THE KANSAS TEST TRACK PART II - APPENDICES



NOVEMBER 1979 FINAL REPORT

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01-Track & Structures

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PREFACE

This report has been prepared as a part of a subcontract between the Atchison, Topeka, and Santa Fe Railroad and the Construction Technology Laboratories of the Portland Cement Association.

The report presents data obtained from the Kansas Test Track. Also, it describes instruments used for data measurement, their location in track, and test procedures. Analysis and evaluation of test data are presented in Part I of the report.

Work on the project was carried out by the Transportation Development Section under the direction of Bert E. Colley and the Structural Development Section under the direction of W. Gene Corley and Henry G. Russell. Particular recognition is given to Richard D. Ward, William Hummerich, Jr., George Fessler, and other project staff for their assistance and suggestions in the design, installation, and monitoring of the instrumentation.

Dr. R. M. McCafferty and Mr. W. B. O'Sullivan of FRA were the technical monitors for the work reported herein. Their cooperation and suggestions are gratefully acknowledged. Also, the cooperation and assistance provided by the Atchison, Topeka, and Santa Fe Railroad, in particular that of Mr. W. S. Tuinstra and W. S. Autrey is acknowledged.

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METRIC CONVERSION FACTORS



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INTRODUCTION

In the early 1970's the Federal Railroad Administration (FRA) and the Atchison, Topeka and Santa Fe Railway Company (ATSF) jointly sponsored an investigation to evaluate the performance of different track support systems. For this purpose, a 1.8-mile long test track consisting of nine sections was constructed adjacent to the mainline track of the ATSF, between Aikman and Chelsea, Kansas. These test sections included continuously reinforced concrete slabs, reinforced concrete twin beams, prestressed concrete ties, stablized ballast, and standard wood-tie track sections. The site was chosen because of abundant rail traffic, a long tangential section of track, relatively flat uniform grade, and climatic conditions typical of vast areas in the continental United States.

The test track was designed and constructed by several organizations under sub-contract to ATSF, the project administrator. The Construction Technology Laboratories (CTL), a division of Portland Cement Association (PCA), was engaged to instrument the test track, obtain data periodically, reduce and analyze data, and submit a report covering the findings. The design, development, and preparation of installation specifications for a new rail fastening anchorage system, to replace the one originally installed in the slab and beam test sections, also was done by PCA.

Analysis and evaluation of data obtained from instrumentation installed in the different test sections are presented in Part I of this report. Details of instruments used for data measurement and their location in track, test procedures, and test data are presented in this report.

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APPENDIX A DETAILS OF INSTRUMENTATION

General details of the instrumentation layout for the test sections is presented in this appendix. Also included is information on the design and instrumentation details of the load cell ties and rail load sensors. Details of the other instrumentation are presented in Appendix F.

Instrumentation of Cross Tie Track Sections

Instrument locations in cross tie track sections are shown in Figures Al to A4.

Strain gages were placed longitudinally on a rail cross section at positions shown in Figure A5. Strain gage locations were marked on the rail using the sheet metal jig. A typical installation is shown in Figure A6.

Strain gages were placed on concrete and timber ties at cross sections directly under the rail seat and tie midlength at positions shown in Figure A7. General views of strain gages on ties are shown in Figure A8.

Linear variable differential transformers (LVDT) with one inch stroke were used to sense rail and tie deflections. The LVDT's were placed so as not to obstruct train movements. The LVDT assemblies are shown in Figures A9 and Al0.

Instrumentation of Beam and Slab Sections

Instrument locations in beam Sections 4 and 7, and slab Sections 5 and 5-1, are shown in Figures All and Al2, respectively. Instrumentation in beam Section 4-1 is shown in Figure Al3. All main array instrumentation was located within a 10 ft track section. The only exception was single-position vertical extensometers which were installed by Sannon and Wilson, Inc. 100-, 200-, and 300-ft east, and 100-ft west of the main multiposition extensometers.

Deflectometers were installed on the north side of the slab and beams at middistance between joints, and at both sides of the west joint as shown in Figures All and Al2. In Section

-Al- 251 - 18



FIGURE A1 - INSTRUMENTS AT MAIN ARRAY

.A2+





A4-

FIGURE A3 - INSTRUMENTS AT "B" LOCATIONS



FIGURE A4 - INSTRUMENTS AT "C" LOCATION



 \star STRAIN GAGE

FIGURE A5 - LOCATION OF STRAIN GAGES ON RAIL CROSS SECTION



FIGURE A6 - STRAIN GAGES ON RAIL







FIGURE A8 - STRAIN GAGES ON TIES







FIGURE A10 - DEFLECTION MEASUREMENT ASSEMBLY



FIGURE All - INSTRUMENTATION LAYOUT FOR SECTIONS 4 AND 7

Al 2-



FIGURE A12 - INSTRUMENTATION LAYOUT FOR SECTIONS 5 AND 5-1



FIGURE A13 - INSTRUMENTATION LAYOUT FOR SECTION 4-1

4-1, additional deflectometers were placed on the field side of the south beam, at both ends. Deflectometers were placed on both rails midway between the two intermediate fasteners.

Soil pressure cells were placed at the subgrade-ballast interface below both rails at the west joint and middistance between joints.

Rail strains were monitored mid-way between the two intermediate fasteners and directly over one of the intermediate fasteners. Strain gages were attached to both sides of the rail at the positions shown in Figure A5.

Strains in reinforcing bars were monitored at the west joint and at middistance between joints directly below both rails. At each location strain gages were placed on two top and two bottom longitudinal reinforcing bars. Duplicate strain gages were also placed at each location as backup, in case of malfunction of the primary gages. In Section 4-1, strain gages were placed on the top and bottom of four different stirrups. The instrumented stirrups were located at middistance between joints in the north and south beams, and 30 ft. west.

Concrete strains were monitored at middistance and west joint of the instrumented panel. The strain gages at midlength were placed longitudinally at the top, middle, and bottom of the concrete section directly below both rails, one inch from the joint. In Section 4-1, the concrete strain gages were placed at middistance between joints on both sides of both beams. The top and bottom gages were placed longitudinally one inch from the top and bottom surfaces of the concrete, respectively. The center gage was located at midlength of the beam at a 45[°] angle.

Gage bars used to hold the north and south beams at the proper spacing were instrumented at Section 4-1. Strain gages were placed on the opposite sides of the gage bars located 2.5 ft east and 32.5 ft west of the midlength of the instrumented, beams.

Rail load sensors were placed, in recesses in the top surface of the concrete, under the two intermediate fasteners for each rail.

Design and Instrumentation of Load Cell Ties

A substitute tie was made for each of the six cross tie track sections to measure rail seat forces entering the tie and reaction forces on the base of the tie. The base of the tie was separated into 10 equal base pads. A special plate was provided on the top at each rail seat. Strain-gaged studs supported the two rail seat plates and the 10 base pads from the tie structure. The stiffness and the exterior dimensions of the tie structure were similar to the adjacent concrete or timber ties.

Stiffness Representation - Concrete Ties

Stiffness of three concrete ties was determined 43 days after manufacturing by bending the ties and measuring the deflections. Ties were supported upside down at the rail seats to form a 60-in. span. Load was applied on the bottom surface at two points 16 in. apart as shown in Figure Al4. Center deflection was measured for loads up to 10 kips with a dial gage graduated in 0.001-in. increments.

Test results shown in Figure Al4 indicate that a 1-in. midspan deflection occurred for a 220.69-kip load. Midpoint deflection is dependent on section dimensions and modulus of elasticity, E_c , of the concrete. Based on cross-sectional moment of inertia and moment diagram, shown in Figure Al5, it was calculated that a 1-in. midspan deflection occurs for 0.0474 E_c -kip load. Therefore, the modulus of elasticity corresponding to these data is 4.65 million psi. The average modulus of elasticity of 4.32 million psi, measured on two companion test cylinders, agrees favorably with this value. The load cell ties were designed for a modulus of elasticity of 5 million psi. The increase was intended to accommodate the increase in modulus value with time. A load-deflection comparison for a 2-1/2-yr. old concrete tie and a load cell tie is shown in Figure Al6.



FIGURE A14 - LOAD VERSUS DEFLECTION FOR CONCRETE TIE

-A17-



FIGURE A15 - CONCRETE TIE CALCULATIONS

-A18-



FIGURE A16 - STIFFNESS COMPARISON

-A19-

Stiffness Representation - Timber Ties

Stiffness of three wood ties was determined by bending the ties and measuring the deflections. Tests were conducted in the same manner as for the concrete ties except that the maximum applied load was 5 kips. Test results are shown in Figure A17. These data indicate that for red oak ties a 1-in. midspan deflection occurred for 91.74 and 82.51 kip loads for a 7x8-1/2-in. and 7-1/8x8-1/4-in. tie, respectively. For the 7-1/2x8-in. white oak tie, a 1-in. midspan deflection occurred for a 82.51 kip load. Considering a uniform cross section and the applied bending moment diagram, the calculated midspan deflection was 0.0002461 EI. The modulus of elasticity corresponding to these data varies from 1.35 to 1.53 million psi for the red oak and is 1.39 million psi for the white oak. The design of the load cell tie was based on a modulus of elasticity of 1.33 million psi. A load-deflection comparison of the load cell tie and a white oak tie is shown in Figure Al6.

Design of Basic Structure - Concrete Load Cell Tie

Design loading for the structure was chosen to be greater than that needed to cause cracking in the concrete ties used on the Kansas Test Track. Calculations indicate cracking at 227 in.-kip at the rail seat and 147.5 in.-kip at midlength. For a uniformly distributed tie-ballast pressure, these bending moments correspond to a load of 42.5 kips at each rail seat. A rail seat load of 50 kips was chosen for design. Design stress of 20 ksi in structure, 8 ksi tensile stress in welds, and 5 ksi shear stress in welds was used. Torsion of the structure was calculated assuming that the 50-kip rail seat load acts eccentric with an eccentricity equal to 1/6 of the tie-width. Therefore, the design torque was 91.8 in.-kips.

The interrelated requirements of stiffness and strength were met by using the 3-tube basic structure shown in Figure Al8a. The midlength cross section extends the full length of the tie. The main channel (-1) and the two angles (-2) were


FIGURE A17 - WOOD TIE STIFFNESS

-A21-



(a) Cross Section at Mid-length



Cross Section at Rail Seat (b)

FIGURE A18 - STRUCTURE OF CONCRETE LOAD CELL TIE

formed from flat sheet steel. As shown in Figure Al8b, stiffness was increased at the rail seat by adding two angles (-4), bottom plates (-16), and top plates (-5).

Design of Basic Structure - Timber Load Cell Tie

The loading chosen for design was that necessary to produce 1.5 times the normal design bending stress of 1,400 psi for oak timber. For a uniformly distributed tie-ballast pressure, this stress corresponds to a 27.5 kip load at each rail seat. The corresponding design moments are 147 in.-kip at the rail seat and 87.5 in.-kip at midlength. Based on the same assumption as for the concrete tie, a design torque of 36.7 in.-kips was calculated. Design stress of 1,400 psi was used.

The 3-tube structure shown in Figure Al9 was used for the entire length. The main channel (-1) and the angle (-2) were formed from flat sheet steel.

Assembly

The exterior height from the base of rail to bottom of the load cell tie was similar to that of the simulated tie. Also, the width and length of the bottom surface of both ties were similar. The exteriors of the ties are shown in Figures A20 and A21. At each rail seat there was a steel plate for rail attachment. Each rail seat plate was supported by 6 steel studs above the main structure. The bottom of each tie was covered by separate U-shaped base pads. Each base pad was supported by 4 steel studs below the main tie structure. The separation between base pads was covered with cloth tape as seen in Figure A21.

A cross section of the load cell simulating a concrete tie is shown in Figure A22. The rail seat plate (-12) was supported by studs (-15) from the structure (-2). The base pad, consisting of lower plate (-7) and side plates (-6), was supported by studs (-14) from the structure (-2).

A cross section of the complete timber tie is shown in Figure A23. The rail seat (-6) was supported by studs (-13) from the structure (-1). The base pad, consisting of lower



-A24-

CROSS SECTION OF STRUCTURE - FULL LENGTH

FIGURE A19 - STRUCTURE OF TIMBER LOAD CELL TIE



FIGURE A20 - TIE ASSEMBLY

-A25-



FIGURE A21 - LOAD CELL TIES



FIGURE A22 - CONCRETE TIE ASSEMBLY - CROSS SECTION AT RAIL SEAT ANCHOR BOLT



FIGURE A23 - WOOD TIE ASSEMBLY - CROSS SECTION AT RAIL SEAT

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plate (-5) and (-4) was supported by studs (-14) from the structure (-1). Upper side-plates (-15) were used at the rail seats to compensate for strength-loss where holes for studs (-13) passed through the structure.

The six support-studs under each rail seat had a 0.948-in. diameter. Design calculations included a 10-kip horizontal load applied at the rail head in addition to the vertical rail seat load. The four support-studs for each base pad had a 0.774-in. diameter. Each stud was threaded on one end to screw into the tie structure. A threaded hole at the other end of a stud accepted a machine bolt to it to a rail seat plate or base pad.

Instrumentation

Two axial and two transverse strain gages were cemented to each sensing stud. The axial gages were placed at 180° apart on a cross section midway between end disturbances. A transverse gage was cemented adjacent to each axial gage. Foil gages with a 2-mm gage length on phenol-epoxy backing were cemented using an epoxy.

Electrical wiring from individual studs were soldered to a terminal strip to form a complete strain-gage bridge sensitive to vertical load, for each base pad and rail seat. Shielded cable was used from the terminal strip to multipin connectors at one end of the tie. A removable cover plate in the end base pad provided access to the plug-in connectors.

Prior to final assembly and wiring of the studs, the stud groups were calibrated. The six rail-seat studs or the four base studs were screwed into a calibration plate and temporarily wired into a bridge for calibration. Strain was recorded as a test load was applied in increments to a maximum of 20 kips for base-pad cells, and 80 kips for rail-seat cells. Estimated calibration factors were approximately 20 and 50 lb per millionth strain for the base-pad cells and the rail-seat cells, respectively.

Electrical Insulation - Rail to Rail

The fastening system used in the concrete tie track provided electrical insulation at each rail. A rubber pad and insulated clips prevented short circuit between rails. The same insulation was provided in the load cell tie.

The fastening system used on timber tie track does not need insulation since timber is a nonconductor. The rail seat was designed to allow for a wrap-around insulation on the rail base at the load cell tie. This detail is shown in Figure A24. A 0.1-in. thick polyester and fiberglass insulation was cemented to a clean rail surface across the bottom and up around the base for 1-3/8 in. along the top surface. The total insulated rail length was 12 in. A 0.1-in. thick sheet steel was cemented on the outside of the insulator as a wearing surface. The rail seat plate was shaped to fit the insulated rail just as the adjacent tie plate fits a bare rail. A machined simulation of a rail spike allowed 3/8-in. vertical rail movement free of the tie.

Details of Rail Load Sensors

Rail load sensors, similar to those shown in Figure A25, were designed and built to monitor vertical and lateral rail loads. The sensors were installed in recesses between the fastener and concrete. The top and bottom plates were bolted to the fastener and concrete, respectively.

Sensors were designed so that the top plate, which was supported on two rockers, could bend and move laterally. Vertical loads were determined from the bending of the top plate and the lateral loads were determined by the lateral movement (or force applied to two load-cell spindles). Bending in the top plate was measured by strain gages bonded to the bottom surface of the plate.

Static and dynamic calibrations of the sensors were done initially in the laboratory. Upon installation of the sensors in track, difficulties were encountered, primarily due to the



FIGURE A24 - INSULATED RAIL SEAT FOR WOOD LOAD CELL TIE



field condition of the fasteners. Details of the problems are presented in Appendix F. In January and February 1975, additional laboratory tests were conducted to improve the method of installing and calibration. To improve the sensitivity and performance of the sensors, a shim was installed between the center of the top plate and the bottom of the fastener. Sensorinstallation modifications and field calibration of each sensor at all locations greatly reduced many of the initial problems. During the April 1975 data-acquisition trip the vertical load sensors functioned properly, but the lateral load sensors did not provide worthwhile data. The project was terminated before any further work could be done on the sensors. . .

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APPENDIX B

DATA REDUCTION METHODS AND SAMPLE DATA

A data trace was produced on each channel of each oscillographic recorder as a selected train passed over a selected test section. A copy of two such traces is shown in Figure Bl. The recording paper was moving at a rate of 25 mm per second under the recording stylii. The stylii were at a rest or zero position before deflecting to 12 successive peaks due to three locomotives passing the test section. Then each wheel of the following cars indicated its effect by stylus movement.

Stylus movement was converted to engineering units of strain, force, pressure or displacement using the following equation:

$$EU = \frac{(A - B)CD}{E}$$

where

EU = engineering units

- A = stylus position at peak due to wheel, mm
- B = stylus rest position, mm from edge
- C = factor

D = range setting on oscillograph

E = Stylus displacement, mm, at calibration prior to train passage.

The factor, C, is predefined by gage factor for strain gage channels and by precalibration for other items. Methods used to define factors and to produce the calibration, E, are described in Appendix F. The upper trace in Figure Bl was recorded in Test 4, Section 2, Train 2, Channel 9 which is an interface pressure cell under midlength of the load cell tie. For the first wheel in this trace:

A	-	35.2 mm from edge to peak,
В	=	14.8 mm from edge of trace,
C ·	=	0.448 psi per mm,
D	-	20,
E	=	10.3 mm,





Therefore,

EU(interface pressure) =
$$\frac{(35.2 - 14.8)(0.448)20}{10.3}$$
 = 17.7 psi

This result is shown in Table C8 of Appendix C as reduced data for wheel number one for the defined data line. The wheel load for the leading train axle was 33 kips as shown on the last line of Table C8.

Data was further summarized by dividing each result by the wheel load. The maximum, minimum, and average ratios were then used to describe a group of data.

For the sample data being considered, the ratio is 17.7 psi/33 kips or 0.536 psi per kip of wheel load. The average interface pressure for this item is 0.57 psi per kip as shown in Table 23 of the report.

Further reductions were done on rail and tie data. Rail strain data were used to calculate rail curvature due to wheel load and to calculate stress at the top of rail head.

S = stress at top of rail head, psi

$$S = \frac{T(U - L)}{N} E_{s}$$

where

T = distance of top surface to neutral axis, in. U = strain at upper gage (average) L = strain at lower gage (average) N = distance between upper and lower gage, in. E_c = modulus of elasticity of rail steel, psi

Tie strain data were used to calculate tie curvature and to calculate bending moment in the tie.

$$M = \frac{(U - L)}{N} (E_{t} I)$$

where

M is bending moment, in.-1b

(E_t I) is stiffness of tie cross section, $16-in.^2$ The stiffness used for timber tie calculations was 335 million lb-in.² as described in Appendix A. Similarily, stiffness of concrete ties at midlength was 877 million and at the rail seat was 1,945 million lb-in.² Acceleration data was stored on magnetic tape at the original train passage. This data was reduced to power spectral density plots as described in Appendix E. Peak values calculated for a range of frequencies are shown in Tables 24 and 25 for rail and tie accelerations, respectively.

 $G = 1.414 F X 10 \frac{(FS - L)}{10}$

where

G = acceleration amplitude in g¹'s
F = frequency, Hz
FS = full-scale db relative to l g² rms/hz

L = db relative to full-scale

APPENDIX C TIE TRACK DATA

Data reduced from oscillograph records are shown in Tables Cl to C24 for tie track Sections 1, 2, 3, 6, 8, and 9. The appropriate engineering units are listed in the data-description line. Each column records the effect of the locomotive wheel numbered at the top of the column. Data values of 0.0 indicate non-existent data. The wheel load is listed at the bottom of each column. For Tests 1 and 2, the same train was used for all sections. The wheel loads are as tabulated in Table Cl.

For Tests 3 and 4, 2 or 3 trains were used to obtain the data. Wheel loads for all trains appear in the last lines of the tables. The TSRCH code number identifies the train used with each line. The TSRCH is a 5 digit number where the first digit indicates the test number, the second digit is the section number, the third digit is the run or train number, and the last two digits are the original channel number. Thus, if the 3rd digit is 2, the data line resulted from the wheels of the second train.

Data obtained from accelerometer tape recordings for tie track sections are shown in Figures Cl to C27. Figures show power spectral density of accelerations versus frequency as described in Appendix E, Accelerometer Data Reduction Procedure.

TABLE C1 - TEST DATA FOR TEST 1 ON SECTION 1

REDUCED RAIL DATA

								MME	FL NUM	858			
	· TSRCH			-			4			9	18	11	12
		1		³				200'1-	140.3-	156.3.	164.2-	203.1-	169.2
ANT ATTANT AT MATH ABOAT AT TTE NORTH UPPER GAGE -HILLIONTHS	11218	-207.1-1	97.1-2	206.1-2	102.1-4		23.3-	200.1-	97.9	27.9	23.3	6.9	28.9
RAIL STRAIN AT HAIW ARALT OF THE MORTH MID GAGE WILLIONTHS	11226	30.2	37.2	9.6	30.2		23.3		2747	16.6	16.9	34.5	30.6
RAIL STRAIN AT HALP ARRAT AT TIC NORTH LOUGH EAGE HILLIONTHS	11227	42.3	39.2	42.0	34.5	37.3	36.1	37.0	33.2	1	20.8	23.4	29.2
RAIL STRAIN AT HAIN ARRAY AT THE FOUTH LOPER GASE WILL IONTHS	11228	24.0	31.0	31.0	31.6	23.2	21,4	25.0	17.0	10.7	20.0	11 1	19.1
RAIL STRAIN AT MATY ARRAY -AT THE SOUTH MEE CACE -MILLIONTHS	11229	10.0	11.5	9.4	8.Q	9,4	0.0	6.6	7.4	2.1	0.0		
RAIL STRAIN AT MAIN ARRAY ANT THE SOUTH HILL BACK WITH TOUTUS	11222	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			20.9
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH COMER GAGE WILL CONTUR	11236	-35.8 -	30.0 -	-33.1 -	32.1 .	.30.0	-27.2	-31.7	-23.0	-23.0	-24.4	-30+/	-24.7
RAIL STRAIN AT HAIN ARRAY .BETWEEN TIES UPPER GAGE .AILLIOUTUR	11237	21.2	23.3	21.0	22.2	22.2	25.0	21.2	25,8	26.6	24.3	20.7	23.8
RAIL STRAIN AT MAIN ARRAY "BETWEEN TIES MID GAGE "HILLIGHTAN	+ 11225	223.6 2	10.8 2	215.5 2	08.5 1	94.5	191.0	192.2	167.7	180.5	193.3	201.5	195.9
MAIL STRAIN AT MAIN ARRAY -BETWEEN TIES LOWER GAGE -MILLIDUINS	11201	-74.3 -	80.5	-63.1 -	54.4	34.8	-69.6	-52.2	-13,0	-26.1	-78.3	-43,5	-50.0
RATE STRAIN AT 100 FT EAST-BETWEEN TIES UPPER GAGE -MILLIONTHS	11202	62.9	60.5	62.9	65.2	60.5	41.9	44.2	62.9	51.2	37.2	55.9	48.9
BATE STRATH AT ING FT EAST-BETWEEN TIES MID GAGE -MILLIONTHS	11202	133 0 1	57 2 1	125.6 1	27.9	93.6	130.2	100.5	73.0	59.3	125.6	102.7	102.7
AND STRATH AT INA ET FAST-RETWEEN TIES LOWER GAGE -NILLIONTHS	11205	191.0 1	974B 1	12310 1			-11 4		.9.7	+9.7	-10-3	-8.9	-9.7
THE STRAIN AT MATH ADDAY NO BAIL SEAT HEPER GAGE -HILLIOUTHS	11255	-9.5 -	10.0	-0.7 -				0.0	0.0	0.0	0.0	0.0	0.0
THE STRAIN AT HAIN ADDAY NO DATE STAT MTD GAGE -MILLIONTHS	11234	0.0	0.0	0.0	0.0	0.0	010		Å Å	0.0	0.0	6.0	0.0
TIE STRAIN AT HAIN ARARI SHOULAIL SEAT LOUSE GAGE MILLIONTHS	. 11235	0.0	0.0	0.0	0.0	0.0			~~ a	34.0	26.2	24.7	26.2
TIE STRAIN AT PAIN ARRAY AND A FUTUE UDDER GASE MILLIONTHS	11231	25.5	27.0	29.5	22.2	24.9	27.9	27.0		20 6	-01.3	-19.9	-19.4
TIE STRAIN AT HAIN ARRAT AND LENGTH OFFEN CREE WILL TOUTHS	11232	-21.3 -	22.7	-19,9 -	20.9	-19.2	+20.7	-20.2	-17.7	-2010	47 0		
TIE STRAIN AT MAIN ARRAY -KID LENGTH LOBER GROE -HILL TOUTUR	11204	-87.9 -	98.9	-76.9 -	-54.9	.76.9	-87.9	-65.9	-24.9	-24+2		-07.7	
TIE STRAIN AT 100 FT EAST-NO.RATE SEAT UPPER GASE MILL CONTUR	11205	0.0	0.0	0.0	0.0	8.0	0,8	0.0	0,0	0.0	0.0	0.0	
TIE STRAIN AT 100 FT EAST-NO.RAIL SEAT MID GAGE MILLIOTING	11206	84.3	86.5	86.5	79.9	86.5	102.1	85.7	84,3	82.1	102.1	73.4	73.2
THE STRAIN AT 100 FT EAST-NO.RAIL SEAT LOWER GAGE -MILLIONING	11297	16.0	13.7	14.8	11.4	10.2	12.5	11.4	10.2	10.2	11.4	11.4	10.2
THE STRAIN AT 100 FT EAST-MID LENGTH UPPER GAGE -MILLIUMING	11208	-16.4	16.4	-14.2 -	-14.2	-13-1	-14.2	-13.1	-12.0	-10.9	-14-2	-14.2	-15.1
TIE STRAIN AT 100 FT EAST-MID LENGTH LOWER GAGE -HILLIONTHS	11138	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
OFELECTION AT MAIN ARRAY -HORTH END OF INST TIE -INCHES	11124		8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	a. a
DEFISITION AT MAIN ARRAY -RAIL HIDSPAN RETWEEN TIES-INCHES	11123		M7 M		87.2	49.1	50.5	46.4	46.4	49.7	50.1	47.6	48. 0
INTERGACE STRESS MAIN ARRAY -NO. RAIL SEAT OF INST TIE -PSI	11207		29 4	20.1	21.7	21.0	22.8	19.1	20.8	21.7	22.5	21.0	22.0
THIER ALL STALLS WATH ABBAY SHID LENGTH OF INST TIE	11210	17.3	2401	10.0	11 4	32.4	38.0	32.7	34.5	34.7	35.9	32.9	35.2
THEREALE STALLS AND ARAY SO. RATE SEAT OF INST TIE	11211	a1. 7	37.7	3217	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0
INTERFACE SPRESS WATH ARDAY -NO RATE SFAT OF LOAD TIE	11515	0.0					18.3	14.8	16.8	17.5	18.1	17.0	17.5
INTERFACE STRESS HAIN ARRAY MAD IFNOTH OF LOAD TIE	11213	15.0	17.0	16.0	10.0	1010	10.4	11 0	31 7	32.2	32.9	31.6	33.4
INTERFALL STRESS HAIN ARAAT FILSE TO BAT OF LOAD TIF	11214	30.6	25.4	30.6	32.1	32.2	J2.n	31.0		2.2	2.1	1.9	2.8
INTERFACE STRESS MAIN ARMAN SULMAIL SEAT OF COMPTENTIES APSI	11215	1.7	1.8	1.7	1.8	1.17	2.0	1.0	1.4.7		0.0	0.0	0.0
INTERFACE STRESS MAIN ARRAY WOOD IN THE DEFUCTA TICE DOST	11216	0.0	0.0	a.o	8.0	0.0		0.0		10.1	10.7	4 4	7.6
INTERFACE STHESS MAIN ARNAT ONLU LRIG DETRECH TILS	11217	7.3	8.8	7.5	8.7	8.2	10.0		7.0	14.7	14.7		10.7
INTERFACE STRESS MAIN ARRAY SOUTH HAIL BEIBER ILLS WIPS	11127	14.3	16.2	14.1	14.5	15.6	16.7	13.6	12.1	12.1	10.5	1 . 7	17.1
RAIL SEAT FORCE MAIN ARRAY -NORTH SEAT LOAD CELL THE AND	11128	16,9	18.5	14.4	16.3	15.6	16.4	15.6	12.0	12.7	1/.3	17.6	11.3
RAIL SEAT FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL THE -RIFS	11129	0.0	0.0	0.0	0.0	8.0	0.4	0.0	0.0	0.0	g.0	0.0	0,0
TTE BASE FORCE PAIN ARRAY -BASE PAD - 1 NORTH END -RIPS	11138	2.5	2.8	2.7	2.6	2.9	2,9	2.7	2.7	2.9	5.9	2.1	2.1
TIF BASE FORCE MAIN ARRAY -BASE PAD = 2 -KIPS	51111	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	· Q • O	0,0	0.0
TIE DALE FORCE NATH ARRAY BASE PAD - 3 -KIPS			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0,0
TTE DASE COPER MAIN ARRAY -BASE PAD - 4 -KIPS	11102		2.4	1.4	2.0	2.0	2.2	1.8	2.0	2.1	2.2	2.0	2.0
TIL DAGE FORTE MAIN ARRAY -RASE PAD = 5 KIPS	11133	1.7	e • 1		A A	0.4	6.0	0.0	0.0	0.0	0.0	0.0	0.0
TIE HASE FURLE MAIR ANNAL GASE BAD - S -KIPS	11134	0.0	0.0	0.0					8.4	4.6	4.9	9,4	4.7
TIL BASE FIREE MAIN ARRAY ORSE DAD - 7 -KIPS	11135	4,3	4.7		7.6				6.0	0.0	0.0	0.0	0.0
THE BASE FORCE MAIN ARTAN + DROL PAD + 7	11136	0.0	u.n	0.0	0.0	4.0				2.9	3.3	2.A	3.4
TIE BASE FORCE MAIN ARRAY -BASE PAU - B	11137	2.7	3.1	2.8	3.2	2,9	3.1	2.7	2.7	6.7	0.0	A. A	0.4
TIE BASE FORCE MAIN ARRAY BASE PAD - 7	11138	0,0	0.0	0.0	0.0	6.0	0.0	0.0	u.u				« na +
TIE BASE FORCE, MAIN ARRAY -BASE PAD -10 SHUTH END - HTPS		35.10	35.18	34.60	34.60	31.10	31.10	5 27.9	2 29.9	2 30.6	5 3U.6	2 54 9	⇒ <u>%</u> 7.6
TOATH DATA -WHEEL LOAD -RIFS													

-02-

TABLE C2 - TEST DATA FOR TEST 2 ON SECTION 1

REDUCED	****	UAIA	

RAIL STRAIN AT MAIN ARRAY -AT TIE -NORTH UPPER GAGE -MILLIONTHS 21218 RAIL STRAIN AT MAIN ARRAY -AT TIE -NORTH MID GAGE -MILLIONTHS MAIN ARRAY -AT TIE -NORTH LOWER GAGE -MILLIONTHS 21226 RAIL STRAIN AT 21227 MAIN ARRAY -AT TIE -NORTH LOWER GAGE -MILLIONTHS MAIN ARRAY -AT TIE -SOUTH UPPER GAGE -MILLIONTHS MAIN ARRAY -AT TIE -SOUTH MID GAGE -MILLIONTHS MAIN ARRAY -AT TIE -SOUTH LOWER GAGE -MILLIONTHS MAIN ARRAY -BETWEEN TIES UPPER GAGE -MILLIONTHS MAIN ARRAY -BETWEEN TIES LOWER GAGE -MILLIONTHS 100 FT CAST-BETWEEN TIES UPPER GAGE -MILLIONTHS 100 FT CAST-BETWEEN TIES WID GAGE -MILLIONTHS 100 FT CAST-BETWEEN TIES UPPER GAGE -MILLIONTHS 100 FT CAST-BETWEEN TIES LOWER GAGE -MILLIONTHS 100 FT CAST-BETWEEN TIES LOWER GAGE -MILLIONTHS AND ARRAY -NO.RAIL SEAT UPPER GAGE -MILLIONTHS MAIN ARRAY -NO.RAIL SEAT UPPER GAGE -MILLIONTHS MAIN ARRAY -NO.RAIL SEAT UPPER GAGE -MILLIONTHS RAIL STRAIN AT 21228 RAIL STRAIN AT 21229 RATL STRAIN AT 21222 RATL STRAIN AT 21236 RAIL STRAIN AT 21237 RAIL STRAIN AT 21225 **MAIL STRAIN AT** 21201 RAIL STRAIN AT 21202

 RAIL STRAIN AT
 BO FT EAST-BETWEEN TIES LOWER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MO, RAIL SEAT UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MO, RAIL SEAT UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MO, RAIL SEAT UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MO, RAIL SEAT LOWER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MID LENGTH
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 MAIN ARRAY -MID LENGTH
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MO, RAIL SEAT
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MO, RAIL SEAT
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MO, RAIL SEAT
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MO, RAIL SEAT
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MID LENGTH
 UPPER GAGE -MILLIONTHS

 TIE STRAIN AT
 100 FT EAST-MID LENGTH
 UPPER GAGE -MILLIONTHS

 DEFLECTION AT
 MAIN ARRAY -NORTH END OF JNST TIE -INCHES
 INTERFACE STRESS MAIN ARRAY -NORAIL SEAT OF INST TIE -PSI

 INTERFACE STRESS MAIN ARRAY -MORAH END OF INST TIE
 PSI
 INTERFACE STRESS MAIN ARRAY -NORAIL SEAT OF LOAD TIE

 INTERFACE STRESS MAIN ARRAY -NORAIL SEAT OF LOAD TIE
 INTERFACE STRESS MAIN ARRAY -NORAI RALL STRAIN AT 21203 TIE STRAIN AT 21233 21234 21235 21231 21232 21204 21205 21206 21207 21208 21124 21125 21209 21210 21211 21212 21213 21214 21215 51519 21217 21127

 RAIL SEAT FORCE
 MAIN ARRAY -SOUTH SCAT LOAD CELL TIE -HIPS

 TIE RASE
 FORCE
 MAIN ARRAY -BASC PAD - 1
 NORTH END -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 2
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 2
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 3
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 3
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 5
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 5
 -KIPS

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 -KIPS

 TIE BASE
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 MAIN ARRAY -BASC PAD - 8
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 8
 -KIPS

 TIE BASE
 FORCE
 MAIN ARRAY -BASC PAD - 8
 -KIPS

 21128 21129 21130 21131 21132 21133 21134 21135 21136 TIE BASE FORCE MAIN ARRAY -BASE PAD - 9 TIE BASE FORCE MAIN ARRAY -BASE PAD -10 SOUTH END 21137 21138 +KIPS *KIPS -WHEEL LOAD TRAIN DATA -XIPS

TSRCH WHEEL NUMBER -215,0-205,1-201,1-194,1-105,2-179,2-101,2-155,3-163,2-175,2-109,1-149,3 20,9 20,9 -13,9 14,3 0,0 4,6 -11,6 20,9 9,3 4,6 0,0 4,6 39,5 38,9 39,2 30,9 33,8 33,8 33,5 31,8 33,5 26,1 36,1 32,9 33,9 39,9 34,5 41,1 22,6 27,4 41,1 23,8 39,9 24,4 33,9 39,3 0.0 0.0 ... 0.0 5.0 -34.9 -34.9 -31.7 -33.8 -33.5 -28.2 -28.2 -23.0 -24.4 -27.9 -31.4 -26.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 229.5 216.6 214.3 208.5 191.0 195.7 182.9 171.2 179.4 196.8 194.5 179.4 -65.3 -89.2 -80.5 -65.3 -37.0 -67.5 -34.6 -10.8 -21.7 -65.3 -15.2 -32.6 -34.9 -48.9 -37.2 -51.2 -34.9 -51.2 -32.6 -9.3 -20.9 -37.2 -27.9 -32.6 119.7 141.6 102.7 116.4 54.8 118.7 84.5 52.5 50.2 116.4 93.6 89.0 +9.2 -9.7 -8.1 -9.4 -9.2 -13.9 -6.1 -8.3 -12.8 -10.8 -9.2 -9.2
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 0.0</td 8.0 0.0 34.0 -19.9 -19.5 -21.3 -21.3 -19.5 -20.2 -19.5 -21.3 -26.5 -26.5 -16.7 -16.9 -54.9 -87.9 -65.9 -65.9 -87.9 -87.9 -43.9 -87.9 -87.9 -87.9 -76.9 -65.9 6.0 95.9 18.2 17.1 18.2 10.2 8.0 15.7 11.4 9.1 9.1 11.4 11.4 8.0 -14.2 -14.2 -14.2 -15.3 -13.1 -14.2 -13.1 -12.0 -13.1 -14.2 -14.2 -15.3 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0,0 0.0 0.0 0.0 8,8 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 8.0 0.0 54.5 57.2 54.0 56.5 55.6 61.1 52.2 54.7 56.3 18.6 19.8 17.6 19.9 18.3 22.0 18.0 19.7 19.8 56.3 61.8 55.6 54.9 22.7 18.3 21.2 11.5 12:3 11.5 12.5 11.9 14.0 12.7 13.6 15.2 13.6 13.9 14.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 15:6 17.7 16.3 17.4 18.2 18.6 16.2 18.2 19.2 19.4 17.2 18.2 24.2 27.2 24.2 27.5 26.4 26.6 26.8 28.9 28.7 27.7 27.2 0.6 0.5 0.6 8.6 0.7 0.4 0.5 0.4 0.8 2.2 2.6 2.9 2.6 2.5 2.9 2.4 2.6 2.6 2.5 2.6 2.1 5,9 8.4 6.9 8.0 7.7 9.4 8.0 8.5 8.5 9.4 10,6 15,7 15,1 16.2 19.5 20.3 14.6 16.5 16.2 18.2 18.5 15.2 16.9 0,0 0.0 0.0 0.0 0.0 0.0 6.0 0.0 0.0 6.0 0.4 0.0 0,0 0.0 8.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0,0 2,4 3,3 3,3 2.4 2.5 3.1 3.1 2.6 2.5 2.7 2.7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 6.8 0.0 ... 0,0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 6.0 0.0 0.0 8,8 1,9 2.8 1.4 2.0 2.3 2.6 1.8 2,1 2.6 2.3 2.2 2.2 0.0 0,0 0.0 6.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 3.1 3.2 3.8 3.2 3.3 3.4 3.2 3.4 3.2 . 3.5 3.1 3.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.8 3.3 3.3 3.1 3.0 5.3 3.1 2.9 .3.1 3,5 3.4 3.5 3.7 0.0 0.0 6 0 8.0 . 0.0 0.8 0.0 8.0 0.0 8.8 0.0 8.6 35,18 35,18 34,60 34,60 31,18 31,18 29,92 29,92 30,65 30,65 29,85 29,85 TABLE C3 - TEST DATA FOR TEST 3 ON SECTION 1

.

