RIGID FRAME STUDIES

Progress Report

FULL SCALE FRAME TESTS
SRLO 60 40/25 20/20

by

Louis Jerez
and
Thomas M. Murray
Principal Investigator

Sponsored by

Star Manufacturing Company
Oklahoma City, Oklahoma

Report No. FSEL/MBMA 80-02

July 1980

FEARS STRUCTURAL ENGINEERING LABORATORY
School of Civil Engineering and Environmental Science
University of Oklahoma
Norman, Oklahoma 73019

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

A series of tests was conducted in the Fears Structural Engineering Laboratory, School of Civil Engineering and Environmental Science, University of Oklahoma, using standard rigid frames produced by Star Manufacturing Company, Oklahoma City, Oklahoma. The purpose of these tests was to determine the structural strength and stiffness of rigid frames designated by Star Manufacturing Company as SRLO 60 40/25 20/20. The frames, referred to herein as SRLO 60, are normally used in pre-engineering buildings with the following design parameters:

Clear Span	60 ft.
Design Live Load	40 psf
Design Wind Load	25 psf
Eave Height	20 ft.
Frame Spacing	20 ft.
Roof Slope	½:12

The SRL frame series consist of clear span gable rigid frames with variable depth tapered columns and variable depth tapered rafters of shop-welded steel plate. A roof slope of ½:12 is used for frames of this series.

The test specimens were fabricated as part of standard production runs. The test set-up and testing procedures were developed using details and descriptions found in the literature. The test set-up consisted of two frames spaced

24 ft. 0 in. apart, with connecting simple span purlins and girts, standard flange brace angles and rod braces as shown in Figure 1. Simulated live load was applied using gravity load simulators similar to those described in Reference 1. In addition, lateral load was applied using an A-frame and hydraulic cylinders. Tests conducted included: unbalanced live load, lateral load only, combined unbalanced live and lateral load, and full live load.

The purpose of the testing was twofold: 1) to verify existing design procedures used by Star Manufacturing Company to predict deflections and strength, and 2) to verify a proposed designed procedure developed specifically for unsymmetrical, tapered members. This report provides a detailed description of the testing procedures, instrumentation and results. Comparisons are made with the standard Star Manufacturing Company design procedures and preliminary comparisons are made to the proposed method.

TEST DETAILS

Description of Specimens

Details and dimensions of the test specimens are shown in Figure 2 and points of load application are shown in Figure 3. The specimens were fabricated from A572 Gr50 steel. The only modification made to the specimens compared to standard production frames was the addition of holes in the top flanges of the rafters to permit installation of loading devices.

Test Set-up

The frames were erected inside the Fears Structural Engineering Laboratory on the laboratory reaction floor. This floor is a concrete slab 30 ft. by 60 ft. in plan, 3 ft. 6 in. deep with four W36x150 steel beams embedded in concrete. The slab weighs one million pounds and is capable of reacting 320,000 lb. in any one location. The frames were erected directly over two of the embedded W36 beams, spaced 24 ft. 0 in. apart. Purlins and girts at standard spacings were connected between the frames along with standard rod bracing in both the roof and side walls. Compression flange braces at the standard locations were connected between the purlins and the bottom flanges of the rafters or inside flanges of the columns. The entire roof area was sheeted using standard roof deck and the end walls from the uppermost girt to the eave strut were also sheeted.

The column base plates were bolted to channel sections which in turn were bolted to the reaction floor beams as shown in Figure 4. Eight, 7/8 in. diameter, A325 bolts were used at the rafter to column connection, six, 3/4 in. diameter, A325 bolts were used at the peak splice connections, and 1/2 in. diameter by 1 1/4 in. hex screws were used to connect all cold-formed parts to the frames. The erection procedure was as near as possible to standard practice and no special procedure was used to tighten bolts in the end plate connections.

Load Applications

Simulated live load was applied using the loading apparatus shown in Figure 5. The loading apparatus consists of a gravity load simulator (Figure 6), a 35 kip tension-compression hydraulic cylinder, spreader beam, two calibrated dynamometers, and spreader beams and tension rods attached to the frame. The simulator is a device which permits horizontal movement of the point of load application while maintaining a vertical line of action of the applied load. For the simulator used in these tests, the point of application of the load can move left or right a maximum of 10 in. and the hydraulic ram will remain vertical.

Lateral load was applied using an A-frame constructed beneath the frame with hydraulic cylinders and calibrated load cells positioned as shown in Figure 7. For all lateral load applications, load was applied to both frames simultaneously using two identical hydraulic cylinders connected in series to a manual pump.

Four loading schemes were used as shown in Figure 8. Figure 8a is the case of unbalanced live load. For this loading, both frames were loaded simultaneously with the four hydraulic rams connected in series to an electric pump. Figure 8b is lateral load only, applied as described above. Figure 8c shows combined lateral and unbalanced live load which is a combination of the cases shown in 8a and 8b. Figure 8c shows full gravity load applied to one frame. For this loading condition, all four hydraulic cylinders were connected in series to an electric pump.

Instrumentation

Instrumentation consisted of calibrated dynamometers, calibrated load cells, strain gages, dial gages and horizontal deflection gages. Gravity load was measured using the calibrated dynamometers positioned as shown in Figure 5; lateral load was measured using the calibrated load cells positioned as shown in Figure 7.

Vertical deflection of the center line of the frames was measured using either a taut wire and a dial gage, Figure 9a, or a weighted scale and a fixed level, Figure 9b. The former was used for symmetrical loading conditions and the latter for loading conditions where significant frame sidesway was expected. Sidesway of the top of the column was measured using a horizontal scale (0.1 in.) located as shown in Figure 10 and a fixed transit. Lateral movement of the column and rafter flanges was measured by means of a transit set in a fixed position with the telescope free to move only in a

vertical plane. Graduated scales (0.1 in.) were attached perpendicular to the plane of the web at the flange locations shown in Figure 11. The locations shown on the rafters are midway between purlin attachment points. The locations shown on the columns were arbitrarily selected.

Foil strain gages were positioned on both frames at critical locations, as shown in Figure 12. Gages on opposite sides of the flange location were wired so that twice the average strain at a particular location was recorded. An electronic data acquisition system was used to record all strain gage data.

Testing Procedure

Prior to any actual testing, an overall check of the testing apparatus and instrumentation was made and zero readings were recorded. In general, load was applied in increments of 1 kip until near the failure load when the increment was decreased. After each load increment, deflection and strain gage readings were recorded and the specimens were checked for signs of yielding. Yielding was detected by flaking of mill scale under the whitewash coat on the frame. When the specimens were no longer able to resist any additional loading, the maximum load was recorded and the load was then removed.

Two series of tests were conducted: initial tests to verify the performance of the frames relative to analytical predictions for a number of loading cases and final tests to determine the load-carrying capacity of the frames under

various loadings.

For the initial tests, the frames were loaded to approximately the design or working loads for the frames. The following initial tests were conducted:

a) Unbalanced live load on both frames simultaneously, Figure 8a. Maximum load 4.5 kips at each location.

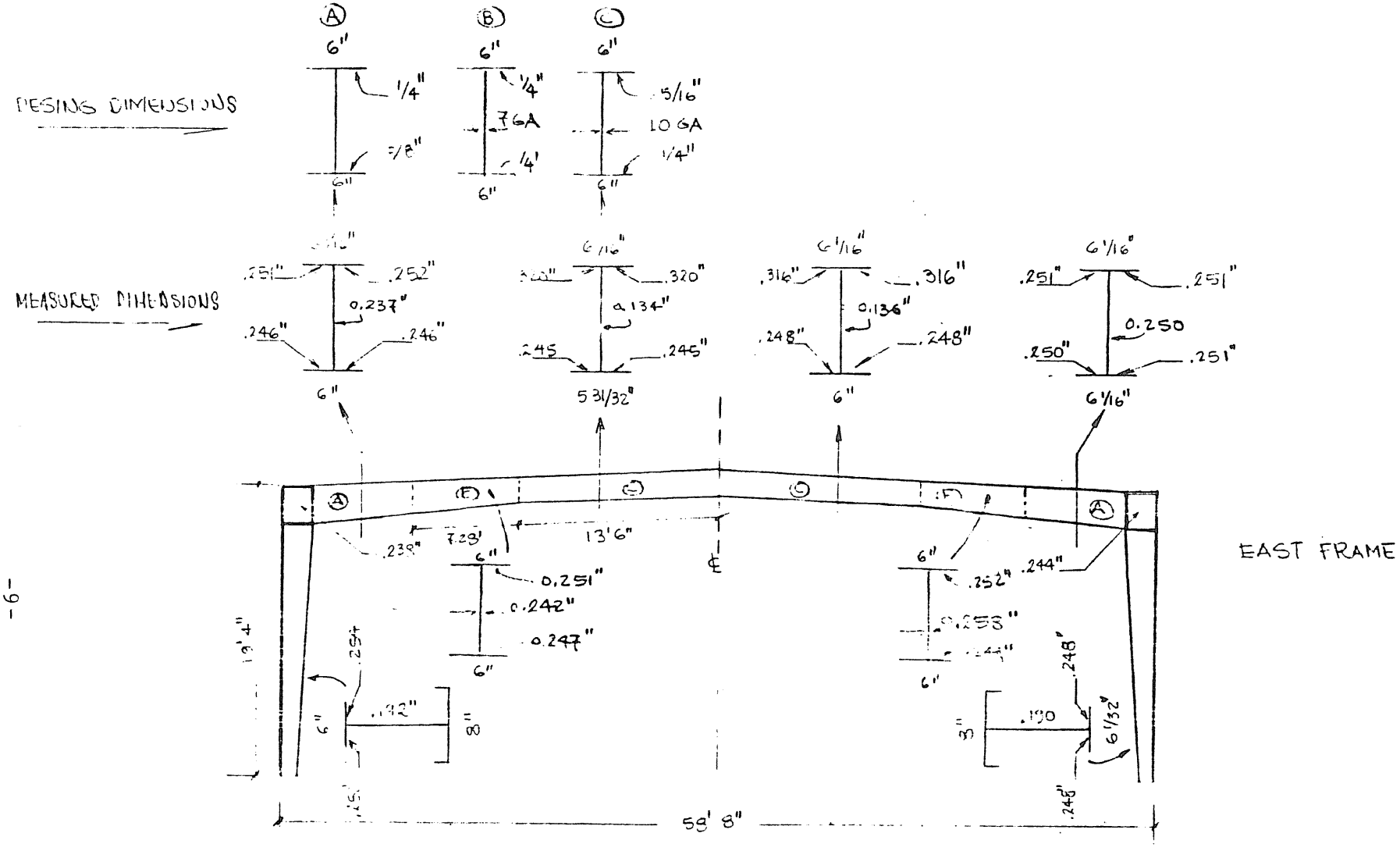
b) Lateral load only applied to both frames simultaneously, Figure 8b. Maximum load 6.0 kips.

c) Unbalanced live load followed by lateral load on both frames simultaneously, Figure 8c. Maximum gravity load 5.0 kips, maximum lateral load 7.0 kips.

d) Full live load west frame, Figure 8d. Maximum load 5.0 kips.

For the case of unbalanced live load with lateral load the simulated live load was applied first until the maximum load was reached. At that point, the gravity load was maintained and the lateral load was increased in 1 kip increments to 7 kips.

Final tests included full live load to factored load on the west frame, unbalanced live load and lateral load on both frames, and full live load with nonstandard flange brace spacing to failure on the east frame. In all tests, failure was determined when additional load could not be applied to the frame. In the first two tests, care was used so that excessive deformation did not occur and therefore reloading was possible.



FRAME TEST 3
SRL04 60 40/3 20/20
OCTOBER 2, 1979

-6-

Figure 2a. [illegible] and Dimensions of Test Specimens--East Fr

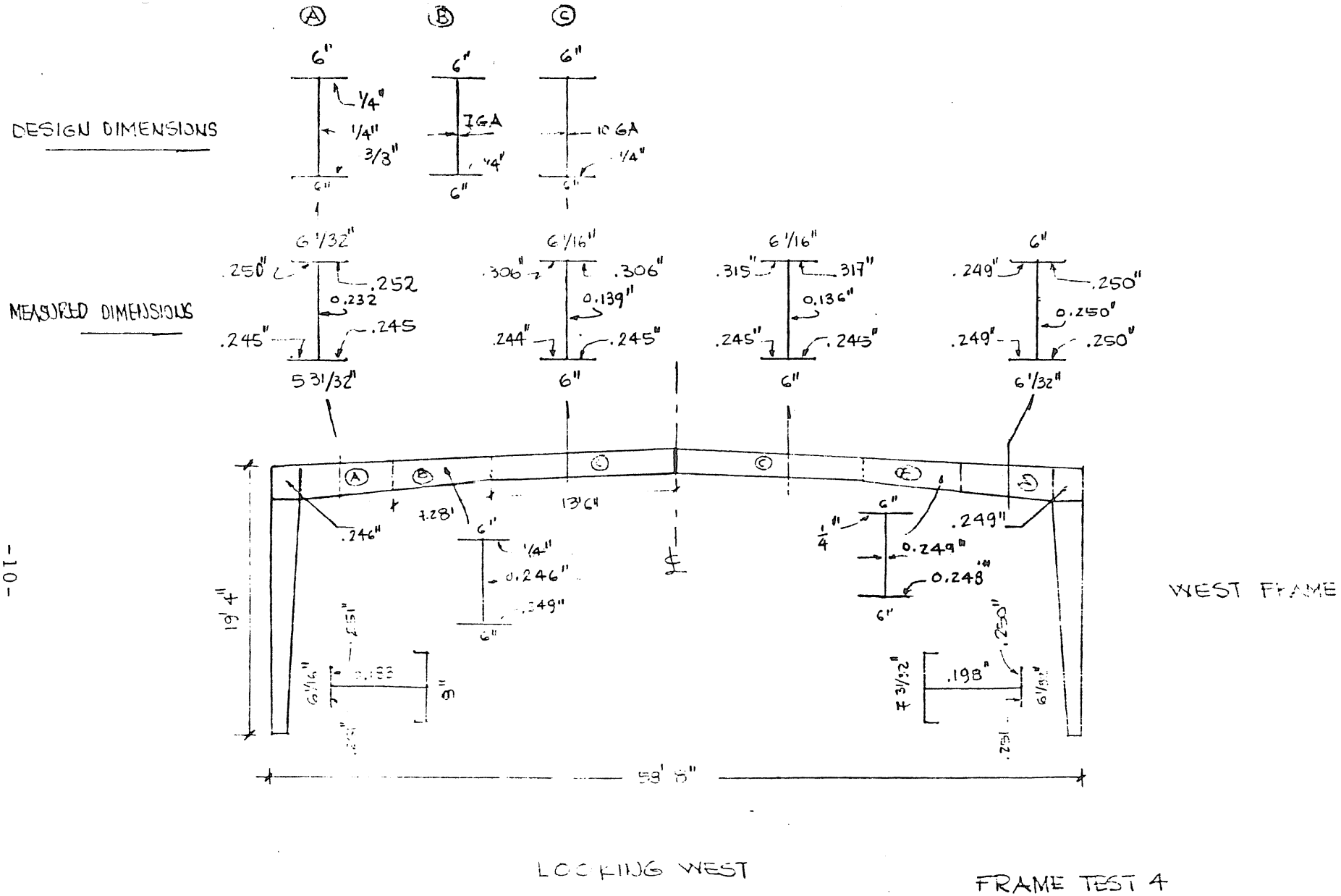


Figure 2b. Details and Dimensions of Test Specimens--West Frame

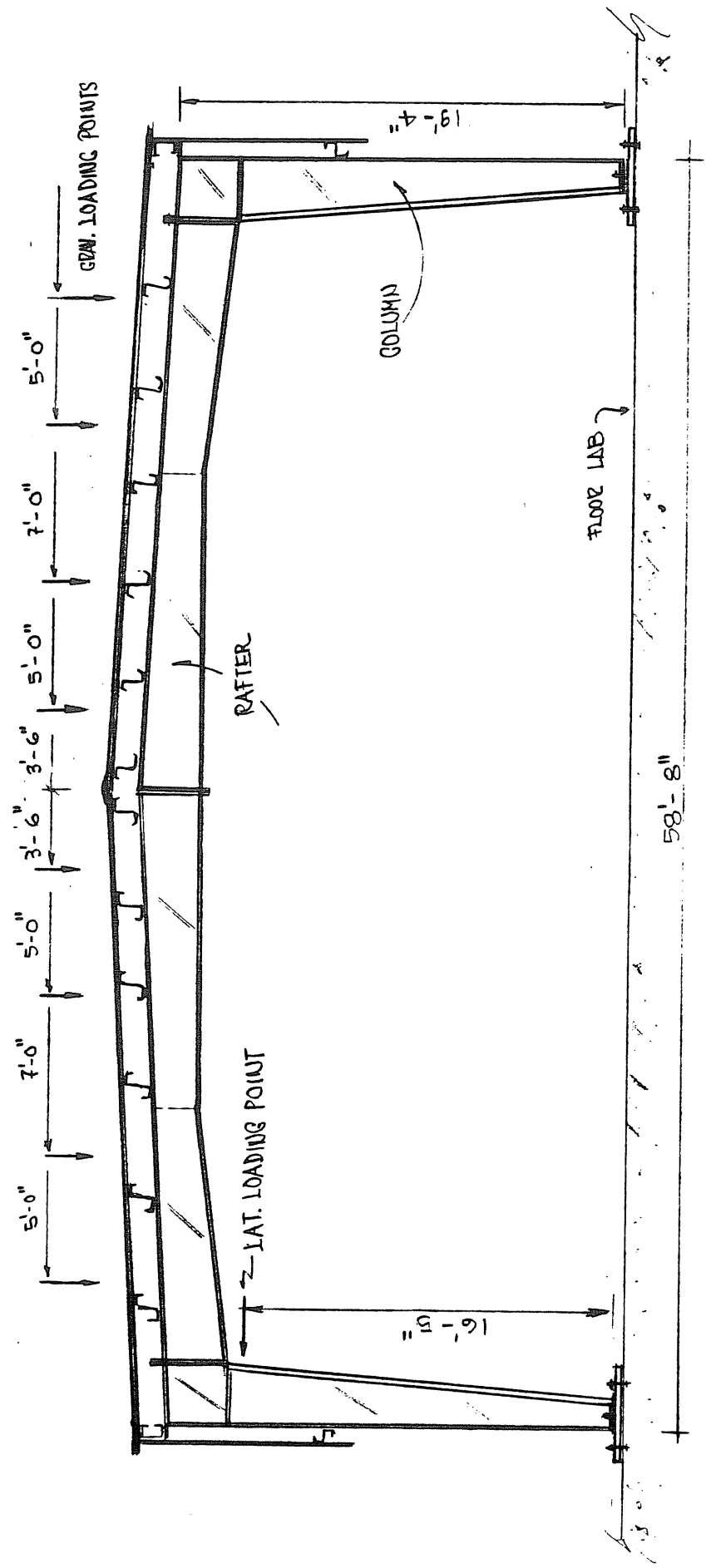


Figure 3. Points of Load Application

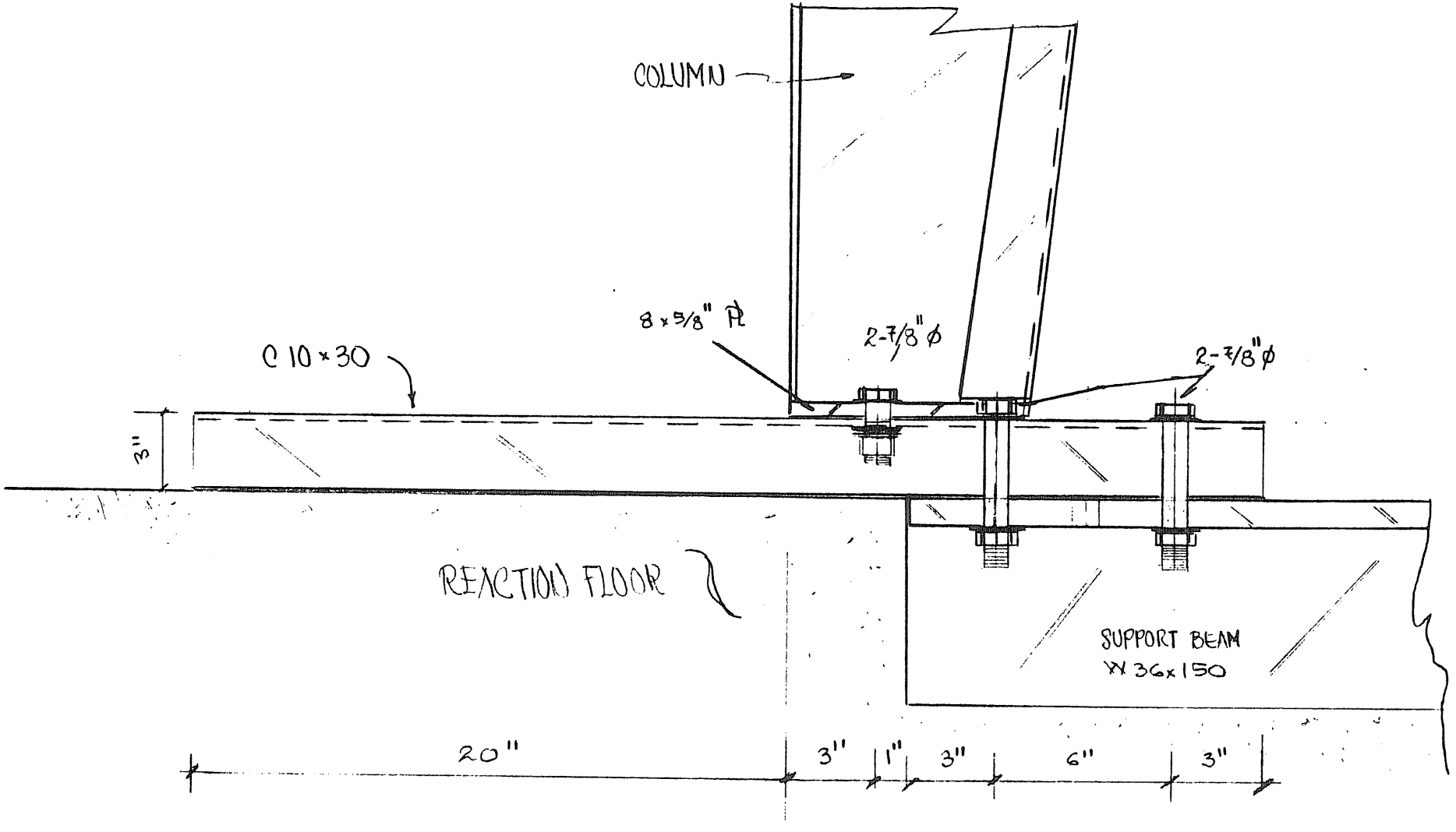


Figure 4. Details of Column to Reaction Floor Connection

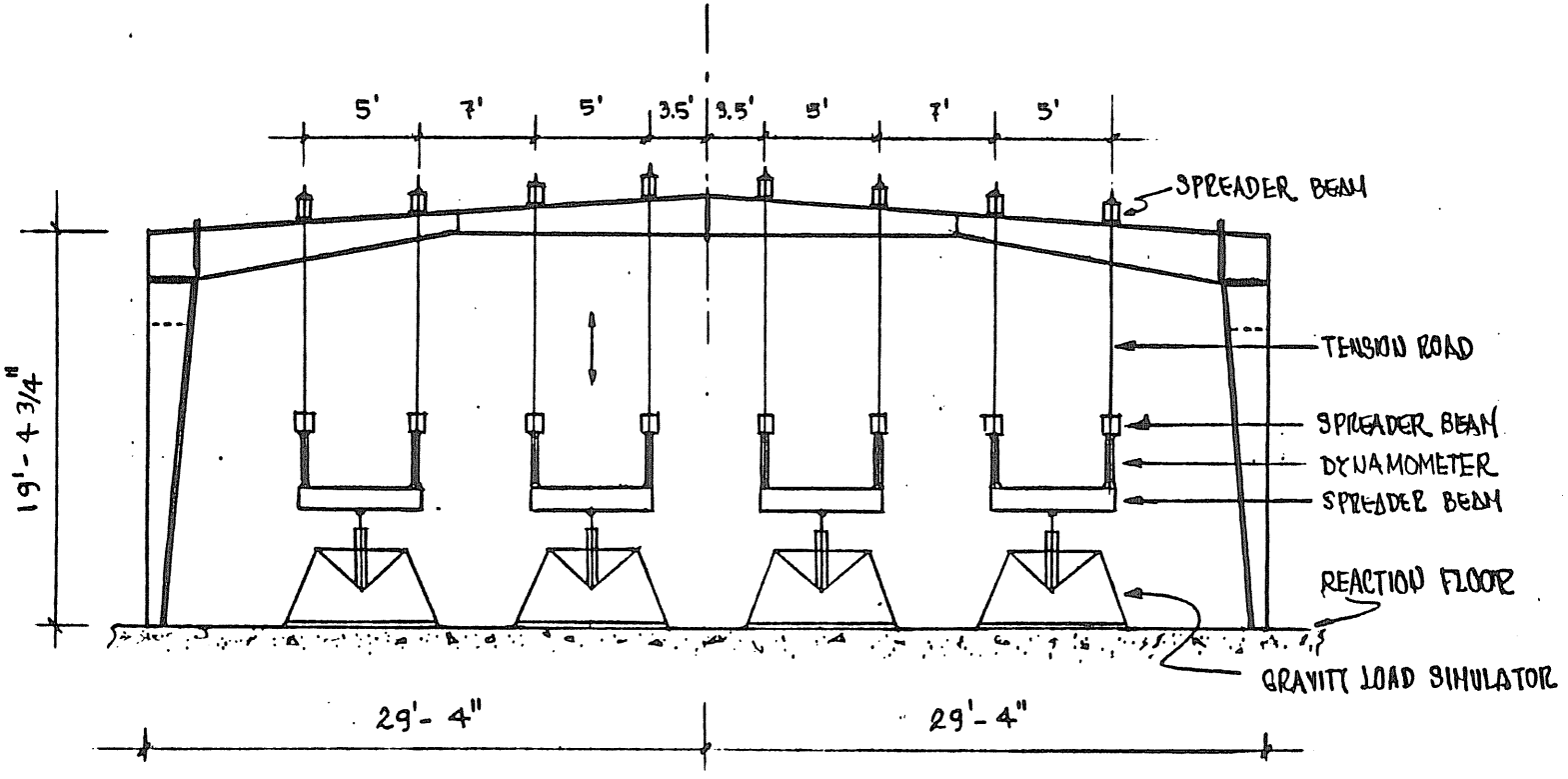


Figure 5. Simulated Live Load Loading

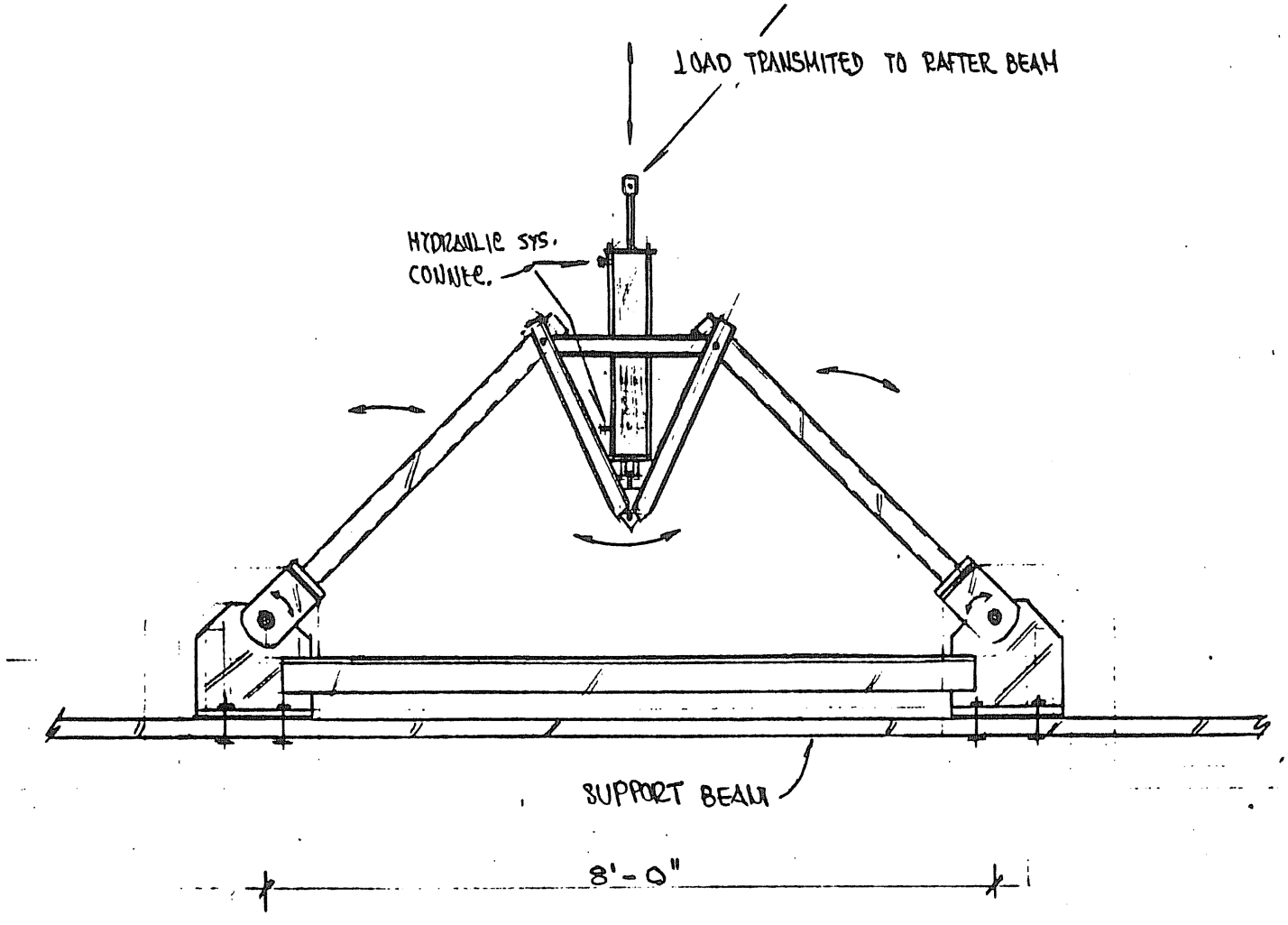


Figure 6. Gravity Load Simulator

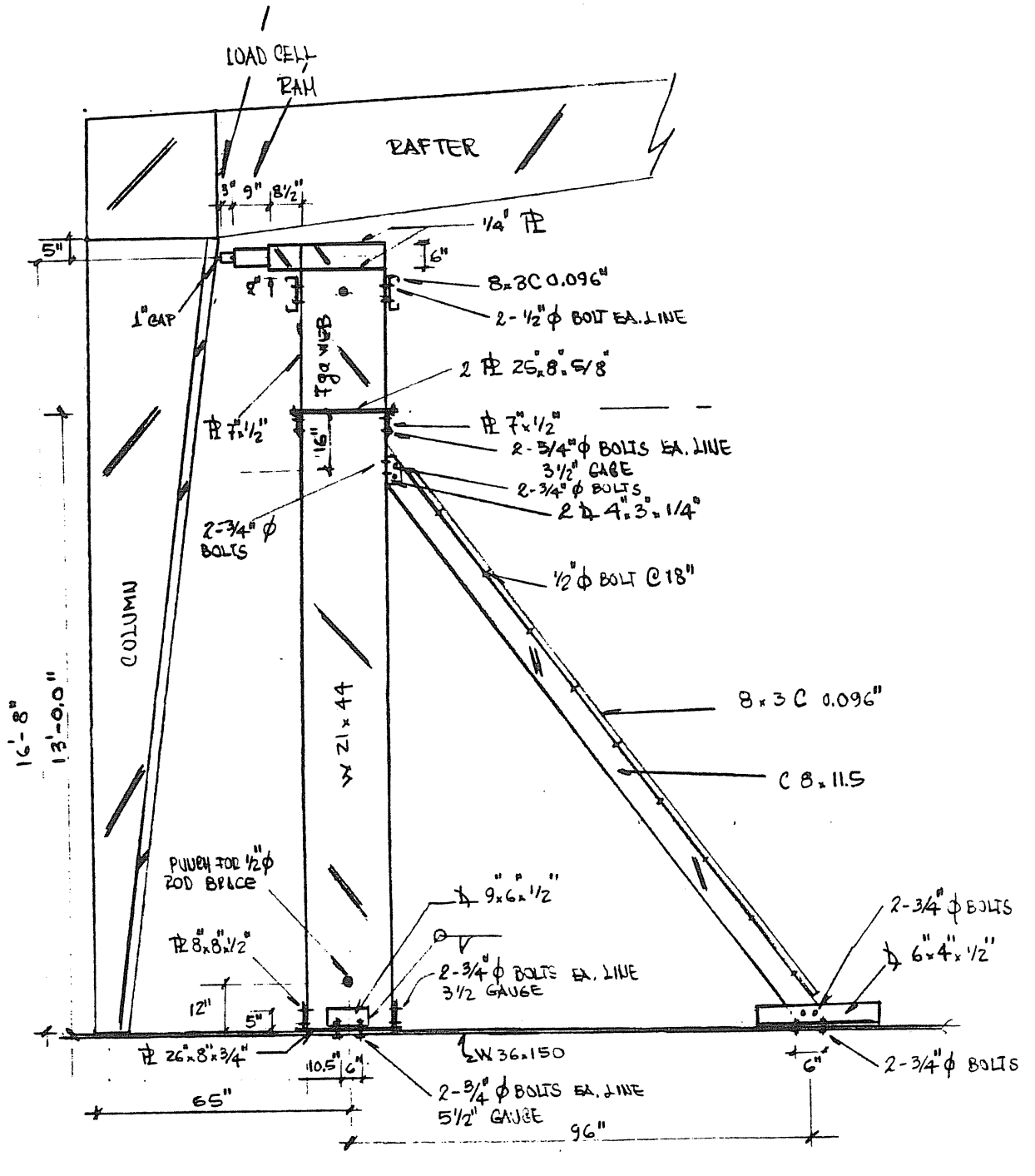
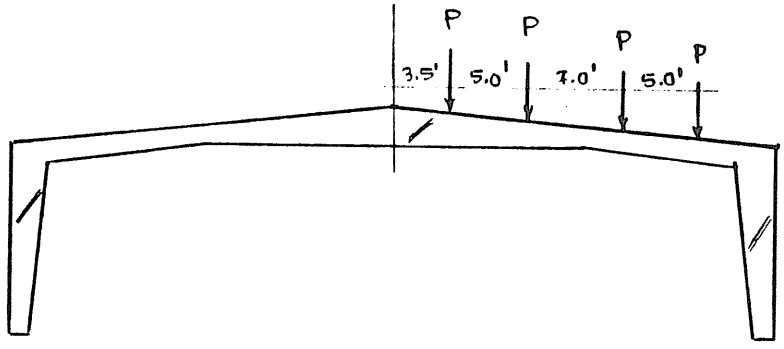
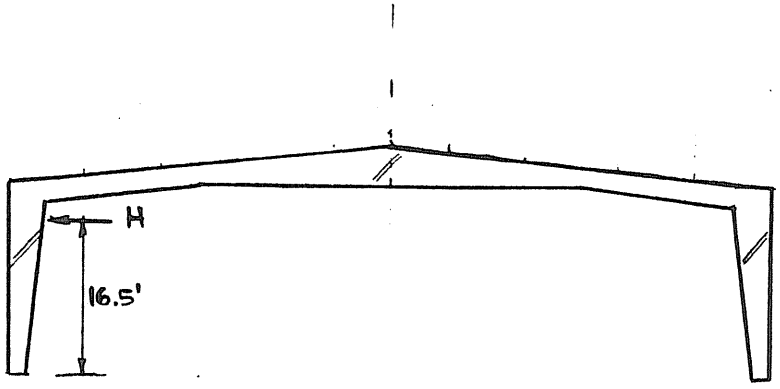


