071	0.079	0.108
	S	22.164	15.283	11.394	12.091	11.777	16.887	16.497							
Y3Run1	Beam 1	-0.134	0.048	-0.034	0.012	0.078	0.120	0.120	-0.006	0.003	-0.003	0.001	0.005	0.008	0.008
	Beam 2	-0.435	0.376	0.904	0.720	0.694	1.007	1.007	-0.020	0.024	0.070	0.050	0.049	0.063	0.063
	Beam 3	2.859	2.386	1.832	2.625	2.667	2.602	2.602	0.131	0.151	0.142	0.183	0.189	0.162	0.162
	Beam 4	10.813	7.138	4.175	4.860	4.894	3.161	3.161	0.497	0.451	0.324	0.339	0.346	0.197	0.197
	Beam 5	6.736	4.414	4.388	4.289	4.207	5.918	5.918	0.309	0.279	0.341	0.299	0.297	0.369	0.369
	Beam 6	1.669	1.298	1.291	1.138	1.178	2.443	2.443	0.077	0.082	0.100	0.079	0.083	0.152	0.152
	Beam 7	0.265	0.170	0.311	0.713	0.429	0.778	0.778	0.012	0.011	0.024	0.050	0.030	0.049	0.049
	S	21.773	15.830	12.867	14.357	14.146	16.029	16.029							
Y3Run2	Beam 1	-0.134	0.048	-0.034	0.081	0.106	-0.031	-0.031	-0.006	0.003	-0.003	0.006	0.008	-0.002	-0.002
	Beam 2	-0.435	0.376	0.904	0.609	0.616	0.668	0.668	-0.020	0.024	0.070	0.046	0.048	0.047	0.047
	Beam 3	2.859	2.386	1.832	2.683	2.732	1.458	1.458	0.131	0.151	0.142	0.203	0.211	0.102	0.102
	Beam 4	10.813	7.138	4.175	4.515	4.589	3.997	3.997	0.497	0.451	0.324	0.342	0.355	0.279	0.279
	Beam 5	6.736	4.414	4.388	3.913	3.673	5.643	5.643	0.309	0.279	0.341	0.296	0.284	0.394	0.394
	Beam 6	1.669	1.298	1.291	1.057	0.999	2.272	2.272	0.077	0.082	0.100	0.080	0.077	0.159	0.159
	Beam 7	0.265	0.170	0.311	0.350	0.219	0.320	0.320	0.012	0.011	0.024	0.027	0.017	0.022	0.022
	S	21.773	15.830	12.867	13.209	12.935	14.326	14.326							
Y4Run1	Beam1	0.350	-0.835		1.476	1.037	1.605	1.250	0.014	0.051		0.103	0.079	0.118	0.094
	Beam2	13.092	-7.278		4.928	3.960	4.715	3.822	0.523	0.441		0.343	0.301	0.347	0.288
	Beam3	9.483	-6.455		5.191	5.546	4.582	5.616	0.379	0.391		0.362	0.422	0.338	0.423
	Beam4	1.825	-1.537		1.792	1.834	2.011	2.159	0.073	0.093		0.125	0.140	0.148	0.163
	Beam5	0.178	-0.307		0.646	0.511	0.765	0.432	0.007	0.019		0.045	0.039	0.056	0.033
	Beam6	0.047	-0.074		0.134	0.125	0.100	-0.059	0.002	0.004		0.009	0.009	0.007	-0.004
	Beam7	0.051	-0.031		0.187	0.122	-0.208	0.051	0.002	0.002		0.013	0.009	-0.015	0.004
	S	25.026	-16.517		14.355	13.136	13.571	13.271							
Y4Run2	Beam1	0.350	-0.835		1.368	1.269	1.867	1.867	0.014	0.051		0.097	0.100	0.124	0.124
	Beam2	13.092	-7.278		4.818	4.678	5.257	5.257	0.523	0.441		0.341	0.367	0.348	0.348
	Beam3	9.483	-6.455		5.151	5.358	4.913	4.913	0.379	0.391		0.364	0.421	0.326	0.326
	Beam4	1.825	-1.537		1.784	1.777	1.976	1.976	0.073	0.093		0.126	0.139	0.131	0.131
	Beam5	0.178	-0.307		0.556	0.159	0.801	0.801	0.007	0.019		0.039	0.012	0.053	0.053
	Beam6	0.047	-0.074		0.135	0.062	0.246	0.246	0.002	0.004		0.010	0.005	0.016	0.016
	Beam7	0.051	-0.031		0.333	-0.563	0.029	0.029	0.002	0.002		0.024	-0.044	0.002	0.002
	S	25.026	-16.517		14.145	12.740	15.089	15.089							

Sn.003-0004		Comparision of Shear and Shear Distribution Factors													
25-May-06		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max.sum	Max.shear	Max. Sum	Max. Shear				Max. sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	-1.801	-0.849	-0.188	-0.562	-0.761			-0.054	-0.031	-0.008	-0.024	-0.033		
	Beam 2	0.879	0.876	0.534	0.649	0.577			0.026	0.032	0.024	0.028	0.025		
	Beam 3	4.744	3.968	4.314	4.957	4.885			0.141	0.145	0.194	0.212	0.212		
	Beam 4	11.772	10.391	7.490	7.436	7.345			0.351	0.379	0.337	0.318	0.319		
	Beam 5	17.951	13.048	10.094	10.887	10.978			0.535	0.476	0.454	0.466	0.477		
	S	33.545	27.434	22.244	23.368	23.024									
Y1Run2	Beam 1	-1.801	-0.849	-0.188	-0.301	-0.301			-0.054	-0.031	-0.008	-0.012	-0.012		
	Beam 2	0.879	0.876	0.534	0.770	0.534			0.026	0.032	0.024	0.032	0.022		
	Beam 3	4.744	3.968	4.314	5.211	5.175			0.141	0.145	0.194	0.215	0.215		
	Beam 4	11.772	10.391	7.490	7.769	7.788			0.351	0.379	0.337	0.321	0.323		
	Beam 5	17.951	13.048	10.094	10.774	10.893			0.535	0.476	0.454	0.445	0.452		
	S	33.545	27.434	22.244	24.223	24.088									
Y2Run1	Beam 1	-0.576	0.284	0.295	0.541	0.531	1.138	1.138	-0.017	0.010	0.013	0.021	0.021	0.035	0.035
	Beam 2	3.279	2.527	0.295	1.701	1.356	1.674	1.674	0.098	0.090	0.013	0.066	0.054	0.052	0.052
	Beam 3	9.053	7.424	8.202	9.235	9.498	10.147	10.147	0.270	0.263	0.362	0.359	0.379	0.316	0.316
	Beam 4	12.903	10.907	8.660	8.230	8.284	11.809	11.809	0.384	0.387	0.382	0.320	0.331	0.368	0.368
	Beam 5	8.9	7.064	5.194	6.015	5.376	7.325	7.325	0.265	0.250	0.229	0.234	0.215	0.228	0.228
	S	33.559	28.206	22.648	25.722	25.046	32.093	32.093							
Y2Run2	Beam 1	-0.576	0.284	0.295	0.437	0.356	1.417	1.690	-0.017	0.010	0.013	0.017	0.014	0.051	0.064
	Beam 2	3.279	2.527	0.295	1.801	1.629	1.694	1.876	0.098	0.090	0.013	0.071	0.065	0.061	0.071
	Beam 3	9.053	7.424	8.202	9.108	9.924	10.180	11.123	0.270	0.263	0.362	0.361	0.394	0.369	0.419
	Beam 4	12.903	10.907	8.660	8.120	7.911	9.966	8.577	0.384	0.387	0.382	0.322	0.314	0.362	0.323
	Beam 5	8.9	7.064	5.194	5.789	5.342	4.297	3.257	0.265	0.250	0.229	0.229	0.212	0.156	0.123
	S	33.559	28.206	22.648	25.255	25.161	27.555	26.522							
Y3Run1	Beam 1	6.68	5.51		5.923	3.826	6.434	6.016	0.202	0.196		0.227	0.183	0.222	0.214
	Beam 2	12.07	10.16		5.461	2.712	5.908	6.253	0.365	0.361		0.209	0.130	0.203	0.223
	Beam 3	10.13	8.51		11.977	13.075	12.507	12.534	0.306	0.303		0.459	0.626	0.431	0.446
	Beam 4	4.28	3.22		2.497	1.190	3.743	3.045	0.129	0.115		0.096	0.057	0.129	0.108
	Beam 5	-0.07	0.70		0.260	0.078	0.442	0.232	-0.002	0.025		0.010	0.004	0.015	0.008
	S	33.085	28.098		26.118	20.881	29.034	28.079							
Y3Run2	Beam 1	6.68	5.51		5.990	3.975	5.842	5.842	0.202	0.196		0.231	0.195	0.201	0.201
	Beam 2	12.07	10.16		5.546	2.679	6.475	6.475	0.365	0.361		0.214	0.132	0.222	0.222
	Beam 3	10.13	8.51		11.717	12.761	13.190	13.190	0.306	0.303		0.451	0.627	0.453	0.453
	Beam 4	4.28	3.22		2.443	0.973	3.286	3.286	0.129	0.115		0.094	0.048	0.113	0.113
	Beam 5	-0.07	0.70		0.259	-0.042	0.321	0.321	-0.002	0.025		0.010	-0.002	0.011	0.011
	S	33.085	28.098		25.956	20.346	29.113	29.113							

Sn.003-0006		Comparision of Shear and Shear Distribution Factors													
25-May-06		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max. sum	Max.Shear	Max. Sum	Max. Shear				Max.Sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	-0.328	-0.145	-0.162	-0.031	-0.084			-0.012	-0.007	-0.017	-0.003	-0.008		
	Beam 2	-0.191	-0.116	0.212	0.023	0.168			-0.007	-0.005	0.023	0.002	0.016		
	Beam 3	-0.119	0.12	0.126	0.165	0.267			-0.004	0.005	0.014	0.015	0.026		
	Beam 4	0.783	1.06	0.690	0.579	0.263			0.028	0.048	0.074	0.053	0.025		
	Beam 5	4.717	3.988	1.172	1.997	1.731			0.168	0.180	0.126	0.182	0.167		
	Beam 6	9.996	8.216	5.284	5.753	6.192			0.355	0.372	0.569	0.524	0.597		
	Beam 7	13.281	8.985	1.966	2.486	1.830			0.472	0.406	0.212	0.227	0.176		
	S	28.139	22.108	9.287	10.972	10.367									
Y1Run2	Beam 1	-0.328	-0.145	-0.162	-0.039	-0.066			-0.012	-0.007	-0.017	-0.003	-0.006		
	Beam 2	-0.191	-0.116	0.212	0.185	0.280			-0.007	-0.005	0.023	0.016	0.026		
	Beam 3	-0.119	0.12	0.126	0.312	0.047			-0.004	0.005	0.014	0.027	0.004		
	Beam 4	0.783	1.06	0.690	0.777	0.377			0.028	0.048	0.074	0.068	0.035		
	Beam 5	4.717	3.988	1.172	1.988	1.816			0.168	0.180	0.126	0.175	0.169		
	Beam 6	9.996	8.216	5.284	5.591	6.264			0.355	0.372	0.569	0.492	0.584		
	Beam 7	13.281	8.985	1.966	2.555	2.002			0.472	0.406	0.212	0.225	0.187		
	S	28.139	22.108	9.287	11.370	10.720									
Y2Run1	Beam 1	-0.613	-0.234	-0.022	-0.036	-0.011	0.101	0.101	-0.022	-0.010	-0.002	-0.003	-0.001	0.006	0.006
	Beam 2	0.05	0.146	0.592	0.347	0.339	0.319	0.319	0.002	0.006	0.045	0.024	0.024	0.018	0.018
	Beam 3	0.868	1.084	1.015	0.847	0.855	1.544	1.544	0.031	0.047	0.077	0.059	0.060	0.085	0.085
	Beam 4	4.434	3.702	1.480	1.491	1.294	1.824	1.824	0.157	0.161	0.112	0.103	0.091	0.101	0.101
	Beam 5	10.096	7.796	2.524	3.675	3.624	4.601	4.601	0.358	0.339	0.190	0.254	0.256	0.255	0.255
	Beam 6	10.189	7.586	5.628	6.371	6.389	7.517	7.517	0.362	0.330	0.424	0.441	0.451	0.416	0.416
	Beam 7	3.145	2.919	2.044	1.764	1.669	2.171	2.171	0.112	0.127	0.154	0.122	0.118	0.120	0.120
	S	28.169	22.999	13.260	14.458	14.158	18.078	18.078							
Y2Run2	Beam 1	-0.613	-0.234	-0.022	-0.114	-0.114	0.487	0.487	-0.022	-0.010	-0.002	-0.008	-0.008	0.025	0.025
	Beam 2	0.05	0.146	0.592	0.530	0.530	1.215	1.215	0.002	0.006	0.045	0.037	0.037	0.062	0.062
	Beam 3	0.868	1.084	1.015	0.975	0.975	1.914	1.914	0.031	0.047	0.077	0.067	0.067	0.097	0.097
	Beam 4	4.434	3.702	1.480	1.473	1.473	2.183	2.183	0.157	0.161	0.112	0.102	0.102	0.111	0.111
	Beam 5	10.096	7.796	2.524	3.649	3.649	4.240	4.240	0.358	0.339	0.190	0.253	0.253	0.215	0.215
	Beam 6	10.189	7.586	5.628	6.332	6.332	7.374	7.374	0.362	0.330	0.424	0.438	0.438	0.374	0.374
	Beam 7	3.145	2.919	2.044	1.601	1.601	2.288	2.288	0.112	0.127	0.154	0.111	0.111	0.116	0.116
	S	28.169	22.999	13.260	14.447	14.447	19.701	19.701							
Y3Run1	Beam 1	-0.869	-0.233	0.217	0.139	0.045	0.661	0.224	-0.031	-0.010	0.015	0.008	0.003	0.030	0.011
	Beam 2	0.83	0.84	1.323	1.525	0.902	2.358	2.325	0.029	0.036	0.089	0.093	0.065	0.108	0.109
	Beam 3	3.59	3.096	2.358	3.211	2.144	3.825	4.355	0.127	0.132	0.158	0.196	0.154	0.175	0.204
	Beam 4	9.511	7.383	2.656	2.349	2.169	4.158	4.180	0.338	0.315	0.178	0.143	0.156	0.190	0.196
	Beam 5	10.28	7.888	2.996	3.938	4.774	5.020	5.181	0.365	0.337	0.201	0.240	0.342	0.229	0.243
	Beam 6	5.13	3.902	3.969	4.100	3.064	4.574	4.030	0.182	0.167	0.266	0.250	0.220	0.209	0.189
	Beam 7	-0.304	0.555	1.416	1.127	0.844	1.313	1.022	-0.011	0.024	0.095	0.069	0.061	0.060	0.048
	S	28.168	23.431	14.936	16.388	13.942	21.910	21.317							
Y3Run2	Beam 1	-0.869	-0.233	0.217	0.071	0.004	0.665	0.665	-0.031	-0.010	0.015	0.004	0.000	0.030	0.030
	Beam 2	0.83	0.84	1.323	1.328	0.992	2.399	2.399	0.029	0.036	0.089	0.083	0.069	0.109	0.109
	Beam 3	3.59	3.096	2.358	3.159	2.204	3.917	3.917	0.127	0.132	0.158	0.198	0.152	0.178	0.178
	Beam 4	9.511	7.383	2.656	2.145	2.552	3.854	3.854	0.338	0.315	0.178	0.134	0.176	0.175	0.175
	Beam 5	10.28	7.888	2.996	3.855	4.802	4.888	4.888	0.365	0.337	0.201	0.241	0.332	0.222	0.222
	Beam 6	5.13	3.902	3.969	4.033	2.972	4.974	4.974	0.182	0.167	0.266	0.252	0.205	0.226	0.226
	Beam 7	-0.304	0.555	1.416	1.398	0.950	1.311	1.311	-0.011	0.024	0.095	0.087	0.066	0.060	0.060
	S	28.168	23.431	14.936	15.990	14.476	22.008	22.008							
Y4Run1	Beam 1	2.14	2.27				3.502	1.208	0.076	0.098				0.184	0.077
	Beam 2	9.454	7.094				5.629	4.421	0.336	0.306				0.295	0.281
	Beam 3	10.588	8.144				5.304	8.026	0.376	0.351				0.278	0.510
	Beam 4	5.368	4.393				2.117	1.153	0.191	0.189				0.111	0.073
	Beam 5	1.152	1.328				1.516	0.625	0.041	0.057				0.080	0.040
	Beam 6	0.133	0.224				0.943	0.167	0.005	0.010				0.050	0.011
	Beam 7	-0.666	-0.245				0.042	0.137	-0.024	-0.011				0.002	0.009
	S	28.169	23.208				19.053	15.737							
Y4Run2	Beam 1	2.14	2.27				3.242	1.094	0.076	0.098				0.161	0.064
	Beam 2	9.454	7.094				5.726	3.998	0.336	0.306				0.284	0.232
	Beam 3	10.588	8.144				5.485	8.556	0.376	0.351				0.272	0.497
	Beam 4	5.368	4.393				2.341	1.873	0.191	0.189				0.116	0.109
	Beam 5	1.152	1.328				1.824	0.715	0.041	0.057				0.090	0.042
	Beam 6	0.133	0.224				1.294	0.863	0.005	0.010				0.064	0.050
	Beam 7	-0.666	-0.245				0.282	0.102	-0.024	-0.011				0.014	0.006
	S	28.169	23.208				20.195	17.200							

Sn.060-0028		Comparision of Shear and Shear Distribution Factors													
25-May-06		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max. sum	Max.Shear	Max. Sum	Max. Shear				Max.Sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	-0.174	-0.079	-0.323	0.0510	-0.0160			-0.004	-0.003	-0.027	0.003	-0.001		
	Beam 2	-0.112	-0.065	-0.049	0.0822	0.0982			-0.003	-0.003	-0.004	0.006	0.007		
	Beam 3	-0.178	0.026	0.024	-0.0634	-0.0240			-0.004	0.001	0.002	-0.004	-0.002		
	Beam 4	-0.009	0.494	1.046	1.4599	1.3884			0.000	0.020	0.089	0.098	0.095		
	Beam 5	4.849	3.599	1.752	2.3500	2.3266			0.119	0.143	0.149	0.158	0.159		
	Beam 6	18.684	12.094	4.635	5.7188	5.7305			0.459	0.479	0.395	0.384	0.392		
	Beam 7	17.671	9.162	4.657	5.2808	5.1230			0.434	0.363	0.397	0.355	0.350		
	S	40.731	25.231	11.742	14.879	14.627									
Y1Run2	Beam 1	-0.174	-0.079	-0.323	-0.0992	-0.0511			-0.004	-0.003	-0.027	-0.007	-0.004		
	Beam 2	-0.112	-0.065	-0.049	-0.0074	0.0319			-0.003	-0.003	-0.004	-0.001	0.002		
	Beam 3	-0.178	0.026	0.024	0.1336	0.0434			-0.004	0.001	0.002	0.009	0.003		
	Beam 4	-0.009	0.494	1.046	1.4177	1.3375			0.000	0.020	0.089	0.097	0.093		
	Beam 5	4.849	3.599	1.752	2.3599	2.2396			0.119	0.143	0.149	0.162	0.156		
	Beam 6	18.684	12.094	4.635	5.5181	5.6573			0.459	0.479	0.395	0.378	0.395		
	Beam 7	17.671	9.162	4.657	5.2612	5.0725			0.434	0.363	0.397	0.361	0.354		
	S	40.731	25.231	11.742	14.584	14.331									
Y2Run1	Beam 1	-0.071	-0.026	-0.318	0.0209	0.0209	-0.0021	-0.0021	-0.002	-0.001	-0.025	0.001	0.001	0.000	0.000
	Beam 2	-0.089	-0.019	0.023	0.2340	0.2340	0.0728	0.0728	-0.003	-0.001	0.002	0.014	0.014	0.004	0.004
	Beam 3	-0.151	0.147	0.333	0.4447	0.4447	0.1939	0.1939	-0.005	0.008	0.026	0.027	0.027	0.010	0.010
	Beam 4	1.166	1.070	2.209	2.9086	2.9086	3.9265	3.9265	0.041	0.055	0.173	0.175	0.175	0.204	0.204
	Beam 5	10.236	7.112	3.316	4.4399	4.4399	5.7903	5.7903	0.359	0.365	0.259	0.268	0.268	0.301	0.301
	Beam 6	14.525	8.996	4.824	5.9161	5.9161	6.5800	6.5800	0.510	0.461	0.377	0.356	0.356	0.342	0.342
	Beam 7	2.891	2.229	2.396	2.6311	2.6311	2.6993	2.6993	0.101	0.114	0.187	0.159	0.159	0.140	0.140
	S	28.507	19.509	12.783	16.595	16.595	19.261	19.261							
Y2Run2	Beam 1	-0.071	-0.026	-0.318	-0.0862	-0.0862	-0.1724	-0.1724	-0.002	-0.001	-0.025	-0.005	-0.005	-0.009	-0.009
	Beam 2	-0.089	-0.019	0.023	0.1370	0.1370	0.4298	0.4298	-0.003	-0.001	0.002	0.008	0.008	0.024	0.024
	Beam 3	-0.151	0.147	0.333	0.4464	0.4464	0.1781	0.1781	-0.005	0.008	0.026	0.026	0.026	0.010	0.010
	Beam 4	1.166	1.070	2.209	3.0584	3.0584	3.6374	3.6374	0.041	0.055	0.173	0.177	0.177	0.199	0.199
	Beam 5	10.236	7.112	3.316	4.5981	4.5981	4.9984	4.9984	0.359	0.365	0.259	0.267	0.267	0.274	0.274
	Beam 6	14.525	8.996	4.824	6.2219	6.2219	6.5610	6.5610	0.510	0.461	0.377	0.361	0.361	0.360	0.360
	Beam 7	2.891	2.229	2.396	2.8723	2.8723	2.6085	2.6085	0.101	0.114	0.187	0.167	0.167	0.143	0.143
	S	28.507	19.509	12.783	17.248	17.248	18.241	18.241							
Y3Run1	Beam 1	-0.128	0.000	-0.162	0.2036	0.1687	0.2331	0.2331	-0.004	0.000	-0.013	0.012	0.010	0.011	0.011
	Beam 2	-0.087	0.161	0.310	0.7752	0.6235	0.7527	0.7527	-0.003	0.008	0.024	0.047	0.038	0.034	0.034
	Beam 3	1.142	1.066	1.489	2.4482	2.1188	2.5270	2.5270	0.040	0.052	0.116	0.147	0.130	0.116	0.116
	Beam 4	10.297	7.101	4.759	5.3385	5.6547	7.4848	7.4848	0.361	0.346	0.371	0.322	0.346	0.342	0.342
	Beam 5	13.543	9.265	3.672	4.3722	4.4441	6.2611	6.2611	0.475	0.452	0.286	0.263	0.272	0.286	0.286
	Beam 6	4.324	2.621	2.064	2.4905	2.4565	3.1632	3.1632	0.152	0.128	0.161	0.150	0.150	0.145	0.145
	Beam 7	-0.574	0.291	0.707	0.9745	0.8654	1.4404	1.4404	-0.020	0.014	0.055	0.059	0.053	0.066	0.066
	S	28.517	20.505	12.839	16.603	16.332	21.862	21.862							
Y3Run2	Beam 1	-0.128	0.000	-0.162	0.1235	0.1235	-0.0042	-0.0042	-0.004	0.000	-0.013	0.007	0.007	0.000	0.000
	Beam 2	-0.087	0.161	0.310	0.6806	0.6806	0.7924	0.7924	-0.003	0.008	0.024	0.040	0.040	0.039	0.039
	Beam 3	1.142	1.066	1.489	2.2250	2.2250	2.6173	2.6173	0.040	0.052	0.116	0.132	0.132	0.128	0.128
	Beam 4	10.297	7.101	4.759	5.8120	5.8120	7.3119	7.3119	0.361	0.346	0.371	0.346	0.346	0.357	0.357
	Beam 5	13.543	9.265	3.672	4.4706	4.4706	5.8690	5.8690	0.475	0.452	0.286	0.266	0.266	0.286	0.286
	Beam 6	4.324	2.621	2.064	2.5792	2.5792	3.0139	3.0139	0.152	0.128	0.161	0.153	0.153	0.147	0.147
	Beam 7	-0.574	0.291	0.707	0.9295	0.9295	0.9071	0.9071	-0.020	0.014	0.055	0.055	0.055	0.044	0.044
	S	28.517	20.505	12.839	16.820	16.820	20.507	20.507							
Y4Run1	Beam 8	-0.198	0.594		2.0301	2.0024	2.1974	2.1974	-0.007	0.030		0.120	0.122	0.113	0.113
	Beam 9	8.862	5.515		4.5528	4.3822	4.7533	4.7533	0.311	0.281		0.269	0.267	0.245	0.245
	Beam 10	14.224	9.200		6.5422	6.6430	8.1548	8.1548	0.499	0.469		0.387	0.405	0.421	0.421
	Beam 11	5.762	3.819		3.0267	2.7875	3.2211	3.2211	0.202	0.195		0.179	0.170	0.166	0.166
	Beam 12	0.068	0.439		0.5326	0.4240	0.6981	0.6981	0.002	0.022		0.032	0.026	0.036	0.036
	Beam 13	-0.109	0.052		0.2176	0.1485	0.2442	0.2442	-0.004	0.003		0.013	0.009	0.013	0.013
	Beam 14	-0.084	-0.008		-0.0031	0.0249	0.1232	0.1232	-0.003	0.000		0.000	0.002	0.006	0.006
	S	28.525	19.611		16.899	16.412	19.392	19.392							
Y4Run2	Beam 15	-0.198	0.594		2.0117	2.0117	2.1621	2.1621	-0.007	0.030		0.115	0.115	0.137	0.137
	Beam 16	8.862	5.515		4.5566	4.5566	3.2795	3.2795	0.311	0.281		0.261	0.261	0.208	0.208
	Beam 17	14.224	9.200		6.8950	6.8950	7.0095	7.0095	0.499	0.469		0.395	0.395	0.444	0.444
	Beam 18	5.762	3.819		3.2358	3.2358	3.0659	3.0659	0.202	0.195		0.185	0.185	0.194	0.194
	Beam 19	0.068	0.439		0.5928	0.5928	0.5648	0.5648	0.002	0.022		0.034	0.034	0.036	0.036
	Beam 20	-0.109	0.052		0.1899	0.1899	0.0706	0.0706	-0.004	0.003		0.011	0.011	0.004	0.004
	Beam 21	-0.084	-0.008		-0.0236	-0.0236	-0.3578	-0.3578	-0.003	0.000		-0.001	-0.001	-0.023	-0.023
	S	28.525	19.611		17.458	17.458	15.795	15.795							

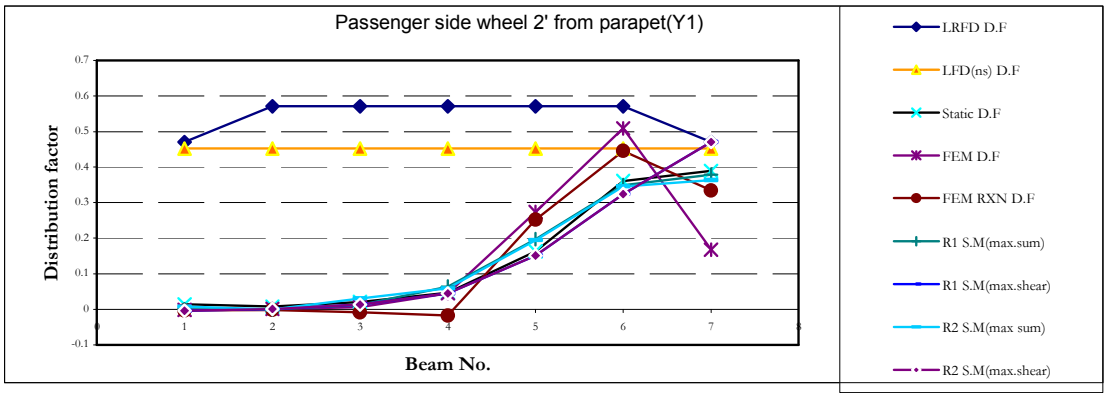
Sn.060-0056		Comparision of Shear and Shear Distribution Factors													
25-May-06		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max. sum	Max.Shear	Max. Sum	Max. Shear				Max.Sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	-0.408	-0.121	-0.022	-0.023	-0.128			-0.016	-0.007	-0.001	-0.001	-0.007		
	Beam 2	-0.23	0.026	-0.038	0.085	0.013			-0.009	0.001	-0.002	0.004	0.001		
	Beam 3	-0.068	0.511	0.267	0.750	0.401			-0.003	0.027	0.016	0.036	0.022		
	Beam 4	2.49	2.505	0.987	1.513	0.691			0.095	0.135	0.059	0.073	0.038		
	Beam 5	8.383	4.976	4.745	5.128	4.032			0.321	0.267	0.283	0.246	0.221		
	Beam 6	10.463	6.283	6.546	7.284	8.435			0.401	0.338	0.391	0.349	0.461		
	Beam 7	5.478	4.422	4.274	6.109	4.835			0.210	0.238	0.255	0.293	0.265		
	S	26.108	18.602	16.760	20.847	18.279									
Y1Run2	Beam 1	-0.408	-0.121	-0.022	0.012	0.409			-0.016	-0.007	-0.001	0.001	0.020		
	Beam 2	-0.23	0.026	-0.038	0.207	0.886			-0.009	0.001	-0.002	0.010	0.044		
	Beam 3	-0.068	0.511	0.267	0.803	0.778			-0.003	0.027	0.016	0.039	0.038		
	Beam 4	2.49	2.505	0.987	1.455	0.881			0.095	0.135	0.059	0.071	0.043		
	Beam 5	8.383	4.976	4.745	5.053	4.058			0.321	0.267	0.283	0.246	0.199		
	Beam 6	10.463	6.283	6.546	7.256	8.592			0.401	0.338	0.391	0.353	0.422		
	Beam 7	5.478	4.422	4.274	5.740	4.744			0.210	0.238	0.255	0.280	0.233		
	S	26.108	18.602	16.760	20.527	20.349									
Y2Run1	Beam 1	-0.807	-0.197	0.024	0.137	0.003	-0.0637	-0.1080	-0.031	-0.010	0.001	0.006	0.000	-0.003	-0.006
	Beam 2	-0.117	0.359	0.198	0.359	0.113	0.0444	0.2660	-0.005	0.019	0.011	0.017	0.006	0.002	0.014
	Beam 3	1.24	1.797	1.446	1.818	0.967	2.2026	0.9062	0.048	0.093	0.080	0.085	0.049	0.105	0.047
	Beam 4	7.269	5.614	3.433	3.804	2.331	4.6375	2.4134	0.283	0.292	0.189	0.177	0.117	0.220	0.125
	Beam 5	9.945	7.126	6.837	7.829	9.022	7.2240	9.2529	0.387	0.370	0.376	0.364	0.454	0.343	0.481
	Beam 6	4.424	3.019	4.262	4.822	5.360	4.6939	5.1080	0.172	0.157	0.234	0.224	0.270	0.223	0.265
	Beam 7	3.775	1.529	1.985	2.725	2.080	2.3059	1.4014	0.147	0.079	0.109	0.127	0.105	0.110	0.073
	S	25.729	19.247	18.186	21.495	19.875	21.045	19.240							
Y2Run2	Beam 1	-0.807	-0.197	0.024	0.172	-0.020	0.1048	-0.1142	-0.031	-0.010	0.001	0.008	-0.001	0.005	-0.006
	Beam 2	-0.117	0.359	0.198	0.353	0.155	0.5123	0.0755	-0.005	0.019	0.011	0.016	0.008	0.025	0.004
	Beam 3	1.24	1.797	1.446	1.680	0.831	2.0011	0.9431	0.048	0.093	0.080	0.078	0.042	0.098	0.049
	Beam 4	7.269	5.614	3.433	3.592	2.091	4.5640	2.6735	0.283	0.292	0.189	0.167	0.105	0.224	0.139
	Beam 5	9.945	7.126	6.837	7.787	8.995	7.3097	9.7016	0.387	0.370	0.376	0.361	0.451	0.359	0.504
	Beam 6	4.424	3.019	4.262	5.028	5.866	3.9477	4.8127	0.172	0.157	0.234	0.233	0.294	0.194	0.250
	Beam 7	3.775	1.529	1.985	2.930	2.030	1.9474	1.1586	0.147	0.079	0.109	0.136	0.102	0.096	0.060
	S	25.729	19.247	18.186	21.543	19.949	20.387	19.251							
Y3Run1	Beam 1	-1.485	-0.185	0.302	0.805	0.679	0.2686	0.2034	-0.059	-0.009	0.016	0.034	0.029	0.013	0.010
	Beam 2	1.803	2.123	1.033	2.199	1.520	0.4881	0.4712	0.072	0.106	0.054	0.092	0.065	0.023	0.023
	Beam 3	7.286	5.769	4.318	3.125	3.289	1.5960	1.3471	0.290	0.287	0.227	0.131	0.140	0.075	0.065
	Beam 4	9.857	7.151	6.995	9.066	9.199	4.8707	3.7684	0.393	0.356	0.368	0.379	0.392	0.230	0.183
	Beam 5	5.536	4.043	4.396	6.607	6.861	10.2041	10.2801	0.221	0.201	0.232	0.276	0.292	0.482	0.498
	Beam 6	1.963	1.167	1.683	1.610	1.544	3.1594	3.7466	0.078	0.058	0.089	0.067	0.066	0.149	0.182
	Beam 7	0.146	0.0066	0.257	0.526	0.376	0.5683	0.8225	0.006	0.000	0.014	0.022	0.016	0.027	0.040
	S	25.106	20.075	18.982	23.937	23.468	21.155	20.639							
Y3Run2	Beam 1	-1.485	-0.185	0.302	0.274	0.175	0.0620	0.2458	-0.059	-0.009	0.016	0.013	0.009	0.003	0.013
	Beam 2	1.803	2.123	1.033	1.183	0.527	0.9759	0.4401	0.072	0.106	0.054	0.055	0.026	0.047	0.022
	Beam 3	7.286	5.769	4.318	4.032	2.561	2.0673	2.0738	0.290	0.287	0.227	0.188	0.128	0.100	0.106
	Beam 4	9.857	7.151	6.995	7.513	8.754	6.8567	4.8736	0.393	0.356	0.368	0.349	0.437	0.331	0.248
	Beam 5	5.536	4.043	4.396	5.872	6.122	8.9839	10.1032	0.221	0.201	0.232	0.273	0.306	0.434	0.515
	Beam 6	1.963	1.167	1.683	1.787	1.423	1.4570	1.5697	0.078	0.058	0.089	0.083	0.071	0.070	0.080
	Beam 7	0.146	0.0066	0.257	0.842	0.456	0.3070	0.3070	0.006	0.000	0.014	0.039	0.023	0.015	0.016
	S	25.106	20.075	18.982	21.503	20.019	20.710	19.613							
Y4Run1	Beam 1	5.557	3.526				2.2924	2.2924	0.214	0.186				0.112	0.112
	Beam 2	11.09	7.996				10.0085	10.0085	0.427	0.422				0.487	0.487
	Beam 3	6.397	4.706				6.0628	6.0628	0.246	0.248				0.295	0.295
	Beam 4	2.401	2.057				1.7988	1.7988	0.092	0.109				0.088	0.088
	Beam 5	0.7	0.722				0.6873	0.6873	0.027	0.038				0.033	0.033
	Beam 6	0.254	0.112				0.0414	0.0414	0.010	0.006				0.002	0.002
	Beam 7	-0.416	-0.165				-0.3464	-0.3464	-0.016	-0.009				-0.017	-0.017
	S	25.983	18.954				20.545	20.545							
Y4Run2	Beam 1	5.557	3.526				3.1569	2.5832	0.214	0.186				0.154	0.135
	Beam 2	11.09	7.996				7.9850	9.5627	0.427	0.422				0.389	0.499
	Beam 3	6.397	4.706				6.0990	4.8807	0.246	0.248				0.297	0.255
	Beam 4	2.401	2.057				2.1619	1.7215	0.092	0.109				0.105	0.090
	Beam 5	0.7	0.722				1.0115	0.5685	0.027	0.038				0.049	0.030
	Beam 6	0.254	0.112				0.2178	0.0121	0.010	0.006				0.011	0.001
	Beam 7	-0.416	-0.165				-0.0925	-0.1755	-0.016	-0.009				-0.005	-0.009
	S	25.983	18.954				20.540	19.153							