REQUCED RAIL DATA

MINDER

2	a c 5 c	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0				0,0	0 .0	0.0	0,0				8.8	23.5	6.9	0.51			•	•			0.0	•••		0,0	0 0 0 0		•••		0.0	0.0			3.6	10 1 10 1				
2			9.0		c -				0.0	. .9	0 . 8		n e 0 c			8.0		6°0	ۍ م					5. 5	6.6	11.6	N 0		2							0.0		•	0, 0 0		0.0	•			-			5.25		
4	n 4				5. •				0.0		4 • •					0.0	0.0	0°0	8,0	, °				22.7	1.7	11.9	د. د			9°9			0		0 0 , 4 0 0	9.0						•	N 4			11 (11)		32.19		
13			•••		e, a	• •			0.0		. .		e (» e		3.6	9.3	• ?;		0	1.12				13.5	6 6			9.0	0.0			0.0	• •	0.0		0	0.0			0.0	*			3 I 10		32.70		
<u>.</u>				0.0	9.0	л. а				9.0	0°1	د ،	a.	<u>،</u> و			2.0	0.3	9°¢	0°.		n (6	6.6	9 5 5			6 .0	8°9	a .		•••	0 d		0.0		•••	•		0.0	* 1 ~ *	-		.	, ,	32.70		
m	0					•	•			0	0,1	<u>،</u>		•				0.0	0.0	0.1	0.0					2.0	•••			•	•••			0.0	00	0	•••		0.0	0.0		0.0	,		10	5.1	e .	32.76		
2	5 C				4								y.		ė .	•••				0.1	ູ້	0 · · ·		• 0 • 1 • 1		3.3	9.7	5.2			0.4			1.3	7.7 7.7		5.3	- 0 - 0	•••	•••		0.0	1	4 a 			5.2	32.55		
			9-102		.7 101	.1-140	0	1 36		136			9.1	5	•				9.8	1.1	0.0	5.6 5.6				3.0 3	9.8	6		• • •		F	. e	. 21	1.6		5.0	N C		0.0		0			• •	5.5	N. N. N.	32.55		
	3-137	57 C -	203 3.	.0	6 195	-9-146		-7 174						15 C.	۳; در						•••	•0 •	с. С.					, . • • •	49 F					*	8.1		5.2	**		0.0			1.3				3.2	10.0		
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. •	6-135.	32.	7 226.					0 130.	0 -92					7 56	0	7 -03.	ية د دي د			1		0 29	á 15.	11 11	10.4 10.4 10.4				6 (-	••••			e 1		27 (-	ю (1		6. A		
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1	-113.0	32.0	214.0	-165.0				174.	- 47.	0	196.				8	- 65.	÷.				•••		9 13.	9 15.	21.	÷:				2 2 2							e d					•	9 - C	• • • •	-			22	2	
-	.123.1	28.5	197.2	-103.9	0			196.	-8f. 2	-						-76.			2				2	1.4.	. 23.					7 17.	8 21.	- 0		•••••			~				•					•1 •	n m e m	10 32	,7 8 52	•
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		AT 716	AT TIE		AT 116	AT TE	861458	BETVE	AET SE			ND. RA	NO. RA	NO. 4A	1) 01**	- 110	NG. PA				-ADRTH	-RAIL	-NO.KA	- CIN-	-50.84		-50.84	-NORTH	014-	H1005-	-50UTH	-BASE	-BASE	-8435	-BASE	-BASE	-BASE	-BASE	-BASE	-50UT	-84SE	-8450	-BASF	-945E	-BASE	3548- 7245-	BASE	-04SC	59	
		RRAT -	RAY -		ANA1 -	P X A Y	RRAY -	ARAY -	RAA		C A S	1444	ARAY .	LERAT .	ARAY .	RAAV	1 EA31			T SAST	VERA	AGRAY	TERME	ARRAY	ARRAY	VANXA Vega	ARAY	ARRAY	ARRAT	ARRAY	ARRAT	ARRAY	ARRAY	TAWAT	ARRAY	ARAT	ARRAY	ARRAY	ARRAY	ARAY	ARAAY	ARRAY	ARRAY	ARRAY	ARRAY	ARAY	AHRAY	ARAY	L.LOAD	
		MATE A	A NIAN				MATH A	MAIN A	MATK		101	MATA		NIN	NALM I	NITH	300 5	4 951			NATA N	HAJ R	MAIN	MAIN	NIN	X I Y		NIN	MAT ²⁴	2142	MIN'	NIV	NIVA		NICH	MAIN	N I N N N N N N N N N N N N N N N N N N	MAIN	A LAN		8541	N I M		NIV	MIN	NIN.	: 7 F M	NIAN		
		AT	H	F.			24	IV.	AT AT	I.		; ;	. Le	, L K	41	47	Ā	14	2	4		P 4	319655	STRESS	STRESS	\$5344S	57RE55	STRE35	STRESS	STRESS	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	FORCE	LOACE	FORCE	FORCE	FUNCE	22	į
		STRAIN	SIRAIN	SIRATO	STRAIN	N14810	STRAIN	STRAIN	STRAIN	STRATE	STRATA	TOAP.	TRAIN	NETER	NIAPT	11 RAIN	SIRAIN	STRAIN	SYRAIN STRAIN	NTVN12		101101	IF ACE	PACE :	HFACE	RFACE	RFACE State	REACE	RFACE	REACE	SCAT	BASE	BASE	BASE	HASE	BASE	BASE	33KB	BASE	SFAT	BASE	BASE	BASE	RASE	PASE	BASC	BASE BASE	BASE	5 6 2 4	
		RAIL	LAIL	4416	RAIL			AAIL	RAIL	RAIL	AIL.	RAIL	1 1 1 1 1		110.5	711 9	196 3	11	312		1910		INTER	1476	INTEN	19TUL	13121	930	ENTE:	12121	843L	TIE	116	11	116	115	317	1 14¥ • • • •	3	RAIL	116	116	311	125	31	710	11.	Ë	TRA	

TABLE C4 TEST DATA FOR TEST ON SECTION 1 4

REDUCED RAIL DATA

		TSRCH	•						VHEE	L NUMO	ER								-	-
			•	2	.i 3		5	6	7	6	9	10	11	12	13	14	15	16	17	14
	MALL TOWARD		· • • •	0.0	8.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8
NURTH UPPER GASE .	MILLIUMIMA	*1102	36.4	42.4	34.3	38.7	39.3	\$2.1	40.4	41.5	37.6	36.5	33.8	41.5	0.0	0.0	0.0	0.0	0.0	
NURTH MID GAGE -	HILLIUNINS	41102	303 2 3	16 7 9	00 0 3	06.6.1	92.4.2		197.7 1	94.7 2	07.0	199.5 1	198.3 2	22.7	0.0	0.0	0.0	0.0		
NORTH LOWER GAGE -	MILLIOHTHS	41103	201.6 2	10.7 2	07.U Z					05 6-1	29.6-1	121.1-1	139.2-1	10.4	0.0	6.0	0.0	0.0	0.0	4.4
-SOUTH UPPER GAGE -	AILLIONTHS	41104	-100.6 -	71-1-1	03.I-I	13.1-1	276272		12465-1	1110-1	16 6	22 9	80.9	80.3	0.0	6.0	0.0	0.0		9.4
SOUTH WID GAGE -	HILLIONTHS	41105	40.5	55,4	1.7	46.3	3941	33.6	31.7	12.1	1344	33.82		41 1			0.0	A . A		
SOUTH LOWER GAGE -	MILLIOUTHS	41106	166.9 1	72.4 1	72.9 1	77.5 1	71.5 1	170.4	177.5 1	82.0 1		191+4 1	101.4 1	103.3		0.0				
TIFS UPPER GASE .	HILL TONTHS	41107	0.0	0.0	0.0	8.0	a.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9		0.0	0.0		
TIES MID GAGE -	AILL TONTHS	\$1108	10.0	14.6	10.6	15.4	15.4	10.6	10.0	13.6	12.4	10.6	19.5	9.5	0.0	0.0	0.0		4.4	4.4
TIES LOVER CASE -	HTEL TONTHS	41109	204.5 2	18.6 1	90.4 Z	04.5 1	183.4 3	185.5	169.3 1	71,6 2	18.6	198.7 2	229.2 2	229.2	0.0	0.0	9.0	0.1	0.0	
TICA LUBER GAGE -	WTLL LAWFUE	U111A	+105.6 -	91.5-1	16.4 -	99.4 -	80.2	-93.7-	114.7 -	92.8 -	91.5-	102+2-3	107.9 4	.99.4	0.0	0.0	0.0	0.0	0.0	8.8
TIES UPPER GAGE -			21 9	21.4	10.9	17.5	12.0	19.2	8.2	19.2	31.8	27.4	17.5	14.8	6.0	0.0	0.0	0.0	0.8	5.6
TILS MID GAGE -	MILLIUMINS		10.5	12.4	10.0	10.0	8.7	11.2	8.7	8.7	10.0	8.7	8.7	8.7	0.0	0.0	0.0	0.0	6.8	
TIES LOWER GAGE -	-MILLIUWIHS	41120		AK 11	42.9 -	77.8 .	Ac. 6 .	.77.9		58.7 .	77.9	-82.5	-61.7 .	.87.7	0.0	0,0	0.0	6.0	0.0	ô.a
SEAT UPPER GAGE -	MILLIDATHS	91110	-04.0 -	0314 -	96.5 ~ 76 l		74 1	99.0	70.7	99.5 1	15.9	102.A	66.3	99.6	0.0	0.0	0.0	8.0	0.6	8.8
SEAT MID GAGE -	MILLIONINS	41111	12.3	7747	1341	7447	10.1	22 4	10.7	10.0	10.8	18.4	18.1	22.6	0.0	6.0	0.0	0.0	0.0	4.8
SEAT LOWER GAGE -	.#illionths	41112	13.6	23.2	14.7	17.2	14.0	22.0	1447	1749	64 6	A9.4		46.5	0.0	0.0	0.0	0.0		0.6
STH UPPER GAGE -	-MILLIOHTHS	41113	89.4	84.2	86.5	66.6	96.7	60.5	88.2	24.0	73.0		- 24 (- 1	00.0		0.0	6.0	0.0	0.9	
TH LOWER GAGE -	-MILLIOUTHS	41214	-95,5+1	13.4 -	93.7-1	13,1 -	-93.0-	113.8	-91.1-1	14.4-1	03.6*	11/+0							A A	0.0
SEAT UPPER GAGE .	-MILL IONTHS	41121	-70.3 -	76.7 -	76.1 -	67.1 .	.57.6	-62.4	-65.5 -	67.7 4	60.5	-70.8	-/0.8	-67.+7	0.0	0.0	0.0			
SCAT MID GASE	WTILL TONTHS	41122	8.0	0.0	0.0	0.0	0.8	0.0	0.5	0.0	0.0	6.0	0.0	0.0	8.0	0.0.	0.0	0.0	0.0	
SEAT LOURD CASE	MILL TONTHS	41123	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0,0	0.0	8.6	0.0	0.0	0.0	0.0	0.0	9.0	9.4	0.0
SEAT LUWER GARE		41124	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
GIN UPPER GAGE		.1125		0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0,4	8.6
GTH LOWER GAGE .		*****		0.3	0.2	8.9	6.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	8.2	0.2	0.2	0.2	0,2
ND OF INST TIE -	-INCHES	41201	0.2	0.2					0 1	0.1	0.1	0.1	0.1	8.1	0.1	0.1	0.1	0.1	6,1	6.1
DSPAN RETWEEN TIES-	– Inches	41202	0,1	0.1							16 8	18.0	12.9	13.9	12.5	16.3	15.2	13.7	14.2	14.2
SEAT OF INST TIE .	-PSI	41205	13.9	15.6	15.7	10.2	12.4	70.3	12.1	13.0	8.0	0.0	0.0	0.0	0.0	0.0 *	0.0	0.0	0.0	0.0
GTH OF INST TIE		41206	0.0	0.0	0.0		0.0	0.0	a.a	0.0					7 2	8.7	10.1	8.5	4.9	9.2
SEAT OF INST TIE		41207	8,1	8.0	A.0	18.0	7.2	8.4	7,8	1.1	6.7			5.2		4.3	4 3	4.4		4.4
SEAT OF LOAD THE		41205	5,8	6.2	6.9	6.0	5.8	7.1	5.6	5,8	6.0		3.0	2.0						
TH OF 1040 TTE		41209	12.1	13.0	13.3	13.6	12.1	14.4	12.3	12.4	13.6	13.7	15.2	13.1	10.7	1949 -	13.3			1944
STAT OF LOAD TIC	· ·	\$1210	13.7	14.3	15.3	17.2	14.4	17.0	15.6	15.5	16.1	15.2	15.8	16.6	13.0	10.5	10.1	13.3	11.2	10.1
SEAT OF LOAD THE		41211	5.1	6.3	6.4	6.2	5.8	6.3	5.3	6.0	6.2	5.1	5.8	5.7	4.5	6.9	6.3	4.3	••	
ALL DEINEEN TIES	-231	81212	4 1	7.4	7.2	7.2	7.0	7.5	6.4	7.0	7.3	6.0	6.9	7.1	5.4	7.9	7.9	6.1	7.7	7.7
B HETWEEN TIES	*P31	#1213	× 7	6.4	6.8	6.9	6.5	7.9	7.0	7.1	7.1	6.4	6.6	7.3	5.4	7,4	8.1	6.4	7.7	6.5
AIL BETWEEN TIES	-F31	*1122	2.0	10 .	18.0	22.6	15.2	20.0	16.0	18.9	19.6	22.0	18.6	24.6	0.0	0.0	0.0	0.8	6.8	8.8
EAT LOAD CELL TIE .	-#125			1	36.8	21 4	14.1	20.3	15.4	20.5	15.9	17.2	16.9	19.4	0.0	0.0	0.0	0,9	0.0	6.6
EAT LOAD CELL TIE •	-KIPS	91126	11.4	17.0	1310					0.0	0.0	0.0	0.0	0.0	0.0	0.0	. 0.0	0.0	0.0	4.8
D - 1 NORTH END .	-KIPS	41129	0+0	0.0	0.0					7 4	3 4.	3.9	3.1	4.0	0.0	0.0	8.0	0.0	0,5	0.0
0-2 .	-KIPS	41130	3,2	4.9	3.0		2.1	3.3	£.0	3.7	2.7	3.4	3.0	3.9	0.0	0.0	0.0	0.0	0.0	
D = 3 ·	-KIPS	41131	5.2	3.9	2.1	. 3.1	1.9	3.6	4.0	3.1	3.1					0.0	8.0	0.0	8.8	
0 - 1	-8125	41132	3.6	5.0	5.4	5.5	3.2		3.7	5.9	3.0	1.1				6 6	" A. A	6.6		
ñ	-KIPS	41133	0.0	0.0	0.0	0.0	0.0	0.0	8,0	0.0	0.0	0.0	0.0			Å Å		A 0	6.6	
0 - 6	-WIPS	41134	1.5	1.6	1.5	1.7	1.4	. 1.5	1.5	1.6	1.9	1.6	1.4	1.0						0.4
		41135	4.3	5.3	4.3	5.4	4.5	5,3	4,3	5.3	4.3	5.2	4.5	2.3	0.0	0.0	0.0			
		\$1136	3.0	3.9	3.1	4.7	3.6	9.1	2.9	4,3	3.0	. 3.8	3.1	4+2	0.0	0.U	0.0			
u - c	-41-3	#1137	0.0	0.0	0.0		0.0	0.0	6.5	0.0	0.0	0.0	6,8	0.0	0.0	0.0	0.0	0.0		
0 - 9	-KIP3	.1134		0.0	0.0		6.A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		8.0
D -10 SOUTH END	-RIPS	41130		22.1	22.9	24.1	14.5	22.7	16.8	18.8	20.7	18.0	14.8	10.4	14.5	20.9	19,8	14.1	18.4	17.0
EAT LOAD CELL THE	-KIPS	- 41661	17.0	1.4	12 8	14 4	14	19.6	17.6	17.6	21.2	17.6	18.9	18.9	14.4	18,0	21,2	15.1	17.8	20.3
EAT LOAD CELL TIE	-KIPS	41228	12.0	10.7	48.47	10.7					A. 6	0.0	0.0	0.0	0.0	0.0	0.0	8,9	8,0	8,8
D - 1 NORTH END	-xIPS	41229	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	6,8	8.8
0 - 2	-KIPS	41230	0.0	0.0	0.0	0.8	0.0	0.0	u.e	0.0	0.0			2.5		2.9	2.5	1.7	2.5	2.5
0 - 1	-KIPS	41231	2.4	2.9	5.8	2.5	2.9	-3.2	2.1	2.	2.0	č.1	2.7	2.14				1.4	1.1	4.1
0 - 3	-*185	41232	3.5	4.3	4.3	4.1	۹,0	4.7	3,8	4.0	4.5	3.9		2.4	3.7					
	-KIPC	41233	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	~~****3	41234	3.4	3.5	3.5	3.5	3.5	3,5	3.5	3.5	3.4	3.4	3.5	3.5	3.2	3,5	3,5	3.4	3.2	3,3
U - 6	•33FB	61235		3.4	3.4	3.8	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3,3	3.4	3.4	3.4	3.9	3.4
0 - 7	-RIF3	41934		8 9	1.1	3.4	3.2	3.4	1.2	3.3	3.2	3.0	3.2	3.5	2.7	3.3	3,5	2.9	3.5	3.5
0 - 6	-KIPS	71630	3.0	0.0	0.0	0.0		0.4	6.6	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0,0		5.8	
0 - 1	-x1P\$	41237	0,0	0.0	9.9			10 a 10	4.0			0.0	0.0	0.0	0.0		0.0	8.0		8.0
D -10 SOUTH END	-KIPS	41238	0,0	0.0	0.9	a*q	8.8	9,0	010		10.1									
N NUMBER 1	_KIPS		32,35	32,35	33,20	35.28	: 31,00	33.6	0 33,24	53,24	32.5	3 32,3	23,20	33,20	10 74	10 74	32.75	32.58	32.54	32.54
	-1125		32.70	32.70	32.70	32.55	32.51	5 32,5	5 33,30	33,30	33,30	0 32.64	2 32,62	: 32,62	32.12	#Z.13	26912	46.10		

RAIL STRAIN AT MAIN ARRAY -AT TIE -RAIL STRAIN AT MAIN ARRAY -AT TIE -RAIL STRAIN AT HAIN ARRAY -AT TIE -RAIL STRAIN AT MAIN ARRAY -AT TIE -RAIL STRAIN AT MAIN ARRAY -AT TIC -RAIL STRAIN AT MAIN ARRAY -AT TIE -RAIL STRAIN AT HAIN ARRAY -BETWEEN RAIL STRAIN AT MAIN ARRAY -BETWEEN RATE STRAIN AT HATH ARRAY -BETWEEN RAIL STRAIN AT. 100 FT EAST-BETWEEN RAIL STRAIN AT 100 FT EAST-BETWEEN RAIL STRAIN AT 100 FT EAST-BETWEEN TIE STRAIN AT MAIN ARRAY -NO, RAIL TIE STRAIN AT MAIN ARRAY -NO.RAIL TIE STRAIN AT MAIN ARRAY -NO.RAIL TIE STRAIN AT MAIN ARRAY -MID LENG TIE STRAIN AT MAYN ARRAY -HID LENG 100 FT EAST-NO.RAIL TIE STRAIN AT 100 FT EAST-NO.RAIL 100 FT EAST-NO.RAIL TIE STRAIN AT THE STRAIN AT 100 FT EAST-MID LENG 100 FT EAST-MID LENG TIE STRAIN AT FIE STRAIN AT DEFLECTION AT MAIN ARRAY -NORTH EP Main Array -Rail 410 DEFLECTION AT INTERFACE STRESS MAIN ARRAY -NO.RAIL INTERFACE STRESS MAIN ARRAY -MID LEN INTERFACE STRESS MAIN ARRAY -SO, RAIL INTERFACE STRESS NAIN ARRAY -NO, RAIL INTERFACE STRESS MAIN ARRAY -HID LENG INTERFACE STRESS MAIN ARRAY -SO.RAIL INTERFACE STRESS MAIN ARRAY -NORTH R INTERFACE STRESS MAIN ARRAY -HID CRI INTERFACE STRESS MAIN ARRAY -SOUTH R Rail Seat Force Main Array -North Si FAIN ARRAY -SOUTH SE RAIL SEAT FORCE MAIN ARRAY -BASE PAG TIE BASE FORCE TIE BASE FORCE PAIN ARRAY -BASE PAG TIE BASE FORCE HAIN ARRAY -BASE PA TIE BASE FORCE HAIN ARRAY -BASE PAG TIE BASE FORCE HAIN ARRAY -BASE PA MAIN ARRAY -BASE PAL TIE BASE FORCE TIE BASE FORCE HAIN ARRAY -BASE PAL MAIN ARRAY -BASE PAL TIE BASE FORCE TIE BASE FORCE MAIN ARRAY -BASE PAR TIE BASE FORCE MAIN ARRAY -BASE PAR RAIL SEAT FORCE HAIN ARRAY -NORTH SI RATL SEAT FORCE MAIN ARRAY -SOUTH S TIE BASE FORCE TIE BASE FORCE NAIN ARRAY -BASE PA MAIN ARRAY -BASE PA TIE BASE FORCE MAIN ARRAY -BASE PA NAIN ARRAY -DASE PA TIE BASE FORCE TIE BASE FORCE MAIN ARRAY -BASE PA TIE BASE FORCE MAIN ARRAY -BASE PARTIE BASE FORCE MAIN ARRAY -BASE PARTIE BASE FORCE MAIN ARRAY -BASE PARTIE -WHEEL LOAD FOR TRAIN NUMBER 1 -WHEEL LOAD FOR TRAIN NUMBER 2 TRAIN DATA -KIPS TRAIN DATA

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TABLE C5 - TEST DATA FOR TEST 1 ON SECTION 2

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					RC	COUCED	RAIL D	ATA		•				
	78061				•		1.1	WHE	EL NUM	8ER				
	Takch			3		5	. 6	7	8	•	10	11	12	
THE ANALY AND ANALY ANY THE MORTH HARE GAGE -MILLI	ONTHS 12218			0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0			
RAIL STRAIN AT FAIN ARRAY AT THE WORTH MTD GAGE WILLI	ONTH\$ 12226	61.0	66.7	56,5	56.5	61.0	70,1	57.6	74.6	72.3	67.8	58.8	66 a T	
RAIL STRAIN AT HAIN ARRAY AT THE WORTH LOWER CAGE -HILLI	ONTHS 12227	55,1	56.6	55.4	52.6	50,6	52.1	49.6	49,9	47.4	47.4	20.7		
RAIL STRAIN AT HAIN ARRAY LAT TIE SOUTH UPPER GAGE -HILLI	ONTHS 12228	-43,2	-47.9	-45.1	-45.1	-38.5	-37.5	-42.6	-29.0	-30.3	-34.7	-37.Z	-30.0	
RAIL STRAIN AT HATM APRAY OAT TIE SOUTH NID GAGE HILLI	ONTHS 12229	9.7	11.5	- 5.4	10.3	R.6	9.2	0.0	8.4	7.7	10.0	741	10.7	
RAIL STRAIN AT HATH ARRAY -AT TIF -SOUTH LOWER GAGE -MILLI	ONTHS 12222	0.0	0.0	0.0	0.0	4.0	0.0	0,0	0.0	21.2		-26.6	- 28 4	
HALL STRAIN AT WATH ARRAY -RETUEEN TIES UPPER GAGE -HILLI	IONTHS 12236	-30.2	-30.2	-38.6	-30.5	-28.1	-26.7	-28.8	-21.1	-23.2	.18.1	-18 8	-16.2	
MAIL STRAIN AT MAIN ARRAY BETWEEN TIES MID GAGE -MILLI	IONTHS 12237	-15,3	-17.0	-18.9	-18.6	-19.5	-10.6	-18.9	-13.4	-13-3	++3+3	147 8	+41 4	
ANT STRATH AT MAIN ARRAY -BETWEEN TIES LOVER GAGE -HILL	IONTHS 12225	185,4	175.3	180,9	168.5	160,6	152.6	160.6	140.2	143.0	0.0	0.0	0.0	
AALL STRATH AT INA FT FAST-BETWEEN TIES UPPER GAGE -HILLI	IONTHS 12201	0.0	0.0	0.0		0.0		10.0	4. 7	51 2	43.1	39.6	43.1	
BATE STRATH AT 100 FT FAST-BETWEEN TIES MID GAGE -MILLS	IONTHS 12202	91.9	41.9	38.4	41.9	39.0	20.0	33.0	39.1	0.0	0.0	0.0	0.0	
MALL STRATH AT ING FT EAST-BETWEEN TIES LOWER GAGE -HILLI	IONTHS 12203	0,0	0.0	0.0	0.0	0.0	0.4	0.0		-17.8	-18.4	.17.3	-18-1	
TIS STUATH AT MAIN ARRAY -NO. RAIL SEAT UPPER GAGE -HILLI	IONTHS 12233	-17.3	-17-5	-17.5	-17.6	-17.4	-20.4	-1/.0	-17.6	1.8	1.4	1.4	1.4	
THE STHAIN AT MAIN ARRAY -NO, RAIL SEAT MIC GAGE -MILL	IONTHS 12234	1.4	1.4	1.9	1.1	~	5.0	0.0	0.0	0.0	0.0	0.0	0.0	
TIE STRAIN AT MAIN ARRAY -NO. RAIL SEAT LOWER GAGE -MILLI	IONTH5 12255	0.0	0.0		0.0	7 8	8.5	5.8	7.3	5.8	7.6	5.0	7.3	1
THE STRAIN AT MAIN ARRAY -NID LENGTH UPPER GAGE -MILLI	10NTH5 12251	12.3	12+3	12.00	7.Q	A. A		0.0	0.0	0.0	0.0	0.0	8.0	
TIE STRAIN AT MAIN ARRAY -HID LENGTH LOWER GAGE -HILL	1011113 12232	0.0	33.7		-24.4			-28.0	-50.4	-50.4	-33-6-	-44.8	-33.6	
THE STRAIN AT 100 FT EAST-NO.RAIL SEAT UPPER GAGE -HILL	10NIHS 12204	~	-33.6	0.0	8.0	a.6	0.0	0.0	0.0	0.0	0.0	0,0	0.0	
THE STRAIN AT 188 FT EAST-NO, RAIL SEAT MID GAGE -HILL		87	33.4	39.5	\$2.5	85.9	43.7	33.4	42.5	59.9	45.7	52.5	59.9	
TIE STRAIN AT 188 FT CAST-NG.RATL SEAT LOWER GAGE -HILL	1041H5 12288	27.1	36.8	26.8	26.8	25.7	28.8	25.7	26.8	24.6	26.8	25.7	26.8	
THE STRAIN AT 100 FT EAST-HID LENGTH UPPER GASE -HILL		-74 5	-25.4	-20.7	-23.1	-20-7	-20.7	-20.7	-18.9	-18.4	-19-6	-20.7	-19.6	
TIE STRAIN AT 188 FT EAST-MID LENGTH LOHER GAGE -HILL	1001NJ 12600	- 40,3	0.2	6.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	
DEFLECTION AT MAIN ARRAY -NORTH END OF INST TIE .INCH		a 1	0.1	6.1	0.1	8.1	0.1	0.1	0.1	0.1	0.1	0.1	.1	
DEFLECTION AT MAIN ARRAY -RAIL MIDSPAN RETWELN THESE INCH	12209	a. 0	0.0	0.0	0.0	0.0	0.0	6, ü	0.0	0.9	0.0	6.9	8,8	
INTERFACE STRESS MAIN ARRAY -NO.RAIL SEAT OF INST TIL OF ST	12214	0.0	9.0	6.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0,0	6.8	
INTERFACE STRESS HAIN ARRAY -MID LENGTH OF INST THE	12211	0.9	0.0	0.0	0,0	6.0	0,0	0.0	0.0	0.0	0.0		0.0	
INTERFACE STRESS MAIN ARRAY -SO, RAIL SEAT OF 1431 112	12212	0.0	0.0	0.0	0.0	6.9	0.0	0.0	0.0	8.0	0.0	0,0	0.6	
INTERFACE STRESS MAIN ARRAY -MG, MAIL SEAT OF LOAD THE	12213	0.0	0.0		0.0	0.0	0.V	0.0	0.0	0.0	0.0	0.0	0.0	
INTERFACE STRESS MAIN ANNAY -NIU LINGTH OF LONG THE	12214	19.4	24.6	20.0	23.6	20.8	23.4	20,3	20.7	20.2	24.6	19.3	22.8	
INTERFACE STRESS MAIN ARRAY SUCHAIL SEAT OF LOAD THE	12215	0.0	e.0	0.0	0.0	0.0	0.9	0.0	0.0	8.0	0.0	0.0		
INTERFACE STRESS HAIR ARRAY SHOWIN HAIL BETWEEN TIES -PST	12216	2,6	3.9	. 3.2	*.*	4.6	5,2	3.9	4.7		6.2	4.5	3.9	
INTERFACE STRESS HAIN ARRAY OFTO CATO OFTICEN TIES -PSI	12217	9,8	13.1	10.3	12.5	12,7	13.A	13.1	13.1	12.0	13.6	12.1	17.7	
INTERFACE STRESS MAIN ARRAY SOUTH MALE SEAL CELL TIE -KIPS	12127	6.8	7.7	7.0	7.1	7.2	7.5	6.4	6,7				17 1	
RAIL SEAT FORCE MAIN ANALY SOUTH SEAT LOAD TELL TIE -KIPS	12128	16.9	18.5	14,9	16.3	15.6	16.4	15.6	15.0	13.7	10.7	19.1	1103	
RAIL SEAT FORCE MAIN ARRAY BASS GAD & 1 HORTH END -KIPS	12129	2.1	2.3	2.5	2.1	2.1	5.3	5.1	1.7	2.9	2.7	2.0	2.9	
THE BASE FORLE MAIN ARRAY -BASE PAD - 2 -KIPS	12130	2.4	2.7	2.7	2.7	2.7	- 2.7	5.2	2.2	2,7	2.5	A 6	0.8	
FIE BASE FORCE FAIN ARRAY BASE DAD = 3 -KIPS	; · 12131 ·	0.0	0.0	0.0	. 0.0	0.0	0.0	0.0			1 1		1 2	
THE DASE FUNCE MATH ARRAY BASE PAD + 4 -KIPS	12132	1,1	1.4	1.1	1.3	1.5	1.3	1.1	1.4	1.3	0.0	0.0	A . A	
TIL DASL FURSE HAIN ARRAY BASE PAD - 5 -KIPS	12133	0.0	0.0	0.0	0.0	a*0	8.0		0.0	0.0	0.0	0.0	0.4	
THE DASE CORES NATH ARRAY -BASE PAD + 6 .KIPS	12134	0.0	0.0	0.0	0.0	0.0	U.0	u.0	5.0	3.2	3.2	2.7	3.1	
TIC DASE CORCE MATH ARRAY -BASE PAD - 7 -KIPS	12135	2.3	· •••5	Z.2	3.2	2,7	3,2	2.7	3.0	3.1	3.1	2.9	3.1	
THE BASE GORCE MATN ARRAY -BASE PAD - 8 -KIPS	12136	2,6	3.3	2.3	3.3	5,0	3.1	8.6	6.2	5.9	6.1	5.9	6.3	
TTE BASE EDRCE MAIN ARRAY -BASE PAD - 9 -KIPS	12137	5.5	6.3	2.4	÷.3	5.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	
TIE BASE FORCE MAIN ARRAY -BASE PAD -10 SOUTH END -KIPS	12138	0,0	0.0											

TABLE C6 - TEST DATA FOR TEST 2 ON SECTION 2

		•		· · · ·					R	CDUCED	RÀIL C	ATA					
•					TSRCH							WHE	EL NUP	BER			
						1	5	3	4	5	6	7	8	9	. 10	11	12
RAIL STRAIN AT	KAIN ARRAY -AT	TIE -NORTH	UPPER GAGE	-MILLIONTHS	22218	0,0	0,0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.
RAIL STRAIN AT	HATH ARRAY -AT	TIE -NORTH	MID GAGE	-MILLIONTHS	22226	46.3	47.5	41.8	45.2	46.3	58,0	39,5	59,9	53,1	50,8	44.1	42.
RAIL STRAIN AT	MAIN ARRAY -AT	TIE -NORTH	LOWER GAGE	-MILLIONTHS	22227	60.1	55,1	56.3	55.4	56,8	57.1	52,1	51.3	52.8	58.1	53,8	53.
RAIL STRAIN AT	HATH ARRAY -AT	TIC -SOUTH	UPPER GAGE	-WILLIONTHS	2222R	-49,2	-48.2	-49.8	-49.5	-42.9	-44.1	-99.8	-37.2	-90.6	-96.0		
RAIL STRAIN AT	MAIN ARRAY -AT	TIE -SOUTH	NTD GAGE	-WILLIONTHS	22229	12.6	15.6	12.3	13.2		10.3	10.0	10.7	10.3	1417		174
RAIL STRAIN AT	HATH ARRAY -AT	TIE -SOUTH	LOJER GAGE	-MILLIONING	22222	- 14 1	.17 0	. 16 1	-16 6	11.6	-30.4	-24.1		-27.7	-29.1	-31.6	-25.
RAIL STRAIN AT	HAIN ANKAT -BE	TWEEN TIES	UPPER GASE	-MILLIONING	22238	-14 5	-18.1	-10.6	-21 4	-21.9	-21.4	-17.8	-15.3	.15.9	-18.6	-19.2	-18.
MAIL SIKAIN AI	PAIN ARRAY -DE	THEEN TICS	HIU GAGE	-NTIL TONTHS	22225	167 7	170.7	168.5	170.7	165.1	168.5	165.1	152.6	150.4	148.5	168.5	156.
HALL STRAIN AT	164 ET CACT-00	THEEN TIES	HUGER GACE	-MILL TONTHS	22201	5.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
HATE STRAIN AT	INA FT FAST-RE	TUFFN TIFS	MIN GAGE	-MILLIONTHS	22202	-50.0	-40.7	-98.9	-40.7	-50.0	-44.2	-38.4	-38.4	-41.9	-39.6	-50.0	-38.
BATI STRAIN AT	160 FT FAST-RE	THEFN TIES	LOWER GAGE	-HILLIONTHS	22203	0.0	0,6	0.0	0.0	0.0	0.0	0.0	0.0	8.8	0.0	0.0	٥.
TIE STRAIN AT	NATH ARRAY -NO	BALL SEAT L	PPER GAGE	-HILLIONTHS	· 22233	-17.6	-20.1	-18.1	-19.8	-19.8	-23.2	-15.3	-20.4	+21.8	-25.4	-19,5	-21.
TIE STRAIN AT	HAIN ARRAY -NO	D.RATL SEAT	NID GAGE	-MILLIONTHS	22234	1.6	1,6	1.6	1.4	i 1.a	1.4	1.6	1.6	1.6	0.9	1.1	1.
TIE STRAIN AT	MALE ARRAY -NO	AATL SEAT	LOWER GAGE	-HILLIONTHS	22235	0,0	0.0	0.0	0,0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	۰.
TIE STRAIN AT	MATH ARRAY -H	D LENGTH	UPPER GAGE	-MILLIONTHS	22231	8. 9	10.1	10.6	8.5	15,9	13.8	10.6	11.3	12.6	12.6	4.8	11.
TIE STRAIN AT	MAIN ARRAY -M	LC NGTH	LOWER GAGE	-MILLIONTHS	22232	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.8	
TIE STRAIN AT	100 FT EAST-NO	D.RATL SEAT	UPPER GAGE	-HILLIONTHS	22204	-47.0	-47.0	-49.3	-30.4	-60.3	-60.5	-57.1	-60.5	-50.5	-30.2	*33.2	-30.
TIE STRAIN AT	100 FT EAST-N	DORAIL SEAT	MID GAGE	-MILLIONTHS	22205	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	-1.6 0			
TIE STRAIN AT	100 FT EAST-H	D.RAIL SEAT	LOWER GAGE	-MILLIONINS	22286	33.0	33.4	38.7	30.1	32.0	36 1	3, 3	11 1	29.7	29.1	24.7	28.
TIE STRAIN AT	100 FT EAST-M	TO LENGTH	UPPCR GAGE	-MILLIUMING	22201	-30 0	27.1	-26.5	-25.8		-24.2	-34.3	-24.2	-23.1	.21.9	-24.2	-24.
TIE STRAIN AT	100 PT EAST-M	IO LENGIN	CONEN GAGE	-4166104143	22200	- 30,0	- 6.3	0.9	0.3	0.2	8.2	0.2	6.2	0.2	0.2	0.2	0.
DEFLECTION AT	MAIN ARRAY -NO	DRTH END OF 1	INSI TIL	* INCHES	22125	0.1	0.1	6.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	
DEFELLIION AT	MAIN ADDAY	AIL HIUSPAN P A BITI SPAT P	STATES INC.	-951	22209	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
INTERFACE STRESS	HALM ADDAY -M	0000010 3000 0	NE INST TIE		22210	12.6	14.6	13.1	14.4	13.3	16.6	13.0	14,3	14.2	16.1	14.3	15.
INTENSACE STRESS	NATH ARRAY -S	D.RATI SEAT	T INST TIE		22211	0.0	0.0	0.0	. 0,0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	6.
INTERFACE STRESS	MATH ARRAY -N	O.RATL SEAT	OF LOAD THE		22212	n,0	0.8	0.0	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.
INTERFACE STRESS	MAIN ARRAY -H	ID LENGTH	OF LOAD THE		22213	0.0	0.0	. 0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
INTERFACE STRESS	MAIN ARRAY -SI	D.RATL SEAT O	OF LOAD TIE		22214	21.8	22.0	20.5	55.5	20.8	22.5	20.5	19.4	23.5	24.3	20.8	21.
INTERFACE STRESS	MAIN ARRAY -N	ORTH RATE BET	THEEN TICS	-PSI	22215	0.0	0.0	0.0	0.0	0.0	0,	0.0	0.0	0.0	0.0	0.0	<u>.</u>
INTERFACE STRESS	MAIN ARRAY -M	10 CR18 801	TWEEN TIES	-P\$I	22216	2.7	3.6	2.5	3.8	3.4				3,1		3.7	
INTERFACE STRESS	MAIN ARRAY -S	OUTH RAIL BET	WEEN TIES	-PSI	22217	10,5	13.5	13.3	10,4	11.7	11.0	13.3	11.1	A.4	A.7	4.8	111
RAIL SEAT FORCE	PATH ARRAY -N	ORTH SEAT LO	AD CELL TIE	-8123	26167			11 0	12 4	12.0	11 4	12.1	11.4	11.6	11.0	10.A	12.
RAIL SEAT FORCE	MAIN ARRAY -S	OUTH SEAT LO	AD CELL TIE	-8173	22120	11,3	13.5	2.1	1 0	2.4	2.7	1.7	2.0	2.7	2.7	2.1	2.
TIE BASE FORCE	MAIN ANNAT -8	ASE PAD - 1	NORTH LND	•K1F3 -MTD8	22130	2.4	2.5	2.5	- 2.5	2.8	3.1	2.2	2.6	2.7	2+8	2.4	2.
TIE BASE FORCE	PAIN ARKAT -B	ASE PAU - 2		-wirs	22131	A.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
TIE BASE FORCE	MATH ADDAY -0	ASE PAD		-KTPS	22132	1.1	1.2	1.1	1.2	1.4	1.6	1.0	1.2	1.3	1.6	1.1	1.
TIE DASE FORLE	MATH ARRAY -0.	ASC DAD - 4		-KIPS	22133	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0,0	0.0	0.0	٥.
TIE BASE FURCE	HAIN ARRAY -R	ASE PAD - 4		-KIPS	22134	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	0.0	٥.
TIF BASE FORCE	MATH ARRAY -R	ASE PAD - 7		-K1PS	22135	2.7	3.4	2.9	3.1	3.2	3.2	2.6	2.9	3.3	2.9	2.3	3.
TIE BASE FORCE	NAIN ARRAY -B.	ASE PAD - A	•	-KIPS	22136	2.9	3.3	3.0	3.2	1 3.3	3.2	3.2	2.7	2.8	-3.1	2.6	3.
VIE BASE FORCE	HAIN ARRAY -8	ASE PAD - 9		-KIPS	22137	5.9	6.7	5.9	6.3	6.2	5.7	6.1	6.8	5.3	5.7	5.2	6.
TIE BASE FORCE	MAIN ARRAY -B	45E PAO -10	BOUTH END	-KIPS	22138	0.0	0.0		0.0	- 0,0	Q.A	0 .0	a*o	U. O	4.9	¢.0	۰.