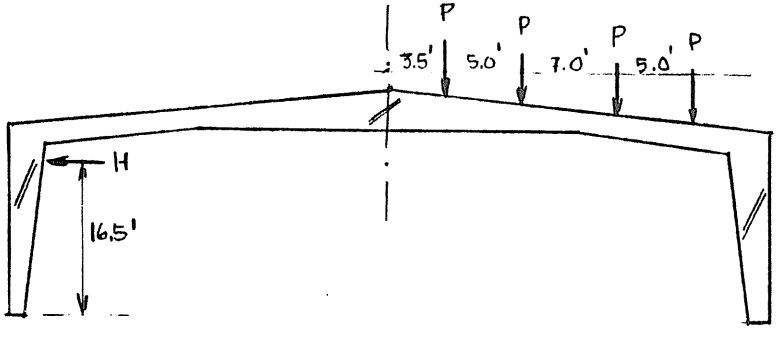
Figure 7. Lateral Load Application



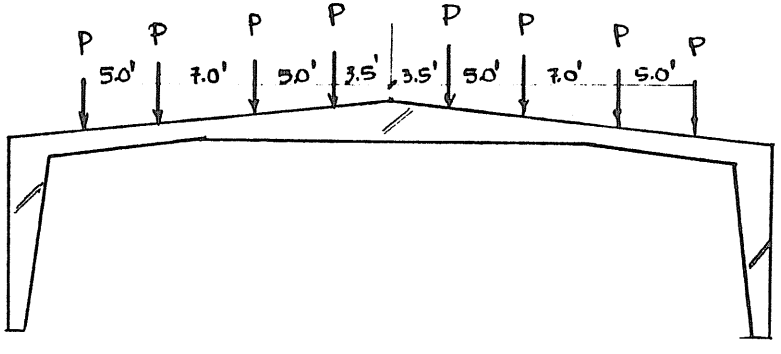
a) Unbalanced Live Load



b) Lateral Load Only

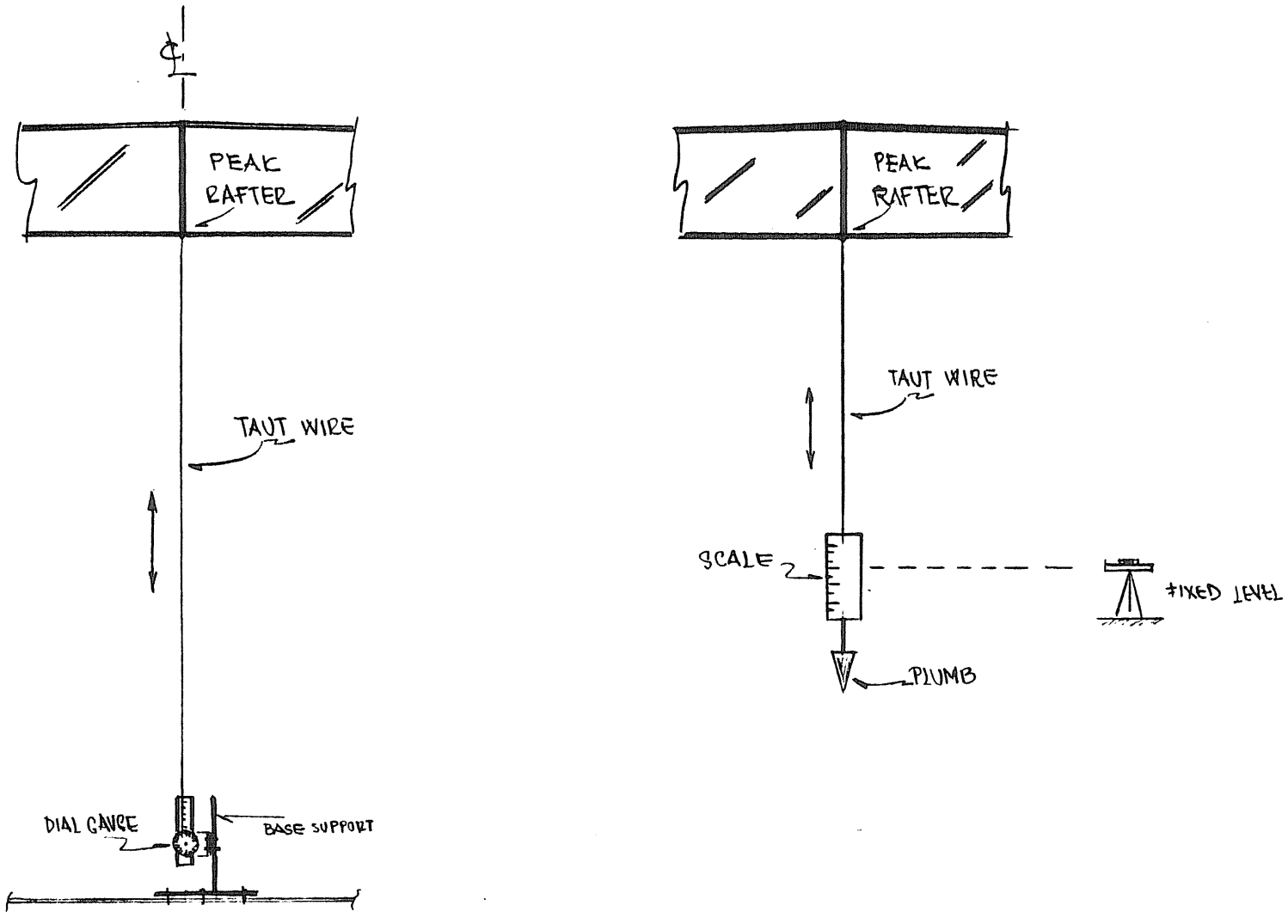


c) Combined Unbalanced Live Load and Lateral Load



d) Full Live Load

Figure 8 Loading Conditions



a) Symmetrical Loading

b) Non-Symmetrical Loading

Figure 9. Measurement of Vertical Deflection

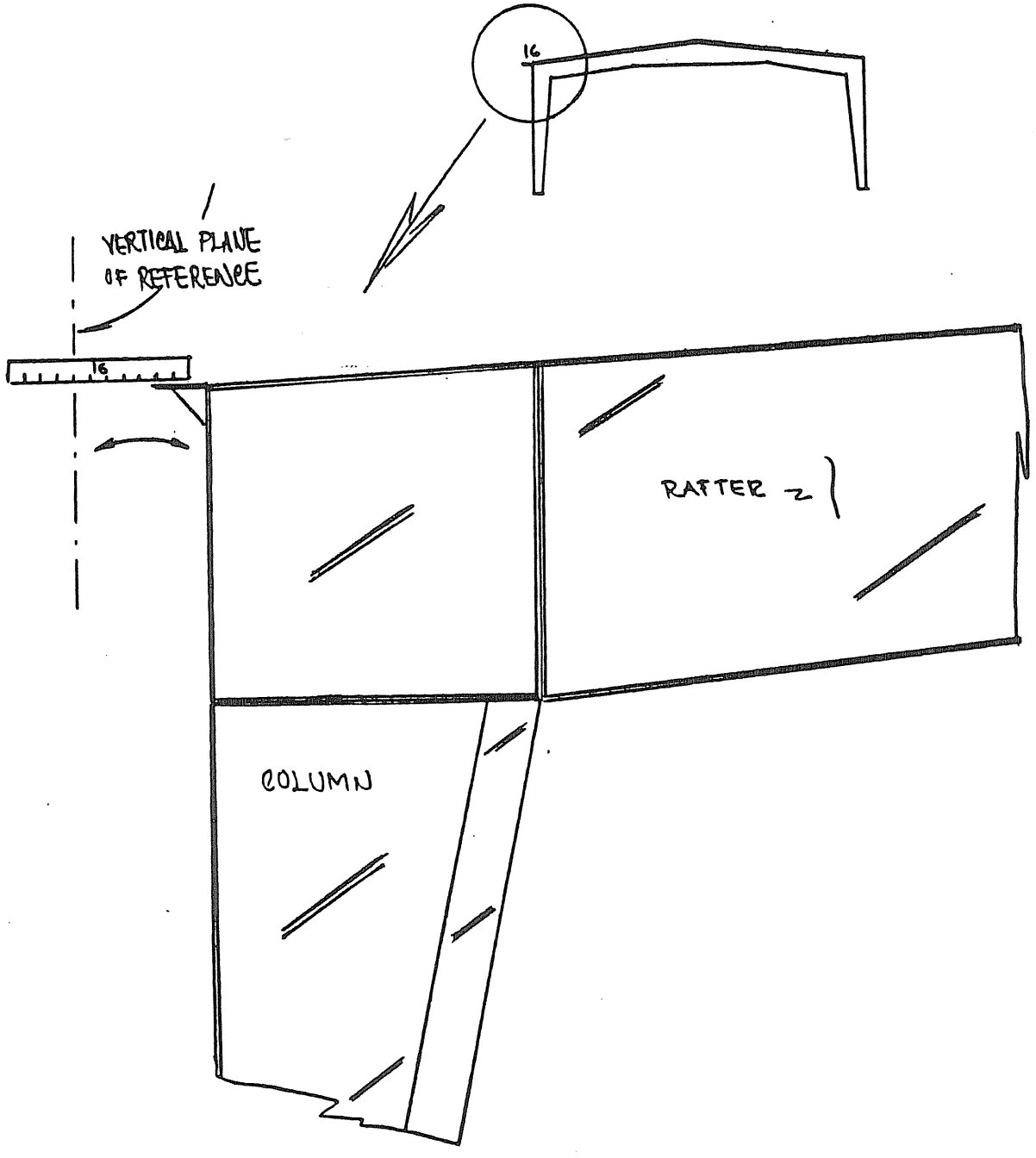


Figure 10. Measurement of Sidesway Deflections

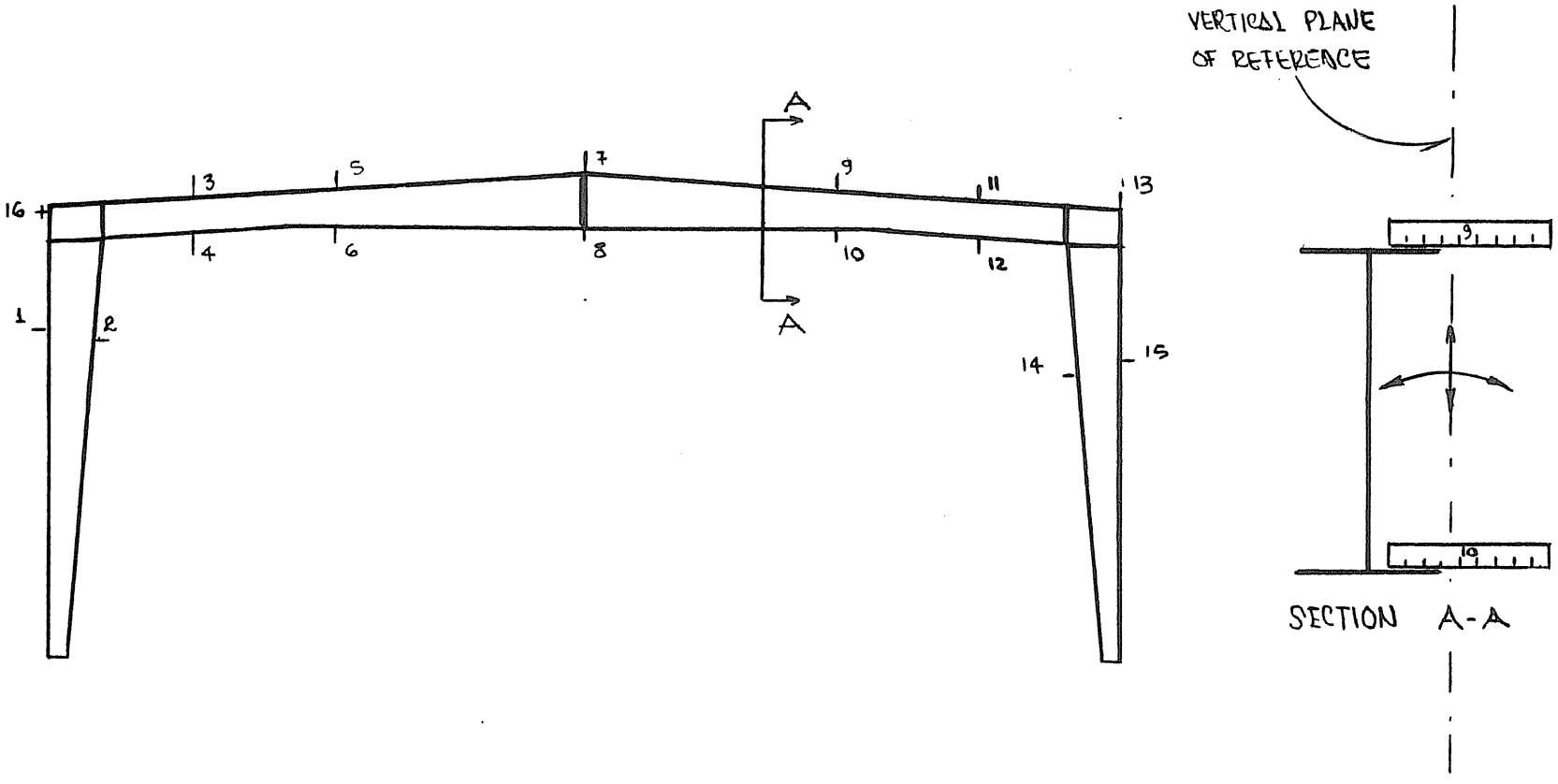


Figure 11. Measurement of Lateral Deflections

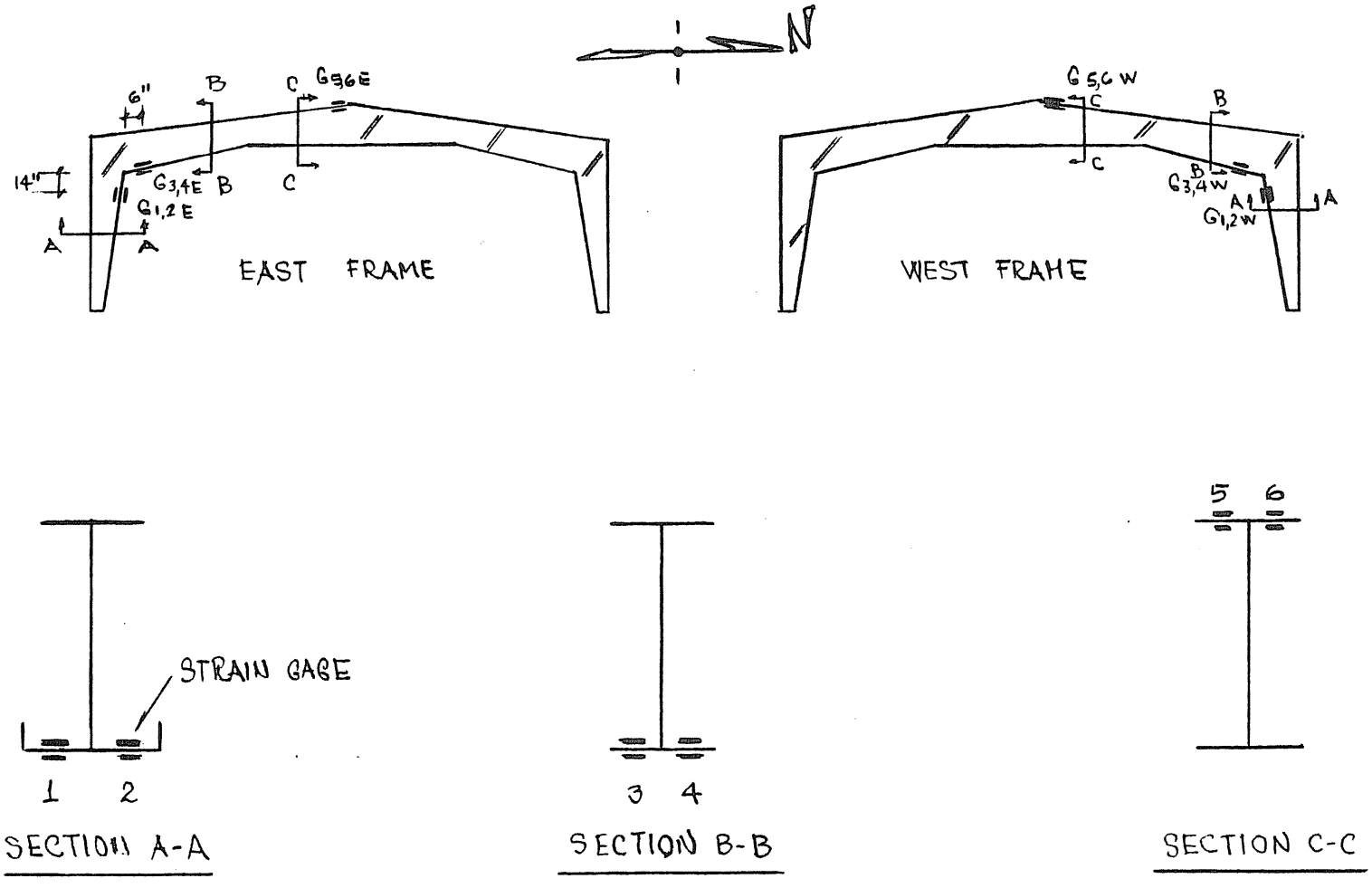


Figure 12. Strain Gage Locations

ANALYTICAL PROCEDURES

In the section following, test results are compared to two analytical procedures. Star Manufacturing Company's standard computer design program was used to obtain theoretical frame stiffness and failure predictions. This program uses a standard stiffness analysis to determine internal axial forces, shears and moments and external deflections. For analysis purposes, non-prismatic members are divided into a number of segments each with uniform properties. The stiffness matrix is then developed and solutions obtained. Stresses at the end of all segments are calculated and standard AISC interaction equations (Formulas 1.6-1a, 1.6-1b or 1.6-2) are used to determine allowable or service load. The interaction equations are checked at each analysis point and the location with a maximum value less than 1.0 (unity check) is used as a criterion for determining maximum service load. In addition, local buckling and shear failure is checked using AISC provisions.

The basic factor of safety in the AISC specification is 1.67. To determine the ultimate load of the frames from the Star Manufacturing Company design procedure, the service loading was increased until a unity check value of approximately 1.67 was attained for at least one analysis point

in the frame. Computer output showing geometry and section property data and the analyses for ultimate loads for the four loading cases shown in Figure 8 are found in Appendix A.

The design check procedures used in the Star Manufacturing Company computer program are based on standard AISC design procedures which were developed specifically for prismatic, doubly symmetrical sections. The columns and some rafter sections used to construct the SRLO 60 frames were both tapered and singly symmetrical. In general, the compression flange of the singly symmetrical members had a smaller width-thickness ratio or was a hot-rolled channel section. An analytical procedure, currently under development, for singly symmetrical, non-prismatic members was also used to predict the failure loads. This procedure is described in Reference 3 and is summarized as follows.

For the case of non-prismatic member subjected to end moments which cause a varying flange stress along the member and without transverse load, the elastic critical moment at the small end is given by

$$(M_e)_S = C_b \, C_a \, M_e \qquad (1)$$

and at the large end by

$$(M_e)_L = C_b \, R \, C_a \, M_e \qquad (2)$$

where C_a = a modifying factor to account for taper, C_b = a modifying factor to account for stress variation due to unequal compressive flange stresses at the beam ends, R = ratio of the section moduli to the extreme fiber of the

compression flange at the large end to that at the small end, and M_e = the critical elastic moment for a prismatic beam with small end section properties subjected to equal but opposite end moments, single curvature bending. (See Reference 3 for complete details and formulas of all terms.) To account for inelastic effects the CRC formula is used

$$M_{cr} = M_y - \frac{M_y^2}{4(M_e)} \qquad (3)$$

where M_{cr} = inelastic critical moment, M_y = first yield moment referenced to the compression flange and (M_e) = elastic critical moment.

Using the computer program described in Reference 3, a failure analysis was conducted for critical rafter sections of the east frame with modified compression flange brace locations and subjected to full live load, Figure 8d. Results of the analysis are shown in Appendix B.

TEST RESULTS AND COMPARISONS

Initial Tests

Unbalanced Live Load. Test results and theoretical predictions from Star Manufacturing Company's design program are shown in Appendix C for both frames subjected to the unbalanced live load shown in Figure 8a. For this test, 4.5 kips was applied at each load point on each frame representing approximately the working load for the frames, e.g., a unity check value of 1.0. Figures C.1 and C.2 show experimental and theoretical load versus deflection data for vertical centerline deflection and sidesway deflection, respectively. Excellent agreement was found between predicted and measured vertical deflections. The measured sidesway deflections were slightly less than the predicted values. The predictions are based on perfectly pinned columns which was not achieved in the test set-up and could explain the discrepancy in the sidesway deflections.

Lateral deflections of the inside and outside flanges of both frames are shown in Figure C.3 to C.5. Maximum lateral deflection was approximately 0.1 in. and is not considered to be significant.

Results of this test indicate that frame stiffness is adequately predicted by Star Manufacturin Company's design

program.

Lateral Load Only. Test results for both frames subjected to a concentrated lateral load near the knee reentrant corner of the south columns as shown in Appendix B. Approximately 6.0 kips was applied horizontally to each frame simultaneously. Load versus sidesway deflection data is shown in Figure D.1. Excellent agreement was obtained between the measured and theoretical sidesway deflections.

Lateral deflection data on both the inside and outside flanges of both frames is shown in Figure D.2 to D.5. Again the maximum lateral displacement was approximately 0.1 in. and is not considered significant.

This test shows that the design program adequately predicts sidesway stiffness of frames.

Unbalanced Load Live Combined with Lateral Load. For this test both frames were loaded simultaneously with unbalanced live load and lateral load as shown in Figure 8c. First, 5.0 kips simulated live load was applied at each load point in 1.0 kip increments and then 7.0 kips lateral load in 1.0 kip increments was applied simultaneously near the reentrant corner at the knee of the south columns. After each lateral load increment, the gravity load was adjusted to 5.0 kips and then the data was recorded. Figures E.1 and E.2 show good agreement between predicted and measured centerline vertical deflections and sidesway deflections.

Lateral deflections on both the inside and outside flanges of both frames are shown in Figures E.3 to E.6. The

maximum lateral displacement was approximately 0.25 in, and is not considered to be significant.

Stresses calculated from measured strains, at the eave of the northwest column and at the peak of the northwest rafter as shown in Figures E.7 and E.8, respectively. Excellent agreement was obtained between predicted and experimental stresses. Strain readings were converted to stress assuming a modulus elasticity of 29,000 ksi.

Test results indicate that the design program adequately predicts frame stiffness under combined loadings. Stress predictions were also excellent.

Final Tests

Full Live Load - West Frame. Test results for the west frame loaded with full live load as shown in Appendix F. The maximum load applied was 7.5 kips at each location. This load corresponds to a unity check value of 1.65 as determined using Star Manufacturing Company's design program. Output is shown in Figure A.5 and the critical location was in the southwest rafter at the knee. As shown in Figure F.1, good agreement was attained between measured and predicted vertical centerline deflection. It is evident from Figure F.1 that the capacity of the frame was not reached under the applied load.

Lateral deflections of the inside and outside flanges are shown in Figures F.2 and F.3, respectively. The maximum lateral deflection was 0.35 in. near the peak. This deflection is not considered to be of significance.

Load versus predicted stress and stress calculated from measured strain data is shown in Figure F.4 for the north column near the knee, Figure F.5 for the north rafter near the knee, and Figure F.6 for the north rafter near the peak. Reasonable agreement was obtained between the predicted stresses and experimentally obtained stresses until near the maximum load. The deviation of the measured stresses indicates that the frame was approaching its capacity.

Results of this test indicate that the design procedure accurately predicts the stiffness of the frame, stress distributions within the frame, and is a reasonable estimate of the capacity of the frame for full live load.

Unbalanced Live Load and Lateral Load. Appendix G shows results for 6.0 kips unbalanced live load combined with lateral load applied simultaneously to both frames. For this test, the unbalanced live load was applied in 1.0 kip increments to 6.0 kips (at each load location). Lateral load was then applied while the unbalanced live load was maintained at the 6.0 kip level. Failure occurred at 7.0 kips of lateral load by lateral buckling of the southwest rafter compression (lower) flange. The predicted failure load using Star Manufacturing Comany's design program was 6.0 kips unbalanced live load and 10.0 kips lateral load as shown in Figure A.4. Because failure was not expected, no data was obtained beyond 5.75 kips of lateral load.

Vertical centerline deflections and sidesway deflections versus load as shown in Figures G.1 and G.2, respectively.

In both cases, the measured deflections were less than those predicted.

Figures G.3 to G.6 show lateral displacement of the inside and outside flanges of both frames. The maximum measured displacement of the east frame was 0.4 in. and the maximum lateral displacement of the west frame was 1.5 in. The lateral buckle is clearly shown in Figure G.6.

Load versus stress, both predicted and that obtained from measured strain, is shown for the four strain gaged sections in Figure 6.7 to 6.12. Good to excellent agreement was obtained at all locations except near the knee in the southeast column.

The experimentally obtained relationships from this test are not in as close agreement with predicted values compared to previous tests. A possible explanation is that the west frame was yielded locally by the application of full live load to a unity check value of 1.65 as described above.

Although the predicted failure load was 6.0 kips live load plus 10.0 kips lateral load, the west frame was only able to resist 6.0 kips live load and 7.0 kips lateral load. Figures G.9 and G.12 show that the stress in the rafter section near the lateral buckle was close to maximum from the application of the 6.0 kips live load. The rate of change of stress at this location is very small relative to the applied lateral load. Hence, the rafter near the peak was subjected to a very high stress level from the live load application and additional lateral load only increased the

stress slightly. If the rafter was near failure due to the live load, a large discrepancy in the predicted lateral failure load is expected. In other words, because the stress in the rafter section is near maximum and the rate of change of that stress to applied lateral load is very small, the rafter may be expected to fail over a relatively wide range of lateral load.

Full Live Load, East Frame with Nonstandard Flange Brace Spacing. To verify the proposed design procedure for singly symmetrical tapered members, the locations of the lower flange braces were changed on the east frame as shown in Figure 13. In addition, the purlin connections to the top flanges were removed except directly over the flange braces. Consequently, the outside rafter segments were fully braced near the knee and at the transition location and the inside rafter segments were braced at the transition section and near the peak. The frame was subjected to full live load and failed by lateral buckling in the south rafter at a load of 5.8 kips at each load location. Lateral movement was visually more evident in the outside segment, however, it was apparent that the inside segment also moved laterally.

Output from the Star Manufacturing Company's computer program for the test condition is shown in Figure A.6. The predicted failure load for this analysis was 4.5 kips. Computer output for the proposed method is shown in Figure B.1 and B.2 for the outside and inside rafter segments, respectively. For these analyses the input moments were determined

from the Star Manufacturing Company's program for 1.0 kips applied at each load location. The predicted failure load is then determined by scaling this load by the ratio of the output moments to the input moments. Using this procedure, the predicted failure load was 7.1 kips.

Load versus vertical deflection at the centerline is shown in Figure H.1. Good agreement was obtained between the measured and predicted deflections. Lateral deflections were shown in Figure H.2 and H.3 for the outside and inside flanges, respectively. The maximum deflection was 0.75 in. and the buckled configuration is clearly shown in Figure H.3.

Load versus experimentally determined and predicted stresses are shown in Figures H.4 to H.6. Excellent agreement was obtained between the experimentally determined and predicted values except for the south column at the knee.

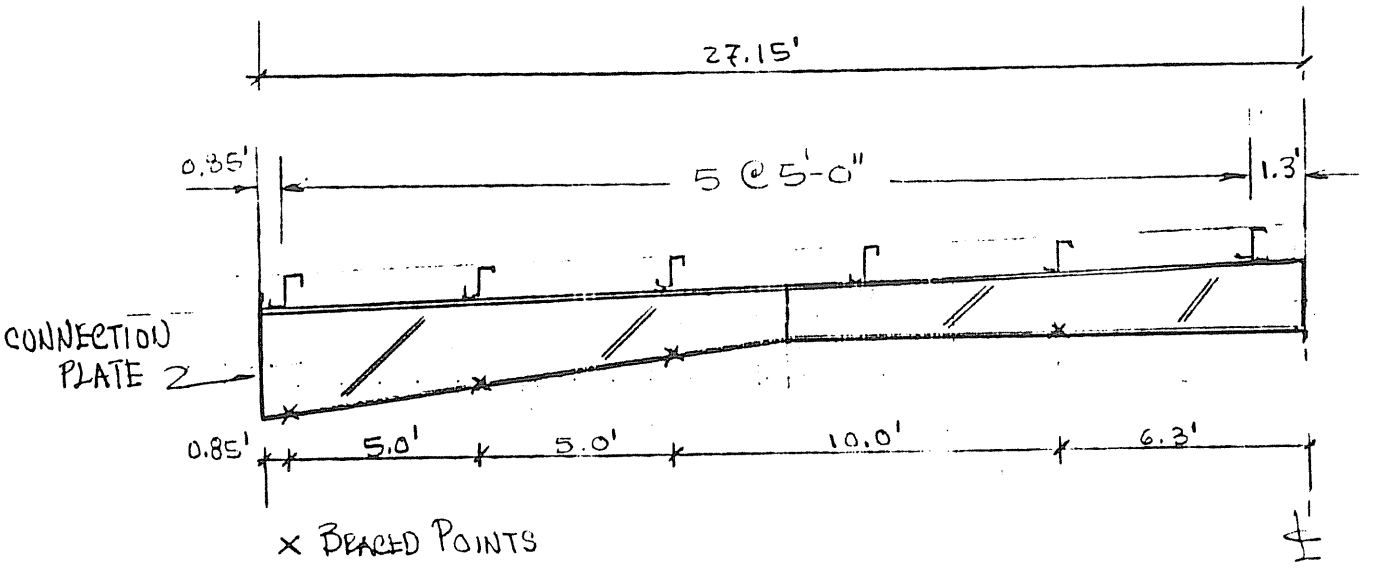
Results of this test indicate that proposed design procedure for singly symmetrical tapered beams subjected to end moments provides a fair estimate of the load-carrying capacity of rafters and rigid frames.

Coupon Tests

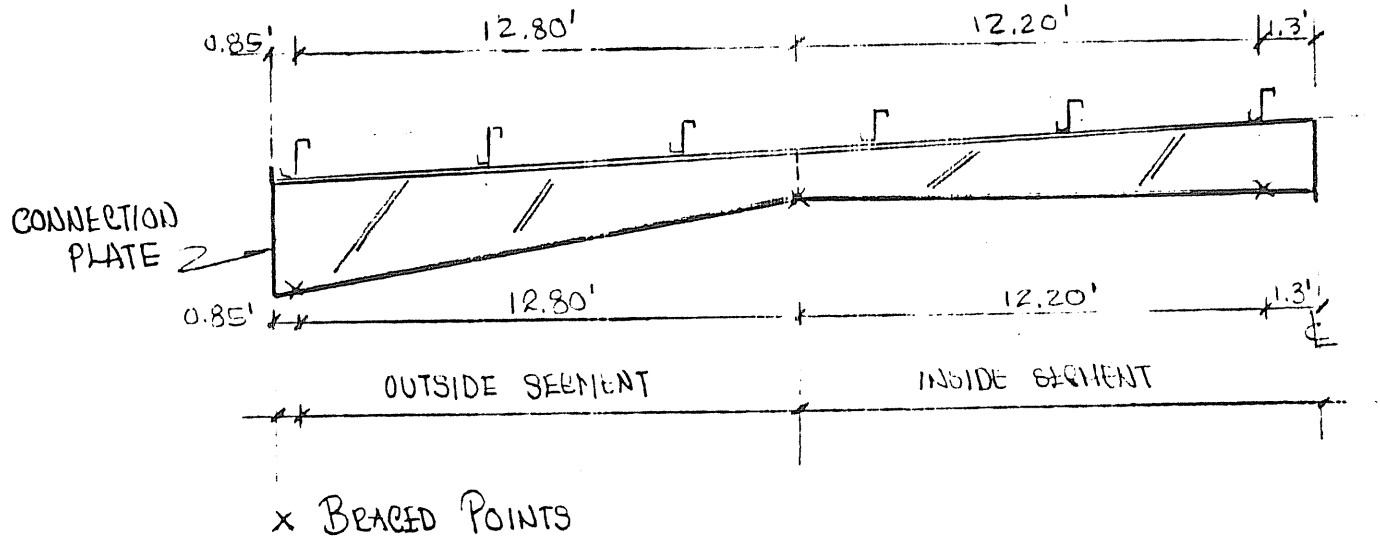
Upon completion of all testing, samples of the plate material used to fabricate the frames were removed at the locations shown in Figure 14. The locations were chosen to minimize the effects of possible yielding due to test loadings. Standard ASTM E-8-57T tensile coupons were then machined and tested. Results are shown in Table 1. Measured yield stresses varied from 47.2 to 58.3 ksi. The lowest yield

levels were found in the southwest column and did not affect the test results. The remaining results were sufficiently close to the specified minimum yield stress, 50 ksi, to be acceptable.

For the Star Manufacturing Company computer analyses, a conservative yield stress of 55 ksi was used in all cases, Appendix A. A yield of 50 ksi was used for the proposed analyses, Appendix B.

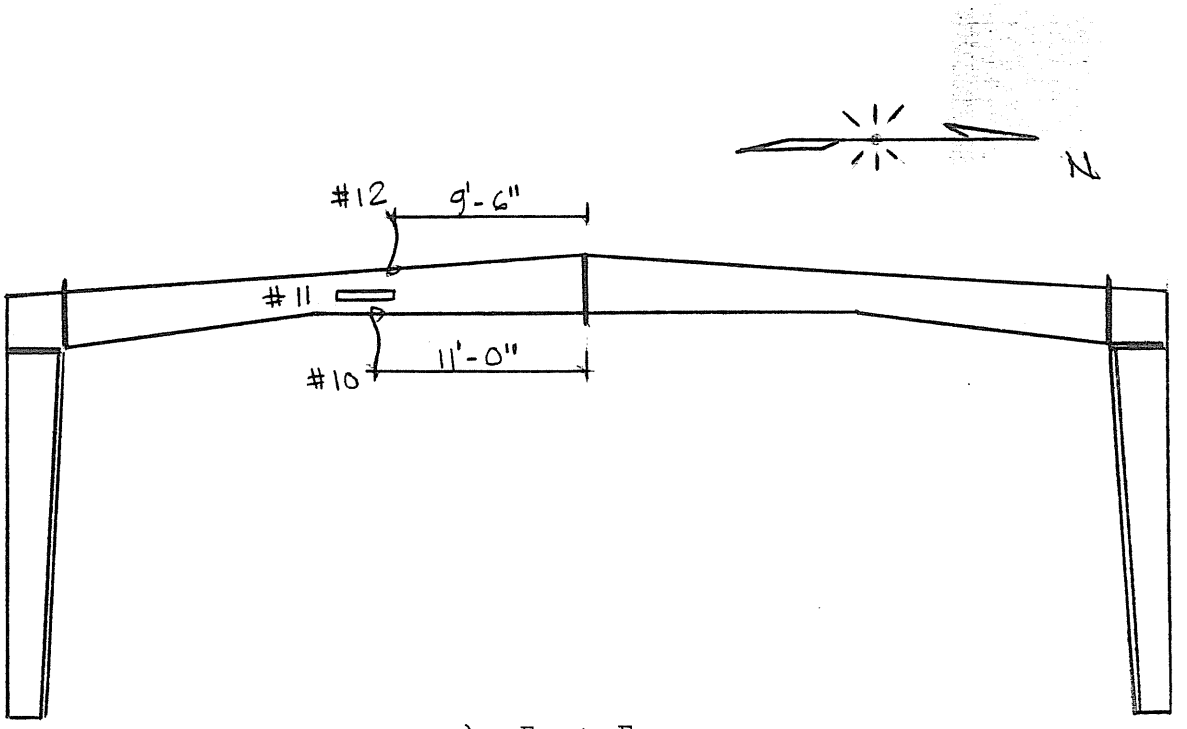


a) Standard Flange Bracing

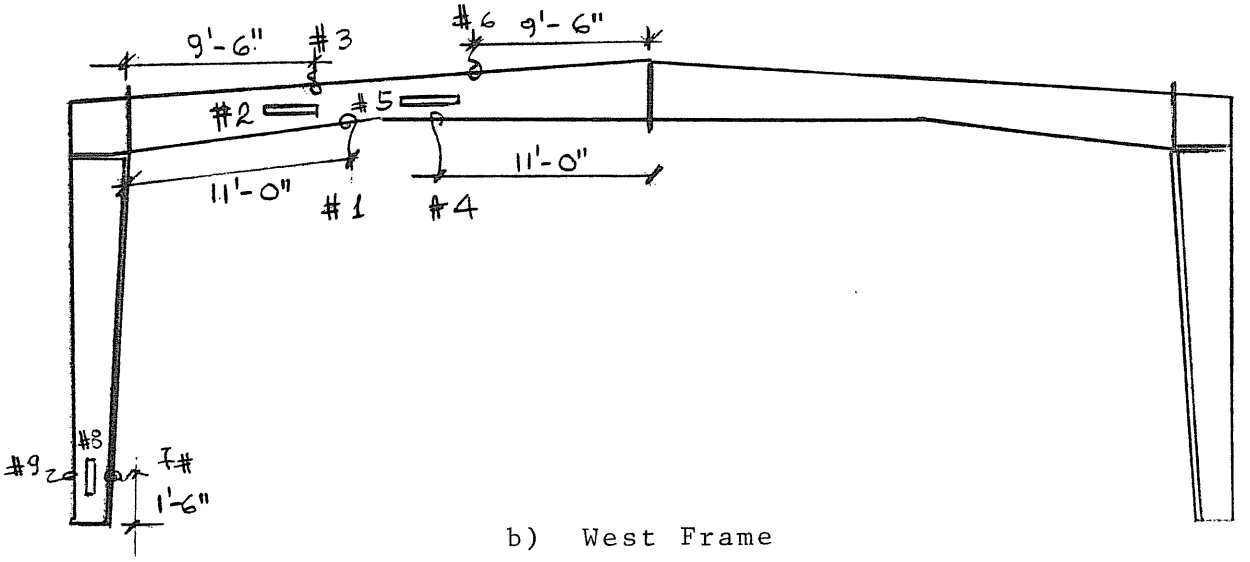


b) Modified Flange Bracing

Figure 13. Standard and Modified Flange Bracing, East Frame



a) East Frame



b) West Frame

Figure 14. Location of Coupon Samples

TABLE 1

Results of Coupon Tests

No	Location	Yield Stress ksi	Ultimate Stress ksi	Elongation % in 2 in.
1	Lower Flange Southwest Rafter	50.7	75.7	12.0
2	Middle Web Southwest Rafter	50.6	64.2	40.0
3	Upper Flange Southwest Rafter	48.9	74.8	37.0
4	Lower Flange Southwest Rafter	49.8	73.7	37.0
5	Middle Web Southwest Rafter	55.8	65.0	37.0
6	Upper Flange Southwest Rafter	58.3	76.8	43.0
7	Inside Flange Southwest Column	50.6	75.5	43.0
8	Middle Web Southwest Column	47.2	64.6	43.0
9	Outside Flange Southwest Column	47.2	67.8	43.0
10	Lower Flange Southeast Rafter	49.3	74.3	43.0
11	Middle Web Southeast Rafter	64.1	73.5	NA
12	Upper Flange Southeast Rafter	58.3	76.2	43.0

SUMMARY AND CONCLUSIONS

A series of tests was conducted on standard pre-engineered metal building frames fabricated by Star Manufacturing Company, Oklahoma City. The frames used in the testing are designated by the manufacturer as SRLO 60 40/25 20/20. The test set-up consisted of two frames forming a single bay, 24 ft. by 60 ft. Standard roof deck, purlins, eave struts, girts, flange braces, and rod braces were used to construct the test set-up. The frames were subjected to a range of loadings, including unbalanced live load, lateral load, combined unbalanced live load and lateral load, and full live load. Loading conditions which caused unsymmetrical bending in the frames were applied to both frames simultaneously; full live load was applied to each frame independently.

Experimentally determined results were compared to predicted values using Star Manufacturing Company's design computer program and in one instance to a proposed design method for singly symmetrical tapered beams. Vertical and sidesway deflection predicted by the design program were in excellent agreement with measured displacements. Failure loads predicted by the design program were in close agreement with those determined experimentally except for the case of unbalanced live load combined with lateral load. For this

loading condition, the variation of maximum stress in the rafters was very small for increasing lateral load and was near maximum for the applied unbalanced live load.

The failure load predicted by the proposed method was in fair agreement with the experimentally determined failure load.

It is apparent from the test results, that the Star Manufacturing Company design program adequately predicts the strength and stiffness of the type of rigid frame tested. The proposed design method for singly symmetrical tapered members predicted a failure load 22% greater than the experimentally determined failure load. A possible explanation is that the frame was damaged in previous loadings which approached the failure load of the frame.

REFERENCES

1. Fisher, J.W., Lee, G.C., Yura, J.A., and Driscoll, G.C., "Plastic Design and Tests of Haunched Corner Connections", Welding Research Council Bulletin, No. 91, October 1963.

2. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", American Institute of Steel Construction, New York, 1978.

3. Yazdani, N. and Murray, T.M., "Design Methodology for Tapered Beams", Research Report submitted to Star Manufacturing Company, Fears Structural Engineering Laboratory, University of Oklahoma, Norman, OK, May 1980.

APPENDIX A

STAR MANUFACTURING COMPANY
COMPUTER ANALYSES

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 2

MEMBER NO. 1- 2 LENGTH= 18.32 FT ANGLE= 86.93 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 15.50 FT OF= 6.00 X 0.2520 WEB=0.1920 IF=C 8 X 11.5
SECTION 2 LENGTH= 1.69 FT OF= 6.00 X 0.2520 WEB=0.2380 IF=C 8 X 11.5

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
1*	0.00	0.00	8.00	6.34	65.4	3.21	2.42	13.3	21.1	1.583	3.025
101	0.09	1.55	9.89	6.70	106.1	3.98	2.35	17.5	27.8	1.552	3.005
102	0.27	4.65	13.68	7.43	222.7	5.48	2.24	26.7	41.6	1.495	2.965
103	0.45	7.75	17.47	8.16	390.9	6.92	2.13	37.1	56.3	1.446	2.925
104	0.63	10.85	21.26	8.88	616.4	8.33	2.05	48.6	71.8	1.403	2.886
105	0.81	13.95	25.04	9.61	904.6	9.70	1.97	61.2	88.2	1.363	2.847
106*	0.90	15.50	26.94	9.97	1073.9	10.38	1.93	67.9	96.6	1.345	2.828
106*	0.90	15.50	26.94	11.19	1150.9	10.14	1.82	73.9	101.3	1.290	2.765
107	0.94	16.33	27.97	11.44	1259.7	10.50	1.80	78.1	106.4	1.280	2.753
108*	0.98	17.16	29.00	11.68	1374.5	10.85	1.78	82.4	111.6	1.270	2.741

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 3

MEMBER NO. 2- 3 LENGTH= 28.08 FT ANGLE= 5.64 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 6.00 FT OF= 6.06 X 0.2510 WEB=0.2370 IF= 6.00 X 0.2460
SECTION 2 LENGTH= 7.65 FT OF= 6.00 X 0.2510 WEB=0.2420 IF= 6.00 X 0.2470
SECTION 3 LENGTH= 13.50 FT OF= 6.06 X 0.3200 WEB=0.1340 IF= 5.97 X 0.2450

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
111*	1.91	18.37	29.00	9.75	1076.7	10.51	0.97	74.6	73.9	1.328	1.304
112	4.89	18.76	25.70	8.97	801.8	9.45	1.01	62.7	62.1	1.362	1.338
113*	7.86	19.14	22.41	8.19	575.6	8.38	1.05	51.6	51.1	1.399	1.374
113*	7.86	19.14	22.41	8.29	578.8	8.36	1.04	51.8	51.5	1.376	1.371
114	9.78	19.40	20.30	7.78	457.2	7.67	1.07	45.2	44.9	1.401	1.396
115	13.60	19.90	16.10	6.76	264.4	6.25	1.15	32.9	32.7	1.456	1.451
116*	15.52	20.15	14.00	6.26	190.9	5.52	1.20	27.4	27.2	1.486	1.481
116*	15.52	20.15	14.00	5.20	185.1	5.97	1.41	28.9	24.3	1.639	1.557
117	16.86	20.24	14.60	5.28	203.1	6.20	1.40	30.4	25.6	1.634	1.551
118	19.54	20.42	15.80	5.44	241.8	6.67	1.37	33.4	28.3	1.625	1.539
119	22.22	20.60	17.00	5.60	284.5	7.13	1.35	36.4	31.0	1.616	1.528
120	24.90	20.78	18.20	5.76	331.2	7.58	1.34	39.5	33.7	1.607	1.516
121	27.58	20.96	19.40	5.93	382.0	8.03	1.32	42.6	36.6	1.598	1.505
3*	28.92	21.05	20.00	6.01	409.0	8.25	1.31	44.2	38.0	1.593	1.500

a) East Frame

Figure A.1 Geometry and Section Properties

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 4

MEMBER NO. 3- 5 LENGTH= 28.08 FT ANGLE= -5.65 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 13.50 FT OF= 6.06 X 0.3160 WEB=0.1360 IF= 6.00 X 0.2480
SECTION 2 LENGTH= 7.65 FT OF= 6.00 X 0.2520 WEB=0.2580 IF= 6.00 X 0.2440
SECTION 3 LENGTH= 6.00 FT OF= 6.06 X 0.2510 WEB=0.2500 IF= 6.06 X 0.2510

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
3*	28.92	21.05	20.00	6.05	411.1	8.25	1.31	44.1	38.5	1.588	1.509
122	30.27	20.96	19.40	5.96	384.0	8.02	1.32	42.5	37.1	1.593	1.515
123	32.95	20.78	18.20	5.80	332.9	7.57	1.33	39.3	34.2	1.602	1.526
124	35.63	20.60	17.00	5.64	285.9	7.12	1.35	36.2	31.4	1.611	1.537
125	38.31	20.42	15.80	5.48	243.0	6.66	1.37	33.2	28.7	1.620	1.549
126	40.99	20.24	14.60	5.31	204.0	6.20	1.39	30.2	26.0	1.630	1.561
127*	42.33	20.15	14.00	5.23	186.0	5.96	1.41	28.8	24.7	1.635	1.567
127*	42.33	20.15	14.00	6.46	193.6	5.48	1.18	27.9	27.5	1.474	1.465
128	44.24	19.90	16.10	7.00	268.7	6.19	1.13	33.6	33.2	1.444	1.433
129	48.07	19.39	20.31	8.09	466.4	7.59	1.05	46.2	45.7	1.388	1.376
130*	49.99	19.14	22.41	8.63	591.4	8.28	1.02	53.1	52.5	1.362	1.350
130*	49.99	19.14	22.41	8.52	592.3	8.34	1.05	52.9	52.9	1.384	1.384
131	52.96	18.75	25.70	9.34	826.2	9.40	1.00	64.3	64.3	1.346	1.346
132*	55.94	18.37	29.00	10.17	1110.8	10.45	0.96	76.6	76.6	1.312	1.312

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 5

MEMBER NO. 4- 5 LENGTH= 18.32 FT ANGLE=-86.94 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 15.50 FT OF= 6.03 X 0.2480 WEB=0.1900 IF=C 8 X 11.5
SECTION 2 LENGTH= 1.69 FT OF= 6.03 X 0.2480 WEB=0.2440 IF=C 8 X 11.5

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
4*	57.85	0.00	8.00	6.31	64.9	3.21	2.43	13.2	21.1	1.591	3.026
134	57.76	1.55	9.89	6.67	105.4	3.98	2.36	17.3	27.7	1.559	3.006
135	57.58	4.65	13.68	7.39	221.2	5.47	2.24	26.5	41.5	1.502	2.967
136	57.40	7.75	17.47	8.11	388.3	6.92	2.14	36.8	56.2	1.453	2.928
137	57.22	10.85	21.26	8.83	612.3	8.33	2.05	48.2	71.6	1.409	2.888
138	57.04	13.95	25.04	9.54	898.5	9.70	1.97	60.6	87.9	1.369	2.850
139*	56.95	15.50	26.94	9.90	1066.7	10.38	1.94	67.2	96.3	1.351	2.831
139*	56.95	15.50	26.94	11.33	1157.2	10.10	1.81	74.4	101.7	1.287	2.758
140	56.91	16.33	27.97	11.59	1266.9	10.46	1.79	78.6	106.9	1.276	2.745
141*	56.87	17.16	29.00	11.84	1382.7	10.81	1.77	83.0	112.1	1.266	2.733

a) East Frame Continued

Figure A.1 Geometry and Section Properties Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 2