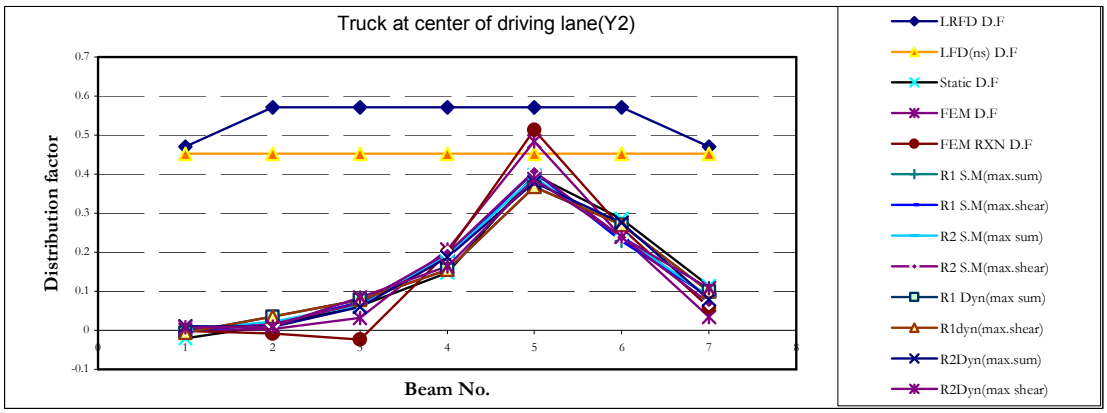
Sn.060-0319		Comparision of Shear and Shear Distribution Factors													
		Forces							Distribution factors						
		FE Model		Field Results					FE Model		Field Results				
25-May-06		Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support					Reaction	Shear D away in Beam (X4 Position)	Shear D Away from support				
				Static (X4)	slow moving test		Dynamic test				Static (X4)	slow moving test		Dynamic test	
					Max. sum	Max.Shear	Max. Sum	Max. Shear				Max.Sum	Max.shear	Max. Sum	Max. Shear
Y1Run1	Beam 1	0.428	-0.039	-0.166	0.049	-0.107			0.014	-0.001	-0.008	0.002	-0.005		
	Beam 2	-0.426	-0.075	0.009	-0.015	0.150			-0.014	-0.003	0.000	-0.001	0.007		
	Beam 3	-0.293	0.248	0.355	-0.259	-0.497			-0.010	0.009	0.016	-0.012	-0.025		
	Beam 4	1.671	2.175	1.573	1.419	1.381			0.055	0.081	0.073	0.067	0.068		
	Beam 5	7.729	9.813	9.487	9.237	8.461			0.254	0.364	0.438	0.435	0.419		
	Beam 6	21.325	14.830	10.425	10.792	10.810			0.701	0.550	0.481	0.508	0.535		
	S	30.434	26.952	21.684	21.223	20.199									
Y1Run2	Beam 1	0.428	-0.039	-0.166	0.210	-0.473			0.014	-0.001	-0.008	0.010	-0.025		
	Beam 2	-0.426	-0.075	0.009	0.124	-0.067			-0.014	-0.003	0.000	0.006	-0.004		
	Beam 3	-0.293	0.248	0.355	-0.620	-0.453			-0.010	0.009	0.016	-0.030	-0.024		
	Beam 4	1.671	2.175	1.573	1.655	1.458			0.055	0.081	0.073	0.080	0.077		
	Beam 5	7.729	9.813	9.487	9.630	8.467			0.254	0.364	0.438	0.468	0.448		
	Beam 6	21.325	14.830	10.425	9.571	9.987			0.701	0.550	0.481	0.465	0.528		
	S	30.434	26.952	21.684	20.570	18.919									
Y2Run1	Beam 1	0.293	-0.212	0.088	-0.040	0.103	0.014	0.065	0.010	-0.008	0.003	-0.001	0.003	0.000	0.002
	Beam 2	0.059	0.396	0.712	0.359	0.428	0.407	0.158	0.002	0.014	0.023	0.011	0.014	0.013	0.005
	Beam 3	3.035	2.868	4.444	4.256	4.330	3.098	3.229	0.100	0.105	0.142	0.134	0.139	0.096	0.106
	Beam 4	8.883	10.382	10.454	11.704	10.255	12.962	11.632	0.293	0.378	0.334	0.368	0.329	0.400	0.382
	Beam 5	12.949	11.887	13.226	13.063	13.207	14.262	13.926	0.427	0.433	0.423	0.410	0.423	0.440	0.458
	Beam 6	5.117	2.109	2.370	2.505	2.886	1.674	1.419	0.169	0.077	0.076	0.079	0.092	0.052	0.047
	S	30.336	27.430	31.293	31.847	31.210	32.416	30.429							
Y2Run2	Beam 1	0.293	-0.212	0.088	0.130	-0.370	-0.201	0.070	0.010	-0.008	0.003	0.004	-0.012	-0.006	0.003
	Beam 2	0.059	0.396	0.712	0.634	0.521	1.334	0.312	0.002	0.014	0.023	0.019	0.016	0.041	0.012
	Beam 3	3.035	2.868	4.444	4.276	4.268	5.530	2.378	0.100	0.105	0.142	0.131	0.133	0.171	0.090
	Beam 4	8.883	10.382	10.454	10.914	10.939	9.364	9.902	0.293	0.378	0.334	0.335	0.341	0.290	0.376
	Beam 5	12.949	11.887	13.226	13.947	13.998	11.949	12.511	0.427	0.433	0.423	0.428	0.437	0.370	0.475
	Beam 6	5.117	2.109	2.370	2.654	2.699	4.320	1.182	0.169	0.077	0.076	0.082	0.084	0.134	0.045
	S	30.336	27.430	31.293	32.554	32.055	32.296	26.354							
Y3Run1	Beam 1	0.181	-0.234	0.124	0.372	0.230	0.313	0.112	0.006	-0.008	0.004	0.010	0.006	0.009	0.004
	Beam 2	0.669	0.813	1.362	1.239	1.181	2.085	0.546	0.022	0.029	0.042	0.034	0.033	0.060	0.020
	Beam 3	4.948	5.172	7.500	8.935	8.493	8.914	6.324	0.163	0.187	0.229	0.245	0.237	0.258	0.234
	Beam 4	11.053	12.749	12.902	14.146	14.302	11.860	13.909	0.363	0.461	0.393	0.388	0.399	0.343	0.515
	Beam 5	11.977	8.533	9.160	10.160	9.964	9.245	5.672	0.393	0.308	0.279	0.279	0.278	0.267	0.210
	Beam 6	1.620	0.632	1.747	1.606	1.640	2.161	0.460	0.053	0.023	0.053	0.044	0.046	0.063	0.017
	S	30.448	27.665	32.796	36.459	35.810	34.579	27.023							
Y3Run2	Beam 1	0.181	-0.234	0.124	0.191	0.055	0.303	0.474	0.006	-0.008	0.004	0.006	0.002	0.009	0.018
	Beam 2	0.669	0.813	1.362	1.109	0.396	2.658	0.379	0.022	0.029	0.042	0.033	0.014	0.076	0.014
	Beam 3	4.948	5.172	7.500	8.076	5.856	8.853	5.956	0.163	0.187	0.229	0.240	0.210	0.252	0.223
	Beam 4	11.053	12.749	12.902	13.388	13.728	11.154	14.095	0.363	0.461	0.393	0.397	0.492	0.318	0.528
	Beam 5	11.977	8.533	9.160	9.614	7.408	9.649	5.496	0.393	0.308	0.279	0.285	0.265	0.275	0.206
	Beam 6	1.620	0.632	1.747	1.306	0.459	2.505	0.285	0.053	0.023	0.053	0.039	0.016	0.071	0.011
	S	30.448	27.665	32.796	33.683	27.902	35.121	26.686							
Y4Run1	Beam1	2.928	2.130		5.135	5.135	7.043	7.043	0.102	0.085		0.176	0.176	0.236	0.236
	Beam2	7.602	9.321		12.961	12.961	11.999	11.999	0.266	0.371		0.445	0.445	0.401	0.401
	Beam3	11.058	10.523		9.564	9.564	8.421	8.421	0.387	0.419		0.328	0.328	0.282	0.282
	Beam4	7.120	2.923		1.085	1.085	2.305	2.305	0.249	0.116		0.037	0.037	0.077	0.077
	Beam5	1.770	0.222		-0.232	-0.232	-0.175	-0.175	0.062	0.009		-0.008	-0.008	-0.006	-0.006
	Beam6	-1.910	-0.009		0.635	0.635	0.307	0.307	-0.067	0.000		0.022	0.022	0.010	0.010
	S	28.568	25.110		29.148	29.148	29.900	29.900							
Y4Run2	Beam1	2.928	2.130		5.147	5.092	6.932	6.932	0.102	0.085		0.184	0.186	0.238	0.238
	Beam2	7.602	9.321		12.953	13.066	11.908	11.908	0.266	0.371		0.463	0.478	0.410	0.410
	Beam3	11.058	10.523		9.641	9.170	8.218	8.218	0.387	0.419		0.344	0.336	0.283	0.283
	Beam4	7.120	2.923		0.666	0.545	2.236	2.236	0.249	0.116		0.024	0.020	0.077	0.077
	Beam5	1.770	0.222		-0.302	-0.129	-0.362	-0.362	0.062	0.009		-0.011	-0.005	-0.012	-0.012
	Beam6	-1.910	-0.009		-0.112	-0.435	0.136	0.136	-0.067	0.000		-0.004	-0.016	0.005	0.005
	S	28.568	25.110		27.994	27.310	29.067	29.067							

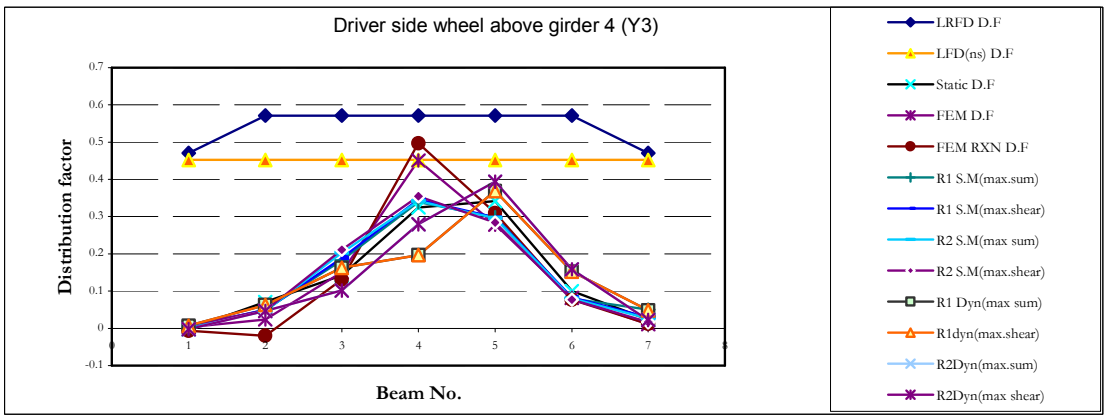
APPENDIX M - GRAPHICAL COMPARISON OF DISTRIBUTION FACTORS (SECOND SIX BRIDGES)

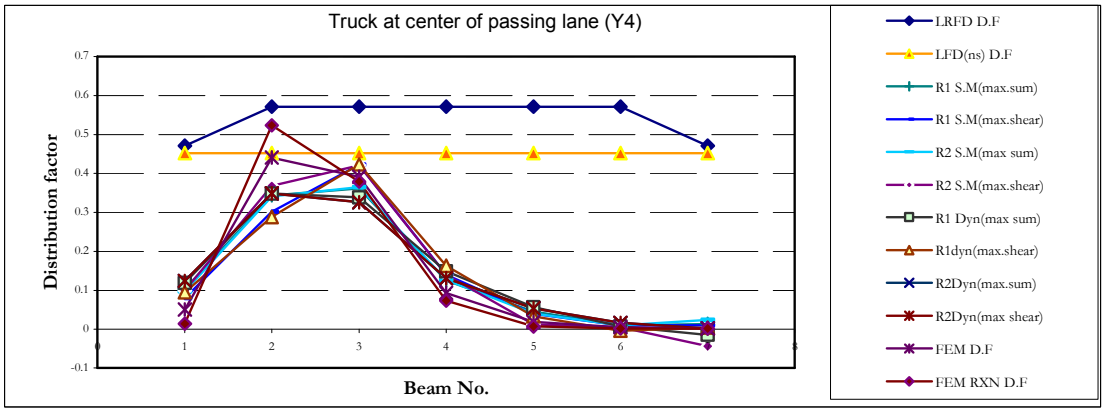
Graphical Comparison of Distribution Factor

Br.No: 003-0001





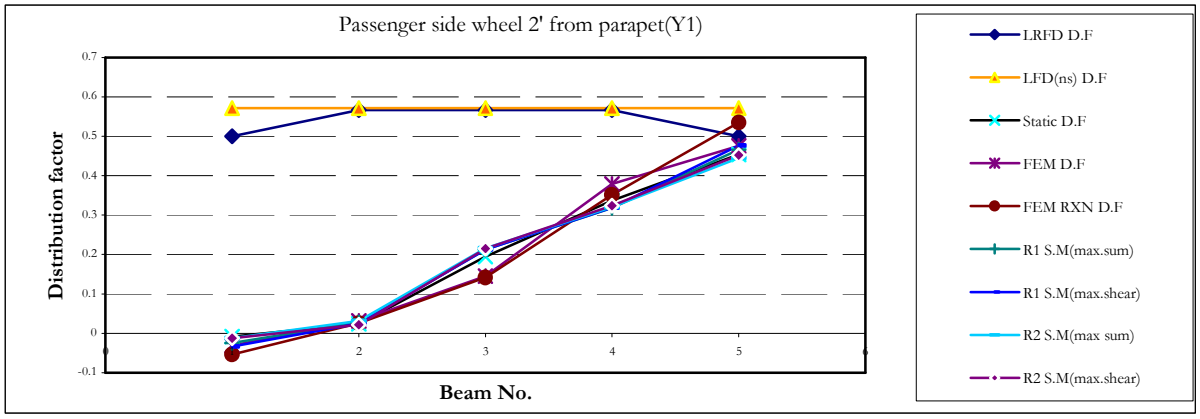


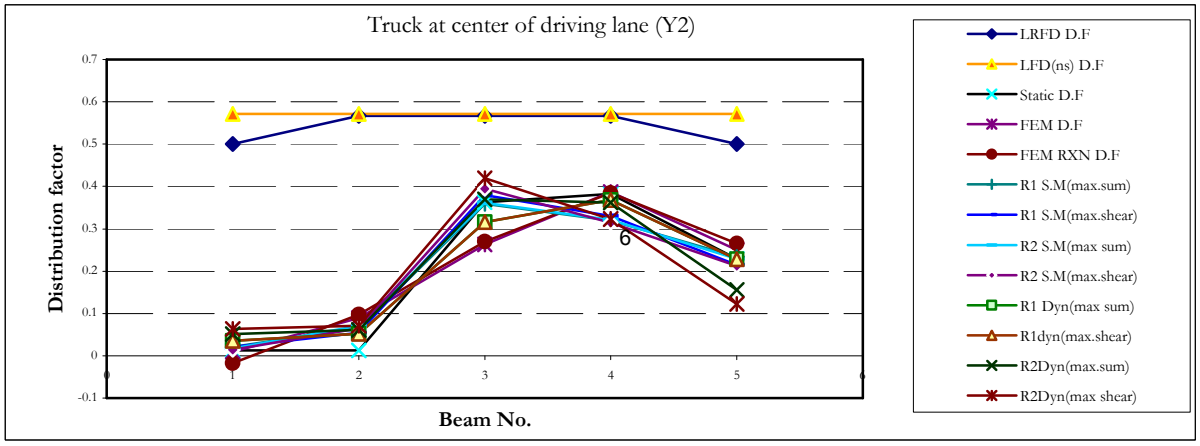


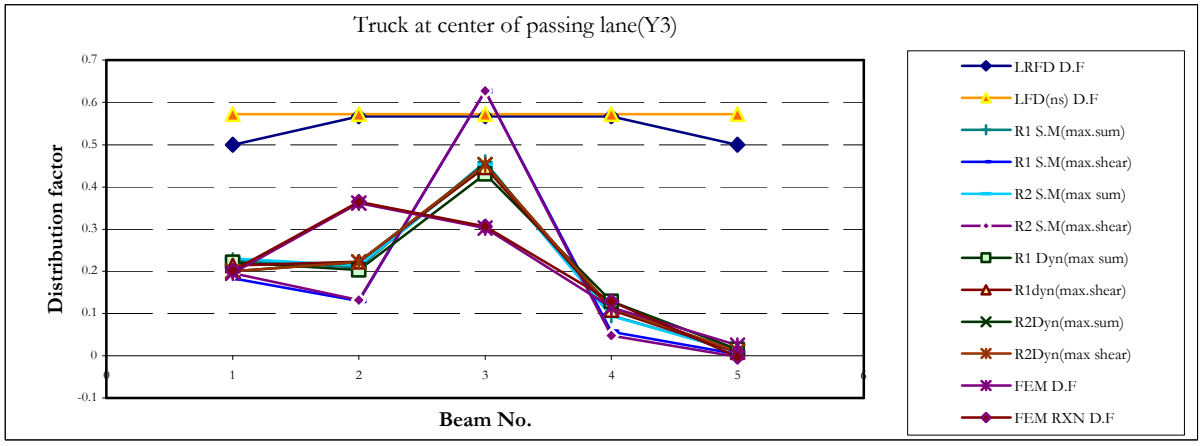
Graph D1

Comparison of Distribution Factor

Br. No: 003-0004



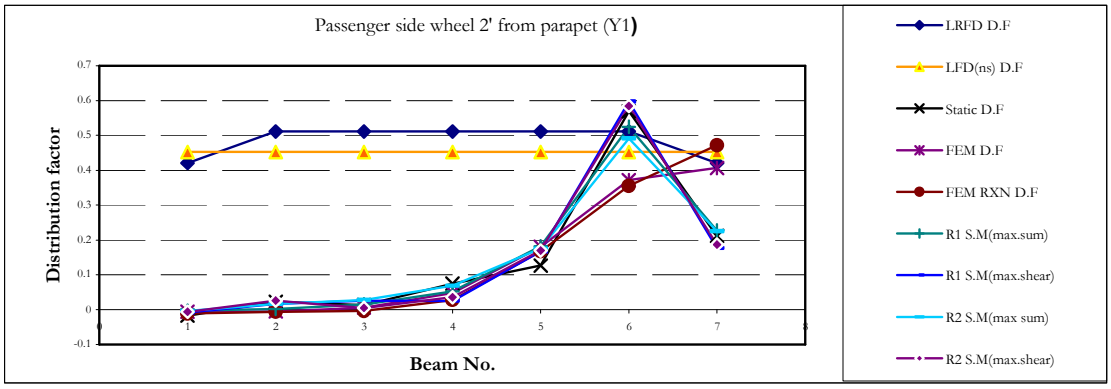


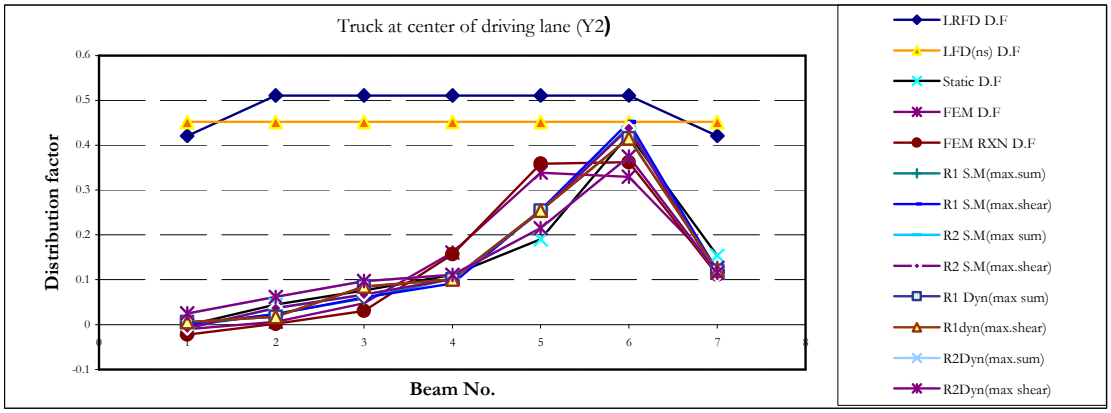


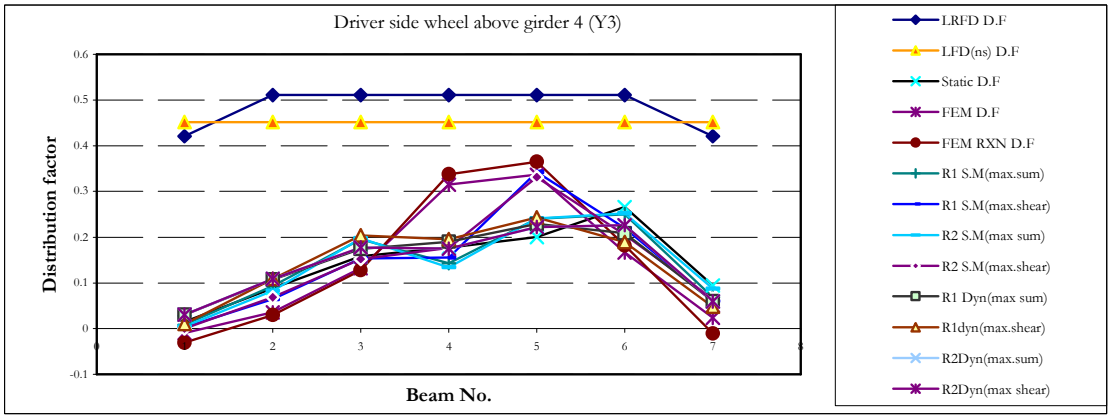
Graph D2

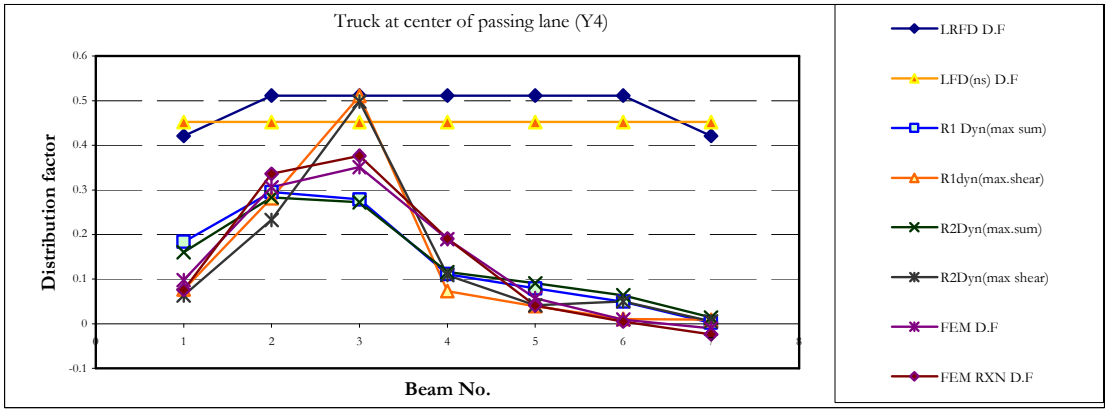
Graphical Comparison of Distribution Factor

Br. No: 003-0006





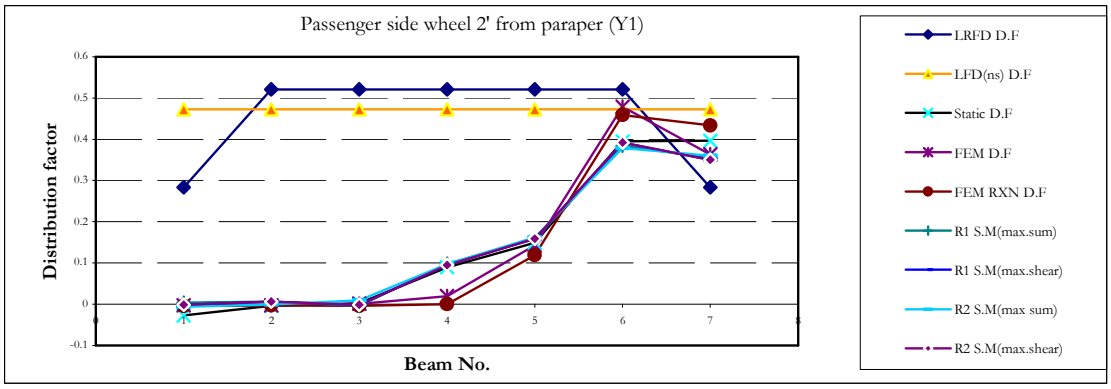


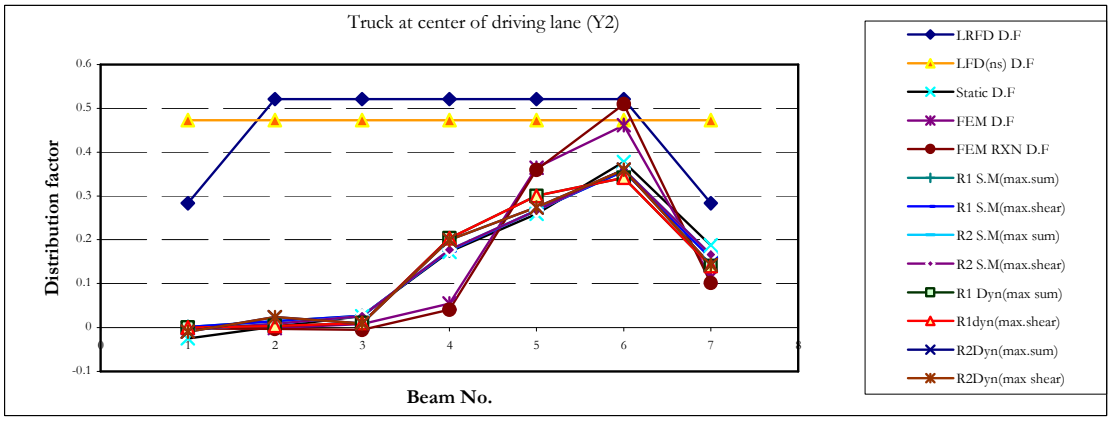


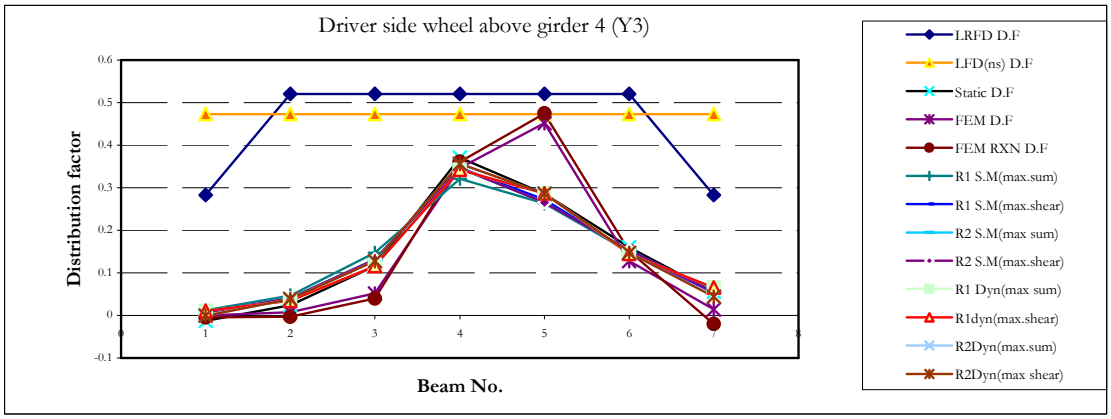
Graph D3

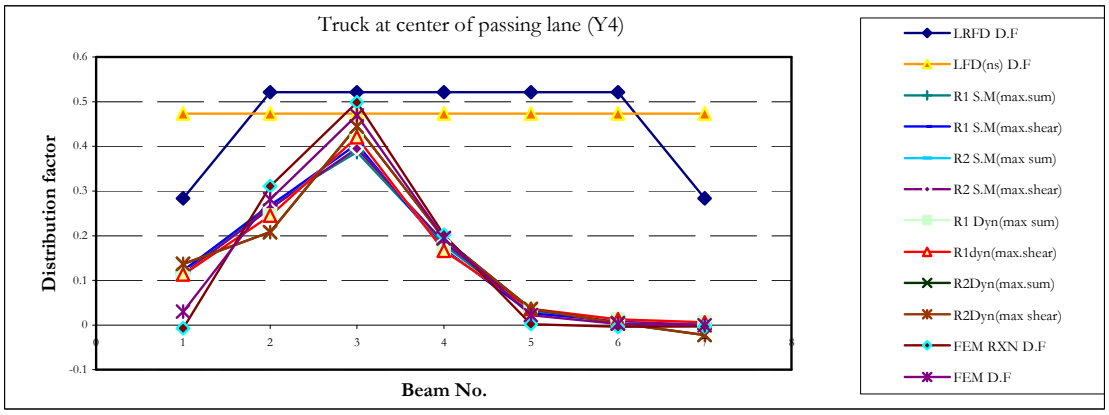
Graphical Comparison of Distribution Factor

Br. No: 060-0028





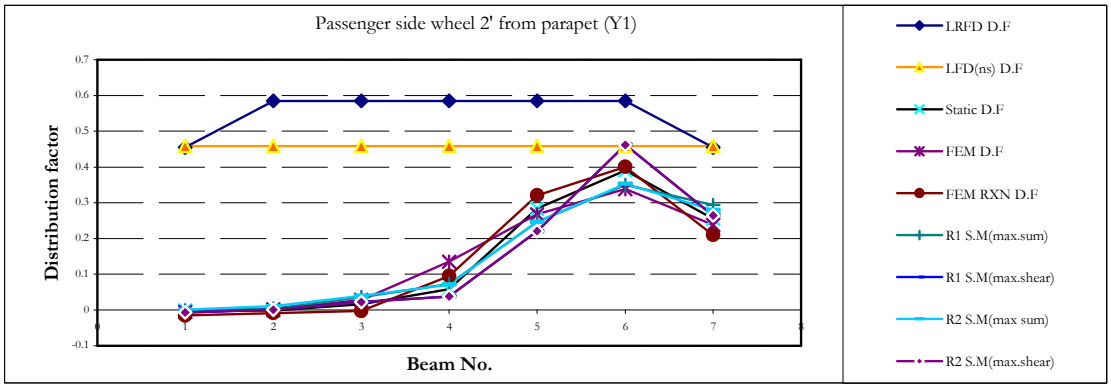


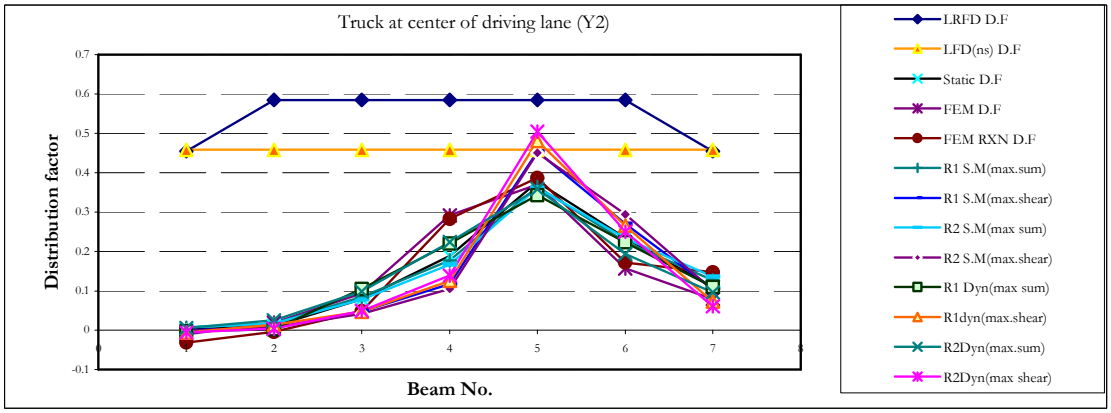


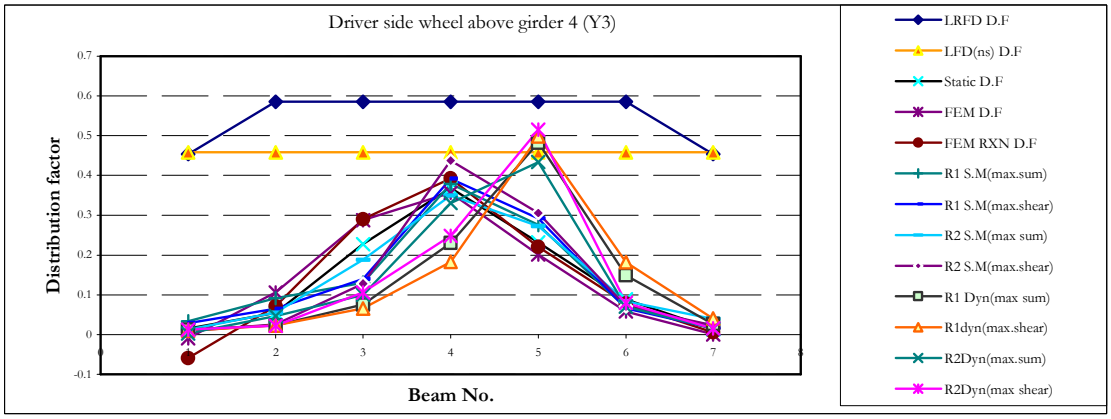
Graph D4

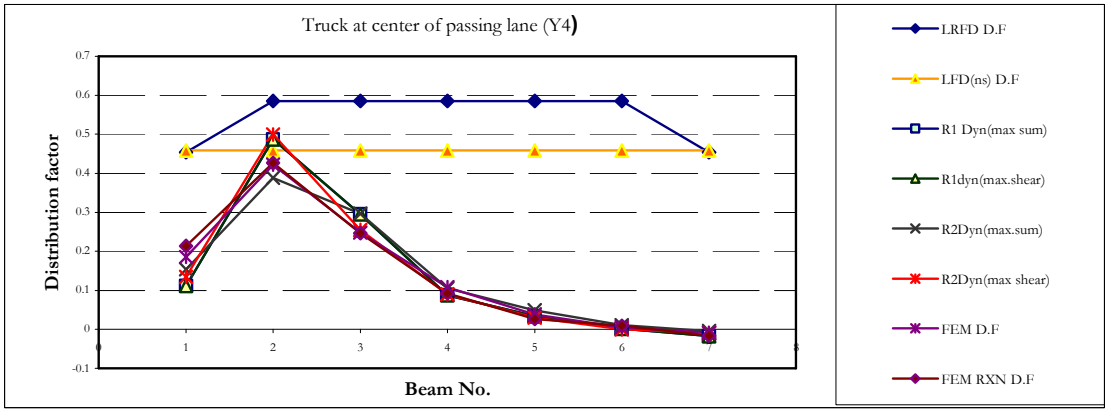
Graphical Comparison of Distribution Factor