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TABLE C7 TEST DATA FOR TEST ON SECTION 2 - 3

REDUCED RAIL DATA

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					TSRCH							WHE	EL NUM	BER			
						<u> </u>	.2	3		-5	6	7	- A _	9	10	11	12
BATH SYRATH AT	MATN AREAV	-AT TIE -NORTH	UPPER GAGE	-NILLIONTHS.	32101	-101.5-1	101.5-1	116.4 -	.93.4-1	14.1-1	184.9-1	125.7	-65.3-	133.8-	114+1-1	124.5-1	14.1
BATI STRATH AT	HATN ARRAY	AT TIE -NORTH	NID GAGE	-HILLIONTHS	52102	34.6	40.3	36.9	34.6	36.9	29.9	34.6	44.9	32.2	39.2	40.3	27.6
RATI STRAIN AT	BATH ARRAY	-AT TIC -NORTH	LOWFR GAGE	-HILLIONTHS	32103	152.1	159.2 1	164.0 1	148.5 1	59.2 1	49.7 1	160.4	160.4	162.8	162.8	172.3 1	39.0
BATE STRAIN AT	HATN ARRAY	-AT TIE -SOUTH	UPPER GAGE	-WILLIONTHS	32104	-149,1-	116.5-1	142.1-1	116.5-1	24.1-1	11.8-1	67.7-	125.4-	139.8-	111+8-1	151.4-1	16.5
BATI STRATH AT	BATH ARRAY	AT TIE -SOUTH	NTO GAGE	-MILLIONTHS	32105	\$6.8	38,1	48.9	40.2	41.3	37.0	46.8	27.2	30.4	53.3	43.5	46.8
PATI STRATM AT	HATH ARRAY	AT TIE -SOUTH	LOWER GAGE	-MILLIONTHS	32106	186.8	173.0 2	205.3 1	158,0 1	61.0 1	182.2 1	177.6	186.8	200.7	177.6	244.5 1	67.2
RATI STRAIN AT	HATN ARRAY	-BETWEEN TIES	UPPER GAGE	-HILLIONTHS	32107	-124.6-3	119.9-1	133.9-1	24.6-1	30.4-1	22.3-1	142.1-	116.5-	129.3-	116.5-	137.4-1	29.3
RATI STRAIN AT	MATH ARRAY	-BETWEEN TIES	RED GAGE	-HILLIONTHS	32108	-21.9	40.3 -	-36.9 -	28.8 -	25.3 .	43.8 .	42.6	-21.9	- 36.9	-42.6	-28.8 -	21.9
BATI STRATH AT	HATH LERAY	-BETWEEN TIES	LOWER GAGE	-MILLIONTHS	32109	154.9	156.1 1	158.4 1	149.1 1	66.5 1	43.2 1	163.0	164.2	154.9	154.9	154.9 1	52.6
BATI STRATH AT	100 FT FAST	-BETWEEN TIES	UPPER GAGE	-WILLIONTHS	32110	=129.4=	141.2-1	150.6-1	105.9-1	64.7-1	12.9-1	101.2-	115.3-	218.8-	105.9-	105.9-1	20.0
BATI STRAIN AT	100 FT EAST	-BETWEEN TIES	NID GAGE	-MILLIONTHS	32111	ຄ.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BALL STRAIN AT	100 FT EAST	-BETWEEN TIES	LOWER GAGE	-HILLIONTHS	32112	174.7	182.0 1	166.2 1	146.8 1	198.0 1	60.1 1	157.7	150.4	166.2	171.1	156.5 1	38.3
TIF STRAIN AT	NATH ARRAY	-NO.RATL SEAT	UPPER GAGE	-MILLIONTHS	32113	-48.7	45.8 -	•38.4 -	-38.4 -	40.7 -	-36.4	-40.7	-38.4	-38.4	-43.0	-38.4 -	36.Z
TIF STRAIN AT	HATH ARRAY	-NO.RATE SEAT	MID GAGE	-HILLIONTHS	32114	3.3	4.5	5.6	5.6	6.7	6.7	6.7	6.7	6.7	6.7	7.9	6.7
TIE STRAIN AT	MAIN ARRAY	-NO. RAIL SEAT	LOWER GAGE	-MILLIONTHS	32115	0.0	0.0	0.0	9.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
TIE STRAIN AT	MATH ARRAY	-MID LENGTH	UPPER GAGE	-MILLIONTHS	32116	28.8	31.1	59.8	32.5	50.0	33.4	34.6	31.1	30.9	50.0	30.0	28.8
TIE STRAIN AT	NAIN ARRAY	-HID LENGTH	LOWER GAGE	-#ILLIONTHS	32117	-33.9	-31.6	-33.9 -	-31.6 -	31.6	-35.9	-32.8	-31.5	-33.7	-31.6	-31.8 -	30.5
TIE STRAIN AT	100 FT EAST	-NO.RATL SEAT	UPPER GAGE	-HILLIONTHS	32118	-65.0	-76.2 .	67.2	-65.0	63.8	-62.8	-65.0	-66.1	-73.9	-63.0	~67.9 -	83.0
TIE STRAIN AT	108 FT EAST	-NO RAIL SEAT	HID GAGE	-MILLIONTHS	32119	19.0	21.2	19.0	17.9	20.1	20.1	19.0	20.1	8065	50.1	~ ~ ~ ~ ~	1749.
TIE STRAIN AT	109 FT EAST	-HO.RAIL SEAT	LOWER GAGE	-MILLIONTHS	32120	108.7	117.6	110.9	106.5 1	105'1 1	196.5	192.1	100.2	115.0	11492	107+8 1	42.1
TIE STRAIN AT	100 FT EAST	-HID LENGTH	UPPER GAGE	-MILLIONTHS	32121	19.0	21.2	19.0	19.0	23.5	19.0	19.0	21.2	19.0	22.4	24.4	1/.9
TIE STRAIN AT	100 FY EAST	-HIO LENGTH	LOWER GAGE	-MILLIONTHS	32122	-24.2	-27.7 .	-27.7	25.1	27.7	23.4	-24.2	- 50.0	-23.1	~23+1	-28.5 -	2147
DEFLECTION AT	MAIN ARRAY	-NORTH END OF	INST TIE	-INCHES	32209	0.0	0.8	0.8	0.1	0,1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
DEFLECTION AT	MATH ARRAY	-RAIL MIDSPAN	RETWEEN TIES	5 • INCHES	32210	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
INTERFACE STRESS	MAIN ARRAY	-NO.RAIL SEAT	OF INST TIE	•PSI	52211	25.6	25.1	25.0	26.3	25.3	25.8	82.1	24.0	23.7	20.1	23.7	16 6
INTERFACE STRESS	MAIN ARAAY	-HID LENGTH	OF INST TIE	•	35515	14.8	19.5	14.8	14.9	16.2	17.0	11.3	13.5		70.0	1/11	70,0
INTERFACE STRESS	MAIN ARRAY	-SO, RAIL SEAT	OF INST THE		52213	7.7	7.4	7.9	1.1	1.7	3.0	5.1		2.6	3 1	2.1	2.5
INTERFACE STRESS	HAIN ARRAY	-NO, RAIL SEAT	OF LOAD TIE		32214	5.1	5.0	1.9	3.2	2.1	<u> </u>	7.6	7 4	7.7	7.7	7.7	7.7
INTERFACE STRESS	MAIN ARRAY	-MIO LENGTH	OF LOAD TIE		32215	7.1	6.7	1.0	1.0	1.3		1.0	16 6	15.1	13.5	19.4	14.9
INTERFACE STRESS	MAIN ARRAY	-SO.RAIL SEAT	OF LOAD TIE		32218	10.7	19.7	10.1	4 0	17.7	6 6		0.0	0.0	0.0	0.0	0.0
INTERFACE STRESS	HAIN ARRAY	-NORTH RAIL BE	THEEN TIES	• # \$1	22211		2.6	6 7	7.4	4.8	7.4	7.8	7.0	4.4	7.3	7.3	7.7
INTERFACE STRESS	HAIN ARRAY	-MIO CAIO BE	THEEN TIES	-PSI	34210	14 1	16 1	15.9	14 8	11 9	17.2	17.6	17.8	15.5	ĩ5.0	16.3	36.4
INTERFACE STRESS	MAYN ARRAY	-SOUTH RAIL BE	THEEN TIES	-P31	36617	40.5	10.1		9.0	8.8		9.8	10.0	9.0	10.1	11.3	7.8
RAIL SEAT FORCE	MAIN ARRAY	-NORTH SEAT LO	AD CELL TIE	-RIPS	32127	17 1	17.1	16.8	15.1	14.3	14.6	16.5	17.2	17.4	15.3	17.9	15.8
RAIL SEAT FORCE	MAIN ARRAY	-SOUTH SEAT LO	AD CELLS TIE	-RIPS	32120		1 2	3.1	1.8	1.3	1.0	1.7	1.6	1.4	1.9	2.4	-1.2
TIE BASE FORCE	MAIN ANNAY	-BASE PAD - 1	DW1 HING	-4123	32130		3.3	- 3. 1	3.1	2.8	3.1	3.2	3.0	3.0	3.5	3.9	2.6
THE BASE FORCE	MATH ARRAT	-UASE PAU - 2		+R1P3	32131	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0'	0.0
TIE BASE FORCE	MAIN ANNAT	-BASE PAD - 3		-KIF3	32132	3.0	3.4	3.2	2.9	3.1	3.3	3.1	3.3	3.1	3.5	3.4	2.8
TIL BASE FORCE	MAIN AKKAT	-BASE PAU - 4		-11196	32133	0.7	0.8	0.8	0.6	8.7	0.A	0.7	0.7	0.8	0.7	0.8	0.6
TIE BASE FORCE	MALW ADDAY	+0A31 7AU - 3			32134	0.9	1.0	1.1	0.0	1.1	1.4	8.9	1.1	1.1	6.9	1.1	8.9
THE BASE PORCE	MATH ADDAW	-0455 PAD - 0		-HIPS	32135	2.9	2.9	3.2	2.5	3.1	2.4	2.7	3.0	3.0	2.6	3.1	2.6
TIE DASE FURCE	MATH ADDAY	-BASE PAD - F		-KTPS	32136	2.8	2.8	3.1	2.4	2.7	2.2	2.7	2.7	2.9	2.5	2.6	5.2
TIC BASE FORCE	MATH ARCAY	-9455 040 - 9		-KIPS	32137	3.9.	3.9	4.2	3,5	3.5	3.1	3.7	4.0	. 4.1	3.3	4.2	3.6
HE BASE FORCE	MATM ARRAY	-BASE PAD -18	SOUTH END	-XIPS	32138	4.0	4.1	4.6	4.4	4.4	3.6	3.8	4.5	4.4	3.7	4.8	4.2
BAN STAT SOUCE	NATH ARRAY	-NORTH SEAT L	DAD CFLL TIE	+KIPS	32227	8.3	8.0	7.8	9.1	8.8	8.5	8,6	7.0	9,2	10.2	8.7	8.1
RATI SCAT CORCE	MATH ARRAY	-SOUTH SEAT L	AN CELL TIE	-KIPS	32228	18,8	16.7	16.5	16.4	16.7	17.6	19.5	17.5	16.8	12+1	17.9	16.6
TIE BASE FORCE	RATH ARRAY	-BASE PAD - 1	NORTH END	-KIPS	32229	1.1	1.0	1.0	1.5	1.2	1.2	1.1	0.9	1.3	1.6	1.5	1.1
TIF BASE FORCE	MATH ARRAY	-BASE PAD - 2		-KIPS	32230	3,5	3,3	3.3	3.6	3.4	3.4	3.4	2.9	3.4	3.8	3.5	5.1
TIP BASE FORCE	HATE ARRAY	-BASE PAD - 3		-KIPS	32231	0.0	0.0	0.0	0,0	6.0	0.0	0.0	0.0	0.0	4.0	0.0	8.0
TIC BASS FORCE	NATH ARRAY	BASE PAD - 4		-KIPS	32232	2.9	2.7	2.7	2.9	2.9	2.9	2.9	2.7	3.6	3.0	2.6	2.7
TIF BASE FORCE	HATR ARRAY	-BASE PAD - 5	•	-KIPS	32233	0.5	0.5	0.5	0.6	0,5	0.5	0.6	0.5	0.5	0.6	0.6	0.3
TIE BASE FORCE	HATN ARRAY	-BASE PAD - 4		-KIPS	32234	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0
THE BASE FORCE	MAIN ARRAY	-BASE PAD - 7		+KIPS	52235	1.0	0.9	6,9	6.4	0.9	1.0	1.0	U.9	9.9	0.9	0.7	0.7
TIE BASE FORCE	HAIN ARRAY	-BASE PAD - 8		-KIPS	32236	0.0	0.0	6.6	0.0	0.0	0.0	0.0	U.0	1.0	1.7	2.0	3.4
TIE BASE FORCE	MATN ARRAY	-BASE PAD - 9		-KIPS	32237	2.2	1.9	2.0	1.9	. 1.7	2.1	7.2	2.0	1.0	2.7	3.1	3.0
TIE BASE FORCE	MAYN ARRAY	-BASE PAD -10	SOUTH END	-KIPS	32238	3.8	3.2	3.3	31 74	3,1	12 14	88.94	31.24	32.34	32.34	33.24	33.28
TRAIN DATA	-WHEEL LOAD	FOR TRAIN NU	HAER 1	-KIPS		32,35	32,55	33.20	33.48	32.33	32,33	33.20	13.43	33.00	33.00	33.24	33.24
	UNER I DAG	COD TRATH NU		-WIPS		33,98	33,40	46.93	76,03	J & . C U	- F + H 0	35.76					

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TABLE C8 - TEST DATA FOR TEST 4 ON SECTION 2

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		-		26.12	102	29.6	6.2.3	-82-9	-16.1	79.8		97.5	80.5	0.0	0.0	22.1		5.91	78.2	0.0	0	0		, a , a			0.0				2	15.7	~		~			n d	0									-	935
		2		100.0	10.5-	26.7	72.4		14.2	909.90		22.7	78.1	0.0	9.0 9			19.1	76.1	0.0							0.0	0.0			12.7	15.1	10 M		2.5		5.2		0.0			•••			0.0				5 32.5
		5			20.6-	26.7	71.6						6	0.0	0.0	52°5				0.0	°.0						•••	0.0	•			17.7		0 0 9 0 9 0	2.6	0 V 1	7		0	0 0		•••				•) •		32.71
		1			0.6-1	0.5	1.1	1-1-6						8°8	9.6				9.4	0.0	0°0	0°0	•••				8.8	0.0	•		17.6	16.6	e e m e	-	2.1										•••	•			32.75
		2		• •	2.3-11	5°2		1-1-1		2°2					9.0					0.0	(•	•••					0.0				2		2.2	9 17 9 9 19 9 19	2.2	9.1	~			•••		•••			0.0		::	•	12.75
		~			9-11	2		11-6-						•	0.							•	-	•				5		N 4			*		•										2.9				2.25
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ATA	HA	7		23.5		29.6	61.3	101.9	-17.4	122.1		4	N	8.0	0.0	21.6				0.0	0.0	0.0	0 . 1	4.55	1.12			24.7	0.0	12.9		16.2	2.7	0 0 0 0		9.1.6		F		1.1		2.5	9.9 9.9	N 0 0	. n	F • •	n 0		
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UCCD		¥1	•••	31 °4	122.A-	25.6	52.3	-1.56	10.4	97.0	- 2 - 6 - 2 -	C. 61.	1000			20.5	•••				0.0	0.0	0, 1	21.4			19.7	22.0	0.0	12.6	•••	17.3	2.9	2		9.1		*		17.0		2.7	2		0 ° M	9-9			32
REC			•••	30.2			61.9	25.1 -	21.9 -	39.7	58.7-1	, , , ,			0	20.0.	•				0.0	0.0	0.1	24.3	26.0		19.0	6 T.	0.0	13.5	•••	17.9	3.8							15.0			8 8 9			6.3	0 4 7 4		32.47
`		m	0.0				0.7	1-2-91	16.8 -	1.5 1	1-9-1					19.5	•••				0.0	0.0	0.1	22.9	56.1				0.0	12.8		. 0	2.3			1.6		3°9				2.7	2.5		3.0	5.4	* 5		32.76 33.24
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			RAY -1	RAY -	AAY - I			RAY -E	RAY -E	RAV -E	CAST-6	EAST-E	EAST-E	NAV -		RAY -	HAY -I	EAST-1	EAST-1	-1343 -1-1343	2 4 4 1 - 1	RAY	RAY -	AAY -	RAY -	RAT -	RAT -	-		RAY -	RAY -	1 7 4	BAT	RAT -	HAY -	A A	RAY -		TAY -	AAY -	LAAT -	IRAY -	KAT -	RAY -	RAY -	KAY -	RAY -		1000
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TABLE C9 - TEST DATA FOR TEST 1 ON SECTION 3

REDUCED RAIL DATA

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		=					1.7		0.0	0.0	0.0	193.2-	31.4	36.3	1.5.1	•						11.2	62,6	53.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0	16.9	32.4	e. e	12,3	11,0	12,3	10.1	•••	0.0	 .	1.0	. .	1.0	8 . 8		9 0 - 0
	•				•			6 · C ?]	0.0	0.0	0.0	45.6-	8.54	33.7	13.4	E C	12.4							53.2	0.0 0	0.1	0,1	0.0	0.0	0.0 9	0,0	10.1	35.6	0 .0	14.1	2.2	19.61	11.5	•••	0.0	3.7	2.1	0.0	.	~		
	5								0.0	0 .9	0.0	11.8-1	47.7	18.0 1	13.1 -	2.6	12.9			0.0				÷.02	0.0	0.1	0.1	0.0	0.0	0°0	0.0	17.2	13.2	•••	*	2 2	~	1.1	6°5	• •	5.7	2.1	a.o		N -		
		• 3			• •					0 .0	0.0	4.1-2	7.2	4.1 2	2.8 -	2.6	2.6	- 11 - 1	3					0 8	0,0	0.1	9.1	e. o	٥°9	0.0	9.0	0.0	11 11 11 11	• •	2 · ·		~			8			•	~	N 4		
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	-	0.0	0.0	. 9		1.3	179.6	0.0								2	15.6		-3°6	- 49.9	11.2	6. 69	54.6																							1.5	0.0
SRCH		1218	5222	1227	1228	1229	1226	1230	236	110			200			2.2	502	231	235	204	203	206	207	26.6								7 4 6			11	127	128	. 66	5		-			5	36	37 .	36
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							-411		- 11	-MILL	- 411											-11-1-	-4326	-8311	- INCH	S-1HCH	ISa.	;					184-	154-	154°	-K 1P3	S-KIPS	241N-	-XIPS	-KIPS	-KIPS	-XIPS	-KIPS	*K1P5	-K1P3	-K 1P3	-KIPS
		L GAGE	6AGC		R GAGE	GAGE	A GAGE	R GAGE	GAGE	R GAGE	A SAGE	GAGF		2002	CACC					1979	BAGE	I GAGE	L GAGE	EAGC	31	311 8	115	1115	TIC T	0 115		0 115	7155	1165	7355	LTIE	LTIE	END					•				8
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					-		312		THEEN	TUEEN	TUEEN	THEEN	THEEN	8-841L	1.8471		0 2 L N				- NAIL	S KAT		D LCH	67H EI	12 + 21	.RAIL	O LENG	AIL	RATL	D LFNG	RATL	RTH R	D CRIF	UTH RA	RTH SE	UTK SE	SE PAQ	SE PAD	SE PAD	SE PAO	SE PAD	SE PAD	SE PAD	SE PAO	SE PAD	E PAU
	14 - X4					- A.	AT aA	AT - 18	A7 -96	4V -8€	AST-BE	AS7-BC	AST-BE	AY -NC	AY -NO	A7 - NO	AY - MI	5 - M	2 % 7 - MO				N-195	121-HE	0N- A1	AT -RA	DM- AN	IH- A1	1Y -50	0M- 11	IN- AI	1750	ON- AN	Sw- A	17 -SO	N- 11	1 - 20	14 - BA	1 - 94	Y -BAS	Y -84	N8- Y	Y -84	Y -84:	YBA	Y -84	7 - 8A
	A A A A								ARM ARM	ANA MI	8 F7 E	3 2 2 8	57 6	IN ARR	N ARR	IN ARR	N 490	20.089							A ARR	N ARR.	N ARR	N ARR	N ARRI	N ARRI	N ARR	M ARRI	N ARKI	N A981	N ARRI	N ARRI	N ARG	N ARRA	N ARRA	N ARRA	N ARRA	N ARRA	N ARRA	N ARRA	ARRA N	ARRA V	4 4 K K
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	L STR.		1 579	L STR.							213	L STRI	L STR	STHA	STRA	STRA	STRAL	STRAL	STRAL	STRAT	A T D A			TYXE S	LECTIC	LECTIC	ERFACE	CRFACE	ERFACE	SHFACE	ERFACE	ERFACE	CAFACE	CRFACE	LKP ACE	A SEAL	- 25 A 1	EASE 1225	HASE	BASE	BASE	BASE	BASE	BASE		ASE ASE	
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TABLE C10 - TEST DATA FOR TEST 2 ON SECTION 3

REDUCED RATE DATA

	TSRCH							WHE	EL NUM	RJB			
		1	- 2	3	· 4	5	6	1 7			10	11	12
RAIL STRAIN AT MAIN ARRAY -AT TIE -NORTH UPPER GAGE -HILLIONTHS	23218	5.0	0,0	0.0	0,0	0.0	0.0	0,0	0.0	0,0	0.0	0.0	0.0
RAIL STRAIN AT MAIN ARRAY AAT TIE ANORTH MID GAGE ANILLIONTHS	23222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0
RAIL STRAIN AT MAIN ARRAY -AT TIE +NORTH LOVER GAGE -MILLIONTHS	23227	6,6	5.9	6,9	5,9	5,9	6.2	5,9	3,4	2.7	5.9	5.5	5.5
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH UPPER GAGE -MILLIONTHS	23228	-7.4	-7.7	-7.0	-6.2	-5,9	-6.2	-7.7	-4.8	+5.9	-6.4	-7.0	-7.7
RAIL STRAIN AT HAIN ARRAY -AT TIE +SOUTH HID GAGE +HILLIONTHS	23229	3.4	3.4	1.7	2.7	1.7	2.7	3,0	3.0	3.4	2,5	3.4	3,4
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH LOVER GAGE -MILLIONTHS	23226	166.2	155,3	186.8	150,4	154.1	150.4	129,8	101.9	75.8	120'2	138.3	114.0
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES UPPER GAGE -MILLIONTHS	23230	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES MID GAGE -MILLIONTHS	23236	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES LOWER GAGE -MILLIONTHS	23237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.0	0.0
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES UPPER GAGE -MILLIONTHS	23201	+145,6-	142.1.	130.4-	100.3	130.44	143.6	137.4	-03.0	-02.74	.110.0.	120.3-	
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES MID GAGE -WILLIOUTHS	23202	-38.4	-44.2	-38.4	-38.9	-39.6	-46.0	-33.7	-32.6	+ 30 + 7			-30.4
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES LOWER GAGE -HILLIONTHS	23203	153.7	143.2	149.1	174.2	152.6	143.2	119.9	102.5	108.5	133.1	130.4	123.4
TIE STRAIN AT MAIN ARRAY -NO.RAIL SEAT UPPER GAGE -HILLIONTHS	23253	-13.4	-14.0	-17.8	-14.3	-10.4	-18.7	-11.8	-12.6	-15+6	-10-1	-15.0	-10.2
TIE STRAIN AT MAIN ARRAY -NO.RAIL SEAT MID GAGE -MILLIONTHS	23234		3.5	2.3		7.3	0.N	3.8	4./			9.2	
TIE STRAIN AT MAIN ARRAY -NO.RAIL SEAT LOWER GAGE -MILLIONTHS	23235	15,8	12.7	33.3	14.0	23.6	40.4	12.6	11.7	10.7	23.3	1240	1212
TIE STRAIN AT MAIN ARRAY -HID LENGTH UPPER GAGE -HILLIONTHS	23231	7.9	7.9	7.1	1.3	2.7		7.1	1.7			1.2	
TIE STRAIN AT MAIN ARRAY -MID LENGTH LOWER GAGE -MILLIONTHS	23232	-4.1	-4.1	-3.8	-4.1	-3+6			-3.8	*3.8	- 3 . 8	-3.7	-3.8
TTE STRAIN AT 100 FT EAST-NO.RAIL SEAT UPPER GAGE -MILLIONTHS	23204	-41.0	-39.9	-38.8		+44.7	-00.4	-38,8	- 39.9	-18.0	-31-0	- 37.7	-3/-/
THE STRAIN AT 100 FY EAST-NO.RAIL SEAT MID GAGE -MILLIONTHS	23205	0.0	0.0	0.0	0.0	0.0	0.0	0.0	U.U				
TIE STRAIN AT 100 FT EAST-NO.RAIL SEAT LOWER GAGE -HILLIONTHS	23206	. 26.0	63.7	60.4	20.2	12.5	01.3	25.1	64.9	10.3	67.0	01.0	33,8
TIE STRAIN AT 100 FT EAST-MID LENGTH UPPER GAGE -MILLIONTHS	23207	47.5	22.5	47.5	47.5	41.0	42*5	40.6	37.0	78.7		44.1	71.0
THE STRAIN AT 100 FT EAST-MID LENGTH LOWER GAGE -MILLIONTHS	23208	0,0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEFLECTION AT MAIN ARRAY -NORTH END OF INST TIE -INCHES	23124	0.1	0.1	0,1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	. 0.1	0.1
DEFLECTION AT PAIN ARRAY -MAIL MIDSPAN BETWEEN TIES-INCHES	23125	0.1	0.1	0.1	0.1	0.1	0,1	0.1	0.1	0.1	0.1	0.1	0.1
INTERFACE STRESS MAIN ARRAY -NO.RAIL SEAT OF INST TIE -PSI	23209	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0
INTERFACE STRESS MAIN ARRAY -MID LENGTH OF INST TIE	23210	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTERFACE STRESS MAIN ARRAY -SO,RAIL SEAT OF INST TIE	23211	0.0	0.0	0.0	0.0	0.0	0.V	0.0	0.0	0.0	0.8	0,0	0,0
INTERFACE STRESS MAIN ARRAY -NO,RAIL SEAT OF LOAD TIE	23212	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
INTERFACE STRESS MAIN ARRAY -MID LENGTH OF LOAD TIE	23213	15.2	16.4	15.6	12.9	16.4	24.9	14.0	12.7	13.9	1/11	13,3	10.7
INTERFACE STRESS MAIN ARRAY -SO.RAIL SEAT OF LOAD TIE	23214	33.3	34.1	30.7	53,8	31.4	25.0	32.5	33.8	38.1	33.3	33.3	27.2
- INTERFACE STRESS MAIN ARRAY -NORTH RAIL BETWEEN TIES -PSI	23215	0,0	0.0	0.0	0.0	0.0	0.0	0.0		0,0			
INTERFACE STRESS HAIN ARRAY -HID CRIB RETWEEN TIES -PSI	23216	14.2	15.3	14.7	14,9	16.0	17.3	14.2	17.3	17.3	1/.4	16.0	10.0
INTERFACE STRESS MAIN ARRAY -SOUTH RAIL BETWEEN TIES -PSI	23217	9,4	10.2		10.2			7.6	12.0	10.2	10.3	10.2	14.7
RAIL SEAT FORCE MAIN ARRAY -NORTH SEAT LOAD CELL TIE -KIPS	23127	14.9	15.6	14,4	19.9	15.7	1/./	15.0	13.1	14.7	10.0	13.1	13.7
RAIL SEAT FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -KIPS	23128	11.1	10.5	10.1	10.7	18.0	10.5	3.3	10.7	12.1	11.1	11.44	11.3
TIE BASE FORCE MAIN ARRAY -BASE PAD - 1 NORTH END -KIPS	25129	2.7	2,9	2.8	5.7	5.1	5.5	2.3	2,5	2.7		3.0	3.1
TIE BASE FORCE MAIN ARRAY -BASE PAD - 2 -KIPS	23130	0.0	0.0	0.9	0.0	0.0	0.6	0.0	4.0	4.8	1.0	0. 0	0.0
TIE BASE FORČE MAIN ARRAY +BASE PAD + 3 -KIPS	23131	2.4	2.4	2,3	- 2.3	2.8	3.2	1.4	2.2	2.1		-2.1	4.3
TTE BASE FORCE MAIN ARRAY -BASE PAD - 4	23132	2,1	2.4	2.1	2.2	2,4	2.7	1.2	1.7	1.5	8.3	2.0	6.1
TIE BASE FORCE MAIN ARRAY -BASE PAD - 5 -KIPS	23133	0.0	0.0	0.0	σ.0	0.0	0.0	0.9	0.0	0.0	0.0	9.9	0.0
TIE BASE FORCE MAIN ARRAY -BASE PAO - 6 - KIPS	25134	1.1	1.1	1.4	1.2	1.0	1.1	1.4	1.7	1.3	v. 7	1.1	
THE BASE FORCE MAIN ARRAY -BASE PAD - 7	25135	2.2	2.3	5+0	2,2	2.2	2.2	1.9	2.1	2.2	2.3	4.1	
TIE BASE FORCE MAIN ARRAY +BASE PAO - 8 -KIPS	23136	1,9	2.1	1.7	2.1	2.0	1.8	1.7	2.9	2.3		2.9	1 0
TIE BASE FORCE MAIN ARRAY -BASE PAD - 9 -KIP\$	23137	1.7	1.4	1.6	1.7	1.6	. 1.6	1.8	1.7	147	1.7	1.1	4.7
TIE BASE FORCE MAIN ARRAY -BASE PAD -10 SOUTH END -KIPS	23138	0.0	0.0	0.0	a'e		0.0	0.0	0.0	v. u	0.0	n *a	v.v

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11	0.0	0.0	•••	••	0.0	0.0	•••	0.0	0.0		9.0		-										•		.			21.4	14.2		11.7	10.0	16.1					0.0	0.0	•••	•••	0 0						•	5.0	1.1	1. 1.	2.5	-				32.63
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TABLE C11 - TEST DATA FOR TEST 3 ON SECTION 3

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TABLE C12 TEST DATA FOR TEST 4 ON SECTION 3 -