MEMBER NO. 1- 2 LENGTH= 18.32 FT ANGLE= 86.95 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 15.50 FT OF= 6.06 X 0.2510 WEB=0.1830 IF=C 8 X 11.5
SECTION 2 LENGTH= 1.69 FT OF= 6.06 X 0.2510 WEB=0.2460 IF=C 8 X 11.5

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
1*	0.00	0.00	8.00	6.28	65.2	3.22	2.44	13.3	21.1	1.606	3.028
101	0.09	1.55	9.89	6.63	105.7	3.99	2.37	17.4	27.7	1.575	3.010
102	0.27	4.65	13.68	7.32	221.3	5.50	2.26	26.5	41.5	1.520	2.972
103	0.45	7.75	17.47	8.01	387.8	6.96	2.16	36.8	56.0	1.472	2.933
104	0.63	10.85	21.26	8.70	610.3	8.37	2.07	48.0	71.4	1.429	2.896
105	0.81	13.95	25.04	9.40	894.3	9.76	1.99	60.3	87.5	1.390	2.858
106*	0.90	15.50	26.94	9.74	1061.0	10.43	1.96	66.9	95.8	1.372	2.840
106*	0.90	15.50	26.94	11.41	1166.4	10.11	1.81	75.2	102.2	1.297	2.754
107	0.94	16.33	27.97	11.67	1276.9	10.46	1.79	79.4	107.3	1.286	2.742
108*	0.98	17.16	29.00	11.92	1393.6	10.81	1.77	83.8	112.6	1.276	2.729

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 3

MEMBER NO. 2- 3 LENGTH= 28.08 FT ANGLE= 5.63 DEG FYF=50.KSI FYW=50.KSI
SECTION 1 LENGTH= 6.00 FT OF= 6.03 X 0.2500 WEB=0.2320 IF= 5.97 X 0.2450
SECTION 2 LENGTH= 7.65 FT OF= 6.00 X 0.2500 WEB=0.2460 IF= 6.00 X 0.2490
SECTION 3 LENGTH= 13.50 FT OF= 6.06 X 0.3060 WEB=0.1390 IF= 6.00 X 0.2440

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
111*	1.91	18.37	29.00	9.58	1061.6	10.53	0.97	73.5	72.9	1.325	1.301
112	4.88	18.76	25.70	8.82	790.8	9.47	1.01	61.8	61.2	1.359	1.334
113*	7.86	19.14	22.41	8.05	568.0	8.40	1.05	51.0	50.4	1.395	1.371
113*	7.86	19.14	22.41	8.38	583.0	8.34	1.04	52.1	52.0	1.371	1.369
114	9.78	19.39	20.30	7.87	460.3	7.65	1.07	45.4	45.3	1.396	1.395
115	13.60	19.90	16.10	6.83	266.0	6.24	1.15	33.1	33.0	1.451	1.450
116*	15.52	20.15	14.00	6.32	192.0	5.51	1.19	27.5	27.4	1.481	1.480
116*	15.52	20.15	14.00	5.19	183.1	5.94	1.39	28.2	24.4	1.628	1.562
117	16.86	20.24	14.60	5.27	200.9	6.17	1.38	29.6	25.7	1.623	1.556
118	19.54	20.42	15.80	5.44	239.4	6.64	1.36	32.5	28.4	1.613	1.544
119	22.22	20.60	17.00	5.60	281.8	7.09	1.34	35.5	31.1	1.603	1.532
120	24.90	20.78	18.20	5.77	328.2	7.54	1.32	38.5	33.9	1.594	1.520
121	27.58	20.96	19.40	5.94	378.7	7.99	1.30	41.6	36.7	1.584	1.509
3*	28.92	21.05	20.00	6.02	405.6	8.21	1.29	43.2	38.2	1.580	1.503

b) West Frame

Figure A.1 Geometry and Section Properties Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 4

MEMBER NO. 3- 5 LENGTH= 28.08 FT ANGLE= -5.64 DEG FYF=50. KSI FYW=50. KSI
SECTION 1 LENGTH= 0.50 FT OF= 6.06 X 0.3160 WEB=0.1360 IF= 6.00 X 0.2450
SECTION 2 LENGTH= 13.00 FT OF= 6.06 X 0.3160 WEB=0.1360 IF= 6.00 X 0.2450
SECTION 3 LENGTH= 7.65 FT OF= 6.00 X 0.2500 WEB=0.2490 IF= 6.00 X 0.2480
SECTION 4 LENGTH= 5.50 FT OF= 6.00 X 0.2490 WEB=0.2500 IF= 6.03 X 0.2490
SECTION 5 LENGTH= 0.50 FT OF= 6.00 X 0.2490 WEB=0.2500 IF= 6.03 X 0.2490

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
3*	28.92	21.05	20.00	6.03	409.2	8.24	1.31	44.0	38.2	1.589	1.506
122	29.14	21.04	19.89	6.01	404.1	8.20	1.31	43.7	38.0	1.590	1.507
123*	29.36	21.03	19.78	6.00	399.1	8.16	1.31	43.4	37.7	1.590	1.508
123*	29.36	21.03	19.78	6.00	399.1	8.16	1.31	43.4	37.7	1.590	1.508
124	30.98	20.92	19.06	5.90	367.1	7.89	1.32	41.5	36.0	1.596	1.515
125	34.22	20.70	17.61	5.70	307.8	7.35	1.34	37.7	32.6	1.607	1.529
126	37.47	20.48	16.17	5.51	254.4	6.80	1.37	34.1	29.2	1.618	1.543
127	40.71	20.26	14.72	5.31	206.8	6.24	1.39	30.5	26.0	1.629	1.557
128*	42.33	20.15	14.00	5.21	185.1	5.96	1.40	28.7	24.5	1.635	1.565
128*	42.33	20.15	14.00	6.35	192.3	5.50	1.19	27.5	27.4	1.479	1.476
129	44.24	19.90	16.10	6.87	266.6	6.23	1.14	33.2	33.1	1.448	1.446
130	48.07	19.39	20.30	7.92	461.7	7.64	1.07	45.5	45.4	1.393	1.390
131*	49.98	19.14	22.41	8.44	585.0	8.32	1.03	52.3	52.1	1.368	1.365
131*	49.98	19.14	22.41	8.47	586.8	8.32	1.03	52.3	52.4	1.365	1.374
132	52.71	18.78	25.43	9.23	797.6	9.30	0.99	62.7	62.8	1.331	1.339
133*	55.44	18.43	28.45	9.98	1050.6	10.26	0.95	73.8	73.9	1.299	1.307
133*	55.44	18.43	28.45	9.98	1050.6	10.26	0.95	73.8	73.9	1.299	1.307
134	55.69	18.40	28.73	10.05	1075.8	10.35	0.95	74.8	75.0	1.296	1.305
135*	55.94	18.37	29.00	10.12	1101.4	10.43	0.95	75.9	76.0	1.294	1.302

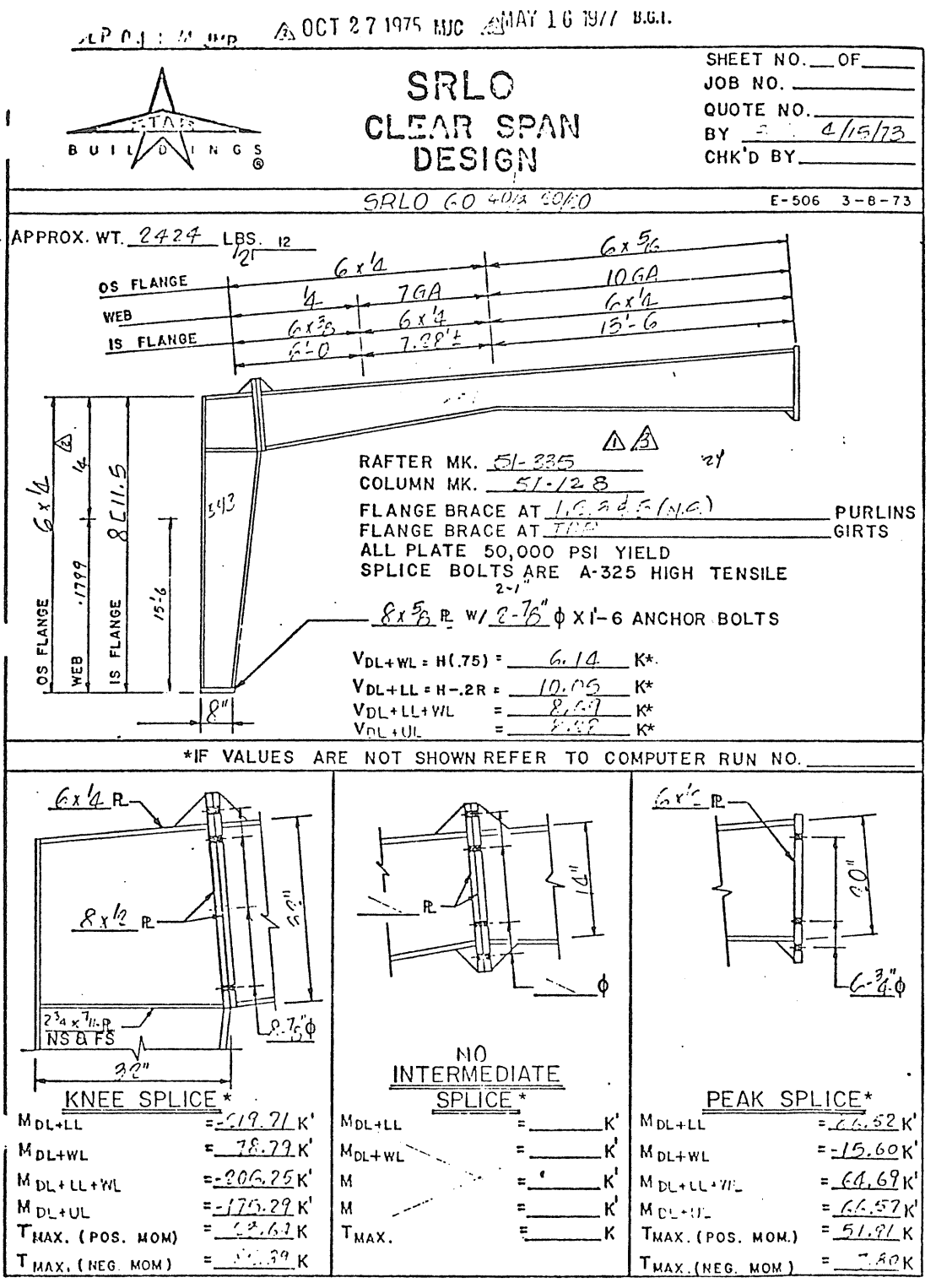
STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
DESIGN DIMENSIONS AND PROPERTIES REPORT PAGE 5

MEMBER NO. 4- 5 LENGTH= 18.31 FT ANGLE=-86.94 DEG FYF=50. KSI FYW=50. KSI
SECTION 1 LENGTH= 15.50 FT OF= 6.03 X 0.2500 WEB=0.1980 IF=C 8 X 11.5
SECTION 2 LENGTH= 0.42 FT OF= 6.03 X 0.2500 WEB=0.2490 IF=C 8 X 11.5
SECTION 3 LENGTH= 1.27 FT OF= 6.03 X 0.2500 WEB=0.2490 IF=C 8 X 11.5

POINT NO.	X (FT)	Y (FT)	DEPTH (IN)	AREA (IN2)	IX (IN4)	RX (IN)	RY (IN)	SOX (IN3)	SIX (IN3)	RTO (IN)	RTI (IN)
4*	57.85	0.00	8.00	6.38	65.5	3.21	2.41	13.4	21.2	1.587	3.022
137	57.76	1.55	9.89	6.75	106.5	3.97	2.35	17.6	27.8	1.554	3.002
138	57.58	4.65	13.68	7.50	223.8	5.46	2.23	26.9	41.7	1.497	2.961
139	57.40	7.75	17.47	8.25	393.3	6.90	2.12	37.4	56.5	1.446	2.920
140	57.22	10.85	21.26	9.00	620.8	8.30	2.03	49.1	72.1	1.402	2.879
141	57.04	13.95	25.04	9.75	911.9	9.67	1.95	61.8	88.6	1.362	2.839
142*	56.95	15.50	26.94	10.13	1083.1	10.34	1.92	68.6	97.2	1.343	2.820
142*	56.95	15.50	26.94	11.48	1168.2	10.09	1.80	75.3	102.3	1.284	2.751
143	56.95	15.71	27.19	11.54	1195.2	10.18	1.80	76.3	103.6	1.281	2.748
144*	56.94	15.92	27.45	11.61	1222.6	10.26	1.79	77.4	104.9	1.279	2.744
144*	56.94	15.92	27.45	11.61	1222.6	10.26	1.79	77.4	104.9	1.279	2.744
145	56.91	16.54	28.22	11.80	1307.6	10.53	1.78	80.7	108.9	1.271	2.735
146*	56.87	17.16	29.00	11.99	1396.2	10.79	1.76	84.0	112.8	1.263	2.726

b) West Frame Continued

Figure A.1 Geometry and Section Properties Continued

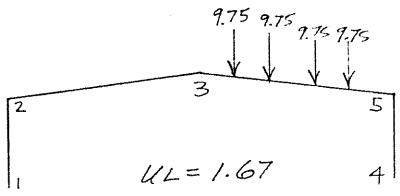


c) Nominal Dimensions

Figure A.1 Geometry and Section Properties Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	12.13	0.0	-11.42	14.16	30.00	30.00	27.09	NONE	0.14	0.00	0.00	0.14	0.0000	0.0000
101	12.13	-17.7	-11.42	18.50	30.00	30.00	33.90	NONE	0.10	0.41	0.26	0.36	-0.3932	0.0198
102	12.13	-53.2	-11.42	20.71	30.00	30.00	34.77	NONE	0.08	0.81	0.51	0.75	-1.1022	0.0553
103	12.13	-88.6	-11.42	20.09	30.00	30.00	28.48	NONE	0.08	0.97	0.63	0.92	-1.6789	0.0840
104	12.13	-124.1	-11.42	19.49	30.00	30.00	23.29	NONE	0.07	1.04	0.70	1.00	-2.1252	0.1059
105	12.13	-159.5	-11.42	26.68	30.00	30.00	19.70	NONE	0.05	1.07	0.73	1.02	-2.4543	0.1217
106*	12.13	-177.3	-11.42	26.96	30.00	29.82	18.29	NONE	0.05	1.07	0.75	1.03		
106*	9.55	-177.3	-13.65	26.80	30.00	30.00	49.09	NONE	0.03	0.94	0.69	0.91	-2.5823	0.1277
107	9.55	-177.8	-13.65	26.80	30.00	30.00	49.00	NONE	0.03	0.94	0.69	0.91		
108*	9.55	-178.4	-13.65	26.79	30.00	30.00	48.91	NONE	0.03	0.94	0.69	0.91		
108*	12.10	-178.4	-11.45	26.79	30.00	30.00	48.91	NONE	0.04	0.94	0.69	0.91		
109	12.10	-187.4	-11.45	26.75	30.00	30.00	47.17	NONE	0.04	0.94	0.69	0.90	-2.6401	0.1304
110*	12.10	-196.5	-11.45	26.71	30.00	30.00	45.54	NONE	0.04	0.93	0.70	0.90		



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
113*	13.47	-200.5	9.80	26.90	30.00	30.00	38.84	NONE	0.05	1.07	1.08	1.13		
114	13.47	-198.0	9.80	26.86	30.00	30.00	39.22	NONE	0.05	1.07	1.08	1.13	-2.7553	0.1906
115*	13.47	-195.6	9.80	26.83	30.00	30.00	39.60	NONE	0.05	1.08	1.08	1.13		
115*	13.47	-195.6	9.80	26.83	30.00	30.00	39.60	NONE	0.05	1.08	1.08	1.13		
116	13.47	-168.6	9.80	22.81	30.00	30.00	44.40	NONE	0.07	1.09	1.10	1.16	-2.7634	0.2545
117*	13.47	-141.6	9.80	23.22	30.00	30.00	50.53	NONE	0.07	1.09	1.10	1.17		
117*	13.49	-141.6	9.77	23.09	30.00	30.00	53.80	NONE	0.07	1.09	1.09	1.16		
118	13.49	-122.7	9.77	23.39	30.00	30.00	59.51	NONE	0.07	1.09	1.09	1.16	-2.7532	0.1205
119	13.49	-85.0	9.77	13.66	30.00	22.10	62.91	NONE	0.15	1.03	1.40	1.55	-2.7203	-0.2430
120*	13.49	-66.2	9.77	14.60	30.00	22.54	62.91	NONE	0.15	0.97	1.29	1.43		
120*	12.84	-66.2	10.61	17.73	30.00	23.70	15.06	NONE	0.14	0.93	1.36	1.49		
121	12.84	-48.9	10.61	17.56	30.00	23.62	14.29	NONE	0.14	0.65	0.95	1.08	-2.6672	-0.8147
122	12.84	-14.4	10.61	17.23	30.00	23.44	12.97	NONE	0.14	0.17	0.25	0.39	-2.6041	-1.4891
123	12.84	20.1	10.61	23.33	30.00	30.00	11.87	NONE	0.10	0.22	0.24	0.31	-2.5369	-2.2036
124	12.84	54.6	10.61	22.95	30.00	30.00	10.94	NONE	0.10	0.53	0.60	0.63	-2.4734	-2.8802
125*	12.84	71.8	10.61	22.69	29.92	30.00	10.53	NONE	0.09	0.67	0.76	0.77		
125*	12.79	71.8	10.67	22.70	29.92	30.00	10.53	NONE	0.09	0.67	0.76	0.77		
126	12.79	74.2	10.67	22.66	29.90	30.00	10.47	NONE	0.09	0.69	0.78	0.79	-2.4405	-3.2318
3*	12.79	76.5	10.67	22.62	29.88	30.00	11.27	3.00	0.09	0.71	0.79	0.80	-2.4364	-3.2761

a) East Frame

Figure A.2 Stress and Deflection Data, Unbalanced Live Load

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	11.31	76.5	12.23	22.98	29.88	30.00	12.02	2.20	0.08	0.71	0.79	0.79	-2.4364	-3.2761
127	11.31	92.9	12.23	23.13	29.97	30.00	12.14	2.40	0.08	0.89	1.00	0.97	-2.4578	-3.4809
128	11.96	120.5	2.50	23.26	30.00	30.00	11.47	NONE	0.09	1.25	1.41	1.34	-2.4923	-3.8049
129	11.96	127.2	2.50	17.03	30.00	30.00	12.31	NONE	0.13	1.43	1.62	1.55	-2.5115	-3.9733
130	12.61	124.9	-7.23	17.31	30.00	30.00	13.28	NONE	0.13	1.53	1.74	1.66	-2.5117	-3.9488
131	12.61	105.5	-7.23	17.59	30.00	30.00	14.41	NONE	0.14	1.42	1.62	1.55	-2.4904	-3.7040
132*	12.61	95.8	-7.23	17.73	30.00	30.00	15.06	NONE	0.14	1.35	1.55	1.49	------	------
132*	13.05	95.8	-6.40	14.21	30.00	30.00	69.65	NONE	0.14	1.37	1.38	1.51	------	------
133	13.05	83.5	-6.40	13.22	30.00	30.00	71.51	NONE	0.14	0.99	0.99	1.13	-2.4368	-3.1313
134	14.32	22.5	-16.07	23.21	30.00	30.00	71.51	NONE	0.08	0.19	0.19	0.27	-2.3504	-2.2270
135*	15.60	-15.0	-25.73	22.90	30.00	30.00	65.19	NONE	0.08	0.11	0.11	0.19	------	------
135*	15.54	-15.0	-25.77	23.13	30.00	30.00	59.31	NONE	0.08	0.11	0.11	0.19	------	------
136	15.54	-92.4	-25.77	22.67	30.00	30.00	51.55	NONE	0.07	0.57	0.57	0.65	-2.2336	-1.0111
137*	15.54	-169.7	-25.77	26.87	30.00	30.00	45.59	NONE	0.06	0.89	0.89	0.94	------	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 - LL

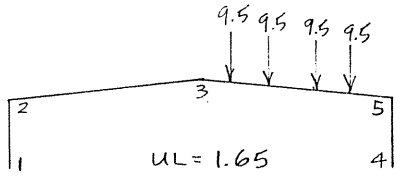
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	28.21	0.0	10.48	14.14	28.37	30.00	27.09	NONE	0.32	0.00	0.00	0.32	0.0000	0.0000
139	28.21	-16.3	10.48	18.49	30.00	28.66	33.91	NONE	0.23	0.38	0.26	0.49	-0.0340	-0.0046
140	28.21	-48.8	10.48	20.72	30.00	28.55	34.77	NONE	0.19	0.75	0.47	0.65	-0.1734	-0.0173
141	28.21	-81.4	10.48	20.10	30.00	28.42	28.48	NONE	0.18	0.90	0.55	0.78	-0.4346	-0.0360
142	28.21	-113.9	10.48	19.25	30.00	28.30	23.29	NONE	0.17	0.96	0.60	0.85	-0.8160	-0.0608
143	28.21	-146.5	10.48	25.10	30.00	30.00	19.70	NONE	0.12	0.98	0.67	0.88	-1.3053	-0.0910
144*	28.21	-162.7	10.48	24.83	30.00	29.82	18.29	NONE	0.12	0.99	0.69	0.89	------	------
144*	28.08	-162.7	10.81	26.82	30.00	30.00	45.64	NONE	0.09	0.87	0.64	0.79	------	------
145	28.08	-171.7	10.81	26.78	30.00	30.00	43.93	NONE	0.09	0.87	0.64	0.79	-1.7486	-0.1175
146*	28.08	-180.7	10.81	26.74	30.00	30.00	42.34	NONE	0.09	0.87	0.64	0.79	------	------

a) East Frame Continued

Figure A.2 Stress and Deflection Data, Unbalanced Live Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	11.82	0.0	-11.14	14.19	30.00	30.00	27.09	NONE	0.13	0.00	0.00	0.13	0.0000	0.0000
101	11.82	-17.3	-11.14	18.52	30.00	30.00	33.90	NONE	0.10	0.40	0.25	0.35	-0.3846	0.0194
102	11.82	-51.9	-11.14	20.73	30.00	30.00	34.77	NONE	0.08	0.79	0.50	0.73	-1.0784	0.0542
103	11.82	-86.5	-11.14	20.11	30.00	30.00	28.48	NONE	0.07	0.95	0.62	0.90	-1.6437	0.0824
104	11.82	-121.0	-11.14	19.50	30.00	30.00	23.29	NONE	0.07	1.01	0.68	0.97	-2.0819	0.1039
105	11.82	-155.6	-11.14	26.68	30.00	30.00	19.70	NONE	0.05	1.04	0.71	1.00	-2.4062	0.1196
106*	11.82	-172.9	-11.14	26.96	30.00	29.82	18.29	NONE	0.05	1.04	0.73	1.00	------	------
106*	11.69	-172.9	-11.28	26.82	30.00	30.00	46.77	NONE	0.04	0.92	0.68	0.89	------	------
107	11.69	-182.3	-11.28	26.78	30.00	30.00	45.02	NONE	0.04	0.92	0.68	0.88	-2.5876	0.1281
108*	11.69	-191.7	-11.28	26.73	30.00	30.00	43.39	NONE	0.04	0.91	0.68	0.88	---- -	- ----



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
111*	13.14	-195.5	9.55	26.91	30.00	30.00	36.43	NONE	0.05	1.06	1.06	1.11	------	------
112	13.14	-166.9	9.55	22.80	30.00	30.00	41.20	NONE	0.07	1.08	1.08	1.14	-2.7124	0.2506
113*	13.14	-138.2	9.55	23.24	30.00	30.00	47.40	NONE	0.07	1.08	1.08	1.15	------	------
113*	13.16	-138.2	9.52	23.04	30.00	30.00	56.51	NONE	0.07	1.06	1.06	1.13	------	------
114	13.16	-119.8	9.52	23.34	30.00	30.00	62.50	NONE	0.07	1.06	1.06	1.13	-2.7029	0.1226
115	13.16	-83.1	9.52	13.53	30.00	22.05	65.01	NONE	0.14	1.00	1.37	1.51	-2.6710	-0.2298
116*	13.16	-64.7	9.52	14.48	30.00	22.50	65.01	NONE	0.14	0.94	1.26	1.40	------	------
116*	12.52	-64.7	10.34	17.81	30.00	23.71	15.05	NONE	0.14	0.92	1.33	1.46	-- ---	------
117	12.52	-50.8	10.34	17.67	30.00	23.64	14.41	NONE	0.14	0.69	0.99	1.13	-2.6240	-0.7362
118	12.52	-23.0	10.34	17.39	30.00	23.49	13.27	NONE	0.13	0.28	0.41	0.54	-2.5739	-1.2724
119	12.52	4.8	10.34	17.12	30.00	30.00	12.30	NONE	0.13	0.05	0.06	0.19	-2.5194	-1.8524
120	12.52	32.6	10.34	23.30	30.00	30.00	11.47	NONE	0.09	0.34	0.38	0.43	-2.4654	-2.4267
121	12.52	60.4	10.34	22.93	29.97	30.00	10.74	NONE	0.09	0.58	0.65	0.67	-2.4154	-2.9594
3*	12.52	74.3	10.34	22.71	29.88	30.00	10.40	NONE	0.09	0.69	0.77	0.78	-2.3928	-3.2016

b) West Frame

Figure A.2 Stress and Deflection Data, Unbalanced Live Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BENO (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	11.12	74.3	11.84	23.03	29.88	30.00	11.56	2.60	0.08	0.69	0.77	0.77	-2.3928	-3.2016
122	11.12	76.8	11.84	23.07	29.90	30.00	11.63	2.60	0.08	0.72	0.80	0.80	-2.3968	-3.2407
123*	11.12	79.4	11.84	23.09	29.92	30.00	11.70	2.60	0.08	0.74	0.84	0.82		
123*	11.03	79.4	11.92	23.09	29.92	30.00	11.70	2.60	0.08	0.74	0.84	0.82		
124	11.03	98.8	11.92	23.17	30.00	30.00	11.85	3.00	0.08	0.97	1.09	1.05	-2.4246	-3.5053
125	11.67	120.3	2.44	23.33	30.00	30.00	11.87	NONE	0.09	1.29	1.47	1.40	-2.4588	-3.8214
126	12.30	127.4	-7.04	17.23	30.00	30.00	12.97	NONE	0.13	1.52	1.73	1.65	-2.4689	-3.8932
127	12.30	104.5	-7.04	17.56	30.00	30.00	14.29	NONE	0.13	1.39	1.59	1.52	-2.4491	-3.6589
128*	12.30	93.1	-7.04	17.73	30.00	30.00	15.06	NONE	0.13	1.32	1.51	1.45		
128*	12.73	93.1	-6.23	14.41	30.00	30.00	66.61	NONE	0.14	1.35	1.35	1.49		
129	12.73	81.1	-6.23	13.44	30.00	30.00	66.61	NONE	0.14	0.98	0.98	1.11	-2.3937	-3.0659
130	13.97	21.6	-15.65	23.30	30.00	30.00	64.82	NONE	0.08	0.19	0.19	0.27	-2.3094	-2.1822
131*	15.21	-14.8	-25.07	23.00	30.00	30.00	58.60	NONE	0.08	0.11	0.11	0.19		
131*	15.16	-14.8	-25.10	23.01	30.00	30.00	59.30	NONE	0.08	0.11	0.11	0.19		
132	15.16	-83.9	-25.10	22.58	30.00	30.00	52.12	NONE	0.07	0.53	0.53	0.61	-2.2007	-1.0502
133*	15.16	-153.0	-25.10	26.79	30.00	30.00	46.48	NONE	0.06	0.83	0.83	0.88		
133*	15.16	-153.0	-25.11	26.79	30.00	30.00	46.48	NONE	0.06	0.83	0.83	0.88		
134	15.16	-159.3	-25.11	26.83	30.00	30.00	46.03	NONE	0.06	0.85	0.85	0.91	-2.1367	-0.3829
135*	15.16	-165.6	-25.11	26.86	30.00	30.00	45.58	NONE	0.06	0.87	0.87	0.93		

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 - LL

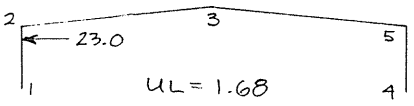
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BENO (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	27.48	0.0	10.23	14.16	20.42	30.00	27.09	NONE	0.31	0.00	0.00	0.31	0.0000	0.0000
137	27.48	-15.9	10.23	18.50	30.00	28.66	33.91	NONE	0.23	0.37	0.25	0.48	-0.0318	-0.0045
138	27.48	-47.6	10.23	20.72	30.00	28.55	34.77	NONE	0.18	0.73	0.45	0.64	-0.1739	-0.0171
139	27.48	-79.4	10.23	20.10	30.00	28.42	28.48	NONE	0.17	0.87	0.54	0.76	-0.4316	-0.0354
140	27.48	-111.2	10.23	19.31	30.00	28.30	23.29	NONE	0.17	0.94	0.58	0.83	-0.8063	-0.0597
141	27.48	-142.9	10.23	25.21	30.00	30.00	19.70	NONE	0.12	0.96	0.66	0.86	-1.2861	-0.0892
142*	27.48	-158.8	10.23	24.94	30.00	29.82	18.29	NONE	0.11	0.96	0.67	0.87		
142*	27.03	-158.8	11.36	26.81	30.00	30.00	48.50	NONE	0.09	0.84	0.62	0.77		
143	27.03	-161.2	11.36	26.80	30.00	30.00	48.04	NONE	0.09	0.84	0.62	0.77	-1.6003	-0.1081
144*	27.03	-163.6	11.36	26.79	30.00	30.00	47.58	NONE	0.09	0.85	0.62	0.77		
144*	27.46	-163.6	10.29	26.79	30.00	30.00	47.58	NONE	0.09	0.85	0.62	0.77		
145	27.46	-170.0	10.29	26.75	30.00	30.00	46.25	NONE	0.09	0.84	0.62	0.77	-1.7608	-0.1174
146*	27.46	-176.4	10.29	26.72	30.00	30.00	44.99	NONE	0.09	0.84	0.63	0.76		

b) West Frame Continued

Figure A.2 Stress and Deflection Data, Unbalanced Live Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 -- HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	7.31	0.0	-12.91	14.09	30.00	30.00	27.09	NONE	0.08	0.00	0.00	0.08	0.0000	0.0000
101	7.31	-20.0	-12.91	18.25	30.00	30.00	33.90	NONE	0.06	0.46	0.29	0.43	-0.6433	0.0336
102	7.31	-60.1	-12.91	20.71	30.00	30.00	34.77	NONE	0.05	0.91	0.58	0.88	-1.8423	0.0961
103	7.31	-100.2	-12.91	20.09	30.00	30.00	28.48	NONE	0.05	1.10	0.72	1.07	-2.8918	0.1509
104	7.31	-140.3	-12.91	19.49	30.00	30.00	23.29	NONE	0.04	1.18	0.79	1.15	-3.7937	0.1978
105	7.31	-180.4	-12.91	26.68	30.00	30.00	19.70	NONE	0.03	1.21	0.83	1.18	-4.5632	0.2378
106*	7.31	-200.4	-12.91	26.96	30.00	29.82	18.29	NONE	0.03	1.21	0.84	1.19	-------	- ----
106*	4.53	-200.4	-14.13	26.80	30.00	30.00	49.09	NONE	0.01	1.06	0.78	1.05	------	------
107	4.53	-201.0	-14.13	26.80	30.00	30.00	49.00	NONE	0.01	1.06	0.78	1.05	-4.9118	0.2559
108*	4.53	-201.6	-14.13	26.79	30.00	30.00	48.91	NONE	0.01	1.06	0.78	1.05	------	------
108*	7.28	-201.6	-12.93	26.79	30.00	30.00	48.91	NONE	0.02	1.06	0.78	1.04	------	- ----
109	7.28	-211.8	-12.93	26.75	30.00	30.00	47.17	NONE	0.02	1.06	0.78	1.04	-5.0854	0.2649
110*	6.01	-206.3	10.04	26.71	30.00	30.00	45.54	NONE	0.02	0.98	0.73	0.96	------	- ----



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 -- HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
113*	-8.77	-188.5	7.74	30.00	30.00	30.00	38.84	NONE	0.03	1.01	1.01	1.04	-- ---	------
114	-8.77	-186.6	7.74	30.00	30.00	30.00	39.22	NONE	0.03	1.01	1.02	1.04	-5.4769	0.4877
115*	-8.77	-184.6	7.74	30.00	30.00	30.00	39.60	NONE	0.03	1.02	1.02	1.05	-- ---	------
115*	-8.77	-184.6	7.74	30.00	30.00	30.00	39.60	NONE	0.03	1.02	1.02	1.05	------	------
116	-8.77	-163.3	7.74	30.00	30.00	30.00	44.40	NONE	0.03	1.06	1.06	1.09	-5.5192	0.9300
117*	-8.77	-142.0	7.74	30.00	30.00	30.00	50.53	NONE	0.04	1.10	1.10	1.13	---- -	------
117*	-8.75	-142.0	7.76	30.00	30.00	30.00	53.80	NONE	0.04	1.09	1.10	1.13	------	------
118	-8.75	-127.0	7.76	30.00	30.00	30.00	59.51	NONE	0.04	1.12	1.13	1.16	-5.5624	1.3895
119	-8.75	-97.1	7.76	30.00	30.00	22.10	62.91	NONE	0.04	1.18	1.60	1.60	-5.5716	1.5031
120*	-8.75	-82.1	7.76	30.00	30.00	22.54	62.91	NONE	0.05	1.20	1.60	1.60	---- -	- ----
120*	-9.23	-82.1	7.18	30.00	30.00	23.70	15.06	NONE	0.06	1.16	1.68	1.68	-- ---	------
121	-9.23	-70.4	7.18	30.00	30.00	23.62	14.29	NONE	0.06	0.94	1.36	1.36	-5.5530	1.3366
122	-9.23	-47.1	7.18	30.00	30.00	23.44	12.97	NONE	0.06	0.56	0.82	0.82	-5.5147	0.9702
123	-9.23	-23.7	7.18	30.00	30.00	29.40	11.87	NONE	0.05	0.26	0.30	0.31	-5.4646	0.4840
124	-9.23	-0.4	7.18	30.00	30.00	29.33	10.94	NONE	0.05	0.00	0.00	0.06	-5.4096	-0.0532
125*	-9.23	11.3	7.18	30.00	29.92	30.00	10.53	NONE	0.05	0.11	0.12	0.17	---- -	------
125*	-9.26	11.3	7.14	30.00	29.92	30.00	10.53	NONE	0.05	0.11	0.12	0.17	------	------
126	-9.26	12.8	7.14	30.00	29.90	30.00	10.47	NONE	0.05	0.12	0.13	0.19	-5.3775	-0.3668
3*	-9.26	14.4	7.14	30.00	29.88	30.00	10.41	NONE	0.05	0.13	0.15	0.20	-5.3733	-0.4084

a) East Frame

Figure A.3 Stress and Deflection Data, Lateral Load Only

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 - HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	-10.10	14.4	5.89	30.00	29.88	30.00	10.41	NONE	0.06	0.13	0.15	0.21	-5.3733	-0.4084
127	-10.10	22.3	5.89	30.00	29.97	30.00	10.74	NONE	0.06	0.21	0.24	0.30	-5.3959	-0.6476
128	-10.10	38.1	5.89	30.00	30.00	30.00	11.47	NONE	0.06	0.39	0.45	0.50	-5.4339	-1.1039
129	-10.10	54.0	5.89	30.00	30.00	30.00	12.31	NONE	0.06	0.61	0.69	0.75	-5.4768	-1.5094
130	-10.10	69.8	5.89	30.00	30.00	30.00	13.28	NONE	0.06	0.85	0.97	1.04	-5.5064	-1.8313
131	-10.10	85.6	5.89	30.00	30.00	30.00	14.41	NONE	0.06	1.15	1.32	1.38	-5.5235	-2.0264
132*	-10.10	93.6	5.89	30.00	30.00	30.00	15.06	NONE	0.06	1.32	1.51	1.58	------	------
132*	-10.46	93.6	5.23	30.00	30.00	30.00	69.65	NONE	0.05	1.34	1.34	1.40	------	------
133	-10.46	103.6	5.23	30.00	30.00	30.00	71.51	NONE	0.05	1.23	1.23	1.28	-5.5217	-2.0314
134	-10.46	123.8	5.23	30.00	30.00	30.00	71.51	NONE	0.04	1.07	1.07	1.11	-5.4908	-1.7401
135*	-10.46	133.9	5.23	30.00	30.00	30.00	65.19	NONE	0.04	1.01	1.01	1.05	------	------
135*	-10.45	133.9	5.25	30.00	30.00	30.00	59.31	NONE	0.04	1.01	1.01	1.05	------	------
136	-10.45	149.7	5.25	30.00	30.00	30.00	51.55	NONE	0.04	0.93	0.93	0.97	-5.4190	-1.0358
137*	-10.45	165.5	5.25	30.00	30.00	30.00	45.59	NONE	0.03	0.86	0.86	0.90	------	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 - HOR

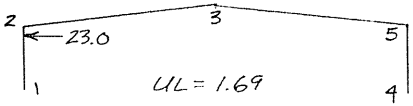
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	-7.10	0.0	-9.29	30.00	30.00	30.00	27.09	NONE	0.04	0.00	0.00	0.04	0.0000	0.0000
139	-7.10	14.4	-9.29	30.00	30.00	30.00	33.91	NONE	0.04	0.34	0.21	0.34	-0.5833	-0.0305
140	-7.10	43.3	-9.29	30.00	30.00	30.00	34.77	NONE	0.03	0.66	0.42	0.66	-1.6865	-0.0882
141	-7.10	72.1	-9.29	30.00	29.19	30.00	28.48	NONE	0.03	0.82	0.52	0.82	-2.6818	-0.1402
142	-7.10	101.0	-9.29	30.00	28.94	30.00	23.29	NONE	0.03	0.88	0.57	0.88	-3.5705	-0.1866
143	-7.10	129.8	-9.29	30.00	30.00	30.00	19.70	NONE	0.03	0.87	0.60	0.87	-4.3636	-0.2280
144*	-7.10	144.3	-9.29	30.00	29.60	30.00	18.29	NONE	0.02	0.89	0.61	0.89	------	------
144*	-6.99	144.3	-9.37	30.00	29.88	30.00	45.64	NONE	0.02	0.78	0.57	0.78	------	------
145	-6.99	152.1	-9.37	30.00	29.82	30.00	43.93	NONE	0.02	0.78	0.57	0.78	-4.9183	-0.2569
146*	-6.99	159.9	-9.37	30.00	29.76	30.00	42.34	NONE	0.02	0.78	0.57	0.78	------	------

a) East Frame Continued

Figure A.3 Stress and Deflection Data, Lateral Load Only Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 - HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	7.31	0.0	-12.92	14.11	30.00	30.00	27.09	NONE	0.08	0.00	0.00	0.08	0.0000	0.0000
101	7.31	-20.1	-12.92	18.26	30.00	30.00	33.90	NONE	0.06	0.46	0.29	0.43	-0.6445	0.0337
102	7.31	-60.2	-12.92	20.73	30.00	30.00	34.77	NONE	0.05	0.91	0.58	0.88	-1.8459	0.0965
103	7.31	-100.3	-12.92	20.11	30.00	30.00	28.48	NONE	0.05	1.10	0.72	1.07	-2.6983	0.1514
104	7.31	-140.4	-12.92	19.50	30.00	30.00	23.29	NONE	0.04	1.18	0.79	1.15	-3.8034	0.1986
105	7.31	-180.5	-12.92	26.68	30.00	30.00	19.70	NONE	0.03	1.20	0.83	1.18	-4.5764	0.2388
106*	7.31	-200.5	-12.92	26.96	30.00	29.82	18.29	NONE	0.03	1.21	0.84	1.18	------	------
106*	7.16	-200.5	-13.00	26.82	30.00	30.00	46.77	NONE	0.02	1.07	0.79	1.05	------	------
107	7.16	-211.3	-13.00	26.78	30.00	30.00	45.02	NONE	0.02	1.06	0.79	1.04	-5.0933	0.2657
108*	6.10	-206.4	9.97	26.73	30.00	30.00	43.39	NONE	0.02	0.98	0.73	0.97	---- -	- ----