Br. No: 060-0056





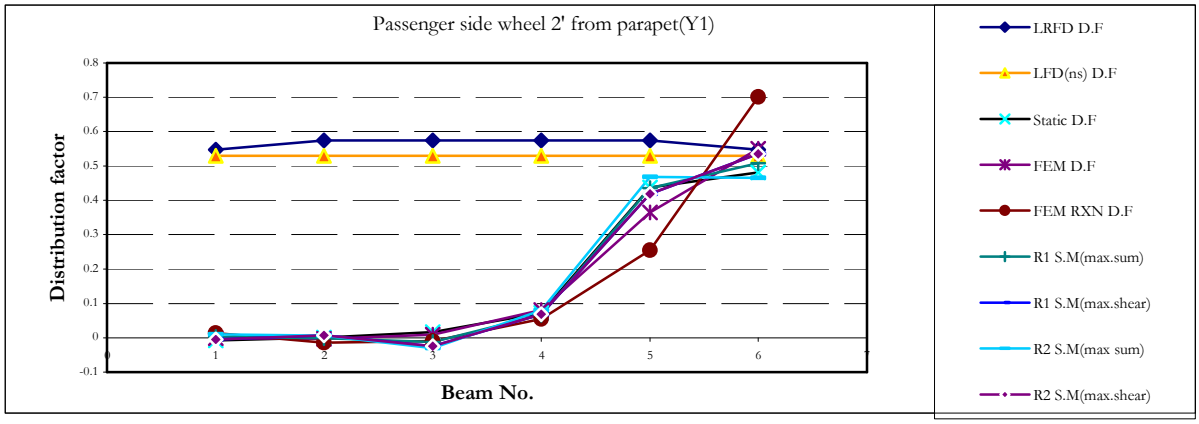


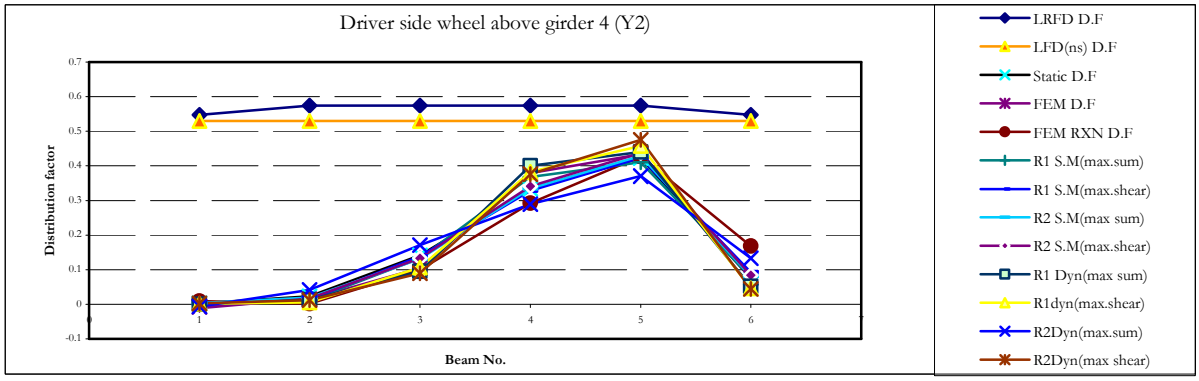


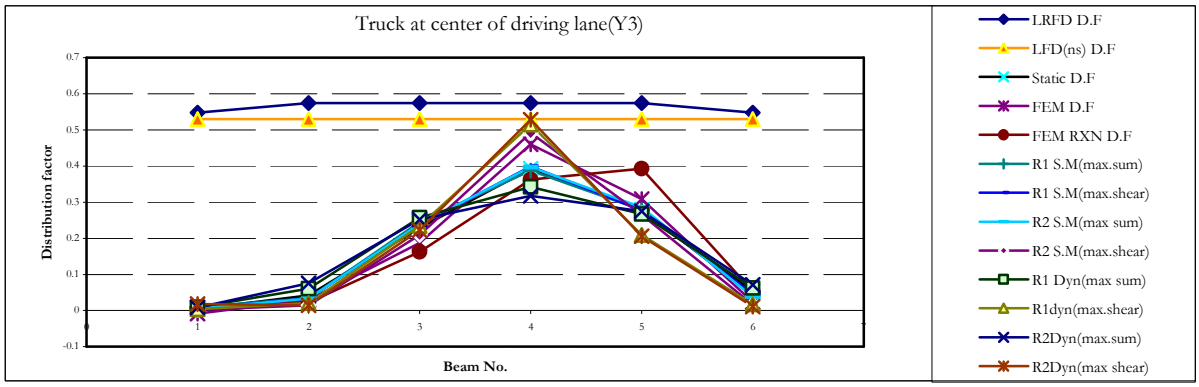
Graph D5

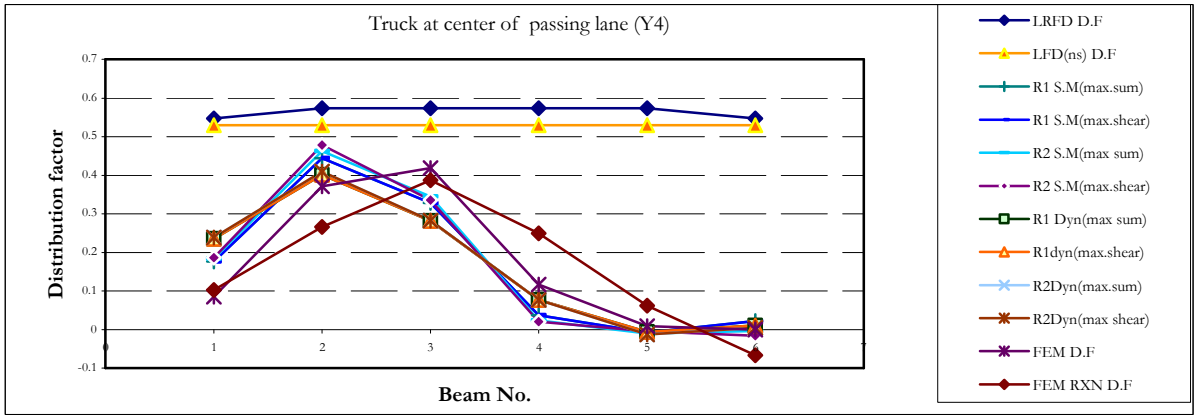
Graphical Comparison of Distribution Factor

Br. No: 060-0319









Graph D6

APPENDIX N – SUMMARY OF DISTRIBUTION FACTORS AND DESIGN SHEAR CALCULATIONS (SECOND SIX BRIDGES)

Summary of distribution factors and design shear

One-Way Traffic

LRFD Design								
Bridge	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
				Interior	Exterior	Beam No.6		
Spacing (ft)	6.330	8.000	6.333	6.417	4.542	5.479	6.625	7.417
V_{truck} (k)	49.700	57.720	54.590	55.040	55.040	55.040	49.570	56.970
V_{tandem} (k)	47.290	48.920	48.250	48.330	48.330	48.330	47.270	48.760
V_{lane} (k)	10.600	25.120	16.370	17.200	17.200	17.200	10.500	23.990
Interior Beam Distribution Factor	**0.695**	**0.814**	**0.695**	**0.701**	**0.562**	**0.632**	**0.716**	**0.773**
One design lane loaded	0.613	0.680	0.613	0.617	0.542	0.579	0.625	0.657
Two or more design lanes loaded	0.695	0.814	0.695	0.701	0.562	0.632	0.716	0.773
Exterior Beam Distribution Factor	**0.505**	**0.509**	**0.505**	**N/A**	**0.545**	**N/A**	**0.367**	**0.627**
One design lane loaded: Lever rule	0.505	0.488	0.505	N/A	0.545	N/A	0.340	0.627
Two or more design lanes loaded	0.486	0.509	0.487	N/A	0.426	N/A	0.367	0.577
Web Thickness (in)	0.470	0.438	0.580	0.605	0.655	0.605	0.460	6.000
Deck Overhang (in)	12.000	3.000	12.000	17.000	17.000	17.000	-10.500	17.500
L (ft)	35.833	78.000	54.750	57.500	57.500	57.500	35.500	69.885
θ (degrees)	26.500	0.000	0.000	32.579	32.579	32.579	0.000	17.000
IDOT Simplified Skew Factor	1.100	1.000	1.000	1.128	1.128	1.128	1.000	1.061
Skew Correction Factor	1.118	1.000	1.000	1.138	1.136	1.138	1.000	1.048
One Design Lane loaded (skew corr.)	0.685	0.680	0.613	0.702	0.616	0.659	0.625	0.689
Corrected Interior Beam DF	0.777	0.814	0.695	0.798	0.638	0.719	0.716	0.810
Design Shear (k)	**46.854**	**67.432**	**49.317**	**57.629**	**46.120**	**51.915**	**43.010**	**65.586**

Table E1

LFD Design								
Bridge	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
Axle at support DF	1.420	1.750	1.421	1.442	0.798	1.175	1.491	1.652
Axle not at support DF	1.151	1.455	1.151	1.167	0.826	0.996	1.205	1.348
Axle not at support DF(one lane loaded)	0.904	1.143	0.905	0.917	0.649	0.783	0.946	1.060
$V_{support}$ (k)	16.260	16.150	16.170	16.160	16.160	16.160	16.260	16.150
$V_{notsupport}$ (k)	8.590	12.710	11.130	11.360	11.360	11.360	8.520	12.330
V_{point} (k)	26.420	26.240	26.270	26.260	26.260	26.260	26.420	26.250
Truck Loading (k)	32.976	46.756	35.788	36.560	22.279	30.303	34.510	43.301
Lane Loading (k)	21.305	37.364	24.539	25.359	17.949	21.643	22.244	33.862
Design Shear (k)	**32.976**	**46.756**	**35.788**	**36.560**	**22.279**	**30.303**	**34.510**	**43.301**

Table E2

Summary of distribution factors and design shear

Two Way Traffic

LRFD Design								
Bridge	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
				Interior	Exterior	Beam No.6		
Spacing (ft)	6.330	8.000	6.333	6.417	4.542	5.479	6.625	7.417
V_{truck} (k)	50.870	62.410	57.830	58.480	58.480	58.480	50.690	61.300
V_{tandem} (k)	47.290	48.920	48.250	48.330	48.330	48.330	47.270	48.760
V_{lane} (k)	10.600	25.120	16.370	17.200	17.200	17.200	10.500	23.990
Interior Beam Distribution Factor	**0.695**	**0.814**	**0.695**	**0.701**	**0.562**	**0.632**	**0.716**	**0.773**
One design lane loaded	0.613	0.680	0.613	0.617	0.542	0.579	0.625	0.657
Two or more design lanes loaded	0.695	0.814	0.695	0.701	0.562	0.632	0.716	0.773
Exterior Beam Distribution Factor	**0.505**	**0.509**	**0.505**	**N/A**	**0.523**	**N/A**	**0.367**	**0.627**
One design lane loaded: Lever rule	0.505	0.488	0.505	N/A	0.523	N/A	0.340	0.627
Two or more design lanes loaded	0.486	0.509	0.487	N/A	0.417	N/A	0.367	0.577
Web Thickness (in)	0.470	0.438	0.580	0.605	0.655	0.605	0.460	6.000
Deck Overhang (in)	12.000	3.000	12.000	17.000	17.000	17.000	-10.500	17.500
L (ft)	35.833	78.000	54.750	57.500	57.500	57.500	35.500	69.885
θ (degrees)	26.500	0.000	0.000	32.579	32.579	32.579	0.000	17.000
IDOT Simplified Skew Factor	1.000	1.000	1.000	1.128	1.128	1.128	1.000	1.061
Skew Correction Factor	1.118	1.000	1.000	1.138	1.136	1.138	1.000	1.048
One Design Lane loaded (skew corr.)	0.685	0.680	0.613	0.702	0.616	0.659	0.625	0.689
Corrected Interior Beam DF	0.777	0.814	0.695	0.798	0.638	0.719	0.716	0.810
Design Shear (k)	**47.763**	**71.249**	**51.569**	**60.373**	**48.317**	**54.387**	**43.812**	**69.094**

Table E3

LFD Design								
Bridge	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
Axle at support DF	1.420	1.750	1.421	1.442	0.798	1.175	1.491	1.652
Axle not at support DF (2 or more lanes)	1.151	1.455	1.151	1.167	0.826	0.996	1.205	1.348
Axle not at support DF(one lane loaded)	0.904	1.143	0.905	0.917	0.649	0.783	0.946	1.060
$V_{support}$ (k)	16.260	16.150	16.170	16.160	16.160	16.160	16.260	16.150
$V_{notsupport}$ (k)	8.590	12.710	11.130	11.360	11.360	11.360	8.520	12.330
$V_{notsupport4}$ (k)	0.580	2.350	1.620	1.720	1.720	1.720	0.560	2.170
V_{point} (k)	26.420	26.240	26.270	26.260	26.260	26.260	26.420	26.250
Truck Loading (k)	33.644	50.175	37.653	38.567	23.700	32.016	35.185	46.226
Lane Loading (k)	21.305	37.364	24.539	25.359	17.949	21.643	22.244	33.862
Design Shear (k)	**33.644**	**50.175**	**37.653**	**38.567**	**23.700**	**32.016**	**35.185**	**46.226**

Table E4

Calculation of Skew correction factor

Bridge #	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
				Interior	Exterior	Beam No.6		
E_B (ksi)	29000	29000	29000	29000	2900	2900	29000	4415
E_D (ksi)	2900	2900	2900	3372	3372	3372	3372	3372
n	10	10	10	9	9	9	9	1
I (in^4)	2370	52505	6710	7450	8200	7450.00	2850	223600
ts(in)	7	7.50	7.00	7.50	7.50	7.50	7.00	7.50
L (ft)	35.833	78.00	54.75	57.50	57.50	57.50	35.50	69.89
A (in^2)	24.7	57.75	38.3	41.6	50.8	41.60	24.8	599
$e_{g\,(in)}$	15.55	36.5	20.045	20.4	18.97	20.40	16.855	30.75
K_g	83425	1294424	220990	212961	238328	222860	89059	789992
θ	26.5	0	0.00	32.58	32.58	32.58	0	17
Skew Factor	1.118	1.000	1.000	1.138	1.136	1.138	1.000	1.048

Table E5

Factored shear due to combined dead and live load

Bridge #	1	2	3	4			5	6
SN #	003-0001	003-0004	003-0006	060-0056	060-0056	060-0056	060-0028	060-0319
				Interior	Exterior	Beam No.6		
ω_b (lb/ft)	92.45	216.16	143.36	155.71	190.15	155.71	92.83	624.00
S (ft)	6.33	8.00	6.33	6.42	4.54	5.48	6.63	7.42
t_s (in)	7.00	7.50	7.00	7.50	7.50	7.50	7.00	7.50
bp(in)	12.00	21.00	12.00	19.00	19.00	19.00	34.00	19.00
WS (lb/ft^2)	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
t_{oh} (in)	9.00	12.00	9.00	9.00	9.00	9.00	12.00	9.00
L_{oh} (in)	24.00	24.00	24.00	42.50	42.50	42.50	23.50	36.50
ω_P (lb/ft)	550.00	806.25	550.00	843.75	843.75	843.75	664.58	843.75
$\omega_{DC(interior)}$ (lb/ft)	724.90	1127.41	776.07	877.81	736.50	789.90	767.46	1459.94
$\omega_{DW(interior)}$ (lb/ft)	158.25	200.00	158.33	160.42	113.55	136.98	165.63	185.42
$\omega_{DC(exterior)}$ (lb/ft)	672.96	1052.41	724.00	975.47	922.03	931.51	771.36	1454.47
$\omega_{DW(exterior)}$ (lb/ft)	104.13	106.25	104.16	129.17	105.73	117.45	60.94	129.17
ω_{DC} (lb/ft)	724.90	1127.41	776.07	975.47	922.03	931.51	771.36	1459.94
ω_{DW} (lb/ft)	158.25	200.00	158.33	160.42	113.55	136.98	165.63	185.42
Factor (k)*	13.90	24.81	21.17	22.17	22.17	22.17	13.79	35.50
DC (k)	10.08	27.97	16.43	21.63	20.44	20.65	10.64	51.83
DW (k)	2.20	4.96	3.35	3.56	2.52	3.04	2.28	6.58
LL+IM (k)	60.83	88.01	64.83	75.81	60.72	68.35	55.79	85.51
Vu (k)	**122.35**	**196.42**	**139.02**	**165.03**	**135.59**	**149.98**	**114.35**	**224.30**

Table E6

Live Load Shear by LRFD

Input data

Spacing of girder	$S := 6.33$ ft	
Modulus of elasticity of beam	$E_B := 29000$ Ksi	
Modulus of elasticity of deck	$E_D := 2900$ Ksi	
Thickness of slab	$t_s := 7.0$ in	
Span of the bridge	$L := 35.833$ ft	
Overall depth of the beam	$d := 24.10$ in	
Skew angle	$\theta := 0.4625$ radians	(26.5 degree)
Girder C.L to edge of roadway	$d_e := 1.00$ ft	
Area of cross section	$A := 24.7$ in^2	
Moment of Inertia	$I := 2370$ in^4	

Calculated shear by SAP2000 analysis

$V_{truck1} := 49.70$ Kips (Onewaytraffic)

$V_{truck2} := 50.87$ Kips (Twowaytraffic)

$V_{tandem} := 47.29$ Kips

$V_{lane} := 10.60$ Kips

Calculation of skew factor

Modular ratio $n := \frac{E_B}{E_D}$ $n = 10.000$

Ecentricity between centiod of deck and girder $e_g := \frac{t_s}{2} + \frac{d}{2}$ $e_g = 15.550$ in

Longitudinal stiffness parameter $k_g := n \cdot \left(I + A \cdot e_g^2\right)$ $k_g = 83425.217$

Skew factor (LRFD Table 4.6.2.2.3c)

$$S_k := 1 + 0.2\left(12 \cdot L \cdot \frac{t_s^3}{k_g}\right)^{0.3} \cdot \tan(\theta) \qquad S_k = 1.118$$

Also, IDOT Skew factor (Journal of bridge engineering@ ASCE/ Nov/ Dec 2004)

$$S_{k1} := 1 + 0.2 \cdot \tan(\theta) \qquad S_{k1} = 1.100$$

Computation of live load distribution factor and live load shear using LRFD

Interior beam distribution factor for shear (LRFD Table 4.6.2.2.3a-1)

Checking the design parameters.

$3.5 \le S \le 16.0$

$20 \le L \le 240$

$4.5 \le t_s \le 12.0$

$10,000 \le K_g \le 7,000,000$

$N_b \ge 4$

One design lane loaded

$mg_{I1} := 0.36 + \frac{S}{25.0}$ $\qquad mg_{I1} = 0.613$

Two or more design lane loaded

$mg_{I2} := 0.2 + \frac{S}{12} - \left(\frac{S}{35}\right)^2$ $\qquad mg_{I2} = 0.695$

$mg_I := \max(mg_{I1}, mg_{I2})$ $\qquad mg_I = 0.695$

Exterior beam distribution factor for shear (LRFD Table 4.6.2.2.3b-1)

One design lane loaded : Use lever rule

Using lever rule,

$mg_{E1} := 1.2 \cdot \frac{[(S + d_e) - 2]}{2 \cdot S}$ (For (S+de)<8ft)

$mg_{E1} = 0.505$

multiple presense factor,m = 1.2 (LRFD Table 3.6.1.1.2-1)

Two or more design lane loaded

Correction factor for distribution, $e_c := 0.6 + \frac{d_e}{10}$ $\qquad e_c = 0.700$

$mg_{E2} := e_c \cdot mg_{I2}$ $\qquad mg_{E2} = 0.486$

$mg_E := \max(mg_{E1}, mg_{E2})$ $\qquad mg_E = 0.505$

Shear distribution factor,

$mg_v := \max(mg_I, mg_E)$ $\qquad mg_v = 0.695$

Corrected shear DF = Skew correction factor X shear DF

$mg_c := S_k \cdot mg_v$ $\qquad mg_c = 0.777$

Maximum design shear for one way and two way traffic

$V_{u1} := mg_c \cdot (\max(V_{truck1}, V_{tandem}) + V_{lane})$ $\qquad V_{u1} = 46.852$ Kips

$V_{u2} := mg_c \cdot (\max(V_{truck2}, V_{tandem}) + V_{lane})$ $\qquad V_{u2} = 47.761$ Kips

Maximum design shear,

$$V_u := \max(V_{u1}, V_{u2})$$

$$V_u = 47.761 \quad \text{Kips}$$

Live Load Shear by LFD

Input data

Spacing of girder, $S = 6.330$ ft

Calculated shear by SAP2000 analysis

HS20-44 Truck Loading

Shear from first axle, $V_s := 16.26$ Kips

Shear from second axle, $V_{ns16} := 8.59$ Kips

Shear from third axle, $V_{ns4} := 0.58$ Kips

HS20-44 Lane Loading

Shear from uniform load, $V_{lane} = 10.600$ Kips

Shear from point load, $V_p := 26.42$ Kips

Calculations

Axle at support, $DF_s := 1 + \frac{(S-4)}{S} + \frac{(S-6)}{S}$ $DF_s = 1.420$ (LFD Art. 3.23.1.2) (For 6<S<10)

Axle not at support, $DF_{ns} := \frac{S}{5.5}$ $DF_{ns} = 1.151$ (LFD Table 3.23.1)

One way traffic

Design shear using HS20-44 Truck loading

$T_{L1} := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns}$ $T_{L1} = 32.979$ Kips

Design shear using HS20-44 lane loading

$L_{L1} := V_p \cdot \frac{DF_{ns}}{2} + V_{lane} \cdot \frac{DF_{ns}}{2}$ $L_{L1} = 21.303$ Kips

Design shear,

$V_1 := \max(T_{L1}, L_{L1})$ $V_1 = 32.979$ Kips

Two way traffic

Design shear using HS20-44 Truck loading

$T_{L2} := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns} + V_{ns4} \cdot DF_{ns}$ $T_{L2} = 33.647$ Kips

Design shear using HS20-44 lane loading

$$L_{L2} := V_p \cdot \frac{DF_{ns}}{2} + V_{lane} \cdot \frac{DF_{ns}}{2} \qquad L_{L2} = 21.303 \quad \text{Kips}$$

Design shear,

$$V_2 := \max\left(T_{L2}, L_{L2}\right) \qquad V_2 = 33.647 \quad \text{Kips}$$

Design shear computed using LFD

$$V_{uL} := \max\left(V_1, V_2\right) \qquad V_{uL} = 33.647 \quad \text{Kips}$$

LRFD dead and live load combination

Input data

Spacing of girder, $S = 6.330 \quad ft$

Density of steel , $D_s := .490 \quad KCF$

Unit weight of the concrete, $\omega_c := .150 \quad KCF$

Area of cross section, $A = 24.700 \quad in^2$

Unit weight of wearing surface, $WS := 25 \quad \frac{lb}{ft^2}$

Thickness of the overhang. $t_{oh} := 9 \quad in$

Lenth of the overhang, $L_{oh} := 24 \quad in$

Width of the parapet, $b_p := 12 \quad in$

Area of the parapet, $A_p := 264 \quad in^2$

Shear Factor based on 1k/ft of loading, $F_a := 13.90 \quad Kips$

Skew factor, $S_k = 1.118$

Interior girder distribution factor, $mg_I = 0.695$

Exterior girder distribution factor, $mg_E = 0.505$

Calculated shear by SAP2000 ,

$V_{truck2} = 50.870 \quad Kips$

$V_{tandem} = 47.290 \quad Kips$

$V_{lane} = 10.600 \quad Kips$

Calculations

Weight of the beam, $\omega_b := \left(D_s \cdot \frac{A}{144} \cdot 1000\right) \cdot 1.1 \qquad \omega_b = 92.453 \quad \frac{lb}{ft}$

Weight of the parapet $\omega_p := 2 \cdot A_p \cdot \frac{\omega_c}{144} \cdot 1000 \qquad \omega_p = 550.000 \quad \frac{lb}{ft}$

$$\omega_{DCI} := \omega_b + \frac{\omega_p}{7} + \left(\frac{t_s}{12} \cdot S \cdot 150\right) \qquad \omega_{DCI} = 724.900 \quad \frac{lb}{ft}$$

$\omega_{DWI} := S \cdot WS$ $\qquad \omega_{DWI} = 158.250 \ \frac{lb}{ft}$

$\omega_{DCE} := \frac{t_{oh}}{12} \cdot \frac{L_{oh}}{12} \cdot 150 + \frac{t_s}{12} \cdot S \cdot \frac{1}{2} \cdot 150 + \omega_b + \frac{\omega_p}{7}$ $\qquad \omega_{DCE} = 672.962 \ \frac{lb}{ft}$

$\omega_{DWE} := \frac{(L_{oh} - b_p)}{12} \cdot WS + \frac{S}{2} \cdot WS$ $\qquad \omega_{DWE} = 104.125 \ \frac{lb}{ft}$

$DC_I := \omega_{DCI} \cdot \frac{F_a}{1000}$ $\qquad DC_I = 10.076$ Kips

$DW_I := \omega_{DWI} \cdot \frac{F_a}{1000}$ $\qquad DW_I = 2.200$ Kips

$DC_E := \omega_{DCE} \cdot \frac{F_a}{1000}$ $\qquad DC_E = 9.354$ Kips

$DW_E := \omega_{DWE} \cdot \frac{F_a}{1000}$ $\qquad DW_E = 1.447$ Kips

$LL_I := S_k \cdot mg_I \cdot (1.33 \cdot \max(V_{truck2}, V_{tandem}) + V_{lane})$ $\qquad LL_I = 60.805$ Kips

$LL_E := S_k \cdot mg_E \cdot (1.33 \cdot \max(V_{truck2}, V_{tandem}) + V_{lane})$ $\qquad LL_E = 44.214$ Kips

$V_{uI} := 1.25 \cdot DC_I + 1.50 \cdot DW_I + 1.75 \cdot LL_I$ (LRFD Table 3.4.1-1 and 3.4.1-2)

$V_{uI} = 122.303$ Kips

$V_{uE} := 1.25 \cdot DC_E + 1.50 \cdot DW_E + 1.75 \cdot LL_E$ $\qquad V_{uE} = 91.238$ Kips

$V_{u.} := \max(V_{uE}, V_{uI})$

$V_{u.} = 122.303$ Kips

CALCULATIONS FOR PRESTRESSED CONCRETE GIRDER BRIDGE

(All units are in kips and inches unless specified.)

Calculation of Sectional Properties of the Girder

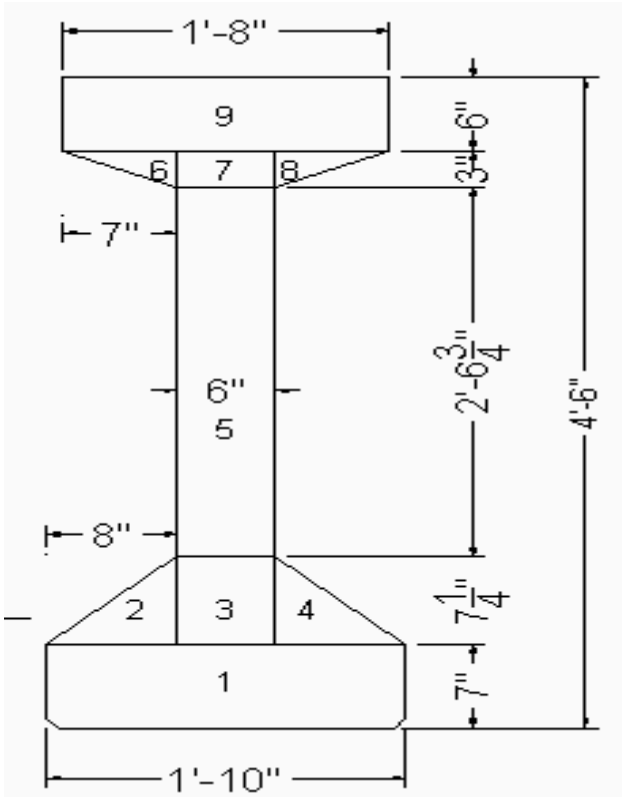


Figure A1: Cross-section of the girder

Composite Section (Including the slab)

Areas

$A_1 := 154$

$A_2 := 29$

$A_3 := 43.5$

$A_4 := A_2$ $\quad A_4 = 29$

$A_5 := 184.5$

$A_6 := 10.5$

$A_7 := 18$

$A_8 := A_6$ $\quad A_8 = 10.5$

$A_9 := 120$

Moment of intertias,

$I_1 := 628.83$

$I_2 := 84.68$

$I_3 := 190.54$

$I_4 := 84.68$

$I_5 := 14538.02$

$I_6 := 5.25$

$I_7 := 13.5$

$I_8 := 5.25$

$I_9 := 360$

Distance of centroid from bottom of gir

$y_1 := 3.5$

$y_2 := 9.416$

$y_3 := 10.625$

$y_4 := 9.416$

$y_5 := 29.625$

$y_6 := 47$

$y_7 := 46.5$

$y_8 := 47$

$y_9 := 51$

Thickness of slab, $t := 7.5$

width of slab, $w := 89$

strength of concrete slab, $f_{cslb} := 3500$ psi

strength of concrete girder, $f_{cgir} := 5000$ psi

modular ratio, $n := \sqrt{\frac{f_{cgir}}{f_{cslb}}}$ $n = 1.195$

transformed width of slab, $w_{trans} := \frac{w}{n}$ $w_{trans} = 74.463$

area of transformed section of slab $A_{10} := w_{trans} \cdot t$ $A_{10} = 558.471$

distance of centroid form the bottom of the girder, $y_{10} := 57.75$

moment of intertia, $I_{10} := w_{trans} \cdot \frac{t^3}{12}$ $I_{10} = 2.618 \times 10^3$

Total area of the section,

$A_{tot} := A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7 + A_8 + A_9 + A_{10}$

$A_{tot} = 1.157 \times 10^3$

distance of centroid of the composite section from the bottom of the girder,

$$y := \frac{\left(A_1 \cdot y_1 + A_2 \cdot y_2 + A_3 \cdot y_3 + A_4 \cdot y_4 + A_5 \cdot y_5 + A_6 \cdot y_6 + A_7 \cdot y_7 + A_8 \cdot y_8 + A_9 \cdot y_9 + A_{10}\right.}{A_{tot}}$$

$$y = 40.786$$

moment of intertia about the c.g of the composite section

$$I_{1xx} := I_1 + A_1 \cdot \left(y - y_1\right)^2$$

$$I_{2xx} := I_2 + A_2 \cdot \left(y - y_2\right)^2$$

$$I_{3xx} := I_3 + A_3 \cdot \left(y - y_3\right)^2$$

$$I_{4xx} := I_4 + A_4 \cdot \left(y - y_4\right)^2$$

$$I_{5xx} := I_5 + A_5 \cdot \left(y - y_5\right)^2$$

$$I_{6xx} := I_6 + A_6 \cdot \left(y - y_6\right)^2$$

$$I_{7xx} := I_7 + A_7 \cdot \left(y - y_7\right)^2$$

$$I_{8xx} := I_8 + A_8 \cdot \left(y - y_8\right)^2$$

$$I_{9xx} := I_9 + A_9 \cdot \left(y - y_9\right)^2$$

$$I_{10xx} := I_{10} + A_{10} \cdot \left(y - y_{10}\right)^2$$

total moment of intertia of the section about the c.g. of the section,

$$I_{totxx} := I_{1xx} + I_{2xx} + I_{3xx} + I_{4xx} + I_{5xx} + I_{6xx} + I_{7xx} + I_{8xx} + I_{9xx} + I_{10xx}$$

$$I_{totxx} = 5.269 \times 10^5$$

Non-Composite Section

total area of the non-composite section,

$$A_{nctot} := A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7 + A_8 + A_9 \qquad A_{nctot} = 599$$

distance of centroid of the non-composite section from the bottom of the girder,

$$y_{nc} := \frac{\left(A_1 \cdot y_1 + A_2 \cdot y_2 + A_3 \cdot y_3 + A_4 \cdot y_4 + A_5 \cdot y_5 + A_6 \cdot y_6 + A_7 \cdot y_7 + A_8 \cdot y_8 + A_9 \cdot y_9\right.}{\left(A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7 + A_8 + A_9\right)}$$

$$y_{nc} = 24.97$$

$$I_{1nc} := I_1 + \left[A_1 \cdot \left(y_{nc} - y_1\right)^2\right]$$
$$I_{2nc} := I_2 + \left[A_2 \cdot \left(y_{nc} - y_2\right)^2\right]$$
$$I_{3nc} := I_3 + \left[A_3 \cdot \left(y_{nc} - y_3\right)^2\right]$$
$$I_{4nc} := I_4 + \left[A_4 \cdot \left(y_{nc} - y_4\right)^2\right]$$
$$I_{5nc} := I_5 + \left[A_5 \cdot \left(y_{nc} - y_5\right)^2\right]$$
$$I_{6nc} := I_6 + \left[A_6 \cdot \left(y_{nc} - y_6\right)^2\right]$$
$$I_{7nc} := I_7 + \left[A_7 \cdot \left(y_{nc} - y_7\right)^2\right]$$
$$I_{8nc} := I_8 + \left[A_8 \cdot \left(y_{nc} - y_8\right)^2\right]$$
$$I_{9nc} := I_9 + \left[A_9 \cdot \left(y_{nc} - y_9\right)^2\right]$$

total moment of intertia of the non-composite section about the c.g,

$$I_{nctot} := I_{1nc} + I_{2nc} + I_{3nc} + I_{4nc} + I_{5nc} + I_{6nc} + I_{7nc} + I_{8nc} + I_{9nc}$$

$$I_{nctot} = 2.137 \times 10^5$$

Shear Equation

shear stress, $\tau = G\gamma$ where G is the shear modulus and γ is the shear strain

$$\tau = \frac{VQ}{It}$$

$$G\gamma = \frac{VQ}{It}$$ where Q is moment of area of the section about the neutra

$$\gamma = \frac{2}{\sqrt{3}}(\varepsilon 1 - \varepsilon 3)$$ where $\varepsilon 1$ and $\varepsilon 3$ are the readings of the inclined gages

$$V = \frac{G\gamma It}{Q}$$

thickness of web, $t_w := 6$

$$Q_a := w_{trans} \cdot t \cdot \left(54 - y + \frac{t}{2}\right) + A_9 \cdot \left(54 - y - \frac{6}{2}\right) + 2 \cdot A_6 \cdot (54 - y - 7) + 9 \cdot 6 \cdot \left(54 - y - 6 - \frac{9}{2}\right)$$

$$Q_a = 1.098 \times 10^4$$

$$k_1 := \frac{\left(I_{totxx} \cdot t_w\right)}{Q_a} \qquad k_1 = 288.01$$

$$Q_b := A_1 \cdot \left(y - \frac{7}{2}\right) + 2 \cdot A_2 \cdot (y - 9.416) + (30.75 - 7) \cdot 6 \cdot \left[y - 7 - \frac{(30.75 - 7)}{2}\right]$$

$$Q_b = 1.068 \times 10^4$$

$$k_2 := \frac{\left(I_{totxx} \cdot t_w\right)}{Q_b} \qquad k_2 = 295.898$$

$$Q_c := A_1 \cdot \left(y - \frac{7}{2}\right) + 2 \cdot A_2 \cdot (y - 9.416) + (30.75 - 7 - 9) 6 \cdot \left[y - 7 - \frac{(30.75 - 9 - 7)}{2}\right]$$

$$Q_c = 9.899 \times 10^3$$

$$k_3 := \frac{\left(I_{totxx} \cdot t_w\right)}{Q_c} \qquad k_3 = 319.362$$

Calculation of Shear Modulus

$f_c := 6000$ psi (after increasing by 20% for aging)

$E := 33 \cdot 145^{1.5} \cdot \sqrt{f_c}$ $E = 4.463 \times 10^6$ psi $\frac{E}{1000} = 4.463 \times 10^3$ ksi

poisions ratio, $\nu := 0.2$

shear modulus, $G := \frac{E}{2(1+\nu) \cdot 1000}$ $G = 1.86 \times 10^3$

Live Load Shear by LRFD

Input data

Spacing of girder	$S := 7.4167$ ft	
Modulus of elasticity of beam	$E_B := 4415$ Ksi	
Modulus of elasticity of deck	$E_D := 3372$ Ksi	
Thickness of slab	$t_s := 7.5$ in	
Span of the bridge	$L := 69.885$ ft	
Overall depth of the beam	$d := 54$ in	
Skew angle	$\theta := 0.297$ radians	(17 degree)
Girder C.L to edge of roadway	$d_e := 1.4583$ ft	
Area of cross section	$A := 599$ in^2	
Moment of Inertia	$I := 223600$ in^4	

Calculated shear by SAP2000 analysis

$V_{truck1} := 56.97$ Kips (Oneway traffic)

$V_{truck2} := 61.30$ Kips (Twoway traffic)

$V_{tandem} := 48.76$ Kips

$V_{lane} := 23.99$ Kips

Calculation of skew factor

Modular ratio $n := \frac{E_B}{E_D}$ $\quad \text{floor}(n) = 1$

Eccentricity between centroid of deck and girder $e_g := \frac{t_s}{2} + \frac{d}{2}$ $\quad e_g = 30.75$

Longitudinal stiffness parameter $k_g := \text{floor}(n) \cdot \left(I + A \cdot e_g^2\right)$ $\quad k_g = 7.9 \times 10^5$

Skew factor (LRFD Table 4.6.2.2.3c)

$$S_k := 1 + 0.2\left(12 \cdot L \cdot \frac{t_s^3}{k_g}\right)^{0.3} \cdot \tan(\theta) \qquad S_k = 1.048$$

Also, IDOT Skew factor (Journal of bridge engineering@ ASCE/ Nov/ Dec 2004)

$$S_{k1} := 1 + 0.2 \cdot \tan(\theta) \qquad S_{k1} = 1.061$$

Computation of live load distribution factor and live load shear using LRF

Interior beam distribution factor for shear (LRFD Table 4.6.2.2.3a-1)

Checking the design parameters.