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			TSRCH							WHE	EL NUM	BER									
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RAIL SYRAIN AT	MAIN ARRAY HAT TEE NORTH UPPER GASE	-MILLIONTHS	: 43101	-114.2	-78.8	-77.0-1	130.3	-13.6-	115.1-	106.0	-57.5-1	115.1-	121.8-	106.0-	124.2						0.0
RAIL STRAIN AT	HAIN ARRAY -AT TIE -NORTH HID GASE	-HILLIONTHS	: 43102	24.1	31.1	20,0	18.5	31.7	38.7	24,1	27.6	31.7	14.1	11.7	94.6	0.0					0.0
RAIL STRAIN AT	MAIN ARRAY -AT TIE -NORTH LOVER GAGE	-HILL TONTHS	43103	192.3	111.9	202.5	133.6	117.5	201.2	201.7	161.2	201.7	141.5	19410	204.7						0.0
GAIL STRAIN AT	MAIN ARRAY -AT TIE -SOUTH UPPER GAGE	-WILLIONTHS	45104	0.0	4.0		0.0	0.0	0.0	0.9	0.0	10.0									
RAIL STRAIN AT	MAIN ARRAY -AT TIE -SOUTH MID GAGE	-HILLIONTHS	- 43105	17.0		23.3	17.6	19.4	17.7	22.3	07 7	131 8 -	194.9	122 8	10.0	0.8					
RAIL STRAIN AT	MAIN ANNAY -AT TIE -SOUTH LOVER GAGE	-MILLIUNIHS	43105	-110 3	-97.1-	179 6.	141 1	-97 1.	152 8.	146.0	- 96 . 6 -	154.4.	199.9	-94.9-	135.6	0.8	6.6				0.3
RAIL STRAIN AT	MAIN ANRAT -BETWEEN TIES UPPER GASE	+#1661041Ha	- #3107	24 8	27.0	37.8	34.8	29.9	15.1	36.8	25.9	34.5	25.9	27.6	27.6	0.0					6.0
AAT STRAIN AT	HANN ARRAY SPECIFICA TICS FOUR CACE	WILLIONING	43109	141.2	150.0	177.0	160.0	150.0	169.2	202.2	120.0	189.0	143.0	1.54.0	164.5	C.0	8.2	8.6	0.8	8.0	0.0
GATS STOATH AT	THAT FT FACT BETALLA TIES HORER GACE	-MILL TONTHS	43116	-63.5	-49-5	-48.5	-57.1	-96.3	-62.5	-75.9	-35.0	-70.0	-82.4	-58.7	-64.1	0.0	0.0	6,8	0.8	5.0	0.0
SALC STRAIN AT	THE FT EAST-BEINEEN TIES OFFEN GAGE	-STH TONTHS	43119	43.2	42.1	42.1	42.1	39.7	42.6	91.5	34.9	44.3	50.4	44.5	48.7	9.0	4,4		8.8	6.0	0.0
RATI STRATU AT	100 FT CAST-PETHEEN TIES LOWER GAGE	-MILL TONTHS	43120	105.8	49.4	101.5	102.6	76.1	104.2	104.7	64.0	104.2	111.1	32.5	109.5	0.#		4.8		0.0	0.0
TIE STRAIN AT	PATH ARRAY +50, NATI STAT UPPER GAGE	-HILL IONTHS	43110	-61.1	-73.1	-75.8 .	-68.6	-77.1	-78.A	-75.4	-68.6	- 83.4	- 71 - 4	-77.1	-86.9	8,8	6.5	4.6	0.9	0.0	0.0
TTE STRAIN AF	MAIN ARRAY -NO. RATE SEAT MID GAGE	.NILLIONTHS	43111	0.0	0.0	0.0	0.0	0.0	6.9	0.0	0.0	0.0	0.0	5.0	0,0	0.0	0.6		8.6	6.0	9.0
THE STRAIN AT	MATT AREAT -HO. BATL SEAT LOWER GAGE	-HILLIONTHS	43112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	6.0	0.0	6.3		a, s	e.•	0,0
FIE STRAIN AT	MAIN ANRAY -MID LENGTH UPPER GAGE	-HILLIONTHS	43113	0.0	6.0	0.0	0.0	0.0	0.0	.0.0	0.0	0.0	0.0	0.0	0.0	0.0		4.4	4.0	0.0	0.0
TIE STRATH AT	MAIN ARRAY -MID LENGTH LOWER GAGE	-HILLIONTHS	43114	0.0	0.0	0.0	0.0	4.8	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.9	0.0
THE STRAIN AT	IDE FT EAST-NO. ANTL SEAT UPPER GAGE	-MILLIONTHS	43121	-65.6	-74.7	-77.5	-69.0	-76.9	-76.9	-73.5	.70.7	-84.8	-71.8	+86.0	-82+0	0.0	0.8		8.9	0.0	C.8
TIE STRAIN AT	100 FT CAST-NO. HAIL SEAT MID GAGE	-MILLIONTHS	43122	13,5	14.1	13.5	16.9	15.0	15.2	15,2	14.1	15.2	17.5	16.9	16.1	0.0					0.0
TIE STRAIN AT	106 FT CAST-HO, RAIL SLAT LOUER GAGE	-MILLIONTHS	43123	0,0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	C.O	0.0	0.0	0.0		8.4			0.4	
TIE STRAIN AF	188 FT LAST-MID LENGTH UPPER GAGE	-WILLIONTHS	43124	85.4	88.0	39.6	89.8	86.4	90.6	48.0	80.1	92.7	85.4	92.2	90.6	0,0	. .a		0.0	0.0.	0.0
TIE STAAIN AT	100 FT EAST-HID LENGTH LOWER GASE	-MILLIONTHS	43125	-35,1	-37.2	-37.2	- 34 . 5	-36.6	-39.3	-39.3	-40.8	-41.4	-39.3	-42.4	-41.4			8.8	0.0	6.0	0.0
DEFLECTION AT	HAIN ARPAY -NORTH FND OF THST TTE	-INCHES	43301	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.3	6.8		e.s		8.0	6.0
DEFLECTION AT	MAIN ARRAY -RALL VIUSPAN RETWEEN TIE	S-INCHES	43302	0.2	0,2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0,2	0.2	0.2	0.2	0.Z	0.2	4.2	0.2	0,2
INTERFACE STRES	S MATE ARRAY -HO, RAIL SEAT OF INST TIE	-FSI	43305	26.5	28.6	29.0	27.7	27.5	28.5	26.6	28.6	28.6	27.3	24.4	28,6	27.5	26.6	28.5	74.9	28.6	28.5
INTERFACE STRES	S MAIN ARRAY -MID LENGTH OF INST TIE		43306	11.2	12.5	12.6	11.7	12.2	12.2	11.6	12.2	12.6	11.4	14.5	12.3	11.7	12.5	12.0	12.0	17.4	11.9
INTERFACE STRES	S MATH ARRAY - SO, RATE SEAT OF INST THE		43307	6.9	7.7	6,9	6.8	6.1	6.2	6.9	6.7	7.3	6+0	8.5	6.1	6.2	1.2				6.4
INTERFACE STRES	S MATE ARRAY -NO, RAIL SEAT OF LOAD TIE		43308	30.2	33.8	34.9	32.1	32.1	32.6	30,1	31.8	34.3	54.1	.7.	32.7	32.1	32.6	31.3	37.46	22.2	32.6
THTEPFACE STRES	S MAIN ARRAY +HID LENGTH OF LOAD TIE		45389	24,6	30.3	30.7	29.9	50.4	29.5	30,2	30.2	31.9	2014	38.3	30.3	£7.1	30.7	30.2	32.6	51.1	30.3
INTERFACE STRES	S MAIN ANAAT -SULKAIL SEAT OF LOAD TIE		43310	8.2	8.7	A.0	9.5	9,2		8.2	10.2			7.1			12 1		7.3	4 3 6	
INTERFACE STRES	S MAIN ARRAY WHONTH WALL RETWEEN TIES	-PSI	43311	10.9	15'2	12.2	11.4	11.8	11.5	10.4	12.9	11.0	11.7	1000	11.4	14.4	34 4		16.7	14 4	11.1
INTERFACE STRES	S MAIN ARRAY -MID CAID DETNEEN TIES	-P31	43412	17.8	19.4	19.1	18.8	50.5	18.6	14.0	24.2	17.7	1010	43.4	17.0	10.3	~ ~ ~	10.1	13.0		10.0
INTERFACE STRES	S PATH ARRAY -SOUTH RAIL BETWEEN TIES .	- # \$I	43213	0,0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	8.8		0.0	4,0					0.0	
RAIL SEAT FORCE	MAIN ARRAY -NORTH SCAI LOAD CELL YIE	=KIPS	43127	13,4	17.3	18.2	16.1	17.6	17.7	17.5	13.3	29.3	1201	1/.0	17.2						
RAIL SLAF FORCE	MAIN ARRAY -SOUTH SEAT LOAD CELL THE	-KIPS	43126	11.6	14.7	13.7	12.5	11.9	12.9	13.2	11.4		11.6	13.7	1218						0.0
TIE BASE FORCE	MAIN ARRAY -BASE HAD - 1 NORTH END	-KIPS	43127	2,2	2.9	5.9	2.9	3.2		3.1	2.1	3.7		3.1	1.0				·		
TIS BASE FORCE	MAIN ARRAY -BASE PAD + 2	-KIPS	43138	2.3	2.8	3.2	2.5		3.3	2.7	2.1	3.3	2.7	<u>.</u>	3.2						0.0
THE BASE FORCE	MAIN ARRAY -BASE PAD - 3	-KIPS	43131	3.0	3.7	4.0	3.3		7.1	3.0	3.2		3.0	3,7							A.0
TIE BASE FORCE	MAIN ARRAY -BASE PAG - 4	-KIPS	43152	3.7	4.0	4.2	3.6	3.7		3.7	3.0		1.8	~ 2	2.3	0.4					
TIE HASE FORCE	HAIN ARRAY -BASE PAD - 5	-KIPS	43133	1.9	2.2	2.3	1.9	2.0	2.3	2.0	1.7	2.3	2.5	244	5.8				A. C		
THE BASE FORCE	HAIN ARRAY -BASE PAU - 6	-K1PS	43134	2.9	2.9	3.0	2.7	2	3.0	2.1	2.5	341	2.0	1.5	3.8	N.8				0.0	
FIE BASE FORCE	HAIN ARRAY -BASE PAD - 7	-KIPS	43135	2.7	3.7	3.0			3.2	2.6	1.9	2.8	1.7	2.3	2.1	0.0			6.8	4.0	0.0
TIE BASE FORCE	WATH ARRAY -BASE PAD - 8	-KIPS	43136	1.6	2		1.7						0.0	0.0	0.0	0.0	2.0		0.0	6.6	0.0
TIE BASE FORCE	KAIN APRAY -BASE PAD - 9	-KIPS	43137	u.u	0.0	0.9	9.0		2 8	2 4	2.4	2.9	2.4	2.7	2.4	6.0				0.0	0.0
TIE BASE FORCE	MAIN ARRAY -BASC PAD -10 SOUTH END	•KIP5	43130		16.7	14.3	17 0	1177	16.8	1	18.3	15.5	14.9	14.7	18.5		1.0			0.0	0.0
HATL SEAT FORCE	HAIN ARRAY -HORTH SEAT LOAD CELL TIE	-KIPS	43221	12.1	10.4	12.0	13 6	12.1	10.0	15.0	13.5	14.2	13.9	13.9	14.4		9.4	8.5	A . 6	8.0	C.0
RATE SEAT FORCE	RAIN ARRAY -SOUTH SEAT LOAD CELL TIE	-8123	43224	12,0	13.7	2.2.1	2 4	1.7	2.7	9.2	3.0	2.3	2.3	2.3	3.1			8.0	. 6. 8	C	0.0
TIC BASE FOPCE	MAIN ARRAY -HASE PAD - 1 NORTH ERD	-KIPS	43227	7 6	11	11	3.5	2.4	3.2	2.9	3.5	3.1	3.1	2.9	3.5	0.0	6.6	1.1	`\$,8	8.0	0,0
TIE BASE FORCE	MEIN ARRAY BASE PAU - 2	*K1F5	43230		0.0	0.8	0 0		0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0			4.8	8.3	0.0
TIE BASE FORCE	MAIN ARRAY -BASE PAD - 5	-A113	# 1239	1.4	8.4	5.7	4.1	3.5	4.1	3.4	4.1	3.6	5.7	3.7	4.2	0.0			8.8	0.3	6.0
TIL PASE FORCE	WAIN ANNAT HASE PAD + 4		43233		0.0	0.4	0.0	8.0	8.6	0.0	0.0	9.0	3.0	0.0	0.0	0.0	1.4	8.8			0.4
THE BASE FORCE	TAIN ANNAL TUALE PAD T	-1108				6.9	0.4	n. •		0.4	0.0	6.8	0.A	0.7	0.8	0.0	9.0		8.8		0.0
TIL BASE FORCE	PAIN ANNAY -USE PAU - & .	441F3 -V180	87384	1.4	3.2	3.1	3.0	3.0	3. •	3.1	3.0	3.0	3.0	2.6	3.0	0.0	6.5	4.4	.0		0.0
THE MASE FORCE	HAIN ARRAT HURSE PAD + 7		49233	3.7	د ود	3.3	5.1	2.1	2 4	2.5	2.4	2.4	2.6	2.4	2.6	0.0		0.t	2,0		ə.n
THE BASE FONCE	RAIR ARRAT -UASE PAU	-8453	43230	F.E	643	0.0	A A	6.0	6.0	6.6	0.0	0.0	0.0	0.0	0,0	0.0	0.4		8.0		0.0
TTE BASE FORCE	MATH ADDAM DADE DAD AN AN ADDAM AND		A3237	3 7	2.5	2.4	2.3	2.9	2.4	2.A	2.4	2.6	2.9	2.6	2.7	0.0	8,8		۰,۵	0.9	8,0
THE BASE FORCE	MAIN ANNAY -UPSE PAU -IB ADUTH ENU		494.30	10 70	. 13 94	33 30	32.84	1 12.5	5 32.4	5 32.70	32.70	32.79	32,55	\$ 32.55	32,55	-					
INAIN DATA	SAMELE LOAD FOR INGIN NUMBER -			32,1	32.10	1 23.04	34,33	32.5	5 12.10	5 33.24	35.26	32.97	32.97	32.66	32.46				~		
TRAIN DATA	- MHELL LOAD FOR THEIN ROWHER S	-51-9		32,33		1 11 24	30.00		3 12	3 13 74	32.74	32.79	32.47	1 32.47	32.47	33,30	33.30	33,30	35''25	32.62	\$2.67
TRAIN DATA	-WHEEL LOAD FOR IRAIN HUMPER 3	-K1PS	÷	35,30	1 22/20	5 33.40	32.62	C 3%.8	5 JA.M	r 32.,10	36.611						-				

TABLE C13 - TEST DATA FOR TEST 1 ON SECTION 6

REDUCED RATL DATA

	TERCU	· .						MHE	EL NUN	BER			
	Lancu	•	2	3		5.	6	7		•	10	11	12
A CALL AND A CALL AND A CALL AND A CALL AND A CALL	16101	-249.3-2	33.0-2	49.3-2	00.3-2	07,3-2	219.8-	198.0-	144.4-	139.8-	285.0-	193,3-2	85.8
RAIL STRAND AT MAIN ARRAY -AT TIE -NORTH UPPER GAGE -HILLIONING	16102	37.2	37.2	34.9	53,5	51.2	44.2	53,5	74', 5	65,2	46,6	55,9	58,2
RAIL STRAIN AT MAIN ARRAY -AT TIE -NORIM MID GASE MILLIONING	16103	312.2.2	88.9 3	02.9 2	86.5 2	37.6 :	260.9	274.9	\$56.0	202.7	246.9	272,6 2	70.2
RAIL STRAIN AT MAIN ARRAY -AT TIE -NORTH LOWER BAGE - ALL TONING	16104	-269.5-20	60.4-2	55.8-2	58,1-2	28.4-2	226.1-	251.2-	210.1-	219.2-	223.8-	235.2-2	19.Z
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH UPPER GAGE ANTEL TONTAG	16105	-36.5 -	36.5 -	41.1 -	57.1 -	50.2 .	43.4	-52.5	-59,3	-54-8	-36.8	-54,8 -	43.4
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH WID GAGE MILLIONING	16106	302.9 2	91.2 2	93.5 2	65.6 2	42,3 2	256.5	253,9	198.0	202.7	265.6	263.2 2	44.6
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH LOVER GAGE -MILLIONING	16107	-254.5-2	37.3-2	54.5-2	09.2-1	96.3-2	217.8-	215.7.	157.4-	138.0-	202.7-	213.5-2	04.7
RAIL STRAIN AT NAIN ARRAY BETWEEN TIES UPPER GAGE ALLIONING	16108	-60.4 -	53.9 -	62.5 -	38.8 -	43.1 -	-51.7	-43.1	-19.4	-23.7	-43-1	-36.6 -	36.6
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES HID GAGE SHILL TOTHIN	16109	257 5 2	30.9 2	53.4 2	35.0 1	85.9 2	204.3	224.8	188.0	159.4	200.2	228,7 2	22.7
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES LOVER GAGE MILLIONING	16110	0.0	0.0	0.0	8.6	0.0	0,0	8,0	0,0	0.0		8.8	0.0
WALL STRAIN AT 100 FT EAST-BETWEEN TIES UPPER GAGE -HILLIONING	14111	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES MID GAGE	14112		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES LOWER GAGE -MILLIONING	10116	-181 5-1	90.6-1	77.0-1	72.6-1	95.8-	208.4-	181.5	-215.1-	203.9-	-168.2-	197.2-2	208.4
TIE STRAIN AT MAIN ARRAY -NO.RAIL SEAT UPPER GAGE -MILLIONTHS	10112	-101, 3-1	0.0	A.A	0.0	0.0	8.8	0.0	0.0	0.0	0.0	8.8	
THE STRAIN AT MAIN ANRAY -NO.RAIL SEAT MID GAGE -NILLIGHTHS	16114	0.0	.0.8	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0,0	9,9	0.0
THE STRAIN AT MAIN ARRAY -NO.RAIL SEAT LOWER GAGE -MILLIONTHS	16115				33.9	AD.7	43.0	47.5	47.5	45.2	48.7	40.7	45.2
THE STRAIN AT MAIN ARRAY -NID LENGTH UPPER GAGE -MILLIONTHS	15115	4/.3	43.0		3.0	8.0	8.6	0.0	0.0	0.0	0.0	0.0	6.6
TIE STRAIN AT MAIN ARRAY -MID LENGTH LOWER GAGE -MILLIONTHS	16118	0.0	n n	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	6.0	6.0
THE STRAIN AT 100 FT EAST-NO.RAIL SEAT UPPER GAGE -HILLIONTHS	10114				0 0	0.0	6.6	0.0	0.0	0.0	0.0	.0	0.0
TIF STRAIN AT 188 FT EAST-NO.RAIL SEAT MID GAGE -HILLIONTHS	16125	0.0	0.0	0.0	a a	0.8	8.6	0.0	0.0	8.0	0.0	6.6	0.0
TIF STRAIN AT 100 FT CAST-NO, RAIL SEAT LOWER GAGE -NILLIONTHS	16125	0.0	0.0				0.0	0.0	0.0	0.0	0.0	6.6	0.0
TIF STRAIN AT IAN FT EAST-MID LENGTH UPPER GAGE -MILLIONTHS	16126	8.0	0. 0	0.0	0.0	5 3	6 0	0.6	0.0	6.0	0.0	8.0	0.0
TTE STRAIN AT ION FT EAST-MID LENGTH LOVER GAGE -MILLIONTHS	16124	0.0	0.0	0.0	0.0				0.0	0.0	0.8	0.0	0.0
DESCRIPTION AT MATM ARRAY -NORTH END OF INST TIE -INCHES	16209	0.9	0.0	0.0	0.0				0.5	0.5	0.5	0.5	0.5
DEFICITION AT HAIN ARRAY -RAIL MIDSPAN RETWEEN TIES-INCHES	16201	0.5	0.5	0.5	0.5				0.8	A.B	0.0		0.8
THTEFACE STAFTS MATH ARRAY -HG.RAIL SEAT OF INST TIE +PSI	16211	0,0	0.0	0.0	0.0	0.0		0.0	5.0	0.0	6.6	4.0	
THEFT ALL STAFES WATH ARRAY -MID LENGTH OF INST THE	16212	0.0	0.0	0.0	0.0	0.0		4.0	5.6	4.3	4.1	e. 6	4.5
THEFT AFF STRESS MATH ARRAY -SO.RAIL SEAT OF INST TIE	16213		2+1	4.1	3.0	2.1			0.0			8.8	9.0
THICHTAGE STRESS MATH ARRAY -NO. RAIL SEAT OF LOAD TIE	16214	0.0	0.8	0.0					0.0	6.0	0.0		0.0
THTERFACE STRESS WATH ARRAY -HID LENGTH OF LOAD TIE	16215	0.0	0.0	0.0	0,0					12.7	10.8	9.3	9.8
THEREACE STRESS WATH ARRAY -SO.RATL SEAT OF LOAD TIE	16216	8.7	9.5	8,3	2.2	10.0				6.8	6.7	5.5	7.5
INTERFACE STRESS MAIN ARRAY -NORTH RAIL BETWEEN TIES -PSI	16217	4,1	5.3		2.3	5 . X			5.0	2.8	2.7	2.2	2.9
THEREALE STRESS HETH ARRAY WITO CATA BETWEEN TIES -PSI	16218	2,1	5'5	2,1	2.1	2.		2.1		A.A			
INTERFACE STRESS MATH ARDAY SOUTH BATI BETWEEN TIES -PSI	16219	0.9	0.0	0.0	0.0	0.0				7.5		7.0	9.1
INTERFALL SINESS HATH ARRAY -NORTH SEAT LOAD CELL TIE -XIPS	16127	6.9	7.5	1.1	1.1		0.9			6.6	0.4		0.8
RAIL SEAT FURCE FAIR ARRAY SOUTH SEAT LOAD CELL TIE THIPS	16128	0.0	0.0	0.0	0.0	0.0	9.0	0.0		0.0	a.a	8.4	6.0
RAIL SERI FIRE MATH ABEAU BASE PAO - 1 NORTH END -KIPS	16129	0.0	0.0	8.9	0.0	0.0	9.0	0.0	2.0	2.5	2.9	2.3	3.1
TIE BASE FUNCE HAIN HERAY -BASE DAD - 2 +KIPS	16130	2.4	2.6	2.8	2.7	2.7	3.2			A.0	0.0		
THE HASE FORLE MAIN ARRAY DASE FAD	16131	8.0	0,0	0.0	9.0		0.0	0.0	0.0		0.7		8.8
TIL BASE FORCE WAIN ADDAY -DASE DAD - K -KIPS	16132	0.5	0.6	0.6	0.5	0.6	9.8			0.5	8.6		8.4
TIE BASE FORLE HALT ANNAL -DASE PAO - 4 -KIPS	16133	0.4	0,5	0.4	9.4.	8.2	Ø.6	0.7	0,7	0.0	8.9	8.1	8.1
TIL DALL FURLE HAIN ANNAL TRACE FAU - 5	16134	0.1	0.2	8.1	0.1	e.2		0.1		1 1	3.1	3.6	3.0
TIL BASE FUNCE MAIN ARRAY BOASE FAD - 0	16135	2,8	2.9	2.8	2.9	3.8	3.8	z.1	3.0		2.4	4 . A	1.5
TIE BASE FORCE RAIN ANNAT -BASE PAU - 1	16136	1.4	1.6	1.4	1.4	1.6	1.9	1.2		<u> </u>		1.4	1.3
TIE BASE FONCE HAIT ARNAT "DASE PAD "	16137	- 1.4	1.6	1.3	1.6	1.7	1.7	1.3	1.6	2.3		6.A	
THE BASE FORLE ARIA ANALT -DASE PAD -7	16138	. 8.0	0.0	0,0	9,0	0.0		0.0	0.0	7 2	7.7	6.4	A. 4
THE BASE FORCE RAIN ARKAT BASE FAU TO BOOT THE KIPS	16227	6.6	7.3	7.3	6.6	7.4	8.7	5.		7.4	6.4	5.2	5.6
RAIL SEAT FORCE RAIN ANRAT "HUNTH SLAT LUAD CLL IL CAT AN ANAL	16228	5.1	5.7	4.7	5.7	5.7	6.2	2.1	3.0			2.2	
RAIL SEAT FORCE HAIN ANNAL SOUTH SEAT LOND LECE THE CALL OF	-												

C1

TABLE C14 - TEST DATA FOR TEST 2 ON SECTION 6

REDUCED RAIL DATA

			572.8		260°9	194.1	-32°		6		200.4		8.9	8 . 8				0.0	0.0	0.0	0 e			•••				0.0		0	0,				•••		1.0	1.1	0.0	0.0	;
;		37.2			108.9	19.8-I	8.65				201.7-	0.0	0.0	5.74				0.0		0,°			3.6	•••			0.0	•••	7.5	•					0.0	0.0	1.6	1.1	•••	7.7	5.5
;		32.6	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1-0-0X	77.2 2	07,1-1	43-1 -				17.4-2	•••	0.0	45.2				0.0	0.0	0.0			.,	•••			0.0	0.0	10.5	0.0	•	N 0				0.0	5	1.1	0.0	10.2	7.6
Ę		9			23.6 2	36.0-2	25.6 -	1 0 . 5			12.9-2	0.0	0.0	17.5	•••	•••				0.0			6.4	0.0	•••			0.0	11.2	0.0	0					0.0	2.7	1.3	0.0	11.8	8.7
			10.0		5. 7 2	5.5-1					5-1-2	0.0	0.0				•••			0.0				0.0				0.0	9.9	/ 0.0	. .	N 0					6		0.0	9,3	6.6
AHEEL					7.2 19	4.1-15	2-3-2	5 9 9			0.5-21		0.0	9*9	e.e	e. •				0.0			, n , n	0.0	•				7.5	0.0	0.0										
,			20	.7-23	27	2-19	53						•	5.6 4	0.0	e -	-			0.0	¥.			0.0					2.2	0.0		3.0		<u>,</u>				-	6.0	-	8.1
		12.6.		062-8-	312 512	.6-223	.5 -5.	.1 226	•		. 6-24			5 5	•	•	•					•					••			0	. e.	•		•••					0.0	8.3	5.6
			E E	8-228	0 2 2 2 2 2 2 2 2	0-197	.0 -34	2 192				0		.8 47	•	ې و	•				r.	••			•	-, '					•	•	•		ņ		2			-	4
				-271.		1-229.	3 -29	6 245.						5. 5	0	0	•	9 4 9 4		0	0	e .		0	0	1	r •					*	•		•	2					
1			ļ		307.	-246.		5 263.	•••										 		•		5 M			د به د	•					2 2 2					5.				
	~			-246-		-258		247.						59.		• •	•	•				•••			•	•							••		••	•••		•••			
	-	- 22 - 22		-228.4				249.2																	-	* .						2									
Ä		-	12	5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	: 2	2	2	•	=	<u>N</u> :			9	16	:	53	8	5 R		10	=	21	1	5	1	5			38	2	3	F	22	50		2				
š		3	Ē	2	3	5	ā	Ξ.	3	-		15		3	5	3	5	3	33	: 5	3	3	25	:3	3	3	3:	35	: :	55	13	3	3	3	5	3	3		6	9 4	1
TSRC		8 261	192 S	5 261	261	190,0	261	5 261	S 261	561 261	261			261	261	13 261	IS 261	S 261	192 51	552	262	262	292	262	262	262	592	365	343		1.1	361	261	261	261	361					
TSRC		TOWTHS 261	10NTHS 261	10WTHS 261	IONTHS 261	102 CHIMO	104THS 261	LIONTHS 261	LIOWTHS 261	LIOWTHS 261	LIONTHS 261	Tez SHIMO		LIONTHS 261	TONTHS 261	LIONTHS 261	LIONTHS 261	LIONTHS 261	LIONTHS 261	LIUNIN3 552	HES 262	262	292	262	262	262	262	363		201		561	361	3	19 2 5 01	S61	561 261				
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13MC		-NORTH UPPER GAGE -MILLIONTHS 261	-NORTH MID GAGE -MILLIUMINA 241 - Morth : Burr Gage -MilliowThs 241	-SOUTH UPPER GAGE -MILLIONTHS 261	-SOUTH MID GAGE -MILLIONTHS 261	-SOUTH LONER GAGE -MILLIUMIMS (****	TIES UPPER GAGE MILLIONING 261	TIES LOUER GAGE -MILLIOWTHS 261	TIES UPPER GAGE -WILLIOWTHS 261	TIES MID GAGE -MILLIOWTHS 261	TIES LOWER GAGE -MILLIONTHS 261	SEAT UPPER GAGE -MILLIOWTHS ZAL	SEAT MID GAGE -MILLIUWINS CON	. SERT LOVEN GAGE ATTLETOTTS	tore interesting the set	STAT HERE GAGE WILLIONTHS 261	SFAT MID GAGE -MILLIONTHS 261	SEAT LONER GAGE -MILLIONTHS 261	HETH UPPER GAGE -MILLIONTHS 261	JGTN LOWER GAGE WILLIUWING 202	CND OF INST ILL - INCHES 262	SEAT OF INST TIE -PSI 262	16TH OF INST TIE 262	SEAT OF INST TIE	5141 UF LVAU 115 262	L SEAT OF LOAD TIE	TALL BETWEEN TIES -PSI 262	IB ACTWEEN TIES -PSI 255	RAIL BETWEEN TIES «PSI 404	SEAT LOAD CELL TIE -KIPS	SEAT LOAD CELL TIE -RIFA	AD - 1 NOWIN LAU ANTA 261		40 - 1	AD = 5 KEPS - 261	AD + 6 -K1PS - 261	AD - 7 - KIPS 261	AD - D - KIPS 241	40 - 0V	AD -10 SOUTH END -KIPS 25	SEAT LOAD CELL TIE -KIPS
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1300		MAIN ARRAY -AT TIC -MORTH UPPER GAGE -MILLSONTHS 261	NARMAY ARRAY AN TIC -NORTH ATO GAGE -HILLIONING 444 	MAIN ARMAY -AT TIE -SOUTH UPPER GAE -MILLIONTHS 261	MAIN ARRAY -AT TIE -SOUTH MID GAGE -MILLIONINS 261	PAIN ARAY -AT TIE -SOUTH LOWER GAGE -FILLIOWING CON	T MAIN ARRAY -BETWEEN TIES OFFER GAGE STILLTOWING SOL	H HATH ANNAL TURING THE TOTER GAGE -MILLIOWTHS 261	T IN FT EAST-BETWEEN TIES UPPER GAGE -MILLIONTHS 261	T 100 FT EAST-BETWEEN TIES MID GAGE -MILLIOWTHS 261	T 100 FT EAST-BETWEEN TIES LOWER GAGE -MILLIOWTHS 261	T MAIN ARRAY -NO.RAIL SEAT UPPER GAGE -MILLIOUTHS 201	T MAIN ARRAY -NO.RAIL SEAT MID GAGE -MILLIUWINS CON	T MAIN ARRAY -NO,RAIL SERT LOWEN GAGE ANTHLEOUTH	T MALA ANAAT -FID LENGTH UP TH BACK CANER CONTRACT -	T MAIN ANNAT "REU LEVUIT LUMEN SAGE "HILLIONTHS 261	T IND FI FAST-NO.RATE SEAT MID GAGE -MILLIONTHS 261	T 100 FT EAST-NO. RAIL SEAT LOVER GAGE -MILLIONTHS 261	T 100 FT EAST-MID LENGTH UPPER GAGE -MILLIONTHS 261	T 100 FT EAST-MID LENGIN LOWER GAGE -MILLIUMINA 44	T MAIN ARRAY -NORTH END OF INST ILL	TAS MAIN ARRAY -NO.RAIL SEAT OF INST TIE -PSI	ESS MATH ARRAY -MID LENGTH OF INST TIE	ESS MAIN ARRAY -SO,RAIL SEAT OF INST TIE	ESS MAIN ARRAY -HO.RAIL SLATEUR LUND IIL	FOR MARKAN ANDRAY SOLVARY OF LOAD YE	FSS MAIN ARRAY -NORTH HAIL BETWEEN TIES -PSI 262	ESS MAIN ARRAY -NID CAIB ACTWIEN TIES -PSI 262	ESS MAIN ARRAY -SOUTH RAIL BETWEEN FIES -PSI - 240	CE MAIN ARHAY -NORTH SEAT LOAD CELL TIE -KIPS - 501	CE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -MITA	CE MAIN ARRAY -MASE PAD - 1 - NOWIN LINU - NITS	CE FAIR AKRAT FOAUE FAU F C FAIR AKRAT FOAUF F C FAIR F F F F F F F F F F F F F F F F F F F				CC MAIN ARRAY BASE PAD - 7 - KIPS - 261	CE MAIN ARAY -BASE PAD - B -KIPS -KIPS	CE MAIN ARRAY -BASE PAD - 9 -KIPS -	CE MAIN ARRAY -BASE PAD -10 SOUTH END -KIPS	CE MAIN ARRAY -NORTH SEAT LOAD CELL TIE -KUPS
T suc		TIM AT MAIN ARMAY -AT TIC -MORTH UPPER GAGE -MILLIONTHS 261	VIN AT MAIN ARRAY -AT TIC -NORTH MIO 6465 -HILLIONING 241	NIM AT MATH ARMAY -AT TIE -SOUTH UPPER 6465 -MILLIONTHS 261	IN AT MAIN ARRAY -AT TIE -SOUTH WID GAGE -WILLIOWTHS 261	AIN AY MAIN ARRAY -AT TIC -SOUTH LONGR GAGE -HILLIUMINS . CONTAINED TO A CONTAINED TO	AIN AT MAIN ARRAY -BETWEEN TIES UPPER GAGE "ALLIGUTAS SOUTHES TO THE MAIN AND AND AND AND AND AND AND AND AND AN	AIN AT MATH ANNAT DEFINED THE CONCERTING THE SET	ATH AT THE FAST-BETWEEN TIES UPPER GAGE -WILLIOWTHS 261	AIN AT 100 FT EAST-BETWEEN TIES MID GAGE -MILLIOWTHS 261	AIN AT 100 FT EAST-BETWEEN TIES LOVER GAGE -MILLIONTHS 261	IN AT MAIN ARRAY -NO. AAIL SEAT UPPER GAGE -MILLIOUTHS 241	IN AT MAIN ARRAY -NO.RAIL SEAT MID GAGE -MILLIUGINS CON	IN AT MAIN ARRAY -NO.RAIL SERI LOWER GAGE THILICTING CONTROL OF THE SERIES	IN AT WATE ANAAY -FID LENGIN UP-EN BAGE	IN AT MAIN ANNAT - NEU LEAUTH LUNCH DAGE	IN AT 100 FI LAST NUMBER SEAT MID GAGE -MILLIONTHS 261	TH AT 100 FT EAST-HO. RAIL SEAT LONER GAGE -MILLIONTHS 261	IN AT 100 FT EAST-MID LENGTH UPPER GAGE -MILLIONTHS 261	IN AT 100 FT EAST-MID LENGIN LOWER GAGE -41.LLIUMINS 201	ON AT MAIN ARRAY -NORTH END OF INST ILE - INCHES	C C C C C C C C C C C C C C C C C C C	E STRESS MAIN ARRAY -MID LENGTH OF INST TIE	C STRESS MAIN ARRAY -SO.RAIL SEAT OF INST TIE 262	C STRESS MAIN ARRAY -NO.RAIL SLAT.CF LVAU IIC 262	L SIKES THEN ANNAL THE LITTURE OF LOAD THE 262 T STREE MAIN AREAY SSO. RATL SEAT OF LOAD THE	C STRESS MATH ARRAY -NORTH RAIL BETWEEN TIES -PSI 262	C STRESS MAYN ARRAY -MID CAIB ACTWICH TIES -PSI 262	C STRESS MAIN ARRAY -SOUTH RAIL BETWEEN TIES -PSI	IT FORCE MAIN ARNAY -NORTH SEAT LOAD CELL TIE -KIPS - 261	IT FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -KITA 261	FORCE MAIN ARRAY -BASE PAD - 1 HORIN LHU WHI'S 261		FORLE MAIN ANNAL SAME TAGE A 261			COACE MAIN ARRAY -BASE PAD - 7 KIPS - 261	FURCE MAIN ARAY BASE PAD - 8 - MIPS - 20	FORCE MAIN ARRAY -RASE PAD - 9 -KIPS - 24	FORCE MAIN ARRAY -BASE PAD -10 SOUTH END -KIPS	T FORCE MAIN ARRAY -NORTH SEAT LOAD CELL TIE -KIPS
130C		L STRAIM AT MAIM ARRAY -AT TIC -MORTH UPPER GAGE -MILLIOWTHS 261	L STRAIM AT MAIN ARRAY -AT TIE -NORTH MID GAGE -MILLIONING 2941	L SITATE AL TAIN ARMAY AT TIE SOUTH UPPER GAGE -MILLIONTHS 261	L STRAIN AT MAIN ARRAY -AT TIE -SOUTH MID GAGE -MILLIONINS 261	L STRAIN AT RAIN ARRAY -AT TIE -SOUTH LOWER GAGE -RILLIUWING -CONT	L STRAIN AT MAIN ARRAY -BETNEEN TIES OFFER GAGE ATLETOTING CON 	L SIMAIN AT MAIN ANNAL PULINICUT IL COLER GAGE -MILLIONTHS 261	L STARIN ZI JAA KANAN ALTANIN TES UPPER GAGE -MILLIOWTHS 261	L STRAIN AT 100 FT EAST-BETWEEN TIES MID GAGE -MILLIOWTHS 261	L STRAIN AT 100 FT EAST-BETWEEN TIES LOWER GAGE -MILLIONTHS 261	STRAIN AT MAIN ARRAY -NO.AAIL SEAT UPPER GAGE -MILLIOUTHS 241	STRAIN AT MAIN ARRAY -NO.RAIL SEAT MID GAGE -MILLIUWINS CON.	STAAIN AT MAIN ARRAY -NO,RAIL SEBT LOWEN GAGE -MILLIOTTHS	STRAIN AT MAIN ARMAT -RUD LEVELY OVER ANE MILLEUTING	STRAIN AT MAIN ANNAT "HU LEVUIT LUNCE ONC. "TELEVITE 261	SIMAIN AT 100 TI LAST-NO.RATE SEAT MID GAGE -MILLIONTHS 261	STATE AT 100 FT FAST-HO ANL SEAT LONER GAGE WILLIONTHS 261	STRAIN AT 100 FT EAST-MID LENGTH UPPER GAGE -MILLIONTHS 261	C STRAIN AT 100 FT EAST-MID LENGIN LONER GAGE -MILLIUNING 241	CLECTION AT MAIN ARRAY -NORTH END OF INST TIL THETES	LECTION AL MAIN ANNAL MALL TUGTAN THINKS THE PSI 262	TERFACE STRESS MAIN ARRAY -MID LENGTH OF INST TIE	TERFACE STRESS MAIN ARRAY -SO.RAIL SEAT OF INST TIE	TENFACE STRESS MAIN ARMAT -NO RAIL SEAT OF LOAD INC. 262	TERFACE STRESS MARM ANNAL THE LINGTH OF LOAD THE 262 Meeting everge warm adeat SSO.Mail SEat Of LOAD THE	SCORACT STRESS MATH ARRAY -NORTH RAIL BETWEEN TIES -PSI 262	TERFACE STRESS MAIN ARRAY -NID CAIB RETWEEN TIES -PSI 262	TERFACE STRESS MAIN ARRAY -SOUTH RAIL BETWEEN TIES -PSI	IL SEAT FORCE MAIN ARNAY -NORTH SEAT LOAD CELL TIE -KIPS - 541	IL SEAT FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -KITS 261	C BASE FORCE MAIN ARRAY -RASE PAD - 1 HOMIN LMU MAIN 261					C DASK FUNCE AN ARRAY BASE PAD - 7	TTASE FORCE MAIN ARRAY - 6ASE PAD - 6 - KIPS - 20	E ASE FORCE MAIN ARRAY -RASE PAD - 9 - KIPS - 48	E BASE FORCE MAIN ARRAY +BASE PAD +10 SOUTH END -KIPS	IL SEAT FORCE MAIN ARRAY +NORTH SEAT LOAD CELL TIE -KIPS

-C15-

TABLE C15 - TEST DATA FOR TEST 3 ON SECTION 6

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'TABLE C17 - TEST DATA FOR TEST 1 ON SECTION 8