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 - HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
111*	-8.76	-188.6	7.74	30.00	30.00	30.00	36.43	NONE	0.03	1.02	1.02	1.05	------	------
112	-8.76	-165.4	7.74	30.00	30.00	30.00	41.20	NONE	0.03	1.07	1.07	1.10	-5.5342	0.9005
113*	-8.76	-142.1	7.74	30.00	30.00	30.00	47.40	NONE	0.04	1.11	1.11	1.15	------	------
113*	-8.74	-142.1	7.76	30.00	30.00	30.00	56.51	NONE	0.03	1.09	1.09	1.13	------	------
114	-8.74	-127.1	7.76	30.00	30.00	30.00	62.50	NONE	0.04	1.12	1.12	1.16	-5.5907	1.3943
115.	-8.74	-97.2	7.76	30.00	30.00	22.05	65.01	NONE	0.04	1.18	1.60	1.60	-5.5901	1.5100
116*	-8.74	-82.2	7.76	30.00	30.00	22.50	65.01	NONE	0.05	1.20	1.60	1.60	------	------
116*	-9.22	-82.2	7.18	30.00	30.00	23.71	15.05	NONE	0.06	1.17	1.68	1.68	------	- ----
117	-9.22	-72.6	7.18	30.00	30.00	23.64	14.41	NONE	0.06	0.98	1.42	1.42	-5.5740	1.3670
118	-9.22	-53.3	7.18	30.00	30.00	23.49	13.27	NONE	0.06	0.66	0.95	0.95	-5.5443	1.0842
119	-9.22	-34.0	7.18	30.00	30.00	23.34	12.30	NONE	0.06	0.38	0.56	0.56	-5.5049	0.7035
120	-9.22	-14.7	7.18	30.00	30.00	29.37	11.47	NONE	0 05	0.15	0.18	0.21	-5.4604	0.2695
121	-9.22	4.6	7.18	30.00	29.97	30.00	10.74	NONE	0.05	0.04	0.05	0.10	-5.4139	-0.1847
3*	-9.22	14.3	7.18	30.00	29.88	30.00	10.40	NONE	0.05	0.13	0.15	0.20	-5.3907	-0.4114

b) West Frame

Figure A.3 Stress and Deflection Data, Lateral Load Only Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 - HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	-10.06	14.3	5.96	30.00	29.88	30.00	10.41	NONE	0.06	0.13	0.15	0.20	-5.3907	-0.4114
122	-10.06	15.6	5.96	30.00	29.90	30.00	10.47	NONE	0.06	0.15	0.16	0.22	-5.3950	-0.4563
123*	-10.06	16.9	5.96	30.00	29.92	30.00	10.53	NONE	0.06	0.16	0.18	0.23	---- -	------
123*	-10.10	16.9	5.89	30.00	29.92	30.00	10.53	NONE	0.06	0.16	0.18	0.23	------	------
124	-10.10	26.4	5.89	30.00	30.00	30.00	10.94	NONE	0.06	0.26	0.29	0.35	-5.4260	-0.7856
125	-10.10	45.6	5.89	30.00	30.00	30.00	11.87	NONE	0.06	0.49	0.56	0.61	-5.4758	-1.3149
126	-10.10	64.7	5.89	30.00	30.00	30.00	12.97	NONE	0.06	0.77	0.88	0.94	-5.5161	-1.7489
127	-10.10	83.9	5.87	30.00	30.00	30.00	14.29	NONE	0.06	1.12	1.28	1.34	-5.5402	-2 0197
128*	-10.10	93.4	5.89	30.00	30.00	30.00	15.06	NONE	0.06	1.32	1.51	1.58	------	- ----
128*	-10.46	93.4	5.23	30.00	30.00	30.00	66.61	NONE	0.05	1.36	1.36	1.41	-- ---	------
129	-10.46	103.5	5.23	30.00	30.00	30.00	66.61	NONE	0.05	1.25	1.25	1.30	-5.5397	-2.0401
130	-10.46	123.7	5.23	30.00	30.00	30.00	64.82	NONE	0.04	1.09	1.09	1.13	-5.5089	-1.7502
131*	-10.46	133.8	5.23	30.00	30.00	30.00	58.60	NONE	0.04	1.02	1.02	1.06	------	------
131*	-10.44	133.8	5.25	30.00	30.00	30.00	59.30	NONE	0.04	1.02	1.02	1.06	-- ---	------
132	-10.44	148.3	5.25	30.00	29.99	30.00	52.12	NONE	0.04	0.94	0.94	0.98	-5.4411	-1.0855
133*	-10.44	162.7	5.25	30.00	30.00	30.00	46.48	NONE	0.03	0.88	0.88	0.92	-- ---	------
133*	-10.44	162.7	5.25	30.00	30.00	30.00	46.48	NONE	0.03	0.88	0.88	0.92	---- -	------
134	-10.44	164.0	5.25	30.00	30.00	30.00	46.03	NONE	0.03	0.88	0.87	0.91	-5.3845	-0.5256
135*	-10.44	165.4	5.25	30.00	30.00	30.00	45.58	NONE	0.03	0.87	0.87	0.90	---- -	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB WEST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 - HOR

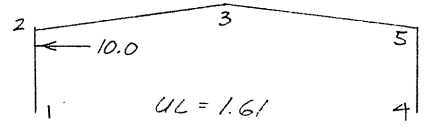
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	-7.10	0.0	-9.29	30.00	30.00	30.00	27.09	NONE	0.04	0.00	0.00	0.04	0.0000	0.0000
137	-7.10	14.4	-9.29	30.00	30.00	30.00	33.91	NONE	0.04	0.33	0.21	0.33	-0.5844	-0.0305
138	-7.10	43.3	-9.29	30.00	30.00	30.00	34.77	NONE	0.03	0.66	0.42	0.66	-1.6900	-0.0881
139	-7.10	72.1	-9.29	30.00	29.24	30.00	28.48	NONE	0.03	0.81	0.52	0.81	-2.6879	-0.1401
140	-7.10	100.9	-9.29	30.00	28.99	30.00	23.29	NONE	0.03	0.88	0.57	0.88	-3.5796	-0.1866
141	-7.10	129.8	-9.29	30.00	30.00	30.00	19.70	NONE	0.03	0.87	0.60	0.87	-4.3759	-0.2280
142*	-7.10	144.2	-9.29	30.00	29.60	30.00	18.29	NONE	0.02	0.88	0.60	0.88	------	- -----
142*	-6.71	144.2	-9.58	30.00	29.89	30.00	48.50	NONE	0.02	0.77	0.56	0.77	-- ---	------
143	-6.71	146.2	-9.58	30.00	29.88	30.00	48.04	NONE	0.02	0.77	0.56	0.77	-4.7900	-0.2496
144*	-6.71	148.2	-9.58	30.00	29.86	30.00	47.58	NONE	0.02	0.77	0.57	0.77	------	------
144*	-7.08	148.2	-9.30	30.00	29.86	30.00	47.58	NONE	0.02	0.77	0.57	0.77	------	- -----
145	-7.08	154.0	-9.30	30.00	29.82	30.00	46.25	NONE	0.02	0.77	0.57	0.77	-4.9799	-0.2595
146*	-7.08	159.8	-9.30	30.00	29.78	30.00	44.99	NONE	0.02	0.77	0.57	0.77	------	- -----

b) West Frame Continued

Figure A.3 Stress and Deflection Data, Lateral Load Only Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 - LL+HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	10.64	0.0	-12.64	14.10	30.00	30.00	27.09	NONE	0.12	0.00	0.00	0.12	0.0000	0.0000
101	10.64	-19.6	-12.64	18.50	30.00	30.00	33.90	NONE	0.09	0.45	0.28	0.40	-0.5217	0.0268
102	10.64	-58.9	-12.64	20.71	30.00	30.00	34.77	NONE	0.07	0.90	0.57	0.85	-1.4793	0.0758
103	10.64	-98.1	-12.64	20.09	30.00	30.00	28.48	NONE	0.07	1.08	0.70	1.03	-2.2905	0.1173
104	10.64	-137.4	-12.64	19.49	30.00	30.00	23.29	NONE	0.06	1.15	0.77	1.11	-2.9572	0.1512
105	10.64	-176.6	-12.64	26.68	30.00	30.00	19.70	NONE	0.04	1.18	0.81	1.14	-3.4944	0.1783
106*	10.64	-196.2	-12.64	26.96	30.00	29.82	18.29	NONE	0.04	1.18	0.83	1.15	------	------
106*	7.84	-196.2	-14.54	26.80	30.00	30.00	49.09	NONE	0.03	1.04	0.77	1.02	------	------
107	7.84	-196.8	-14.54	26.80	30.00	30.00	49.00	NONE	0.03	1.04	0.77	1.02	-3.7247	0.1898
108*	7.84	-197.4	-14.54	26.79	30.00	30.00	48.91	NONE	0.03	1.04	0.77	1.02	------	------
108*	10.61	-197.4	-12.67	26.79	30.00	30.00	48.91	NONE	0.03	1.04	0.77	1.01	------	------
109	10.61	-207.5	-12.67	26.75	30.00	30.00	47.17	NONE	0.03	1.04	0.77	1.01	-3.8357	0.1954
110*	10.06	-210.6	-2.68	26.71	30.00	30.00	45.54	NONE	0.03	1.00	0.75	0.97	------	------



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 - LL+HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
113*	4.48	-205.3	9.40	26.90	30.00	30.00	38.84	NONE	0.02	1.10	1.10	1.12	------	------
114	4.48	-203.0	9.40	26.86	30.00	30.00	39.22	NONE	0.02	1.10	1.11	1.12	-4.0768	0.3293
115*	4.48	-200.6	9.40	26.83	30.00	30.00	39.60	NONE	0.02	1.10	1.11	1.13	------	------
115*	4.48	-200.6	9.40	26.83	30.00	30.00	39.60	NONE	0.02	1.10	1.11	1.13	------	------
116	4.48	-174.7	9.40	22.81	30.00	30.00	44.40	NONE	0.02	1.13	1.14	1.16	-4.1002	0.5609
117*	4.48	-148.9	9.40	23.22	30.00	30.00	50.53	NONE	0.02	1.15	1.16	1.18	------	------
117*	4.50	-148.9	9.39	23.09	30.00	30.00	53.80	NONE	0.02	1.15	1.15	1.17	------	------
118	4.50	-130.8	9.39	23.39	30.00	30.00	59.51	NONE	0.02	1.16	1.16	1.18	-4.1127	0.6783
119	4.50	-94.5	9.39	13.27	30.00	22.10	62.91	NONE	0.05	1.15	1.56	1.61	-4.0965	0.5040
120*	4.50	-76.4	9.39	13.67	30.00	22.54	62.91	NONE	0.05	1.12	1.49	1.54	------	------
120*	3.89	-76.4	9.66	17.73	30.00	23.70	15.06	NONE	0.04	1.08	1.57	1.61	------	------
121	3.89	-60.7	9.66	17.56	30.00	23.62	14.29	NONE	0.04	0.81	1.17	1.22	-4.0557	0.0798
122	3.89	-29.3	9.66	17.23	30.00	23.44	12.97	NONE	0.04	0.35	0.51	0.55	-4.0002	-0.4945
123	3.89	2.0	9.66	23.33	30.00	30.00	11.87	NONE	0.03	0.02	0.02	0.05	-3.9371	-1.1457
124	3.89	33.4	9.66	23.17	30.00	30.00	10.94	NONE	0.03	0.33	0.37	0.36	-3.8741	-1.7956
125*	3.89	49.1	9.66	23.07	29.92	30.00	10.53	NONE	0.03	0.46	0.52	0.50	------	------
125*	3.85	49.1	9.67	23.07	29.92	30.00	10.53	NONE	0.03	0.46	0.52	0.50	------	------
126	3.85	51.2	9.67	23.06	29.90	30.00	10.47	NONE	0.03	0.48	0.54	0.51	-3.8399	-2.1482
3*	3.85	53.3	9.67	23.05	29.88	30.00	10.41	NONE	0.03	0.49	0.55	0.53	-3.8355	-2.1936

a) East Frame

Figure A.4 Stress and Deflection Data, Unbalanced Live Load Combined with Lateral Load

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 - LL+HOR

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	2.57	53.3	10.09	23.06	29.88	30.00	10.41	NONE	0.02	0.49	0.55	0.54	-3.8355	-2.1936
127	2.57	66.9	10.09	23.13	29.97	30.00	10.74	NONE	0.02	0.64	0.72	0.71	-3.8585	-2.4237
128	2.97	90.8	4.10	23.26	30.00	30.00	11.47	NONE	0.02	0.94	1.06	1.04	-3.8984	-2.8214
129	2.97	101.8	4.10	17.03	30.00	30.00	12.31	NONE	0.03	1.14	1.30	1.28	-3.9267	-3.1014
130	3.37	107.2	-1.89	17.31	30.00	30.00	13.28	NONE	0.04	1.31	1.50	1.47	-3.9398	-3.2262
131	3.37	102.2	-1.89	17.59	30.00	30.00	14.41	NONE	0.04	1.37	1.57	1.55	-3.9340	-3.1604
132*	3.37	99.6	-1.89	17.73	30.00	30.00	15.06	NONE	0.04	1.41	1.61	1.59	------	------
132*	3.48	99.6	-1.67	13.51	30.00	30.00	69.65	NONE	0.04	1.43	1.43	1.47	------	------
133	3.48	96.4	-1.67	12.47	30.00	30.00	71.51	NONE	0.04	1.14	1.15	1.18	-3.9033	-2.8101
134	4.27	67.7	-7.61	22.34	30.00	30.00	71.51	NONE	0.02	0.58	0.59	0.61	-3.8337	-2.1270
135*	5.05	49.0	-13.56	22.90	30.00	30.00	65.19	NONE	0.03	0.37	0.37	0.39	------	------
135*	5.02	49.0	-13.57	23.13	30.00	30.00	59.31	NONE	0.03	0.37	0.37	0.40	------	------
136	5.02	8.2	-13.57	22.67	30.00	30.00	51.55	NONE	0.02	0.05	0.05	0.08	-3.7306	-1.0726
137*	5.02	-32.5	-13.57	26.87	30.00	30.00	45.59	NONE	0.02	0.17	0.17	0.19	------	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 - LL+HOR

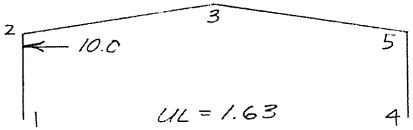
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	14.27	0.0	2.41	14.14	28.37	30.00	27.09	NONE	0.16	0.00	0.00	0.16	0.0000	0.0000
139	14.27	-3.7	2.41	18.49	30.00	30.00	33.91	NONE	0.12	0.09	0.05	0.17	-0.2745	-0.0161
140	14.27	-11.2	2.41	20.72	30.00	30.00	34.77	NONE	0.09	0.17	0.11	0.20	-0.8400	-0.0490
141	14.27	-18.7	2.41	20.10	30.00	30.00	28.48	NONE	0.09	0.21	0.13	0.22	-1.4334	-0.0831
142	14.27	-26.2	2.41	19.49	30.00	30.00	23.29	NONE	0.08	0.22	0.15	0.23	-2.0546	-0.1185
143	14.27	-33.7	2.41	26.67	30.00	30.00	19.70	NONE	0.06	0.23	0.15	0.21	-2.7005	-0.1551
144*	14.27	-37.4	2.41	26.95	30.00	29.82	18.29	NONE	0.05	0.23	0.16	0.21	------	------
144*	14.24	-37.4	2.58	26.82	30.00	30.00	45.64	NONE	0.05	0.20	0.15	0.19	------	------
145	14.24	-39.6	2.58	26.78	30.00	30.00	43.93	NONE	0.05	0.20	0.15	0.19	-3.2145	-0.1840
146*	14.24	-41.7	2.58	26.74	30.00	30.00	42.34	NONE	0.04	0.20	0.15	0.19	------	------

a) East Frame Continued

Figure A.4 Stress and Deflection Data, Unbalanced Live Load Combined with Lateral Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 6
MEMBER 1 - 2 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	10.64	0.0	-12.64	14.09	30.00	30.00	27.56	NONE	0.12	0.00	0.00	0.12	0.0000	0.0000
101	10.64	-19.6	-12.64	18.50	30.00	30.00	34.49	NONE	0.09	0.45	0.28	0.40	-0.5228	0.0269
102	10.64	-58.9	-12.64	20.69	30.00	30.00	35.98	NONE	0.07	0.89	0.57	0.84	-1.4831	0.0762
103	10.64	-98.1	-12.64	20.06	30.00	30.00	29.98	NONE	0.07	1.07	0.70	1.02	-2.2980	0.1179
104	10.64	-137.4	-12.64	19.45	30.00	30.00	24.52	NONE	0.06	1.14	0.77	1.10	-2.9692	0.1521
105	10.64	-176.6	-12.64	26.67	30.00	30.00	20.74	NONE	0.04	1.17	0.81	1.13	-3.5117	0.1795
106*	10.64	-196.2	-12.64	26.95	30.00	29.87	19.25	NONE	0.04	1.17	0.82	1.14	------	------
106*	10.50	-196.2	-12.76	26.82	30.00	30.00	46.77	NONE	0.03	1.04	0.77	1.01	------	------
107	10.50	-206.9	-12.76	26.77	30.00	30.00	45.02	NONE	0.03	1.04	0.77	1.01	-3.8526	0.1967
108*	10.03	-210.6	-2.77	26.73	30.00	30.00	43.39	NONE	0.03	1.01	0.75	0.98	------	------



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 2 - 3 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
111*	4.48	-205.3	9.40	26.90	30.00	30.00	36.42	NONE	0.02	1.12	1.13	1.14	------	------
112	4.48	-177.1	9.40	22.74	30.00	30.00	41.19	NONE	0.02	1.15	1.16	1.18	-4.1253	0.5522
113*	4.48	-148.9	9.40	23.18	30.00	30.00	47.39	NONE	0.02	1.17	1.18	1.20	------	------
113*	4.50	-148.9	9.39	23.03	30.00	30.00	56.50	NONE	0.02	1.14	1.15	1.17	------	------
114	4.50	-130.8	9.39	23.33	30.00	30.00	62.50	NONE	0.02	1.15	1.15	1.18	-4.1396	0.6869
115	4.50	-94.5	9.39	12.98	30.00	22.03	65.01	NONE	0.05	1.14	1.56	1.61	-4.1236	0.5151
116*	4.50	-76.4	9.39	13.61	30.00	22.48	65.01	NONE	0.05	1.11	1.49	1.54	------	------
116*	3.89	-76.4	9.65	17.67	30.00	23.60	16.60	NONE	0.04	1.09	1.59	1.63	------	------
117	3.89	-63.4	9.65	17.53	30.00	23.52	15.89	NONE	0.04	0.86	1.26	1.30	-4.0869	0.1336
118	3.89	-37.5	9.65	17.24	30.00	23.36	14.64	NONE	0.04	0.46	0.68	0.72	-4.0423	-0.3278
119	3.89	-11.6	9.65	16.95	30.00	23.21	13.57	NONE	0.04	0.13	0.19	0.23	-3.9907	-0.8592
120	3.89	14.4	9.65	23.21	30.00	30.00	12.65	NONE	0.03	0.15	0.17	0.18	-3.9373	-1.4100
121	3.89	40.3	9.65	23.08	30.00	30.00	11.85	NONE	0.03	0.39	0.44	0.42	-3.8855	-1.9431
3*	3.89	53.3	9.65	22.99	29.97	30.00	11.48	NONE	0.03	0.49	0.56	0.54	-3.8612	-2.1941

a) West Frame

Figure A.4 Stress and Deflection Data, Unbalanced Live Load Combined with Lateral Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 3 - 5 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	2.57	53.3	10.09	23.10	29.91	30.00	10.76	NONE	0.02	0.49	0.56	0.54	-3.8612	-2.1941
122	2.57	66.9	10.09	23.17	30.00	30.00	11.10	NONE	0.02	0.63	0.73	0.71	-3.8843	-2.4246
123	2.97	90.7	4.10	23.30	30.00	30.00	11.86	NONE	0.02	0.92	1.07	1.05	-3.9244	-2.8236
124	2.97	101.8	4.10	17.11	30.00	30.00	12.72	NONE	0.03	1.12	1.31	1.29	-3.9529	-3.1050
125	3.37	107.2	-1.89	17.39	30.00	30.00	13.73	NONE	0.04	1.29	1.51	1.49	-3.9662	-3.2317
126	3.37	102.2	-1.89	17.67	30.00	30.00	14.90	NONE	0.04	1.35	1.59	1.56	-3.9606	-3.1681
127*	3.37	99.6	-1.89	17.81	30.00	30.00	15.56	NONE	0.04	1.39	1.63	1.61	------	------
127*	3.48	99.6	-1.66	13.57	30.00	30.00	66.61	NONE	0.04	1.45	1.45	1.49	------	------
128	3.48	96.4	-1.66	12.54	30.00	30.00	66.61	NONE	0.04	1.16	1.17	1.20	-3.9271	-2.8203
129	4.27	67.7	-7.61	23.29	30.00	30.00	64.81	NONE	0.02	0.59	0.60	0.62	-3.8603	-2.1362
130*	5.06	49.0	-13.56	22.98	30.00	30.00	58.59	NONE	0.03	0.37	0.38	0.40	------	------
130*	5.02	49.0	-13.57	23.00	30.00	30.00	59.30	NONE	0.03	0.37	0.37	0.40	------	------
131	5.02	8.3	-13.57	22.54	29.96	30.00	51.54	NONE	0.02	0.05	0.05	0.08	-3.7565	-1.0776
132*	5.02	-32.5	-13.57	26.86	30.00	30.00	45.58	NONE	0.02	0.17	0.17	0.19	------	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 4 - 5 LOAD CONDITION 1 -

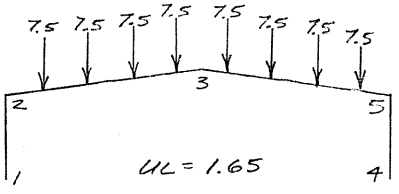
POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	14.27	0.0	2.42	14.03	28.35	30.00	29.82	NONE	0.16	0.00	0.00	0.16	0.0000	0.0000
134	14.27	-3.8	2.42	18.40	30.00	30.00	37.32	NONE	0.11	0.09	0.05	0.17	-0.2773	-0.0162
135	14.27	-11.3	2.42	20.50	30.00	30.00	42.12	NONE	0.09	0.17	0.11	0.20	-0.8482	-0.0492
136	14.27	-18.8	2.42	19.83	30.00	30.00	37.97	NONE	0.09	0.20	0.13	0.22	-1.4465	-0.0835
137	14.27	-26.3	2.42	19.17	30.00	30.00	31.05	NONE	0.08	0.21	0.15	0.23	-2.0720	-0.1191
138	14.27	-33.8	2.42	26.63	30.00	30.00	26.27	NONE	0.05	0.22	0.15	0.21	-2.7216	-0.1557
139*	14.27	-37.5	2.42	26.92	30.00	30.00	24.39	NONE	0.05	0.22	0.15	0.21	------	------
139*	14.25	-37.5	2.55	26.81	30.00	30.00	48.50	NONE	0.05	0.20	0.15	0.19	------	------
140	14.25	-39.6	2.55	26.76	30.00	30.00	46.68	NONE	0.05	0.20	0.15	0.19	-3.2381	-0.1847
141*	14.25	-41.7	2.55	26.72	30.00	30.00	44.99	NONE	0.04	0.20	0.15	0.19	------	------

b) West Frame Continued

Figure A.4 Stress and Deflection Data, Unbalanced Live Load Combined with Lateral Load Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 1 - 2 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	31.03	0.0	-16.88	14.16	28.47	30.00	27.56	NONE	0.35	0.00	0.00	0.35	0.0000	0.0000
101	31.03	-26.2	-16.88	18.50	30.00	28.66	34.49	NONE	0.25	0.60	0.43	0.68	-0.2794	0.0119
102	31.03	-78.6	-16.88	20.69	30.00	28.54	35.98	NONE	0.20	1.19	0.75	1.04	-0.7243	0.0299
103	31.03	-131.1	-16.88	20.06	30.00	28.41	29.98	NONE	0.19	1.43	0.89	1.30	-0.9748	0.0381
104	31.03	-183.5	-16.88	19.11	30.00	28.28	24.52	NONE	0.19	1.53	0.96	1.41	-1.0335	0.0365
105	31.03	-235.9	-16.88	24.89	30.00	30.00	20.74	NONE	0.13	1.56	1.08	1.45	-0.9202	0.0260
106*	31.03	-262.1	-16.88	24.61	30.00	29.87	19.25	NONE	0.13	1.57	1.10	1.46	------	------
106*	30.84	-262.1	-17.23	26.82	30.00	30.00	46.77	NONE	0.10	1.40	1.03	1.31	------	------
107	30.84	-276.5	-17.23	26.77	30.00	30.00	45.02	NONE	0.10	1.39	1.03	1.30	-0.7284	0.0127
108*	30.84	-290.8	-17.23	26.73	30.00	30.00	43.39	NONE	0.10	1.39	1.03	1.30	------	------



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 2 - 3 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
111*	22.34	-285.5	27.36	26.90	30.00	30.00	36.42	NONE	0.09	1.55	1.57	1.65	------	------
112	22.34	-203.3	27.36	22.74	30.00	30.00	41.19	NONE	0.11	1.32	1.33	1.44	-0.4591	-0.5712
113*	22.34	-121.1	27.36	23.18	30.00	30.00	47.39	NONE	0.12	0.95	0.96	1.08	------	------
113*	22.41	-121.1	27.31	23.03	30.00	30.00	56.50	NONE	0.12	0.93	0.93	1.05	------	------
114	21.43	-77.8	19.87	23.33	30.00	30.00	62.50	NONE	0.12	0.69	0.69	0.80	-0.3620	-1.6057
115	20.45	-1.9	12.44	13.51	30.00	22.03	65.01	NONE	0.22	0.02	0.03	0.25	-0.2704	-2.5794
116*	20.45	22.1	12.44	14.47	30.00	30.00	65.01	NONE	0.22	0.30	0.32	0.52	------	------
116*	19.61	22.1	13.72	17.67	30.00	30.00	16.60	NONE	0.21	0.29	0.36	0.50	------	------
117	19.61	40.6	13.72	17.53	30.00	30.00	15.89	NONE	0.21	0.50	0.63	0.72	-0.1922	-3.4186
118	19.61	77.4	13.72	17.10	30.00	30.00	14.64	NONE	0.21	0.86	1.09	1.07	-0.1363	-4.0290
119	19.11	101.1	6.23	16.71	30.00	30.00	13.57	NONE	0.20	1.02	1.30	1.23	-0.0936	-4.5043
120	19.11	117.9	6.23	22.30	30.00	30.00	12.65	NONE	0.15	1.22	1.39	1.37	-0.0658	-4.8263
121	18.61	118.5	-1.25	21.93	30.00	30.00	11.85	NONE	0.14	1.14	1.29	1.28	-0.0530	-4.9956
3*	18.61	116.9	-1.25	21.70	29.97	30.00	11.48	NONE	0.14	1.08	1.22	1.22	-0.0517	-5.0282

Figure A.5 Stress and Deflection Data, Full Live Load, West Frame

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 3 - 5 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	18.62	116.9	1.02	21.71	29.91	30.00	10.76	NONE	0.14	1.07	1.22	1.21	-0.0517	-5.0282
122	18.62	117.1	1.02	21.75	29.93	30.00	10.82	NONE	0.14	1.07	1.23	1.22	-0.0517	-5.0248
123*	18.62	117.3	1.02	21.79	29.95	30.00	10.88	NONE	0.14	1.08	1.24	1.23	------	------
123*	18.61	117.3	1.25	21.79	29.95	30.00	10.88	NONE	0.14	1.08	1.24	1.22	------	------
124	18.61	119.3	1.25	22.05	30.00	30.00	11.31	NONE	0.14	1.15	1.33	1.29	-0.0482	-4.9620
125	19.11	109.8	-6.23	22.51	30.00	30.00	12.27	NONE	0.15	1.16	1.35	1.31	-0.0261	-4.6902
126	19.62	88.9	-13.71	17.08	30.00	30.00	13.40	NONE	0.21	0.94	1.22	1.15	0.0177	-4.1980
127	19.62	44.4	-13.71	17.59	30.00	30.00	14.77	NONE	0.21	0.53	0.68	0.74	0.0819	-3.4969
128*	19.62	22.1	-13.71	17.81	30.00	30.00	15.56	NONE	0.21	0.28	0.36	0.50	------	------
128*	20.46	22.1	-12.42	14.38	30.00	30.00	66.61	NONE	0.22	0.30	0.32	0.52	------	------
129	20.46	-1.9	-12.42	13.41	30.00	21.97	66.61	NONE	0.22	0.02	0.03	0.25	0.1662	-2.5937
130	21.44	-77.8	-19.86	23.29	30.00	30.00	64.81	NONE	0.12	0.68	0.69	0.80	0.2579	-1.6219
131*	22.43	-121.1	-27.29	22.98	30.00	30.00	58.59	NONE	0.12	0.93	0.93	1.04	------	------
131*	22.36	-121.1	-27.35	23.00	30.00	30.00	59.30	NONE	0.11	0.93	0.92	1.04	------	------
132	22.36	-196.3	-27.35	22.57	30.00	30.00	52.11	NONE	0.11	1.25	1.25	1.36	0.3512	-0.6311
133*	22.36	-271.6	-27.35	26.79	30.00	30.00	46.48	NONE	0.08	1.47	1.47	1.55	------	------
133*	22.35	-271.6	-27.35	26.79	30.00	30.00	46.48	NONE	0.03	1.47	1.47	1.55	------	------
134	22.35	-278.5	-27.35	26.83	30.00	30.00	46.03	NONE	0.08	1.49	1.49	1.57	0.3954	-0.1560
135*	22.35	-285.3	-27.35	26.86	30.00	30.00	45.58	NONE	0.08	1.50	1.50	1.58	------	------

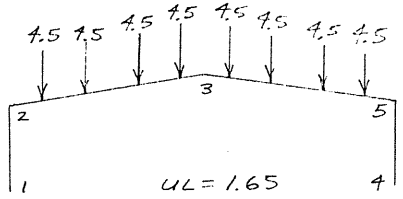
STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB JOB
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 10
MEMBER 4 - 5 LOAD CONDITION 1 -

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	31.03	0.0	16.89	14.04	28.35	30.00	29.82	NONE	0.35	0.00	0.00	0.35	0.0000	0.0000
137	31.03	-26.2	16.89	18.40	30.00	28.63	37.32	NONE	0.25	0.60	0.43	0.68	0.2679	0.0114
138	31.03	-78.7	16.89	20.50	30.00	28.50	42.12	NONE	0.20	1.17	0.75	1.03	0.6905	0.0283
139	31.03	-131.1	16.89	19.83	30.00	28.37	37.97	NONE	0.19	1.40	0.88	1.28	0.9210	0.0356
140	31.03	-183.5	16.89	19.17	30.00	28.22	31.05	NONE	0.18	1.50	0.95	1.38	0.9622	0.0332
141	31.03	-236.0	16.89	25.58	30.00	30.00	26.27	NONE	0.12	1.53	1.07	1.42	0.8342	0.0221
142*	31.03	-262.2	16.89	25.32	30.00	30.00	24.39	NONE	0.12	1.53	1.08	1.43	------	------
142*	30.50	-262.2	17.81	26.81	30.00	30.00	48.50	NONE	0.10	1.39	1.02	1.31	------	------
143	30.50	-266.0	17.81	26.80	30.00	30.00	48.04	NONE	0.10	1.39	1.03	1.31	0.6942	0.0124
144*	30.50	-269.7	17.81	26.79	30.00	30.00	47.58	NONE	0.10	1.39	1.03	1.31	------	------
144*	30.99	-269.7	16.96	26.79	30.00	30.00	47.58	NONE	0.10	1.39	1.03	1.30	------	------
145	30.99	-280.2	16.96	26.75	30.00	30.00	46.25	NONE	0.10	1.39	1.03	1.30	0.6113	0.0070
146*	30.99	-290.8	16.96	26.72	30.00	30.00	44.99	NONE	0.10	1.39	1.03	1.30	------	------

Figure A.5 Stress and Deflection Data, Full Live Load, West Frame Continued

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 7
MEMBER 1 - 2 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
1*	18.62	0.0	-10.12	14.16	28.38	30.00	27.09	NONE	0.21	0.00	0.00	0.21	0.0000	0.0000
101	18.62	-15.7	-10.12	18.50	30.00	28.66	33.90	NONE	0.15	0.36	0.23	0.39	-0.1664	0.0071
102	18.62	-47.2	-10.12	20.71	30.00	30.00	34.77	NONE	0.12	0.72	0.46	0.63	-0.4306	0.0177
103	18.62	-78.6	-10.12	20.09	30.00	30.00	28.48	NONE	0.12	0.86	0.56	0.78	-0.5775	0.0224
104	18.62	-110.0	-10.12	19.49	30.00	30.00	23.29	NONE	0.11	0.92	0.62	0.85	-0.6086	0.0211
105	18.62	-141.5	-10.12	26.68	30.00	30.00	19.70	NONE	0.07	0.95	0.65	0.88	-0.5359	0.0146
106*	18.62	-157.2	-10.12	26.59	30.00	29.82	18.29	NONE	0.07	0.95	0.66	0.88		
106*	16.16	-157.2	-13.71	26.80	30.00	30.00	49.09	NONE	0.05	0.83	0.61	0.79		
107	16.16	-157.7	-13.71	26.80	30.00	30.00	49.00	NONE	0.05	0.83	0.61	0.79	-0.4624	0.0094
108*	16.16	-158.3	-13.71	26.79	30.00	30.00	48.91	NONE	0.05	0.83	0.61	0.79		
108*	18.59	-158.3	-10.17	26.79	30.00	30.00	48.91	NONE	0.06	0.83	0.61	0.78		
109	18.59	-166.4	-10.17	26.75	30.00	30.00	47.17	NONE	0.06	0.83	0.62	0.78	-0.4144	0.0063
110*	18.59	-174.4	-10.17	26.71	30.00	30.00	45.54	NONE	0.06	0.83	0.62	0.78		



STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 8
MEMBER 2 - 3 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
113*	13.41	-171.2	16.41	26.90	30.00	30.00	38.84	NONE	0.05	0.92	0.92	0.97		
114	13.41	-167.1	16.41	26.86	30.00	30.00	39.22	NONE	0.05	0.91	0.91	0.96	-0.2754	-0.0917
115*	13.41	-162.9	16.41	26.83	30.00	30.00	39.60	NONE	0.05	0.90	0.90	0.95		
115*	13.40	-162.9	16.42	26.83	30.00	30.00	39.60	NONE	0.05	0.90	0.90	0.95		
116	13.40	-117.8	16.42	6.90	30.00	13.83	44.40	NONE	0.22	0.76	1.43	1.65	-0.2490	-0.3765
117*	13.40	-72.6	16.42	7.50	30.00	14.53	50.53	NONE	0.22	0.56	1.01	1.23		
117*	13.44	-72.6	16.39	7.30	30.00	14.42	53.80	NONE	0.22	0.56	1.01	1.23		
118	12.85	-46.6	11.92	7.78	30.00	14.95	59.51	NONE	0.21	0.41	0.72	0.93	-0.1931	-0.9728
119	12.26	-1.0	7.46	8.94	30.00	16.14	62.91	NONE	0.20	0.01	0.02	0.22	-0.1381	-1.5581
120*	12.26	13.4	7.46	9.66	16.84	30.00	62.91	NONE	0.20	0.31	0.20	0.51		
120*	11.76	13.4	8.23	13.11	19.41	30.00	15.06	NONE	0.17	0.26	0.22	0.43		
121	11.76	26.7	8.23	12.87	19.31	30.00	14.29	NONE	0.17	0.49	0.41	0.66	-0.0376	-2.1018
122	11.76	53.5	8.23	12.41	19.11	30.00	12.97	NONE	0.17	0.88	0.73	1.05	-0.0491	-2.5236
123	11.46	66.0	3.74	11.98	18.90	30.00	11.87	NONE	0.17	0.99	0.80	1.15	-0.0229	-2.8194
124	11.16	71.8	-0.75	11.59	18.70	30.00	10.94	NONE	0.16	0.98	0.79	1.14	-0.0097	-2.9824
125*	11.16	70.6	-0.75	25.66	29.92	30.00	10.53	NONE	0.07	0.66	0.74	0.73		
125*	11.16	70.6	-0.70	25.66	29.92	30.00	10.53	NONE	0.07	0.66	0.74	0.73		
126	11.16	70.4	-0.70	25.66	29.90	30.00	10.47	NONE	0.07	0.66	0.74	0.73	-0.0076	-3.0197
3*	11.16	70.3	-0.70	25.66	29.88	30.00	10.41	NONE	0.07	0.65	0.73	0.72	-0.0076	-3.0217

a) East Frame

Figure A.6 Stress and Deflection Data, Full Live Load, Modified Bracing

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 9
MEMBER 3 - 5 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
3*	11.16	70.3	0.75	25.66	29.88	30.00	10.41	NONE	0.07	0.65	0.73	0.72	-0.0076	-3.0217
127	11.16	71.3	0.75	11.50	18.65	30.00	10.74	NONE	0.16	0.95	0.77	1.12	-0.0068	-3.0019
128	11.46	70.8	-3.74	11.82	18.82	30.00	11.47	NONE	0.17	1.02	0.83	1.19	0.0009	-2.9003
129	11.46	60.8	-3.74	12.16	18.99	30.00	12.31	NONE	0.17	0.94	0.77	1.11	0.0175	-2.7075
130	11.76	46.6	-8.23	12.52	19.16	30.00	13.28	NONE	0.17	0.79	0.65	0.96	0.0430	-2.4233
131	11.76	24.4	-8.23	12.91	19.32	30.00	14.41	NONE	0.17	0.45	0.38	0.63	0.0764	-2.0584
132*	11.76	13.4	-8.23	13.11	19.41	30.00	15.06	NONE	0.17	0.26	0.22	0.43	------	------
132*	12.27	13.4	-7.46	9.35	16.57	30.00	69.65	NONE	0.20	0.31	0.19	0.51	------	------
133	12.27	-1.0	-7.46	8.63	30.00	15.83	71.51	NONE	0.20	0.01	0.02	0.22	0.1232	-1.5569
134	12.85	-46.6	-11.92	7.49	30.00	14.62	71.51	NONE	0.21	0.40	0.72	0.93	0.1780	-0.9745
135*	13.44	-72.6	-16.38	7.02	30.00	14.08	65.19	NONE	0.22	0.55	1.01	1.23	------	------
135*	13.41	-72.6	-16.41	7.35	30.00	14.62	59.31	NONE	0.21	0.55	0.97	1.19	------	------
136	13.41	-121.9	-16.41	6.71	30.00	13.84	51.55	NONE	0.21	0.76	1.41	1.63	0.2366	-0.3524
137*	13.41	-171.1	-16.41	26.87	30.00	30.00	45.59	NONE	0.05	0.89	0.89	0.94	------	------

STAR MANUFACTURING CO. 8600 S. I-35 OKLAHOMA CITY, OK. JOB EAST
SRL04 60 40/25 20/20 FILE
FORCE, MOMENT, AND STRESS REPORT PAGE 10
MEMBER 4 - 5 LOAD CONDITION 1 - LL

POINT NO.	AXIAL FORCE (KIP)	MOMENT (KIP-FT)	SHEAR FORCE (KIP)	-ALLOWABLE STRESS- FA (KSI)	FBO (KSI)	FBI (KSI)	ALLOW SHEAR (KIP)	A/H RATIO	-UNITY CHECK- UCA	BEND (OF)	BEND (IF)	MAX. COMB UC	DEFLECTIONS DELTA-X (IN)	DELTA-Y (IN)
4*	18.62	0.0	10.12	14.14	28.37	30.00	27.09	NONE	0.21	0.00	0.00	0.21	0.0000	0.0000
139	18.62	-15.7	10.12	18.49	30.00	28.66	33.91	NONE	0.15	0.37	0.23	0.39	0.1656	0.0070
140	18.62	-47.1	10.12	20.72	30.00	30.00	34.77	NONE	0.12	0.72	0.46	0.64	0.4279	0.0176
141	18.62	-78.6	10.12	20.10	30.00	30.00	28.48	NONE	0.12	0.87	0.56	0.79	0.5726	0.0222
142	18.62	-110.0	10.12	19.49	30.00	30.00	23.29	NONE	0.11	0.93	0.62	0.86	0.6012	0.0208
143	18.62	-141.4	10.12	26.67	30.00	30.00	19.70	NONE	0.08	0.95	0.65	0.88	0.5256	0.0141
144*	18.62	-157.2	10.12	26.58	30.00	29.82	18.29	NONE	0.07	0.95	0.66	0.89	------	------
144*	18.50	-157.2	10.34	26.82	30.00	30.00	45.64	NONE	0.06	0.84	0.62	0.79	------	------
145	18.50	-165.8	10.34	26.78	30.00	30.00	43.93	NONE	0.06	0.84	0.62	0.79	0.4041	0.0058
146*	18.50	-174.4	10.34	26.74	30.00	30.00	42.34	NONE	0.06	0.84	0.62	0.79	------	------

a) East Frame Continued

Figure A.6 Stress and Deflection Data, Full Live Load, Modified Bracing Continued

APPENDIX B

ANALYSIS RESULTS FROM PROPOSED PROCEDURE FOR SINGLY SYMMETRICAL TAPERED MEMBERS

OUTSIDE SEGMENT . FULL GRAVITY LOAD . INPUT --- 1 KIP

DIMENSIONS OF CROSS SECTION

B1 = 0.0 IN T1 = 0.0 IN

B2 = 6.0000 IN T2 = 0.2510 IN

B3 = 13.5050 IN T3 = 0.2500 IN

B4 = 6.0000 IN T4 = 0.2440 IN

LENGTH= 153.60 IN.

ALPHA = 0.0916

LEFT END SECTION PROPERTIES		RIGHT END SECTION PROPERTIES	
RC =	30.8315 IN.	RO =	102.4224 IN.
YC =	0.0508 IN.	YC =	0.1363 IN.
YBAR =	6.7078 IN. FROM TOP	YBAR =	13.7271 IN. FROM TOP
YBAR =	6.7972 IN.FROM BOTTOM	YBAR =	13.6445 IN. FROM BOTTOM
AREA =	6.3462 IN**2	AREA =	9.8629 IN**2
IX =	186.7381 IN**4	IX =	1001.0908 IN**4
IY =	8.9100 IN**4	IY =	8.9100 IN**4
CW =	406.1809 IN**6	CW =	1692.9980 IN**6
J =	0.1310 IN**4	J =	0.2043 IN**4
BX =	0.1640 IN.	BX =	0.3375 IN.
SEC. MOD. =	27.8389 IN**3 TOP	SEC. MOD. =	72.9279 IN**3 TOP
SEC. MOD. =	27.4728 IN**3 BOTTOM	SEC. MOD. =	72.3095 IN**3 BOTTOM
MOMENT =	34.80 K-IN.	MOMENT =	421.20 K-IN.

Figure B.1 Results from Proposed Analysis Procedure, Outside Rafter Segment

OUTSIDE SEGMENT , FULL GRAVITY LOAD , INPUT --- 1 KIP

STRESS AND MOMENT RESULTS

STRESS AT LEFT TOP =	-1.25 KSI	STRESS AT LEFT BOTTOM =	1.27 KSI
STRESS AT RIGHT TOP =	5.78 KSI	STRESS AT RIGHT BOTTOM =	-5.82 KSI

NODE WITH MAX. COMPR. STRESS = 4

MAX. COMP. STRESS = -5.82 KSI

CRITICAL MOMENT BASIC CASE = -647.67 K-IN.