$3.5 \le S \le 16.0$

$20 \le L \le 240$

$4.5 \le t_s \le 12.0$

$10,000 \le K_g \le 7,000,000$

$N_b \ge 4$

One design lane loaded

$mg_{I1} := 0.36 + \frac{S}{25.0}$ $\qquad mg_{I1} = 0.657$

Two or more design lane loaded

$mg_{I2} := 0.2 + \frac{S}{12} - \left(\frac{S}{35}\right)^2$ $\qquad mg_{I2} = 0.773$

$mg_I := \max(mg_{I1}, mg_{I2})$ $\qquad mg_I = 0.773$

Exterior beam distribution factor for shear (LRFD Table 4.6.2.2.3b-1)

One design lane loaded : Use lever rule

Using lever rule,

$mg_{E1} := 1.2 \cdot \frac{\left[2 \cdot (S + d_e) - 10\right]}{2 \cdot S}$ (For (S+de)>8ft)

$mg_{E1} = 0.627$

multiple presense factor,m = 1.2 (LRFD Table 3.6.1.1.2-1)

Two or more design lane loaded

Correction factor for distribution, $e_c := 0.6 + \frac{d_e}{10}$ $e_c = 0.746$

$mg_{E2} := e_c \cdot mg_{I2}$ $mg_{E2} = 0.577$

$mg_E := \max(mg_{E1}, mg_{E2})$ $mg_E = 0.627$

Shear distribution factor,

$mg_v := \max(mg_I, mg_E)$ $mg_v = 0.773$

Corrected shear DF = Skew correction factor X shear DF

$mg_c := S_k \cdot mg_v$ $mg_c = 0.81$

Maximum design shear for one way and two way traffic

$V_{u1} := mg_c \cdot (\max(V_{truck1}, V_{tandem}) + V_{lane})$ $V_{u1} = 65.605$ Kips

$V_{u2} := mg_c \cdot (\max(V_{truck2}, V_{tandem}) + V_{lane})$ $V_{u2} = 69.114$ Kips

Maximum design shear,

$V_u := \max(V_{u1}, V_{u2})$

$V_u = 69.114$ Kips

Live Load Shear by LFD

Input data

Spacing of girder, $S = 7.417$ ft

Calculated shear by SAP2000 analysis

HS20-44 Truck Loading

Shear from first axle, $V_s := 16.15$ Kips

Shear from second axle, $V_{ns16} := 12.33$ Kips

Shear from third axle, $V_{ns4} := 2.17$ Kips

HS20-44 Lane Loading

Shear from uniform load, $V_{lane} = 23.99$ Kips

Shear from point load, $V_p := 26.25$ Kips

Calculations

Axle at support, $DF_s := 1 + \frac{(S-4)}{S} + \frac{(S-6)}{S}$ $DF_s = 1.652$ (LFD Art. 3.23.1.2) (For 6'<S<10'

Axle not at support, $DF_{ns} := \frac{S}{5.5}$ $DF_{ns} = 1.348$ (LFD Table 3.23.1)

One way traffic

Design shear using HS20-44 Truck loading

$T_{L1} := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns}$ $T_{L1} = 43.302$ Kips

Design shear using HS20-44 lane loading

$L_{L1} := V_p \cdot \frac{DF_{ns}}{2} + V_{lane} \cdot \frac{DF_{ns}}{2}$ $L_{L1} = 33.874$ Kips

Design shear,

$V_1 := \max(T_{L1}, L_{L1})$ $V_1 = 43.302$ Kips

Two way traffic

Design shear using HS20-44 Truck loading

$T_{L2} := V_s \cdot DF_s + V_{ns16} \cdot DF_{ns} + V_{ns4} \cdot DF_{ns}$ $T_{L2} = 46.228$ Kips

Design shear using HS20-44 lane loading

$$L_{L2} := V_p \cdot \frac{DF_{ns}}{2} + V_{lane} \cdot \frac{DF_{ns}}{2} \qquad L_{L2} = 33.874 \quad \text{Kips}$$

Design shear,

$$V_2 := \max\left(T_{L2}, L_{L2}\right) \qquad V_2 = 46.228 \quad \text{Kips}$$

Design shear computed using LFD

$$V_{uL} := \max\left(V_1, V_2\right) \qquad V_{uL} = 46.228 \quad \text{Kips}$$

LRFD dead and live load combination

Input data

Spacing of girder, $S = 7.417$ ft

Unit weight of the concrete, $\omega_c := .150$ KCF

Area of cross section, $A = 599$ in^2

Unit weight of wearing surface, $WS := 25 \frac{lb}{ft^2}$

Thickness of the overhang. $t_{oh} := 9$ in

Lenth of the overhang, $L_{oh} := 36.5$ in

Width of the parapet, $b_p := 19$ in

Area of the parapet, $A_p := 405$ in^2

Shear based on 1k/ft of loading, $F_a := 35.50$ Kips

Skew factor, $S_k = 1.048$

Interior girder distribution factor, $mg_I = 0.773$

Exterior girder distribution factor, $mg_E = 0.627$

Calculated shear by SAP2000 ,

$V_{truck2} = 61.3$ Kips

$V_{tandem} = 48.76$ Kips

$V_{lane} = 23.99$ Kips

Calculations

Weight of the beam, $\omega_b := \omega_c \cdot \frac{A}{144} \cdot 1000$ $\quad \omega_b = 623.958 \ \frac{lb}{ft}$

Weight of the parapet $\omega_p := 2 \cdot A_p \cdot \frac{\omega_c}{144} \cdot 1000$ $\quad \omega_p = 843.75 \ \frac{lb}{ft}$

$\omega_{DCI} := \omega_b + \frac{\omega_p}{6} + \left(\frac{t_s}{12} \cdot S \cdot 150\right)$ $\quad \omega_{DCI} = 1.46 \times 10^3 \ \frac{lb}{ft}$

$\omega_{DWI} := S \cdot WS$ $\quad \omega_{DWI} = 185.417 \ \frac{lb}{ft}$

$\omega_{DCE} := \frac{t_{oh}}{12} \cdot \frac{L_{oh}}{12} \cdot 150 + \frac{t_s}{12} \cdot S \cdot \frac{1}{2} \cdot 150 + \omega_b + \frac{\omega_p}{6}$ $\quad \omega_{DCE} = 1.454 \times 10^3 \ \frac{lb}{ft}$

$\omega_{DWE} := \frac{(L_{oh} - b_p)}{12} \cdot WS + \frac{S}{2} \cdot WS$ $\quad \omega_{DWE} = 129.167 \ \frac{lb}{ft}$

$DC_I := \omega_{DCI} \cdot \frac{F_a}{1000}$ $\quad DC_I = 51.826$ Kips

$DW_I := \omega_{DWI} \cdot \frac{F_a}{1000}$ $\quad DW_I = 6.582$ Kips

$DC_E := \omega_{DCE} \cdot \frac{F_a}{1000}$ $\quad DC_E = 51.632$ Kips

$DW_E := \omega_{DWE} \cdot \frac{F_a}{1000}$ $\quad DW_E = 4.585$ Kips

$LL_I := S_k \cdot mg_I \cdot \left(1.33 \cdot \max\left(V_{truck2}, V_{tandem}\right) + V_{lane}\right)$ $\quad LL_I = 85.507$ Kips

$LL_E := S_k \cdot mg_E \cdot \left(1.33 \cdot \max\left(V_{truck2}, V_{tandem}\right) + V_{lane}\right)$ $\quad LL_E = 69.339$ Kips

$V_{uI} := 1.25 \cdot DC_I + 1.50 \cdot DW_I + 1.75 \cdot LL_I$ (LRFD Table 3.4.1-1 and 3.4.1-2)

$V_{uI} = 224.293$ Kips

$V_{uE} := 1.25 \cdot DC_E + 1.50 \cdot DW_E + 1.75 \cdot LL_E$ $\quad V_{uE} = 192.761$ Kips

$V_{u.} := \max\left(V_{uE}, V_{uI}\right)$

$V_{u.} = 224.293$ Kips

APPENDIX O – MODELING PARAMETERS FOR SECOND SIX BRIDGES

Finite Element Model Descriptions

Structure No.	Model execution time(min:sec)	Number of frame elements	Number of shell elements	Number of solid elements	File size (MB)	Number of spring elements
003-0001	9m33s	42	5684	7721	17.7	_
003-0004	1h25m21s	632	18900	13536	39.6	_
003-0006	29m34s	114	10149	11782	28.4	_
060-0028	26m6s	114	9660	16632	34.7	_
006-0056	33m13s	136	12484	20244	43.8	-
006-0319	15m13s	156	_	16242	23.9	30

Shear Equation Constants for Different Bridges

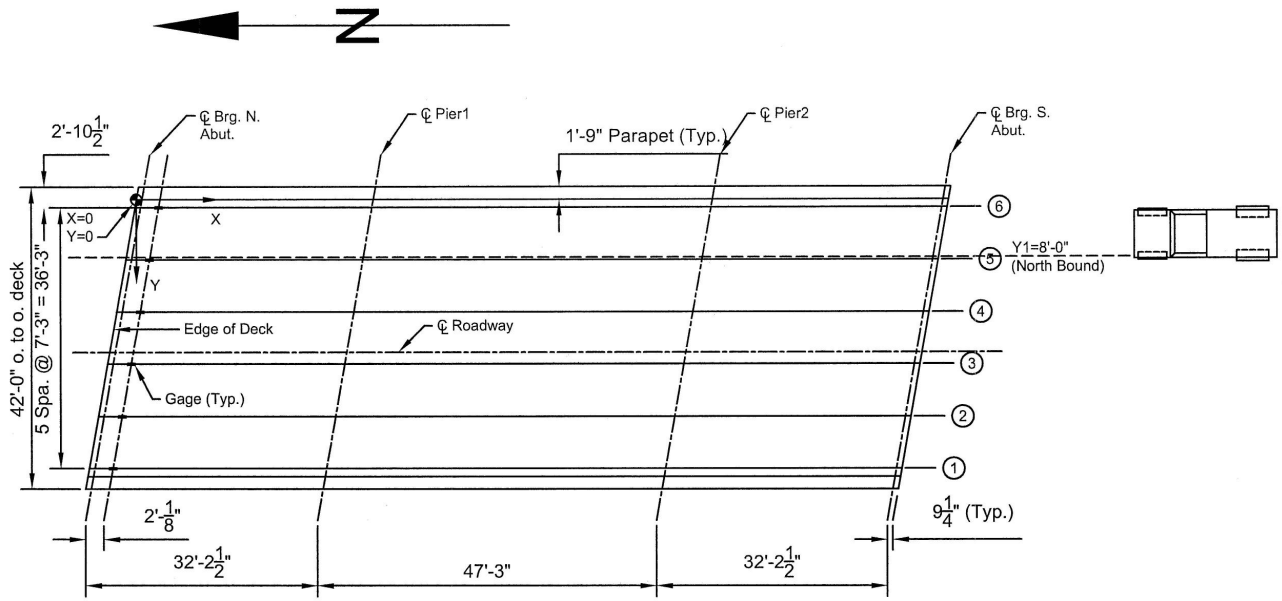
Structure No.	Beam Depth	Web thickness	Flange thickness	Gage spacing	Distance Y	K1,K3	K2
003-0001	24.7	0.47	0.77	8.00	4.35	9.8107	5.0786
003-0004	64	0.4375	0.75	25.00	7	17.4763	29.0475
003-0006	33.09	0.58	0.855	11.00	5.545	12.4765	8.1369
060-0028	26.71	0.46	0.64	9.00	4.355	9.80224	7.1055
060-0056	33.3/30.44	.605/.655	.960/1.065	11.0/10.0	5.65/5.22	12.7156/11.7523(nb)	7.8688/6.9354(nb)
060-0319	54	6	N/A	12.00	15	18.99,22.90	20.09

Note:
x/y=old beams/new beam
nb=new beam
Y= dist. from bottom of the flange to the lowest gage
For 060-0319 use G=11500 (concrete bridge)

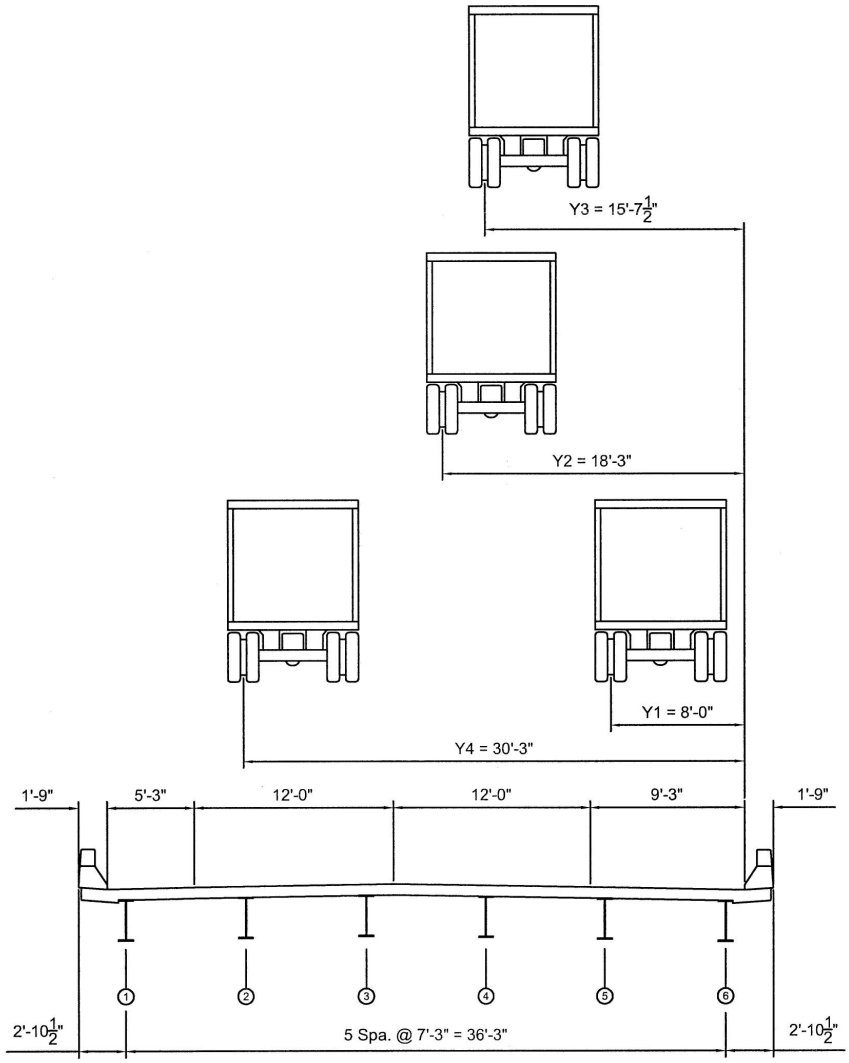
APPENDIX P – TEST TRUCK LOAD PLANS

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	12/15/2004, 1/26/05(dynamic), 1/27/05(Static)
Bridge No.	059-0041
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 18' - 3" = Truck at center of driving lane. Y3 = 15' - 7.5" = Driver-side wheels directly above Girder 4. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 13' - 6"; Y1X2 = 9' - 6"; Y1X3 = 5' - 6"; Y1X4 = -6' - 6" At Y2: Y2X1 = 12' - 3"; Y2X2 = 8' - 3"; Y2X3 = 4' - 3"; Y2X4 = -7' - 9" At Y3: Y3X1 = 12' - 3"; Y3X2 = 8' - 3"; Y3X3 = 4' - 3"; Y3X4 = -7' - 9"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



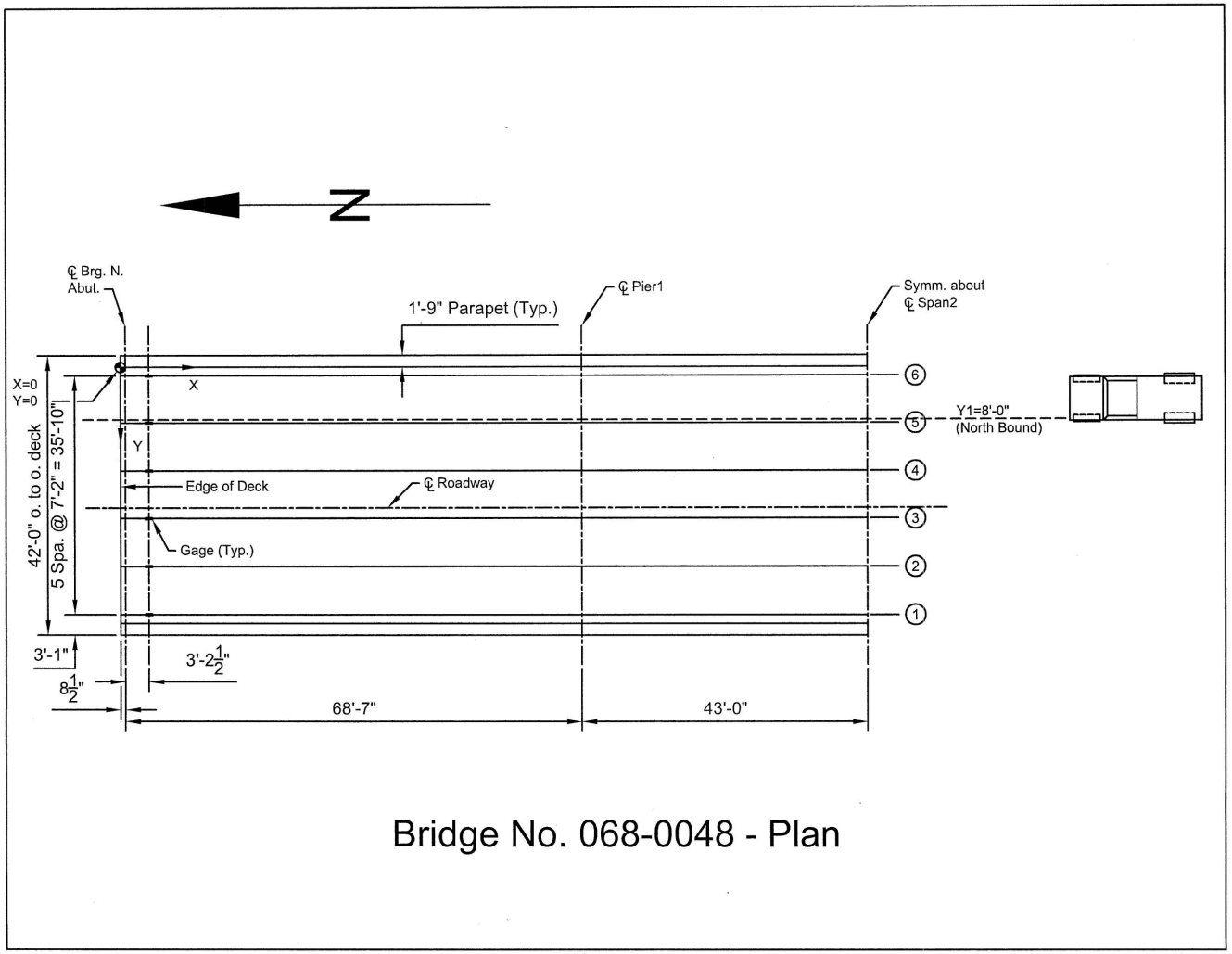
Bridge No. 059-0041 - Plan



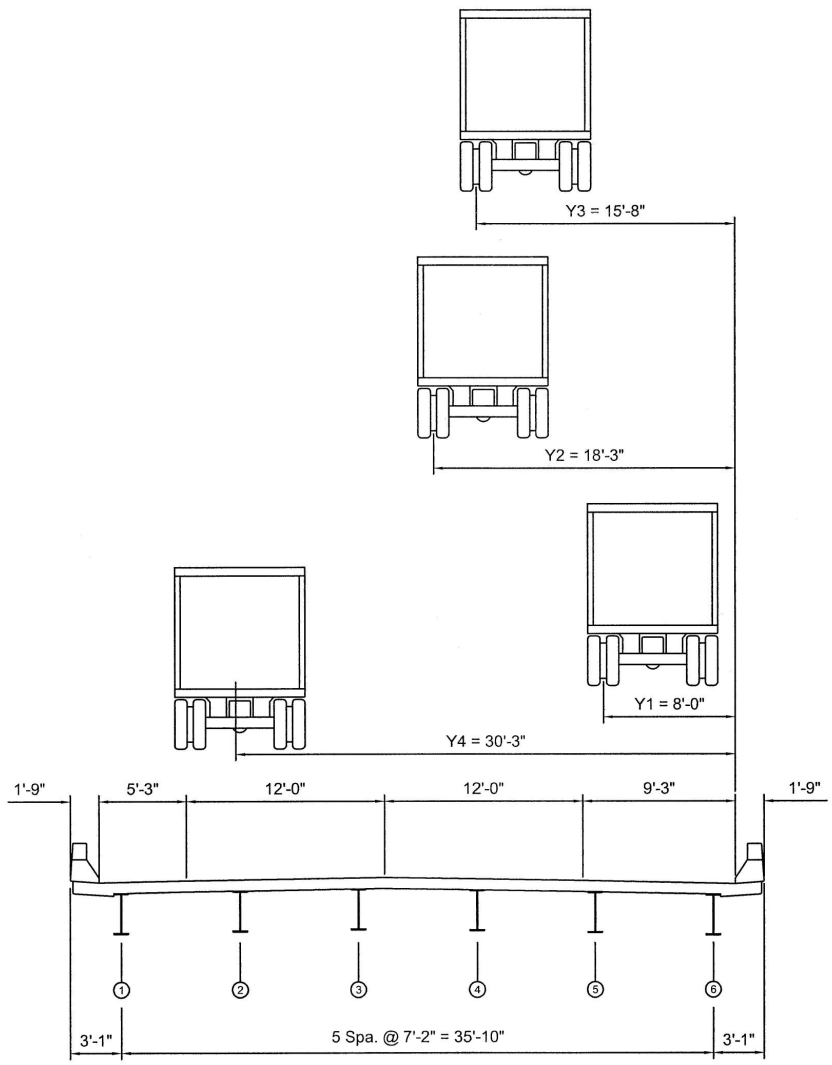
Bridge No. 059-0041 - Cross Section
(Looking North)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	2/3/2005
Bridge No.	068-0048
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 15' - 8" = Driver-side wheels directly above Girder 4. Y3 = 18' - 3" = Truck at center of driving lane. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 39' - 0" YnX2 = 29' - 0" YnX3 = 19' - 0" n = 1,2,3 YnX4 = 9' - 0" YnX5 = -3' - 0"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



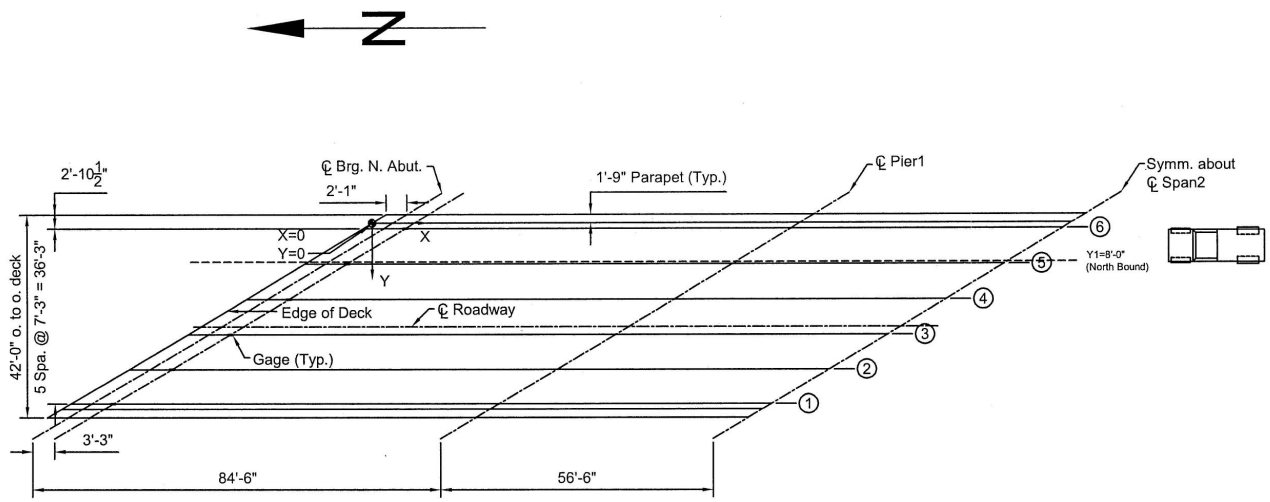
Bridge No. 068-0048 - Plan



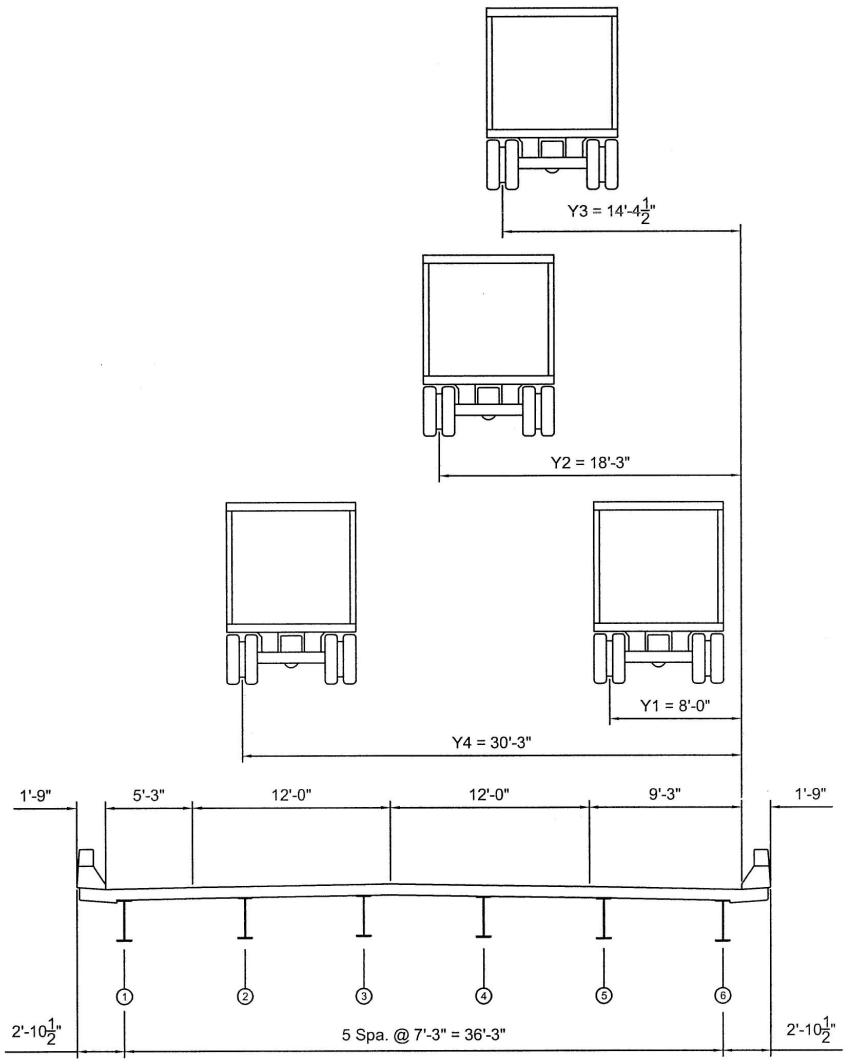
Bridge No. 068-0048 - Cross Section
(Looking North)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	1/27/2004
Bridge No.	068-0046
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 14' - 4.5" = Passenger-side wheels directly above Girder 5. Y3 = 18' - 3" = Truck at center of driving lane. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 40' - 6"; Y1X2 = 30' - 6"; Y1X3 = 20' - 6"; Y1X4 = 10' - 6"; Y1X5 = 0' - 6" At Y2: Y2X1 = 29' - 6"; Y2X2 = 19' - 6"; Y2X3 = 9' - 6"; Y2X4 = -0' - 6"; Y2X5 = -12' - 6" At Y3: Y3X1 = 17' - 0"; Y3X2 = 7' - 0"; Y3X3 = -3' - 0"; Y3X4 = -13' - 0"; Y3X5 = -25' - 0"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



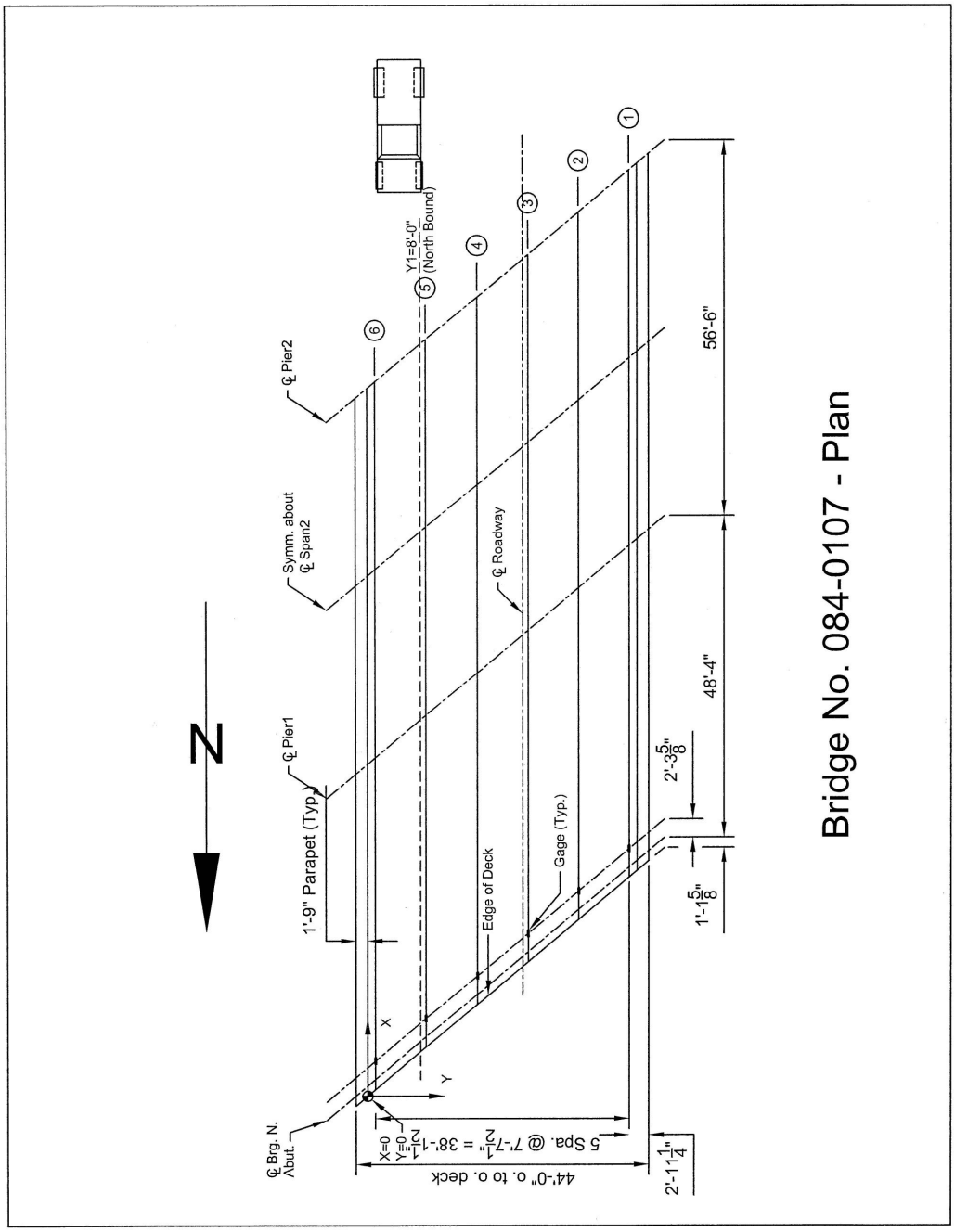
Bridge No. 068-0046 - Plan



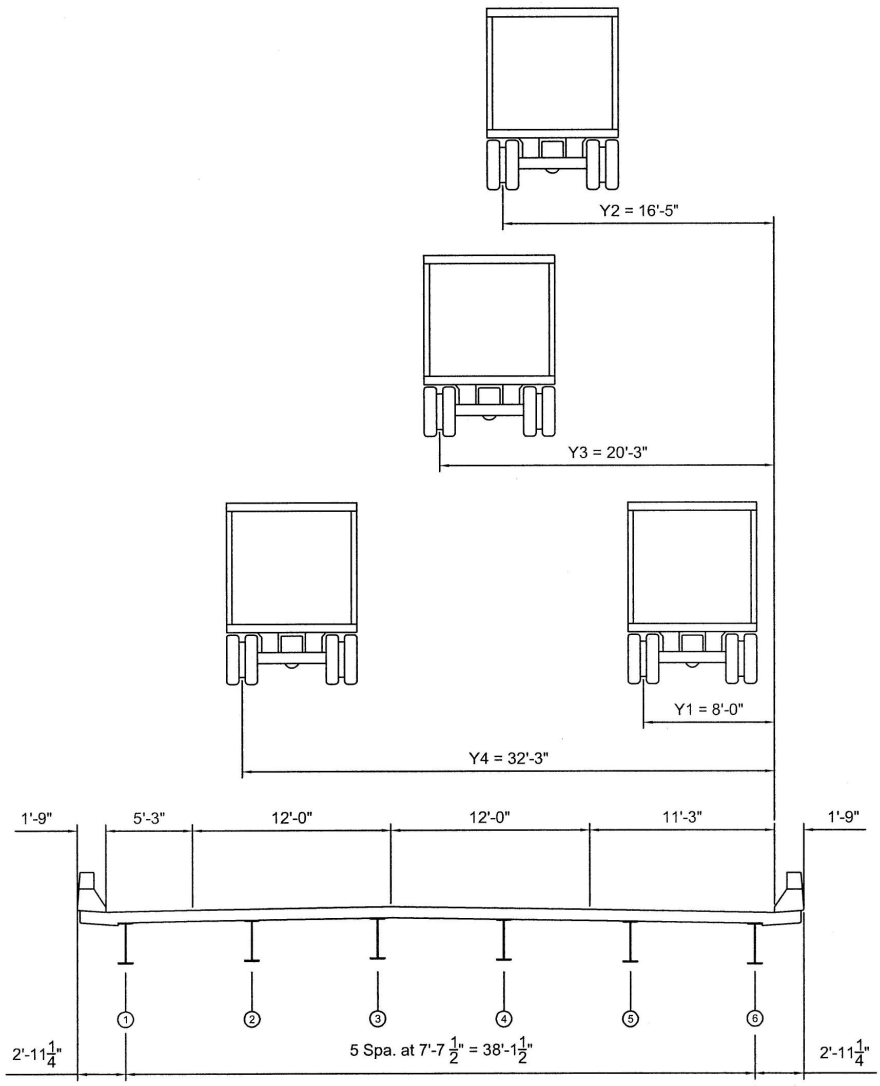
Bridge No. 068-0046 - Cross Section
(Looking North)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	2/10/2004
Bridge No.	084-0107
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 16' - 5.25" = Driver-side wheels directly above Girder 4. Y3 = 20' - 3" = Truck at center of driving lane. Y4 = 32' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 24' - 0"; Y1X2 = 19' - 0"; Y1X3 = 14' - 0"; Y1X4 = 8' - 6"; Y1X5 = -3' - 0" At Y2: Y2X1 = 37' - 0"; Y2X2 = 32' - 0"; Y2X3 = 27' - 0"; Y2X4 = 22' - 0"; Y2X5 = 10' - 3" At Y3: Y3X1 = 36' - 0"; Y3X2 = 31' - 0"; Y3X3 = 26' - 0"; Y3X4 = 21' - 0"; Y3X5 = 9' - 0"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



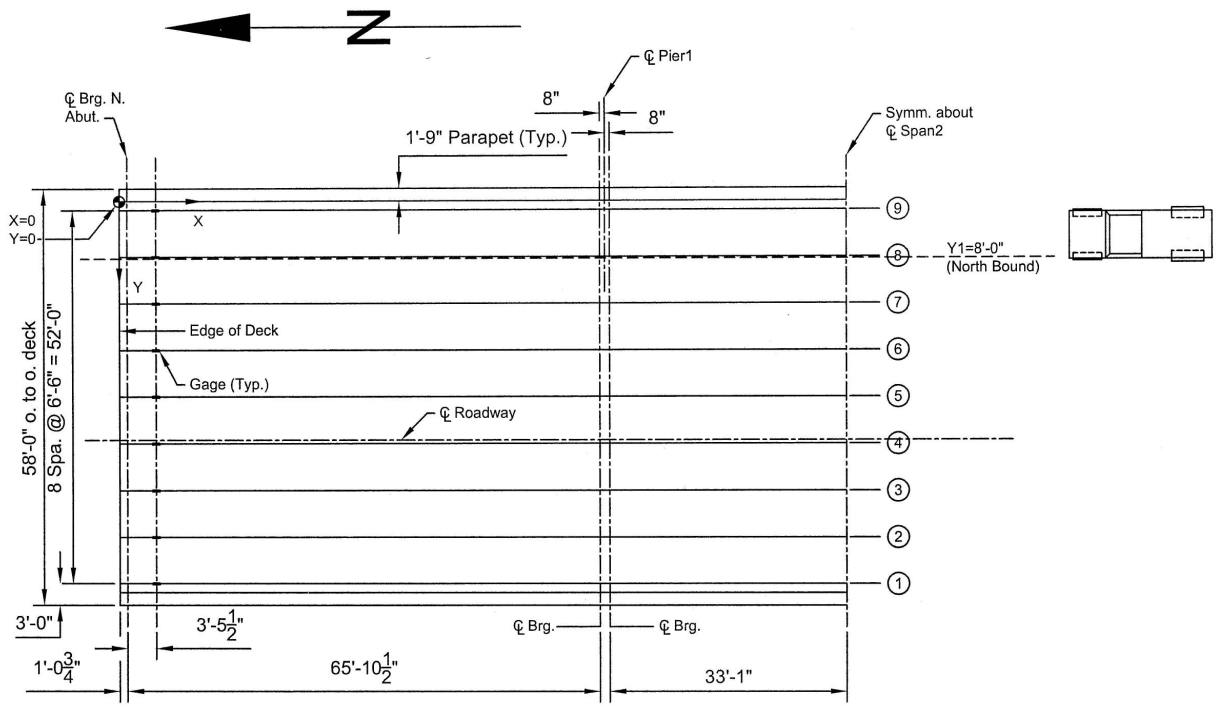
Bridge No. 084-0107 - Plan



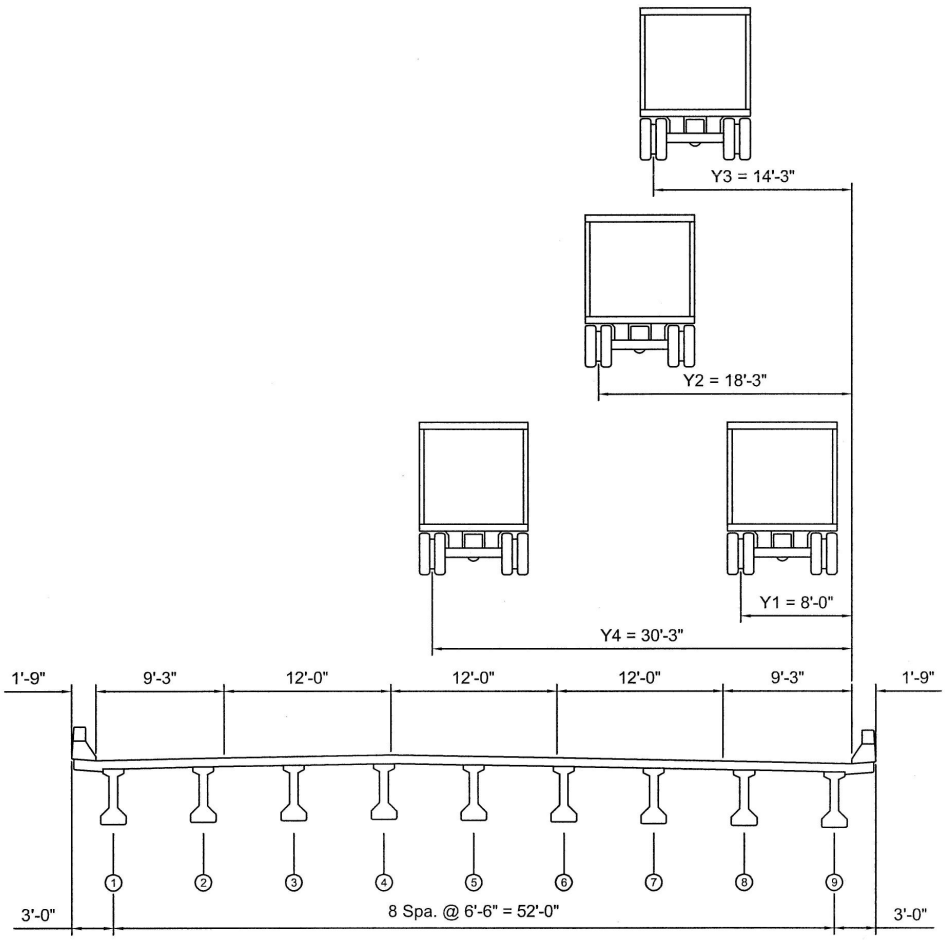
Bridge No. 084-0107 - Cross Section
(Looking North)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	2/17/2004
Bridge No.	054-0043
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 14' - 3" = Driver-side wheels directly above Girder 7. Y3 = 18' - 3" = Truck at center of driving lane. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 40' - 0" YnX2 = 30' - 0" YnX3 = 20' - 0" n = 1,2,3 YnX4 = 10' - 0" YnX5 = -2' - 6"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