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REDUCED RAIL DATA

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AND ANALY AT MANY AND A TAT AND TH HOUTE GAST ANTI- IONTH	5 18101	-167.8-	163.3-	159.3-	153.0-	145.0-	147.3-	139.3	-101.6-	102.7	133.6-	145.0-	124.4
ALL BINAIR AT HAIN ARRAY AT TE -MORTH MID GAGE -MILLIONTH	18102	63.0	33,2	53.4	53.4	52.3	59.4	63.8	48.7	57.0	79.8	. 43.1	
TALL STRAIN AT MATE ARRAY -AT TIC -MORTH LOURR BASE -MILLIONTH	5 18103	196,5	188.2	169.4	182.3	169.4	187.1	158,8	137.6	134.1	1//	172.7	130,3
ATT STRATH AT MATH ARRAY -AT TIE -SOUTH UPPER GAGE -MILLIOHTH	5 18104	-244.8-2	225.8-	223.4-	213.9-	225.8	197.7	218.7	·185.4·	-177.3	210./-	63 1	69.8
RAIL STRAIM AT HAIN ARRAY -AT TIE -SOUTH HID SAGE -HILLIONTH	S 10105	65,4	59,9	51.0	71.0	96.0	47.9	64.3	7.CG		223.0	244.4	282.9
MAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH LOWER GAGE -MILLIONTH	5 18186	247.8	244.1	249.1	249.1	224.0	223,9	234,2		.131.9	.161.6	165.2-	149.7
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES UPPER GAGE -HILLIONTH	5 15107	-200.9-	177.5-	173./-		.10410.	#6 L	19 4	88.3	52.8	51.2	31.4	43.1
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES RID GAGE -MILLIONTH	5 18108	37.5	37.8	20.4	101 7	179.8	182.7	166.7	163.0	163.0	185.1	163.0	170.4
RAIL STRAIN AT MATH ARRAY -BETWEEN VIES LOJER GAGE -MILLIONTH	5 18109	-177.0-	166.5-	167.7.	153.7.	164.2	138.6	151.4	-117.6	-119.9	-129.3	144.4-	136.4
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES UPPER GAGE - ILLIGHT	e (A)()	-1119-	46.6	47.7	45.4	47.7	55.9	46.6	46.6	50.0	54.7	47.7	47.7
RAIL STRAIN AT 100 FT EAST-BETWEEN TIES MID GAGE MILLIONIN	S 18119	186.1	181.3	168.5	172.9	178.5	166.9	163.3	132.1	141.7	165.7	165.1	165.7
RAIL STRAIN AT 180 FT EAST-BETWEEN FILS LINKE GROE CHILLIOUTH	5 18113	-268.9-	274.5.	274.5	252.1	274.5	-313.8	-235.3	-257.7	-268.9	-291.4	-212,9	252.1
TIE STRAIN AI RAIN ANNAT -NU, HAIL BEAT SPPER DAGE -MULLIONTH	S 1A114	197.5	113.2	107.5	101.5	113.2	113.2	79.2	98.5	101.8	107.5	98.5	84.9
THE STRAIN AT MASH ANRAY HUGHAIL SEAT HILD GADE WILLIONTH	5 18115	372.6	405.6	349.0	363.1	372.6	183.9	325.4	330.1	342.0	410.3	391.0	330.1
THE STRAIN AT MAIN ANAL HU, THE SEAT LORT GARE - HILLIONTH	S 18116	90.5	113.2	113.2	124.5	124.5	124.5	45.2	56.6	79.2	90.5	56.5	67.7
THE STRATH AT MAIN ADDAY -MID LENGTH LOWER GAGE -MELLIONTH	S 18118	0,0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8		
TTE STRATH AT THE FT FAST-NO. RATE SEAT UPPER GAGE -MILLIONTH	5 18119	6.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	V 0 0	1 . 7
TTE STRATH AT 100 FT FAST-NO. RALL SFAT MID GAGE -HILLIONTH	S 18123	14.7	12.7	15.7	11.4	19.7	14.7	12.7	12.7	13.7	76.4	74 8	77 4
TTE STRATH AT 100 FT FAST-HO, RAIL SEAT LOWER GAGE -MILLIONTH	\$ 10125	74.3	75.4	73.2	67.6	95.4	94.3	74.3	. /6.3	12.4	1913	1003	4.4
TIE STRAIN AT 100 FT EAST-WID LENGTH UPPER GAGE -NILLIONTH	5 18126	6.0	9.0	6.0	0.0	0.0	0.0	9.0	12.0		-10.9	-28.6	-29.5
TIE STRAIN AT 100 FT EAST-HID LENGTH LOWER GAGE -HILLIONTH	5 18124	-40.1	-37.0	-39.1	- 38.0	-33+7	-33,4	+ JZ + 7	432,7	0.2	0.2	0.2	8.2
DEFLECTION AT HAIN ARRAY -NORTH END OF THST TIE -INCHES	18289	0,2	0.2	0,2	0.2	9.2		8.1	0.1	8.1	0.1	0.1	0.1
DEFLECTION AT MAIN ARRAY -RAIL MIDSPAN RETWEEN TIES-INCHES	16210	0.1	0.1	9.1	8.0	8.0	0.0		9.0	0.0	0.8		
INTERFACE STRESS HAIN ARRAY -HO, RAIL SEAT OF INST TIE +PSI	19211		8 4	5.0	0.4	0.0	0.0	0.0	8.0	0.0	0.0	0,0	0,0
INTERFACE STRESS MAIN ARRAY -NID LENGTH OF INST TIE	10212		0.8	0.8	9.0		9.0	0.0	0,0	0.0	0.0	0,6	*,*
INTERFACE STRESS MAIN ARRAY -SO, RAIL SEAT OF INST THE	10213	0.0	8.0	6.0	0.0	0.8	0.0	0,0	0.0	0.0	0.0	6.4	0.0
INTERFACE STRESS MAIN ARRAY -NO. RAIL SEAT OF LOAD THE	18215	6.6	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	.0	· 0,0	0.0
INTERFACE STRESS MAIN ARRAY -MIG LENGTH OF LOAD THE	18216	4.9	5.3	5.5	5.7	5.7	5.9	5.4	6.5	6.5	6.3	6.0	6.7
INTERFACE SINESS MAIN ARRAT SUCHAL SCALOF CAR THE	10217	6.0	0.9	e.e	0.9	0.0	0.0	9.0	0.0	0.0	0.8		0.0
INTERPACE STRESS MAIN ARRAY MUNITE MAIL BEINEEN THES PSI	18218	0.0	0.0	. 0.0	0.4	0.0	0.0	0.0	0.0	0,0	0.0		
INTERFACE SINGS MAIN ANALY SOUTH BATI RETUREN TIES -PSI	18219	0.5	0.7	6.7	0,4	8.9	1.4	0.1	1.0	1.0	1.0		
THILL STAT SAPER MAIN ARRAY NORTH SEAT LOAD CELL TIE -KIPS	18127	9,6	- 9,9	9,2	8.9	10.0	10.7	8.1		7.	4.1		7.3
BALL SEAT FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -HIPS	18128	4,9	5.2	4.9	5.4	5.4	3.6	6.3			0.0	A. 6	8.6
TTE BASE FORCE MATH ARRAY BASE PAD + 1 NORTH END -KIPS	18329	0.0	0.0	0.0	0.0	0.0	0.8	. u.v		1.7	1.1	1.2	1.3
TIF BASE FORCE MAIN ARRAY -BASE PAD - 2 -KIPS	18330	1.4	1.5	1.4		1.7	1.7						0.5
THE BASE FORCE MAIN ARRAY "BASE PAD - 3 -KIPS	18331	6.9		0.0	0.0	0.0			1.1	1.0	1.1	9.4	1.0
TIE BASE FORCE MAIN ARBAY -BASE PAO - 4 -KIPS	16332	0.7	1.0	1.0	0,7	1.0					0.0		8.8
TIE BASE FORCE MAIN ARRAY -BASE PAD - 5 -KIPS	18353	0.7	e.a	9.7	v. 1				0.4		4.4	0.5	9.6
TIE BASE FORCE, MAIN ARRAY -BASE PAD - 6 -KIPS	18534	D.6	2.5	1.5	1.8	1.3	1.4	1.	r.	1.4	1.4	1.5	1.5
TIE BASE FORCE MAIN ARRAY -BASE PAD - 7 -KIPS	10333	1.3	1.8	1.0	1.9	1.7	2.0	1.	2,1	2.1	2.1	1.1	2.2
TIE BASE FORCE MAIN ARRAY -BASE PAD - 4 -KIPS	14317	1.7		1.9	2.0	. 1.7	2.1	2.0	2.1	2.0	2.1	2.6	2.2
TIE MASE FORCE HAIN ARRAY -BASE PAD - 7 -RIPS	18414				0.0	0.0	0.0	0.0	0.0) 8. (e 1	
TTE DIEF FARTE HAIM ANNAY MANE WAN AND AND AND AND ANAFA	*****												
TABLE C18 - TEST DATA FOR TEST 2 ON SECTION 8

REDUCED RAIL DATA

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•	TSRCH		UK	EFL MUMBER
		1 2 3	4 5 6 7	8 9 10 11 12
BAIL STRAIN AT HAIN ARRAY -AT TIE -NORTH UPPER GAGE -NILLIONTHS	20101	-150,7-146.1-154.1-	-137.0-125.6-124.4-124.4	-95.9 -86.8-108.5-133.6-111.9
BALL STRATE AT MAIN ARRAY AT TIE -NORTH MID SAGE -MILLIONTHS	28102	53,4 59,4 54,2	39.2 40.8 122.4 45.1	68.9 64.9 68.9 55.8 59.4
BATE STRATE AT MATE ARAY AT TE MUNIN LOVER SAGE WILLIONTHS	26103	0.0 0.0 0.0	0.0 0.0 0.6 0.0	0.0 0.0 0.8 0.0 0.0
RATE STRATE AT NATH ADDAY AT THE SOUTH UPPER BAGE WILLINGTHS	28104	-221.1-225.8-225.8-	·204.4-221.1-202.0-185.4	-180.6-137.8-175.9-171.1-183.0
RATE STRATE AT MARY ANT TTE SOUTH AND CASE WILLIGHTHS	28105	61.0 63.2 62.1	75.4 61.0 95.4 54.3	75.4 63.2 78.7 98.7 72.1
RALL STRAIN AT MAIN ARRAY - ALTIE -SUUR LINER BAGE - MILLINGHA	20106	236.7 231.7 230.5	236.7 271.4 294.9 292.4	270,1 206,2 271.4 301,1 285,0
RALL STRAIN AT MAIN ARRAY ARTUCA TICS OFFIC GAGE MILLIONING	28107	-170,2-213,9-191,3-	178.3-160.4-175.9-146.2	-145.0-135.5-149.7-159.2-130.7
RAIL STRAIN AT MATH AND Y DETUEN THE ADD GALE MILLINGTHS	28108	24.4 26.7 24.7	32.6 32.6 36.1 26.7	38,4 40.7 34.9 25.6 32,6
RAIL STRAIN AT INA ST FAST-BETWEEN TICS LUBER GAGE WHILLIONTHS	24109	203.5 202.3 204.7	197,4 177.8 185.8 166.7	154.5 170.4 177.8 175.3 166.7
RAIL STRAIN AT 100 FT FAST-BETWEEN THES OFFER DAGE WHILLIONTHS	20110	-139.6-146.7-157.2-	194.4-135.1-116.5-139.8	-121.1-110.6-116.5-135.1-124.6
RAIL STRAIN AT 100 FT FAST-BETUFFN TIFS INUE GACE - MILLIONTING	20111	51.4 27.4 38.4	56.1 30.2 36.1 41.9	38.4 38.4 41.9 33,7 38,4
THE STRAIN AT MAIN ARRAY AND RATE STAT HODER CASE - HILL TOLTHS	20112	184,8 176,4 171,6	159.6 154.8 145.2 160.8	138.0 104.4 150.0 171.6 172.8
TIE STRAIN AT MAIN ARRAY -NO. BATI SEAT BID. CASE -MILLIONTUR	20113	-207,0-2/4,5-263,3-	287.8-246.7-336.2-207.3	-252.1-246.5-252.1-246.5-257.7
TIE STRAIN AT MAIN ARRAY NO. RAIL SEAT HOUSE GAGE -MILLIONTING	20114	107.3 133.8 197.3	107.5 113.2 158.4 101.8	135.8 135.8 124.5 114.8 113.2
THE STRAIN AT MAIN ARRAY -HID LENGTH UPPER GAGE -HILL IONTHS	20113	111 3 116 a 112 a	344.3 333.7 448.0 306.5	382.0 377.3 363.1 334.8 334.8
THE STRAIN AT MAIN ARRAY -MID LENGTH LOWER GAGE -MILLIOUTHS	24118		113.2 101.6 124.7 101.8	115.2 124.5 155.8 113.2 124.5
TIE STRAIN AT 100 FT EAST-NO.RAIL SEAT UPPER GAGE -MILLIONTHS	24119			
TIE STRAIN AT 100 FT EAST-NO.RAIL SEAT MID GAGE -MILLIONTHS	26123	14.7 14.7 14.7	14.7 18.7 14 7 75 7	
TIE STRAIN AT 100 FT EAST-NO.RAIL SEAT LOVER GAGE -MILLIONTHS	28125	71.0 68.4 69.9	66.5 72.1 74.3 72 1	
TLE STRAIN AT 100 FT EAST-MID LENGTH UPPER GAGE -NILLIONTHS	28126	0.0 0.0 0.0	8.0 8.0 8.0 D	
TIE STRAIN AT 100 FT EAST-MID LENGTH LOWER GAGE -MILLIONTHS	28124	-41.1 -40.1 -39.1	-36.0 -33.9 -36.0 -36.0	
DEFLECTION AT MAIN ARRAY -NORTH END OF INST TIE -INCHES	28289	0.1 0.2 0.2	0.2 0.2 0.2 0.2	
DEFLECTION AT MAIN ARRAY -RAIL MIDSPAN RETWEEN TIES-INCHES	28210	0.1 0.1 0.1	0.1 0.1 0.2 0.1	
INTERFACE STRESS MAIN ARRAY -NO.RAIL SEAT OF INST TIE -PSI	28211	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
INTERFACE STRESS MAIN ARRAY -MID LENGTH OF INST TIE	28212	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
INTERFACE STRESS MAIN ARRAY -SO, MAIL SEAT OF INST TIE	28213	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
INTERFALL STRESS MAIN ARRAT -NO, RAIL SEAT OF LOAD TIE	28214	0,0 0,0 0,0	0.0 0.0 0.0 0.0	0.0 0.0 8.0 5.6 0.8
THICKFALL STRESS MAIN ANNAT WHU LENGTH OF LOAD THE	28215	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
INTERACE STRESS WAIN ARRAT -DURALL SEAT OF LUAD THE	28216	3.7 4.4 3.8	4.5 4.4 4.7 4.6	5.3 5.4 5.3 4.8 6.0
INTERACE STATES HAIN ADDAY -NUM A NAL DEINEN IIES -PSI	20217	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
INTERFACE STRESS MAIN ADDAY SCHITL DATE DEVELO HIES SPSI	20218	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
RAIL STAT FORCE MAIN ARRAY WOOTH STAT LOND FELL THE WIRE	28219	6.5 0.5 0.5	0.5 0.6 0.7 0.6	0.7 0.7 0.7 0.5 0.6
RAIL SEAT FORCE MAIN ARRAY SOUTH SEAT LOND CELL THE MITS	20127	11.1 11.9 10.9	11.6 13.3 13.6 12.1	11.2 13.0 12.4 12.6 13.4
THE RASE FORCE WITH ANDRY BASE DAD I MORTH FUD - MADE	20120	n.u u.o o.u	0.0 0.0 0.0 0.0	
TIE BASE FORCE MATH ARRAY BASE DAD - 2 MUNIT ENU TATS	20329	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0
	20330	4.3 4.2 3.6	3.6 3.8 4.1 4.1	3,6 4,6 4,1 3,6 3,9
TIE BASE FORCE MAIN ARRAY BASE PAD - 4	20331	0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0
TIE BASE FORCE MAIN ARRAY BASE PAD - 5 - WIPS	20332			0.7 1.0 1.2 0.9 1.0
TIE BASE FORCE MAIN ARRAY -BASE PAG - 6	28334			
TIE BASE FORCE MAIN ARRAY -BASE PAG - 7 -KIPS	28335	1.5 1.7 1.6		
TIE BASE FORCE MAIN ARRAY -BASE PAD - 8 -KIPS	28334	1.9 2.1 1.6	2.2 1.8 2.5 9.8	2.2 2.1 2.1 2.1 1.9 2 4
TIE BASE FORCE MAIN ARRAY -BASE PAD - 9 WIPS	28337	1.9 2.2 1.6	2.2 1.9 2.3 1.4	2.3 2.3 2.3 1.8 3.A
THE BASE PORCE MAIN ARRAY -BASE PAD -10 SOUTH END -KIPS	26336	8.8 8.6 9.9		

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TABLE C19 - TEST DATA FOR TEST 3 ON SECTION 8

REDUCED NAIL DATA

						TSRCH						NHEEL N	UMBER	4	:	
							-	<i>n</i> N	*	n	9	•	•	10	=	
		10 10 1 1 1 1	1001 1100	. 546F .	MILL TONTHS	10101	-125.6-116		9-132.9-	125.8-11	8.1-130	.4-124.	1-130.4	-128.1-1	29.1-1	8.20
STRAIN AT M	ATH ARRAY				ATL TONTHS	38102	10.4 25	.9 20.7	7 29.9	14.4	9.9 18	.4 25.	3 23°0	23.0	20.7	5.0
STRAIN AT M	AIN ARRAT	N- 311 18-	UNTH PIU		WILL TONTUS	30103	170.0 184	0 181.	1 106.4	167.7 1	14.7 177	.0 170.	0 170.0	174.7 1	74.7 1	19.4
STRAIN AT H	AIW ANNAY	4- 371 IV-	0414 COM		MENT TONTUS	38104	-177.0-181	.7-191.0	0-1,53.1-	172.4-1	72.4-167	.7-163.	1-167.7	-167-7-1	72.4-1	1.04
A NIVALA	AFRICA FIA		0011 0110		AILL IONTHS	30105	34.2	51.5	3 22.8	51.3	22.5 39	.9 39.	9.64 6	29-5	22.8	
STRAIN AV R	ALAR ALA		300 1 H100		MILL IONTHS	30105	204.7 202	.4 205 H	1.11.	207.1 20	19.4 223	.5 207.	1 211.0	211.8		
A TA MIANU			VER 1005	2000 H	MILL TOWTHS	38107	-151.4-175	.4-362.0	7-858-4-	146.7-1	49 .1-16 3	.1-167.	7-121-9		1	
A TA MIANA	AIN ARRAY	-BETWEEN	OIN SIL	EAGE .	MELL TOWTHS	36108	19- 19-5P-	1°3 -35.	g -32.9	- 39-5		· 0 • 58	4 . 28 - 2			
STGATM AT M	ATH ARRAY	T NEEVERN	IES LOAE	R GAGE .	MILLIOWTHS	36195	163.7 24	.9 178	2 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 -	103.1						
STEALM AT 1	OD FY EAS	1 N337139-1	3000 \$31.	R GAGE	SHINDITIN	33130	-116.5 -9		5-111-5-		911					0.0
STAATH AT 2	AD FT CAS	T-BETNEEN T	355 410	GAGE	MILLIOWTHS	22222	0									
STRAIN AT	0.0 FT E.25	T-BETHEEN I	TES LONE	R GAGE	-MILL BOWTHS	39112	0									
STRAIN AT M	AIM ARRAY	-NO.RAIL S	REAT UPPER	GAGE	MILLIONTHS	35113	- 40° 54°	- 9 - 6 2°							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
STRATH AT M	ATM ARRAY	-NO.RAIL	SEAT MID	GAGE	SHINOITIS	42196	28°3	• 6 6 6 6 6	F-00 F							
STRAIN AT M	ATN ARRA	-NO. SAIL	EAT LOWE	R GAGE	AILL IONTHS	38115	8		8 G G							
STRAIN AT A	ALM ARRAY	-MID LENGI	Jddn H	A GAGE	MILLIOWTHS	36116	0									
STRAIN AT M	AIR ARRAY	19H31 01H- 1		R GAGE	-HILLIONTHS	11195							- 77 - 4	- 8.5 a b		5.60
STRAIN AT 1	DO FT CAS	ST-NO.RAIL	SEAT UPPE	R GAGE	-#1LL 1047HS	33116	12 · · · · · · · · · · · · · · · · · · ·						0.0	0.0	0.0	0.0
STRAIN AT 1	00 FT EA	57-NO.RAIL 1	5EAT #10	GAGE	-4111104145	A1100							0.0	0.0	0.0	0.0
STRAIN AT 1	DO FT EAL	5T-NO.RAIL	SEAT LOUE	R. GAGE	-WINDI TIM-							0.0	0.0	0.0	0.0	0.0
STRAIN AT 1	00 FT EA	ST-MID LENG	IN UPPE	R GAGE						0.0	0.0		0.0	0.0	0.9	.0
STRAIN AT 1	100 FT EA	ST-MID LENG						1.1	1 0 1	0.1	0.1	0.1 0.	.1 0.3	0.1	0.1	9°3
LECTION AT *	AIN ARRA	N -NORTH EN	1 2 1 1 1 1 2 1 2 1 2 1 2 1 2 1 2 2 2 2		-INCALS	38210		0.1	1 0.1	9.1	0.1	9.1 0.	01		0°1	
LECTION AT P	AATN ANKA	7 - MAJL MBU	STAT NC W		P.5.1	39211	13.6 1	1.3 12.	1.11.4	31.4	11 0.11	l.6 13.	.6 21.0	11.0		12,6
ERFACE STRESS !	ANNA TIAS			311 120		38212	10.9 1	1.5 11.	2 12.0	11.2	12.0 21	1.9 12	19 19 19 19	13,0		
	ARRA NIA		SEAT OF 10	IST FEE		36213	17.2 3	1.6 27.	2 10.1	28.9	20.2 10					
COLAC STREES	TATA ARA	T -NO.RAIL	SEAT OF L	DAD TIE		55214	22.2 2	1.9 23.	6 21.5	21.6			0 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		16.6	
ERFACE STRESS P	AIN ARRA	7 -MIO LENG	TH OF L	DAG TIE		36215	12°0	5.5 16.		6 d						
ERFACE STRESS P	ATH ARRA	Y -SO.RAIL	SEAT OF LI	DAD TIE		36216								17.5	17.2	17.9
ERFACE STRESS !	ANN ARAN	Y -NORTH RA	IL BETHEE	N 7165	15d-	38217	16.7		2				1	6.6	8.8	
ERFACE SURESS !	HAIN ARRA	A -MIO CAIR	33ML38		154-	81700 81700			1112-5	16-9	19.1	7.6 14	16.7	1 19.3	17.6	10.2
ENFACE STHESS !	AIN ARRA	Y -SOUTH RA	11. BETWEE	# 11ES	164-	10105		9.9	8.9		8.8	8.6	.6 8.3	9 6.7	8° 3	6
L SEAT FORCE	VAIN ARRA	Y -NORTH SE	A7 LOAD C			38128	12.6 1	2.9 14.	1 12.6	13.9	13.3 1	3.6 12		# "2" A	13.5	12.
L SEAT FORCE	ANAA VIA'				-KIPS	39129	0.0	0.0	0.0	0.0	0	0.0	0. 0		0 (0)	
	ANTA NIAT	Y -RASE PAD			-KIPS	35130	0.4	8.1 %.	0	6 . 6	с, (P 0	ŕ
BASE FUNCE	ARA ARA	Y -BASE PAD	4 F3		-KIPS	35131	e. •		0.0	0 0 0 1					0 N 0 M	
BASE FORCE 1	HAIN ARRA	V -BASE PAD	3		-KIPS	38132	2.1									
PASE FORCE	MAIN ARRA	Y -BASE PAD	- - 		-K1PS	30100	, a 									-
BASE FORCE	MAIN ARRA	Y -BASE PAD					- 9		9.6		G. 5	8.9 N	. 4 .	9.9 9	9°6	
BASE FORCE	HATN ARRA	Y -BASE PAD	- a			30136			0.0	0.0	9.0	0.0		•••		•
BASE FORCE	ANNA MIAP 4904 1.11				S-IX-	38137		0.0	0.0	•••	8.0	0.0				
BASE FORCE	ARA NIAN	Y -BASE PAD	-10 500	TH E40	241X-	36130	0 .0									
L SEAT FORCE	MAIN ARRA	A -NORTH SE	AT LOAD C	CLL TIE		36227					16.4	11 6.4	13	6 15.7	14.0	1
L SCAT FORCE	MAIN ARRA	32 HINDS- A	AT LOAD C			8228¢					e.0	0.0			0.0	ċ
RASE FONCE	MAIN ARRA	V -BASE PAL		TH CHO	2012	38230			5.0		3.6	3.9 4		8 - F - S	***	÷
BASE FORCE	MAIN ARRA	TA -BASE PAL	N F		241 Ja	39231	0	0.0	0.0	0.0	n.0	•••	01		0.0	•
BASE FONCE	ATA NIAN Use	T BASE DAD			Sq1M-	38232	B .8	3.5 3.	5°.3	20 20 20	5 .0	5°0	•			• •
BASE FONCE	ARA WIAN	V -BASE PAE	- 10		-KIPS	58233	*** 0	0 		- -	e ,					
L BASE FUNCE	MATN ARRA	V -BASE PAL	-		SALPS.	36234			N 1							
LASE FORCE	MAIN ARRA	TY -BASE PAC	1 - 7		-KIPS	36295	n 4							6 J. 1		-
DASE FORCE	MAIN ARRA	A -BASE PAC			SAINS					-	~	2.7	~	3.2	2.7	~
DASE FORCE	MAIN ARRA	N -BASE PAL	6 I 0		-X175	1020C							.0 3.	0 1.2	5.0	-
BASE FORCE	MAIN ARRI	Y -BASE PAL	-10 SOU					62 4 C	. 66 32.6	4 32.97	22.97 3	12.66 32	.66 32.	97 32.9	1 32.66	25
LIN DATA -	HHEEL LO	AD FOR TRAIL				•		10 30 31	28 33.2	0 33.40	33,40 3	12.45 32	05 33.	1.55 11	1 33.36	η.
IN DATA -	יאאננר רסי	NO FOR TRAIN		A												

TABLE C20 - TEST DATA FOR TEST 4 ON SECTION

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5000 C 8225555 DATA RAIL REDUCED - - -Ś ANN ARAY -AT TE -BONTH UPPER GASE -HILLOWTHS ANN ARAY -AT TE -SOUTH UPPER GASE -HILLOWTHS ANN ARAY -AT TE -SOUTH UPPER GASE -HILLOWTHS ANN ARAY -AT TE -SOUTH UPPER GASE -HILLOWTHS ANN ARAY -HETWERN TIES UPPER GASE -HILLOWTHS ANN ARAY -HOLFER TES UPPER GASE -HILLOWTHS ANN ARAY CND CND 20 10 SOUTH EN LOAD CELL 7 LOAD CELL 7 LOAD CELL 7 1 NOATH EN SOUTH ER 1 STRESS ST 70800 70800 70800 70800 70800 70800 70800 70800 70800 70800 TACE ACCE BBASE STRAIN