MODULAR RATIO REF. FLANGE = 2.63

STRESS RATIO REF. FLANGE = -0.2175

CA = 0.8350 CB = 2.6554

GOVERNING STRESS AT FAILURE = 41.52 KSI C

LOCATION OF GOVERNING STRESS = 4

STRESSES AT FAILURE

LOCATION 1	8.91 KSI C	LOCATION 3	41.16 KSI T
LOCATION 2	9.03 KSI T	LOCATION 4	41.52 KSI C

CRITICAL MOMENTS AT FAILURE

SMALL END	248.03 IN-K	LARGE END	3002.03 IN-K

Figure B.1 Results from Proposed Analysis Procedure, Outside Rafter Segment Continued

```
INSIDE SEGMENT , FULL GRAVITY LOAD , INPUT --- 1 KIP

DIMENSIONS OF CROSS SECTION

  B1 =    0.0     IN    T1 = 0.0     IN
  B2 =    6.0600  IN    T2 = 0.3160  IN
  B3 =   13.4360  IN    T3 = 0.1360  IN
  B4 =    6.0000  IN    T4 = 0.2480  IN
  LENGTH=    146.40 IN.
  ALPHA =   0.0370

        LEFT END SECTION PROPERTIES                RIGHT END SECTION PROPERTIES

    RC   =    36.4272 IN.                      RC   =    65.0770 IN.
    YC   =     0.3602 IN.                      YC   =     0.6007 IN.
    YBAR =     6.1696 IN. FROM TOP             YBAR =     8.7547 IN. FROM TOP
    YBAR =     7.2664 IN.FROM BOTTOM           YBAR =    10.1039 IN. FROM BOTTOM
    AREA =     5.2303 IN**2                    AREA =     5.9677 IN**2
    IX   =   179.5208 IN**4                    IX   =   375.6846 IN**4
    IY   =    10.3244 IN**4                    IY   =    10.3244 IN**4
    CW   =   457.4299 IN**6                    CW   =   901.1672 IN**6
    J    =     0.1055 IN**4                    J    =     0.1101 IN**4
    BX   =     1.6284 IN.                      BX   =     2.2612 IN.
    SEC. MOD. =   29.0977 IN**3 TOP            SEC. MOD. =   42.9352 IN**3 TOP
    SEC. MOD. =   24.7056 IN**3 BOTTOM         SEC. MOD. =   37.2018 IN**3 BOTTOM

    MOMENT =     34.80 K-IN.                   MOMENT =   -190.80 K-IN.
```

Figure B.2 Results from Proposed Analysis Procedure, Inside Rafter Segment

INSIDE SEGMENT , FULL GRAVITY LOAD , INPUT --- 1 KIP

STRESS AND MOMENT RESULTS

STRESS AT LEFT TOP =	-1.20 KSI	STRESS AT LEFT BOTTOM =	1.41 KSI
STRESS AT RIGHT TOP =	-4.44 KSI	STRESS AT RIGHT BOTTOM =	5.13 KSI

NODE WITH MAX. COMPR. STRESS = 3

MAX. COMP. STRESS = -4.44 KSI

CRITICAL MOMENT BASIC CASE = 1156.95 K-IN.

MODULAR RATIO REF. FLANGE = 1.48

STRESS RATIO REF. FLANGE = 0.2691

CA = 0.9435 CB = 1.6751

GOVERNING STRESS AT FAILURE = 40.05 KSI C

LOCATION OF GOVERNING STRESS = 3

STRESSES AT FAILURE

LOCATION 1	10.78 KSI C	LOCATION 3	40.05 KSI C
LOCATION 2	12.70 KSI T	LOCATION 4	46.23 KSI T

CRITICAL MOMENTS AT FAILURE

SMALL END	313.67 IN-K	LARGE END	1719.76 IN-K

Figure B.2 Results from Proposed Analysis Procedure, Inside Rafter Segment Continued

