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EFFECTS OF TRAFFIC VARIATION ON FATIGUE BEHAVIOR OF THE HOLSTON RIVER BRIDGE

A Thesis

Presented for the

Masters of Science

Degree

The University of Tennessee, Knoxville

Joseph Carson Swann

May, 1995

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I would like to thank the members that served on my graduate committee for their patience and guidance not only through this endeavor but also through my post secondary education. Dr. Hal Deatherage is owed a special debt of gratitude for serving as my major professor during the graduate program. Another note of thanks is extended to Dr. David Goodpasture and Dr. Ed Burdette for their tremendous effort with regard to instruction of their students. The academic as well as personal achievements garnered over the past two years would not have been possible without the assistance of these three gentlemen. Their unwavering regard for the engineering discipline as well as genuine interest in their students is greatly admired. I would also like to thank my family, especially my mother and father, Mr. & Mrs. Bill Swann, for their support both financially and spiritually during the stressful times associated with the completion of this task.

ABSTRACT

In January 1992, the Holston River Bridge experienced a fatigue failure in the eastbound fascia girder in the second span. After repairing the girder and retrofitting similar details associated with the failure location a research project was initiated by the Tennessee Department of Transportation in conjunction with the University of Tennessee.

The Holston River Bridge research project provided the students and faculty at the University of Tennessee an opportunity to participate in a full scale fatigue study of an in service steel bridge. In order to complete the required scope of the project data were taken on 127 strain gages at selected fatigue prone locations on the bridge structure. The purpose of this thesis is to summarize all of the data taken on the Holston River Bridge project. Also, it is the intent of this thesis to investigate the effects of traffic pattern on the fatigue characteristics at several fatigue prone locations. This was accomplished due to the fact that traffic varied from normal during testing.

There has been little or no research done on the effects of traffic pattern with regard to fatigue resistance. Hopefully, the results of this thesis can provide those interested in this subject a reference with a wealth of data to draw from as well as recommendations and conclusions in regard to the Holston River Bridge.

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CHAPTER 1

INTRODUCTION

1.1 Description

The Holston River Bridge (HRB) located east of Knoxville, Tennessee carries Interstate 40 over the Holston River. Traffic flowing over the bridge under normal conditions consists of three lanes in both the eastward and westward direction for a total of six lanes. The bridge is 1193 feet in total length consisting of eight spans ranging in length from 100 feet to 240 feet (Figure 1.1). Composite action is utilized with four continuous steel plate girders supporting a seven and one-half inch thick concrete deck. Although the plate girders vary in depth throughout the length of the bridge, they are identical at each cross section. Cantilever plates which frame into the web of the outside girders support the roadway shoulder in both directions. The plate girders are laterally supported with cross frames within the 240 foot span (Figure 1.2) and with floor beams in the other spans (Figure 1.3). Two wide flange sections, which act as stringers for the bridge deck are located between each pair of girders and are supported by the cross frames and the floor beams.

1.2 Background

The Tennessee Department of Transportation discovered a failure in the eastbound outside girder within the 240 foot span approximately at the one third span point. This failure was discovered in January 1992 as a result of a highway department employee

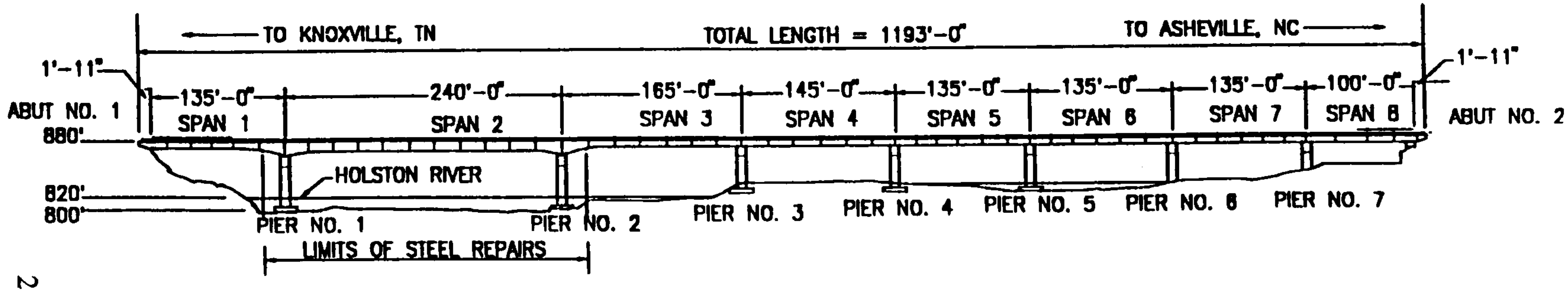


Figure 1.1: Elevation view of the Holston River Bridge.

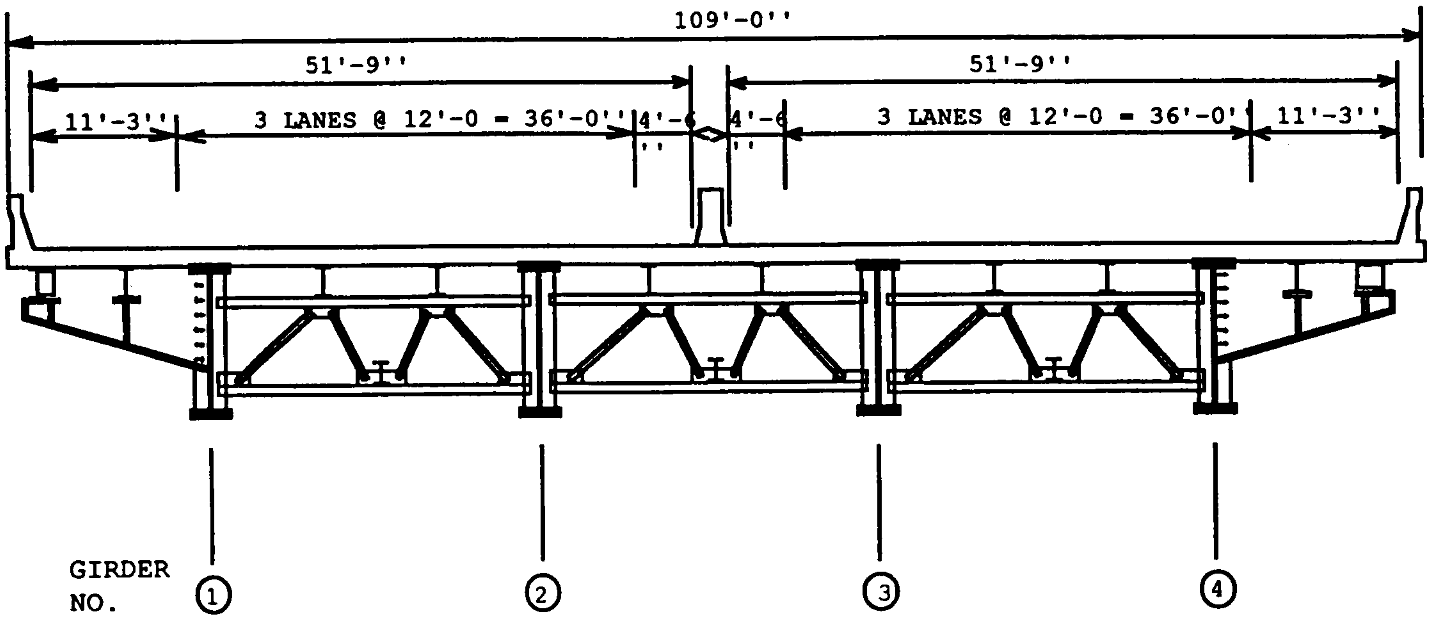


Figure 1.2: Cross-section of the HRB in the second span showing crossframes.

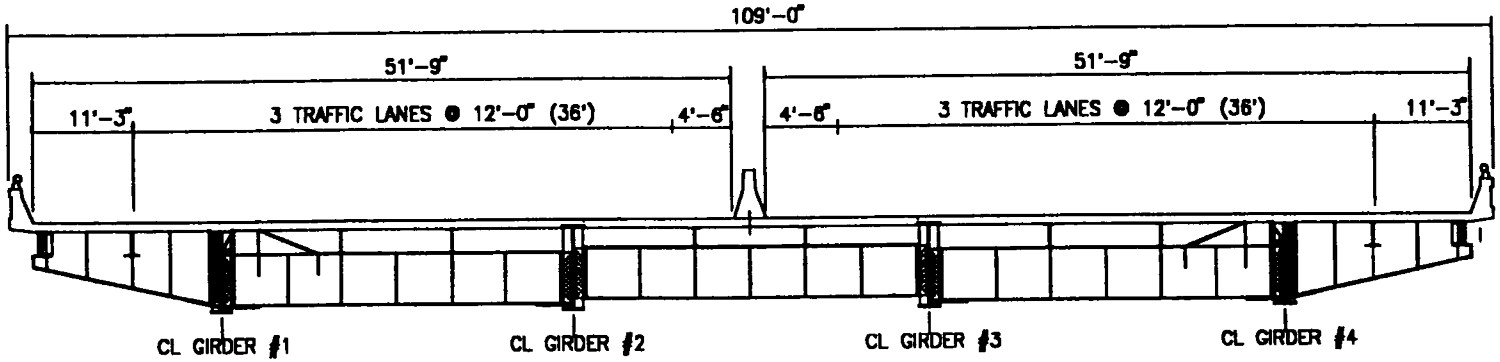


Figure 1.3: Cross-section of the HRB in the other seven spans showing floorbeams.

noticing a sag in the roadway and shoulder. Immediate inspection revealed a fracture that extended almost the entire depth of the girder and which left a gap in the bottom flange roughly 1.5" - 2.0" in width (Figure 1.4). After this failure was discovered the two outside lanes in both the eastbound and westbound directions were promptly closed to traffic, and measures were undertaken to repair the girder. Also, the cantilever to girder web connection in this span was retrofitted in order to eliminate the out of plane distortion which was believed to have initiated the failure.

In January 1993, the University of Tennessee Transportation Center in conjunction with TDOT started a research project to investigate the Holston River Bridge fatigue failure. The objectives of the initial proposal were fourfold: evaluate the effects of the retrofit, estimate the fatigue life consumed at time of failure, estimate the remaining fatigue life of the bridge, and study fatigue prone details in the bridge structure. Upon approval of the proposal several key steps were undertaken to assure the objectives would be met. First, the bridge plans and the bridge itself were carefully inspected to locate critical points of interest. Following the initial inspection, Dr. John Fisher was used as a consultant to review and make suggestions in regard to strain gage locations. Next, these points of interest were then instrumented with strain gages in order to monitor the behavior of the structure under dynamic loads. Finally, strain gage data were collected under varying traffic conditions and used to determine the response of the structure under these loads.

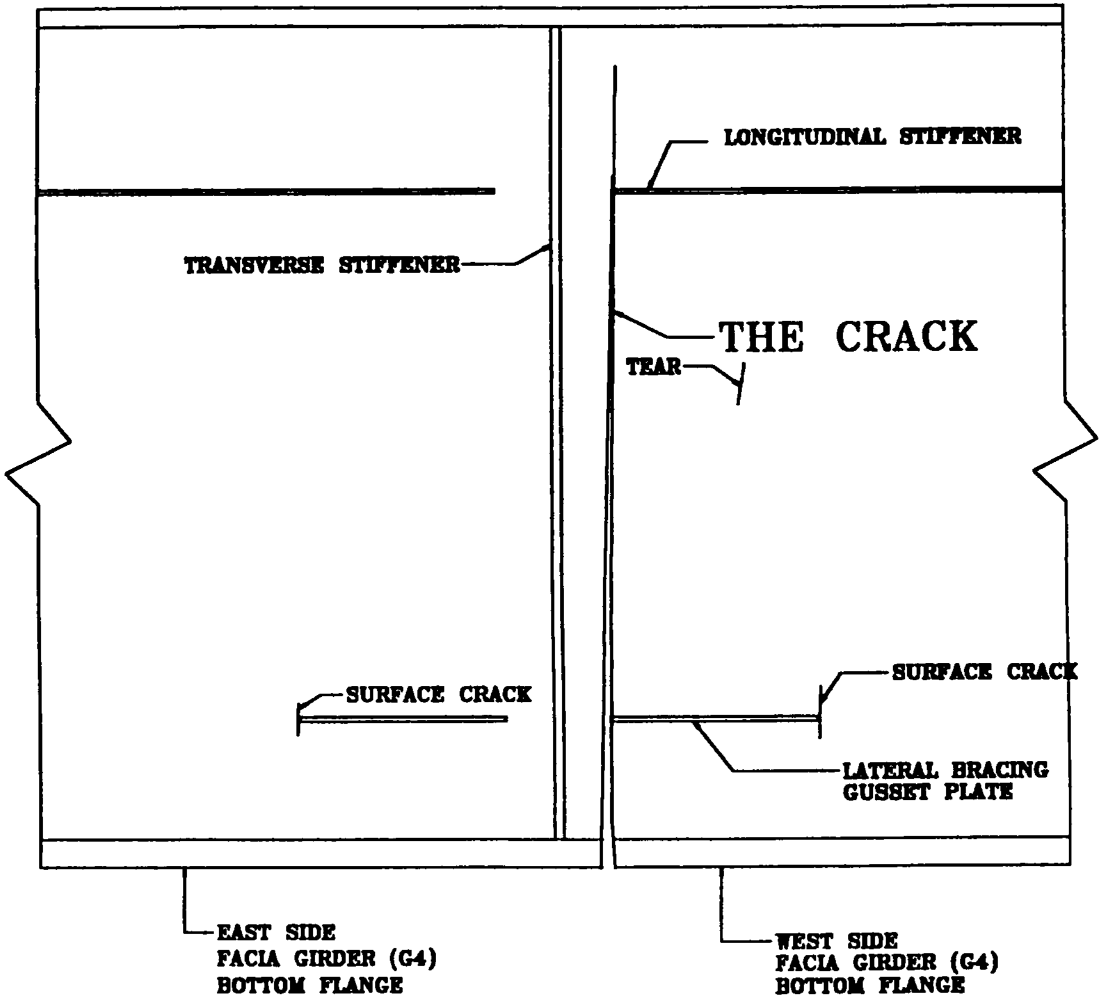


Figure 1.4: Elevation view of the eastbound fascia girder showing the failure.

1.3 Objective

On several occasions throughout the life of this research project, mitigating circumstances forced the traffic on the bridge to deviate from normal flow patterns. These circumstances included the retrofitting of the cantilever bracket - main girder - cross frame connections, repaving of the roadway surface, and replacement of the expansion joints at each end of the bridge. The patterns in which data were collected in both eastbound and westbound directions were as follows: right-hand and shoulder, left-hand and middle, and normal traffic. The objective of this thesis is to summarize the stresses measured at each strain gage under differing traffic patterns, analyze the data, and make recommendations based upon these analyses. From these summaries and investigation of the details where the gages are located, the effects of the variation of traffic flow on the fatigue life of these details can be evaluated. Because of the fact that stress levels were measured under a variety of different conditions, the results of this thesis can potentially be used as a basis for determining a method for altering traffic on similar types of bridges when the need arises.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Background on Fatigue Research

In the United States fatigue research began in earnest after WWII. Unforeseen cracks in battleships and aircraft created a need in the metallurgical and structural engineering disciplines to investigate the phenomena causing these cracks. Previously, fatigue was typically not considered important in civil engineering structures because the stress was either considered to be static rather than cyclic or so low as to be of no consequence. The purpose of this chapter is to review some of the literature related to fatigue prone details in highway bridges.

2.2 Fatigue Prone Details

Repetitive loadings have caused cracks to develop in certain bridge structures. These cracks can be attributed to the frequency of traffic, the magnitude of the induced stress range, and the type of detail.. There are several details common on welded structures that have been determined to be fatigue prone. The purpose of this section is to review some of the myriad of research done on these details.

2.2.1 Web Connection Plates

Web connection plates are ordinarily used to connect diaphragms and lateral bracing members to the main girders in a bridge structure. These web connection plates usually frame around a transverse stiffener. This particular detail has been fabricated in the past in a manner such that the lateral connection plates can be welded to the transverse stiffener or a web gap can be left between the weld for the lateral plate and the transverse stiffener as a result of coping the lateral plates. The typical web gap is illustrated in Figure 2.1. Both of these methods lend themselves to problems of fatigue cracking. The first method, known as intersecting welds, lends itself to load-induced fatigue cracking, and the second method leaves a web gap which lends itself to displacement-induced fatigue cracking.

The Lafayette Street Bridge located near St. Paul, Minnesota spans the Mississippi River and was one of the first bridges to develop a crack in one of its main girders at such a detail (7). In March of 1978 a crack was discovered in the outside facia girder of the Third Street Viaduct near Columbus, Ohio (7). The primary cause of these failures was the lack of fusion between the base metal and the welding agent created by the intersection of welds at the connection of the lateral connection plate to transverse stiffener. Appropriate retrofit methodology and a detailed discussion of each bridge are included in references (7,8).

The Canoe Creek Bridge located on Interstate 80 in Pennsylvania is an example of a structure that provided an understanding of the potential for distortion-induced fatigue cracking at lateral connection plates (4). This distortion-induced fatigue cracking is prevalent in the unstiffened web gap. The magnitude of distortion induced fatigue cracking depends upon the length of web plate over which the distortions must be absorbed (9). The

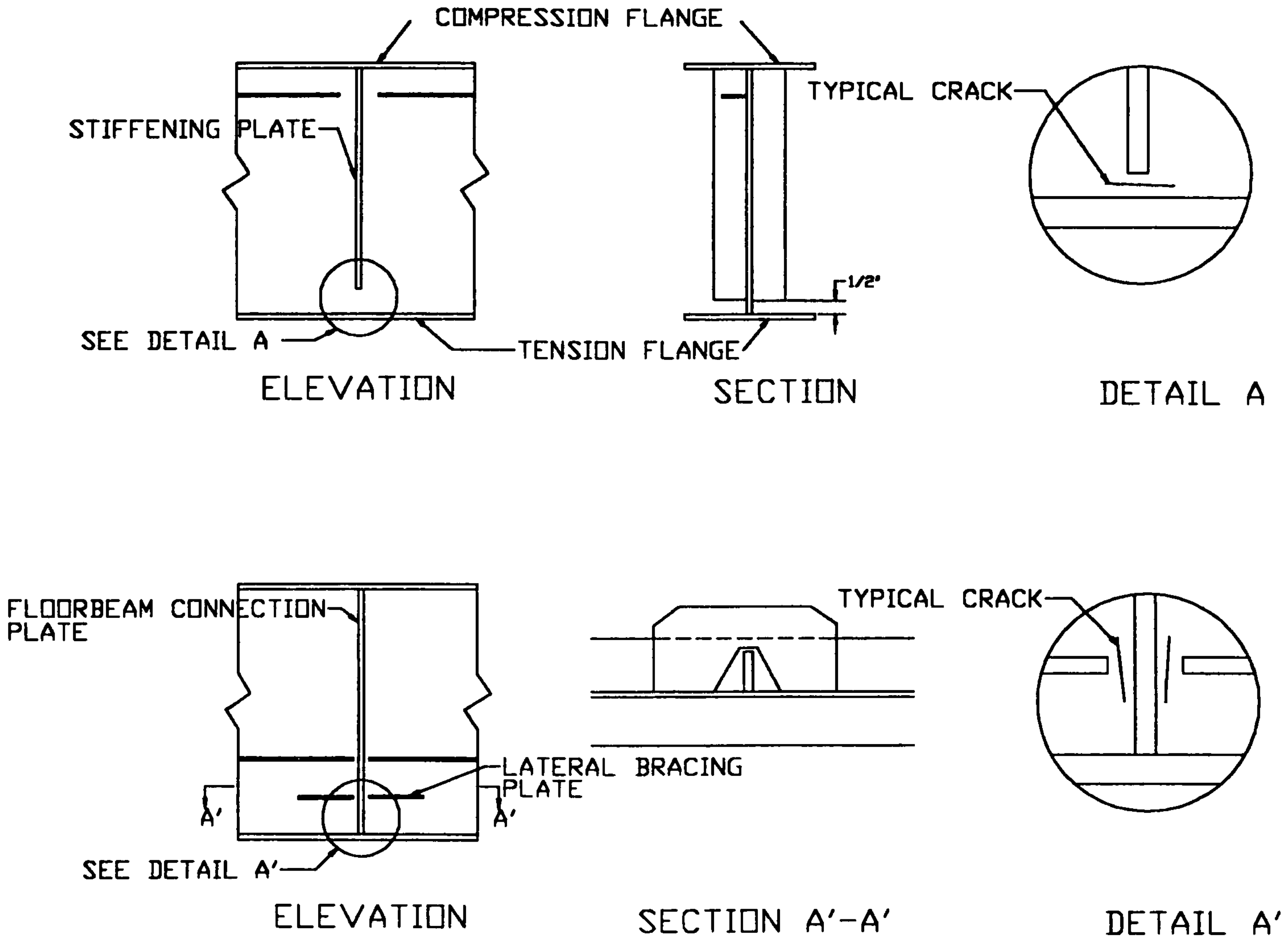


Figure 2.1: Typical web gap connection and resulting crack orientation.

No. 2682 bridge in West Virginia which crosses the Big Sandy River on Interstate 79 illustrated the need to identify the phenomena causing the distortion-induced fatigue cracks (4,8). This was done by visually inspecting the orientation of the cracks at the detail in question. The orientation of the crack relative to induced stress fields assisted in determining the cause of the cracks and therefore led to an appropriate retrofit procedure.

2.2.2 Beam-to-Girder Connections

In a number of bridge structures floorbeams are used as diaphragms. It has been the practice to cope or block a beam flange to provide some clearance at the beam-girder connection. This method of fabrication has been widely used due to the resulting ease of connecting the floorbeam to girder. Unfortunately, this technique causes problems with regard to fatigue cracking and can result in the type of cracks shown in Figure 2.2. Studies have shown that the bending resistance of members with their flanges removed can be reduced as much as 80-90 percent (6). Since most of these connections are assumed simple shear connections for design purposes, the resulting reduction in bending resistance can cause the connection to become partially fixed. This introduction of moment capacity can cause fatigue cracking in the bolts, floorbeam, and/or the connecting plate. It has been recommended to make this connection as flexible as possible in order to reduce the likelihood of these three failure modes occurring (15).

The Woodrow Wilson Memorial Bridge carries traffic over the Potomac River on I-95 near Washington, D.C.. It was concluded that the cracking at the cope in a floorbeam was due to the reduction in in-plane bending resistance and the end restraint provided by the

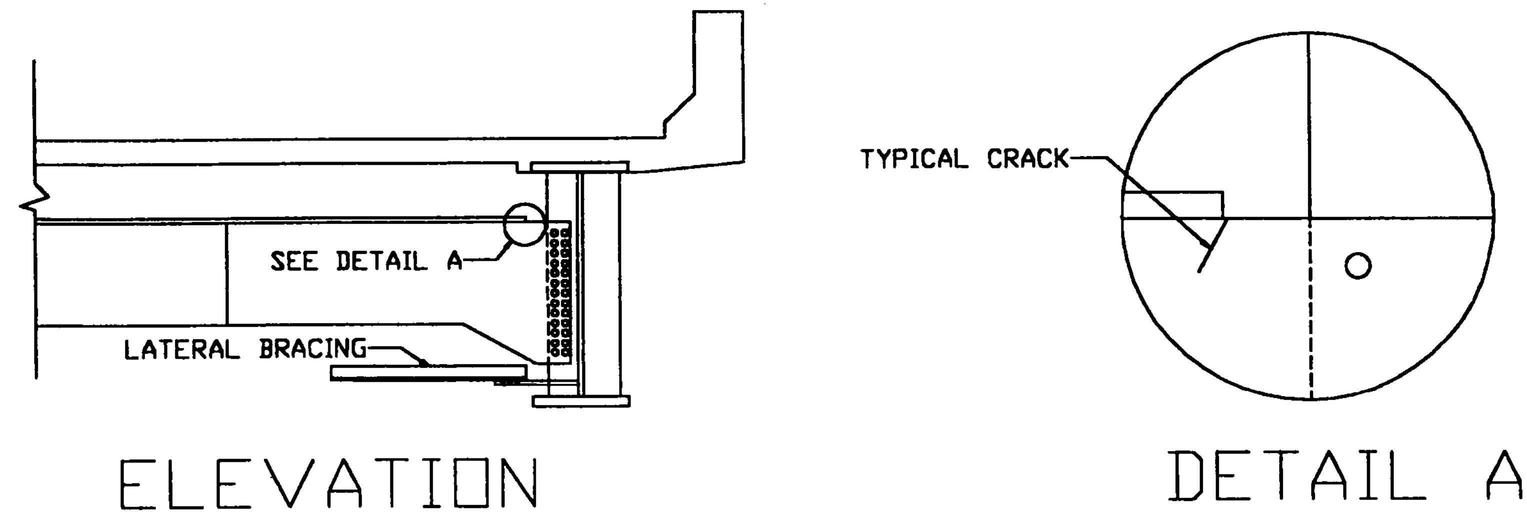


Figure 2.2: Typical floorbeam-girder connection and resulting crack orientation.

shear connection (4). The retrofit procedure at this detail included drilling a 1 inch diameter hole in the web at the cope (4). Another example of this particular type of connection causing fatigue cracking is bridge No. 2682 carrying traffic on I-79 in West Virginia (4).

2.3 Estimation of Fatigue Damage

2.3.1 S-N Curve Development

The fatigue characteristics of structural details are typically represented by an S-N curve. This curve is a log-log plot that shows the relationship between the stress range, S, and the number of loading cycles, N, causing the stress range responsible for the fatigue failure. A typical S-N curve is shown in Figure 2.3. These curves are based on an extensive amount of research initiated by the National Cooperative Highway Research Program (NCHRP) beginning in 1968. The NCHRP research was conducted in order to establish a statistically meaningful experimental program which related the number of cycles to failure to stress level for the various bridge details studied under the controlled laboratory conditions (6).

In order to develop a sound set of recommendations, approximately 500 test beams and plate girders were tested under this program (6). Each of the test specimens was fitted with typical bridge details and tested under constant amplitude loading until fatigue failure occurred. The resulting data points were plotted and a least squares linear regression was performed to establish a curve for each detail . The design curves used by AASHTO (1)

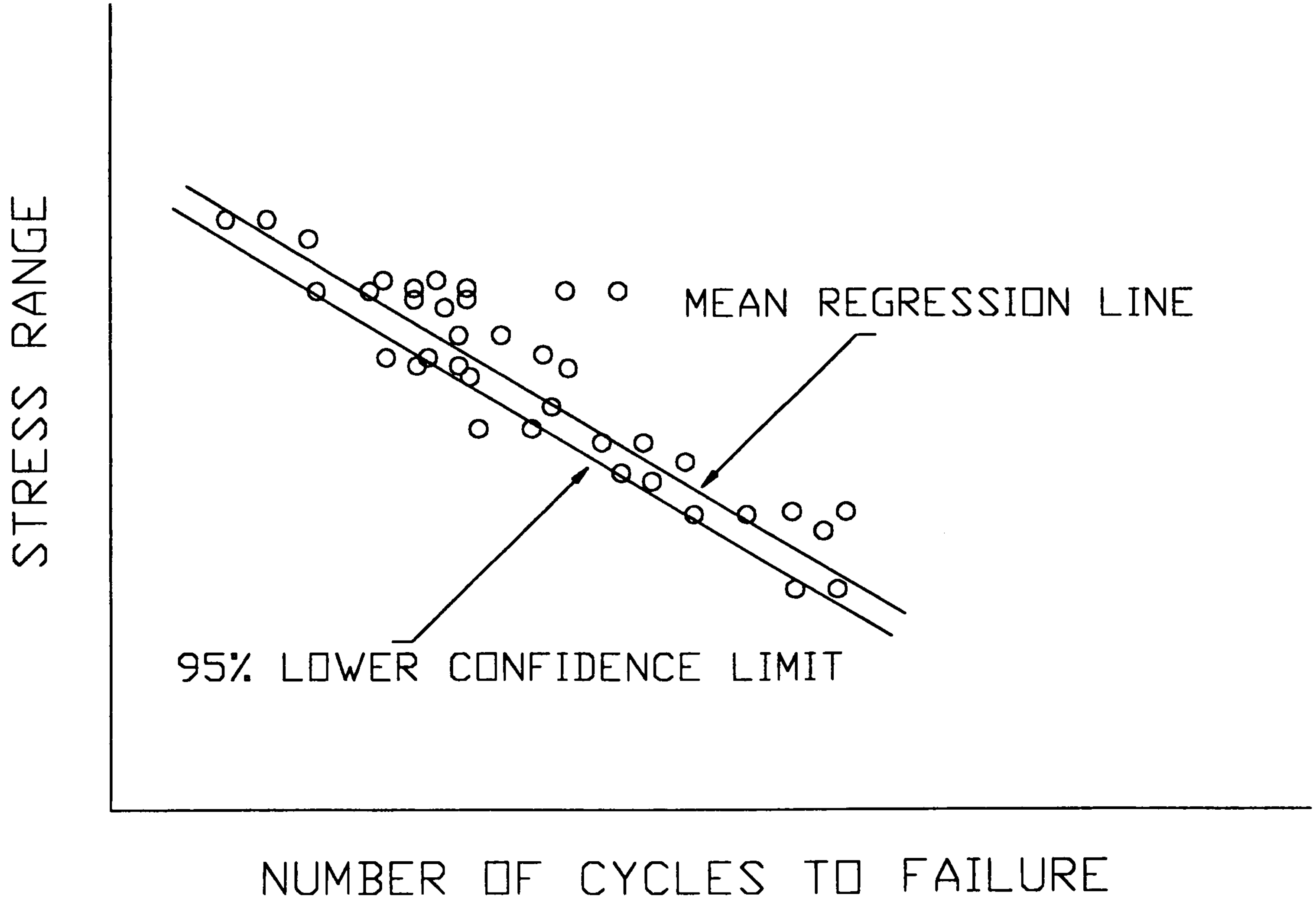


Figure 2.3: Typical S-N curve developed in NCHRP test program.

and AISC (2) represent a 95 percent (two standard deviations below the mean) confidence level that fatigue failure will not occur (6).

2.3.2 Classification of Details

The fatigue strength of a particular detail in a bridge structure is governed by either the initial discontinuities inherent in welding, a stress concentration resulting from geometrical irregularities, or a combination of both (18). To assist the design engineer the NCHRP research classified the numerous types of details tested. This classification system assigned an alphabetical letter for each detail ranging from the letter A, representing high fatigue resistance, through the letter E, representing low fatigue resistance. The letters B' and E' were added to the classification system as a result of later testing (13). The fatigue curves for each AASHTO classification are shown in Figure 2.4.

Category A classification reflects the optimum detail to resist fatigue cracking. This classification refers to the base metal, such as the surface of a rolled beam or plate, located away from a bolted or welded connection (18). Fatigue cracks are not likely to occur in these areas. The Category B classification encompasses the majority of welded details as well as high strength bolted connections (18). Examples of Category B welded details include longitudinal fillet and full penetration groove welds, transitioned flange splices, and transverse groove welds that are ground flush. The fatigue cracks in Category B details are generally attributed to the discontinuities in the weldments (6). Additional research has produced a subcategory referred to as Category B'. Category B' details include partial penetration groove welds, full penetration groove welds with the backing bars left in place,

Table 2.1 AASHTO Fatigue Limits

AASHTO FATIGUE LIMIT

CATEGORY	LOADING 1	LOADING 2	LOADING 3	LOADING 4
	100000	500000	2000000	> 2,000,000
A	63	37	24	24
B	49	29	18	16
B'	39	23	14.5	12
C	35.5	21	13	10
D	28	16	10	7
E	22	13	8	4.5
E'	16	9.2	5.8	2.6

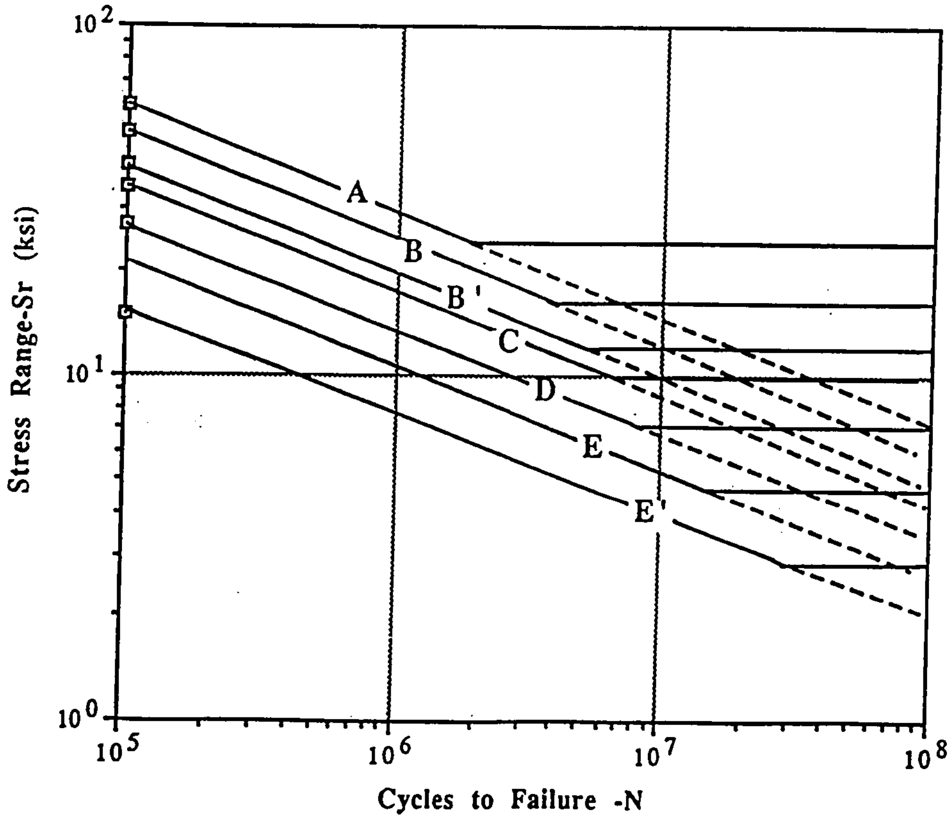


Figure 2.4: AASHTO S-N curves.

and straight transition splices with A709 Gr 100/100W steel (6).