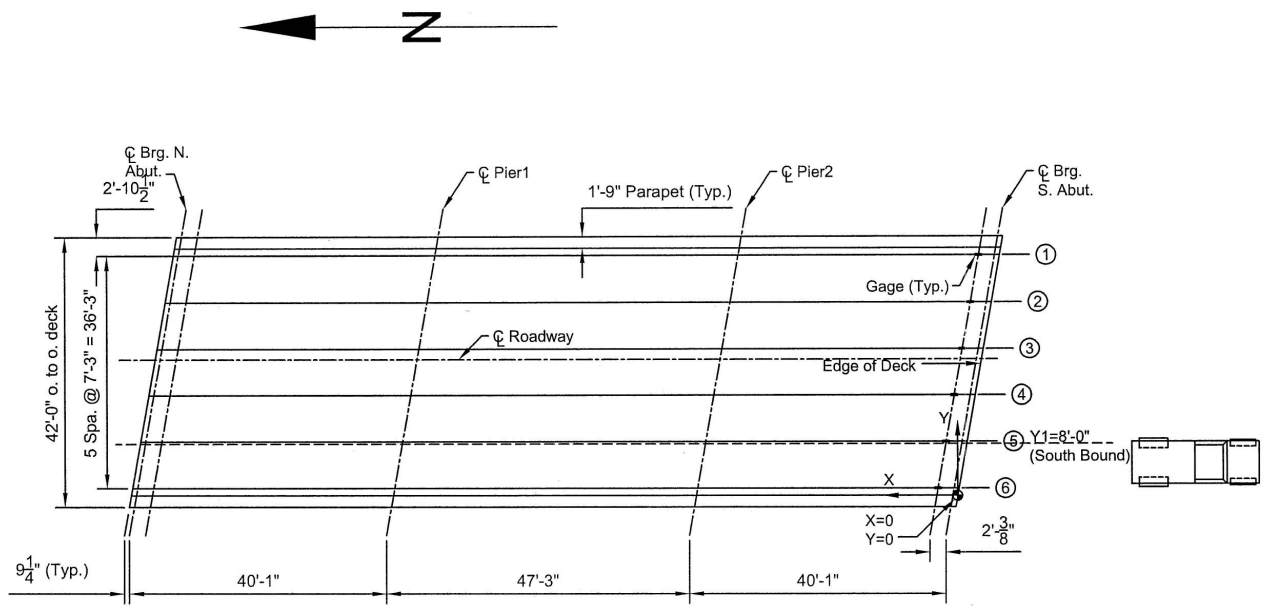
Bridge No. 054-0043 - Plan



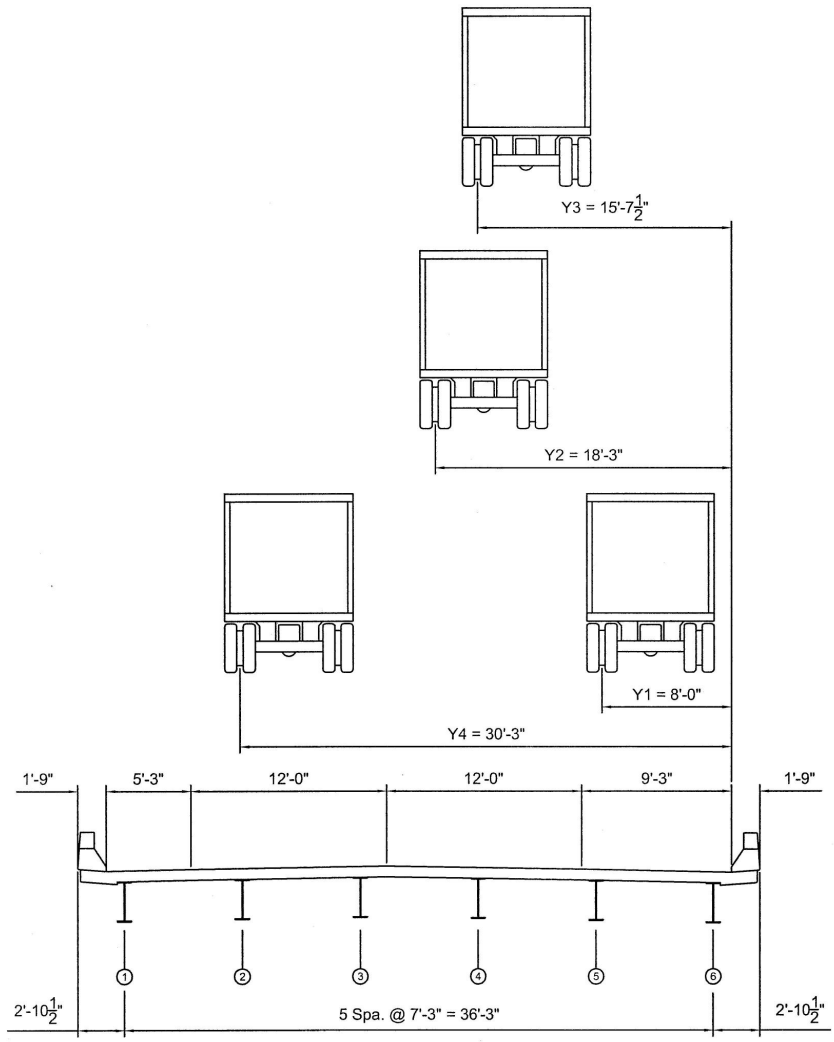
Bridge No. 054-0043 - Cross Section
(Looking North)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	1/26/2005
Bridge No.	059-0040
Structural Reference Point	X=0, Y=0 at intersection of South Edge of Deck and West Face of Parapet.
Test Truck Direction	Southbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from West Face of Parapet. Y2 = 18' - 3" = Truck at center of driving lane. Y3 = 15' - 7.5" = Driver-side wheels directly above Girder 4. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 13' - 6"; Y1X2 = 9' - 6"; Y1X3 = 5' - 6"; Y1X4 = -6' - 6" At Y2: Y2X1 = 12' - 3"; Y2X2 = 8' - 3"; Y2X3 = 4' - 3"; Y2X4 = -7' - 9" At Y3: Y3X1 = 12' - 3"; Y3X2 = 8' - 3"; Y3X3 = 4' - 3"; Y3X4 = -7' - 9"
Dynamic Test	Truck travelling Southbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



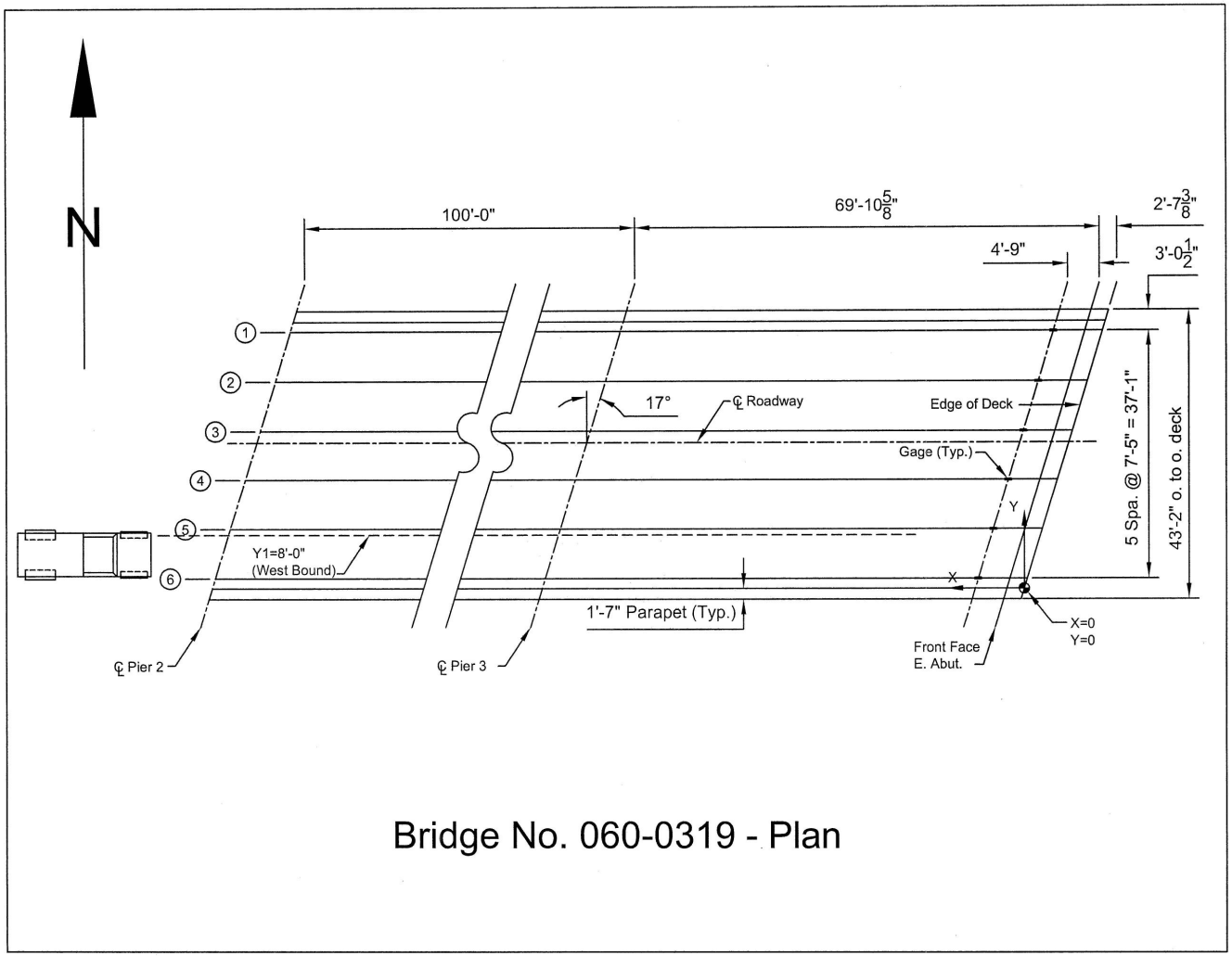
Bridge No. 059-0040 - Plan



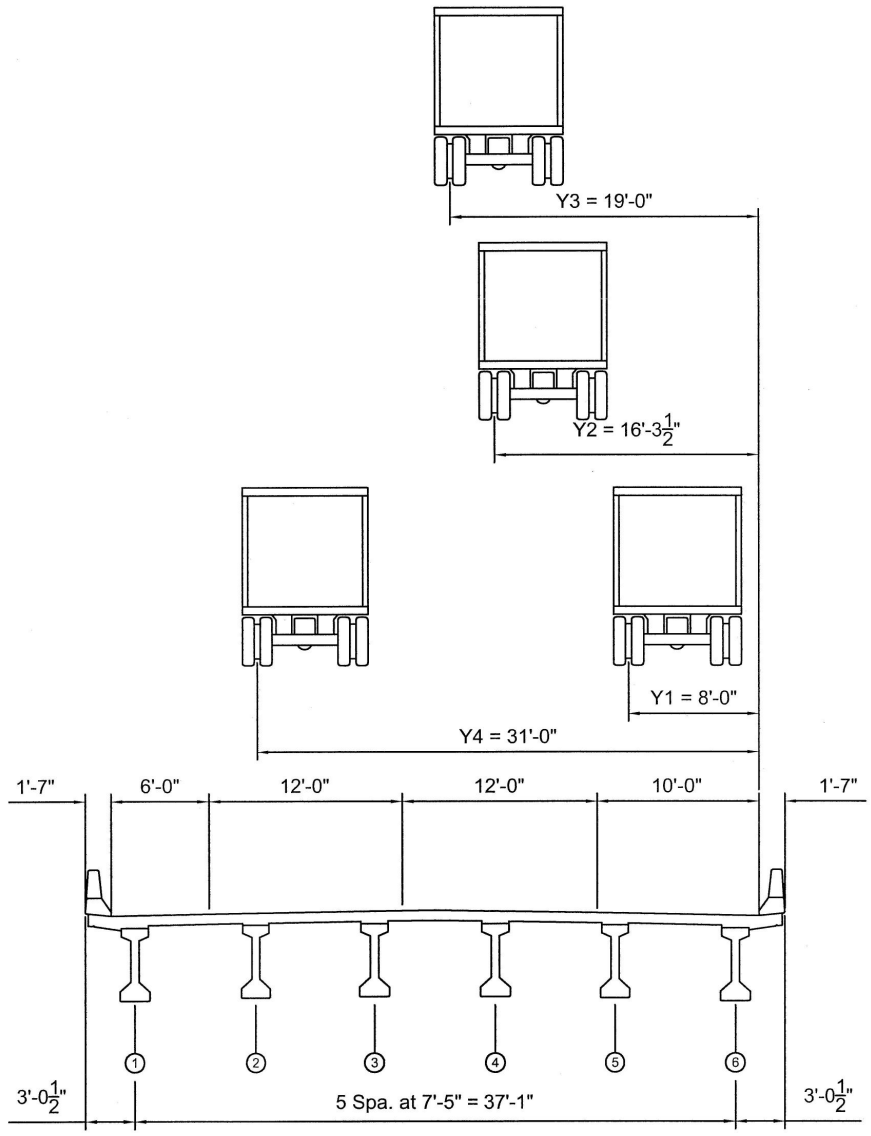
Bridge No. 059-0040 - Cross Section
(Looking South)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	12/7/2005
Bridge No.	060-0319
Structural Reference Point	X=0, Y=0 at intersection of East Edge of Deck and South Face of Parapet.
Test Truck Direction	Eastbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from South Face of Parapet. Y2 = 16' - 3.5" = Driver-side wheels directly above Girder 4. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 29' - 6"; Y1X2 = 19' - 6"; Y1X3 = 14' - 6"; Y1X4 = 9' - 6"; Y1X5 = -4' - 6" At Y2: Y2X1 = 27' - 0"; Y2X2 = 17' - 0"; Y2X3 = 12' - 0"; Y2X4 = 7' - 0"; Y2X5 = -7' - 0" At Y3: Y3X1 = 26' - 0"; Y3X2 = 16' - 0"; Y3X3 = 11' - 0"; Y3X4 = 6' - 0"; Y3X5 = -8' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2, Y3 and Y4 at 5 mph.
Dynamic Test	Truck travelling Eastbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2, Y3 and Y4) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



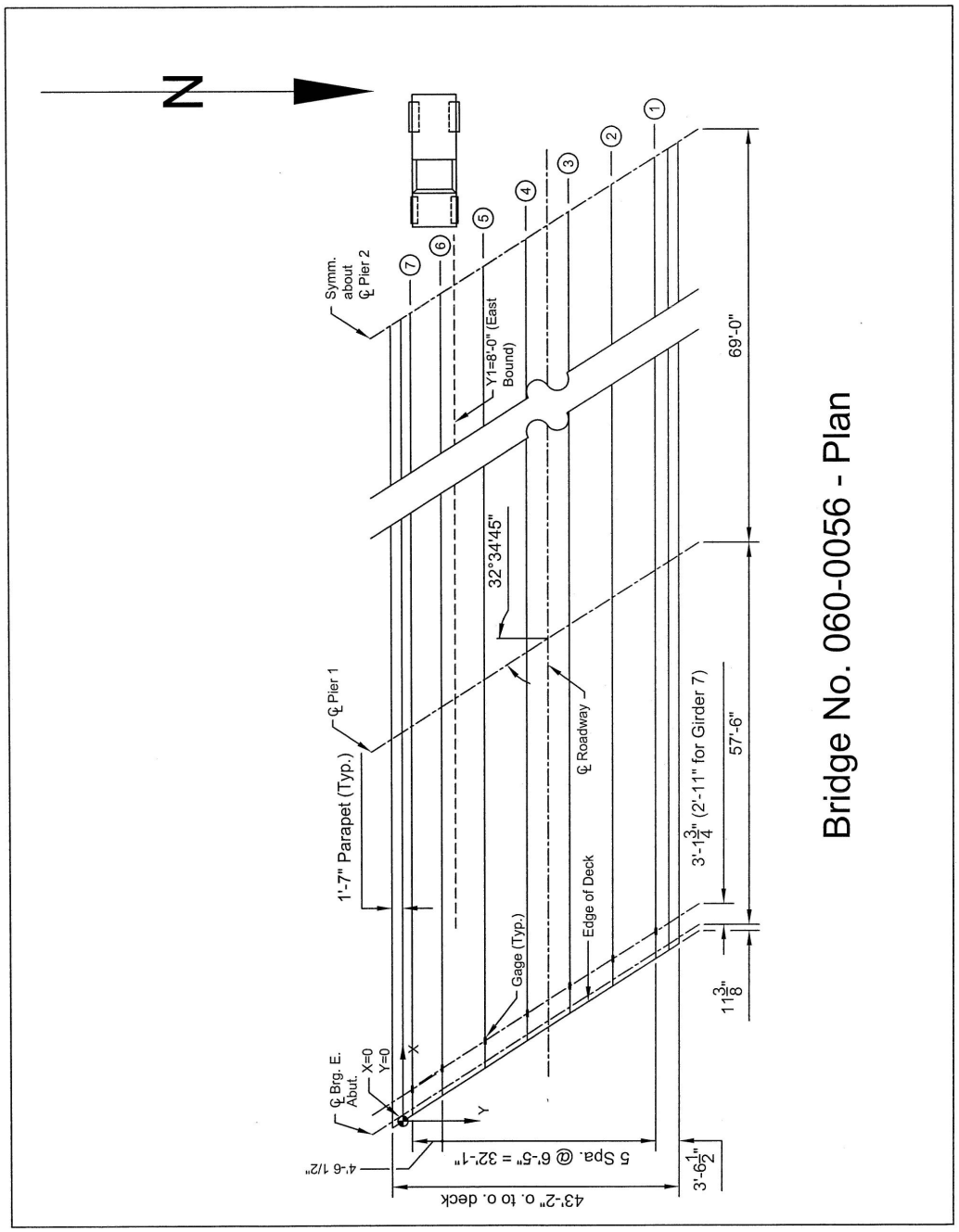
Bridge No. 060-0319 - Plan



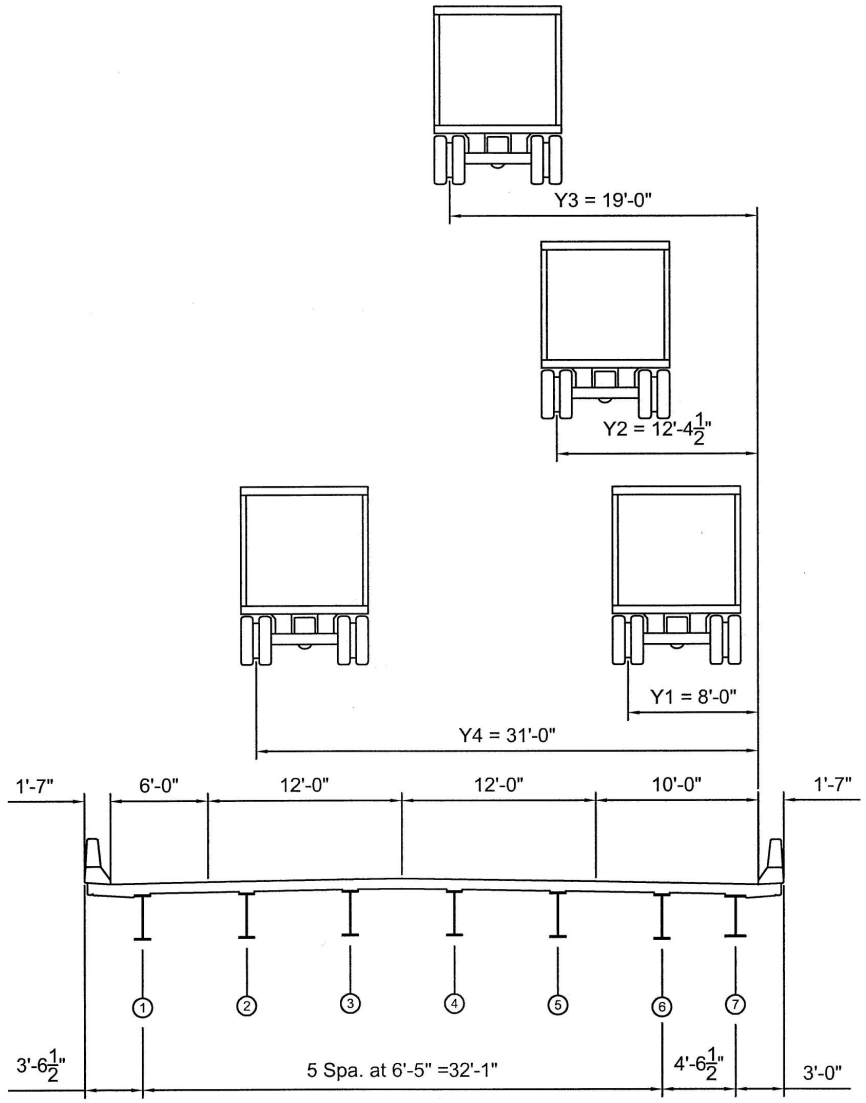
Bridge No. 060-0319 - Cross Section
(Looking East)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	11/9/2005
Bridge No.	060-0056
Structural Reference Point	X=0, Y=0 at intersection of East Edge of Deck and South Face of Parapet.
Test Truck Direction	Eastbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from South Face of Parapet. Y2 = 12' - 4.5" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 32' - 6"; Y1X2 = 22' - 6"; Y1X3 = 17' - 6"; Y1X4 = 12' - 6"; Y1X5 = 0' - 3" At Y2: Y2X1 = 35' - 3"; Y2X2 = 25' - 3"; Y2X3 = 20' - 3"; Y2X4 = 15' - 3"; Y2X5 = 3' - 0" At Y3: Y3X1 = 39' - 6"; Y3X2 = 29' - 6"; Y3X3 = 24' - 6"; Y3X4 = 19' - 6"; Y3X5 = 7' - 3"
Slow Moving Test	Truck travelling Eastbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Eastbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



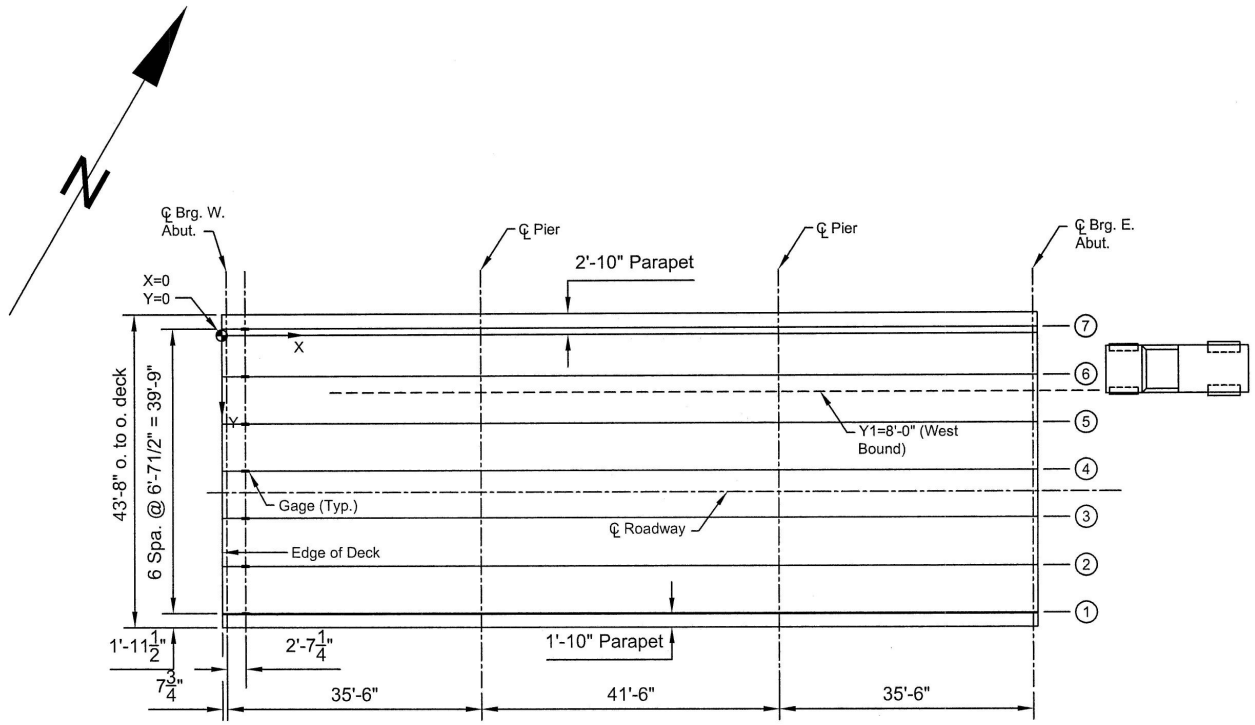
Bridge No. 060-0056 - Plan



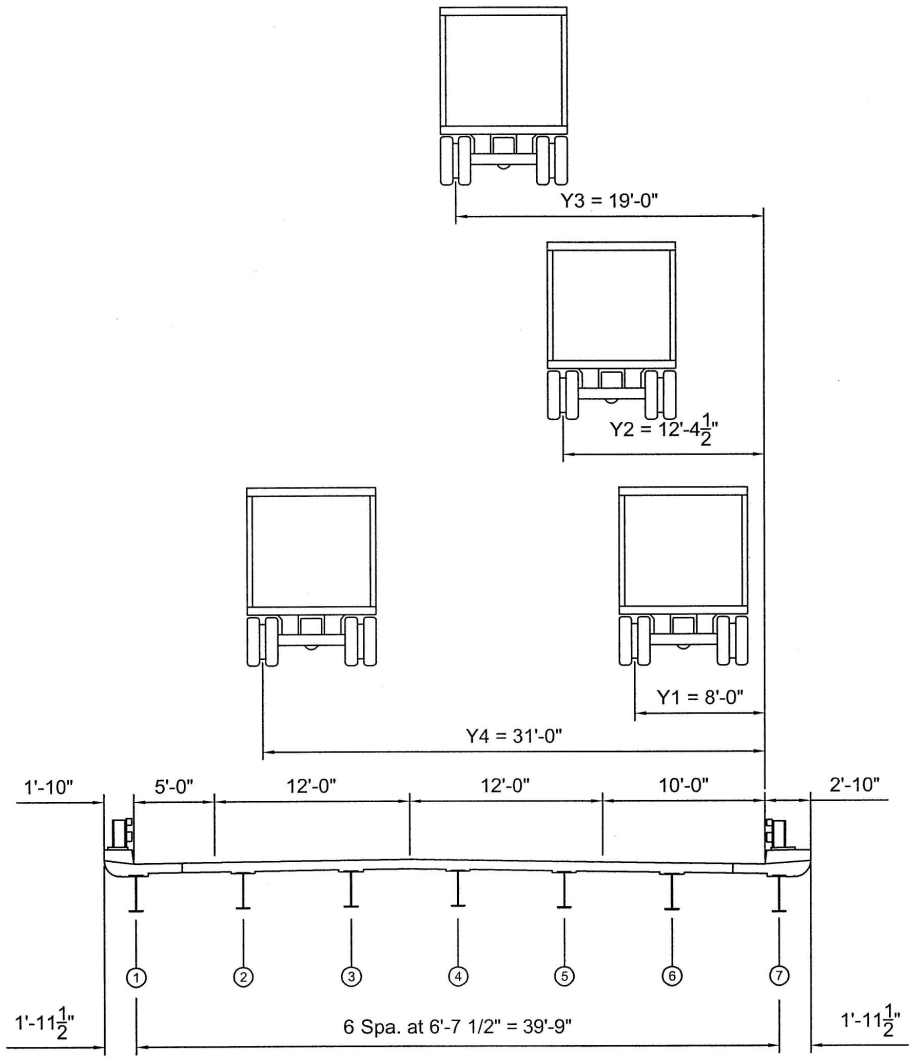
Bridge No. 060-0056 Cross Section
(Looking East)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	11/10/2005
Bridge No.	060-0028
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 12' - 4.5" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 20' - 6" YnX2 = 13' - 6" YnX3 = 6' - 6" n = 1,2,3 YnX4 = -7' - 6"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



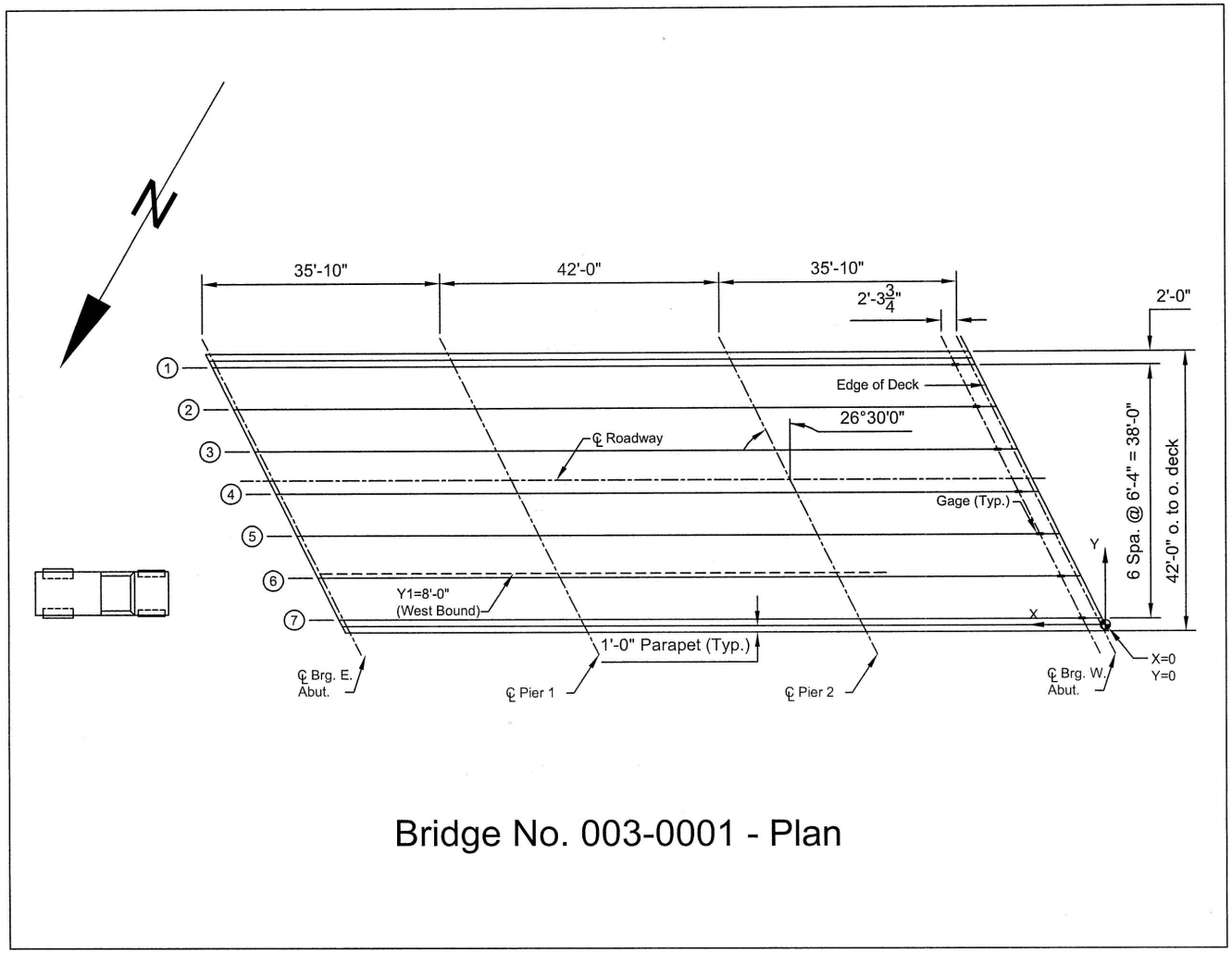
Bridge No. 060-0028 - Plan



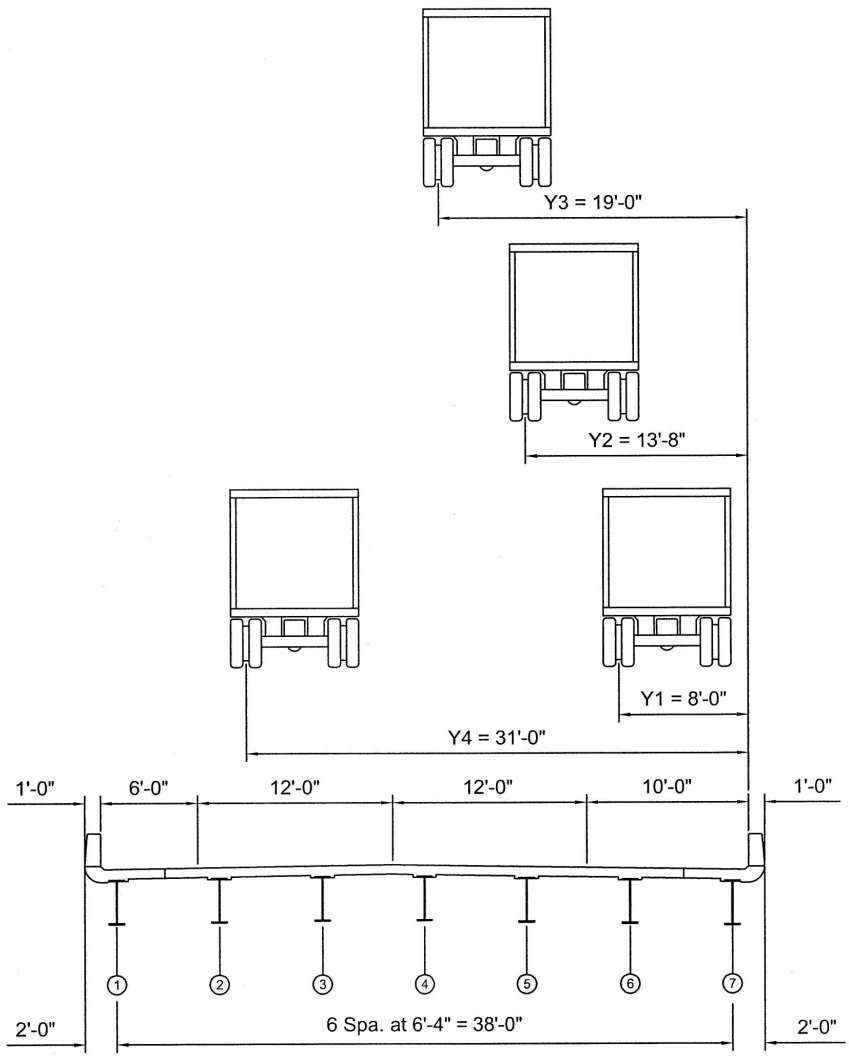
Bridge No. 060-0028 Cross Section
(Looking West)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	11/30/2005
Bridge No.	003-0001
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 8" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 21' - 0"; Y1X2 = 16' - 0"; Y1X3 = 11' - 0"; Y1X4 = -2' - 0" At Y2: Y2X1 = 24' - 0"; Y2X2 = 19' - 0"; Y2X3 = 14' - 0"; Y2X4 = 1' - 0" At Y3: Y3X1 = 27' - 0"; Y3X2 = 22' - 0"; Y3X3 = 17' - 0"; Y3X4 = 4' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2, Y3 and Y4 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2, Y3 and Y4) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