APPENDIX C

INITIAL TEST, UNBALANCED LIVE LOAD

Test Date January 16, 1980

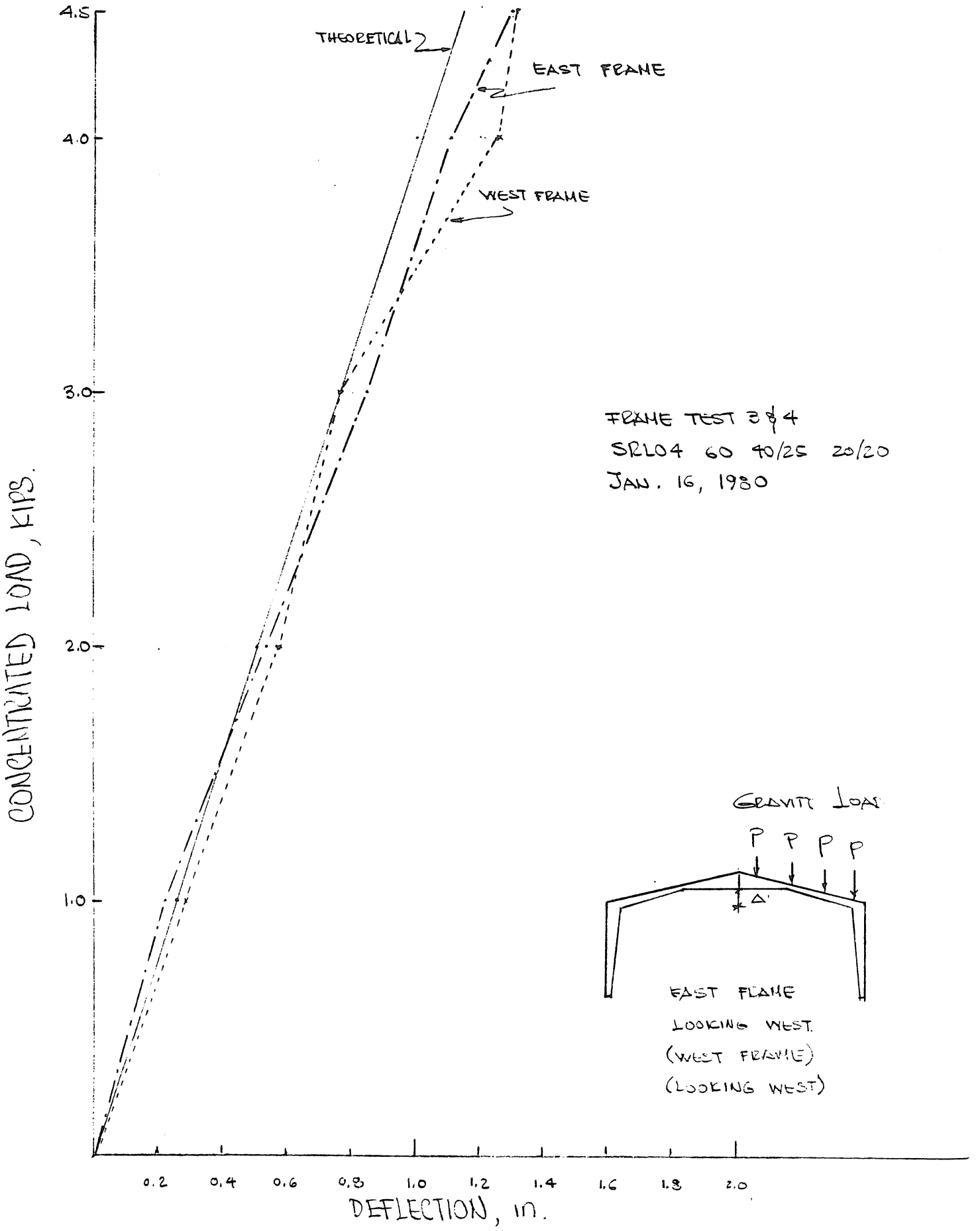


Figure C.1 Load vs. Centerline Vertical Deflection

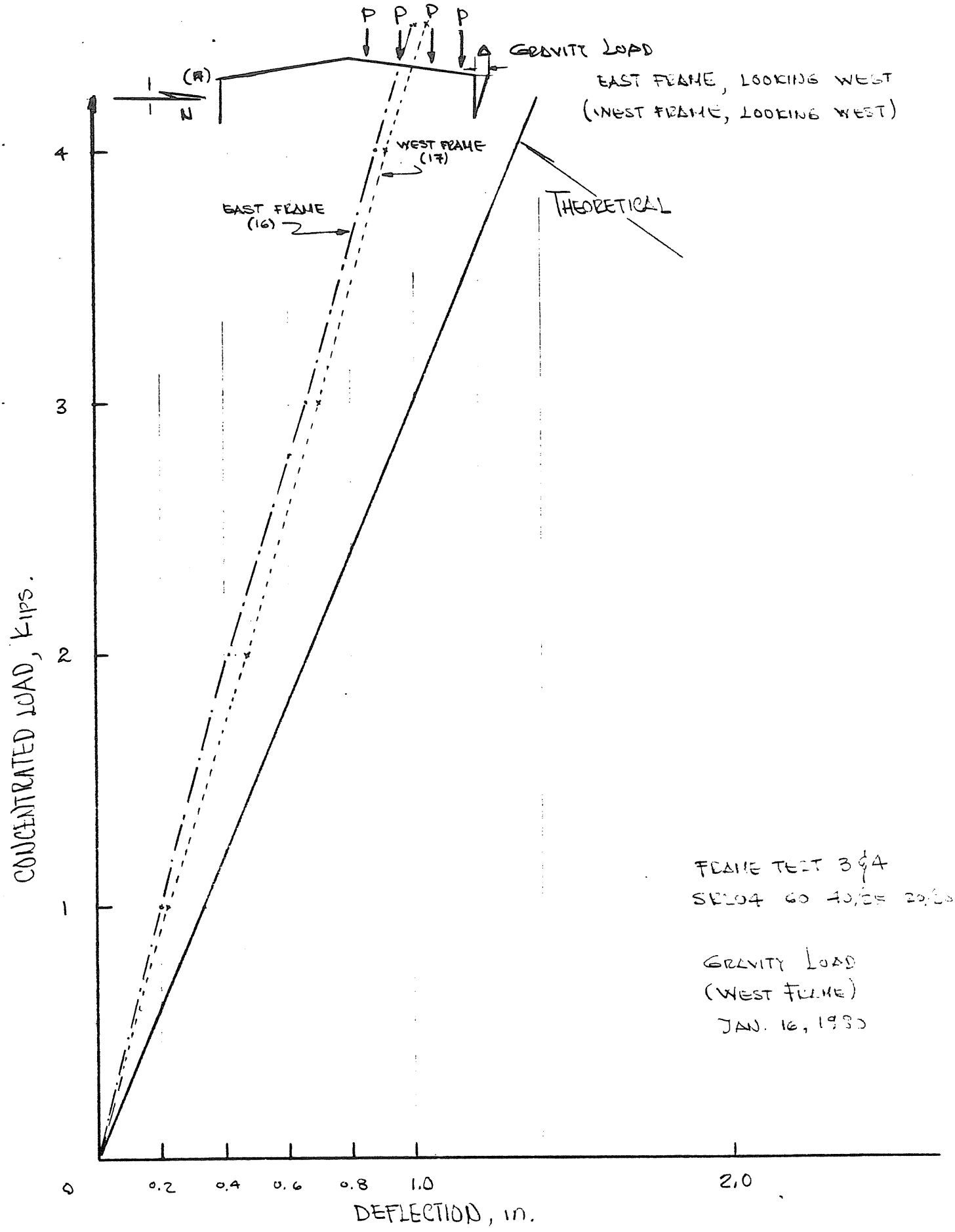


Figure C.2 Load vs. Sidesway Deflection

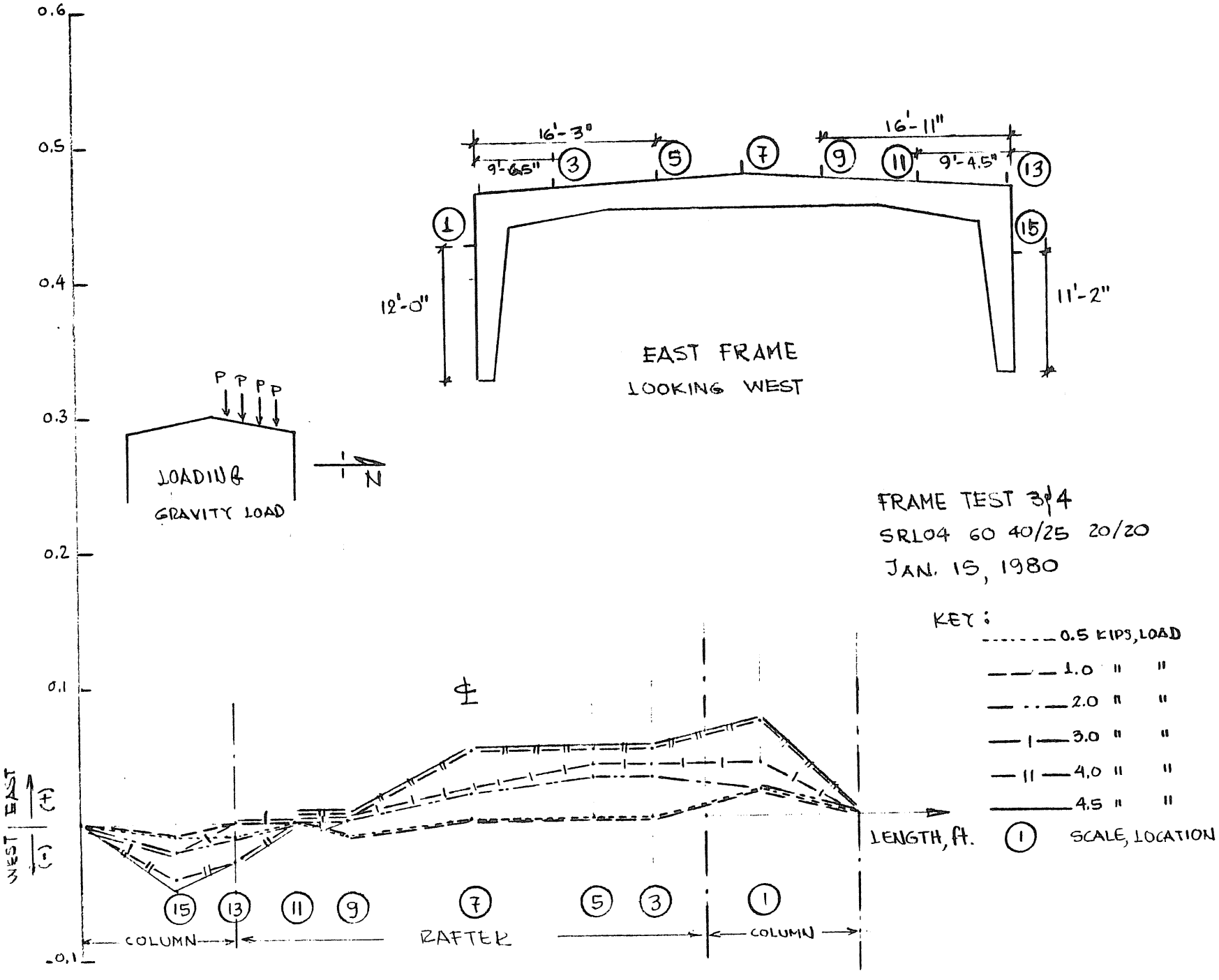


Figure C.3 Lateral Deflection, Outside Flange, East Frame

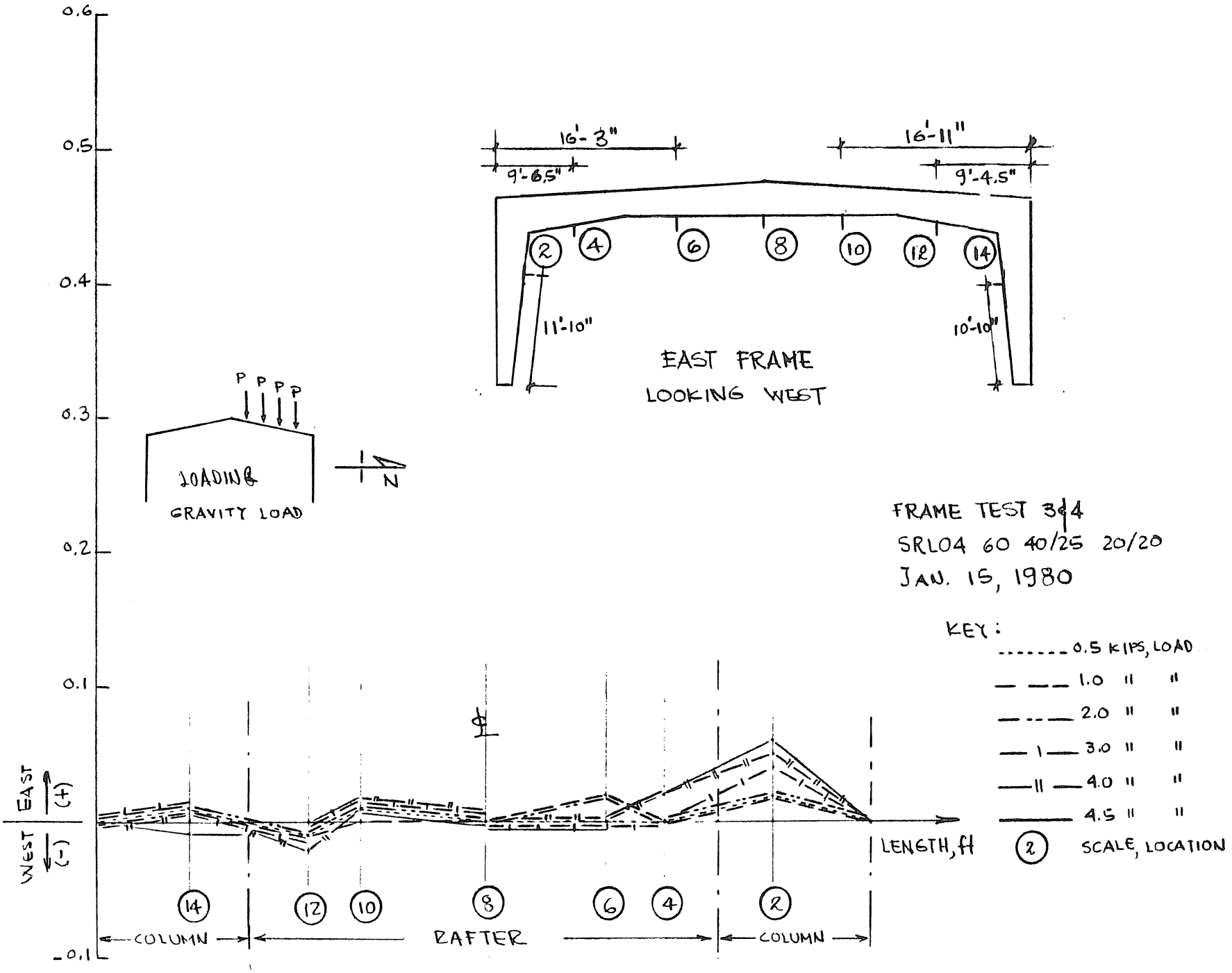


Figure C.4 Lateral Deflection, Inside Flange, East Frame

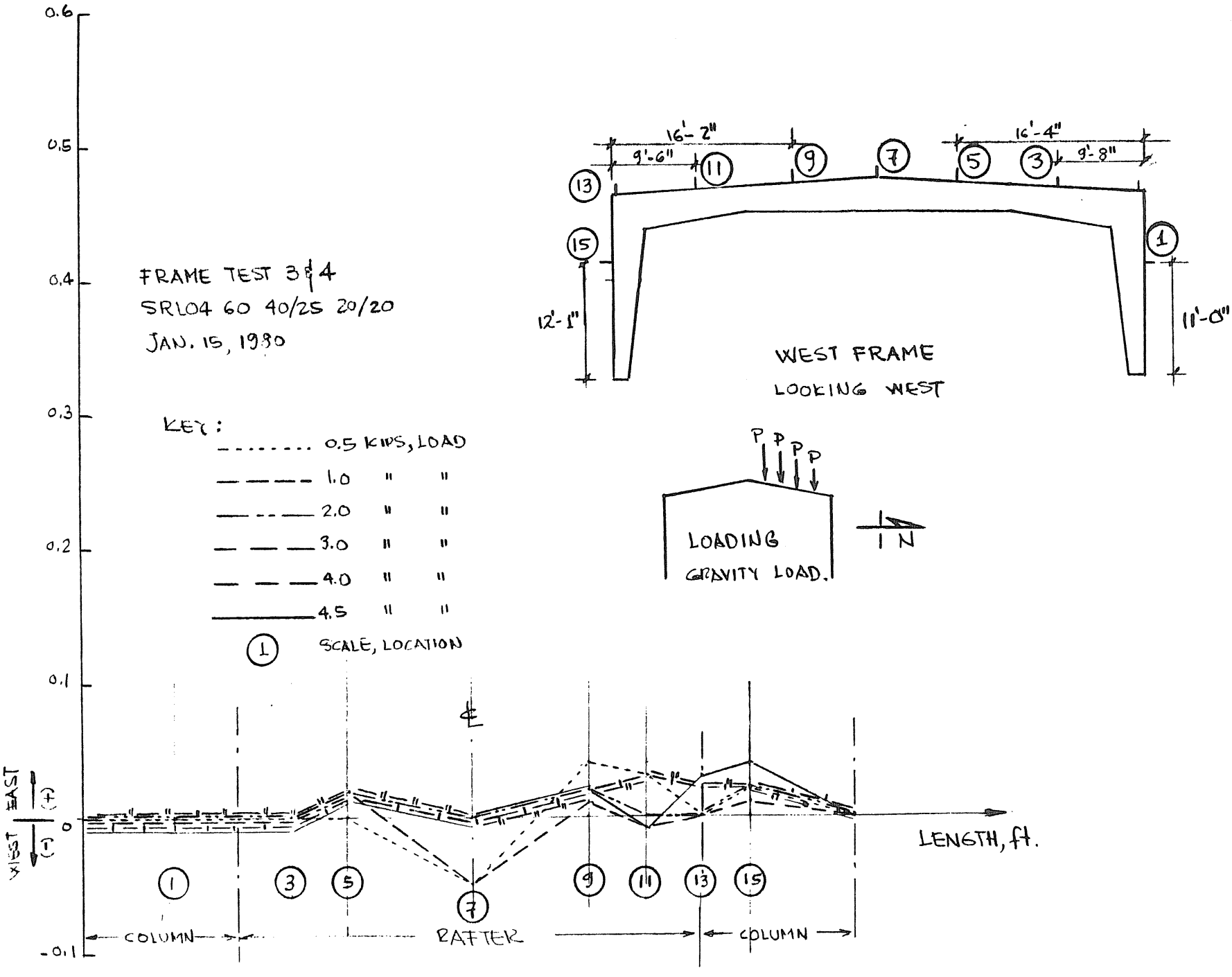


Figure C. 5 Lateral Deflection, Outside Flange, West Frame

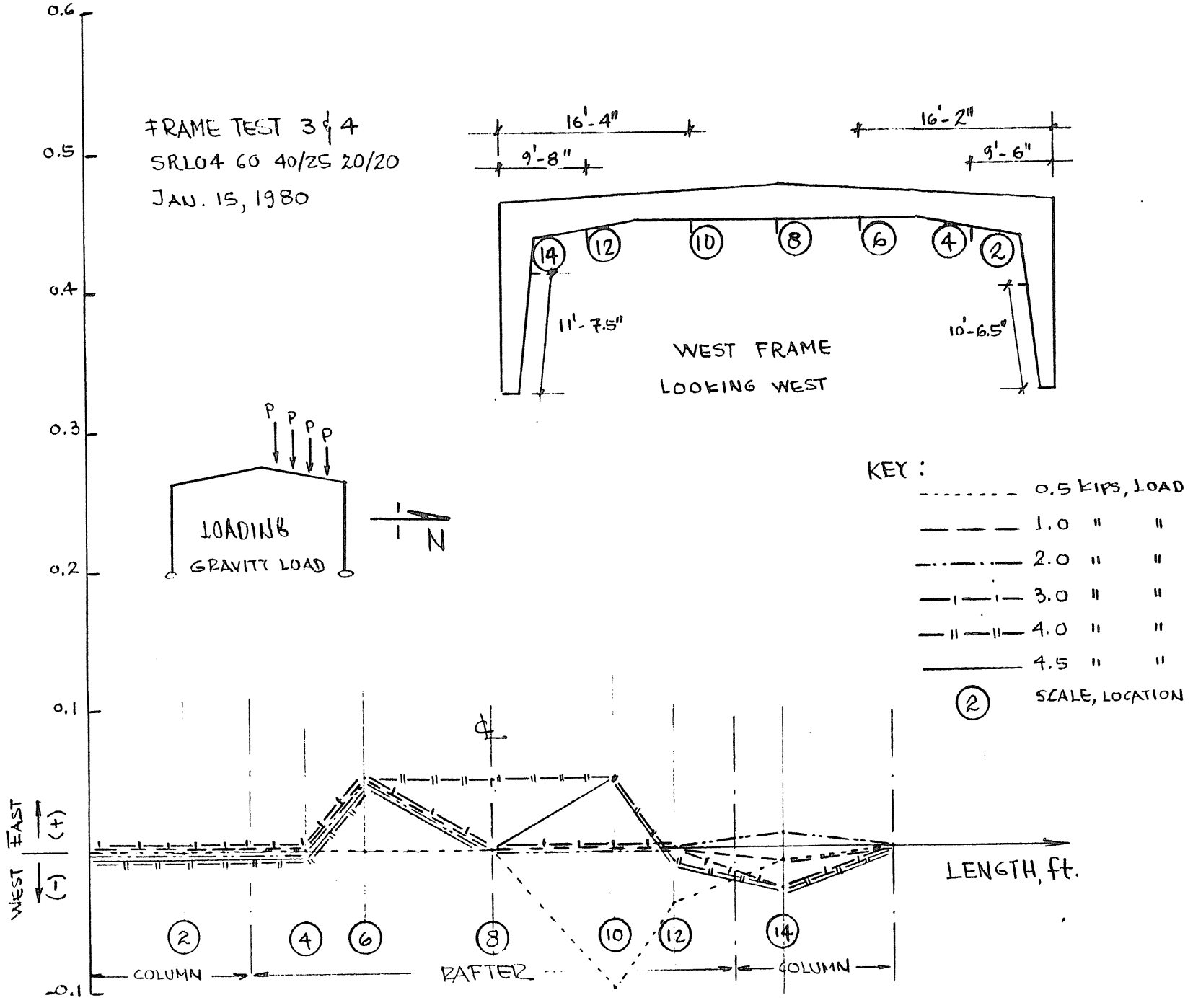


Figure C.6 Lateral Deflection, Inside Flange, West Frame

APPENDIX D

INITIAL TEST, LATERAL LOAD ONLY

Test Date January 18, 1980

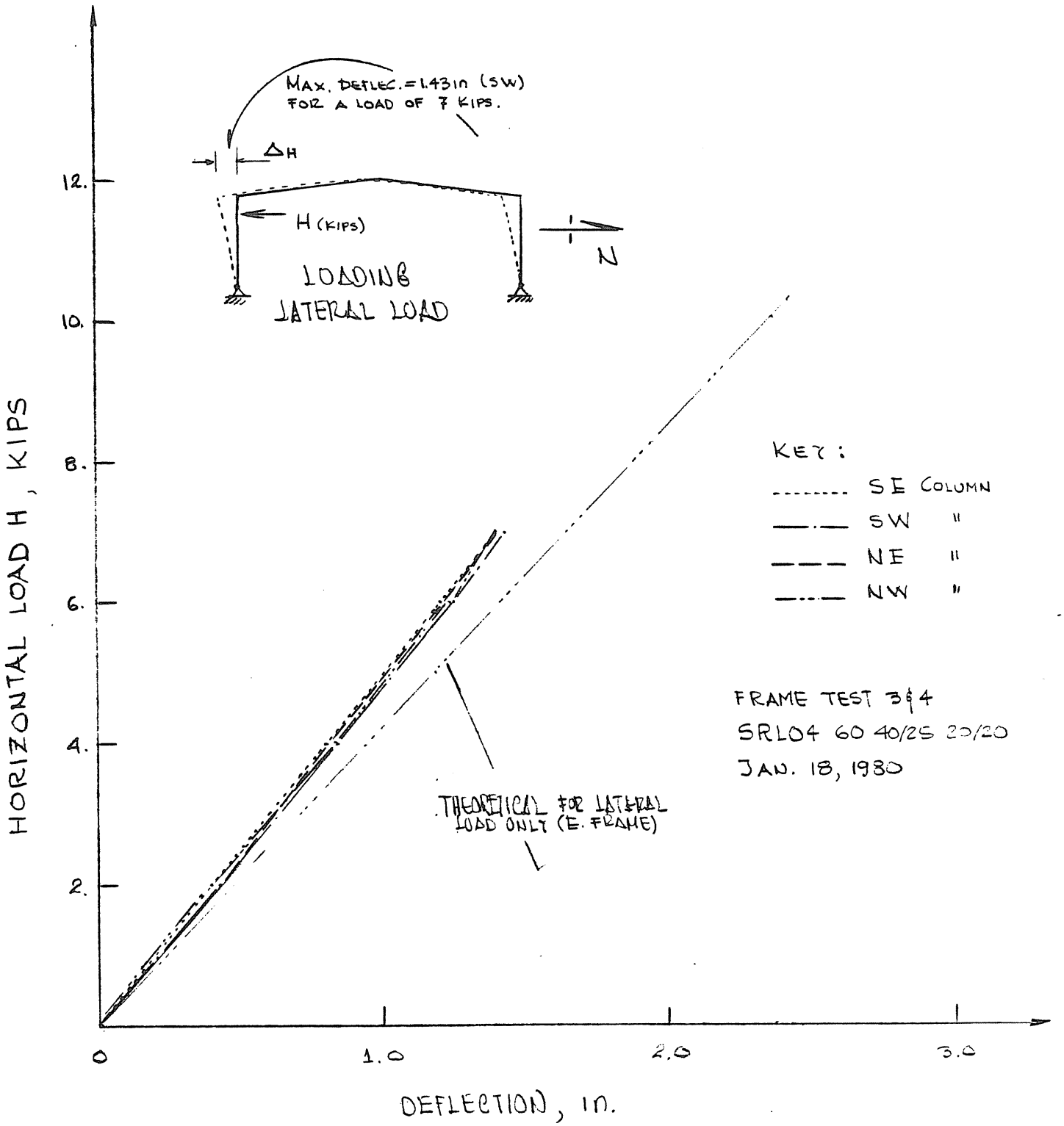


Figure D.1 Load vs. Sidesway Deflection

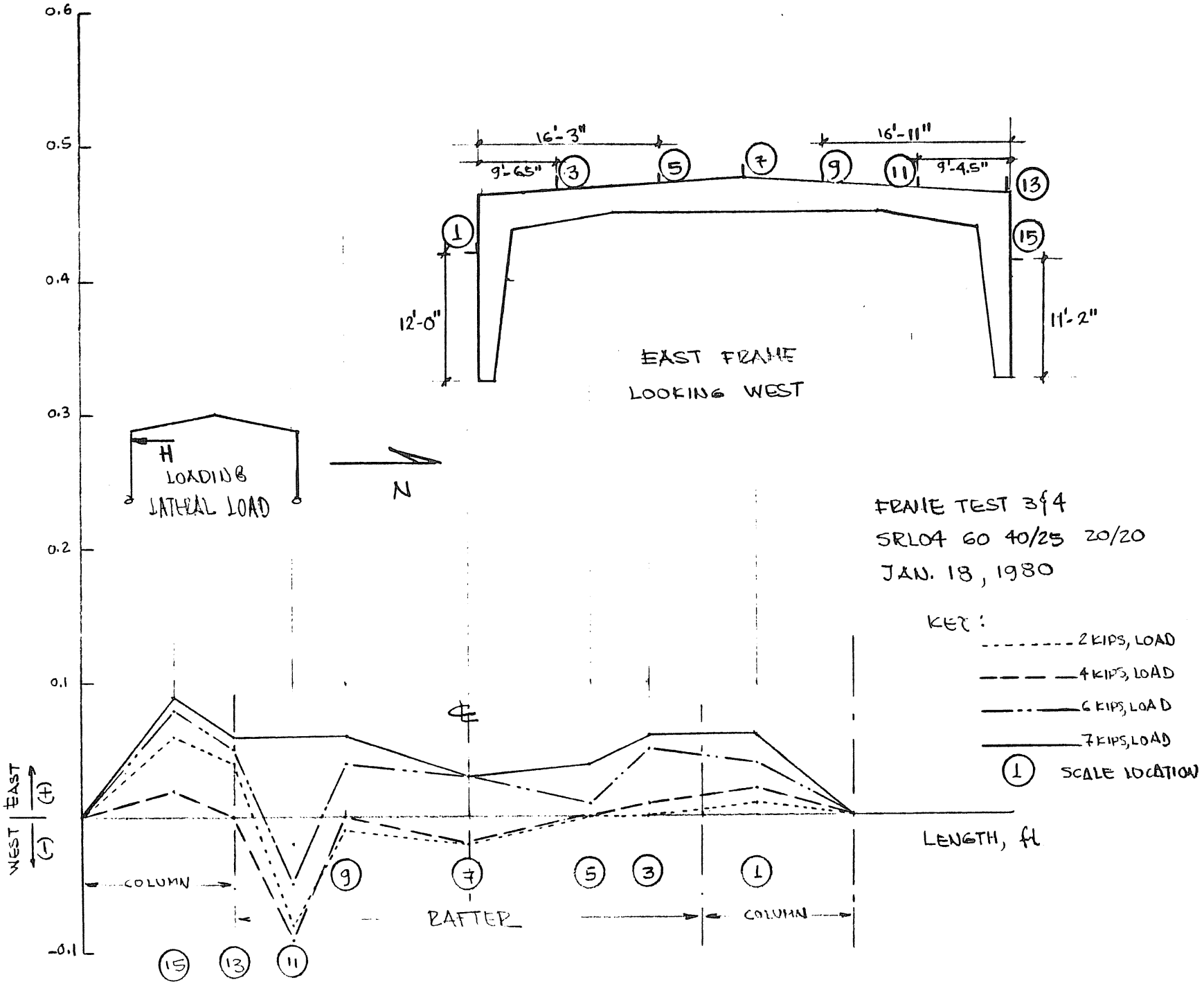


Figure D.2 Lateral Deflection, Outside Flange, East Frame

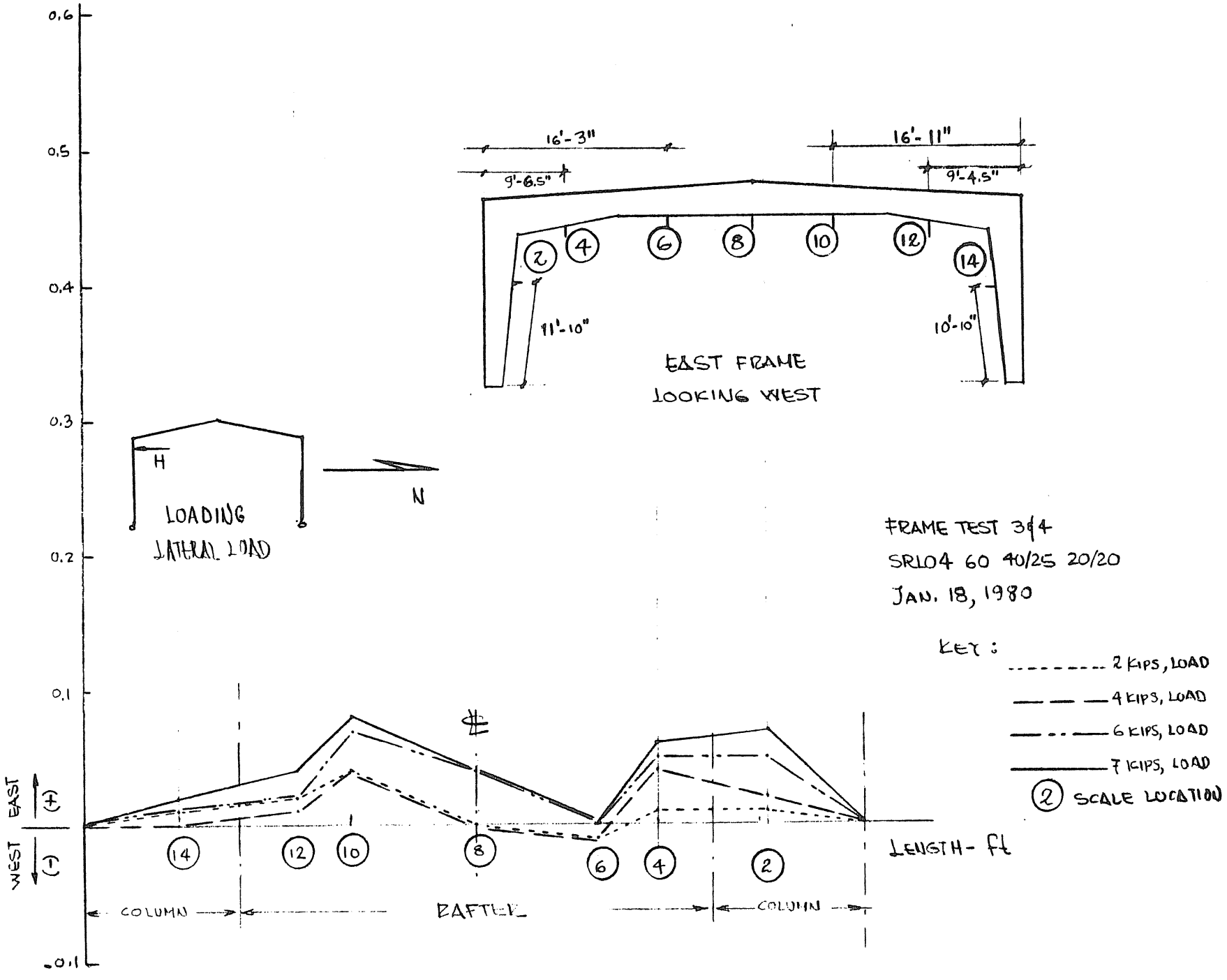


Figure D.3 Lateral Deflection, Inside Flange, East Frame

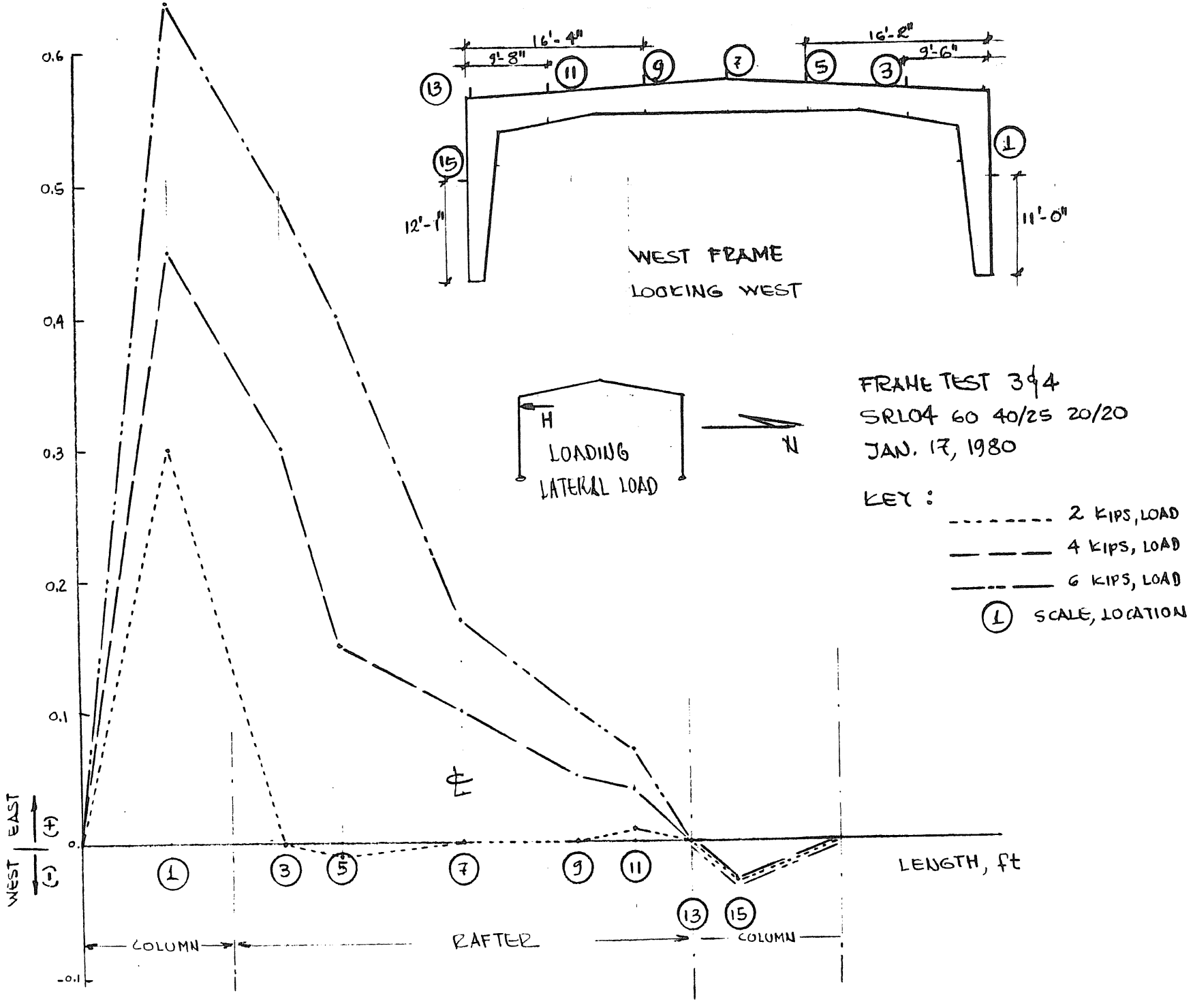


Figure D.4 Lateral Deflection, Outside Flange, West Frame

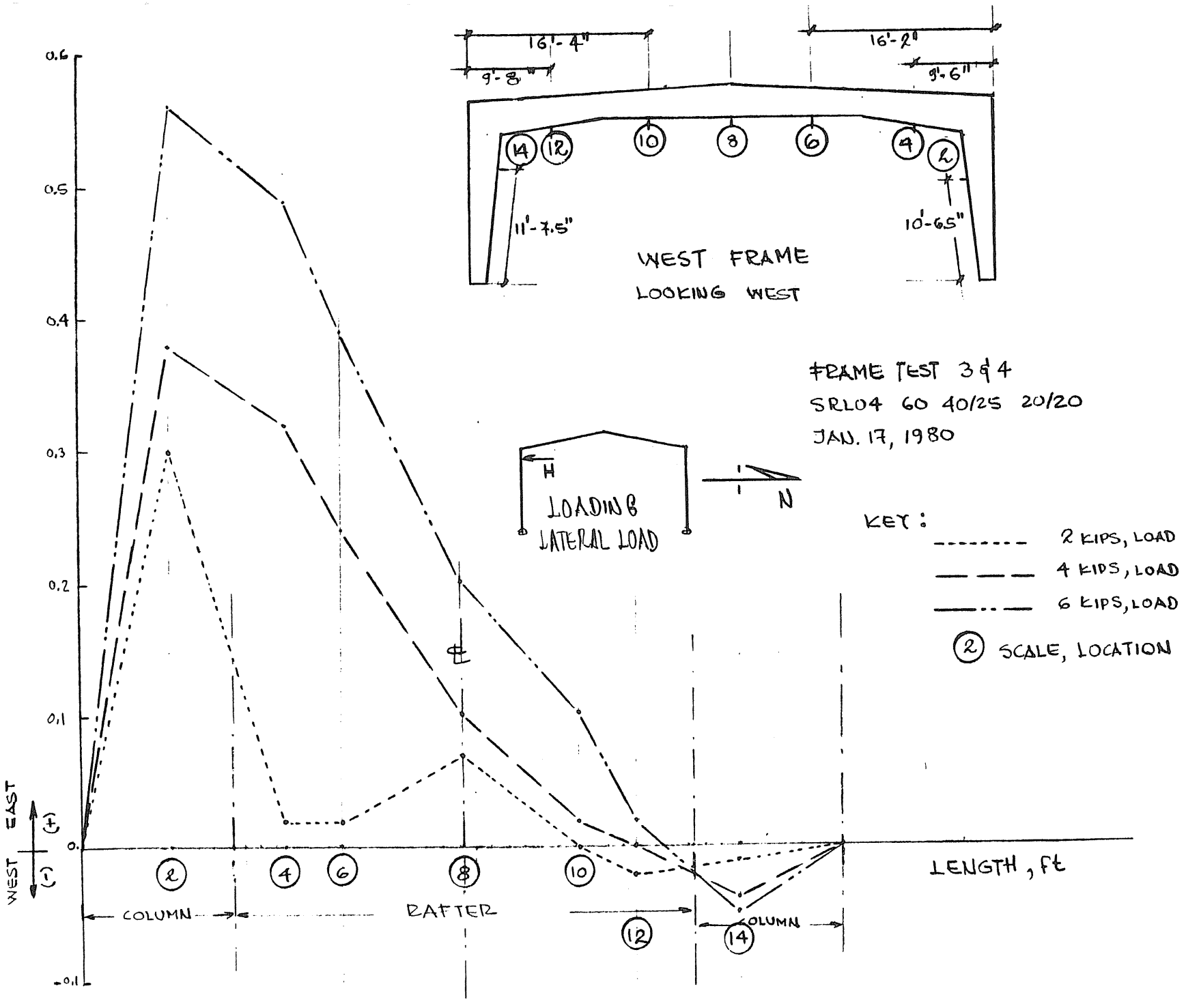


Figure D.5 Lateral Deflection, Inside Flange, West Frame

APPENDIX E

INITIAL TEST, UNBALANCED LIVE LOAD AND LATERAL LOAD

Test Date January 31, 1980

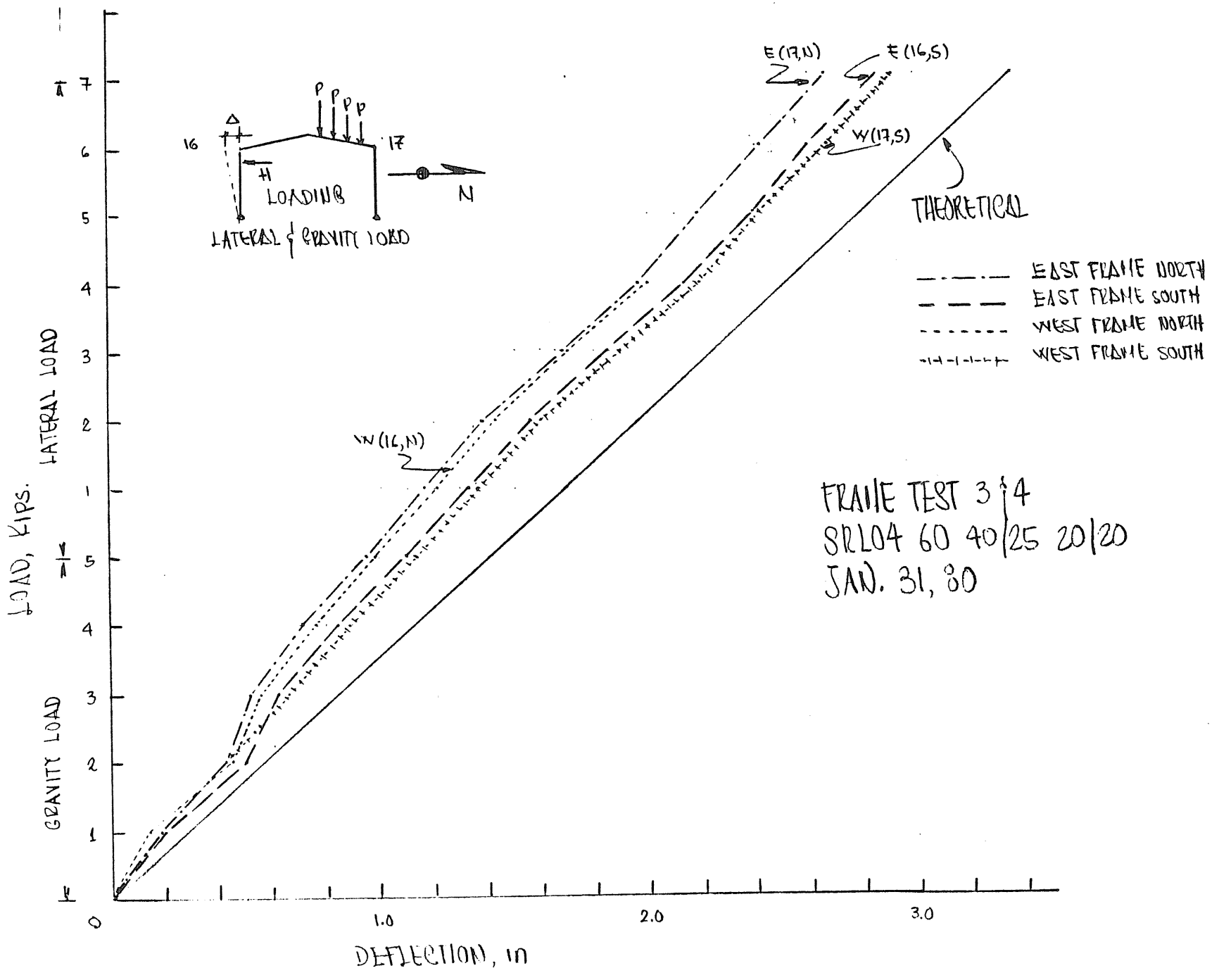


Figure E. 2 Load vs. Sidesway Deflection

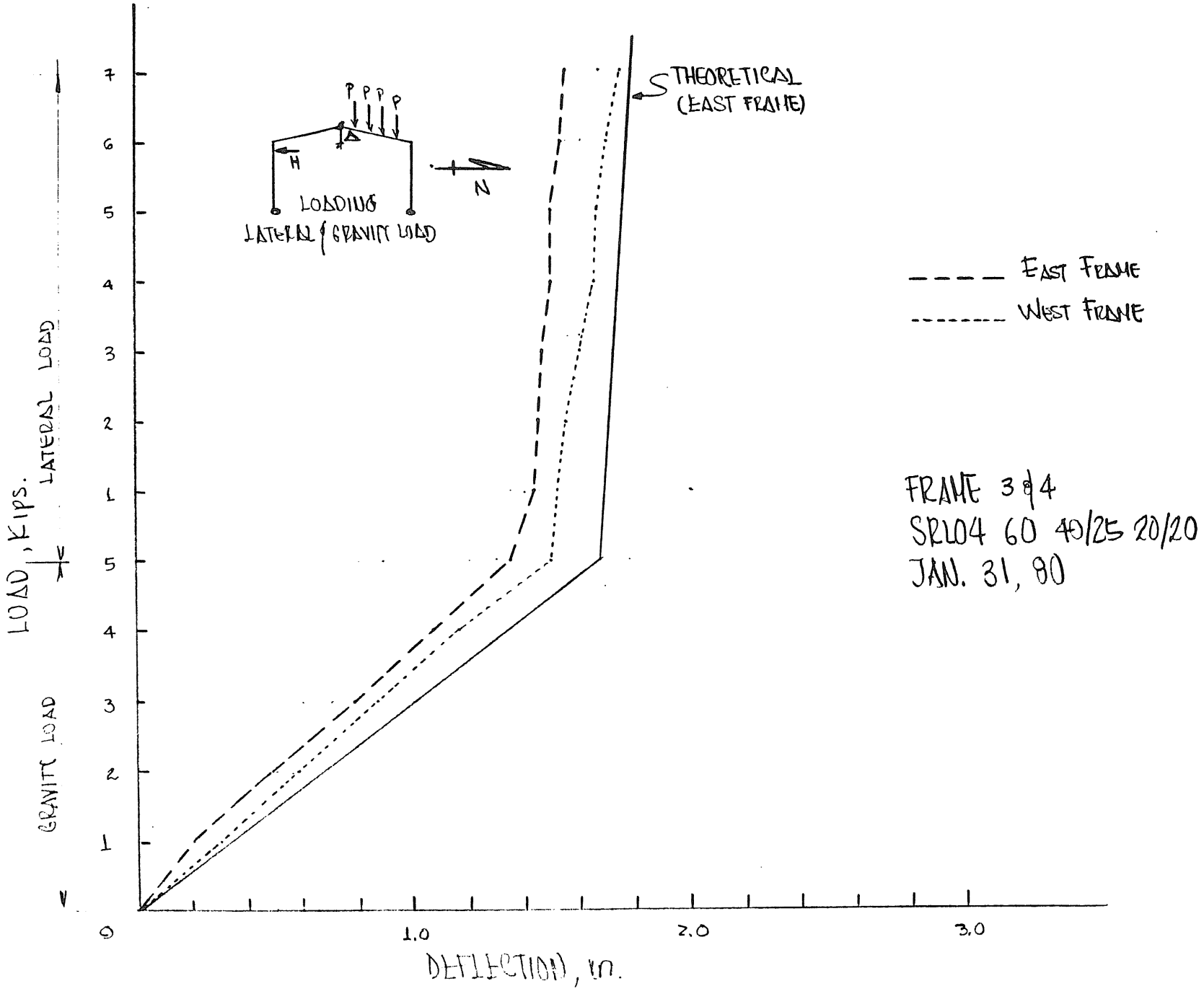


Figure E.1 Load vs. Centerline Vertical Deflection

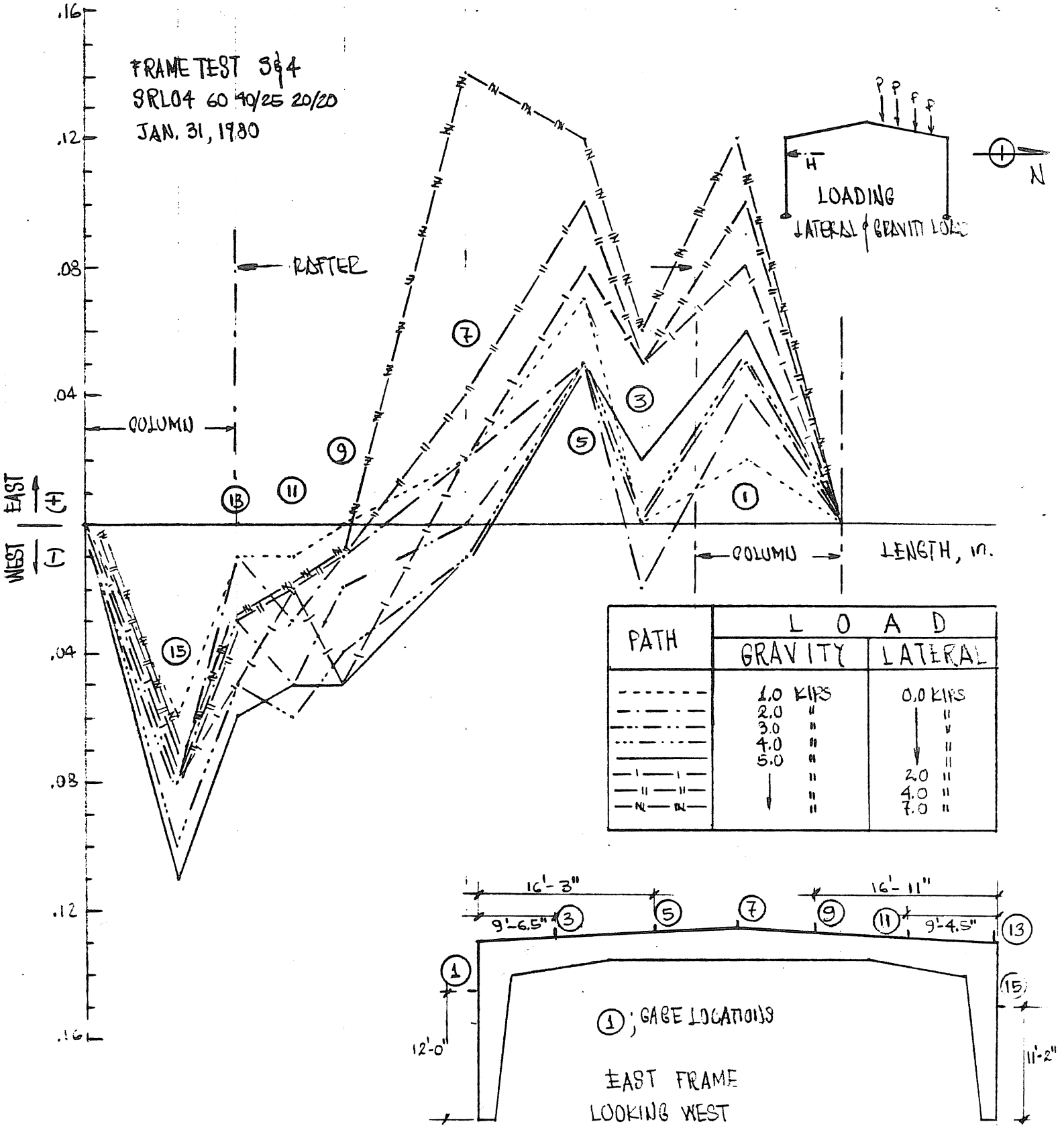