The transition between the weld discontinuity and the geometrical stress concentration influencing the fatigue resistance occurs in Category C (6) . This transition is shown in Figure 2.5. Transverse stiffeners, vertical gusset plates, short (less than 2-inches) horizontal web attachments, and welded shear studs are examples of Category C details. Another transition zone, between high and low strength fatigue details, is shown in the Category D classification. Improvements to reduce the stress concentrations due to the geometrical configuration as well as attachment length affect the details in this category (6). Riveted connections and welded connections with sharp transition radii are examples of Category D details.

From a fatigue strength standpoint the most important detail classifications are Categories E and E'. These categories represent a wide variety of details that exhibit low fatigue strength where the governing criterion is the stress concentration at the weld toe (6). Examples of Category E details are coverplated beams, lateral gusset plates, and coped or blocked flanges. The difference between Category E details and Category E' details is related to the thickness of either the plate being attached or the thickness of the flange. According to oral communication from John Fisher, the web gap can also be considered a category E' detail due to the two dimensional stress state present.

2.3.3 Effective Stress Range Determination

The fatigue curves described in Section 2.3.1 were developed under a constant-amplitude loading condition. Traffic flowing over a bridge produces a variable-amplitude

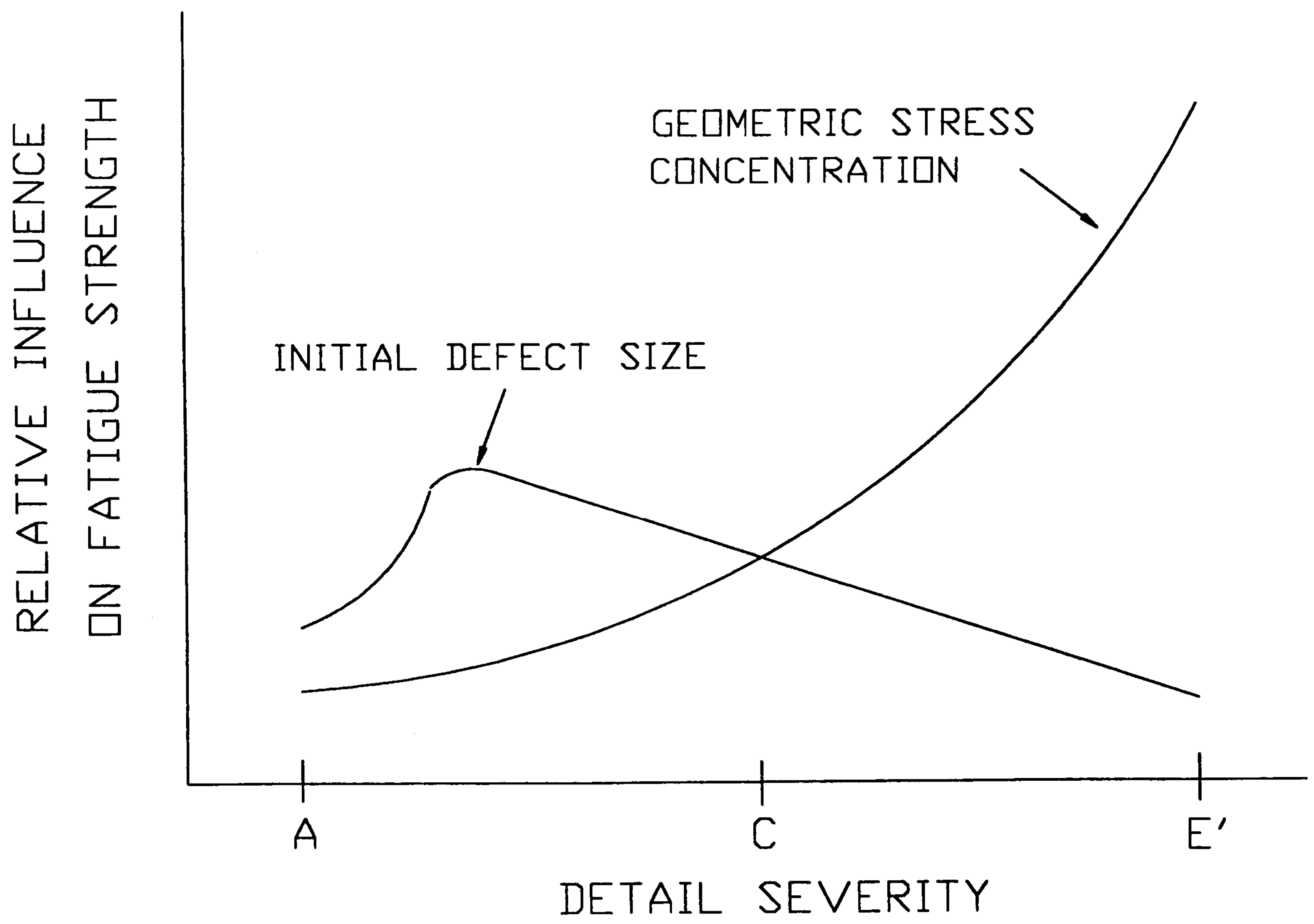


Figure 2.5: Transition between influence on fatigue behavior.

loading condition. In order to utilize the results of the NCHRP research, an equation for relating the constant-amplitude fatigue strength to the variable-amplitude fatigue strength was developed (16). This relationship can be calculated using a stress-range histogram obtained from field measurements on the bridge. The equation is given as:

$$S_r = (\Sigma f_i S^3_{ri})^{1/3}$$

where f_i = fraction of stress ranges within an interval i, S_{ri} = midwidth of stress interval i, and S_r = effective stress range.

This equation, referred to as the root-mean-cubed formula, is based upon Miner's cumulative damage theory (14) and a calculated slope of -3.0 for the S-N curves developed in the NCHRP project (6). This theory is generally referred to as "Miner's Law" and is based on the notion that the fatigue damage experienced under variable amplitude loading is represented by the expression:

$$\Sigma\ n_i/N_i = 1$$

where,

n_i/N_i represents the incremental damage experienced under a constant stress range S_{ri}. The value of N_i represents the constant amplitude cycles to failure at the same stress range. Failure, according to Miner, occurs when this incremental damage approaches unity. The calculated root-mean-cubed (RMC) value was proven to be adequate for use in predicting the fatigue strength of bridge details (10,16).

CHAPTER 3

ASSESSMENT OF THE HOLSTON RIVER BRIDGE

3.1 Introduction

Immediately after discovering the fracture in the eastbound fascia girder, the Tennessee Department of Transportation initiated a plan to repair the damaged girder. The methodology and repair sequence is outlined in Section 3.2. After the fractured girder was successfully repaired, steps were taken to identify the likely cause of failure. Initial inspection of the failure led to a consensus that the failure was due to the out of plane distortion brought about by the cantilever bracket-girder web connection. Therefore, this connection was retrofitted in order to eliminate the perceived cause of failure.

The first step in the research project called for evaluating the bridge plans. After the plans were reviewed, several details were deemed critical and marked for further observation. There were several common fatigue prone details identified. These fatigue prone details are discussed at length in Section 3.3.

3.2 Fracture Repair Sequence and Retrofit Methodology

The Tennessee Department of Transportation instituted a step by step process to repair the fascia girder in the eastbound direction. The first step was to channel traffic away from the shoulder and outside lane into the middle and left-hand lanes. After this was accomplished the repair process was able to begin. The following is a brief discussion of the sequence that took place.

High strength bolts were attached to the bottom flange of the fractured girder and connected to four steel girders on the bridge deck using hanger rods. The bottom flange of the girder was then partially jacked back into place with the use of hydraulic rams. While in this position the bolts on the bottom flange of the girder were tightened and the bottom flange was welded back together. Finally, splice plates were bolted to both sides of the bottom flange and web to further ensure that the repair was going to be effective. Since completion of the repair there has been no major structural problem with the exception of some minor ponding on the roadway deck in the vicinity of the failure location.

Following the repair of the fascia girder, steps were taken to ensure that a similar type of failure would not occur in the future. Since the failure was initially considered to be caused by the out of plane distortion induced by the cantilever bracket-girder web connection, this was the logical place to retrofit. The retrofit was achieved by adding a plate to the bottom flange of the existing cantilever structure. This new plate frames into the girder web coinciding with the lateral connection plate used for the cross frames. As a result of this procedure the resulting out of plane forces are transferred from the cross frame to the girder web where the failure took place. With this scenario the out of plane distortion is greatly reduced with regard to the cantilever bracket as is any out of plane distortion caused by the cross frames or lateral braces.

The important fact should be noted that, after careful review, the failure was attributed to the out of plane distortion in the web gap caused by the cross frames and lateral X-bracing. The distortions caused by the cantilever brackets were found to be negligible.

3.3 Identification of Fatigue Prone Details

After the girder was successfully repaired and the retrofit completed, TDOT decided to implement the proposed research project in conjunction with the University of Tennessee Transportation Center. The research project was started in January 1993.

The research project called for implementing a procedure to estimate the remaining fatigue life of the structure. In order to predict the remaining fatigue life of a bridge structure the remaining fatigue life of each individual detail must be determined. Therefore, the most critical fatigue details were identified on the Holston River Bridge (HRB). This was done by first examining the bridge plans and then visually inspecting the bridge structure itself. The HRB research staff with consultation from Dr. John Fisher, considered to be the leading expert on structural fatigue in the United States, determined the details that should be instrumented with strain gages for further study.

There were several locations on the bridge that were deemed critical from a fatigue standpoint. The failure location was one of the obvious choices; therefore, instrumentation was concentrated around this particular area. The failure occurred in the 240 foot second span at approximately the one-third point of the span. In the second span the cross frames are composed of double angle truss members which frame into the main girder web at a transverse stiffener. These cross frames support rolled wide flange shapes which act as stringers for the roadway deck. T-sections are used as diagonal cross bracing and frame into the girder web at the same location as the bottom chord of the cross frame.

Lateral plates were welded to the web of the fascia girders to serve as tabs for the gusset plates carrying the cross frames and the diagonal cross bracing. In order to ease construction this detail was fabricated by terminating the lateral plates four inches from the transverse stiffener on both sides. This was also done to avoid intersecting the welds for the transverse stiffener and the lateral plates. With this method of fabrication a four inch web gap resulted between the end of the lateral plate and the transverse stiffener. In addition to locations at the web gap, strain gages were attached to the web of the main girder at the weld toe for the lateral plates adjacent to the web gap location. This location was instrumented to measure the stresses and stress cycles seen at the weld toe.

In the second span, the top chord, bottom chord, first truss diagonal, and second truss diagonal were instrumented to determine the behavior of these structural components under applied loads. The gusset plates connecting these members were also instrumented because of the category E classification. Furthermore, the flanges of the diagonal cross bracing were instrumented to determine the out of plane forces being introduced. This connection was also determined to be a category E detail.

In the other seven spans of the bridge, floor beams span between the main girders. The floor beams are plate girders used to support the stringers carrying the roadway deck. The web of the floor beam was bolted to a vertical stiffener. This connection was effected by terminating the top and bottom flanges of the floor beam while extending the floor beam web. The geometrical stress concentration that results in the web at the flange termination was seen as a potential fatigue prone detail and therefore noted for further observation. Likewise, the connection for the diagonal cross bracing in each of the other spans resembles that in the second span. Therefore, this connection was investigated in the first span to compare with the investigation in the second span.

3.4 Gage Locations

After the critical fatigue prone locations were identified by the research team, they were instrumented for testing. Several sample locations on the bridge were chosen in order to come to a full understanding of the fatigue behavior. These locations are shown in Figure 3.1. The research team decided on three locations that were similar to the location of the failure. These locations are referred to herein as Locations 1A, 1B, 1C, and 1D. Location 1A is at the eastbound fascia girder where the failure took place. Location 1B is also on the eastbound fascia girder at a similar location except that it is three cross frames east of location 1A. Locations 1C and 1D are at the exact same locations as 1A and 1B, respectfully, except that they are on the westbound fascia girder. Figures 3.2 and 3.3 show the typical gage layouts for these four locations.

Since the floorbeams were deemed critical from a fatigue standpoint, they were instrumented. Location 2 refers to the second floorbeam in the first span at the west abutment. Location 3 is in the same span except at the first floorbeam where the diagonal lateral cross bracing was attached. Furthermore, location 7 is similar to locations 2 and 3 except that it is located in the third span between pier numbers 2 and 3. The gage layouts for

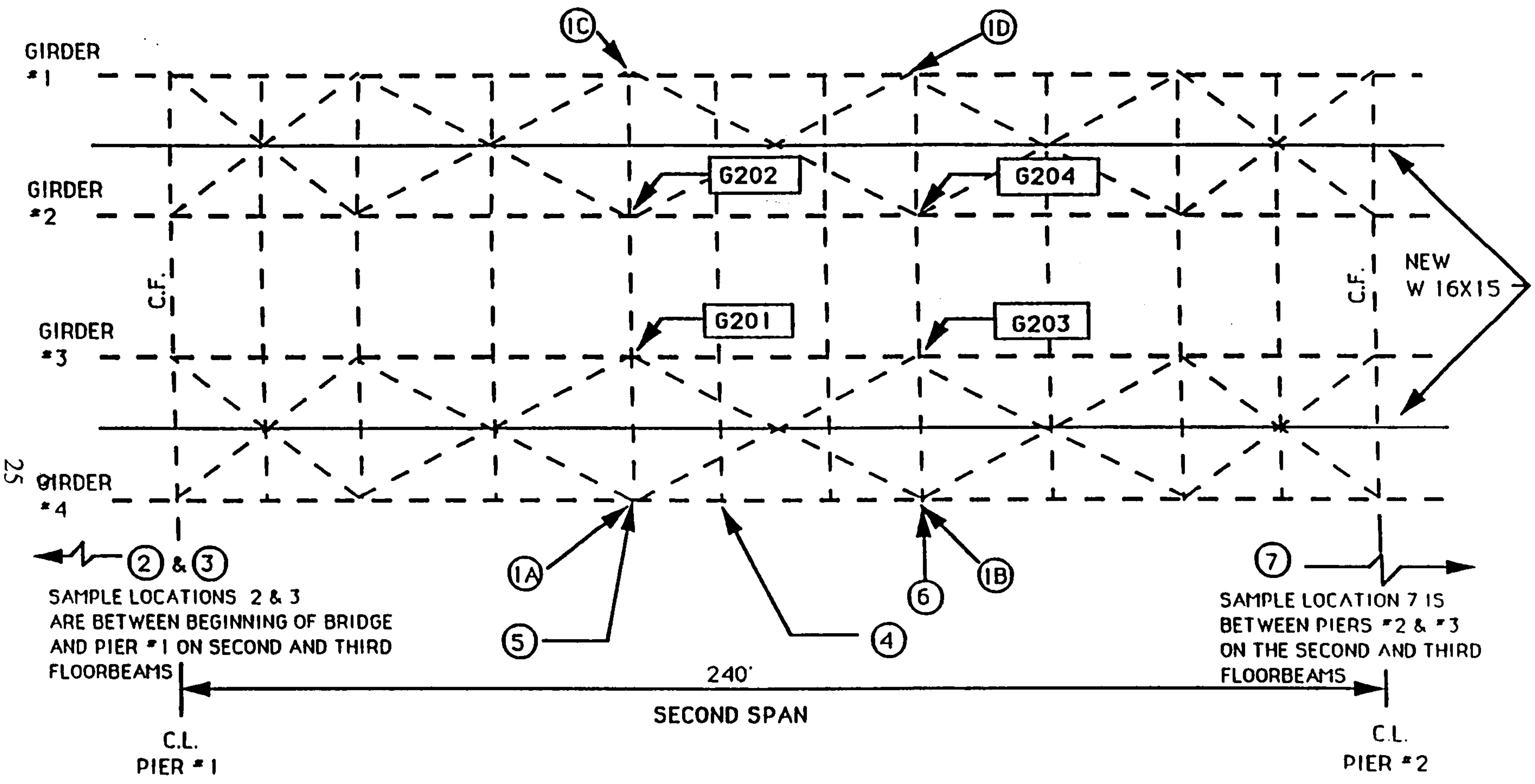


Figure 3.1: Plan view showing testing locations.

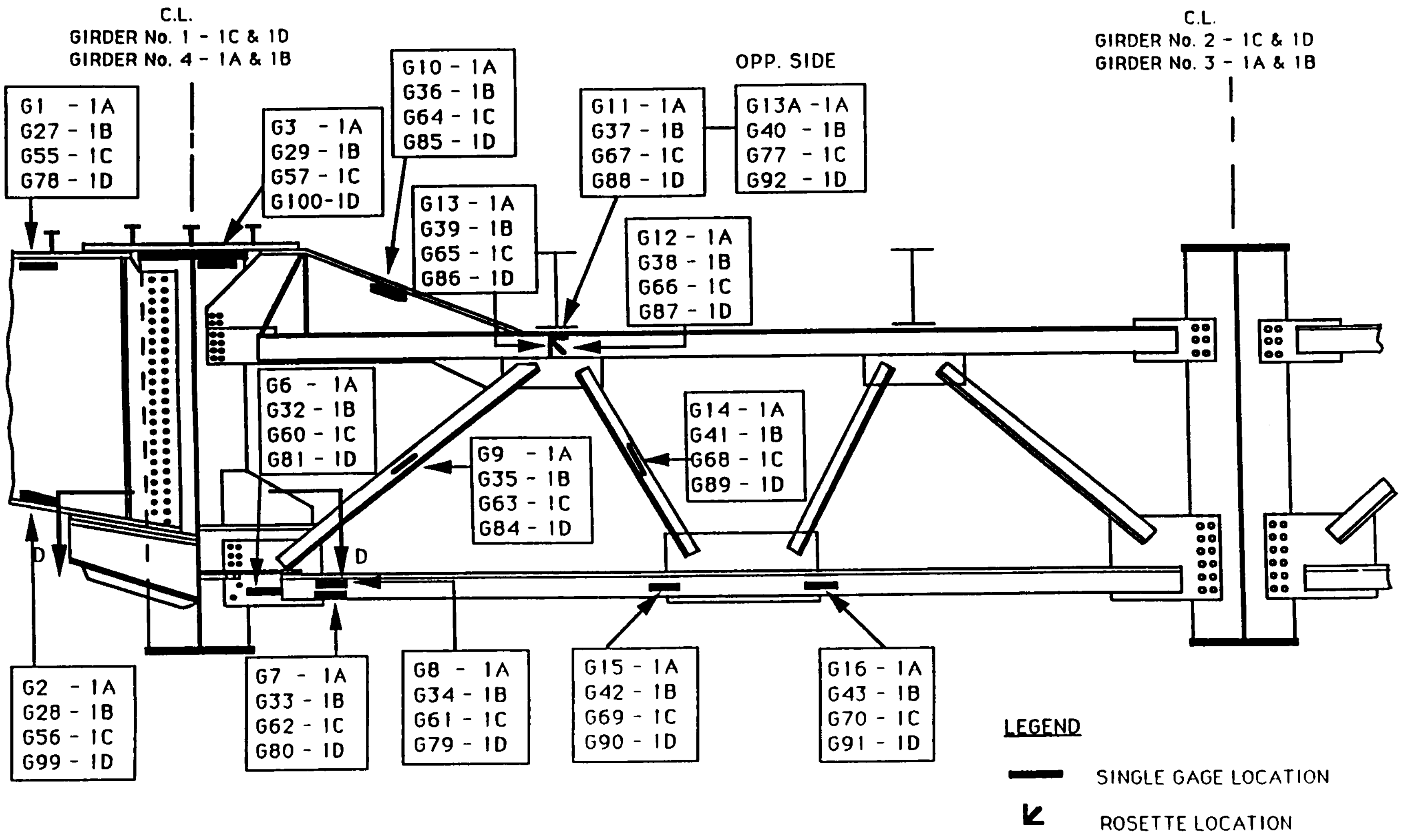


Figure 3.2: Gage locations for Locations 1A,1B,1C, & 1D

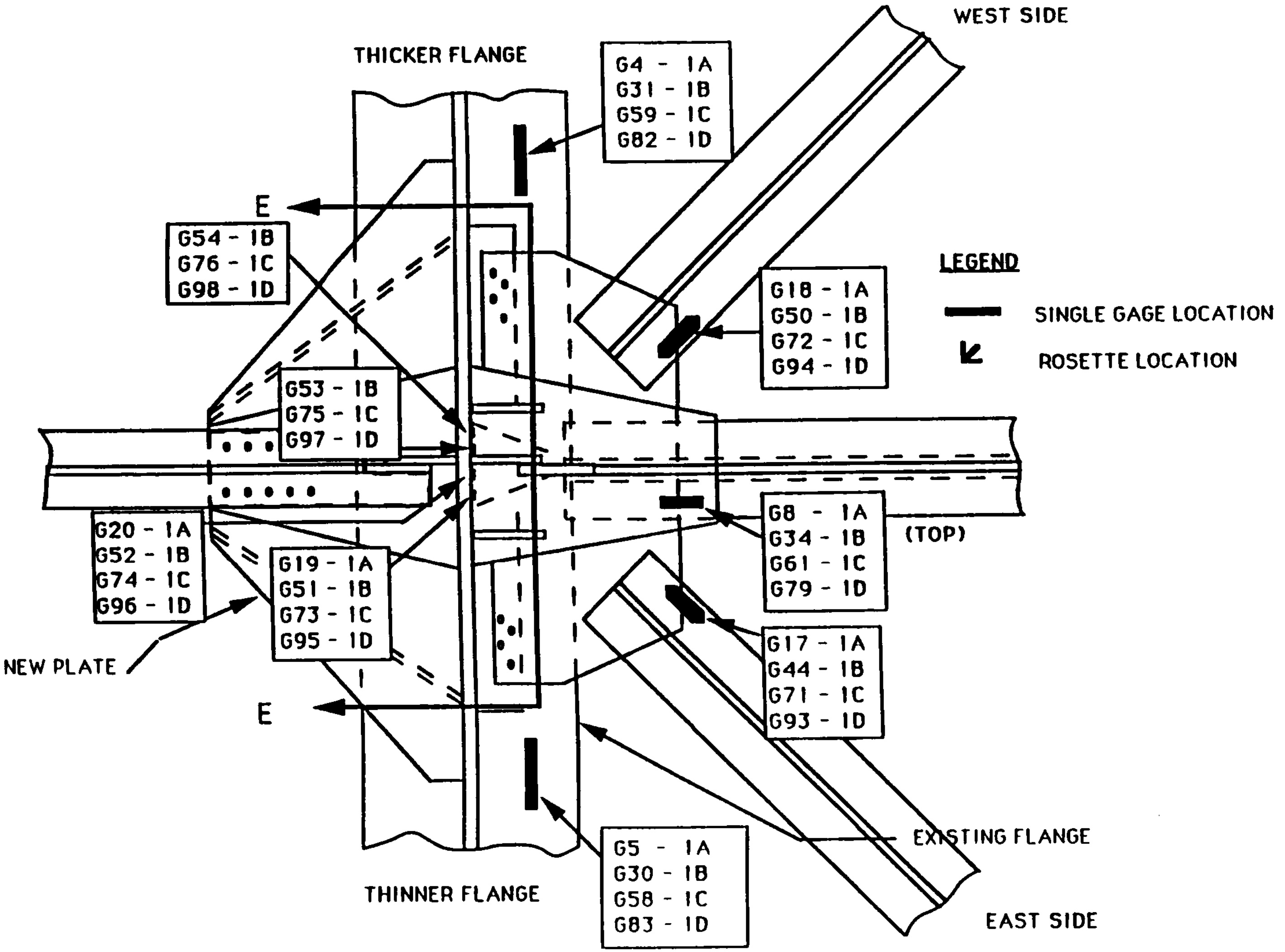


Figure 3.3: Gage Locations for Locations 1A,1B,1C, & 1D (Section D-D)

locations 2 and 7 are shown in Figure 3.4, and the gage layouts for locations 3 and 7 are shown in Figure 3.5.

Locations 4, 5, and 6 are similar in that they are at the end of the retrofit plate on the inside of the girder number 4 web. Typical gage layouts for these three locations are shown in Figures 3.6 thru 3.8. The only difference is that location 4 is located at the next cross frame east of the failure location where no lateral X-bracing frames into the web. Location 6 is at the end of the retrofit plate coinciding with Location 1B. Also, Location 5 is at the failure location where some small tears were discovered in the web of girder number 4.

Tables 3.1 thru 3.4 summarize the gage numbers as well as the location of each gage used on the HRB project. These tables also give a description of each gage location and the fatigue category classification associated with each gage. There were a total of one-hundred and thirty-seven gages monitored at some time during the research project.