-C21-

TABLE C21 - TEST DATA FOR TEST 1 ON SECTION 9

REDUCED RAIL DATA

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SACH		7201	5282	9203		9286	1207	9204	9203	9218	9211	9212	9213	9234	9235	9216	9217		9222	9223	1 K K K K K K K K K K K K K K K K K K K		3124	9116	9115	9116	9117	9128	9119	\$13 0	121	9122	9127	9128	9129	9130	1216	9132	2715	1010			1516 158	
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		LIOWTHS	LIONTHS	SHINDE	CHTWCLL	LIGHTHS	LIONTHS	LEONTHS	LIONTHS	LIOVTHS	LIDNTHS	LIOUTHS	LEGUTHS	LIONTHS	LEONTHS	TOWTHS	L 1077HS	1021201	LIGNINS	1001145		155	S L L L L L														6							•
		-MILLIOWTHS	WILLIONTHS	MITCIONTHS		HILLEOWTHS	WILL IONTHS	SHANDEJJIM	-MILLIONTHS	-MILL BONTHS	MILL TOWTHS	-MILL TOWTHS	-MILL CONTHS	MILL IONTHS	-MILL LONTHS	-HILL JONTHS	- 411L13077HS		HILLIONINS	-HILLIOWTHS			- ZNCHES	184-						124	104	154		S-1X-	Sel 14	21 PS	KIPS	Sdix		Sdl X-	Sdi X			•
		GE -MILLIOWTHS	GE -MILLIONTHS	SHING TOWARD	6E -#141134745	GE -HILLEOUTHS	GE -MILLIONTHS	GE -MILLEOWTHS	GE -MILLEONTHS	GE -MILLIONTHS	166 -MILL JONTHS	GE WILLIOUTHS	E -MILLIONTHS	GE -MILLIONINS	IGE -MILLIOWTHS	IGE -HILLIONTHS	65 -41LLIOWTHS	IGE * HILL BOWINS	GE -HILLIONINS	GE -HILLIOUTHS	CC - MILLEUNING		TES-ZWCHES	18d- JI.	16	16	31	32	JC.	12d- 5	15d- S		S-11- 31	S-1X- 31.	S-1X- 0	541X-	-KIPS	Sdix	021X1	541×-			-HIPS	
		A GAGE -MILLIOWTHS	GAGE -MILLIONTHS	R SAGE -MILLIONTHS	R 646E -MILLIOWTHS 636F -MILLIOWTHS	R GAGE -HILLIONTHS	R GAGE -MILLIONTHS	GAGE -MILLEONTHS	R GAGE -MILLIONTHS	R GAGE -MILLIONTHS	GASE -MILLIOWTHS	R GAGE -MILLIOWTHS	SAGE -MILLIGHTHS	GAGE -MILLIONTHS	A GAGE -MILLEONTHS	R CAGE -MILLIONTHS	R CAGE - MILLIOWTHS	R GAGE ANILLIOUTHS	BAGE - HILLIONTHS	A GAGE -HILLIOWTHS	N CACL CALLELOUTHS		EN TIES-ZNCHES	57 T1E -PSI	STTIC	ST 71C	JLL OF	AD 715	AD TIC	12d- 2311	104 · 5324	ISd- SJIL	LL TIE -XIPS	LL TIE - MIPS	H ENO -KIPS	S A I A	-KIPS	Sdix	8-1-X-1	S.41.X-			N END -KIPS	
		JPPER GAGE WILLIOWTHS	TTD GAGE -MILLIONTHS	ONER SAGE -MILLIONTHS	JPPER GAGE -MILLIOWTHS 417 6365 -MILLIOWTHS	OVER GAGE -HILLIONTHS	JPPER GAGE -MILLIONTHS	410 GAGE -MILLIOWTHS	COVER GAGE -MILLIONTHS	JHPER GAGE -WILLIOWINS	TID GAGE -MILLIONTHS	LONCH GAGE -MILLIOWTHS	PPER SAGE -HILLIONTHS	ATO GAGE -MILLIONTHS	CUER CAGE -MILLIOWTHS	JPPER GAGE -MILLIONTHS	CONER GAGE - MILLIOWINS		CID BAGE -HILLIONINS	OKER GAGE -HILLIOWTHS	PPELK BAGE HALE SURAN		THEEN TIES-ZNCHES	5 8457 73E -PSI	7 2 45 2 1 2 C	- 1857 71C	· LOAD TIE	: L ⁰ ad 715	F LOAD TIE	IS4- SJI HJJP	104 SJL 1334	HEN TLES -PSI	O CELL TIE -HIPS	CELL TIE -KIPS	SORTH END -KIPS	541K-	Sel 1	SdIX-		Sel X-			SOUTH END -MIPS	
		TH UPPER GAGE -MILLIOWTHS	TH AID GAGE -WILLIGHTHS	ITH LONER SAGE -MILLIONTHS	TH UPPER GAGE -MILLIOWTHS The with case -milliowths	ITH LOVER CAGE -HILLIOUTHS	S UPPER GAGE -MILLIONTHS	S HID GAGE - HILLEONTHS	S LOVER GAGE -MILLIONTHS	S UPPER GAGE -MILLIONTHS	S MID GAGE -MILLIOWTHS	S LONCH GAGE -MILLEOWTHS	I UPPER SAGE -MILL CONTHS	IT MID. GAGE -MILLIONTHS	IT LOUER CAGE -MILLIOWTHS	UPPER SAGE -MILLIONTHS	LONER GAGE - MILLIOWTHS	I UPPER GAGE - HILLIOWINS	I XIO BAGE - HILLIONINS	T LOREA GAGE -HILLIOWTHS	UTTLK BAGE -MILLSUNING - SUPS CASE - MILLSUNING - SUPS CASE - MILLSUNING - SUPS	NUMBER DAVE TARGED THE	N RETWEEN TIES-ZNCHES	IT OF SNST TIE -PSI	OF INST TIE	IT OF 1857 71C	IT OF LOAD TIE	0F L ⁰ AD 715	(I OF LOAD TIE	TETHEEM TIES -PSI	154 SJL H334236	BETHER TLES -PSI	LOAD CELL TIE -HIPS	LOAD CELL TIE -MIPS	I NORTH ENO -KIPS	S S S S S S S S S S S S S S S S S S S	Set 1 - Kips	TXIPS	5 · · · · · · · · · · · · · · · · · · ·				e south End -kirs	
		-NORTH UPPER GAGE -MILLIOWTHS	HORTH HID GAGE -MILLIONTHS	CHORTH LONER GAGE -MILLIONTHS	-SOUTH UPPER GAGE -MILLIOWTHS -south with care -mill towins	-SOUTH LAVER GAGE -HILLIONTHS	TIES UPPER GAGE -MILLIONTHS	TIES HID GAGE -HILLIOWTHS	TIES LOWER GAGE -MILLIONTHS	TIES UPPER GAGE -MILLIOWINS	TIES MID GAGE -MILLIOWTHS	TIES LONER GAGE -MILLIOWTHS	SEAT UPPER SACE -MILLEOUTHS	SEAT MID. GAGE - MILLIONTHS	SEAT LOUER GAGE -MILLIOWTHS	STH UPPER SAGE -MILLIONTHS	574 LONER CACE - MILLIOWINS	SEAL UPPER GAGE MILLIUMINS	SEAT MID. BAGE -HILLIGHTHS	SEAT LONER GAGE -HILLIOWTHS	AIN UPPLK BACL HALLEDURING BTU SAUTO CACT AND SAUTUR	NO OF THE TRUE - THE OF THE	DSPAN ACTHEEN TIES-ZNCHES	SEAT OF INSY TIE -PSI	ETH OF INST TIE	SEAT OF 18ST 71E	SEAT OF LOAD TIE	GTM OF LOAD TIE	SEAT OF LOAD TIE	AJL BETHEEN TIES -PSI	15d- 5311 H33H236 0	AIL BETWEEN TLES -PSI	EAT LOAD CELL TIE -XIPS	EAT LOAD CELL TIE -KIPS	D - 1 RORTH END -KIPS	0 + 2							0 - 10 SOUTH END - MIPS	
		FRE -NORTH UPPER GAGE -MILLIOWTHS	THE "-NORTH AID GAGE -WILLIONTHS	FIE CHORTH LONER GAGE -MILLIONTHS	FIC ASOUTH UPPER GAGE ANLLIDWINS Fit Asouth win ciger will fourns	TT	JEEM TIES UPPER GAGE -MILLIONTHS	ALEN TIES MID GAGE OMILLIONTHS	HEEN TTES LOVER GAGE -MILLIONTHS	JEEN TIES UPPER GAGE -MILLIONTHS	HEEN TIES MID GASE MILLIONTHS	JEEN TIES LONER GAGE -MILLIOWTHS	TATL SEAT UPPER SACE -MILLIOUTHS	TALL SEAT MID GAGE - MILLIONTHS	RARD SEAT LONER GAGE -MILLIOWINS	LEUGIN UPPER GAGE -MILLIONTHS	LENGTH LONER GAGE - MILLIOWTHS	AGAL SEAL UPPER GAGE CHILLEOWIMS	TATL SEAT XID BAGE - HILLIONINS	TAIL SEAT LOKER GAGE -HILLIOWTHS	LENGIN UPTLK BAGL -MILLEUVING Armetu - Auto Cast -MILLEUVING	LETTER LETER BAUE	WIDSPAN BETWEEN TIES-ZNCHES	RAIL SEAT OF INSY TIE -PSI	LENGTH OF THST TIE	RAPL SEAT OF 1457 71E	TAIL SEAT OF LOAD THE	LENGTH OF LOAD TIE	PAIL SEAT OF LOAD TIE	TH RATL BETHEEN TIES -PSI	CAID SETUTEN TES -PSI	TH RAIL BETWEEN TLES -PSI	TH SEAT LOAD CELL TIE -XIPS	TH SEAT LOAD CELL TIE -HIPS	PAD - 1 NORTH END -KIPS	PAD - 2 - WIPS	C PAD - 3 - KIPS	PAD - 4 - KIPS		PAD ~ 6 -KIPS			TAU - 10 SOUTH END - MIPS	
		AT THE WORTH UPPER GAGE WILLIOWTHS	AT THE HORTH AID GAGE -WILLIGHTMS	AT TIE CHORTH LOVER SAGE -MILLIONTHS	AT TTE -SOUTH UPPER GAGE -WILLIDWIMS AT TTE -South with Eact -Willidwims	AT TIE -SOUTH LONER GAGE -HILLIONTHS	BETHEEN TIES UPPER GAGE -MILLIONTHS	BETWEEN TIES MID GAGE -MILLIOWTHS	BETWEEN TIES LOVER GAGE -MILLIONTHS	BETHEEN TIES UMPER GAGE -MILLIONTHS	BETHEEN TIES MID GAGE -MILLIOWTHS	BETUEEN TIES LONER GAGE -MILLIOWTHS	NO. AAJL SEAT UPPER SACE -MILLIONINS	NG. MALL SEAT MID GAGE - MILLIONINS	NO. RARD SEAT LONER CAGE -MILLIOWINS	MED LTGETH UPPER GAGE .MILLIONTHS	KID LENGTH LONER GAGE -MILLIOWINS	HOLMAR SEAL BOPER GAGE HALLEONIMS	HO.RAIL SEAT MID. BAGE - HILLIGUINS	HO. AAIL SEAT LOKEA GAGE -HILLIOWTHS	MED LENGTH UPPLK BAGL CALLEDUINS Med isnety - outo cast anis toneus	ADDRE THO OF THE TES STREET	AAL MIDSPAN BETWEEN TIES-ZNCHES	HO.RAIL SEAT OF INSY TIE -PSI	HID LENGTH OF THST TIE	SC, RATL SEAT OF 1857 71E	NO. RAIL SEAT OF LOAD TIE	MID LENGTH OF LOAD TIE	SO.RAIL SEAT OF LOAD TIE	NORTH RAJL DETHEEN TIES -PSI	AID CAID SETUEN TIES	SOUTH RAIL BETWEEN TLES -PSI	HOUTH SEAT LOAD CELL TIE -HIPS	SOUTH SEAT LOAD CELL TIE -MIPS	BASE PAD - 1 NORTH END -KIPS	B4SE PAD - 2 - KIPS	BASC PAD - 3 - KIPS	BASE PAD - 4 - KIPS	HASE PAD + 5 KIPS	BASE PAD ~ 6 KIPS	BASE PAD - 7 - KIPS		BASE FAD - 10 SOUTH END - KIPS	
		AY -AT THE -NORTH UPPER GAGE -MILLIOWTHS	AT -AT THE "HORTH HID GAGE -MILLIONINS	AY -AT TLE CHORTH LONER SAGE -MILLIONTHS	AT -AI FIC -SOUTH UPPER GAGE -WILLIDWIMS 24 -AT TTE -SOUTH WIN - CAGE -WILLIDWIMS	AT -AT TIT -SOUTH LOVER GAGE -HILLIONTHS	AT -BETHEEN TIES UPPER GAGE -MILLIGNTHS	AT -BETWEEN TIES MID GAGE -MILLIONTHS	AT -BETWEEN TIES LOVER GAGE -MILLIONTHS	AST-BETHEEN TIES UMPER GAGE -MILLIONTHS	ASTOBETHEEN TIES WID GAGE -MILLIONTHS	AST-BETHEEM TIES LONER GAGE -MILLEOWTHS	AT THO, AAJL SEAT UPPER SACE -HILLEONTHS	AV -NG MAIL SEAT MID GAGE -MILLIONINS	AV -NO. RARD SEAT LONER GAGE -MILLIOWTHS	AT -MED LTUSTH UPPER GAGE -MILLIONTHS	AY -MID LENGTH LONER CACE -MILLIOWINS		AST-HO.RAIL DEAT MID BAGE -HILLIONINS	AST-NO.AASL SEAT LONEA GAGE -HELLIOWTHS	ADIATED LENGTH UPTLK BACL ANLLEDUTION ADI-NYD LYNGTU - AUCD CACT ANLLO	AV	AY -RABL MIDSPAN BETWEEN TIES-ZNCHES	AY -HO.RAIL SEAT OF INSY TIE -PSI	at -MID LENGTH OF INST TIE	AY -SO RATL SEAT OF THEY 71C	AT "NO"RAIL SEAT OF LOAD THE	AY -MID LINGTH OF LOAD TIE	AT -SO.RAIL SEAT OF LOAD TIE	AY -MORTH RAJL TELTHEEN TIES -PSI	A *HID CASE SETURES TIES 225	AT -SOUTH RAIL BETHEEN TLES -PSI	AY -NOTTH SEAT LOAD CELL TIE -XIPS	AT -SOUTH SEAT LOAD CELL TIE -MIPS	AV -BASE PAD - 1 NORTH END -KIPS	AY -84SE PAD - 2 - KIPS	AY BASE PAD - 3 - KIPS	AY -BASE PAD - 4 -KIPS	AT HASE PAD - 5 white	AT -BASE PAD ~ 6 - KIPS	AY -BASE PAD - 7 -KIPS		AT +BASE FAD + 10 SOUTH END +KIPS	
		AKRAY -AT TEE -NORTH UPPER GAGE -MILLIOWTHS	ARAY -AT THE -NORTH AID GAGE -MILLIONINS	ARRAY -AT TIE CHORTH LONER SASE -MILLIONTHS	ARRAT -AI TIE -SOUTH UPPER GAGE -MILLIDWINS Array -AT TIE -South with Eace -Mill Towins	ARAT - AT TIT -SOUTH LOVER GAGE -HILLIONTHS	ARAT -BETHEEN TIES UPPER GAGE -MILLIONTHS	ARRAY -BEVUELN TIES MID GAGE -MILLEONTHS	ARRAT -BETWEEN TIES LOVER GAGE -MILLIONTHS	T EAST-BETHEEN TIES UMPER GAGE -MILLIONTHS	T EAST-DETHEEN TIES WID GAGE -MILLIONTHS	FT EAST-BETHEER TIES LONER GAGE -MILLIOWTHS	BRRAT IND. RATL SEAT UPPER SAGE -MILLIONINS	ARRAY -NG AALL SEAT MID. GAGE -MILLIONINS	ARAY -NO. #ARE SEAT LONER GAGE -MILL LONTHS	ARRAY -MEG LYNGIN UPPER GAGE -MILLIONTHS	ARRAY -MED LENGTH LONER SAGE -MILLIOWINS	THE REAL PROPAGE SEAN UPPER GAGE ARILLEGUATERS	T EAST-HO.RAIL DEAT MID. GAGE -HILLICHTHS	T EAST-HO.AAIL SEAT LOKER GAGE -HILLOWTHS	T EASTON LEVEL UPTLY CACL ANTELEOUTING TY TARE MAN TARETU S AUTO CACL ANTELEOUTING TO TARE MAN TARETU S AUTO CACL ANTELEOUTING	BRDAY -MADPA FUN AS THEY DAVE	ARAY -RAIL MIDSPAN BETWEEN TIES-INCHES	ARAY -110.RAIL SEAT OF INST TIE -PSI	ARRAY -MIG LENGTH OF INST TIE	ARMAY -SO, RATL SEAT OF 1887 715	ARRAY "NO, RAIL SEAT OF LOAD TIE	ARMAY -MID LINGTH OF LOAD TIE	ARRAY -SO.RAIL SEAT OF LOAD TIE	ARRAY -NORTH RAJL BETHEEN TIES -PSI	ARAA * MID CAID 9274554 TIES * 255	ARRAY -SOUTH RAIL BETHERN TIES -PSI	ARRAY -NOTTH SEAT LOAD CELL TIE -HIPS	ARRAY -SOUTH SEAT LOAD CELL TIE -KIPS	ANAAV -BASE PAD - 1 NORTH END -KIPS	ARRAY -BASE PAD - 2 -KIPS	ARRAY -BASC PAD - 3 -KIPS	ARRAY -BASE PAD - 4 -KIPS	AHRAY HASE PAD - 5 whiles	ARRAY -BASE PAD ~ 6 -KIPS	ARRAY -BASE PAD - 7 -KIPS		ARKAY -845E FAU - 9 SOUTH END -KIPS	
		IAIN AKNAY -AT YEE -NORTH UPPER GAGE -MILLIOWTHS	AIN ARAY -AT THE -HORTH MID GAGE -MILLIGNINS	IAIM ARRAY -AT TIE CHORTH LOVER 646E -MILLIONTHS	KAIM ANNAT -AITTE STOUTH UPPER GAGE -MILLIOWTHS Vate Analy -Att tit atouth with fact -Milliowths	TATH ARRAY -AT TIT -SOUTH LANER CAGE -HILLIONTHS	141M ARRAY -BETHEEN TIES UPPER GAGE -MILLIONTHS	VAIM ARRAY -BETWEEN TIES MID GAGE -MILLIOWTHS	AIM ARRAT -BETWEEN TIES LOVER GAGE -MILLIONTHS	108 FT EAST-BETWEEW TIES UMPER GAGE -WILLIOWTHS	IOD FT EAST DETHEEN TIES MID GAGE -MILLIOWTHS	IAD F7 EAST-BETUEEN TIES LOUCH GAGE -MILLEOUTHS	101W BRRAY WOLARST SEAT UPPER SACE -MILLEOUTHS	ALIN ARRAY -NG RALL SEAT MID. GAGE -NILLIONINS	GAIN ARRAY -HO, RARE SEAT LOUER GAGE -MILLIOWTHS	ABY ARRAY -MED LENGTH UPPER GAGE -MILLIONTHS	141W ARKAY -MID LENGIN LONER 546E -MILLIOWINS	LOO Y EXXI-ROUNDED SEAT STREET GAGE ARILLEGONTAS	100 FT EAST-HO.RAIL DEAL MID. BAGE -4ILLIGHINS	DO FT EAST-HO.AA3L SEAT LONER GAGE -HELLIONTHS	DE AL ENDIATE ELTERIA DATE ALLESUSIYO A SY SAPE YES A FACTURES OF ALLESUSAL	1011 BRDAY - WARPEN SHI AN AN THE TARK	1414 ARAY -AAIL MIDSPAN BETWEEN TIES-INCHES	IATH ARRAY -110.RAIL SEAT OF INSY TIE -PSI	112N ARRAT -MIO LENGTH OF 2451 TIE	IATH ARMAY -SO, RATL SEAT OF LHST 71E	141N ARRAY NO RAIL SEAT OF LOAD THE	IAIN ARMAY -MID LENGTH OF LOAD TIE	AIN ARRAY -SO.RAIL SEAT OF LOAD TIE	141N ARRAY -NORTH RATL BETHEEN TILS -PSI	AIN ARRAY -MID CARD SETUCEN TIES - PSI	AIN ARRAY -SOUTH RAIL BETWEEN THES -PSI	AIN ARRAY -NOTTH SEAT LOAD CELL TIE -HIPS	AIW ARRAT -SOUTH SEAT LOAD CELL TIE -MIPS	AIN ARRAY -BASE PAD - 1 NORTH ENO -KIPS	ARRAY -BASE PAD - 2 - KIPS	ATH ARRAY -BASE PAD - 3	AIN ARRAY -BASE PAD - 4	AIR ARRAY HASE PAD + 5 KIPS	AIM ANNAT -BASE PAD ~ 6 - XIPS	IAJN ARRAY -BASE PAO - 7 - KIPS		ARTA ARAAT +DAAL FAU + 9 AIM ARAAT +DAAL FAU + 9 AIM ARAAT +DAAL FAU - 10 SOUTH EMO -MIPS	
		MAIN ANNAY -AT YEE -NORTH UPPER GAGE -MILLIOWTHS	MAIN ARRAY -AT THE MORTH HID GAGE -WILLIONTHS	MATH ARRAY -AT THE CHONTH LOVER SAGE -AILLIONTHS	MAIM ANNAT -AI JIS +3001H UPPER BAGE -WILLIOWTHS Math Annay -At tit annith with fact will Inwius	MAIN ARRAY -AT TIT -SOUTH LONER GAGE -MILLIGUTHS	MAIN ARRAY -BETHEEM TIES UPPER GAGE -MILLIONTMS	MAIM ARRAT -BETWEEN TIES MID GAGE OMILLEONTHS	MAIN ARRAT - METWEEN TIES LOVER GAGE -MILLIONTHS	108 FT EAST-BETWEEN TIES UMPER GAGE -WILLIOWINS	100 FT EASTODETHEEN TIES MID GAGE -MILLIGWTHS	100 FT EAST-BETHEEN TIES LONCH GAGE -MILLIGHTHS	MAIN BRRAY (NO. MAJL SEAT UPPER SAGE -MILLIGUTHS	BAIN ARRAY -NG. AALLSEAT MID. GAGE -NILLIONINS	MAIN ARRAY -NO.RARE SEAT LOUER CAGE -MILLIOWINS	PASH ARRAY -MED LYNSEH UPPER GAGE -MILLIONTHS	MAIN ANNAY -MAD LENGTH LONER SACE -MILLIOWINS		300 FT EAST-NO.RAIL DEAT MID. BAGE -HILLIONINS	JPO FT EAST-HO.AA3L SEAT LOKER GAGE -HILLIOWIAS	DE ST SASTATUR L'ENGIN UPTLK BAGL ANLEIGUNIND Par Sy sasturd innets : Aug Circi anleighte	BATH BRDAY LEADER THAT AS THE TS	MAIN ARRAY -RAIL MIDSPAN METWEEN TIES-ZWEHES	SS MAIN ARRAY -110.RAIL SEAT OF INSY TIE -PSI	SS MAIN ARRAT -MID LENGTH OF INST TIE	55 MARM ARMAY -SO RARL SEAT OF 1857 71C	SS MAIN ARRAY "NO RAIL SEAT OF LOAD THE	SS MAIN ARMAY -MID LINGIN OF LOAD TIE	SS MAIN ARRAY -SO.RAIL SEAT OF LOAD TIE	33 Main Array -North Rail Betheen Ties -PSI	ss wain array onto case between ties opsi	SS MAIN ARRAY -SOUTH RAIL BETHER TIEN TIES -PSI	E ZAIN ARRAY -NOTTH SEAT LOAD CELL TIE -XIPS	E MAIN ARRAT -SOUTH SEAT LOAD CELL TIE -KIPS	C MAJN ARRAY -BASE PAD - 1 NORTH END -KIPS	E MAIH ARRAY -BASE PAD - 2 - KIPS	E MAIN ARRAY -BASC PAD - 3 -KIPS	E MAIN ARRAY -BASE PAD - 4 -KIPS	C HAIN ANNAY "HASE PAD - 5 - KIPS	E MAJW AKRAY -BASE PAD ~ 6 -KIPS	C MAIN ARRAY -BASE PAD - 7 - KIPS		C. TAIR ARKAT THASE FAU * 9 C. MAIN ARRAY -BASE PAD -10 SOUTH END -MIPS	
		N AT. MAIN AKRAY MAT TEE WORTH UPPER GAGE WILLIOWTHS	N AT MAIN ARRAY -AT THE HORTH HID GAGE -MILLIONTMS	N AI HAIM ARMAY +AT TIE CHORTH LOVER SAGE -MILLIONTHS	R AT MARY ANNAT -AT TIE ACOUTH UPPER GAGE -MILLIOWING V AT MARY AMADY -AT TIE ACOUTH WIN CAGE -MILLIOWING	W AT MAIN ARRAT AT TIT SOUTH LANER GAGE MILLIGUTHS	N AT MAIN ARRAY -BETWEEN TIES UPPER GAGE -MILLIONTMS	N AT MAIN ARRAY -BETWEEN TIES MID. GAGE -MILLEONTHS	N AT MAIN ARRAT - BETWEEN TIES LOVER GAGE - MILLIONTHS	N AT 108 FT EAST-BETWEEN TIES UPPER GAGE -WILLIOWTHS	N AT IDD FT EASTOBETHEEN TIES MID GAGE ONLLIONTHS	N AT 180 FT EAST-BETUEEN TIES LOUER GAGE -MILLIOUTHS	AT MAIN ARRAY TWO MAST SEAT UPPER SACE -MILLIOUTHS	AT MAIN ARRAY -NO. MALL STAT MID GAGE -MILLIONINS	AT MAIN ARRAY -NO. RAKE SEAT LOUER GAGE -MILLEOWTHS	AT TAJA ARRAY - MEG LEGETH UPPER 6AGE - MILLIONTHS	AT MAIN ARKAY -MID LENGTH LONER GAGE -MILLIONIHS		AL 300 FT EAST-HO.RATL SEAT MID. CAGE -4ILLIONTHS	AT 300 FT EAST-NO.AARL SEAT LONER GAGE -MILLIOWTHS	AT PAR SY SAPETERS INGTO PARTY CASE ANDELED 191730 AT PAR SY SAPETERS INVETO PARTY PARTY AND CASE AND PARTY	AT BATH BRDAY - MARKEN THAT THE SHARE STATE	AT MAIN ARRAY -RAIL MIDSPAN METWEEN TIES-INCHES	STRESS MATH ARRAY -110.RAIL SEAT OF INST TIE -PSI	staess mash arrat -mid length of thst tie	STAESS MARM MANAY -SO, MARL SEAT OF 1487 71E	STRESS MAIN ARRAY NO, MAIL SEAT OF LOAD TIE	STRESS MAIN ARMAY -MID LINGTH OF LOAD TIE	STRESS MAIN ARRAY -SO.RAIL SEAT OF LOAD TIE	stress main Armay -Morth Rast between Ties -psi	STRESS MAIN ARRAY -MID CAID SETULEN TIES -PSI	STRESS MAIN ARRAY -SOUTH RALL BETHER TLES -PSI	FORCE ZAIN ARRAY -NOTTH SEAT LOAD CELL TE -HIPS	FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -MIPS	FONCE MAIN ANRAY -BASE PAD - 1 NORTH END -KIPS	FORCE MAIN ARRAY -BASE PAD - 2 - KIPS	FORCE MAIN ARRAY -BASC PAD - 3 -KIPS	TORCE MAIN ARMAY -BASE PAD - 4 - 4	ONCE HAIR ANNAY HASE PAD + 5 4/1PS	FUNCE MAIN ARRAY -BASE PAD ~ 6 - KIPS	FORCE MAIN ARRAY -BASE PAD - 7 - KIPS		TORCE MAIN ANNAL FORCE FAU * 9 FORCE MAIN ARRAY -BASE FAO *10 SOUTH END *NIPS	
	「「「「」「「「」」「「」」「」」「「」」」「「」」」「「」」」「「」」」」「」」」」	TAIN AT MAIN ANNAY -AT THE -NORTH UPPER GAGE -MILLIOWINS	FAIN AT MAIN ARRAY -AT THE HORTH MID GAGE -WILLIONEMS	TAIN AT TAIM ARAAY -AT TIS CHORTH LONGY 6460 -MILLIONTHS	RAIR AT MAIM ANNAT -AISTIC -SOUTH UPPER GAGE -WELLIGWING TAIN AT MATH ARAGY -AT TIT ASOUTH WIN FACT -MILLIGWING	RAIN AT MAIN ARRAY -AT TIT -SOUTH LANER GAGE -HILLEOUTHS	RAIN AT MAIN ARRAT -BETWEEN TIES UPPER GAGE -MILLIONTHS	RAIN AT MAIN ARRAT -BETWEEN TIES MID. GAGE -MILLIONTHS	rain at math Arrat - detween Ties Lover Gage -Millionths	RAIN AT 200 FT EAST-BETWEEN TIES UPPER GAGE -WILLIONTHS	TAIN AT 100 FT EAST OF THEEN TIES MID GAGE MILLIONTHS	TABLE AT 280 FT EAST-SETUREN, TIES LOND GAGE -MILLIOUTHS	IAIN AT MAIN ARRAY WOORAND SEAT UPPER SACE -MILLEOUTHS	tain at main Afray -NG MAIL SEAT HID GAGE -MILLIONINS	IAIN AT MAIN ARRAY -NO. RARE SEAT LOUER GAGE -MILLIONTHS	RAIN AT WASH ARRAT - MED LEVESTH UPPER GAGE - MILLIONTHS	AIN AT MAIN ARRAY - MED LENGTH LONER EACE - MILLIOUTHS		MAIN AL 300 FT EAST-HO.RATL DEAT MID. BAGE -HILLICHINS	IAIM AT 300 FT EAST-NO.AAJL SEAT LONEN GAGE -HILLIONTHS	INDER AN AND THE RANGE AND	TON AT BATH BRDAY - WORRA FUL DE SEAT 75	TON AT MAIN ARRAY -RAIL MIDSPAN METHEEN TIES-INCHES	ICE STRESS MAIN ARRAY -110.RAIL SEAT OF INSY TIE -PSI	ice stress hash array -MIO Length of this tie	ICE STRESS MAIN ARMAY .SO RAFL SEAT OF 1457 73E	ICE STRESS MAIN ARRAY "NO HAIL SEAT OF LOAD THE	ICE STREES MAIN ARMAY MID LINGTH OF LOAD TIE	ICE STRESS MAIN ARRAY -SO.RAIL SEAT OF LOAD TIE	ice stress main Array ~North Ratl betheen ties ~PSI	ICE STRESS MAIN ARRAY -MID CARD SETUCEN THES -PSI	ICE STRESS MAIN ARRAY -SOUTH RAIL BETHER THES -PSI	AT FORCE MAIN ARRAY -NOTTH SEAT LOAD CELL TIE -MIPS	AF FORCE MAIN ARRAY -SOUTH SEAT LOAD CELL TIE -MIPS	E FONCE MAIN ANRAY -BASE PAD - 1 NORTH ENO -KIPS	IE FORCE MAIN ARRAY -BASE PAD - 2 - KIPS	E FORCE MAIN ARRAY -BASE PAD - 3 - KIPS	A FORCE NAIN ARRAY -BASE PAD - 4	E FONCE HAIN ANAX HASE PAD - 5	E FONCE HAIN ARRAT -BASE PAD ~ 6	E FORCE NAIN ARRAY -BASE PAD - 7 -KIPS	C FORLE MARKET - BASE PAG - B - Control to the second sec	KE FONCE MAIN ANNAI +DASE FAU + 9 E FONCE MAIN ARRAY +BASE FAD +10 SOUTH END +KIPS	
	「「「」、「「」、「「」、「」、「」、「」、「「」、「」、「」、「」、「」、「」	L STRAIN AT MAIN ANRAY AT TER NORTH UPPER GAGE MILLIOWTHS	L STRAIM AT MAIN ARRAY -AT THE HORTH AID GAGE -MILLIGNTHS	L STARIN AT PAIR ARAT AT TIT CHORTH LOVER GAGE WILLIOWTHS	L STRAIR AT MAIN ARRAT -ALCUE -SOUTH UPPER GAGE -MILLIOWINS 1 Strain at Main Array -Artists -South Wing Eact -Milliowing	L STRAIN AT MAIN ARRAY AT TIT SOUTH LANER GAGE MILLIONTHS	L STRAIN AT MAIN ARRAY -BETWEEN TIES UPPER GAGE -MILLIONTMS	L STRAIN AT MAIN ARRAY - JENNMERCH TIES MID. GAGE -MILLIOUTHS	L STAAIN AT MAIM ARRAY -BETWEEN TIES LOVER GAGE -MILLIONINS	L STRAIN AT 108 FT EAST-BETHEEN TIES UMPER GAGE -WILLIONTHS	L STRAIN AT 100 FT EAST BETHEEN TIES WID GAGE MILLIONTHS	L SYAAIM AT 200 FT EASTORETUEEW TIES LONER GAGE -MILLIOUTHS	STRAIN AT MAIN ARRAY WORRAY WORRAY WPER SAGE -MILLIOUTHS	STRAIN AT PAIN ARRAY -NG. MAIL SEAT HIS GAGE -NILLIONTHS	STRAIN AT MAIN ARRAY -HOURAGE SEAT LOUER GAGE - MILLIONTHS	STRAIN AT MAIN ARRAY -MED LEUGTH UPPER GAGE -MILLIONTH-	STRAIM AT MAIN ARRAY -MID LENGTH LONG GAGE -MILLIOWING		STRAIN AL 300 FT EAST-NO.RATL DEAT XIO. BAGE -41LLIGNINS	SIRAIN AT 390 FT EAST-NO.AASL SEAT LONER GAGE -HILLOWINS	CURREN AT ADD. LEASTANCE LEASTANCE LYTER DAGE ALLELSUGING Atoric at the Sy they truck courd that any the	LECTION AT MAIN BROAM - MADEM FUN OF PART TEF	LECTION AT MAIN ARMAY -RAIL MIDSPAN RETWEEN TIES-INCHES	EAFACE STRESS MAIW ARRAY -110.RAIL SEAT DF INST TIE -PSI	ERFACE STRESS MAIN ARRAY -MIO LENGTH OF 2457 TIE	LWFACE STRESS MAIN ARMAY -SOGRATL SEAT OF 1887 71E	EHFACE STRESS MAIN ARRAY NO. GAIL SEAT OF LOAD TIE	EAFACE STREES MAIN ARMAY .MID LINGTH OF LOAD TIE	ERFACE STRESS MAIN ARRAY -SO.MAIL SEAT OF LOAD TIE	ERFACE STRESS MAIN ARRAY -NORTH RAIL BETHEEN TIES -PSI	ERFACE STRESS MAIN ARRAY -MID CASO BETWEEN TRES -PSI	CHFACE STRESS MAIN ANNAT -SOUTH RAIL BETWEEN TLES -PSI	L SEAT FORCE MAIN ARRAY -NORTH SEAT LOAD CELL TE -MIPS	L SEAF FORCE MAIN ANNAY -SOUTH SEAT LOAD CELL TIE -KIPS	BASE FONCE MAIN AWAY -BASE PAD - 1 MORTH END -KIPS	BASE FORCE MAIN ARRAY -BASE PAD - 2 -MIPS	BASE FORCE MAIN ARRAY -BASE PAD - 3	UASE FORCE MAIN ARRAY -BASE PAD - 4	HASE FONCE HAIN ANNAT HASE PAD - 5	BASE FONCE MAIN ARRAT BASE PAD ~ 6	BASE FORCE MAIN ARRAY -BASE PAD - 7 -KIPS	SALT I SAL TARE TARE TARE ATTENDED IN THE SALE	BASE FORCE RAIN ARRAY -BASE FAD - 9 SOUTH END -KIPS	
	「「「「」」「「」」「「」」」「「」」」」」」「「」」」」」」」」」」」」	RAIL STRAIN AT MAIN ANNAY AT TEE NORTH UPPER GAGE MILLIOWTHS	RAIL STRAIN AT MAIN ARRAY -AT THE HORTH MID GAGE -MILLIONINS	ANLE STANIN AL MAIN ANAY AT TIC CHONTH LOWER GAGE MILLIONTHS	RALL STRATE AT MATM ANNAT -ALTER SOUTH UPPER BAGE -MILLIOWING Rait straim at matw anady -at the asouth with rage williowing	RAIL STRAIN AT MAIN ARRAT AT TIE SOUTH LOVER GAGE WILLIGUTHS	RAIL STRAIN AT MAIN ARRAY -BETHEEN TIES UPPER GAGE -MILLIONTHS	RAIL STRAIN AT MAIN ARRAY BERVERWATES MID. GAGE MILLEONTHS	RAIL STRAIN AT MAIN ARRAT -BETWEEN TIES LOVER GAGE -MBLLIONTHS	TAIL STRAIN AT 108 FT EAST-BETHEEW TIES UPPER GAGE -WILLIOWTHS	RAIL STRAIN AT 100 FT EASTOBETHEEX TIES WID. GAGE -MILLIOWTHS	RAIL SYRAIM AT 200 F7 EAST-BETHEEW ILES LONER GAGE -MILLIOUTHS	VIE STRAIN AT MAIN ANNAY (NO ANT SEAT UPPER SACE - MILLIOUTHS	IL STRAIN AT MAIN ARRAY -NG MAIL SEAT HIG GAGE -MILLIONINS	TIE STRAIN AT MAIN ARRAY -HO, RAKE SEAT LOUER GAGE -MILLIOWINS	TIE STRAIN AT MAIN ARRAY -MED LEUGTH UPPER SAGE -MILLIONTHS	VIE STRAIM AT MAIN AARAY - MID LENGTH LONER GAGE - MILLIOWTHS		THE STRAIN AN BOOFT EAST-NO. RAIL DEAT MID. BAGE -HILLIOWINS	THE STATH AT 300 FT RAST-NO. AASU SEAT LONGA GAGE -HELLIOUTHS	THE STORES AT ADD ST CASE LED LEVELS LEVELS AND CALLEGOURD	DEFLECTION AT MATH SADAY -MODER SUN OF THE TASK - SUCHES	DEFLECTION AT MAIN ARAY -HAIL MIDSPAN METHEN TIES-INCHES	INTERFACE STRESS MAIN ARRAY -110.RAIL SEAT OF SUSY TIE -PSI	INTERFACE STRESS MAIN ARRAT -MID LENGTH OF INST TIE	INTERFACE STRESS MAIN ARMAY -SO,RAFL SEAT OF 1887 71C	BATEHFACE STRESS MAIN ARRAY NO, RAIL SEAT OF LOAD THE	INIEAFACE STREES MAIN ARMAYMID LENGTH OF LOAD TIE	INTERFACE STRESS MAIN ARMAY -SOURAIL SEAT OF LOAD TIE	INTERFACE STRESS MAIN ARRAY -NORTH RAIL BETWEEN TIES -PSI	INTERFACE STRESS MAIN ARRAY -MID CARD SETUESH THES -PSI	THICHTACE STRESS MAIN ARRAY -SOUTH RAIL BETWEN TLES -PSI	RAIL SEAT FONCE WAIN ARRAY -NOTTH SEAT LOAD CELL TIE -HIPS	HAIL SEAF FORCE WAIN ARAT -SOUTH SEAF LOAD CELL TIE -KIPS	TIL BASE FONCE MAIN AWAAV -BASE PAD - 1 MORTH END -KIPS	TIE BASE FORCE MAIN ARRAY -BASE PAD - 2 -KIPS	TIE BASE FORCE MAIN ARRAY -BASE PAD - 3 - MIPS	TIE BASE FORCE MAIN ARRAY -BASE PAD - 4 - KIPS	THE BASE FONCE HAIN ANHAT HASE PAD + 5	IIE BASE FONCE MAIN ARRAT BASE PAD ~ 6	TIE BASE FORCE MAIN ARRAY -BASE PAD - 7 -KIPS		TIE BASE FORCE MAIN ARMAT TORSE FAU * 9 TIE BASE FORCE MAIN ARRAY -BASE FAD ~10 SOUTH END -MIPS	

-C22-

TABLE C22 - TEST DATA FOR TEST 2 ON SECTION 9

REDUCED RAIL DATA

		TSRCH							WH	CEL NU	MBCR			
			1	2	3	4	5	6	7	6		10	11	12
RAIL SYRAIN AT MAIN ARRAY -AT TIE -NORTH UPPER	GAGE -HILLIONTHS	29201	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	÷.•	
RAIL STRAIN AT MAIN ARMAY -AT THE -NORTH MID	GAGE -MILLIONTHS	29202	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0		
RAIL STRAIN AT MAIN ARRAY -AT TIF -NORTH LOWER	GAGE -MILLIONTHS	29203	0.0	0.0	0.0	0,0	0.0	0,0	0.0	0.0	0.0	0.0	0.0	
"RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH UPPER	GAGE -MILLIONTHS	29204	-90.0	-84.7	-94.4	-74-1	+50.8	-69.9	-68.8	-47.6	-56.1	-66.7	-61.4	-56.1
RAIL STRAIN AT MAIN ARRAY -AT TIE -SOUTH MID	GAGE -WILLIONTHS	29205	8.0	. 0.0	0,0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	
RAIL STRAIN AT HAIN ARRAY -AT TIF -SOUTH LOWER	GAGE -MILLIONTHS	29206	152.8	153.6	159.4	148.7	82,6	132,1	134.6	57,8	103.2	99.1	164,1	121.4
RATE STRATH AT NATH ARRAY -BETWEEN TIES UPPER	GAGE -HILLIONTHS	29207	-184.0-	182.9.	184.0-	170.0.	-144.4	-160.7	-164.2	-117.6	-121,1	-145.6	-168,9-	146.7
RAIL STRAIN AT MAIN ARRAY -BETWEEN TIES MID	GAGE -HILLIONTHS	29208	-44.2	-40.7	-44.2	-38.4	-34.9	-34.9	-38.4	-29.1	-30.2	-32.6	-26.7	-23.3
AATE STRATH AT MATH ARRAY -RETURN TIES LOJER	GAGE -HILLIONTHS	29209	163.1	166.5	172.4	151.4	146.7	166.5	163.1	137.4	125.8	160.7	170.0	163.1
RATI STRAIN AT 100 FT FAST-BETWEEN TIES UPPER	GAGE -MILLIONTHS	29210	-182.9-	189.8	180.5	157.2	-147.9	-180.5	-133.9	-97.8	-100.1	-159.6	-130.4-	135.1
RATI STRATH AT INA ET FAST-RETHEEN TIES MID	GAGE -MILLIONTHS	29211	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	Ó.0	0.0
BALL STRAIN AT 100 FT FAST-RETWEEN TIES LOWER	GAGE -MILLIONTHS	29212	0.0	0.0	0.0	0.0	0.0	. 0.0	0.0	0.0	0.0	0.0	0.6	0.0
TTE STRATH AT MAIN ARRAY -MO. PATE SEAT HPPER	GAGE WILLIONTHS	29213	-140.9	154.3	143.0	-131.7	164.6	-171.A	+164.6	-174.9	-170.8	-167.8-	-165.6-	166.7
TTE CTOATH AT NAVN AGOAY -NO MATE SEAT HID	GAGE -MILLIONTHS	29214	23.1	29.2	25.5	15.4	31.6	31.6	29.2	37.7	37.7	25.5	29.2	27.9
TTE STRATH AT MAIN ARRAY -MORALL CERT INHER	GAGE -MILLIONTHS	29215	201.6	224.1	224.1	178.8	234.3	249.0	227.5	245.6	252.4	227.5	234.3	226.3 -
TTE STRATH AT MAIN ARRAY -NTO I CHETH HOPES	GAGE -MILLIONTHS	29216	163.3	200.3	183.3	172.0	183.3	287.1	178.8	176.5	174.3	183.3	186.7	187.9
TIC CTAIN AT MAIN ADDAY -NTO ICHGTH IANGR	GACE -WILL LOUTHS	29217	0.0	0.0	0.0	0.0	8.0	8.0	0.0	8.0	0.0	8.6	0.0	
TIC STRATH AT SAN EY CAST_NO DATE SEAT HODER	GAGE -HILL BONTHS	29214	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	6.6	
TTE STRATH AT THE FT EAST-HOURATE SEAT MID	GAGE -HILL TONTHS	29222	n. 0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
TIE STRAIN AT 100 FT EAST-NO DATE SEAT 1000	GAGE -MILLIONINS	29223	10.1	15.4	11.5	12.9	16.9	16.9	10.1	12.4	16.9	18.1	12.9	15.4
TIC STRAIN AT SAN EY CART MID ICHCTH HADES	GAGE -HILLIONTHS	29224	6.6	6.0	0.6	0.0	0.0	0.0	6.0	0.0	0.0	0.0	9.8	9.8
TIC STRAIN AT THE ET CAST NO FINGTH TAUCH	GAGE WILL TONTHS	29225	-244.7	218.4	226.3	-210.5	-201.4	-186.7	-202.6	-141.1	-182.2	-167.5	212.8-	101.1
THE STRAIN AT INGS ADDAY JUNETH SHE AS ANOT		29123	n.1	6.9	6.2	6.2	0.2	0.2	4.2	0.2	0.2	0.2	6.2	8.2
DESTECTION AT MAIN ARRAY -NUMITIEND OF 1931 T	N TIESTHOUSE	29124	0.2	0.2	0.2	0.2	0.2	0.2	A.2	0.2	0.2	8.2	8.2	8.2
DEFECTION AT MAIN ANNAL THAT HUDTAN HELEC	7 115 -081	29118		0.A	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTERFACE STACAS MAIN ARAM -NO LENGTH OF INS	T TIE	29115		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	
INTERFACE STRESS HATM ABBAY SO BATH SEAT OF 143	7 776	29116	0.0	0.0	8.6	0.0	0.0	0.0	8.0	8.0	0.0	9.8		9.4
INTERFACE STRESS MAIN ARRAY HO BATH SEAT OF IGA	A TIC	29117		6.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	8.0		
INTERFACE STALES MAIN ABOAN _NIG SENCTH OF LOA		29116		0.0		0.4	0.0	8.0	6.0	0.0	0.0	0.0	8.6	0.4
THICKFACE STRESS HATH AMAN -SO DATS REAT OF LOW	0 71C	29119	n. .	0.0	4.0	6.6	0.0	6.0	0.8	0.0	0.0	0.0	8.0	6.8
INTERFACE STREAD HAIN ADDAY SHORTH BATT TETUERN	TICE -931	29120	6.6	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		6.6
INTERFACE ATTERS MAIN ADDAY -NTO CATE DETUELS	TICC _Bet	24121	0.0	0.0	. 6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0		8.8
THICKLACE PLACE HAIR ABOUT CONTR DATE DETWICE	1163	201 22		A . A	0.0	0.0	0.0	A. A	0.0	0.0	0.0	8.0		6.6
INTERFACE STRESS MAIN ARNAT -SOUTH HALL SETNELW	lits wat	20123					11 2	11.	18.7	12.1	12.4	10.4	11.2	12.1
RAIL SEAT FORCE PATH ANNAY -NONTH SEAT LUAD CEL	L 116 -K173	27121		7.0	7.3	7.3						10.9	7.1	
RAIL SEAT FORCE MAIN ARRAY -SOUTH SEAT LOAD CEL	L TIE -RIPS	27124	0.7	3.5		2.1			1,6		3.5	5.4	2.8	2.7
THE BASE FORCE MALK ARRAY -BASE PAD - 1 NORTH	END -KIPS	27129	2.0	2.1	2.1				2.0	2.3	4.3		1 5	
VIE BASE FORCE MAIN ARRAY -BASE PAD - 2	-RIPS	27130	2.5	· 4.7	- <u></u>		3.4	4.7	3,1	241	3.5	1.1	1.4	1.7
TIE BASE FORCE HAIN ARRAY -BASE PAD + 3	-RIPS	27131	2.7	3.1	3.1	3.0	3.8		3,3		3.3	3.3	1 3	
TIE BASE FORCE HAIN ARRAY -BASE PAD - 4	-KIPS	27132	9.9	1.0		0.7	1.8	1.0	1.1		1.3	4.5	4.4	
TIE BASE FORCE MAIN ARRAY -BASE PAD - 5	-KIPS	27133	9.0	0.0	0.0	0.0	0.0			0,0		2.0		
TIE BASE FORCE, MAIN ARRAY -BASE PAD - 6	-KIPS	27134	1.5	1.6	1.3	1.4	1.7		1.5	1.7	3.5			3 1
TIE BASE FORCE MAIN ARRAY -BASE PAD - 7	-KIPS	27135	1.7	1.7	1.5	1.9	2.5	<.1	1.0	2.0	2.6	1.9	1.7	2,3
TIE RASE FORCE MAIN ARRAY -BASE PAD - 6	-KIPS	27136	2.5	2.9	2.3	Z.9	2.0	£.9	2.0	2.3	2.0	2.1	1 7	2.1
TIE BASE FORCE MAIN ARRAY -BASE PAD - 9	-KIPS	29137	2.3	2.3	2.1	2.2	2.2	2.7	1.0	2.0	6.3	e.1	- 11	4 • •
TIE BASE FORCE MAIN ARRAY -BASE PAD -10 SOUTH	END -KIPS	27138	0.9	0.U		u.0	0.0	U. *		0.9	0.0	0,0	a.a	

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TABLE C23 - TEST DATA FOR TEST 3 ON SECTION 9