Figure E.3 Lateral Deflection, Outside Flange, East Frame

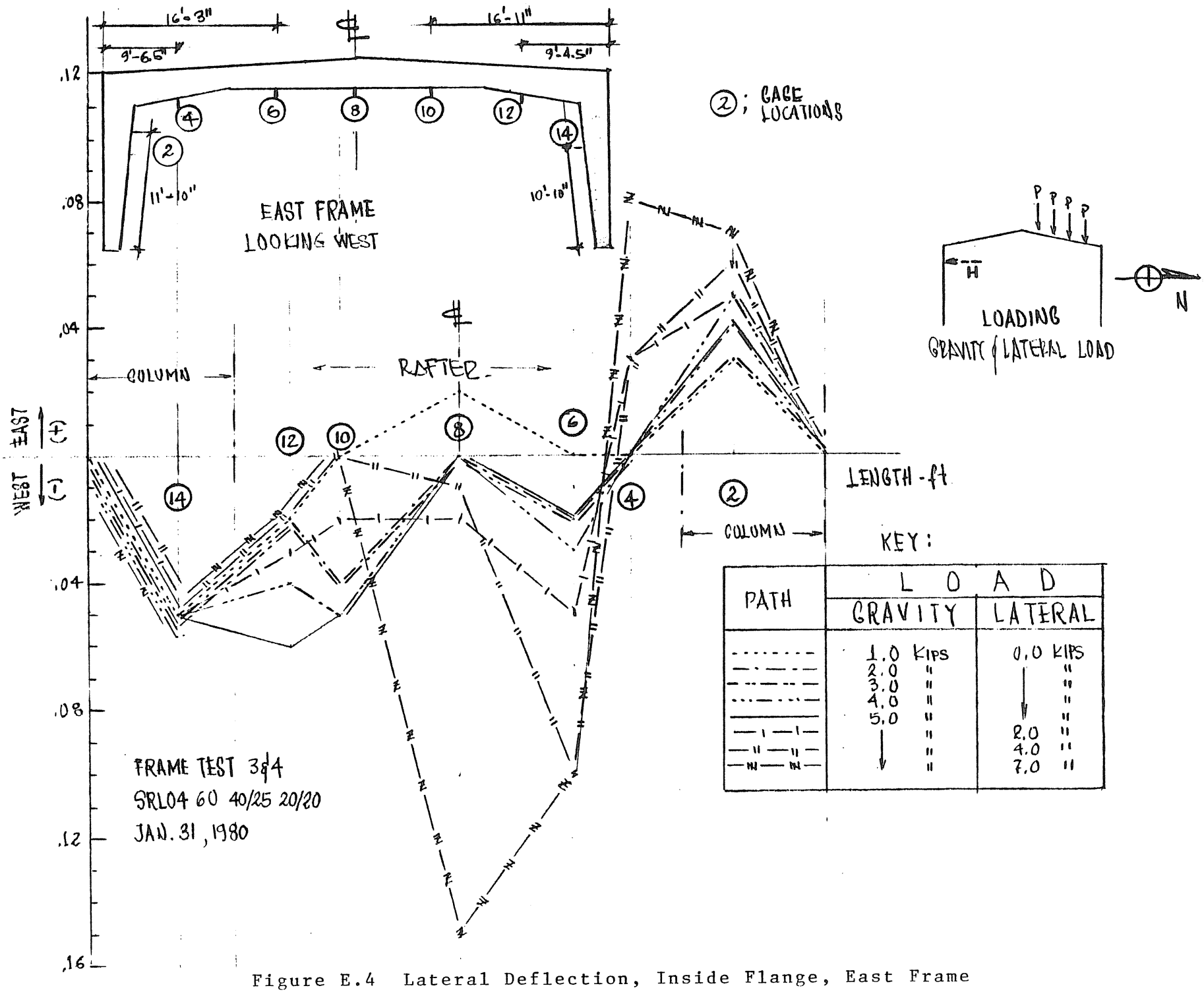


Figure E.4 Lateral Deflection, Inside Flange, East Frame

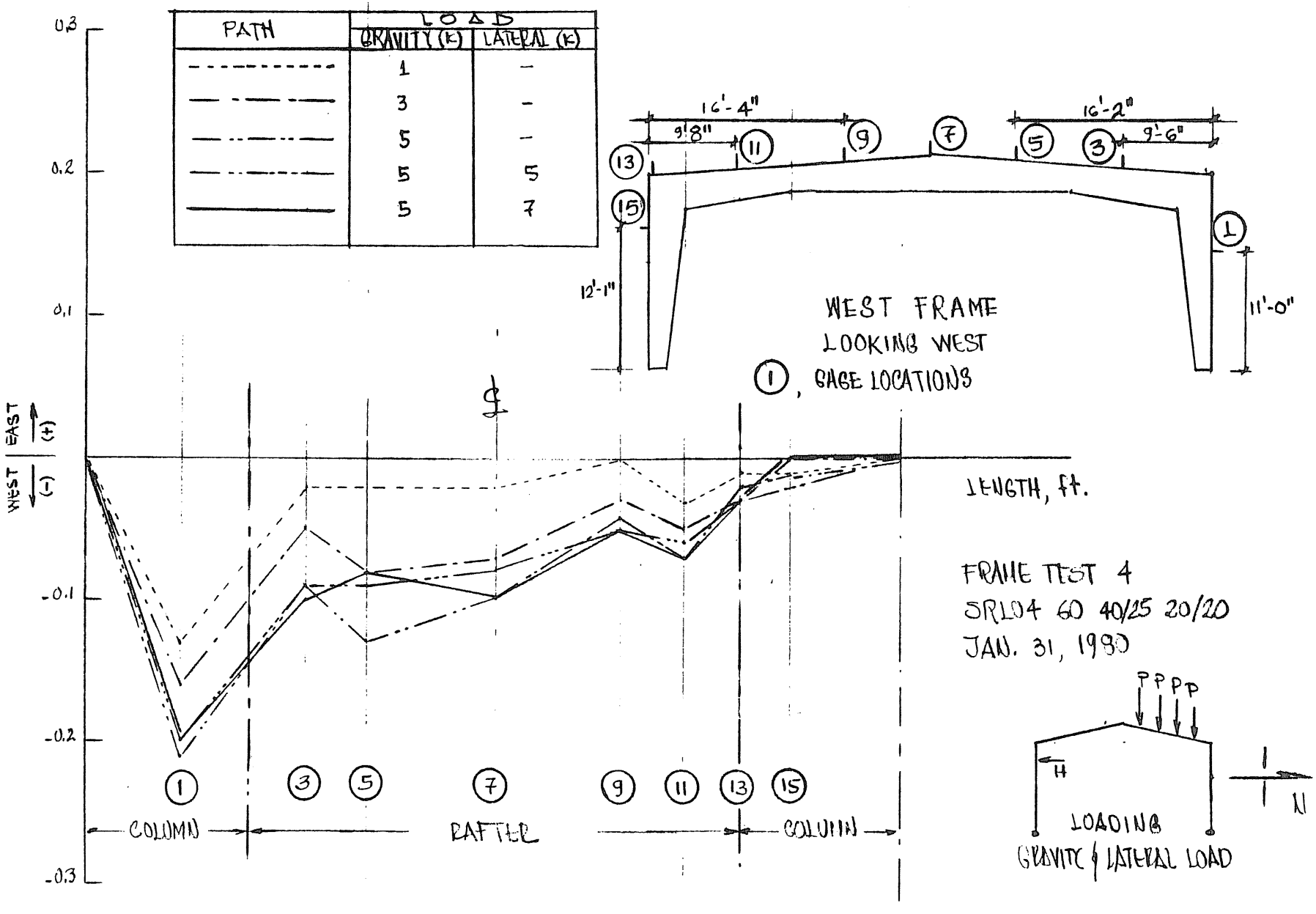


Figure E.5 Lateral Deflection, Outside Flange, West Frame

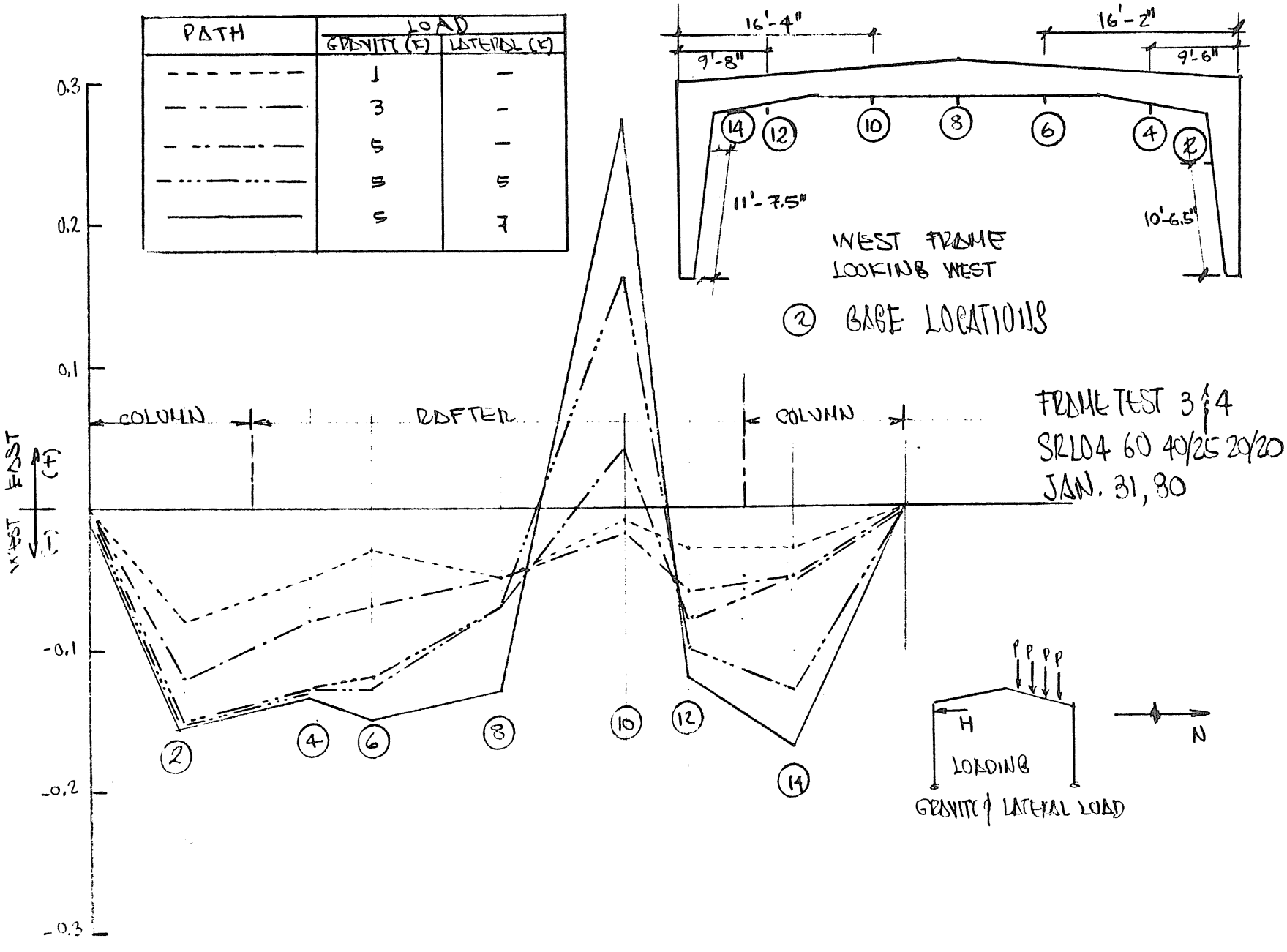


Figure E.6 Lateral Deflection, Inside Flange, West Frame

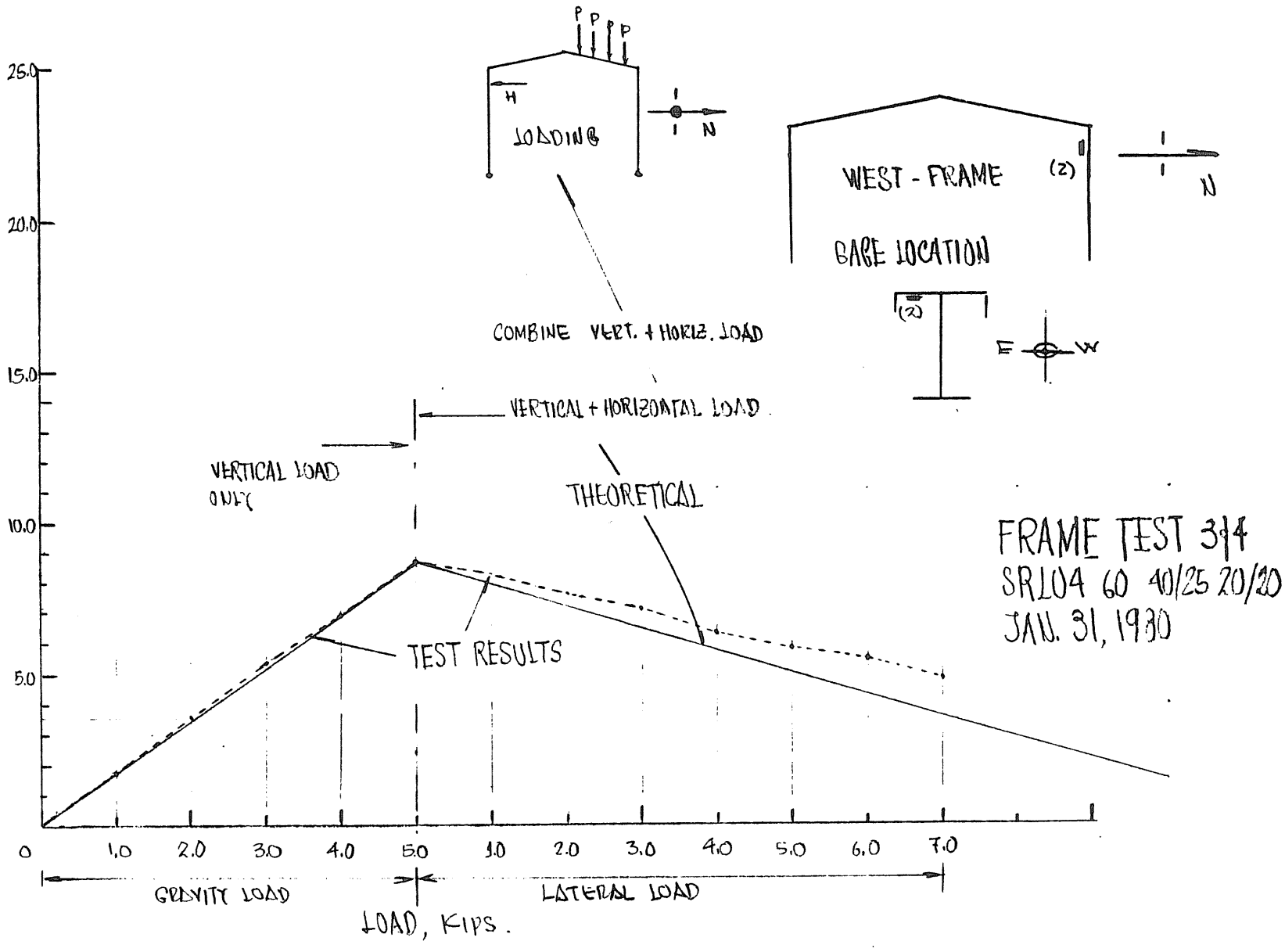


Figure E.7 Load vs. Stress, Northwest Column at Knee

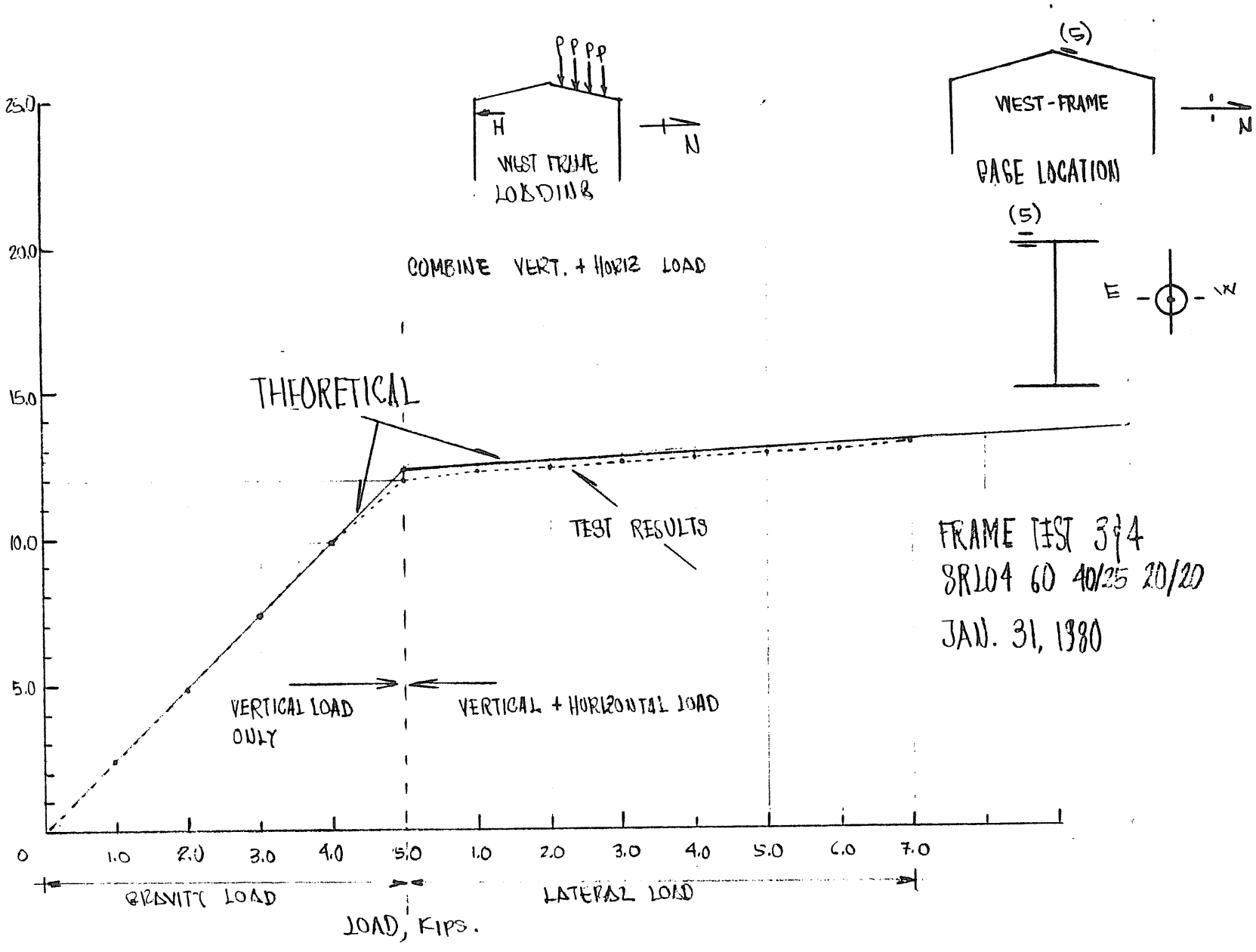


Figure E.8 Load vs. Stress, West Rafter at Peak

APPENDIX F

FINAL TEST, FULL LIVE LOAD, WEST FRAME

Test Date February 14, 1980

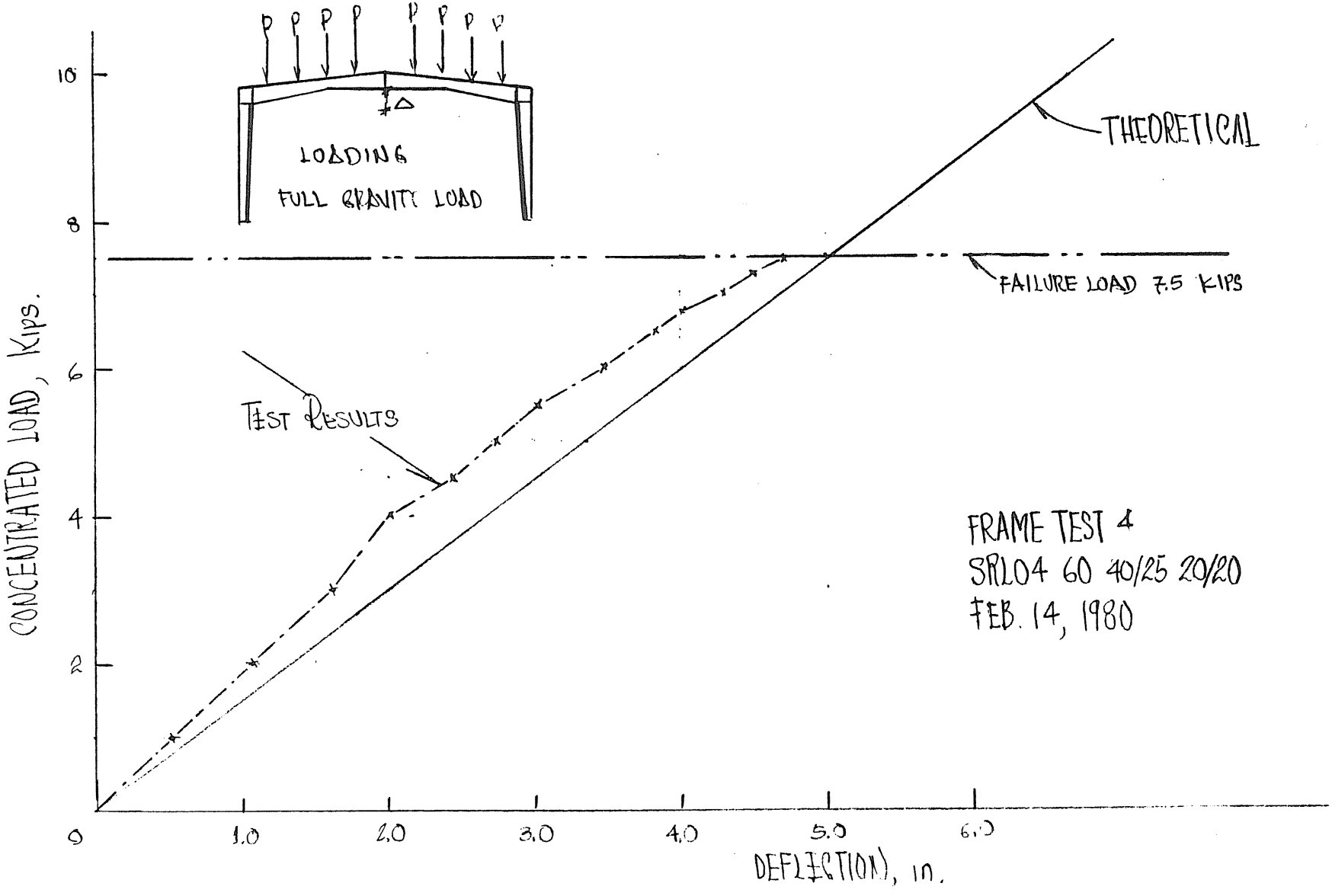


Figure F.1 Load vs. Centerline Vertical Deflection

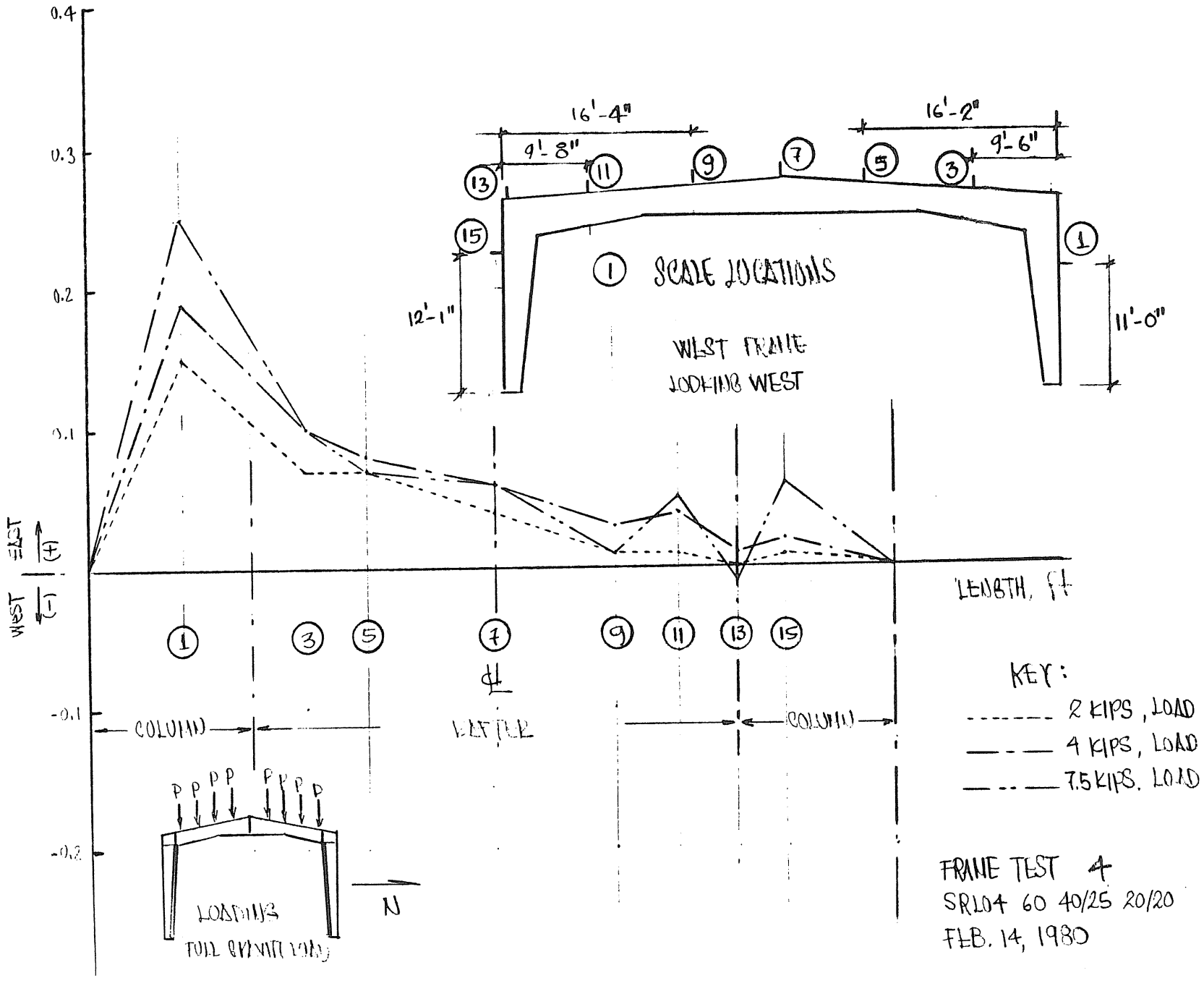


Figure F.2 Lateral Deflection, Outside Flange

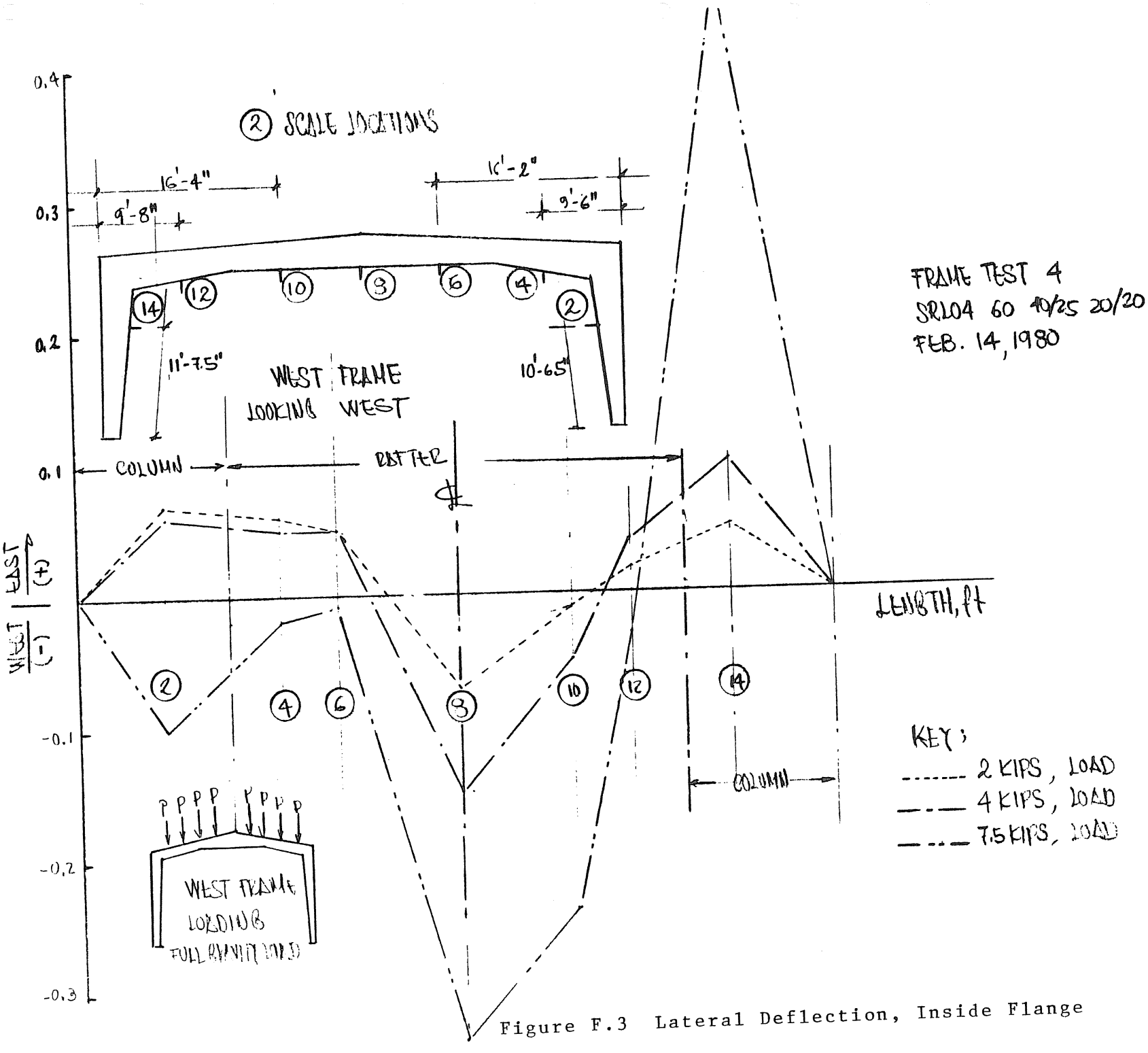


Figure F.3 Lateral Deflection, Inside Flange

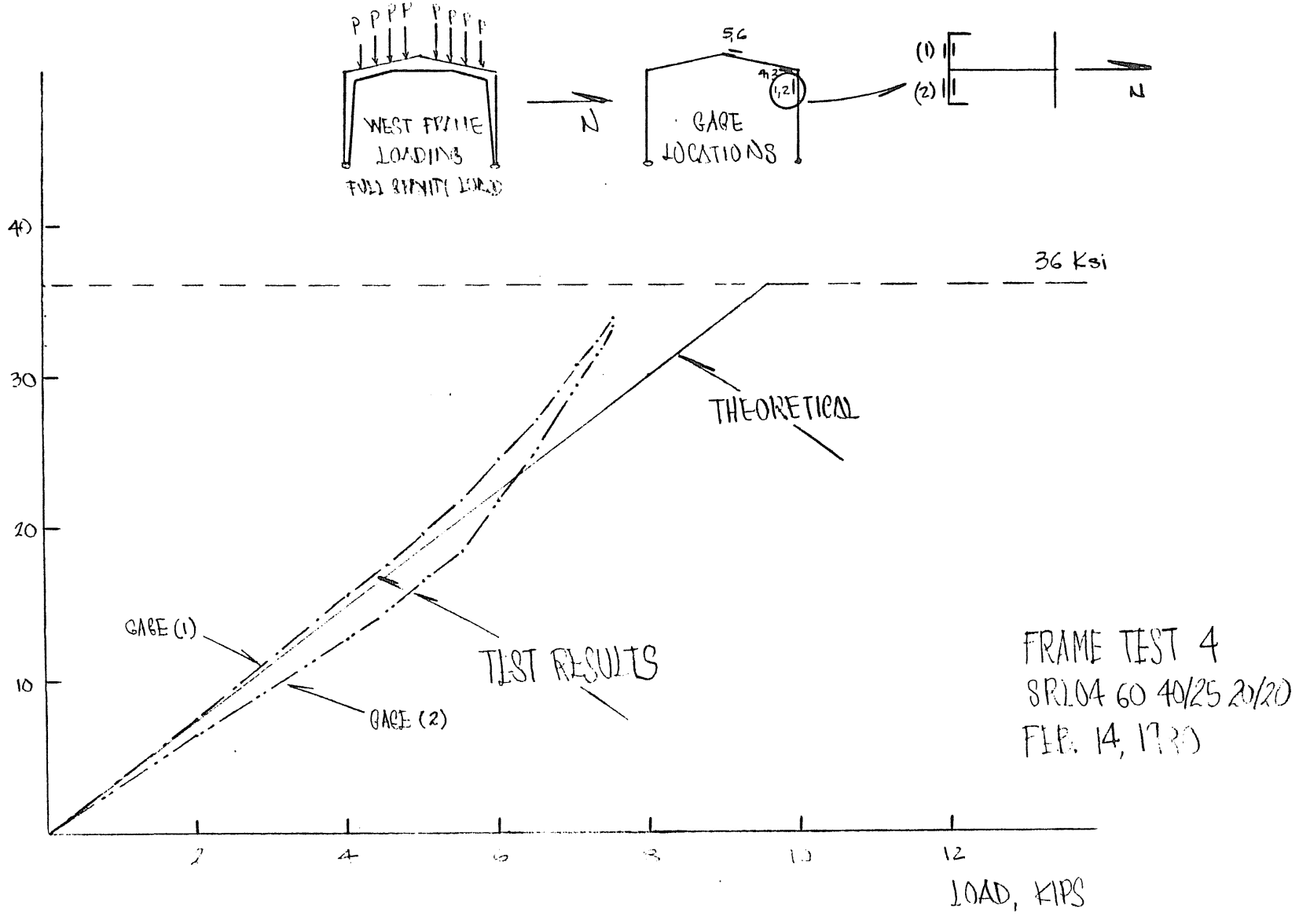


Figure F.4 Load vs. Stress, North Column at Knee

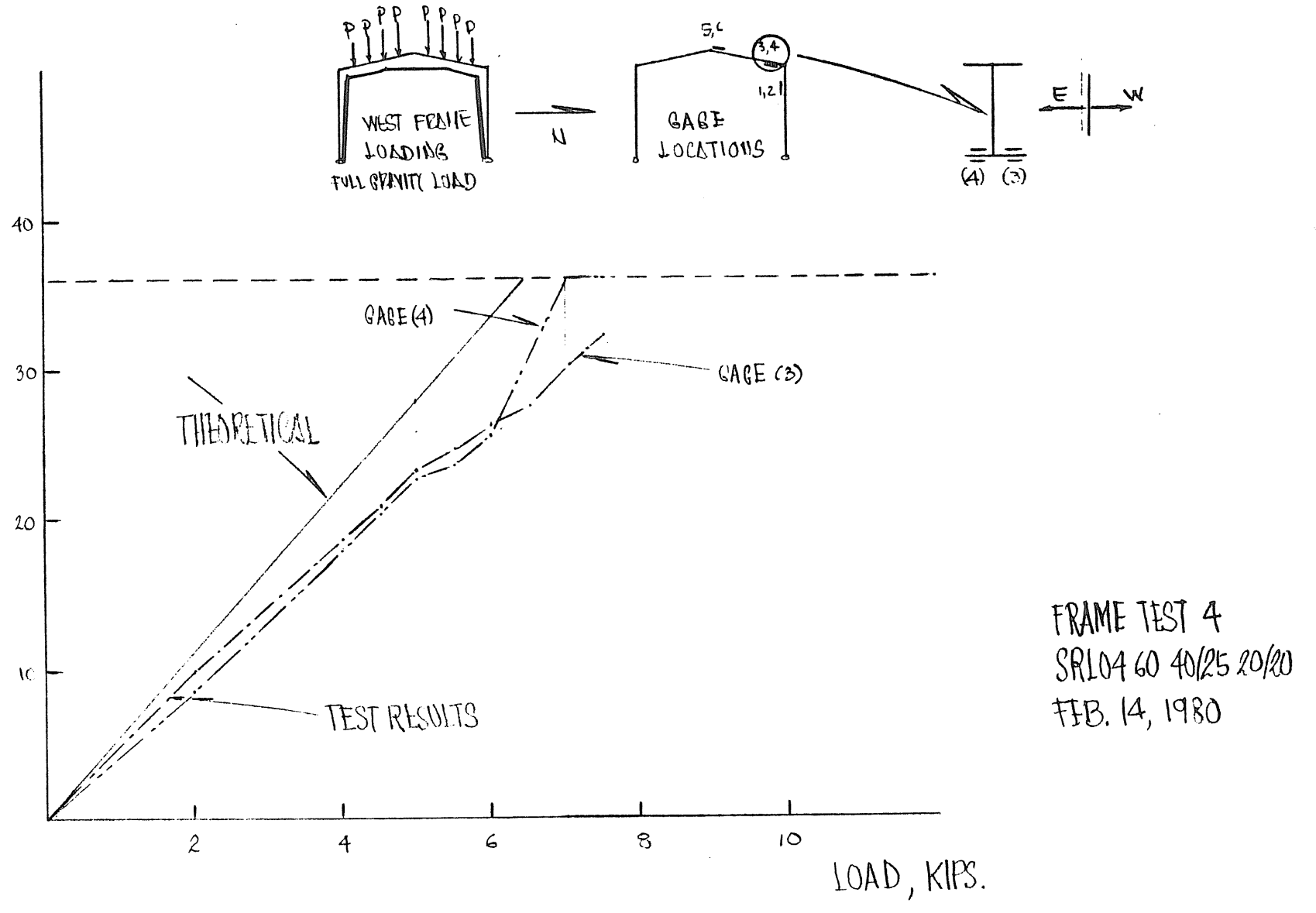


Figure F.5 Load vs. Stress, North Rafter at Knee

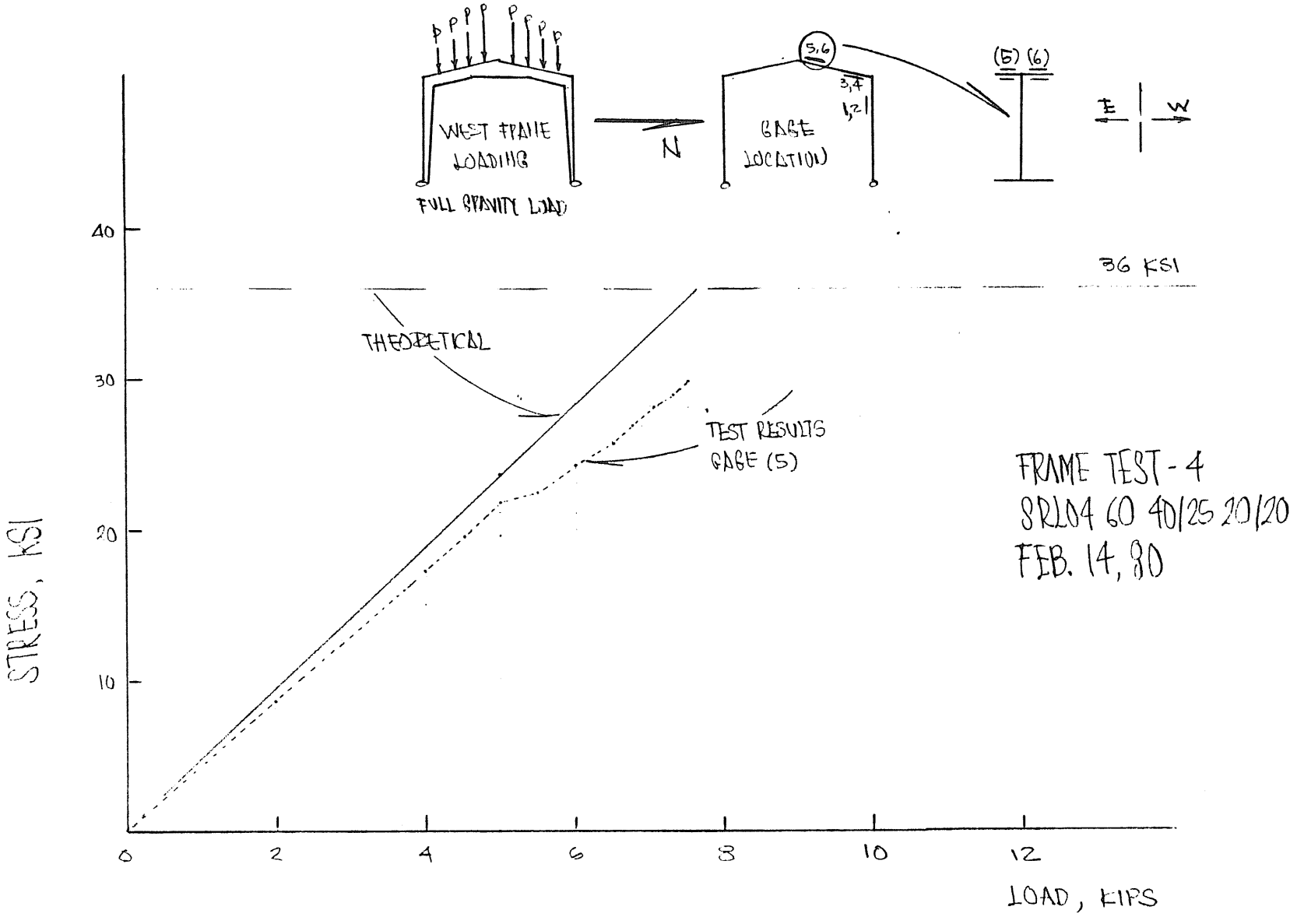


Figure F.6 Load vs. Stress, North Rafter at Peak

APPENDIX G

FINAL TEST, UNBALANCED LIVE LOAD AND LATERAL LOAD

Test Date February 29, 1980

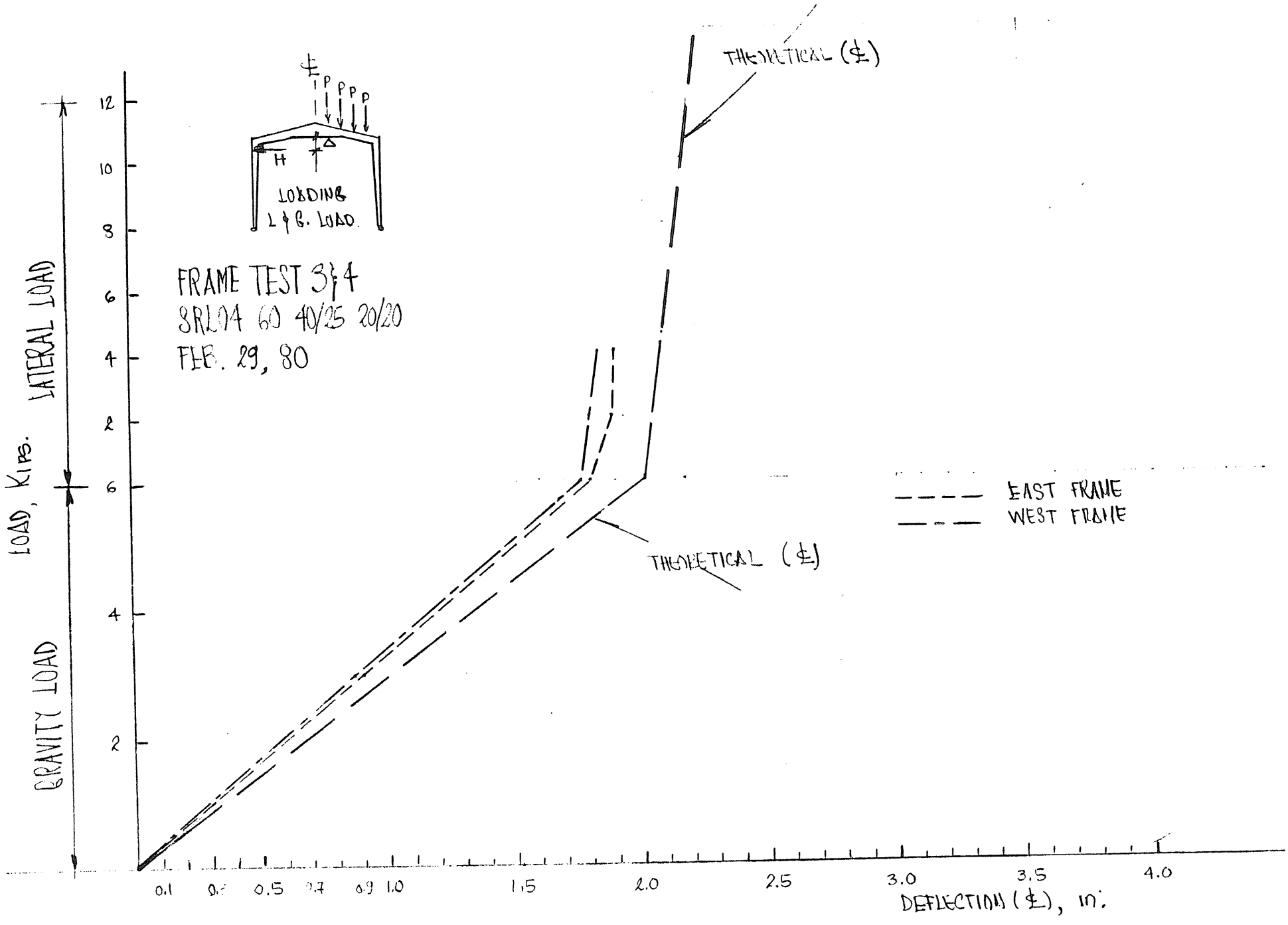


Figure G.1 Load vs. Centerline Vertical Deflection

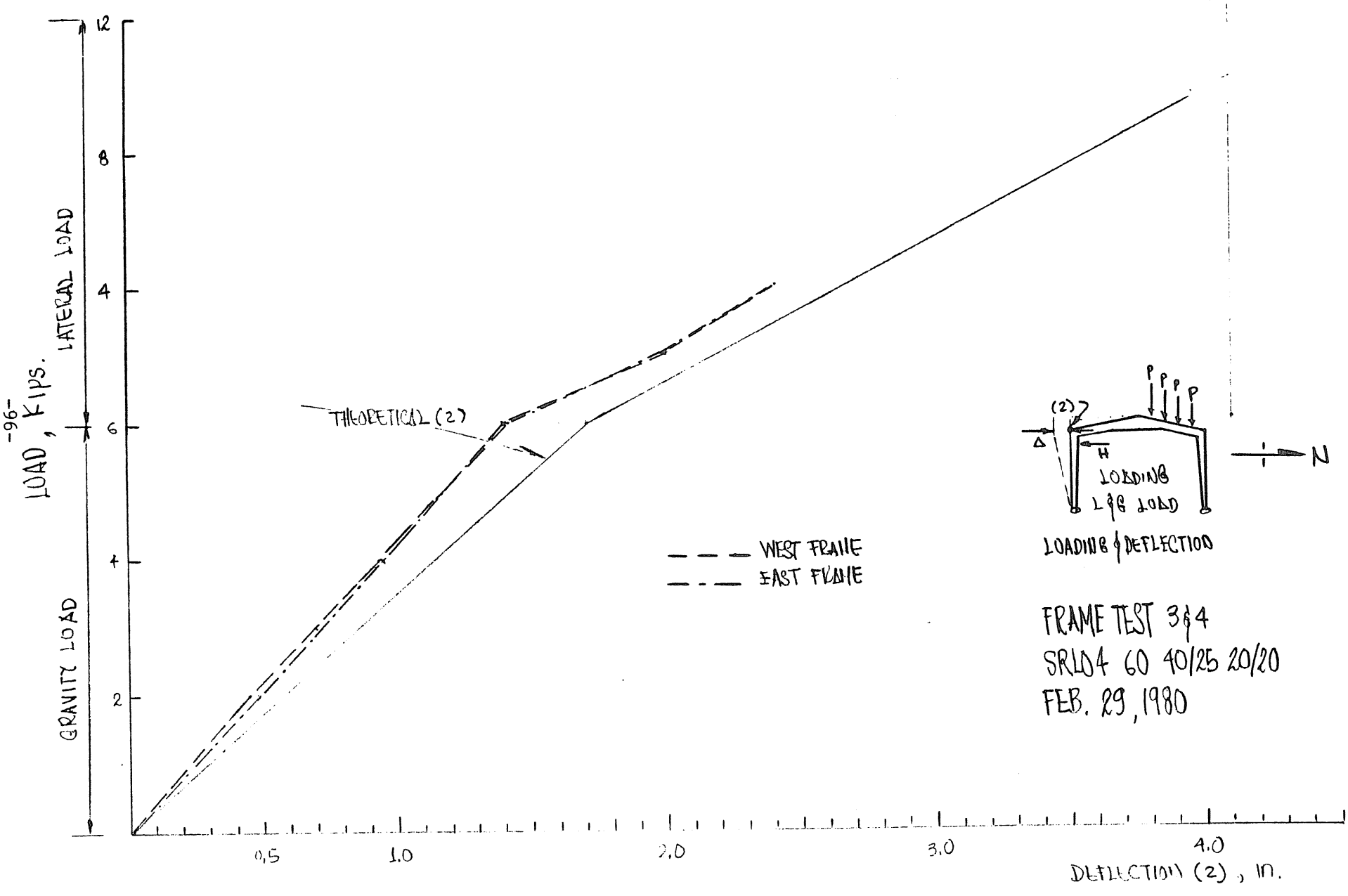


Figure G.2 Load vs. Sidesway Deflection

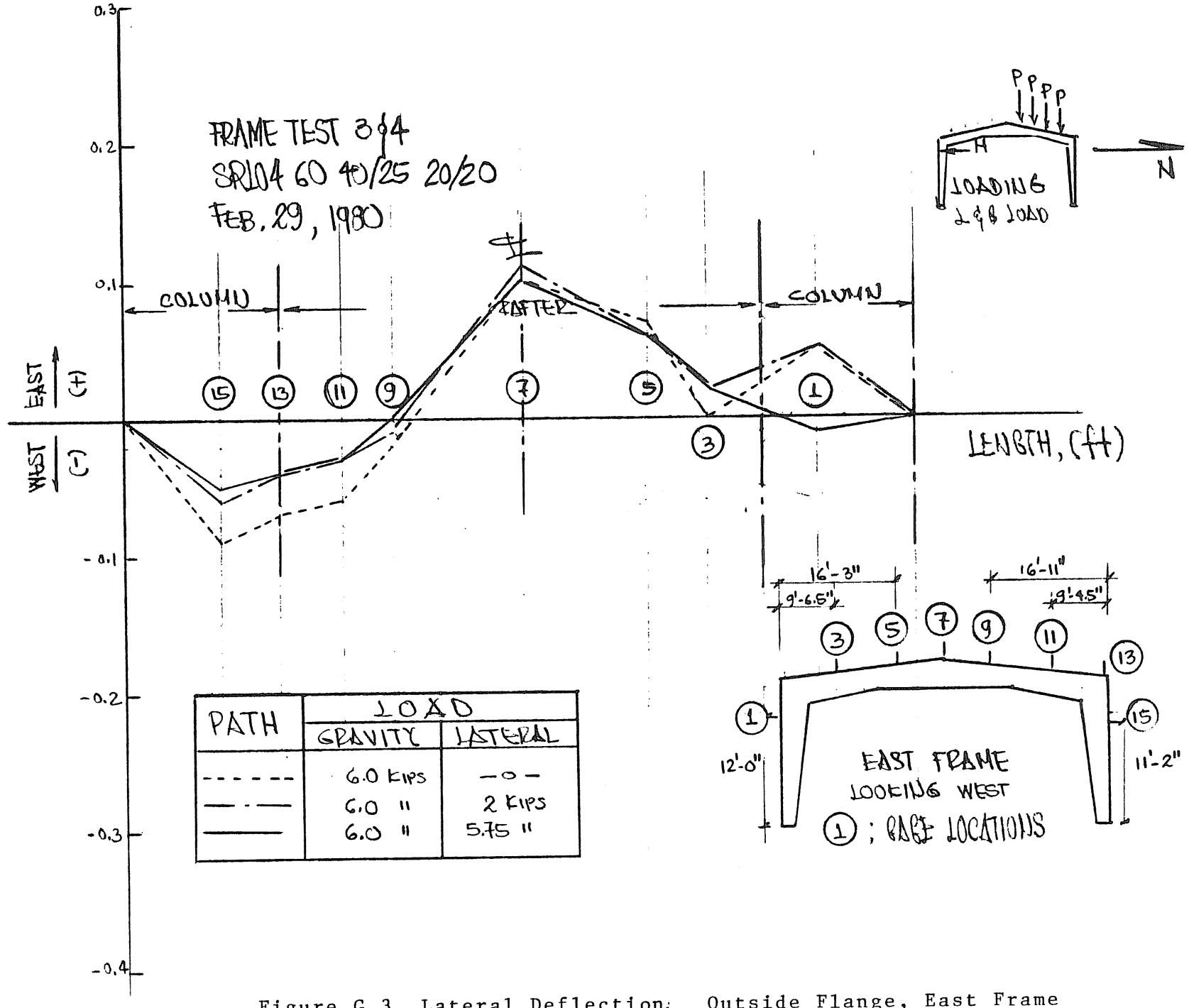


Figure G.3 Lateral Deflection; Outside Flange, East Frame