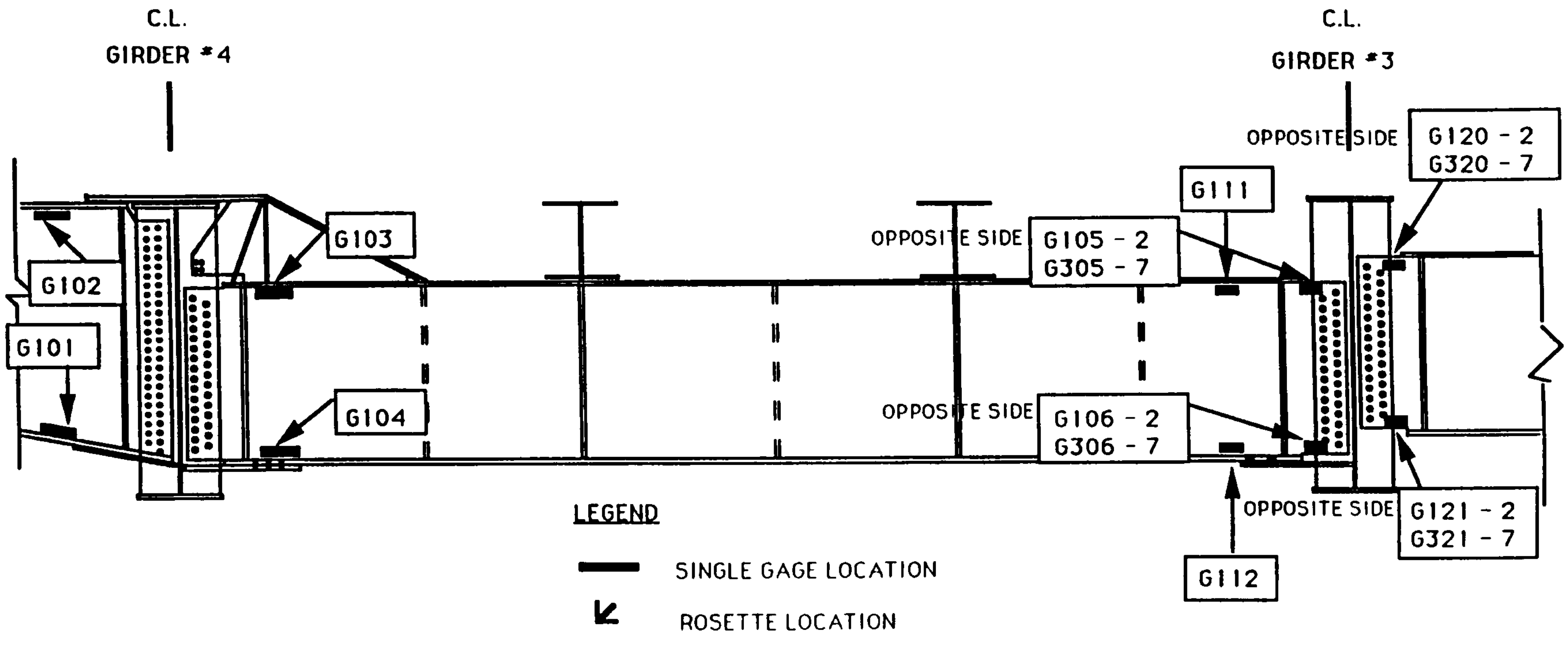


Figure 3.4: Gage Locations for Locations 2 & 7

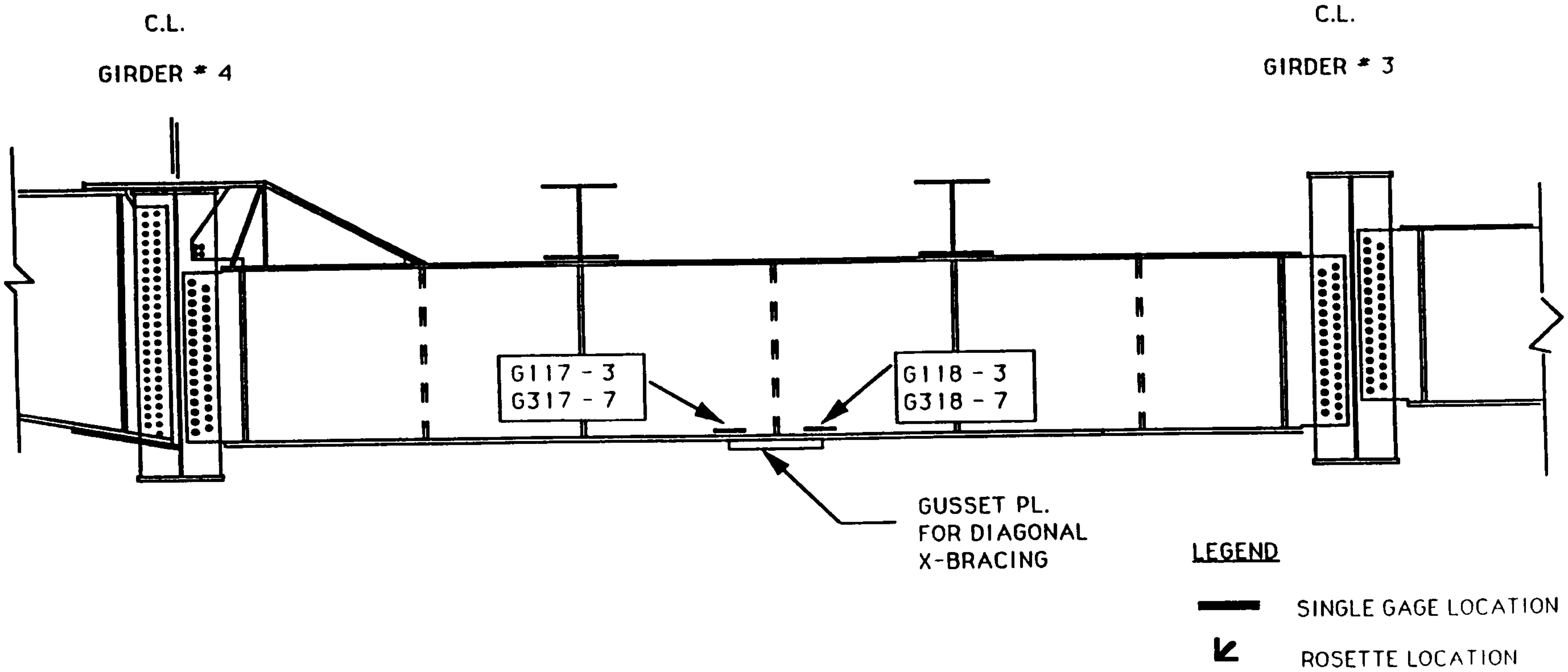


Figure 3.5: Gage Locations for Locations 3 & 7

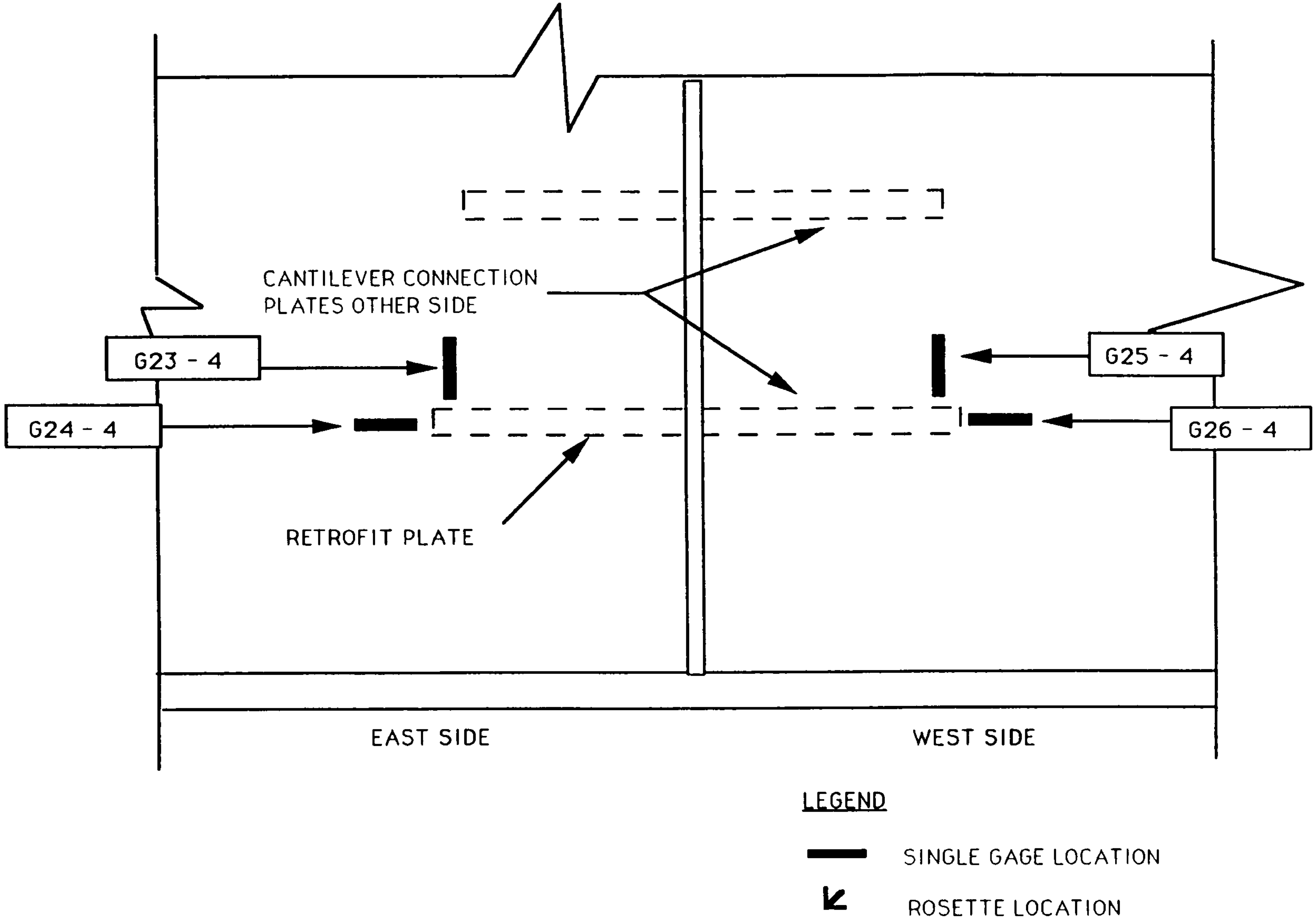


Figure 3.6: Gage Locations for Location 4

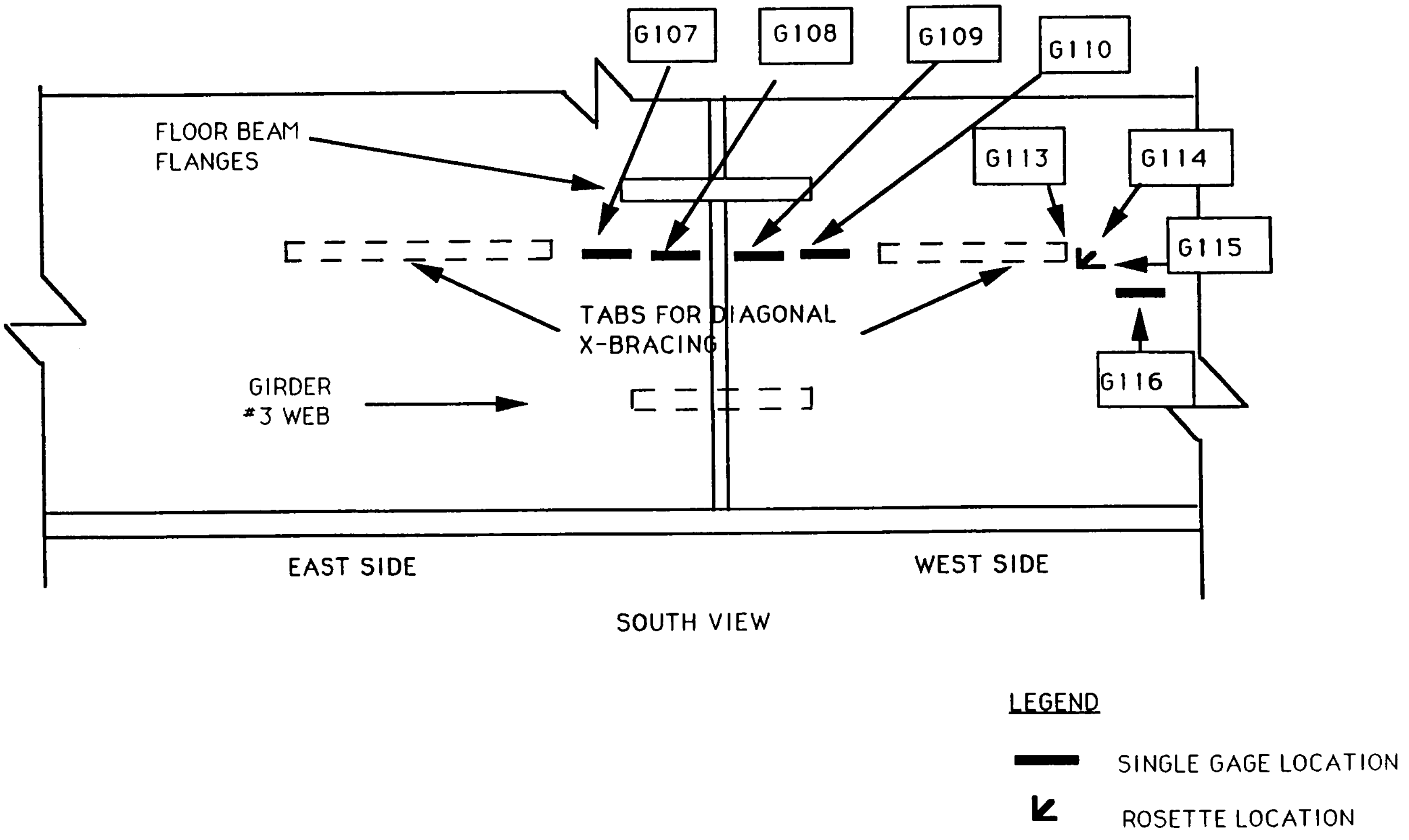


Figure 3.7: Gage Locations for Location 2 (South View)

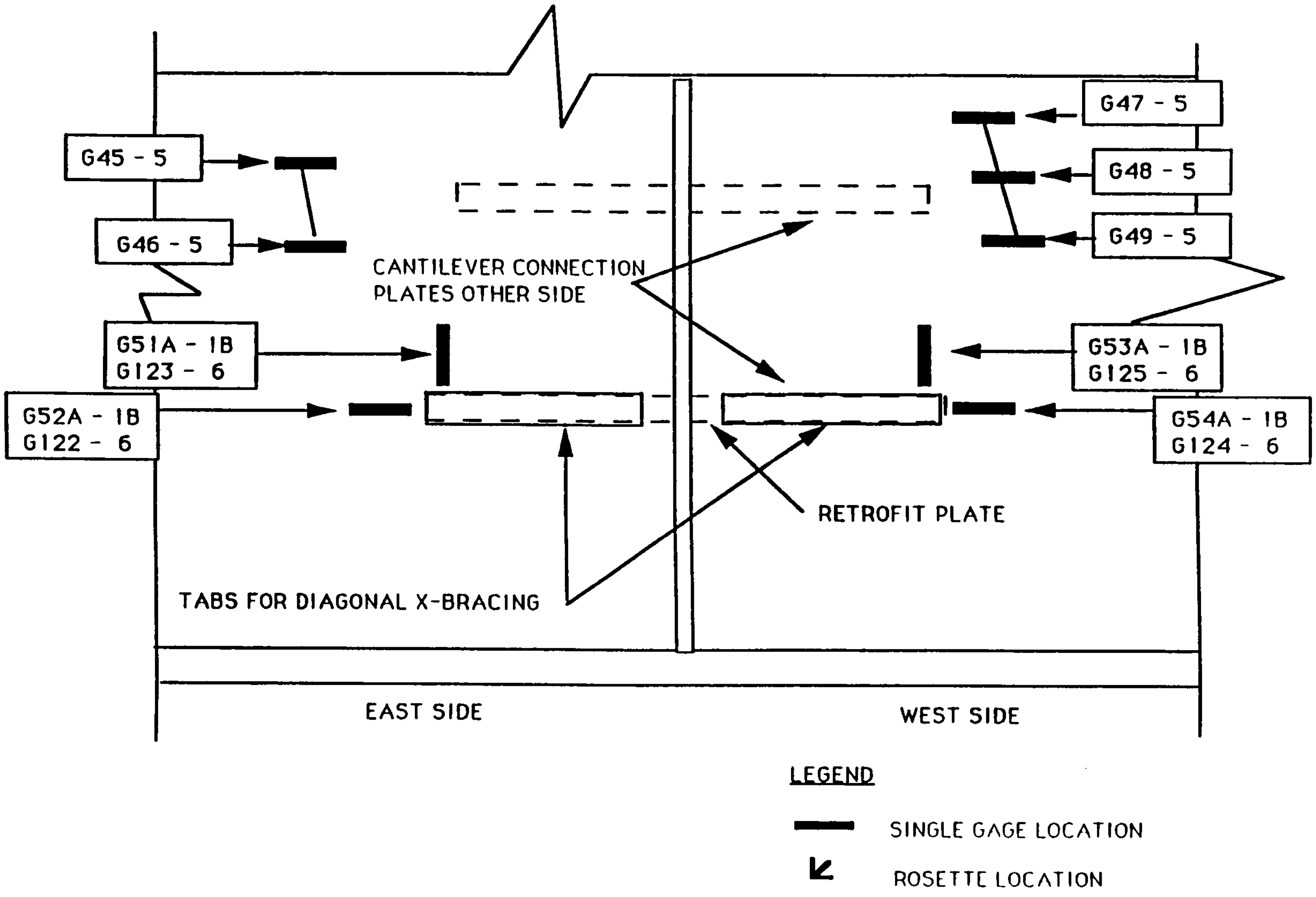


Figure 3.8: Gage Locations for Locations 1B (Section E-E), 5, & 6

Table 3.1 - Gage Information (Gages 1-40)

GAGE NUMBER	GAGE LOCATION	FATIGUE CATEGORY	DETAIL DESCRIPTION
1	1A	A	Top flange of cantilever bracket
2	1A	A	Bottom flange of cantilver bracket
3	1A	A	Top flange of girder #4
4	1A	A	Thick bottom flange of girder #4 on eastside
5	1A	A	Thin bottom flange of girder #4 on westside
6	1A	A	Gusset plate at end of bottom chord of cross frame
7	1A	B	Bottom gage cross frame bottom chord at first diagonal
8	1A	A	Top gage cross frame bottom chord at first diagonal
9	1A	A	First truss diagonal of cross frame
10	1A	A	Top flange of knee brace
11	1A	A	Horizontal Rosette - cross frame top chord
12	1A	A	45 Degree Rosette - cross frame top chord
13	1A	A	Vertical Rosette - cross frame top chord
13A	1A	A	Horizontal gage cross frame top chord opposite gage 11
14	1A	A	Second truss diagonal of cross frame
15	1A	E	End of gusset plate at cross frame 2nd truss diagonal
16	1A	E	End of gusset plate at cross frame 3rd truss diagonal
17	1A	E	Flange of lateral X-bracing at gusset plate on eastside
18	1A	E	Flange of lateral X-bracing at gusset plate on westside
19	1A	E'	Web gap near lateral gusset plate on eastside
20	1A	E'	Web gap near transverse stiffener on eastside
21	NOT	USED	
22	NOT	USED	
23	4	E	Vertical gage at end of retrofit plate on east side
24	4	E	Horizontal gage at end of retrofit plate on east side
25	4	E	Vertical gage at end of retrofit plate on west side
26	4	E	Horizontal gage at end of retrofit plate on east side
27	1B	A	Top flange of cantilever bracket
28	1B	A	Bottom flange of cantilver bracket
29	1B	A	Top flange of girder #4
30	1B	A	Thick bottom flange of girder #4 on eastside
31	1B	A	Thin bottom flange of girder #4 on westside
32	1B	A	Gusset plate at end of bottom chord of cross frame
33	1B	B	Bottom gage cross frame bottom chord at first diagonal
34	1B	A	Top gage cross frame bottom chord at first diagonal
35	1B	A	First truss diagonal of cross frame
36	1B	A	Top flange of knee brace
37	1B	A	Horizontal Rosette - cross frame top chord
38	1B	A	45 Degree Rosette - cross frame top chord
39	1B	A	Vertical Rosette - cross frame top chord
40	1B	A	Horizontal gage cross frame top chord opposite gage 37

Table 3.2 - Gage Information (Gages 41-77)

GAGE NUMBER	GAGE LOCATION	FATIGUE CATEGORY	DETAIL DESCRIPTION
41	1B	A	Second truss diagonal of cross frame
42	1B	E	End of gusset plate at cross frame 2nd truss diagonal
43	1B	E	End of gusset plate at cross frame 3rd truss diagonal
44	1B	E	Flange of lateral X-bracing at gusset plate on eastside
45	5	E	End of lateral gusset above 2" tear on eastside
46	5	E	End of lateral gusset below 2" tear on eastside
47	5	E	End of lateral gusset above 6" tear on westside
48	5	E	End of lateral gusset across 6" tear on westside
49	5	E	End of lateral gusset below 6" tear on westside
50	1B	E	Flange of lateral X-bracing at gusset plate on westside
51	1B	E'	Web gap near lateral gusset plate on eastside
51A	1B	E	Vertical gage at end of lateral gusset plate on eastside
52	1B	E'	Web gap near transverse stiffener on eastside
52A	1B	E	Horizontal gage at end of lateral gusset plate on eastside
53	1B	E'	Web gap near transverse stiffener on westside
53A	1B	E	Vertical gage at end of lateral gusset plate on westside
54	1B	E'	Web gap near lateral gusset plate on westside
54A	1B	E	Horizontal gage at end of lateral gusset plate on westside
55	1C	A	Top flange of cantilever bracket
56	1C	A	Bottom flange of cantilver bracket
57	1C	A	Top flange of girder #1
58	1C	A	Thin bottom flange of girder #1 on eastside
59	1C	A	Thick bottom flange of girder #1 on westside
60	1C	A	Gusset plate at end of bottom chord of cross frame
61	1C	B	Top gage cross frame bottom chord at first diagonal
62	1C	A	Bottom gage cross frame bottom chord at first diagonal
63	1C	A	First truss diagonal of cross frame
64	1C	A	Top flange of knee brace
65	1C	A	Vertical Rosette - cross frame top chord
66	1C	A	45 Degree Rosette - cross frame top chord
67	1C	A	Horizontal Rosette - cross frame top chord
68	1C	A	Second truss diagonal of cross frame
69	1C	E	End of gusset plate at cross frame 2nd truss diagonal
70	1C	E	End of gusset plate at cross frame 3rd truss diagonal
71	1C	E	Flange of lateral X-bracing at gusset plate on westside
72	1C	E	Flange of lateral X-bracing at gusset plate on eastside
73	1C	E'	Web gap near lateral gusset plate on westside
74	1C	E'	Web gap near transverse stiffener on westside
75	1C	E'	Web gap near transverse stiffener on eastside
76	1C	E'	Web gap near lateral gusset plate on eastside
77	1C	A	Horizontal gage cross frame top chord opposite gage 67

Table 3.3 - Gage Information (Gages 78 -118)

GAGE NUMBER	GAGE LOCATION	FATIGUE CATEGORY	DETAIL DESCRIPTION
78	1D	A	Top flange of cantilever bracket
79	1D	B	Top gage cross frame bottom chord at first diagonal
80	1D	A	Bottom gage cross frame bottom chord at first diagonal
81	1D	A	Gusset plate at end of bottom chord of cross frame
82	1D	A	Thick bottom flange of girder #1 on eastside
83	1D	A	Thin bottom flange of girder #1 on westside
84	1D	A	First truss diagonal of cross frame
85	1D	A	Top flange of knee brace
86	1D	A	Vertical Rosette - cross frame top chord
87	1D	A	45 Degree Rosette - cross frame top chord
88	1D	A	Horizontal Rosette - cross frame top chord
89	1D	A	Second truss diagonal of cross frame
90	1D	E	End of gusset plate at cross frame 2nd truss diagonal
91	1D	E	End of gusset plate at cross frame 3rd truss diagonal
92	1D	A	Horizontal gage cross frame top chord opposite gage 88
93	1D	E	Flange of lateral X-bracing at gusset plate on westside
94	1D	E	Flange of lateral X-bracing at gusset plate on eastside
95	1D	E'	Web gap near lateral gusset plate on westside
96	1D	E'	Web gap near transverse stiffener on westside
97	1D	E'	Web gap near transverse stiffener on eastside
98	1D	E'	Web gap near lateral gusset plate on eastside
99	1D	A	Bottom flange of cantilver bracket
100	1D	A	Top flange of girder #1
101	2	A	Bottom flange of cantilver bracket
102	2	A	Top flange of cantilver bracket
103	2	B	Floor beam web near top flange at girder #4
104	2	B	Floor beam web near bottom flange at girder #4
105	2	E	Floor beam web at top flange termination south side of girder #3
106	2	E	Floor beam web at bottom flange termination south side of girder #3
107	2	E'	Web gap near lateral gusset plate on eastside at girder #3
108	2	E'	Web gap near transverse stiffener on eastside at girder #3
109	2	E'	Web gap near transverse stiffener on westside at girder #3
110	2	E'	Web gap near lateral gusset plate on westside at girder #3
111	2	B	Floor beam web near top flange at girder #3 north side
112	2	B	Floor beam web near bottom flange at girder #3 north side
113	2	E	Vertical Rosette on girder #3 web at end of lateral gusset plate
114	2	E	45 degree Rosette on girder #3 web at end of lateral gusset plate
115	2	E	Horizontal Rosette on girder #3 web at end of lateral gusset plate
116	2	E	Horizontal gage adjacent to and below gage 115
117	3	E	Floor beam bottom flange at end of gusset plate for X-bracing south
118	3	E	Floor beam bottom flange at end of gusset plate for X-bracing north

Table 3.4 - Gage Information (Gages 119-321)

GAGE NUMBER	GAGE LOCATION	FATIGUE CATEGORY	DETAIL DESCRIPTION
119	NOT	USED	
120	2	E	Floor beam web at top flange termination north side of girder #3
121	2	E	Floor beam web at bottom flange termination north side of girder #3
122	6	E	Horizontal gage at end of retrofit plate east
123	6	E	Vertical gage at end of retrofit plate east
124	6	E	Horizontal gage at end of retrofit plate west
125	6	E	Vertical gage at end of retrofit plate west
201	201	A	Bottom flange of girder #3 at location 201
202	202	A	Bottom flange of girder #2 at location 202
203	203	A	Bottom flange of girder #3 at location 203
204	204	A	Bottom flange of girder #2 at location 204
305	7	E	Floor beam web at top flange termination south side of girder #3
306	7	E	Floor beam web at top flange termination south side of girder #3
317	7	E	Floor beam bottom flange at end of gusset plate for X-bracing south
318	7	E	Floor beam bottom flange at end of gusset plate for X-bracing north
320	7	E	Floor beam web at top flange termination north side of girder #3
321	7	E	Floor beam web at bottom flange termination north side of girder #3

CHAPTER 4

PRESENTATION OF SUMMARIZED DATA

4.1 Data Acquisition System

The data collection system used for the HRB project included the following: Optim Megadac, TCS 3000, Zenith 486, and Micromeasurement strain gages. This system was chosen based on the past experience of the research staff in collecting dynamic data on other projects.

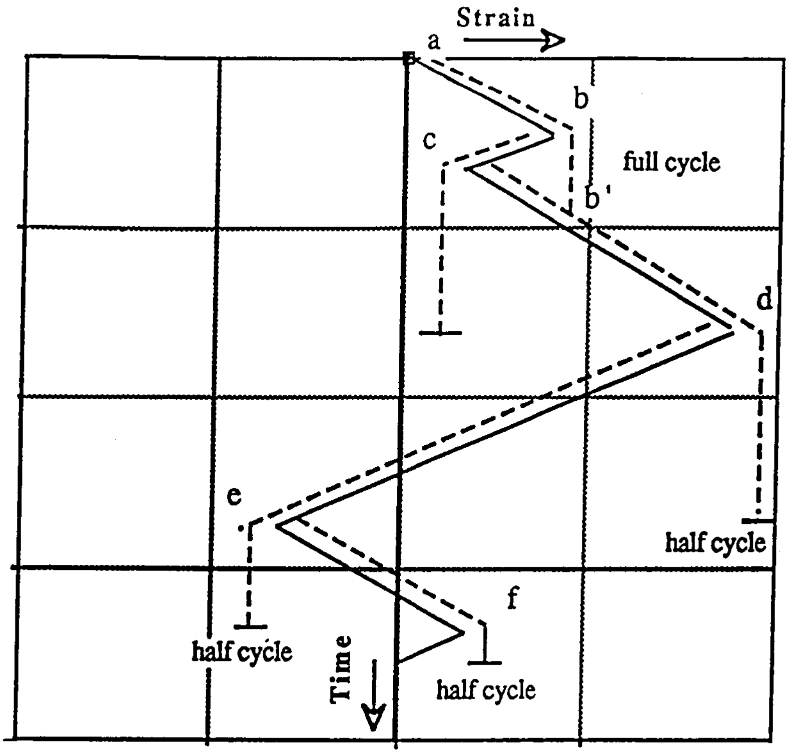
The Optim Megadac is a data acquisition system used to capture dynamic data. TCS 3000 (Test Control Software) is a software package manufactured as an interface between the Megadac and a personal computer. This software allows the researcher to vary sampling rates, change test channels, and monitor the data collection as it occurs. The Megadac has the capacity to sample at a rate of 25,000 samples per second on 48 input channels. A sample rate of 50 samples per second on 32 input channels was used on the HRB project. The personal computer used on the project was a Zenith 486DX.

Strain gages manufactured by Measurements Group, Inc. were used as sensors at the determined locations. The strain gages were 350-ohm gages which varied in length from 1/8-inch to 1/4-inch depending upon location.

4.2 Data Reduction Process

After the dynamic data were collected using the acquisition system described in Section 4.1, a system to reduce the data into histogram format was adopted. The data were collected as variable amplitude data, and a method for converting the data into constant amplitude histogram format was needed. The method determined for use was the rainflow cycle counting method, a method that defines cycles by looking at closed stress-strain hystersis loops. Therefore, this method is good for converting variable amplitude loadings into constant amplitude fatigue data (17).

Rainflow used on the Holston River bridge counts the cycles using a one dimensional array that is based on a vector concept (5). This means that an array is established as the data are read and, once a closed stress-strain loop is read, the peak and valley associated with it can be counted and then eliminated. For example, rainflow starts reading with the first most positive or most negative strain in the strain-time history and progresses through the history counting completed hystersis loops as cycles of loading. This cycle counting procedure is analogous to rain flowing down a series of pagoda roofs (11). Figure 4.1 shows graphically the rainflow counting process. Once the cycles are counted for the stress history they are presented in histogram format according to the number of cycles obtained for each stress range.



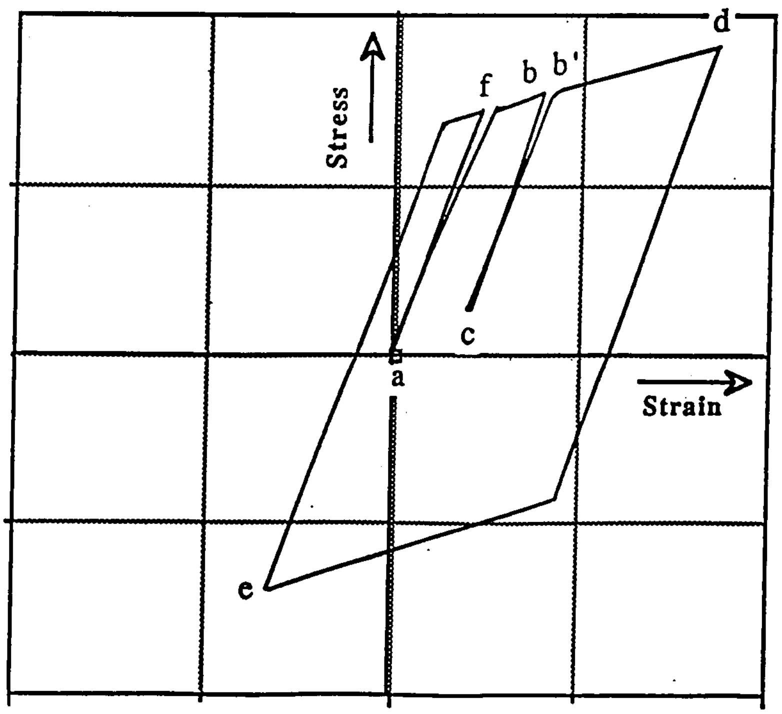


Figure 4.1: Rainflow diagrams.

4.3 Data Summarization

This section summarizes all of the data taken to date on the Holston River Bridge research project. The data were taken by the research staff throughout the life of the project under different traffic conditions. In order to provide the reader with an easy approach to viewing the overwhelming amount of data collected, the data is broken down in this chapter according to traffic condition. The data are further broken down according to the location of the gage on the bridge structure. The locations marked for testing were discussed in Section 3.3 of this thesis and drawings showing the locations were also presented. Presentation of the summarized data is done in a table format for ease of viewing. These tables include a description of each gage location, the location on the bridge structure, the calculated RMC (root-mean-cubed) value, total duration of testing for the gage, the number of trucks counted, and the total number of cycles above 1 ksi (12).

Table 4.1 summarizes the duration of testing for each gage under the different traffic conditions. Tables 4.2 thru 4.6 show the summaries for the gages tested with traffic under normal conditions. The summaries for traffic flowing in the right hand lane and shoulder are shown in Tables 4.7 thru 4.11. The results of the traffic flowing in the left hand and middle lanes are shown in Tables 4.12 thru 4.14.

Also included in this chapter are the resulting histograms and truck traffic for each gage tested during the life of the research project. These histograms and truck data are shown in Tables 4.15 thru 4.65. These tables are a compilation of data taken during the time between July 1993 and October 1994.

Table 4.1 - Testing Duration for each gage on HRB project

	Duration (hours)		
Gage Number	Normal	RL & SH	ML & LL
1	0.57	1.58	0.00
2	13.86	1.58	0.00
3	21.27	1.58	0.00
4	0.57	0.00	2.56
5	27.45	4.06	0.00
6	0.57	1.12	0.00
7	0.57	1.58	0.00
8	0.57	0.00	0.00
9	0.57	1.58	0.00
10	0.57	0.92	0.00
11	0.57	1.58	0.00
12	0.57	0.00	0.00
13	0.57	0.00	0.00
13A	0.57	0.00	0.00
14	0.57	0.92	0.00
15	0.57	0.92	0.00
16	0.57	0.00	0.00
17	0.57	4.06	0.00
18	0.57	4.06	0.00
19	14.85	3.28	0.00
20	14.86	3.28	0.00
23	14.67	1.24	0.00
24	15.70	1.24	0.00
25	15.70	1.24	0.00
26	13.64	1.24	0.00
27	0.57	2.17	0.00
28	0.57	2.17	0.00
29	22.49	2.17	0.00
30	9.24	0.00	2.16
31	0.57	2.17	0.00
32	11.24	2.17	4.72
33	0.00	2.17	4.72
34	24.52	2.48	4.72
35	26.61	0.00	4.72
36	0.00	2.17	0.00
37	12.30	2.17	4.72
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	0.00	0.00	0.00
41	26.61	3.32	2.16
42	15.31	2.17	0.00
43	9.24	2.48	3.71
44	15.31	4.65	4.72
45	15.31	1.24	0.00
46	15.31	1.24	0.00
47	15.31	1.24	0.00
48	14.30	1.24	0.00
49	14.29	1.24	0.00
50	22.49	4.65	4.72

Table 4.1 - Testing Duration for each gage on HRB project

	Duration (hours)		
Gage Number	Normal	RL & SH	ML & LL
51	33.68	4.65	4.72
51A	18.37	4.38	4.72
52	31.69	4.65	4.72
52A	18.37	4.38	4.72
53	31.65	4.65	4.72
53A	18.37	4.38	0.00
54	33.68	4.65	2.56
54A	18.37	1.90	2.16
55	16.39	1.24	0.00
56	16.39	1.24	0.00
57	17.33	1.24	0.00
58	34.78	2.02	5.69
59	1.94	0.00	0.00
60	1.94	1.24	5.69
61	20.35	0.00	3.13
62	0.00	1.24	5.69
63	20.34	1.24	5.69
64	5.14	1.03	0.00
65	0.00	0.00	0.00
66	0.00	0.00	0.00
67	21.37	1.24	3.13
68	19.31	0.59	3.60
69	17.59	1.24	5.69
70	17.59	0.00	5.69
71	1.94	1.24	3.13
72	12.28	1.24	3.13
73	17.16	1.24	5.69
74	1.94	0.83	5.69
75	19.53	0.00	5.69
76	16.41	1.24	5.69
77	0.00	0.00	0.00
78	33.99	1.83	0.00
79	17.44	0.00	3.13
80	0.00	1.83	3.13
81	1.94	1.83	2.09
82	0.65	1.83	0.00
83	66.64	2.48	3.13
84	19.53	0.00	2.08
85	0.00	1.83	0.00
86	0.00	0.00	0.00
87	0.00	0.00	0.00
88	19.53	1.83	3.13
89	19.53	1.83	3.13
90	17.59	1.46	3.13
91	17.59	0.00	3.13
92	0.00	0.00	0.00
93	18.50	1.83	3.13
94	18.50	1.83	3.13
95	16.40	1.83	3.13
96	19.53	1.83	3.13
97	19.53	1.83	3.13
98	15.31	1.83	3.13
99	33.99	1.83	0.00
100	1.94	1.83	0.00

Table 4.1 - Testing Duration for each gage on HRB project

	Duration (hours)		
Gage Number	Normal	RL & SH	ML & LL
101	1.25	1.24	0.00
102	1.25	1.24	0.00
103	1.25	1.24	0.00
104	1.25	1.24	0.00
105	35.39	3.72 *	2.16 *
106	16.89	1.24 *	2.16 *
107	14.78	3.72	2.16
108	14.78	2.94	2.16
109	14.78	1.24	2.16
110	14.78	1.24	2.16
111	0.00	1.24	2.16
112	0.00	1.24	2.16
113	32.82	1.24	0.00
114	14.45	1.24	2.16
115	14.45	1.24	2.16
116	32.82	1.24	2.16
117	17.03	1.24	2.16
118	17.03	1.24	0.00
120	34.36	2.48 *	0.00
121	8.07	0.00	0.00
122	17.34	2.48	0.00
123	18.37	0.78	0.00
124	18.37	2.48	0.00
125	12.31	2.48	0.00
201	25.87	1.24	2.56
202	31.03	0.00	2.56
203	14.45	2.48	0.00
204	45.20	2.48	3.13
305	33.31	0.00	0.00
306	26.12	0.00	0.00
317	17.03	0.00	0.00
318	6.68	0.00	0.00
320	0.00	0.00	0.00
321	0.00	0.00	0.00

* Data was taken when gage was located at the stress concentration

Table 4.2 - Normal Traffic
Gage Locations 1A & 5

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1A	1	0	0.57	343	0
Bottom flange of cantilver bracket	1A	2	1321	13.86	8137	29
Top flange of girder #4	1A	3	1250	21.27	13212	5
Thick bottom flange of girder #4 on eastside	1A	4	1844	0.57	343	81
Thin bottom flange of girder #4 on westside	1A	5	2057	27.45	16617	3286
Gusset plate at end of bottom chord of cross frame	1A	6	0	0.57	343	0
Bottom gage cross frame bottom chord at first diagonal	1A	7	1250	0.57	343	22
Top gage cross frame bottom chord at first diagonal	1A	8	1369	0.57	343	39
First truss diagonal of cross frame	1A	9	1250	0.57	343	4
Top flange of knee brace	1A	10	1370	0.57	343	22
Horizontal Rosette - cross frame top chord	1A	11	1659	0.57	343	63
45 Degree Rosette - cross frame top chord	1A	12	1698	0.57	343	91
Vertical Rosette - cross frame top chord	1A	13	1498	0.57	343	26
Horizontal gage cross frame top chord opposite gage 11	1A	13A	0	0.57	343	0
Second truss diagonal of cross frame	1A	14	1326	0.57	343	18
End of gusset plate at cross frame 2nd truss diagonal	1A	15	1358	0.57	343	37
End of gusset plate at cross frame 3rd truss diagonal	1A	16	1631	0.57	343	74
Flange of lateral X-bracing at gusset plate on eastside	1A	17	1250	0.57	343	5
Flange of lateral X-bracing at gusset plate on westside	1A	18	1250	0.57	343	6
Web gap near lateral gusset plate on eastside	1A	19	1817	14.85	8606	1782
Web gap near transverse stiffener on eastside	1A	20	1594	14.86	8620	1647
End of lateral gusset above 2" tear on eastside	5	45	1465	15.31	8857	1270
End of lateral gusset below 2" tear on eastside	5	46	1966	15.31	8857	2797
End of lateral gusset above 6" tear on westside	5	47	1967	15.31	8857	2288
End of lateral gusset across 6" tear on westside	5	48	2338	14.30	8093	2024
End of lateral gusset below 6" tear on westside	5	49	1530	14.29	8316	1902