REDUCED RAIL DATA

			1															
	TERFU						WHEEL	NUMBE	R				13	14	15	16	17 1	18
		1 2	3	4	5	6	. 7		7	7.0-194		1.5	0.0	0.0	0.0	0.0	3.6 (0.0
TONTHE	19161	-215.5-198.0	-206.2-	193.3-1	44.2-18	9.8-19	1.0-14	4.2-17	3.3-11		3.7.2		0.0	0.0	0.0	8.0	0.0 (0.0
TIE -NORTH UPPER GASE -HILLIOHTHS	19102	-34.0 -55.2	-34.4	-30.9 -	24.5 -2	A.5 -2	26.1 -7	24.7 -4	1.3 -2	0 0 333	2 2 21		0.0	0.0	0.0	0.0	0,0 (0.0
TIE -NORTH MID GAGE -MILLIONTHS	39103	223.7 223.1	214.0	224.9 2	14,5 21	9,1 21	11.0 20	11.6 21	345 20	787 EE		7.6	0.0	0.0	0.0	e.0	0.0	0.0
TIE -NORTH LOWER GAGE -MILLIDATHS	89104	-173.0-159.1	-159.1-	143.0-1	59.1-13	6.1-16	51.4-14	17.6-16	8.4-14				0.0	0.0	0.0	0.0	0.0	0.0
TIE -SOUTH UPPER GAGE -MILLIUMTHS	10105	22 4 44.4	44.8	33.6	44.8 2	2.4 5	50.4 3	53.6 2	9.2 4			7.0	n A	6.0	0.0	0.0	0.0	0.0
TIE -SOUTH HID GAGE -MILLIONTHO	37103	320 4 211.2	199.6	199.5 2	11.2 21	7.0 21	17.0 24	15.5 23	4.1 21	1.0. 22			a a	0.0	0.0	0.0	0.0	0.0
TIE -SOUTH LOWER GAGE -HILLIONTHS	37106	210 0-208.	-213.1-	202.7-2	01.5-19	2.2-19	95.7-17	73.5-19	3.3-18	4.0-19	3.1-11			0.0	A A	0.0	6.0	0.0
WEEN TIES UPPER GAGE -HILLIONTHS	39107	-219,0-200,	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
WEEN TIES MID GAGE -MILLIONTHS	39100			342.3 2	20.1 24	5.8 21	27.1 21	17.8 23	18.4 22	8.3 24	6.9 25	9.9	0.0			0.0	0.0	0.0
WEEN TIES I DAER GAGE WILLIONTHS	39109	228.3 230.1	· · · · · · ·	112 0.1	24.6-13	5.1-12	26.9-1	15.3-13	50.4-12	3.4-14	4.4-11	3.0	0.0	0.0	0.0			0.0
WEEN TIES UPPER GAGE -MILLIONTHS	39110	-139,8-136.	5-133.7-	132.3-1	D.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0		A A	0.0
WERN THES MIN GAGE -MILLIONTHS	39111	0.0 0.1		167 0 1	140 1 17	9.4 1	57.2 1	38.6 15	59.6 17	1.2 18	0.5 14	7,9	0.0	0.0	8,0	0.0		0 0 0 0
WERN TTES LOUFE SIGE -HILLIONTHS	39112	173.5 1/1.	2 123.4	13/** 1		. 1 . 1	41.5-1	15.4-13	30.1-14	1.5-14	1.5-15	2.8	0.0	0,0	0.0			
BATH STAT HODER BASE -HILLIONTHS	39113	-181,1-175.	4-147-1-	125.0-1			15.8.	14.7]	16.9 1	5.8 2	0.3 1	6.9	0.0	0,0	0.9	0.0		
HALL SEAT MYD GAGE WHILL IONTHS	39114	21.5 23.	7 25.7	29.9	23.3 4		A1 & 1	00.2 10	06.7 10	9.9 10	8.3 10	8.3	0.0	0.0	0.0	6,0	0.0	0.0
RAIL SEAT HOUSE CASE -HILLIONTHS	39115	109.9 116.	4 198.5	116.4	34.6 11	344 1	76 8	AB 2 7	78.1 8	0.3 8	9.4 8	3.7	0.0	0.0	0.8	0,0	9.4	0.0
HATL SEAT LORER GAGE -MILL LONTHS	39116	78,1 87.	1 80.3	84.9	/0.1 0	1.02	0.4	a n	0.0	0.0	0.0	0.0	9.0	0.0	9,9	0,0	6.9	0.0
LENGTH OFFER GROC -HILL TOUTHS	39117	0.0 0.	0 0.0	0.0	0,9	U.N		A2 4.21	03.7-21	5-0-21	5.0-20	3.7	0.0	0.0	0.0	0.0	0.0	U. D
LENGIN LOWER GALL MILLIONTHS	39118	-215.0-215.	0-203.7.	-215.0-	214.0-22	26.4-2	17.0-1	72.9-60		7.4 10	A.9 A	4.3	0.0	0.0	0.0	0.0	0.0	C.O
RATE SEAT UPPER GAGE MILLIONTHS	39119	89.8 88.	7 85.4	89.8	88.7 9	36.0	82.1	81.0			0.0	0.0	0.0	0,0	0,0	0,0	0.0	6.8
RAIL SEAT HID GAGE MILLIOITHS	39128	n.a 0.	0 0.0	0.0	0.9	0.8	0.0	0.0	0.0		A. 0	0.0	0.0	0.0	0.0	0,0	0.0	0.0
RAIL SEAT LOWER GAGE MILLIONTHS	39121	0.0 0.	0 0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	8.0
LENGTH UPPER GAGE -MILLIONING	39122	0.0 0.	0 0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0 .	0.0	9.0	0.0	0.0
LENGTH LOWER GAGE -MILLIONTHS	39166	0.0 0.	0 0.0	0.0	0.0	0.0	0.0	0.0	0.0	u.u .	0.0		0.0	0.0	8.0	0.0	0.0	0.0
TH END OF INST TIE -INCHES	37207	0 0 0.	0 0.0	6.0	0.0	0.0	0.0	0.0	0.0	u.o	0.u			12.7	16.2	10.9	12.6 1	12.9
IL MIDSPAN RETWEEN TIES-INCHES	37210	12 0 13.	5 13.3	12.3	13.7	13.4	11.7	13.7	16.7	14.0 1	1.3			16.9	18.1	14.6	16.5	16.7
RATE SEAT OF INST THE -PSI	37211	14 0 16.	2 16.0	14.3	16.7	16.5	15.1	16.0	20.0	17.3 1	4.1			36 1	28 1	24.8	26.9	26.9
D LENGTH OF INST TIE	37212		0. 24.0	22.6	26.9	26.7	26.0	25.2	29.7 3	27.8 2	3.0		40.0	2011	37 7	14.2	20.8	21.5
BATL SEAT OF INST THE	39213	23,3 201	. 21 9	19.4	21.5	21.9	18.4	22.7	24.4 3	24.4 1	17,6	23.3	10.0	2141	23.7	18.7	19.8	19.6
BATH SEAT OF LOAD THE	39214	14.4 204	* 19 8	14.1	19.7	19.9	18.9	19.7	20.3 :	20.0 1	17.9	19+7	19.0	1740	20.5	37 1	39.6	28.9
D LENGTH OF LOAD TIE	39215	16.2 174	1 20.1	21.4	24.5	28.4	28.0	28.0	31.3	32.2 2	20.4	26.8	26.3	53.0	17 5		4.0	16.6
BATL SEAT OF LOAD THE	39216	24.2 20.		14 7	16.8	16.5	13.9	16.8	19.9	16:3 1	15.0 🔅	17.7	13.3	1307	4742	1111	0.0	0.0
ATU BATI ACTUCEN TIES -PSI	39217	13.6 16	2 15.5	17.1	1010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
A COLO BETHEEN TIES -PSI	39218	0.0 0.	0 0.0		14 2	13.0	13.1	13.2	16.5	15.3 1	11.8	13.8	12.2	13.9	34.4	12.0	19.1	4 4
WELL DATE DETUEEN TIES +PSI	39219	12.0 14	6 19.1	10.5	17.2	17 H	10.4	11.5	11.2	12.1	11.5	12.5	0.9	0.0	0.0			
ATH CEAT LOAD CELL THE HEIPS	39127	10.7 13	2 11.0	14.2	1.0	16 7	10.2	11.9	11.0	11.7	6.7	12.0	0,0	9.0	w.c	9,9	0.7	
TH SEAT LOAD CELL THE HIPS	; 39126	9,8 11	,4 9,4	10.9	10.1	2000	3 8	2.6	2.4	2.5	2.7	2.9	0.0	0.0	0.0	0.0	0.0	
UTH SEAT LUAD CELL THE WIPS	39129	i 2,4 3.	.0 2.4	2.9	2.3	2.9		2.0	1.6	1.9	1.9	2.2	0.0	0,0	0.0	8,0	0.0	0.0
SE PAD + 1 NURTH LAU -KIDE	39130	1,7 2	.2 1.7	2.2	1.6	2.3	1.1		0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0
SE PAD - 2	· 39131	0,0 0	.0 0.0	0.0	0.0	១.១	0.0	0.0		2.1	2.0	2.3	0.0	0.0	0.0	0,0	0.0	0.0
SE PAD - 3	39132	2.0 2	.4 2.0	2.4	1.8	2.4	1.9	2,1	<u> </u>			1.0	0.0	0.0	0.0	0.0	8.0	0.0
SE PAD + 4 -KIPS	39133	6.8 1	.1 0.9	1.1	.8.8	1.1	0.9	1.0	V.7	1.10		1.4	0.0	0.0	0.0	0.0	0.0	0.0
SE PAD - 5 -KIPS	1913	1.1 1	.4 1.1	1.3	1.1	1.3	1.2	1.3	1.4	143		3.3	0.0	0.0	0.0	0.0	D.0	. 0.0
SE PAD - 6 -RIPS	19110	1.8 2	.1 1.7	.2.0	1.8	5.0	1.8	2.1	2.0	2.1	1.0	2 . 2	A.0	0.0	0.0	0.0	0.0	6.0
SE PAD - 7 -KIPS	2913	2.8 3	.5 2.6	3.2	3.0	3.2	3.1	3.5	3,3	3.3		3.5	0.0	0.0	0.0	0.0	0.0	8.0
SE PAD - 8 -KIPS	37131	1.9.2	. i.e	2.2	2.1	2.2	2.2	2.6	2,3	2.4	1,6	6.3	~ ~	0.0	0.0	0.0	0.0	0.0
SF PAD - 9 -KIPS	3713		7 1.4	1.7	1.7	1.7	1.6	2.0	1.8	1.8	1.6	1.0		11 2	12.7	9.6	11.1	11.8
SE PAD -10 SOUTH END -KIPS	3713		3 12.0	11.2	12.5	12.5	10.3	12.4	13.7	14+1	9.5	12.3			14 4	11.6	14.9	13.7
ARTH SEAT LOAD CELL TIE -KIPS	3922	/ 10.5 16		10.0	14.2	13.6	13.6	13.3	15.3	16.6	9.7	12.3	15.3	13.7	2 4	2.5	9.6	2.6
WITH SEAT LOAD CELL TIE -KIPS	3922	5 11.2 13		7 2.4	2.8	2.7	2.4	2.9	3.0	3.3	2,6	5.0	2	2.1	3.8		2.0	1.9
SE DAD - 1 NORTH END -KIPS	3922	9 2.4 2				2.0	1.7	2.3	2.4	2.7	2.4	2,9	1.7	5.0	2.2		0.8	0.0
ASE PAD - 2 -KIPS	3923	0 1.8 2	.0 2.		6 A	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			2.2
-KIPS	3923	1 6.0 U	.0 0.		2.5	2.1	1.9	2.4	2.4	2.6	1.8	2.3	1.9	2.1	2.4	1.7		1.1
ASC PAU S J	3923	2 2.0 2	.2 2.	J 2.9	2.3		0.4	1.0	1.1	1.3	0.9	1.1	0.6	1.0	1.1	U. 6	1	
ASE PAD + + + + + + + + + + + + + + + + + + +	3923	3 0.9 1	.0 1.	1 '∀•8	1.0	1.1	1.2	1.3	1.5	1.7	1.3	1.3	1.2	1.4	1.5	1.2	1.7	1.4
ASL PAD . D	3923	4 1.2 1		1.1	1.4		1.6	1 0	2.2	2.4	1.4	1.8	1.8	2.0	2.1	1.7	2.1	2.0
ASE PAD + 6	3923	5 1.7 2	.0 2.	0 1.5	2.1	4.0	÷.,		1.7	3.8	2.0	2.9	3.0	3.5	3.7	2.8	3.7	3.4
ASE PAD = 7	3923	6 2.7 3	i.S 3.	3 2.5	3.6	3.5	5.3	3.3	3.6	3.1	1.6	2.2	2,1	2.4	2.5	1.9	2.7	2.4
ASE PAD - 8 -RIFS	3923	7 2.0 2	.4 2.	3 1.6	2.4	2.4	2.4	5.7	4 2	4.6	1.7	4.0	3.0	4.0	4.0	3.6	4.1	۹.0
ASE PAD - 9 -KIPS	3923	8 3.6 4	.0 3.	9 3.4	3.9	4.0	.4.1	4.0	9 . 4	11.4	11 14	11 14						
ASE PAD -10 SOUTH END -KIPS		32 97 32	.97 32.	66 32.6	6 32.80	32.AC	32.92	2 32.92	53.14	33,14	37,30	33,00	33 47	1 12 44	\$2.46	33.44	33.04	35.04
R TRAIN NUMBER 1 -KIPS	S	10 88 15	. 80 32	60 33.0	4 33.04	33,04	\$ 32,60	0 32,80	52.80	33.04	22.04	33,04	32,01	36.00	,			
A TO TH WINGER 2 -KIPS		32,00 34				÷												

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TABLE C24 - TEST DATA FOR TEST 4 ON SECTION 9

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</ 2.0 33.21 32.6 DATA RAIL REDUCED 49102 49105 49105 49105 49105 49105 49105 49119 19110 49119 19111 49112 19112 49112 19112 19112 19112 19112 19112 19112 19122 **TSRCH** MAIN MAAY -AT TE -MORTH UDDER GAE -MILLIONTHS MAIN ARAY -MITTE -SOUTH UDDER GAE -MILLIONTHS MAIN ARAY -METVECH TES UUDER GAE -MILLIONTHS MAIN ARAY -METVECH TES UUDER GAE -MILLIONTHS MAIN ARAY -METVECH TES UUDER GAE -MILLIONTHS MAIN ARAY -MOLTECH TES UUDER GAE -MILLIONTHS MAIN ARAY -MID LENGTH UDDER GAE -MILLIONTHS MAIN ARAY -MOLTECH TES UDDER GAE -MILLIONTHS MAIN ARAY -MID LENGTH UDDER GAE -MILLIONTHS MAIN ARAY -MID LENGTH UDDER GAE -MILLIONTHS MAIN ARAY -MOLTECH TES TO AND STATE MAIN ARAY -MOLTECH TES TO AND STATE MAIN ARAY -MOLTECH TES TO AND STATE MAIN ARAY -MOLTECH TES AND AND STATE MAIN ARAY -MORTH SEAT DOAD TEE MAIN ARAY -MOLTH SEAT DOAD TEE MAIN ARAY -MORTH SEAT DOAD TEE Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-Selly-8 SOUTH REA 1 STRESS MAIL STRESS MAIL STRESS MAIL STRESS MAIL FORCE MAIL RAIL STAIN A ALL S

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FIGURE C1 - RAIL VERTICAL ACCELERATION FOR TEST 3 ON WOOD TIE TRACK SECTIONS

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FIGURE C2 - RAIL VERTICAL ACCELERATION FOR TEST 4 ON WOOD TIE TRACK SECTIONS

-027-



FIGURE C3 - RAIL VERTICAL ACCELERATION FOR TEST 3 ON CONCRETE TIE TRACK SECTIONS 1 and 2

-C28-



FIGURE C4 - RAIL VERTICAL ACCELERATION FOR TEST 3 ON CONCRETE TIE TRACK SECTIONS 3 and 8

-029-





-C30-



FIGURE C6 - RAIL VERTICAL ACCELERATION FOR TEST 4 ON CONCRETE TIE TRACK SECTIONS 3 and 8

-C31-



FIGURE C7 - RAIL HORIZONTAL ACCELERATION FOR TEST 3 ON WOOD TIE TRACK SECTIONS

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FIGURE C8 - RAIL HORIZONTAL ACCELERATION FOR TEST 4 ON WOOD TIE TRACK SECTIONS



-C33-



FIGURE C9 - RAIL HORIZONTAL ACCELERATION FOR TEST 3 ON CONCRETE TIE TRACK SECTIONS 1 and 2

-C34-





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FIGURE C11 - RAIL HORIZONTAL ACCELERATION FOR TEST 4 ON CONCRETE TIE TRACK SECTIONS 1 and 2

-036-



FIGURE C12 - RAIL HORIZONTAL ACCELERATION FOR TEST 4 ON CONCRETE TIE TRACK SECTIONS 3 and 8

-C37-



FIGURE C13 - WOOD TIE RAIL SEAT ACCELERATION FOR TEST 3

-C38-



FIGURE C14 - WOOD TIE RAIL SEAT ACCELERATION FOR TEST 4

-C39-



FIGURE C15 - CONCRETE TIE RAIL SEAT ACCELERATION FOR TEST 3 ON SECTIONS 1 and 2

-C40-



FIGURE C16 - CONCRETE TIE RAIL SEAT ACCELERATION FOR TEST 3 ON SECTIONS 3 and 8

-C41-



FIGURE C17 - CONCRETE TIE RAIL SEAT ACCELERATION FOR TEST 4 ON SECTIONS 1 and 2

-C42-



FIGURE C18 - CONCRETE TIE RAIL SEAT ACCELERATION FOR TEST 4 ON SECTIONS 3 and 8 $\,$

-C43-



FIGURE C19 - WOOD TIE END ACCELERATION FOR TEST 3

-C44-



FIGURE C20 - WOOD TIE END ACCELERATION FOR TEST 4

-C45-



FIGURE C21 - CONCRETE TIE END ACCELERATION FOR TEST 3 ON SECTIONS 1 and 2

-C46-



FIGURE C22 - CONCRETE TIE END ACCELERATION FOR TEST 3 ON SECTIONS 3 AND 8

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FIGURE C23 - CONCRETE TIE END ACCELERATION FOR TEST 4 ON SECTIONS 1 AND 2

-C48-



FIGURE C24 - CONCRETE TIE END ACCELERATION FOR TEST 4 ON SECTIONS 3 AND 8

-C49-

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FIGURE C25 - WOOD TIE MIDLENGTH ACCELERATION FOR TESTS 3 AND 4

-050-



FIGURE C26 - CONCRETE TIE MIDLENGTH ACCELERATION FOR TEST 3

-C51-



FIGURE C27 - CONCRETE TIE MIDLENGTH ACCELERATION FOR TEST 4

-C52-

APPENDIX D BEAM AND SLAB TRACK DATA

Data reduced from oscillisgraph records are shown in Tables D2 to D30 for beam and slab track sections 4, 4-1, 5, 5-1, and 7. In addition, Table D1 lists details of engines monitored during the tests.

Concrete deflection data are listed in Table D2 to D6. Rail deflection data are listed in Tables D7 to D9. Soil pressure data are listed in Tables D10 to D14. Rail stress data are listed in Tables D15 to D22. Stresses in reinforcing bars are listed in Tables D23 to D26. Concrete stress data are listed in Tables D29 to D30.

TABLE D1 - ENGINES MONITORED FOR DATA ANALYSIS

Date	Test Section	Test Run	Engine No.	No. of Axles	Engine Weight, lb	Wheel Load, 1b
10/74	4 5 7	1 2 1 2 1 2	3127 3127 3127 3127 3127 3127 3127	4 4 4 4 4	265,000 265,000 265,000 265,000 265,000 265,000	33,100 33,100 33,100 33,100 33,100 33,100 33,100
12/74	4-1 4-2 5 5-1 7	1 2 1 2 1 2 1 2 1 2	3515 8755 5007 3615 5596 2645 6348 5687 5623 6311	4 6 6 4 6 4 4 6 6 4	262,500 391,500 391,500 265,000 391,500 258,100 262,500 391,500 391,500 262,500	32,800 32,600 32,600 33,100 32,600 32,300 32,800 32,600 32,600 32,800 32,800
4/75	4-1 4 5 5-1 7	1 2 1 2 1 2 1 2 1 2	8795 8773 5708 8715 5607 3605 5679 8725 3629 5013	6 6 6 6 4 6 4 6	391,500 391,500 391,500 391,500 391,500 265,000 391,500 391,500 265,000 391,500	32,600 32,600 32,600 32,600 32,600 33,100 32,600 32,600 32,600 33,100 32,600
Averaç Coeff	ge icient of	Varia	tion 0.8	38		32,800

-D2-
TABLE D2 - BEAM DEFLECTIONS, SECTION 4

Loc	ation	Run NO	10/3	28/74	12/10/74	4/11/75
		10.	Deflect 10/28/74 11 Creep 30 mph	30 mph	50 mph	
At	West	1	-	-	0.039	0.053
JOINC	East	1		_	0.046	0.063
	Average	1		—	0.043	0.058
	West	2	-	-	0.036	-
	East	2	-	-	0.052	0.054
	Average	2		-	0.044	0.054
	Average	1 & 2	-		0.043	0.056
At Middistance Between Joints		1	-	-	0.070	0.075
		2	—	-	0.700	0.072
	Average	1 & 2	-	-	0.070	0.074

TABLE D3 - BEAM DEFLECTIONS, SECTION 4-1

				Deflec	tion, in.	
Loc	Location		10/28	3/74	12/10/74	4/11/75
		NO.	Creep	30 mph	30 mph	50 mph
At	West	1	0.059	0.049	0.101	0.137
JOINC	East	1	0.050	0.042	0.108	-
	Average	1	0.055	0.046	0.105	0.137
	West	2	0.061	0.050	0.090	0.139
	East	2	0.050	0.044	0.116	-
	Average	2	0.056	0.047	0.103	0.139
	Average	1 & 2	0.055	0.046	0.104	0.138
At Mid Betwee	At Middistance Between Joints		0.036	0.028	0.067	0.098
		2	0.033	0.029	0.062	0.092
	Average	1&2	0.035	0.029	0.065	0.095

-D4-

TABLE D4 - SLAB DEFLECTIONS, SECTION 5

			Deflection, in.				
Loc	ation	Run No.	10/2	8/74	12/10/74	4/11/75	
			Creep	30 mph	30 mph	50 mph	
At	West	1	0.026	0.023	0.067	0.058	
	East	1	0.024	0.020	0.079	0.059	
	Average	1	0.025	0.022	0.073	0.059	
	West	2	0.031	0.026	0.059	0.056	
	East	2	0.024	0.021	0.067	0.061	
	Average	2	0.028	0.024	0.063	0.059	
	Average	1 & 2	0.026	0.023	0.068	0.059	
At Middistance Between Joints		1	0.020	0.014	0.060	0.045	
		2	_ ·	-	0.047	0.034	
	Average	1 & 2	0.020	0.020	0.054	0.040	

TABLE D5 - SLAB DEFLECTIONS, SECTION 5-1

				Deflec	tion, in.		
Log	ation	Run	10/2	8/74	12/10/74	4/11/75	
LICCACION		NO.	Deflection, in. 10/28/74 12/10/74 4/11 Creep 30 mph 30 mph 50 m - - 0.030 0.0 - - 0.030 0.0 - - 0.039 0.0 - - 0.035 0.0 - - 0.036 0.0 - - 0.036 0.0 - - 0.036 0.0 - - 0.038 0.0 - - 0.036 0.0 - - 0.038 0.0 - - 0.036 0.0 - - 0.036 0.0 - - 0.031 0.0	50 mph			
At	West	1	-	-	0.030	0.037	
Joint	East	1	-		0.039	0.042	
,	Average	1	-	_	0.035	0.040	
•	West	2	_	-	0.036	0.038	
	East	2	-	-	0.040	0.035	
	Average	2	-	-	0.038	0.037	
	Average	1 & 2	-	-	0.036	0.038	
At Middistance Between Joints		1	-	-	0.028	0.037	
		2	-	-	0.034	0.038	
	Average	1&2	-	-	0.031	0.038	

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TABLE D6 - BEAM DEFLECTIONS, SECTION 7

			Deflection, in.				
Log	ation	Run	10/2	3/74	12/10/74	4/11/75	
Docation		NO.	Creep	30 mph	30 mph	50 mph	
At	West	1	0.043	0.048	0.126	0.188	
JOINE	East	1	0.038	0.045	0.135	0.187	
,	Average	ុា	0.041	0.047	0.131	0.188	
	West	2	0.050	0.055	0.115	0.181	
	East	2	0.045	0.048	0.130	0.167	
	Average	2	0.048	0.052	0.123	0.174	
	Average	1 & 2	0.044	0.049	0.127	0.181	
At Middistance Between Joints		1	0.029	0.029	0.130	0.162	
		2	0.033	0.035	0.114	0.171	
	Average	1 & 2	0.031	0.032	0.122	0.167	

TABLE D7 - RAIL DEFLECTIONS, SECTION 4

4		Deflection, in.					
Terrier	Run	10/2	28/74	12/10/74	4/11/75		
LOCALION	NO.	Creep	30 mph	30 mph	50 mph		
North Rail	2	0.014	0.015	0.025	0.014		
South Rail	2	0.014	0.024	0.018	0.033		
Average	2	0.014	0.020	0.022	0.024		

			Defle	ction, in.			
Location	Run	10/	10/28/74 12/10/74		4/11/75		
Location	, NO.	Creep	30 mph	30 mph	50 mph		
North Rail	2	0.018	0.020	0.034	0.036		
South Rail	2	0.033	0.031	0.039	0.031		
Average	2	0.026	0.026	0.037	0.034		

TABLE D8 - RAIL DEFLECTIONS, SECTION 5

TABLE D9 - RAIL DEFLECTIONS, SECTION 7

			Defle	ction, in.		
Logation	Run	10/2	28/74	12/10/74	4/11/75	
Hocación	NO.	Creep	30 mph	30 mph	50 mph	
North Rail	2	0.034	0.035	0.016	0.033	
South Rail	2	0.051	0.053	0.035	0.020	
Average	2	0.043	0.045	0.026	0.027	

-D10-

			1	Pre	essure, psi	
Lo	cation	Run	10/2	8/74	12/10/74	4/11/75
			Creep	30 mph	30 mph	50 mph
At	North Rail	1	_	-	5.7	-
Joint	South Rail	1		-	3.4	12.5
	Average	1				
	North Rail	2	- -	-	7.6	11.9
	South Rail	2		-	5.8	13.3
	Average	2				
	Average	1 & 2		-	5.6	12.6
At Mid-	North Rail	1	-	-	17.5	16.3
distance	South Rail	1	-	. 	14.9	7.3
Between	Average	1				
Joints	North Rail	2	-	-	24.8	20.8
	South Rail	2	-	, -	34.9	6.9
	Average	2				
	Average	1 & 2		-	23.0	12.8

TABLE D10 - SOIL PRESSURES, SECTION 4-1

TABLE D11 - SOIL PRESSURES, SECTION 4

				Pre	ssure, psi	
с Т. т. т.		Run	10/28/74		12/10/74	4/11/75
LOC	ation	NO.	Creep	30 mph	30 mph	50 mph
At	North Rail	1	6.2	3.2	12.5	16.1
Joint	South Rail	1	1.3	1.9	12.0	7.5
	Average	1			F	
	North Rail	2	5.2	3.0	12.6	9.0
	South Rail	2	0.9	2.2	13.7	5.8
	Average	2				
	Average	1&2	3.4	2.6	12.7	9.6
At Mid-	North Rail	1	4.4	2.4	12.2	10.3
distance	South Rail	1	2.4	1.5	5.7	16.8
Between	Average	1				
Joints	North Rail	2	3.9	2.7	17.3	9.9
	South Rail	2	2.1	1.5	8.0	18.1
	Average	2				
	Average	1 & 2	3.2	2.0	10.8	13.8

TABLE D12 - SOIL PRESSURES, SECTION 5

			Pressure, psi				
T og	ation	Ruń	10/28/74		12/10/74	4/11/75	
hocación		NO.	Creep	30 mph	30 mph	50 mph	
At	North Rail	1	2.6	1.9	15.4	4.1	
Joint	South Rail	1	3.4	1.5	31.5	5.1	
	Average	· 1					
	North Rail	2	10.0	8.4	11.9	4.5	
	South Rail	2	1.4	0.8	25.7	4.3	
	Average	2					
	Average	1&2	4.4	3.2	21.1	4.5	
At Mid-	North Rail	1	16.2	12.9		-	
distance	South Rail	1	8.7	8.1	13.4	- -	
Between	Average	1					
Joints	North Rail	2	10.3	9.5	– .	-	
	South Rail	2	2.8	2.2	8.3	-	
	Average	2					
	Average	1&2	9.5	8.2	10.9	_	

TABLE D13 - SOIL PRESSURES, SECTION 5-1

			Pressure, psi			
Too	ation	Run	10/28/74		12/10/74	4/11/75
LOC	ation	NO.	Creep	30 mph	30 mph	50 mph
At	North Rail	1	-		18.3	_
Joint	South Rail	1	. .	· —	2.1	5.5
	Average	1				
	North Rail	2	-		24.0	· -
	South Rail	2	-	-	3.5	6.7
	Average	2				
	Average	1&2	-	_	12.0	6.1
At Mid-	North Rail	l	-	_	6.9	-
distance	South Rail	1	-	-	2.0	6.2
Between	Average	1				
Joints	North Rail	2		_	9.9	-
	South Rail	2	-	-	3.4	8.1
	Average	2				
	Average	1 & 2	-	_	5.6	7.1

TABLE D14 - SOIL PRESSURES, SECTION 7

				Pre	ssure, psi	
Too	ation	Run	10/2	8/74	12/10/74	4/11/75
	ación	NO.	Creep	30 mph	30 mph	50 mph
At	North Rail	1	0.8	-	17.6	7.6
Joint	South Rail	1	.1.1	1.3	20.8	9.0
, , .	Average	1				
	North Rail	2	0.2	-	10.5	8.7
	South Rail	2	0.4	-	16.7	15.7
	Average	2				
	Average	1&2	0.6	1.3	16.4	10.2
At Mid-	North Rail	1	9.2	7.1	9.5	-
distance	South Rail	1	8.2	9.4	1.5	23.3
Between	Average	1				
Joints	North Rail	2	5.9	6.5	4.9	-
	South Rail	2	9.5	19.1	1.1	9.1
	Average	2				
	Average	1 & 2	8.2	10.5	4.3	16.2

TABLE D15 - RAIL STRESS AT FASTENER, SECTION 4

				·				
			Stress, psi					
Location on	Rail Location	Rail Side	10/28/74		12/10/74	4/11/75		
Cross Section			Creep	30 mph	30 mph	50 mph		
_{Top} (-)	North North South South	Field Gage Gage Field	8,342 6,667 3,633 4,426	8,996 6,841 3,508 4,695	7,320 7,320 6,177 8,542			
	Average		5,767	6,010	7,340	3,825		
Middle(-)	North North South South	Field Gage Gage Field	1,324 1,364 1,290 -	2,021 1,031 645 -	_ 1,661 1,676 _	1,346 _ _ _		
	Average		1,326	1,232	1,669	1,346		
Bottom(+)	North North South Scuth	Field Gage Gage Field	6,330 5,419 3,637 4,091	6,146 7,044 4,052 4,246	7,410 7,226 6,770 6,331	2,252 2,222 - -		
	Average		4,869	5,372	6,934	2,237		

(-) Stresses are Compression(+) Stresses are Tension

-D16-

1 7

TABLE D16 - RAIL STRESS AT FASTENER, SECTION 5

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Strain Gage	Rail		Stress, psi					
Location on Cross Section	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75		
			Creep	30 mph	30 mph	50 mph		
Тор(-)	North North South South	Field Gage Gage Field	9,040 8,572 9,200 7,307	7,040 8,313 10,053 6,672	- 6,438 3,828	5,152 5,231 3,992 5,217		
	Average		8,530	8,020	5,133	4,898		
Middle(-)	North North South South	Field Gage Gage Field	2,355 1,410 2,040	2,771 1,234 2,578 -	_ 1,218 _	936 763 1,038 -		
	Average		1,935	2,194	1,218	912		
Bottom(+)	North North South South	Field Gage Gage Field	6,388 8,096 6,990 7,360	7,036 7,452 7,028 7,517	3,074 3,335 4,176 4,031	4,370 4,758 5,257 4,079		
	Average		7,209	7,259	3,654	4,616		

TABLE D17 - RAIL STRESS AT FASTENER, SECTION 5-1

Strain Gago			Stress, psi					
Location on	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75		
Closs Section			Creep	30 mph	30 mph	50 mph		
Top(-)	North North South South	Field Gage Gage Field		 	- 5,257 5,650	4,067 2,880 - 3,128		
	Average		-		5,454	3,358		
Middle(-)	North North South South	Field Gage Gage Field	- - - -		- 765 1,479 -	- 704 - -		
	Average		-	_	1,122	704		
Bottom(+)	North North South South	Field Gage Gage Field	- - - -		- 4,266 6,264	3,413 1,772 5,675 4,162		
	Average		-		5,265	3,756		

(-) Stresses are Compression(+) Stresses are Tension

-D18-

TABLE D18 - RAIL STRESS AT FASTENER, SECTION 7

Strain Gage			Stress, psi					
Location on Cross Section	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75		
			Creep	30 mph	30 mph	50 mph		
Top(-)	North North South South	Field Gage Gage Field	8,309 9,851 7,917	9,206 4,584 12,456 7,472	5,182 5,714 6,576	4,976 5,011 3,827 -		
	Average		8,692	8,430	5,824	4,605		
Middle(-) Nor Nor Sou Sou	North North South South	Field Gage Gage Field	2,139 1,142 2,061 1,761	2,956 1,001 2,006 1,078	2,327 1,257 _ _	1,544 1,600 759 841		
	Average		1,776	1,760	1,792	1,186		
Bottom(+)	North North South South	Field Gage Gage Field	9,010 4,864 8,053 7,851	9,932 4,634 8,471 8,832	4,898 4,774 5,505 5,561	5,528 4,711		
	Average		7,445	7,967	5,185	5,120		

TABLE D19 - RAIL STRESS BETWEEN FASTENER, SECTION 4

			Stress, psi					
Location on	Rail Location	Rail Side	10/28/74		12/10/74	4/11/75		
Cross Section			Creep	30 mph	30 mph	50 mph		
Top(-)	North North South South	Field Gage Gage Field	6,680 5,568 8,832 6,114	6,036 4,416 7,210 4,824	- 5,992 5,432	- 3,696 3,605 3,593		
	Average		6,799	5,634	5,712	3,698		
Middle(-)	North North South South	Field Gage Gage Field	1,405 2,019 1,927 1,529	1,192 1,136 - 1,476	1,380 1,818 1,406 1,212	822 1,063 824 -		
	Average		1,720	1,268	1,454	903		
Bottom(+)	North North South South	Field Gage Gage Field	6,798 4,623 5,511 5,031	4,218 5,106 4,946 4,304	4,873 - 4,993 4,911	3,028 3,660 5,419 3,886		
	Average		5,491	4,644	4,926	3,998		

TABLE D20 - RAIL STRESS BETWEEN FASTENER, SECTION 5

Strain Gage			Stress, psi				
Location on	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75	
Closs Section			Creep	30 mph	30 mph	50 mph	
Top (-)	North North South South	Field Gage Gage Field	6,140 5,692 8,057 7,377	- 5,888 6,818 6,442	3,654 7,482 3,973	3,062 3,637 4,106 2,998	
	Average		6,817	6,383	5,036	3,451	
Middle(-)	North North South South	Field Gage Gage Field	1,909 1,258 2,425 1,325	1,137 1,285 1,582 1,016	1,392 1,508 1,392 812	1,204 823 726 721	
	Average		1,729	1,255	1,276	871	
Bottom(+)	North North South South	Field Gage Gage Field	5,770 4,328 4,728 -	5,770 3,767 -	4,582 4,147	- 4,694 3,741	
	Average		4,942	4,769	4,365	4,218	

TABLE D21 - RAIL STRESS BETWEEN FASTENER, SECTION 5-1

Strain Gage			Stress, psi					
Location on Cross Section	Rail Location	Rail Side	10/28/74		12/10/74	4/11/75		
			Creep	30 mph	30 mph	50 mph		
Top(~)	North North South South	Field Gage Gage Field			3,651 4,727 6,206 7,250	3,238 2,579 5,578 4,156		
	Average	ι, τ		, –	5,459	3,888		
Middle(-)	North North South South	Field Gage Gage Field	- - - -		1,843 - 1,160 1,450	981 505 822 -		
	Average			-	1,484	769		
Bottom(+)	North North South South	Field Gage Gage Field	- - -	- - - -	_ _ 5,626 5,800	3,533 4,005 5,888 4,703		
	Average			-	5,713	4,532		

TABLE D22 - RAIL STRESS BETWEEN FASTENER, SECTION 7

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Strain Gage				Stre	ss, psi	· · · · · · · · · · · · · · · · · · ·
Location on	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75
			Creep	30 mph	30 mph	50 mph
Top(-)	North North South South	Field Gage Gage Field	6,006 6,423 8,327 -	4,332 5,701 9,265	6,351 - 6,757 5,191	4,084
	Average		6,919	6,433	6,100	3,740
Middle(-)	North North South South	Field Gage Gage Field	2,129 1,932 2,019 1,659	1,597 1,812 - -	1,363 1,653 1,102 1,537	1,151 1,038
	Average		1,935	1,705	1,489	1,095
Bottom(+)	North North South South	Field Gage Gage Field	6,936 4,762 5,625 6,431	6,721 4,493 4,881 5,933	- - 5,684 5,887	-
	Average		5,939	5,507	5,786	_

TABLE D23 - REBAR STRESS, SECTION 4

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Tanalia	Strain Gage				Stre	ss, psi	
in Track	Location on Cross	Rail Location	Rail Side	10/	28/74	12/10/74	4/11/75
· · · · · · · · · · · · · · · · · · ·	Section			Creep	30 mph	30 mph	50 mph
At Joint	_{Тор} (-)	North North South South	Field Gage Gage Field	- 1,664 -	_ 1,572 _	7,764 3,241	2,713 - 7,103 8,197
		Average		1,664	1,572	5,503	6,004
	Bottom(+)	North North South South	Field Gage Gage Field	- 2,815 3,395	_ 3,132 3,424	- 3,719 3,674	- 2,944 2,313
		Average		3,105	3,278	3,697	2,629
At Mid- distance Between Joints	тор(-)	North North South South	Field Gage Gage Field	345 - 837 880	431 1,162 	464 667 - -	491 570 2,975 1,550
		Average		687	818	566	1,397
	Bottom(+)	North North South South	Field Gage Gage Field	306 448 131 300	424 312 493 584	203 203 221 295	253 426 576 590
		Average		296	453	231	461

TABLE D24 - REBAR STRESS, SECTION 5

	Strain Gage			Stress, psi					
Location in Track	Location on Cross	Rail Location	Rail Side	10/3	28/74	12/10/74	4/11/75		
	Section			Creep	30 mph	30 mph	50 mph		
At Joint	Top(-)	North North South South	Field Gage Gage Field	448 401 301 -	285 385 435 -	1,161 2,372 1,349 -			
•		Average		383	368	1,627	-		
	Bottom(+)	North North South South	Field Gage Gage Field	2,008 2,037 2,055	1,790 1,576 1,855	1,252 1,294 1,067 1,409	2,067 1,091 1,345		
		Average		2,033	1,740	1,256	1,501		
At Mid- distance Between Joints	тор(-)	North North South South	Field Gage Gage Field	633 712 392 417	- 361 272 433	- - 563 -	- - 463 262		
		Average		539	389	563	363		
	Bottom (+)	North North South South	Field Gage Gage Field	190 266 552 372	317 205 418 434	- - 385 445	- - - -		
		Average		345	344	415			

TABLE D25 - REBAR STRESS, SECTION 5-1

	Strain Gage				Stre	ss, psi	
Location in Track	Location on Cross	Rail Location	Rail Side	10/2	28/74	12/10/74	4/11/75
	Section			Creep	30 mph	30 mph	50 mph
At Joint	Top(-)	North North South South	Field Gage Gage Field	. . .		464 - 408 -	- 204 269
		Average		-	-	436	237
	Bottom(+)	North North South South	Field Gage Gage Field	 - -		174 87 174 232	234 - 356 374
		Average			_	167	321
At Mid- distance Between Joints	Top(-)	North North South South	Field Gage Gage Field			601 310 203 203	282 420 325 153
		Average		-	-	329	295
	Bottom(+)	North North South South	Field Gage Gage Field	- '		116 87 - 58	193 62 86 -
		Average		-	_	87	114

TABLE D26 - REBAR STRESS, SECTION 7

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	Strain Gage				Stress,		psi	
Location in Track	Location on Cross	Rail Location	Rail Side	10/28/74		12/10/74	4/11/75	
	Section			Creep	30 mph	30 mph	50 mph	
At Joint	_{Top} (-)	North North South South	Field Gage Gage Field	1,091 992 736 -	1,091 1,537 - -	841 667 812 -	6,864 2,361 2,582 -	
	a a second	Average		940	1,314	773	3,936	
	Bottom(+)	North North South South	Field Gage Gage Field	1,857 1,322 2,137 2,799	2,116 1,860 2,273 2,609	2,233 2,929 3,190	6,695 _ 2,643 1,610	
		Average		2,029	2,215	2,784	3,649	
At Mid- distance Between Joints	_{Тор} (-)	North North South South	Field Gage Gage Field	694 724 1,148 -	645 724 1,349 -	1,653 1,392 783 725	2,411 1,975 3,340 3,182	
		Average		855	906	1,138	2,727	
	Bottom (+)	North North South South	Field Gage Gage Field	378 414 1,061 1,036	441 468 1,424 1,282	1,566 1,624 667 783	1,605 1,764 2,727 2,965	
		Average		722	904	1,160	2,265	

TABLE D27 - CONCRETE STRESS, SECTION 4

			·			in the second second
	Strain Gage		Sti		ess, psi	
Location in Track	Location	Rail Location	10/2	8/74	12/10/74	4/11/75
	OII STAD		Creep	30 mph	30 mph	50 mph
At Joint	Top(-)	North South Average	36 102 69		20 96 58	-
	Bottom(+)	North South Average		- - -	24 - 24	
At Mid- distance Between Joints	_{тор} (-)	North South Average	85 140 113	106 47 77	32 32 32	29 101 65
	Middle(+)	North South Average	-		- 48 48	- 65 65
	Bottom(+)	North South Average		-	116 404 260	_ 149 149

(-) Stresses are Compression(+) Stresses are Tension

-D28-

TABLE D28 - CONCRETE STRESS, SECTION 5

Toophion	Strain Gage	_		St	ress, psi	
in Track	Location on Slab	Rail Location	10/2	10/28/74		4/11/75
			Creep	30 mph	30 mph	50 mph
At Joint	Top(-)	North South Average	89 75 82	6 <u>3</u> 63	56 69 63	- 50 50
and the second state of the second state of the	Bottom (+)	North South Average	57 72 65	86 82 84	59 77 68	, _ 36 36
At Mid- distance Between Joints	Тор(-)	North South Average	26 44 35	21 23 22		- - - - - - -
	Middle(+)	North South Average	- 28 28	- 18 18	- - -	
	Bottom(+)	North South Average	58 74 66	59 76 68	- -	_ _ _

TABLE D29 - CONCRETE STRESS, SECTION 5-1

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	Chroin Cogo			Sti	ess, psi	
Location in Track	Location	Rail Location	10/28/74		12/10/74	4/11/75
	OII STAD	1	Creep	30 mph	30 mph	50 mph
At Joint	Top(-)	North South Average			56 52 54	40 24 32
	Bottom(+)	North South Average			40 - 40	57 109 83
At Mid- distance Between Joints	Top(-)	North South Average	- - -		20 20	
	Middle(+)	North South Average		- - - -	32 - 32	- - -
	Bottom(+)	North South Average			- 44 44	- - -

(-) Stresses are Compression(+) Stresses are Tension

-D30-

TABLE D30 - CONCRETE STRESS, SECTION 7

1		P II	Stress, psi			
Location in Track	Strain Gage Location	Rail Location	10/28	8/74	12/10/74	4/11/75
	on Slab		Creep	30 mph	30 mph	50 mph
At Joint	Top(-)	North South Average		- - -		
	Bottom(+)	North South Average	-		-	
At Mid- distance Between Joints	Top(-)	North South Average	86 101 94	100 65 83	236 236	289 289
N N	Middle(+)	North South Average	76 58 67	61 68 65	68 - 68	70 - 70
	Bottom(+)	North South Average	146 240 193	157 257 207	56 - 56	230 230

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APPENDIX E

ACCELEROMETER DATA REDUCTION PROCEDURE

Data obtained from the accelerometers attached to the rails and ties were recorded on magnetic tapes. The tapes and a compatible tape recorder were forwarded to ENSCO, Inc. for data reduction. The approach and procedure used for accelerometer data reduction are described in this Appendix.*

A two-phase approach was proposed for the reduction of the data. The first phase was to review the data and to provide frequency domain analysis in the form of Power Spectral Densities (PSD's). A second phase was suggested to provide time domain descriptors for the recorder signals.