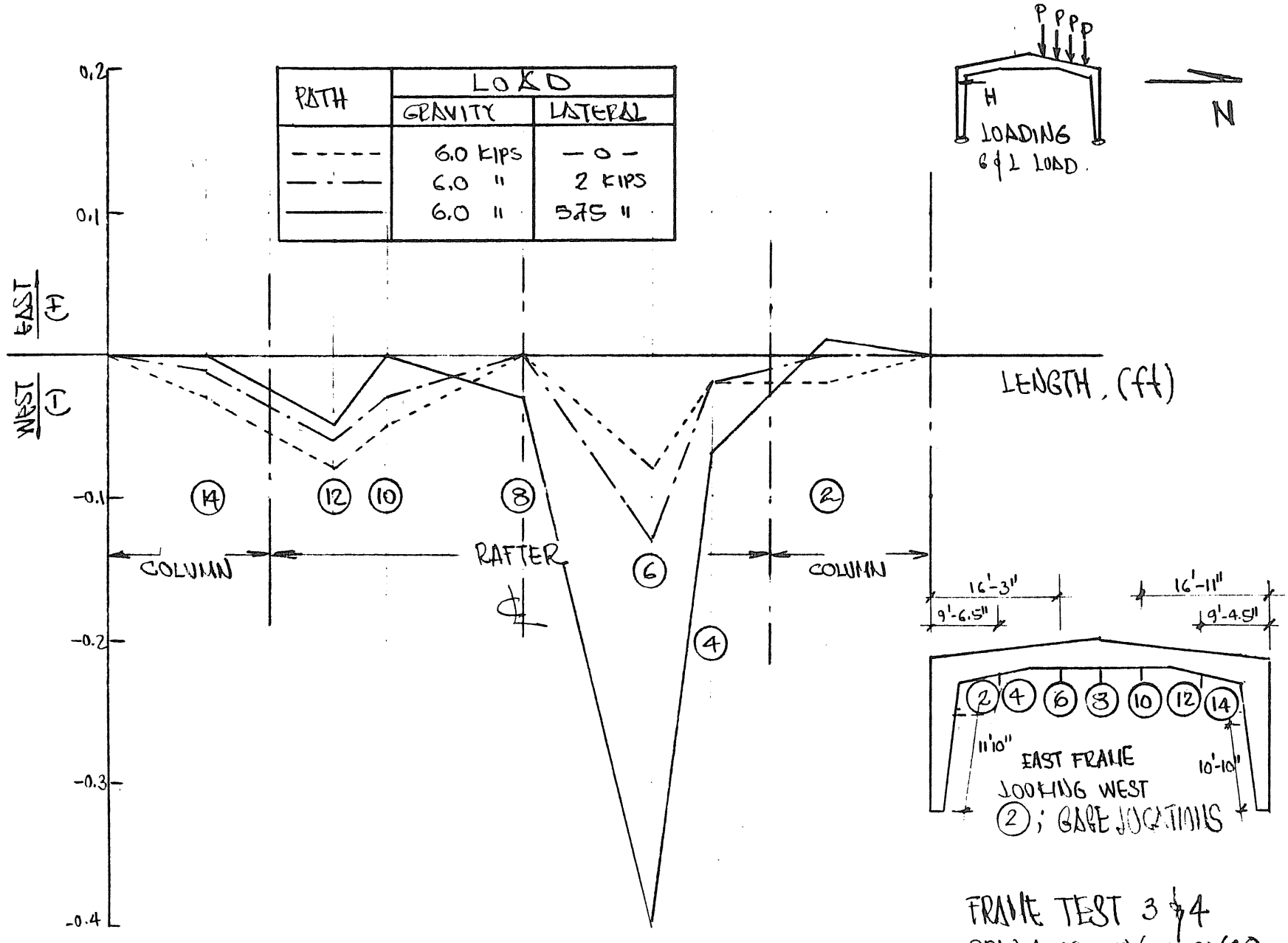


Figure G.4 Lateral Deflection, Inside Flange, East Frame

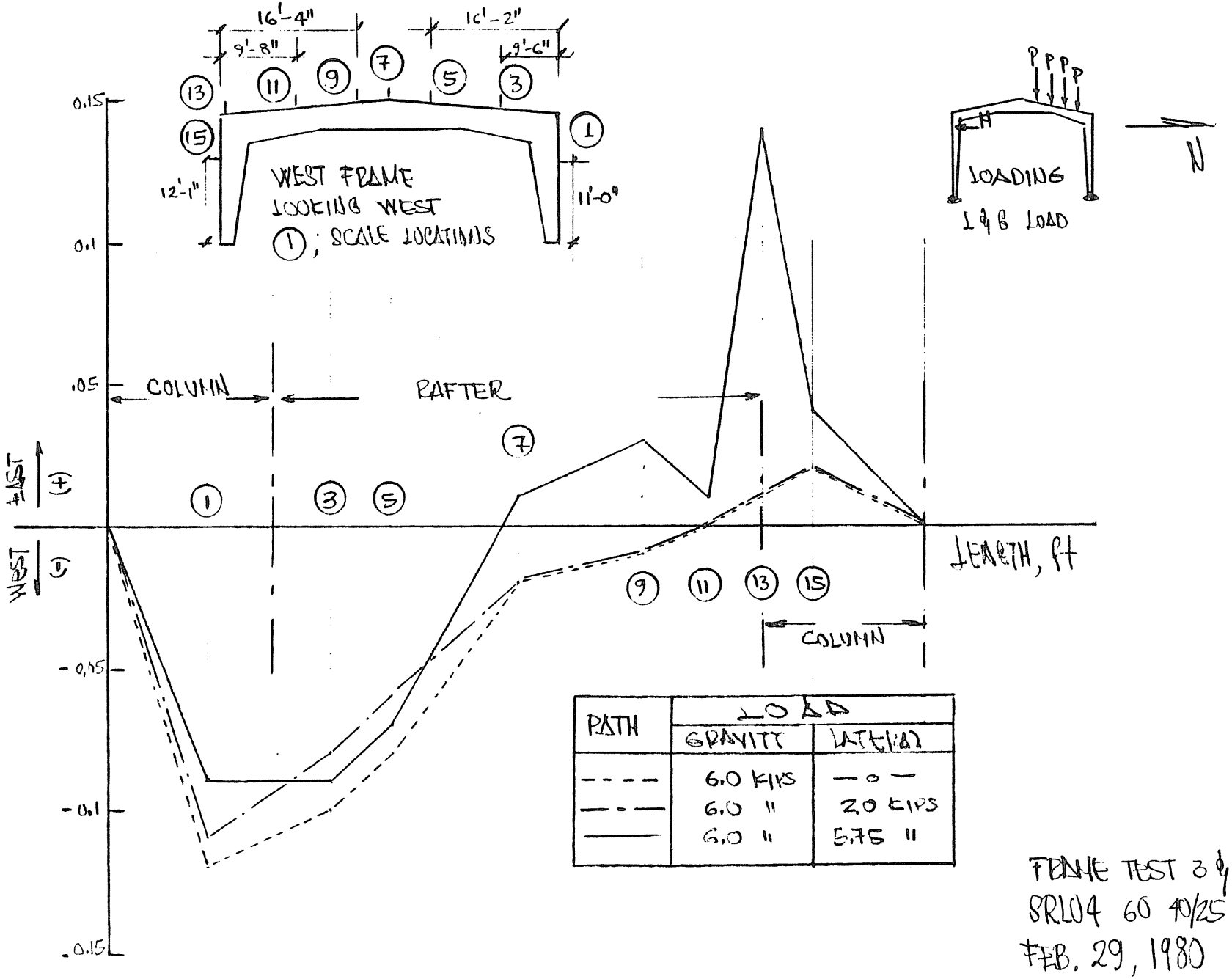


Figure G.5 Lateral Deflection, Outside Flange, West Frame

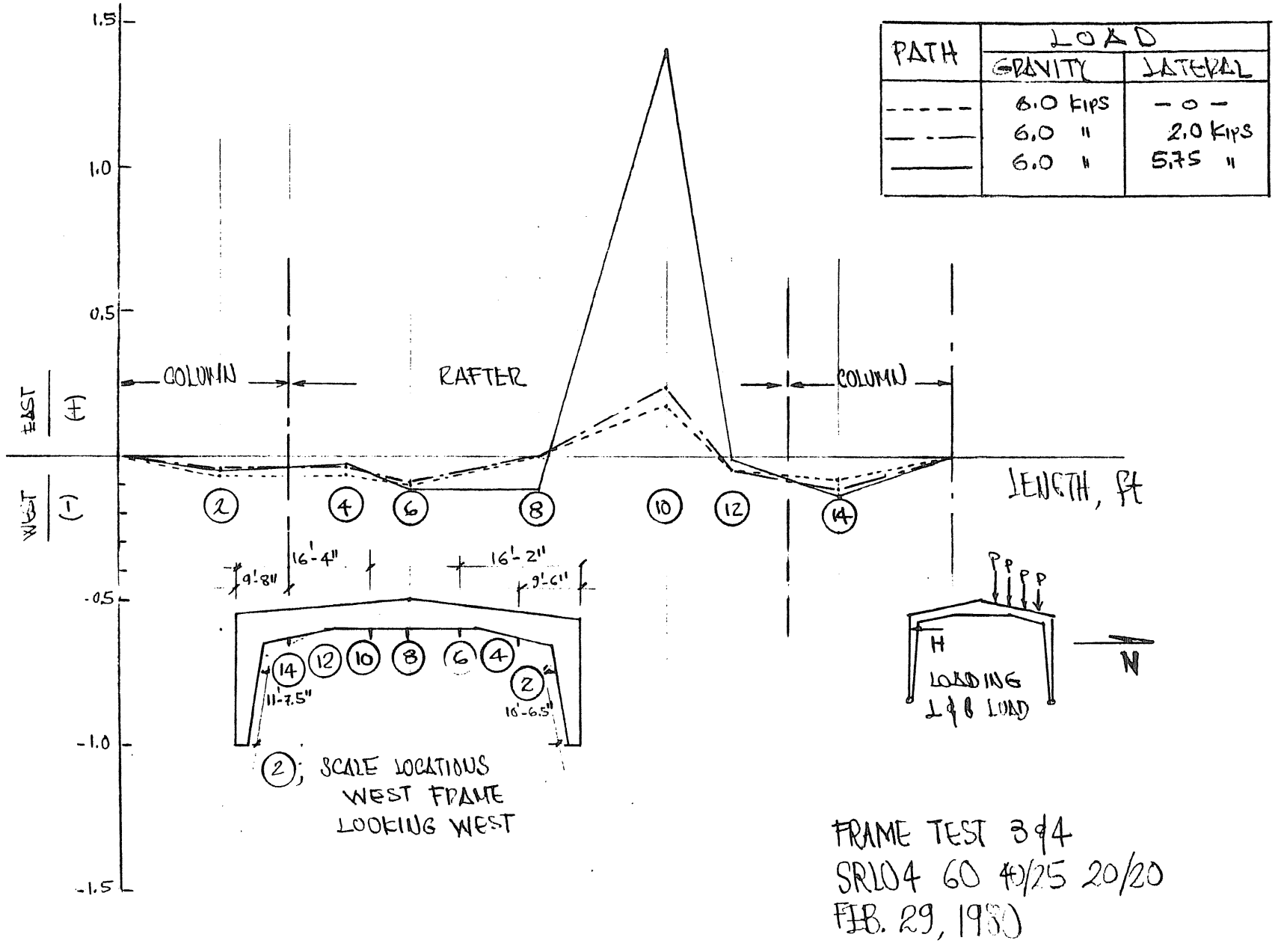


Figure G.6 Lateral Deflection, Inside Flange, West Frame

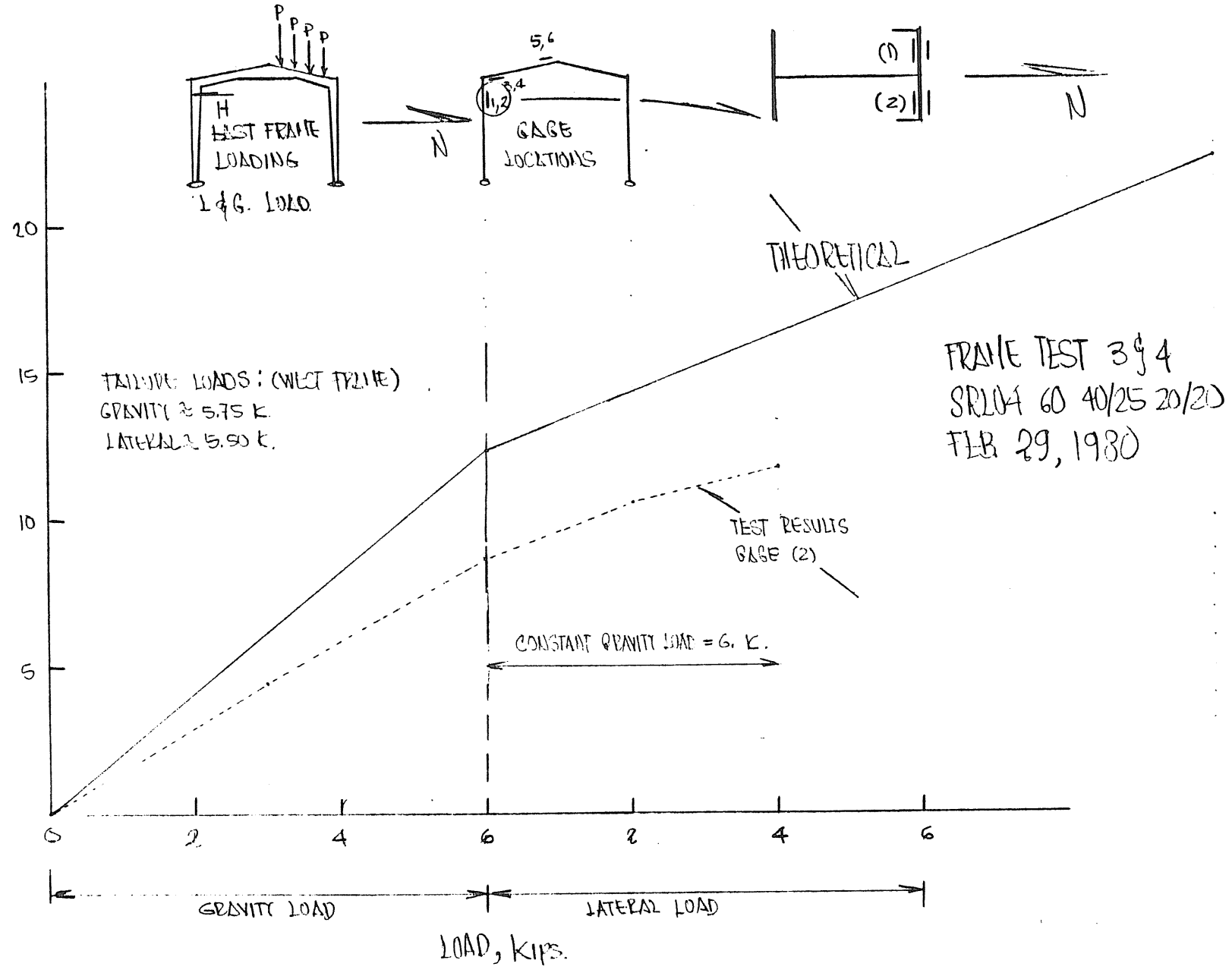


Figure G.7 Load vs. Stress, Southeast Column at Knee

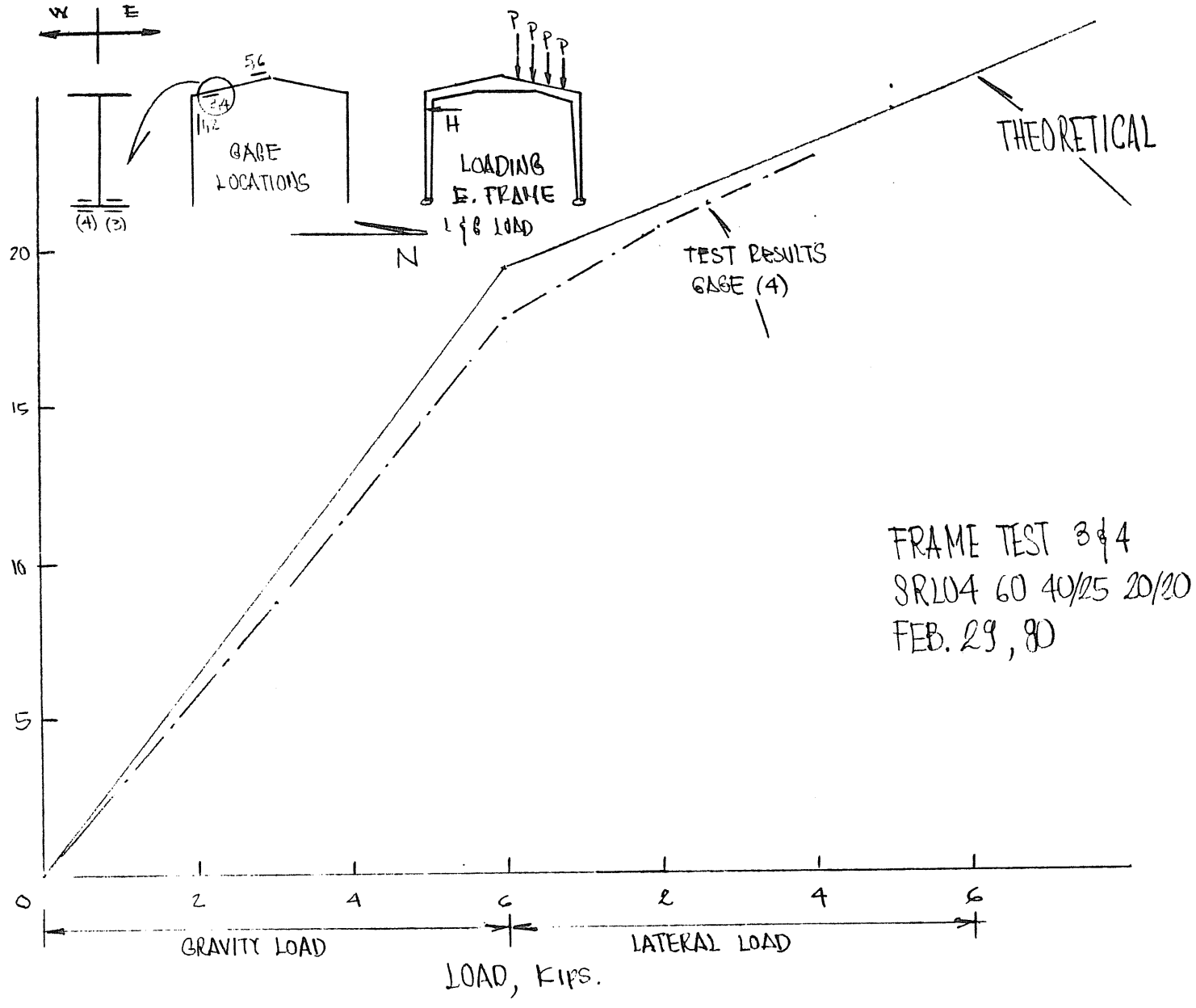


Figure G.8 Load vs. Stress, Southeast Rafter at Knee

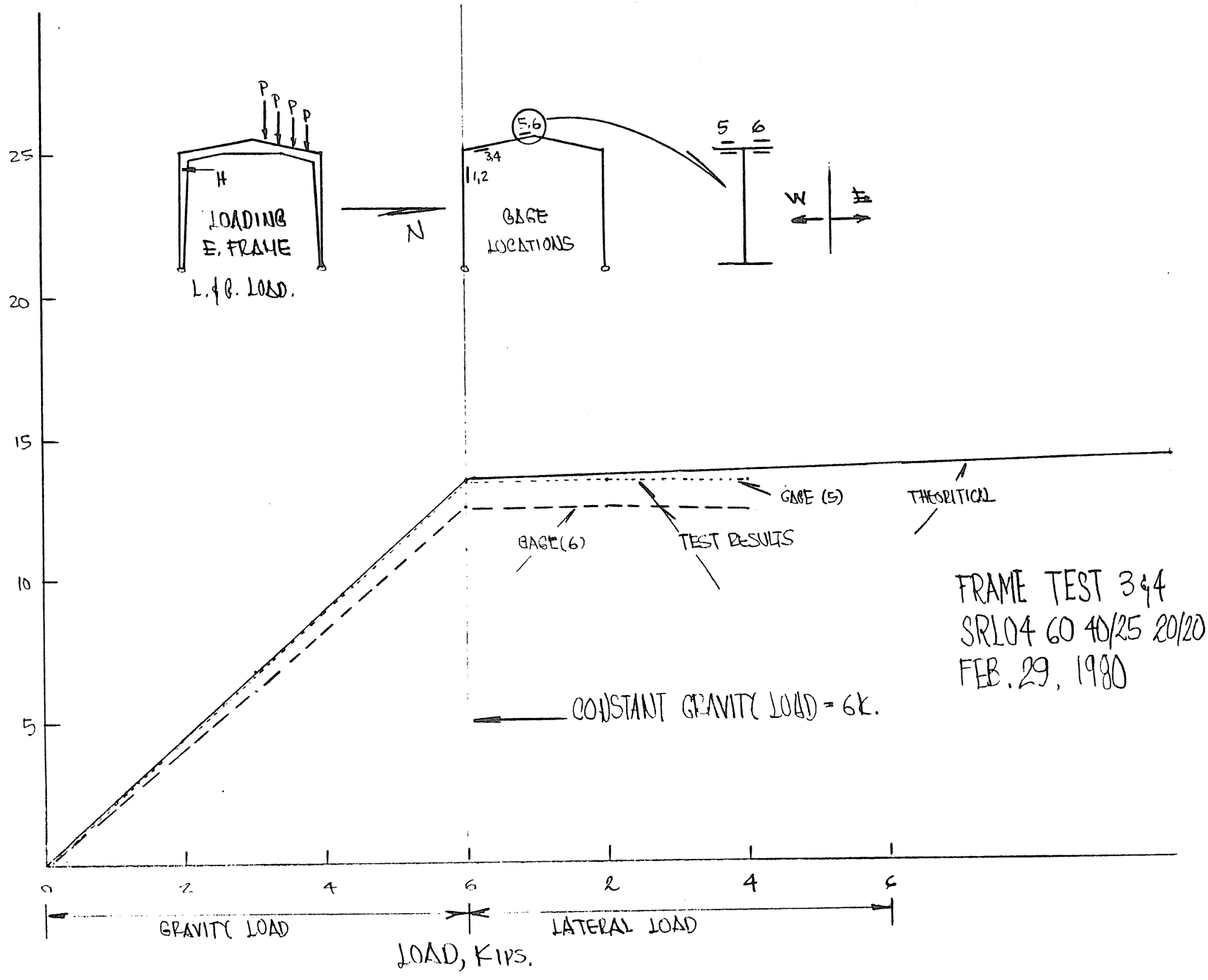


Figure G.9 Load vs. Stress, Southeast Rafter at Peak

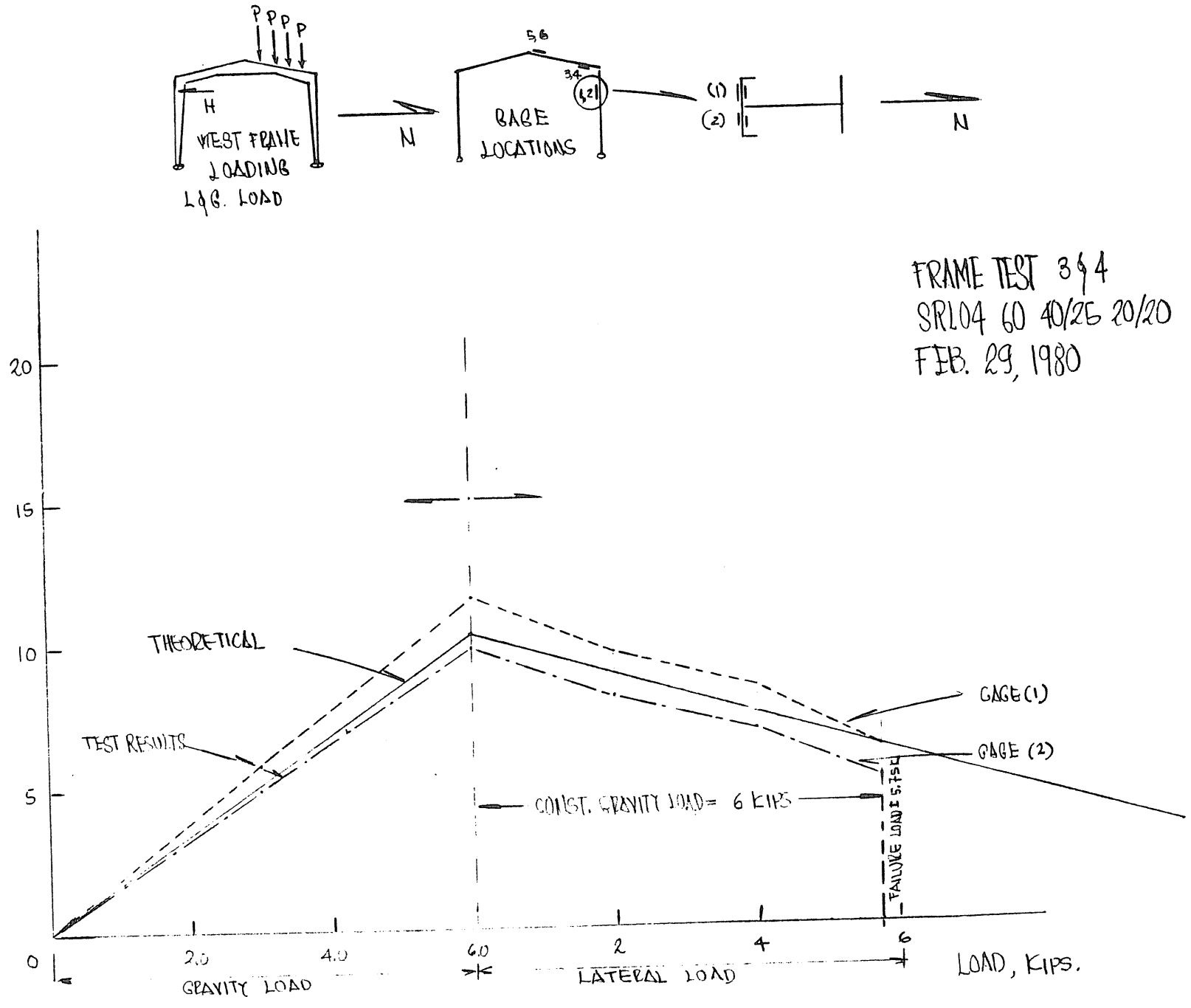


Figure G.10 Load vs. Stress, Northwest Column at Knee

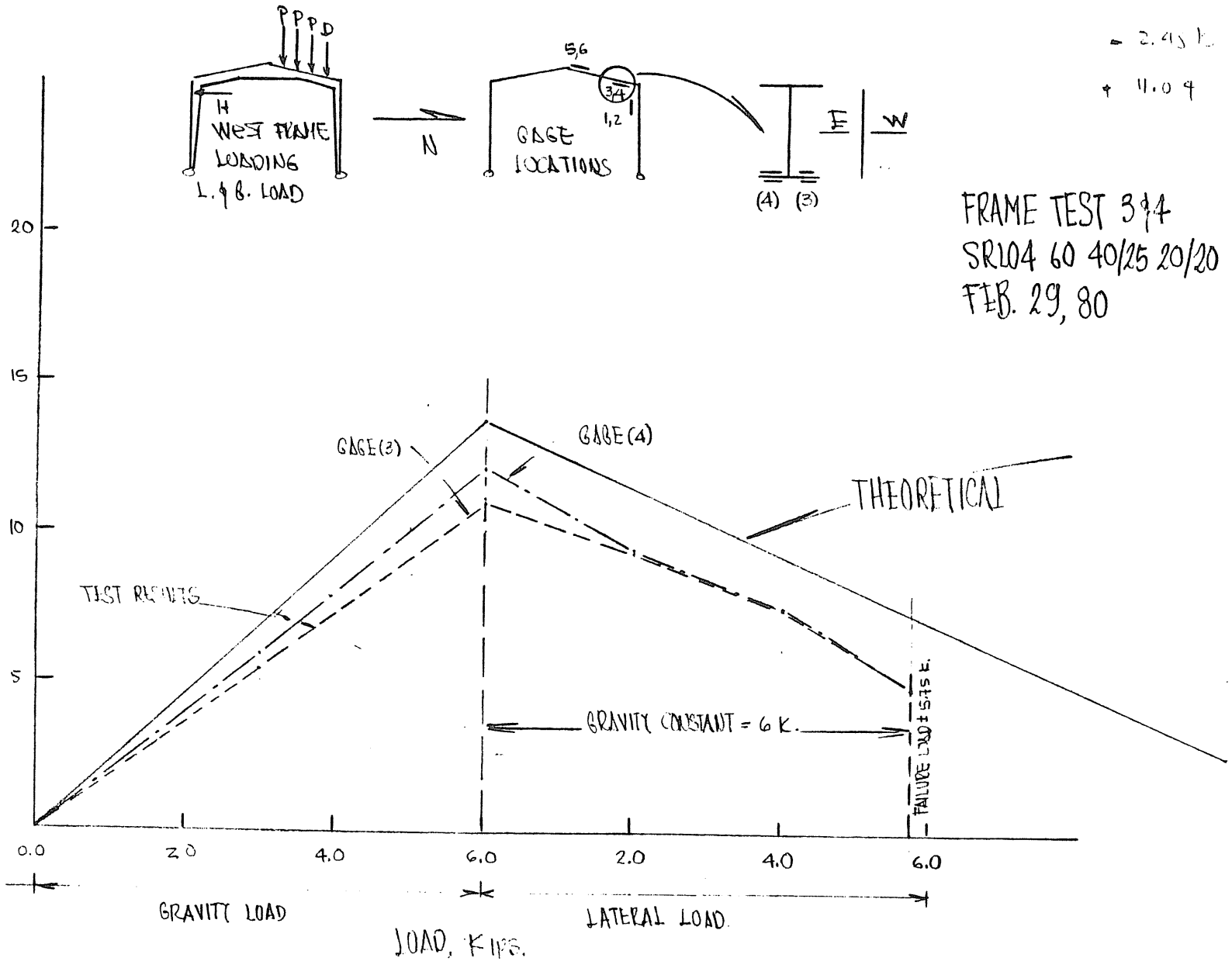


Figure G.11 Load vs. Stress, Northwest Rafter at Knee

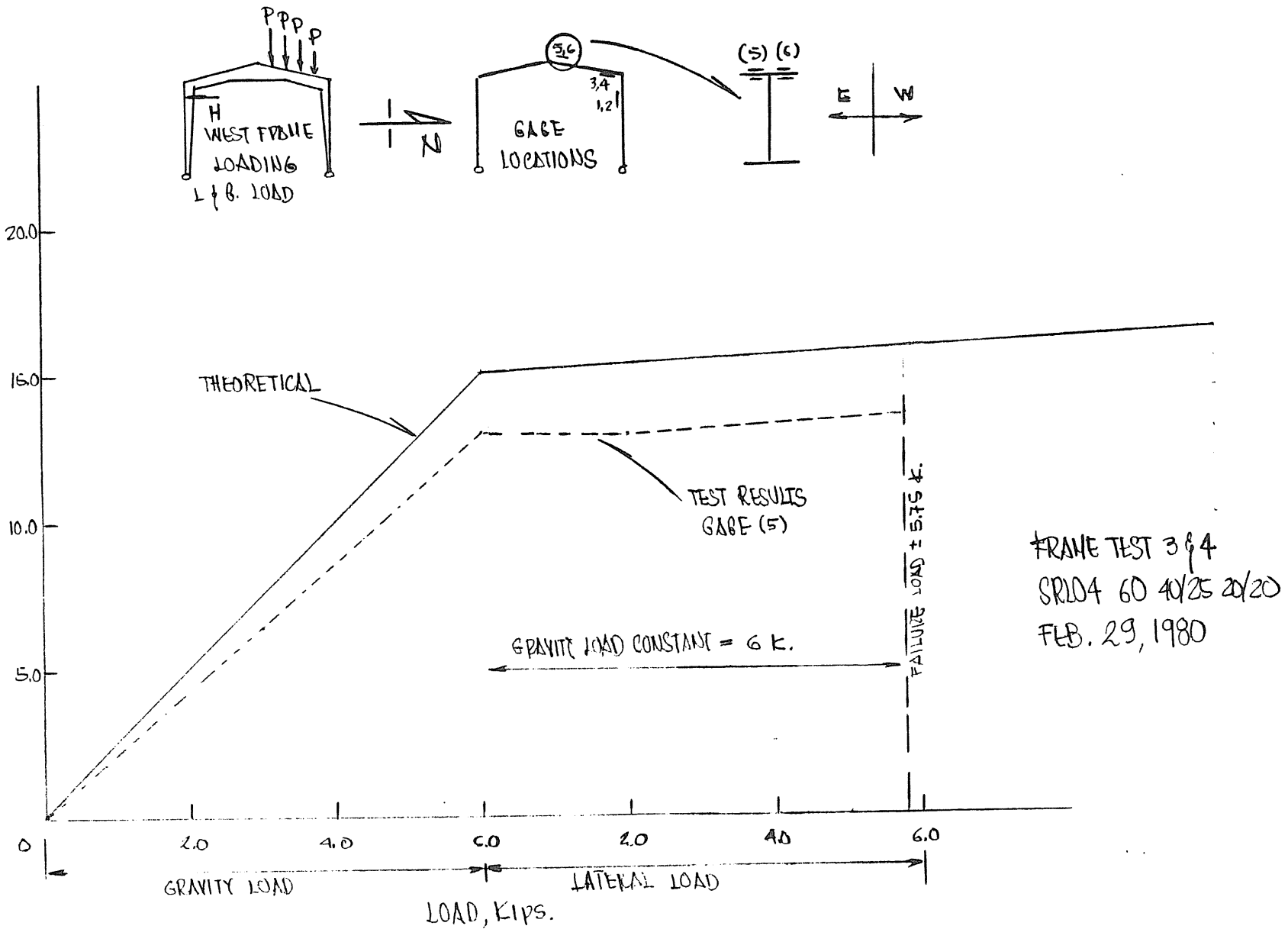


Figure G.12 Load vs. Stress, Northwest Rafter at Peak

APPENDIX H

FINAL TEST, FULL LINE LOAD, EAST FRAME WITH NONSTANDARD FLANGE BRACE SPACING

Test Date March 5, 1980

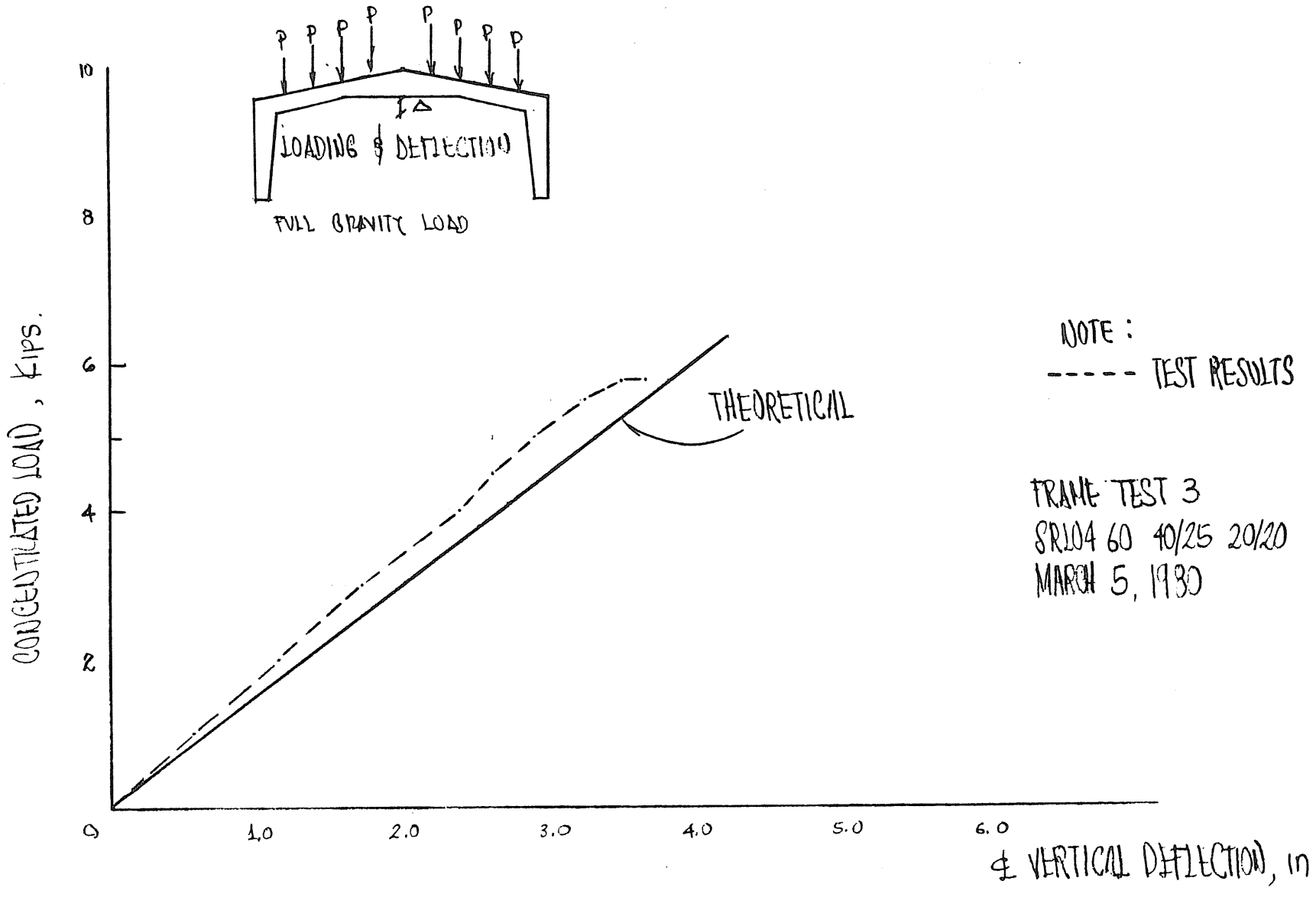


Figure H.1 Load vs. Centerline Vertical Deflection

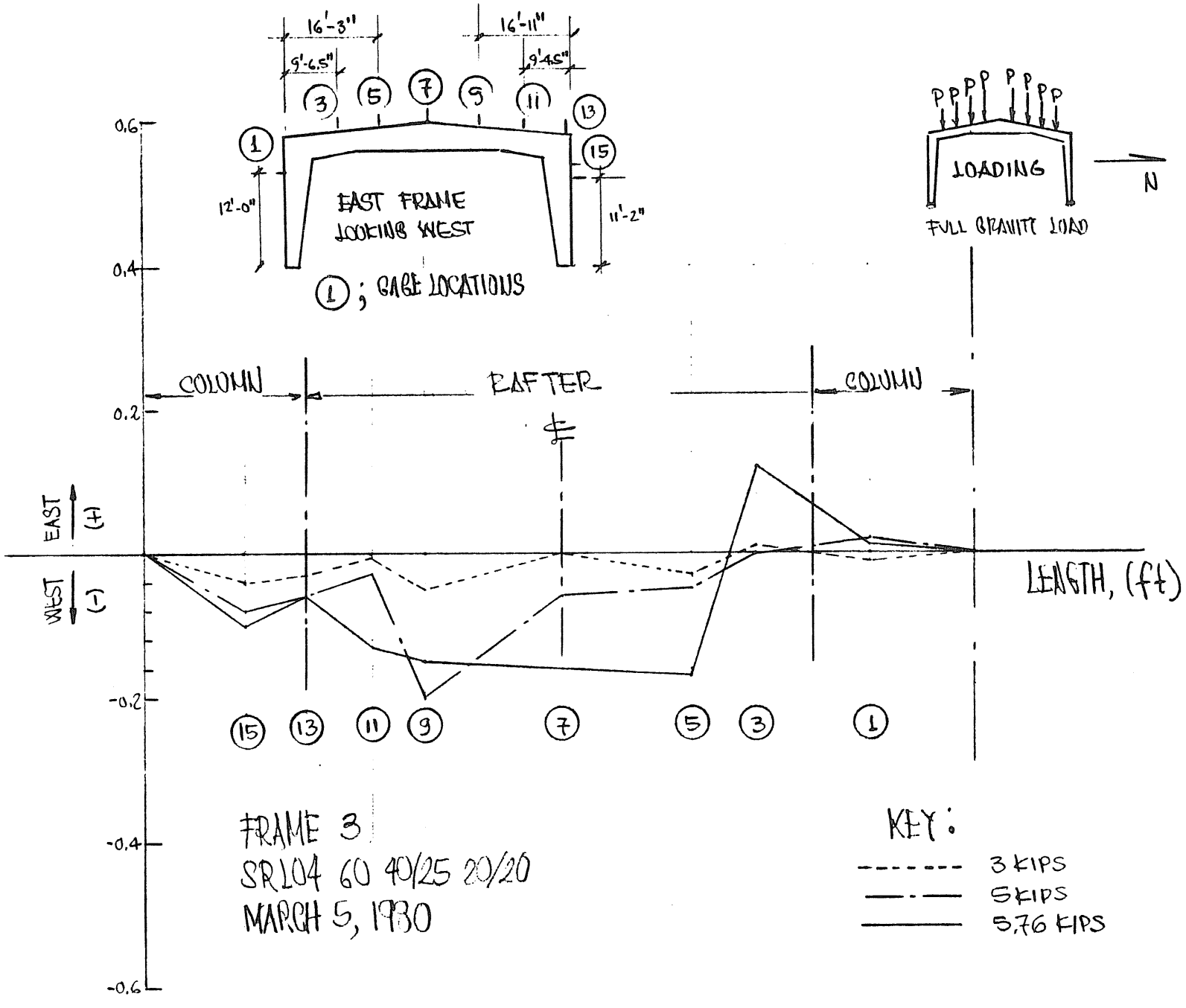


Figure H.2 Load vs. Lateral Deflection, Outside Flange

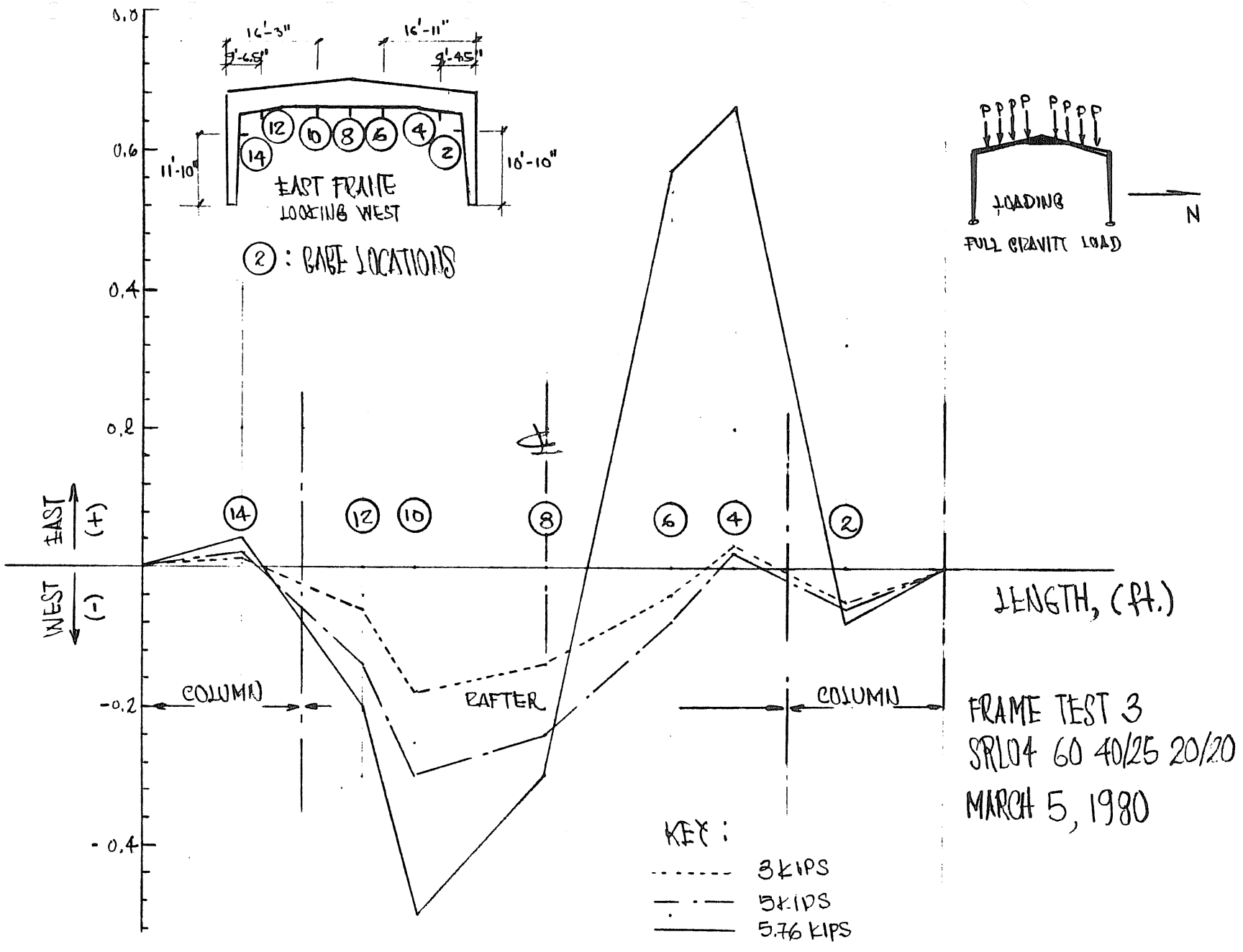


Figure H.3 Load vs. Lateral Deflection, Inside Flange

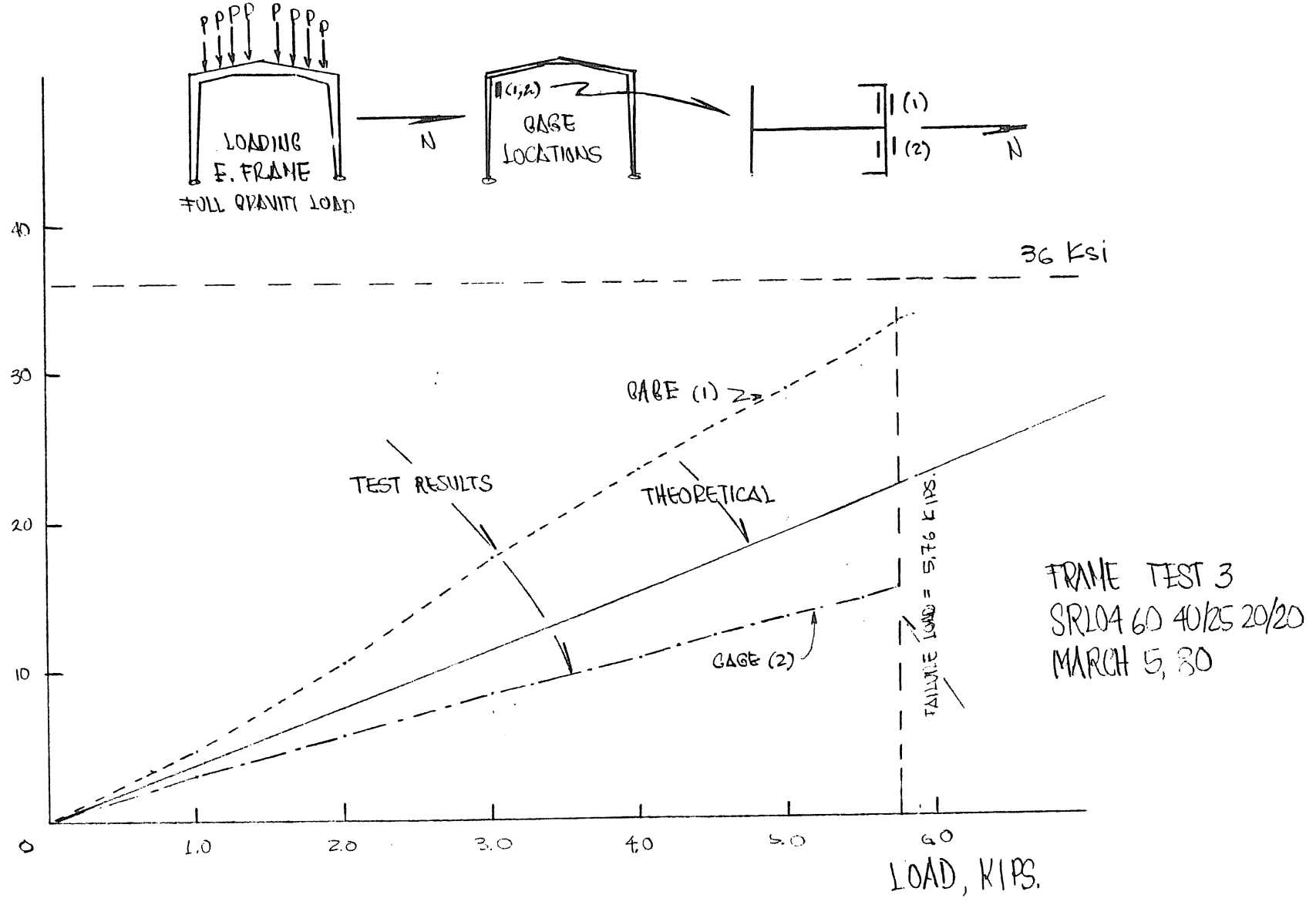


Figure H.4 Load vs. Stress, South Column at Knee

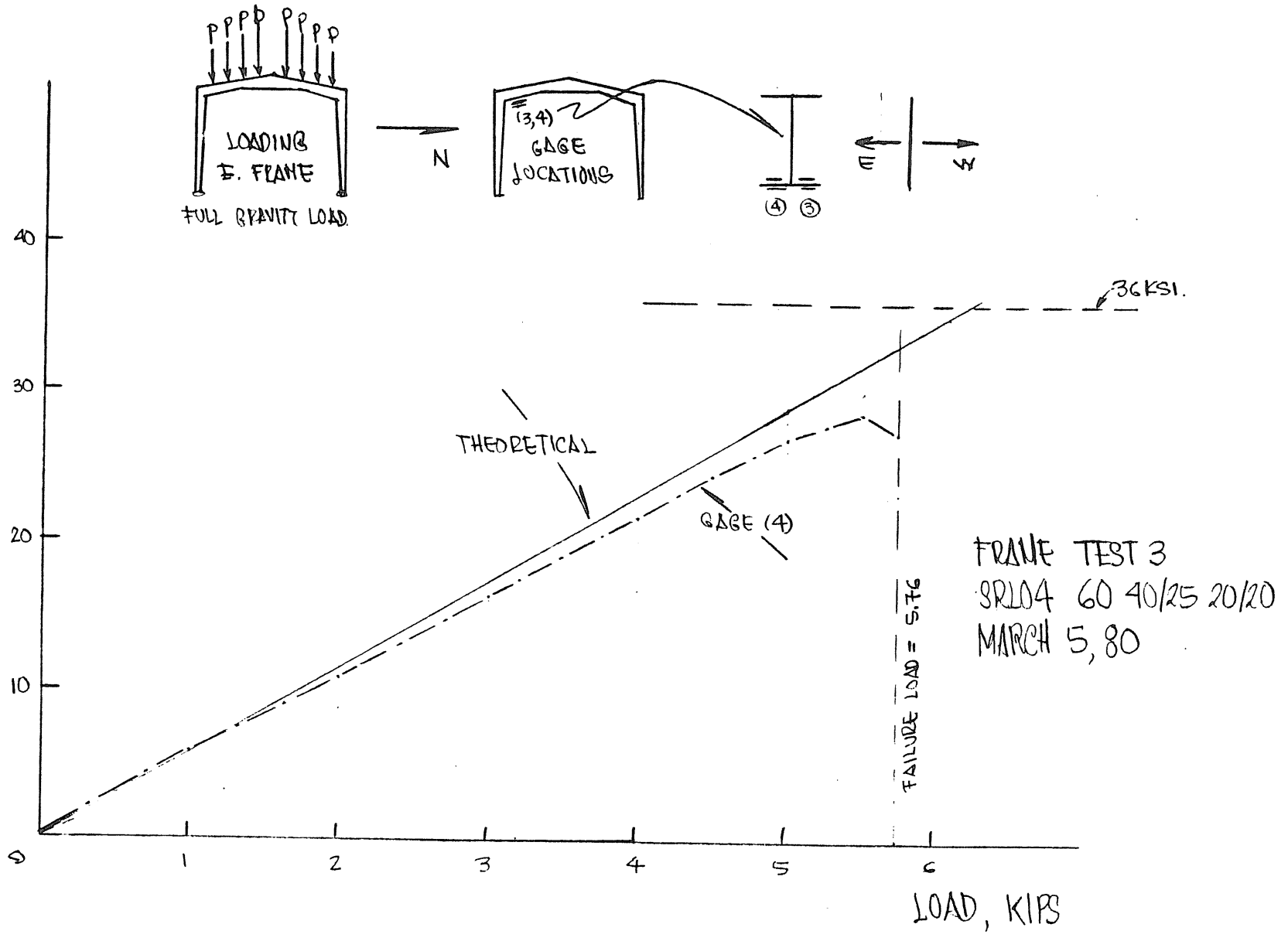


Figure H.5 Load vs. Stress, South Rafter at Knee

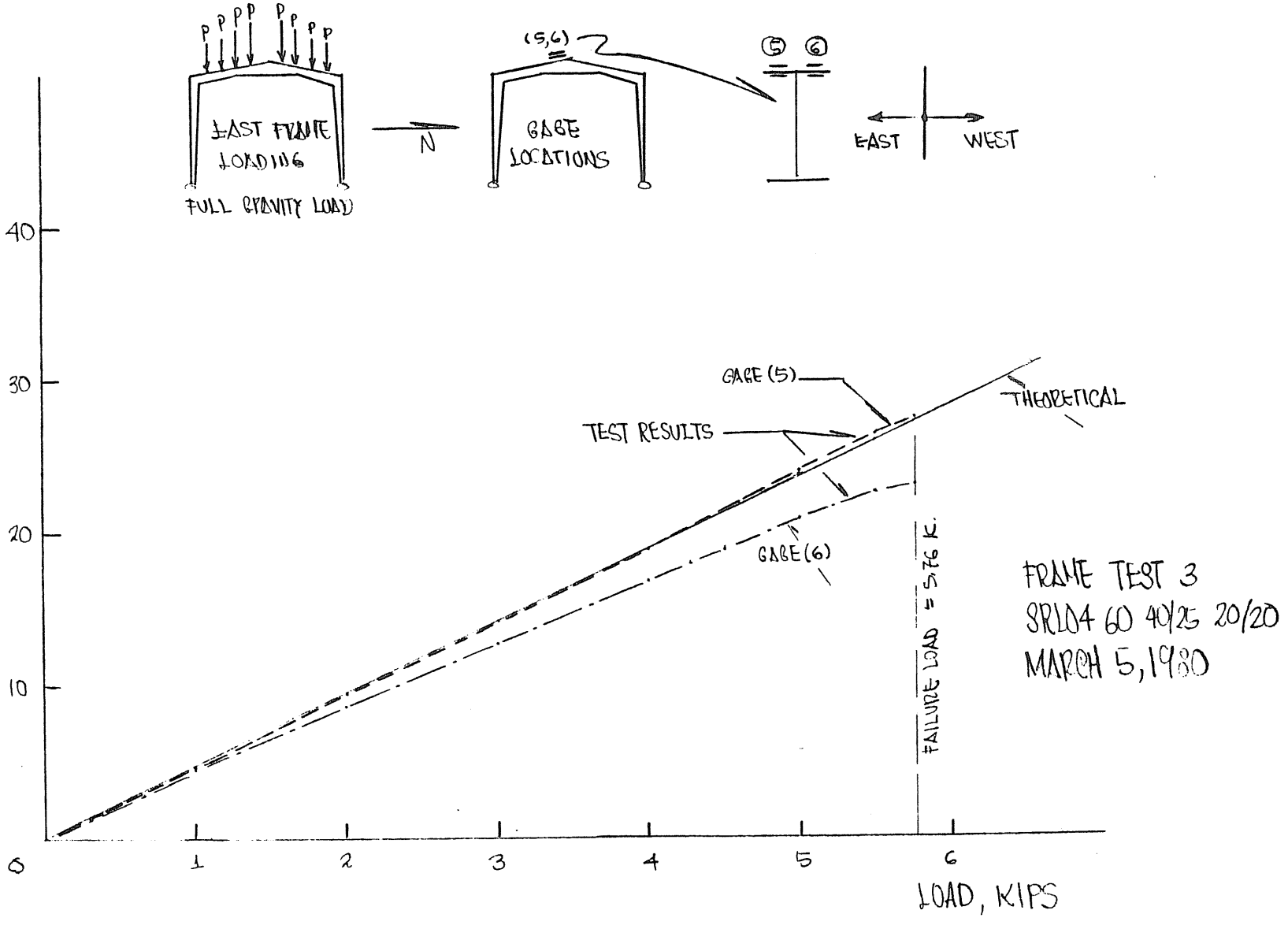


Figure H.6 Load vs. Stress, South Rafter at Peak