Table 4.3 - Normal Traffic
Gage Location 1B

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1B	27	0	0.57	343	0
Bottom flange of cantilver bracket	1B	28	1250	0.57	343	1
Top flange of girder #4	1B	29	1250	22.49	13487	2
Thick bottom flange of girder #4 on eastside	1B	30	1782	9.24	5241	1066
Thin bottom flange of girder #4 on westside	1B	31	1773	0.57	343	82
Gusset plate at end of bottom chord of cross frame	1B	32	1250	11.24	6193	41
Bottom gage cross frame bottom chord at first diagonal	1B	33	0	0.00	0	0
Top gage cross frame bottom chord at first diagonal	1B	34	1377	24.52	14292	1778
First truss diagonal of cross frame	1B	35	1269	26.61	15617	866
Top flange of knee brace	1B	36	0	0.00	0	0
Horizontal Rosette - cross frame top chord	1B	37	2335	12.30	7036	2111
45 Degree Rosette - cross frame top chord	1B	38	0	0.00	0	0
Vertical Rosette - cross frame top chord	1B	39	0	0.00	0	0
Horizontal gage cross frame top chord opposite gage 11	1B	40	0	0.00	0	0
Second truss diagonal of cross frame	1B	41	1489	26.61	15617	817
End of gusset plate at cross frame 2nd truss diagonal	1B	42	1490	15.31	8857	1249
End of gusset plate at cross frame 3rd truss diagonal	1B	43	1781	9.24	4781	828
Flange of lateral X-bracing at gusset plate on eastside	1B	44	1258	15.31	8857	91
Flange of lateral X-bracing at gusset plate on westside	1B	50	1363	22.49	13388	1122
Web gap near lateral gusset plate on eastside	1B	51	1926	33.68	20890	4355
Vertical gage at end of lateral gusset plate on eastside	1B	51A	2210	18.37	12033	2487
Web gap near transverse stiffener on eastside	1B	52	2360	31.69	19360	5410
Horizontal gage at end of lateral gusset plate on eastside	1B	52A	2840	18.37	12033	2907
Web gap near transverse stiffener on westside	1B	53	1758	31.65	19587	4028
Vertical gage at end of lateral gusset plate on westside	1B	53A	1292	18.37	12033	63
Web gap near lateral gusset plate on westside	1B	54	1287	33.68	20890	546
Horizontal gage at end of lateral gusset plate on westside	1B	54A	2474	18.37	12033	2651

Table 4.4 - Normal Traffic
Gage Locations 1C & 4

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1C	55	1250	16.39	9744	6
Bottom flange of cantilver bracket	1C	56	1250	16.39	9744	7
Top flange of girder #1	1C	57	0	17.33	10728	0
Thin bottom flange of girder #1 on eastside	1C	58	1661	34.78	21360	3662
Thick bottom flange of girder #1 on westside	1C	59	1729	1.94	1248	376
Gusset plate at end of bottom chord of cross frame	1C	60	1342	1.94	1248	235
Top gage cross frame bottom chord at first diagonal	1C	61	1453	20.35	13203	2296
Bottom gage cross frame bottom chord at first diagonal	1C	62	0	0.00	0	0
First truss diagonal of cross frame	1C	63	1302	20.34	13288	800
Top flange of knee brace	1C	64	1359	5.14	2798	120
Vertical Rosette - cross frame top chord	1C	65	0	0.00	0	0
45 Degree Rosette - cross frame top chord	1C	66	0	0.00	0	0
Horizontal Rosette - cross frame top chord	1C	67	1391	21.37	13573	526
Second truss diagonal of cross frame	1C	68	1370	19.31	11760	571
End of gusset plate at cross frame 2nd truss diagonal	1C	69	1420	17.59	11091	1233
End of gusset plate at cross frame 3rd truss diagonal	1C	70	1716	17.59	11091	1357
Flange of lateral X-bracing at gusset plate on westside	1C	71	1308	1.94	1248	24
Flange of lateral X-bracing at gusset plate on eastside	1C	72	1267	12.28	8528	82
Web gap near lateral gusset plate on westside	1C	73	2091	17.16	11121	2380
Web gap near transverse stiffener on westside	1C	74	1905	1.94	1248	425
Web gap near transverse stiffener on eastside	1C	75	1906	19.53	12339	2260
Web gap near lateral gusset plate on eastside	1C	76	2083	16.41	10888	2169
Horizontal gage cross frame top chord opposite gage 67	1C	77	0	0.00	0	0
Vertical gage at end of retrofit plate on eastside	4	23	1542	14.67	8398	1106
Horizontal gage at end of retrofit plate on eastside	4	24	1355	15.70	9127	148
Vertical gage at end of retrofit plate on westside	4	25	1867	15.70	9127	1684
Horizontal gage at end of retrofit plate on westside	4	26	1375	13.64	7758	813

Table 4.5 - Normal Traffic
Gage Locations 1D & 6

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1D	78	1336	33.99	20835	22
Top gage cross frame bottom chord at first diagonal	1D	79	1424	17.44	10946	1411
Bottom gage cross frame bottom chord at first diagonal	1D	80	0	0.00	0	0
Gusset plate at end of bottom chord of cross frame	1D	81	1461	1.94	1248	352
Thick bottom flange of girder #1 on eastside	1D	82	1814	0.65	457	152
Thin bottom flange of girder #1 on westside	1D	83	1826	66.64	41025	7485
First truss diagonal of cross frame	1D	84	1273	19.53	12339	425
Top flange of knee brace	1D	85	0	0.00	0	0
Vertical Rosette - cross frame top chord	1D	86	0	0.00	0	0
45 Degree Rosette - cross frame top chord	1D	87	0	0.00	0	0
Horizontal Rosette - cross frame top chord	1D	88	1339	19.53	12339	377
Second truss diagonal of cross frame	1D	89	1494	19.53	12339	895
End of gusset plate at cross frame 2nd truss diagonal	1D	90	1478	17.59	11091	1643
End of gusset plate at cross frame 3rd truss diagonal	1D	91	1784	17.59	11091	1460
Horizontal gage cross frame top chord opposite gage 88	1D	92	0	0.00	0	0
Flange of lateral X-bracing at gusset plate on westside	1D	93	1286	18.50	11701	138
Flange of lateral X-bracing at gusset plate on eastside	1D	94	1288	18.50	11604	51
Web gap near lateral gusset plate on westside	1D	95	2544	16.40	10721	2718
Web gap near transverse stiffener on westside	1D	96	1563	19.53	12339	1673
Web gap near transverse stiffener on eastside	1D	97	1619	19.53	12339	1800
Web gap near lateral gusset plate on eastside	1D	98	2146	15.31	10294	2434
Bottom flange of cantilever bracket	1D	99	1456	33.99	20835	3
Top flange of girder #1	1D	100	0	1.94	1248	0
Horizontal gage at end of retrofit plate east	6	122	2994	17.34	11179	9113
Vertical gage at end of retrofit plate east	6	123	1910	18.37	12033	2553
Horizontal gage at end of retrofit plate west	6	124	3612	18.37	12033	4494
Vertical gage at end of retrofit plate west	6	125	2194	12.31	7528	1886

Table 4.6 - Normal Traffic
Gage Locations 2,3,7,201,202,203, & 204

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Bottom flange of cantilver bracket	2	101	1288	1.25	631	22
Top flange of cantilver bracket	2	102	1250	1.25	631	1
Floor beam web near top flange at girder #4	2	103	1541	1.25	631	2
Floor beam web near bottom flange at girder #4	2	104	1462	1.25	631	97
Floor beam web at top flange termination south side of girder #3	2	105	2184	35.39	22143	11026
Floor beam web at bottom flange termination south side of girder #3	2	106	1952	16.89	11170	1380
Web gap near lateral gusset plate on eastside at girder #3	2	107	2552	14.78	8706	2952
Web gap near transverse stiffener on eastside at girder #3	2	108	1958	14.78	8706	2166
Web gap near transverse stiffener on westside at girder #3	2	109	1915	14.78	8706	2348
Web gap near lateral gusset plate on westside at girder #3	2	110	3372	14.78	8706	3129
Floor beam web near top flange at girder #3 north side	2	111	0	0.00	0	0
Floor beam web near bottom flange at girder #3 north side	2	112	0	0.00	0	0
Vertical Rosette on girder #3 web at end of lateral gusset plate	2	113	2726	32.82	20529	10148
45 degree Rosette on girder #3 web at end of lateral gusset plate	2	114	1992	14.45	8496	2185
Horizontal Rosette on girder #3 web at end of lateral gusset plate	2	115	1592	14.45	8496	911
Horizontal gage adjacent to and below gage 115	2	116	2055	32.82	20529	5010
Floor beam bottom flange at end of gusset plate for X-bracing south	3	117	1666	17.03	10110	1726
Floor beam bottom flange at end of gusset plate for X-bracing north	3	118	1711	17.03	10110	1644
Floor beam web at top flange termination north side of girder #3	2	120	3753	34.36	21289	19247
Floor beam web at bottom flange termination north side of girder #3	2	121	1700	8.07	5560	1821
Floor beam web at top flange termination south side of girder #3	7	305	2684	33.31	20960	6567
Floor beam web at top flange termination south side of girder #3	7	306	1425	26.12	16547	576
Floor beam bottom flange at end of gusset plate for X-bracing south	7	317	1570	17.03	10110	1177
Floor beam bottom flange at end of gusset plate for X-bracing north	7	318	1739	6.68	4384	618
Bottom flange of girder #3 at location 201	201	201	1444	25.87	16217	668
Bottom flange of girder #2 at location 202	202	202	1411	31.03	18896	2232
Bottom flange of girder #3 at location 203	203	203	1419	14.45	8496	1043
Bottom flange of girder #2 at location 204	204	204	1522	45.20	29234	4555

Table 4.7 - Right Hand Lane and Shoulder Traffic
Gage Locations 1A and 5

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1A	1	1346	1.58	575	7
Bottom flange of cantilever bracket	1A	2	1297	1.58	575	15
Top flange of girder #4	1A	3	0	1.58	575	0
Thin bottom flange of girder #4 on eastside	1A	5	2391	4.06	1476	997
Gusset plate at end of bottom chord of cross frame	1A	6	1250	1.12	370	2
Bottom gage cross frame bottom chord at first diagonal	1A	7	1621	1.58	575	190
First truss diagonal of cross frame	1A	9	1250	1.58	575	3
Top flange of knee brace	1A	10	1294	0.92	307	16
Horizontal Rosette-cross frame top chord	1A	11	1362	1.58	575	269
Second truss diagonal of cross frame	1A	14	1463	0.92	307	8
End of gusset plate at cross frame 2nd truss diagonal	1A	15	1644	0.92	307	105
Flange of lateral X-bracing at gusset plate on eastside	1A	17	1280	4.06	1476	24
Flange of lateral X-bracing at gusset plate on westside	1A	18	1285	4.06	1476	101
Web gap near lateral gusset plate on eastside	1A	19	2318	3.28	1194	787
Web gap near transverse stiffener on eastside	1A	20	1821	3.28	1194	642
End of lateral gusset above 2" tear on eastside	5	45	1593	1.24	354	173
End of lateral gusset below 2" tear on eastside	5	46	2047	1.24	354	286
End of lateral gusset above 6" tear on westside	5	47	2136	1.24	354	263
End of lateral gusset across 6" tear on westside	5	48	2520	1.24	354	309
End of lateral gusset below 6" tear on westside	5	49	1639	1.24	354	185

Table 4.8 - Right Hand Lane and Shoulder Traffic
Gage Location 1B

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1B	27	1250	2.17	984	2
Bottom flange of cantilever bracket	1B	28	1430	2.17	984	7
Top flange of girder #4	1B	29	1750	2.17	984	1
Thick bottom flange of girder #4 on eastside	1B	30	0	0.00	0	0
Thin bottom flange of girder #4 on westside	1B	31	2034	2.17	984	562
Gusset plate at end of bottom chord of cross frame	1B	32	1458	2.17	984	165
Bottom gage cross frame bottom chord at first diagonal	1B	33	1631	2.17	984	304
Top gage cross frame bottom chord at first diagonal	1B	34	1822	2.48	901	318
Top flange of knee brace	1B	36	1310	2.17	984	23
Horizontal Rosette-cross frame top chord	1B	37	2413	2.17	984	733
Second truss diagonal of cross frame	1B	41	1307	3.32	1439	204
End of gusset plate at cross frame 2nd truss diagonal	1B	42	1868	2.17	984	403
End of gusset plate at cross frame 3rd truss diagonal	1B	43	1898	2.48	901	304
Flange of lateral X-bracing at gusset plate on eastside	1B	44	1302	4.65	1885	216
Flange of lateral X-bracing at gusset plate on westside	1B	50	1373	4.65	1885	78
Web gap near lateral gusset plate on eastside	1B	51	2265	4.65	1885	1326
Vertical gage at end of lateral gusset plate on eastside	1B	51A	2611	4.38	1523	765
Web gap near transverse stiffener on eastside	1B	52	2943	4.65	1885	2000
Horizontal gage at end of lateral gusset plate on eastside	1B	52A	3099	4.38	1523	1598
Web gap near transverse stiffener on westside	1B	53	1901	4.65	1885	1005
Vertical gage at end of lateral gusset plate on westside	1B	53A	1392	4.38	1523	189
Web gap near lateral gusset plate on westside	1B	54	1404	4.65	1885	504
Horizontal gage at end of lateral gusset plate on westside	1B	54A	3077	1.90	622	405

Table 4.9 - Right Hand Lane and Shoulder Traffic
Gage Locations 1C & 4

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1C	55	1323	1.24	441	75
Bottom flange of cantilever bracket	1C	56	1250	1.24	441	1
Top flange of girder #1	1C	57	0	1.24	441	0
Thin bottom flange of girder #1 on eastside	1C	58	1840	2.02	723	396
Gusset plate at end of bottom chord of cross frame	1C	60	1499	1.24	441	151
Bottom gage cross frame bottom chord at first diagonal	1C	62	1747	1.24	441	191
First truss diagonal of cross frame	1C	63	1381	1.24	441	5
Top flange of knee brace	1C	64	1817	1.03	372	11
Horizontal Rosette-cross frame top chord	1C	67	1438	1.24	441	26
Second truss diagonal of cross frame	1C	68	1250	0.59	190	10
End of gusset plate at cross frame 2nd truss diagonal	1C	69	1830	1.24	441	201
Flange of lateral X-bracing at gusset plate on westside	1C	71	1380	1.24	441	19
Flange of lateral X-bracing at gusset plate on eastside	1C	72	1594	1.24	441	9
Web gap near lateral gusset plate on westside	1C	73	2395	1.24	441	385
Web gap near transverse stiffener on westside	1C	74	1983	0.83	323	233
Web gap near lateral gusset plate on eastside	1C	76	2506	1.24	441	378
Vertical gage at end of retrofit plate on eastside	4	23	1611	1.24	354	161
Horizontal gage at end of retrofit plate on eastside	4	24	1363	1.24	354	65
Vertical gage at end of retrofit plate on westside	4	25	2066	1.24	354	249
Horizontal gage at end of retrofit plate on westside	4	26	1465	1.24	354	150

Table 4.10 - Right Hand Lane and Shoulder Traffic
Gage Location 1D & 6

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1D	78	3578	1.83	850	8
Bottom gage cross frame bottom chord at first diagonal	1D	80	1783	1.83	850	302
Gusset plate at end of bottom chord of cross frame	1D	81	1878	1.83	850	473
Thick bottom flange of girder #1 on eastside	1D	82	2000	1.83	850	494
Thin bottom flange of girder #1 on westside	1D	83	1412	2.48	901	261
Top flange of knee brace	1D	85	1511	1.83	850	28
Horizontal Rosette-cross frame top chord	1D	88	1377	1.83	850	56
Second truss diagonal of cross frame	1D	89	1325	1.83	850	99
End of gusset plate at cross frame 2nd truss diagonal	1D	90	1814	1.46	741	321
Flange of lateral X-bracing at gusset plate on westside	1D	93	1316	1.83	850	21
Flange of lateral X-bracing at gusset plate on eastside	1D	94	1286	1.83	850	39
Web gap near lateral gusset plate on westside	1D	95	2844	1.83	850	647
Web gap near transverse stiffener on westside	1D	96	1606	1.83	850	366
Web gap near transverse stiffener on eastside	1D	97	1657	1.83	850	352
Web gap near lateral gusset plate on eastside	1D	98	2404	1.83	850	569
Bottom flange of cantilever bracket	1D	99	1261	1.83	850	66
Top flange of girder #1	1D	100	1250	1.83	850	1
Horizontal gage at end of retrofit plate east	6	122	3151	2.48	901	6640
Vertical gage at end of retrofit plate east	6	123	2681	0.78	282	363
Horizontal gage at end of retrofit plate west	6	124	3814	2.48	901	1808
Vertical gage at end of retrofit plate west	6	125	2691	2.48	901	1169

Table 4.11 - Right Hand Lane and Shoulder Traffic
Gage Locations 2, 3, 201, 202, 203 & 204

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Bottom flange of cantilever bracket	2	101	1337	1.24	354	31
Top flange of cantilever bracket	2	102	0	1.24	354	0
Floor beam web near top flange at girder #4	2	103	0	1.24	354	0
Floor beam web near bottom flange at girder #4	2	104	1587	1.24	354	91
Floor beam web at top flange termination south side of girder #3	2	105	3294	3.72	1255	16900
Floor beam web at bottom flange termination south side of girder #3	2	106	1722	1.24	354	372
Web gap near lateral gusset plate on eastside at girder #3	2	107	2005	3.72	1255	1638
Web gap near transverse stiffener on eastside at girder #3	2	108	1934	2.94	973	807
Web gap near transverse stiffener on westside at girder #3	2	109	1919	1.24	354	329
Web gap near lateral gusset plate on westside at girder #3	2	110	2569	1.24	354	619
Floor beam web near top flange at girder #3 north side	2	111	1250	1.24	354	5
Floor beam web near bottom flange at girder #3 north side	2	112	1470	1.24	354	99
Vertical Rosette on girder #3 web at end of lateral gusset plate	2	113	1752	1.24	354	514
45 degree Rosette on girder #3 web at end of lateral gusset plate	2	114	1486	1.24	354	219
Horizontal Rosette on girder #3 web at end of lateral gusset plate	2	115	1818	1.24	354	204
Horizontal gage adjacent to and below gage 115	2	116	1580	1.24	354	183
Floor beam web at top flange termination north side of girder #3	2	120	3513	2.48	901	7250
Floor beam bottom flange at end of gusset plate for X-bracing south	3	117	1791	1.24	354	163
Floor beam bottom flange at end of gusset plate for X-bracing north	3	118	1608	1.24	354	112
Bottom flange of girder #3 at location 201	201	201	2212	1.24	354	252
Bottom flange of girder #2 at location 202	202	202	0	0.00	0	0
Bottom flange of girder #3 at location 203	203	203	1441	2.48	901	332
Bottom flange of girder #2 at location 204	204	204	1593	2.48	901	345

Table 4.12 - Left Hand and Middle Lane Traffic

Gage Locations 1A and 1B

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Thick bottom flange of girder #4 on eastside	1A	4	1409	2.6	1765	151
Thick bottom flange of girder #4 on eastside	1B	30	1551	2.16	577	245
Gusset plate at end of bottom chord of cross frame	1B	32	1250	4.72	2342	2
Bottom gage cross frame bottom chord at first diagonal	1B	33	1479	4.72	2342	10
Top gage cross frame bottom chord at first diagonal	1B	34	1359	4.72	2342	66
First truss diagonal of cross frame	1B	35	1394	4.72	2342	9
Horizontal Rosette-cross frame top chord	1B	37	1365	4.72	2342	248
Second truss diagonal of cross frame	1B	41	1434	2.16	577	179
End of gusset plate at cross frame 3rd truss diagonal	1B	43	1779	3.71	1619	575
Flange of lateral X-bracing at gusset plate on eastside	1B	44	1284	4.72	2342	21
Flange of lateral X-bracing at gusset plate on westside	1B	50	1430	4.72	2342	7
Web gap near lateral gusset plate on eastside	1B	51	1599	4.72	2342	542
Vertical gage at end of lateral gusset plate on eastside	1B	51A	1535	4.72	2342	398
Web gap near transverse stiffener on eastside	1B	52	1923	4.72	2342	924
Horizontal gage at end of lateral gusset plate on eastside	1B	52A	2062	4.72	2342	713
Web gap near transverse stiffener on westside	1B	53	1375	4.72	2342	300
Web gap near lateral gusset plate on westside	1B	54	1326	2.56	1765	27
Horizontal gage at end of lateral gusset plate on westside	1B	54A	1874	2.16	577	268

Table 4.13 - Left Hand and Middle Lane Traffic
Gage Locations 1C and 1D

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Thin bottom flange of girder #1 on eastside	1C	58	1364	5.69	2936	477
Gusset plate at end of bottom chord of cross frame	1C	60	1318	5.69	2936	167
Top gage cross frame bottom chord at first diagonal	1C	61	1310	3.13	1171	67
Bottom gage cross frame bottom chord at first diagonal	1C	62	1368	5.69	2936	58
First truss diagonal of cross frame	1C	63	1491	5.69	2936	15
Horizontal Rosette-cross frame top chord	1C	67	1327	3.13	1171	130
Second truss diagonal of cross frame	1C	68	1537	3.61	2138	180
End of gusset plate at cross frame 2nd truss diagonal	1C	69	1317	5.69	2936	165
End of gusset plate at cross frame 3rd truss diagonal	1C	70	1644	5.69	2936	979
Flange of lateral X-bracing at gusset plate on westside	1C	71	1394	3.13	1171	17
Flange of lateral X-bracing at gusset plate on eastside	1C	72	1616	3.13	1171	3
Web gap near lateral gusset plate on westside	1C	73	1683	5.69	2936	870
Web gap near transverse stiffener on westside	1C	74	1472	5.69	2936	579
Web gap near transverse stiffener on eastside	1C	75	1548	5.69	2936	721
Web gap near lateral gusset plate on eastside	1C	76	1665	5.69	2936	807
Top gage cross frame bottom chord at first diagonal	1D	79	1325	3.13	1171	78
Bottom gage cross frame bottom chord at first diagonal	1D	80	1374	3.13	1171	20
Gusset plate at end of bottom chord of cross frame	1D	81	1388	2.08	769	476
Thin bottom flange of girder #1 on eastside	1D	83	1398	3.13	1171	248
First truss diagonal of cross frame	1D	84	3076	2.08	775	4
Horizontal Rosette-cross frame top chord	1D	88	1302	3.13	1171	142
Second truss diagonal of cross frame	1D	89	1320	3.13	1171	151
End of gusset plate at cross frame 2nd truss diagonal	1D	90	1320	3.13	1171	84
End of gusset plate at cross frame 3rd truss diagonal	1D	91	1658	3.13	1171	525
Flange of lateral X-bracing at gusset plate on westside	1D	93	1542	3.13	1171	13
Flange of lateral X-bracing at gusset plate on eastside	1D	94	1728	3.13	1171	4
Web gap near lateral gusset plate on westside	1D	95	1910	3.13	1171	537
Web gap near transverse stiffener on westside	1D	96	1312	3.13	1171	73
Web gap near transverse stiffener on eastside	1D	97	1322	3.13	1171	89
Web gap near lateral gusset plate on eastside	1D	98	1661	3.13	1171	459

Table 4.14 - Left Hand and Middle Lane Traffic
Gage Locations 2, 3, 201, 202 and 204

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	NO. OF TRUCKS	TOTAL NO. OF CYCLES
Floor beam web at top flange termination south side of girder #3	2	105	2739	4.67	577	5564
Floor beam web at bottom flange termination south side of girder #3	2	106	2158	2.16	577	956
Web gap near lateral gusset plate on eastside at girder #3	2	107	2462	4.67	577	934
Web gap near transverse stiffener on eastside at girder #3	2	108	1751	4.67	577	543
Web gap near transverse stiffener on westside at girder #3	2	109	1684	2.16	577	618
Web gap near lateral gusset plate on westside at girder #3	2	110	2855	2.16	577	1266
Floor beam web near top flange at girder #3 north side	2	111	1685	2.16	577	202
Floor beam web near bottom flange at girder #3 north side	2	112	1850	2.16	577	442
45 degree Rosette on girder #3 web at end of lateral gusset plate	2	114	2077	2.16	577	848
Horizontal Rosette on girder #3 web at end of lateral gusset plate	2	115	1640	2.16	577	330
Horizontal gage adjacent to and below gage 115	2	116	2010	2.16	577	352
Floor beam bottom flange at end of gusset plate for X-bracing south	3	117	1558	2.16	577	182
Bottom flange of girder #3 at location 201	201	201	1497	2.56	1765	291
Bottom flange of girder #2 at location 202	202	202	1438	2.56	1765	321
Bottom flange of girder #2 at location 204	204	204	1550	3.13	1171	465

Table 4.15 Normal Traffic (Gages 1-8)

Stress Range (psi)	G1	G2	G3	G4	G5	G6	G7	G8
1000-1500	0	26	5	37	984	0	22	32
1500-2000	0	3	0	24	1203	0	0	7
2000-2500	0	0	0	13	603	0	0	0
2500-3000	0	0	0	6	373	0	0	0
3000-3500	0	0	0	1	70	0	0	0
3500-4000	0	0	0	0	40	0	0	0
4000-4500	0	0	0	0	11	0	0	0
4500-5000	0	0	0	0	1	0	0	0
5000-5500	0	0	0	0	1	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.57	13.86	21.27	0.57	27.45	0.57	0.57	0.57
Total Cycles	0	29	5	81	3286	0	22	39
RMC (psi)	0	1321	1250	1844	2057	0	1250	1369
EB 3S2	101	3453	5352	101	6461	101	101	101
EB 2D	33	346	580	33	699	33	33	33
EB DT	8	222	338	8	481	8	8	8
EB Other	18	199	368	18	478	18	18	18
EB TOTAL	160	4220	6638	160	8119	160	160	160
WB 3S2	132	2993	5115	132	6411	132	132	132
WB 2D	25	396	630	25	951	25	25	25
WB DT	10	254	373	10	505	10	10	10
WB OTHER	16	274	456	16	631	16	16	16
WB TOTAL	183	3917	6574	183	8498	183	183	183
TOTAL	343	8137	13212	343	16617	343	343	343

Table 4.16 Normal Traffic (Gages 9-15)

Stress Range (psi)	G9	G10	G11	G12	G13	G13A	G14	G15
1000-1500	4	18	27	49	17	0	16	31
1500-2000	0	4	29	26	8	0	2	6
2000-2500	0	0	7	13	1	0	0	0
2500-3000	0	0	0	3	0	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Total Cycles	4	22	63	91	26	0	18	37
RMC (psi)	1250	1370	1659	1698	1498	0	1326	1358
EB 3S2	101	101	101	101	101	101	101	101
EB 2D	33	33	33	33	33	33	33	33
EB DT	8	8	8	8	8	8	8	8
EB Other	18	18	18	18	18	18	18	18
EB TOTAL	160	160	160	160	160	160	160	160
WB 3S2	132	132	132	132	132	132	132	132
WB 2D	25	25	25	25	25	25	25	25
WB DT	10	10	10	10	10	10	10	10
WB OTHER	16	16	16	16	16	16	16	16
WB TOTAL	183	183	183	183	183	183	183	183
TOTAL	343	343	343	343	343	343	343	343

Table 4.17 Normal Traffic (Gages 16-25)

Stress Range (psi)	G16	G17	G18	G19	G20	G23	G24	G25
1000-1500	43	5	6	638	958	737	130	603
1500-2000	23	0	0	759	562	306	15	685
2000-2500	7	0	0	317	99	44	3	297
2500-3000	0	0	0	45	24	13	0	70
3000-3500	1	0	0	21	3	6	0	17
3500-4000	0	0	0	2	1	0	0	10
4000-4500	0	0	0	0	0	0	0	2
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.57	0.57	0.57	14.85	14.86	14.67	15.70	15.70
Total Cycles	74	5	6	1782	1647	1106	148	1684
RMC (psi)	1631	1250	1250	1817	1594	1542	1355	1867
EB 3S2	101	101	101	3618	3591	3081	3306	3306
EB 2D	33	33	33	318	365	307	337	337
EB DT	8	8	8	255	241	321	353	353
EB Other	18	18	18	189	215	260	283	283
EB TOTAL	160	160	160	4380	4412	3969	4279	4279
WB 3S2	132	132	132	3289	3278	3031	3294	3294
WB 2D	25	25	25	364	357	531	620	620
WB DT	10	10	10	296	295	323	346	346
WB OTHER	16	16	16	277	278	544	588	588
WB TOTAL	183	183	183	4226	4208	4429	4848	4848
TOTAL	343	343	343	8606	8620	8398	9127	9127

Table 4.18 Normal Traffic (Gages 26-33)

Stress Range								
(psi)	G26	G27	G28	G29	G30	G31	G32	G33
1000-1500	695	0	1	2	426	33	41	0
1500-2000	99	0	0	0	464	29	0	0
2000-2500	18	0	0	0	124	19	0	0
2500-3000	1	0	0	0	42	1	0	0
3000-3500	0	0	0	0	7	0	0	0
3500-4000	0	0	0	0	2	0	0	0
4000-4500	0	0	0	0	1	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	13.64	0.57	0.57	22.49	9.24	0.57	11.24	0.00
Total Cycles	813	0	1	2	1066	82	41	0
RMC (psi)	1375	0	1250	1250	1782	1773	1250	0
EB 3S2	2859	101	101	5560	2080	101	2670	0
EB 2D	288	33	33	596	240	33	226	0
EB DT	305	8	8	368	195	8	185	0
EB Other	232	18	18	321	129	18	165	0
EB TOTAL	3684	160	160	6845	2644	160	3246	0
WB 3S2	2812	132	132	5150	2074	132	2356	0
WB 2D	457	25	25	623	179	25	226	0
WB DT	307	10	10	484	244	10	207	0
WB OTHER	498	16	16	385	100	16	158	0
WB TOTAL	4074	183	183	6642	2597	183	2947	0
TOTAL	7758	343	343	13487	5241	343	6193	0

Table 4.19 Normal Traffic (Gages 34-41)

Stress Range (psi)	G34	G35	G36	G37	G38	G39	G40	G41
1000-1500	1459	845	0	639	0	0	0	540
1500-2000	310	20	0	504	0	0	0	252
2000-2500	6	1	0	335	0	0	0	24
2500-3000	3	0	0	332	0	0	0	1
3000-3500	0	0	0	222	0	0	0	0
3500-4000	0	0	0	65	0	0	0	0
4000-4500	0	0	0	11	0	0	0	0
4500-5000	0	0	0	3	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	24.52	26.61	0.00	12.30	0.00	0.00	0.00	26.61
Total Cycles	1778	866	0	2111	0	0	0	817
RMC (psi)	1377	1269	0	2335	0	0	0	1489
EB 3S2	5908	6453	0	2877	0	0	0	6453
EB 2D	621	642	0	310	0	0	0	642
EB DT	444	478	0	232	0	0	0	478
EB Other	332	356	0	212	0	0	0	356
EB TOTAL	7305	7929	0	3631	0	0	0	7929
WB 3S2	5433	5985	0	2668	0	0	0	5985
WB 2D	659	700	0	326	0	0	0	700
WB DT	542	578	0	229	0	0	0	578
WB OTHER	353	425	0	182	0	0	0	425
WB TOTAL	6987	7688	0	3405	0	0	0	7688
TOTAL	14292	15617	0	7036	0	0	0	15617

Table 4.20 Normal Traffic (Gages 42-49)

Stress Range (psi)	G42	G43	G44	G45	G46	G47	G48	G49
1000-1500	781	331	90	924	1098	808	521	1212
1500-2000	453	320	1	305	904	788	487	605
2000-2500	14	148	0	35	466	448	469	65
2500-3000	1	27	0	5	239	175	333	18
3000-3500	0	2	0	0	53	44	141	1
3500-4000	0	0	0	1	29	23	41	1
4000-4500	0	0	0	0	7	2	22	0
4500-5000	0	0	0	0	1	0	6	0
5000-5500	0	0	0	0	0	0	3	0
5500-6000	0	0	0	0	0	0	1	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	15.31	9.24	15.31	15.31	15.31	15.31	14.30	14.29
Total Cycles	1249	828	91	1270	2797	2288	2024	1902
RMC (psi)	1490	1781	1258	1465	1966	1967	2338	1530
EB 3S2	3779	2078	3779	3779	3779	3779	3498	3560
EB 2D	339	220	339	339	339	339	318	325
EB DT	256	170	256	256	256	256	233	239
EB Other	203	152	203	203	203	203	192	185
EB TOTAL	4577	2620	4577	4577	4577	4577	4241	4309
WB 3S2	3324	1605	3324	3324	3324	3324	3004	3127
WB 2D	384	263	384	384	384	384	356	362
WB DT	294	171	294	294	294	294	271	272
WB OTHER	278	122	278	278	278	278	221	246
WB TOTAL	4280	2161	4280	4280	4280	4280	3852	4007
TOTAL	8857	4781	8857	8857	8857	8857	8093	8316

Table 4.21 Normal Traffic (Gages 50-54)

Stress Range (psi)	G50	G51	G51A	G52	G52A	G53	G53A	G54
1000-1500	970	1519	796	1721	629	1962	61	521
1500-2000	133	1501	722	986	495	1338	1	23
2000-2500	17	1020	533	1064	468	549	1	2
2500-3000	2	223	189	1071	535	128	0	0
3000-3500	0	61	145	360	391	41	0	0
3500-4000	0	27	71	106	175	8	0	0
4000-4500	0	4	21	55	111	2	0	0
4500-5000	0	0	10	29	53	0	0	0
5000-5500	0	0	0	13	24	0	0	0
5500-6000	0	0	0	5	12	0	0	0
6000-6500	0	0	0	0	10	0	0	0
6500-7000	0	0	0	0	4	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	22.49	33.68	18.37	31.69	18.37	31.65	18.37	33.68
Total Cycles	1122	4355	2487	5410	2907	4028	63	546
RMC (psi)	1363	1926	2210	2360	2840	1758	1292	1287
EB 3S2	5483	8483	4704	7827	4704	7971	4704	8483
EB 2D	601	862	523	819	523	789	523	862
EB DT	391	612	356	595	356	581	356	612
EB Other	316	505	302	485	302	471	302	505
EB TOTAL	6791	10462	5885	9726	5885	9812	5885	10462
WB 3S2	5166	8061	4737	7403	4737	7579	4737	8061
WB 2D	604	998	614	943	614	912	614	998
WB DT	460	752	458	704	458	712	458	752
WB OTHER	367	617	339	584	339	572	339	617
WB TOTAL	6597	10428	6148	9634	6148	9775	6148	10428
TOTAL	13388	20890	12033	19360	12033	19587	12033	20890

Table 4.22 Normal Traffic (Gages 54A-61)