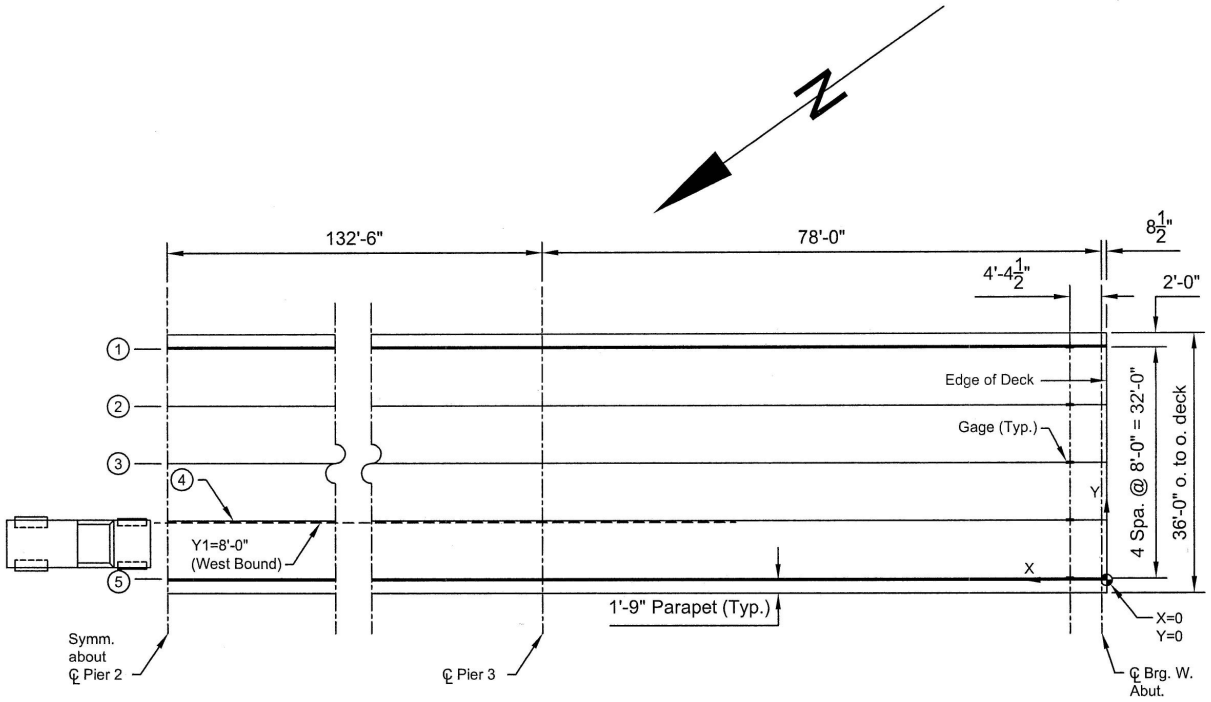
Bridge No. 003-0001 - Plan



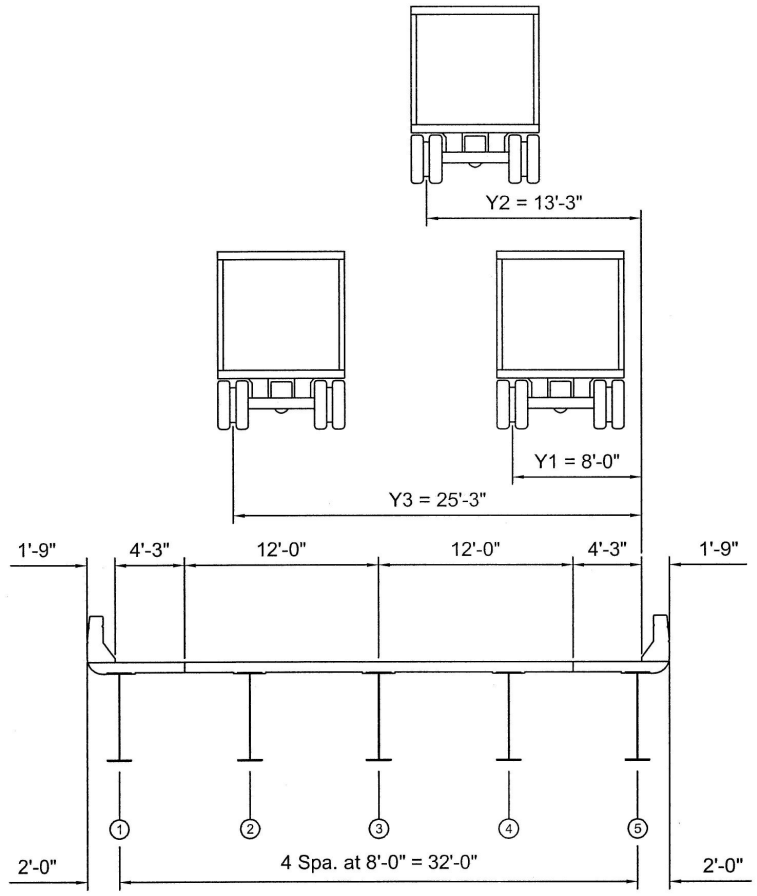
Bridge No. 003-0001 - Cross Section
(Looking West)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	11/17/2005
Bridge No.	003-0004
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	3 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 3" = Truck at center of driving lane. Y3 = 25' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1 and Y2</u> YnX1 = 28' - 0" YnX2 = 18' - 0" YnX3 = 11' - 0" n = 1,2 YnX4 = 8' - 0" YnX5 = -4' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2and Y3 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1 and Y2) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2 and Y3) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



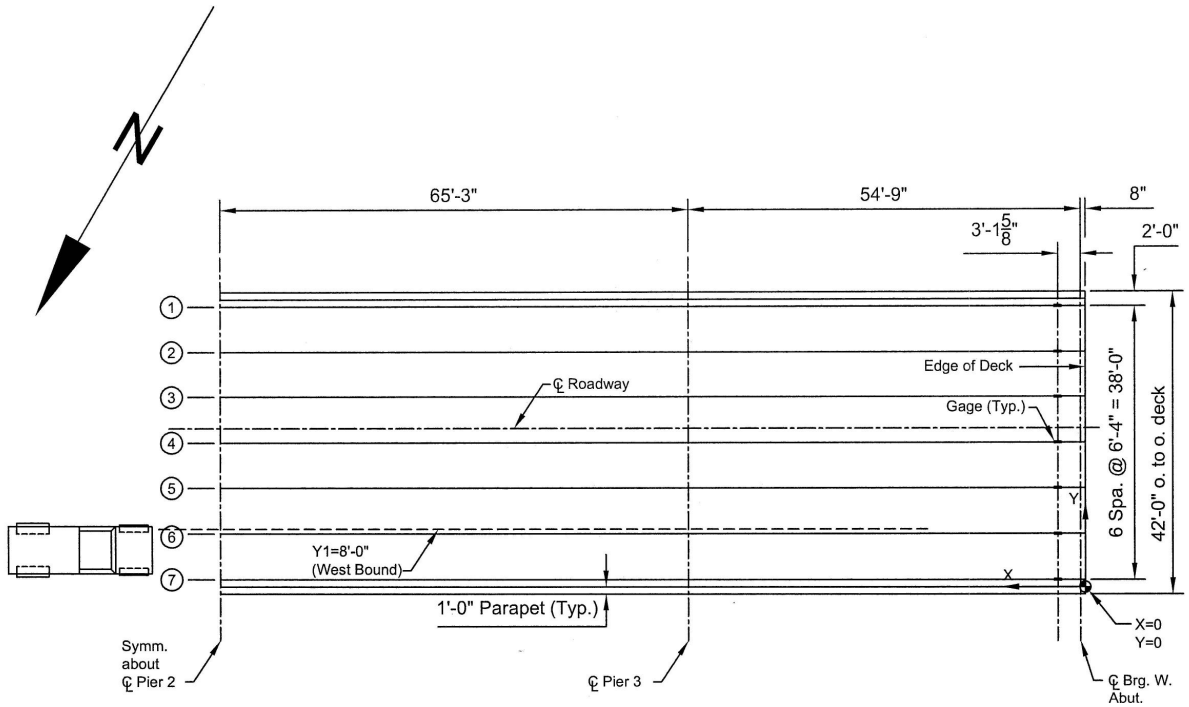
Bridge No. 003-0004 - Plan



Bridge No. 003-0004 - Cross Section
(Looking West)

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

Date	11/16/2005
Bridge No.	003-0006
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 8" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position) Slow Moving Test	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 27' - 6" YnX2 = 17' - 6" YnX3 = 12' - 6" n = 1,2,3 YnX4 = 7' - 6" YnX5 = -5' - 6" Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



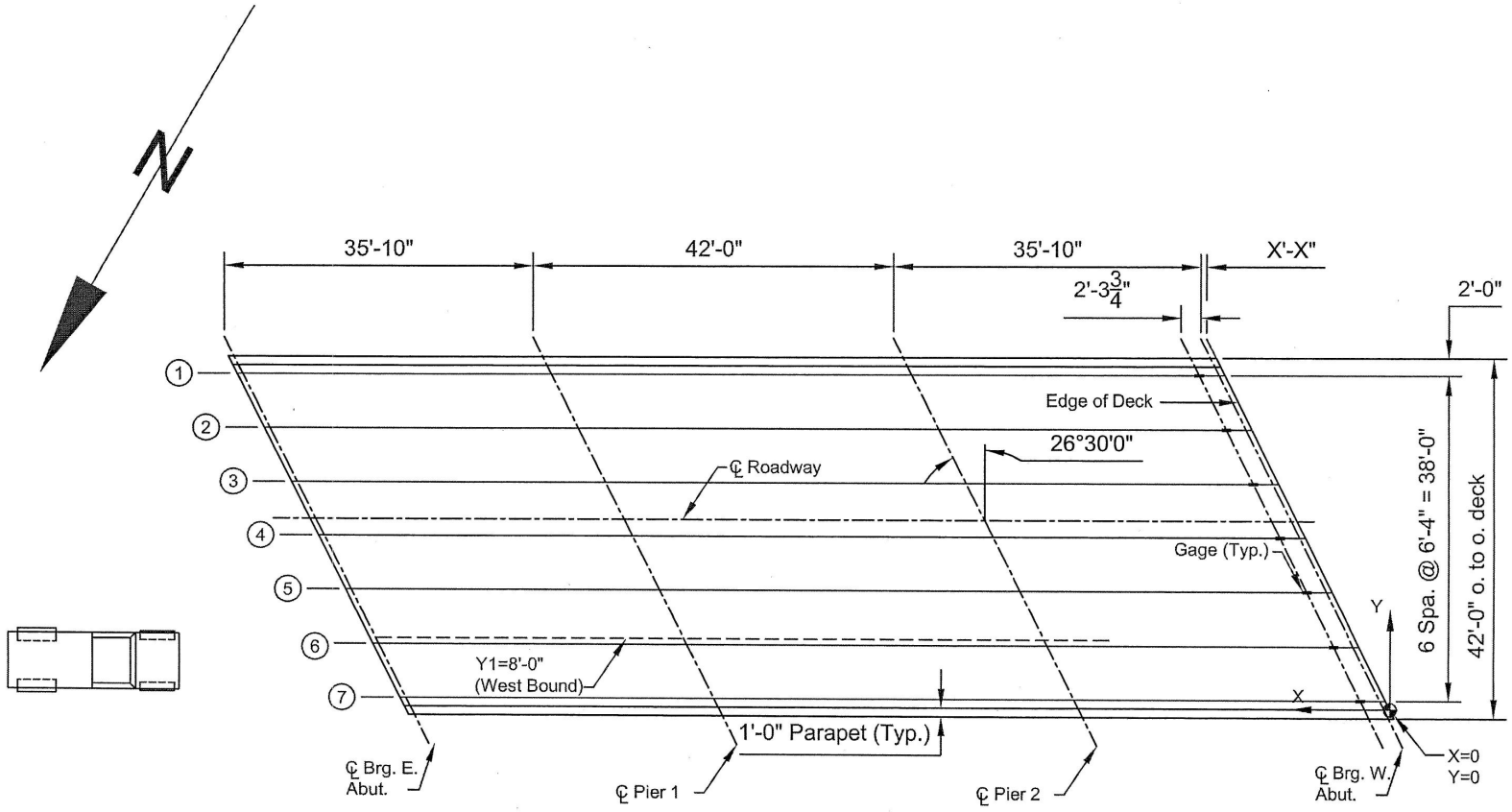
Bridge No. 003-0006 - Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

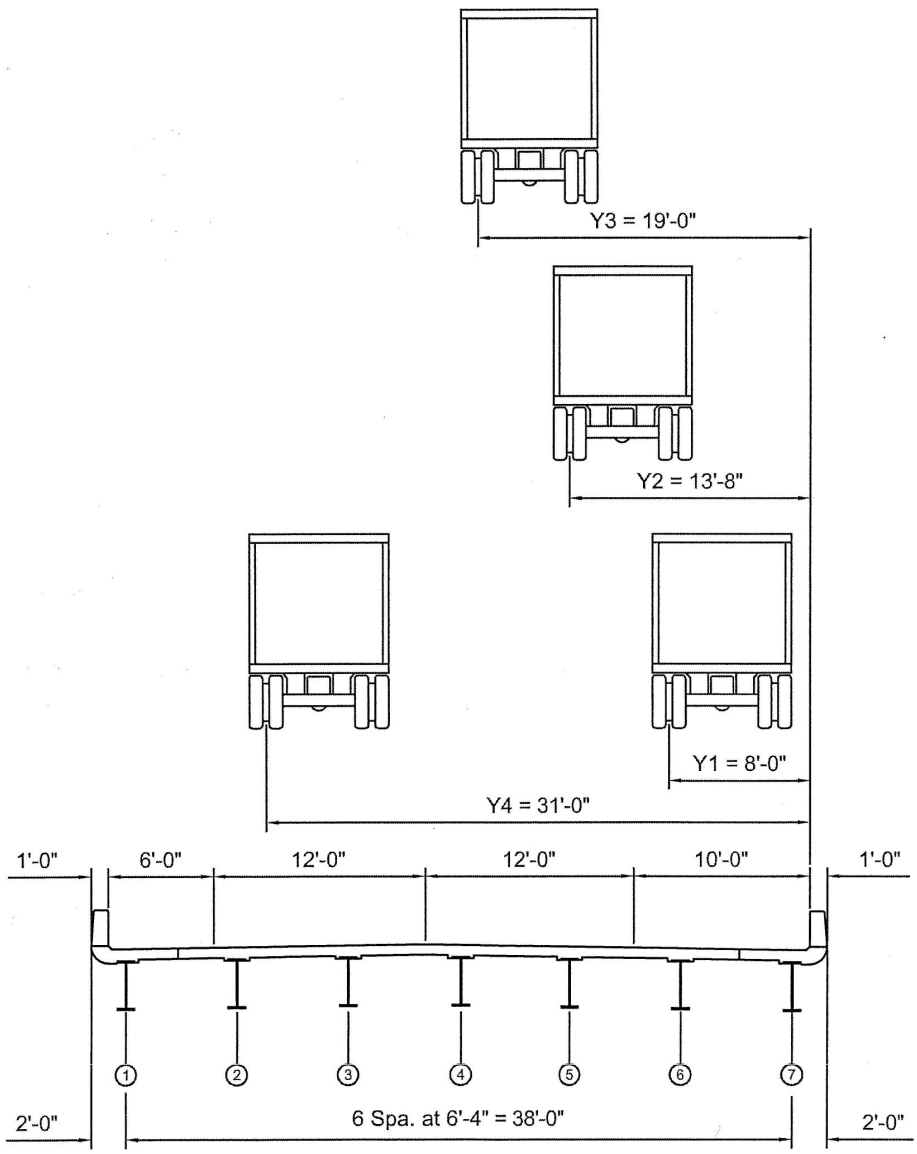
Date	12/15/2004, 1/26/05(dynamic), 1/27/05(Static)
Bridge No.	059-0041
Structural Reference Point	X=0, Y=0 at intersection of North Edge of Deck and East Face of Parapet.
Test Truck Direction	Northbound for Static Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from East Face of Parapet. Y2 = 18' - 3" = Truck at center of driving lane. Y3 = 15' - 7.5" = Driver-side wheels directly above Girder 4. Y4 = 30' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 13' - 6"; Y1X2 = 9' - 6"; Y1X3 = 5' - 6"; Y1X4 = -6' - 6" At Y2: Y2X1 = 12' - 3"; Y2X2 = 8' - 3"; Y2X3 = 4' - 3"; Y2X4 = -7' - 9" At Y3: Y3X1 = 12' - 3"; Y3X2 = 8' - 3"; Y3X3 = 4' - 3"; Y3X4 = -7' - 9"
Dynamic Test	Truck travelling Northbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

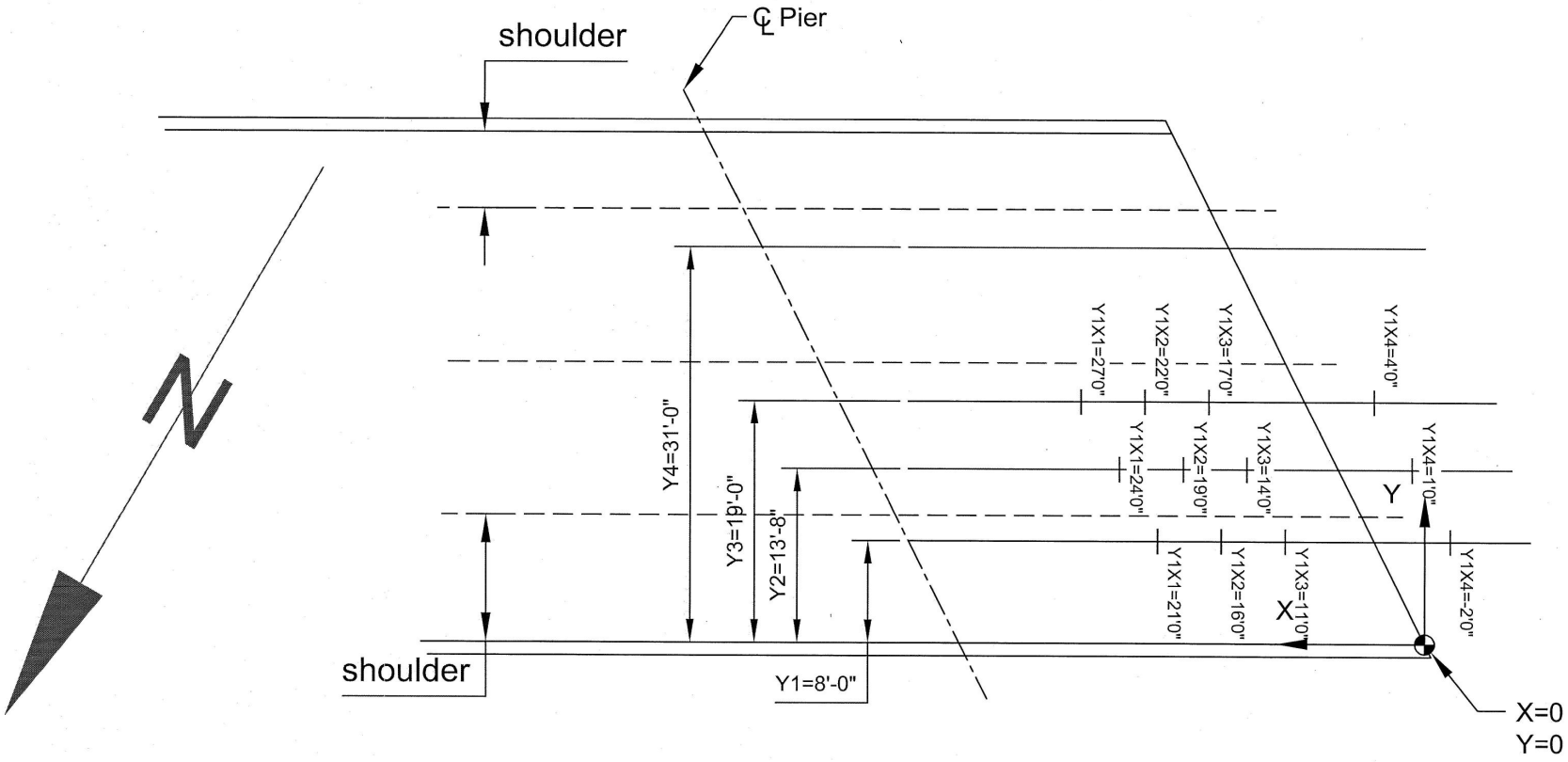
Date	11/30/2005
Bridge No.	003-0001
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 8" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 21' - 0"; Y1X2 = 16' - 0"; Y1X3 = 11' - 0"; Y1X4 = -2' - 0" At Y2: Y2X1 = 24' - 0"; Y2X2 = 19' - 0"; Y2X3 = 14' - 0"; Y2X4 = 1' - 0" At Y3: Y3X1 = 27' - 0"; Y3X2 = 22' - 0"; Y3X3 = 17' - 0"; Y3X4 = 4' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2, Y3 and Y4 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2, Y3 and Y4) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 003-0001 - Plan



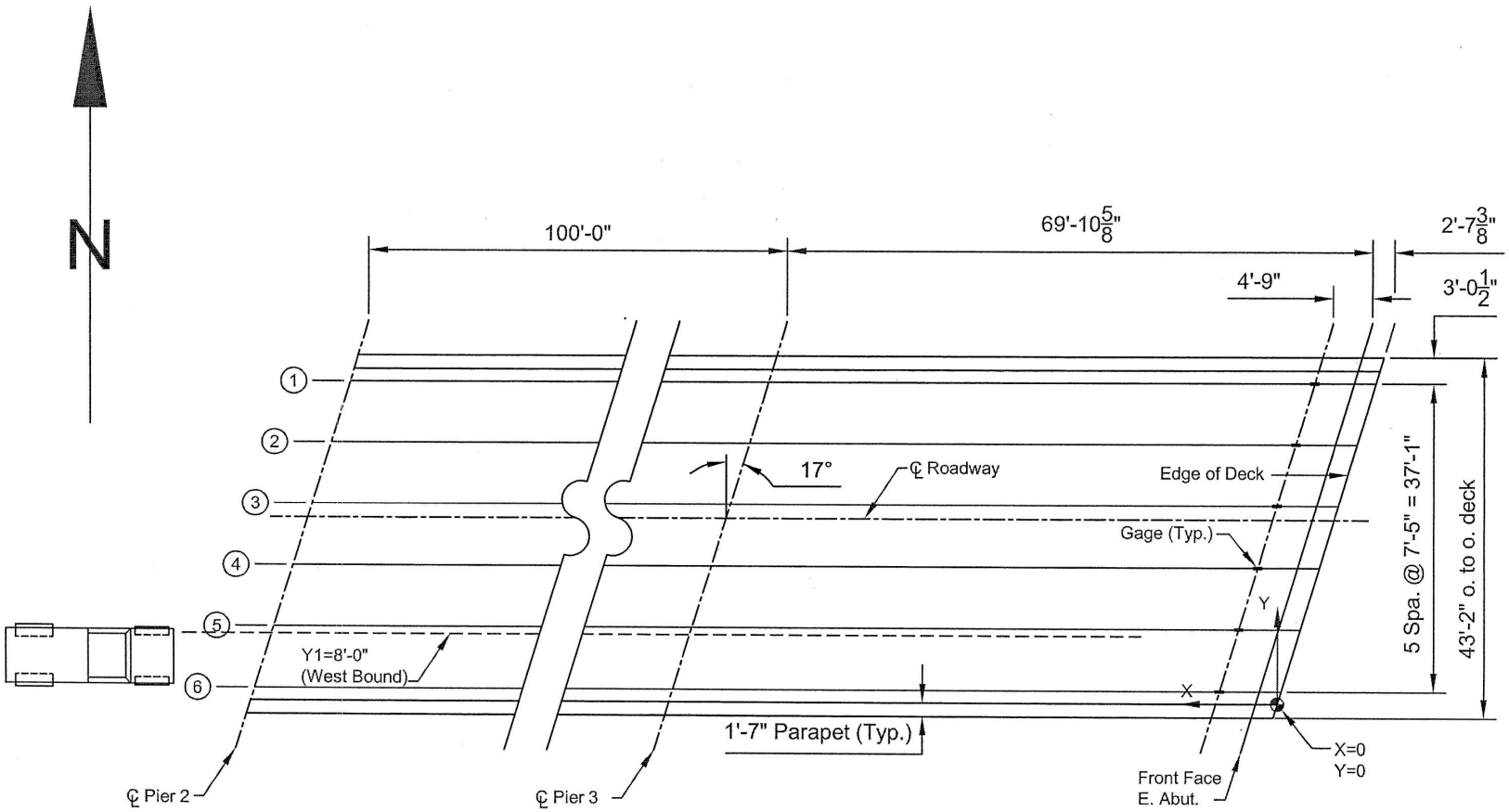
Bridge No. 003-0001 - Cross Section
(Looking West)



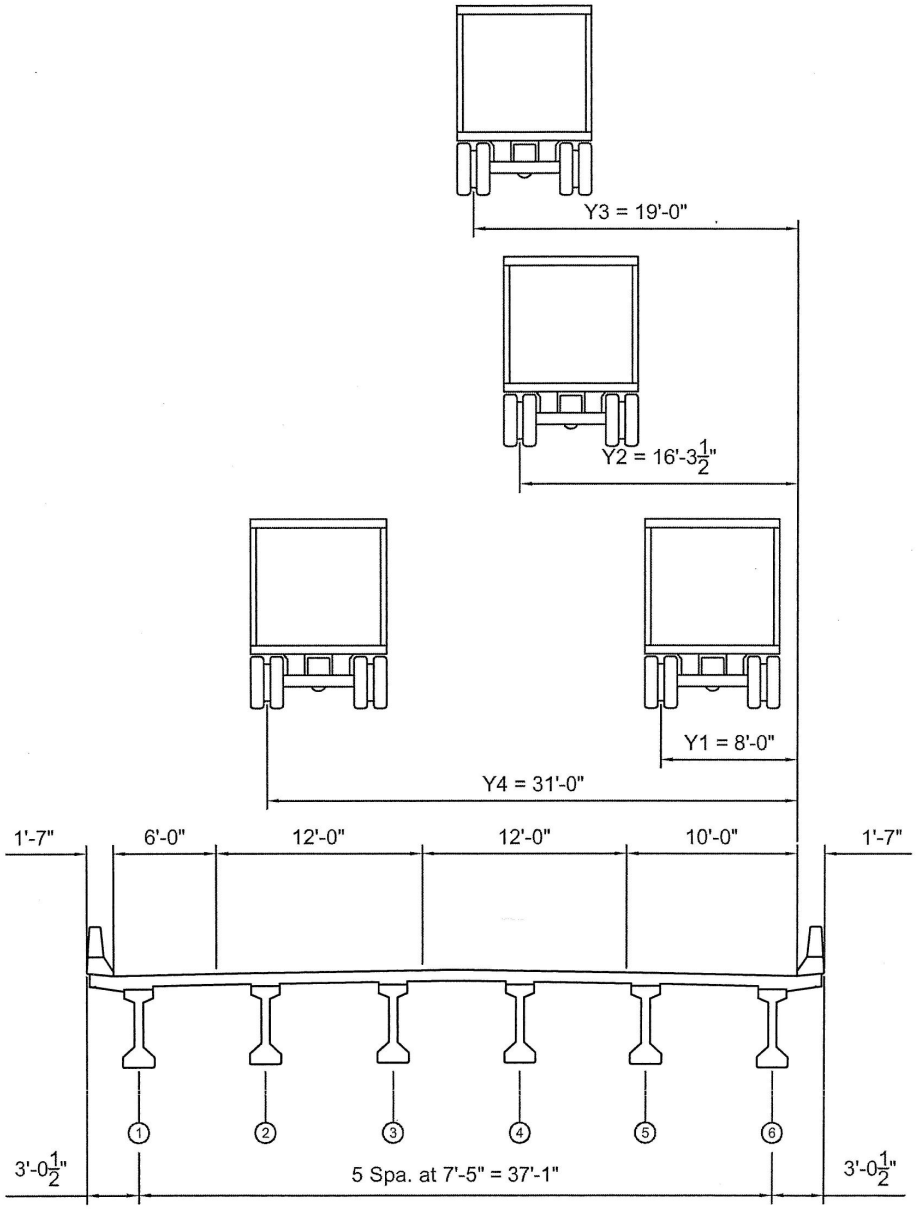
Bridge No. 003-0001 - Marking Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

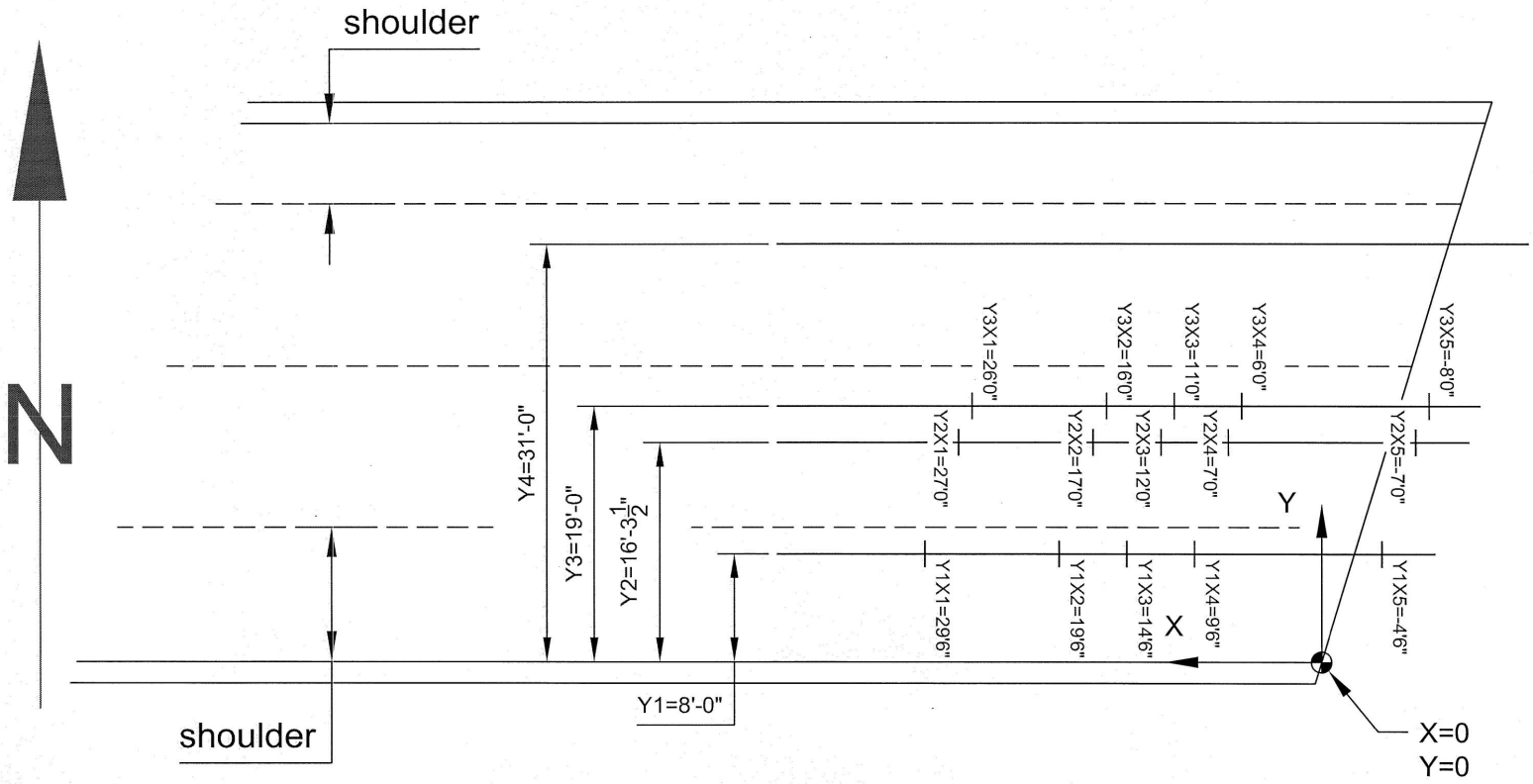
Date	12/7/2005
Bridge No.	060-0319
Structural Reference Point	X=0, Y=0 at intersection of East Edge of Deck and South Face of Parapet.
Test Truck Direction	Eastbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from South Face of Parapet. Y2 = 16' - 3.5" = Driver-side wheels directly above Girder 4. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 29' - 6"; Y1X2 = 19' - 6"; Y1X3 = 14' - 6"; Y1X4 = 9' - 6"; Y1X5 = -4' - 6" At Y2: Y2X1 = 27' - 0"; Y2X2 = 17' - 0"; Y2X3 = 12' - 0"; Y2X4 = 7' - 0"; Y2X5 = -7' - 0" At Y3: Y3X1 = 26' - 0"; Y3X2 = 16' - 0"; Y3X3 = 11' - 0"; Y3X4 = 6' - 0"; Y3X5 = -8' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2, Y3 and Y4 at 5 mph.
Dynamic Test	Truck travelling Eastbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2, Y3 and Y4) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 060-0319 - Plan



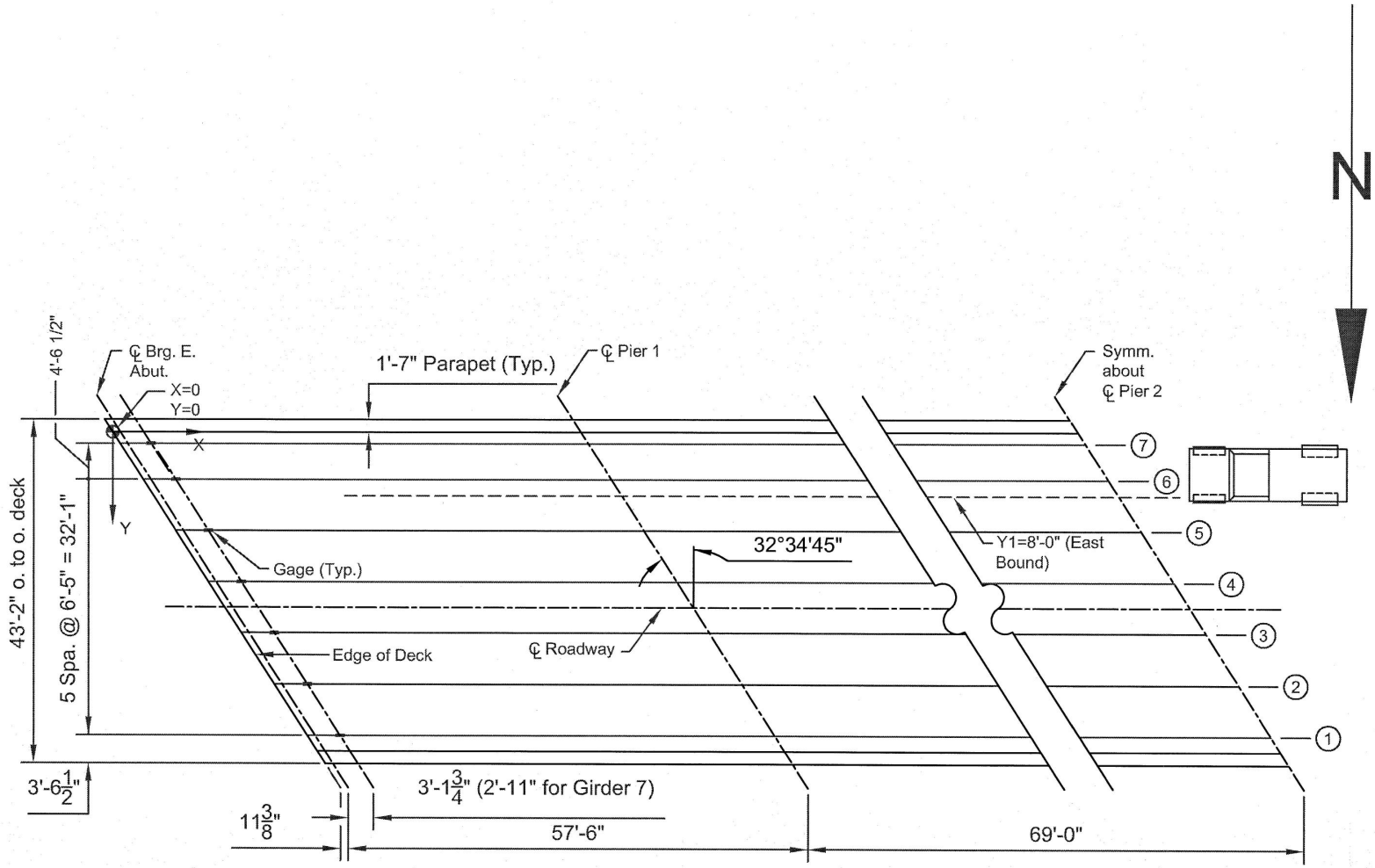
Bridge No. 060-0319 - Cross Section
(Looking East)