Initially, it was proposed to digitize the data using a FAST Fourier Transform (FFT) techique to develop analog plots of the Power Spectral Densities. However, later it was decided to proceed with a much wider frequency range than was originally discussed. The maximum frequency range of interest for the data was increased to a range of 0 to 20 KHz. To facilitate this type of analysis, a change from a digital to an analog approach was suggested. The analog approach uses a Ubiquitous Spectrum Analyzer.

Data and Data Reduction Procedure

The data to be processed consisted of recorded time histories from high frequency accelerometers. The accelerometers were attached to one rail of the railroad track and data were collected for the passing of a train consist. The accelerometers were oriented in either the vertical or lateral direction. Data were collected on a 14-channel tape recorder at a speed of 30 inches per second. This provided for a flat frequency response from 0 to 10 KHz. The accelerometers were of the high frequency variety, with flat frequency response beyond the 10 KHz bandwidth tape recorder. The arrangement of the data on

^{*&}quot;Data Tape Analysis," Ensco, Inc. Report prepared for the Portland Cement Association, November 1976.

tape is shown in Table El. Scale factors for each channel are given in Table E2.

A Ubiquitous Spectrum Analyzer was used for data reduction. The data reduction system is shown in flow chart form in Figure El.

Since it was expected that the bandwidth of data collected would be 0 to 10 KHz, this range was first considered for use. However, some of the data (particularly the data collected in January) produced a spectrum with content beyond the 10 KHz frequency. This could be a result of exceeding the linear range of operation of the tape recorder system. A 0 to 20 KHz range was used for all analysis unless the resulting spectrum showed that a smaller frequency range of the UA500 could be used. For instance, if the power spectral density produced no spectral content above 5 KHz, the data was reprocessed, using the frequency range 0 to 5 KHz.

The processing bandwidth of the UA500 Spectrum Analyzer (SA) is 1/500 of the full range frequency. Thus, for the 0 to 20 KHz range, the processing bandwidth is 40 Hz. For 5 KHz, the full scale frequency resolution is 10 Hz. To assign a full scale level to the power spectral densities generated, the following equation is used:

Full Scale PSD = $10 \log_{10} \left\{ \frac{0.79}{\beta} (V_{rms} xSF)^2 \right\}$ - Spectrum Gain Setting where β = processing bandwidth

V = full scale input setting SF = scale factor (g's/volt)

The full scale PSD level measured in db is relative to lg^2_{rms}/Hz . A data reduction sheet was generated for each power spectral density. All important parameters, including the sensitivity of the accelerometer and the various setting of the Ubiquitous Spectrum Analyzer were recorded on this data sheet. A sample data reduction form is shown in Figure E2.

In all cases, the duration of the analyzed record was 3.2 seconds. For a frequency range of 0 to 20 KHz, this provided 128 independent estimates of the PSD which were averaged by the

-E2-

TABLE E1 - ARRANGEMENT OF DATA ON TAPE

FOOTAGE COUNTER	DESCRIPTION	FOR DATA SEGMENT NO.
17	"Testing 1,2,3" (No data following)	
45	"Test Section 1, Jan. 8, 1975"	1
228	"Section 9, Run 3, Jan. 9"	2
472	"Section 8, Run 3, Jan. 9, Accelerometers"	3
732	"Section 6, Run 3, Jan. 11, Afternoon"	4
921	"Section 3, Run 3, Jan. 12"	5
1144	"Section 2, Run 3, Jan. 13"	6
1314	BEGIN CALIBRATION	
1329	END CALIBRATION	7
1548	"Section 9, Run 3, April 21, 1975"	8
1866	"Section 8, Run 3, April 22, 1975"	9
2035	"Section 6, Run 3, April 23, 1975"	10
2330	"Section 3, Run 3, April 24, 1975"	11
2648	"Section 2, Run 3, Delayed To April 25, 1975"	12
2886	"Section 1, Run 3, April 25, 1975, 5 P.M."	13

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TABLE E2 - CHANNEL SCALE FACTORS

		Calibration, g/vol	
Tape Channel	Item	January Test	April Test
1	North Rail-Vertical	13.71	54.05
2	North Rail-Horizontal	15.68	60.98
3	South Rail-Vertical	13.31	51.73
4 , •••	South Rail-Horizontal	13.70	53.48
5	Tie-North End-Vertical	17.65	68.70
7	Tie-North Rail Seat-Vertical	13.91	53.69
8	Tie-Mid Length-Vertical	14.13	55.79
9	Tie-South Rail Seat-Vertical	` 13.89	54.80
10	Tie-South End-Vertical	13.34	52.56

-E4-



FIGURE E1 - DATA REDUCTION PROCEDURE

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Date:
Operator:
Tape Recorder Channel Number:
Test Section: Collection Date:
Accelerometer Scale Factor: g/volt
UA-500-1 UBIQUITOUS SPECTRUM ANALYZER
Analysis Range: Hz
Number of Spectra:
Averaging Method:
Instantaneous Spectrum Gain: DB
Input Amplitude: V _{rms} Full Scale Beta (Nominal Bandwidth):
Full Scale Spectrum Level =
10 $\log_{10} \{ \frac{0.79}{\beta} (V_{rms} * SF)^2 \}$ - Spectrum Gain
10 $\log_{10} \left\{\frac{0.79}{\beta}\right\} + 20 \log_{10} (V_{rms}) + 20 \log_{10} (SF) - Spectrum Gain$
FIGURE E2 - SAMPLE DATA REDUCTION FORM
spectrum analyzer. For the 0 to 10 KHz, 64 independent samples were available for averaging. A total of 32 samples were averaged for the 0 to 5 KHz range.

The procedure for using the data reduction signal was as follows:

- Set up Spectrum Analyzer for expected frequency range and input level.
- 2. Position tape at beginning of section of interest.
- 3. Start tape recorder.
- 4. Observe oscilloscope for onset of signal.
- 5. Start Spectrum Analyzer.
- 6. Complete data sheet.
- 7. Plot data.

Results

Over 150 PSD curves were generated from the combination of 12 tests and the nine accelerometers per test. The format of the curves is PSD level in db (relative to $\lg^2_{\rm rms}/\rm Hz$) versus linear frequency. The full scale range for the PSD is calculated for each curve and rounded to the nearest whole number and recorded on each curve. The Spectrum Analyzer provides approximately 60 db on dynamic range for the plots shown.

A sample length of 3.2 seconds was taken from the available data record and analyzed in all cases. The importance of the position in the total data record (beginning, middle, and end) from which the 3.2 second sample was taken, is illustrated in Figure E3. The two spectra marked "beginning spectrum" were generated by starting the Spectrum Analyzer at the beginning of the data record. These are very similar. A second PSD marked "middle spectrum" was generated by starting the Spectrum Analyzer in the middle of the data record. The third PSD was generated from a time sample taken at the end of the data record. While it has the shape of previous spectrum, it is 4 to 8 db higher in spectral level than the previous curves.



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APPENDIX F TEST TRACK INSTRUMENTATION

The purpose of this appendix is to describe and discuss the instrumentation used on the Kansas Test Track. Design, installation, and monitoring of the instrumentation are considered. In general, PCA instrumentation functioned properly. Most of the problems encountered were associated with delays in the project, adjustments and changes in the track condition, construction activities, and weather. Special emphasis is placed on those aspects needed to avoid difficulties in future work.

As outlined in Table F1, each instrument consisted of a sensor connected to a recorder through a long electrical cable. In some instances, there were intermediate items between the sensor and the long cable. These included such equipment as boxes, attenuators, zero balance units, etc. These items are identified as Box A and Box B.

At the recorder end of the cable, there was always an entry connection to the van followed by a connection to the recorder. In one case there was a power supply between van entry and recorder. This item is called Box C. Table F1 lists all instrumentation with descriptive labels for Boxes A, B, and C. Reference will be made to this table as each item is discussed.

Common Components

Instrumentation and recording equipment common to all test sections are discussed.

Electrical Cables

Seventy-five feet of our conductor shielded cable was used between the van and the sensor at the test section. Belden 8728 Strain Gage cable was used. An Amphenol MS3106A-14S-5P was used at each end of the cable. Prior to each field trip, the continuity of the four conductors and shield was checked. A cable check box was also used in the field to identify problems caused by cable open circuits.

-F1-

TABLE F1 - INSTRUMENTATION COMPONENTS

SENSOR	BOX A	BOX B	BOX C	RECORDER
Shannon & Wilson Embankment Multiple Extensometer Single Extensometer Horizontal Extensometer Pressure Cell	Junction Box	A and Z* A and Z* Attenuate A and Z*	- - - -	Oscillograph " "
<u>Tie Track Instruments</u> Rail Strain Tie Strain Load Cell Tie Deflection Interface Pressure Accelerometer	Bridge Complete Junction Cable Junction Box Charge Amp.	- - - - -	- - - - Power Supply	" " " Tape Recorder
Beam and Slab Track Instruments Rail Strain Structure Strain Rail Pressure Sensor Deflection Interface Pressure	Junction Box - Junction Box	- - - - -	Bridge Com. " "" - - -	Oscillograph " " "

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*A is Attenuation and Z is zero balancing.

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Most cable problems were related to weather. Electrical noise in the recordings was a problem during damp and rainy weather. Protecting the connectors from wetness by covering with plastic sheet reduced the problem. Freezing rain caused an additional mechanical interference problem, and ice also prohibited free rotation of the security ring. During cold weather, it was difficult to turn the security ring while wearing heavy gloves. These problems were solved by removal of the security ring. A new problem of accidental disconnection was then created. Careful inspection was required to reduce this possibility.

Oscillographic Recorders

Thirty-eight channels of Sanborn Carrier Type Amplifier, Oscillographic Recorders were installed in the instrument van. Recordings were made with heated stylii on plastic coated paper. A width of 50 mm was provided for each trace. Twelve channels were Model 150 in two units of six channels each. The amplifiers in these were Sanborn 150-110. Eighteen channels were Model 67A. These were in three units of six channels each. Eight channels were Model 67A in two units of four channels each. The amplifiers in these twenty-six channels were Sanborn 67A-500B.

Carrier Type Amplifiers were required to permit monitoring of the embankment Linear Variable Differential Transformers (LVDT). A noise problem was created when multiple channels of this type were used. Each channel had an oscillator to provide AC power to the sensor. Small grounding problems became major noise sources when the oscillators were not all using the same frequency. Some improvement was made by interconnecting the oscillators of the 150 series amplifiers. However, this solution also caused other problems since a minor fault on one channel could overload the oscillator and then cause all twelve channels to malfunction. The only solution was to eliminate ground resistance paths on all of the sensors. This was not always possible in wet weather.

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If Carrier Type Amplifiers were necessary again in multichannel field work, a system using synchronized oscillators would avoid this problem.

Van Entry Connection

All sensors were connected at the outer surface of the Instrument Van to wiring that lead inside the recorders. Fortynine Amphenol MS3102A-14S-5P base connectors were mounted on an aluminum plate that replaced one of the van windows. Connectors on the end of the 75-ft cables plugged into these connectors. Shielded cable inside the van connected 38 circuits to Amphenol MS3106A-14S-5P connectors that matched the input recepticals on each Sanborn channel. The same cable was used on 10 circuits leading to the power supply and junction box for tape recorder inputs. One circuit was wired to marker relays for channel mark signals.

The van entry wiring was excellent in all respects.

Shannon and Wilson Instruments

Instrumentation placed in embankments by Shannon and Wilson, Inc. are discussed.

Multiple Extensometers

Connections to Linear Variable Differential Transformers (LVDT) at the main array of the instrumentation terminated in a junction box located at the edge of the embankment. Hookups for instruments recording the vertical displacement of the embankment due to train traffic were made at this junction box. Two distinct electrical circuits were required at that point to enable recording of the output of the LVDT's.

The first consisted of an attentuation circuit. Only about 5 percent of the output signal from the LVDT's could be used by the oscillographic recorders. To cut this signal down, the attenuation circuit in Figure Fl was wired into the plug-in box.

A second circuit was added to enable a wide range of electrical balancing to be applied to compensate for permanent displacement of the LVDT's from their electrical zero position.



FIGURE F1 - CONNECTIONS TO EMBANKMENT SENSORS

The zero balance circuit shown in Figure Fl was connected between the 75-ft cable and the plug-in box. The zero balance circuit required adjustment to compensate for the actual offset of each LVDT. The procedure consisted of a sequence of adjustments to the two potentiometers to produce a minimum voltage between A and C. A digital voltmeter was connected to A and C through miniature pin connectors provided on the box. To provide the signal source to the LVDT for adjustment, the complete cable and recorder system were connected. Zero adjustment required about one minute per channel.

Calibration of an LVDT recorder system is usually done by moving the LVDT core through a known distance and noting Since there was no access to the LVDT core, recorder movement. it was necessary to use a substitute calibration device. The amplifier recorder system was balanced with a 4-resistor bridge circuit connected. A calibration resistance of 1 megohm in the recorder was temporarily connected in parallel with one leg of the 120-ohm resistor bridge to cause a pen deflection. The amplifier gain was than set to give a calibration pen deflection (K) of about 10 mm. Analysis of the resistance bridge indicated that the calibration signal was 0.03 millivolts per volt. The sensitivity of the amplifier-recorder system was then 0.03/K millivolts per volt per mm of pen displacement. The stated calibration factor in millivolts per volt for each LVDT was used to interpret data. This calibration factor was reduced by a predetermined amount to account for the attenuation circuit and cable resistance.

Although calibration by a substitute bridge and prior zero balancing were cumbersome and time consuming, the results were excellent.

Single Extensometers

A single LVDT was located at each of several distances from the main array and in the embankment. Electrical connection and calibration of these extensometers was the same as for the multiple extensometers. Physically, the attenuation circuit was located in the end connection at the LVDT end of an extension cable. The zero balance circuit was connected between the extension cable and the standard cable. Extension cables were in lengths of 50, 100, 150 or 150 feet. The attenuation effect due to the additional cable length was included in the total attenuation provided by the electrical circuit of Figure 1. These factors were established in the laboratory early in the program.

Horizontal Extensometers

Three horizontal extensometers with LVDT sensing elements were used for dynamic measurements. These were individually installed in holes in the embankment at each test section. At installation the LVDT was set at its electrical zero position as indicated on a Shaevitz TR-100 instrument. The electrical wires were then connected to a junction box that included the attenuation circuit shown in Figure 1. No zero balance circuit was necessary. Calibration of the recorder-amplifier system used the substitute bridge described previously.

On warm days, some minor problems were experienced with this instrumentation. A teflon sleeve inside an aluminum collar provided a sliding surface for in-out relative movement of the two ends of the horizontal extensometer. High temperature swelled the teflon and locked the device against movement. Immersing the extensometer in its embankment hole for 10 minutes prior to installation cooled the plastic and allowed proper installation.

Presssure Cells

Cables from the multiple pressure cells at the main array were terminated in the same junction box as the multiple extensometers. The pressure cells used LVDT's as the sensing element. Discussion in the section related to multiple extensometers is also applicable to the pressure cells.

Tie Track Instruments

Rail and tie strains were sensed with electrical resistance strain gages. Forces were measured with load cell ties consisting of strain-gaged sensors in a steel member designed to

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substitute for a concrete or timber tie. Deflections were sensed with LVDT instruments. Pressures at the interface between the ballast and the embankment were measured using Carlson pressure cells. Accelerations were sensed with piezoelectric accelerometers. Details of each of these items and the associated problems are discussed below.

Rail Strain Gages

Strain gages to sense bending strains were cemented to the gage side and the field side of the rail at selected locations. Longitudinal gages were positioned just under the rail head, at mid-height and on the top of the lower flange near the web. An epoxy cement was used to attach 20-mm long polyester-backed wire gages to the steel. Lead wires about 2-ft long were attached and a waterproofing wax was used for protection.

When data were to be collected, the lead wire was connected to a junction box. The box contained bridge completion resistors and provided a cable connector. The long cable to the van connected the full bridge to the oscillographic recorder. Calibration of each channel utilized a shunt resistance of 1 megohm across one leg of the full bridge. The pen deflection corresponding to this calibration signal was set at approximately 10 mm. Cable resistance and gage factor were used in the calculation of strain per millimeter of pen deflection according to the oscillograph operating instructions. Maximum sensitivity was about 5 millionths strain per millimeter. A well defined and accurate data trace was the usual recording for rail strain.

Recording of rail strains was affected by the environment. Time between recording sessions permitted weather to degrade the waterproofing and in some instances caused gage grounding. Also, some disappeared due to unknown actions between visits. These two problems had been anticipated and were corrected by gage testing and replacement prior to recording a set of data.

Another problem was associated with temperature change of the rail and the bridge completion box. This was caused by shade and wind as the train passed. This effect produced a drift in the recorded base line, as the wheels passed over the rail. Data reduction problems resulted from this drift.

One problem was solved by redesign. Junction boxes initially used binding posts for connection of strain gage leads. Cold weather made the binding posts difficult to handle. Also, rain froze them and pliers had to be used to connect or disconnect a wire. After the first use during freezing rain, these connections were changed to barrier terminals with screwdriver tightened connector screws.

For future studies, it would be advantageous to use a single channel to record rail curvature instead of using several channels to record strains. The advantages are several. The first is a reduction of data channels needed to get the same information. With the method used on these tests, the reduced data from 2 to 3 channels was used to calculate a curvature. If 2 gages at different levels on the rail were connected in adjacent legs of a single bridge circuit, the resulting output would be a measure of curvature. A second advantage of this method is that the bridge is temperature compensated and drift due to shade and wind are eliminated. Strain at any point in the cross section is equal to the curvature times the distance of that point from the neutral axis.

<u>Tie Strain Gages</u>

Strain gages were cemented to the sides of ties. They were located under the rail seat and at mid length and arranged to sense bending strains. Longitudinal gages were positioned on each side of the tie at one rail seat and at mid length. A gage was located near the upper face and near the lower face. An additional gage was positioned at mid height at the rail seat. An epoxy cement was used to attach 70-mm long polyesterbacked electrical resistance wire gages to the concrete or timber. Lead wires about 2-ft long were attached to the gages and a waterproofing wax was used for protection.

These gages were connected and the recording equipment was calibrated in the same manner as described for the rail strains. Temperature drift was not so serious with gages on the ties, but otherwise the comments made previously apply.

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Gages on the ties tended to be removed by the up-down movement of the tie and ballast as trains passed. Lower gages seldom survived between visits. Permanent bonding to the timber tie surface was not possible with the techniques used. However, short term bonding provided satisfactory results. Load Cell Ties

Twelve load measuring sensors in the load cell tie contained full bridge strain gage circuits. The base of the tie consisted of 10 equal length sections split up to give 10 tie base forces. A force sensor under each rail seat gave the vertical component of the force entering the rail seat.

Connection to the sensor was at one end of the tie. A steel plate was removed to give access to a multi-pin connector and two 5-pin connectors. The multi-pin connector lead to the 10-base load cells. Each 5-pin connection was for one of the rail seat cells. A matching multi-pin connector lead to 10 short cables. Each cable terminated in a 5-pin connector. The long cables that lead to the recorders plugged into the 5-pin connectors. Long cables were also plugged directly into the two 5-pin connectors on the tie.

Calibration of the Model 150 series amplifiers used a setting of the factor dial. This setting was related to loadversus output calibration obtained in the laboratory. Pen displacement due to a calibration signal was set at approximately 10 mm. The usual data trace was well defined and accurate.

Electrical noise problems were encountered early in the testing. The noise was caused by the variable frequency of oscillators mentioned in the section on Oscillographic Recorders.

Water and clay was pumped into the ties by traffic action as the embankment material intruded into the ballast. This caused major problems late in the testing. The wet clay caused grounding of circuits at the connectors as well as other points. The ties had been originally designed to allow water to drain out on the assumption that the ballast would remain in good condition. A more successful design would be to seal the load cell tie against any intrusion of moisture, water, or other material.

Deflection Devices

Vertical and longitudinal displacement of the rail and vertical deflection of the tie during traffic was sensed with LVDT's. Deflection reference was two rods driven into the embankment inside tubes that isolated the rods from the embankment over their upper 5 feet.

At the time an LVDT was put in place to obtain a set of measurements, the core was positioned for zero electrical output. The LVDT had a built-in attenuation circuit so the long cable was connected directly to the short cable on the LVDT. This is in contrast to the separate attenuation and zero balance boxes provided on the embankment LVDT instrumentation described previously.

Interface Pressure Cells

Commercially available soil pressure cells were placed in a predetermined pattern under the ties at each main array. Cable from the nine cells terminated at a junction box at the edge of the embankment. Two 121-ohm resistors were wired into the circuit at the junction box to convert the half bridge from each cell to a full bridge. Long cables plugged directly into the connectors at the junction box.

Calibration of the recorded information was set by use of the 1-megohm shunt resistor in the oscillograph channel used for other strain gage bridges. Manufacturers calibration and data from a calibration at installation were used to define a calibration factor.

Problems with the pressure cells included electrical noise due to moisture at the junction box and malfunction of the cells. The electrical noise was reduced by protective covers and by removing visible moisture prior to obtaining readings.

Malfunction of cells could not be repaired. It was believed to be due to ballast pieces penetrating the sand pad on top of the cell and thereby producing errors in the recorded pressure. Changes for future use would include a modification in installation techniques to prevent local loading of the pressure sensing diaphragm.

Accelerometers

Piezoelectric accelerometers were temporarily bolted to metal blocks that were cemented to the rail or tie. A coaxial cable 4-ft long was connected from each accelerometer to an amplifier. Long cables connected the amplifiers to input connectors at the van end. The connectors lead to the power supply and tape recorder.

Calibration of the tape recorded level consisted of recording with known voltage across the input terminals. Manufacturers calibration of the accelerometers and calibration information on the charge amplifiers were used to convert the recorded voltage to acceleration units.

Connection of the metal blocks to the ties and rails presented some problems. Aluminum blocks were glued with epoxy or polyester. Temperature changes caused the aluminum to change dimension at a different rate than the rail or tie and the blocks were lost. This required that the blocks be reattached. In future installations, compatible materials should be used.

Beam and Slab Track Instruments

Rail, reinforcing bar, and concrete strains were sensed with electrical resistance strain gages. Rail-fastener loads applied to the beams and slabs were measured with load sensors designed and built by PCA. Rail and slab deflections were sensed with strain gaged deflectometers. Pressure at the interface between the ballast subbase and the embankment was measured using Carlson pressure cells. Joint opening was measured with a Whittemore Strain Gage and a Vernier meter. Beam and slab settlement was measured with a Wild level. Details of each of these items and the associated problems will be discussed separately.

<u>Rail Strain Gages</u>

Prefabricated gages were used to reduce the field installation time and minimize the possibility of electrical shorts

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occurring during field wiring. Polyester adhesive was used to bond 5 mm-long gages to 1.00x0.25x0.005-in. phosphorous-bronze shims. Lead wires, about 2-ft long, were attached and a water-proofing wax was used for protection.

The prefabricated gages were cemented to the gage and field sides of the rail at predetermined locations to sense bending. Gages were positioned in a longitudinal direction under the rail head, at mid-height, and on the lower flange near the web. The gages were located accurately with jigs designed to position the gages and hold them firmly in place until the bonding adhesive cured. Prior to applying the gages, the rail surface was ground smooth and cleaned with acetone. Gages were attached with a polyester adhesive and coated with a final layer of waterproofing wax.

At data collection time, the lead wires were connected to terminal blocks that plugged into the cables leading to the van. Boxes containing bridge completion resistors were located inside the van. Recorder calibration was accomplished by use of a shunt resistance of 1 meghom across one leg of the full bridge. The pen deflection corresponding to this calibration signal was set at approximately 10 mm. Cable resistance and gage factors were used in the calculation of strain per millimeter of pen deflection according to the oscillograph operating instructions. The maximum sensitivity was about 5 millionths strain per millimeter.

Problems in recording rail strain were associated principally with damage to the gages between data acquisition periods. Between recording sessions, moisture caused gages to short. Also, gages disappeared due to unknown action between visits. These two problems had been anticipated and were corrected by gage testing and replacement prior to recording.

Another problem was associated with changes in rail temperature relative to the temperature of the bridge completion resistor networks located inside the instrument van. This caused the recorders to drift with time and required continuous zeroing of the recorders prior to monitoring a train. Since

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the time required to monitor a train was relatively small, the drift did not affect the data significantly. If readings are to be taken over a long period of time, it would be desirable to have a temperature compensated full bridge network at the rail.

Concrete Strain Gages

Prewired waterproof acrylic resin encapsulated electrical resistance strain gages were cemented to the surface of the concrete and embedded in the concrete to sense bending. Surface gages were attached with polyester adhesive. Wiring for embedded gages was carried in buried conduits to the junction boxes at the main arrays.

For recording, the gages were connected, and the recording equipment was calibrated, in the manner described for rail strains.

Some of the gages on the sides and top of the slabs and beams were damaged due to ballast tamping, modifications of the fastener systems, and general construction activities. Some top surface gages at the joints in the beams and slabs were lost due to cracking and spalling of the concrete. Wherever possible the damaged or missing gages were replaced prior to each data acquisition session. The embedded gages functioned properly in the beginning, but as the project continued electrical shorts and cross-interference began to develop. For the last two data acquisition trips, the electrical interference in some of the embedded gages was so bad they had to be disconnected to avoid affecting other instrumentation.

Reinforcing Bar Strain Gages

Strain gages were cemented to the reinforcing at various locations in the slabs and beams. Primary and redundant 5 mm long gages were applied to opposite sides of the reinforcing bars. The bar surface was ground smooth and cleaned with acetone. Gages were applied with polyester adhesive, wired, and waterproofed with a wax coating. All instrumented bars were prepared in the laboratory and shipped to the test track for installation. All gage leads were enclosed in underground conduit that led to junction boxes at the main arrays.

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For recording, the wires from the van were plugged in the junction boxes and the oscillographic recorders. The recorders were calibrated in the same manner as described for the rain strain.

Generally gages on the reinforcement functioned properly. Occasionally, the primary gage did not work, and the redundant gage was used. At one of the test sections, several of the wires were cut by the construction crew during repair of the fastening system. These wires were severed inside of the concrete during the stud placement drilling operation and could not be repaired.

Rail and Slab Deflection Devices

Rail and slab deflections were sensed with PCA designed strain gage deflectometers. Slab deflections were referenced to rods driven into the embankment inside of pipes that isolated the rods from the embankment for the upper 5 ft. Rail deflections midway between fasteners were referenced to the slab.

For recording, the deflectometers were secured in place and the wires from the van were connected. The recording equipment was calibrated in the manner described for rail strains.

The deflectometer functioned perfectly and no problems were noted.

Interface Pressure Cells

Details of the soil pressure cell installation, wiring, monitoring and problems are described in the interface pressure portion of the Tie Track Instruments section of this report. <u>Rail Load Sensors</u>

Rail load sensors were designed and built by PCA for monitoring the vertical and lateral loads applied by a fastener to the concrete slabs and beams. The vertical load was sensed by strain gages on the bottom of a steel plate supported on two rollers. Lateral load was sensed by two load cells.

The vertical and lateral sensors were wired separately to connectors that plugged directly into cables leading to the van. The recording equipment was balanced and calibrated in the manner described for rail strains. The sensors were calibrated in the laboratory both statically and dynamically.

Under field conditions the sensors did not function as they were designed. Variations in the location of the fastening being monitored, warped fastener bottom channels, variations in rail support between adjacent fasteners, rail loads applied through the fastener nylon stops instead of the rubber pad, and similar difficulties made it impossible to install the sensors in the field in the manner used for the laboratory calibration. In some instances the instrumented plate was not evenly supported on the two rollers. In other instances the load was transferred to the instrumented plate outside the rollers. Both cases gave erroneous results. Part way through the testing program, the load sensors were modified and loading frames were made to calibrate the sensor in place. This eliminated many of the problems and permitted the sensor to operate as designed. However, some difficulties still occurred. For future load sensors, it is recommended that vertical and lateral loads not be measured with the same sensor. Also, a spindle-load cell type of sensor should be used.

Joint Opening Plugs

Joint width measurements were taken with a Whittemore Strain Gage Meter and a Whittemore Vernier. Whittemore gage plugs were recessed into the top surface of the concrete. A waterproof was was used to seal the plugs between readings. Readings were taken once each data acquisition trip. These data provided information concerning the effect of time and climate changes on joint width.

Some Whittemore plugs were destroyed during the repair of the fastener anchoring system. When possible, plugs were reinstalled and readings with a new reference base were obtained. Settlement Measurement

Slab and beam settlement measurements were taken at each instrumentation array. Readings were obtained with a Wild level. Brass reference plugs were recessed into the top surface of the concrete and waterproofed when not in use. Settlement readings were referenced to Invar reference rods. These rods were driven to bed rock inside tubes that isolated the upper portion of the rod from the embankment.

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As in the case of the Whittemore plugs, some settlement plugs were also destroyed during the repair of the fastening system.

Post Traffic Inspection

During the month of May 1976, an inspection was made of each of the test sections to determine if conditions existed that could have adversely influenced the output of instrumentation. This work was done concurrently with a study being conducted by the Corps of Engineers.

Soil pressure cells for measuring interface pressure were exposed at the main arrays in Sections 1, 2, 3, 7, 8 and 9. In the tie track sections the cells were arranged in groups of 9, with 3 cells beneath each of two adjacent ties and 3 cells between the ties. Three of the cells were located beneath each of the rails and three beneath the track centerline. The cells were installed originally with their top surface approximately one inch below the top surface of the lime stabilized layer. A sand cushion was placed over each cell.

After the careful removal of the ballast at the cell locations and elsewhere in and near the main arrays, it was noted that the exposed surface of the lime stablilized layer presented a washboard appearance. The spacing of the parallel ridges and valleys corresponded to the spacing of the ties in that particular test section with the valleys falling directly beneath the ties. The portion of the valleys located beneath the original tamped bearing surface of the ties was much deeper than at the centerline of track. The resulting recesses in the top surface of the embankment collected both rain water and water from snow melt.

Tie spacing and ballast depth influenced the size and depth of the recesses in the top surface of the embankment. The wider the spacing the worse the condition. The shallower the ballast the worse the condition.

The soil pressure cells that were located beneath the rail seats of the two adjacent ties in the main arrays had been dis-

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placed vertically downward. This displacement was as much as 4 in. with respect to the cell located in the crib between the ties at the centerline of track. The maximum value was measured in Section 1. Lesser values on the order of 1 to 2.5 in. were measured in the other test sections.

Many of the cells had been tilted, one by as much as 15 degrees. This tilting appeared to be caused by ties not being positioned directly over the pressure cells. Instead of being at the bottom of the recesses the cells were located in the side of the recesses.

The four soil pressure cells located in the main array of Section 7 were excavated and inspected. The cell that was located beneath the south beam midway between the joints had been severely tilted and partially covered by a heavy timber wedge used to position the beam during tamping. Maintenance records kept by the Santa Fe do not show any tamping was done in that area after the initial installation of the beams. Evidence was found that the bottoms of the beams were located approximately one inch above the cell located beneath the north beam of the joint.

The main arrays in Sections 4 and 5 could not be excavated because the cast-in-place structures had not yet been removed. Several of the slabs at the west end of Section 5 had been removed, including the one which covered the soil pressure cells at secondary array 5-2. The bottom surface of these slabs were found to be very rough and irregular. Variations in the depth of the slabs of up to 6-in. were noted, particularly the slab that contained the instrumentation recesses. It is likely that a similar condition exists in the main array at 5-1.

The concrete ties in Sections 1, 2, 3 and 8 were inspected in November, 1975. All ties inspected, including one of the instrumented ties in the main array of Section 3, were cracked beneath both rails. Because only 10% of the ties were inspected at that time it could not be stated that all instrumented ties were cracked. During the post traffic inspection, the instrumented ties from the main arrays of Section 2 and 8 were

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inspected and determined to be cracked beneath the rail seats. All other concrete ties remaining at the test site were inspected and found to be similarly cracked. It is therefore reasonable to assume that all the instrumented ties were cracked when the track was taken out of service.

It is not known when the ties cracked. However, because 100% of the ties were cracked after 6 months of traffic, even at the narrowest tie spacing, it is probable that the ties cracked shortly after they were put in service, perhaps during the 2 weeks shakedown period. This would mean that the instrumented ties were cracked during the first and second quarterly data acquisition periods. However, they may not have been cracked during the static and slow moving load tests.

In summary the post traffic inspection revealed several conditions that adversely influenced the output of some instrumentation. These were:

- Softening of the subgrade resulted in recesses that collected water. Soil pressure cells located in the recesses were submerged in water, mud, and ballast. Also, they were subjected to vertical and tilt displacement. Thus, the data obtained varied depending on the degree of tilt.
- 2. Cracking of the instrumented ties at or near the strain gages has affected the recorded strains.
- 3. The tilting and partial covering of a pressure cell by a timber wedge in the main array of Section 7 seriously affected the output of that cell. Similar conditions may have existed in Sections 4 and 5 where slabs and beams had not been removed at the time of inspection.
- 4. The rough irregular bottom surface of the slabs at secondary array 5-1 affected the output of pressure cells and strain gages. Variations in slab thickness of up to 6 inches were observed.

As the condition that existed at the time of data collection was not known, its effect on instrumentation output could not be estimated.

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