Stress Range (psi)	G54A	G55	G56	G57	G58	G59	G60	G61
1000-1500	569	6	7	0	2034	160	203	1655
1500-2000	613	0	0	0	1257	153	32	581
2000-2500	577	0	0	0	262	53	0	58
2500-3000	531	0	0	0	77	10	0	2
3000-3500	197	0	0	0	21	0	0	0
3500-4000	108	0	0	0	6	0	0	0
4000-4500	28	0	0	0	3	0	0	0
4500-5000	16	0	0	0	2	0	0	0
5000-5500	10	0	0	0	0	0	0	0
5500-6000	2	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	18.37	16.39	16.39	17.33	34.78	1.94	1.94	20.35
Total Cycles	2651	6	7	0	3662	376	235	2296
RMC (psi)	2474	1250	1250	0	1661	1729	1342	1453
EB 3S2	4704	3567	3567	4386	8371	438	438	5365
EB 2D	523	361	361	498	857	53	53	541
EB DT	356	363	363	265	645	30	30	326
EB Other	302	274	274	299	537	36	36	317
EB TOTAL	5885	4565	4565	5448	10410	557	557	6549
WB 3S2	4737	3581	3581	4078	8160	563	563	5243
WB 2D	614	647	647	567	1176	65	65	611
WB DT	458	360	360	299	682	37	37	379
WB OTHER	339	591	591	336	932	26	26	421
WB TOTAL	6148	5179	5179	5280	10950	691	691	6654
TOTAL	12033	9744	9744	10728	21360	1248	1248	13203

Table 4.23 Normal Traffic (Gages 62-69)

Stress Range								
(psi)	G62	G63	G64	G65	G66	G67	G68	G69
1000-1500	0	747	104	0	0	435	477	930
1500-2000	0	49	14	0	0	81	90	289
2000-2500	0	4	2	0	0	8	3	13
2500-3000	0	0	0	0	0	2	1	1
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	20.34	5.14	0.00	0.00	21.37	19.31	17.59
Total Cycles	0	800	120	0	0	526	571	1233
RMC (psi)	0	1302	1359	0	0	1391	1370	1420
EB 3S2	0	5430	1318	0	0	5548	4834	4142
EB 2D	0	566	196	0	0	573	494	721
EB DT	0	330	75	0	0	339	304	355
EB Other	0	317	77	0	0	327	300	334
EB TOTAL	0	6643	1666	0	0	6787	5932	5552
WB 3S2	0	5275	795	0	0	5351	4539	4163
WB 2D	0	575	184	0	0	620	568	571
WB DT	0	371	73	0	0	386	360	359
WB OTHER	0	424	80	0	0	429	361	446
WB TOTAL	0	6645	1132	0	0	6786	5828	5539
TOTAL	0	13288	2798	0	0	13573	11760	11091

Table 4.24 Normal Traffic (Gages 70-77)

Stress Range (psi)	G70	G71	G72	G73	G74	G75	G76	G77
1000-1500	624	22	80	772	161	852	717	0
1500-2000	490	2	2	597	146	751	548	0
2000-2500	221	0	0	630	74	474	563	0
2500-3000	19	0	0	295	38	143	263	0
3000-3500	3	0	0	55	6	31	52	0
3500-4000	0	0	0	24	0	7	18	0
4000-4500	0	0	0	5	0	2	7	0
4500-5000	0	0	0	2	0	0	1	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	17.59	1.94	12.28	17.16	1.94	19.53	16.41	0.00
Total Cycles	1357	24	82	2380	425	2260	2169	0
RMC (psi)	1716	1308	1267	2091	1905	1906	2083	0
EB 3S2	4142	438	3154	4131	438	4580	3973	0
EB 2D	721	53	474	723	53	774	682	0
EB DT	355	30	204	331	30	385	299	0
EB Other	334	36	225	323	36	370	317	0
EB TOTAL	5552	557	4057	5508	557	6109	5271	0
WB 3S2	4163	563	3424	4249	563	4726	4270	0
WB 2D	571	65	478	579	65	636	600	0
WB DT	359	37	226	337	37	396	324	0
WB OTHER	446	26	343	448	26	472	423	0
WB TOTAL	5539	691	4471	5613	691	6230	5617	0
TOTAL	11091	1248	8528	11121	1248	12339	10888	0

Table 4.25 Normal Traffic (Gages 78-85)

Stress Range (psi)	G78	G79	G80	G81	G82	G83	G84	G85
1000-1500	21	1066	0	261	59	2942	413	0
1500-2000	0	323	0	76	59	2861	11	0
2000-2500	1	21	0	14	26	1317	1	0
2500-3000	0	1	0	1	7	270	0	0
3000-3500	0	0	0	0	1	64	0	0
3500-4000	0	0	0	0	0	29	0	0
4000-4500	0	0	0	0	0	2	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	33.99	17.44	0.00	1.94	0.65	66.64	19.53	0.00
Total Cycles	22	1411	0	352	152	7485	425	0
RMC (psi)	1336	1424	0	1461	1814	1826	1273	0
EB 3S2	7709	4183	0	438	183	15889	4580	0
EB 2D	1082	644	0	53	16	1933	774	0
EB DT	718	365	0	30	10	1316	385	0
EB Other	608	318	0	36	6	1104	370	0
EB TOTAL	10117	5510	0	557	215	20242	6109	0
WB 3S2	7744	4174	0	563	215	15526	4726	0
WB 2D	1218	516	0	65	15	2171	636	0
WB DT	719	348	0	37	10	1452	396	0
WB OTHER	1037	398	0	26	2	1634	472	0
WB TOTAL	10718	5436	0	691	242	20783	6230	0
TOTAL	20835	10946	0	1248	457	41025	12339	0

Table 4.26 Normal Traffic (Gages 86-93)

Stress Range (psi)	G86	G87	G88	G89	G90	G91	G92	G93
1000-1500	0	0	331	592	1116	619	0	131
1500-2000	0	0	44	269	483	494	0	7
2000-2500	0	0	2	34	40	303	0	0
2500-3000	0	0	0	0	4	39	0	0
3000-3500	0	0	0	0	0	5	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	19.53	19.53	17.59	17.59	0.00	18.50
Total Cycles	0	0	377	895	1643	1460	0	138
RMC (psi)	0	0	1339	1494	1478	1784	0	1286
EB 3S2	0	0	4580	4580	4142	4142	0	4407
EB 2D	0	0	774	774	721	721	0	714
EB DT	0	0	385	385	355	355	0	375
EB Other	0	0	370	370	334	334	0	337
EB TOTAL	0	0	6109	6109	5552	5552	0	5833
WB 3S2	0	0	4726	4726	4163	4163	0	4483
WB 2D	0	0	636	636	571	571	0	580
WB DT	0	0	396	396	359	359	0	368
WB OTHER	0	0	472	472	446	446	0	437
WB TOTAL	0	0	6230	6230	5539	5539	0	5868
TOTAL	0	0	12339	12339	11091	11091	0	11701

Table 4.27 Normal Traffic (Gages 94-101)

Stress Range (psi)	G94	G95	G96	G97	G98	G99	G100	G101
1000-1500	50	716	1044	1089	776	2	0	21
1500-2000	0	498	501	479	605	1	0	1
2000-2500	1	482	107	205	576	0	0	0
2500-3000	0	491	20	23	360	0	0	0
3000-3500	0	349	1	4	74	0	0	0
3500-4000	0	106	0	0	28	0	0	0
4000-4500	0	47	0	0	12	0	0	0
4500-5000	0	16	0	0	3	0	0	0
5000-5500	0	9	0	0	0	0	0	0
5500-6000	0	4	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	18.50	16.40	19.53	19.53	15.31	33.99	1.94	1.25
Total Cycles	51	2718	1673	1800	2434	3	0	22
RMC (psi)	1288	2544	1563	1619	2146	1456	0	1282
EB 3S2	4340	3849	4580	4580	3655	7709	438	177
EB 2D	695	744	774	774	730	1082	53	29
EB DT	367	300	385	385	266	718	30	20
EB Other	337	345	370	370	328	608	36	45
EB TOTAL	5739	5238	6109	6109	4979	10117	557	271
WB 3S2	4482	4153	4726	4726	4024	7744	563	276
WB 2D	567	599	636	636	592	1218	65	38
WB DT	376	321	396	396	289	719	37	23
WB OTHER	440	410	472	472	410	1037	26	23
WB TOTAL	5865	5483	6230	6230	5315	10718	691	360
TOTAL	11604	10721	12339	12339	10294	20835	1248	631

Table 4.28 Normal Traffic (Gages 102-109)

Stress Range (psi)	G102	G103	G104	G105	G106	G107	G108	G109
1000-1500	1	1	82	5359	784	1053	867	1081
1500-2000	0	1	10	1717	274	490	572	596
2000-2500	0	0	3	1331	145	426	524	441
2500-3000	0	0	1	1431	80	388	146	166
3000-3500	0	0	1	852	71	335	33	42
3500-4000	0	0	0	240	20	135	20	19
4000-4500	0	0	0	70	6	74	4	2
4500-5000	0	0	0	20	0	30	0	1
5000-5500	0	0	0	6	0	8	0	0
5500-6000	0	0	0	0	0	9	0	0
6000-6500	0	0	0	0	0	2	0	0
6500-7000	0	0	0	0	0	2	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.25	1.25	1.25	35.39	16.89	14.78	14.78	14.78
Total Cycles	1	2	97	11026	1380	2952	2166	2348
RMC (psi)	1250	1541	1462	2184	1952	2552	1958	1915
EB 3S2	177	177	177	8379	4326	3202	3202	3202
EB 2D	29	29	29	946	522	316	316	316
EB DT	20	20	20	715	303	337	337	337
EB Other	45	45	45	599	273	240	240	240
EB TOTAL	271	271	271	10639	5424	4095	4095	4095
WB 3S2	276	276	276	8402	4375	3093	3093	3093
WB 2D	38	38	38	1309	615	610	610	610
WB DT	23	23	23	843	421	331	331	331
WB OTHER	23	23	23	950	335	577	577	577
WB TOTAL	360	360	360	11504	5746	4611	4611	4611
TOTAL	631	631	631	22143	11170	8706	8706	8706

Table 4.29 Normal Traffic (Gages 110-117)

Stress Range (psi)	G110	G111	G112	G113	G114	G115	G116	G117
1000-1500	1002	0	0	4786	925	586	1696	869
1500-2000	326	0	0	1448	512	233	1458	656
2000-2500	279	0	0	810	479	73	1178	164
2500-3000	263	0	0	760	192	15	484	30
3000-3500	303	0	0	660	57	4	122	5
3500-4000	280	0	0	724	12	0	43	2
4000-4500	290	0	0	529	6	0	23	0
4500-5000	197	0	0	248	2	0	6	0
5000-5500	98	0	0	98	0	0	0	0
5500-6000	38	0	0	43	0	0	0	0
6000-6500	20	0	0	19	0	0	0	0
6500-7000	10	0	0	13	0	0	0	0
7000-7500	17	0	0	6	0	0	0	0
7500-8000	2	0	0	1	0	0	0	0
8000-8500	3	0	0	3	0	0	0	0
8500-9000	1	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	14.78	0.00	0.00	32.82	14.45	14.45	32.82	17.03
Total Cycles	3129	0	0	10148	2185	911	5010	1726
RMC (psi)	3372	0	0	2726	1992	1592	2055	1666
EB 3S2	3202	0	0	7833	3129	3129	7833	3675
EB 2D	316	0	0	831	308	308	831	423
EB DT	337	0	0	689	333	333	689	359
EB Other	240	0	0	540	238	238	540	297
EB TOTAL	4095	0	0	9893	4008	4008	9893	4754
WB 3S2	3093	0	0	7755	3018	3018	7755	3665
WB 2D	610	0	0	1196	582	582	1196	695
WB DT	331	0	0	781	323	323	781	385
WB OTHER	577	0	0	904	565	565	904	611
WB TOTAL	4611	0	0	10636	4488	4488	10636	5356
TOTAL	8706	0	0	20529	8496	8496	20529	10110

Table 4.30 Normal Traffic (Gages 118-201)

Stress Range								
(psi)	G118	G120	G121	G122	G123	G124	G125	G201
1000-1500	720	8056	997	4491	1180	1632	799	601
1500-2000	646	3421	464	1561	832	439	571	53
2000-2500	258	1728	317	698	251	328	258	3
2500-3000	19	1301	42	490	180	343	113	3
3000-3500	1	916	1	401	84	347	75	2
3500-4000	0	788	0	380	20	299	34	3
4000-4500	0	626	0	396	5	403	13	3
4500-5000	0	475	0	215	1	282	9	0
5000-5500	0	377	0	144	0	133	5	0
5500-6000	0	286	0	105	0	88	1	0
6000-6500	0	253	0	92	0	82	4	0
6500-7000	0	213	0	63	0	47	0	0
7000-7500	0	179	0	32	0	36	1	0
7500-8000	0	166	0	16	0	10	3	0
8000-8500	0	137	0	13	0	6	0	0
8500-9000	0	121	0	9	0	13	0	0
9000-9500	0	73	0	3	0	2	0	0
9500-10000	0	45	0	3	0	2	0	0
10000-10500	0	25	0	0	0	2	0	0
10500-11000	0	20	0	1	0	0	0	0
11000-11500	0	7	0	0	0	0	0	0
11500-12000	0	12	0	0	0	0	0	0
12000-12500	0	11	0	0	0	0	0	0
12500-13000	0	6	0	0	0	0	0	0
13000-13500	0	4	0	0	0	0	0	0
13500-14000	0	1	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	17.03	34.36	8.07	17.34	18.37	18.37	12.31	25.87
Total Cycles	1644	19247	1821	9113	2553	4494	1886	668
RMC (psi)	1711	3753	1700	2994	1910	3612	2194	1444
EB 3S2	3675	8093	2165	4418	4704	4704	2988	5928
EB 2D	423	927	311	504	523	523	326	785
EB DT	359	701	164	342	356	356	236	539
EB Other	297	576	177	279	302	302	175	467
EB TOTAL	4754	10297	2817	5543	5885	5885	3725	7719
WB 3S2	3665	8012	2082	4347	4737	4737	2973	6067
WB 2D	695	1240	282	545	614	614	362	1042
WB DT	385	820	177	435	458	458	311	519
WB OTHER	611	920	202	309	339	339	157	870
WB TOTAL	5356	10992	2743	5636	6148	6148	3803	8498
TOTAL	10110	21289	5560	11179	12033	12033	7528	16217

Table 4.31 Normal Traffic (Gages 202-321)

Stress Range (psi)	G202	G203	G204	G305	G306	G317	G318
1000-1500	1808	841	3085	1977	446	616	260
1500-2000	369	171	1229	1357	115	515	277
2000-2500	44	25	183	874	14	39	64
2500-3000	9	5	48	767	1	7	10
3000-3500	2	1	9	675	0	0	4
3500-4000	0	0	1	525	0	0	2
4000-4500	0	0	0	226	0	0	1
4500-5000	0	0	0	105	0	0	0
5000-5500	0	0	0	38	0	0	0
5500-6000	0	0	0	14	0	0	0
6000-6500	0	0	0	8	0	0	0
6500-7000	0	0	0	1	0	0	0
7000-7500	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0
Time (hours)	31.03	14.45	45.20	33.31	26.12	17.03	6.68
Total Cycles	2232	1043	4555	6567	576	1177	618
RMC (psi)	1411	1419	1522	2684	1425	1570	1739
EB 3S2	6960	3129	10930	7873	6173	3675	1625
EB 2D	1014	308	1499	927	746	423	192
EB DT	673	333	945	663	515	359	110
EB Other	565	238	827	586	474	297	119
EB TOTAL	9212	4008	14201	10049	7908	4754	2046
WB 3S2	6939	3018	11033	7939	6409	3665	1638
WB 2D	1140	582	1684	1280	1014	695	309
WB DT	644	323	1038	787	620	385	162
WB OTHER	961	565	1278	905	596	611	229
WB TOTAL	9684	4488	15033	10911	8639	5356	2338
TOTAL	18896	8496	29234	20960	16547	10110	4384

Table 4.32 Right Lane and Shoulder Traffic (Gages 1-8)

Stress Range								
(psi)	G1	G2	G3	G4	G5	G6	G7	G8
1000-1500	6	14	0	0	244	2	108	0
1500-2000	1	1	0	0	215	0	62	0
2000-2500	0	0	0	0	236	0	16	0
2500-3000	0	0	0	0	176	0	4	0
3000-3500	0	0	0	0	84	0	0	0
3500-4000	0	0	0	0	27	0	0	0
4000-4500	0	0	0	0	10	0	0	0
4500-5000	0	0	0	0	4	0	0	0
5000-5500	0	0	0	0	1	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.58	1.58	1.58	0.00	4.06	1.12	1.58	0.00
Total Cycles	7	15	0	0	997	2	190	0
RMC (psi)	1346	1297	0	0	2391	1250	1621	0
EB 3S2	467	467	467	0	1239	304	467	0
EB 2D	59	59	59	0	108	37	59	0
EB DT	21	21	21	0	44	14	21	0
EB Other	28	28	28	0	85	15	28	0
EB TOTAL	575	575	575	0	1476	370	575	0
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	575	575	575	0	1476	370	575	0

Table 4.33 Right Lane and Shoulder Traffic (Gages 9-15)

Stress Range (psi)	G9	G10	G11	G12	G13	G13A	G14	G15
1000-1500	3	15	229	0	0	0	7	55
1500-2000	0	1	37	0	0	0	0	38
2000-2500	0	0	3	0	0	0	1	10
2500-3000	0	0	0	0	0	0	0	2
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.58	0.92	1.58	0.00	0.00	0.00	0.92	0.92
Total Cycles	3	16	269	0	0	0	8	105
RMC (psi)	1250	1294	1362	0	0	0	1463	1644
EB 3S2	467	251	467	0	0	0	251	251
EB 2D	59	33	59	0	0	0	33	33
EB DT	21	10	21	0	0	0	10	10
EB Other	28	13	28	0	0	0	13	13
EB TOTAL	575	307	575	0	0	0	307	307
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	575	307	575	0	0	0	307	307

Table 4.34 Right Lane and Shoulder Traffic (Gages 16-25)

Stress Range (psi)	G16	G17	G18	G19	G20	G23	G24	G25
1000-1500	0	23	96	226	251	95	54	90
1500-2000	0	1	5	248	257	56	11	66
2000-2500	0	0	0	119	98	7	0	56
2500-3000	0	0	0	99	28	1	0	25
3000-3500	0	0	0	55	6	1	0	8
3500-4000	0	0	0	27	2	1	0	3
4000-4500	0	0	0	8	0	0	0	1
4500-5000	0	0	0	2	0	0	0	0
5000-5500	0	0	0	2	0	0	0	0
5500-6000	0	0	0	1	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	4.06	4.06	3.28	3.28	1.24	1.24	1.24
Total Cycles	0	24	101	787	642	161	65	249
RMC (psi)	0	1280	1285	2318	1821	1611	1363	2066
EB 3S2	0	1239	1239	980	980	217	217	217
EB 2D	0	108	108	101	101	74	74	74
EB DT	0	44	44	39	39	21	21	21
EB Other	0	85	85	74	74	42	42	42
EB TOTAL	0	1476	1476	1194	1194	354	354	354
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	0	1476	1476	1194	1194	354	354	354

Table 4.35 Right Lane and Shoulder Traffic (Gages 26-33)

Stress Range (psi)	G26	G27	G28	G29	G30	G31	G32	G33
1000-1500	111	2	5	0	0	166	122	182
1500-2000	33	0	2	1	0	190	39	80
2000-2500	5	0	0	0	0	133	2	36
2500-3000	1	0	0	0	0	57	2	6
3000-3500	0	0	0	0	0	10	0	0
3500-4000	0	0	0	0	0	5	0	0
4000-4500	0	0	0	0	0	1	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.24	2.17	2.17	2.17	0.00	2.17	2.17	2.17
Total Cycles	150	2	7	1	0	562	165	304
RMC (psi)	1465	1250	1430	1750	0	2034	1458	1631
EB 3S2	217	619	619	619	0	619	619	619
EB 2D	74	90	90	90	0	90	90	90
EB DT	21	37	37	37	0	37	37	37
EB Other	42	32	32	32	0	32	32	32
EB TOTAL	354	778	778	778	0	778	778	778
WB 3S2	0	158	158	158	0	158	158	158
WB 2D	0	20	20	20	0	20	20	20
WB DT	0	13	13	13	0	13	13	13
WB OTHER	0	15	15	15	0	15	15	15
WB TOTAL	0	206	206	206	0	206	206	206
TOTAL	354	984	984	984	0	984	984	984

Table 4.36 Right Lane and Shoulder Traffic (Gages 34-41)

Stress Range (psi)	G34	G35	G36	G37	G38	G39	G40	G41
1000-1500	185	0	21	167	0	0	0	189
1500-2000	55	0	2	209	0	0	0	14
2000-2500	45	0	0	139	0	0	0	1
2500-3000	28	0	0	88	0	0	0	0
3000-3500	5	0	0	90	0	0	0	0
3500-4000	0	0	0	30	0	0	0	0
4000-4500	0	0	0	10	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	2.48	0.00	2.17	2.17	0.00	0.00	0.00	3.32
Total Cycles	318	0	23	733	0	0	0	204
RMC (psi)	1822	0	1310	2413	0	0	0	1307
EB 3S2	772	0	619	619	0	0	0	1030
EB 2D	49	0	90	90	0	0	0	96
EB DT	23	0	37	37	0	0	0	39
EB Other	57	0	32	32	0	0	0	68
EB TOTAL	901	0	778	778	0	0	0	1233
WB 3S2	0	0	158	158	0	0	0	158
WB 2D	0	0	20	20	0	0	0	20
WB DT	0	0	13	13	0	0	0	13
WB OTHER	0	0	15	15	0	0	0	15
WB TOTAL	0	0	206	206	0	0	0	206
TOTAL	901	0	984	984	0	0	0	1439

Table 4.37 Right Lane and Shoulder Traffic (Gages 42-49)

Stress Range (psi)	G42	G43	G44	G45	G46	G47	G48	G49
1000-1500	210	146	200	90	113	80	78	92
1500-2000	89	67	16	73	57	72	75	75
2000-2500	57	58	0	8	68	66	48	15
2500-3000	40	28	0	2	38	29	54	3
3000-3500	6	4	0	0	9	11	27	0
3500-4000	1	1	0	0	1	4	20	0
4000-4500	0	0	0	0	0	1	3	0
4500-5000	0	0	0	0	0	0	3	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	1	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	2.17	2.48	4.65	1.24	1.24	1.24	1.24	1.24
Total Cycles	403	304	216	173	286	263	309	185
RMC (psi)	1868	1898	1302	1593	2047	2136	2520	1639
EB 3S2	619	772	1391	217	217	217	217	217
EB 2D	90	49	139	74	74	74	74	74
EB DT	37	23	60	21	21	21	21	21
EB Other	32	57	89	42	42	42	42	42
EB TOTAL	778	901	1679	354	354	354	354	354
WB 3S2	158	0	158	0	0	0	0	0
WB 2D	20	0	20	0	0	0	0	0
WB DT	13	0	13	0	0	0	0	0
WB OTHER	15	0	15	0	0	0	0	0
WB TOTAL	206	0	206	0	0	0	0	0
TOTAL	984	901	1885	354	354	354	354	354

Table 4.38 Right Lane and Shoulder Traffic (Gages 50-54)

Stress Range (psi)	G50	G51	G51A	G52	G52A	G53	G53A	G54
1000-1500	72	458	263	777	568	329	163	402
1500-2000	5	257	135	312	204	353	19	93
2000-2500	0	305	77	231	155	281	6	8
2500-3000	0	154	105	233	131	26	1	1
3000-3500	1	110	98	131	118	13	0	0
3500-4000	0	29	55	71	172	2	0	0
4000-4500	0	8	20	71	117	1	0	0
4500-5000	0	5	8	73	77	0	0	0
5000-5500	0	0	2	53	36	0	0	0
5500-6000	0	0	2	26	5	0	0	0
6000-6500	0	0	0	13	9	0	0	0
6500-7000	0	0	0	7	3	0	0	0
7000-7500	0	0	0	1	2	0	0	0
7500-8000	0	0	0	1	1	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	4.65	4.65	4.38	4.65	4.38	4.65	4.38	4.65
Total Cycles	78	1326	765	2000	1598	1005	189	504
RMC (psi)	1373	2265	2611	2943	3099	1901	1392	1404
EB 3S2	1391	1391	1205	1391	1205	1391	1205	1391
EB 2D	139	139	149	139	149	139	149	139
EB DT	60	60	55	60	55	60	55	60
EB Other	89	89	114	89	114	89	114	89
EB TOTAL	1679	1679	1523	1679	1523	1679	1523	1679
WB 3S2	158	158	0	158	0	158	0	158
WB 2D	20	20	0	20	0	20	0	20
WB DT	13	13	0	13	0	13	0	13
WB OTHER	15	15	0	15	0	15	0	15
WB TOTAL	206	206	0	206	0	206	0	206
TOTAL	1885	1885	1523	1885	1523	1885	1523	1885

Table 4.39 Right Lane and Shoulder Traffic (Gages 54A-61)

Stress Range (psi)	G54A	G55	G56	G57	G58	G59	G60	G61
1000-1500	132	67	1	0	176	0	97	0
1500-2000	53	8	0	0	116	0	49	0
2000-2500	51	0	0	0	75	0	5	0
2500-3000	40	0	0	0	27	0	0	0
3000-3500	29	0	0	0	1	0	0	0
3500-4000	41	0	0	0	1	0	0	0
4000-4500	28	0	0	0	0	0	0	0
4500-5000	15	0	0	0	0	0	0	0
5000-5500	11	0	0	0	0	0	0	0
5500-6000	2	0	0	0	0	0	0	0
6000-6500	2	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	1	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.90	1.24	1.24	1.24	2.02	0.00	1.24	0.00
Total Cycles	405	75	1	0	396	0	151	0
RMC (psi)	3077	1323	1250	0	1840	0	1499	0
EB 3S2	433	0	0	0	259	0	0	0
EB 2D	100	0	0	0	7	0	0	0
EB DT	32	0	0	0	5	0	0	0
EB Other	57	0	0	0	11	0	0	0
EB TOTAL	622	0	0	0	282	0	0	0
WB 3S2	0	330	330	330	330	0	330	0
WB 2D	0	63	63	63	63	0	63	0
WB DT	0	25	25	25	25	0	25	0
WB OTHER	0	23	23	23	23	0	23	0
WB TOTAL	0	441	441	441	441	0	441	0
TOTAL	622	441	441	441	723	0	441	0

Table 4.40 Right Lane and Shoulder Traffic (Gages 62-69)

Stress Range (psi)	G62	G63	G64	G65	G66	G67	G68	G69
1000-1500	101	4	6	0	0	20	10	104
1500-2000	48	1	2	0	0	5	0	51
2000-2500	33	0	2	0	0	1	0	31
2500-3000	9	0	1	0	0	0	0	11
3000-3500	0	0	0	0	0	0	0	2
3500-4000	0	0	0	0	0	0	0	2
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.24	1.24	1.03	0.00	0.00	1.24	0.59	1.24
Total Cycles	191	5	11	0	0	26	10	201
RMC (psi)	1747	1381	1817	0	0	1438	1250	1830
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	330	330	281	0	0	330	145	330
WB 2D	63	63	49	0	0	63	23	63
WB DT	25	25	22	0	0	25	14	25
WB OTHER	23	23	20	0	0	23	8	23
WB TOTAL	441	441	372	0	0	441	190	441
TOTAL	441	441	372	0	0	441	190	441

Table 4.41 Right Lane and Shoulder Traffic (Gages 70-77)

Stress Range (psi)	G70	G71	G72	G73	G74	G75	G76	G77
1000-1500	0	17	8	101	77	0	90	0
1500-2000	0	1	0	83	66	0	86	0
2000-2500	0	1	0	78	69	0	74	0
2500-3000	0	0	1	63	17	0	61	0
3000-3500	0	0	0	43	2	0	36	0
3500-4000	0	0	0	15	2	0	26	0
4000-4500	0	0	0	1	0	0	2	0
4500-5000	0	0	0	1	0	0	1	0
5000-5500	0	0	0	0	0	0	1	0
5500-6000	0	0	0	0	0	0	1	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	1.24	1.24	1.24	0.83	0.00	1.24	0.00
Total Cycles	0	19	9	385	233	0	378	0
RMC (psi)	0	1380	1594	2395	1983	0	2506	0
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	0	330	330	330	241	0	330	0
WB 2D	0	63	63	63	51	0	63	0
WB DT	0	25	25	25	15	0	25	0
WB OTHER	0	23	23	23	16	0	23	0
WB TOTAL	0	441	441	441	323	0	441	0
TOTAL	0	441	441	441	323	0	441	0

Table 4.42 Right Lane and Shoulder Traffic (Gages 78-85)

Stress Range (psi)	G78	G79	G80	G81	G82	G83	G84	G85
1000-1500	5	0	168	230	160	204	0	22
1500-2000	1	0	65	121	148	52	0	4
2000-2500	0	0	44	71	134	5	0	1
2500-3000	0	0	24	40	41	0	0	1
3000-3500	0	0	1	10	6	0	0	0
3500-4000	0	0	0	1	5	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.83	0.00	1.83	1.83	1.83	2.48	0.00	1.83
Total Cycles	8	0	302	473	494	261	0	28
RMC (psi)	3578	0	1783	1878	2000	1412	0	1511
EB 3S2	152	0	152	152	152	772	0	152
EB 2D	31	0	31	31	31	49	0	31
EB DT	16	0	16	16	16	23	0	16
EB Other	4	0	4	4	4	57	0	4
EB TOTAL	203	0	203	203	203	901	0	203
WB 3S2	488	0	488	488	488	0	0	488
WB 2D	83	0	83	83	83	0	0	83
WB DT	38	0	38	38	38	0	0	38
WB OTHER	38	0	38	38	38	0	0	38
WB TOTAL	647	0	647	647	647	0	0	647
TOTAL	850	0	850	850	850	901	0	850

Table 4.43 Right Lane and Shoulder Traffic (Gages 86-93)

Stress Range (psi)	G86	G87	G88	G89	G90	G91	G92	G93
1000-1500	0	0	47	90	176	0	0	19
1500-2000	0	0	8	8	77	0	0	2
2000-2500	0	0	1	1	36	0	0	0
2500-3000	0	0	0	0	29	0	0	0
3000-3500	0	0	0	0	2	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	1	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	1.83	1.83	1.46	0.00	0.00	1.83
Total Cycles	0	0	56	99	321	0	0	21
RMC (psi)	0	0	1377	1325	1814	0	0	1316
EB 3S2	0	0	152	152	152	0	0	152
EB 2D	0	0	31	31	31	0	0	31
EB DT	0	0	16	16	16	0	0	16
EB Other	0	0	4	4	4	0	0	4
EB TOTAL	0	0	203	203	203	0	0	203
WB 3S2	0	0	488	488	404	0	0	488
WB 2D	0	0	83	83	72	0	0	83
WB DT	0	0	38	38	30	0	0	38
WB OTHER	0	0	38	38	32	0	0	38
WB TOTAL	0	0	647	647	538	0	0	647
TOTAL	0	0	850	850	741	0	0	850

Table 4.44 Right Lane and Shoulder Traffic (Gages 94-101)

Stress Range (psi)	G94	G95	G96	G97	G98	G99	G100	G101
1000-1500	37	163	196	183	145	65	1	27
1500-2000	2	105	145	124	122	1	0	4
2000-2500	0	88	19	38	102	0	0	0
2500-3000	0	95	5	7	123	0	0	0
3000-3500	0	80	1	0	58	0	0	0
3500-4000	0	67	0	0	12	0	0	0
4000-4500	0	34	0	0	4	0	0	0
4500-5000	0	7	0	0	3	0	0	0
5000-5500	0	3	0	0	0	0	0	0
5500-6000	0	5	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.24
Total Cycles	39	647	366	352	569	66	1	31
RMC (psi)	1286	2844	1606	1657	2404	1261	1250	1337
EB 3S2	152	152	152	152	152	152	152	217
EB 2D	31	31	31	31	31	31	31	74
EB DT	16	16	16	16	16	16	16	21
EB Other	4	4	4	4	4	4	4	42
EB TOTAL	203	203	203	203	203	203	203	354
WB 3S2	488	488	488	488	488	488	488	0
WB 2D	83	83	83	83	83	83	83	0
WB DT	38	38	38	38	38	38	38	0
WB OTHER	38	38	38	38	38	38	38	0
WB TOTAL	647	647	647	647	647	647	647	0
TOTAL	850	850	850	850	850	850	850	354

Table 4.45 Right Lane and Shoulder Traffic (Gages 102-109)

Stress Range (psi)	G102	G103	G104	G105	G106	G107	G108	G109
1000-1500	0	0	56	8827	208	820	372	154
1500-2000	0	0	27	3856	96	345	196	79
2000-2500	0	0	6	1658	49	255	157	59
2500-3000	0	0	2	809	17	126	52	28
3000-3500	0	0	0	409	2	55	24	7
3500-4000	0	0	0	287	0	29	4	2
4000-4500	0	0	0	174	0	4	2	0
4500-5000	0	0	0	114	0	2	0	0
5000-5500	0	0	0	117	0	2	0	0
5500-6000	0	0	0	79	0	0	0	0
6000-6500	0	0	0	81	0	0	0	0
6500-7000	0	0	0	66	0	0	0	0
7000-7500	0	0	0	62	0	0	0	0
7500-8000	0	0	0	59	0	0	0	0
8000-8500	0	0	0	47	0	0	0	0
8500-9000	0	0	0	47	0	0	0	0
9000-9500	0	0	0	37	0	0	0	0
9500-10000	0	0	0	37	0	0	0	0
10000-10500	0	0	0	27	0	0	0	0
10500-11000	0	0	0	23	0	0	0	0
11000-11500	0	0	0	19	0	0	0	0
11500-12000	0	0	0	17	0	0	0	0
12000-12500	0	0	0	14	0	0	0	0
12500-13000	0	0	0	12	0	0	0	0
13000-13500	0	0	0	5	0	0	0	0
13500-14000	0	0	0	5	0	0	0	0
14000-14500	0	0	0	2	0	0	0	0
14500-15000	0	0	0	4	0	0	0	0
15000-15500	0	0	0	2	0	0	0	0
15500-16000	0	0	0	2	0	0	0	0
16000-16500	0	0	0	1	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	1	0	0	0	0
Time (hours)	1.24	1.24	1.24	3.72	1.24	3.72	2.94	1.24
Total Cycles	0	0	91	16900	372	1638	807	329
RMC (psi)	0	0	1587	3294	1722	2005	1934	1919
EB 3S2	217	217	217	989	217	989	730	217
EB 2D	74	74	74	123	74	123	116	74
EB DT	21	21	21	44	21	44	39	21
EB Other	42	42	42	99	42	99	88	42
EB TOTAL	354	354	354	1255	354	1255	973	354
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	354	354	354	1255	354	1255	973	354