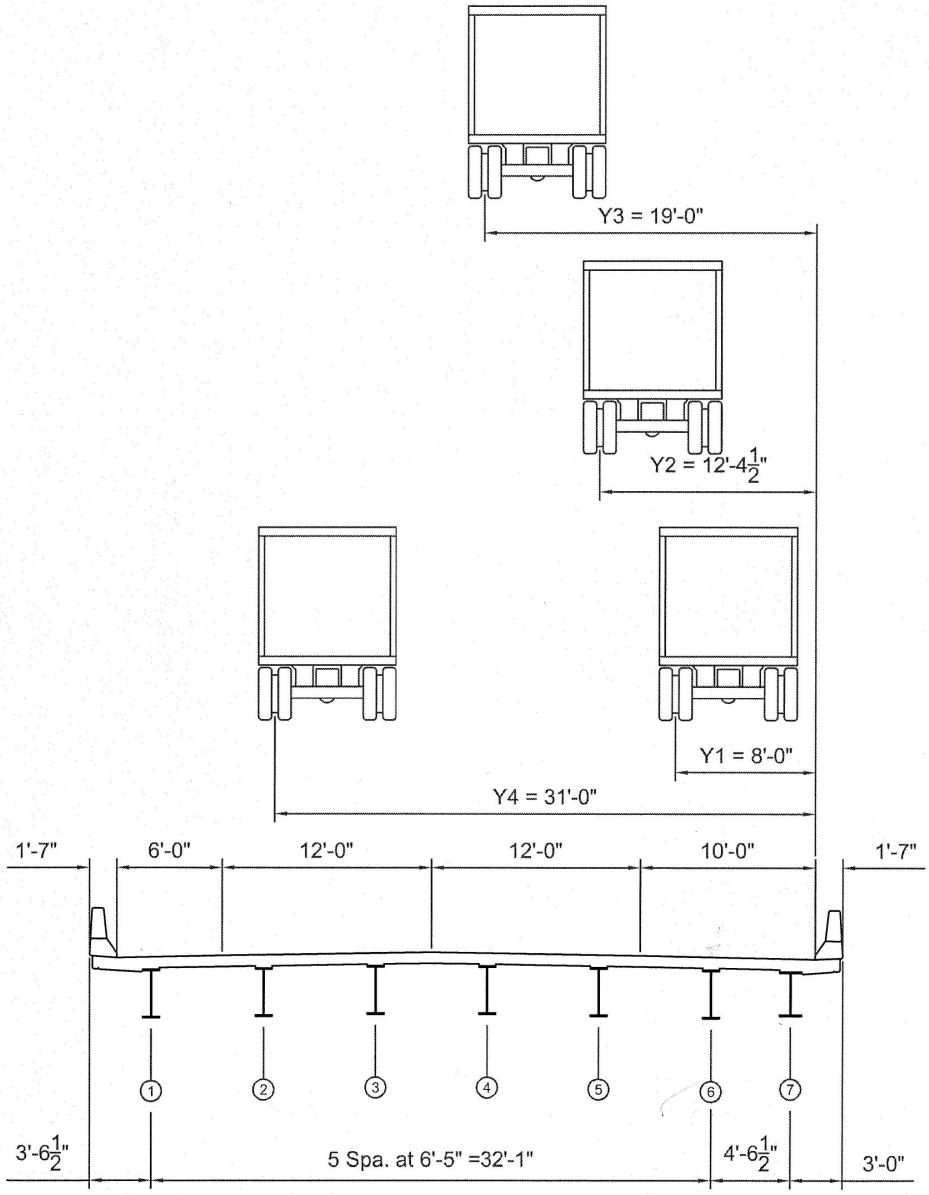
Bridge No. 060-0319 - Marking Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

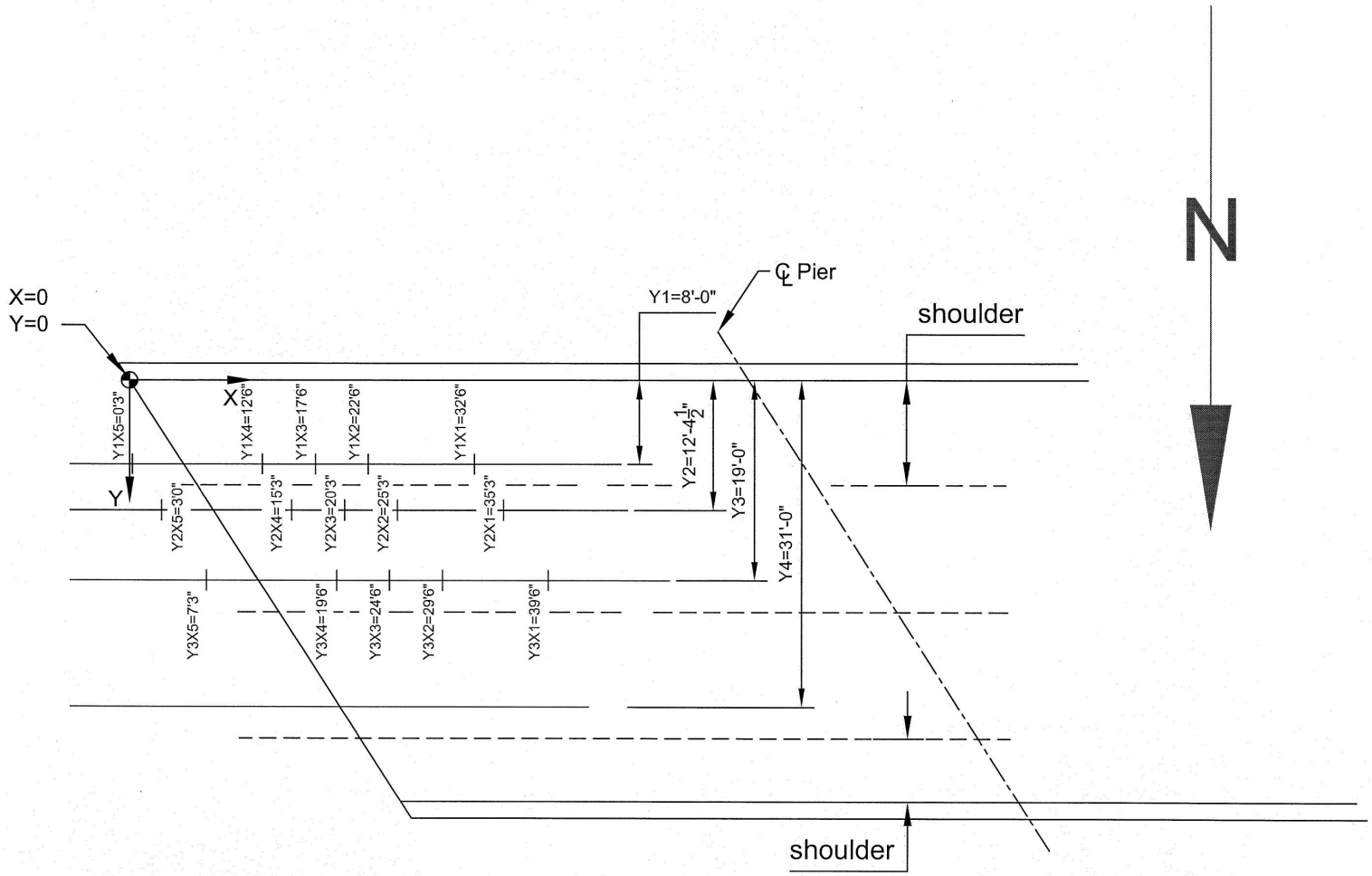
Date	11/9/2005
Bridge No.	060-0056
Structural Reference Point	X=0, Y=0 at intersection of East Edge of Deck and South Face of Parapet.
Test Truck Direction	Eastbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from South Face of Parapet. Y2 = 12' - 4.5" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. At Y1: Y1X1 = 32' - 6"; Y1X2 = 22' - 6"; Y1X3 = 17' - 6"; Y1X4 = 12' - 6"; Y1X5 = 0' - 3" At Y2: Y2X1 = 35' - 3"; Y2X2 = 25' - 3"; Y2X3 = 20' - 3"; Y2X4 = 15' - 3"; Y2X5 = 3' - 0" At Y3: Y3X1 = 39' - 6"; Y3X2 = 29' - 6"; Y3X3 = 24' - 6"; Y3X4 = 19' - 6"; Y3X5 = 7' - 3"
Slow Moving Test	Truck travelling Eastbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Eastbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 060-0056 - Plan



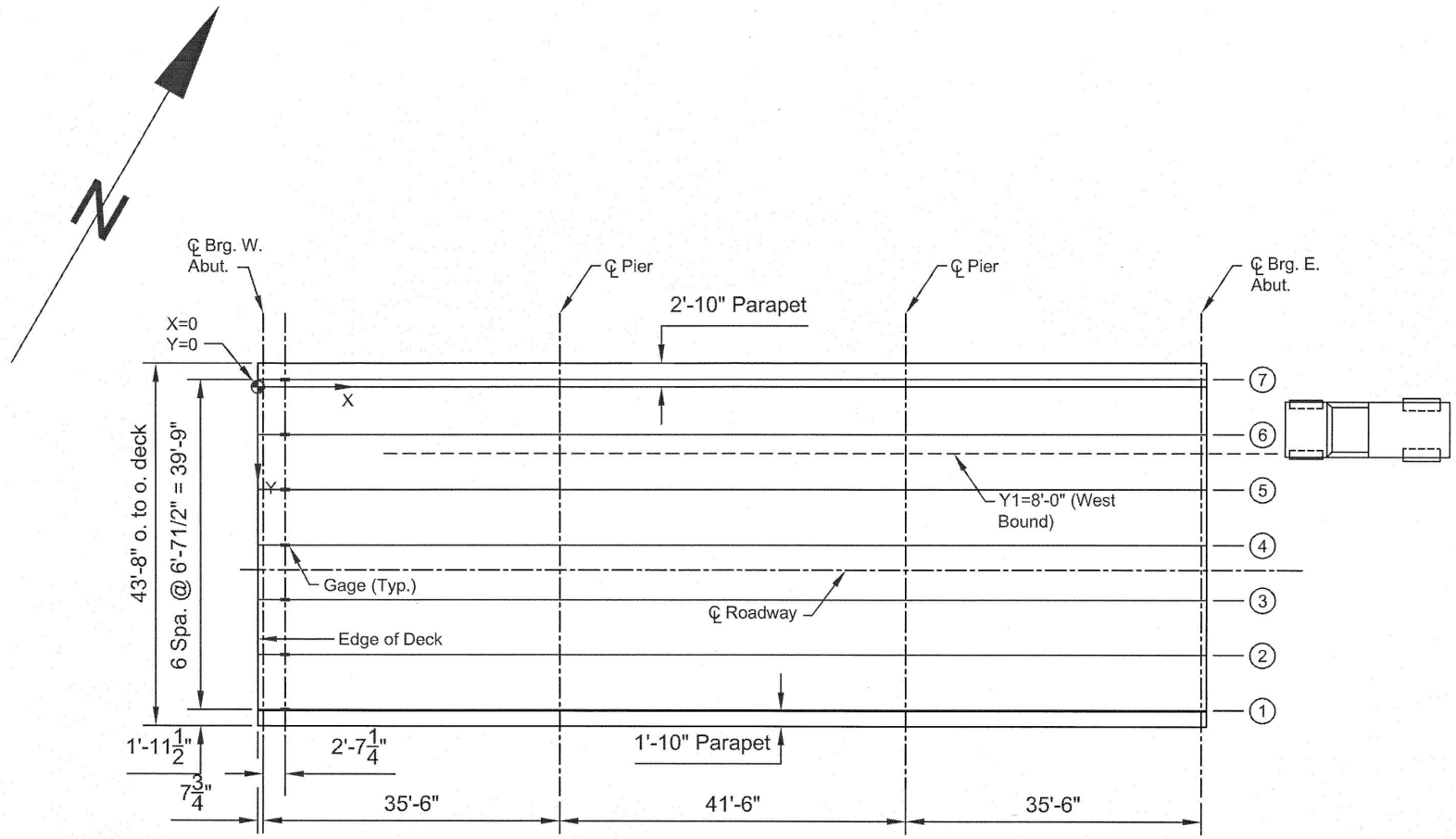
Bridge No. 060-0056 Cross Section
(Looking East)



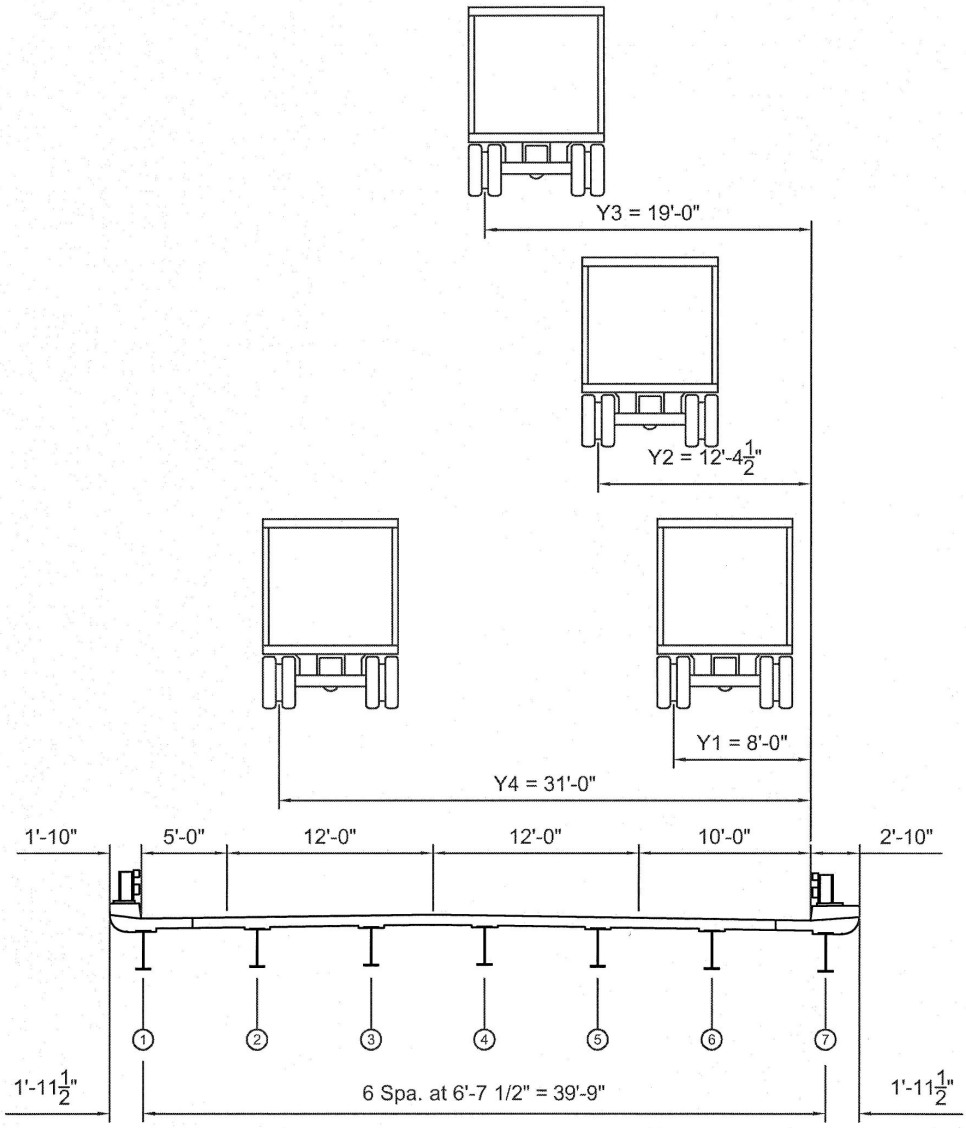
Bridge No. 060-0056 - Marking Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

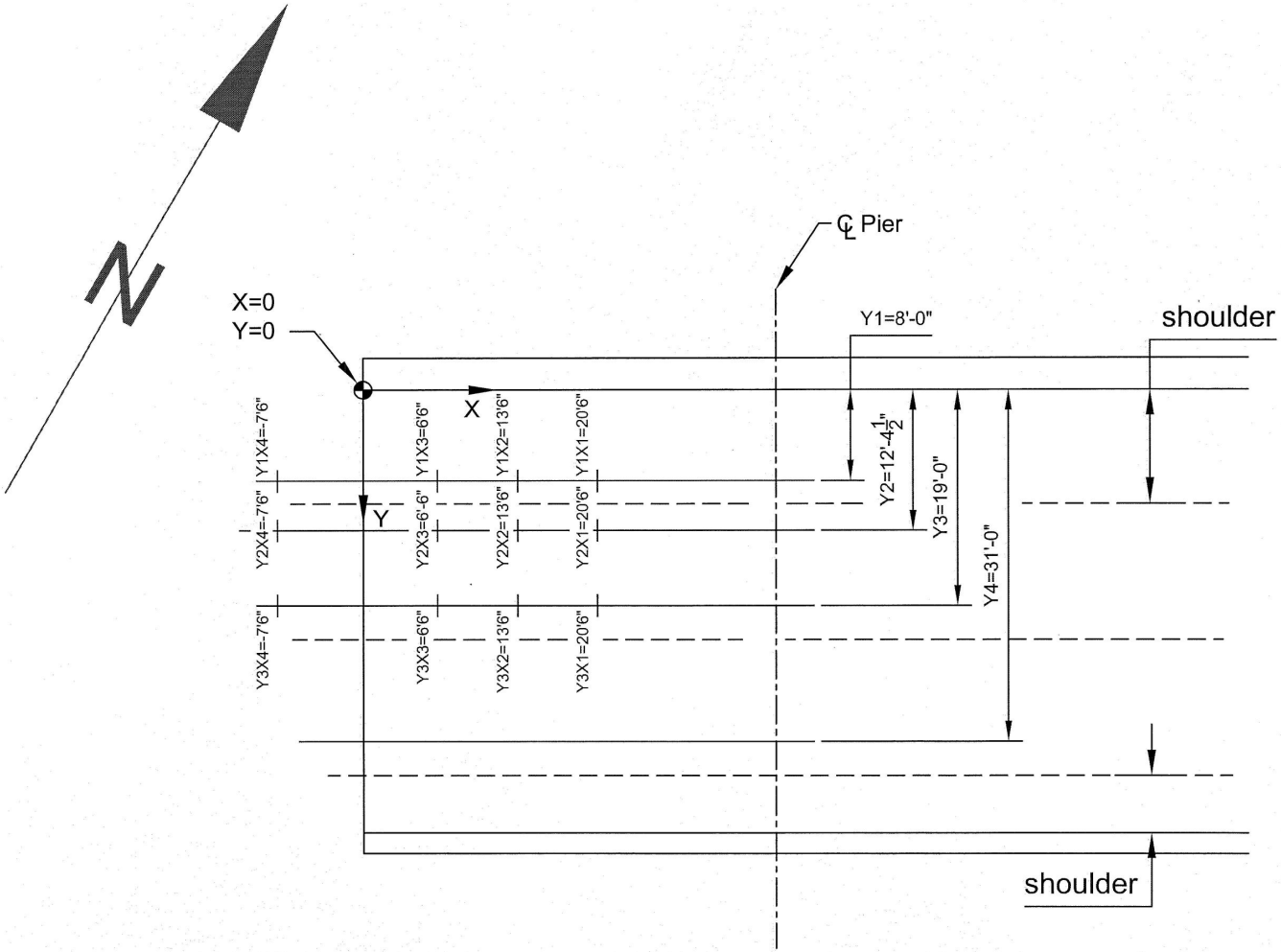
Date	11/10/2005
Bridge No.	060-0028
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 12' - 4.5" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 20' - 6" YnX2 = 13' - 6" YnX3 = 6' - 6" n = 1,2,3 YnX4 = -7' - 6"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 060-0028 - Plan



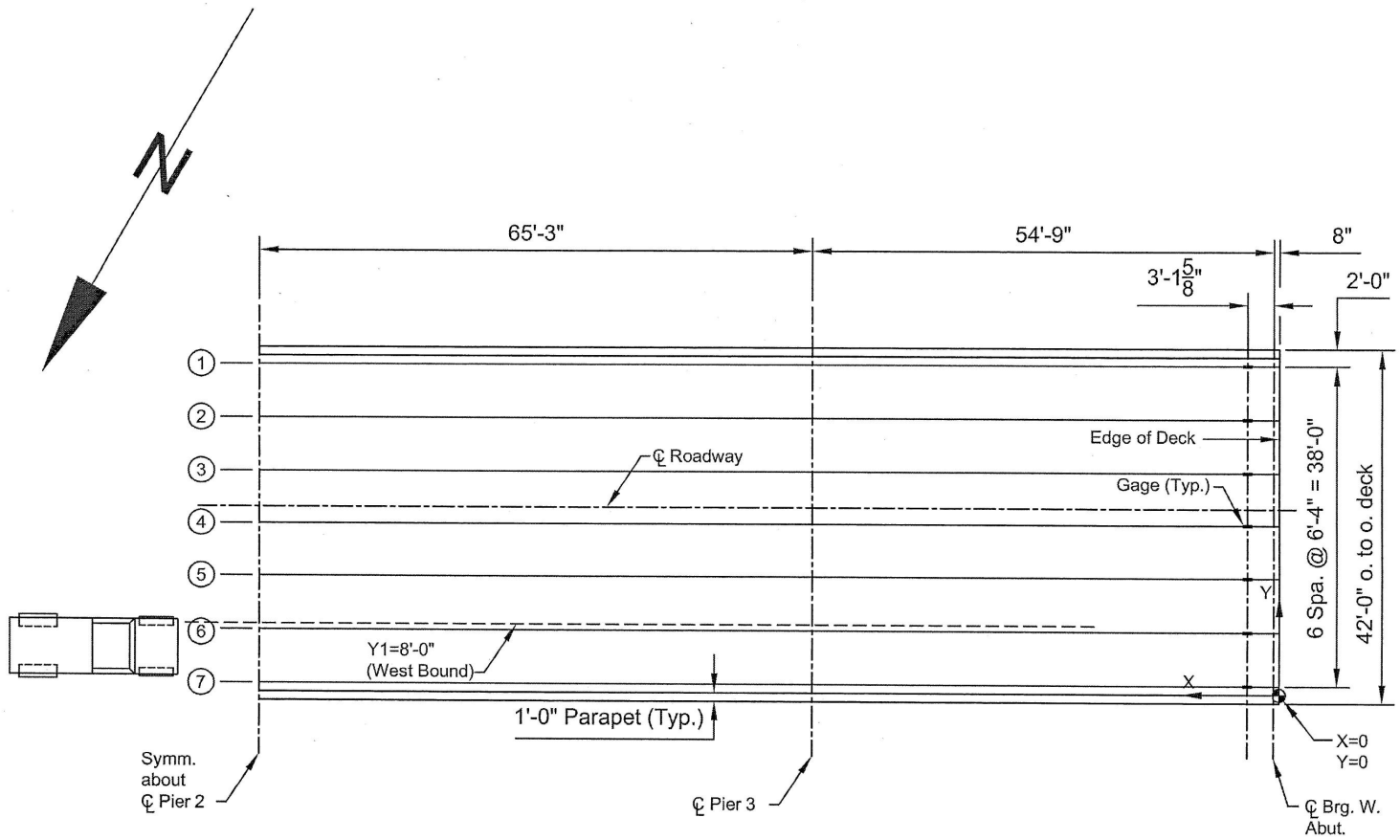
Bridge No. 060-0028 Cross Section
(Looking West)



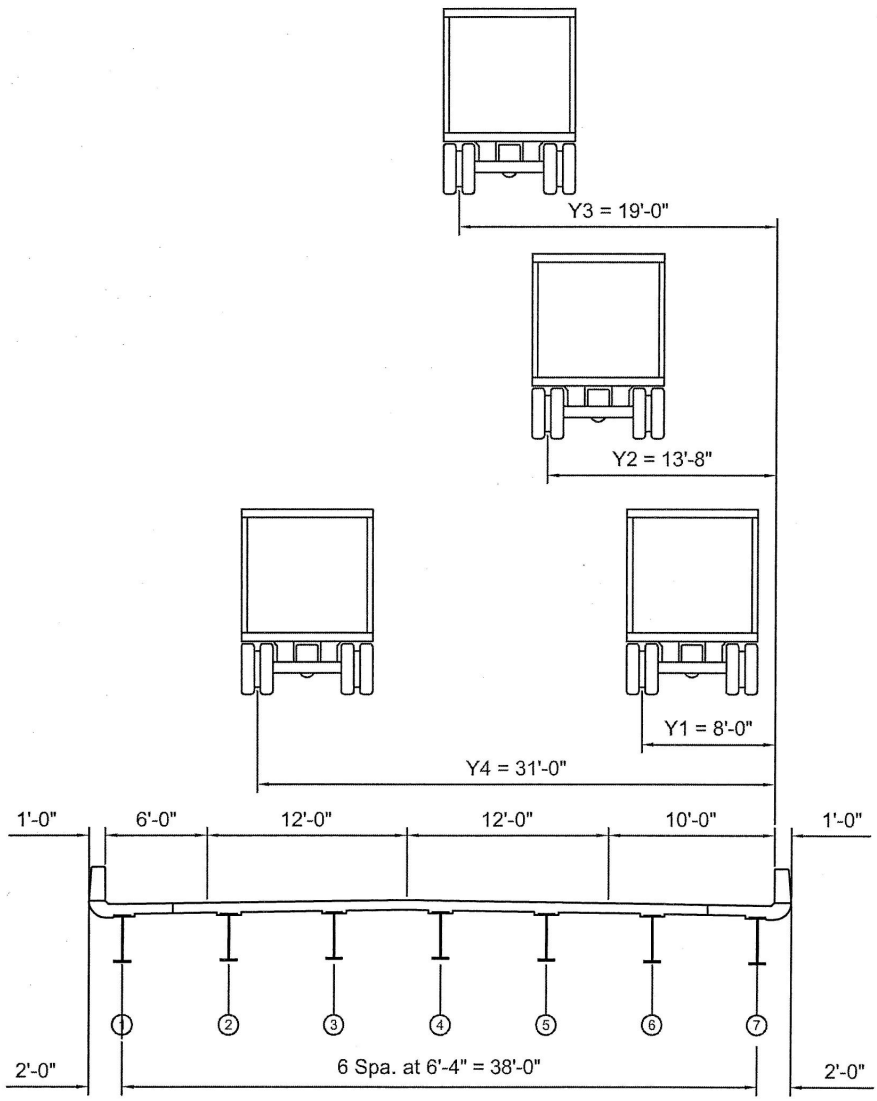
Bridge No. 060-0028 - Marking Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

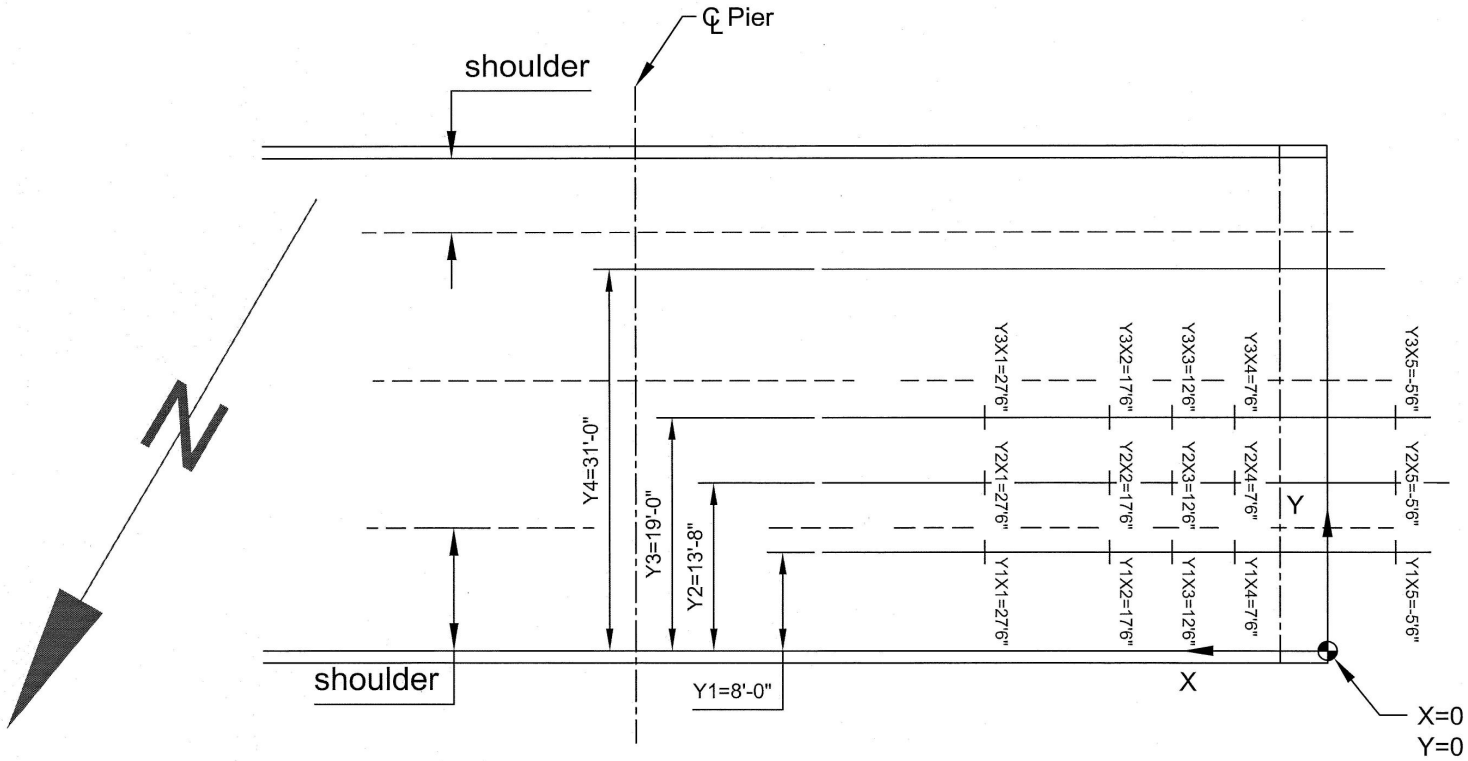
Date	11/16/2005
Bridge No.	003-0006
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	4 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 8" = Driver-side wheels directly above Girder 5. Y3 = 19' - 0" = Truck at center of driving lane. Y4 = 31' - 0" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1, Y2 and Y3</u> YnX1 = 27' - 6" YnX2 = 17' - 6" YnX3 = 12' - 6" n = 1,2,3 YnX4 = 7' - 6" YnX5 = -5' - 6"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2, Y3 and Y4 at 60 to 65 mph.
Number of Test Cycles	Static and Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2, Y3 and Y4) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 003-0006 - Plan



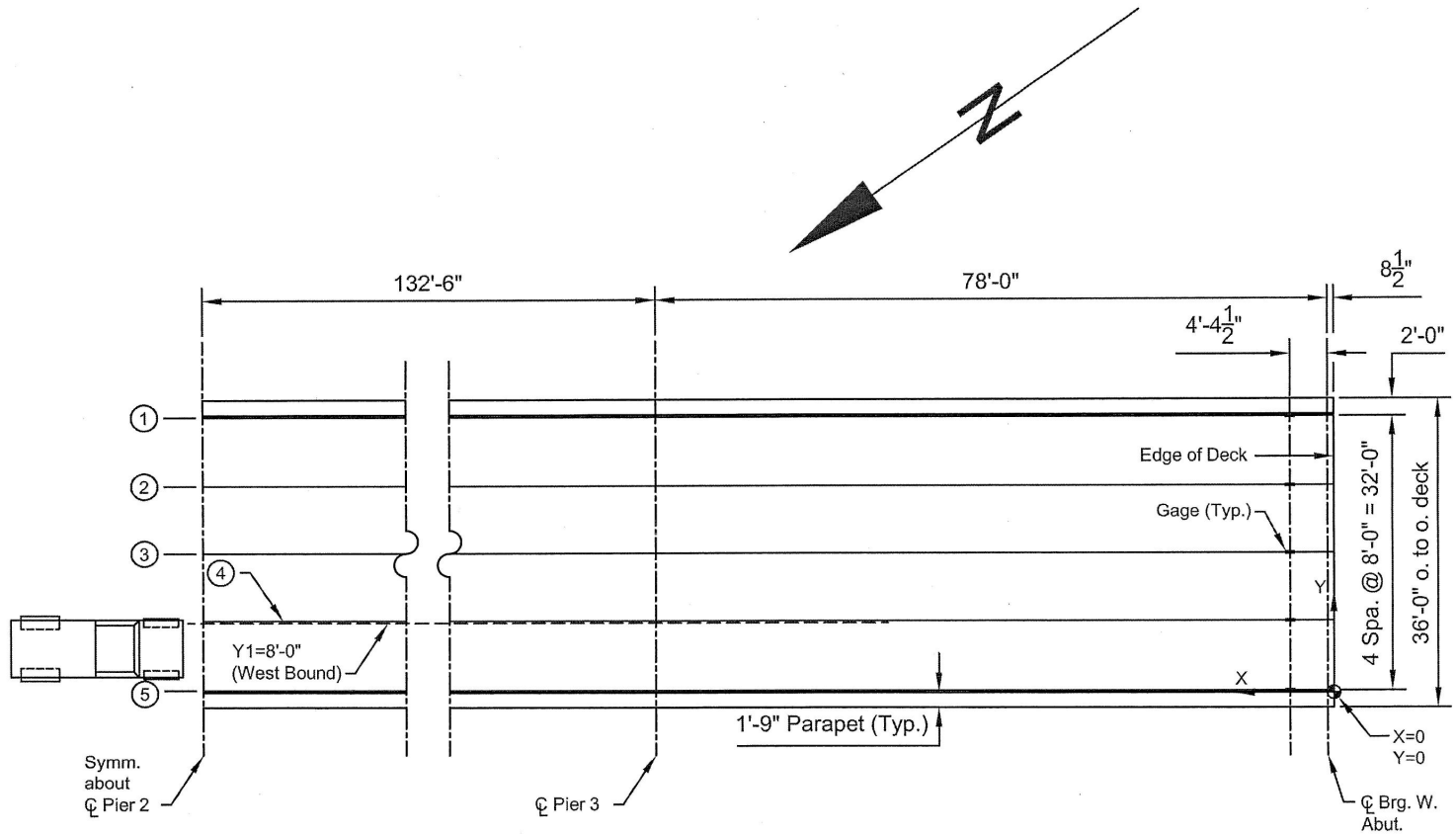
Bridge No. 003-0006 - Cross Section
(Looking West)