Table 4.46 Right Lane and Shoulder Traffic (Gages 110-117)

Stress Range (psi)	G110	G111	G112	G113	G114	G115	G116	G117
1000-1500	317	5	67	330	166	108	102	94
1500-2000	92	0	30	100	41	50	68	31
2000-2500	52	0	2	44	8	28	12	26
2500-3000	33	0	0	27	4	14	1	9
3000-3500	38	0	0	9	0	4	0	3
3500-4000	38	0	0	4	0	0	0	0
4000-4500	31	0	0	0	0	0	0	0
4500-5000	9	0	0	0	0	0	0	0
5000-5500	7	0	0	0	0	0	0	0
5500-6000	1	0	0	0	0	0	0	0
6000-6500	1	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Total Cycles	619	5	99	514	219	204	183	163
RMC (psi)	2569	1250	1470	1752	1486	1818	1580	1791
EB 3S2	217	217	217	217	217	217	217	217
EB 2D	74	74	74	74	74	74	74	74
EB DT	21	21	21	21	21	21	21	21
EB Other	42	42	42	42	42	42	42	42
EB TOTAL	354	354	354	354	354	354	354	354
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	354	354	354	354	354	354	354	354

Table 4.47 Right Lane and Shoulder Traffic (Gages 118-201)

Stress Range								
(psi)	G118	G120	G121	G122	G123	G124	G125	G201
1000-1500	69	3826	0	3420	164	862	531	92
1500-2000	31	1627	0	1418	46	300	145	43
2000-2500	9	653	0	586	42	125	126	65
2500-3000	3	324	0	340	41	64	120	29
3000-3500	0	163	0	166	25	62	103	16
3500-4000	0	89	0	145	12	40	42	6
4000-4500	0	70	0	84	13	46	44	0
4500-5000	0	56	0	76	13	45	38	1
5000-5500	0	52	0	70	5	50	11	0
5500-6000	0	42	0	58	0	53	4	0
6000-6500	0	49	0	57	2	50	2	0
6500-7000	0	27	0	66	0	37	2	0
7000-7500	0	32	0	36	0	26	1	0
7500-8000	0	36	0	37	0	20	0	0
8000-8500	0	45	0	30	0	10	0	0
8500-9000	0	34	0	19	0	5	0	0
9000-9500	0	32	0	8	0	7	0	0
9500-10000	0	28	0	7	0	3	0	0
10000-10500	0	27	0	6	0	0	0	0
10500-11000	0	11	0	5	0	1	0	0
11000-11500	0	7	0	3	0	1	0	0
11500-12000	0	7	0	0	0	1	0	0
12000-12500	0	2	0	0	0	0	0	0
12500-13000	0	3	0	3	0	0	0	0
13000-13500	0	4	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	3	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	1	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	1.24	2.48	0.00	2.48	0.78	2.48	2.48	1.24
Total Cycles	112	7250	0	6640	363	1808	1169	252
RMC (psi)	1608	3513	0	3151	2681	3814	2691	2212
EB 3S2	217	772	0	772	259	772	772	217
EB 2D	74	49	0	49	7	49	49	74
EB DT	21	23	0	23	5	23	23	21
EB Other	42	57	0	57	11	57	57	42
EB TOTAL	354	901	0	901	282	901	901	354
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	354	901	0	901	282	901	901	354

Table 4.48 Right Lane and Shoulder Traffic (Gages 202-321)

Stress Range (psi)	G202	G203	G204	G305	G306	G317	G318
1000-1500	0	267	189	0	0	0	0
1500-2000	0	56	136	0	0	0	0
2000-2500	0	5	14	0	0	0	0
2500-3000	0	3	5	0	0	0	0
3000-3500	0	0	1	0	0	0	0
3500-4000	0	1	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0
Time (hours)	0.00	2.48	2.48	0.00	0.00	0.00	0.00
Total Cycles	0	332	345	0	0	0	0
RMC (psi)	0	1441	1593	0	0	0	0
EB 3S2	0	772	772	0	0	0	0
EB 2D	0	49	49	0	0	0	0
EB DT	0	23	23	0	0	0	0
EB Other	0	57	57	0	0	0	0
EB TOTAL	0	901	901	0	0	0	0
WB 3S2	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0
TOTAL	0	901	901	0	0	0	0

Table 4.49 Middle and Left Hand Lane Traffic (Gages 1-8)

Stress Range (psi)	G1	G2	G3	G4	G5	G6	G7	G8
1000-1500	0	0	0	120	0	0	0	0
1500-2000	0	0	0	29	0	0	0	0
2000-2500	0	0	0	1	0	0	0	0
2500-3000	0	0	0	1	0	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	2.56	0.00	0.00	0.00	0.00
Total Cycles	0	0	0	151	0	0	0	0
RMC (psi)	0	0	0	1409	0	0	0	0
EB 3S2	0	0	0	602	0	0	0	0
EB 2D	0	0	0	87	0	0	0	0
EB DT	0	0	0	43	0	0	0	0
EB Other	0	0	0	65	0	0	0	0
EB TOTAL	0	0	0	797	0	0	0	0
WB 3S2	0	0	0	763	0	0	0	0
WB 2D	0	0	0	96	0	0	0	0
WB DT	0	0	0	41	0	0	0	0
WB OTHER	0	0	0	68	0	0	0	0
WB TOTAL	0	0	0	968	0	0	0	0
TOTAL	0	0	0	1765	0	0	0	0

Table 4.50 Middle and Left Hand Lane Traffic (Gages 9-15)

Stress Range (psi)	G9	G10	G11	G12	G13	G13A	G14	G15
1000-1500	0	0	0	0	0	0	0	0
1500-2000	0	0	0	0	0	0	0	0
2000-2500	0	0	0	0	0	0	0	0
2500-3000	0	0	0	0	0	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cycles	0	0	0	0	0	0	0	0
RMC (psi)	0	0	0	0	0	0	0	0
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0

Table 4.51 Middle and Left Hand Lane Traffic (Gages 16-25)

Stress Range (psi)	G16	G17	G18	G19	G20	G23	G24	G25
1000-1500	0	0	0	0	0	0	0	0
1500-2000	0	0	0	0	0	0	0	0
2000-2500	0	0	0	0	0	0	0	0
2500-3000	0	0	0	0	0	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cycles	0	0	0	0	0	0	0	0
RMC (psi)	0	0	0	0	0	0	0	0
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0

Table 4.52 Middle and Left Hand Lane Traffic (Gages 26-33)

Stress Range (psi)	G26	G27	G28	G29	G30	G31	G32	G33
1000-1500	0	0	0	0	136	0	2	8
1500-2000	0	0	0	0	100	0	0	1
2000-2500	0	0	0	0	8	0	0	1
2500-3000	0	0	0	0	1	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	0.00	2.16	0.00	4.72	4.72
Total Cycles	0	0	0	0	245	0	2	10
RMC (psi)	0	0	0	0	1551	0	1250	1479
EB 3S2	0	0	0	0	478	0	1080	1080
EB 2D	0	0	0	0	40	0	127	127
EB DT	0	0	0	0	33	0	76	76
EB Other	0	0	0	0	26	0	91	91
EB TOTAL	0	0	0	0	577	0	1374	1374
WB 3S2	0	0	0	0	0	0	763	763
WB 2D	0	0	0	0	0	0	96	96
WB DT	0	0	0	0	0	0	41	41
WB OTHER	0	0	0	0	0	0	68	68
WB TOTAL	0	0	0	0	0	0	968	968
TOTAL	0	0	0	0	577	0	2342	2342

Table 4.53 Middle and Left Hand Lane Traffic (Gages 34-41)

Stress Range (psi)	G34	G35	G36	G37	G38	G39	G40	G41
1000-1500	57	7	0	213	0	0	0	133
1500-2000	8	2	0	32	0	0	0	44
2000-2500	1	0	0	2	0	0	0	1
2500-3000	0	0	0	1	0	0	0	1
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	4.72	4.72	0.00	4.72	0.00	0.00	0.00	2.16
Total Cycles	66	9	0	248	0	0	0	179
RMC (psi)	1359	1394	0	1365	0	0	0	1434
EB 3S2	1080	1080	0	1080	0	0	0	478
EB 2D	127	127	0	127	0	0	0	40
EB DT	76	76	0	76	0	0	0	33
EB Other	91	91	0	91	0	0	0	26
EB TOTAL	1374	1374	0	1374	0	0	0	577
WB 3S2	763	763	0	763	0	0	0	0
WB 2D	96	96	0	96	0	0	0	0
WB DT	41	41	0	41	0	0	0	0
WB OTHER	68	68	0	68	0	0	0	0
WB TOTAL	968	968	0	968	0	0	0	0
TOTAL	2342	2342	0	2342	0	0	0	577

Table 4.54 Middle and Left Hand Lane Traffic (Gages 42-49)

Stress Range (psi)	G42	G43	G44	G45	G46	G47	G48	G49
1000-1500	0	292	20	0	0	0	0	0
1500-2000	0	156	1	0	0	0	0	0
2000-2500	0	97	0	0	0	0	0	0
2500-3000	0	24	0	0	0	0	0	0
3000-3500	0	5	0	0	0	0	0	0
3500-4000	0	1	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	3.71	4.72	0.00	0.00	0.00	0.00	0.00
Total Cycles	0	575	21	0	0	0	0	0
RMC (psi)	0	1779	1284	0	0	0	0	0
EB 3S2	0	813	1080	0	0	0	0	0
EB 2D	0	81	127	0	0	0	0	0
EB DT	0	63	76	0	0	0	0	0
EB Other	0	61	91	0	0	0	0	0
EB TOTAL	0	1018	1374	0	0	0	0	0
WB 3S2	0	482	763	0	0	0	0	0
WB 2D	0	57	96	0	0	0	0	0
WB DT	0	28	41	0	0	0	0	0
WB OTHER	0	34	68	0	0	0	0	0
WB TOTAL	0	601	968	0	0	0	0	0
TOTAL	0	1619	2342	0	0	0	0	0

Table 4.55 Middle and Left Hand Lane Traffic (Gages 50-54)

Stress Range (psi)	G50	G51	G51A	G52	G52A	G53	G53A	G54
1000-1500	5	301	248	427	263	254	0	24
1500-2000	2	196	132	240	189	43	0	3
2000-2500	0	38	15	144	129	1	0	0
2500-3000	0	7	2	90	105	2	0	0
3000-3500	0	0	1	16	19	0	0	0
3500-4000	0	0	0	6	8	0	0	0
4000-4500	0	0	0	1	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	4.72	4.72	4.72	4.72	4.72	4.72	0.00	2.56
Total Cycles	7	542	398	924	713	300	0	27
RMC (psi)	1430	1599	1535	1923	2062	1375	0	1326
EB 3S2	1080	1080	1080	1080	1080	1080	0	602
EB 2D	127	127	127	127	127	127	0	87
EB DT	76	76	76	76	76	76	0	43
EB Other	91	91	91	91	91	91	0	65
EB TOTAL	1374	1374	1374	1374	1374	1374	0	797
WB 3S2	763	763	763	763	763	763	0	763
WB 2D	96	96	96	96	96	96	0	96
WB DT	41	41	41	41	41	41	0	41
WB OTHER	68	68	68	68	68	68	0	68
WB TOTAL	968	968	968	968	968	968	0	968
TOTAL	2342	2342	2342	2342	2342	2342	0	1765

Table 4.56 Middle and Left Hand Lane Traffic (Gages 54A-61)

Stress Range (psi)	G54A	G55	G56	G57	G58	G59	G60	G61
1000-1500	106	0	0	0	410	0	154	63
1500-2000	89	0	0	0	60	0	11	3
2000-2500	57	0	0	0	6	0	2	1
2500-3000	12	0	0	0	1	0	0	0
3000-3500	3	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	1	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	2.16	0.00	0.00	0.00	5.69	0.00	5.69	3.13
Total Cycles	268	0	0	0	477	0	167	67
RMC (psi)	1874	0	0	0	1364	0	1318	1310
EB 3S2	478	0	0	0	602	0	602	0
EB 2D	40	0	0	0	87	0	87	0
EB DT	33	0	0	0	43	0	43	0
EB Other	26	0	0	0	65	0	65	0
EB TOTAL	577	0	0	0	797	0	797	0
WB 3S2	0	0	0	0	1667	0	1667	904
WB 2D	0	0	0	0	242	0	242	146
WB DT	0	0	0	0	105	0	105	64
WB OTHER	0	0	0	0	125	0	125	57
WB TOTAL	0	0	0	0	2139	0	2139	1171
TOTAL	577	0	0	0	2936	0	2936	1171

Table 4.57 Middle and Left Hand Lane Traffic (Gages 62-69)

Stress Range (psi)	G62	G63	G64	G65	G66	G67	G68	G69
1000-1500	54	9	0	0	0	119	163	157
1500-2000	2	6	0	0	0	9	8	5
2000-2500	1	0	0	0	0	2	4	2
2500-3000	1	0	0	0	0	0	3	1
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	1	0
4500-5000	0	0	0	0	0	0	1	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	5.69	5.69	0.00	0.00	0.00	3.13	3.60	5.69
Total Cycles	58	15	0	0	0	130	180	165
RMC (psi)	1368	1491	0	0	0	1327	1537	1317
EB 3S2	602	602	0	0	0	0	602	602
EB 2D	87	87	0	0	0	0	87	87
EB DT	43	43	0	0	0	0	43	43
EB Other	65	65	0	0	0	0	65	65
EB TOTAL	797	797	0	0	0	0	797	797
WB 3S2	1667	1667	0	0	0	904	1061	1667
WB 2D	242	242	0	0	0	146	141	242
WB DT	105	105	0	0	0	64	54	105
WB OTHER	125	125	0	0	0	57	85	125
WB TOTAL	2139	2139	0	0	0	1171	1341	2139
TOTAL	2936	2936	0	0	0	1171	2138	2936

Table 4.58 Middle and Left Hand Lane Traffic (Gages 70-77)

Stress Range (psi)	G70	G71	G72	G73	G74	G75	G76	G77
1000-1500	558	15	1	428	415	439	411	0
1500-2000	304	1	2	325	146	244	300	0
2000-2500	99	1	0	97	13	30	77	0
2500-3000	15	0	0	18	5	8	16	0
3000-3500	1	0	0	1	0	0	3	0
3500-4000	1	0	0	1	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	1	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	5.69	3.13	3.13	5.69	5.69	5.69	5.69	0.00
Total Cycles	979	17	3	870	579	721	807	0
RMC (psi)	1644	1394	1616	1683	1472	1548	1665	0
EB 3S2	602	0	0	602	602	602	602	0
EB 2D	87	0	0	87	87	87	87	0
EB DT	43	0	0	43	43	43	43	0
EB Other	65	0	0	65	65	65	65	0
EB TOTAL	797	0	0	797	797	797	797	0
WB 3S2	1667	904	904	1667	1667	1667	1667	0
WB 2D	242	146	146	242	242	242	242	0
WB DT	105	64	64	105	105	105	105	0
WB OTHER	125	57	57	125	125	125	125	0
WB TOTAL	2139	1171	1171	2139	2139	2139	2139	0
TOTAL	2936	1171	1171	2936	2936	2936	2936	0

Table 4.59 Middle and Left Hand Lane Traffic (Gages 78-85)

Stress Range (psi)	G78	G79	G80	G81	G82	G83	G84	G85
1000-1500	0	74	18	404	0	202	2	0
1500-2000	0	3	1	62	0	43	1	0
2000-2500	0	0	1	6	0	1	0	0
2500-3000	0	1	0	4	0	2	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	1	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	3.13	3.13	2.09	0.00	3.13	2.08	0.00
Total Cycles	0	78	20	476	0	248	4	0
RMC (psi)	0	1325	1374	1388	0	1398	3076	0
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	0	904	904	595	0	904	607	0
WB 2D	0	146	146	93	0	146	98	0
WB DT	0	64	64	43	0	64	34	0
WB OTHER	0	57	57	38	0	57	36	0
WB TOTAL	0	1171	1171	769	0	1171	775	0
TOTAL	0	1171	1171	769	0	1171	775	0

Table 4.60 Middle and Left Hand Lane Traffic (Gages 86-93)

Stress Range (psi)	G86	G87	G88	G89	G90	G91	G92	G93
1000-1500	0	0	135	142	79	313	0	11
1500-2000	0	0	5	7	3	135	0	1
2000-2500	0	0	2	1	2	67	0	0
2500-3000	0	0	0	1	0	9	0	1
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	3.13	3.13	3.13	3.13	0.00	3.13
Total Cycles	0	0	142	151	84	525	0	13
RMC (psi)	0	0	1302	1320	1320	1658	0	1542
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	0	0	904	904	904	904	0	904
WB 2D	0	0	146	146	146	146	0	146
WB DT	0	0	64	64	64	64	0	64
WB OTHER	0	0	57	57	57	57	0	57
WB TOTAL	0	0	1171	1171	1171	1171	0	1171
TOTAL	0	0	1171	1171	1171	1171	0	1171

Table 4.61 Middle and Left Hand Lane Traffic (Gages 94-101)

Stress Range (psi)	G94	G95	G96	G97	G98	G99	G100	G101
1000-1500	2	223	70	86	234	0	0	0
1500-2000	1	156	1	1	166	0	0	0
2000-2500	1	105	2	1	50	0	0	0
2500-3000	0	51	0	1	9	0	0	0
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	2	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	3.13	3.13	3.13	3.13	3.13	0.00	0.00	0.00
Total Cycles	4	537	73	89	459	0	0	0
RMC (psi)	1728	1910	1312	1322	1661	0	0	0
EB 3S2	0	0	0	0	0	0	0	0
EB 2D	0	0	0	0	0	0	0	0
EB DT	0	0	0	0	0	0	0	0
EB Other	0	0	0	0	0	0	0	0
EB TOTAL	0	0	0	0	0	0	0	0
WB 3S2	904	904	904	904	904	0	0	0
WB 2D	146	146	146	146	146	0	0	0
WB DT	64	64	64	64	64	0	0	0
WB OTHER	57	57	57	57	57	0	0	0
WB TOTAL	1171	1171	1171	1171	1171	0	0	0
TOTAL	1171	1171	1171	1171	1171	0	0	0

Table 4.62 Middle and Left Hand Lane Traffic (Gages 102-109)

Stress Range (psi)	G102	G103	G104	G105	G106	G107	G108	G109
1000-1500	0	0	0	2392	496	461	311	383
1500-2000	0	0	0	1379	167	189	140	152
2000-2500	0	0	0	628	104	75	57	57
2500-3000	0	0	0	399	88	56	25	16
3000-3500	0	0	0	228	68	53	9	8
3500-4000	0	0	0	190	18	44	0	1
4000-4500	0	0	0	115	8	24	1	1
4500-5000	0	0	0	77	5	21	0	0
5000-5500	0	0	0	45	2	7	0	0
5500-6000	0	0	0	31	0	4	0	0
6000-6500	0	0	0	18	0	0	0	0
6500-7000	0	0	0	14	0	0	0	0
7000-7500	0	0	0	15	0	0	0	0
7500-8000	0	0	0	8	0	0	0	0
8000-8500	0	0	0	6	0	0	0	0
8500-9000	0	0	0	6	0	0	0	0
9000-9500	0	0	0	3	0	0	0	0
9500-10000	0	0	0	4	0	0	0	0
10000-10500	0	0	0	2	0	0	0	0
10500-11000	0	0	0	2	0	0	0	0
11000-11500	0	0	0	1	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	1	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	2.16	2.16	2.16	2.16	2.16
Total Cycles	0	0	0	5564	956	934	543	618
RMC (psi)	0	0	0	2739	2158	2462	1751	1684
EB 3S2	0	0	0	478	478	478	478	478
EB 2D	0	0	0	40	40	40	40	40
EB DT	0	0	0	33	33	33	33	33
EB Other	0	0	0	26	26	26	26	26
EB TOTAL	0	0	0	577	577	577	577	577
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	0	0	0	577	577	577	577	577

Table 4.63 Middle and Left Hand Lane Traffic (Gages 110-117)

Stress Range (psi)	G110	G111	G112	G113	G114	G115	G116	G117
1000-1500	665	104	198	0	508	215	155	132
1500-2000	225	70	142	0	118	60	48	23
2000-2500	97	24	74	0	62	50	113	27
2500-3000	59	3	18	0	81	2	18	0
3000-3500	32	0	8	0	47	3	17	0
3500-4000	36	1	1	0	24	0	1	0
4000-4500	43	0	0	0	5	0	0	0
4500-5000	41	0	1	0	3	0	0	0
5000-5500	30	0	0	0	0	0	0	0
5500-6000	15	0	0	0	0	0	0	0
6000-6500	11	0	0	0	0	0	0	0
6500-7000	8	0	0	0	0	0	0	0
7000-7500	3	0	0	0	0	0	0	0
7500-8000	1	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	2.16	2.16	2.16	0.00	2.16	2.16	2.16	2.16
Total Cycles	1266	202	442	0	848	330	352	182
RMC (psi)	2855	1685	1850	0	2077	1640	2010	1558
EB 3S2	478	478	478	0	478	478	478	478
EB 2D	40	40	40	0	40	40	40	40
EB DT	33	33	33	0	33	33	33	33
EB Other	26	26	26	0	26	26	26	26
EB TOTAL	577	577	577	0	577	577	577	577
WB 3S2	0	0	0	0	0	0	0	0
WB 2D	0	0	0	0	0	0	0	0
WB DT	0	0	0	0	0	0	0	0
WB OTHER	0	0	0	0	0	0	0	0
WB TOTAL	0	0	0	0	0	0	0	0
TOTAL	577	577	577	0	577	577	577	577

Table 4.64 Middle and Left Hand Lane Traffic (Gages 118-201)

Stress Range (psi)	G118	G120	G121	G122	G123	G124	G125	G201
1000-1500	0	0	0	0	0	0	0	199
1500-2000	0	0	0	0	0	0	0	78
2000-2500	0	0	0	0	0	0	0	13
2500-3000	0	0	0	0	0	0	0	1
3000-3500	0	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0	0
Time (hours)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56
Total Cycles	0	0	0	0	0	0	0	291
RMC (psi)	0	0	0	0	0	0	0	1497
EB 3S2	0	0	0	0	0	0	0	602
EB 2D	0	0	0	0	0	0	0	87
EB DT	0	0	0	0	0	0	0	43
EB Other	0	0	0	0	0	0	0	65
EB TOTAL	0	0	0	0	0	0	0	797
WB 3S2	0	0	0	0	0	0	0	763
WB 2D	0	0	0	0	0	0	0	96
WB DT	0	0	0	0	0	0	0	41
WB OTHER	0	0	0	0	0	0	0	68
WB TOTAL	0	0	0	0	0	0	0	968
TOTAL	0	0	0	0	0	0	0	1765

Table 4.65 Middle and Left Hand Lane Traffic (Gages 202-318)

Stress Range (psi)	G202	G203	G204	G305	G306	G317	G318
1000-1500	252	0	283	0	0	0	0
1500-2000	60	0	156	0	0	0	0
2000-2500	5	0	21	0	0	0	0
2500-3000	4	0	5	0	0	0	0
3000-3500	0	0	0	0	0	0	0
3500-4000	0	0	0	0	0	0	0
4000-4500	0	0	0	0	0	0	0
4500-5000	0	0	0	0	0	0	0
5000-5500	0	0	0	0	0	0	0
5500-6000	0	0	0	0	0	0	0
6000-6500	0	0	0	0	0	0	0
6500-7000	0	0	0	0	0	0	0
7000-7500	0	0	0	0	0	0	0
7500-8000	0	0	0	0	0	0	0
8000-8500	0	0	0	0	0	0	0
8500-9000	0	0	0	0	0	0	0
9000-9500	0	0	0	0	0	0	0
9500-10000	0	0	0	0	0	0	0
10000-10500	0	0	0	0	0	0	0
10500-11000	0	0	0	0	0	0	0
11000-11500	0	0	0	0	0	0	0
11500-12000	0	0	0	0	0	0	0
12000-12500	0	0	0	0	0	0	0
12500-13000	0	0	0	0	0	0	0
13000-13500	0	0	0	0	0	0	0
13500-14000	0	0	0	0	0	0	0
14000-14500	0	0	0	0	0	0	0
14500-15000	0	0	0	0	0	0	0
15000-15500	0	0	0	0	0	0	0
15500-16000	0	0	0	0	0	0	0
16000-16500	0	0	0	0	0	0	0
16500-17000	0	0	0	0	0	0	0
17000-17500	0	0	0	0	0	0	0
17500-18000	0	0	0	0	0	0	0
Time (hours)	2.56	0.00	3.13	0.00	0.00	0.00	0.00
Total Cycles	321	0	465	0	0	0	0
RMC (psi)	1438	0	1550	0	0	0	0
EB 3S2	602	0	0	0	0	0	0
EB 2D	87	0	0	0	0	0	0
EB DT	43	0	0	0	0	0	0
EB Other	65	0	0	0	0	0	0
EB TOTAL	797	0	0	0	0	0	0
WB 3S2	763	0	904	0	0	0	0
WB 2D	96	0	146	0	0	0	0
WB DT	41	0	64	0	0	0	0
WB OTHER	68	0	57	0	0	0	0
WB TOTAL	968	0	1171	0	0	0	0
TOTAL	1765	0	1171	0	0	0	0

CHAPTER 5

RESPONSE DUE TO VARIATION IN TRAFFIC PATTERNS

5.1 Introduction

The Holston River Bridge research project was unique in that during the life of the research project traffic deviated from normal flow conditions. This deviation was brought about by the replacement of the expansion joints on both ends of the bridge as well as by the repaving of the roadway. In order to facilitate these modifications, traffic was diverted into the right hand lane and shoulder in one case and the middle and left hand lane in another. Data were taken by the research staff during these periods of abnormal traffic flow. Also, data under normal conditions were taken throughout the life of the research project.

Using the available data, this chapter analyzes the effects of the variation in traffic flow with regard to fatigue behavior at selected locations on the bridge. These locations include the web gaps, floorbeam flange terminations, lateral connection plates, selected cross frame members, and the bottom flanges of the main girders. This was done by comparing the RMC value and number of cycles above 1000 psi under similar test durations. The duration of data taken for each gage under the different traffic patterns varied as shown in chapter 4 of this thesis. For relationship purposes, however, a similar duration of data for each gage under the abnormal and normal traffic patterns was used in the analyses presented in this chapter.

5.2 Response Summarization

In order to understand the fatigue behavior of the structure under different traffic conditions a method to relate critical fatigue parameters was developed. This was done with the aid of three dimensional bar charts. A typical bar chart, as shown in Figure 5.1, was developed for each of the gage locations that was monitored under the abnormal conditions as well as under the normal conditions. These charts show the test duration, number of cycles experienced above 1000 psi, and the calculated RMC value. The magnitude of each of these parameters is shown on the vertical axis and the traffic conditions are shown on the horizontal axis. This section explains the relationship between these parameters for selected locations on the Holston River Bridge.

5.2.1 Web Gap (Locations 1B,1C, & 1D)

The fatigue parameters chosen for comparison for the web gap locations on the eastside of the cross frames near the lateral gusset plate are shown in Figures 5.1 thru 5.3. This location represents a category E' fatigue detail. Figure 5.2 (Gage 76) provides a typical representation of the behavior at this particular fatigue prone location. Location 1C is in the second span on the westbound fascia girder (girder #1). The parameters for gage 76 are compared based on a test duration of around 1.25 hours. The RMC value for traffic flowing under normal conditions was 2196 psi versus 2506 psi for traffic diverted into the right hand land and shoulder. This represented about a 14% increase in the RMC value.

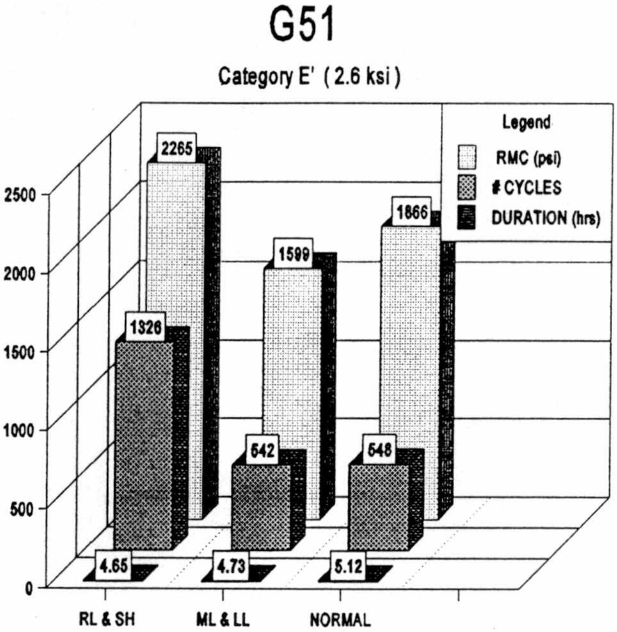


Figure 5.1: Web gap near lateral gusset plate on eastside at location 1B.

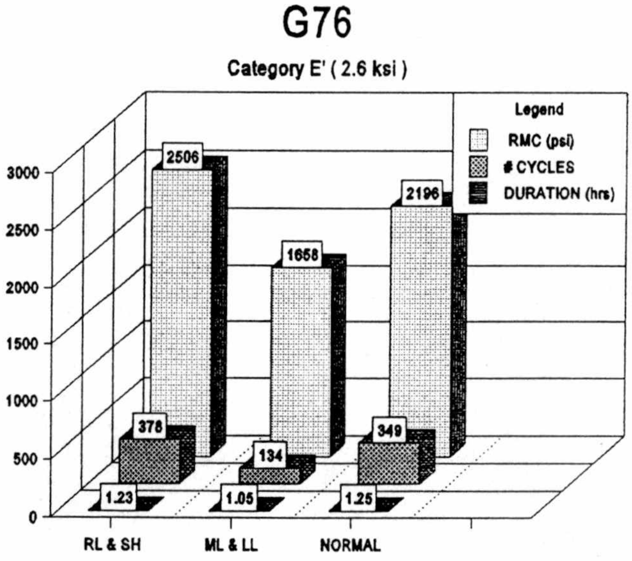


Figure 5.2: Web gap near lateral gusset plate on eastside at location 1C.

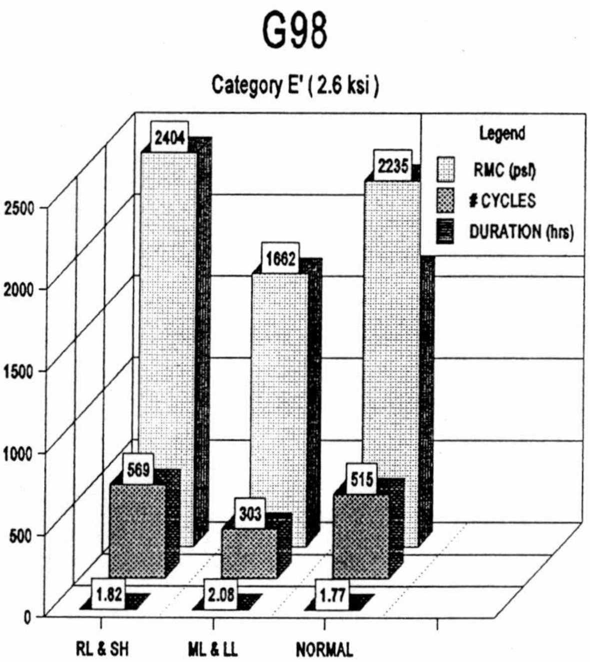


Figure 5.3: Web gap near lateral gusset plate on eastside at location 1D.

Likewise, for the same gage and test duration the structure experienced about an 8% increase in the number of cycles experienced above 1000 psi. The number of cycles experienced were 378 (RL & SH) versus 349 (NORMAL). Furthermore, the same parameters are shown for traffic in the middle and left hand lanes. The RMC value for traffic under these conditions was calculated to be 1658 psi. This represents a value that is approximately 51% below that calculated for RL & SH and 32% below that for normal conditions. The number of cycles experienced correlates appropriately. This reduction was to be expected due to the location of the gage and the location of the traffic on the bridge.

The same fatigue parameters at a similar location except on the westside of the cross frame are presented in Figures 5.4 thru 5.6. Gage 73, shown in Figure 5.5, represents the typical parameters for the web gap near the lateral gusset plate on the west side of the cross frame. These parameters correspond similarly to the parameters for gage 76 discussed previously. This result was expected due to the fact that the gages are located at the same point in the web gap except on different sides of the cross frame. The parameters for gage 95 shown in Figure 5.6 show that the RMC value for traffic under normal conditions and right lane and shoulder exceed the AASHTO fatigue limit of 2.6 ksi for a category E' detail.

The results for gage 54 presented in Figure 5.4 were unexpected. The figure shows little or no difference in the magnitude of the RMC value for each of the traffic conditions and a significantly lower value than calculated for gage 51 on the eastside of the cross frame. The RMC value for right hand lane and shoulder was about 60% larger for gage 51 than gage 54. These results were determined to exist due to the retrofit plate, described in chapter 3

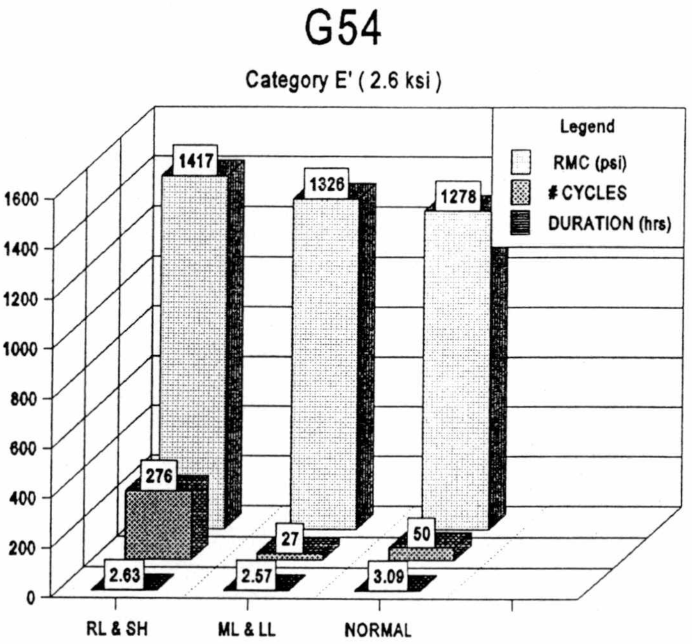


Figure 5.4: Web gap near lateral gusset plate on westside at location 1B.

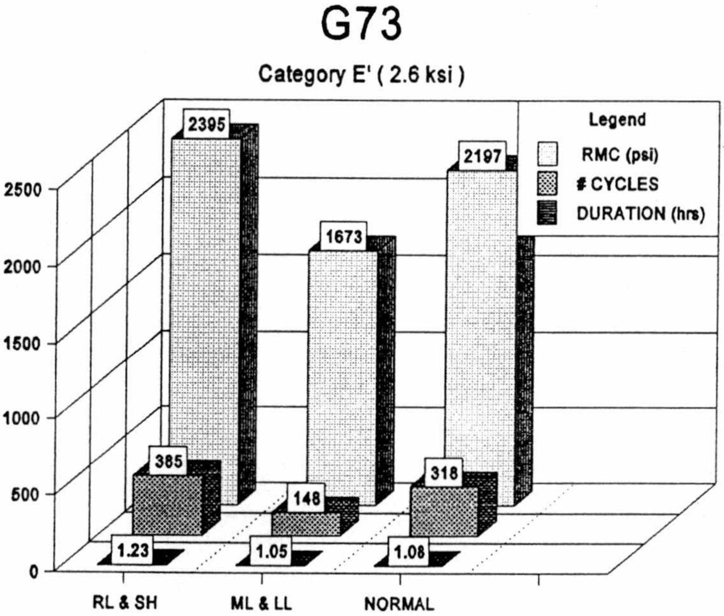


Figure 5.5: Web gap near lateral gusset plate on westside at location 1C.

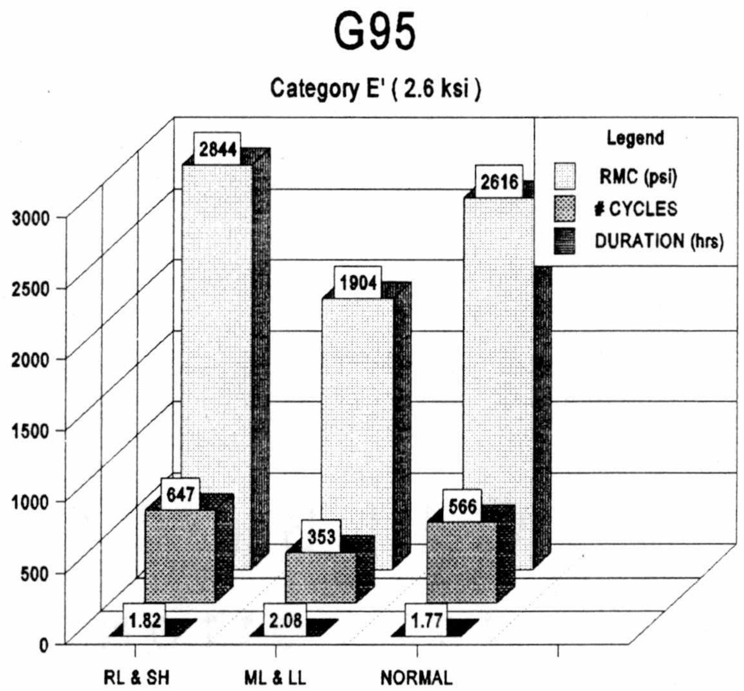


Figure 5.6: Web gap near lateral gusset plate on westside at location 1D.

of this thesis, being skewed. The location of the strain gage in relation to the retrofit plate greatly influences the magnitude of the stress range seen at the location. The plate bridges the web gap and transfers the load away from the stress concentration. Therefore, gage 54 was located closer to the retrofit plate than gage 51, and this fact was reflected in the results.

In addition to the response of the web gap near the lateral gusset plate, the response of the web gap near the transverse stiffener was measured under the different traffic patterns. The web gap near the transverse stiffener represents a category E' fatigue detail. Figures 5.7 and 5.8 present the fatigue parameters for this location on the eastside of the cross frame. The typical results for this location are exemplified by gage 97 shown in Figure 5.8. The RMC value for traffic in the right lane and shoulder as well as under normal conditions was calculated to be around 1650 psi for both patterns. As would be expected the RMC value for traffic in the middle and left hand lane was somewhat lower and measured around 1325 psi. The number of cycles experienced at this location reflects this RMC value. Traffic in the right hand lane and shoulder and under normal conditions experienced around 350 cycles versus 60 cycles for traffic in the middle and left hand lane for the approximately 1.80 hours tested.

The west side of the cross frame at the same location in the web gap behaves in a similar manner as illustrated in Figures 5.9 thru 5.11. Figure 5.11 provides a good representation of the effect of traffic variation for this particular location. This figure shows that the RMC value and number of cycles are approximately the same for normal and right hand lane and shoulder traffic for gage 96. The same parameters are lower for middle and

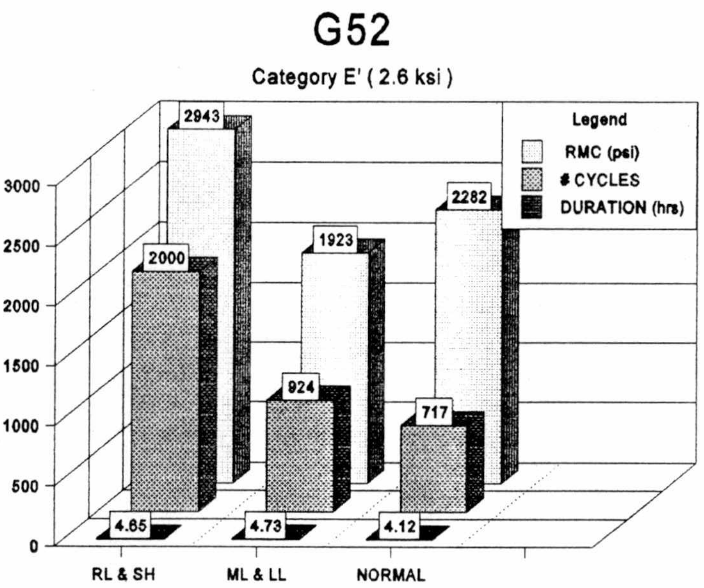


Figure 5.7: Web gap near transverse stiffener on eastside at location 1B.

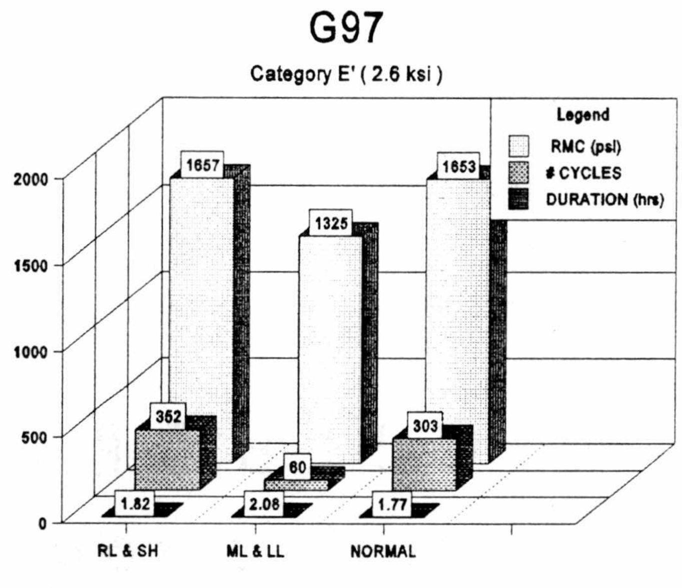


Figure 5.8: Web gap near transverse stiffener on eastside location 1D.

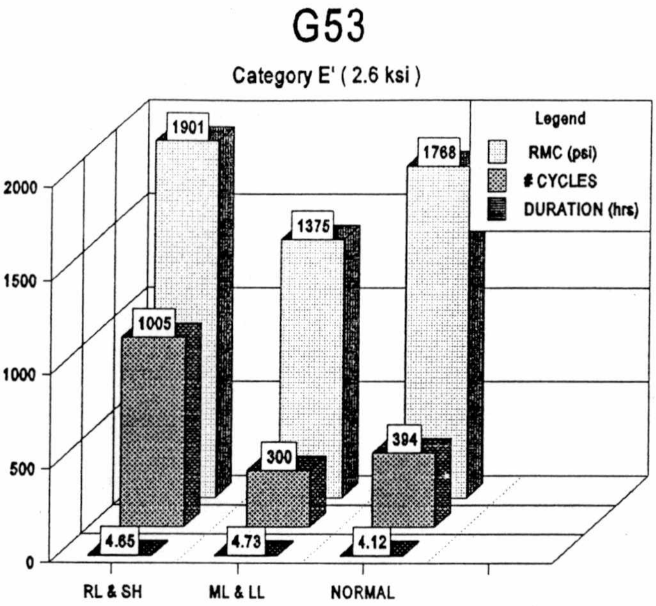


Figure 5.9: Web gap near transverse stiffener on westside at location 1B.

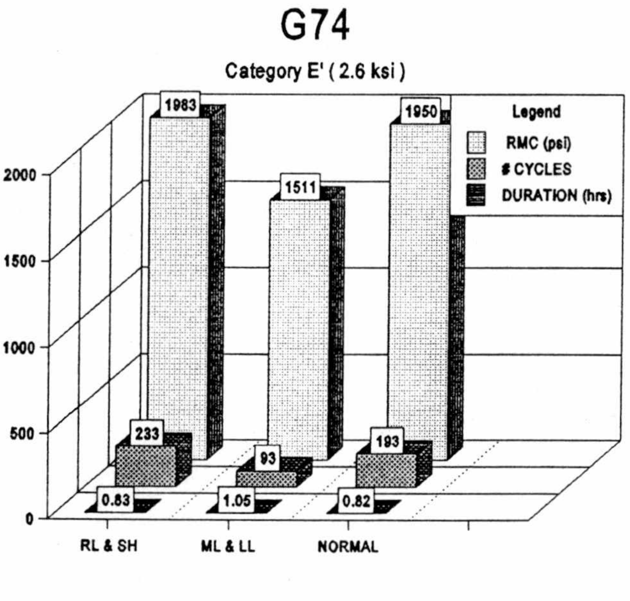


Figure 5.10: Web gap near transverse stiffener on westside at location 1C.

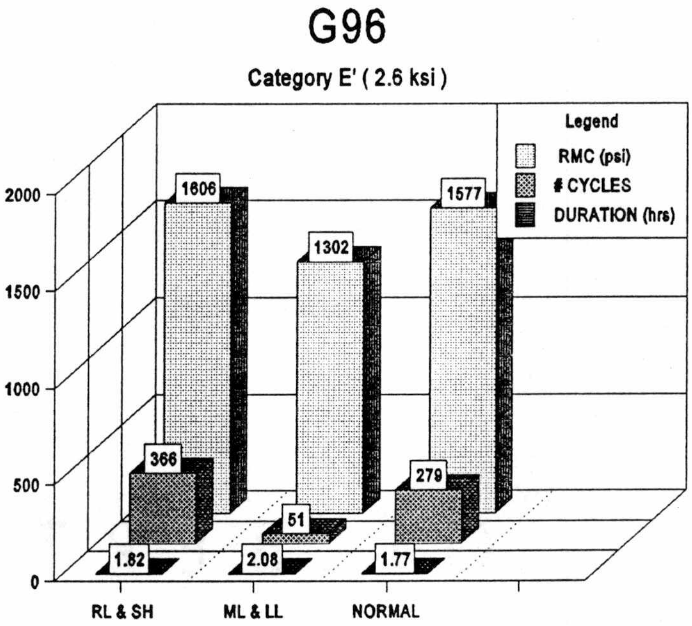


Figure 5.11: Web gap near transverse stiffener on westside at location 1D.

left lane as expected.

Gage 52 and gage 53 were also monitored during the research project and the results are shown in Figures 5.7 and 5.9, respectfully. The RMC value for gage 52 was calculated to be about 50% larger than that for gage 53 as was the number of cycles experienced. This was likewise attributed to the skewness of the retrofit plate. Furthermore, when traffic was diverted into the right hand lane and shoulder, the RMC value for gage 52 exceeded the AASHTO fatigue limit.

5.2.2 Web Gap (Location 2)

Another potential problem area that was monitored was the web gap at the interior girder. This connection resembles the one discussed in Section 5.2.1; however, this connection was at the interior girder (girder # 3) in the first span. The web gap at this particular location was instrumented and data were taken throughout the life of the project. As discussed in the previous section the gages were located where a category E' classification exists. The fatigue parameters for each traffic condition are compared graphically in Figures 5.12 thru 5.15.

The data presented in Figure 5.12 for gage 107 show that there were an exceedingly high number of cycles for the short duration tested in the modified traffic patterns. More data should be taken for gage 107 under the modified traffic patterns for sake of accuracy. Also, the RMC value for gage 107 under normal conditions exceeds the AASHTO fatigue limit. Gage 110 parameters are shown in Figure 5.13. These parameters represent the typical response for the web gap at the lateral gusset plate for an interior girder. For

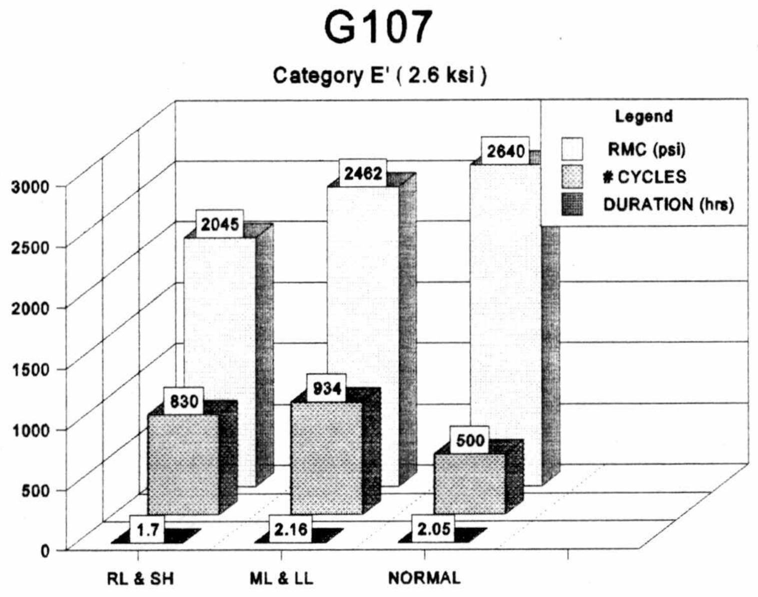


Figure 5.12: Web gap near lateral gusset plate on eastside at girder #3 location 2.

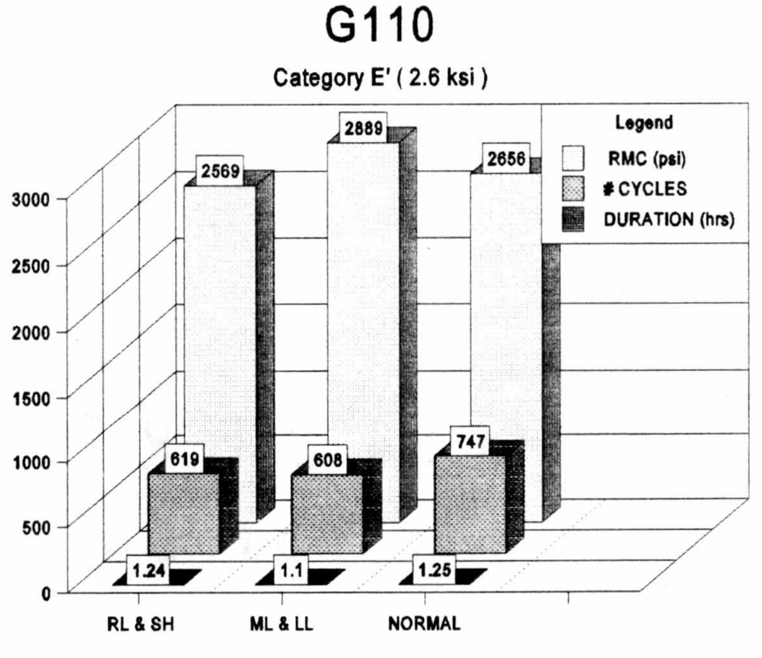


Figure 5.13: Web gap near lateral gusset plate on westside at girder #3 location 2.

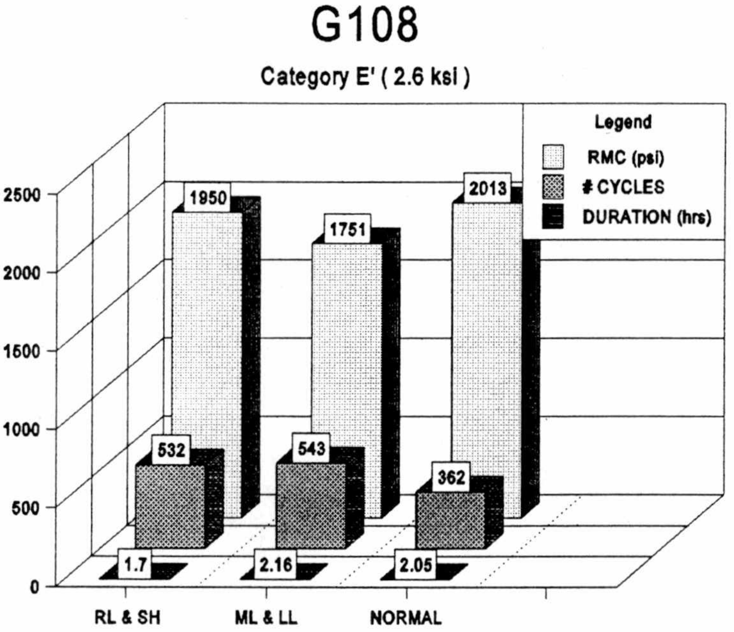


Figure 5.14: Web gap near transverse stiffener on eastside at girder #3 location 2.

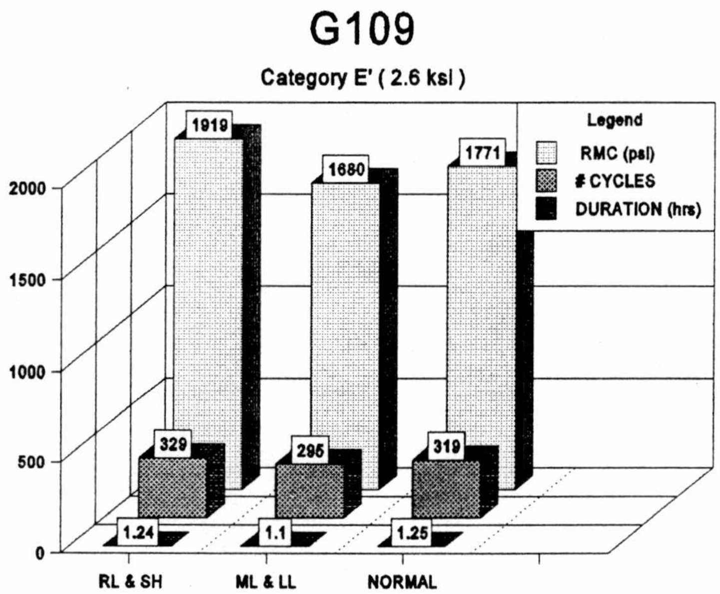


Figure 5.15: Web gap near transverse stiffener on westside at girder #3 location 2.

example, the RMC value for gage 110 when traffic was under normal conditions was calculated to be 2656 psi versus 2569 psi for traffic in the right lane and shoulder as well as 2889 psi for traffic in the middle and left hand lane. It should be noted that the RMC value for normal and left hand and middle exceed the AASHTO fatigue limit. Likewise, the number of cycles experienced for the approximately 1.15 hours tested were as follows: 747 for traffic under normal conditions, 608 for traffic in the middle and left hand lane, and 619 for traffic in the right hand lane and shoulder. These values lead to a 12% increase in the RMC value for traffic in the middle and left hand lanes. There was about a 20% increase in the number of cycles when traffic was under normal conditions compared to when traffic was in the right lane and shoulder. It should be noted that the retrofit process discussed in chapter 3 of this thesis pertained to the fascia girders only.

The web gap near the transverse stiffener on the westside of the floorbeam was also monitored for this location. The results for this location are shown in Figure 5.15 which was instrumented and marked as gage 109. These results show that there was no substantial difference in regard to the fatigue parameters measured regardless of the traffic condition during the duration monitored.

5.2.3 Floorbeam-Girder Connections

Two category E details that were monitored under the different traffic patterns were the floorbeam web at the top and bottom flange terminations at location 2. This geometrical stress riser was one of the primary points of interest in the research project. Initially, the strain gage was located precisely at the stress concentration. Dr. John Fisher suggested that

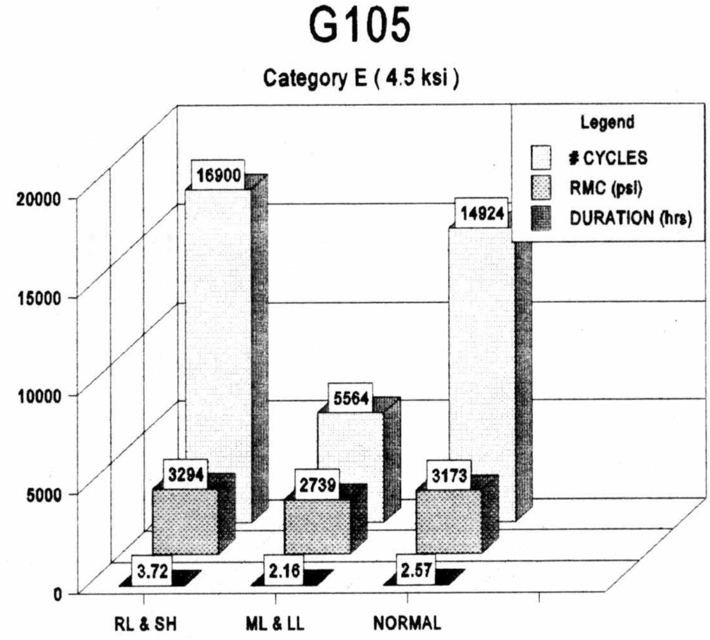


Figure 5.16: Floorbeam web at top flange termination southside of girder #3 location 2.

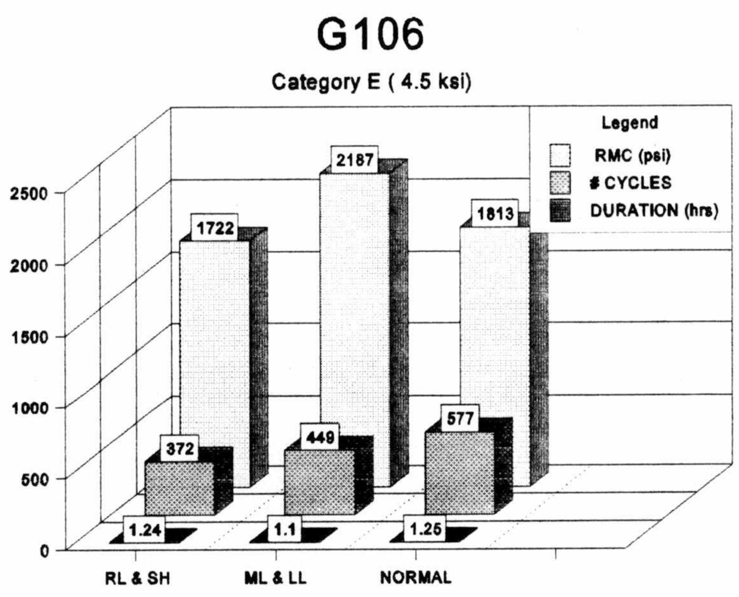


Figure 5.17: Floorbeam web at bottom flange termination southside of girder #3 location 2.

the gage be located approximately 1-inch vertically and 2-inches horizontally away from the stress concentration. This was done after data were taken with the abnormal traffic patterns. Therefore, the results in Figures 5.16 and 5.17 represent an artificially high number of loading cycles seen at the particular gage location for the test durations involved. However, the relative values can be compared for the purpose of determining the effect of traffic pattern on the behavior. The accuracy of the data taken when the gage was located at the stress concentration is open to some question.

Gage 105 as represented in Figure 5.16 was one of the most interesting gage locations monitored during the research project. This particular gage was located at the top flange termination. The same parameters used for comparison throughout this chapter were used for for this gage location also. The number of cycles experienced under normal conditions for a duration of 2.57 hours was 14924 versus 16900 cycles for 3.72 hours of data taken with traffic in the right hand lane and shoulder. On the contrary, only 5564 cycles were seen for 2.16 hours when traffic was in the middle and left hand lane. This signifies a substantial decrease in the number of cycles experienced. The RMC value varies from 2739 psi for middle and left hand lane to 3294 psi for traffic in the right hand lane and shoulder. Although this represents about a 20% increase in the RMC value, the stress range falls well below the 4500 psi fatigue limit given by the AASHTO standards.

The bottom flange termination at this same location was instrumented and tested under the different traffic conditions. Gage 106 results in Figure 5.17 show the relationship between the fatigue parameters discussed previously. This figure shows that there was not

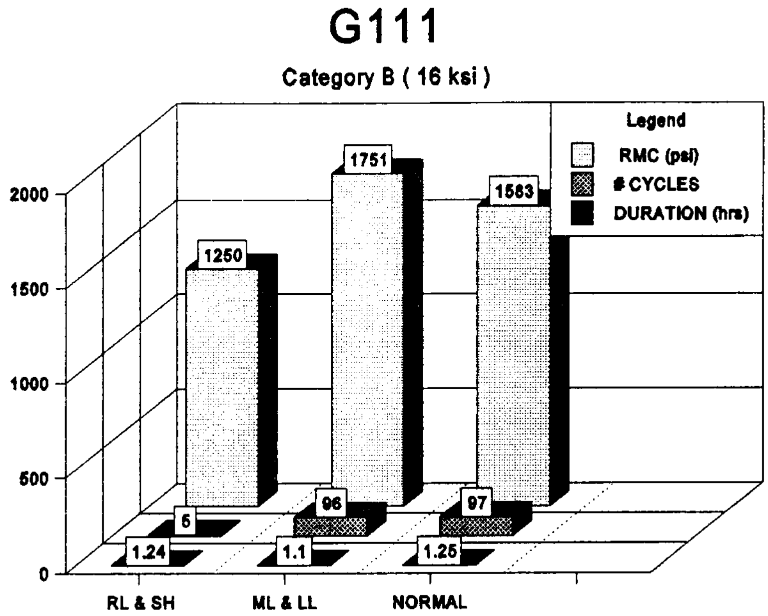


Figure 5.18: Floorbeam web near top flange at gider #3 northside location 2.

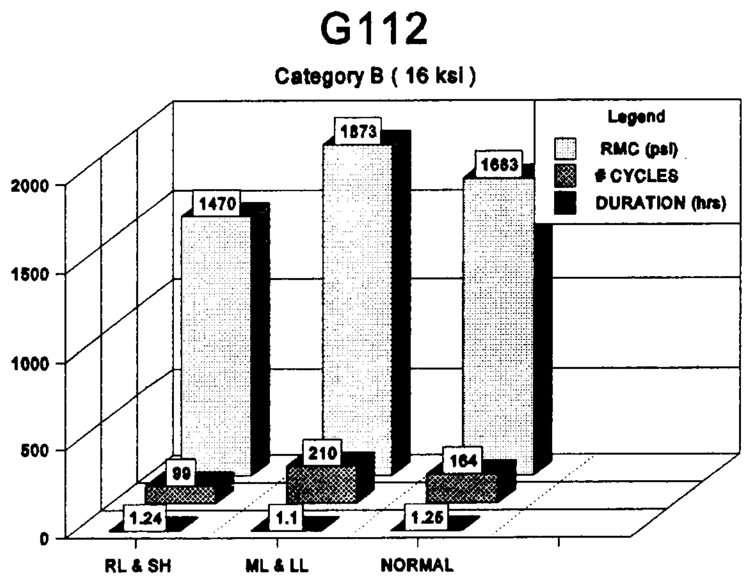


Figure 5.19: Floorbeam web near bottom flange at girder #3 northside location 2.

a substantial increase in any of the parameters under the different traffic conditions. It should be noted that the magnitude with regard to gage 105 shows a dramatic reduction in the RMC value as well as the number of cycles experienced for gage 106.

Also included at this particular location are the results of two category B locations on the floorbeam. These locations are on the floorbeam web with one being near the top flange and the other at the bottom flange. The results for these two locations are tabulated and shown graphically in Figures 5.18 and 5.19. Gage 111 was located near the top flange, and the fatigue parameters represented in Figure 5.18 show that the RMC value was largest when traffic was in the middle and left hand lane. The magnitude of the calculated RMC value was 1751 psi versus 1250 psi for traffic in the right hand lane and shoulder and 1583 psi for traffic under normal conditions. The number of cycles was essentially the same for traffic in the middle and left hand lane along with traffic under normal conditions. These were around 100 cycles for 1 hour of testing. However, there were only 5 cycles experienced when traffic was in the right hand lane and shoulder. Gage 112 represented in Figure 5.19 near the bottom flange of the floorbeam behaved similarly to Gage 111 with the exception of the number of cycles being larger for gage 112.

5.2.4 Lateral Gusset Plate (Location 1B)

Another important set of detail locations that were monitored under the different traffic patterns included the ends of the lateral gusset plates at location 1B. This location coincides with the end of the retrofit plate for the cantilever brackets in the second span except on the north side of the girder number 4 web. This location was instrumented in order

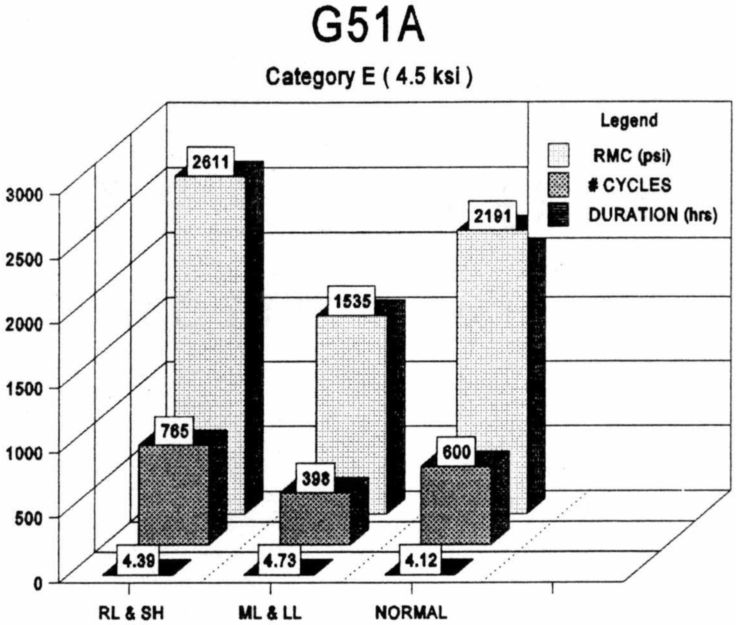


Figure 5.20: Vertical gage at the end of lateral gusset plate on eastside location 1B.

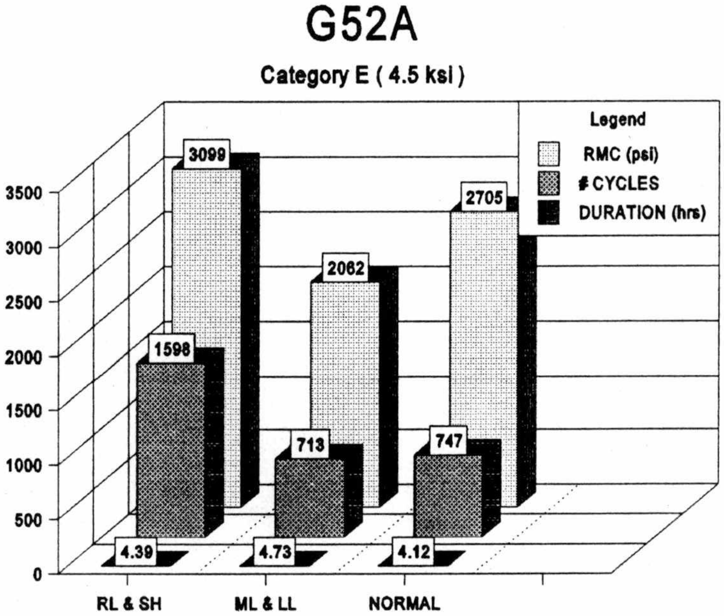


Figure 5.21: Horizontal gage at the end of lateral gusset plate on eastside location 1B.