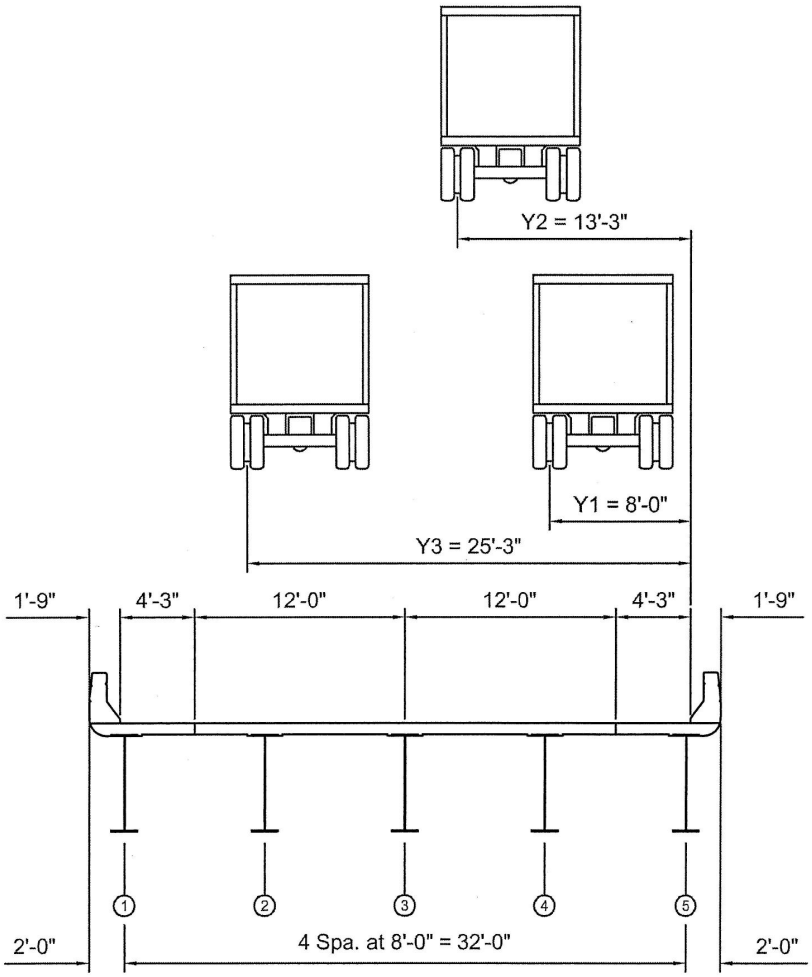
Bridge No. 003-0006 - Marking Plan

IDOT/SIUE Bridge Instrumentation Project
Test Truck Load Plan

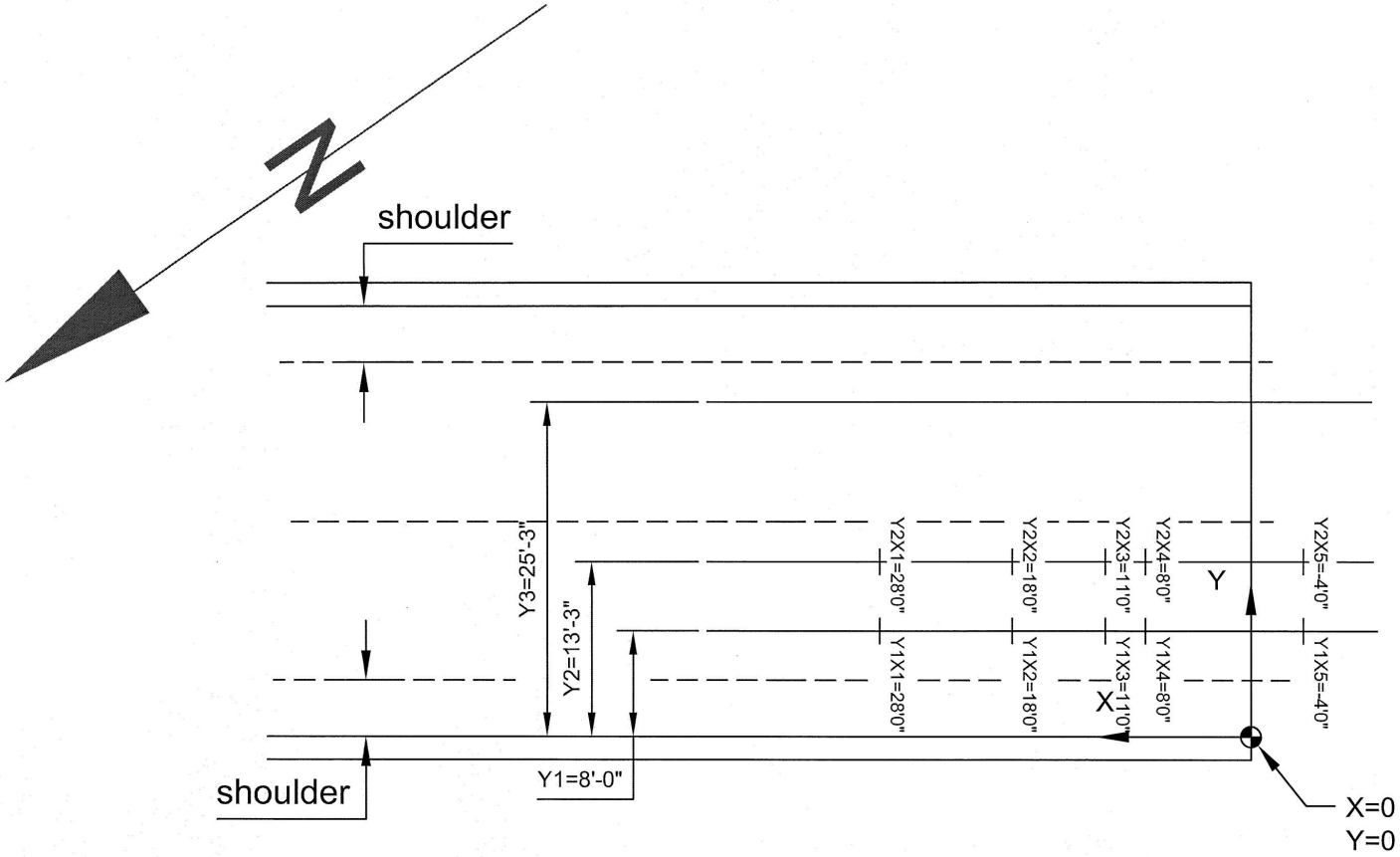
Date	11/17/2005
Bridge No.	003-0004
Structural Reference Point	X=0, Y=0 at intersection of West Edge of Deck and North Face of Parapet.
Test Truck Direction	Westbound for Static (and Slow Moving) Test and Dynamic Test
Transverse Truck Position	3 truck lanes were defined for the load test. The Y position refers to distance between driver side front wheel and the reference point. Y1 = 8' - 0" = Passenger-side wheels 2' from North Face of Parapet. Y2 = 13' - 3" = Truck at center of driving lane. Y3 = 25' - 3" = Truck at center of passing lane.
Static Test (Longitudinal Truck Position)	The X position refers to distance between driver side front wheel and the reference point. <u>At Y1 and Y2</u> YnX1 = 28' - 0" YnX2 = 18' - 0" YnX3 = 11' - 0" n = 1,2 YnX4 = 8' - 0" YnX5 = -4' - 0"
Slow Moving Test	Truck travelling Westbound along Lane Y1, Y2 and Y3 at 5 mph.
Dynamic Test	Truck travelling Westbound along Lane Y2and Y3 at 60 to 65 mph.
Number of Test Cycles	Static Test Each transverse truck position (Y1 and Y2) will be run twice to check data reproducibility. Slow Moving Test Each transverse truck position (Y1, Y2 and Y3) will be run twice to check data reproducibility. Dynamic Test Each transverse truck position (Y2 and Y3) will be run 3 times (minimum twice) to check data reproducibility
Gage Placement	See Plan View



Bridge No. 003-0004 - Plan

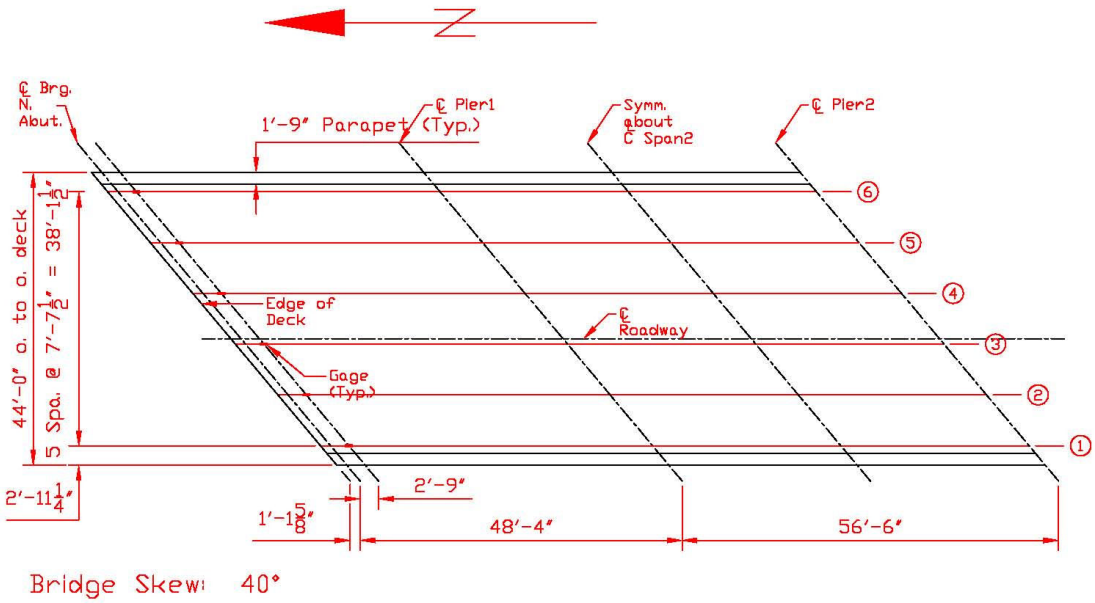


Bridge No. 003-0004 - Cross Section
(Looking West)

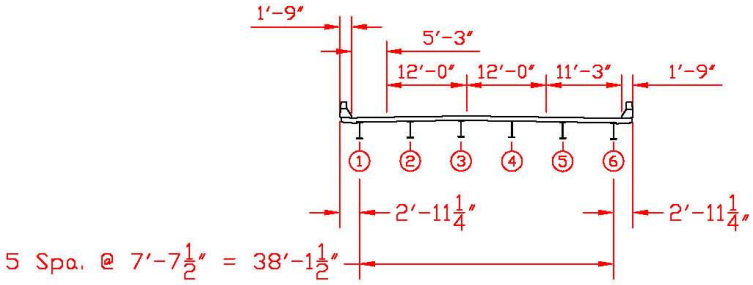


Bridge No. 003-0004 - Marking Plan

APPENDIX Q – INSTRUMENTED BRIDGE PLANS AND SECTIONS

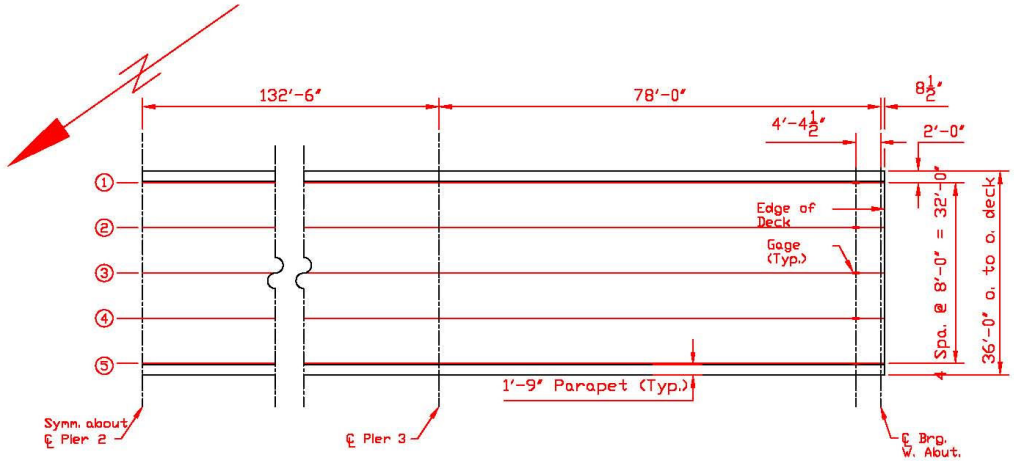


Bridge No. 084-0107 - Plan View

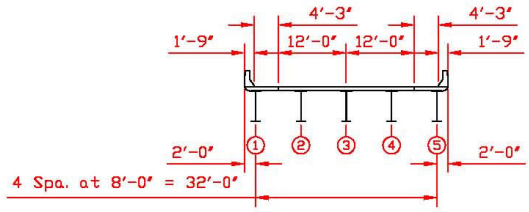


Bridge No. 084-0107 - Cross Section
(Looking North)

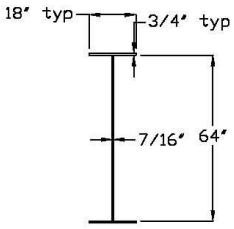
Slab Thickness: 8"
Parapet Height: 2.1'
Beam Size: 33 WF 130
Skew Angle: 39.92°



Bridge No. 003-0004 - Plan View

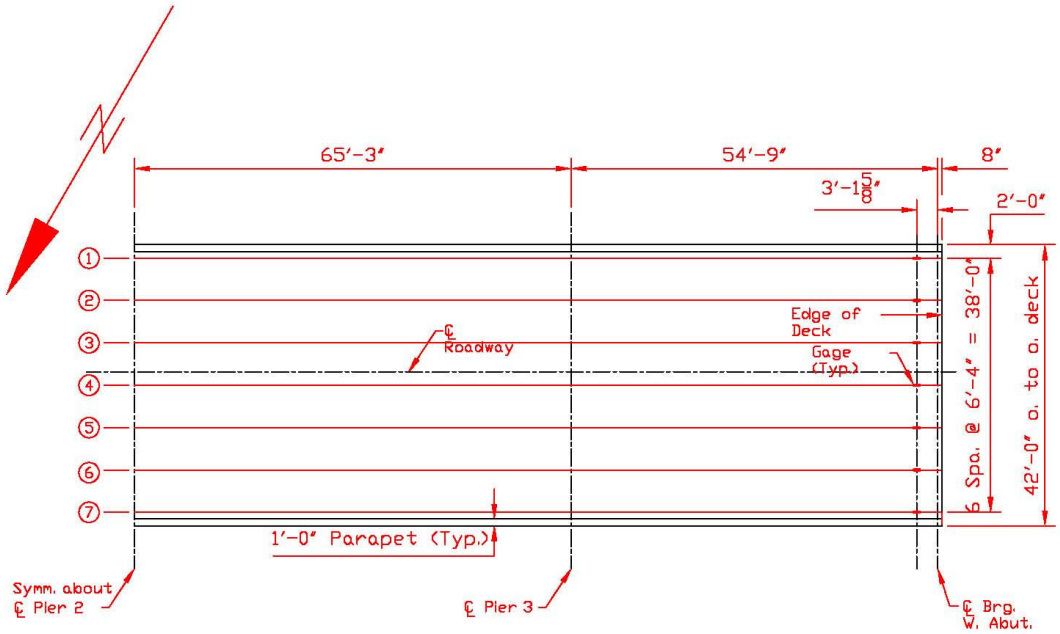


Bridge No. 003-0004 - Cross Section
(Looking West)

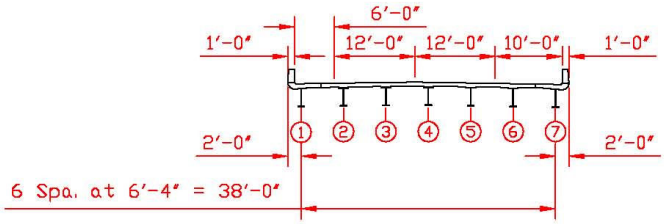


Details of Beam

Slab Thickness: 7 1/2"
Parapet Height: 2.1'
Beam size: 64" Web Depth Plate Girder
Skew Angle: 0°

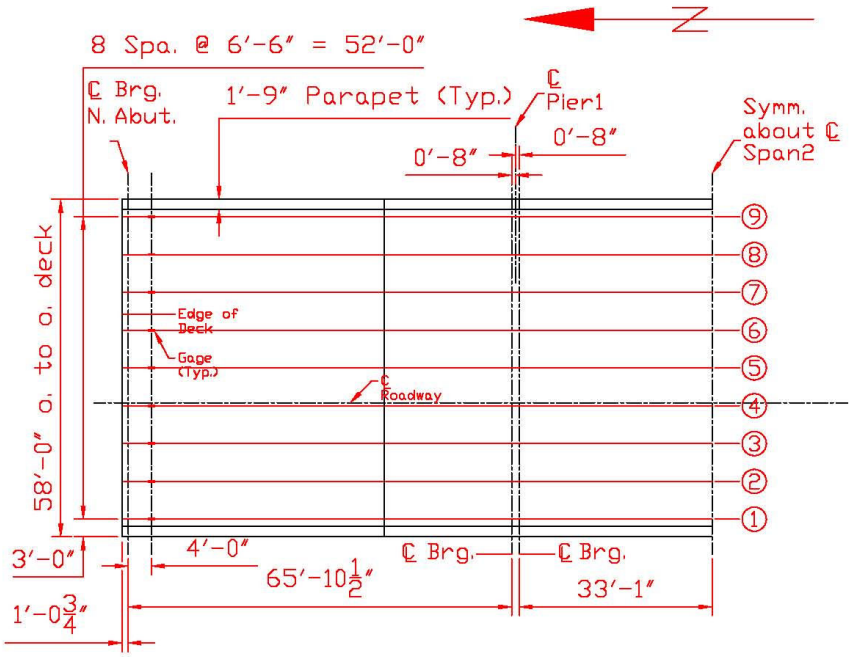


Bridge No. 003-0006 - Plan View

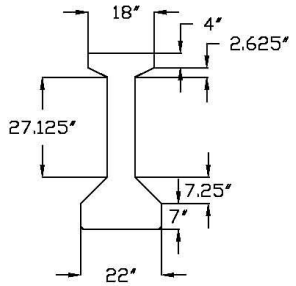


Bridge No. 003-0006 - Cross Section (Looking West)

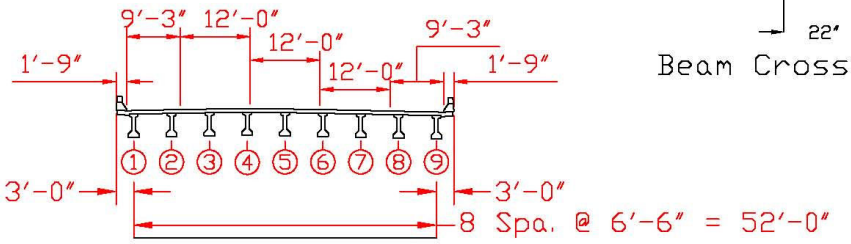
Slab Thickness: 7"
Topping: 2" Concrete Overlay
Parapet Height: 2.1'
Beam Size: 33 WF 130
Skew Angle: 0°



Bridge No. 054-0043 - Plan View

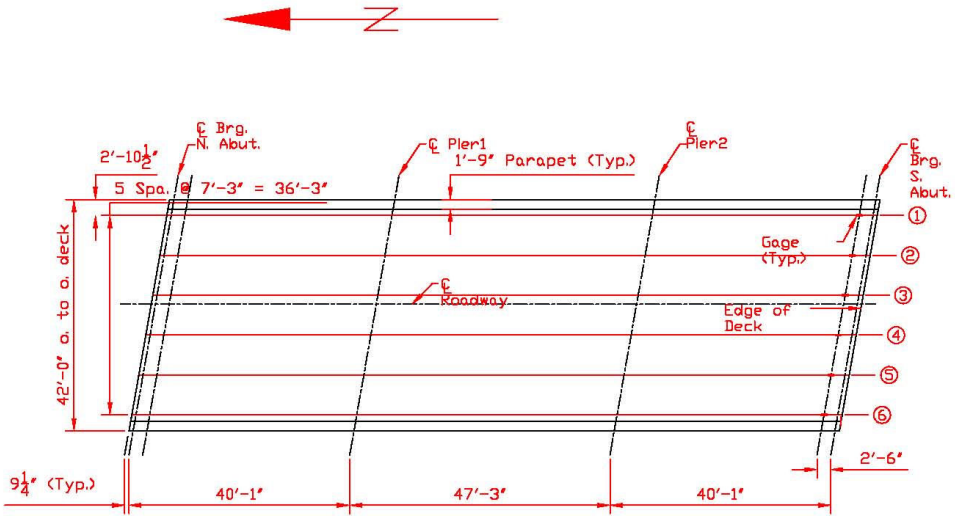


Beam Cross Section

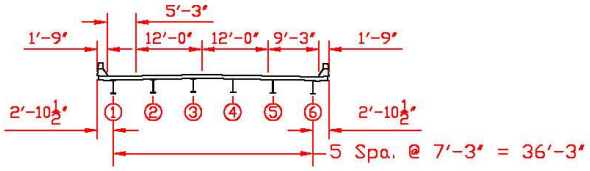


Bridge No. 054-0043 - Cross Section
(Looking North)

Slab Thickness: 7 1/2"
Topping: 1 1/2" Bit. Conc. Surf. Course, Class I
Parapet Height: 2.3'
Beam Size: See detailed drawing
Skew Angle: 0°

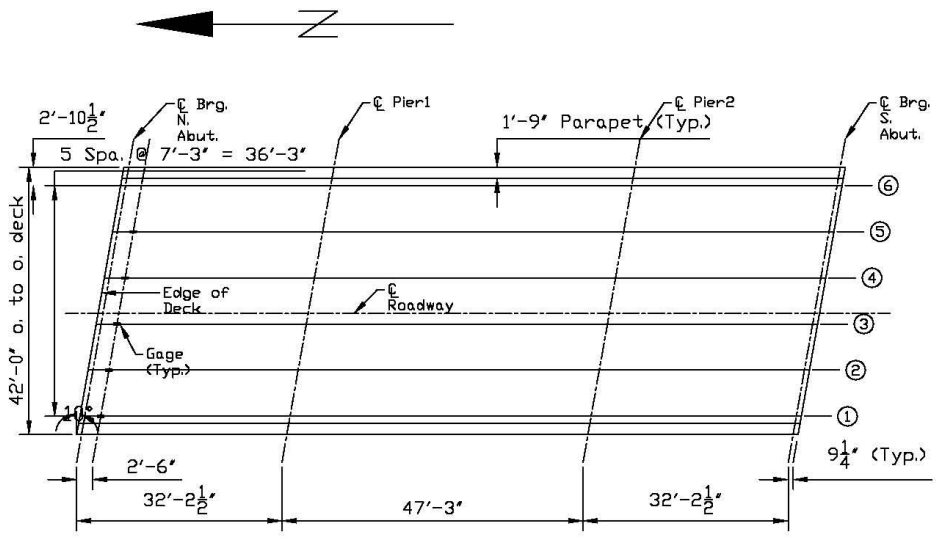


Bridge No. 059-0040 - Plan View

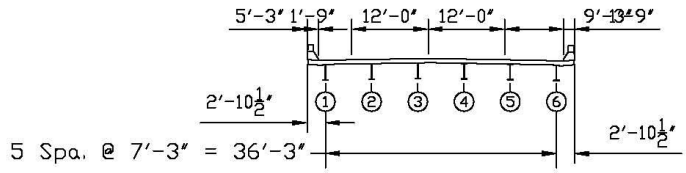


Bridge No. 059-0040 - Cross Section
(Looking South)

Slab Thickness: 8"
Topping: Bit. Conc. Surf. CSE. Mix d, cl I (1.25" min)
Parapet Height: 2.3'
Beam Size: W30 X 99
Skew Angle: 10°

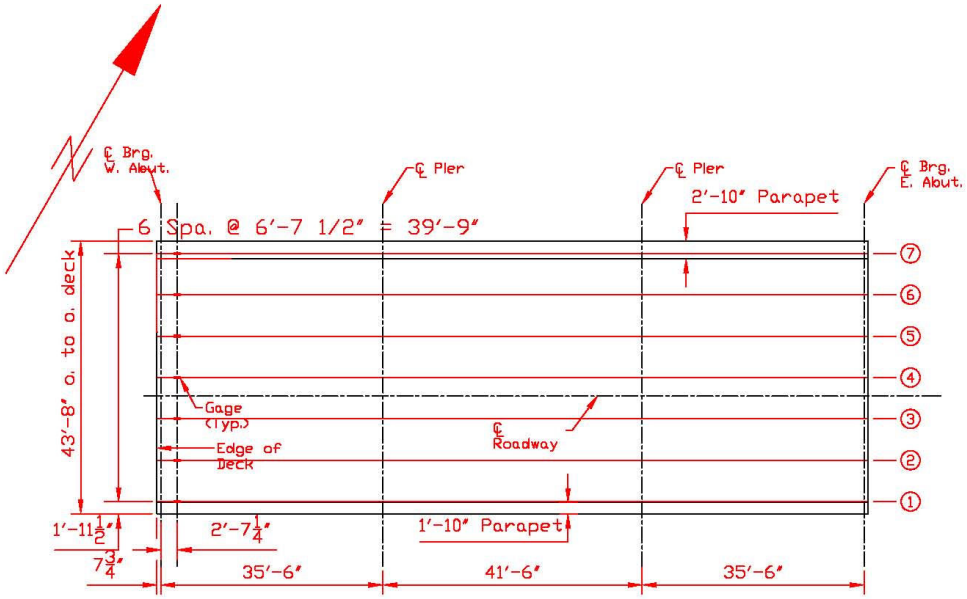


Bridge No. 059-0041 - Plan View

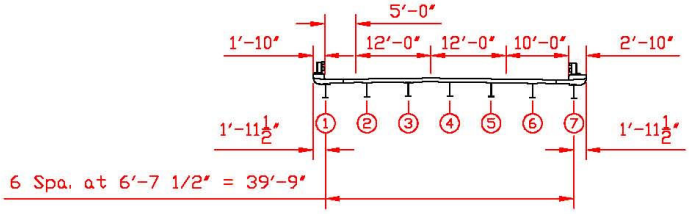


Bridge No. 059-0041 - Cross Secton
(Looking North)

Slab Thickness: 8"
Topping: Bit. Conc. Surf. CSE. Mix d, cl I (1.25' min)
Parapet Height: 2.3'
Beam Size: W30 X 99
Skew Angle: 10°

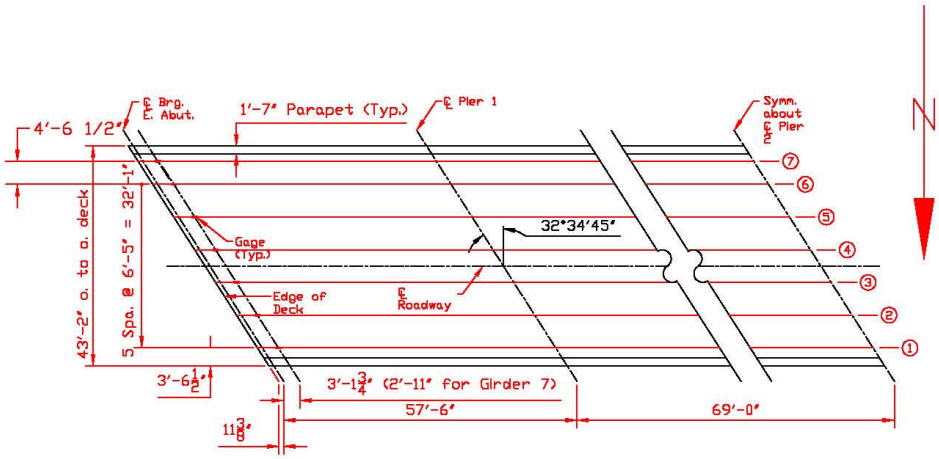


Bridge No. 060-0028 - Plan View

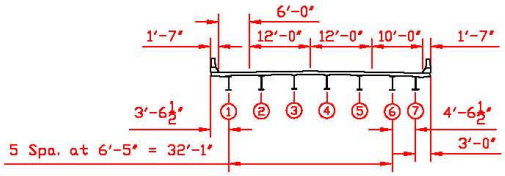


Bridge No. 060-0028 - Cross Section
(Looking West)

Slab Thickness: 7"
Topping: 2" min Concrete Overlay
Parapet Height: 1.1'
Beam Size: W27 X 84
Skew Angle: 0°

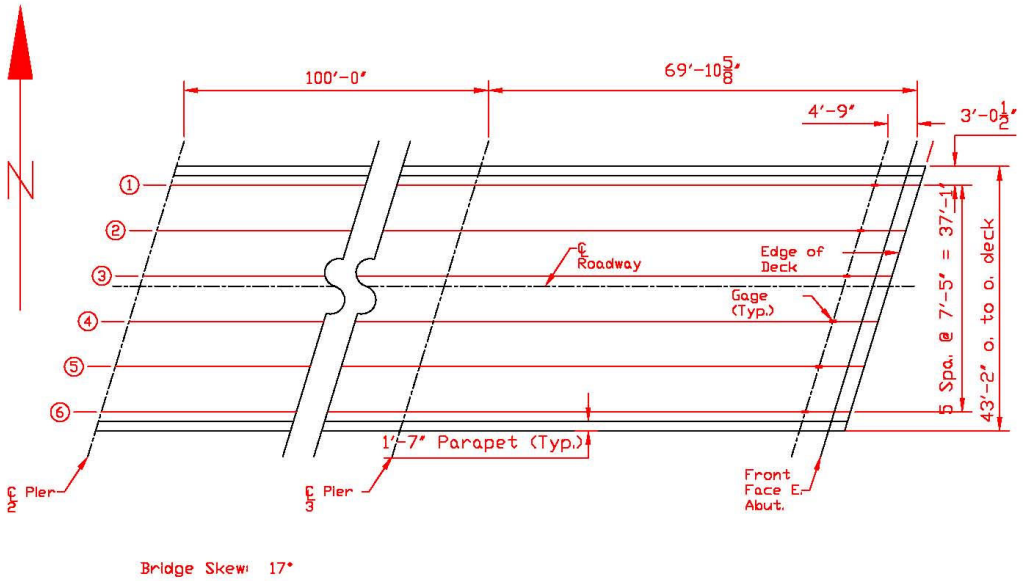


Bridge No. 060-0056 - Plan View

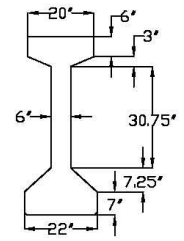


Bridge No. 060-0056 - Cross Section
(Looking East)

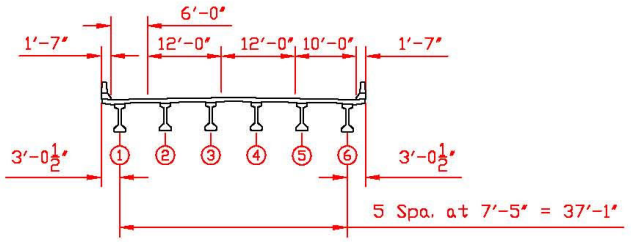
Slab Thickness: 7 1/2"
Topping: 1.5" WS
Parapet Height: 2.7'
Beam Size: 33 WF 141 (6 old beams) + W30 X 173 (1 new beam)
Skew Angle: 32°



Bridge No. 060-0319 - Plan View

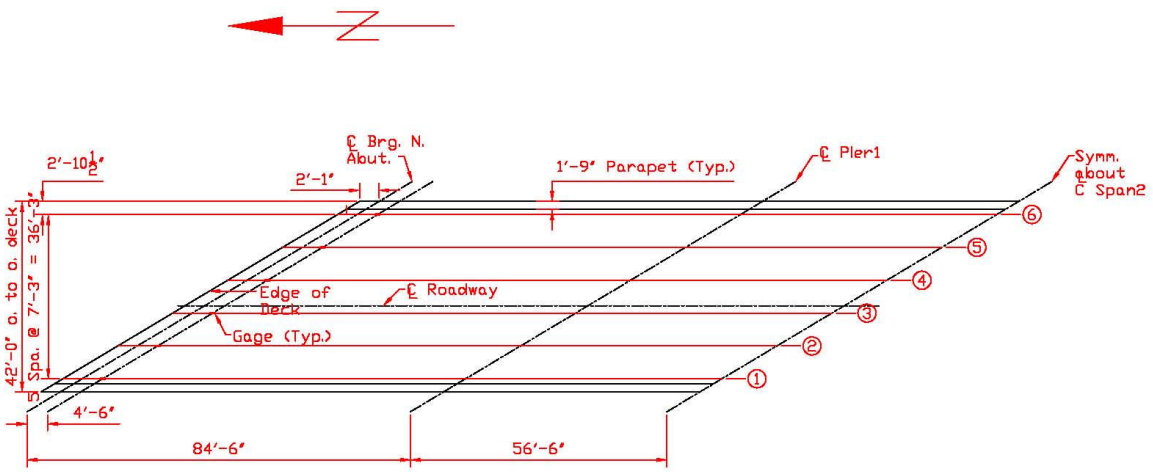


Beam Cross Section



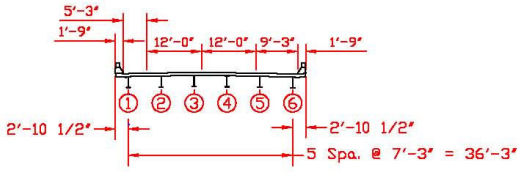
Bridge No. 060-0319 - Cross Section (Looking East)

Slab Thickness: 7 1/2"
Parapet Height: 2.7'
Beam Size: 54" PCC I-Beam
Skew Angle: 17°



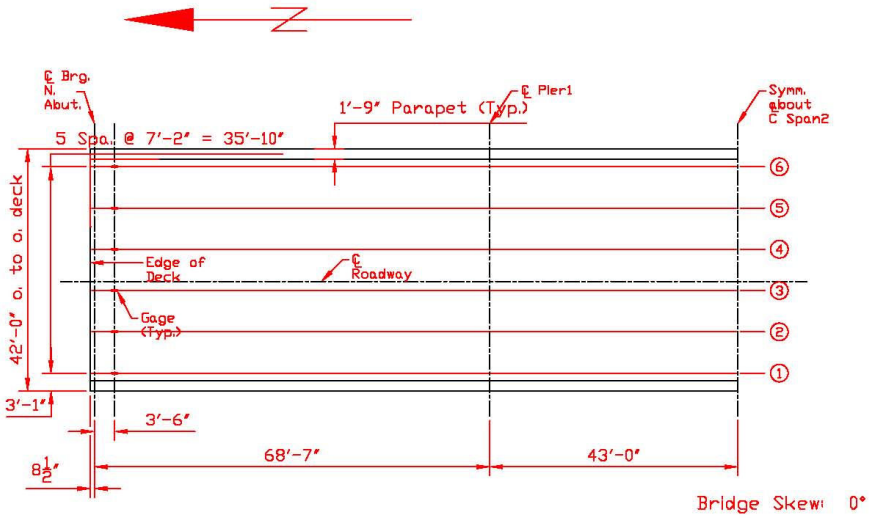
Bridge Skew: 59°

Bridge No. 068-0045 - Plan View

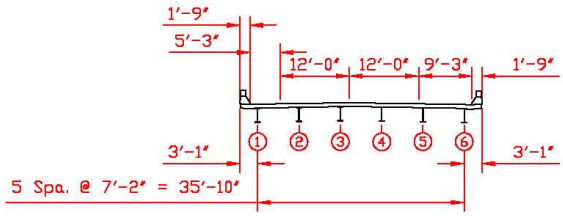


Bridge No. 068-0045 - Cross Section
(Looking North)

Slab Thickness: 8"
Topping: 2.25" min Bridge Deck Micorsilica Conc. Overlay
Parapet Height: 2.3'
Beam Size: 54" Welded Plate Girder
Skew Angle: 59.12°

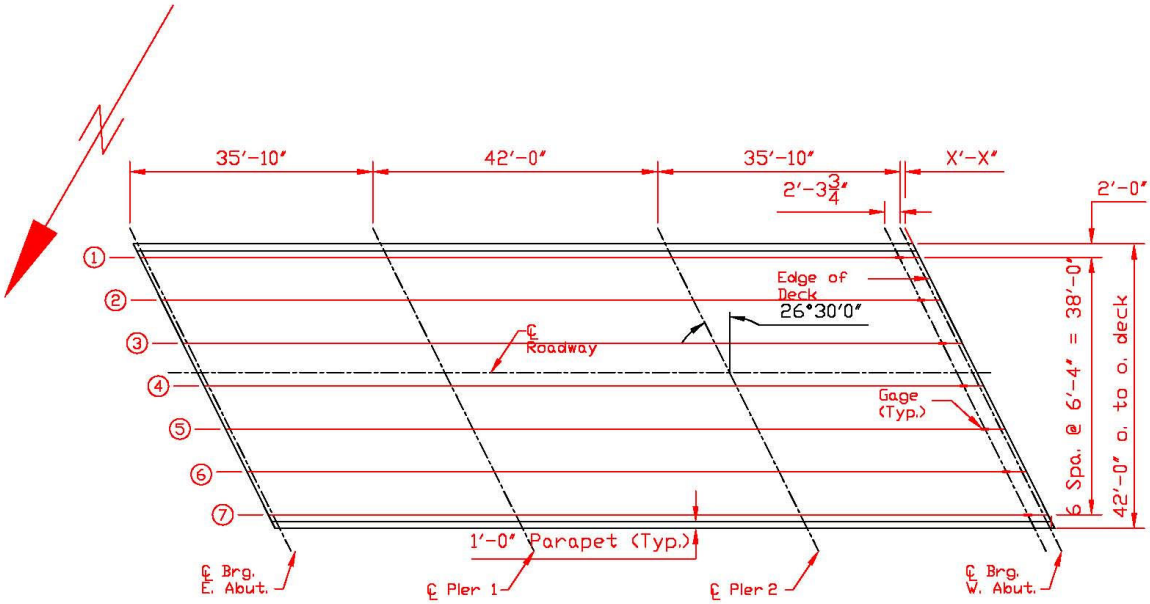


Bridge No. 068-0048 - Plan View

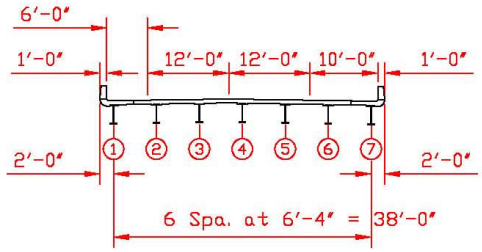


Bridge No. 068-0048 - Cross Section
(Looking North)

Slab Thickness: 6 1/2"
Topping: 2.25" min Bridge Deck Microsilica Conc. Overlay
Parapet Height: 2.3
Beam Size: 42" Welded Plate Girder
Skew Angle: 0°



Bridge No. 003-0001 - Plan View



Bridge No. 003-0001 - Plan View
(Looking West)

Slab Thickness: 7"
Topping: 2" Concrete Overlay
Parapet Height: 2.1'
Beam Size: 24 WF 84
Skew Angle: 26.5°