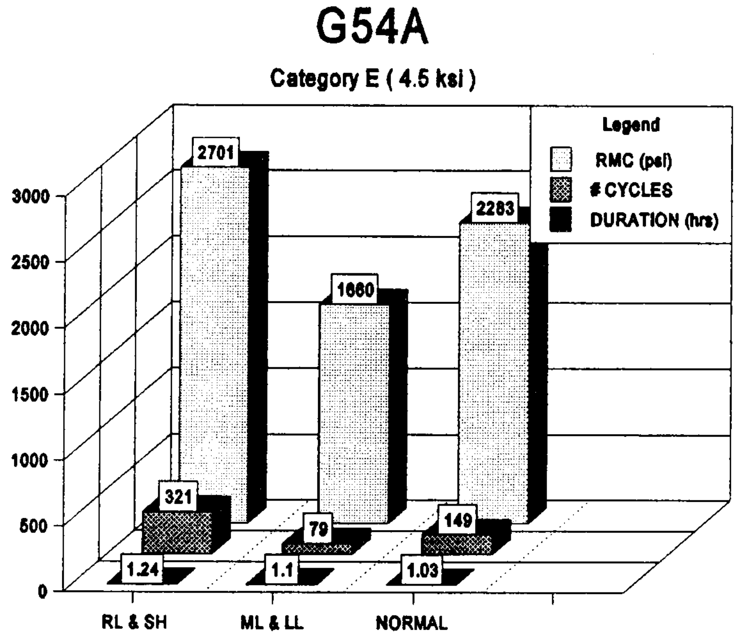


Figure 5.22: Horizontal gage at the end of lateral gusset plate on westside location 1B.

to measure the stress created by the addition of the retrofit plate. Based on a finite element analysis, Barham concluded that the addition of the retrofit plate decreased the stresses in the web gap while increasing the stresses at the ends of the retrofit plate (3). The ends of the lateral gusset plates were classified as category E details. The differences in the fatigue parameters under the different traffic patterns are shown graphically in Figures 5.20 thru 5.22. These details were labeled 51A, 52A, and 54A respectfully.

Gages 52A and 54A are horizontal gages located at the end of the lateral gusset plates on the eastside (52A) and westside (54A) of the cross frame at girder number 4. Figures 5.21 and 5.22 show that the RMC value and number of cycles are larger for traffic flowing in the right hand lane and shoulder than in the other patterns. It is self evident that these parameters should be lower for the traffic flowing in the middle and left hand lanes due to the location of the gage. This location experiences approximately twice the number of cycles and a 15% higher RMC value when traffic is in the right lane and shoulder than with normal traffic. For example, gage 52A in Figure 5.21 had a calculated RMC value of 3099 psi for traffic in the right hand lane and shoulder versus a RMC value of 2705 psi for traffic under normal conditions. These RMC values were calculated to be below the fatigue limit even with the expected increase due to the retrofit plate.

5.2.5 Flanges of Lateral X-bracing

WT7WF24 sections were used as lateral X-bracing between girders number 3 and 4 on the south side of the bridge as well as girders number 1 and 2 on the north side of the bridge. These sections were welded to the lateral gusset plates described in section 5.2.4 of this chapter. The research team instrumented the flanges of these section where the bottom weld for the lateral gusset plate was located. These locations were monitored in order to calculate the forces being introduced into the web gap by the diagonal X-bracing. Figures 5.23 thru 5.28 illustrate the differences in the parameters discussed throughout this chapter. Table 5.1 summarizes the tension force introduced into the web gap by the diagonal bracing for each gage location monitored.

Gage 44, gage 72, and gage 94 are located on the east side of the individual cross frames specific to each location. Gage 44 parameters shown in Figure 5.23 show that there was essentially no difference in the calculated RMC value. However, there were significantly more cycles when traffic was in the right hand lane and shoulder. In fact, there were 216 cycles versus 21 for middle and left hand lane and 34 for normal conditions. Figure 5.24 graphically shows these parameters for gage 72 with the RMC value being larger for traffic in the middle and left hand lanes by 9% and 40% for right hand lane and shoulder and normal conditions respectfully. The number of cycles experienced at this gage were very low. The parameters for gage 94 shown in Figure 5.25 reveal that the RMC value for traffic in the middle and left hand lane was calculated to be about 40% larger than for the other two traffic conditions.

On the west side of the cross frame for each gage location the fatigue parameters are shown in Figures 5.26 thru 5.28. These figures indicate that there were practically no differences in the parameters used to investigate the effects of traffic with the exception of the number of cycles experienced by gage 50 at location 1B.

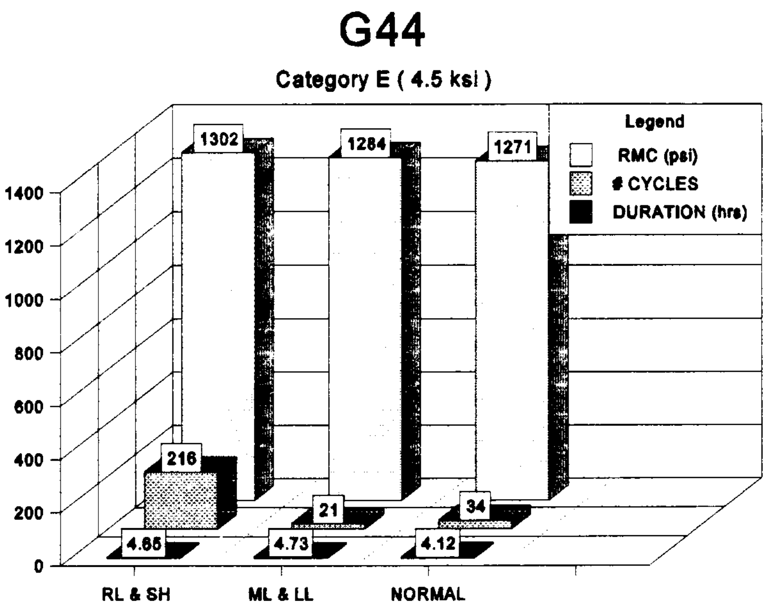


Figure 5.23: Flange of lateral X-bracing at lateral gusset plate on eastside location 1B.

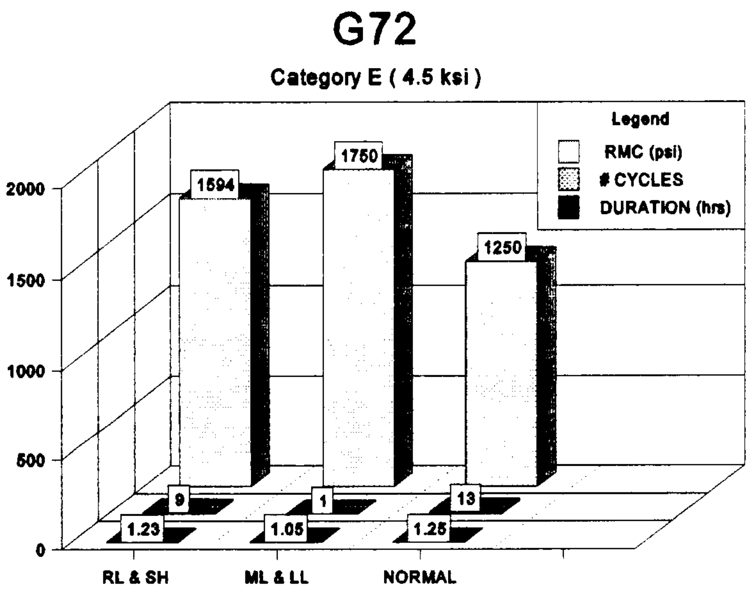


Figure 5.24: Flange of lateral X-bracing at lateral gusset plate on eastside location 1C.

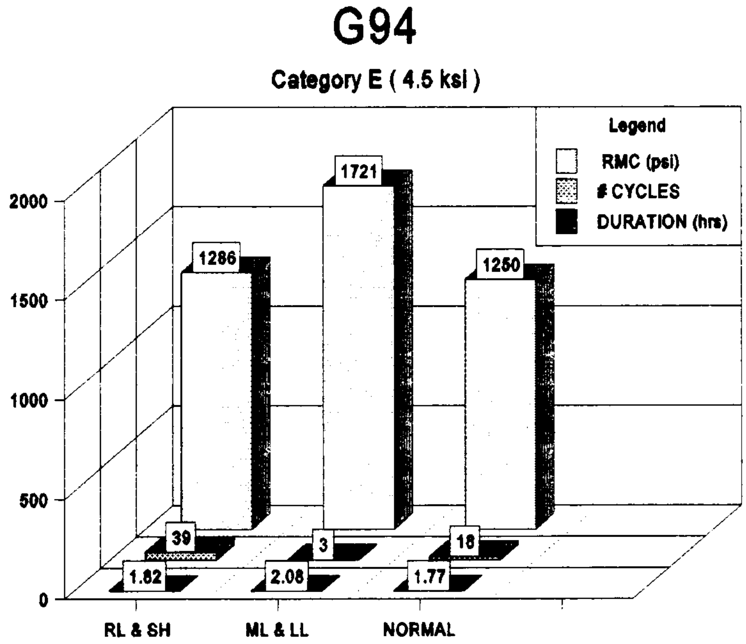


Figure 5.25: Flange of lateral X-bracing at lateral gusset plate on eastside location 1D.

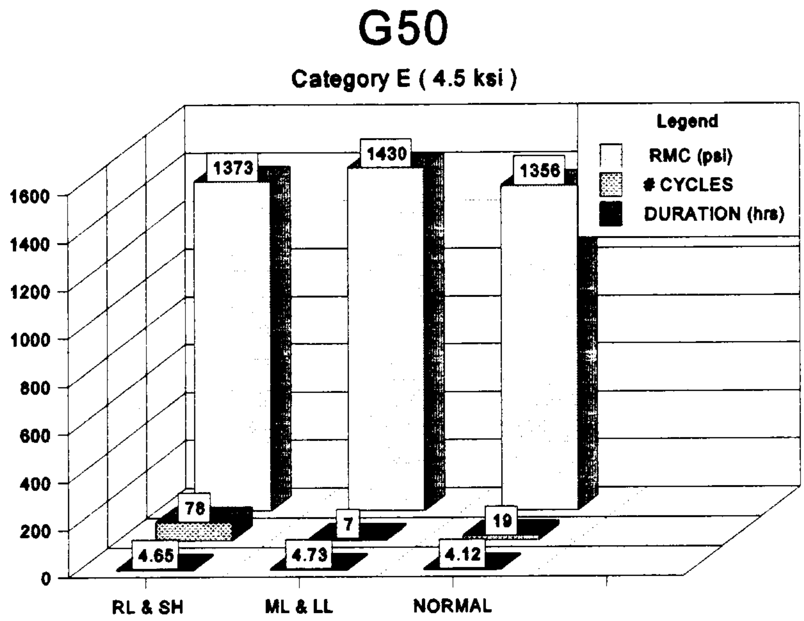


Figure 5.26: Flange of lateral X-bracing at lateral gusset plate on westside location 1B.

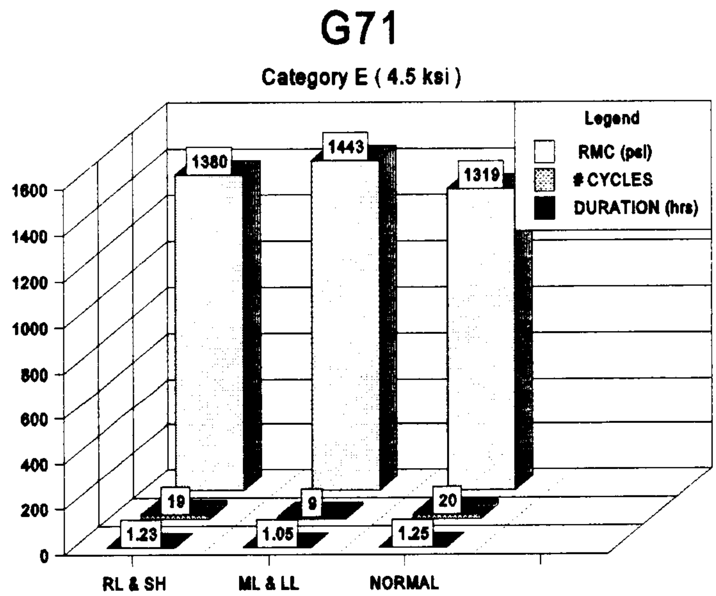


Figure 5.27: Flange of lateral X-bracing at lateral gusset plate on westside at 1C.

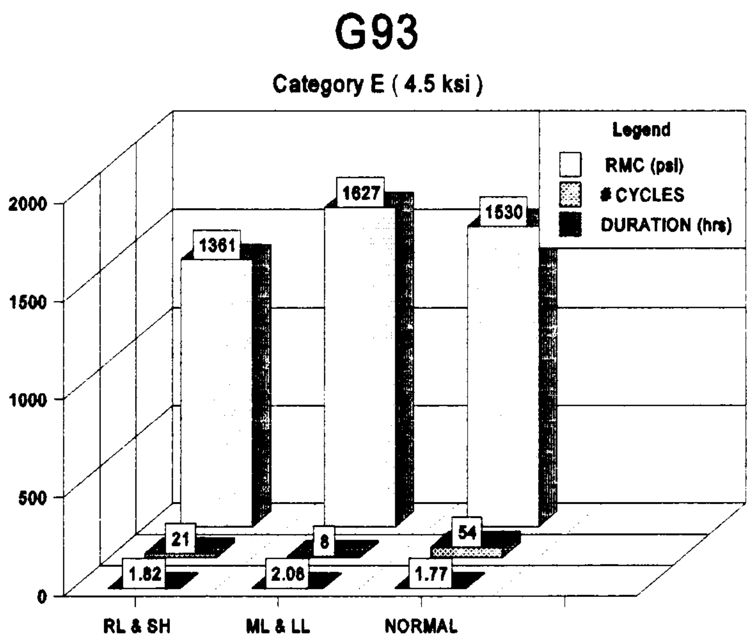


Figure 5.28: Flange of lateral X-bracing at lateral gusset plate on westside location 1D.

Table 5.1 - Forces Introduced in Web Gap by Lateral X-bracing

GAGE LOCATION	GAGE NUMBER	TRAFFIC CONDITION	RMC (psi)	AREA (in^2)	FORCE (T)
LOCATION 1B	44 EAST SIDE OF CROSSFRAME	RL & SH	1302	7.07	9205
		ML & LL	1284	7.07	9078
		NORMAL	1271	7.07	8986
	50 WEST SIDE OF CROSSFRAME	RL & SH	1373	7.07	9707
		ML & LL	1430	7.07	10110
		NORMAL	1356	7.07	9587
LOCATION 1C	72 EAST SIDE OF CROSSFRAME	RL & SH	1594	7.07	11270
		ML & LL	1750	7.07	12373
		NORMAL	1250	7.07	8838
	71 WEST SIDE OF CROSSFRAME	RL & SH	1380	7.07	9757
		ML & LL	1443	7.07	10202
		NORMAL	1319	7.07	9325
LOCATION 1D	94 EAST SIDE OF CROSSFRAME	RL & SH	1286	7.07	9092
		ML & LL	1721	7.07	12167
		NORMAL	1250	7.07	8838
	93 WEST SIDE OF CROSS FRAME	RL & SH	1361	7.07	9622
		ML & LL	1627	7.07	11503
		NORMAL	1530	7.07	10817

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary

The Holston River Bridge research project provided those involved the opportunity to participate in a full scale fatigue study of an in-service bridge structure. The purpose of the work in this thesis was to collate the data taken to date on the HRB project and to investigate the effect of traffic variation on the fatigue behavior of certain critical details. With the myriad of data collected during the life of the research project summarized, this chapter highlights the fatigue data according to the AASHTO fatigue category classification. There were several locations on the bridge structure that were tested extensively. These locations included the web gaps, floorbeams, diagonal X-bracing, ends of the lateral gusset plates, ends of the retrofit plates, and the bottom flanges of the four main girders.

In total there were 137 gages monitored on the HRB project. According to fatigue classification, there were 62 category A details, 8 category B details, 49 category E details and 18 category E' details. Tables 6.1 thru 6.6 show the RMC stress and the total number of cycles experienced for each gage location according to fatigue classification for traffic under normal conditons. The duration of reliable data varied depending upon the gage. The majority of testing was performed when the traffic was under normal conditions. However, there were situations as discussed in Chapter 5 of this thesis that provided the research staff

Table 6.1 - Normal Traffic
Category A Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1A	1	0	0.57	0
Bottom flange of cantilver bracket	1A	2	1321	13.86	29
Top flange of girder #4	1A	3	1250	21.27	5
Thick bottom flange of girder #4 on eastside	1A	4	1844	0.57	81
Thin bottom flange of girder #4 on westside	1A	5	2057	27.45	3286
Gusset plate at end of bottom chord of cross frame	1A	6	0	0.57	0
Top gage cross frame bottom chord at first diagonal	1A	8	1369	0.57	39
First truss diagonal of cross frame	1A	9	1250	0.57	4
Top flange of knee brace	1A	10	1370	0.57	22
Horizontal Rosette - cross frame top chord	1A	11	1659	0.57	63
45 Degree Rosette - cross frame top chord	1A	12	1698	0.57	91
Vertical Rosette - cross frame top chord	1A	13	1498	0.57	26
Horizontal gage cross frame top chord opposite gage 11	1A	13A	0	0.57	0
Second truss diagonal of cross frame	1A	14	1326	0.57	18
Top flange of cantilever bracket	1B	27	0	0.57	0
Bottom flange of cantilver bracket	1B	28	1250	0.57	1
Top flange of girder #4	1B	29	1250	22.49	2
Thick bottom flange of girder #4 on eastside	1B	30	1782	9.24	1066
Thin bottom flange of girder #4 on westside	1B	31	1773	0.57	82
Gusset plate at end of bottom chord of cross frame	1B	32	1250	11.24	41
Top gage cross frame bottom chord at first diagonal	1B	34	1377	24.52	1778
First truss diagonal of cross frame	1B	35	1269	26.61	866
Top flange of knee brace	1B	36	0	0.00	0
Horizontal Rosette - cross frame top chord	1B	37	2335	12.30	2111
45 Degree Rosette - cross frame top chord	1B	38	0	0.00	0
Vertical Rosette - cross frame top chord	1B	39	0	0.00	0
Horizontal gage cross frame top chord opposite gage 11	1B	40	0	0.00	0
Second truss diagonal of cross frame	1B	41	1489	26.61	817

Table 6.2 - Normal Traffic
Category A Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
Top flange of cantilever bracket	1C	55	1250	16.39	6
Bottom flange of cantilver bracket	1C	56	1250	16.39	7
Top flange of girder #1	1C	57	0	17.33	0
Thick bottom flange of girder #1 on eastside	1C	58	1661	34.78	3662
Thin bottom flange of girder #1 on westside	1C	59	1729	1.94	376
Gusset plate at end of bottom chord of cross frame	1C	60	1342	1.94	235
Top gage cross frame bottom chord at first diagonal	1C	61	1453	20.35	2296
First truss diagonal of cross frame	1C	63	1302	20.34	800
Top flange of knee brace	1C	64	1359	5.14	120
Vertical Rosette - cross frame top chord	1C	65	0	0.00	0
45 Degree Rosette - cross frame top chord	1C	66	0	0.00	0
Horizontal Rosette - cross frame top chord	1C	67	1391	21.37	526
Second truss diagonal of cross frame	1C	68	1370	19.31	571
Horizontal gage cross frame top chord opposite gage 67	1C	77	0	0.00	0
Top flange of cantilever bracket	1D	78	1336	33.99	22
Top gage cross frame bottom chord at first diagonal	1D	79	1424	17.44	1411
Gusset plate at end of bottom chord of cross frame	1D	81	1461	1.94	352
Thick bottom flange of girder #1 on eastside	1D	82	1814	0.65	152
Thin bottom flange of girder #1 on westside	1D	83	1826	66.64	7485
First truss diagonal of cross frame	1D	84	1273	19.53	425
Top flange of knee brace	1D	85	0	0.00	0
Vertical Rosette - cross frame top chord	1D	86	0	0.00	0
45 Degree Rosette - cross frame top chord	1D	87	0	0.00	0
Horizontal Rosette - cross frame top chord	1D	88	1339	19.53	377
Second truss diagonal of cross frame	1D	89	1494	19.53	895
Horizontal gage cross frame top chord opposite gage 88	1D	92	0	0.00	0
Bottom flange of cantilever bracket	1D	99	1456	33.99	3
Top flange of girder #1	1D	100	0	1.94	0

Table 6.3 - Normal Traffic

Category A & Category B Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
Category A					
Bottom flange of cantilver bracket	2	101	1288	1.25	22
Top flange of cantilver bracket	2	102	1250	1.25	1
Bottom flange of girder #3 at locaton 201	201	201	1444	25.87	668
Bottom flange of girder #2 at locaton 202	202	202	1411	31.03	2232
Bottom flange of girder #3 at locaton 203	203	203	1419	14.45	1043
Bottom flange of girder #2 at locaton 204	204	204	1522	45.20	4555
Category B					
Bottom gage cross frame bottom chord at first diagonal	1A	7	1250	0.57	22
Bottom gage cross frame bottom chord at first diagonal	1B	33	0	0.00	0
Bottom gage cross frame bottom chord at first diagonal	1C	62	0	0.00	0
Bottom gage cross frame bottom chord at first diagonal	1D	80	0	0.00	0
Floor beam web near top flange at girder #4	2	103	1541	1.25	2
Floor beam web near bottom flange at girder #4	2	104	1462	1.25	97
Floor beam web near top flange at girder #3 north side	2	111	0	0.00	0
Floor beam web near bottom flange at girder #3 north side	2	112	0	0.00	0

Table 6.4 - Normal Traffic
Category E Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
End of gusset plate at cross frame 2nd truss diagonal	1A	15	1358	0.57	37
End of gusset plate at cross frame 3rd truss diagonal	1A	16	1631	0.57	74
Flange of lateral X-bracing at gusset plate on eastside	1A	17	1250	0.57	5
Flange of lateral X-bracing at gusset plate on westside	1A	18	1250	0.57	6
Vertical gage at end of retrofit plate on eastside	4	23	1542	14.67	1106
Horizontal gage at end of retrofit plate on eastside	4	24	1355	15.70	148
Vertical gage at end of retrofit plate on westside	4	25	1867	15.70	1684
Horizontal gage at end of retrofit plate on westside	4	26	1375	13.64	813
End of gusset plate at cross frame 2nd truss diagonal	1B	42	1490	15.31	1249
End of gusset plate at cross frame 3rd truss diagonal	1B	43	1781	9.24	828
Flange of lateral X-bracing at gusset plate on eastside	1B	44	1258	15.31	91
End of lateral gusset above 2" tear on eastside	5	45	1465	15.31	1270
End of lateral gusset below 2" tear on eastside	5	46	1966	15.31	2779
End of lateral gusset above 6" tear on westside	5	47	1967	15.31	2288
End of lateral gusset across 6" tear on westside	5	48	2338	14.30	2024
End of lateral gusset below 6" tear on westside	5	49	1530	14.29	1902
Flange of lateral X-bracing at gusset plate on westside	1B	50	1363	22.49	1122
Vertical gage at end of lateral gusset plate on eastside	1B	51A	2210	18.37	2487
Horizontal gage at end of lateral gusset plate on eastside	1B	52A	2840	18.37	2907
Vertical gage at end of lateral gusset plate on westside	1B	53A	1292	18.37	4028
Horizontal gage at end of lateral gusset plate on westside	1B	54A	2474	18.37	2651
End of gusset plate at cross frame 2nd truss diagonal	1C	69	1420	17.59	1233
End of gusset plate at cross frame 3rd truss diagonal	1C	70	1716	17.59	1357
Flange of lateral X-bracing at gusset plate on westside	1C	71	1308	1.94	24
Flange of lateral X-bracing at gusset plate on eastside	1C	72	1267	19.53	82

Table 6.5 - Normal Traffic
Category E Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
End of gusset plate at cross frame 2nd truss diagonal	1D	90	1478	17.59	1643
End of gusset plate at cross frame 3rd truss diagonal	1D	91	1784	17.59	1460
Flange of lateral X-bracing at gusset plate on westside	1D	93	1286	18.50	138
Flange of lateral X-bracing at gusset plate on eastside	1D	94	1288	18.50	51
Floor beam web at top flange termination south side of girder #3	2	105	2184	35.39	11026
Floor beam web at bottom flange termination south side of girder #3	2	106	1952	16.89	1380
Vertical Rosette on girder #3 web at end of lateral gusset plate	2	113	2726	32.82	10148
45 degree Rosette on girder #3 web at end of lateral gusset plate	2	114	1992	14.45	2185
Horizontal Rosette on girder #3 web at end of lateral gusset plate	2	115	1592	14.45	911
Horizontal gage adjacent to and below gage 115	2	116	2055	32.82	5010
Floor beam bottom flange at end of gusset plate for X-bracing south	3	117	1666	17.03	1726
Floor beam bottom flange at end of gusset plate for X-bracing north	3	118	1711	17.03	1644
Floor beam web at top flange termination north side of girder #3	2	120	3753	34.36	19247
Floor beam web at bottom flange termination north side of girder #3	2	121	1700	8.07	1821
Horizontal gage at end of retrofit plate east	6	122	2994	17.34	9113
Vertical gage at end of retrofit plate east	6	123	1910	18.37	2553
Horizontal gage at end of retrofit plate west	6	124	3612	18.37	4494
Vertical gage at end of retrofit plate west	6	125	2194	12.31	1886
Floor beam web at top flange termination south side of girder #3	7	305	2684	33.31	6567
Floor beam web at top flange termination south side of girder #3	7	306	1425	26.12	576
Floor beam bottom flange at end of gusset plate for X-bracing south	7	317	1570	17.03	1177
Floor beam bottom flange at end of gusset plate for X-bracing north	7	318	1739	6.68	618

Table 6.6 - Normal Traffic
Category E' Details

DETAIL DESCRIPTION	LOCATION	GAGE NUMBER	RMC (psi)	DURATION (hrs)	TOTAL NO. OF CYCLES
Web gap near lateral gusset plate on eastside	1A	19	1817	14.85	1782
Web gap near transverse stiffener on eastside	1A	20	1594	14.86	1647
Web gap near lateral gusset plate on eastside	1B	51	1926	33.68	4355
Web gap near transverse stiffener on eastside	1B	52	2360	31.69	5410
Web gap near transverse stiffener on westside	1B	53	1758	31.65	4028
Web gap near lateral gusset plate on westside	1B	54	1287	33.68	546
Web gap near lateral gusset plate on westside	1C	73	2091	17.16	2380
Web gap near transverse stiffener on westside	1C	74	1905	1.94	425
Web gap near transverse stiffener on eastside	1C	75	1906	19.53	2260
Web gap near lateral gusset plate on eastside	1C	76	2083	16.41	2169
Web gap near lateral gusset plate on westside	1D	95	2544	16.40	2718
Web gap near transverse stiffener on westside	1D	96	1563	19.53	1673
Web gap near transverse stiffener on eastside	1D	97	1619	19.53	1800
Web gap near lateral gusset plate on eastside	1D	98	2146	15.31	2434
Web gap near lateral gusset plate on eastside at girder #3	2	107	2552	14.78	2952
Web gap near transverse stiffener on eastside at girder #3	2	108	1958	14.78	2166
Web gap near transverse stiffener on westside at girder #3	2	109	1915	14.78	2348
Web gap near lateral gusset plate on westside at girder #3	2	110	3372	14.78	3129

with the opportunity to monitor the gages under abnormal conditions. Although the duration of data taken under these different conditions was not as large as the duration under normal conditions, some predictions can be made in regard to the effects of the traffic pattern on the fatigue behavior.

6.2 Conclusions

Due to the fact that data were taken when traffic was in a modified condition, discussion within the research staff deemed that a closer investigation was appropriate. After analyzing the data for the Holston River Bridge, one must conclude that the modified traffic patterns did not adversly affect the fatigue parameters to the extent that there should be any concern for altering the traffic if such a need arises. This conclusion is based largely on the fact that the traffic deviates from normal only a fraction of the service life of the bridge. It can be expected that approximately 5-10% of the life of a bridge experiences traffic patterns other than normal. The influence of traffic pattern on the parameters shown in Chapter 5 of this thesis also confirm this conclusion.

It should also be noted that after looking at the data for the web gap, the alignment of the retrofit plate affects the stress distribution but does not adversley affect the fatigue behavior in the web gap. This was established by looking at the data collected for the web gaps at four locations. Figures 6.1 and 6.2 illustrate the effects of alignment of the retrofit plate.

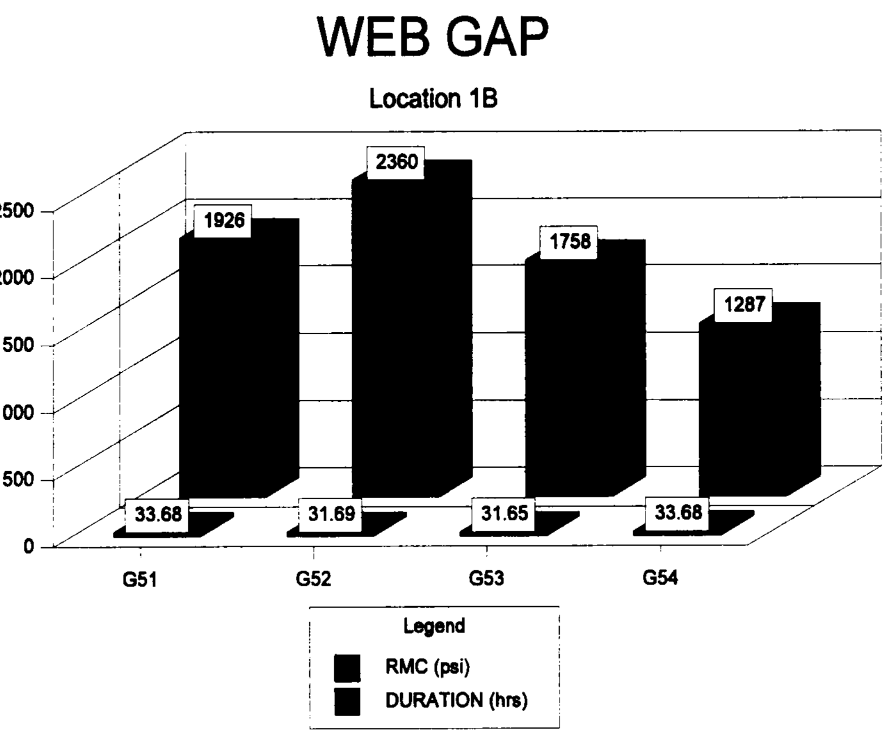


Figure 6.1: Web gap @ location 1B with the retrofit plate skewed.

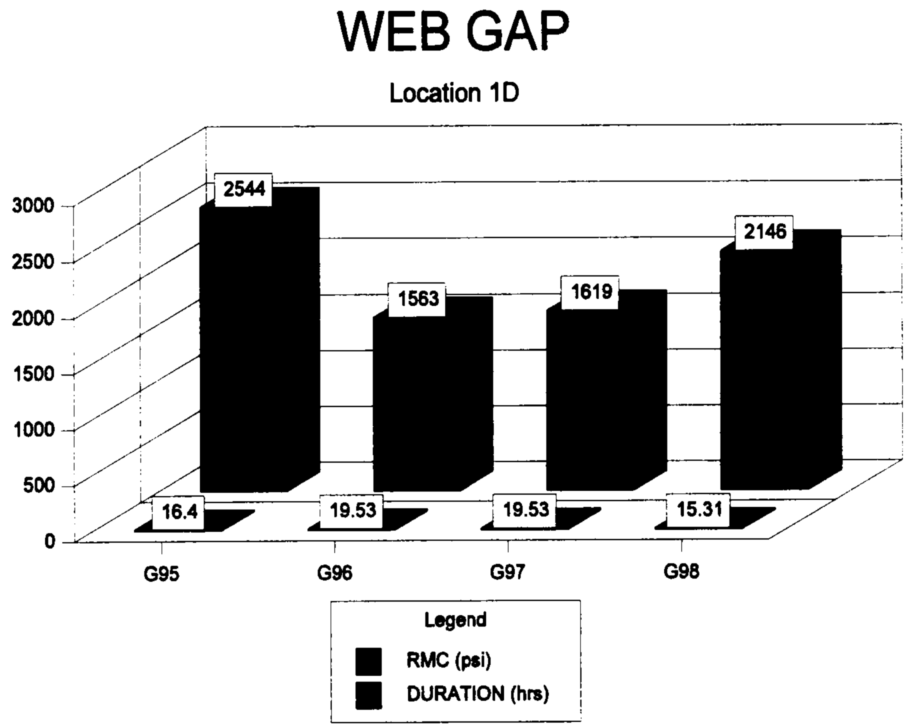


Figure 6.2: Web gap @ location 1D with the retrofit plate properly aligned.

6.3 Recommendations

Based upon the research done herein, the Department of Transportation can divert traffic into different patterns on the bridge and not significantly affect the fatigue behavior of the bridge. This recommendation is made based on the perception that the traffic diversion is only on a temporary basis. It is also recommended that the lateral X-bracing be loosened so that the effects of the forces introduced into the web gap can be analyzed. Also, the retrofit plate should be removed at one of the locations in the second span so that the fatigue behavior prior to the failure can be established. Finally, one of the web gap locations at an interior girder in the second span should be monitored based upon the results obtained for the same type location in the first span.

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